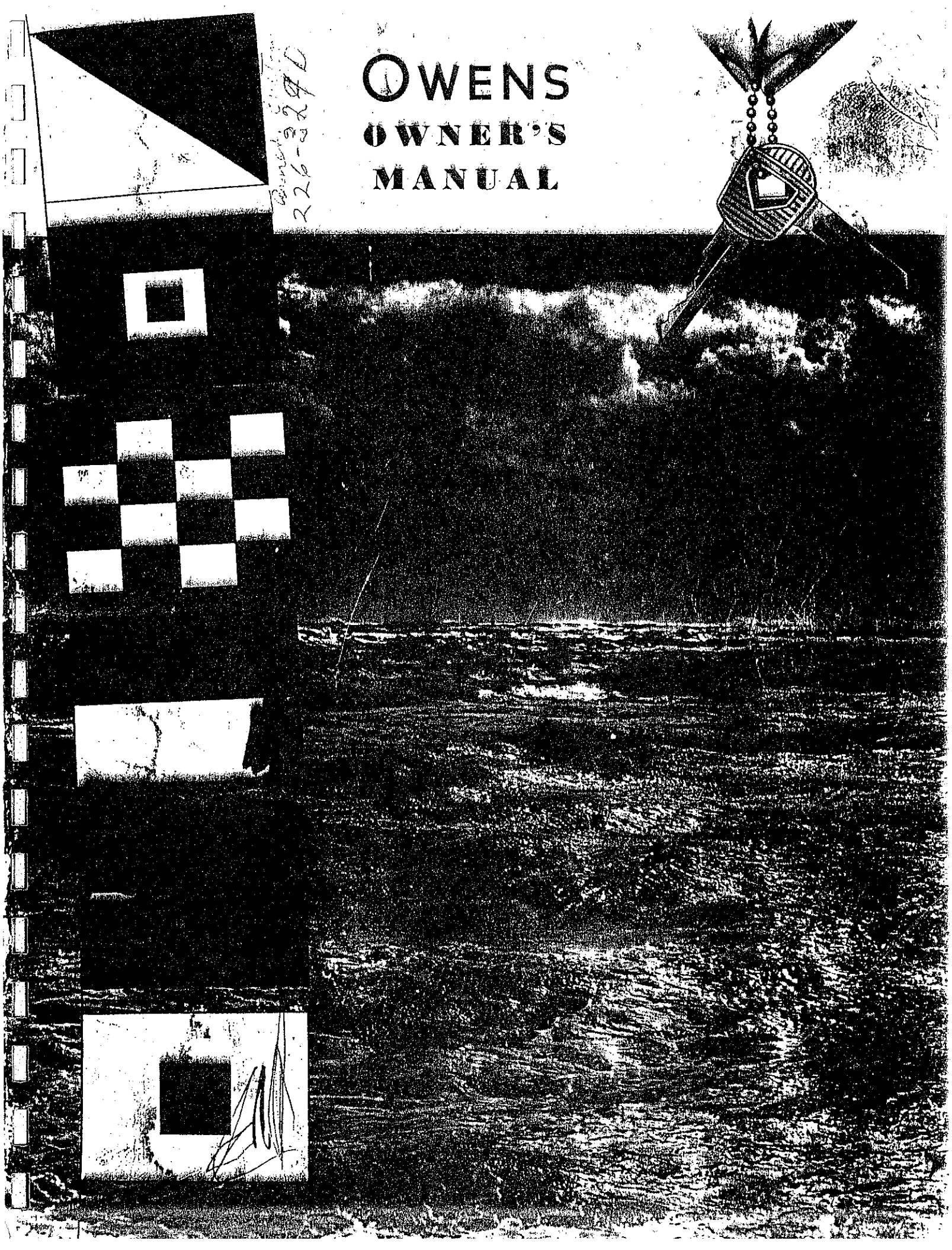
OWENS

OWNER'S MANUAL



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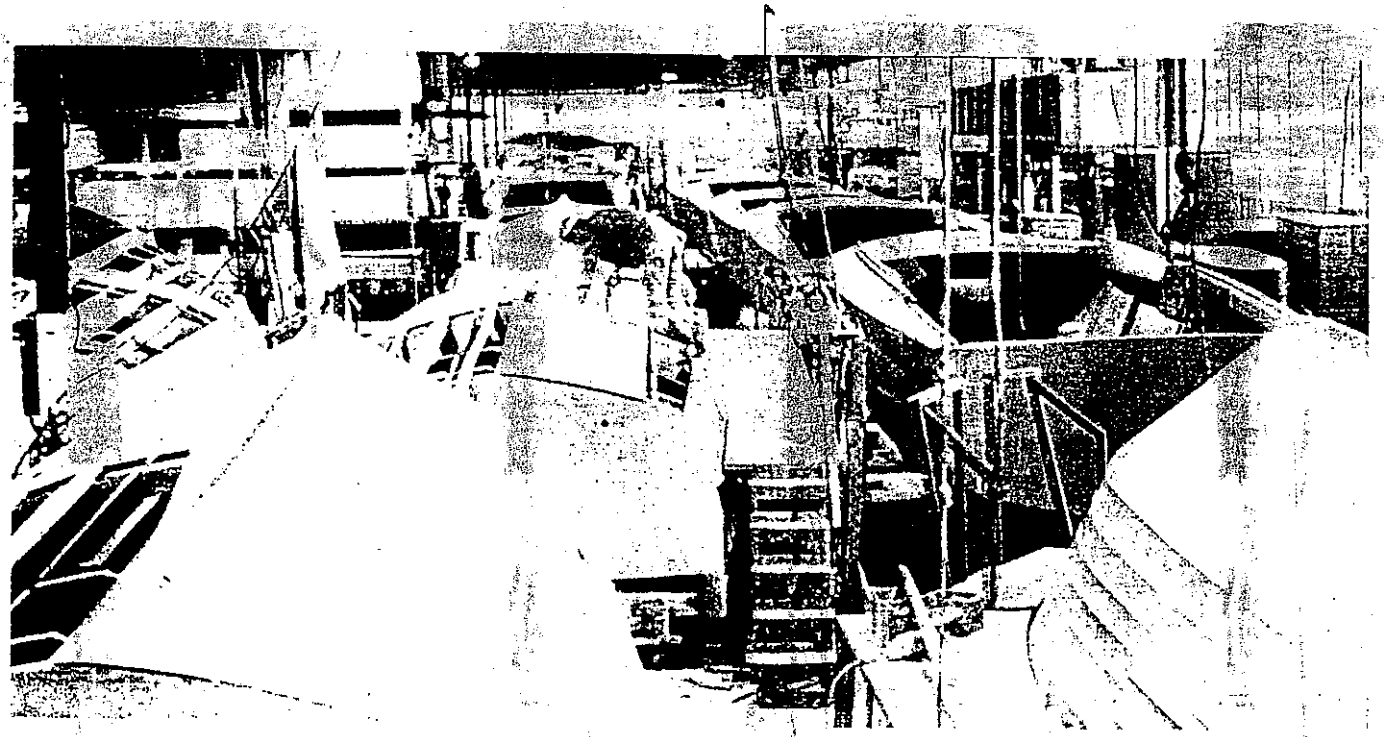
Specifications outlined in this manual are subject to change without notice.



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INTRODUCTION

And, there is more! The boat is sanded again, varnished again, painted twice more, and sent into the oven for the third time . . . to give it the high-gloss, yacht-like showroom finish normally found only on high priced craft.

Mahogany parts are then carefully wet sanded and the craft once more is given another coat of varnish.

All in all, the boat's bottom receives a sealer and two coats of bronze anti-fouling paint . . . the topsides receive a primer and four coats of paint . . . and the superstructure and the inside of the hull receive a filler, a sealer stain and three coats of varnish.

After painting and varnishing, Owens cruisers are moved into the "final stages area" where metal deck fittings and interior furnishings are installed. Once again, every installed item—inside and out—is the highest quality and designed to add to the boating pleasure of the buyer. Marine hardware and fittings are of the highest quality manganese bronze, Tobin bronze, copper bronze and stainless steel.

As the boat progresses to the end of the assembly line, it undergoes many stages of inspection, including final inspection, before it is ready for shipment to the Owens dealer. This entire process is unhurried. Owens takes the time to build a better inboard cruiser to give the public its money's worth in value, performance and pleasure.

Inspect any Owens cruiser and you will see how Owens engineers have improved hull shapes and construction methods to properly "mate" the engine to the hull. The result is a more powerful, scientific hull-engine assembly for greater efficiency and performance.

Read this OWNER'S MANUAL carefully. The information and suggestions you find here will help you immeasureably to get the maximum performance and enjoyment from your Owens. If these instructions are followed carefully, you will be assured of years of dependable operation and satisfaction.

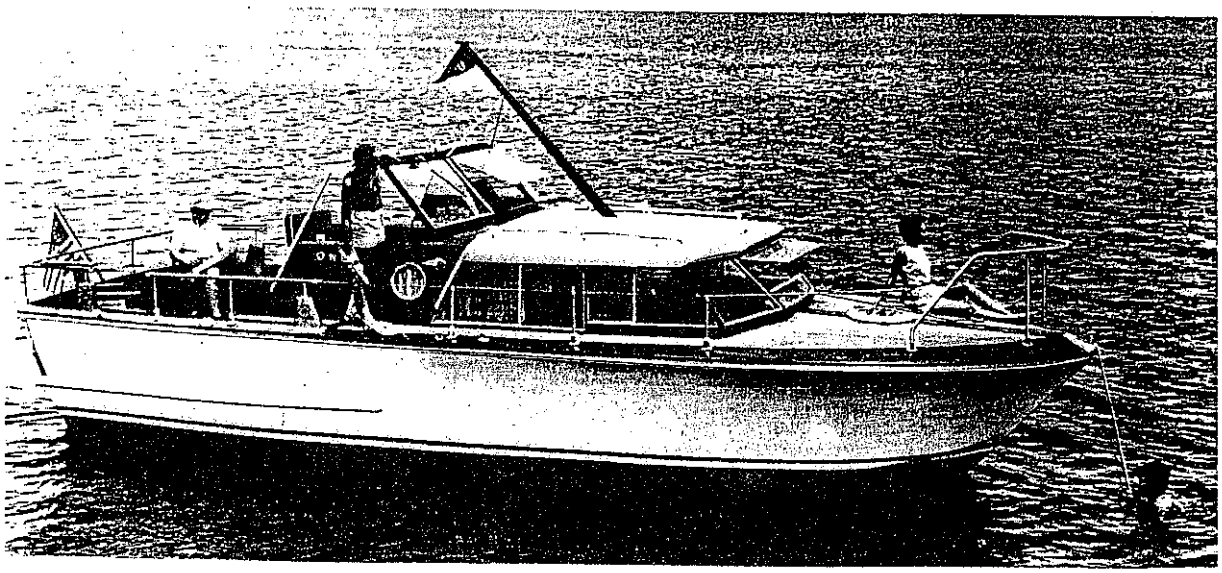
For extensive repairs or overhaul, it is suggested that you contact your authorized Owens dealer. He has the experience, personnel and equipment to service you promptly, efficiently and economically.

If you should find it necessary to communicate with the factory, be sure to furnish all pertinent data concerning your Owens inboard cruiser — Model—size—serial number—date of purchase and dealer's name. Address all inquiries to Owens Division, Brunswick Corporation, Baltimore 22, Md.

AN OWENS INBOARD CRUISER IS YOUR BEST DOLLARS AND CENTS INVESTMENT.

OWENS CRUISERS ARE BUILT TO LAST. THE 35' OWENS YACHT SHOWN BELOW HAS BEEN PROPERLY MAINTAINED OVER THE YEARS AND LOOKS AS GOOD TODAY AS WHEN NEW.

THE OWENS DIVISION OF BRUNSWICK CORPORATION HAS DEVOTED ITS CRAFTSMANSHIP AND ENGINEERING SKILL TOWARD PROVIDING YOU WITH A QUALITY BOAT THAT WILL RETAIN ITS VALUE AND BE WORTH MORE WHEN YOU TRADE IT IN ON A NEW MODEL.



OPERATING INSTRUCTIONS

ON-DELIVERY CHECK

Your Owens Inboard Cruiser has been thoroughly inspected and performance tested at the factory. Your dealer will go over it carefully, cleaning up any dirt accumulated in transit, unpacking the equipment, touching up the paint work and generally getting your Owens shipshape for you.

To insure that all items of both standard and extra equipment are aboard your boat at the time of delivery, a careful, itemized check should be made with your dealer. The dealer will have already made an inspection of your cruiser to insure that everything is in perfect condition and ready for the initial run. At this time you should thoroughly acquaint yourself with all controls, switches and instruments. Your dealer will be glad to instruct and assist you in becoming familiar with their operation. Carry out the following checks:

Before launching the cruiser:

1. check presence and tightness of all drain plugs.
2. inspect and close all engine drains.

After launching:

1. check all electrical installations, tighten loose connections.
2. fill the fresh-water tanks.
3. check all water connections for leaks.
4. check tightness of all fuel lines and fittings.
5. fill fuel tanks and check for leaks. Check all fuel tank vents.
6. check that engine oil is at correct level. Start engines and check operation of all instruments.
7. check water circulation by noting flow from exhausts.
8. operate engines for brief period in both forward and reverse position. Run boat at open throttle briefly and make carburetor and spark adjustments for best performance.

DEALER SERVICE LIST

Below is a list of pre-delivery boat work Owens Dealers will perform without charge for new purchasers:

1. Wash down and clean inside and out.
2. Fill water tank, test all faucets, toilet, sink, etc.
3. Fill stove, test, and explain operation.
4. Fill gasoline tanks (cost of gasoline extra), and explain all safety recommendations.
5. Inspect for leaks caused by shipping.
6. Inspect all thru-hull fittings (exhaust, toilet, sink, pumps, etc.) and underwater bolts (strut, rudder, propeller).
7. Check battery, add acid and charge.
8. Start engines. Run slowly. Check all instruments and gauges.
9. Adjust reverse gear and forward gear after 20 hours.
10. Adjust engine leg shims for engine alignment after 20 hours.
11. Change engine oil (cost of oil extra) after 25 hours.
12. Tighten engine head bolts and manifold and Rams Horn muffler bolts after 15 hours.

ENGINE REVOLUTIONS/CRUISER SPEED RELATIONSHIP

A very definite relationship exists between engine rpm and speed and the tabulation which records this relationship is known as a "Speed Curve" or "RPM vs MPH Table". The table is computed by actually running the cruiser over a measured course at various rpm and carefully noting the time involved.

Factors such as wind, current and sea, of course, affect this computation, and allowances must be made in analyzing such data. However, a speed curve computed as follows will be found indispensable if you do any cruising or navigating:

- choose a calm day.
- select an even mile for your course, along a breakwall or between buoys or other objects shown on government charts.
- run both with and against the current and average the two speeds.
- have your cruiser carrying a normal equipment and passenger load, with water and gasoline tanks half full.
- ensure that your propeller and other underwater equipment is in perfect condition.

In using your Speed Curve remember that you are measuring your cruiser's speed through the water, not over the bottom. Going down-stream your speed over the bottom is boat speed plus speed of current. Going upstream, it is boat speed less speed of current. When a boat goes into a heavy head sea, the waves tend to hold it back when they hit. The correction necessary to allow for varying conditions of wind, sea and current can be learned only by experience with a particular boat.

The "catalog" or advertised speed of the cruiser is the average speed attained near the factory over a measured course, under favorable conditions with a new cruiser, and is not guaranteed. A normal loss of speed can be expected after the cruiser has been in the water for some time, but the speed is affected also by the circumstances under which the cruiser is used.

OPERATING INSTRUCTIONS

FACTORS AFFECTING PERFORMANCE

In estimating the speed loss, the following contributing factors must be given consideration:

1. Atmospheric Conditions:

An engine will develop more horsepower in the early spring and late fall than it will during the middle of summer. Tests have shown this variation to be from five to ten percent. Therefore, it is reasonable to assume that his loss of power will be reflected in loss of cruiser speed during the summer when both the air and engine cooling water is very warm. This loss must be taken into consideration when comparing the speed of a cruiser which has been tested at the factory and then shipped to southern waters.

2. Tachometer Errors:

The tachometer may indicate a loss of revolutions, while in realtiy the motor is producing its full rpm. This error in the tachometer may be caused by a variation in temperature which greatly influences this instrument.

Tests conducted by the manufacturers have shown a temporary variation of as much as 100 to 200 revolutions indicated on the tachometer, the error varying or disappearing when the temperature changes. This indicates that it is misleading for an owner to form a quick judgment on any particular part of the engine or cruiser itself, as outside factors may appear to indicate that something is wrong when in reality both the boat and engine are performing perfectly.

3. Loading:

Carrying of personal equipment and extra accessories can be a cause of speed losses. The cause of a loss of speed when several passengers are on board is obvious, but sometimes an owner loads a cruiser with supplies, personal equipment, and many accessories without taking into consideration the resulting effect on the cruiser's performance.

4. Marine Growth:

If the cruiser speed is to be maintained, the bottom of the hull must be kept reasonably free from marine growth and moss.

5. Water in Bilge:

This is dependent to some extent on the conditions under which the cruiser is used. When running in a heavy sea, considerable water may come over the deck into the stern cockpit. Since fifty gallons of water weighs over four hundred pounds it is essential to keep the bilge pumped dry if the best possible performance is desired.

6. Damaged Underwater Equipment:

Vibrations and loss of speed can result from a damaged propeller, propeller shaft or strut. Badly corroded zinc collars or zinc collars installed out of balance can cause vibration.

7. Engine Efficiency:

To maintain maximum speed, the engine must develop its maximum power. With normal care and proper lubrication carried out in accordance with the manufacturer's recommendations the engine will require very little attention. Remember, however, that the engine is the 'heart' of the cruiser, and the performance is dependent on the care given to the engine.

In general, ordinary maintenance consists of proper lubrication, periodic valve tappet adjustment, seasonal valve grinding, maintenance and cleaning of gasoline lines and carburetor, periodical adjustment and cleaning of the spark plugs and distributor points, and spark timing.

OPERATING THE HEAD

Before using the head, the seacocks and inlet valve should be opened, and some water pumped into the bowl. After use, the pump should be operated until the bowl is clean. When in rough seas or when the boat is left overnight, the inlet valve should be closed.

If the pump is hard to operate, check that the seascocks and inlet valve are open. Other causes may be a dry piston rod or a jammed pump.

OPERATING THE STOVE

The stove in the galley is designed to burn alcohol fuel. The fuel tank should not be overfilled.

The lighting procedure is as follows:

1. Check that the burner valves are closed.
2. Operate the pump about ten full strokes.
3. Open one burner valve until approximately two teaspoonfuls of fuel flow into the preheating tray, then close the valve.
4. Repeat (3) for the other burner if required.
5. Light the fuel and allow it to burn out.
6. As soon as the fuel burns out, slowly open the burner valve and light the burner immediately.
7. Allow the burner to operate on a low flame for a few minutes before turning it up.

If the flame is yellow or if it sputters when turned up, it should be turned down again for several minutes.

If the stove roars, pressure is too high and the flame should be turned lower until the excess pressure dissipates.

To turn the stove off, close the burner valves and then release the pressure from the tank by loosening, but not removing, the cap.

12-VOLT D. C. REFRIGERATION

For detailed information concerning your electric refrigeration you should read the instruction pamphlets which are included in the refrigerator. Twelve-volt electric refrigeration requires about 12 amps of current during the time that the refrigerator is operating. This means that a normal battery will be fully discharged in about four hours running time. The four-battery pack normally supplied with these refrigerators would run the refrigerator about sixteen hours if all of the batteries were fully charged when the refrigerator was started. In any case, it is unwise to operate the refrigeration from the batteries alone without the use of a battery charger such as our Powermate or without operating the engines to supply power from the engine alternators.

Every amp of current used by your refrigerator must be supplied by the battery charger or by the engine alternators. The batteries merely store this current until the refrigerator demands it.

If the battery voltage gets too low, the magnetic clutch which operates the refrigerator compressor will not be able to hold in during operation. This will result in a loud chattering, the only solution is to turn the refrigerator off until you have the batteries returned to a reasonable state of charge by the use of your Powermate or your engine alternators.

In case of other difficulties with your refrigeration, consult a reputable refrigeration mechanic.

OPERATING INSTRUCTIONS

OPERATIONAL TIPS

You will find driving an Owens cruiser is easier than driving an automobile when you have become familiar with the controls and the way a boat "slides". That a boat slides and moves with the tide or current and wind is the fact you want to remember. It may take you several days, but soon you'll have the tide or current and wind helping you, working with you, not against you. Rule number one is run your engine slowly. 500 revolutions when the engine is in gear will mean about 700 revolutions when you pull the lever into neutral.

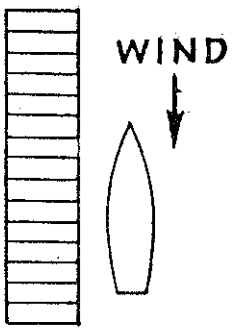
Feel out the neutral, forward and reverse positions even when your boat is tied to the dock. On your first trial run, after you leave the dock pull the lever into neutral as soon as you have room to maneuver and observe the "drift" or "head-way" you have. Try this at different speeds. Try this heading into the wind or current and try this when the wind or current is to your stern and try this at right angles to the wind or current. Next go thru some turning operations. Notice that it is the stern of the boat that "kicks" around, with either right or left rudder, when you put the lever in forward position. Still turning now pull the lever into neutral. Notice that the turning circle becomes wider. This is because the response, due to the area of a rudder on a power boat, is quickest and most effective when the propeller stream is directed against the rudder blade: i .e., when the reverse lever is in forward position.

Because of this you do not have to spin the steering wheel from right to left rudder even when making a 180° turn in a narrow channel. Turn all the way to the right and before the bow approaches the dock or goes out of the channel, pull the lever into reverse and back up about 3 boat lengths. Then push the lever into forward position and the stern will swing around even further on your course. Repeat this three or four times and you'll have made a 180° turn. A little trick is to speed the engine up when you are in the forward position, and to slow it down just before and while you are backing up. It is not necessary to spin the steering wheel from right to left when you are backing up in moderately smooth water. Reversing the position of the rudder will help you only when wind and current are against you and when you have about 5 boat lengths to the stern of you then only if you speed up the motor when you are in reverse.

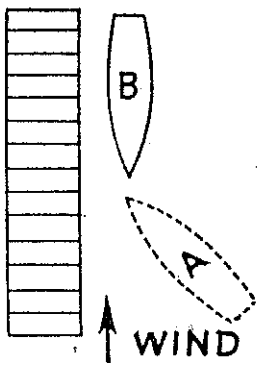
TURNING A TWIN SCREW BOAT

This requires a little more practice than turning the single screw. With the engine going slowly and when you are out in the open water, pull one clutch lever into reverse. Keep the steering wheel straight; then speed up both motors, with the motor that is going astern running a little faster; then notice the response of your boat. Vary the speed of the port and the starboard motors independently and observe the results. After getting the "feel" of reverse gear and throttle effects, then turn the rudder in the direction you wish to turn. The rudder will help, but you will observe that your boat's response will come mostly from the thrust of the propellers.

DOCKING

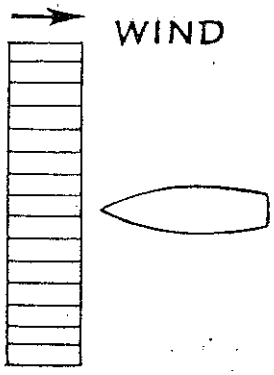


To leave a dock in this position, push out the bow and let the wind or current set the boat at 45° angle before pushing the lever into ahead position; otherwise if you were to immediately steer the boat to the right and go ahead, your boat's stern would bump all along the dock. It is even better to let the wind swing your bow away from the dock, and then to go ahead with a left rudder, before you turn to the right. Approaching a dock as shown, head up into the wind or current, and come in at about a 45° angle or less angle if the wind or current is strong. Reverse the boat just before touching the dock and (in an Owens Cruiser) the stern will swing to the left. Rule number one: Have your engine turning over slowly, not so slowly tho that in the case of a new motor it might stall.



If the wind or current were in this position, and you wished to dock as shown in position A, it would be better to head up into the wind and dock as shown by position B.

However, to land from position A requires the more practice; but if you have familiarized yourself with the "drift" of your boat under similar wind and current conditions, then you'll have no trouble. You should approach the dock at a 45° angle; take the motor out of gear, turn broadside to the dock stern slightly in. Reverse the engine to hold your position if necessary. The important thing to remember is to do this far enough away from the dock so that the drift of your boat, due to the strength of the wind or current, will set your boat gently up against the dock. It goes without saying, of course, that it is better to be too far away from the dock than too close.



This is one of the easiest docking conditions. Simply come straight in slowly and throw your bow line to a dock attendent. Give about ten feet of slack to bow line after it is made fast, and turn your rudder hard to the right, and "slip" the lever into head position. The boat's bow should then bear against the dock (use a fender if necessary) and the stern will swing to the left. You can then throw your stern line to the dock attendent.

ROUGH WATER

There are many handling tricks that smooth the ride in rough water: The first one is not to run broadside or parallel with the waves. If this should be your course and the seas are rough, it is better to slice into them at about a 45° angle, and then when you have gone a few miles, come back on your "destination mark" still holding a course 45° to the waves. This puts the sea on your stern quarter, and when steering in this position you do have to spin the wheel back and forth to keep the bow constantly on your course. The important thing to do on this course is to prevent the waves from turning the stern of your boat.

ROPES, ANCHOR AND LINES

New ropes can be made easy to handle by alternately wetting and drying in the sun. Be sure of the condition of your ropes. Untwist them and examine the inner strands. Propellers and ropes have an attraction for each other; and each one does the other no good. So don't let any ropes trail overboard. When you are towing a dingy and you have to back up, always shorten in on the tow rope so that it cannot reach the propeller. Be careful also when at anchor that you do not swing your boat's stern over your anchor line upon starting up.

When anchoring wait until the boat has stoppped moving, then lower the anchor. If you are using your heavier or "storm" anchor, rather than try to throw it over the side and perhaps get the anchor line fouled around the anchor, lower the anchor to the water's surface with the line tied to a bitt; take your time and get the anchor line neatly coiled so it will feed out. Then untie the anchor line from bitt, and stand back as anchor is dropped. When handling any anchor examine the knot at the anchor, and have the end of the inboard anchorline made fast. The longer the anchor line you have out, the better you hold. Be sure, though, to allow for a 360° swing.

CHARTS AND PILOT RULES

The experienced boatman "goes by his charts.' They show depths, buoys, shoal spots sometimes in the middle of a body of water, range lights, red and white sectors of lights, descriptions of different kinds of fixed and flashing lights. They keep you straight, and keep you interested. They let you plot your course. They let you plan your destination arrival time. So get the charts you need. Pilot rules or rules of the road you should know by heart. A little rhyme you should remember is: "Red (marker) to starboard, into a harbor." This means leave the red buoy to your right hand side, or pass to the left of it, when going into a harbor. When going out of a harbor you leave the red buoy on the opposite side.

An easy way to remember port from starboard is:

Port . . . . 4 letters	Starboard . 9 letters
Left . . . . 4 letters	Right . . . 5 letters
Red . . . . 3 letters	Green . . . 5 letters

All the words with less letters refer to the port side.

SAFETY INSTRUCTIONS

Complete information and instructions on the starting, operation and maintenance of your Flagship Marine Engine is contained in the engine section of this manual. Consult this section for all general information.

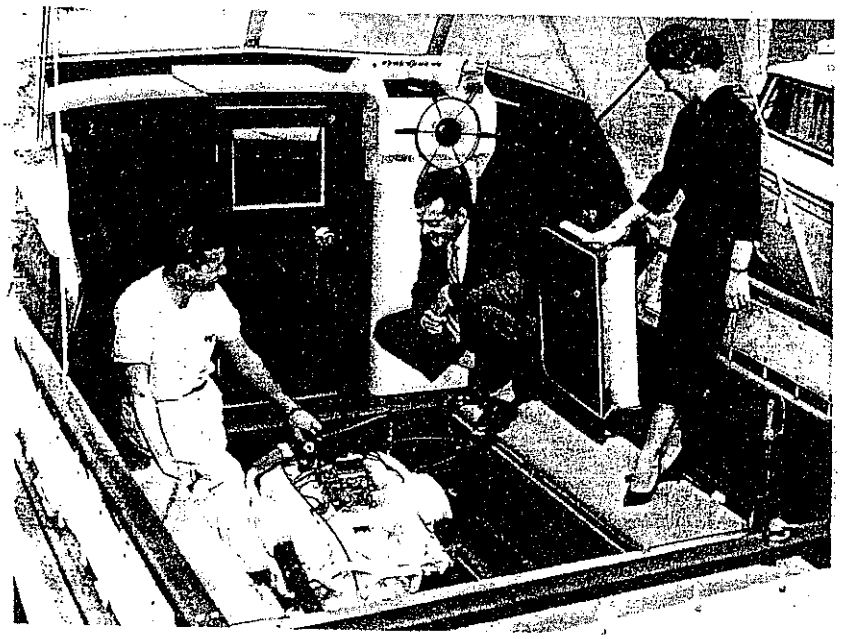
FUELING SAFETY

1. Check fuel tank, fill pipe, vent pipe and fuel lines for damage or loose fittings.
2. Fueling should never be undertaken at night except under well lighted conditions.
3. Whenever the boat is moored at service station for fueling:
   - A—Do not smoke, strike matches or throw switches.
   - B—Stop all engines, motors, fans and devices liable to produce sparks.
   - C—Put out all lights and galley fires.
4. Before starting to fuel:
   - A—See that boat is moored securely.
   - B—Close all ports, windows, doors and hatches.
   - C—Ascertain definitely how much additional fuel the tanks will hold.
5. During fueling:
   - A—Keep nozzle of hose, or can, in contact with fill opening to guard against possible static spark.
   - B—See that no fuel spills get into hull or bilges.
6. After fueling is completed:
   - A—Close fill openings.
   - B—Wipe up ALL spilled fuel.
   - C—Open all ports, windows, doors and hatches.
   - D—Permit boat to ventilate for at least 5 minutes.
   - E—See that there is no order of gasoline in the engineroom or below decks before starting machinery or lighting fire.

