T. O. NO. 19-85AD-1

HANDBOOK OF INSTRUCTIONS

FOR

AAF RESCUE BOATS

42-FOOT

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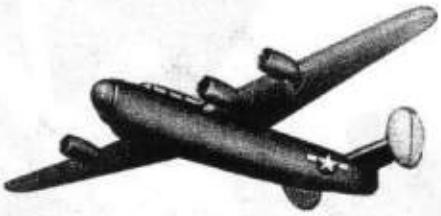
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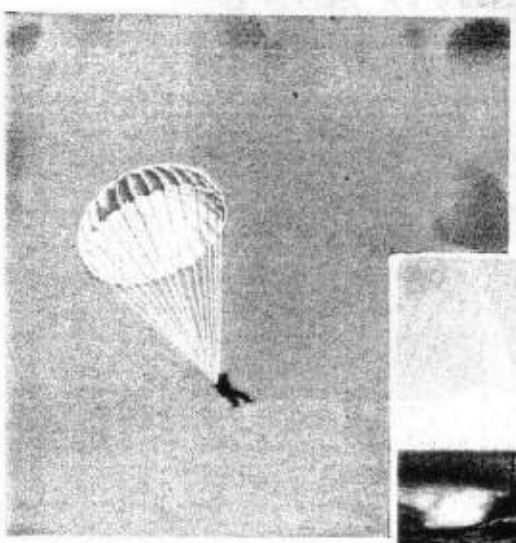


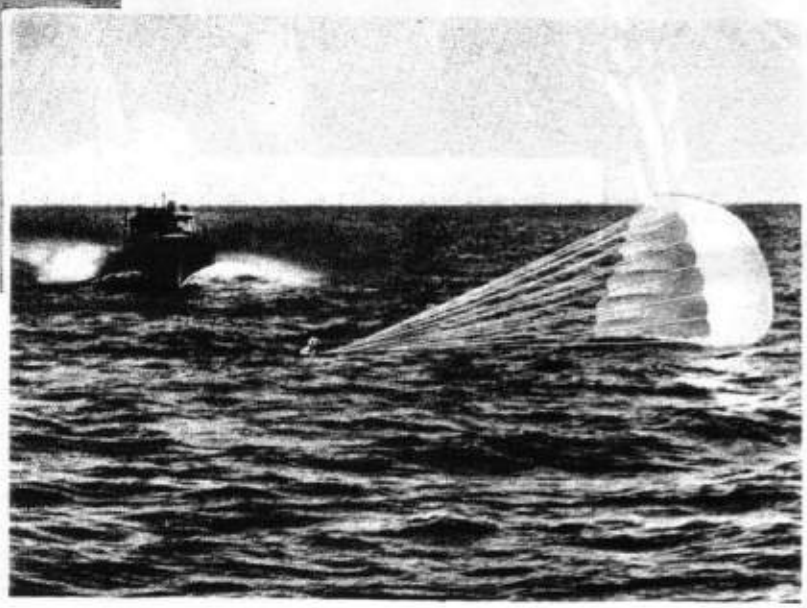
Introduction

1. This Handbook covers the Operation, Service, and Maintenance of the 42-foot AAF Rescue Boat, Design 221-D. The text and illustrations were prepared from data obtained on boats numbered P-151 and P-152, built by Chris-Craft Corporation, Algonac, Michigan, and in operation at Eglin Field, Florida.

2. Because of successive alterations of plans, changes made at various yards for local reasons, and authorized modifications after the boats have been in operation, not all the data in this Handbook will apply to every 42-foot boat of this design. For this reason, it is important that operating personnel become familiar with wiring, piping, and equipment installed on individual boats, and compare the actual installations with the text and diagrams.









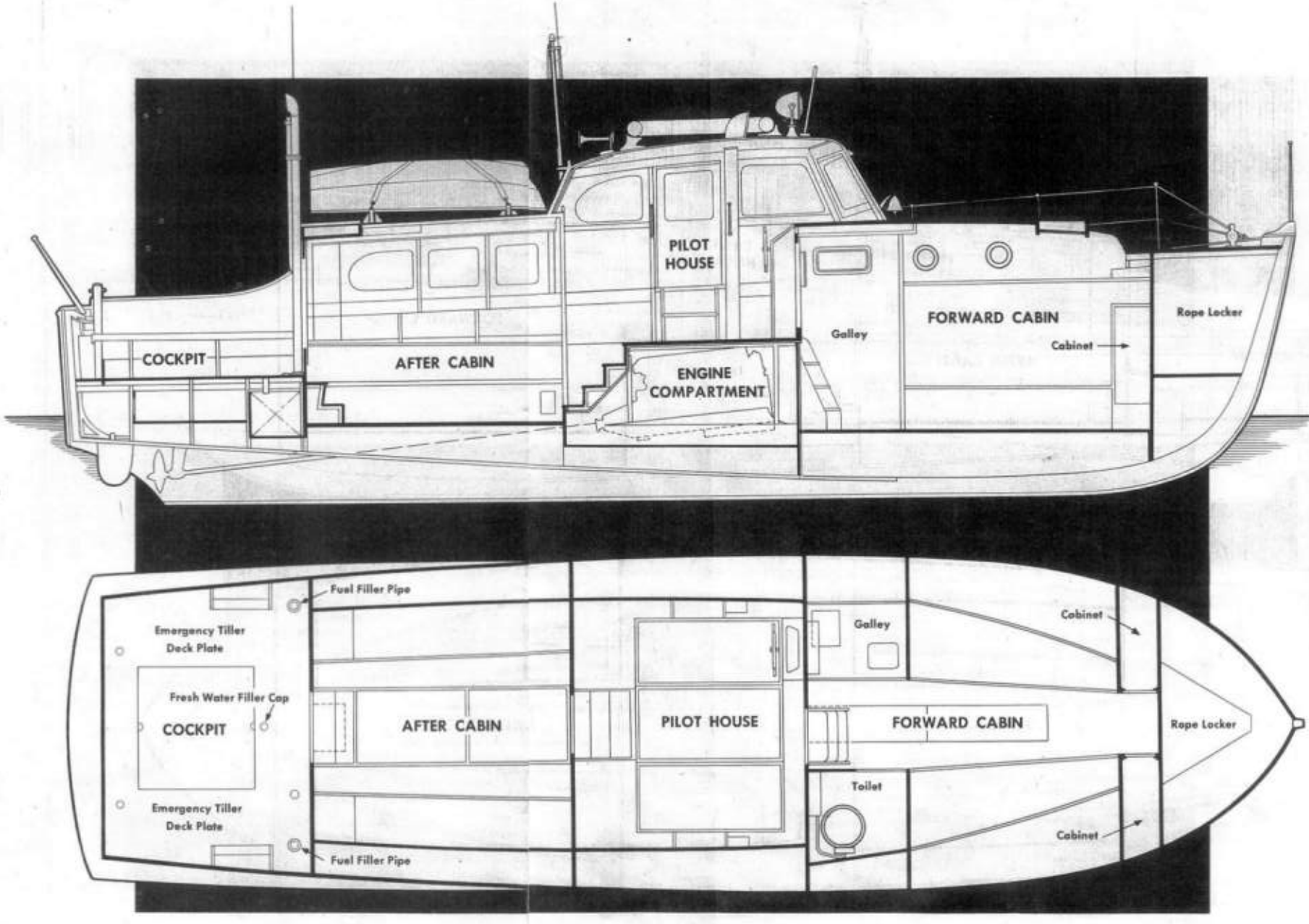


Figure 1—Outboard Profile and Plan

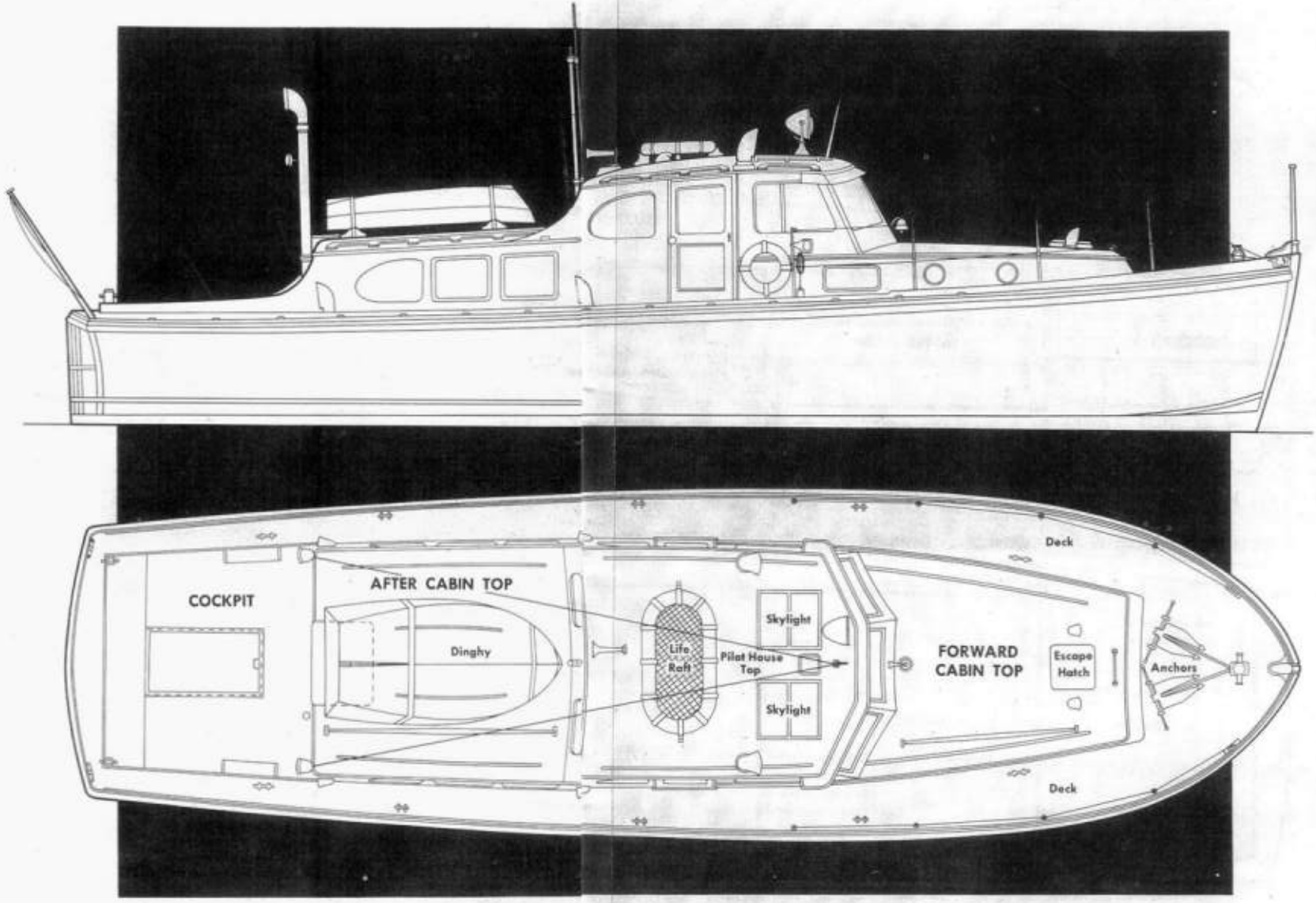


Figure 2—Inboard Profile and Plan

SECTION I

Description

1. GENERAL INFORMATION.

a. TYPE.—The 42-foot AAF Rescue Boat *(figures 1 and 2)*, Design 221-D, is a twin-screw self-propelled gasoline motor boat of vee bottom construction. It is intended to serve as a harbor patrol boat. The forward cabin is fitted with four portlights and two watertight windows, two bunks with removable cushions and stowage space below, two lockers against the forward bulkhead, an enclosed toilet space against the after bulkhead containing a water closet and medicine cabinet, and the galley space containing a one-burner alcohol pressure stove, sink, and stowage shelves. The pilothouse aft of the forward cabin is equipped with the steering gear, engine controls, compass, folding seats, and one cabinet for the ship's log. Two skylights are in the pilothouse top. In the pilothouse floor are removable hatches for access to the engine compartment below. The after cabin or dispensary is fitted with two bunks with removable cushions, stowage space below the bunks for litters, stowage space for life preservers between the bunks and the hull, and two cabinets against the after bulkhead for the radio equipment. The cockpit is of the self-bailing type with a hatch leading to the space below, which contains the fuel and water tanks. The cockpit it fitted with a hinged seat at the stern.

b. DIMENSIONS.

Length over-all	42 ft 4 in.
Length on waterline	40 ft 8 in.
Draft, forward: maximum	2 ft 9 in.
Draft, aft: mean	2 ft 0 in.
Beam	11 ft 8½ in.
Freeboard bow	5 ft 7½ in.
Freeboard stern	3 ft 6 in.

c. DISPLACEMENT.

Full load displacement	11.2 tons

d. TANK CAPACITIES.

Fuel gasoline capacity	280 gallons
Fresh water capacity	50 gallons

e. RANGE AND SPEED.

Range, at cruising speed	187 statute miles
Running hours at full power	7.5
Speed, loaded	23.09 miles per hour
Cruising speed (engine speed 1500 to 1800 rpm)	15 to 18 miles per hour

2. DECK FITTINGS AND DECK HARDWARE.

a. On the forward deck are two 30-pound anchors stowed in wood chocks. *(See figure 3.)* The anchor lines are two 40-fathom lengths of 3-inch Manila rope, spliced over thimbles and fitted to shackles at each end. The ropes are fastened to the anchors and pass through deck pipes and pipe caps *(figures 4 and 5)*, to the rope locker below *(figure 6)*, where they are fastened to ring bolts. In the forward bulwarks are two bow chocks *(figure 3)*. The four 10½-inch mooring cleats *(figure 7)* and six 6-inch cleats *(figure 8)* for fenders are bolted through the deck to blocks below. Between the anchors on the forward deck is the riding bitt. *(See figure 3.)* Two stern chocks *(figure 9)* are on the after deck. Two wood bitts *(figure 9)* are located in the after corners of the cockpit. Four 2½-inch Manila decklines are each 10 fathoms in length with one end loop-spliced and the other end served. The six netted rope fenders are of the double-ended rope loop type.

b. The deck railing stanchions *(figure 3)* are forged galvanized steel or cast bronze about 30 inches high above the galvanized deck sockets, which are bolted to the deck and footrail. The wire rope rails pass through the two eyes in each stanchion and are fastened to the turnbuckles and deck attachments. There are wood handrails on the cabin tops.

c. A mahogany, spruce, or fir mast is on the after side of the pilothouse. The mast socket is cast bronze or gal-

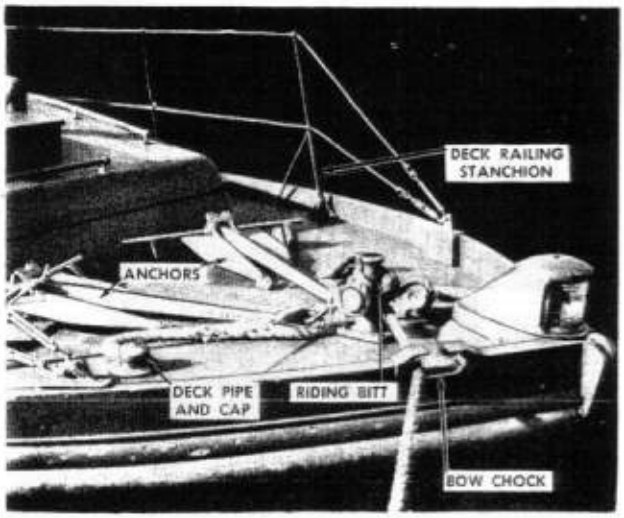


Figure 3—Anchor Stowage

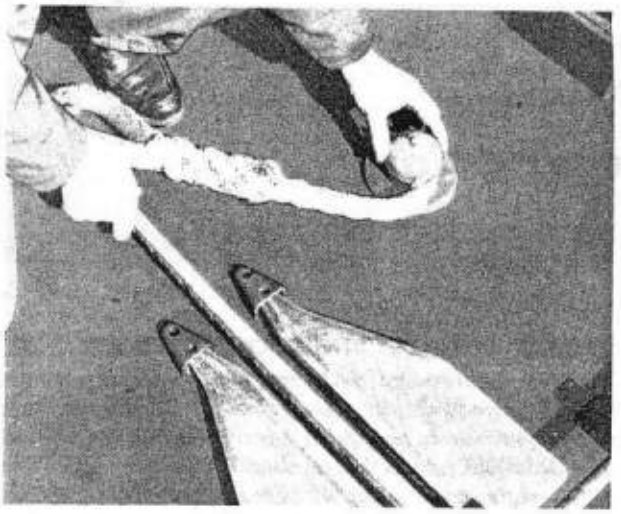


Figure 4—Cap in Place on Deck Pipe

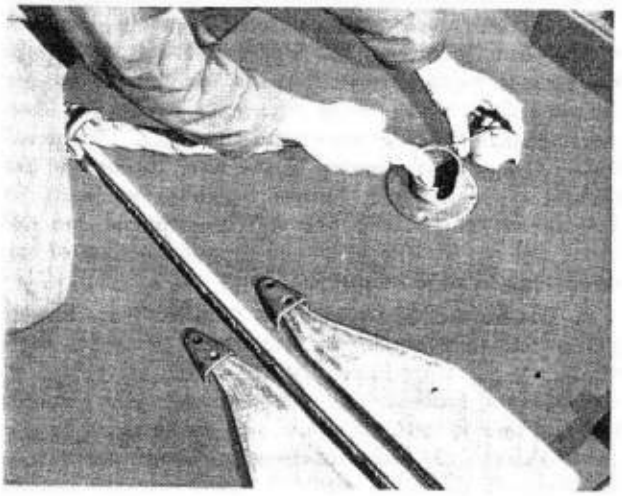


Figure 5—Deck Pipe with Cap Removed

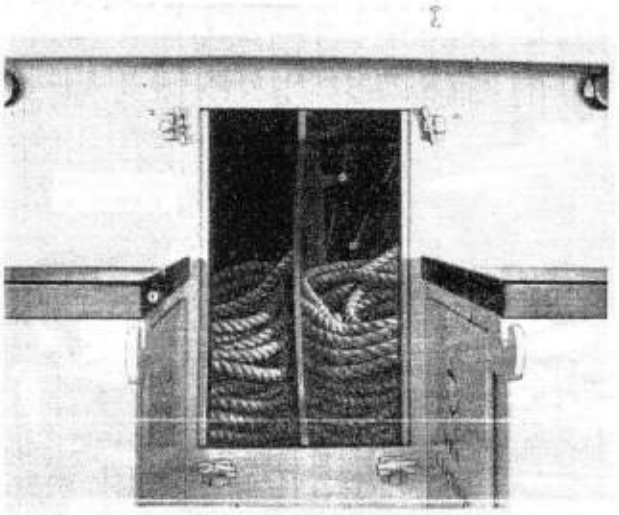


Figure 6—View of Anchor Rope Locker from Forward Cabin

vanized steel fastened with bolts. The mast is equipped with an anchor or blinker light and a watertight deck receptacle. The white cotton halyards are secured by galvanized steel cleats. The mahogany jack staff is fitted with a truck and halyard. The mahogany ensign staff aft is fitted into a flush flag pole socket.

d. One 6-foot and one 8-foot boat hook with galvanized iron ball tips and ash or mahogany poles are stowed in wood chocks on the forward and after cabin tops. *(See figure 10.)*

3. LIFE-SAVING EQUIPMENT.

a. One balsa wood, canvas-covered life raft *(figure 11)*, five-person capacity, having two spruce paddles, is secured in wood chocks with eye straps and lashings on the pilothouse top.

b. A dinghy of plywood *(figure 12)* is secured in wood chocks with eye straps and lashings on the after cabin top.

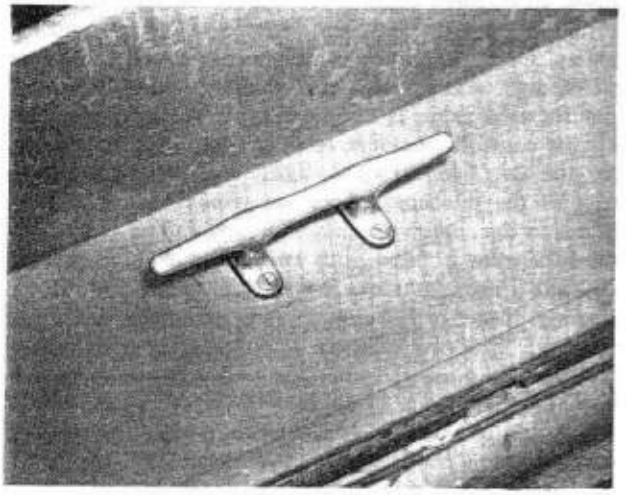


Figure 7—Mooring Cleat

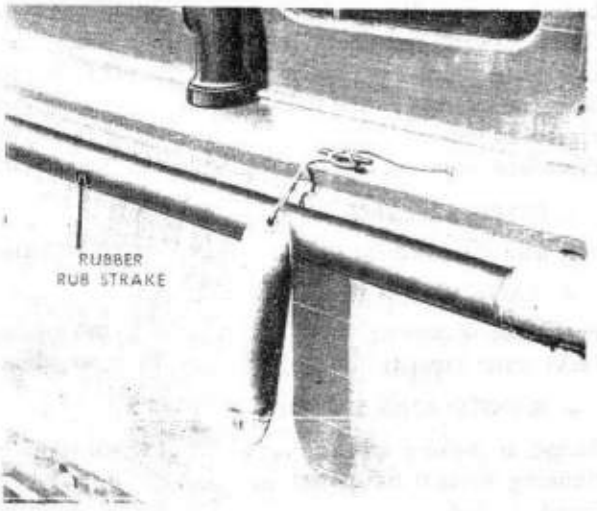


Figure 8—Cleat with Fender Made Fast

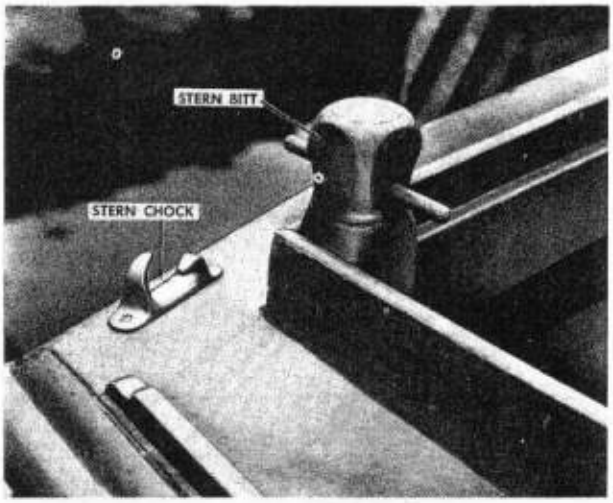


Figure 9—Port Stern Chock and Bitt

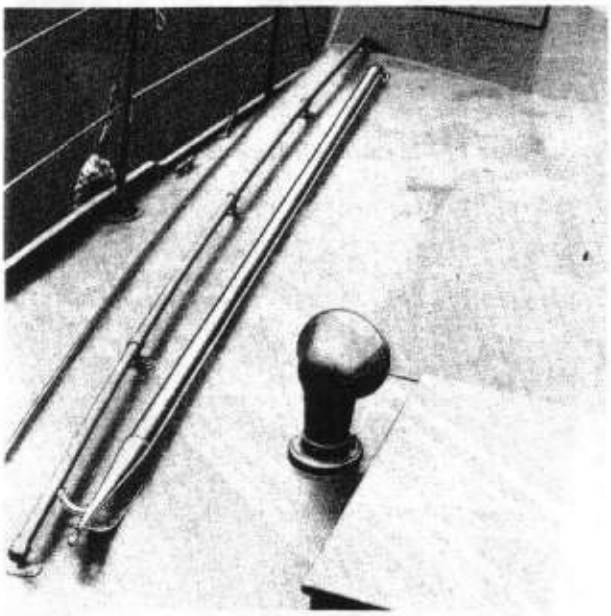


Figure 10—Boat Hook Stowed on Forward Cabin

c. Twenty-four adult size life jackets, kapok filled, are stowed in the space between the hull and the bunks in the after cabin.

d. Two cork-filled ring buoys are secured in ring buoy hooks on opposite sides of the pilothouse and tied with twine. One ring buoy is equipped with a water flare and suitable line. *(See figure 13.)* The other ring buoy is secured to a 50-foot line. *(See figure 14.)*

e. A mahogany folding ladder *(figure 15)*, complete with fittings and hooks, is stowed in wood chocks in the cockpit.

f. Two sealed medical kits, Medical Department Item No. 9730305, are furnished by the Medical Supply Officer. They are stowed in the forward cabin; one on the shelf against the forward bulkhead *(figure 16)* and the other in the space below a bunk *(figure 17.)* The four