LIGHTING OFF & SECURING MAIN ENGINES

Follow the ABC's of SAFETY each time you start the engine.

1. Check engine oil with dip stick.
2. Check reverse gear oil with dip stick.
3. Open valve on cooling water intake; handle up and down is open.
4. Turn on fuel valve; handle parallel to pipe is open.
5. Check engine mounts and other fastenings.
6. RUN BILGE BLOWER OR OPEN ENGINE HATCH AT LEAST 5 MINUTES TO VENTILATE BILGE. CHECK ENGINE COMPARTMENT FOR FUMES BEFORE STARTING ENGINE.
7. PUT SHIFT LEVER IN NEUTRAL POSITION.
8. ADVANCE THROTTLE TO FAST IDLE POSITION.
9. TURN ON IGNITION.
10. ENERGIZE STARTER.
11. Pump bilge—check for signs of leaking fuel or water.
12. Check oil pressure indicator or gauge.
13. Check for cooling water discharge from exhaust.



MAINTENANCE INSTRUCTIONS

DAILY

Ventilate engine compartment thoroughly before starting engine.

Check for and stop possible leaks of fuel, oil or water.

Give grease cup on water pump one-half turn. Always use waterproof grease. Do not over-grease.

Check the lubricating oil level in crankcase (engine not running), when necessary add sufficient SAE 20 oil of Heavy Duty quality to bring level to full mark on depth gauge. (Manual type reverse gear lubrication is integral with engine lubrication and therefore does not have a separate oil supply.)

Check oil level in Hydraulic reverse gear if your engine is so equipped.

NOTE: If oil is needed to bring level to full mark on gauge, add type "A" automatic transmission fluid. Look for a leak because Hydraulic reverse gears normally consume no oil.

Remove any accumulated bilge water.

Each time engine is started, check for water circulation by observing outlet fitting in transom. Proper water circulation is indicated by water being discharged along with exhaust gases.

Check for ample supply of fuel.

AFTER 50 HOURS OF OPERATION

Lubricate and service as specified under "Daily" and perform the following operations:

Check propeller shaft stuffing box for leaking.

Check water level in battery. Maintain water level at approximaely $\frac{3}{8}$" above top of plates.

Remove oil from crankcase and Manual reverse gear, using hand sump pump. Replace full-flow engine oil filter element. Refill to full mark on oil depth gauge, plus one quart for filter element, with Heavy Duty quality SAE 20 engine oil.

NOTE: Before removing old oil, run engine until the oil is thoroughly warm.

Fill oil cup on side of distributor housing with light engine oil. Apply one drop of light engine oil on breaker arm pivot levers.

On engines equipped with Auto-Lite starter, put a few drops of light engine oil in each oil cup.

Lubricate each joint of reverse gear control linkage with a few drops of engine oil.

If possible, inspect water intake scoop to see that inlet slots are not obstructed.

ONCE A MONTH

Have the following done:

Clean fuel filter sediment bowl.

Clean screen in electric fuel pump if engine is so equipped.

Inspect flame arrestor to make sure that air passages are open and free from oil and lint. If dirty, remove flame arrestor elements and wash in kerosene. Blow out elements with compressed air if available, before re-installing.

Check adjustment of clutch and reverse gear if it is the Manual type. (Hydraulic type gear does not require adjustment.)

EVERY 150 HOURS

On engines equipped with Hydraulic reverse gear, change oil in Hydraulic clutch. Refill with a good quality to the full mark on the depth gauge.

Lubricate Tachometer drive.

Remove distributor rotor and apply 3 to 5 drops of light engine oil (SAE 10) to the felt in the top of the breaker cam.

TWICE A SEASON

Clean engine thoroughly, paint any rust spots.

Check engine coupling for misalignment. Tighten engine mounting lag bolts.

Check carburetor idle adjustments.

Check valve tappet adjustment.

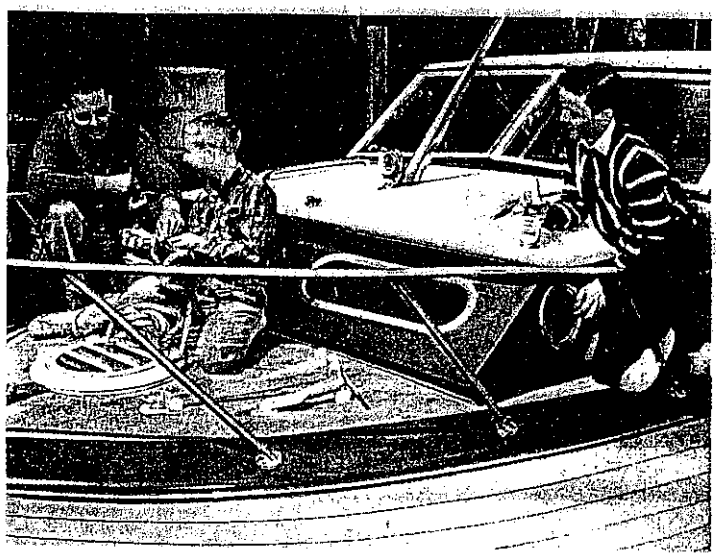
Inspect all wiring. Clean battery terminals.

Check spark plugs.

Clean and adjust breaker points on distributor.

Apply a light film of high temperature grease to the breaker cam to lubricate point bumper blocks.

Check and re-set ignition timing.



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MAINTENANCE INSTRUCTIONS

EVERY 1000 HOURS OR ONCE A SEASON

Check cylinder compression pressure. If compression is uneven between cylinders or weak, look for imperfectly seating valves or rings stuck in grooves on pistons.

EVERY 2500 HOURS

Time for major overhaul.

Install new piston rings. Check piston clearance.

If oil pressure has been below normal, this is an indication of worn bearings. Replace bearing inserts.

BOAT MAINTENANCE — ONCE A YEAR

Haul boat out and carefully inspect bottom.

Wash with strong soap solution.

Refill all indentions and scrape off excess.

Repaint, using anti-fouling paint, just before launching.

Check strut, strut bolts, rudder post and bolts, shaft log and bolts.

Check all through hull connections.

Inspect all underwater bronze parts.

Pull shaft and inspect for wear.

Check propellers for nicks, bends, balance, etc.

Check entire steering mechanism from wheel through to rudder for wear, lost motion, worn pins, missing cotter pins, etc.

Check electrical connections throughout boat.

VENTILATION

It is most important that the cabins in the cruiser be properly ventilated at all times. If a cabin is closed up tightly for a week or more without adequate air circulation, the interior will become damp and musty. Abnormal swelling of locker doors and drawers will occur together with mildewing of clothes and equipment. Normal expansion of doors and drawers is allowed for during manufacture but if the cruiser is operated in unusually humid conditions, additional dressing down may be required.

REPLACING SACRIFICIAL ANODES (ZINCS)

To assist in the prevention of galvanic corrosion, zinc sacrificial anodes may be attached to each side of the rudders and shaft struts, and to each propeller shaft.

They should be checked periodically and replaced when eroded to the extent that their effectiveness is dubious. Do not paint the surfaces of the zinc anodes.

LAYING UP

When laying up the Cruiser for winter storage it is very important that a few simple rules be followed in preparing the supporting timbers and properly draining the engine cooling system.

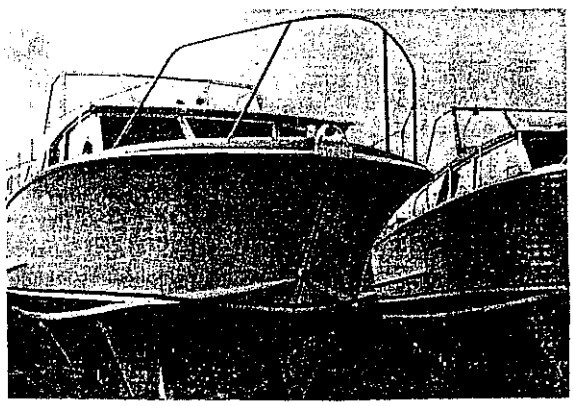
The following should be performed:

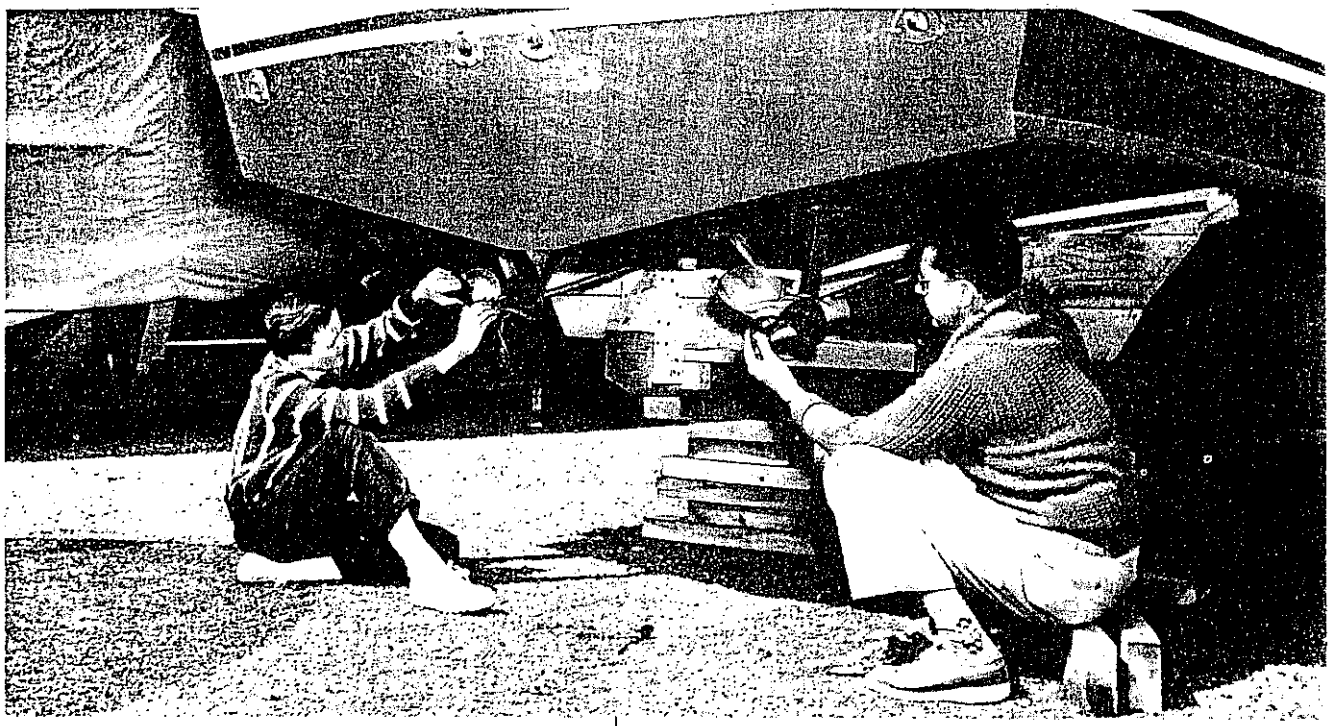
a) Preparing the Engine:

1) Run the engine until it is completely warmed up. Then remove the old oil from the crankcase and replace with new SAE 30. Fill slightly over the full mark shown on the oil depth stick.

2) Oil the engine internally to prevent rust. This is easily accomplished by starting the engine and running it until it is completely warmed up, then gradually pouring one quart of the best lubricating oil into the carburetor air intake chamber. The lubricating oil will be sucked through the carburetor with the gasoline-vapors and enter into the cylinders through the intake manifold, covering all moving parts with a thin coat of lubricating oil. A heavy discharge of smoke from the exhaust pipe will indicate that the oil has reached the cylinders and valves.

3) Thoroughly drain the water from the engine cooling system.





b) Preparing the Hull:

As soon as the cruiser is hauled from the water it is very important that it be thoroughly washed and cleaned of all marine growth and barnacles. If this is done when it is removed from the water, while the marine growth and barnacles are soft, they are cleaned off more easily than if allowed to remain on the cruiser until they dry and become hard. A coat of bottom paint should be applied before storing the boat, making sure the bottom is thoroughly dry before the paint is put on. The bowl, pump, and discharge lines of the head should be flushed with fresh water and pumped overboard several times. If the boat has been used in salt water, fresh water should be left in the bowl for several days to dissolve the salt. It should then be pumped dry and the base plug removed. Vaseline should be applied to the pump piston rod.

c) Draining the Water System:

The water system should be drained by opening faucets until the tanks are pumped dry. Drain the water tanks by disconnecting the lines at the tank.

It is preferable to remove the automatic pressure pump and store it in a warm dry place if freezing conditions are likely to be encountered. If this cannot be done, drain the pump by removing the plug in the pump casing.

d) Batteries:

Batteries should be removed and stored in a battery service station where they can be charged periodically to keep them from running down and deteriorating during the storage season.

e) Ventilation:

If the cruiser is stored in a building, a hatch or cabin window should be left open to allow the circulation of air through the cruiser and prevent the accumulation of excessive moisture. If the cruiser is covered with a canvas cover out of doors, the covering should be placed on a framework over the boat so that ample air circulation is provided around it. All hatches, drawers, clothes lockers, cabinets and doors should be partially opened to allow free air circulation. Upholstery and portable equipment should be removed and stored in a safe, clean, dry place. Chrome-plated and stainless steel trim should be given a protective coat of grease.

HOW TO CARE FOR THE FINISH

BRIGHT WORK

The bright work on your cabin, trim and deck has been finished with a polyurethane varnish which is one of the most durable water resisting spar varnishes available. During the first season's operation of a new boat, the finish is subjected to the severest kind of stresses. The wood undergoes a dimensional change as the moisture content of the wood tends to adjust itself to a constant value. For this reason, **it is extremely desirable to recoat the bright work after the boat has been in service for two to three months.** By doing this the life of the entire finish will be greatly extended.

The following Regatta varnishes are compatible with the production finish used on Owens Cruisers:

Regatta Spar Varnish

Regatta Quick Drying Super Spar Varnish

Regatta Polythane Spar Varnish

The bright work on your Owens Cruisers may have been protected during transit with silicone polish. All vestiges of this polish should be removed by washing with Regatta thinners prior to the application of any varnish. The surface should also be sanded sufficiently to dull the gloss before varnishing.

Apply one coat of the Regatta varnish selected. Flow the varnish on with a minimum of brushing.

It is well to keep a small can of varnish on board the boat, and in the event the bright work is scuffed or scratched, touch up the damaged section as soon as possible to avoid allowing water to get to the wood. This will prevent darkening of the wood and rotting, which can take place in a surprisingly short time on unprotected mahogany.

During subsequent seasonal fitting out periods, it will only be necessary to sand the bright work and apply one or two coats of varnish.

Should it ever be necessary to completely remove the bright work finish, this may be done with Regatta Paint & Varnish Remover and the surface should then be refinished according to the following directions: first wash the entire surface of the wood with mineral spirits to remove any slight residue from the paint remover. Then apply one coat of Owens Mahogany Wood Filler. This material is furnished in a paste form and should be thinned to a brushing consistency with mineral spirits. It should be brushed on in the direction of the grain to force the filler into the pores of the wood. It is best to do relatively small sections of the boat at a time. When this is dry, apply one coat of sealer such as #3806 Quick Drying Clear Plywood Sealer. After an overnight dry, this should be sanded lightly. This should be followed by two coats of varnish such as Regatta Spar Varnish, allowing an overnight dry between coats and wet sanding the first coat.

At subsequent fitting out periods, sand the bottom to remove any decomposed powdery material and apply two coats of either finish.

HULL FINISHES

The hull of your Owens Cruiser has been carefully finished to a smooth satiny finish by many steps including sealing the wood, glazing the surface to fill the grain, surfacing it with several coats of undercoat and surfacing compound, and finally given a tough long lasting semi-gloss top coat. Normally, when it becomes necessary to refinish the hull it is only necessary to resurface any scratches or gouges with Regatta White Trowel Cement and then apply one coat of Regatta topside finish, either gloss or semi-gloss. If a change of color is desired, any of the poplar colors of Regatta Deck and Topside Paints may be applied in the same manner.

Owens Yachts are now being finished with Regatta SeaGlaze. SeaGlaze represents the most modern achievement in paint chemistry and is unequalled for durability and gloss retention. However, if a change in color is desired, the SeaGlaze finish may be recoated with any of the Regatta Topside Colors after a thorough sanding.

If at any time you have any particular problem relative to caring for the finish on your boat or completely refinishing it, do not hesitate to write or call the Technical Service Department of the Baltimore Copper Paint Company. Your questions will be answered cheerfully and promptly.

Consult Baltimore Copper Paint Company's price list for other Regatta products that will be very helpful in keeping your Owens Cruiser in first class shape. For example:

Spray enamels for engines.
Signal Metal Polish for brass and chrome.
Cabin Interior Finishes.
Sea Mist for fresher cabins, mildew resistance.
Compounds for caulking
Epoxydur Adhesive for repairs.

Obtain Regatta products from your Owens Dealer.

BOTTOM PROTECTION

The bottom of your Owens Cruiser is protected against both fresh and salt water fouling organisms by two coats of Regatta Copper Bronze or Rich Red. Normally this provides sufficient protection for one season's use. However, if your new boat has been out of water in transit or in a show room for more than two months, it is advisable to apply an additional coat prior to launching.

STUFFING BOXES

Propeller Shaft Stuffing Boxes:

Each propeller shaft stuffing box is attached to a shaft log by a flexible hose coupling which will allow up to .010" shaft misalignment without excessive wear of the stuffing box packing. The stuffing boxes should be inspected periodically.

A slight leak at a stuffing box is necessary to lubricate the packing. Do not overtighten the gland nut or the shaft may become scored.

Should a persistent leak develop after the cruiser has been in use for some time, it will be necessary to re-pack the stuffing box. Remove the old wind sufficient new packing around the shaft to practically fill the stuffing box. Tighten the gland nut and the lock nut. Should the propeller shaft stuffing box still show signs of leaking, it is suggested that you see your nearest dealer and have him investigate the trouble. It is possible that the shaft log or the engine is misaligned, or that the shaft has become scored or bent.

Rudder Post Stuffing Boxes:

This same procedure for checking leaks and repacking may be followed for the rudder stuffing boxes, although repacking will seldom be necessary.

PROPELLER SHAFT ALIGNMENT

The propeller shaft alignment was completely checked before your cruiser was shipped from the factory. However, it is recommended that a re-check of the alignment be made after two or three days' operation and periodically thereafter.

If you have run aground or struck a log hard enough to damage a propeller, the shaft alignment should be checked. The strut may have been sprung sufficiently to cause shaft misalignment or the shaft itself may have been sprung. If the adjustment required cannot be compensated for by the shims under the engine mountings, the strut and/or propeller shaft should be removed and straightened. A bent shaft cannot be properly aligned and will cause a loss of power, unnecessary noise and vibration.

A straight shaft properly aligned will require very little attention and adds greatly to the life of the strut bushing.

PROPELLER PERFORMANCE

There is probably no item of equipment which exerts more influence upon the speed and general performance of the cruiser as the propellers. For maximum efficiency they must be correct in both balance and pitch.

A sudden and otherwise unexplained drop in engine revolutions, a new and disturbing period of vibration, or a sudden loss of speed without cause, are usually definite symptoms of propeller disorders.

A propeller can be thrown out of pitch without the boat running aground. With a high-powered cruiser, a change in pitch can occur when making a sudden turn at high speed or bucking heavy seas. The sudden shocks imposed by these conditions on one or more blades can exceed their normal design limitations. The result can be a propeller blade which, although apparently undamaged, is sufficiently out of true pitch to cause vibration and a loss of engine speed.

Unfortunately, slight errors in propeller pitch can seldom be detected with the naked eye. Careful measurements with proper instruments are required to establish the degree of distortion.

Whether or not a distorted propeller can be effectively reconditioned depends largely upon the material from which it is made and the extent of the damage. In any event, propeller repair should be entrusted only to the original manufacturer or to specialist firms properly equipped for this type of work.

INSTALLING A PROPELLER

Ensure that the bore of the propeller is free from dirt and corrosion and that the tapered end of the propeller shaft is clean and smooth. The keyways in the bore and shaft must be free from any burrs which would prevent the propeller from seating tightly on the shaft.

Put the propeller on the shaft. Line up the keyway in the propeller bore with the keyway in the shaft. The key should fit snugly at the sides, be at least .010" clearance. If the key fits too tightly at this point and is driven in by force, the propeller will be forced off center. It will then be out of balance and cause serious vibration problems. Do not set the key on the shaft and slide the propeller over it as this can cause the key to ride up and wedge the propeller off-center.

With the key properly located, screw on the lock nuts, align the cotter pin holes and insert the cotter pin, spreading the ends to lock it in place.

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CHECK LIST FOR COMPLETE ENGINE TUNE-UP

- ☐ Test battery and cables; clean or replace if necessary.
- ☐ Complete check of starting system.
- ☐ FUEL PUMP — check fuel pump for correct pressures and fuel delivery.
- ☐ Compression check of all cylinders.
- ☐ CARBURETOR — clean and adjust — install new gaskets, needle and seat, and pump plunger each 1,000 hours. Longer service may indicate complete re-carburetion.
- ☐ FUEL FILTER — clean sediment bowl — service or replace filter element.
- ☐ Tighten manifold studs and inspect manifold heat control valve.
- ☐ Clean or replace spark plugs, depending on hours and condition; set electrode gap.
- ☐ Check all ignition wiring and cables for loose connections, resistance, wear and corrosion.
- ☐ Replace and align distributor points, check or replace condenser, test advance mechanisms and adjust came angle.
- ☐ Adjust idle mixture.
- ☐ Set engine timing to correspond with grade of fuel being used.
- ☐ Clean air cleaner and service or replace filter element as required.
- ☐ Complete check of charging system.
- ☐ Adjust generator belt, other drive belts where used.
- ☐ Lubricate distributor, generator and starter.
- ☐ Inspect exhaust system for corrosion or rust accumulation and check for excessive back pressure.
- ☐ Check cooling system for leaks, faulty connections and restrictions.

Hull # _____

Length _____

Engine: Port# _____

Starboard # _____

Date: _____

The following "MECHANICAL AND ELECTRICAL" check sheets were used by our Inspection Department during final inspection of your boat. It would be desirable for you to check your boat to this same check sheet when you take delivery of your new Owens.

ELECTRICAL CHECK LIST

Hull #_____ Length _____

Engine: Port # _____ Starboard # _____ Date: _____

Generator, Alternator & Regulator

		Satisfactory	Unsatisfactory
a)	Discharges when ignition is energized; light on. (If light stays off check bulb and see note on temperature indicator.)	☐	☐
b)	Charges when engine is revved, light off.	☐	☐
c)	No smoke, heat, noise or sparking detected.	☐	☐
d)	No charge or discharge after ignition de-energized.	☐	☐
e)	Regulator case secured to mounting block and grounded.	☐	☐

Temperature Indicator

a)	Meter moves to cold; light stays off when ignition is energized. (If light comes on the indicator lamp sockets might be interchanged.)	☐	☐
b)	Meter moves up toward Normal (140°) as engine runs.	☐	☐
c)	Light goes on when sender is shorted to engine with ignition energized.	☐	☐

Oil Pressure

a)	Meter moves to Low; light comes on when ignition is energized.	☐	☐
b)	Meter moves toward Normal (30 PSI); light goes out when engine is started.	☐	☐
c)	Meter pressure drops; light comes on when engine is stopped with ignition on.	☐	☐

Fuel Level

a)	Meter moves to Empty or further when ignition is energized. (Full scale reading indicates open wire or sender.)	☐	☐

Ignition System

a)	No loose or frayed wires; all wires in spreaders.	☐	☐
b)	No broken spark plug insulators.	☐	☐
c)	Firing order correct.	☐	☐
d)	Engine operates smoothly without backfiring.	☐	☐
e)	Coil case not too hot to touch (140° F.).	☐	☐
f)	Condenser installed and does not show any sign of smoking or heating.	☐	☐

Engine Starter Motor, Starter Relay

a)	Starter cranks engine at good speed without sparking, smoking, excessive noise or heat.	☐	☐
b)	Starter relay and starter engagement mechanism release immediately when starter switch is de-energized.	☐	☐
c)	Starter, starter relay and battery conductor terminals are bolted securely in place.	☐	☐

Ignition Switch

a)	Key type operates smoothly; key inserts and retracts easily.	☐	☐
b)	Blower-ignition type operates blower and ignition in proper sequence as called for on the switch plate.	☐	☐
c)	Three-way type operates both on and off from either station.	☐	☐

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ELECTRICAL CHECK LIST

	Satisfactory	Unsatisfactory
Starter Switch		
a) Spring return operates smoothly and instantly when switch is released. This applies to all three types of starter switches.	☐	☐
All Switches		
a) Switches each operate the required accessory.	☐	☐
b) Switches are all mechanically secure.	☐	☐
c) No sign of sparking, heating intermittent operation.	☐	☐
Battery Generator Indicator		
a) Indicates in red or yellow (10 - 12 volts) with ignition off.		
Port	☐	☐
Starboard	☐	☐
b) Indicates in green with engine running.	☐	☐
c) Does not indicate in high red (15 - 16 volts) when engine is revved.	☐	☐
d) Does not indicate both port and starboard when either port or starboard main disconnect switch is off. (This would indicate port and starboard circuits shorted together or improperly connected.)	☐	☐
Fuse Panel		
a) New fuse of proper amp rating in each circuit.	☐	☐
b) Fuse block properly secured to mounting block.	☐	☐
c) No loose or frayed wires.	☐	☐
Circuit Protection Panel		
a) Circuit breakers of proper amp rating in each circuit.	☐	☐
b) Each circuit breaker properly secured with base clip.	☐	☐
c) Metal separator panel properly installed between 12 V. D. C. circuit breakers and 120 V. A. C. circuit breakers.	☐	☐
d) No high voltage wires running through low voltage end of box or vice versa.	☐	☐
e) All conductors rigidly secured to structure just outside box with non-metallic clamps.	☐	☐
f) Green and white conductors of 120 V. A. C. circuits grounded to box.	☐	☐
g) No loose or frayed wires. No wires in danger of shorting by movement of wiring.	☐	☐
Binnacle Box Wiring		
a) All wiring neatly dressed and secured by non-metallic clamps where necessary to relieve strain on connectors.	☐	☐
b) No frayed or loose wires or connectors.	☐	☐
c) No wires in danger of shorting by movement.	☐	☐
d) All wires secured clear of throttle and shift mechanisms.	☐	☐
e) Harness connectors either locked mechanically or taped together.	☐	☐
f) All wires connected to proper terminals as shown in wiring diagram and photo instructions.	☐	☐

ELECTRICAL CHECK LIST

	Satisfactory	Unsatisfactory
Engine Room Wiring		
a) No loose or frayed wires; no wires in danger of mechanical damage.	☐	☐
b) Harness connectors secured to mounting board and connector locks gaged.	☐	☐
c) All wires routed along structural members and secured with non-metallic clamps to prevent accidental damage by persons working in engine room.	☐	☐
d) Battery trays rigidly mounted.	☐	☐
e) All wires connected to proper terminals as shown in wiring diagram and photo instructions.	☐	☐
120 V. A. C. Wiring		
a) Green and white wires grounded throughout from the shore connector to each switch box and fixture.	☐	☐
b) Three pin grounding outlets installed with green wire to third terminal.	☐	☐
c) If motor-generator is installed, transfer switch is properly installed in accordance with wiring diagram.	☐	☐
Bilge Blower and Vents		
a) Vent pipes clear of obstructions. Lower ends no more than 6" above chine. Upper ends secure to terminal fittings.	☐	☐
b) Bilge blower securely installed.	☐	☐
c) Bilge blower operates properly as evidenced by feeling for air flow out through the vent terminal fitting.	☐	☐
d) Blower and wiring show no sign of sparking, heating, frayed wires or excessive noise.	☐	☐
Bilge Pump		
a) Pump and discharge hose fittings installed securely.	☐	☐
b) Pump not clogged by debris and bilge is clean.	☐	☐
c) Pump discharges solid stream of water when suction ports are submerged.	☐	☐
d) No sign of frayed wires, sparking, heating or excessive noise.	☐	☐

Serial Size Type

Fuel System		
a) Securing straps and cradles.	☐	☐
b) Vent line secure, joints tight, no kinks, flame arrester screen in place.	☐	☐
c) Fuel level sender properly installed in accordance with drawing ———	☐	☐
d) Shut-off value installed securely, joint tight.	☐	☐
e) Fuel filter installed securely in accordance with drawing ———	☐	☐
f) Fuel line installed securely with straps, all joints tight, flares properly formed.	☐	☐
g) Flexible fuel line section installed at engine.	☐	☐
h) Coast Guard Approved flame arrester installed on carburetor.	☐	☐
i) Fuel fill pipe properly installed, joints tight, flexible section clamped tightly, ground strap or static conducting hose properly installed.	☐	☐

MECHANICAL CHECK LIST

Mechanical

		Satisfactory	Unsatisfactory
a)	Throttle control works smoothly and in proper direction.	☐	☐
b)	Shift control works smoothly and in proper direction.	☐	☐
c)	Steering operates without binding and in proper direction.	☐	☐
d)	Right hand (RH) wheel on starboard shaft or single screw boats, left hand (LH) wheel on port shaft.	☐	☐
e)	Both propeller nuts, key and cotter pin on each shaft.	☐	☐
f)	With transmission in neutral, shaft can be turned easily by hand with no sign of binding or rubbing on shaft alley.	☐	☐
g)	All bolts in place securing struts and rudder ports.	☐	☐

Refrigerator

a)	Refrigerator operates normally on twelve volt supply without excessive noise, heat or vibration.	☐	☐
b)	Refrigerator freezes ice cubes within a reasonable time after being energized.	☐	☐
c)	Refrigerator cycles no more than 50% of the time after box has reached the set temperature.	☐	☐
d)	In the case of remotely installed compressors, all connections mechanically secure, electrical connections properly made, tubing not connected to compressor, refrigerator not operated.	☐	☐

Instructions

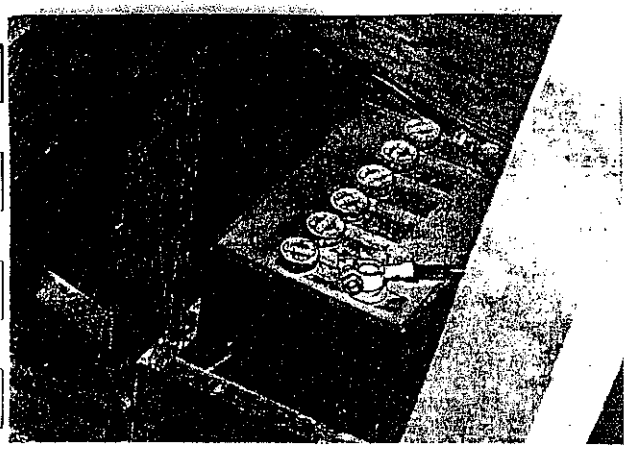
a)	Each item which applies should be checked as Satisfactory or Unsatisfactory by the inspector.	☐	☐
b)	Unsatisfactory items must be corrected and then initialed by the inspector.	☐	☐
c)	Items which do not apply must be lined out with a single line.	☐	☐

d) After all items are completed this page should be signed as follows:

"I have read this inspection report and have had all unsatisfactory terms corrected by personnel under my control; _____."
(Supervisor)

"I have personally observed and recorded all of the above tests; _____."
(Inspector)

ELECTRICAL SYSTEM



SINGLE ENGINE BOATS

The wiring system for single engine boats is similar in many respects to the wiring system in an automobile. The voltage of the system is 12 volts, D.C., which is supplied by a 60 ampere-hour battery and a 35 amp alternator. Both ignition and accessory power are supplied by the same battery system. If accessories requiring great amounts of power, such as radio telephone sets, are installed on the boat it is advisable to provide battery switching which can separate one battery from the rest of the batteries on the boat to be used solely for ignition and starting.