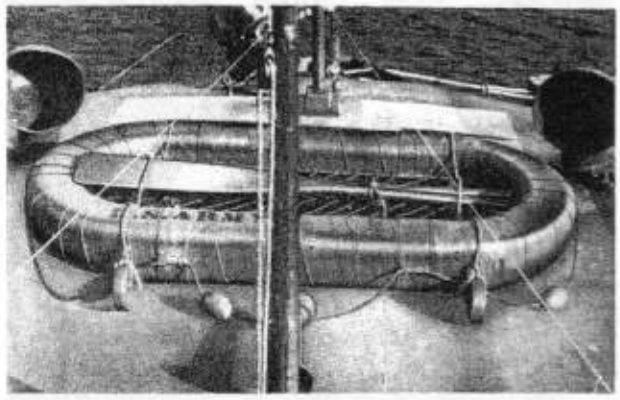


Figure 11—Life Raft Stowed on Pilothouse Top

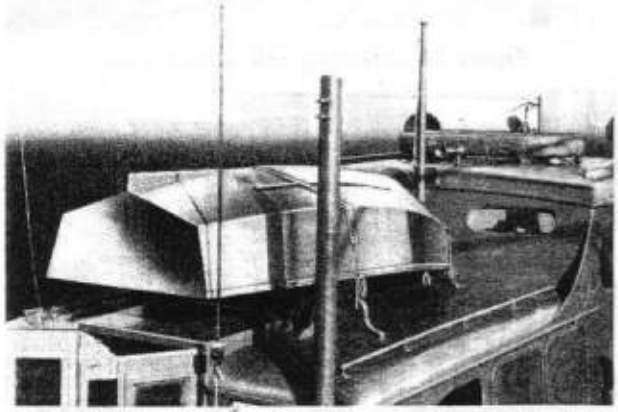


Figure 12—Dinghy Stowed on After Cabin

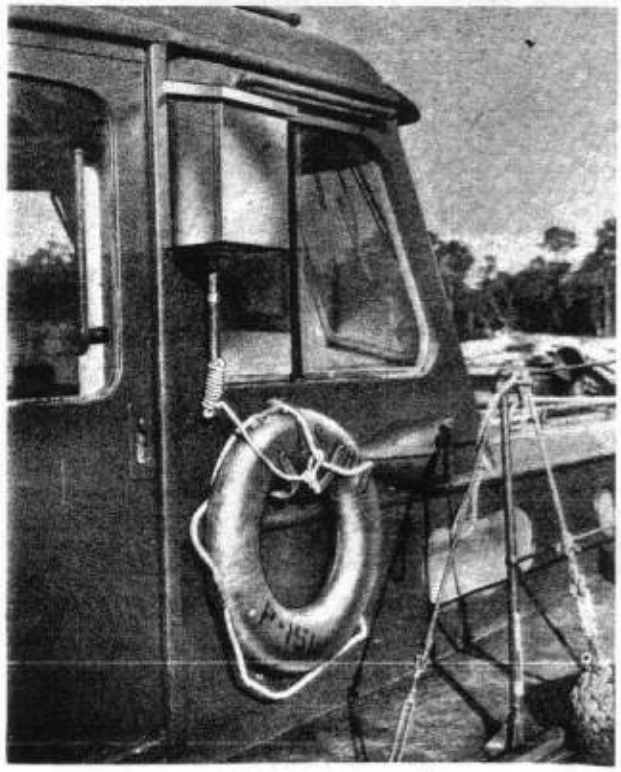


Figure 13—Life Ring and Flare

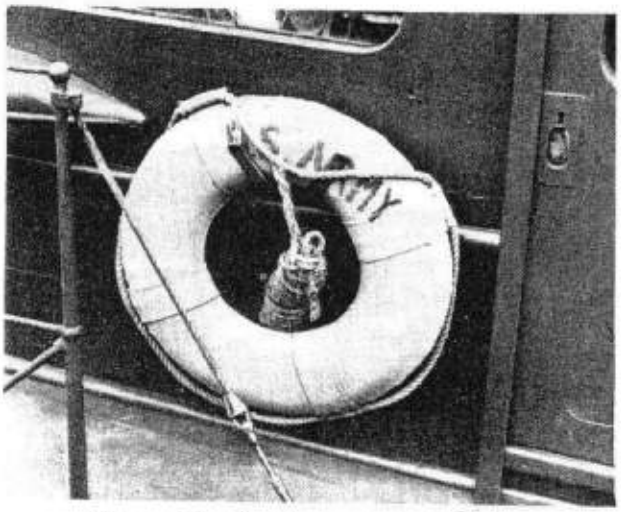


Figure 14—Life Ring and 50-foot Line

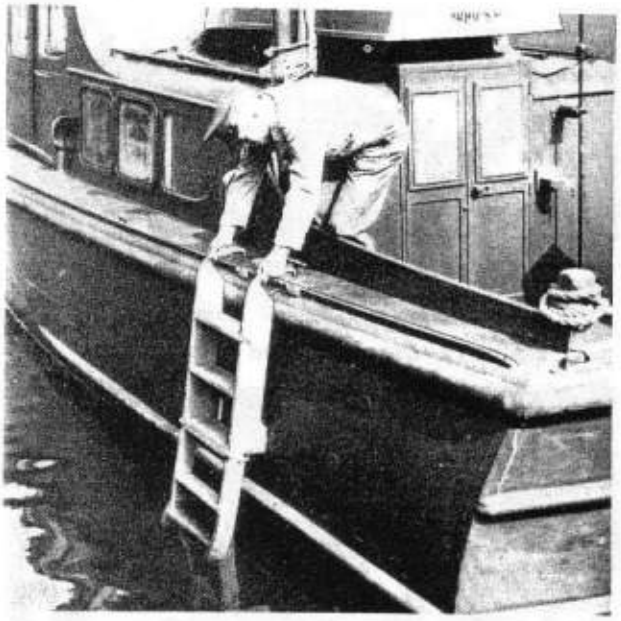


Figure 15—Placing Folding Ladder in Fittings

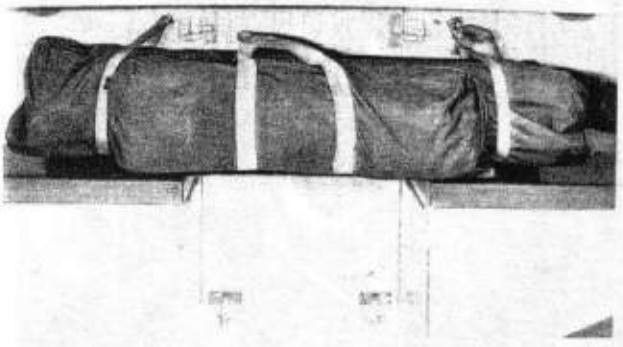


Figure 16—Medical Kit Stowed Against Forward Bulkhead

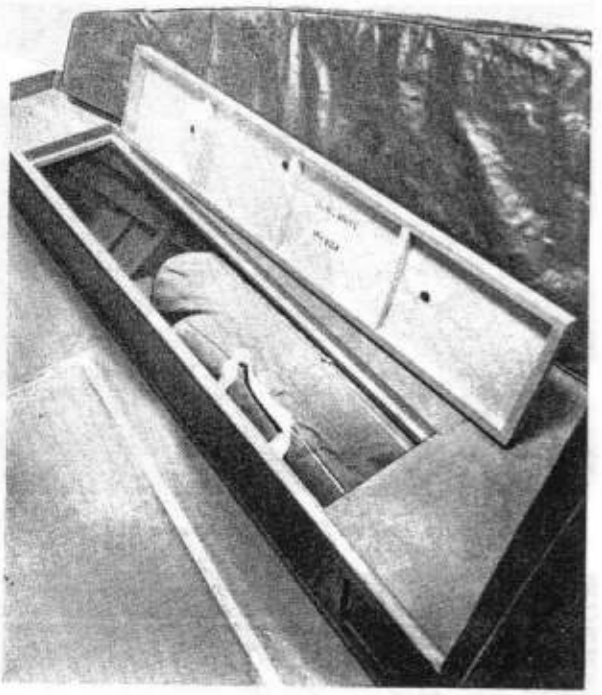


Figure 17—Medical Kit Stowed Below Bunk

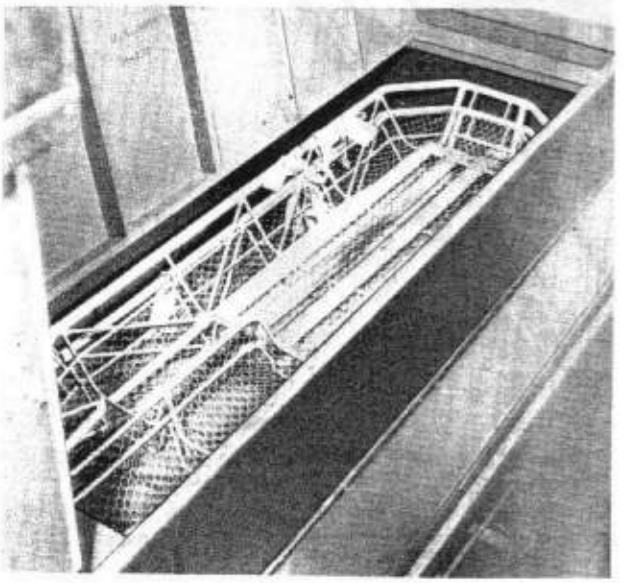


Figure 18—Litters Stowed Below Bunk

litters included with the two medical kits are stowed below the bunks in the after cabin. *(See figure 18.)*

4. FIRE PROTECTION EQUIPMENT.

a. The permanently piped carbon dioxide fire extinguishing system with a capacity of approximately 250 cubic feet is in the engine compartment and cockpit. The discharge system has five nozzle leads adapted to the twin motor installation: one to the bilge under each engine, one near the carburetors on each engine, and one in the bilge between the fuel tanks in the cockpit.

The gas cylinder, mounted in chocks, is connected to the nozzles with brass piping. The system has an automatic gas release control in the engine compartment and a manual control valve in the pilothouse.

b. In addition to the permanent fire extinguishing system, three portable 4-pound carbon dioxide type extinguishers are located in the pilothouse, the galley, and the after cabin, and two 15-pound extinguishers are in the flotation gear rack in the cockpit.

5. ELECTRICAL SYSTEM.

a. Two 12-volt storage batteries provide the electric current for the boat. On the switchboard, against the bulkhead in the galley, is a double-pole double-throw switch to connect either battery to the system. The batteries are in lead-lined waterproof boxes in the engine compartment, port and starboard.

b. The navigating lights consist of the bow light, the side or running lights (port — red, and starboard — green), and the anchor or blinker light with a blinker switch.

c. The searchlight is located on the pilothouse top forward of the port skylight. It is of brass construction, and has a 150-candlepower, 6-ampere, 12-volt bulb. Controls for rotation and deflection are of the wheel type.

d. Two floodlights are located on the ventilator posts in the forward corners of the cockpit.

e. The signal horn is an electric air whistle of brass construction mounted on the center line of the after portion of the pilothouse top.

6. TANKS AND PIPING.

a. The two fuel tanks, of No. 16 or No. 18 copper sheets, are located on the port and starboard sides below the floor of the cockpit. The seams of the tanks are soldered and riveted. The fuel lines are copper tubing with brass couplings and have diaphragm packless valves near the fuel tanks. The filling pipes are brass, connected to filling plates in the side decks. Vent pipes pass from each tank through the sides of the hull. *(See figure 19.)* A finely meshed screen in the vent pipes prevents water from entering the outboard end of the pipe. Where piping passes through watertight bulkheads, the holes around the pipes are watertight. All piping is fastened with brass clips.

b. The 50-gallon water tank of tin-lined copper is located on the center line below the cockpit floor. The filling pipe is connected to a self-ventilated brass filling plate in the cockpit floor. The deck plate is marked "WATER." This tank is connected with copper tubing to a pump on the sink in the galley.

7. PLUMBING.

The toilet with white seat and white pump parts has lead suction and discharge pipes. The porcelain-enameled sink has a pump connected to the fresh water supply line. All drain pipes are connected to bronze cocks with through-hull connections.

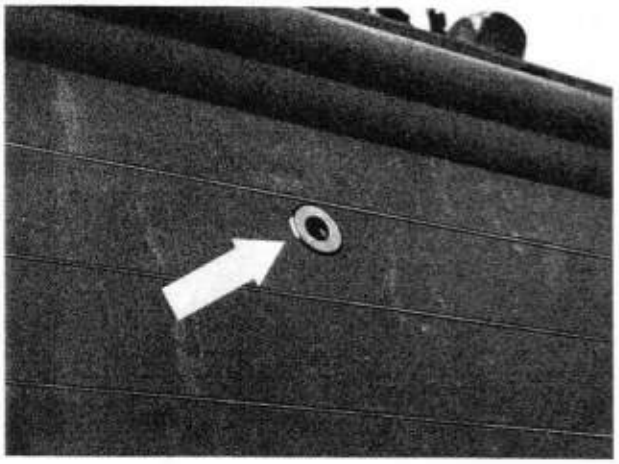


Figure 19—Port Vent from Fuel Tank

8. VENTILATORS AND BLOWERS.

(See figure 20.)

Four side ventilators of the half-cowl type are fitted to the sides and deck. The forward pair ventilate the engine compartment and the after pair the space below the after cabin. There are exhaust ducts from the lowest part of each compartment. The two ducts at the after end of the engine compartment are equipped with exhaust blowers. On the engine control panel, automatic safety switches are installed for operation of the blowers. Two galvanized iron cowl ventilators are on top of the pilothouse deck. These ventilators have wooden inlet ducts leading to the engine compartment, port and starboard. Two galvanized iron cowl ventilators are on galvanized iron posts at the forward corners of the cockpit. These ducts exhaust air and fumes from the lowest part of the compartment under the cockpit. Spaces between the sheathing and the side of the boat, port and starboard, furnish additional ventilation for the fuel tank compartments. Two ventilators are in the forward bulkhead, between the anchor rope locker and the forward cabin. *(See figure 21.)*



Figure 20—Ventilator Cowls

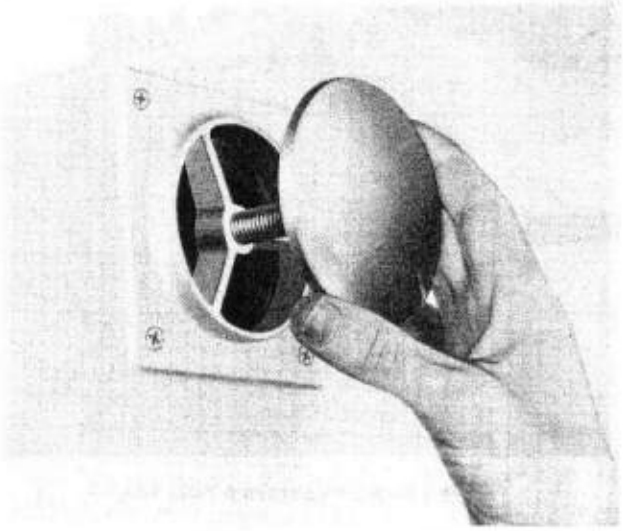


Figure 21—Ventilator in Forward Bulkhead



Figure 23—Placing Oil Can in Canvas Sea Anchor

9. MISCELLANEOUS EQUIPMENT.

a. Stowed in the starboard locker which is against the forward bulkhead in the forward cabin *(figure 22)* is a canvas sea anchor, with folding ring and oil can. *(See figures 23 and 24.)*

b. The bronze bilge pump is a rotary hand-operated suction pump which discharges through the side of the hull. The piping is galvanized steel and rubber hose. The through-hull fitting is about 4 inches above the waterline. A portable hand bilge pump is also used to remove small quantities of water from the bilge.

c. The 8-inch fog bell is mounted below the center front window of the pilothouse with a removable bracket, socket, and bell cord. *(See figure 25.)*

d. Hardware in the cabins, bridge, and engine compartment consists of hinges, drawer pulls, catches for holding doors open, door knobs and lock sets, slide-bolt catches, and clothes hooks. Duplicate keys with brass label plates for all locks are in a glassed key locker. *(See figure 26.)*

e. The compass is of the underlit, liquid spherical type, mounted in a heavy brass dome-type binnacle,



Figure 22—Sea Anchor and Oil Can Stowed

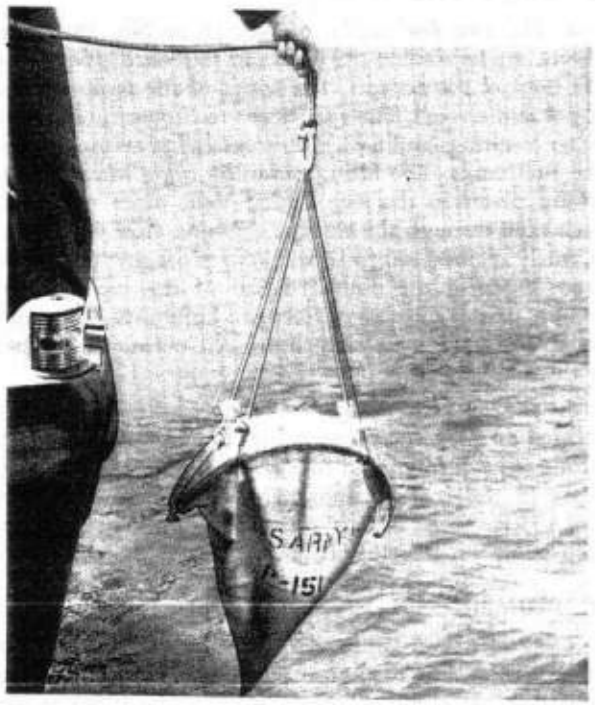


Figure 24—Lowering Sea Anchor

fitted with suitable correcting magnets. The binnacle is installed in the forward cabin deck forward of the instrument panel.

f. Windshield wipers are installed on the three forward windows of the pilothouse. *(See figures 27 and 28.)*

g. The hoist is attached to either of the ventilator posts in the forward corners of the cockpit. *(See figure 29.)*

h. In the forward cabin is a ladder to the escape hatch fastened to hooks on the lockers which are against the forward bulkhead. *(See figures 30 and 31.)* The escape hatch is located in the forward cabin top. *(See figures 32 and 33.)*

i. A crash kit *(figure 34)*, kept under the seat in the cockpit, contains the following articles: 1 saw, 2 wrecking bars, 2 carbon tetrachloride fire extinguishers (1 quart), 1 hacksaw with 12 blades, 1 pair of tin snips, 2 bolt cutters, 1 fire ax, 1 hand ax, 1 ball peen hammer, 1 chisel, 1 sheath knife, 1 pair of pliers, 1 flashlight with 2 sets of batteries and 2 bulbs, and 100 feet of ½-inch line.



Figure 25—Fog Bell

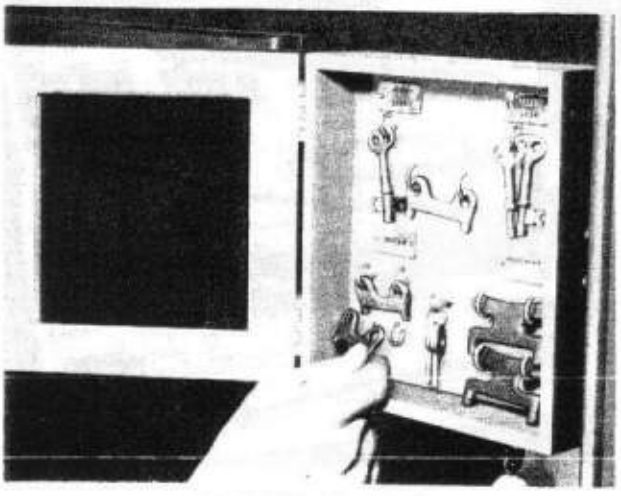


Figure 26—Key Locker

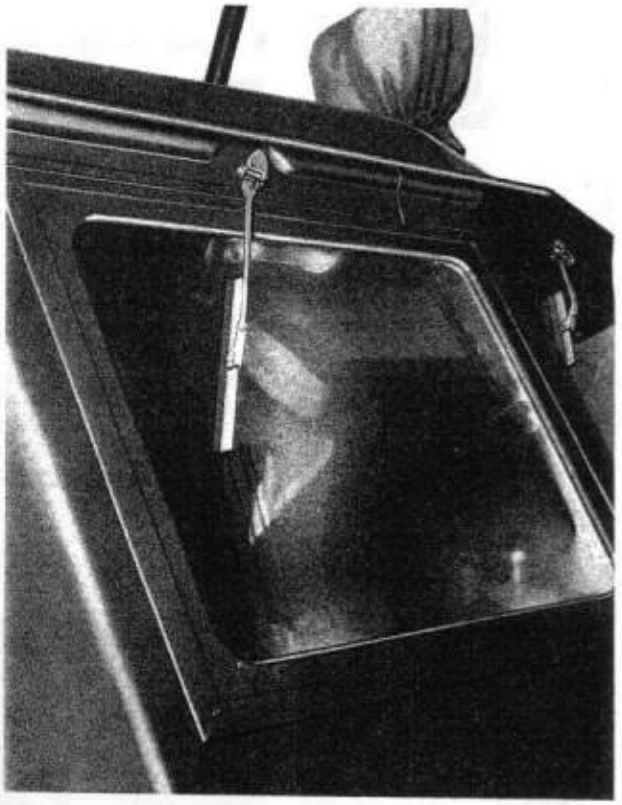


Figure 27—Outboard View of Window Wiper

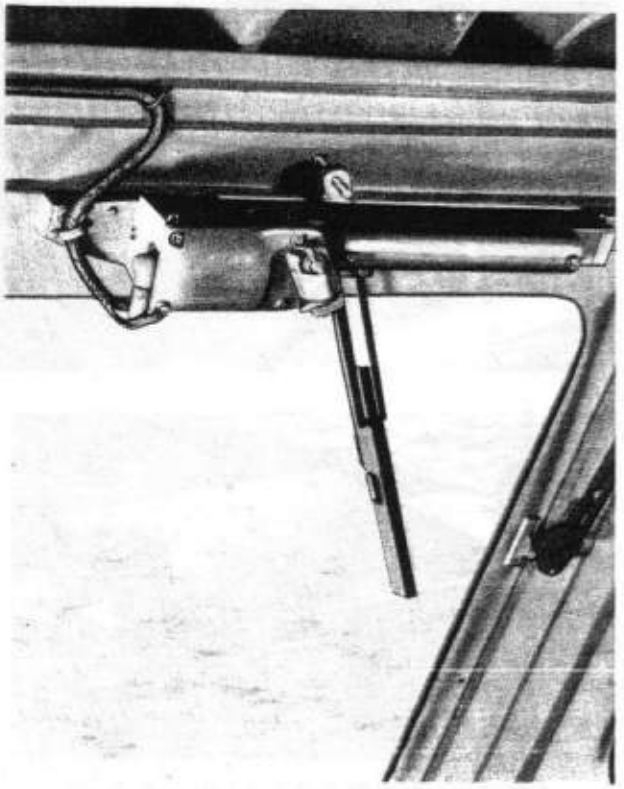


Figure 28—Inboard View of Window Wiper

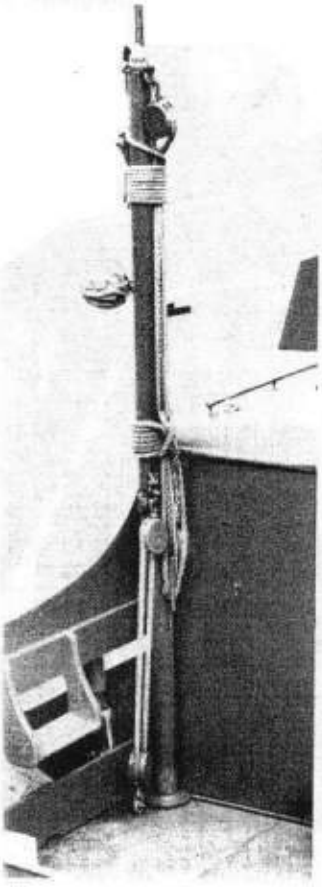


Figure 29—Hoist Attached to Port Ventilator Post



Figure 30—Escape Hatch Ladder Stowed



Figure 31—Using Ladder to Escape Hatch

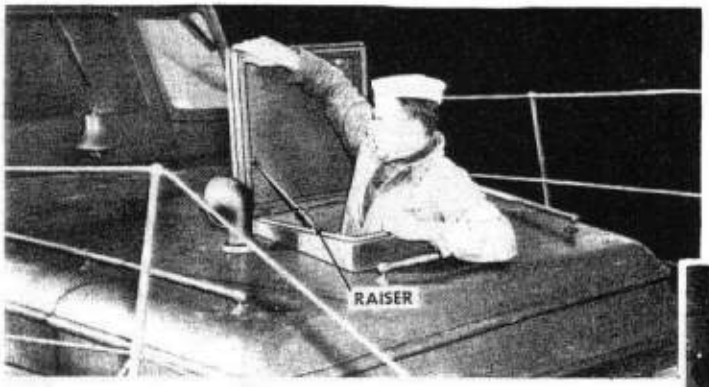


Figure 32—Emerging from Escape Hatch

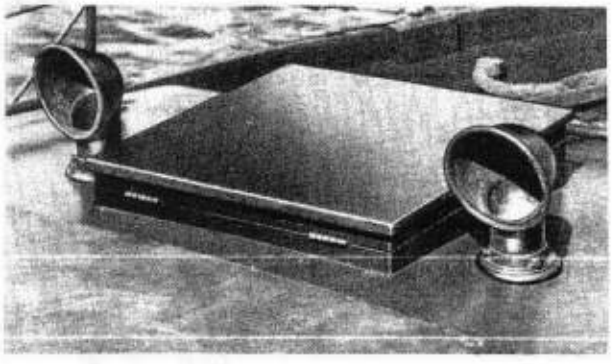


Figure 33—Escape Hatch to Forward Cabin

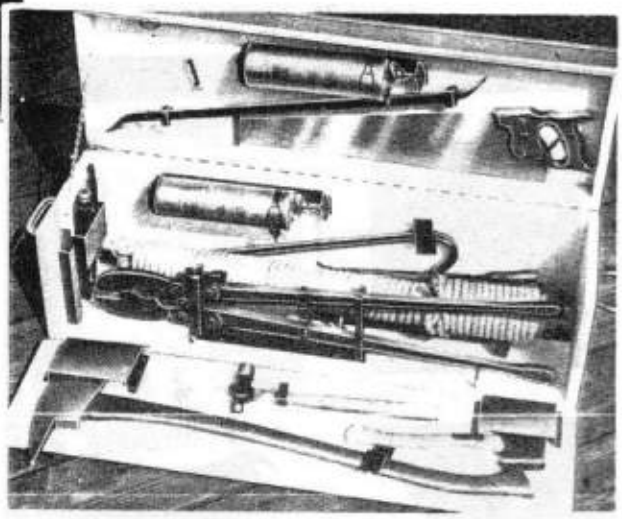


Figure 34—Crash Kit

SECTION II Engine Operation

1. GENERAL.

The engine operations presented are primarily those affecting the Kermath Sea Raider 6 Marine Engine. *(See figure 35.)* For operations of the Hall-Scott Invader 6 Marine Engine, see figure 36. Engines should be thoroughly warmed up before the boat leaves the dock. This warm-up period should cover 5 to 10 minutes. Running the engines below 800 rpm for periods exceeding 10 minutes may result in fouled plugs.

WARNING

At all times blowers will be run 3 to 5 minutes before starting the engines to clear the bilge and engine compartment of fumes which can cause explosions.

Oil and water must be checked before and after missions. Fuel must be checked before leaving on a mission. Check oil and water instrument panel gages frequently while the boat is in operation to see that they are registering satisfactorily. If the oil gage registers below 15 pounds at 1800 rpm, shut down the engine in question and investigate. If a satisfactory adjustment cannot be made, proceed on the other engine. If the water temperature gage registers above 77°C (170°F), shut down the engine and check the water level. If the temperature rises above 82°C (180°F), do not add water until the engine has cooled to normal heat, 71°C (160°F). This will avoid the danger of cracking castings.

Note

Except in emergencies never run an engine faster than 80 per cent of its maximum rpm.

2. BEFORE STARTING.

a. Raise the center hatch to detect the possible presence of fumes or fuel leaks. Fumes must be cleared and fuel leaks repaired before starting the engines. Each engine has its own fuel tank and system. If a leak is found in one system, cut off the fuel to the tank by closing the cut-off valve. *(See figure 37.)* After the leak is repaired, clear the bilge of any fuel which may have gathered there by soaking it up with rags. The bilge should be scrubbed with hot soapy water before turning the fuel on by turning the cut-off valve completely to the left.

b. Turn the engine switches on "BLOWER." *(See figure 38.)* Operate the blowers for 3 to 5 minutes to clear the bilge and engine compartment of fumes.

c. Turn the switches to "BLOWER-IGNITION," making sure that the clutches are in neutral.

CONDITION	*RMP*	*CONTROLS*	*TIME*
WARM-UP (At the dock)	500-800	Clutch neutral	5 to 10 minutes
LEAVING DOCK	500-800 (1000 maximum until port is cleared except for emergencies)	Clutch engaged	
WARM-UP (Under way)	1500 maximum		15 minutes
CRUISING (After clearing port)	1800-2000		
EMERGENCY	2300-2400		1½ hours maximum
REVERSE	500-1200	Clutch full down	30 minutes maximum
AFTER DOCKING	500-800	Clutch neutral	3 to 5 minutes

Figure 35—Kermath Sea Raider 6 Engine Chart

CONDITION	*RPM*	*CONTROLS*	*TIME*
WARM-UP (At the dock)	500-800	Clutch neutral	5 to 10 minutes
LEAVING DOCK	500-800 (1000 maximum until port is cleared except for emergencies)	Clutch engaged	
WARM-UP (Under way)	1500 maximum		15 minutes
CRUISING (After clearing port)	1600-1800		
EMERGENCY	2100 maximum	Clutch full ahead	1½ hours maximum
REVERSE	500-1200	Clutch full back	30 minutes maximum
AFTER DOCKING	500-800	Clutch neutral	3 to 5 minutes

Figure 36—Hall-Scott Invader 6 Engine Chart

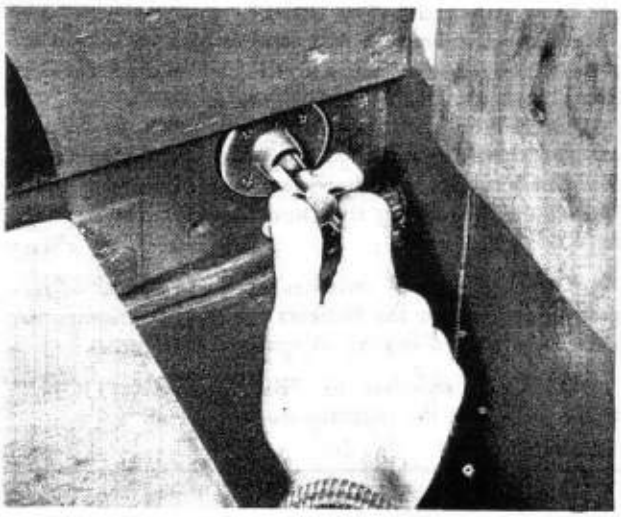


Figure 37—Closing Port Fuel Tank Cut-off Valve

3. STARTING THE ENGINES.

a. Either engine may be started first. Selecting one engine, leave the switch in "BLOWER-IGNITION" and pull out the choke if the engine is cold. *(See figure 39.)* This is not necessary for restarting. Choking a hot engine will cause flooding.

b. Press the autopulse button on the side of the control pedestal to prime the fuel lines. *(See figure 39.)* A slight clicking noise will be heard. When this noise stops, indicating that the fuel lines are primed, release the button.

c. Start the engine by pulling the starter button. *(See figure 40.)*

d. When the engine starts, release the starter button and push the choke down if it has been used.

e. Repeat steps *a.* through *d.* to start the other engine.