The Battery:

Owens boats are shipped from the factory equipped with dry-charge batteries. These batteries require the addition of electrolyte to activate them. This service is usually rendered by the dealer but could be done by any well equipped service station. A dry charge battery is usually ready to use within fifteen minutes of the time the electroltye is added but, occasionally, the charge must be topped off by a slow charge battery charger for eight to twelve hours. The use of automotive type fast chargers is not recommended.

Each battery is supplied with an acid resistant plastic tray or a lead lined wooden tray. The exposed metal parts of the battery cable clamps and battery terminals should be given a light coating of oil or grease to inhibit corrosion. Never hammer a battery cable into place and never use a screwdriver to pry a battery cable off the terminal. Always use a wrench to tighten or loosen the battery cable clamps. The battery post and cable clamps should be cleaned with a wire brush periodically during the season. After each cleaning they should be reoiled. Do not, however, use such an excess of oil that it runs down on the rubber battery case. Loose or corroded battery terminals or cable ends can cause difficult starting and can keep the alternator from properly charging the battery.

The liquid level in the battery should be checked each time the boat is fueled; if the battery requires the addition of water at frequent intervals it is because the battery is being overcharged. This can result from an improperly operating regulator on the alternator or from a battery charger or converter which is charging at too high a rate. Any battery charger used on a boat should have automatic cut-off and automatic line voltage compensation. A battery can be ruined in a week by a cheap battery charger. Owens' Parts Department can supply an excellent 30 amp charger (converter) which incorporates these safety features.

BATTERY GENERATING SYSTEMS ON TWIN ENGINE BOATS

On twin engine boats each engine has its own alternator. If the two alternators are not the same size then the larger alternator is on the port engine. Electric power generated by the port engine supplies all accessory circuits, electric power generated by the starboard engine supplies only ignition and starting circuits. You will notice that the positive terminal of the battery on the starboard side of the boat in connected to both engine starting motors. Generally, one battery is sufficient for this purpose. With this arrangement you will still be able to start and run both engines even though you discharge all of your accessory batteries by running such things as lights and refrigerators.

Separate main battery disconnect switches are provided for port and starboard battery banks. Normally the main battery disconnect switches should be turned OFF when leaving the boat. Never run either engine with the main disconnect switch for that engine in the off position as damage may occur to the alternator. When a battery charger or converter, such as the Powermate, is provided for charging batteries it should be installed with a four-position battery switch. This switch permits you to selectively charge the port bank, the starboard bank, both banks or to switch the converter out of the circuit entirely.

The converter operates on 120 volts, A.C., and produces twelve to fifteen volts for charging the batteries. Whenever you have a supply of 120 VAC to the boat and the main engines are not running, the four-position switch should be in the BOTH position in order to charge both the accessory batteries and the ignition batteries. The ONE and TWO positions on this switch permit you to selectively charge either port or starboard banks. Whenever the engines are to be started, this switch should be in the OFF position to avoid blowing fuses in the converter. When underway, the four-position switch should never be turned to the BOTH position, as this connects the two battery systems together and prevents the alternator from operating properly.

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ELECTRICAL SYSTEM

In an emergency, if the ignition batteries are discharged, you might be able to start the engines on the accessory batteries by turning the four-position switch to the BOTH position. It is advisable to start only the starboard engine in this manner and then switch the four-position switch back to OFF position. After the starboard engine has run for a few minutes you should be able to start the port engine on the charge already generated by the starboard engine.

BATT-GEN INDICATOR

The Batt-Gen Indicator is a voltmeter which indicates the voltage of your batteries or the voltage produced by the alternators. On twin engine boats a selector switch is provided to connect the Batt-Gen Indicator to either the port or the starboard electrical system or, in the center position, to turn the meter off.

A fully charged battery will read about 12½ volts. The battery has a partial charge if it reads in the yellow area on the meter. When the engines are running with the alternators charging, the Batt-Gen Indicator will show 13 to 15 volts; this voltage is being supplied by the alternator and does not indicate that the batteries are actually up to that voltage.

After the engines are shut down the batteries will continue to show a higher voltage than normal for as long as thirty minutes because of a surface charge on the battery plates. This surface charge is not a true indication of the battery's state of charge.

If the Batt-Gen Indicator shows a reading in the high red portion, which is over 15 volts, when the engines are running, it indicates a faulty voltage regulator. Operation at such a high voltage for any length of time can warp the plates of the battery or damage the alternator.

If the Batt-Gen Indicator shows no reading for one of the battery banks look for an open battery disconnect switch or a corroded battery terminal or a battery which is completely discharged.

Identical reading on the port and starboard batteries might indicate that the two battery systems are connected together through the four-position battery switch or thru a wiring fault.

120 VOLT AC ELECTRICAL SYSTEM

The AC electrical system on your boat is a three wire grounded system. The black wire is 120 volts above ground, the white wire is ground, and the green wire is the grounding conductor.

On the convenience outlets in the boat the third pole, that is the round hole below the two knife blades holes, is connected to the green wire to provide positive grounding of all appliances throughout the boat.

No appliance should be used on a boat which does not have the Underwriters Laboratories approval stamp, which is a "U.L." in a circle. All U.L. approved appliances of recent manufacture will be equipped with the grounding plug on the power cord. This grounding plug is for your protection, do not remove the round ground terminal.

The shore power connector plug is located in the cockpit near the control console. This will be a recessed, male, twist-lock, three terminal connector. The connector supplied with the boat should be wired to a heavy-duty, maintenance type, extension cord having a minimum size of 3/12 conductors. Care should be taken on the shore side plug to assure that the black wire, or the hot wire, matches the hot wire on the shore and that each of te two grounded wires match. If these wires are interchanged the shore side fuses will be blown when you plug in the extension cord to the boat.

This is not a fault in the boat wiring, but rather in the connection of the wiring to the shore power. Many marinas are not equipped with U.L. approved three conductor AC wiring systems. For situations where you must take power from an ungrounded shore power system, you should have an adaptor plug, which has a grounding wire to be connected to the shore conduct or some other definitely grounded metal object on the shore.

With a three-wire grounded system such as Owens places on boats, a polarity indicator is unnecessary on the AC supply provided the shore power connection is also three-wire grounded.

All boat owners should apply pressure on marina owners to install U.L. approved grounded systems for their own protection.

ELECTROLYSIS AND GALVANIC CORROSION

ELECTROLYSIS

Electrolysis or stray current corrosion on boats in the water consists of transfer of metal from one part to another part by means of an electric current flowing through the parts and through the water in which they are immersed. Electrolysis and galvanic corrosion are related but are caused by different conditions and are combatted by different measures. Galvanic corrosion will be explained later in this section.

Corrosion by electrolysis can best be compared to a plating operation such as electroplating of chromium on brass. Salt water acts as an excellent electroplating bath in this case. The 12-volt D.C. battery in your boat is the source of the electric power for the plating operation. In electroplating, the metal which is intended to be plated upon the object is immersed in the electroplating bath and is connected to the positive terminal of the voltage source. This positive terminal is called the anode. When the circuit is completed by making the plated object negative in the circuit, current will flow thru the plating bath and carry particles of metal from the anode to the cathode or plated object. The requirements for this action are a complete circuit in which one electrode is more positive than another electrode within a conducting solution such as salt water.

This could occur on a boat, for instance, if a positive battery ground were made to the engine which, in turn, would make the propeller and shaft positive and if the negative side of a bilge pump became shorted to the water. In this case metal from the propeller and shaft would be carried thru the water and plated onto the exposed portion of the bilge pump. With 12-volts impressed on the circuit and sea water as the electrolyte, the propeller and shaft would disappear in a matter of days. Two things are recommended to reduce this danger.

First, all marine engines manufactured by major builders today have negative ground in the battery system. With the engine and, therefore, the propeller negative, the worst that can happen is that a bilge pump or other minor electrical item might be destroyed by being plated to the propeller and shaft, instead of the shaft and propeller being destroyed.

Additional protection can be gained by bonding all thru-hull metal fittings, shafts, struts, rudders and engines together in one circuit, using a heavy copper conductor such as number eight wire or quarter-inch copper buss bar. Whenever a radio-telephone installation is made it is mandatory for such a bonding system to be installed at the same time. The high rates of current which are induced into the water beneath the boat through the radio-telephone grounding plate can enter adjacent metal parts and cause heavy electrolysis unless all metal parts are bonded together in the same circuit as the ground plate.

GALVANIC CORROSION

Galvanic corrosion is the transfer of one metal through an electrolyte to another metal which is electrically connected to the first metal where no external voltage is applied but the two metals occupy different positions in the galvanic series. The galvanic series refers to a listing of all metals in order of the voltage generated between them in an electrolyte. At one end of the galvanic series we have magnesium, zinc and aluminum. This is referred to as the corroded or least noble end of the series.

At the other end of the series lie graphite, platinum and gold which are referred to as the protected metals or the most noble. Roughly halfway between these two extremes lie many of the marine metals such as the bronzes, nickle and copper. Printed below is a portion of the galvanic series.

(Corroded End — anodic, or least noble)

- Magnesium
- Zinc
- Aluminum
- Cadmium
- Steel or Iron
- Cast Iron
- Chromium-iron (active)
- Lead-tin solders
- Lead
- Tin
- Nickel (active)
- MARINE ALLOYS*:
  - Brasses
  - Copper
  - Bronzes
  - Copper-nickel alloys
  - Nickel-copper alloys
- Silver solder
- Nickel (passive)
- Chromium-iron (passive)
- Silver
- Graphite
- Gold
- Platinum

(Protected End — cathodic, or most noble)

*The metals and alloys bracketed are considered the best to use together in marine application.

When two different metals are electrically connected and immersed in an electrolyte, the metal which lies closer to the protected or noble end of the galvanic series will not be harmed, while the metal which lies nearer the less noble or corroded end will gradually be eaten away by galvanic corrosion.

The best way to eliminate galvanic corrosion is to use only compatible alloys from the brass, copper, bronze, nickel-copper group in the middle of the galvanic series.

ELECTROLYSIS AND GALVANIC CORROSION

Galvanic corrosion can be reduced or eliminated by insulating the two dissimilar metals from each other in the electrolyte. This is sometimes done in aluminum-hulled boats where a bronze fitting must be used by mounting the bronze fitting in a Micarta or plastic bushing to insulate it from the aluminum hull.

The relative severity of galvanic corrosion acting upon a corroded metal depends on the area exposed in relation to the area of noble metal exposed. A less noble metal can be protected in a galvanic circuit by painting the noble metal with a non-metallic paint. This will reduce the area of the noble metal to the point where galvanic corrosion of the less noble metal will be reduced considerably.

Painting of the less noble metal, while leaving the noble metal bare, is not advisable because scratches or gouges in the paint film would expose a small area of the less noble metal to accelerated corrosion in relation to the large area of noble metal. An instance of this would be where an aluminum casting is adjacent to a bronze propeller and the aluminum casting is painted while the bronze propeller is left bare. A gouge in the paint on the aluminum casting could result in accelerated galvanic corrosion to the extent that the aluminum casting would be completely pierced at the point where the paint was scratched on the casting.

Whether the metal is destroyed by electrolysis or galvanic corrosion, the appearance will be roughly the same. Electrolysis generally works much faster and destroys more metal than galvanic corrosion.

To review . . . the conditions required for electrolytic corrosion are: two metals submerged in a conducting liquid, connected to a voltage source which causes one of the metals to be at a higher voltage than the other. The conditions for galvanic corrosion are: two dissimilar metals electrically connected, immersed in a conducting liquid but with no external voltage impressed upon the circuit.

As you see from the above, conditions which are unfavorable to electrolytic corrosion are very favorable to galvanic corrosion. However, since electrolytic corrosion can be much more destructive it is common practice to protect the boat against electrolyte corrosion by bonding and depend upon the use of underwater fittings constructed all of the same metal to protect the boat from galvanic corrosion.

Additionally, sacrificial annodes of zinc or magnesium may be bolted to the underwater metal parts to provide an alternate source of corroded metal to enter into any galvanic corrosion circuit. A boat which is adequately protected against electrolytic corrosion will, therefore, consume the sacrificial annodes much more quickly than a boat which does not have a bonding system. Assuming that all underwater parts are of the same or compatible alloys and that the boat itself is made of a non-metallic material such as wood or fiberglass, there is less need for the use of sacrificial anodes or zincs.

However, not all boats are constructed to this ideal. Some manufacturers have, in the past, used aluminum or magnesium for underwater struts, rudders and other fittings. There have even been instances of the use of aluminum gearboxes in V-drives which are cooled by salt water. When a bronze propeller and possibly a bronze shaft is introduced into this environment, the aluminum underwater parts are very quickly destroyed except where they are protected by an adequate paint film. The paint film, however, is of limited protection because it has nicks and scratches. The paint does not usually coat the internal passages of the castings where salt water can complete the circuit and destroy the casting from the inside.

All underwater fittings and fasteners on Owens Yacht Division cruisers are made of one of the compatible alloys in the brass, copper, bronze, nickel-copper group.

ELECTROLYSIS CAUSED BY RADIO-TELEPHONE INSTALLATIONS

The normal radiotelephone installation instructions require the use of an external ground plate, bonding wires to all underwater fittings including the ground plate, a negatively grounded battery system and heavy conductors from the batteries to the transmitter. In spite of the installations being made in accordance with these instructions, owners occasionally experience severe electrolysis after beginning to use their radiotelephones.

The following points should be checked on any installation of a radiotelephone to minimize problems with electrolysis:

a) bonding conductors should be at least as large as number eight electrical wire.

b) the ground plate should be bonded to the engine negative grounding stud as well as to the transmitter frame.

c) the external ground plate should be kept clean and should never be painted.

d) all wire terminals in the bonding system and in the 12-volt supply system to the transmitter should be soldered to the wires. The standard crimping or clamping types of wire connectors develop a high resistance which can lead to electrolysis. If clamp or crimping type connectors are already installed they should be carefully soldered at the neck where the wire enters the connector.

e) The 12-volt power leads for the transmitter should be at least as large a wire size as is recommended in the instructions and should be of the minimum length possible. These power leads should be connected to the batteries or to the battery disconnect switch. Do not connect the power leads to any other part of the boat circuit such as the fuse block.

SHIP'S LIBRARY

The following listed books are representative of what is available and useful to the average boat owner. You will notice that the list is divided into several sections. We recommend that you be familiar with, or have on board ,at least one book or publication from each section.

PILOTING, SEAMANSHIP & SMALL BOAT HANDLING, by Charles F. Chapman, price $5.00

SEAMANSHIP, A Practical Manual on Boating - Inboard, Outboard and Sail, by Charles F. Chapman, 336 pages, 5 x 7¼", pager covered, $2.00

MARINER'S NOTEBOOK, by Capt. Wm. P. Crawford (Mariner Publications, P.O. Box 1150, San Pedro, Calif., price $15.00)

BLUEJACKETS MANUAL, 648 pages, Illus. (1960) price $2.50

* * *

MOTORBOATING "IDEAL SERIES":

BOAT MAINTENANCE, AFLOAT AND ASHORE, Part 1, $3.50

BOAT MAINTENANCE, AFLOAT AND ASHORE, Part 2, $3.50

BOAT MAINTENANCE, AFLOAT AND ASHORE, Part 3, $3.50

($8.50 per set)

MARINE ENGINE BOOK, $3.50

MODERN MARINE ENGINE HANDBOOK (1961) by C. Miller, $6.00

MODERN BOATING GUIDE: Care and Repair of Your Inboard Motor, NABB, $1.95, $2.95 cloth.

* * *

COMPASS ADJUSTMENT: A handbook for ships' officers and yachtsmen. So written that any officer or yachtsman should be able to eliminate or at least reduce his compass error. By W. E. May, $2.50

RECREATIONAL BOATING GUIDE, C.G.-340, Supt. of Documents, Wash. 25, D. C. Price, 40 cents.

EXCERPTS FROM THE INTERNATIONAL CODE OF SIGNALS: With Special Navy Pennants and Flags, 88 pages, 5½ x 8½", Illus., (1944), $1.00

* * *

THE YACHTSMAN'S ANNUAL GUIDE, 424 pages of useful boating information, current edition price $2.00

NAUTICAL YEARBOOK AND EXPENSE RECORD: A Handy Logbook for Every Yachtsman, spiral bound, 6 x 9", $1.00

YACHT LOG, GUEST REGISTER AND RADIO LOG: 192 pages, 8⅝ x 11½", canvas binding with suggestions on keeping a log, cruising information and compass deviation card, $3.50

* * *

FIRST AID AFLOAT by Paul B. Sheldon, M.D. (56 pages, 1958, $1.00), small format to fit the medicine chest.

MEDICAL EMERGENCIES IN PLEASURE BOATING, 164 pages, illus., (1958), advice to the amateur sailor on prevention and treatment of medical emergencies that arise aboard pleasure craft, by N. C. Leone and E. C. Phillips. Price $2.95

MEDICAL CARE OF MERCHANT SEAMEN: A handbook of Ship Sanitation and Emergency Medical Aid, 224 pages, 5½ x 7½", illus., (1949) by W. L. Wheeler, Jr., M.D. Price $3.00

* * *

THE NEW CRUISING COOKBOOK by Russell K. Jones and C. McKim Norton. 304 pages, 1960, $4.50. (350 galley-tested recipes for a two-burner stove. Formerly entitled "Cruising Cookbook".).

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SHIP'S LIBRARY

CHARTS & NAVIGATIONAL INFORMATION

Coastal Charts by the United States Coast and Geodetic Survey, Washington 25, D. C. Sales agents located in most major cities and listed in the Notices to Mariners. U.S.C. & G.S. charts cost from 25 cents to $1.00. On the East Coast the 1200 series are in most common use, cost $1.00 each and cover an area about 30 miles from north to south.

GREAT LAKES: charts of the Great Lakes and connecting waters, Lake Champlain, New York State Canals, Lake of the Woods, and Rainy Lake are published by the U.S. Lake Survey, 630 Federal Building, Detroit 26, Michigan. They cost from 25 cents to $1.00 and are listed in their free catalog.

The GREAT LAKES PILOT, an annual publication kept up to date by seven supplements thru the year is obtainable from the U.S. Lake Survey, Corps of Engineers, 630 Federal Building, Detroit 26, Michigan. Price $3.50.

GREAT LAKES WATERWAY GUIDE, an excellent nontechnical book covering the Great Lakes, St. Lawrence River, Richelieu River, Lake Champlain, and New York Barge Canal. Lists the harbors, services and supplies available with aerial photographs. $1.50 from the Great Lakes Publishing Company, 843 Delray, Grand Rapids, Michigan.

MISSISSIPPI AND MISSOURI RIVERS: Mississippi River, Grafton to Cairo, Illinois available from the Chicago District, Corps of Engineers, U.S. Army, 475 Merchandise Mart, Chicago 54, Illinois. Price 50 cents.

Mississippi River, Cairo, Illinois to Minneapolis, Minnesota; available from Chicago District, Corps of Engineers, U.S. Army, 475 Merchandise Mart, Chicago 54, Ill. Price $1.50

Mississippi River, Cairo, Illinois to the Gulf of Mexico; available from same address as two preceding items above, or from the Mississippi River Commission, Corp of Engineers, U.S. Army, P.O. Box 80, Vicksburg, Miss. Price $2.00

Missouri River navigation charts are available from the Corps of Engineers, U.S. Army, 1709 Jackson St., Omaha 2, Nebraska.

OHIO RIVER. (9') From Pittsburg, Pa. to the Mississippi River, in three bound sets, at $2.00 per set, is available from the U.S. Army Engineer Division Ohio River, Corps of Engineers, U.S. Army, P.O. Box 1159, Cincinnati 1, Ohio.

POTOMAC RIVER (23' to Washington, D.C.) The U.S. Coast and Geodetic Survey has selected this area for the first of its new and entirely different Small Craft Charts, Series 101, priced at $1.50

TENNESSEE RIVER, KENTUCKY LAKE . . . a bound set of charts available for $2.00 from the U.S. Army Engineer District, P.O. Box 1070, Nashville, Tennessee.

FLORIDA . . . "Florida Boating", an excellent booklet listing Florida's waterways, boating laws and the marine facilities at 135 ports, free, from the Florida Development Commission, Talahassee, Florida.

BAHAMAS . . . "Yachtsman's Guide to the Bahamas", a complete guide book for a cruise to the Bahamas. The data it contains is much like the information found in Coast Pilots. The Customs and Immigration information will be found especially valuable to those who have never cruised to foreign waters. Copies may be obtained at $1.50 each from the Nassau Development Board, 608 First National Bank Bldg., Miami 32, Florida.

CANADIAN CHARTS . . . charts available from Chart Distribution Office, Canadian Hydrographic Service, Department of Mines and Technical Surveys, 249 Queen Street, Ottawa, Canada. Complete catalog showing Canadian Atlantic, Pacific and Arctic Coast, Great Lakes, St. Lawrence Waterway and all charted Canadian inland navigable lakes and rivers. Price 75 cents. (Note: money orders and checks for Canadian charts should be made out to The Receiver General of Canada.)

* * *

COAST PILOTS

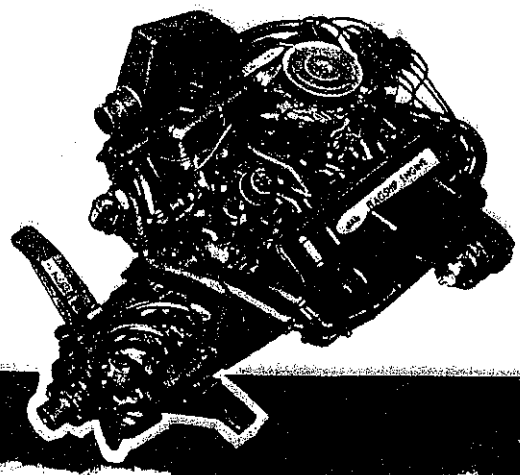
These are the standard Government publications which supplement the information given on charts. Available from the U.S. Coast and Geodetic Survey, Washington 25, D.C., or any of their field agents in principal ports. Price varies, up to $2.50

* * *

RULES OF THE ROAD

The Coast Guard publishes three pamphlets on this subject. These are: "Rules of the Road, International-Inland", for coastal waters, CG-169; "Rules of the Road, Great Lakes", CG-172; and "Rules of the Road, Western Rivers", (these are the rivers flowing into the Gulf of Mexico and their tributaries and the Red River of the North), CG-184. Obtainable free from local Coast Guard District offices.

FLAGSHIP
ENGINE
MANUAL



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FLAGSHIP MARINE V8 ENGINE

LYNCH COVE • BALTIMORE 22, MD.

Brunswick CORPORATION

INTRODUCTION

WHAT YOU SHOULD KNOW ABOUT FLAGSHIP V8 MARINE ENGINES

Over a half-century of knowledgeable marine engineering experience has been packed into today's Flagship V8's.

Flagship designers and engineers have produced a superior marine engine that will give your boat an incredible new high in seaworthiness and performance. With the Flagship V8 Marine Engine, you'll have the power, efficiency and dependability that you expect in a marine engine.

FLAGSHIP V8 MARINE ENGINES ARE SCIENTIFICALLY DESIGNED FOR POWER, RELIABILITY AND ECONOMY!

Flagship V8 Marine Engines will give you dependable and reliable performance under the most rugged seagoing conditions.

The newly designed RAM'S HORN is exclusive with Flagship. The RAM'S HORN is a combination manifold and muffler of corrosion-resistant cast iron that allows a higher-level discharge of cooling water and exhaust.

The engineered compactness of the new Flagship V8 will add extra cubic feet of space to your boat. The engine's lighter weight and lower, angled mounting will give your boat better balance and performance. Durability, as always, is engineered into every part. A combination of modern engineering and the newest advances in metallurgy assures long-lasting performance. Each part is precision engineered to provide greater efficency, while time-consuming repairs are almost entirely eliminated.

Flagship V8's are the overhead valve type. Flagship's skilled mechanics assemble the precision engineered parts in its Baltimore plant. They test and make all final adjustments. A special break-in oil is poured into the crankcase and the engine is run on a test bed prior to shipment. This assures you of top performance immediately.

HERE'S WHY FLAGSHIP V8 MARINE ENGINES ARE YOUR BEST INVESTMENT!

POWER

* High compression ratios produce more power per cubic inch.
* High speed torque develops maximum efficiency at higher speeds.
* Modern design manifold provides smoother intake and exhaust passage.
* 12 volt "sure-spark" ignition system increases efficiency and smoothness.

SAFETY

* Carburetor flooding pickup draws surplus fuel back into intake manifold.
* Backfire flame arrester restricts backfires to engine's internal passage. This does not harm engine.
* Spark-proof electrical system. Starter, generator and other parts have separated "closed housings".
* Full-flow oil filter for positive cleaning of all oil.
* Rear engine mount has been moved aft for stronger support of the reverse gear.
* The forward engine mount has been angled upward to permit a heavier engine bed.

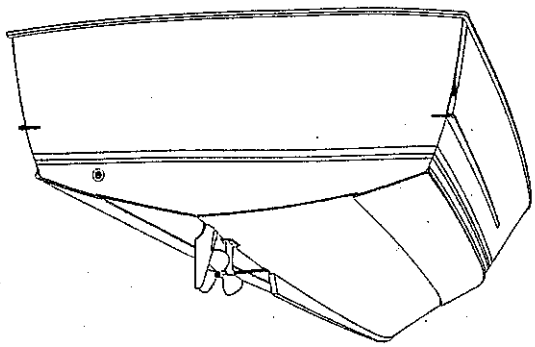
LONGER LIFE

* Large capacity water jackets are located in head, block, and manifold to reduce uneven heat and wear.
* Sturdy bronze gear-type water pumps are used for lasting dependability.
* Heat-treated alloy exhaust valve seats are used and cooled by a high velocity stream of water.
* Block, head, and manifold are constructed of a special alloy that resists wear and corrosion.
* Extra large reverse gear clutch has increased capacity.
* Generator has greater capacity to handle same work load with less strain.
* Heavy duty, cast iron precision-machined oil pan.
* High pressure lubrication system makes parts last longer.
* Flagship's exclusive Ram's Horn muffler/manifold of corrosion-resistant cast iron allows a higher level discharge of cooling water and exhaust.

QUIETNESS

* Lightweight, sturdy aluminum pistons and precision-balanced internal moving parts reduce noise considerably.
* Extra heavy cast-and-machined-flywheel absorbs vibrations.
* Accurately located 4-point suspension.
* Engine mountings rest "softly" on live, wide, cylindrical rubber bases.

INTRODUCTION



HOW AND WHY OWENS "MATES" THE ENGINE AND THE HULL!

Owens was the first to adopt the modern V8 power plant as standard equipment on its Sea Skiffs, Flagships, and Yachts. This action was taken when it was obvious that the V8 would replace the old L-head, 6-in-line engine.

The new V8 engine proved so advanced in power and performance that it became necessary to match the boat to the engine. Owens engineers began immediately to improve traditional hull shapes and construction methods.

The result was a more powerful hull; heavier, with a new scientifically-framed bottom shape. After numerous tests under actual conditions, a hull was designed with sharper waterline sections forward, greater bow flare and increased overhang. Additional scantlings and girders were added to better distribute the stress and strain from V8 power.

These design changes, along with rubber-mounted engine installation and muffled engine noise, made smooth, quiet performance a standard on Owens Cruisers.

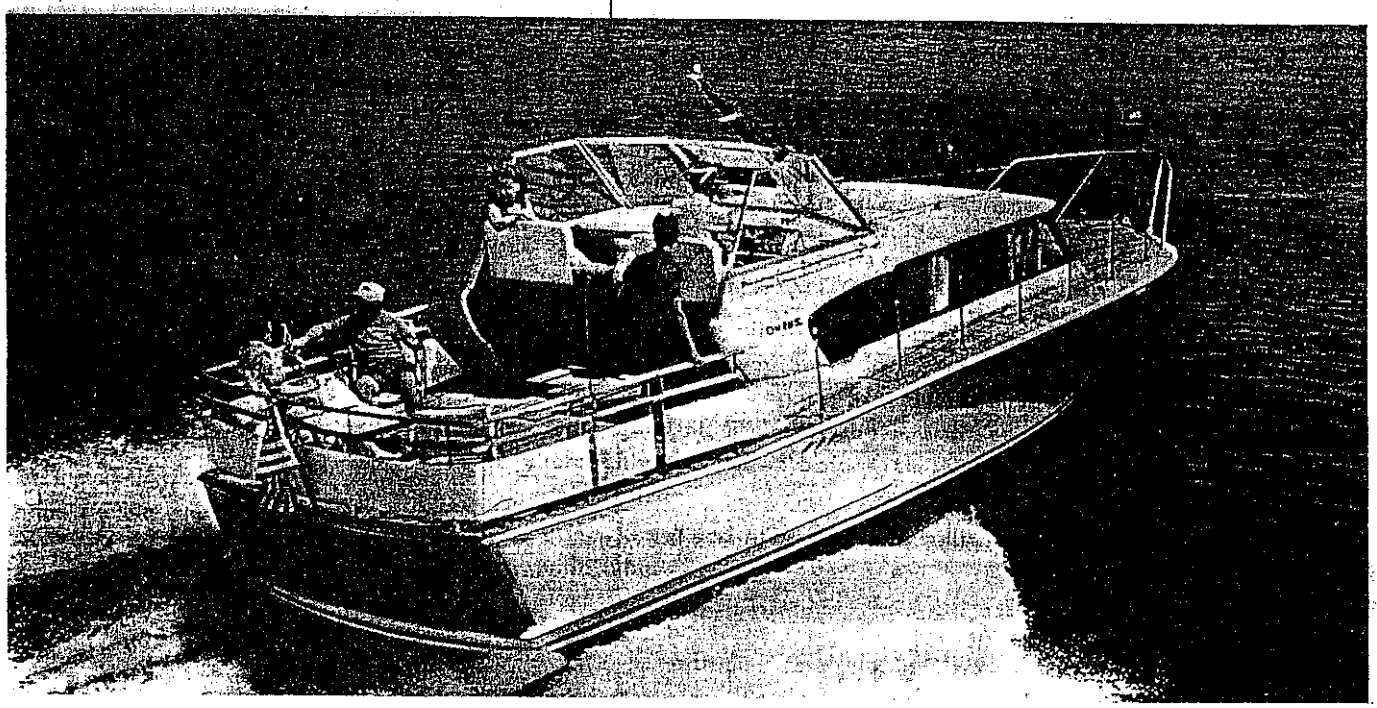
Unlike any other boat builder, Owens does more to properly "mate" hull and engine. Because Owens builds the hull for its power plant, the proper size and strength of other important components such as propellers, and propeller shafts is provided.

"Mating" eliminates guesswork. You can determine the best propeller size for greater speed, easier handling and gasoline efficiency.

"Mating" also permits Owens engineers to predetermine the proper thickness and design of rudder struts, skegs, as well as the proper shapes, depths, and lengths.

Even the entire electrical system is pre-planned as an integral part of the hull-engine unit . . . right down to the instrument panel. There's nothing haphazard about Owens planning, designing and engineering.

When you combine the features of the new Flagship V8 Marine Engine and the newly-designed hulls, you have a better boat. You get the hidden extras of strength, reliability and better boat performance. An Owens inboard cruiser . . . stem to stern . . . inside and out . . . is a cruiser designed to create a new high in satisfaction.



GENERAL INFORMATION

Your boat and marine engine are designed to serve you faithfully and economically for many thousands of hours. These tips on servicing your boat can help you enjoy it to the fullest.

In order to get full economical use of your boat, it is necessary that your engine be treated with reasonable care and serviced regularly.

If followed, these tips will insure dependable operation, long service and satisfaction. For extensive repairs or over haul, call on your authorized dealer, in whose establishment your engine will receive expert care.

ENGINE DIMENSIONS

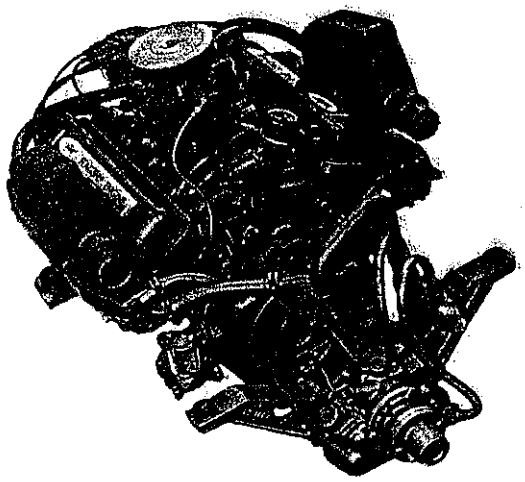
Length
- Hydraulic Direct Drive (Warner) ..... 42½"
- Hydraulic Reduction Gear (Warner) ... 49"

Width Overall ..... 28-13/16"
Width at Rams Horn ..... 26½"
Height (Mallory Dist.) ..... 26⅜"

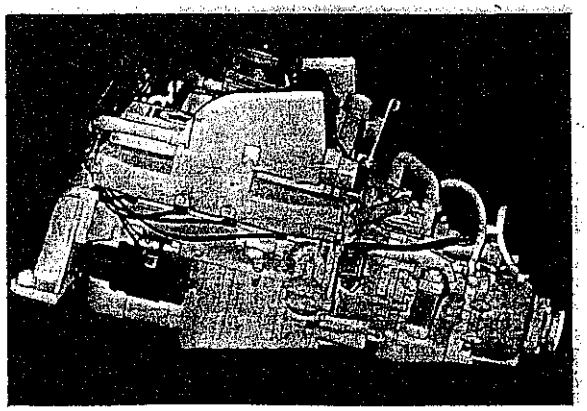
CONSTRUCTION

Flagship V8 Marine Engines are 8-cylinder, V-type, gasoline, 4-cycle, valve in head engines using mechanical valve lifters. They are liquid cooled by means of a positive displacement, mechanically driven water pump and lubrication is provided by full pressure system used in conjunction with a full flow oil filter.

When viewed from the aft (reverse gear) end, the standard or right hand rotation engine turns clockwise (right hand), and the opposite or left hand rotation engine turns counterclockwise (left hand). When equipped with a direct drive or single reduction reverse gear with any of the various ratios available, the right hand rotation engine turns a right hand propeller. The opposite rotation engine turns a left hand propeller.



FLAGSHIP V/8, MODEL 225
With Borg Warner DD Reverse Gear
Enclosed Cooling



FLAGSHIP V/8, MODEL 185
With Borg Warner Reverse and Reduction Gear

ENGINE SPECIFICATIONS

MODEL 185

ENGINE GENERAL DATA

Type Engine	Valve in Head
RH Rotation or Standard	
LH Rotation or Opposite	
Horsepower	185 hp
Torque	270
Number of Cylinders	8
Bore	3.875
Stroke	3.0
Displacement	283 cu. in.
Compression Ratio	8.0:1
Compression pressure	135 PSI

Pressure taken at cranking speed, all spark plugs removed, and wide open throttle.

Recommended Maximum operating RPM-Model 185 @ 3600	
Cylinder Head Material	Cast Alloy Iron

PISTONS

Material	Cast Alloy Aluminum with Steel Insert in Top Ring Groove
Type	Solid Slipper Skirt
Clearance Limits	(Top Land .017-.020 (Skirt .0006-.0010
Ring Groove) Depth)	Compression .195-.203 Oil .178-.188

PISTON RINGS

Compression

Material	Cast Alloy Iron
Type	Thickwall Inside Bevel
Width	.077-.078
Gap	.010-.020

OIL RING

Material	Steel
Type	Multi-Piece (rail) spacer and expander)
Width	.187-.189
Gap	.015-.055
Wall Thickness	.150-.156
(Expanders)	Yes

PISTON PINS

Material	Steel
Length	2.990-3.010
Diameter	.9270-.9273
Type	Press fit in Rod
Clearance	In Piston .00015-.00025
	In Rod - Press or Shrunk Fit

CONNECTION RODS

Material	Drop forged Steel
Length (C/L to C/L)	5.699-5.701

BEARING

Material	Moraine #100
Type	Precision Removable
Clearance	.0007-.0028
End Play	.0017-.0038

CRANKSHAFT

Material	Forged Steel
End Play	.002-.006

MAIN BEARINGS

Journal Diameter	2.2978-2.2988

ROD

Bearing Journal Diameter	1.999-2.000
Bearing Clearance	.001-.003

CAMSHAFT

Material	Cast Alloy Iron

CAM BEARINGS

Diameter	1.8687
Length	.740 (except for No. 5 - .940)

VALVE SYSTEMS

Lifters Type	Mechanical

VALVE CLEARANCE

Intake	.010
Exhaust	.016

Engine must be thoroughly warmed up to normalize the expansion of all parts.

INTAKE VALVE

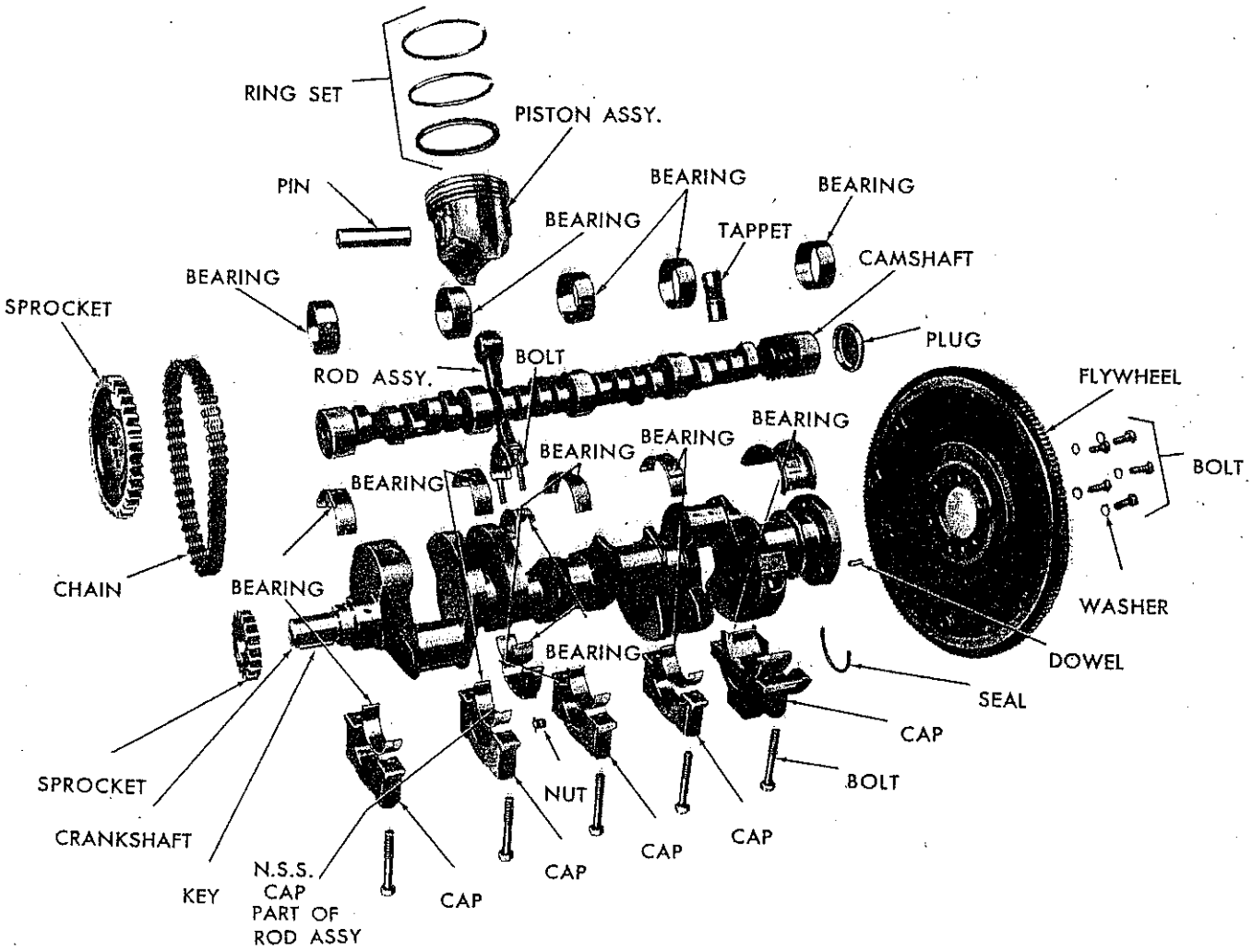
Overall Length	4.9024-4.9224
Head Diameter	1.715-1.725
Face Angle	45°
Seat Angle	46°
Stem Diameter	.3410-.3417
Stem to Guide Clearance	.0010-.0027

EXHAUST VALVE

Overall Length	4.913-4.933
Head Diameter	1.495-1.505
Face Angle	45°
Seat Angle	46°
Stem Diameter	.3410-.3417
Stem to Guide Clearance	.0010-.0027

Recommended Valve Seat Width

Intake	1/32" to 1/16"
Exhaust	1/16" to 3/32"



EXPLODED VIEW OF FLAGSHIP V/8 185 HP MARINE ENGINE INTERIOR COMPONENT PARTS

Showing Relative Position of Interior Component Parts.

ENGINE SPECIFICATIONS

ENGINE LUBRICATION

Type Oil Pump	Spur Gear, Full Pressure System
Normal Oil Pressure	35 PSI @ 2000 RPM 15 PSI @ Idle
Oil Filter Type	Replacement Element No. 141 AC.
Crankcase Capacity (dry engine)	7 qts.

(Add 1 qt. when full flow filter element is changed).

Oil Grade Recommended	32° F. and above — SAE 20, 20W or 10W-30
SPARK PLUGS	Champion UJ 6
Gap	.035
Distributor Point Gap	
New Points	.020
Old Points	.017
FIRING ORDER	
Standard (RH)	
Rotation	1, 8, 4, 3, 6, 5, 7, 2
Opposite (LH)	
Rotation	1, 2, 7, 5, 6, 3, 4, 8

(No. 1 Cylinder is the aft cylinder on the starboard bank).

EXHAUST SYSTEM	2" IPS min.
DUAL WATER PUMP	Mechanically driven, Self-Priming, Positive Displacement Type, Inlet 7/8" pt.
ELECTRICAL SYSTEM	12 Volts Negative Ground
FUEL - MODEL 185	80 Octane Rating or Better

MODEL 225

ENGINE GENERAL DATA

Type Engine	Valve in Head
RH - Rotation or Standard	
LH - Rotation or Opposite	
Horsepower	225
Torque	305
Number of Cylinders	8
Bore	4.0
Stoke	3.250
Displacement	327
Compression Ratio	8.0.1
Compression Pressure	135

(Pressure taken at cranking speed, all spark plugs removed, and wide open throttle.)

Recommended Maximum operating RPM-Model 225 @ 3600

Cylinder Head	
Material	Cast Alloy Iron
PISTONS	
Material	Cast Alloy Aluminum w/steel insert in top
Type	Solid Slipper Skirt (Top land .015-.017
Clearance Limits	(Skirt .0010-.0014
Ring Groove Depth	(Compression .189-.196 (Oil .214-.217

PISTON RINGS

Compression	
Material	Cast Alloy Iron
Type	Thickwall-inside bevel
Width	.077-.078
Gap	.013-.025

OIL RING

Material	Steel
Type	Multi-Piece (rail, spacer and expander)
Width	.187-.189
Gap	.015-.055
Wall Thickness	.150-.156
(Expanders)	Yes

PISTON PINS

Material	Steel
Length	2.990-3.010
Diameter	.9270-.9273
Type	Press fit in Rod
Clearance	(In Piston-.00015-.00025 (In Rod-Press or Shrunk
Offset Direction	None

CONNECTION RODS

Material	Drop Forged Steel
Length (c/l to c/l)	5.699 - 5.701

BEARING

Type	Precision Removable
Clearance	.0007 - .0028
End Play	.0017 - .0038

CRANKSHAFT

Material	Forged Steel
End Play	.002 - .006

MAIN BEARINGS

Journal Diameter	2.2978 - 2.2988

ROD BEARING

Journal Diameter	1.999 - 2.000
Bearing Clearance	.001 - .003

CAMSHAFT

Material	Cast Alloy Iron
Cam Bearings	(Dia. 1.8687 (Length .740 (except for No. 5 - .940)

ENGINE SPECIFICATIONS

VALVE SYSTEMS

Lifters Type ..... Mechanical

Valve Clearance

Intake ..... .010

Exhaust ..... .016

(ENGINE MUST BE THOROUGHLY WARMED UP TO NORMALIZE THE EXPANSION OF ALL PARTS)

INTAKE VALVE

Overall Length ..... 4.9024 - 4.9224

Head Diameter ..... 1.715 - 1.725

Face Angle ..... 45°

Seat Angle ..... 46°

Stem Diameter ..... .3410 - .3417

Stem to guide Clearance ..... .0010 - .0027

EXHAUST VALVE

Overall Length ..... 4.913 - 4.933

Head Diameter ..... 1.495 - 1.505

Face Angle ..... 45°

Seat Angle ..... 46°

Stem Diameter ..... .3410 - .3417

Stem to guide Clearance ..... .0010 - .0027

Recommended Valve Seat Width

Intake ..... 1/32 - 1/16

Exhaust ..... 1/16 - 3/32

ENGINE LUBRICATION

Type Oil Pump ..... Spur Gear, Full Pressure System

Normal Oil Pressure .. 35 PSI @ 2000 RPM
15 PSI @ Idle

Oil Filter Type ..... Replaceable Element No. 141 AC

Crankcase Capacity (dry engine) ..... 7 qts.

(Add 1 qt. when full flow filter element is changed.)

SPARK PLUGS ..... Champion UJ .6

Gap 035

FIRING ORDER

Standard (RH) Rotation .. 1, 8, 4, 3, 6, 5, 7, 2

Opposite (LH) Rotation .. 1, 2, 7, 5, 6, 3, 4, 8

(No. 1 Cylinder is aft cylinder on the starboard bank.)

EXHAUST SYSTEM ... 2" LPS min.

DUAL WATER PUMP .. Mechanically driven, self-priming, positive displacement type, inlet 7/8" pt.

ELECTRICAL SYSTEM .. 12 Volts
Negative ground

FUEL ..... 80 Octane Rating or better

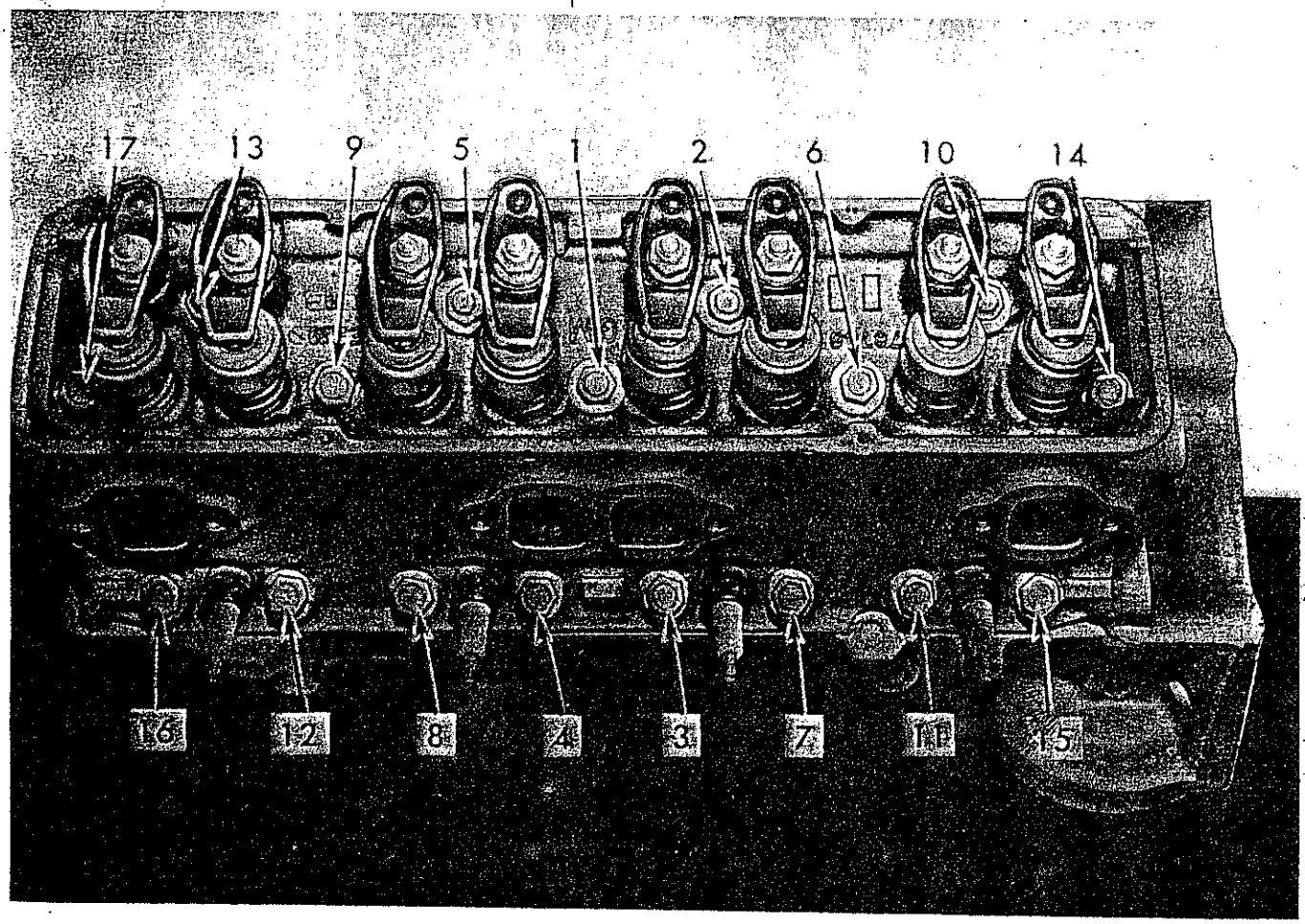
FLAGSHIP'S modern production line. Here all top quality components are assembled and thoroughly tested.

TORQUE SPECIFICATIONS

Main Bearing Cap Nuts	60-70 ft. lbs.
Connecting Rod Cap Nuts	30-35 ft. lbs.
Oil Pump Assembly Attaching Bolt	45-50 ft. lbs.
Oil Pump Cover Assembly Bolts	72-90 in. lbs.
Oil Pan Attaching Bolts, 1/4"	72-90 in. lbs.
Oil Pan Attaching Bolts, 5/16"	150-180 in. lbs.
Flywheel and Flywheel Pulley Bolts	50-55 ft. lbs.
Oil Filter Cover	20-25 ft. lbs.
Head Attaching Bolts	60-70 ft. lbs.
Intake Manifold Bolts	25-35 ft. lbs.
Exhaust Manifold Nuts	18-22 ft. lbs.
Spark Plugs	20-25 ft. lbs.
Distributor Clamp Bolt	14-18 ft. lbs.
Camshaft Sprocket Bolts	15-20 ft. lbs.
Timing Case Bolts, 3/8"	25-35 ft. lbs.
Timing Case Bolts, 1/4"	72-90 in. lbs.
Reverse Gear Mounting Bolts	25-35 ft. lbs.

V8 CYLINDER HEAD BOLT TORQUE SEQUENCE

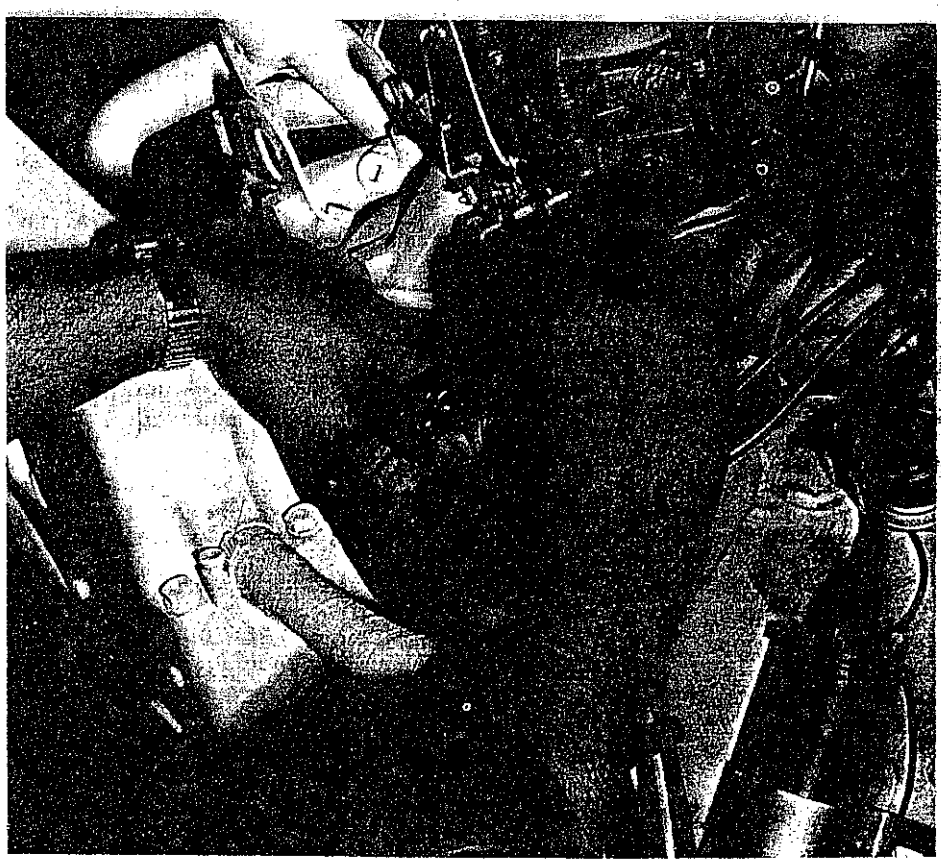
For best results, tighten the cylinder head bolts a little at a time in the order shown below. The final tightening torque should be 60 — 70 ft. lbs. NOTE: Two intermediate length bolts are used; one at No. 17 position and one at No. 14 position.



VALVE ADJUSTMENT

The exhaust and intake valves in any internal combustion engine operate at high speed in extreme heat. Before adjusting valve stem to rocker arm clearance it is extremely important that the engine be thoroughly warmed up to normalize the expansion of all parts. This is very important because during the warm-up period, the valve clearance will change considerably. To adjust the valve during or before this warm-up period will produce clearances which will be far from correct after the engine reaches normal operating temperature.

Tests have shown that valve clearance will vary as much as .005 from a cold check through the normalizing range. The correct valve adjustment and valve seating are important, because the contact at valve seat is the only escape route for heat from valve head. Improper valve adjustment will cause valve failure by uneven wear at valve seat, carbon deposit on valve seat, warping and burned valves, or sticking stems caused by carbon. Valve failure is the main cause of compression loss, or falling off of power. Adjust valve rocker arm clearance by turning the self-locking rocker arm stud nuts as required to obtain .010" clearance on intake valves, and .016" clearance on exhaust valves.



hoto on right shows the proper way
o adjust valves.

FUEL SYSTEM

The fuel system of your boat is constructed in accordance with the recommendations from NFRA 302 and the Yacht Safety Bureau. Whether you have a galvanized steel fuel tank or monel fuel tank, the system is the same. A fuel fill fitting is located in the side deck for each of the fuel tanks on the boat. Directly under this fuel fitting will be a flexible rubber section connecting the deck fitting to the $1\frac{1}{2}$" fuel fill pipe, which is in turn connected to the fitting on the top of the fuel tank. This flexible rubber hose has a static grounding strap bridging between the metal fuel fill plate and the fuel fill pipe.

A copper vent line is provided for each tank to release air during filling of the tank, to supply air when the tank is being drained, and to drain overboard any excess fuel during refueling. At the end of this vent line, where it goes thru the hull, there is a fine copper screen which acts as a flame arrestor. This flame arrestor screen must never be removed or permitted to become clogged with paint or corrosive products.

The fuel level sender for your fuel level gauge is bolted to a flange on the tank with five machine screws. The insulated terminal on the fuel sender flange is wired to the fuel gauge on your instrument panel. The fuel level sender is operated by a hollow brass float acting on a lever arm which varies a resistance element inside the tank.

A fuel pickup tube of heavy brass pipe is inserted in the tank below the fuel shut-off valve. A fuel shut-off valve is attached to the top of each fuel tank and all tanks are connected together by copper tubing. Fuel may be drawn from any tank for all engines. Normally, all valves should be left open so that all fuel tanks empty at the same rate, but if one tank should become empty ahead of the others that tank should be shut off at the fuel valve.

A fuel filter is installed in the fuel line between the fuel tank and the engine. This fuel filter element should be kept clean, as dirt here can rob you of power or shut off the fuel supply entirely, causing your engine to backfire or stop. The fuel pump is a mechanical type which operates only when the engine is operating.