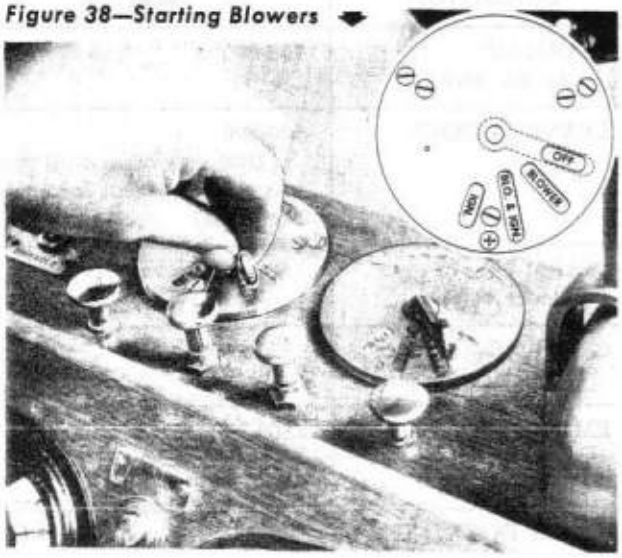
f. Observe the instrument board to see that the oil pressure is up and the generator is charging.

g. Check to see that the salt water pumps are operating. This may be determined by inspecting the sea strainer glasses or by noting that water is flowing toward scoops on the sides of the hull below the waterline and out through the exhaust at the stern. It will be found that some boats are not equipped with scoops.

h. Check the engines by sound to discover evidences of broken pistons, loose bearings, or other injuries to working parts. If damage is discovered, the engine must be shut down and suitable repairs made.

i. Check the exhaust manifold and pipe. A hissing sound will indicate leaks. If any occurs, shut down the engine and make suitable repairs.

Figure 38—Starting Blowers



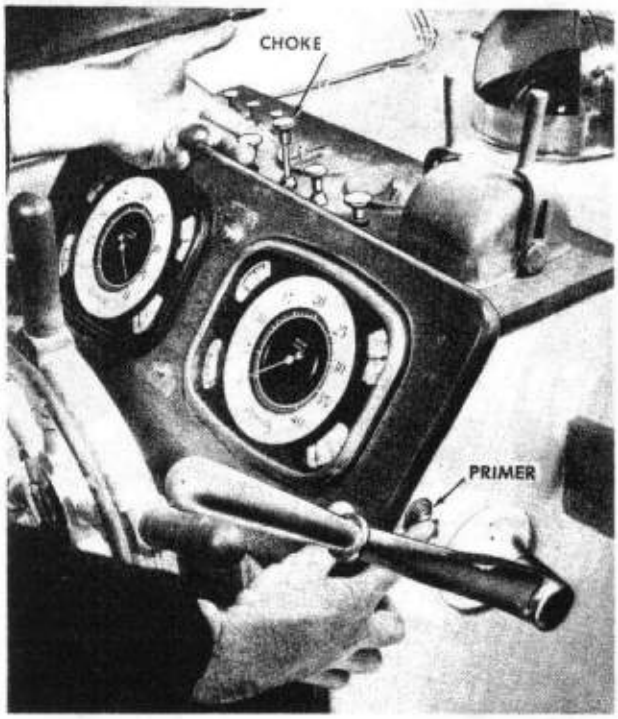


Figure 39—Choking and Priming the Port Engine

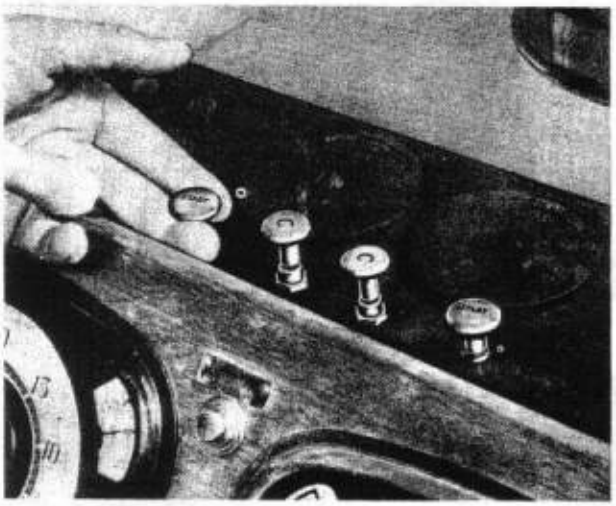


Figure 40—Starting the Port Engine

4. WARM-UP AT THE DOCK.

a. Warm up the engines at 500 to 800 rpm for 5 to 10 minutes. *(See figure 41.)*

b. After engines have run 2 to 3 minutes, check the oil and the water in each. The bayonet-type oil level indicator should register not below "DANGER" and should range close to "FULL." Read the oil level to the solid line, disregarding foam which may appear on the top. *(See figure 42.)* The bayonet-type water level indicator should register "FULL." *(See figure 43.)* On certain types of engines the oil and water checks are made before the engines are started.

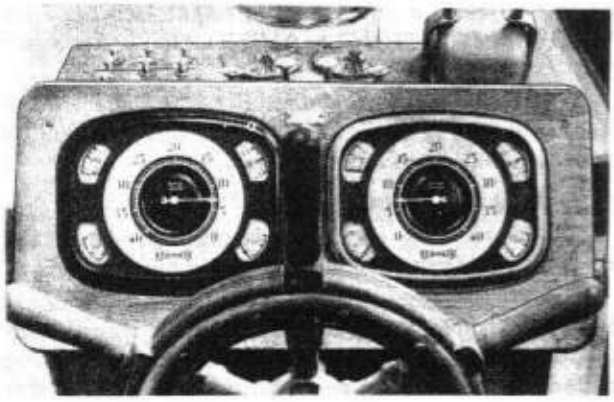


Figure 41—Engines Set for Warm-up

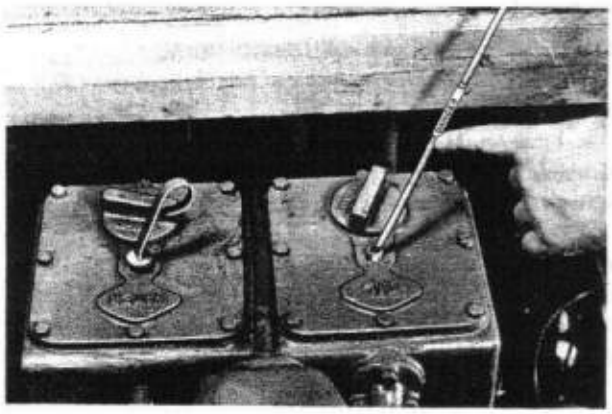


Figure 42—Checking the Oil Level

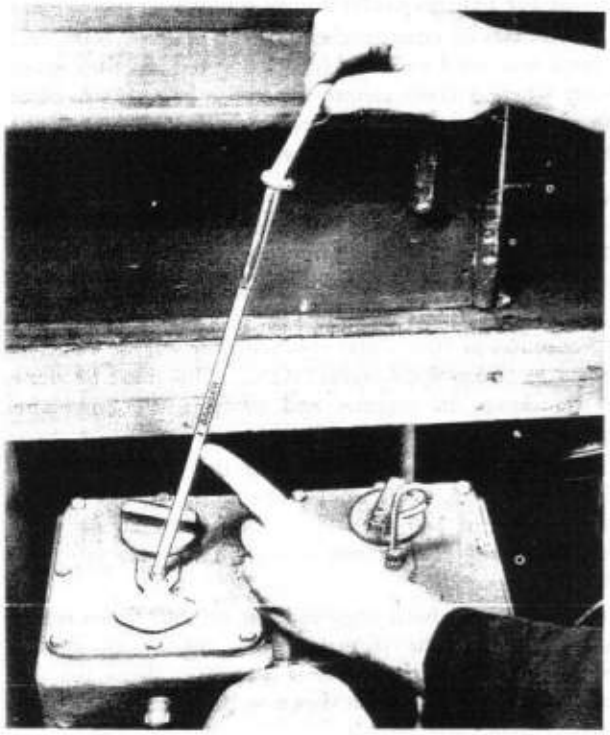


Figure 43—Checking the Water Level

c. After running 3 to 5 minutes on "BLOWER-IGNITION" to clear fumes, turn the engine switches from "BLOWER-IGNITION" to "IGNITION." *(See figure 44.)*

d. Make a visual inspection to see if there are any leaks in the oil or water lines. If leaks are found, cut off the engines and make the necessary repairs.

5. WARM-UP UNDER WAY.

a. When leaving the dock, engage the clutch and advance the throttle to 500 rpm. *(See figure 45.)*

b. Except for emergencies, 1000 rpm maximum should be observed until the port is cleared. The throttle may then be advanced to 1500 rpm. A 15-minute warm-up period after leaving the dock will result in better engine performance.

c. Observe all instruments carefully during the warm-up period.

6. UNDER WAY AT CRUISING RPM.

a. Best cruising performance is obtained at 1800 to 2000 rpm. *(See figure 46.)*

b. Observe instruments periodically during the course of a mission. Normal evidence of faulty engine operation can be read on the instrument gages.

c. Full speed ahead is obtained with an rpm reading of 2300 to 2400. *(See figure 47.)* This speed should be used only for emergencies and then only for periods not exceeding 1½ hours.

7. REVERSING.

a. For reversing, use a throttle setting of 500 to 1200 rpm. *(See figure 48.)* Unless greater time is required by emergencies, the engines should not be operated in reverse for periods exceeding 30 minutes.

b. In cases of emergencies to avoid crashes, reefs, etc., reverse will tend to offset forward speed. In dire emergency where a crash cannot otherwise be avoided, place the clutches in the full reverse position and push the throttles wide open. *(See figure 49.)*

8. STOPPING THE ENGINES.

a. The boat should be eased into the docks at 500 to 800 rpm, depending on conditions of wind, tide, drift, etc., unless emergencies requiring greater speed exist.

b. After the boat is made fast, run the engines for 3 to 5 minutes at 500 to 800 rpm with the engine switches turned to "BLOWER-IGNITION." This must be done to run down the engines and to clear the bilge and engine compartment of fumes.

c. Stop the engines by turning the switches to the "OFF" position. This should be done at the engine idling speed of 500 rpm. In no case while at the dock should the engines be shut down when operating over 800 rpm.

d. If either or both engines must be shut down while cruising, retard the throttle, place the clutch in the "NEUTRAL" position and, if possible, allow the engine or engines to be shut down to drop below 800 rpm before cutting the switch.

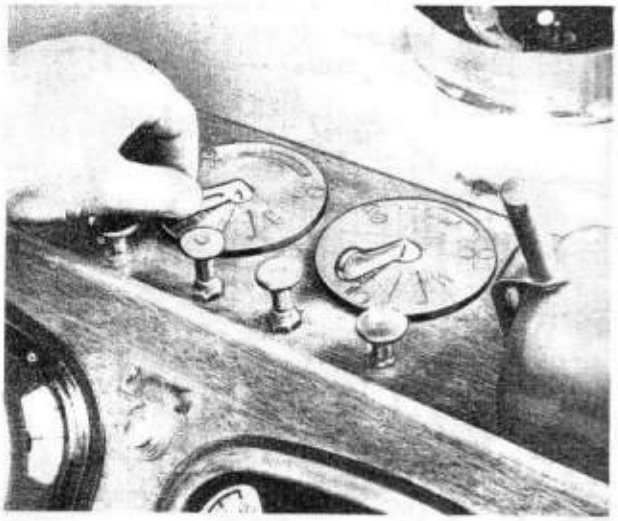


Figure 44—Turning Switches from "BLOWER-IGNITION" to "IGNITION"

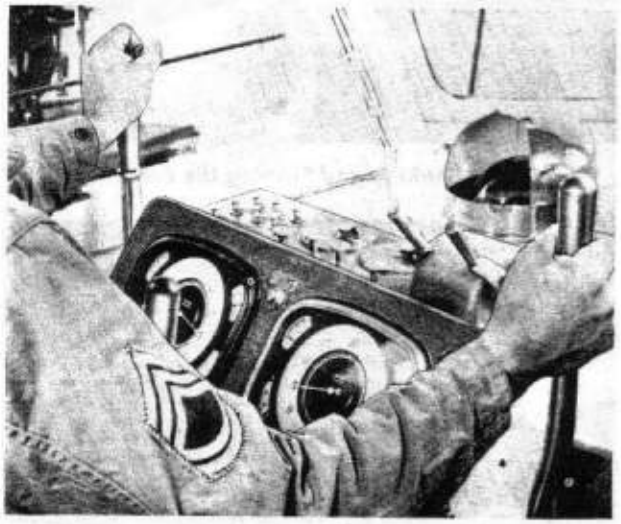


Figure 45—Leaving the Dock



Figure 46—Instruments Set for Cruising

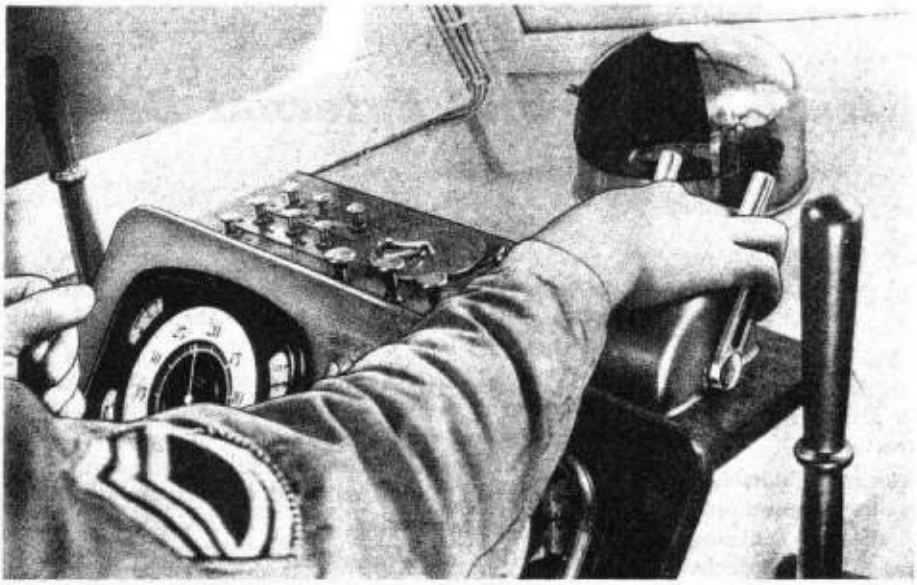


Figure 47—
Full Speed Ahead

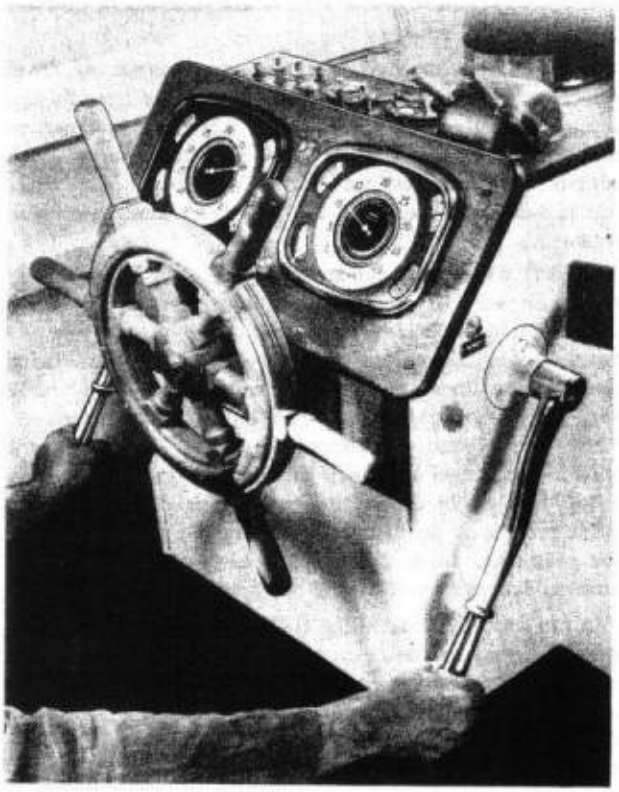


Figure 48—Reversing

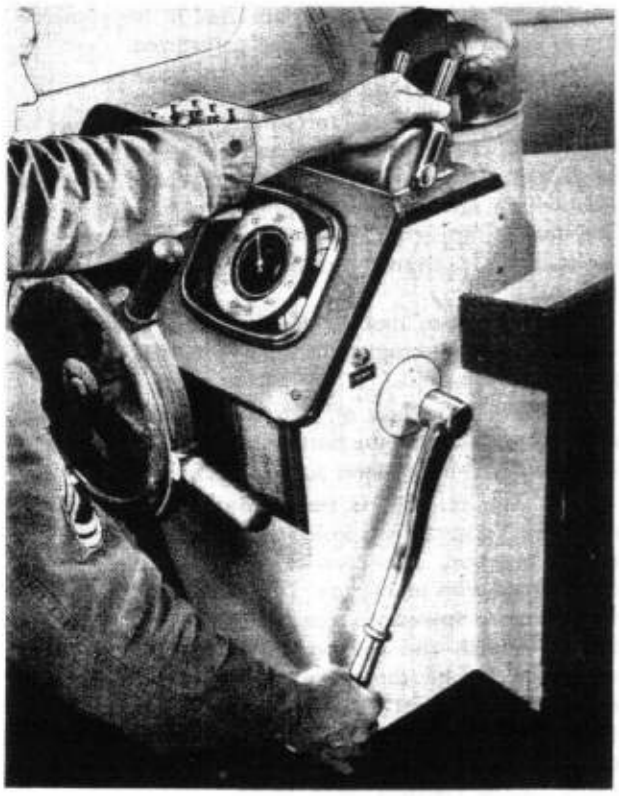


Figure 49—Emergency Use of Reverse to Avoid Crash

SECTION III Hull, Deck, and External Drive

1. CONSTRUCTION.

a. GENERAL.

(1) All lumber is air-dried, free from sapwood, splits, decay, box heart, unsound or loose knots, and sound knots greater than 1 inch in diameter. Red oak is never used for any part of the structure.

(2) All screw and bolt fastenings in the outside of the hull are counterbored and plugged with wood plugs set in white lead or marine cement. All hull fastenings are of galvanized iron except those within 12 inches of any bronze.

(3) No ferrous materials are used in the construction or outfitting unless they are galvanized.

b. HULL FRAMING AND PLANKING.

(1) The keel, stem, apron, and shoe are made of white oak. The stem is sided and rabbeted to receive the planking. The lower knee of natural crook white oak with a long scarf is securely bolted to stem and keel. The stem is supported at the deck by oak breast hooks and stringers. Galvanized iron protects the face of the stem.

(2) The horn timber, of white oak, is sided and rabbeted for planking and fastened to the keel with galvanized iron bolts.

(3) The stern post of white oak is securely bolted to the transom and to the horn timber through a natural crook or a galvanized steel angle clip cut to suit.

(4) The transom is mahogany over plywood. A waterproof cement is applied between the mahogany and the plywood. The screw fastenings are countersunk and plugged with mahogany. The transom is fitted with oak stiffeners spaced on centers to line up with the engine keelsons and keelson knees, and has a shaped oak frame around the edges to receive planking and side clamps. Vertical and horizontal oak guards with brass half-oval guards protect the outer face of the transom. The edge of the transom is protected by a shaped bronze edging fastened on by screws.

(5) The shelf forward is white oak or mahogany sawed to shape, notched for frames, and bolted to scarfs and to the sheer clamp. The sprung shelf from the sawed shelf to the transom is fir, scarfed and bolted to the sawed shelf and also to the sheer clamp and frames. Copper or soft iron galvanized rivets fasten the shelf to the frames.

(6) The sheer clamps are of spruce or Oregon fir and extend the full length of the boat. They are riveted to every frame with copper or galvanized soft iron hooks. Galvanized steel bolts fasten the shelf and clamp together.

(7) Side clamps and bilge stringers are spruce or Oregon fir in as long lengths as possible. The scarfs are bolted and well distributed throughout the boat. Clamps are riveted to every frame the full length of the boat and are fitted at the stem and transom frames to oak knees and breast hooks.

(8) The white oak transverse frames, spaced on approximately 8-inch centers, extend continuously from keel to timber heads. The frames are steam bent and are beveled where required.

(9) The white oak web frames are continuous from the center line to the timber head, shaped to the inboard side of the bilge and side clamps. They are fastened to the regular floors, the stringer, and the clamps with copper or galvanized soft iron rivets. Mahogany filler pieces are fitted between the regular frames and web frames.

(10) Floor timbers are of white oak, 1 inch sided except in way of engine space and shaft logs, where they are 1⅜ inch sided and molded to suit. They are fitted at every frame and notched over the keel and horn timber. The floors are securely fastened to each frame with bronze or galvanized iron bolts or copper rivets. Rivets are peened over copper washers. The floors are bolted to the keel and horn timber with galvanized iron bolts. The edges of the floors are faired off with the outer surface of the frames to maintain a perfect fit with the planking. Limber holes are provided in all floor timbers except at watertight bulkheads.

(11) Chines extend the full length of the boat from stern transom to stem. Inner chines are white oak, fastened to the frames, the bilge stringers, and the web frames with copper or galvanized soft iron rivets. The outer chine is white oak or mahogany and is fastened to the inner chine by screws. The screw holes are counterbored, bunged, and beveled to fair with side and bottom planking. Chines and bilge stringers are fastened on natural crook knees at the stern transom and stem. The outer chine is planed fair.

(12) The bottom is double planked with mahogany laid longitudinally over cedar. A waterproof cement is applied between the planking. Topside planking is a single thickness of mahogany, fastened with screws. Oak butt blocks are fitted frame to frame and shifted so as not to lie in the same vertical width. All fastenings for

outside planking are counterbored and plugged watertight with mahogany bungs set in cement. Inner planking on the bottom is fastened with nails, and the outer planking and topside planking are fastened with galvanized iron screws. Seams are coated with paint, caulked with cotton, and filled with white seam compound. Surfaces are dressed down and sanded before painting. Deck planking is of plywood and fastened with screws to the deck beams, sheer plank, cabin trunk header and strong beams. The deck is covered with No. 8 canvas, ironed down into canvas cement. A 2-inch flap of canvas turned up under the cabin sides and a 2-inch flap turned down over sheer planks are fastened with copper tacks. The canvas is filled and painted.

(13) Shaft logs of seasoned mahogany or white oak, rabbeted and shaped, are bored to the angle to receive the propeller shafts and have copper or lead sleeves. Shaft logs in way of frames and floors are bolted with bronze bolts. The bottoms of the shaft logs are flush with the planking surface.

(14) Engine foundations are white oak, notched over floor timbers and frames and fastened to floors, frames, and engine stringers. All fastenings are galvanized iron bolts. Engine stringers are spruce or Oregon fir, molded and extending longitudinally, notched over and securely fastened to each frame and floor. The engine stringers are fastened to the stern with galvanized steel knees or brackets and to the watertight bulkheads with galvanized steel angles.

(15) Foundations for rudder posts, struts, tanks, etc., are of white oak or mahogany fitted to structural members with galvanized fastenings.

(16) The three watertight transverse bulkheads are plywood, fastened with galvanized iron screws. Where structural members pass through the bulkheads, the fit is watertight. Outer edges of bulkheads are faired with frames to insure a tight fit against the planking. Sluice valves are fitted at the bottom of the bulkhead floors. The edges of all plywood are treated with plywood primer.

(17) The main deck beams are white oak or mahogany bolted to a deck plate and to shelves. Strong beams are provided in way of the cabin openings, and oak frame knees are fitted at the web frames forward. Short beams at the sides in way of the cabins are let into white oak trunk headers and fastened to white oak shelves with galvanized steel bolts.

(18) The guards or rub strakes are long leaf yellow pine, fir, or white oak and are beveled to shape. They are protected by a half oval of galvanized iron or by a canvas-covered rubber strip held in place by waterproof cement and two strips of molding. The guards are fastened through planking and frames with galvanized iron bolts set up from the inside with galvanized iron nuts over washers. Similar guards are fastened to the stern vertically and horizontally.

(19) Bulwarks and toe rails are shaped mahogany. The rails are fastened to the deck with galvanized steel screws. The screw holes are counterbored and plugged.

c. CABIN STRUCTURES.

(1) The forward and after cabin trunks have sides and ends of solid mahogany. The sides are secured to the deck frames and are reinforced vertically between the windows by stiffeners. Corner posts are of mahogany and are rabbeted to receive the cabin sides and ends. Roof carlines and upper cabin stringers are white oak or mahogany. The canvas flap from the main deck is turned up inside against the cabin sides and secured by cement and tacks. The trunk decks are of the same construction as used for the pilothouse top. Port lights and windows are set over canvas gaskets soaked in waterproof cement. Windows in the after cabin are of weathertight hinged jump-sash construction except the after window on each side, which remains fixed. The jump sashes have mahogany frames with hardware. All windows are glazed with heat-strengthened plate glass set in a waterproof compound. All windows and ports are equipped with removable screens.

(2) The pilot house sides are solid mahogany, strengthened by mahogany stiffeners and having shaped mahogany corner posts. The roof carlines are oak or mahogany. Cabin tops are planked with tongue and groove white cedar or plywood, covered with No. 10 canvas duck, ironed down into canvas cement with edges drawn down over the side seam and tacked. The edges of the cabin tops are finished with half-round mahogany binding, fastened with screws. The screw holes are mahogany plugged. The two outboard front windows of the pilothouse hinge up and outboard, and each is equipped with lifts. The center front window is fixed. In the after end of the pilot house are two brass-framed windows for ventilation, located port and starboard to give clear vision aft. The forward side windows are in two parts, arranged so the after glass will slide forward. The side windows are fixed. The doors slide aft. A galvanized visor, stiffened with a split galvanized steel tubing and supported by flanged galvanized steel brackets, is installed above the front windows.

(3) The interior flooring is plywood, fastened with galvanized nails to the floor beams and with hatch openings. Floors in the forward and after cabins and the pilothouse are covered with linoleum laid in cement.

(4) The cockpit is self-draining. Mahogany coamings are shaped and finished along the top with a brass half-oval edging. The floor beams are white oak, supported by two fore-and-aft girders and stanchions. The cockpit floor is plywood covered with No. 8 canvas laid in canvas cement, filled, and painted. The canvas, in one piece, extends up the full height behind the margin plank. The margin plank is mahogany. The after end of the cockpit is fitted with a hinged mahogany seat which folds up flush with the after coaming. The cockpit has a weathertight hatch and four lead pipe drains, flanged at the ends and fitted flush with leather flaps on the outside.