The carburetor is a down draft carburetor with automatic choke. The basic carburetor is an automotive type, but it has been specifically modified for use on marine engines. As additinal protection for the fine orifices and seats in the carburetor a filter screen has been inserted in the fuel inlet of the carburetor. This screen can be removed by unscrewing the large aluminum hex nut which is installed in the carburetor casting just above the fuel inlet fitting. Be very careful to re-align the inlet screen when refastening the filter nut.

FUEL

High grade fresh gasoline as marketed by reputable refineries is recommended. The correct octane rating of fuel for the model 225 and 185 is 80 (motor method) or better.

Some lower grade fuels will cause damage to the pistons and ring lands as a result of detonation. Good gasolines are processed against gum-forming tendencies even when subjected to long time storage. A lower grade fuel will also leave gum deposits appearing as a jelly-like coating within the fuel tanks. They are also observed as a whitish precipitate in fuel lines and in carburetor float bowls and jets. Such deposits impair or restrict fuel flow. This gum-forming tendency with attendant deposit can contribute to impaired operation of engine intake valves.

Whenever a boat is to be out of commission for 30 days or more, drain the fuel tanks, fuel lines, fuel pump and the carburetor. An alternate precaution against possible formation of gum deposits is to proceed as follows:

With the engine running, shut off the fuel supply by closing the shut-off valve in the fuel line at the tank. Loosen the fuel line nut on the engine side of the shut-off valve. By continuing to let the engine run until it stops of its own accord, you will have used all of the fuel out of the line, fuel pump, filter and carburetor bowl. CAUTION: Turn off ignition switch.

The fuel tank should then be completely filled to reduce the possibility of condensation taking place inside the tank and also to retard evaporation.

NOTE: Do not forget to tighten the fuel line nut and open the shut-off valve when the equipment is to be used again. This insures against possible forming of gum deposits within these parts. Use good gasoline supplied by a reputable fuel marketer.

NOTE: On new steel tank the first fill of gasoline will often carry off rust-inhibitor coatings, flux and other matter detrimental to the carburetor. Therefore, we suggest the addition of a solvent such as Siloo, Casite, or equivalent, in new tanks.

For operation in foreign countries where anti-knock quality is below U. S. standards, the following precautions should be observed:

1 — The Flagship V8 Engines should be operated on the highest grade of fuel available.

2 — In some instances even the model 225 may have to have the ignition timing adjusted for satisfactory operation on foreign fuels.

In all cases, excessive knocking should be avoided as much as possible in order to avoid possible engine damage.

SHIP'S TOOL LOCKER

The below listed tools and supplies are considered basic. You may wish to expand on this basic list.

(1) Frearson cross-recess screwdriver (Reed & Prince)
(1) Slotted screwdriver, 10 inch
(1) Slotted screwdriver, 4 inch
(1) Spark plug wrench
(1) Set combination open end, box wrenches, $\frac{3}{8}$" — $\frac{7}{8}$"
(1) Adjustable wrench, 10 inch
(1) Pair channel lock pliers
(1) Pair gas pliers
(1) Set Allen hex wrenches
(1) Set spark plug feeler gauges
(1) Hammer
(1) Set drift punches
(1) Roll friction tape
(1) Roll plastic electricians tape
(1) Lb. can water pump grease
(1) Oil can
(1) Emergency gasoline can, 5 gal., with spout
(1) Fire pail, 2 gal. with 6' landyard attached to sturdy bail.

SPARE PARTS

These spare parts carried on board can save you many times their cost if you have mechanical difficulty while cruising. Some of these are available as a spare parts kit from Owens. The other items can be obtained from your dealer.

(8) spark plugs
(1) generator belt
(1) distributor cap
(1) distributor rotor
(1) ignition coil
(2) sets distributor points
(1) distributor condensor
(1) right hand propeller
(1) propeller shaft
(6) fuses
(2) Navigation light bulbs
(1) each, propeller shaft key, cotter pin, nut

COOLING SYSTEM

WATER DRAIN PLUGS

At the factory, all water drain plugs (painted red) for the Flagship V8 Engines have been removed and placed into a cloth bag and attached to top of the engine's lifting ring. By doing this it assures both the dealer and operator that his new V8 Flagship marine engine had been properly drained at our factory before shipment.

Before testing or operating your new V8 Flagship engine, all drain plugs are to be installed as follows:

1 — 1/4" N-P-T Brass Plug, Portside of block just in front of fuel pump.

1 — 1/4" N-P-T Brass Plug, starboard side of block opposite the fuel pump.

2 — 1/4" N-P-T Brass Plugs, portside, bottom of Ram Horn muffler.

2 — 1/4" N-P-T Brass Plugs, starboard side bottom of Ram Horn muffler.

1 — 1/8" N-P-T Brass Plug, bottom of water pump rear back plate.

2 — 1/8" N-P-T Brass Screw Plugs, lower exhaust manifold (rear plug only) just below Ram Horn muffler (one on each side).

2 — 1/8" N-P-T Brass Screw Plugs, exhaust manifold rear end cap at bottom (one on each side).

1 — 1/8" N-P-T Brass Plug on bottom of oil cooler (BW reverse gear only).

NOTE: It is very important that both 1/4" brass plugs be removed from underside of both Ram Horn mufflers inasmuch as they are independent of each other.

DRAIN ALL WATER JACKETS AND PIPING:

Current production engines in addition to having one drain plug in the dual water pump body, have two drain plugs; one on each side of the block just above the oil pan and just forward of the timing gear housing. There is also a brass slotted head screw on the bottom of each exhaust end cap for draining the lower passage in each exhaust manifold.

The upper passage in the standard exhaust manifold can be drained by removing the brass slotted head screw from the side of each exhaust manifold. Prodding the drain holes with a piece of wire will make sure that they are fully open and not clogged with scale or sediment. Remove both 1/4" brass plugs from underside of each Ram's Horn muffler. Removal of one plug will not drain unit.

DUAL WATER PUMP

1. Pump is of the gear type. It is positive displacement in its action. Construction is all bronze with monel metal shafting.
2. The mechanical seal and ceramic seat provide the ultimate in sealing efficiency. If for any reason the mating surfaces are ever disturbed it is advisable to replace. Never mate a worn seal and new seat or vise versa. Coat the mating surfaces with a light oil at installation. Oiling the shaft will facilitate easy installation of the seal.
3. Use good grade water pump grease in pump grease cup.
4. For winter storage drain pump completely. Freezing water could cause internal pump damage.
5. At least once a season, disassemble the aft end of the water pump by removing the (4) bolts holding the end cap, pump body and idler gear assembly to the housing.
6. Remove all old grease from exposed parts and repack shaft bearings and grease cup with waterproof grease.
7. Reassemble, using a new gasket on each side of pump body.

DISASSEMBLY PROCEDURE

1. Remove rear bolts and cover.
2. With suitable gear puller, remove rear drive gear. (Puller holes provided).
3. Remove rear driver gear (Slip fit).
4. Remove rear Woodruff key.
5. Remove front bolts and slip the gear housing off the shaft.
6. Remove driver shaft with front drive gear contact.
7. With suitable gear, remove front drive gear. (Puller holes provided).
8. Remove front Woodruff key.
9. Remove body plate (holes provided).
10. Remove groove pin from nylon drive gear.
11. Press drive shaft thru body from nylon gear side. It will carry the shaft seal.
12. Remove water seal seat from the pump body.
13. Remove internal retaining ring at ball bearing.
14. Remove ball bearing by inserting 33/64 dia. pusher thru oil seal; pressing against inner race of bearing.
15. Press oil seal out of the body.
16. Reverse procedure to assemble.

GENERAL LUBRICATION

For maximum engine protection under all operating conditions, oils designated "For Service MS" or "For Service DG" are recommended.

SAE VISCOSITY OILS

SAE Viscosity Numbers indicate only the viscosity or body of the oil; that is, whether an oil is a light or a heavy body oil, and do not consider or include other properties of quality factors. The SAE viscosity number such as SAE 20, which represents heavier body oil than SAE 10, is recommended for use to provide improved oil economy and adequate lubrication under high operating temperatures.

TYPES OF OILS

In service, crankcase oils may form sludge and varnish and under some conditions corrosive acids unless protected against oxidation. To minimize the formation of these harmful products and to supply the type of oil best suited for various operating conditions, the oil industry markets several types of crankcase oils. These types have been defined by the American Petroleum Institute as follows:

"Service ML" (Comparable to former Regular type) — Generally suitable for use in internal combustion engines operating under light and favorable service conditions.

"Service MM" (Comparable to former Premium type) — Oil having the characteristics necessary to make it generally suitable for use in internal combustion engines operating under moderate to severe service conditions which present problems of sludge, varnish or bearing corrosion control when crankcase oil temperatures are high.

"Service MS" and "Service DG" (Comparable to former Heavy-Duty Types)—Oils having all the characteristics of the "Service MM" type plus additives to make them generally suitable for use in internal combustion engines operating under severe types of service conditions.

FOR MAXIMUM ENGINE PROTECTION UNDER ALL OPERATING CONDITIONS, OILS DESIGNATED "FOR SERVICE MS" OR "FOR SERVICE DG" ARE RECOMMENDED.

ENGINE LUBRICATION

The engine is lubricated by oil drawn from the crankcase through a screen strainer by the Spur gear type oil pump. The oil is forced under pressure through the full flow engine oil filter and then through drilled passages in the cylinder block to the camshaft bearings and mechanical valve lifters; hence through drilled passages in the push rods in order to lubricate the valves, valve springs, etc., by a spraying action which is metered by the action of the valve lifter arms.

There are also drilled passages in the cylinder block which provide pressure lubrication to the crankshaft main bearings, and through drilled passages in the crankshaft, oil is forced to the connecting rod bearings where a spraying action of the oil under pressure lubricates the cylinder walls and wrist pins. Oil is forced in a limited quantity from the aft camshaft bearing directly onto the timing chain and sprockets. Oil pressure is controlled by a relief valve in the oil pump cover.

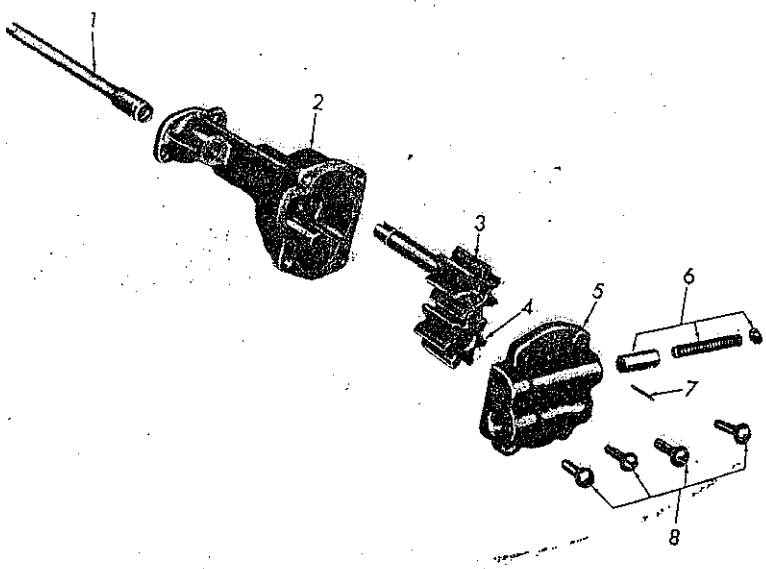
ENGINE OIL FILTER

A full flow oil filter, provided as Standard equipment, filters all of the oil delivered by the oil pump. For this reason the interval of element change is very important. The oil filter element should be replaced after the first 25 hours and every 50 hours of operation, or whenever engine oil is changed.

CHANGING OF OIL FILTER ELEMENT

Unscrew element container center bolt to drop and remove filter element. After dropping the container, use a hand sump pump to lower level of oil in container to avoid spilling. Before installing new element, clean out element container and place new seal in position in oil filter body casting.

NOTE: Oil filter center bolt should be tightened 20-25 ft. lbs. of torque.



V8 OIL PUMP EXPLODED VIEW

1 — Shaft Extension
2 — Pump Body
3 — Drive Gear and Shaft
4 — Idler Gear
5 — Pump Cover
6 — Regulator Valve
7 — Retaining Pin
8 — Screws

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GENERAL LUBRICATION

MAINTAINING OIL LEVEL

The oil gauge rod is marked "Full" and "Add Oil". These notations have broad arrows pointing to the level line. The oil level should be maintained between the two lines, neither going above the "Full" line nor under the "Add Oil" line. Check the oil level frequently and add oil when necessary.

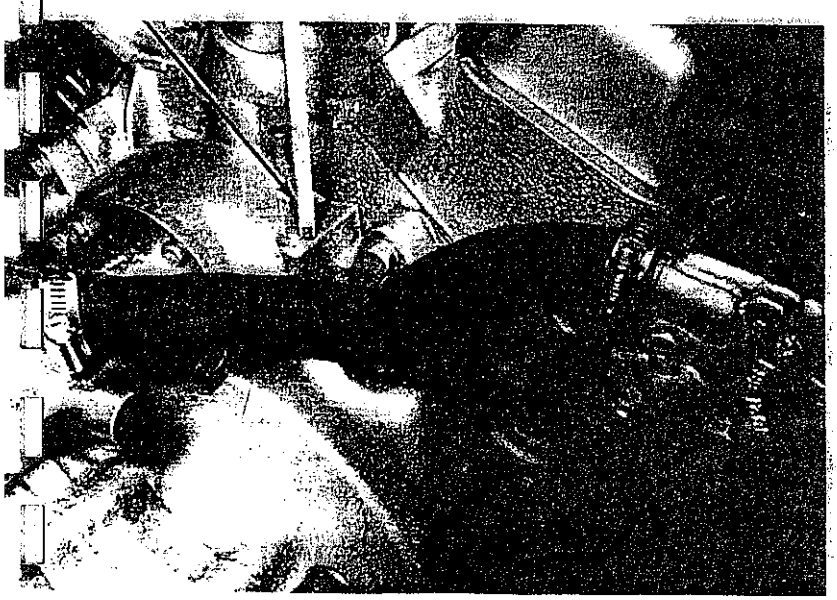
NOTE:

It is advisable when taking a long trip to recheck the oil level after the first hour of the trip. This is a precautionary measure due to the possibility of crankcase dilution which would give a false oil level reading. The diluents which are usually the result of incomplete engine warmup (traveling short distances) are driven out of the crankcase with high speed operation or sustained normal engine operating temperatures.

Care should be exercised when checking the height of the dip stick tube so a correct oil reading can be made.

When properly inserted in the measuring tube, the top of the dip stick tube should be 2" from the top of the timing gear housing. If the top of the dip stick tube is higher than 2", an incorrect reading on the dip stick would result in overfilling the engine crankcase with oil.

If the tube is not adjusted to the proper position, and too much oil is put in the crankcase, a serious problem can develop in the engine. The engine's oil pressure would fluctuate, crankcase pressure would build up, the engine would burn excessive amount of oil, the spark plugs could foul up, and the main bearing or rod bearing could conceivably burn up.



LUBRICATION — FIRST 25 HOURS

The engine crankcase of a new marine engine when shipped is filled with a light body, heavy duty oil. This oil will assure the proper "mating-in" of the engine components. Use this oil during the first 25 hours of operation. Check frequently and maintain the proper level.

If it is necessary to add oil, use SAE 10 oil designated "For Service MS" or "For Service DG".

At the end of the first 25 hours, drain the original oil when hot and refill with an oil of SAE 20 designated "For Service MS" or "For Service DG".

Replace oil filter element.

AFTER FIRST 25 HOURS

After the first 25 hours, change engine oil and engine oil filter element every 50 hours of operation.

Refill using SAE 20 oil designated "For Service MS" or "For Service DG" to "Full" mark on the depth gauge. Add one (1) qt. for filter element absorption.

During warm or hot weather, an oil which will provide adequate lubrication under high operating temperatures is required.

CRANKCASE CAPACITY

Engines equipped with the Hydraulic DD type reverse gear, having a separate oil supply, will require approximately 3 pts. Type A. Hydraulic fluid.

The capacity of the crankcase is given as an approximate volume due to the effect of the engine mounting angle in the particular installation, and the trim of the boat in the water when all equipment and passengers are abroad.

HOW TO CHANGE CRANKCASE OIL

Warm or hot oil will hold in suspension the foreign materials which are produced by an internal combustion engine and always found in used engine oil. Therefore, be sure the engine is thoroughly warmed up before removing the used engine oil.

Remove the engine oil depth gauge from its guide tube.

Use a hand suction or sump pump. Insert the hose or tube over the depth gauge guide tube, and pump out all used engine oil.

Change engine oil filter element each time engine oil is changed.

WHEN TO CHANGE CRANKCASE OIL

NORMAL CONDITIONS

Oils have been greatly improved, operating conditions have changed, and improvements in engine such as crankcase ventilating system, have greatly lengthened the life of good lubricating oils. However, to insure continuation of best performance, low maintenance cost and long engine life, it is necesarry to change the crankcase oil whenever it becomes contaminated with harmful foreign materials. Under normal operating conditions, draining the crankcase and refilling with fresh oil every 50 hours is recommended.

HIGH TEMPERATURE OPERATION

Frequent long runs at high speed with the resultant high engine operating temperatures may oxidize the oil and may result in a more rapid formation of sludge and varnish. While no definite drain periods can be recommended under these conditions, they should be more frequent than under normal operating conditions.

LOW TEMPERATURE OPERATION

Short runs in cold weather and excessive idling do not permit thorough warming up of the engine and water. Fuel and acid may accumulate in the crankcase. Water resulting from condensation in the crankcase may freeze and interfere with proper oil circulation. These factors also promote corrosion and sludge formation, and may cause clogging of oil screens and passages. Under normal operating conditions, this water is removed in the form of vapor by the crankcase ventilator. However, if crankcase diluents accumulate, they should be removed by draining the crankcase as frequently as may be required.

CRANKCASE DILUTION

Probably the most serious phase of engine oil deterioration is that of crankcase dilution which is the thinning of the oil by fuel vapor leaking by pistons and rings and mixing with the oil, and by condensation of water on the cylinder walls and crankcase.

Leakage of fuel, or fuel vapors, into the oil pan occurs during the "warming up" period when the fuel is not thoroughly vaporized and burned. Water vapors enters the crankcase through normal exhaust gas blow-by. When the engine is not completely warmed up, these vapors condense, combine with the condensed fuel and exhaust gases, and form acid compounds in the crankcase.

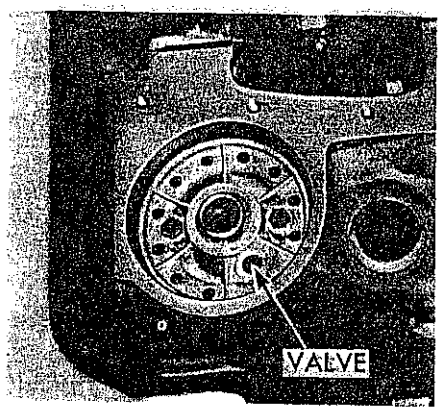
As long as the gases and internal walls of the crankcase are hot enough to keep water vapor from condensing, no harm will result. However, when the engine is run in low temperatures, moisture will collect and unite with the gases formed by combustion resulting in an acid formation. The acid thus formed is likely to cause serious etch or pitting which will manifest itself in excessively rapid wear on piston pins, camshaft bearings and other moving parts of the engine, oftentimes causing the owner to blame the engine manufacturer or the lubricating oil, when in reality the trouble may be traced to the character of fuel used or a condition of the engine such as excessive blow-by or improper carburetor adjustment.

AUTOMATIC CONTROL DEVICES TO MINIMIZE CRANKCASE DILUTION

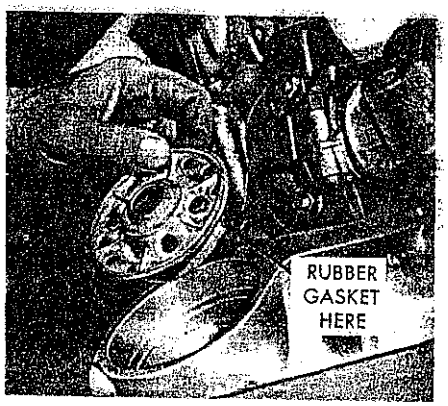
The Flagship engine is equipped with automatic devices which aid greatly in minimizing the danger of crankcase dilution.

The automatic choke reduces the danger of raw or unvaporized fuel entering the combustion chamber and leaking into the oil reservoir.

An efficient crankcase ventilating system draws off fuel vapors and aids in the evaporation of the raw fuel and water which may find its way into the oil pan.



NOTE: Shell gasket in oil filter base is of permanent type and need not be changed unless damaged. If replacement is necessary, use enclosed gasket type G-348. When replacing gasket be sure all traces of old gasket are removed from gasket seat. Seat new gasket fully before installing new element and shell.



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ENGINE ELECTRICAL SYSTEM

Flagship V8 generator is the 12 amp. capacity, fully enclosed marine type with 12 volt output. The generator is the only belt-driven component on the engine and the belt should be inspected periodically for proper tension.

The front and rear bearings of the generator require periodic lubrication. Two drops of engine oil should be applied to each bearing every 100 hours of operation, or at least twice each season. No other generator service is necessary.

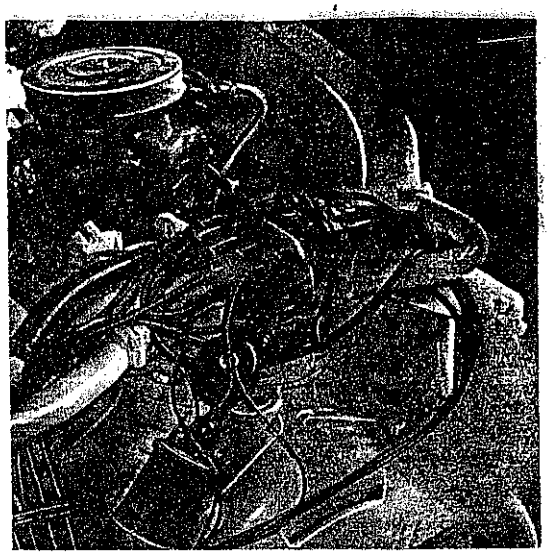
CONDENSER

The condenser is constructed with long strips of metal foil separated by strips of oiled paper and wound in alternate layers into a tight roll. It is mounted with a clip either inside or on the side of the distributor. Correct condenser capacity protects the life of the breaker points by preventing excessive arc. A burned out or punctured condenser can be detected by a feeble spark when the high-tension wire from the coil is held 1/4" from cylinder head, or by extensive pitting or welding of the breaker points in distributor. If any damage to the condenser is noted, it must be replaced as it cannot be repaired successfully. A spare condenser is a good item to carry on board at all times.

COIL

The ignition coil on your V8 Flagship Engine has an internal resistor and consists of two sets of windings around an iron core. The primary winding has two terminals and comparatively few turns of heavy wire. The second set of windings has many layers of fine wire. One end of the secondary wiring (fine wire) is grounded (the other end is connected to the "hot" terminal at the end of the coil).

Due to its construction, the ignition coil requires no service of any kind other than inspection to make sure all connections are clean and tight. Ignition coil failure is usually the result of broken down insulation either in its primary or secondary windings. In case of coil failure, the entire ignition coil must be replaced.

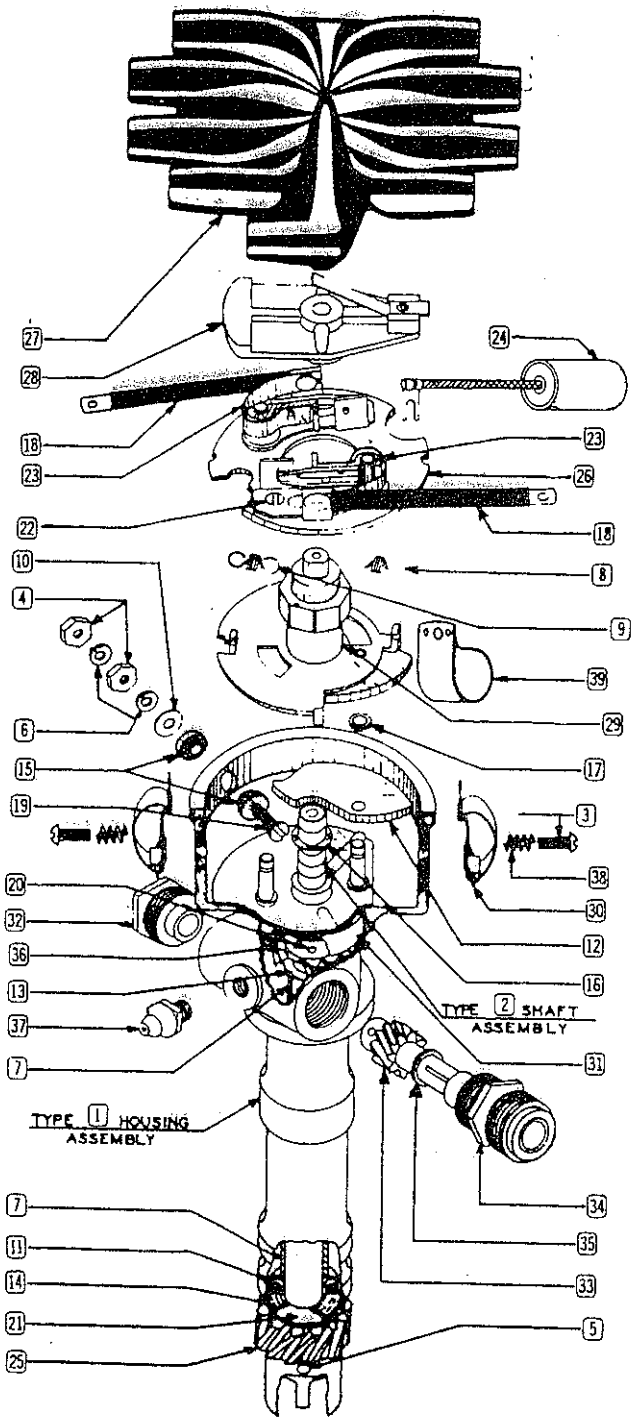


DISTRIBUTOR

The distributor used on the Flagship V8 Engine is a 12 volt, 8 cylinder unit, having a centrifugal advance mechanism which is done automatically by two methods.

With the engine at idling speed, the spark will occur according to the timing setting. As the engine speed increases, the centrifugal weights in the distributor start to swing outward advancing the spark. This continues until the engine reaches a speed at which maximum advance is obtained. As engine speed decreases the springs pull the weights inward, retarding the spark and providing governor advance in direct relation to engine speed. To maintain efficient operation, the contact points in the distributor must be adjusted at all times or otherwise engine lost efficiency may develop. All Flagship V8 Marine Engines have been equipped with Mallory Distributors. This change was made specifically in the interest of lower ovall engine height. If this distributor is not adequately lubricated, serious damage could easily result to the tachometer shaft and gear asembly. It is most important that the zerk grease fitting should be lubricated every 25 hours (refer to distributor specification) for best results. Please check this point carefully for Flagship Marine Engine cannot accept warranty claims resulting from lack of lubrication.

Every 100 hours, apply a light film of grease to the distributor cam lobes.



MALLORY YD 356A-2 DISTRIBUTOR

ALL V/8'S

PARTS LIST

Item No.	Description
1	Housing Assembly
2	Shaft Assembly (Less Bearing)
3	8-32 Screw (2) Ea.
4	10-32 Hex Nut (2) Ea.
5	Roll Pin
6	#8 Lockwasher (2) Ea.
7	Shaft Bushing (2) Ea.
8	Governor Advance Spring
9	Governor Advance Spring
10	#8 Brass Washer
11	Oil Seal
12	Governor Weight
13	Thrust Washer
14	Thrust Washer
15	Insulator (2) Ea.
16	Shim Washer
17	Spacer Washer
18	Insulating Sleeve (2) Ea.
19	8-32 Screw
20	Roll Pin
21	Bronze Washer
22	8-32 Screw
23	Circuit Breaker (2) Ea.
24	Condenser
25	Distributor Drive Gear
26	Circuit Breaker Plate Assembly
27	Distributor Cap
28	Rotor
29	Cam and Advance Plate Assembly
30	Cap Clip Assembly (2) Ea.
31	Ball Bearing
32	Tach. Stop Plug
33	Tach. Shaft and Gear Assembly
34	Tach. Drive Coupling
35	Thrust Washer
36	Tach. Drive Gear
37	Zerk Fitting
38	Tension Spring (2) Ea.
39	Condenser Clamp

DISTRIBUTOR SPECIFICATIONS YD 356A-2

Point opening (each)	.020
Point closing (Dwell—each)	26°
Condenser capacity	.28 MFD

Centrifugal Advance

Following based at engine R. P. M. and fly wheel advance.
Start at 800 R. P. M.
28° at 2800 R. P. M.

Suggested procedure for point settings:

1. POINT OPENING WITH FEELER GAUGE:
   a. Turn shaft slowly. Set rubbing block of one circuit breaker at the high portion of a cam lobe. Adjust to .020" clearance.
   b. Turn shaft slowly. Set opposite circuit breaker to the high portion of a cam lobe. Adjust to .020" clearance.

2. POINT CLOSING WITH DWELL METER:
   a. Place a clean piece of insulating material between points of one circuit breaker.
   b. Adjust opposite circuit breaker to 26°.
   c. Transfer insulating material to the circuit breaker you have adjusted.
   d. Adjust remaining circuit breaker to 26° dwell.
   e. Remove insulating material. With both circuit breakers in operation, total dwell reading will be 31 to 35 degrees.

DISTRIBUTOR LUBRICATION: (Every 50 hours). Apply a light film of grease to the cam lobes as needed. This will minimize rubbing block wear. Apply Chassis Lubricant to fittng No. 25737. **CAUTION:** — USE A HAND GUN. STOP GREASE FLOW WHEN YOU FEEL THE FIRST SLIGHTEST BACK PRESSURE.

TUNE-UP SUGGESTIONS

1. DISTRIBUTOR CAP: To test for a secondary breakdown, position the cap so that the inner segments can be seen. Turn ignition key on and crank the engine. The high voltage entering into the cap from the coil will arc across any portion that may be defective. If the cap is free from defects, check the seating of each spark plug wire and clean all surfaces.

2. ROTOR: To test, remove the distributor cap. Remove the coil wire that leads into the cap. Hold this coil wire one half inch above the rotor. Crank the engine with the key on: no sparks should be obtained. If the rotor is defective the high voltage spark will pin point the exact location of the defect. Replace if necessary.

3. CONDENSER: Capacity should be approximately 26 to 28 MFD'S.

4. CIRCUIT BREAKERS: Inspect surfaces of each point. Replace if pitting is excessive. Contacts should be free from grease or any other foreign matter that would cause flashing. Adjust properly to specifications.

5. CENTRIFUGAL ADVANCE

A. MINOR TUNE-UP: Test advance curve to specifications. The two governor springs can be adjusted by rotating the saft slowly until each spring is visible through a hole provided in the circuit breaker plate. Use a screw driver. Bending the supports inward will decrease the tension for a more rapid advance. Bending the supports outward will increase the spring tension and lower the rate of advance. Adjust as required.

B. MAJOR TUNE-UP: Should the governor mechanism fail to operate properly after adjustment, remove the breaker plate assembly. The governor springs are not interchangeable. The light 22126FED and the heavier 22126A springs must be in the identical position as illustrated. Remove the springs. Do not damage the loops. Remove the cam and governor assembly. Inspect the distributor shaft and inside of the cam sleeve for rust or any foreign matter that might cause sticking. Clean these surfaces thoroughly. Wash the entire governor in a suitable cleaning solvent. During the assembly put a light film of grease on the upper part of the shaft. A light film of oil is desirable on all other moving parts. Replace the governor springs in the proper location. Install breaker plate. Adjust points and proceed to adjust governor mechanism.

6. TACHOMETER DRIVE ASSEMBLY: Use a suitable wrench to back off assembly 25714 and 25708. Remove the drive gear and inspect for wear. Wash in a suitable cleaning solvent. Lubricate properly according to the above instructions.

7. REMOVAL OF THE DISTRIBUTOR SHAFT: To remove the distributor shaft, drive out pin #20959 at the gear. Remove gear. Remove circuit breaker plate. Tap shaft lightly at the bottom on a wooden surface. The shaft can now be removed through the top of the housing.

8. OIL SEAL SERVICE: To remove the 24048 oil seal, insert a screw driver between the upper and lower wall of the seal. The screw driver will now be at a slight angle. Drop a long round drive in the top of the distributor housing on the screw driver. A slight tap on this drive against the screw driver will force the seal outward. When a new seal is installed, place it in the housing with the number facing upward. Use the old seal as a drive and tap your new seal into place.

9. COIL CHECK: Remove the coil output wire from the distributor cap. Hold this wire about 1/2 inch away from ground. Crank engine with the ignition key "on". A reasonable snappy blue spark should be obtained. If spark output is weak, check the following: Point condition and clearance, condenser, moisture, leakage of secondary wiring, and all wiring and connections in the primary circuit. If these parts are ok, remove coil for testing.

ENGINE CONTROL INSTRUMENTS

AMP METER

Boats having individual instruments instead of the instrument cluster are equipped with an amp meter. The amp meter indicates the amount of current being used by your 12 volt D. C. system or the amount of current being generated by the engine alternator. Except when the batteries are fully charged, the amp meter will show a charge when the engines are operating at a speed greater than 800 RPM.

If the battery has reached full charge the regulator will automatically cut the output of the alternator so that your amp meter will show no charge. On twin engine boats the port amp meter indicates current being used or charged by accessory alternator and batteries. The starboard amp meter indicates current only for the ignition and starting alternator and batteries. On boats having the combination blower-ignition switch the engine-room blower is also operated by the ignition batteries.

AMP LIGHT

The amp indicator light is a visual indication that the alternator is charging when the light is not lit. When the amp indicator light is lit this indicates that the alternaor is not producing sufficient voltage to charge the batteries. Normally, the amp indicator light will not be lit except when engines are not running with ignition on or when the engines are operating at a very low RPM. The amp light is not effective as an indicator of battery discharge when the ignition is turned off.

OIL PRESSURE GAUGE

The oil pressure gauge is calibrated with an "L", and "N" and an "H", meaning low, normal and high. This is equivalent to a pressure range of zero to eighty PSI. Oil pressures from ten to fifty are safe. New engines will show oil pressure readings from slightly below normal to slightly above normal. This is no cause for concern, since the variation is the result of minute differences in bearing clearances in the different engines and in the normal error tolerance of the oil pressure sender and gauge. You can expect a gradual drop in the oil pressure readings on your engine as engine wear increases with age.

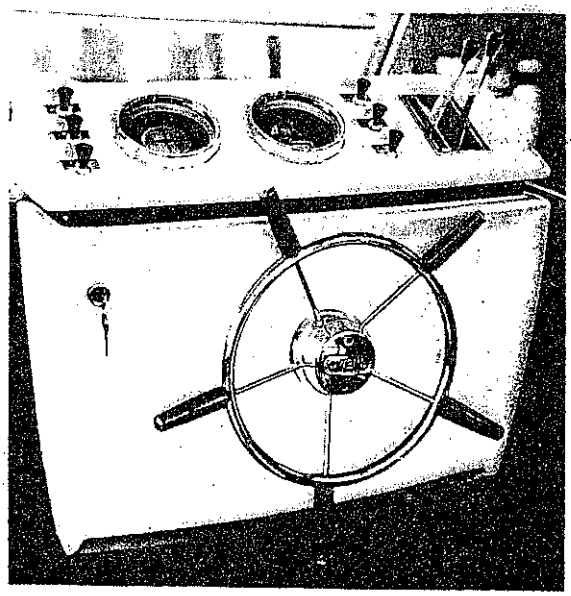
Port and starboard engines on a given boat are seldom the same. Variations of five to ten PSI are normal. Oil pressure at idling speed will always be lower than the oil pressure at full RPM. Watch for very low pressures or very high pressures or for sudden changes in the pressure which you have been accustomed to observing on a given engine.

OIL PRESSURE INDICATOR LIGHT

The oil pressure indicator light is a visual indication of low oil pressure. The pressure switch is set to turn this light on at pressures below six PSI.

WATER TEMPERATURE GAUGE

Your engine water temperature gauge is calibrated with a "C", an "N" and an "H", meaning cold, normal and hot. These calibrations correspond to a temperature range of 60°F to 220° F. Normal temperature is 140°F. Cooling water temperatures from 100°F to 160°F are safe. Low temperatures are generally the result of low water temperatures in which the boat is operating. Higher than normal water temperatures can be indicated as a result of clogging of the water intake strainer, the water intake valve, clogging of the transmission oil cooler on the water side, insufficient lubrication of the water pump, excessive wear on the water pump or a build-up of scale in the water passages in the engine. As with oil pressure gauges, you can expect a slight variation between the indicators on the port and starboard engines caused by the normal production tolerances in the manufacturing of these gauges and senders.



Instrument Control Panel on 28' Owens

STARTING ENGINE FIRST TIME

BEFORE STARTING THE ENGINE

After the engine has been properly installed and all controls properly connected, the following instructions are to carried out before starting a new engine:

1. CHECK FUEL SUPPLY: Be sure the tank is clean, then fill with a good grade of gasoline of 80 octane (Motor Method).

2. CHECK LUBRICATING OIL IN CRANKCASE: Flagship V8 marine engines are shipped from the factory with special break-in oil in the crankcase. Do not, however, fail to check the oil level after the engine has been installed and the boat is resting in the water. Depending on the angle at which the engine is positioned, it may be necessary to add oil or remove some of the break-in oil in order to have the crankcase properly filled to the full mark on the depth gauge. However, do not remove oil until engine is run and oil level is rechecked. If lubricating oil is required, add a sufficient quantity of Heavy Duty quality SAE 10 engine oil such as Humble's "Encolube HDX", "Essolube HDX", or "Uniflo", Gulf Pride "HD Select", or equivalent.

3. CHECK LAG BOLTS holding engine to bed. They must be tight.

IMPORTANT: If the boat came off a train or truck, or if it has been out of the water for considerable time, check the shaft alignment.

4. INSPECT THE ENGINE for loose nuts or screws. Transportation frequently loosens fastenings on a new engine on account of gasket shrinkage. After engine has had a preliminary run, take up on exhaust manifold nuts and intake manifold bolts. Intake manifold bolts should be torqued to 25-35 ft. lbs. Exhaust manifold nuts should be torqued to 18-22 ft. lbs.

5. CHECK STORAGE BATTERY: Make sure that storage battery is filled with water level at least 3/8" above the plates, and fully charged. Proper fluid gravity is 1.275. Low battery will result in slow cranking speed and weak spark.

6. CHECK ALL ELECTRICAL CONNECTIONS including battery cables. Make sure they are tight and all connections soldered. (Use rosin flux in soldering.)

7. CHECK WATER CIRCULATION SYSTEM: Open the gate valve if used in the cooling water intake line. This valve should be located in the bottom of the boat.

8. CHECK ALL CONTROLS to make sure they are working freely with sufficient travel so that they do not strike against woodwork. This refers to throttle and reverse gear controls.

9. TURN ON THE GASOLINE: The shut-off cock is properly located near the fuel tank.

10. SAFETY PRECAUTIONS: Check engine compartment and bilge for gasoline fumes. If boat is equipped with ventilating fan run it for 5 minutes before starting engine; otherwise, open hatch or engine box and let dead air out.

11. PUT FORWARD AND REVERSE SHIFT LEVER IN NEUTRAL POSITION.

HOW TO START THE ENGINE

1. CRACK THE THROTTLE off idling position to set on fast idle.

2. TURN ON IGNITION SWITCH.

3. PRESS STARTER BUTTON.

CAUTION: Do not operate cranking motor longer than 30 seconds. A longer period than 30 seconds may damage the solenoid switch and cranking motor. If engine does not start after filter bowl and carburetor bowl has filled with gasoline, refer to "Trouble Shooting" section.

NOTE: Engines which have been in transit and storage for a period of weeks may start hard the first time. In such case, remove spark plugs and clean the electrodes. While the plugs are out, squirt a teaspoonful (no more) of light oil, SAE 10, in each cylinder to provide an initial oil seal between piston rings and cylinder walls.

MEMO ON FLOODING: If the engine should flood before starting, the correct way to dry it out is to move the throttle to full open position. Then with ignition on, by cranking the engine nothing but air will be drawn through the carburetor as the idling jet is out of action at full throttle and the engine does not turn over fast enough for the main jets to go into action.

CAUTION: Be sure shift lever is in NEUTRAL position.

AFTER THE ENGINE STARTS

1. CHECK OIL PRESSURE GAUGE: Normal oil pressure at operating speeds is 25-35 pounds. An oil pressure of less than 20 pounds calls for investigation (5 to 15 pounds is satisfactory at idle).

STARTING ENGINE FIRST TIME

NOTE: Gauge may show no pressure for a minute or two while the filter is filling with oil if element has been changed.

2. CHECK SEA WATER PUMP: Circulation should begin within a minute after engine is started. With branze gear pumps, the prime of the pump is assisted by sufficient grease sealing the pump gears. If pump does not operate immediately, turn water pump grease cup down one-half turn.

CAUTION If boat is run in muddy waters, the water pump idler gear and pump body should be removed and all old grease in impeller housing thoroughly cleaned out at frequent intervals. Silt which entered the pump will mix with the grease and act as a grinding compound. This can cause exceptionally rapid wear on metal parts.

3. The first time the engine is started, run it at idle for 5 minutes, no longer. Then stop engine and re-check oil level in crankcase, and in reverse gear housing when applicable. (Do not check oil level while engine is running.) Oil level may be found low due to the fact that considerable oil is required to fill the oil passages; or, it may be found high due to mounting angle of engine or angle at which hull rides on water. Bring oil level to full mark on dept gauge.

4. WARM-UP INSTRUCTIONS: (To be followed every time you start a cold engine.) As soon as possible put the clutch lever in forward position and run at fast idle for 10 to 15 minutes in order to bring the oil up to proper temperature for normal operation. An indication of warm oil is that the oil pressure may drop off about 5 lbs. from what it was when the engine was cold.

IMPORTANT: Do not under any circumstances race the engine with clutch disengaged.

BREAK-IN PERIOD OPERATION

1. We do not recommend engine speeds of more than 2500 RPM during the first 15 hours of operation, nor engine speeds greater than 3000 RPM for the next 10 hours of operation. However, you will not damage your engine if you exceed these engine speeds ocassionally for short periods of time by intermittently opening the throttle and then returning the throttle to a slower or to the recommended RPM speed position.

2. RECHECK THE OIL PRESSURE as soon as you try out the boat at 2500 RPM. If indicating needle on the oil pressure gauge fluctuates wildly, this wil indicate that the angle of the engine is such that oil pickup screen is not completely submerged. The remedy for this is to stop engine and add more oil. This condition would be the result of an abnormal mounting angle of the engine and would require remarking the oil depth gauge to assure an adequate oil level in the future.

3. REDUCE ENGINE SPEED WHEN REVERSING: Gear should not be reversed at full engine speed except in extreme emergency.

4. Although all Flagship engines are thoroughly tested at the factory, good judgment is expected on the warm-up and operation during the early life of the engine. It takes from fifteen to twenty hours run-in to break in an engine for peak performance. On high speed models, oil consumption may be greater until the piston rings fit themselves perfectly inside cylinder walls after a few hours of fast operation.

ADJUSTMENTS ON A NEW ENGINE

1. PROPELLER SHAFT ALIGNMENT: If the boat is new, be sure to check the alignment within a few days, after the hull has soaked up some water, because the hull is liable to change its shape slightly, especialy when loaded—resulting in binding on the shaft.

2. CARBURETORS: Careful adjustment is made in the test room. Never re-adjust idle jets on the carburetor unless engine is warm. Make sure that throttle controls permit full travel of throttle.

4. HYDRAULIC REVERSE GEAR ADJUSTMENT: On engines equipped with Hydraulic Reverse Gears, no adjustments are required since the Hydraulic piston travel in the reverse gear will compensate for any wear.

5. VALVE STICKING: Sometimes valves on new engines or those which have been in storage, tend to stick. A corrective which is widely used in the automotive field is the use of a gum solvent in the fuel or a penetrating additive in the oil. Such additives are marketed widely by the leading oil companies and include such products as Houghton's "Motor Fuel Concentrate," Shaler "Risione," "Casite," "Siloo," "Wynn Oil," "Upperlube," and others. These additives are advantageous in counteracting special conditions because of their solvent and detergent effect.

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ENGINE TIMING

V8 FLAGSHIP ENGINE TIMING

By timing an engine is meant the synchronization of moving parts with the crankshaft and with each other.

Under ordinary circumstances the operator need only be concerned about one adjustment of timing that on the distributor setting with the flywheel as indicated by the white pointer shown in Fig. 1.

You may have noticed that there are two timing marks located on our V8 flywheel: one marking is for the opposite (LH) Rotation engine, the other is for Standard (RH) Rotation engine. Both markings have been set at our factory to read 12° before T-D-C (Top Dead Center) and the timing mark in RED on the flywheel should not be confused for T-D-C.

Using a timing light with engine at idle speed (600 RPM), loosen distributor hold down clamp, turn distributor until RED marking on flywheel appears at T-D-C, located on front of flywheel housing, with timing of engine complete, lock distributor hold down clamp.

NOTE: A mirror may be used in locating the timing mark, whenever the clearance between the bulk head and flywheel housing is not sufficient.

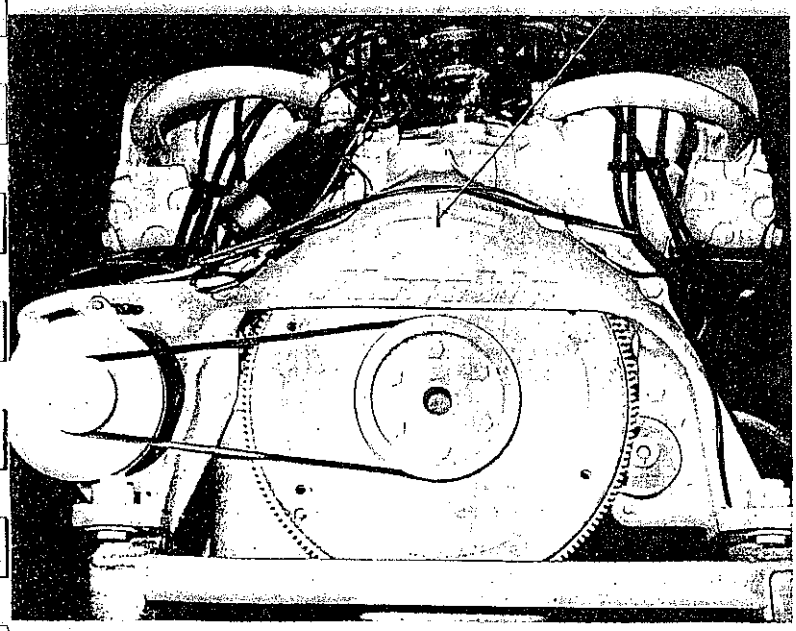


Fig. 1

ENGINE SERIAL NUMBER LOCATIONS

All Flagship V8 marine engines are identified by an engine serial number. At present, this number is being stamped on the machined surface of the block between the aft end of the port cylinder head and the water inlet from the port exhaust manifold into the block. See Fig. 2, indicated by white pointer.

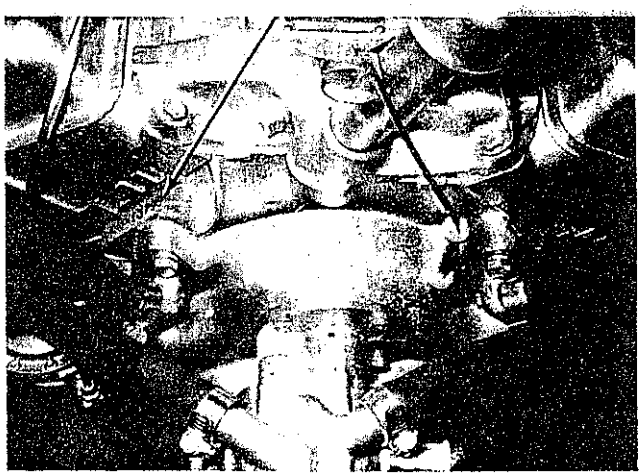
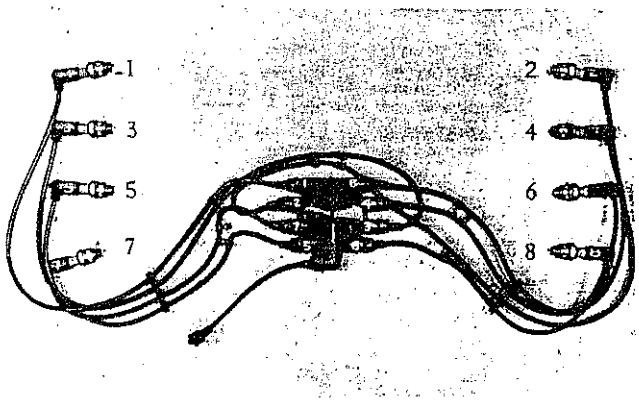


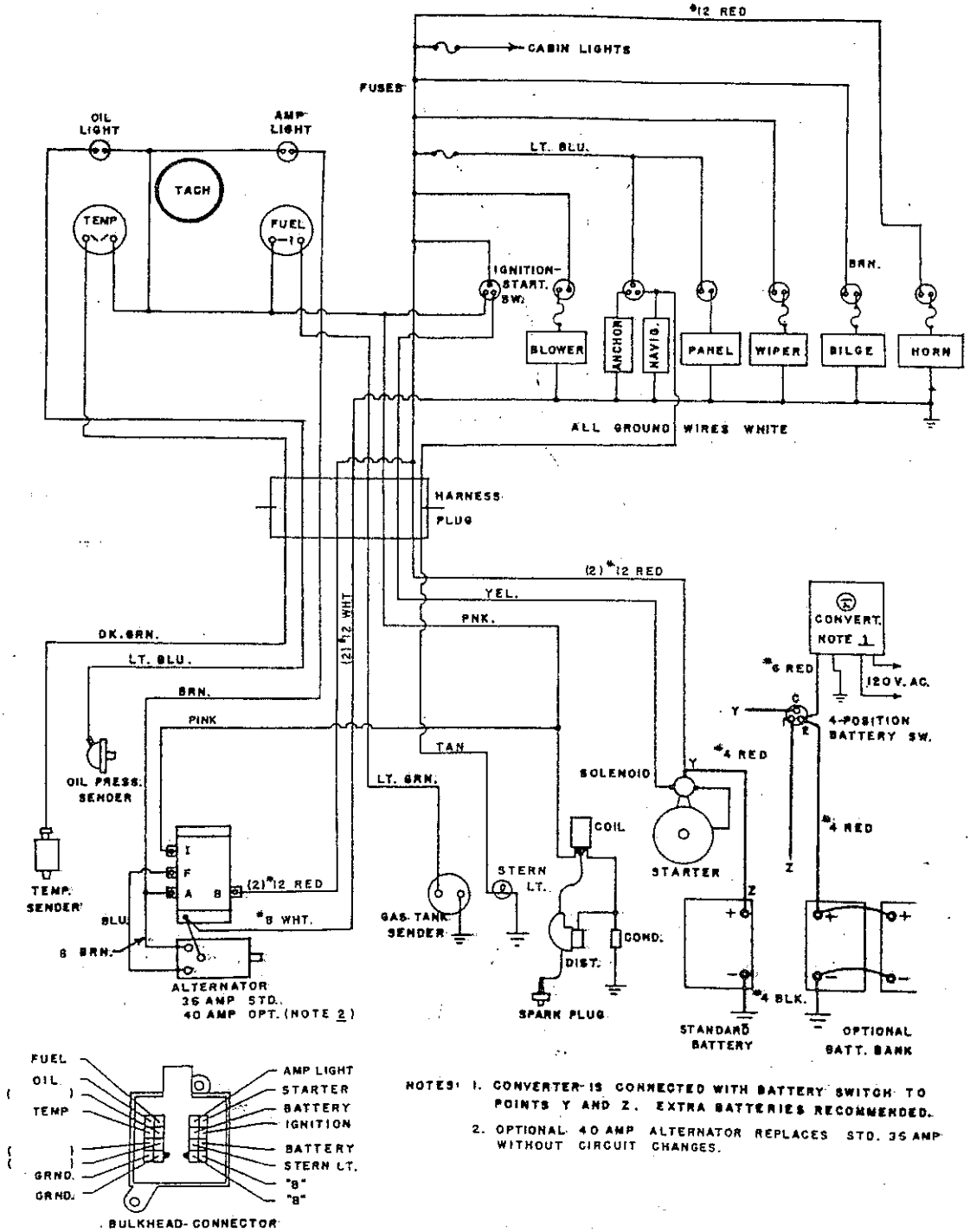
Fig. 2

Showing V8 Engine Cylinder Location



Front of Engine

WIRING DIAGRAMS

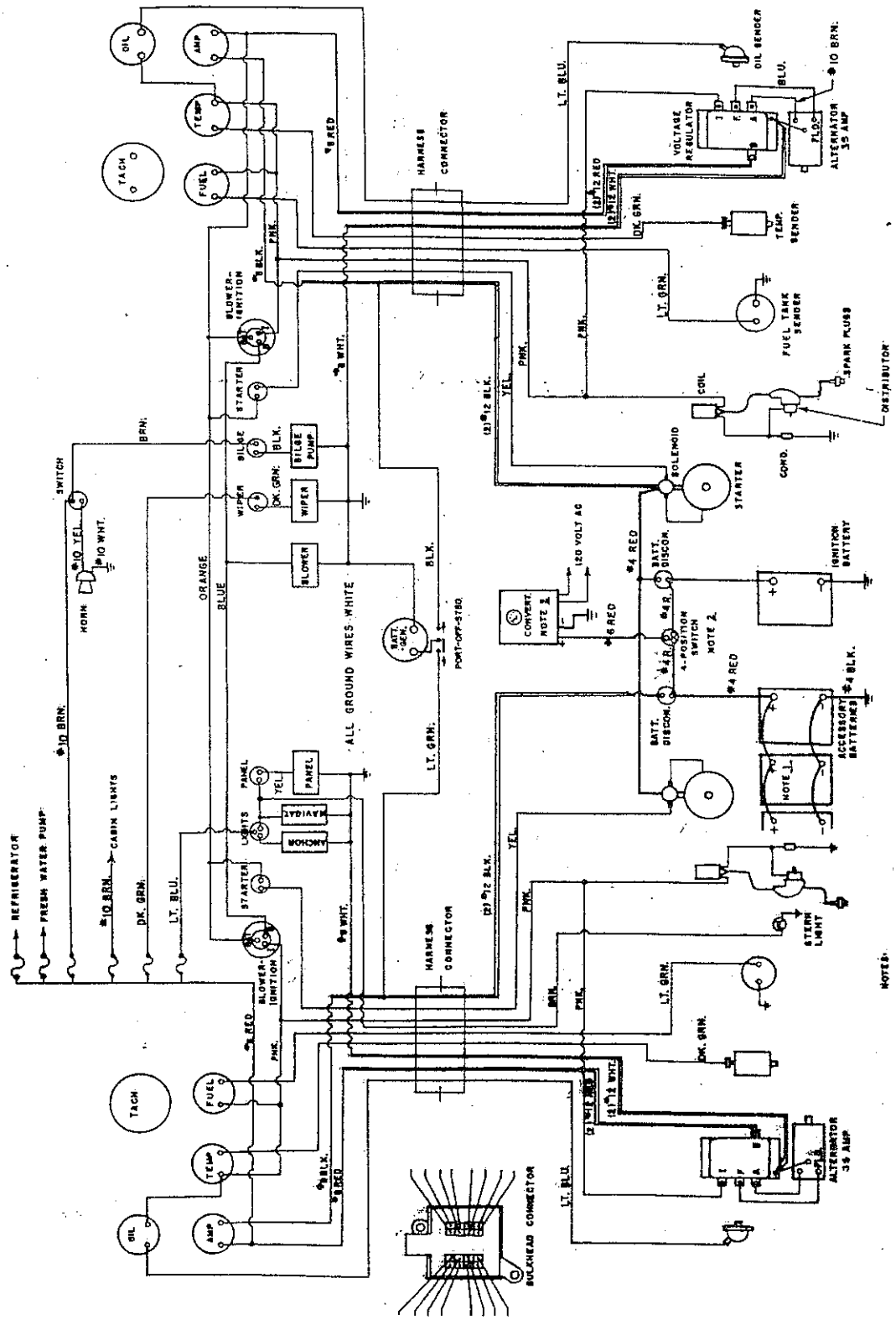


NOTES: 1. CONVERTER IS CONNECTED WITH BATTERY SWITCH TO POINTS Y AND Z. EXTRA BATTERIES RECOMMENDED.

2. OPTIONAL 40 AMP ALTERNATOR REPLACES STD. 35 AMP WITHOUT CIRCUIT CHANGES.

TYPICAL SINGLE ENGINE WIRING DIAGRAM

WIRING DIAGRAMS



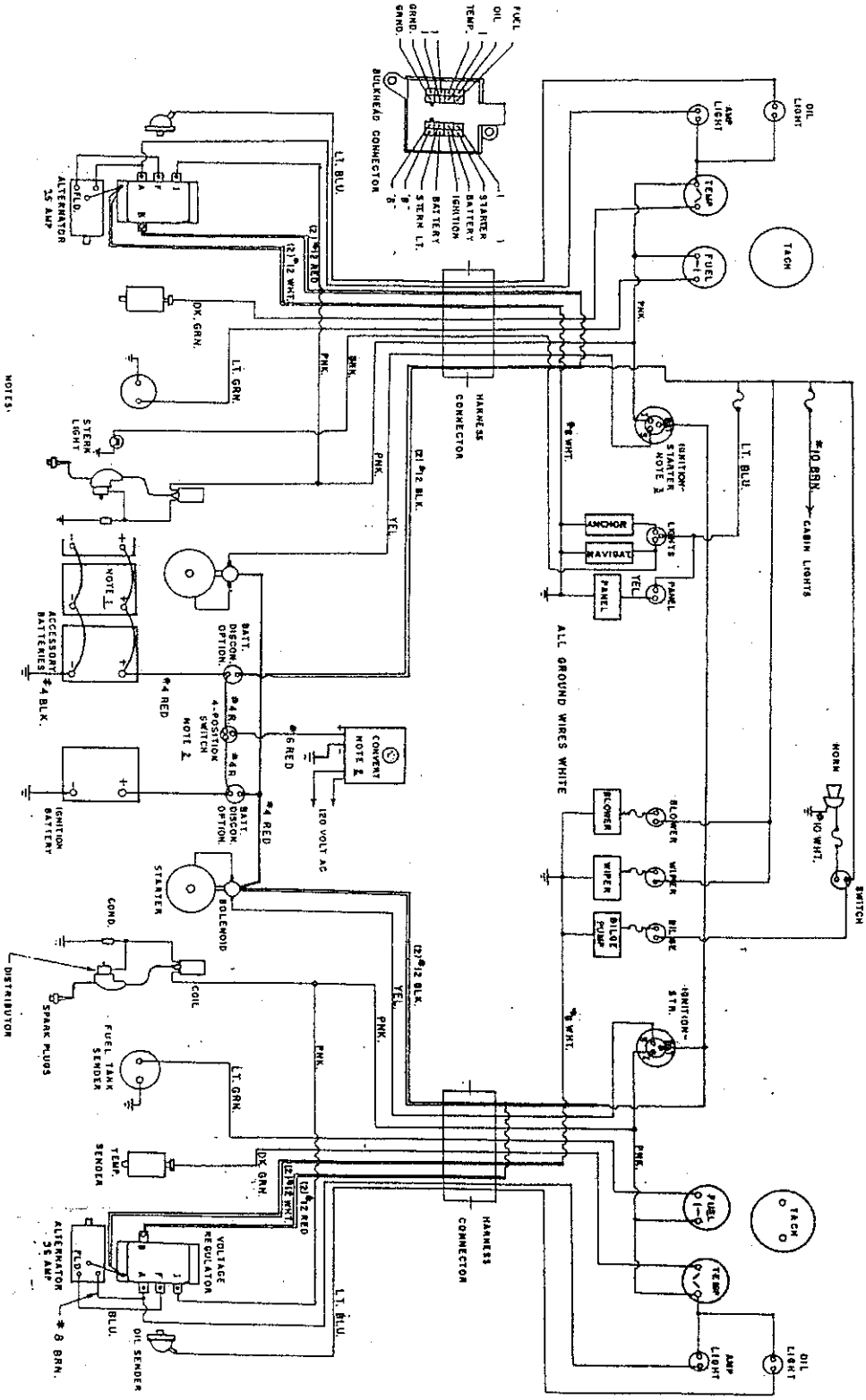
TYPICAL TWIN ENGINE WIRING DIAGRAM

EXCEPT WHERE NOTED, ALL WIRES ARE #14.