(5) Flush hatches are planked with the same material as the deck or floor in which they are located, fitted with oak frames. All flush hatches are bound with

brass binding mitered at the corners and fastened with brass screws. Hinged weathertight hatches over the companionway and on the forward cabin top are mahogany. Both hatches have sliding screens in mahogany frames. Brass hooks secure the hatches from the inside. All hinged hatches have raisers.

(6) Doors in the pilothouse and in the after cabin are mahogany. All windows are glazed with ¼-inch glass. The after companionway doors are fitted with fixed screens and hinged windows. The weathertight door frames in the cabin structure are mahogany and equipped with brass step plates on the sills.

(7) The cabins are sheathed with plywood. The sheathing is fastened with screws. There are grommets under the screw heads. The underside of the decks of the cabin trunks and pilothouse top are insulated with ½-inch celotex, or equal, and held in place with quarter rounds.

d. RUDDERS AND STEERING GEAR.

(1) The rudders are cast manganese bronze. The rudder post passes through bronze stuffing boxes bolted to the rudder post foundations. The port and starboard rudder posts are connected by an adjustable pipe. The rudder posts are of sufficient height under the cockpit floor to use an emergency tiller, which fits over the squared head of the rudder posts. Brass deck plates are fitted over the top of the rudder posts in the cockpit floor.

(2) Two types of steering gear are found in these boats: the cable type, with roller chain and sprocket, and the link rod type made of galvanized pipe.

e. PROPELLER SHAFT STRUTS AND BEARINGS. —The propeller shaft struts are of the single arm type, of cast manganese bronze. The struts are bolted to the hull through the oak strut foundations. All struts and shaft bearings outside the hull have rubber bearings with provisions for water lubrication.

f. SHAFT LOGS AND SHAFTING. — The shaft logs are cast manganese bronze of the self-aligning type. Each is fitted with a packed gland with a tightening flange. The metal shaft logs are bedded down to the wood shaft logs with a canvas gasket soaked in marine cement and are fastened with screws and bolts. The shafts are copper-plated steel, with bronze sleeves at all bearings, in two lengths with taper sleeve or muff couplings keyed to the forward shaft and to the after shaft. The shafts are machined to receive the flange coupling at the engine end, and tapered, keyed, and threaded at the after end to receive the propellers. Propeller nuts are fitted with locking pins and fairwater nuts. The propellers are a high-speed type.

2. POLICING AND STOWAGE.

a. GENERAL.

(1) Proper stowage of equipment on board a boat is important not only for the sake of appearance, but because it increases the efficiency of the boat and crew.

(2) The maintenance periods suggested in this section may vary with climate and with conditions of operation. The periods may be changed to fit local conditions at the discretion of the commanding officer.

(3) Refer to the overhaul instructions for each system in the following sections. Most overhaul work—such as topsides and interior painting and machinery repair—should be made while the boat is in the water. Haul the boat only for bottom painting and repairs that cannot be made afloat.

b. AT DOCK.

(1) Wash down the deck daily with fresh water from a hose, if available. Mop the decks clean and dry. *(See figure 50.)*

(2) Sweep interior floors daily. Mop them with fresh water twice a week.

(3) Wash interior surfaces and fittings as required. Use soap or cleaning powder for interior walls. Use a piece of chamois for windows and glass surfaces. Never use cleaning powders on the windows. A liquid cleaner which will not scratch the window should be used.

(4) Polish brass daily or as otherwise ordered.

(5) To preserve bright work, wipe with a cloth slightly moistened with a light oil.

(6) Keep canvas covers installed and lashed on the searchlight, floodlights, and flotation gear rack.



Figure 50—Swabbing the Deck

(7) Keep lines and fenders stowed neatly when not in use. Make sure they are dry before stowing them in the closed lockers. Air and dry stowed lines once a week.

(8) Air life jackets in the sun once a week.

(9) Keep the galley and equipment scrupulously clean. Do not leave food exposed.

(10) Clean toilets as often as necessary.

c. AT SEA.

(1) All loose deck gear should be stowed away or lashed in place.

(2) Keep the canvas covers installed on such items as the searchlight when the use of such equipment is not anticipated during the trip.

(3) Fasten the after cabin doors to prevent them from swinging and close all hatches to exclude salt spray while under way.

d. AFTER MOORING.

(1) Wash down the decks and all exterior surfaces with fresh water to remove salt water deposits. Use a hose, if possible, and mop the decks dry and clean.

(2) Wash interior surfaces which have been wet by salt water. Use a piece of chamois and fresh water.

(3) Wash windows with fresh water and a chamois.

(4) Dry all lines and fenders thoroughly before stowing them.

(5) Polish all brass.

3. NINETY-DAY INSPECTION IN DRY-DOCK.

a. GENERAL.—The boat must be dry-docked and the bottom inspected, cleaned, and painted every 3 months, except when it is used in fresh water, in which case a period of 4 months is possible.

b. HAULING.—The following methods of hauling may be used:

(1) Where conventional ways are used and a boat cradle is available, the cradle should be used to place the boat on the ways for hauling. If a cradle is not available, suitable keel chocks should be set up on the runway at the bulkheads to guarantee an even distribution of weight on the keel. Suitable blocks *(figure 51)* should be arranged on the ways to accommodate a portion of the weight of the boat. All such blocks should be nailed down, to keep them from fouling the wheels when the boat is placed in the water. Use jacks to support the stern. *(See figures 52 and 53.)* Take care that the weight is equally distributed at all bearing points. Do not let the propellers, struts, rudders, or any other underwater projections carry any weight while the boat is out of the water.

(2) If a crane is the only means available for removing the boat from the water, sling the cradle on the crane and then lower the cradle into the water deep enough that the boat may be placed on it without

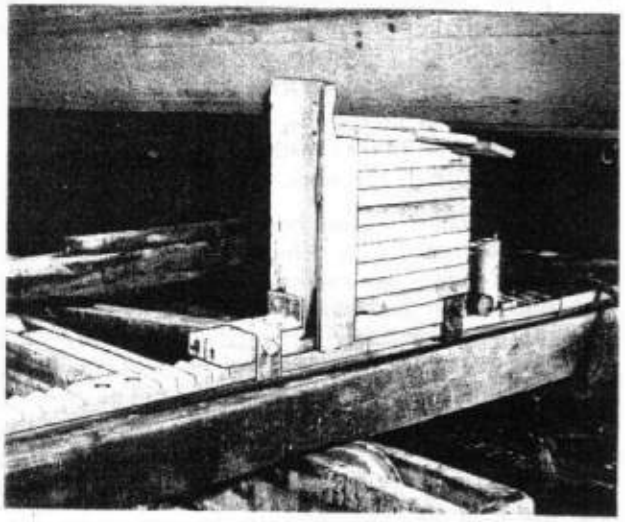


Figure 51—Blocks Supporting Bottom of Boat

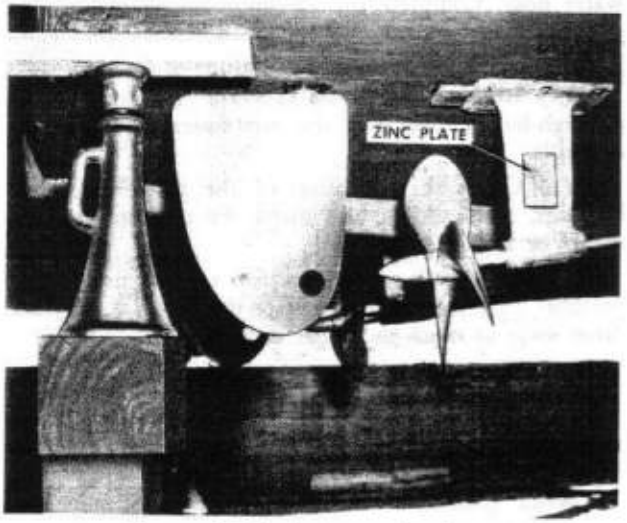


Figure 52—Jack Supporting Stern



Figure 53—Boat on the Ways

damaging the propellers or rudders. When the boat is in proper position on the cradle, lift the cradle and boat clear of the water and place them in a suitable location.

CAUTION

If a crane is used, it is very important that personnel acquainted with this procedure directly supervise the work.

(3) If neither a crane nor ways are available, the boat may be beached in a locality with sufficient rise and fall of tide. Place the cradle in shallow water at high tide so that just enough water is over it to float the boat onto the cradle. When the tide recedes, the necessary underwater repairs may be made and the bottom painted. The boat can then be floated off the cradle at the next high tide. Be sure to support the cradle firmly.

c. CLEANING AND INSPECTION. — After the boat has been dry-docked, clean the underwater surfaces thoroughly with brushes, scrapers, and fresh water hose. Complete the cleaning before the marine growth dries and hardens on the bottom. Upon completion of this task make the following inspection:

(1) Inspect and clean all the below-waterline through-hull fittings and the salt water scoop screens or grills.

(2) Check the operation of the propellers, strut bearings, and rudders, and make the necessary adjustments or repairs.

(3) Check all zinc plates for electrolytic decomposition. *(See figure 52.)* Replace the plates if they are eaten away as much as 50 per cent.

Note

Repairs should be made before painting is started on the underwater surfaces. For instructions on and maintenance of the underwater assemblies, refer to paragraph 5., this section.

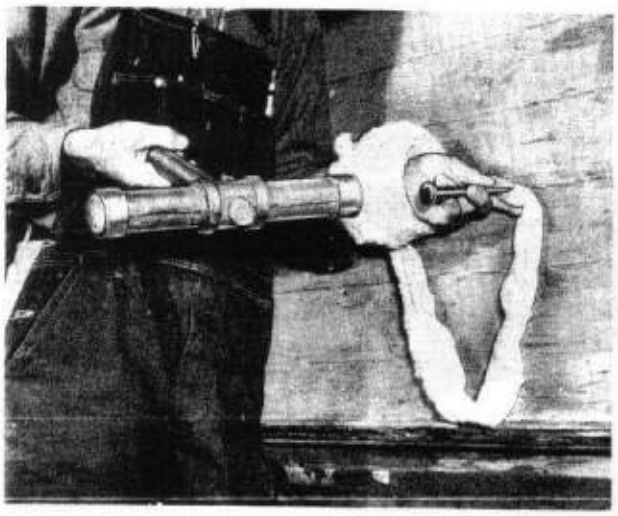


Figure 54—Caulking Seams with Cotton

4. PAINTING.

a. GENERAL. — The following procedures should be observed in painting:

(1) Never paint over a wet, dirty, or greasy surface. Make sure that the sections to be painted have been cleaned and sanded and are dry.

(2) If possible, do not paint in wet weather or in bright sunlight. Too much heat may blister the paint.

(3) Brush the paint evenly on the surface. Thick, uneven coats will crack, blister, and peel.

(4) Do not let dirt or water fall on fresh paint until it is thoroughly dry.

(5) Paint the hull above the waterline with sea blue paint conforming to Formula No. 5S, Marine Design Construction and Procurement Specification No. 1-MDCP-2. Use the same paint for the vertical surfaces of the forward and after cabins, the pilothouse, the cockpit, the mast, the life rings, the life raft, the dinghy, and all similar surfaces or items fastened to vertical surfaces.

(6) Paint all horizontal exterior surfaces above the waterline with deck blue paint conforming to Formula No. 20B, Marine Design Construction and Procurement Specification No. 1-MDCP-1. This includes the main deck, the cockpit deck, all exterior steps, and deck gear and fittings such as the anchors, bitts, chocks, hand rails, cleats, and deck plates.

(7) When successive coats of paint become too thick on vertical surfaces, burn and scrape off all the old paint down to the bare wood for repainting. Fill any cracks with plastic wood or seam compound. Coat exposed seams with paint, caulk them with cotton *(figure 54)*, and fill with white seam compound *(figure 55)*. Apply a first coat of hull or deck paint thinned down with 1½ quarts of linseed oil to 1 gallon of paint, and then apply a regular coat of the proper paint.

(8) Whenever metal surfaces such as through-hull connections and deck fittings are cleaned down to the

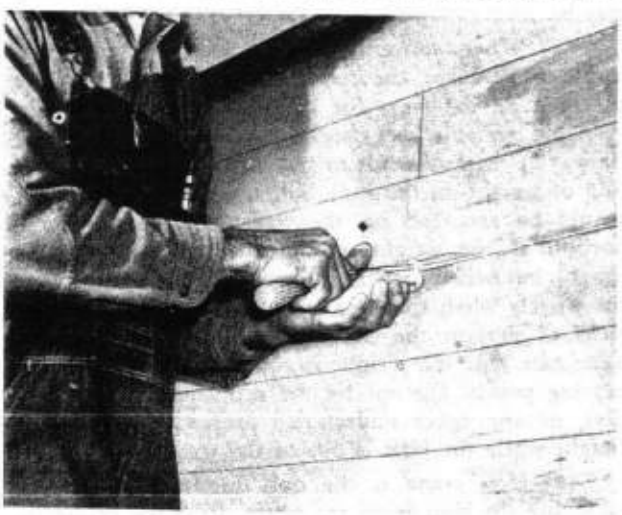


Figure 55—Filling Seams with Seam Compound

bare metal, prime the surface with red lead, Federal Specification No. TT-R-191a, grade B or C, before repainting.

(9) ORDER OF PAINTING.—The boat is most conveniently painted in the following order:

(a) Hull above waterline (while the boat is in the water).

(b) Underwater surfaces (in drydock).

(c) Deck gear. (This gear should be removed from the boat, painted, and replaced after the entire deck has been painted and is dry.)

(d) Vertical surfaces in deck structure.

(e) All horizontal deck surfaces, working from the bow to the stern.

b. SIDES.—Paint the hull sides from the waterline to the gunwale according to paragraph 4.*a.*(5), this section. After this paint has sufficiently dried so that it will not scuff off at the dock, the bottom may be painted.

c. BOTTOM.—After all underwater repairs have been completed, apply a coat of suitable antifouling marine bottom paint, preferably New Jersey red copper, New Jersey brown copper, or copperoid, should be applied to the bottom. If more than one coat is necessary, this first coat should be left to dry before applying a second coat. After the last coat of antifouling paint has been applied, the boat should be put in the water as soon as possible. If antifouling paint is allowed to dry, it will crack and peel, leaving the bottom unprotected.

CAUTION

In launching the boat, care should be taken that all loose shores or chocks or other blocking used in hauling the boat are free from the bottom before the engines are started. Otherwise, when the boat is put in motion under power, the loose shores or chocks or blockings may be sucked into the propellers and damage them.

d. DECK AND SUPERSTRUCTURES. — The deck and superstructures of the boat should now be cleaned, prepared for painting, and painted as outlined in paragraph 4.*a.*, this section. All existing lettering and numerals should be refinished with black exterior paint.

e. INTERIOR (EXCEPT BILGES).—If it is necessary to refinish interior surfaces of the boat, the same procedure outlined in paragraph 4.*a.*, this section, should be followed.

(1) Paint all interior surfaces with suitable paint and varnish, following the same color scheme already used.

(2) The interior walking surfaces which are linoleum covered are to be varnished and waxed.

(3) When the interior has been painted, use stencils and black paint to refinish all existing lettering and numerals.

f. BILGES.

(1) If the bilges are not painted when the boat is received, it is recommended that they be thoroughly cleaned, dried and painted with deck paint to make their upkeep easier.

(2) The painting period of the bilges varies with their care and the amount of water seepage. It is usually not necessary to repaint them as often as exterior surfaces, but they may require painting more frequently than interior walls and floors.

(3) Before painting is started, the bilges must be thoroughly cleaned. Oil, grease, and dirt can be removed by dumping 5 pounds (10 pounds if bilge condition requires) of trisodium-phosphate into the bilge water before a short trip. On the sea this bilge wash will be sloshed over the entire bilge, cleaning off any undesirable material. At the dock, pump the bilge dry. (Refer to section IX.) Sponge out the entire bilge with clean kerosene and then wash it down with clean water. Pump the bilges dry again and then paint.

5. MAJOR REPAIRS.

a. PLANKING.

(1) Repair small gouges in the hull, if they are not through the outer planking, with several thin layers of plastic wood, and sand off flush with the planking.

(2) Repair more serious cuts or cracks by replacing the damaged planks. Usually it is necessary to replace only the outer layer.

(3) It is generally advisable to replace entire planks but, when the damage is slight, the affected sections of planks can be cut out and replaced. When only sections of planks are installed, stagger the seams where the new patches butt against the old planks so they are not in a straight line. *(See figure 56.)* These end seams should be backed with butt blocks, the same thickness of the planks, placed between frames to receive the screws.

(4) When a new plank is installed, use larger screws or plug the old screw holes with wooden pegs and duplicate the fastenings of the old plank as closely as possible.

(5) New planks should fit as snugly as possible. Where a slightly open seam is unavoidable, fill the crack with plastic wood.

(6) When the new plank is installed, sand it down to a very smooth finish matching the surrounding planks. Prime and paint it.

b. FRAME MEMBERS.

(1) Broken main frames are almost impossible to remove and must be repaired in the boat. Cut two pieces of heavy plywood to fit both sides of the broken frame and extend them as far as possible above and below the break. *(See figure 57.)* Place the plywood pieces on both sides of the frame and bolt them with brass or galvanized bolts. Use fairly large bolts and as few of them as practical, for many holes in the frame will weaken it.

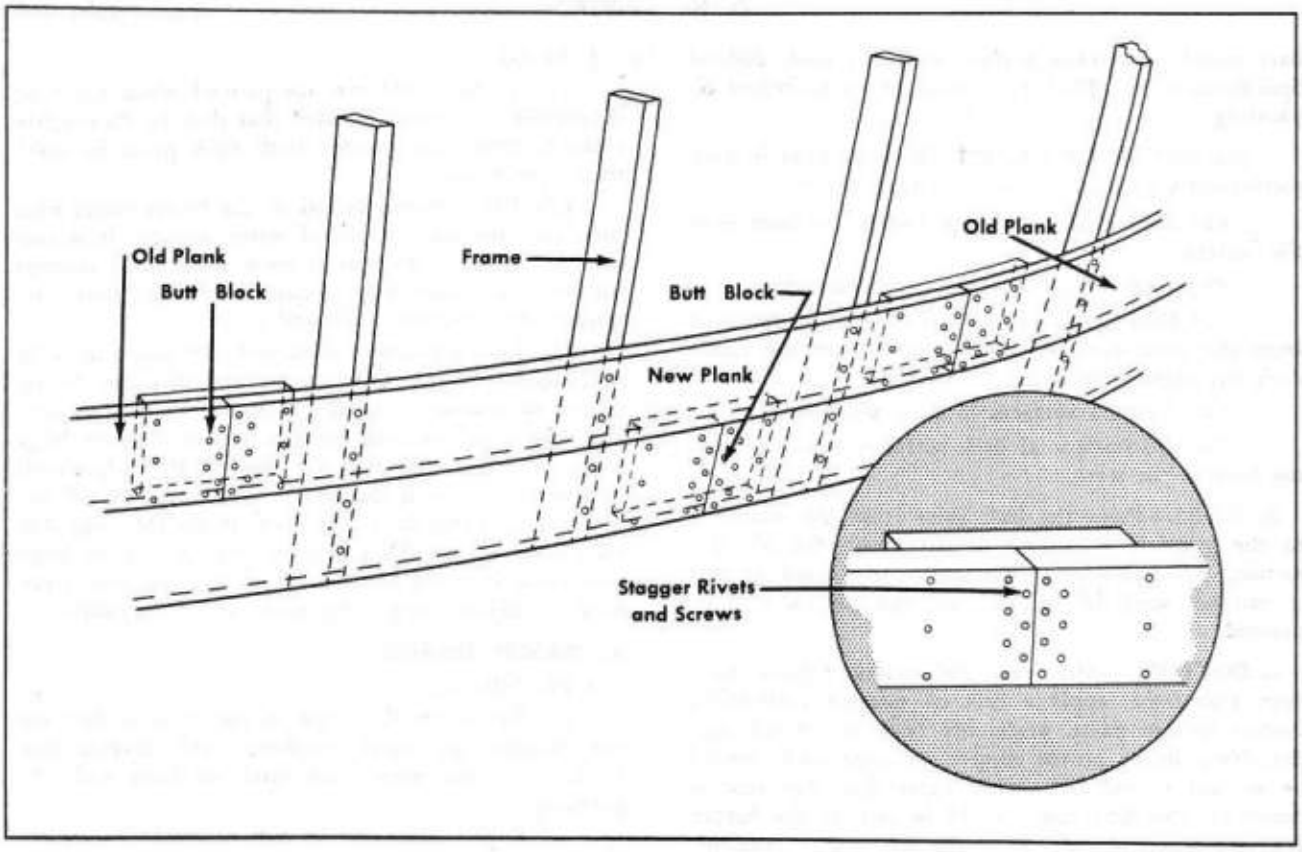


Figure 56—Patching Planking

(2) Cracked battens do not weaken the structure of the boat materially unless several of them in the same area are cracked. To repair a batten, cut a new piece to fit between the frames over the damaged one. Fasten the new piece to the frames at either end with metal angles and to the cracked batten with screws. *(See figure 58.)*

(3) The metal-covered rub strake and chine cap are designed to prevent damage to more vital parts of the boat when it comes in contact with the dock or floating objects, and therefore they must be replaced fairly often. Remove the damaged pieces in entire sections as they were built on the boat. Plug the old screw holes, and install new sections. When a new chine cap is shaped and installed, do not let it overlap or come flush with the bottom of the chine; the bottom of the chine should extend at least $\frac{1}{8}$ inch below the bottom of the cap so the force of the water will not rip the cap off.

(4) On some boats the rub strake is made of canvas-covered rubber. To repair this type, remove the top and bottom molding carefully. The first time the rail is repaired, cut only the edges of the canvas (at the molding edges) from the rubber portion. Do not try to separate the first covering of canvas from the rubber, but all later coverings should be removed. Lay the 6-ounce canvas in Khurs canvas cement, or equal, over the rubber. The bottom edge of the canvas should be tacked first. Stretch the top edge and tack. *(See figure 59.)* The tacks should

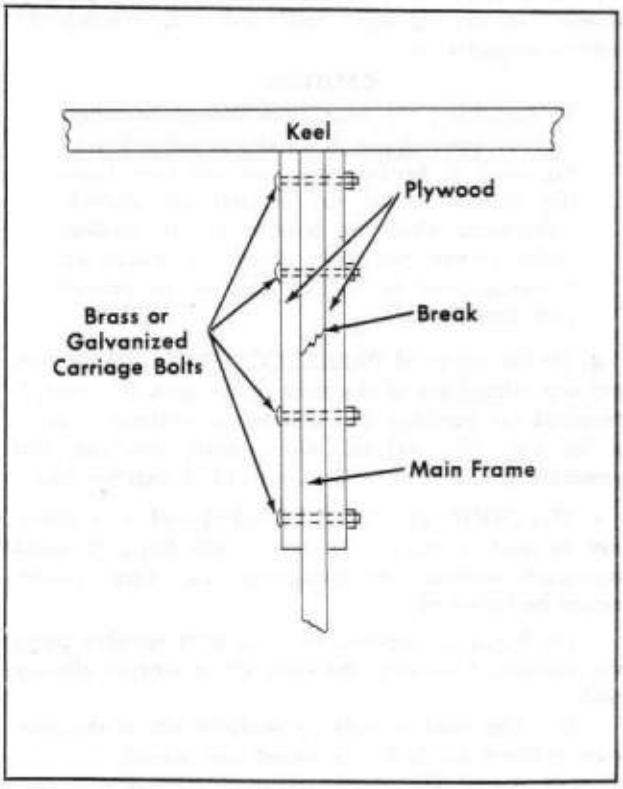


Figure 57—Patching Main Frame

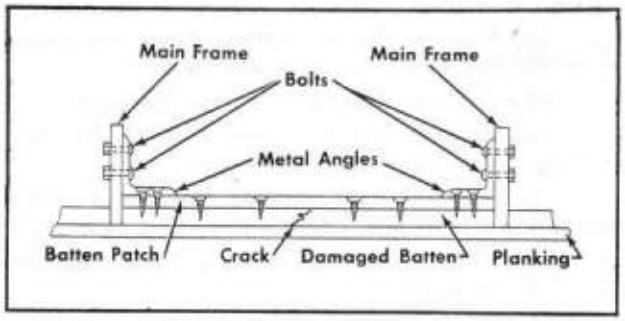


Figure 58—Patching Batten

be placed far enough from the edge of the rubber so that when the molding is screwed into place it will stretch the canvas evenly. Thin the canvas cement with white gasoline and use the thinned cement as a waterproof coating over the new canvas. The molding, when badly damaged, must be replaced. Duplicate the original as closely as possible. It is fastened with screws and the holes plugged with wood.

c. ENGINE DRIVE.

(1) GENERAL.

(a) A damaged propeller must be repaired or replaced. Before installing a shaft, check it for straightness with a dial indicator on a lathe or suitable stand.

(b) Bent struts must be straightened or replaced. Before installing a shaft, check it for straightness with a dial indicator on a lathe or suitable stand.

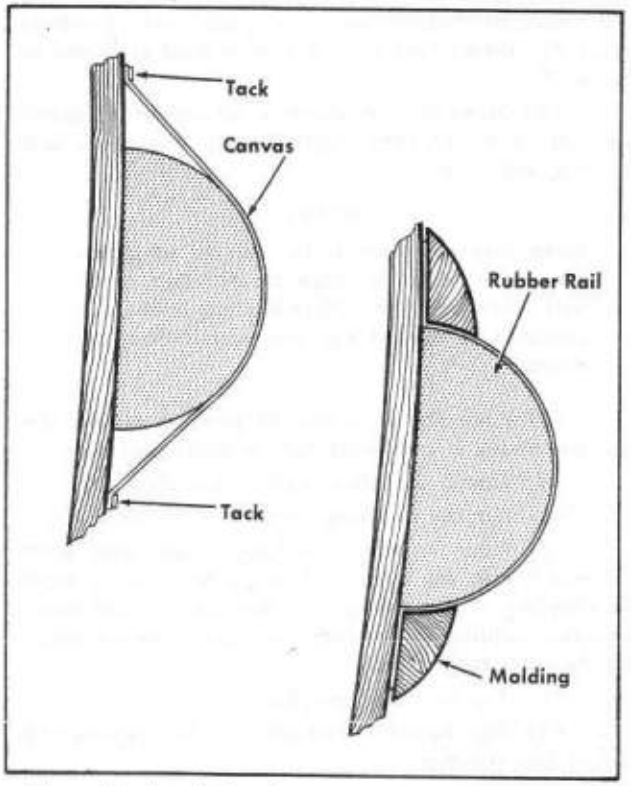


Figure 59—Replacing Canvas on Rubber Rub Strake

Note

As a bent strut can cause or be caused by a bent shaft, the shaft must be removed and tested for trueness when a strut is being repaired.

(c) Check the condition of the rubber bearings in the forward and after struts as a regular part of overhaul. The rubber bearing liner should pinch the shaft slightly all around. If it does not, replace the bearing.

(2) REMOVAL.

(a) Remove the setscrew from the acorn or fairwater nut. *(See figure 60.)*

(b) Remove the acorn nut. *(See figure 61.)*

(c) Remove the cotter pin from the castle nut. *(See figure 62.)*

(d) Remove the castle nut from the propeller shaft. *(See figure 63.)*

(e) Fasten the propeller puller to the propeller and tighten it until the propeller becomes loose. *(See figure 64.)*

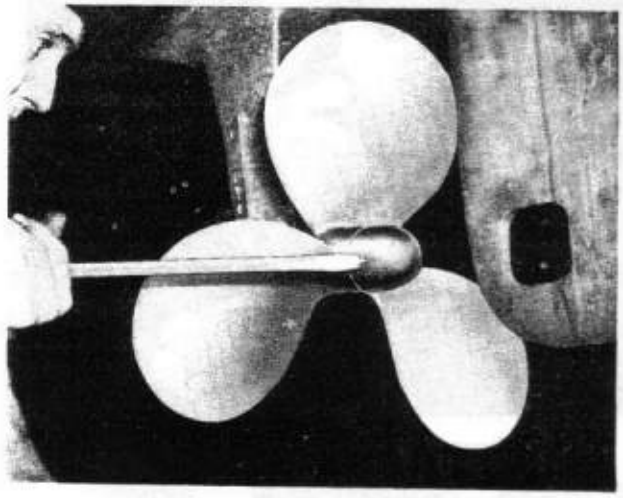


Figure 60—Removing Setscrew

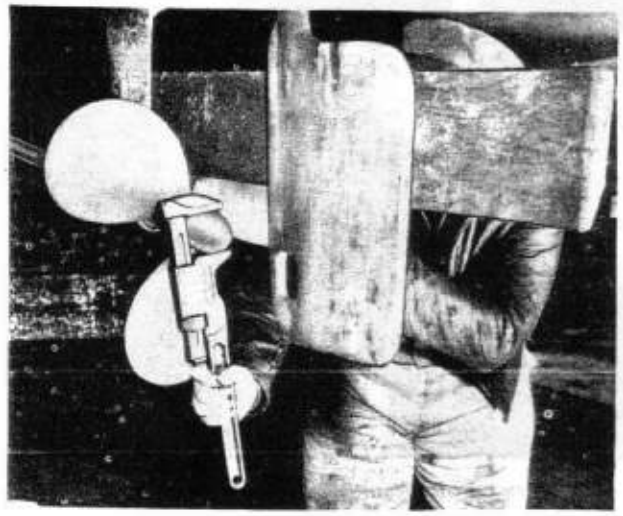


Figure 61—Removing Acorn Nut

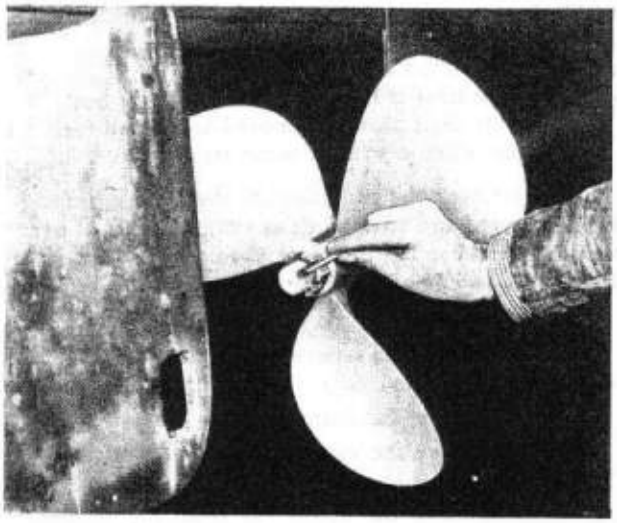


Figure 62—Removing Cotter Pin



Figure 63—Removing Castle Nut

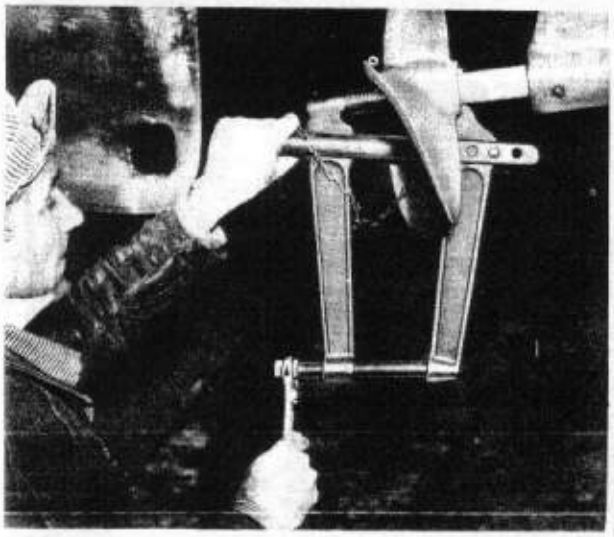


Figure 64—Removing Propeller with Puller

(f) Remove the propeller and the key from the keyway. If necessary, drift the key out of the keyway.

(g) Unscrew the two screws *(figure 65)* which secure the zinc ring to the muff coupling.

(h) Drift off the coupling cover. *(See figure 66.)*

(i) Drift out the four pins holding the muff coupling to the shafts. *(See figure 67.)*

(j) Drift the muff coupling from the forward shaft, using a brass drift and hammer. *(See figure 68.)*

(k) Remove the muff coupling from the after shaft. *(See figure 69.)*

(l) Remove the key from the keyway.

(m) Remove the after shaft from the after strut. *(See figure 70.)*

(n) Use the special tool shown in figure 71 to remove the rubber bearing from the after strut.

(o) To remove the forward strut, remove the cushions from the bunks in the after cabin and lift up the removable hatches. Lift out the litters. The bolts and nuts holding the struts to the hull are located in the after end of the space under the bunks. Unscrew the nuts, remove the lock washers, and drift out the bolts which hold the struts. *(See figure 72.)* Remove the bolts from the struts. *(See figure 73.)* The after struts may be removed in a similar manner.

(p) Remove the strut from the forward shaft. *(See figure 74.)*

(q) Remove the bearing from the forward strut, using the special tool shown in figure 71.

(3) INSTALLATION.

(a) Hold the forward strut in a soft-jawed vise, and install the bearing with the special tool shown in figure 71. Install bearing in the after strut as shown in figure 75.

(b) Move the forward strut into position against the hull on the forward shaft. Replace the bolts, lock washers, and nuts.

Note

Make sure the shaft is free of oil or grease when it is passed through the bearings, as oil will deteriorate the rubber bearing liner. If a lubricant is needed for easy installation, use water.

(c) Place the after strut in position against the hull and fasten it with bolts, lock washers, and nuts.

(d) Install the after shaft in the after strut.

(e) Slip the coupling cover on the after shaft.

(f) Place the muff coupling on the after shaft with the key in the keyway. Using a brass drift, drive the coupling on far enough to clear the forward shaft. Start the coupling on the forward shaft, carefully aligning the holes for the pins.

(g) Tap the pins into place.

(h) Slip the cover forward onto the coupling and drift it into position.

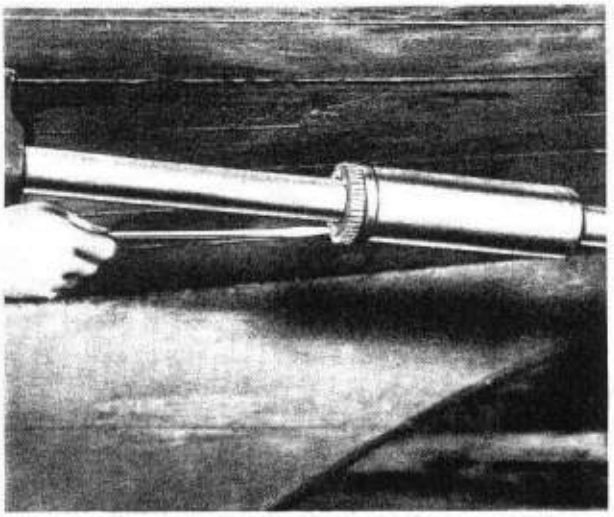


Figure 65—Removing Zinc Ring



Figure 68—Drifting Muff Coupling from Forward Shaft

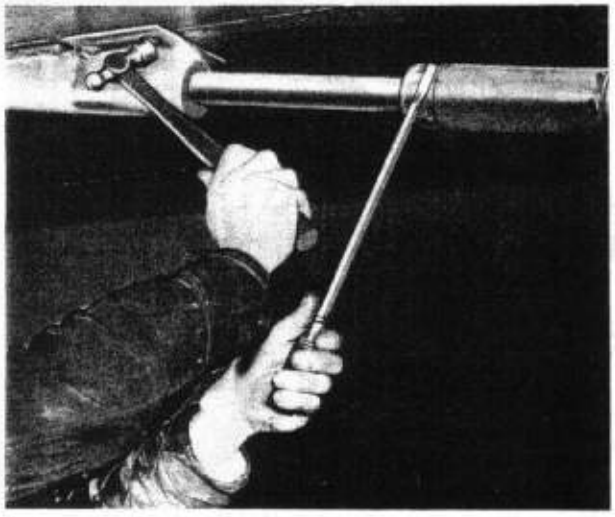


Figure 66—Drifting Off Coupling Cover

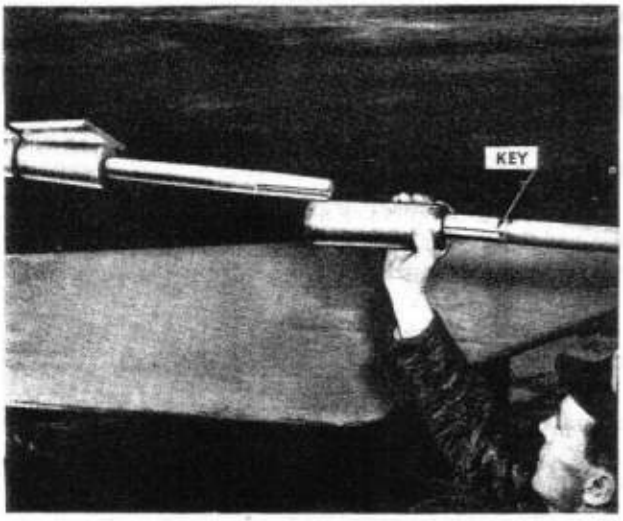


Figure 69—Removing Coupling from After Shaft



Figure 67—Drifting Out Pins

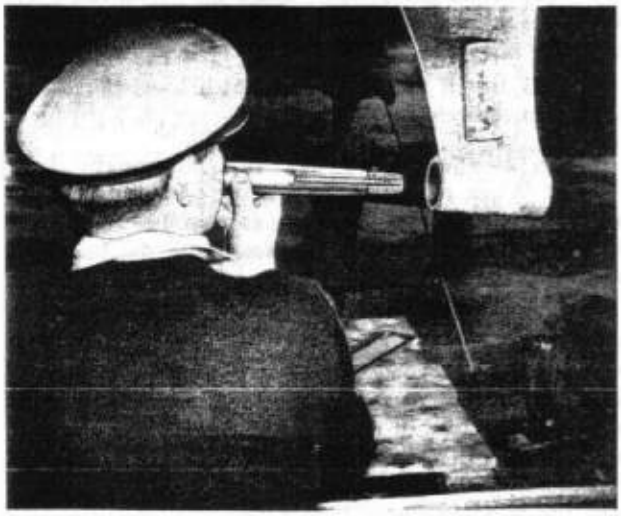


Figure 70—Removing After Shaft from After Strut

(i) Tighten the screws which secure the zinc ring to the muff coupling.

(j) Fit the key in the keyway, and place the propeller on the shaft. *(See figure 76.)*

Note

Make sure the shaft and inside of the propeller hub are clean.

(k) Install the castle nut. Insert the cotter pin and bend back the tabs.

d. METAL TANKS.

(1) TEMPORARY PATCH.

(a) Bend down jagged edges of the hole so that the outside surface of the tank will be smooth.

(b) Clean oil from the surface of the tank around the hole.

(c) Cut a cloth patch large enough to extend 4 inches away from the hole in all directions.

(d) Coat one side of the patch with No. 1 Permatex, or equal, and center the patch over the hole in the tank, pressing it firmly into place.

(e) If possible, place a flat piece of wood over the patch and brace it firmly in place.

(f) Let the Permatex harden before filling the tank above the break.

(2) PERMANENT PATCH.—As soon as convenient and the proper tools and materials are available, replace temporary patches with permanent ones as follows:

(a) Pound the edge of the hole flush with the metal of the tank or trim the edges of the hole.

(b) Cut a patch of sheet metal large enough to extend at least 1 inch beyond any part of the break.

(c) Drill matching holes around the edges of both the patch and the break.

(d) Thread the drilled holes to fit the threads of available screws.

(e) Cut a gasket to fit under the patch, and coat both sides with shellac or No. 1 Permatex. Be sure to cut screw holes in the gasket.

(f) Install the gasket and patch over the break, and fasten securely with screws.

e. PLUMBING.

(1) When replacing any unit of plumbing, duplicate the original fittings as closely as possible. Make sure the pipe lines are securely bracketed and the bonding system is not broken.

(2) Temporary repairs of pipes can be made with rubber hose of the proper diameter to fit around the pipe. Cut out the broken or leaking section of pipe. Drain the pipe and dry the ends. Connect the two open ends with a section of the hose, allowing a liberal overlap on the pipe. Fasten the hose with hose clamps. Install bonding clamps and cable to bridge the hose and keep the bonding system intact.

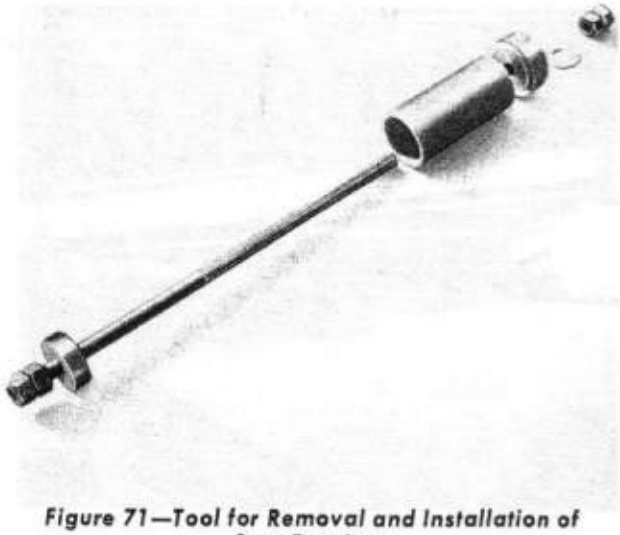


Figure 71—Tool for Removal and Installation of Strut Bearings

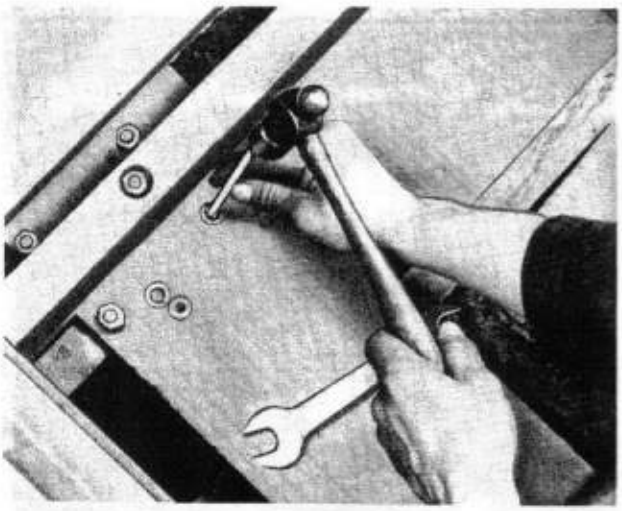


Figure 72—Drifting Out Bolt Holding Forward Strut

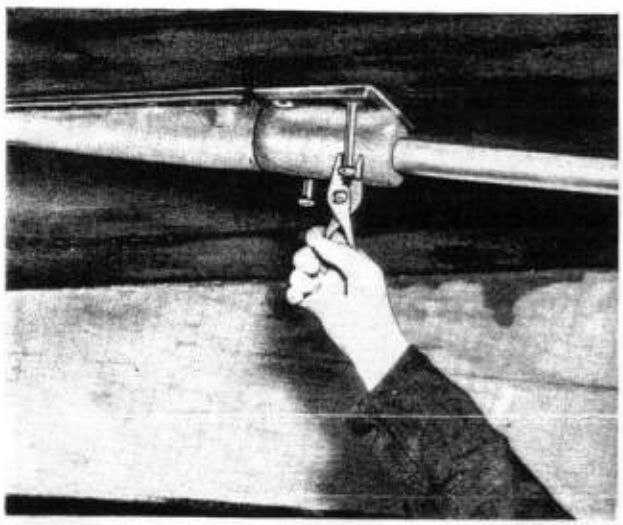


Figure 73—Removing Bolts Holding Forward Strut

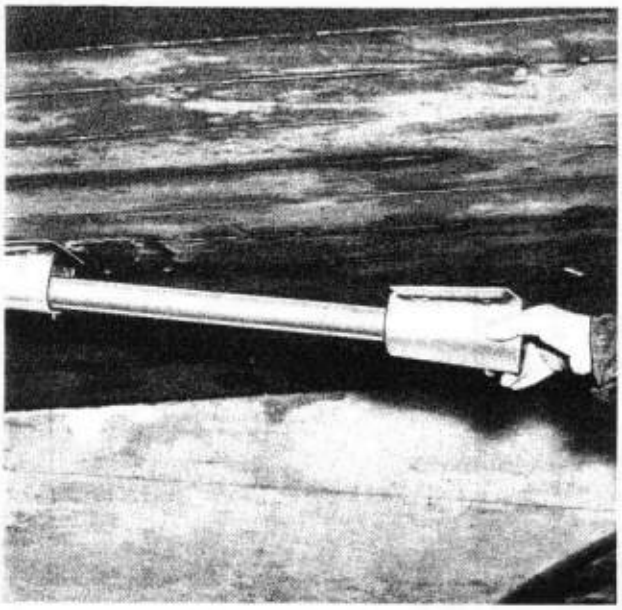


Figure 74—Removing Forward Strut



Figure 75—Installing Bearing in After Strut

(3) For permanent repairs, replace the entire section of pipe at the nearest connection.

(4) Coat the threads of mating units of plumbing, except fuel lines, with litharge and glycerine, white lead, red lead, or gasket paste. After the pieces are screwed together, sweat the joints with solder.

(5) Paint new units of pipe, valves, or fittings to match the color of the rest of the system.

(6) Through-hull and through-bulkhead fittings should be watertight. If a fitting is replaced, insert cotton wick coated with white lead around the fitting between it and the bulkhead. Paint the bulkhead where the flange will fit with white lead and screw the flange securely to the bulkhead.

(7) VALVES.

(a) Valves should maintain their open or closed positions. If a valve slips open when left closed, or works closed when left open, the stem is worn and the valve should be replaced.

(b) If fluid flows through a line when the valve controlling that line is closed, the washer should be replaced or the valve seat reground to stop the leak.

(c) Leaks around valve stems can be stopped by tightening the gland nut. If this does not stop the leak, unscrew the gland nut and insert more packing around the valve stem. Ordinary cotton twine is suitable for packing in most cases.

Note

If it is necessary to repack a gate valve gland while the system is being used, open the valve fully and then the gland nut can be removed without leakage.

(d) If a check valve does not stop the back flow of fluid in a line, remove the plug in the top of the valve and clean out the valve chamber. If the valve flap does not fit closely against its seat, replace the valve. When installing a new check valve, be sure it permits free flow in the proper direction. The arrow cast on the side of the valve indicates the direction of free flow.

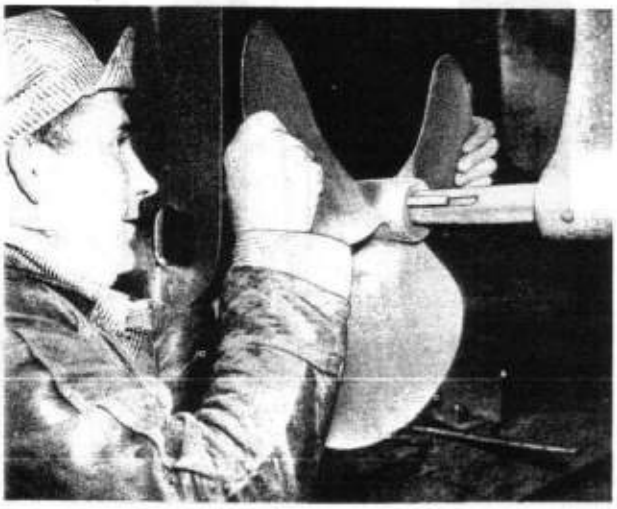


Figure 76—Installing Propeller

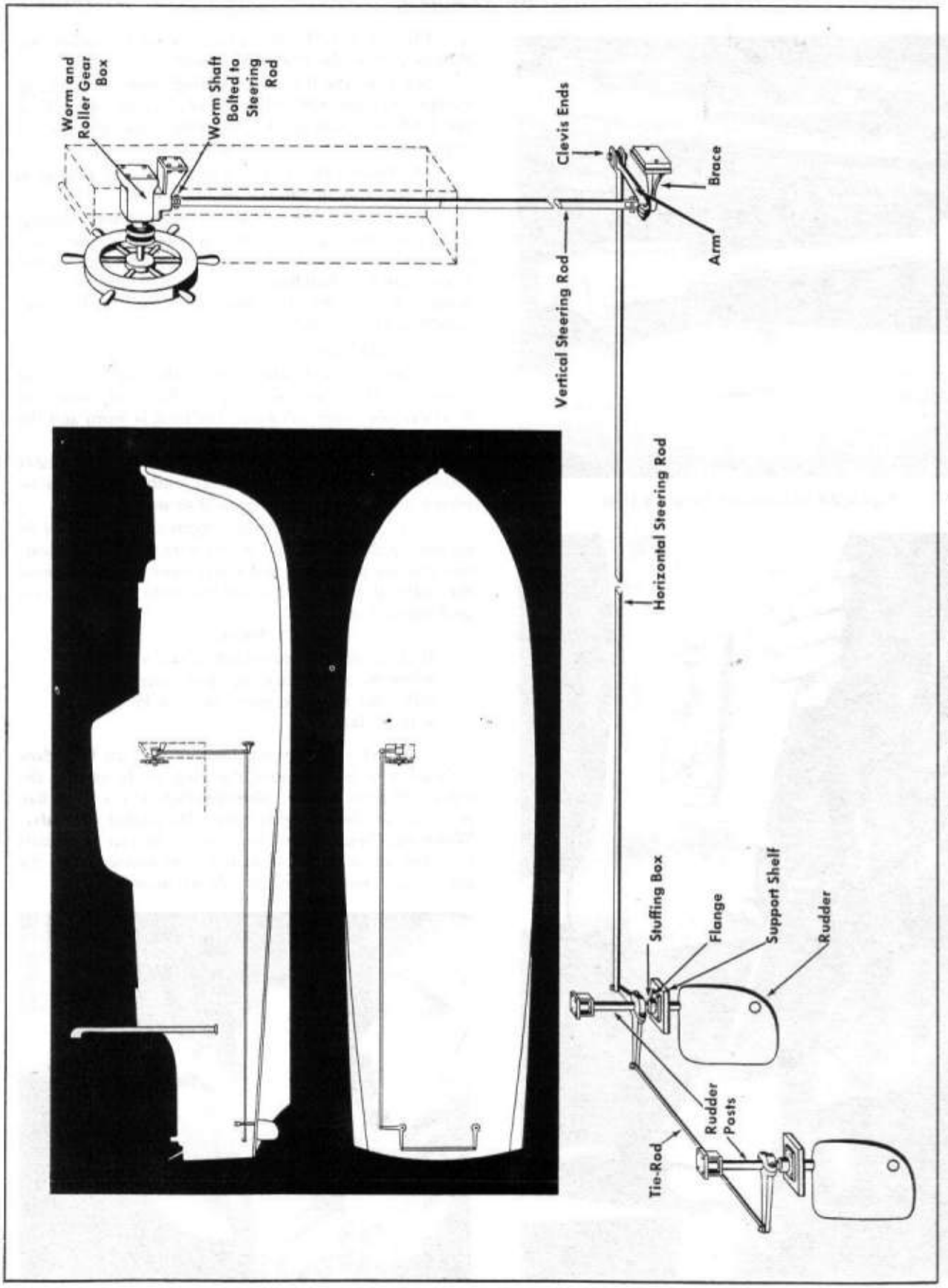


Figure 77—Link-Rod Steering Gear System

SECTION IV

Steering Gear

1. DESCRIPTION.

The steering gear is arranged to operate both port and starboard rudders at the same time. They may be operated by an automobile-type steering gear with link rods, or by a cable, with a sprocket wheel and chain.

a. LINK-ROD TYPE.

(1) MAIN ASSEMBLY.

(a) This type is controlled by an automobile-type worm and roller gear, located behind the steering wheel panel, joined to the steering wheel shaft. A vertical pipe sleeve is keyed and bolted to the worm shaft, and to a short shaft extending upward from a horizontal brace attached at the bottom to the engine compartment forward bulkhead. *(See figure 77.)* At this point an arm joins the vertical pipe to a horizontal rod which runs along the port side to the rudders.

(b) At each end of the sleeve where it fits over a shaft is a keyway and key. A bolt running through both sleeve and shaft holds the key in place. One of the keys is fitted smaller to allow for a little play in the steering wheel, thus reducing stiffness in operation.

(2) RUDDER ASSEMBLY.—The rudders are connected by a tie-rod with clevis ends. An arm from the rudder post connects with the clevises. *(See figure 77.)* The rudders are carried by a flange bolted to a support shelf. Combined with the flange is a stuffing box packed with ⅜-inch flax packing.

b. CABLE TYPE.

(1) MAIN ASSEMBLY.—The cable type steering gear consists of a sprocket wheel on the steering wheel shaft with a chain fitting over the teeth. Clamped to each end of the chain is a ¼-inch cable. *(See figure 78.)* The cable runs over a double sheave pulley, under the sprocket wheel, one line going to the port and the other to the starboard side. *(See figure 79.)* Pulleys support the cable fore and aft on both port and starboard sides. The two lines are fastened to their respective rudder quadrants. *(See figure 78.)*

(2) RUDDER ASSEMBLY.—The rudders are joined by a tie-rod connecting on the rudder quadrants. Each rudder is carried by a flange bolted to the rudder support shelf. Combined with the flange is a stuffing box and packing nut.

c. EMERGENCY TILLER.—Both types of steering gears are provided with an emergency tiller for steering the boat from the after cockpit. It consists of an arm and four-cornered adapter which fits over the rudder post. It can be used on either the port or the starboard rudder.

2. OPERATION.

a. NORMAL.

(1) LINK-ROD TYPE.—Four full turns of the wheel are required to turn the rudders from hardover to hardover. For easier operation, a certain amount of play is left in the wheel; however, the wheel should take hold at not more than a half turn. To locate the rudders amidships, turn the wheel hardover, then make two turns in the opposite direction.

(2) CABLE TYPE.—Two and one-half turns are required to turn the rudders from hardover to hardover.

b. EMERGENCY.—If the steering gear fails, use the emergency tiller. Access is made by removing the plate over the rudder on the after cockpit floor. Use as follows:

(1) Remove the plate, either port or starboard. *(See figure 80.)* Use the special key to unscrew the plate.

(2) Insert the emergency tiller and connect it to the rudder post. *(See figure 81.)*

3. SERVICE AND INSPECTION.

a. GENERAL.—Every 50 hours check the steering gear for wear, misalignment, and binding or looseness.

b. WORM GEAR.—Except for periodic lubrication, further servicing of the worm gear is seldom required. Lubricate with SAE-50 lubrication oil (in cold weather SAE-30) through the oil filler hole in the gear housing at least every 100 hours. Oil the shaft from the worm gear through an oil filler hole in the shaft.

CAUTION

Do not use graphite or heavy solidified oil in the worm gear.

c. LINK RODS.