NOTES:

1. ADDITIONAL BATTERIES CONNECTED IN PARALLEL AS SHOWN.
2. CONVERTER (RECTIFIER) INSTALLED WITH 4-POSITION SWITCH AS SHOWN.

WIRING DIAGRAMS



NOTES:

1. ADDITIONAL BATTERIES CONNECTED IN PARALLEL AS SHOWN
2. CONVERTER (RECTIFIER) INSTALLED WITH 4-POSITION SWITCH AS SHOWN.
3. MODIFY SINGLE ENGINE HARNESS BY REMOVING "BAT" CONNECTOR. SPLICE PANEL LIGHTS FOR STBD. INSTRUMENTS INTO PANEL SWITCH.

EXCEPT WHERE NOTED, ALL WIRES ARE #14

TYPICAL TWIN ENGINE WIRING DIAGRAM

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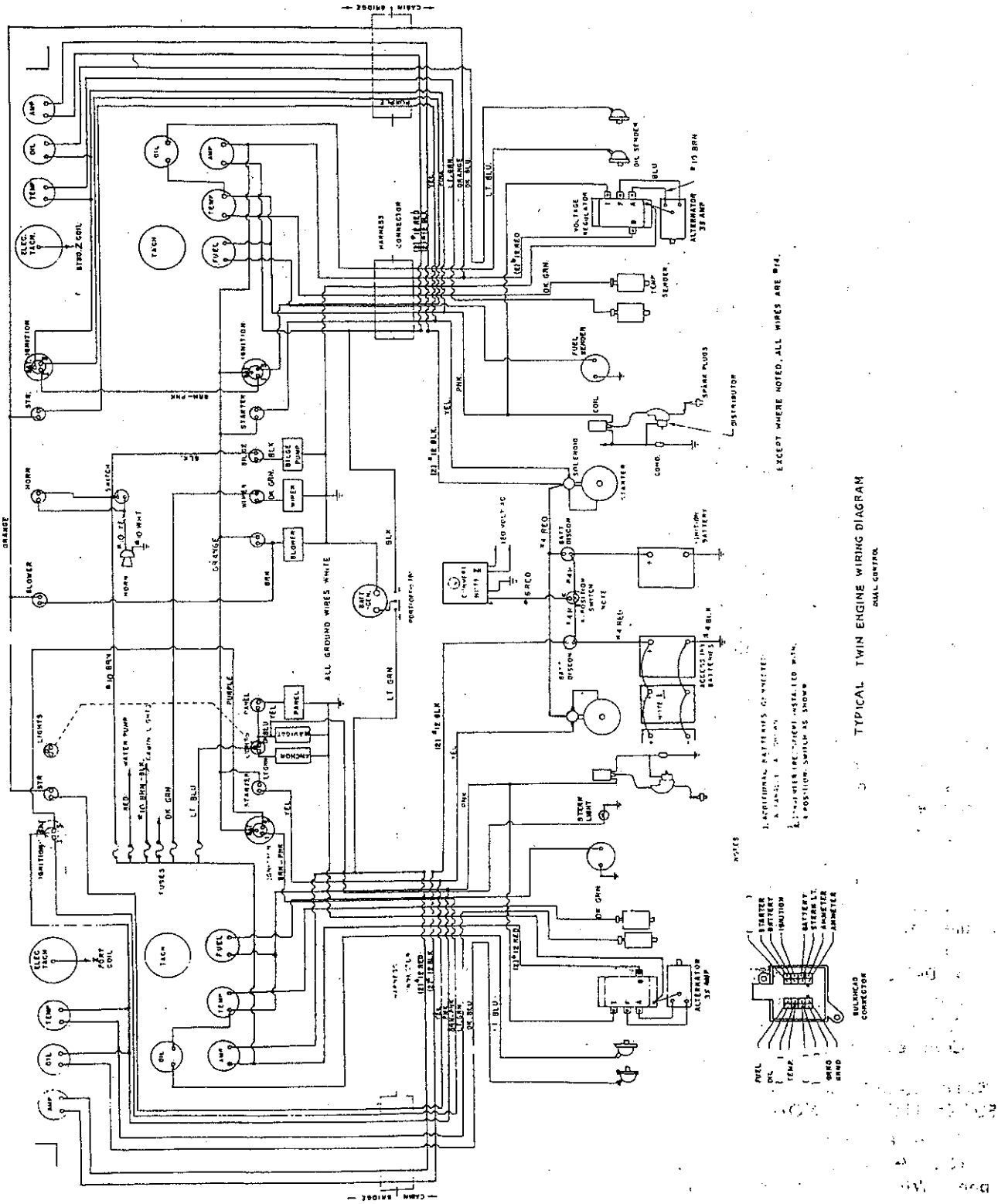
WIRING DIAGRAMS



TROUBLE SHOOTING GUIDE

A good rule to follow in locating engine trouble is never to make more than one adjustment at a time. Stop and think how the engine operates, and figure out the probable cause of any irregular operation, locating the trouble by elimination. Remember that the cause usually is a simple one, rather than a mysterious and complicated one. The following outline will be helpful in locating the ordinary engine troubles:

CRANKING MOTOR WILL NOT OPERATE

1. Discharged or low battery:

Recommended test for battery is to check with a hydrometer or voltmeter. If these are not available, in emergency, a quick check for battery condition is to touch a pair of pliers quickly across the terminals. A good fat spark will indicate a live battery.

SAFETY CAUTION: Before working around the battery or ignition circuits, the engine compartment should first be thoroughly aired out and a check made for gasoline fumes, before breaking any connections which might result in an exposed spark.

2. Loose or corroded battery terminals:

Check cable connections at the terminal posts. Dont just look: break the connection, clean and reclamp.

3. Defective starter switch:

First inspect connections and look for broken wire between switch and starter solenoid. In an emergency, turn on ignition switch and short across starter solenoid terminals with jumper wire to start engine.

CAUTION: Before using jumper be sure to ventilate engine compartment to remove any gasoline fumes.

Do not use jumper longer than 30 seconds at a time and be sure to remove it as soon as engine starts.

4. Defective cranking motor:

Inspect commutator and brushes.

5. Engine itself may be frozen.

Crank engine by hand to make sure it is free.

CRANKING MOTOR REVOLVES BUT ENGINE DOES NOT:

1. Weak battery:

Not sufficient power to turn engine at normal speed. When this condition exists the cranking motor will have a characteristic hum.

2. Acid-eaten cable:

Insufficient current getting through. Give particular attention to ground connection on battery.

3. Stripped gear on flywheel:

This is extremely rare.

CRANKING MOTOR OPERATES BUT ENGINE WILL NOT START

(This also covers hard starting and slow starting. Possible causes will be covered under (A) Improper Carburetion, (B) Electrical Difficulties, (C) Poor Compression, (D) Wrong Timing.)

A. Improper Carburetion

1. Out of fuel: tank empty?

2. Is gasoline reaching fuel pump? If there is fuel in tank, shut-off cock may be closed or the line may be clogged. Disconnect line at fuel pump and blow through line. Look for dents in tubing, and air leaks in fuel pump gaskets or in fuel line connections. Make sure that vent to gasoline tank is open.

3. Is fuel reaching the carburetor? Check screen in carburetor near inlet fitting. To check for clogged fuel filter element, remove filter assembly from carburetor and deassemble to fuel pump outlet line.

CAUTION: Use container to catch discharged fuel. The Flagship engine is equipped with mechanical fuel pump, check for fuel flow to carburetor by cranking engine with starter after removing filter assembly from carburetor. Also check screen in carburetor.

4. Is fuel reaching the cylinders? Remove spark plugs and see if they are moist. If there is no trace of gasoline in the cylinders, carburetor may be out of adjustment, float level too low, or the jets may be clogged with dirt or gum.

5. Is choke closing properly? Position of choke valve can be observed by removing aft flame arrestor.

6. Engine flooded? If the spark plugs are wet, this indicates flooding. Refer to Page (15) for instructions on deflooding the engine.

7. Air leaks at intake manifold.

8. Poor grade old or stale fuel in combination with cold weather. In very cold weather, heating the oil and warming the plugs will help.

B. Electrical Difficulties (Possible troubles may be summarized as follows.)

1. Primary Circuit.

Corroded, dirty or loose connections.

Weak, leaky or grounded condenser.

Distributor points pitted or fused.

Distributor points set to wrong gap, or loose.

Breaker arm sticking.

Spring weak or broken.

Hinge bushing tight on pin.

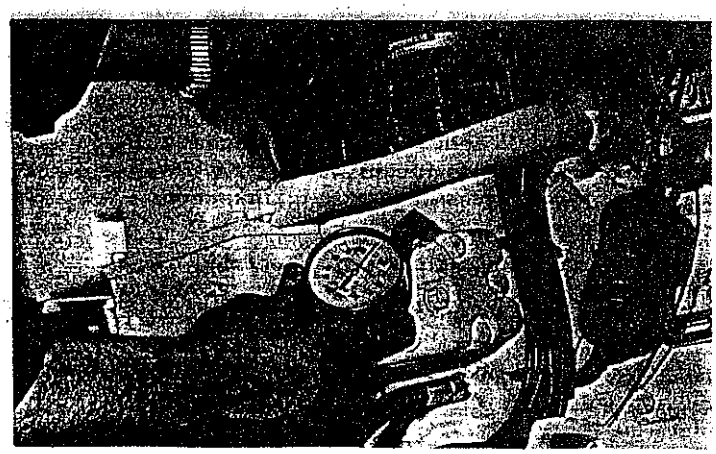
2. Secondary Circuit.

Corroded, dirty or loose connections (Pay particular attention to high-tension wire from coil to distributor, and all wires in distributor cap.)
Wet wires.
Moisture or carbon on spark plugs porcelains.
Cracked distributor cap.
Carbon contact inside distributor cap broken or missing.
Rotor contact spring broken.
Ignition coil weak.
Cracked insulation, leaks and shorts.
Wrong type of spark plug.
Improper gap on spark plug.
Fouled or cracked spark plugs.
Distributor wired to wrong plugs.

POOR COMPRESSION

The compression of each cylinder should be checked, because an engine with uneven compression cannot be tuned successfully to give peak perfomance.

1. Remove any foreign matter from around the spark plugs, and then loosen them about one turn to break free any accumulation of carbon.
2. Start engine and accelerate to 1000 RPM to blow out the carbon. (Starting and accelerating the engine after the plugs are loosened is extremely important in preventing false compression reading due to chips of carbon being lodged under the valves.
3. Stop engine and remove all spark plugs, placing them in order that they were removed.
4. Hold or block throttle in wide open position.
5. Insert compression tester in a spark plug hole (below).



6. Crank engine with the starting motor until the cylinder being tested passes through at least four to five compression strokes, using the same number of strokes on each cylinder.
7. Repeat this test on all cylinders and record the compression reading of each cylinder.
8. Compression on all cylinders when new should be 145 PSI (on the four barrel 283 cu. in.) and all cylinders should read alike within 20 PSI for satisfactory engine performance.

Should a low compression reading be obtained on two adjacent cylinders, it indicates the possibility of a leak from one cylinder to the other, usually caused by a leak at the cylinder head gasket. If the compression readings are low, or vary widely, the cause of the trouble may be determined by injecting engine oil on top of the pistons of the low reading cylinders. Crank the engine over several times, then take a second compression test. If there is practically no difference in the readings when compared with the first test, it indicates sticky or poorly seating valves.

However ,if the compression on the low reading cylinders is higher and about uniform with the other cylinders, it indicates compression loss past the pistons and rings. The cause of low or uneven compression should be corrected before proceeding with an engine tune-up.

OVERHEATING

1. Worn water pump.
2. Obstruction in lines or passages.
3. Obstruction in water intake scoop.
4. Scale or sand in water jackets.
5. Collapse of intake water hose under load.
6. Retarded ignition timing.
7. Low oil level in crankcase.
8. Grass in reverse gear oil cooler.

LACK OF POWER

1. Faulty compression.
2. Improper timing.
3. Poor carburetion.
4. Restriction in air supply to carburetor caused by dirt in flame arrestor screen, or choke valve not completely opening.
5. Throttle control linked up so that throttle valve is not fully opening.
6. Dirt or water in sediment bowl of fuel pump.
7. Dirt or water in fuel lines of carburetor jets.
8. Air leak in fuel pump or fuel line.
9. Air leak in intake manifold gasket.

10. High engine temperature, caused by worn water pump or clogged water jackets.
11. Vent of gasoline tank not open.
12. Pre-ignition, caused by carbon deposits, by wrong plugs, or warped valve head.
13. Engine and propeller shaft misalignment.
14. Insufficient air getting into engine compartment.

ROUGH, UNEVEN IDLING

1. Improper adjustment of idling screw on carburetor.
   Float level too high or too low.
   Idling jet air passage clogged.
2. Air leaks in intake manifold or carburetor.
   Loose intake manifold.
   Damaged gasket at intake manifold.
   Warped intake manifold.
3. Improper ignition.
4. Weak ignition coil.
5. Spark plug difficulties (gap too close).
6. Uneven compression.
7. Water leak in cylinder head, block exhaust manifold or Ram's Horn mufflers.

MISSING AT HIGH SPEED

1. Spark plug troubles.
2. Broken insulation on high-tension wires.
3. Weak breaker-point spring.
4. Defective ignition circuit resistor.
5. Fuel obstruction, indicated by back-firing.
6. Weak valve springs.
7. Improper tappet clearance.

MISSING AT ALL SPEEDS

1. Blown head gasket between cylinders.
2. Sticking valves, broken valve spring.
3. Fouled spark plugs, broken insulation.
4. Leaky high-tension wiring.
5. Pitted or fused breaker points.
6. Incorrect breaker-point gap.
7. Defective ignition circuit resistor.
8. Improper valve tappet clearance.
9. Punctured condenser.
10. Gasket leak at intake manifold.
11. Carburetor out of adjustment.

CRANKSHAFT KNOCKS. (Do not confuse with normal reverse-gear back lash.)

These are usually detected as dull, heavy, metallic knocks which either increase in frequency as the speed and load on the engine is increased, or are more noticeable at idling speeds. The most common crankshaft knock is that caused by excessive clearance at one or more main bearings. This is most audible when engine is pulling hard, on acceleration, or when engine is cold. By alternately shorting out each spark plug, the approximate location of the loose bearing can usually be determined. Excessive crankshaft end play causes a sharper noise or rap which occurs at irregular intervals. In bad cases this can generally be detected by releasing and engaging the clutch.

Causes of crankshaft knocks include the following:

1. Excessive bearing clearance.
2. Excessive end play.
3. Eccentric or out-of-round journals.
4. Sprung crankshaft.
5. Bearing misalignment.
6. Insufficient oil supply.
7. Low oil pressure.
8. Badly diluted oil.
9. Loose flywheel.

CONNECTING ROD NOISES

Connecting rod noises are usually a light pound or knock of much less intensity than main bearing knocks. The noise is usually evident with the engine idling and becomes louder when engine speed is slightly increased. Connecting rod noise can best be located by shorting out one spark plug at a time. These noises should not be confused with piston or piston pin noises. Possible causes are as follows:

1. Excessive bearing clearance on crank journal.
2. Insufficient oil supply.
3. Low oil pressure.
4. Badly diluted oil.
5. Misaligned connecting rods.
6. Out-of-round or tapered crank journal.

PISTON NOISES

The most common piston noise is 'slap', due to the piston rocking from side to side in the cylinder. Piston slap usually causes a hollow, muffled bell-like sound, or a click. Slight piston noises that occur with a cold engine and disappear after the engine is warm do not ordinarily warrant an overhauling. Piston slap is most audible when driving the engine at low speed under load. Do not confuse with reverse gear back lash, which is normal in a marine engine of this type, especially at speeds below 600 RPM. Piston ring noises generally cause a click, snap, or sharp rattle on acceleration.

Piston and ring noises can be located by putting a spoonful of heavy engine oil (SAE) into the suspected cylinder through the spark plug hole. Crank the engine over by hand for several revolutions with the ignition off, until the oil has worked down past the piston rings. Replace the spark plug, start the engine, and determine if the noise still exists.

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TROUBLE SHOOTING GUIDE

PISTON PIN NOISES

The most common piston pin noise is the result of excessive piston, pin clearance. This is characterized by a sharp, metalic double knock, generally audible with the engine idling. Possible causes:

1. Excessive piston pin clearance in piston boss.
2. Connecting rod end rubbing piston pin boss.

VALVE AND TAPPET NOISES

Noisy valve action has a characteristic clicking noise occuring usually at regular intervals. The frequency of valve action noise is generally less than other engine noises because the valves are operated by the camshaft running at one-half of crankshaft speed. If one or two of the valves or tappets are causing the noise, the clicking sound will be intermittent, but if the condition exists with a majority of the valves, the noise may be continuous.

The common cause of valve action noise is that of excessive clearance between tappet and valve stem. Correct setting will be found in specifications. Do not set for less than specifications call for, since this is liable to cause burned valves.

Possible causes of valve and tappet noises:

1. Excessive valve stem to tappet clearance.
2. Threads stripped on adjusting screw.
3. Weak valve springs.
4. Excessive valve stem to guide clearance.

SPARK KNOCK AND FUEL KNOCK

Included under this heading are Pre-ignition and Detonation. Pre-ignition is caused by an incandescent particle of carbon or metal in the combustion chamber which fires the mixture prematurely while the piston is still rising. Detonation is caused by fuel of low octane rating which burns too rapidly, throwing a sudden and abnormally high pressure againt the down-moving piston. The two have a similar sound, a metallic ringing knock which is often described as a "ping." This is usually heard when the engine is laboring, accelerating rapidly, or overheated.

Causes:

1. Carbon deposits in combustion chamber.
2. Ignition timed too early.
3. Weak springs in automatic distributor advance.
4. Incorrect spark plugs (too hot).
5. Carbon on spark plugs or burned porcelains.
6. Sharp metalic edges in combustion chamber or on gasket edge.
7. Cylinder head gasket projecting in combustion chamber.
8. Hot valves resulting from:
   - Insufficient tappet clearance.
   - Water lines too small.
   - Use of wrong type of valve.
   - Improper seating.
   - Thin edge valves.
   - Warped or cracked valve heads.
9. Excessive engine temperature, caused by faulty water circulation.
10. Low octane fuel.
11. Old or stale fuel.
12. Extremely lean carburetor mixture.

BACK-LASH KNOCK

This can, under certain conditions, appear as a rattle or chuckling noise in the reverse gear, and it may be easily confused with other types of engine knocks.

It is caused by normal back lash between the teeth of the reversing gears, and it is heard only at low speeds, "washing out" when the engine is accelerated above 600 RPM. Normal back lash is not an indication of wear, and is harmless.

VIBRATION ORIGINATING AT ENGINE

The commonest sources of vibration originating in or on the engine, as distinguished from causes originating outside the engine (covered below) are as follows:

1. Mis-firing.
2. Misalignment of engine and propeller shaft.
3. Bent or off-center coupling.
4. Engine loose on bed.
5. Engine support loose on cylinder block.
6. Unbalanced or sprung crankshaft.
7. Unequal compression of cylinders.

COMMON VIBRATION OR NOISE ORIGINATING OUTSIDE THE ENGINE

Thumping sounds and vibration originating outside the engine often telegraph along the propeller shaft and appear to originate in the engine. These may be caused by one or more of the following:

1. Bent propeller.
2. Sprung propeller shaft.
3. Worn stuffing box.

UNCOMMON ENGINE NOISES

The following possible causes of engine noise are more rare, but should be considered and checked in locating foreign sounds:

1. Flywheel loose on crankshaft.
2. Crankshaft pulley loose on flywheel.
3. Foreign object in exhaust passages.

4. Loose exhaust pipe at manifold connection.
5. Loose engine accessories, such as generator, waterpump, etc.

BACK-FIRING AT CARBURETOR

Engine back-firing through the carburetor when starting cold is many times unavoidable as it is the result of imperfect air-gasoline mixture, which will automatically correct itself after the engine reaches normal operating temperatures. The cause of back-firing in this case is late burning of the mixture in the cylinder, due to improper ratio of fuel to air, igniting the incoming charge and causing an explosion in the intake manifold and carburetor. Thus lean mixtures and retarded spark are the commonest cause of back-firing. Continued back-firing after the engine is warm should be corrected by checking the following possible causes:

1. Excessively lean fuel mixture.
2. Late ignition timing.
3. Incorrect valve timing.
4. Improperly seating valves, especially intake.
5. Obstruction in fuel line.
6. Dirt or water in sediment bowl.
7. Intake manifold air leaks.
8. Poor grade of fuel.
9. Secondary wires crossed in distributor cap.
10. Distributor governor sticking.
11. Badly worn or improper spark plugs.
12. Defective ignition circuit resistor.
13. Worn lobe off camshaft.

ABNORMAL OIL CONSUMPTION

1. Worn forward or rear end oil seal.
2. Engine half of propeller coupling not contacting oil seal.
3. Bad oil seals at clutch shafts.
4. Damaged or poorly fitting gaskets.
5. Cracked oil pan.
6. Worn piston rings.
7. Excessive valve stem clearance or worn "O" ring seal.
8. Crankcase oil level to high (refer to page

NOTE: Marine engines normally consume more oil than automotive engines of like size.

LOW OIL PRESSURE

Normal oil pressure in a new engine is 30 to 40 pounds. A pressure of less than 20 lbs. calls for investigation. (5 to 15 lbs. is satisfactory at idle.)

Possible causes of low oil pressure:

1. Incorrect grade of oil. (Correct viscosity is SAE 20.)
2. Badly diluted engine oil.
3. Worn bearings.
4. Oil relief valve not properly seating, or stuck. Look for dirt on seat of valve.
5. Air leak in oil pump suction line.
6. Sludge on oil pick-up screen.
7. Pick-up screen not submerged, due to insufficient oil or engine installed at too steep angle.
8. Worn or damaged pump gears.
9. Inaccurate oil pressure gauge.

HIGH OIL PRESSURE

Oil pressure should not exceed 40 lbs., except momentarily when the engine is started up cold. Abnormally high oil pressure is not desirable because it increases oil consumption. Possible causes of high oil pressure:

1. Engine oil too heavy. (Use SAE 20.)
2. Relief valve not opening. (It may be stuck, or spring may be too stiff.
3. Obstruction in distributing system.
4. Inaccurate oil pressure gauge.

FOULED SPARK PLUGS

1. Worn piston rings.
2. Worn cylinders.
3. Excess piston clearance.
4. Rich mixture.
5. Plugs too low in heat range. (For correct plug, see specifications.)
6. Gap too narrow, causes missing at idle.

BURNED SPARK PLUGS

1. Plugs too high in heat range. (For correct plug, see specifications.)
2. Lean mixture.
3. Late ignition timing.
4. Engine overheated, due to worn water pump, obstructions, etc.
5. Low octane fuel.
6. Badly leaking valves.
7. Cracked valve seat.

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WARNER VELVET DRIVE HYDRAULIC MARINE GEAR

DESCRIPTION AND MAINTENANCE PROCEDURES

The Warner Hydraulic Marine Gear consists of a planetary gear set, a forward clutch, a reverse clutch, an oil pump and a pressure regulator and rotary control valve, all of which are contained in a cast iron housing along with necessary shafts and connectors, to provide forward, reverse and neutral operation. A direct drive ratio is used for all forward opeation.

In reverse, the speed of the output shaft is equal to input shaft speed, but in the opposite direction. Shifting is accomplished by fore and aft movement of the shift lever, which in turn rotates the control valve and directs oil under controlled pressure to required channels.

Oil pressure is provided by the crescent type pump, the drive gear of which is keyed to the drive shaft and operates at transmission input speed to provide screened oil to the pressure regulator. Both input and output shafts are coaxial and splined at outer ends. The unit is sealed against escape of oil and entry of dirt and water.

The Warner Hydraulic Marine Gear has a seperate oil supply.

It is recommended that Automatic Transmission Fluid Type "A" be used. When filling transmission, unit should be filled to the full mark on the dip stick. The unit should be turned over at low speed for a short time in order to fill all the circuits, in cluding the cooler and cooled piping. After this has been done the proper amount of oil should be added to bring the transmission level up to full mark again.

The transmission should be checked periodically for proper oil level reading.

We recommend a seasonal complete oil change. After removing the oil from the unit, the removable oil screen should be thoroughly cleaned before refilling the transmission with Type "A" lubricant.

A cooler of sufficient size should be used as we recommend that the oil temperature is not to exceed 190°.

IMPORTANT

For any change in direction of rotation see instruction manual.

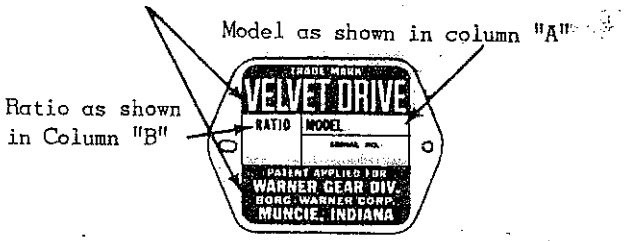
Position of control lever on gear when in forward should be shifted to the point where it covers the letter "F" on case casting. The warranty is cancelled if the shift lever poppet spring and/or ball is removed, or if the control lever is changed in any manner, or repositioned, or if linkage between remote control and transmission shift lever does not have sufficient travel in both directions.

For repairing units and further maintenance information see our "Velvet Drive" Service Manual available at $1.50 per copy for direct drive each model and $2.00 each for the reduction portion of the transmission assembly.

The following are identification markings for Warner Gear "Velvet Drive" Marine Gears:

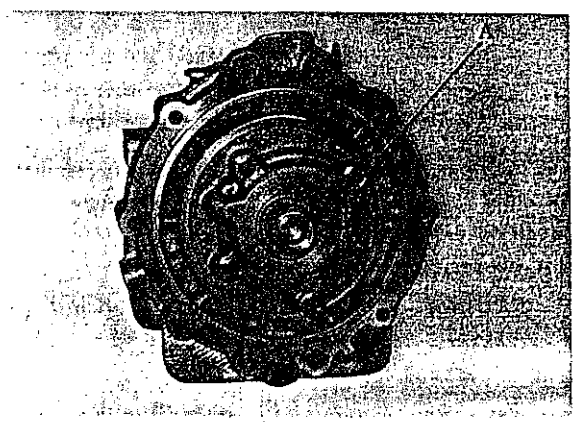
A	B	C
Model	Hand of Rotation	Forward Ratio	Tag Color
AS1-71C	Both	1 : 1	Red
AS2-71C	Both	1.52 : 1	Red
AS4-71C	Both	2.57 : 1	Red
AS7-71C	Counter-Clockwice	1.91 : 1	Red
AS7-71CR	Clockwise	1.91 : 1	Red

NOTE: The hand of rotation referred to above is when viewed from stern of boat looking forward.



ROTATION OF FRONT PUMP ASSEMBLY

The direction of the front pump rotation on an assembled transmission can be changed by backing off the four bolts, marked "A" in figure below, and tap pump housing with a soft hammer to free the pump housing from the gasket. The pump can then be indexed to the desired position without pulling the pump assembly outward. Pulling the pump outward across the drive gear spline may damage the seal when matching the rotation of the transmission with the engine rotation.



BOLTS — 1-7/8" long HEX HEAD BOLTS — Marked "A"

WARNER VELVET DRIVE HYDRAULIC MARINE GEAR

HYDRAULIC REVERSE GEAR

The Borg Warner Hydraulic transmission is lubricated separately from the engine, and before engine is started for the first time the housing must be checked for oil up to high level mark on dip stick. Use type A Hydraulic fluid. Capacity will vary with the installation angle, and a unit with reduction gear will of course require more than a direct drive unit, but an approximate quantity will be from 1-1/2 qts. for DD and 3 qts. for the Reduction units.

After the initial fill, check the oil level again after the engine has been run for a few minutes to be sure the oil level in both the reduction gear and reverse gear is adequate. The reason for this is that a certain amount of oil is required to fill internal passages within the transmission.

Oil level must be maintained at the proper height in order for the transmission to function properly, and this should be checked every time crankcase oil level is checked, which should be every day. If the oil level is too low, there is not enough oil in the sump to operate or lubricate the transmission. If the oil level is too high, it may be forced out of the breather on the reverse gear cover under certain types of operation.

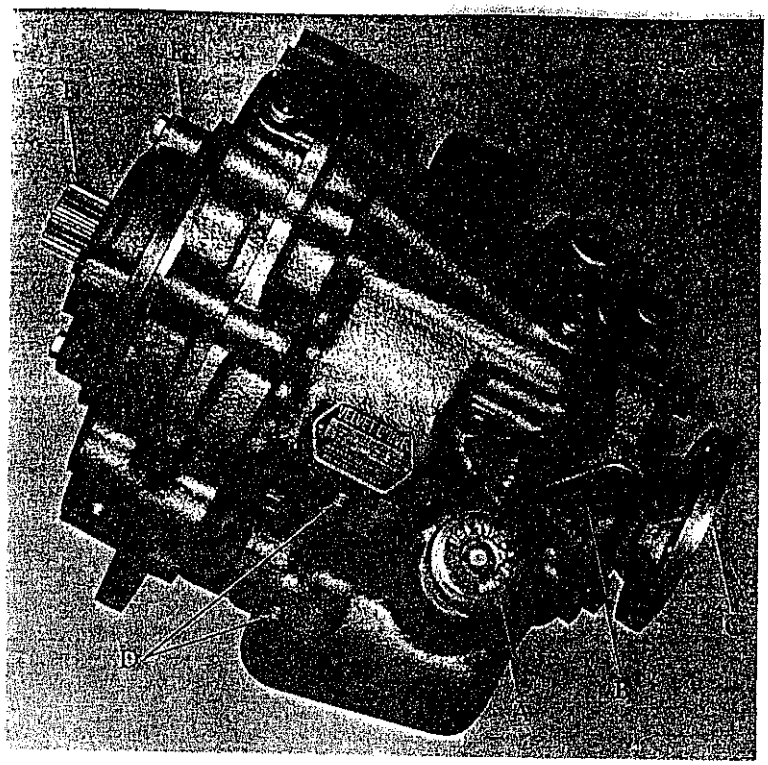
We recommend transmission oil change every 100 hours of engine operation. Regular oil change is important on a Hydraulic mechanism because regardless of the apparent condition of the oil itself, the oil sump may accumulate sludge and wear particles which will damage the close fitting surfaces in the pump.

CAUTION: Cleanliness is especially important in adding oil or changing oil because dirt getting into the oil may damage the oil pump or the neoprene o-rings on the pistons.

To remove old oil, insert hose of sump pump through dip stick hole, then after pumping out as much oil as possible: Remove oil screen and clean off all residue.

CAUTION: Be sure the sump pump hose is long enough to reach to the bottom of the reverse gear housing.

Non-foaming oil is commercially sold under the name of "automatic transmission oil, type A." This special oil is low in viscosity and has excellent non-foaming characteristics.



71-C DIRECT DRIVE TRANSMISSION

Location of several transmission details are shown above.

A — Oil Filler Cap
B — Shift Lever
C — Output Shaft Flange
D — Mounting Pads and Mounting Bolt-holes
E — Front Oil Pump
F — Drive Gear

ENGINE INSTALLATION

Proper engine installation is a condition of the Flagship Marine Engine Warranty. When installing an engine it is advisable to take precaution to insure the best possible installation. This will result in the elimination of service troubles caused by faulty installation.

1. MOVING THE ENGINE: The engine is equipped with two lifting eyes positioned at diagonally opposite corners of the intake manifold, which are designed to carry the full weight of the engine and reverse gear assembly. Auxiliary slings should not be put around the engine as they will not hold the engine as safely as the lifting eyes and the use of slings may damage engine accessories.

2. ENGINE BED: This should always be of sufficiently strong section to insure rigidity and be well secured to hull structural members. Engine beds not only support the weight of the engine but absorb the full thrust of the developed engine power. Maximum mounting angle of the engine on the beds should not exceed 20 degrees from the operational water line. Remember that the angle between the engine and the water may increase if the boat is heavily loaded at the stern and the bow is light and high. Engine mounting legs resting on wooden engine bed stringers should have adjustable metal mounting wedges.

3. EXHAUST PIPING: The exhaust piping must never be reduced in size at any point smaller than the 2" size which are provided in the exhaust elbows; or the 2" ID opening in the Ram's Horn type exhaust muffler if the engine is so equipped. It may, however, be increased in size. Use standard 2" pipe and fittings only, or tubing of equal or larger inside diameter. Do not use "street ells" for connections, and no bends should be more than 45 degrees. The exhaust must be above the water line.

4. WATER PIPING: For salt water operation, use of non-collapsible hose of at least $\frac{3}{4}$" ID or copper pipe of at least $\frac{3}{4}$" standard pipe size and copper fittings only are recommended. Do not use "street ells" between the thru-hull fitting and the water intake piping supplied with the engine. We recommend installing a good quality non-collapsible hose which should be positioned over the pipe nipple supplied on the inlet side of the water pump to provide the connecting line between the water pump and the thru-hull fittings. Allow sufficient slack in hose to provide flexibility. This hose when used with properly tightened hose clamps will not transmit engine vibration to the thru-hull fitting. Avoid sharp bends.

5. WATER INTAKE SCOOP: Thru-hull fitting should always be (1) size larger than the pump intake size. Locate the scoop so that the intake pipe to pump line will be as short and free from sharp bends as possible. Sharp bends reduce flow and add to load on pump.

6. SEA COCK: A gate valve in the water intake line is desirable but not essential. It must be free flow type and of sufficient size to prevent any restriction to the flow of water.

7. FUEL TUBING: Fuel line between the tank and fuel pump must not be smaller in diameter than the size indicated by the tube between the fuel pump and the fuel filter supplied with engine. A flexible section of fuel line of sufficient size is desirable and recommended between the fuel pump and the copper tubing fuel line.

8. OIL PRESSURE GAUGE CONNECTION: A fitting is provided on the engine to which either a tube for a direct pressure gauge or an electric oil pressure gauge sending unit can be attached. This fitting is the 45 degree $\frac{1}{8}$" "street ell" which is screwed into the top of the block just forward of the distributor.

9. ENGINE ALIGNMENT: Remove all bolts from the coupling flange and rotate the shaft one complete turn, or 360 degrees, checking the gap between the flange faces with a feeler gauge. For satisfactory alignment, the machined faces of the coupling flanges should be exactly parallel so that a .003 gauge can be inserted at any point. It may be necessary to shift the engine or aluminum mounting wedges to get perfect alignment with the propeller shaft at time of installation, and again after the boat is in the water when the final alignment check must be made.

CARBURETOR

The Carter WCFB Climatic Control Carburetor is available as standard equipment on most of our 8 cylinder Flagship Engines.

Basically, the Model WCFB Carburetor is two dual carburetors contained in one assembly and is built from four basic castings. Choke housing, bowl cover, carburetor body, and throttle flange. The section containing the metering rods, accelerating pump and choke is termed the primary side of the carburetor, and the other section is termed the secondary side. It has five conventional systems as have been used in previous carburetors, float system, low speed system, high speed system, pump system and climatic control system (choke).

Major carburetor overhauls should never be attempted by anyone other than an expert. Minor adjustments, if necessary, may be made by the owner.

AUTOMATIC CHOKE ADJJUSTMENT

Your Flagship V8 Engine is equipped with an automatic choke. Normal setting of the choke is such that the index mark on the plastic cover is lined up with the molded center mark on the choke housing, but can vary slightly due to certain climate conditions.

When operating temperature is reached, check to make sure that the choke valve is full open. All moving parts of the choke and throttle inkage should be checked periodically with oil or grease applied as required.

The automatic choke reduces the danger of raw or unvaporized fuel entering the combustion chamber and leaking into the oil reservoir.

An efficient crankcase ventilating system draws off fuel vapors and aids in the evaporation of the raw fuel and water which may find its way into the oil pan.

FLAME ARRESTOR

Flagship V8 engines are equipped with an approved type flame arrestor.

FUEL FILTER

The fuel filter bowl should be removed periodically and the water and sediment drained. The filter element should be inspected for clogging. When removing the bowl be careful to see that no gasoline is spilled into the bilges; if the fuel tank is higher than the bowl it will be necessary to close the fuel line shut-off valve at the tank to prevent siphoning.

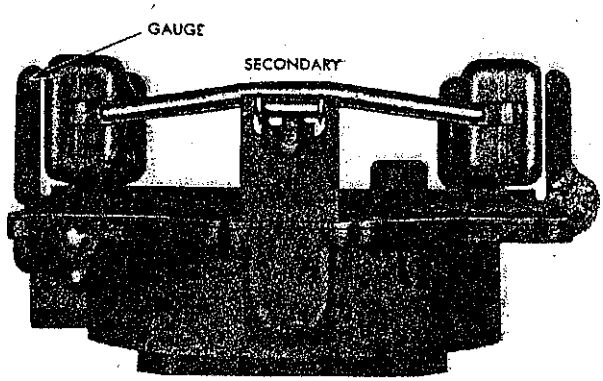
When re-installing the bowl be sure that the gasket is in good condition and firmly seated, and that the bowl is tightly clamped into place. Inspect this joint for leakage after re-installation with the engine running.

LINKAGE

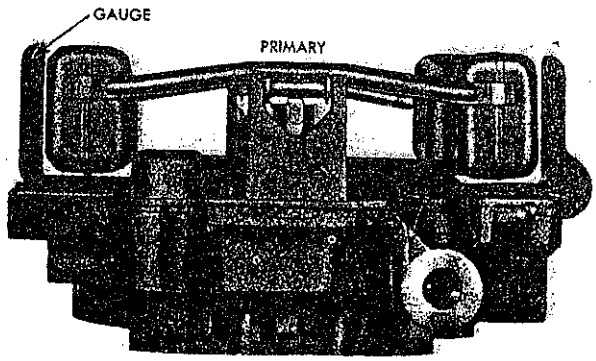
Every 50 hours apply CRC-666 directly from spray can to all joints of the carburetor and throttle linkage.

FLOAT ADJUSTMENT

FIG.1. MEASURING PRIMARY AND SECONDARY FLOAT LATERAL AND VERTICAL ADJUSTMENT.



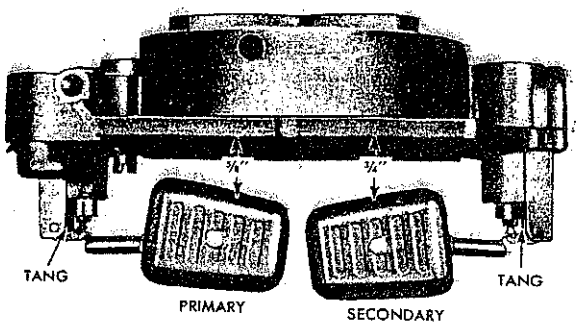
1. Lateral adjustment (Fig. 1). Position gauge directly under the center of secondary float with notched portion of gauge fitted over edge of casting as illustrated. Sides of float should just clear vertical uprights of gauge, otherwise bend float arms as required. Repeat this adjustment on the primary float using the gauges that are provided with kits.



2. Vertical adjustment (Fig. 2). With float gauges positioned as in the above, tops of floats should just clear the horizontal bar of gauges, otherwise bend arms of floats as required. Proper distance between top of floats and bowl cover is $\frac{1}{4}$ inch on secondary floats (measured with tool from kit) and $\frac{1}{8}$ inch on primary float (measured with tool from kit).

CARBURETOR

FLOAT DROP ADJUSTMENT



1. Drop measurement must be made with bowl cover gasket removed.

2. Float drop adjustment (Fig. 3) with bowl cover held in upright position and measuring from the center of the float, the distance between the top of the floats and the bottom of the bowl cover should be $\frac{5}{8}$ inch for primary floats and $\frac{3}{4}$ inch for secondary floats (Fig. 3). Bend float tangs as required to achieve these distances.

BOWL COVER ATTACHING SCREWS

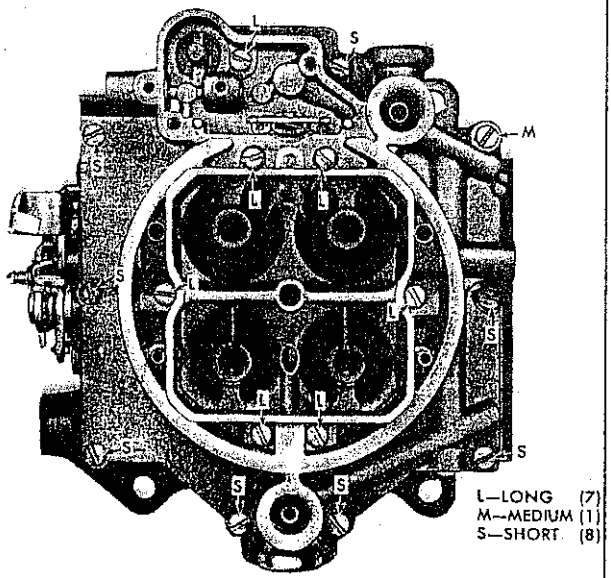


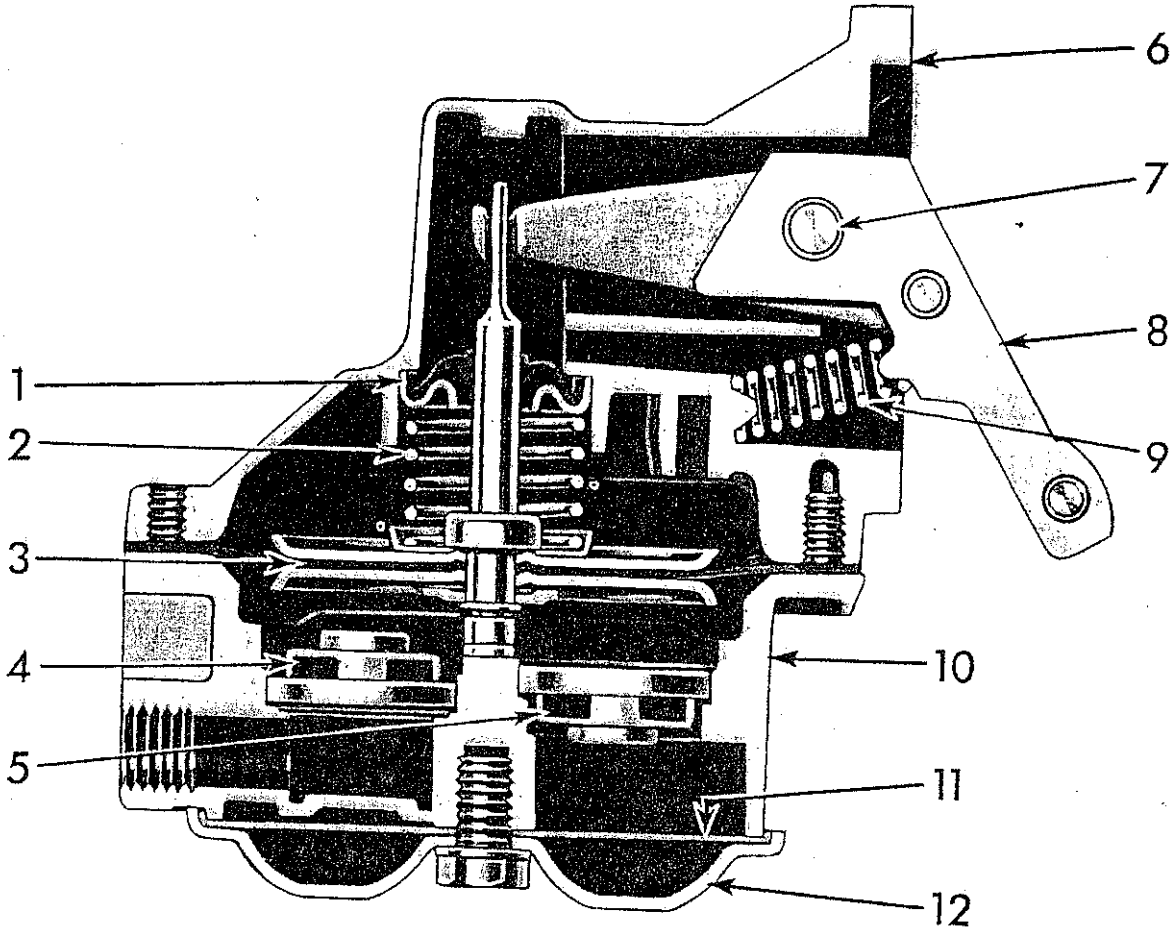
Fig. No. 4 Location of Bowl Cover Attaching Screws

1. There are 16 Bowl Cover Attaching Screws installed in the bowl cover assembly, determining proper location of the different length screws from Fig. 4.

2. Tighten all screws evenly, working from the inner located screws to the screws located around the outer edge of the Carburetor.

WCFB FOUR BARREL CARBURETOR SPECIFICATIONS

Carburetor	Carter
Part No.	3585S
Throttle Bore	
Primary	1-5/16"
Secondary	1-5/16"
Main Venturi	
Primary	1"
Secondary	1-1/8"
Small Venturi	
Primary	11/32"
Secondary	11/32"
Low Speed Jets	
Idle Needle Orifice	.0595
Primary	.031
Main Metering Jets	
Primary	.086
Secondary	.076
Metering Rods	
Economy Step	.067
Power Step	.046
Float Setting	Gasket removed (Casting to float top)
Primary	1/8"
Secondary	1/4"
Choke Setting	(One mark to lean side)
Accelerator Pump	
Capacity - 10 Strokes	18.5 cc to 21.5 cc
Idle Port	
Length	.113 to .119
Width	.029 to .031
Idle Mixture Screws	
(Turns open)	3/4 to 1-3/4
Idle Speed	
Standard	600 RPM



EIGHT CYLINDER PUMP CROSS SECTION

The fuel pump used on the V8 Flagship and models are of the diaphragm type. The pump Rocker Arm is actuated by a Push Rod, located in the cylinder block between the pump and the fuel pump eccentric on the camshaft.

1 — Oil Seal and Retainer
2 — Diaphragm Spring
3 — Diaphragm Assembly
4 — Inlet Valve
5 — Outlet Valve
6 — Pump Body
7 — Pivot Pin
8 — Rocker Arm and Lever Assembly
9 — Rocker Arm Return Spring
10 — Fuel Cover
11 — Pulsator Diaphragm
12 — Pulsator Cover

LAYING UP INSTRUCTIONS

If the engine is to be out of service over a "lay-up" or storage period, it should have proper care. These instructions give a quick and safe method of preparing for storage.

CARE OF ENGINE

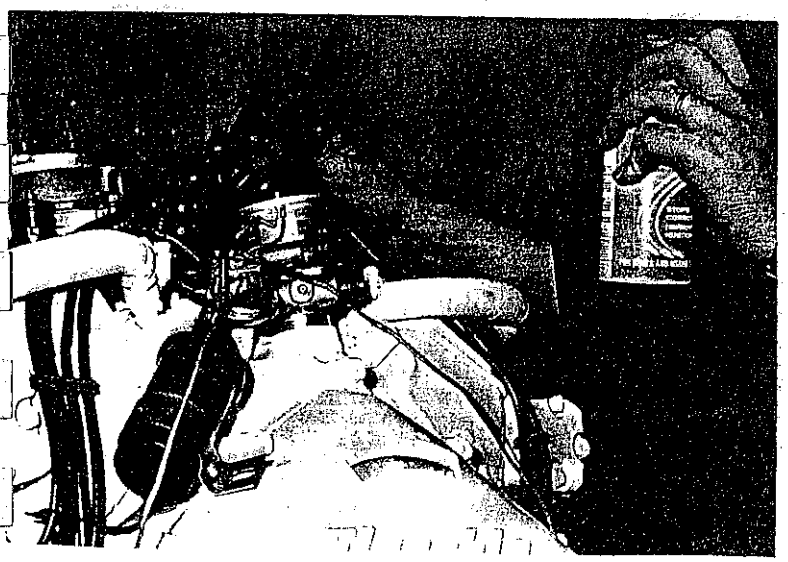
1. FIRST CHANGE OIL. With the engine and reverse gear thoroughly warmed up, remove the old oil (see "Lubrication" section) while it is hot and is therefore holding in suspension the accumulated impurities which are the product of combustion. These impurities are carbon particles and forms of sulphurous and carbonous acids that will attack bearing metals. Remove the element from the engine oil filter and after thoroughly cleaning out the filter can, install a new filter element and reassemble. Refill the engine crankcase to the full mark on the depth gauge with a good grade of fresh Heavy Duty oil designated "for Service MS" or "For Service DG" of SAE 20 viscosity.

NOTE: The Borg Warner Hydraulic reverse gear has a separate oil supply. The reverse gear should be filled to the full mark on the depth gauge with Automatic Transmission fluid Type A.

2. AFTER FILLING THE ENGINE AND REVERSE GEAR with fresh oil, start and run the engine in order to distribute clean oil through the engine. Let the engine run for a few minutes, then shut it off.

NOTE: While the engine is running to distribute the oil is a good time to drain the fuel from the line, fuel pump, fuel filter and carburetor. (See Step "7" this section.)

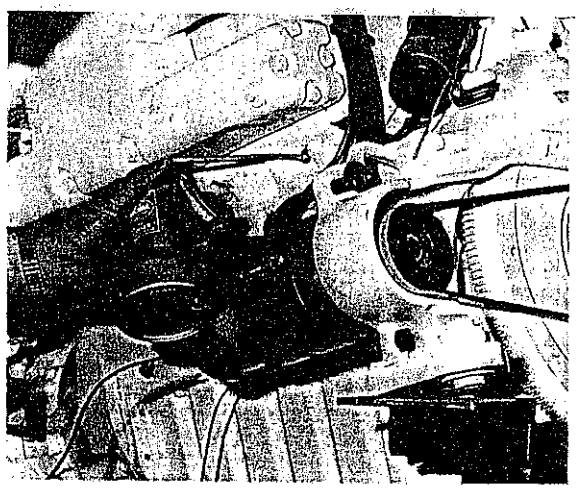
Recheck the oil level in order to be sure that after filling the filter, the level is still at the full mark on the depth gauge. Add oil if necessary.



Further steps can be taken towards protecting your V8 overhead valve engine for storage; such as, removing the valve covers and spraying or lightly coating the exposed mechanical parts such as valve stems, valve springs, lifter arms, valve rotators and push rod ends, with a film of premium grade SAE 30 engine oil. (Premium grade engine oils produced by reputable refineries contain a rust preventive additive.)

3. PROTECT CYLINDER WALLS by removing the spark plugs and spraying a small quantity of the previously mentioned premium grade SAE 30 engine oil into each cylinder. If a means of spraying the oil into each cylinder is not available, this operation can be performed with a squirt-type oil can after which the engine can be turned over a few times with the spark plugs **out**, in order to distribute the oil evenly over the cylinder walls.

CAUTION: If you use the electric starter for cranking the motor at this time, the spark plugs must be **out**; otherwise, the oil may be compressed enough to break the pistons.



Before replacing the water pump drains, it is advisable to close off the sea cock, and after loosening the hose clamp, remove the lower end of the water intake hose in order to drain it. Then crank the engine over a few times to assist in the complete draining of the water pump.

Replace all drain plugs and close all drain cocks.

The filling of the water passages is particularly important if the engine has been operated in salt water, as it will exclude oxygen and thus retard rusting. All drain plugs painted red.

LAYING UP INSTRUCTIONS

5. DISCONNECT BATTERY AND REMOVE FROM BOAT.

CAUTION: Since you will surely get some hot sparks in disconnecting the battery, be sure that the gasoline fumes are exhausted from the bilge. It is also advisable to disconnect the battery before draining the fuel lines which usually results in the dripping or spilling of some gasoline in the bilge.

6. DRAIN THE FUEL TANK AND GASOLINE LINES: By draining all fuel, it will prevent the formation of gum or varnish deposits as a result of evaporation in the component parts of the fuel system and contamination of the gas in the fuel tank as a result of condensation. Furthermore, it is a common sense precaution against fire. The draining procedure should include the fuel tank, fuel lines, fuel pump, sediment bowl and carburetor.

An easy way to drain all the components of the fuel system with the exception of the gasoline tank is to start the engine, and while it is running at a fast idle, close the fuel line shut-off valve located at the tank and loosen the tubing fitting on the engine side of the shut-off valve. By allowing the engine to run until it stops of its own accord you will of course have used all the fuel out of the line, fuel pump and carburetor bowl. There will be a small amout of fuel left in the filter bowl which will be easy to dispose of by removing the fuel filter sediment bowl.

After the engine has stopped, **be sure to turn off the ignition switch.** Siphon off any fuel remaining in the gas tank. Clean the tank now. It will be easier than later on.

CAUTION: An "empty" gasoline tank is a source of danger since vapor is more explosive than raw gasoline.

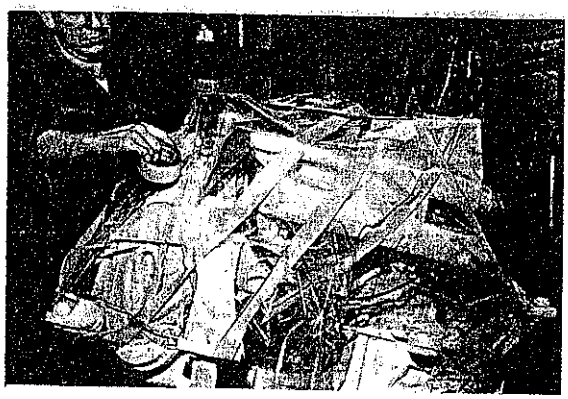
7. ELECTRICAL EQUIPMENT: The voltage regulator, starter and generator are best cared for if they are removed from the engines, then cleaned and wrapped in waterproof paper and stored in a dry place with an even temperature. Spark plugs should be replaced in the cylinder head and tightened down firmly. These protect the threads and seal out dirt. Do not use corks in spark plug holes. Remove the battery and have it cared for by your dealer or a local battery dealer.

8. EXTERNAL CARE OF ENGINE:

A. Examine the paint on the outside of the engine and repaint any damaged spots before rust appears. Flagship distributors can supply touch-up paint in cans, one pint size.

B. Always disconnect the propeller shaft from the engine at the coupling **before hauling boat from the water.** This is to prevent straining or bending the shaft. Now is a good time to check the propeller for bent blades.

C. Put a tarpaulin or waterproof canvas cover loosely over the engine to protect it from water drips and snow. Be sure the covering is not too tight because good ventilation is desirable: this discourages rust and condensation.



9. HOW ABOUT OVERHAULING: If the engine has been in service for an extended period, its performance will be improved by a general overhaul. During storage period is the time to do it. Don't wait until the boat is needed in a hurry.

These tips on servicing your boat can help you enjoy it to the fullest if followed, these tips will insure dependable operation, long service and satisfaction. For extensive repairs or overhaul, call on your authorized dealer, in whose establishment your engine will receive expert care.

STARTING ENGINE AFTER STORAGE

1. Drain antifreeze from all water passages and close all drains.

2. Reconnect water pump intake hose and open sea cock.

3. Fill the tank with a good grade of clean gasoline of 80 octane (Motor Method) or better for Model 225.

4. Double-check the gasoline line and fittings for leaks.

5. Check the lubricating oil and make sure the crankcase is filled to the high level mark on depth stick, using SAE 20 oil of Heavy Duty quality designated "For Service MS" or "For Service DG".

6. Put new grease in all grease cups and a few drops of engine oil in the oil cups of generator and cranking motor if they are so equipped; also on all control joints. Remove all old grease from grease cups before refilling.

7. Brighten up the terminal posts on the battery using steel wool, and attach cables. After tightening down the clamps, smear lightly with grease to exclude acid and air. Do not put vaseline on the battery posts **before** attaching the cables, as vaseline is a nonconductor.

8. Clean all contacts inside the distributor with fine sandpaper. (No. 00) or a small point file. If the points are pitted, dress them down evenly on an oil stone or, better still, replace them with a new set of points. Wipe inside of distributor clean and rub a very thin film of cup grease around the cam and terminals inside cap.

9. Inspect top of pistons by looking through the spark plug holes using a flashlight and make sure there is no excess oil standing on top of the pistons. Inspect spark plugs and check to make certain they are set for the correct gap. If they look doubtful, replace them with new plugs or have them sandblasted and tested. One faulty plug can cause no end of trouble.

10. Now is a good time to recheck the stock of spares. It is a good policy to carry on board an extra condenser, distributor rotor, distributor cap, coil, set of distributor points, set of spark plugs and filter element. These should be protected by wrapping in waterproof paper. For extended cruising it is wise also to carry a spare propeller.

11. Tighten down all bolts, nuts, screws, paying particular attention to the cylinder head bolts, the lag bolts holding engine to the bed, and electrical connections.

12. Reconnect the coupling **after** the boat is put in the water and check the alignment. Tighten up on stuffing box as necesary.

13. CAUTION: Before starting the engine, remove the engine cover and let the engine compartment air out. Make sure the bilge is dry. Be certain there is no possible cause of fire — rags, gas or oil leaks, open tins of kerosene or gasoline, etc., anywhere around the boat.

14. Finally, with gasoline in the tank, oil in the pan, propeller tight on the shaft, stuffing box tight, engine running normally, water coming freely through the overflow, oil gauge and ammeter reading O. K. —you will be ready for a trial run. It is important to check the reverse gear carefully at this time to make sure of having proper oil level.

15. If you have questions, ask your dealer. **Don't guess.**

HAPPY BOATING!

Follow the instructions and recommendations outlined in this manual carefully, and you will benefit by having years of trouble free pleasure as well as maintaining the value of your boat. Regular care and attention to details will help you spot trouble before it starts and make it possible for you to enjoy every boating day.