(1) The most frequent servicing required on the link-rod steering gear is replacing the bolts at the following locations:

(a) Two bolts on the vertical steering rod. These bolts should be checked to make sure that they have not become loosened enough to permit the keys to fall out.

(b) Two tie-rod bolts.

(c) Steering rod bolt joining the steering rod to each rudder barrel arm.

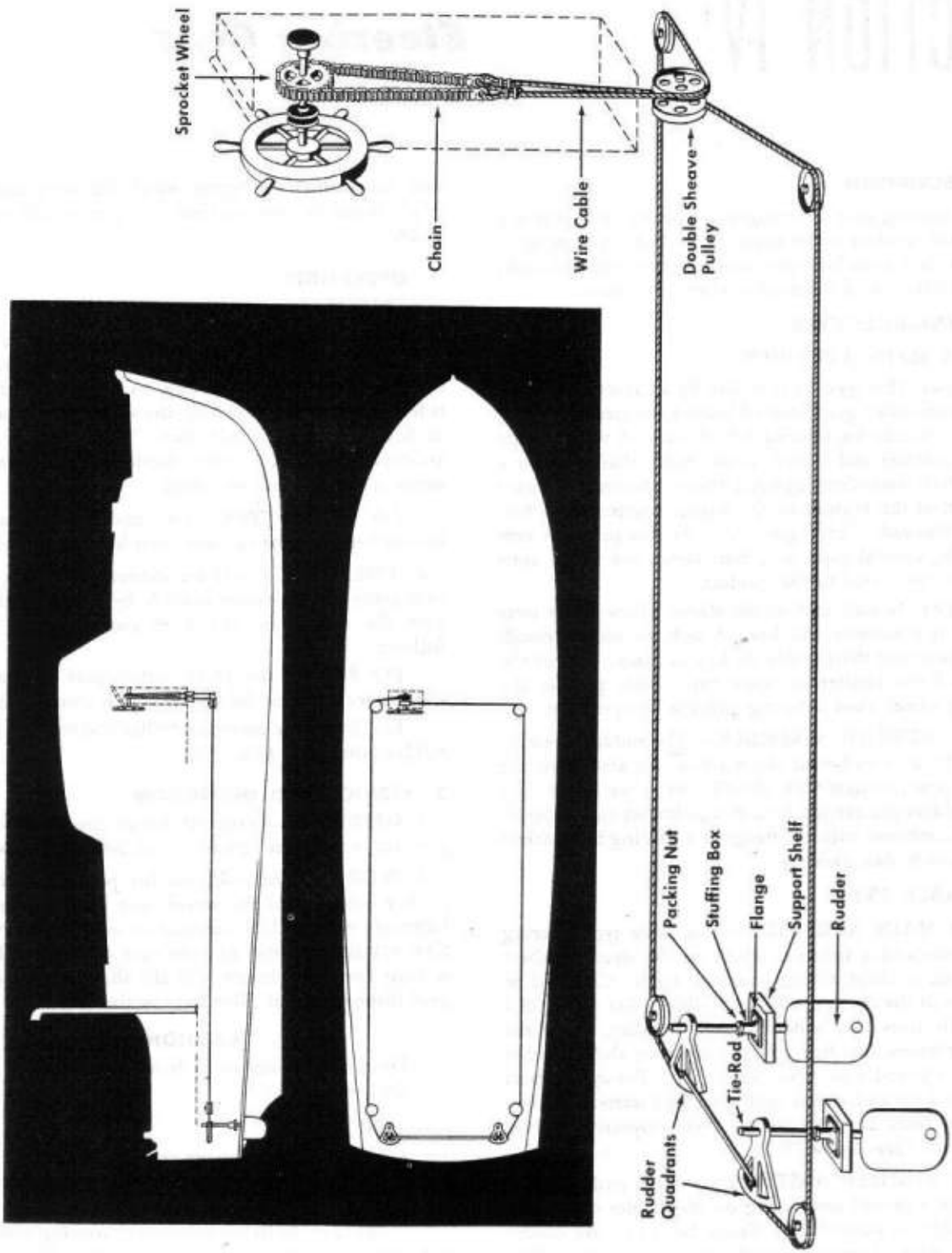


Figure 78—Cable Type Steering System

(2) Grease all connections with a thin cup grease.

d. SPROCKET WHEEL.—The set screw which holds the sprocket wheel key in place on the cable type steering gear may easily become loosened by vibration, permitting the key to fall out. This should be examined from time to time. If considerable trouble requires frequent adjusting, it may be remedied by one of the following changes:

(1) Use a longer setscrew with a locking nut.

(2) Replace the original setscrew with a squarehead screw, the head of which has been drilled to permit safety wiring.

(3) Drill a 1/4-inch hole through the shaft and both sides of the sprocket wheel. Insert a bolt through the sprocket wheel and shaft, tighten the nut, and peen the bolt end to prevent the nut from working loose.

e. WIRE CABLE.

(1) TAKE-UP.—When the steering wheel begins to show play, the wire cable needs tightening. Take-up is made by adjusting the clamps which fasten the cable to the chain.

(2) Grease the wire cable with a rag, running it along the entire length of the cable. Use a rust-preventive grease, Specification No. AN-C-52 or Graphite Grease, Specification No. VV-G-671.



Figure 79—Sheave Pulleys Supporting Wire Cable

f. STUFFING BOXES.—Adjustment of the stuffing boxes for watertightness is made by tightening the packing nut and the lock nut. When it becomes necessary to use considerable pressure to tighten the lock nut, repack the stuffing boxes. Repack with 3/8-inch flax packing. Be sure that the packing is not too tight for easy rotation of the rudders.



Figure 80—Removing Plate Over Rudder

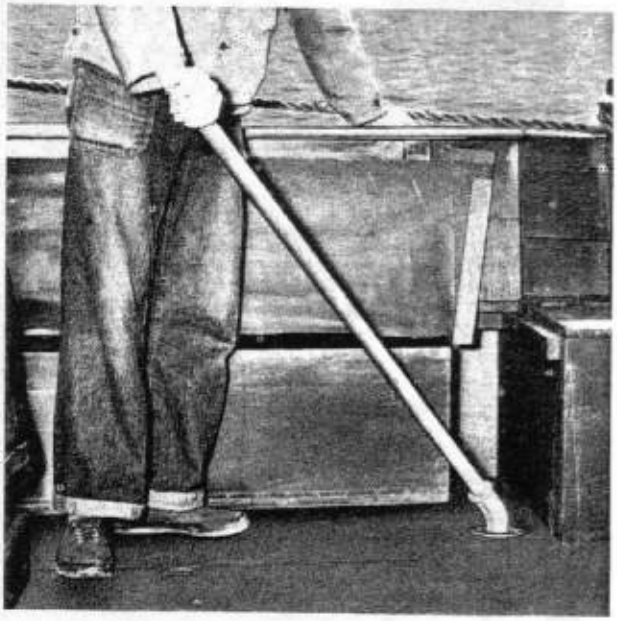


Figure 81—Operating Emergency Tiller

4. TROUBLE SHOOTING.

TROUBLE	*PROBABLE CAUSE*	*REMEDY*
WHEEL DOES NOT TAKE HOLD	Bolt in steering rod loose or broken.	Tighten or replace. See paragraph 3.*d.*, this section.
	Key lost from sprocket wheel.	
CONTROLS STIFF	Rudder stuffing boxes packed too tightly.	Loosen or repack. (See paragraph 3.*f.*, this section.)
	Cable taken up too tightly.	Loosen clamps and let out.

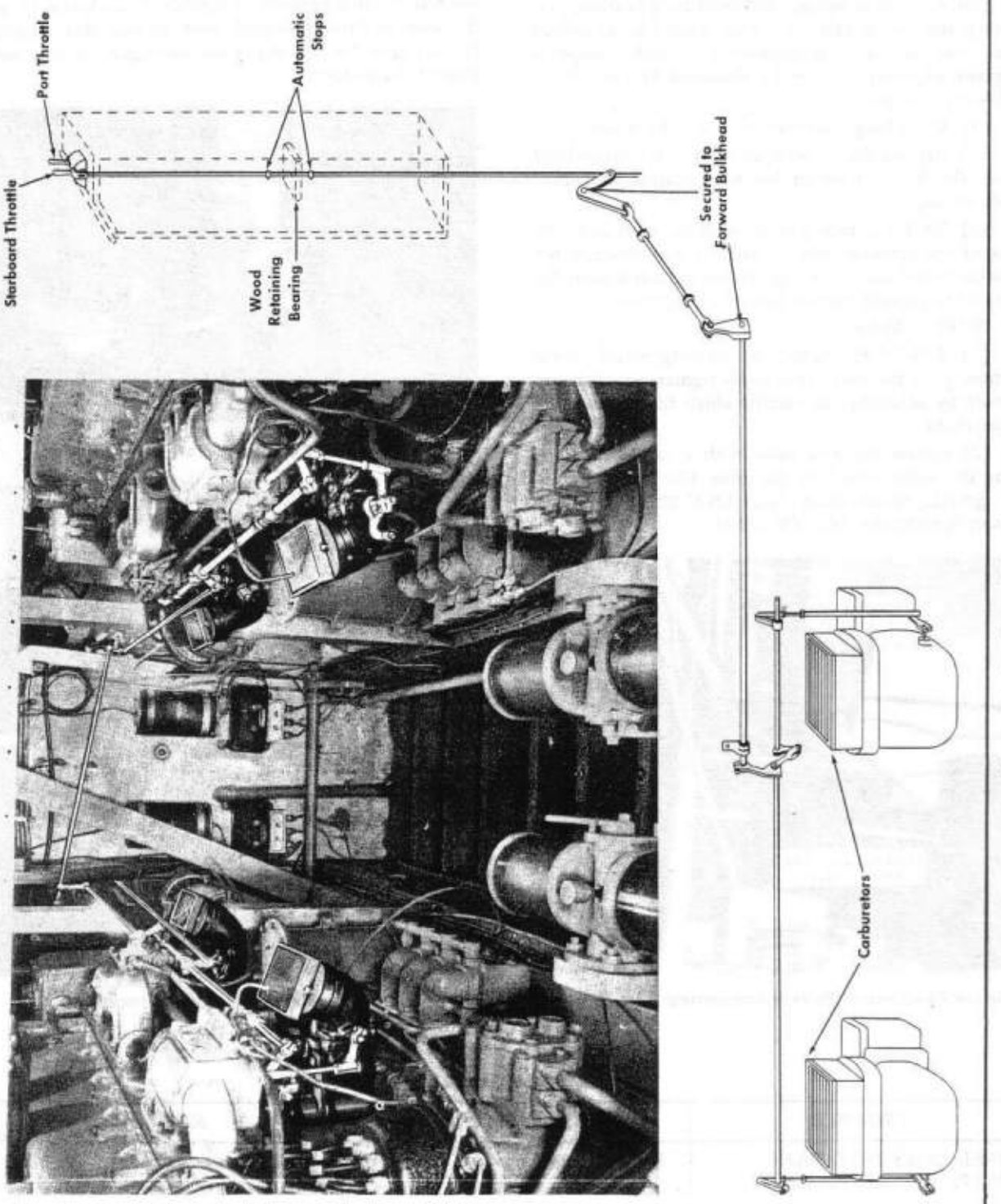


Figure 82—Starboard Throttle System

SECTION V

Engine and Fire Extinguishing Systems

1. CONTROLS.

a. THROTTLE CONTROLS. *(See figure 82.)*

(1) DESCRIPTION.—The throttle controls for the engines are manually operated, transmitting movement by a mechanical linkage composed of bell cranks, throttle rods, clevises, clevis pins, and control rod bearings. *(See figure 83.)*

(2) OPERATION.—Each engine has a separate throttle. Any movement of the throttle is transmitted through the throttle control rod to the carburetor. The entire linkage is mechanical from the control pedestal to the carburetor.

(3) SERVICING.

(a) Occasionally a few drops of light-weight oil Specification No. AN-VV-O-581, grade 30, or Specification No. AN-VV-O-446, grade 40, are needed in the control rod bearing located beneath the control pedestal. Similar lubrication is required for the control rod bearing located near the carburetor on the intake manifold. *(See figure 84.)*

(b) The point where the link pin passes through the clevis extending from the carburetor to the control rod on the intake manifold should be lubricated occasionally with a few drops of 30 or 40 weight oil.

(c) If slippage occurs in the working parts of the throttle controls, tighten or adjust the parts affected. *(See figure 85.)*

b. CLUTCH CONTROLS. *(See figure 86.)*

(1) DESCRIPTION.—Each engine is equipped with a manually operated clutch control. This is a mechanical linkage composed of clutch rods, bearings, clevises, clevis pins, and a self-locking device which locks the clutch in either "FORWARD" or "REVERSE" positions.

(2) OPERATION.—The clutch controls are operated by moving the levers on the control pedestal up to go forward and down for reverse. When the clutch levers are parallel to the pilothouse floor, the clutch controls are in the "NEUTRAL" position. Movement of the clutch levers is transmitted to the engine gears by the mechanical clutch control linkage.

(3) SERVICING.

(a) The bracket below the control pedestal, through which the control rod passes, should be lubricated occasionally with a few drops of 30 or 40 weight

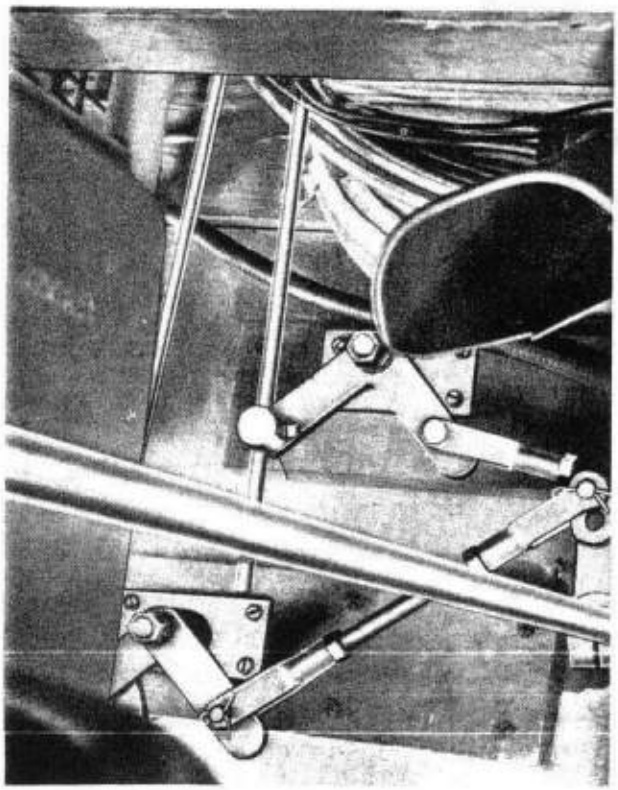


Figure 83—Throttle Control Linkage

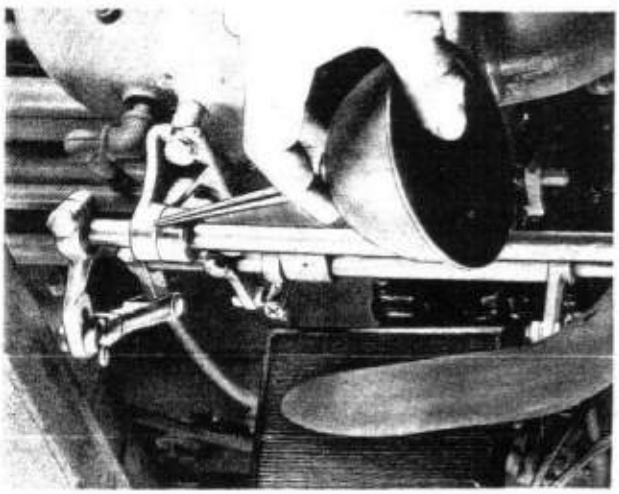


Figure 84—Lubricating Throttle Quadrant

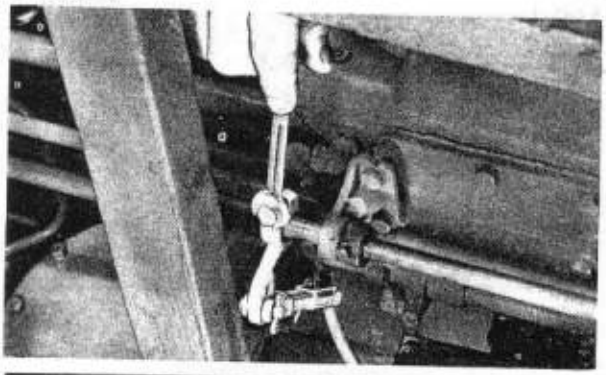


Figure 85—Tightening Throttle Adjusting Nut

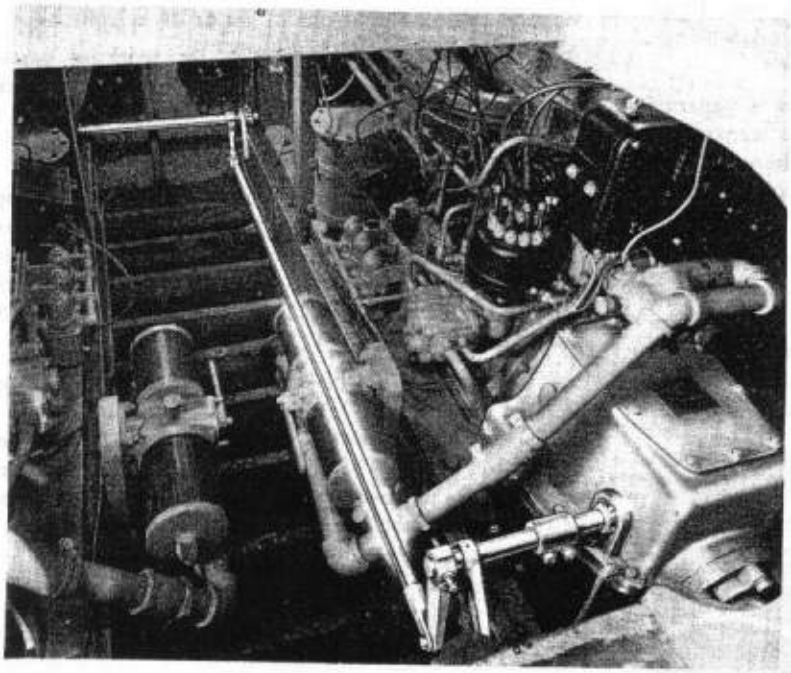


Figure 86—Clutch System

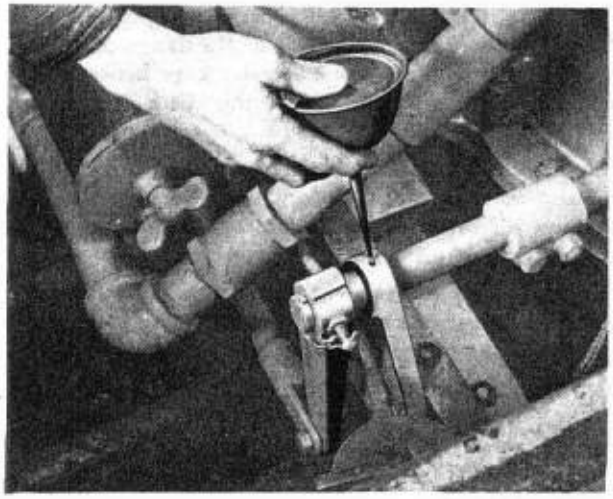


Figure 87—Lubricating Clutch Control Bearing

are a stuffing box and a shaft log. At this point the drive becomes external. It is secured as it leaves the boat by the forward strut which has a rubber bearing installed. The two main shafts of each drive are coupled together aft of the forward strut by a muff coupling. *(See figure 89.)* The second shaft follows to the after strut, where a second rubber bearing is installed. The drive is then completed at the propeller, which is fastened to the shaft by a key and a nut secured by a cotter pin. This nut is covered by a fair water or acorn nut.

b. OPERATION.—With the engines operating, placing the clutches in the forward or reverse positions actuates the clutch gears, enabling the engines to turn the drive shafts revolving the propellers. There is a right-hand and a left-hand propeller, consequently the drives turn in opposite directions. When the boat is going ahead, the drives rotate outward. In reverse, the drives rotate inward.

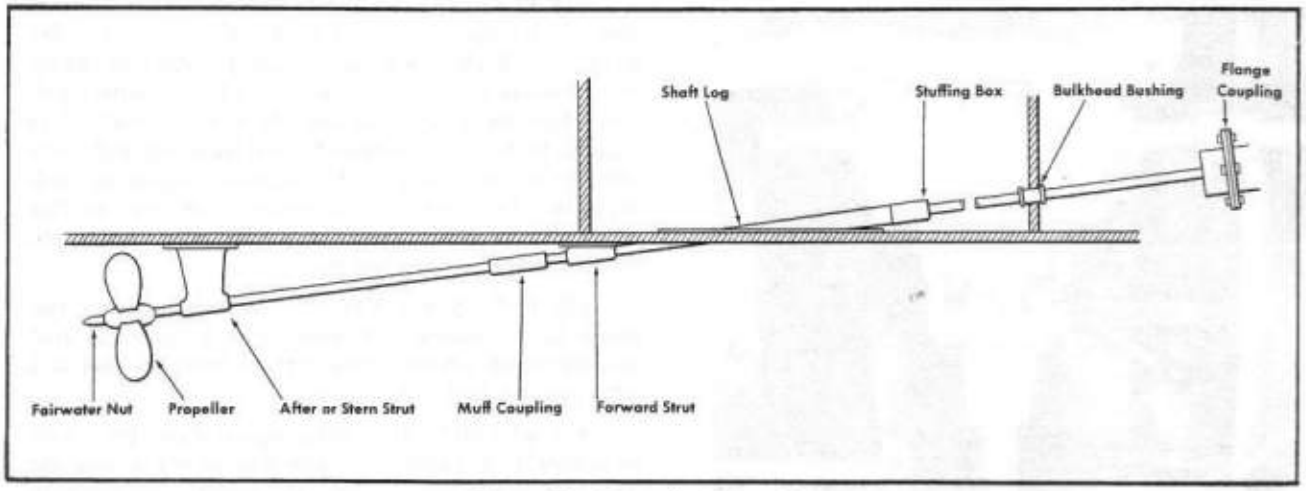


Figure 88—Propeller Drive Shaft

oil. Lubricate the bearing attached to the engine bed at the after end of the engine with a few drops of 30 or 40 weight oil every 50 hours. *(See figure 87.)*

(b) Points where the link pins pass through the clevises should be lubricated occasionally with a few drops of 30 or 40 weight oil. If a pin has been removed, and is being replaced, adequate lubrication may be obtained by applying a thin coating of cup grease.

(c) If slippage occurs in the working parts of the clutch controls, tighten or adjust the parts affected.

2. THE DRIVE.

(See figure 88.)

a. DESCRIPTION.—There is a drive from each engine to each propeller. Each drive is composed of two main shafts, coupled together, which transmit power to a three-bladed propeller beneath the stern. *(See figures 89 and 90.)* Each drive is coupled to an engine by a flange coupling fastened with bolts, nuts, and lock washers. *(See figure 91.)* The flange coupling is fastened to the drive by means of a key, over which the coupling slips, and a castle nut. The castle nut is secured with a cotter pin. About 18 inches aft of the flange coupling

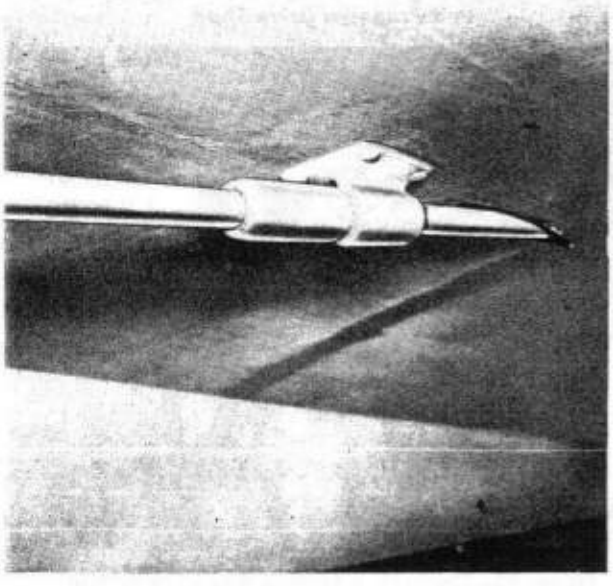


Figure 89—Starboard Propeller Drive Shaft

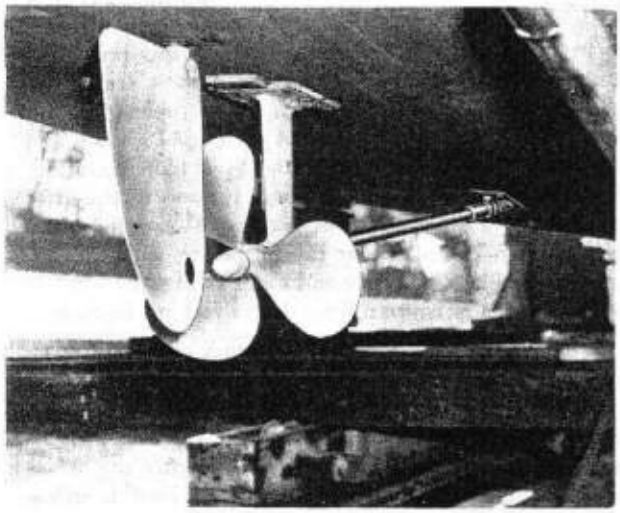


Figure 90—Port Propeller Drive Shaft

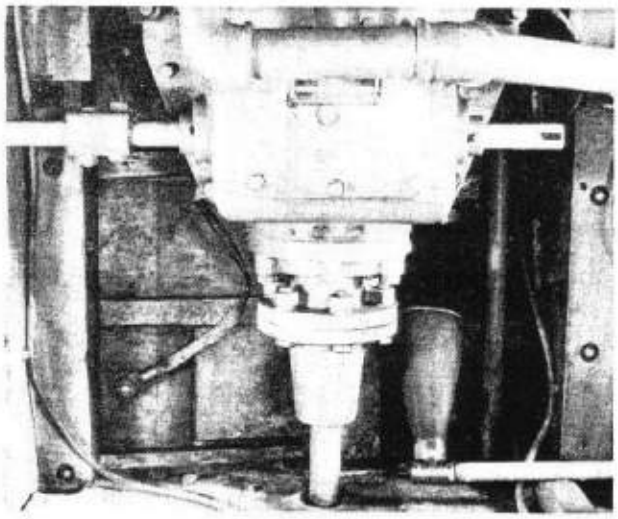


Figure 91—Flange Coupling Connecting Engine and Propeller Drive Shaft

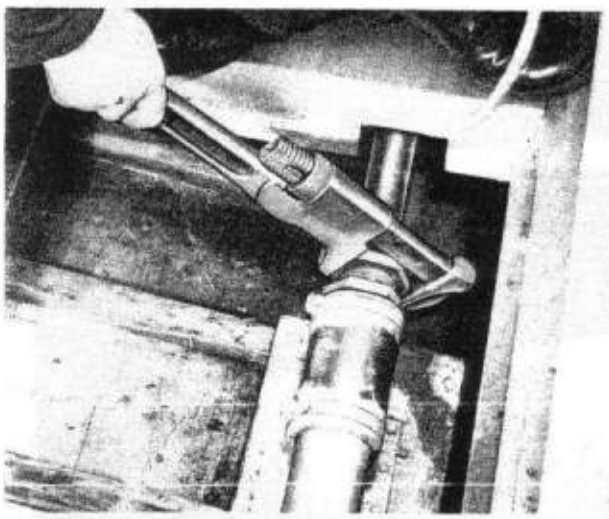


Figure 92—Tightening Stuffing Box Packing Nut

c. SERVICING.

(1) It is essential that the drive and engine be in alignment where they are joined by the flange coupling. To determine alignment, use a feeler gage between the unbolted coupling flanges. Make this check only while the boat is in the water.

(2) The forward and stern struts and the stuffing box also must be in alignment. If faulty operation of the drive indicates lack of alignment, haul the boat up on the ways and make necessary corrections.

(3) If a leak develops in the stuffing box, flax packing and greasing are necessary. After packing and greasing the stuffing box, tighten the packing nut and run up the locking nut. *(See figures 92 and 93.)*

3. FUEL SYSTEM.

(See figure 94.)

a. DESCRIPTION.

(1) FUEL TANKS AND LINES.—Two copper-lined fuel tanks are located in the after cockpit. *(See figure 95.)* Each tank normally supplies only one engine and each has a capacity of 130 U.S. (108 Imperial) gallons. Fuel lines run from each tank to the fuel filters located at the main companionway bulkhead and from there to the autopulse of the particular engine the tank supplies. The tanks are connected, however, so that either may be made to serve both engines by closing the shut-off valve of the other tank.

(2) FUEL STRAINERS. — In each fuel line, fastened to the engine bed stringer, is a quart-size fuel strainer which strains foreign matter from the fuel and separates the fuel from water.

(3) AUTOPULSE.—Each engine is equipped with an autopulse or electric fuel pump to draw fuel into the lines for initial starting, in cold weather, in morning starting, or when the fuel lines or carburetor have been removed and replaced. The autopulse is operated by a

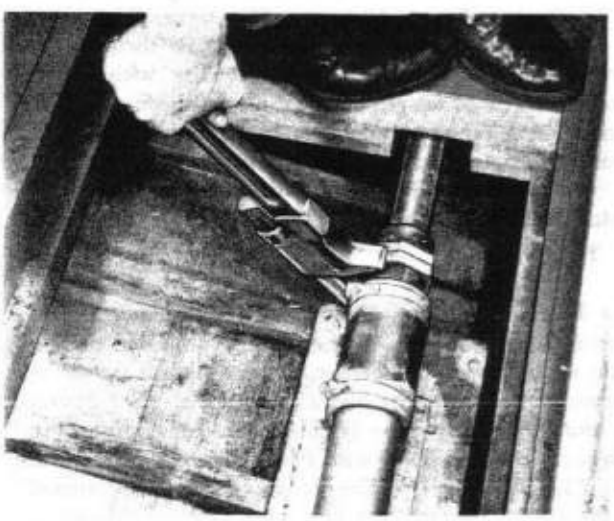


Figure 93—Tightening Stuffing Box Locking Nut

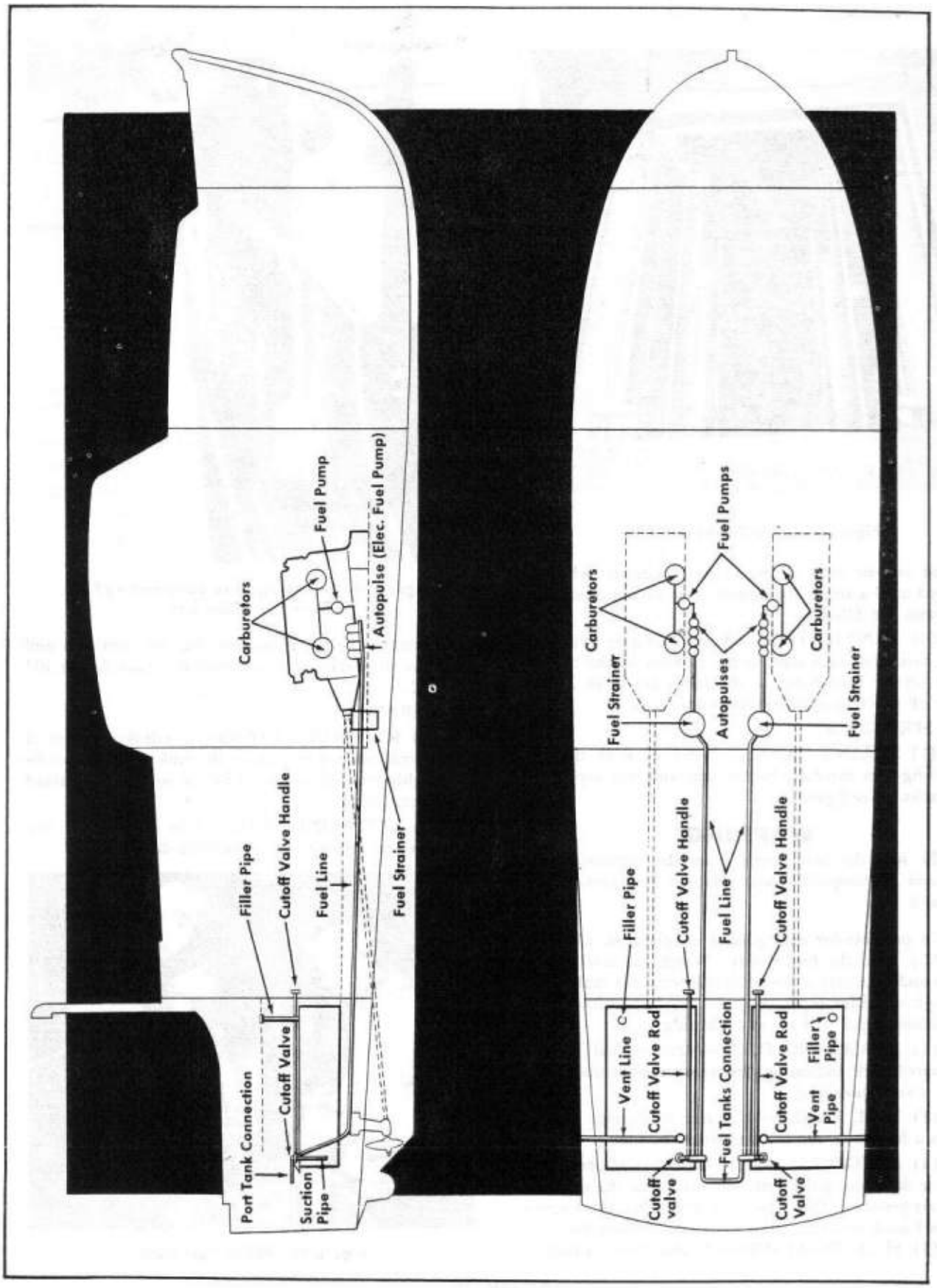


Figure 94—Fuel System

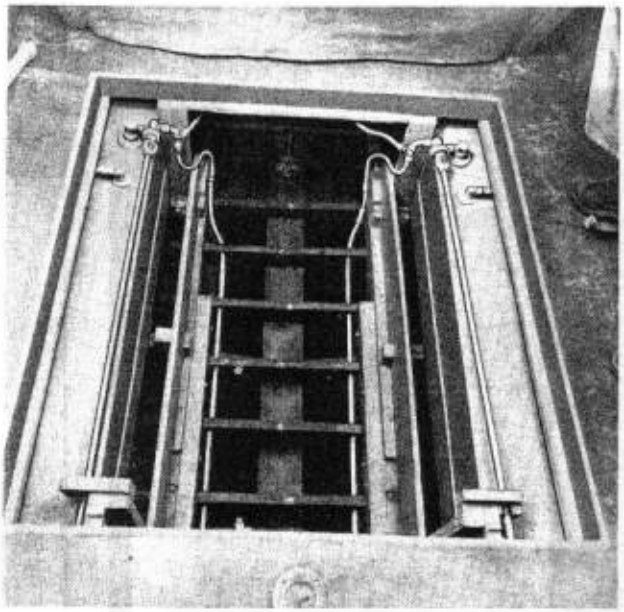


Figure 95—Fuel Tanks and Lines

button on the side of the control pedestal, which is pressed until a slight clicking noise stops indicating that the lines are filled.

(4) VENTILATORS.—Ventilating or overflow lines pass from each tank to the exterior of the boat to carry off air forced out as the tanks are filled and to carry off any fuel overflow from the tanks.

b. SERVICING.

(1) FILLING TANKS.—Sweep or swab the surrounding area carefully before removing the cap to fill the tanks. *(See figure 96.)*

WARNING

Be sure the fuel nozzle from the dispensing unit is grounded to avoid danger of explosion and fire.

Keep a portable fire extinguisher in readiness. *(See figure 97.)* Feed the fuel slowly. Watch the level in the tanks and take care to avoid overflowing the tanks back through the filler pipe. A slight overflow through the ventilating pipes will act as a warning.

(2) MEASURING FUEL.—Measure fuel with a graduated stick indicating the number of gallons in a tank. *(See figure 98.)*

(3) FUEL TANKS.—If water or foreign matter enters a fuel tank, remove and clean the tank.

(4) AUTOPULSE.—Every 100 hours of operation, remove the caps on the autopulse and clean the strainers with air pressure. *(See figures 99 and 100.)* If excessive dirt is found, clean the strainers with cleaning fluid.

(5) FUEL STRAINERS.—At each 50-hour inspection, remove the wing nuts on the fuel strainers and clean the strainers with compressed air. *(See figures 101 and 102.)*



Figure 96—Sweeping Area Surrounding Fuel Tank Filler Pipe Cap

c. REPAIR.

(1) REPAIRING TANKS.—If a leak develops in a fuel tank, remove and solder the tank. Tanks must be thoroughly cleaned and aired before soldering to avoid fire or explosion.

(2) REPLACING LINES.—Shut off the fuel cut-off valve and remove and replace the damaged line.

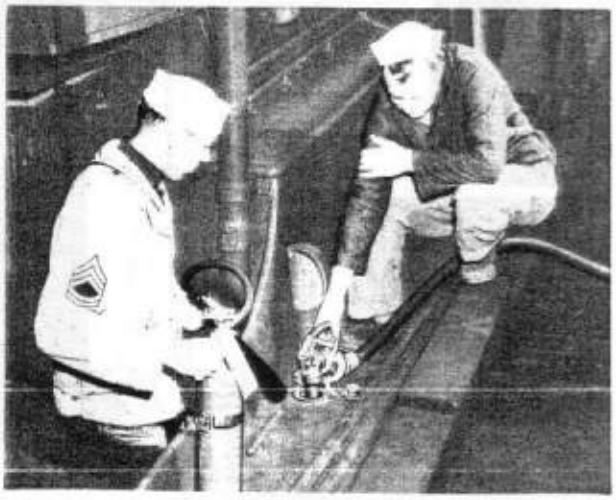


Figure 97—Filling Fuel Tank

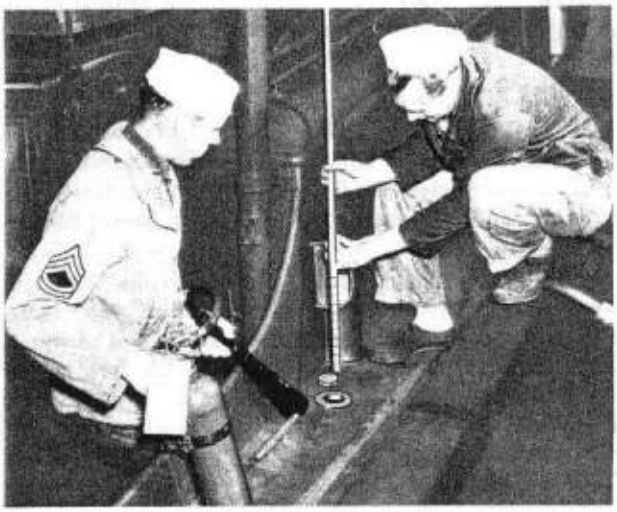


Figure 98—Measuring Fuel Level

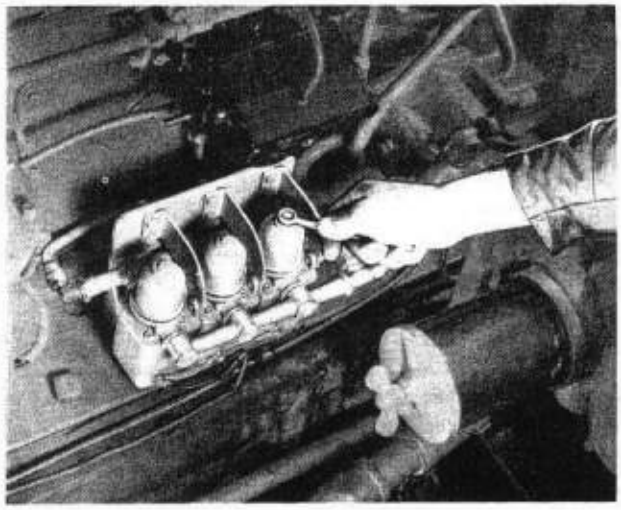


Figure 99—Removing Autopulse Strainer Cover Cap Screw

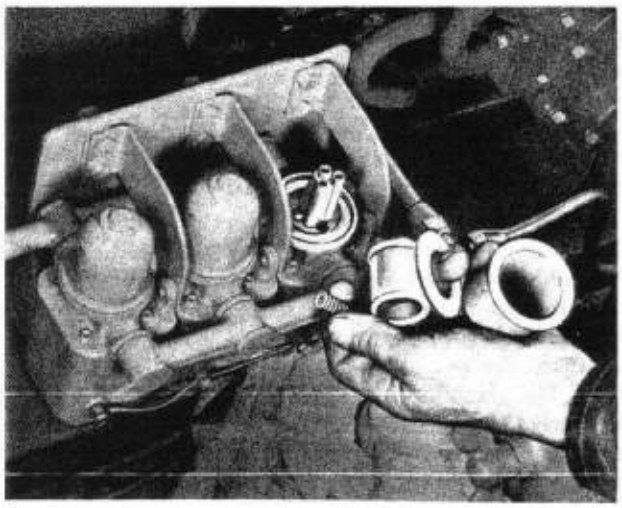


Figure 100—Autopulse Strainer Removed and Ready for Cleaning

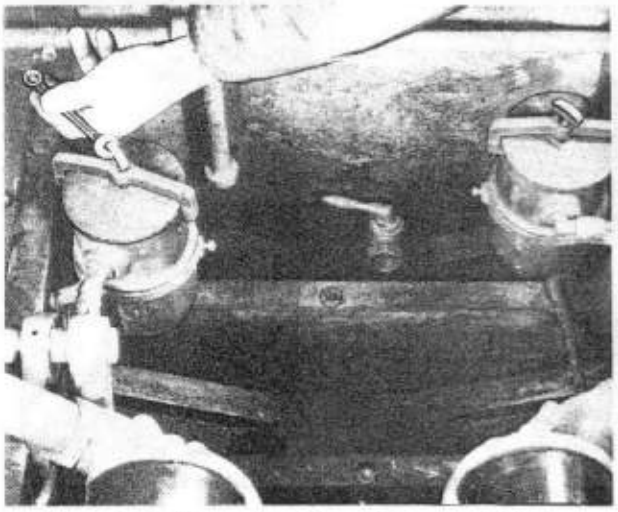


Figure 101—Removing Wing Nut on Fuel Strainer



Figure 102—Fuel Strainer Removed and Ready for Cleaning

d. REMOVING FUEL TANKS. — To remove fuel tanks, a carpenter must remove the plywood floor of the cockpit. This must be done carefully so that the boards will not be damaged. Pump the fuel from the tank or tanks to be removed. Disconnect the filler pipe, the cut-off valve, and the ventilating or overflow line. Then lift the tank from its compartment.

4. LUBRICATION.

a. GENERAL.—For engine lubrication, use 40 weight oil in the summer and 30 weight oil in the winter.

Note

Engine lubrication is discussed in this Handbook only to the extent of filling the oil reservoirs and servicing the oil filters.

b. FILLING THE OIL RESERVOIRS.

(1) KERMATH SEA RAIDER 6 MARINE ENGINE.—Initial filling of the oil reservoirs requires 6 gallons for each engine. On oil changes, normally only

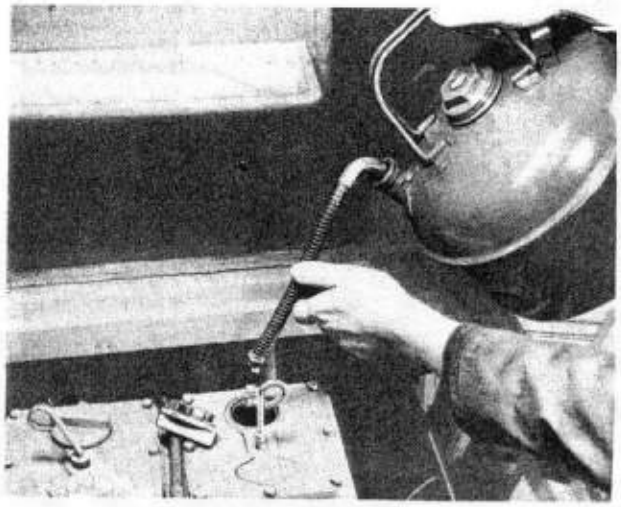


Figure 103—Filling Oil Tank

3 gallons for each engine are required since some of the oil remains in the lines, oil filters, and oil coolers. To fill an oil reservoir, unscrew the cap and fill until the oil level indicator registers above "DANGER" and ranging toward "FULL." *(See figure 103.)* Remove the strainers attached to the oil level indicator every 100 hours and clean them with cleaning fluid and compressed air.

(2) HALL-SCOTT INVADER 6 MARINE ENGINE.—Initial filling of the oil reservoirs requires 5 gallons for each engine. Refilling normally requires 3½ gallons for each engine. To fill an oil reservoir, remove the scavenging pump and measuring stick unit, which also acts as an oil reservoir cap, and fill until the measuring stick registers above "DANGER" and ranging toward "FULL."

c. SERVICING OIL FILTERS.—Remove the top bolted to the oil filter and remove the oil filter element. Clean the oil filter element housing with a rag and cleaning compound. Clean the element housing every 200 hours or whenever the oil turns dark, showing the presence of excessive dirt. Then replace the element and bolt down the top.

5. COOLING SYSTEM.

a. DESCRIPTION.—The cooling system employed is of the indirect type. The fresh water system, which cools the engine directly by circulation, is self-contained with a reservoir filled before the boat leaves the dock. The fresh water system cools the oil by passing through the oil cooler. It then passes into the cylinder jackets to cool the cylinders. From there, the water flows upward through the cylinder head. The fresh water system is controlled by a bypassed thermostat mounted on the side of the cylinder head near the water pump. A salt water system cools the fresh water. The salt water system *(figure 104)* draws water through an inlet pipe in the hull. *(See figure 105.)* The salt water is picked up by a salt water pump, circulated through a heat exchanger, and then discharged outside the boat. One-third of the salt water system also passes through the exhaust pipe *(figure 106)*, cooling it. For normal draining of the salt water system, open the petcock shown in figure 107.

b. SERVICING.

(1) Remove the strainer in the fresh water reservoir every 100 hours and clean it with compressed air. More frequent cleaning is required if engine cooling is impaired and inspection of the strainer shows foreign matter.

(2) To prevent corrosion and rust in the fresh water system, add to the water in each fresh water reservoir eight drops of Aqua Clear for each gallon of water. This will form a protective coating on the fresh water reservoirs, lines, and the cylinder heads. This ratio of eight drops of Aqua Clear to 1 gallon of water, or 1 ounce to 100 gallons of water must be maintained. Aqua Clear is harmless and tasteless.

(3) An antifreeze solution should be used in the fresh water system when the boat is operated at temperatures below freezing. Use the proportions indicated in Table I.

TABLE I—ANTIFREEZE SOLUTION

Temperature	*Ethylene Glycol*
– 9°C (16°F)	20%
–12°C (10°F)	25%
–15°C (4°F)	30%
–18°C (0°F)	33%
–25°C (–12°F)	40%
–37°C (–34°F)	50%

(4) Every 200 hours, and oftener if necessary, remove the heat exchanger and clean it with hot soapy water. If it is excessively dirty, use a cleaning fluid.

(5) Inspect the sea strainers in the salt water system every 100 hours or oftener, if required by water conditions. Remove the wing nut and lift out the sea strainer glass. Remove the strainer and clean it of foreign matter. *(See figure 108.)* Wash the strainer with plain or soapy water, depending upon the amount of dirt present. Replace the strainer, the glass, and the wing nut.

(6) If insufficient water is drawn through the salt water inlet pipes, the boat should be drawn on the ways and the salt water scoops beneath the hull cleaned and freed of all foreign matter. *(See figure 109.)*

(7) There are two sea strainers for each engine. Only one is operated at a time. If the operating sea strainer gives evidence of faulty performance while on a mission, change to the other strainer by pushing over the handle located between the two. *(See figure 110.)* Alternate the sea strainers, keeping one clean at all times. The sea strainer not in use should be cleaned immediately. Upon return from the mission, clean both strainers thoroughly.

(8) To drain the salt water system in cold weather, loosen the retaining plug shown in figure 111.

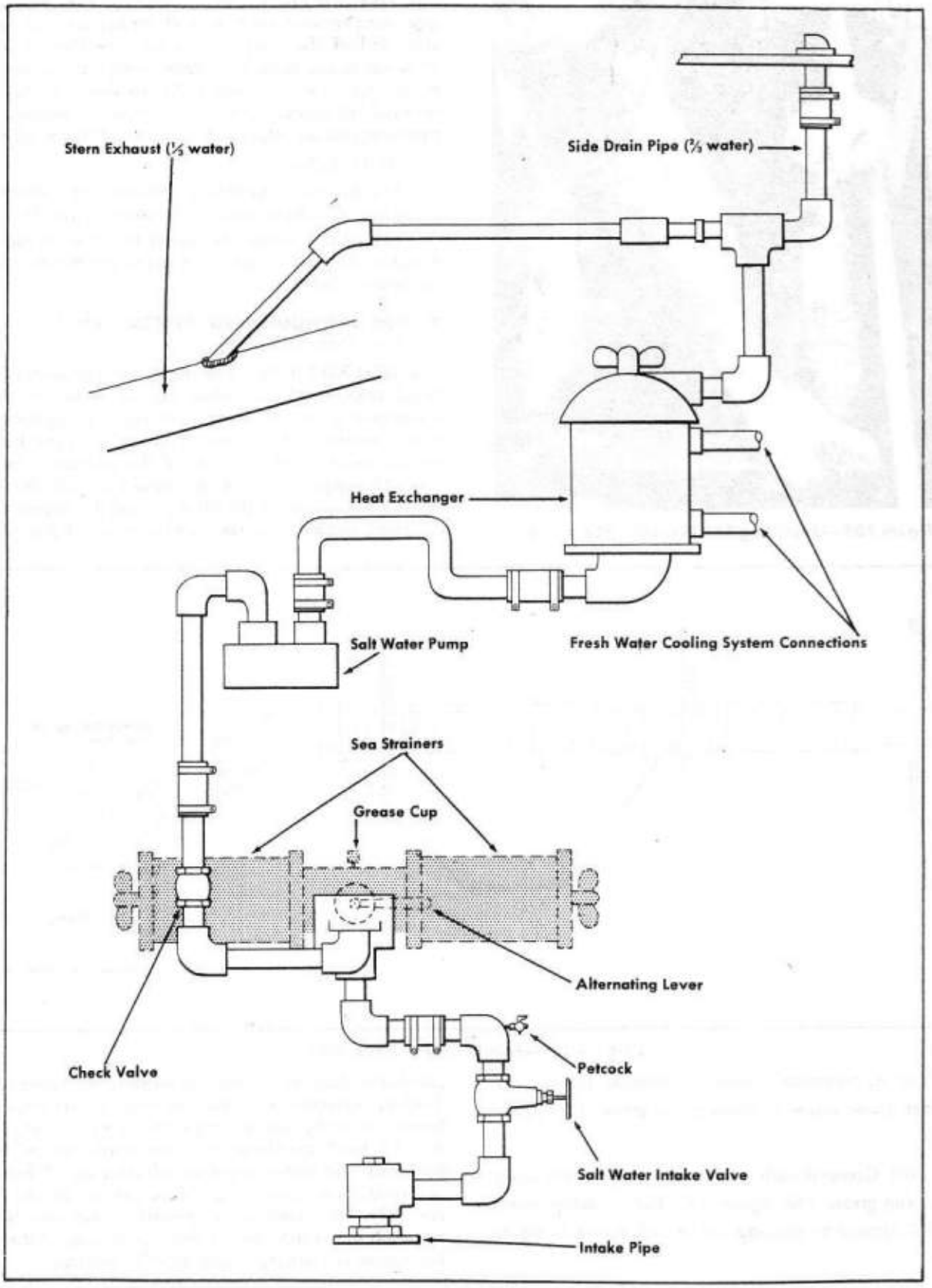


Figure 104—Salt Water Cooling System



Figure 105—Operating Salt Water Intake Valve

(9) Approximately every 6 months, fill the sea strainer grease cup with ordinary cup grease. *(See figure 112.)*

(10) Grease the salt water pump occasionally, using No. 2 cup grease. *(See figure 113.)* The salt water pump may be drained by opening the petcock shown in figure 114.

6. VENTILATING SYSTEM.

(See figure 115.)

a. DESCRIPTION.—In the forward part of the engine compartment are two cowl ventilators, and in the after end of the compartment are two blowers which draw off fumes from the engine compartment and the bilge. *(See figures 116 and 117.)* Air enters through the forward ventilators, circulates through the engine compartment and the bilge, and is drawn off by the blowers.

b. SERVICING.

(1) At every monthly inspection, use compressed air to dust out the screens on the forward ventilators.

(2) In the rear of the blower motor is an aperture which needs a few drops of oil every 300 hours to keep the bearing lubricated.

7. FIRE EXTINGUISHING SYSTEM (CO_2).

(See figure 118.)

a. DESCRIPTION.—The engine compartment is protected from fire by a carbon dioxide system which is automatically set off by excessive heat. To operate the system manually, break the glass and pull the handle located on the starboard side of the pilothouse by the door. *(See figure 119.)* A 20-pound CO_2 cylinder *(figure 120)* is located in the after part of the engine compartment, and above it, fastened to the under part of the pilothouse floor, is the heat activator. *(See figure 121.)* The heat activator causes the system to operate when fire breaks out in the engine compartment. At the top of the cylinder head mechanism is a red knob covered by a half-black and half-transparent celluloid cap. When the red knob is concealed by the black part of the cap *(figure 122)*, the system is in operating condition. If the red knob shows through the transparent part of the cap, the system is discharged and must be serviced.

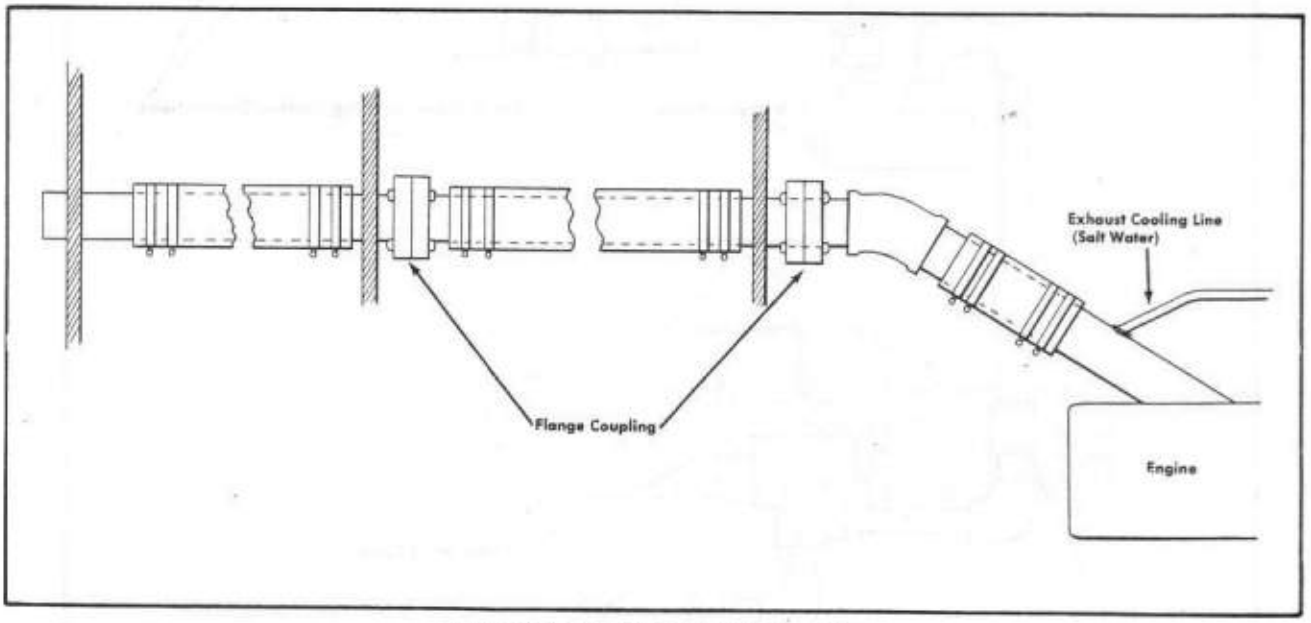


Figure 106—Port Engine Exhaust Pipe

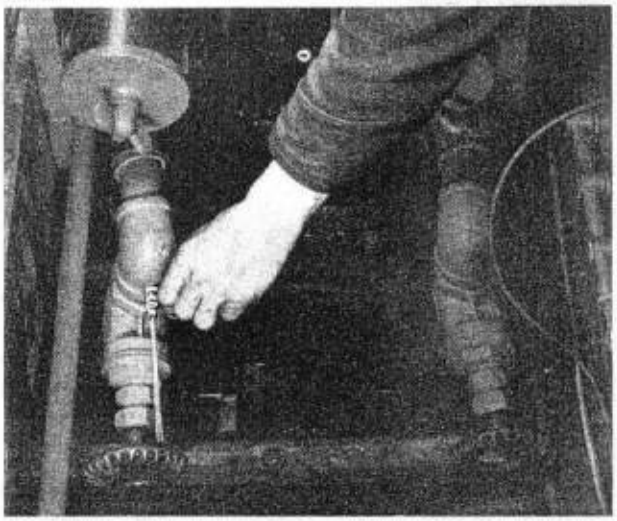


Figure 107—Normal Draining of Salt Water System

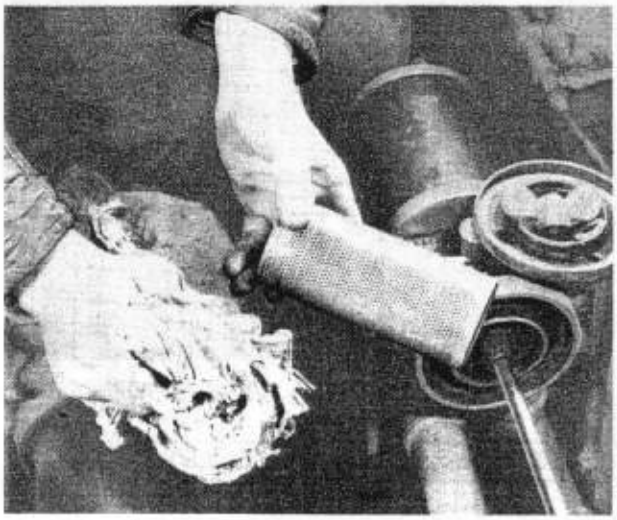


Figure 108—Sea Strainer Removed and Ready for Cleaning

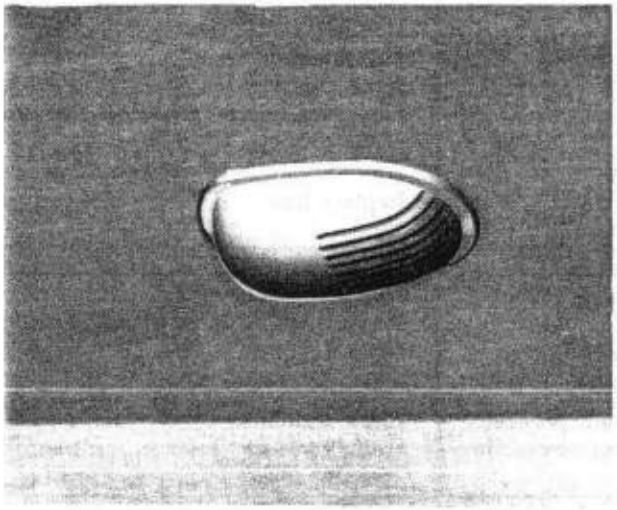


Figure 109—Salt Water Scoop

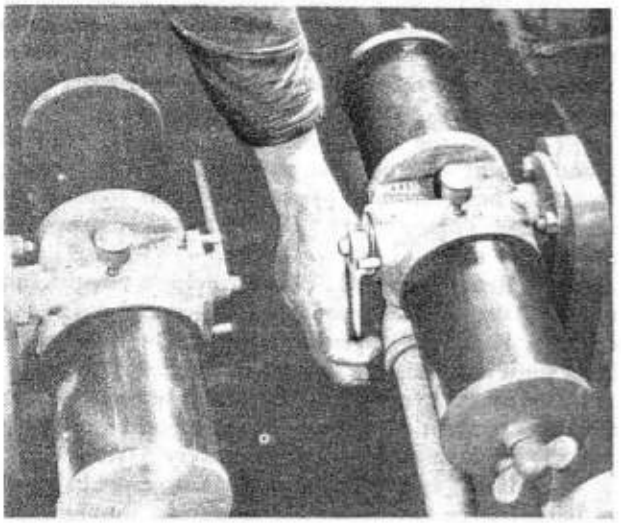


Figure 110—Alternating Sea Strainers



Figure 111—Cold Weather Draining of Salt Water System

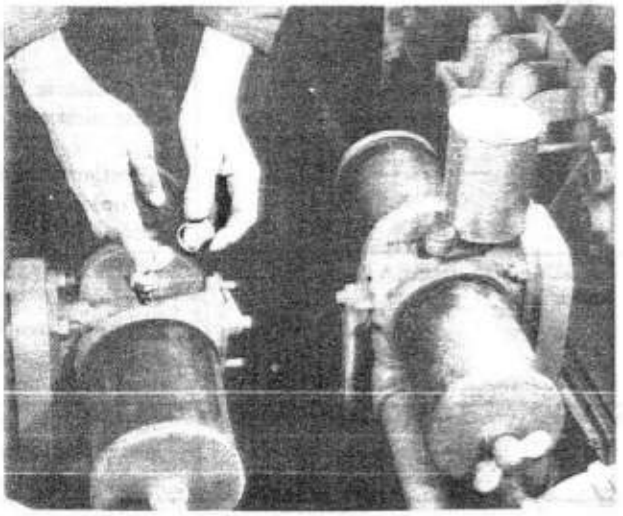


Figure 112—Filling Sea Strainer Grease Cup

b. SERVICING.

(1) Inspect the cylinder head every 30 days to see that the cylinder is set for operation. If the red knob shows through the transparent part of the cap, check the system, refill the cylinder, and set the cylinder head mechanism.

(2) Test the heat activator for leaks every 6 months, using a manometer test. Disconnect the tubing from the heat activator *(figure 123)* and connect the manometer *(figure 124)*. Directions accompany the manometer tester.

(3) Remove the CO_2 cylinder every 6 months and test it by the use of a manometer. Check and weigh the cylinder. If the weight indicates leakage, refill the cylinder until it contains 20 pounds.

(4) Every 2 years, clean the entire system. Remove the cylinder from the boat; trip, empty, and refill it.

(5) Pressure-test the cylinder every 5 years.

(6) If the cylinder head mechanism must be reset as indicated by the red knob appearing through the transparent part of the celluloid cap *(figure 125)*, the cable to the remote manual control and the copper tubing to the heat activator must be released and the cylinder head removed and placed in a vise. Install a hold wrench and remove the setscrew. *(See figure 126.)* Using a manometer, test the mechanism to see that it is set for 6-inch pressure. *(See figure 127.)* Loosen the cutter valve screw to allow resetting of the mechanism. *(See figure 128.)* Turn the cutter valve screw backwards until the mechanism clicks and the red knob is up, indicating that the mechanism is reset. *(See figure 129.)* Tighten down the cutter valve screw with a reset wrench. *(See figure 130.)* Replace the cylinder head in the boat. Attach the cable to the remote manual control and the copper tubing to the activator. Replace the celluloid cap, and affix the cover plate to the cylinder head.

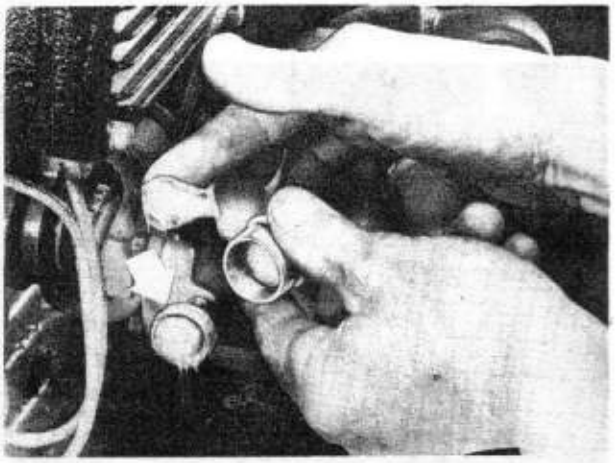


Figure 113—Filling Salt Water Pump Grease Cup

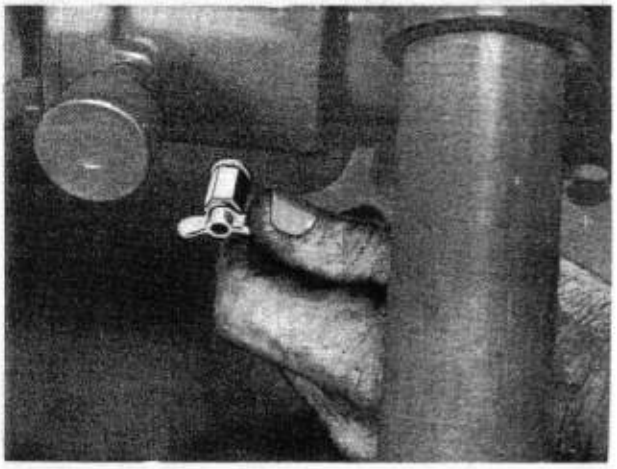


Figure 114—Draining Salt Water Pump

8. TROUBLE SHOOTING.

TROUBLE	*PROBABLE CAUSE*	*REMEDY*
CLUTCH CONTROL LINKAGE NOT OPERATING	Wear.	Readjust clutch rod or linkage.
THROTTLE CONTROLS STICKING	Throttle lever stuck or slipping.	Tighten or replace, depending on amount of wear.
FUEL SYSTEM NOT OPERATING	Leaky diaphragm in pump.	Replace diaphragm.
	Air leaks in line.	Repair and tighten lines.
	Line airbound.	Blow out line or release it and run fuel through it.
	Ventilating pipe outlet at stern fouled.	Clean and free of foreign matter.
	Ventilating line bent.	Replace line.
ENGINE OVERHEATING	Water low in reservoir.	Check and add water.
	Strainer in reservoir clogged.	Remove and clean strainer.
	Pump not working.	Replace pump.
	Salt water system not operating.	Clean sea strainers and see that inlet pipe is not fouled.
EXCESSIVE FUMES IN BILGE	Strainers in ventilators plugged.	Clean strainers.
	Ventilating pipes bent obstructing the flow of air.	Straighten or replace ventilating pipes.

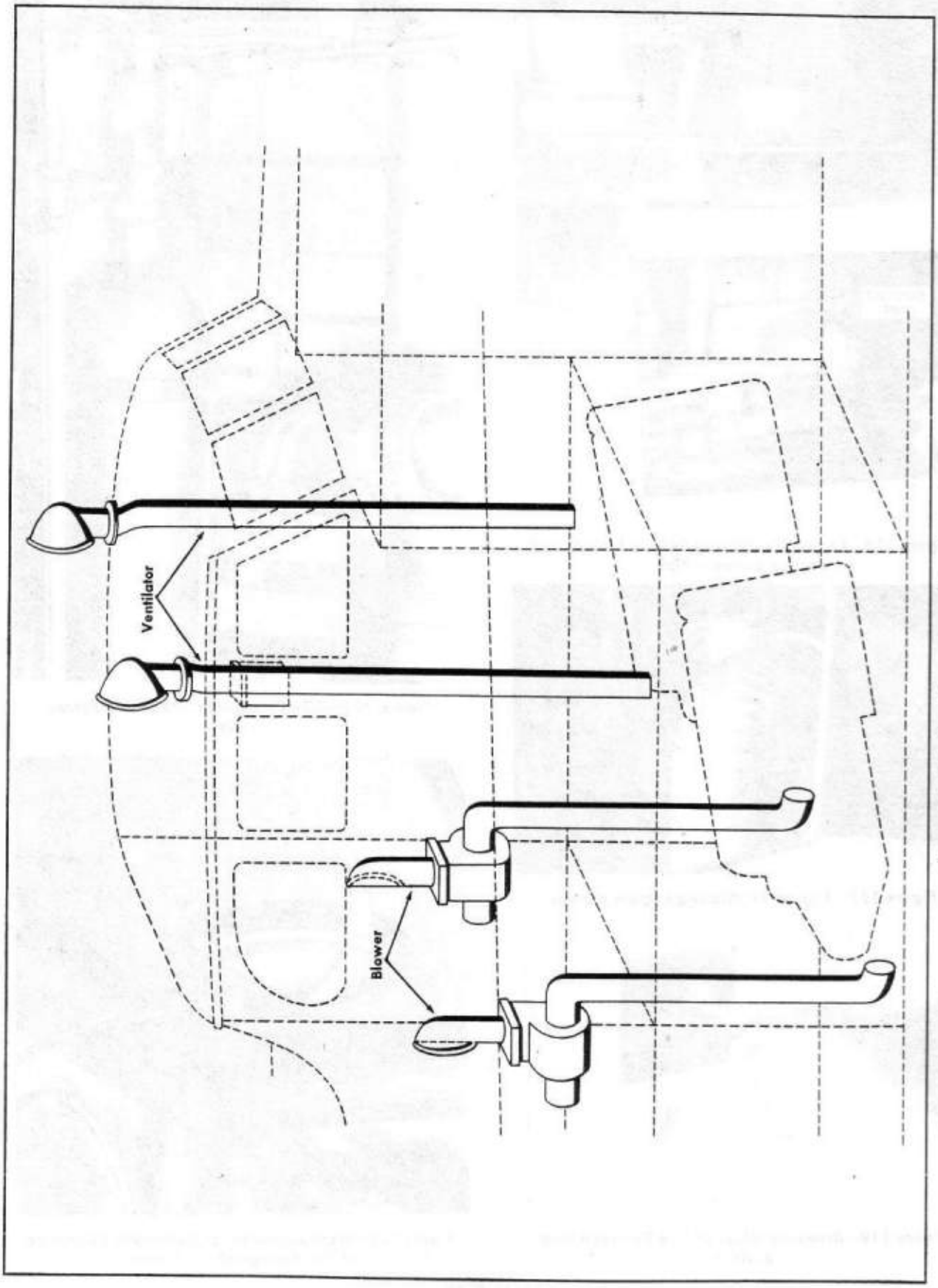


Figure 115—Engine Compartment Ventilating System

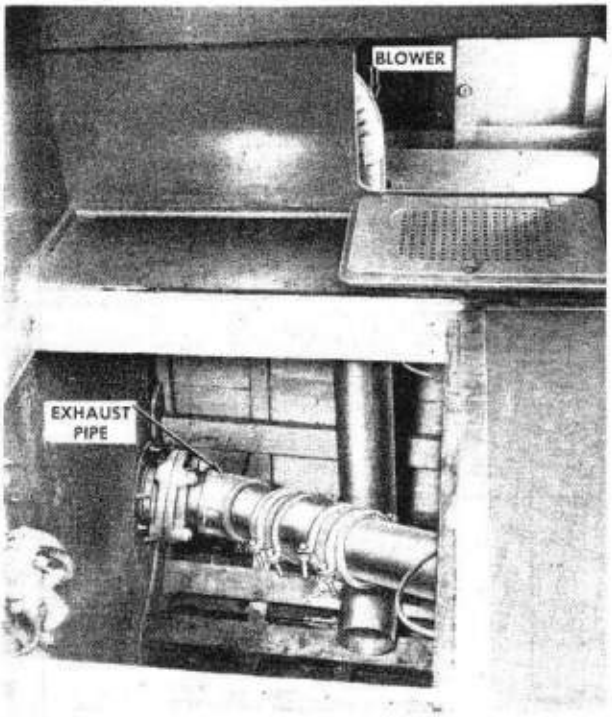


Figure 116—Engine Ventilating System Blower and Engine Exhaust Pipe

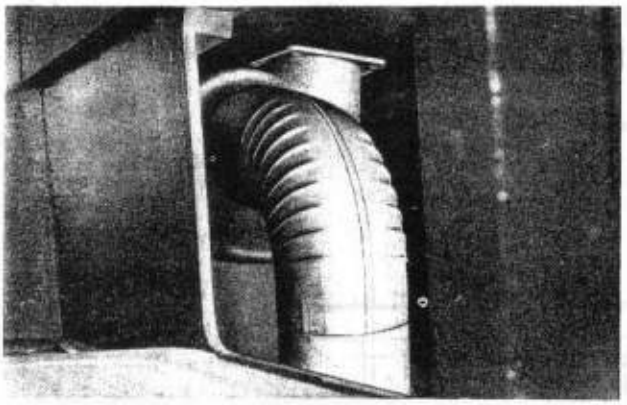


Figure 117—Engine Ventilating System Blower

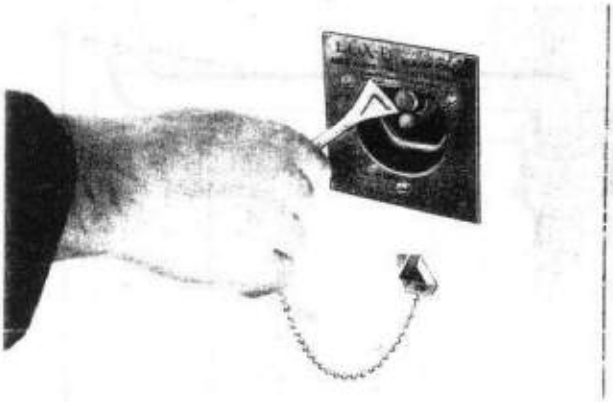


Figure 119—Breaking Glass of Fire Extinguishing System

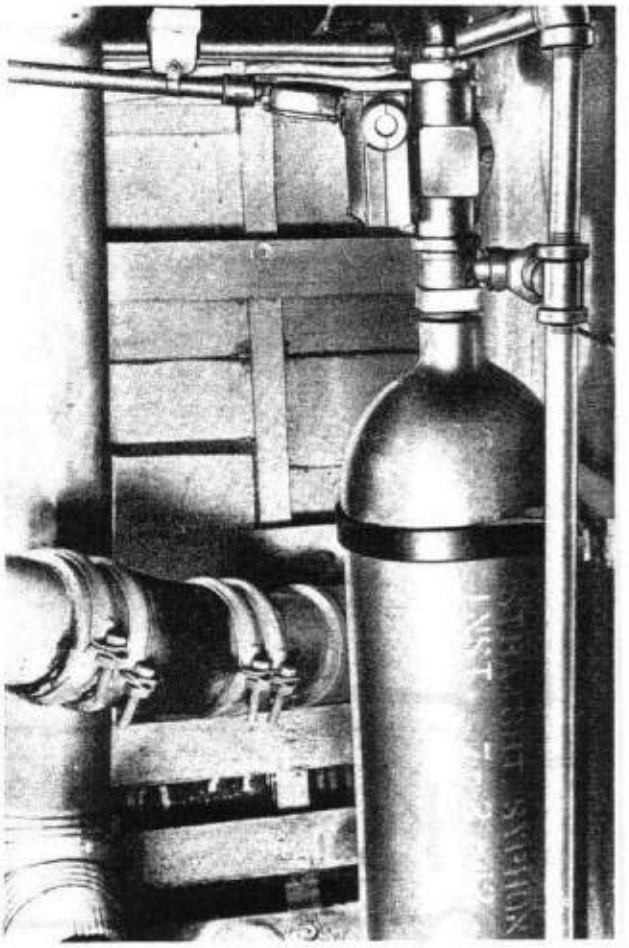


Figure 120—CO_2 Cylinder in Fire Extinguishing System

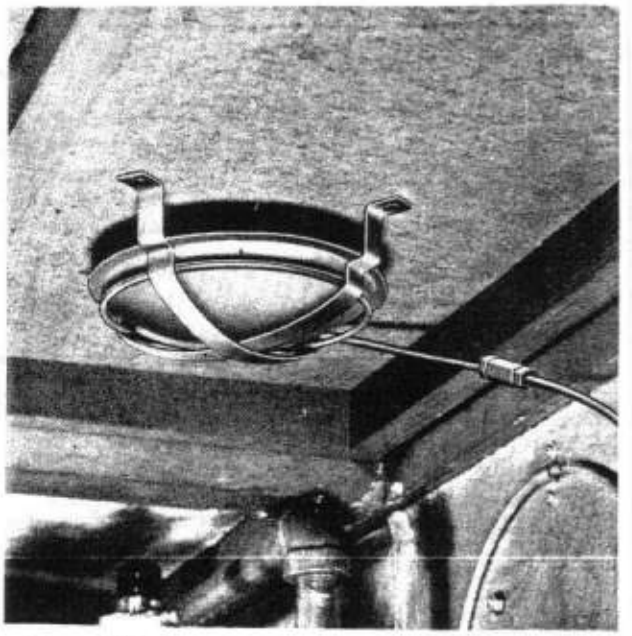


Figure 121—Heat Activator for Automatic Discharge of Fire Extinguishing System

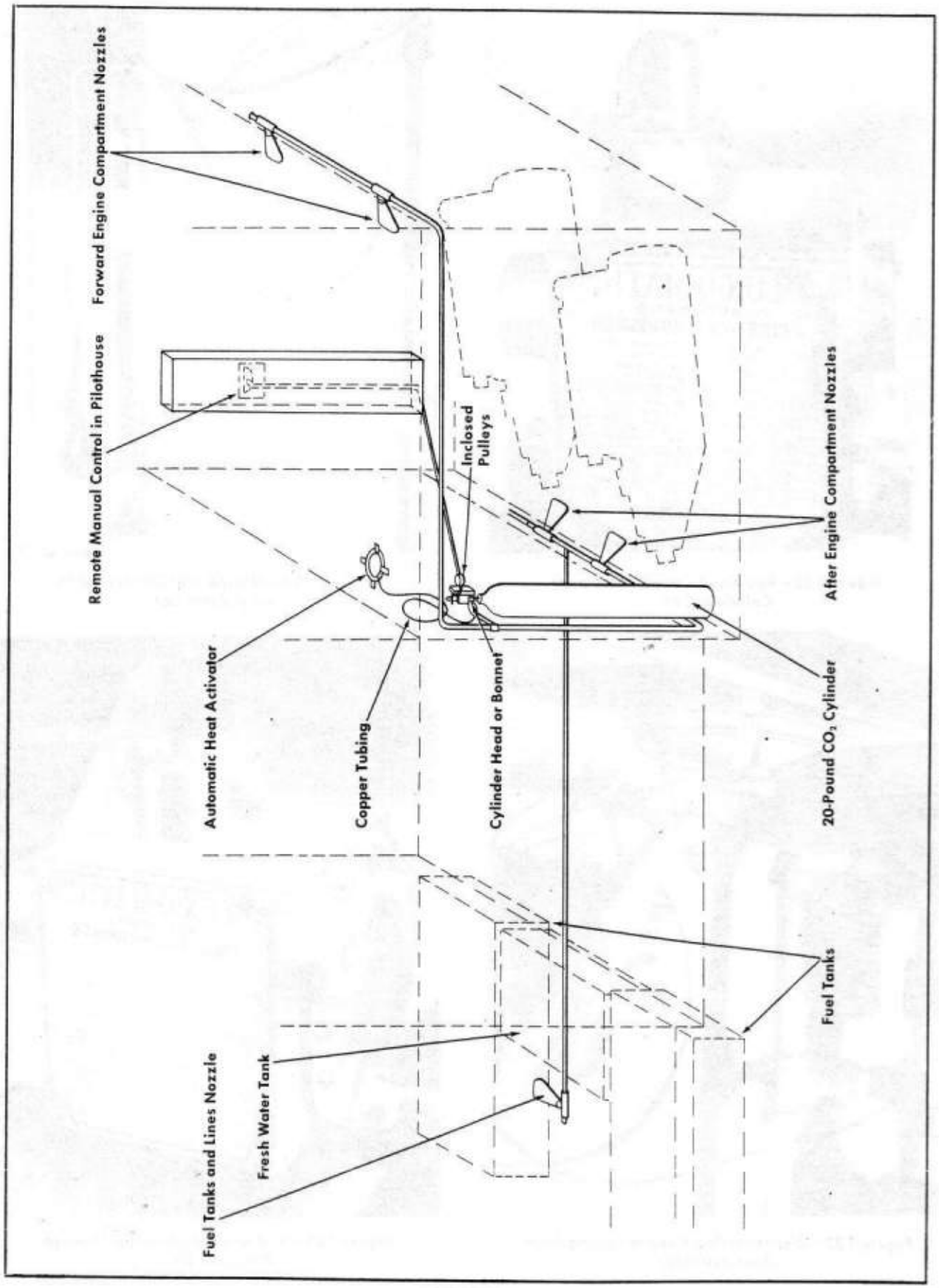


Figure 118—Automatic Fire Extinguishing System



Figure 122—Red Knob Concealed Under Celluloid Cap

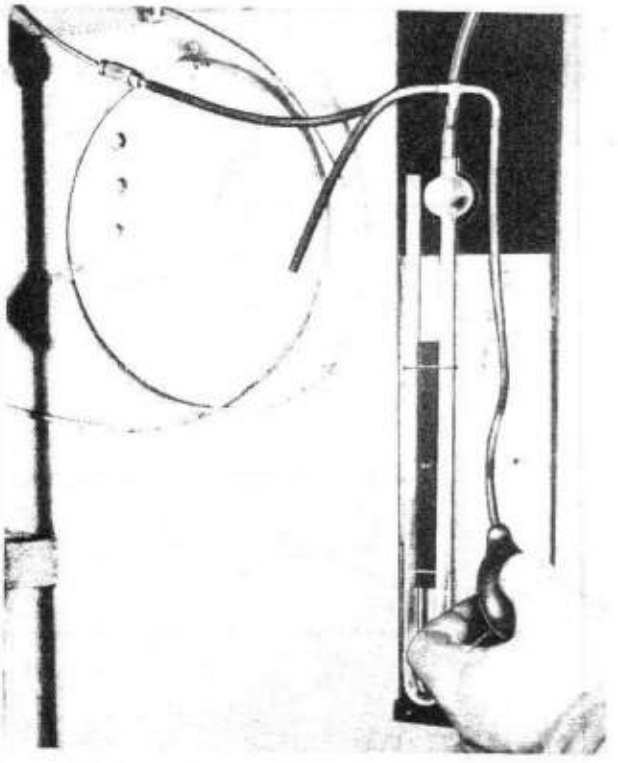


Figure 124—Manometer Connected to Heat Activator

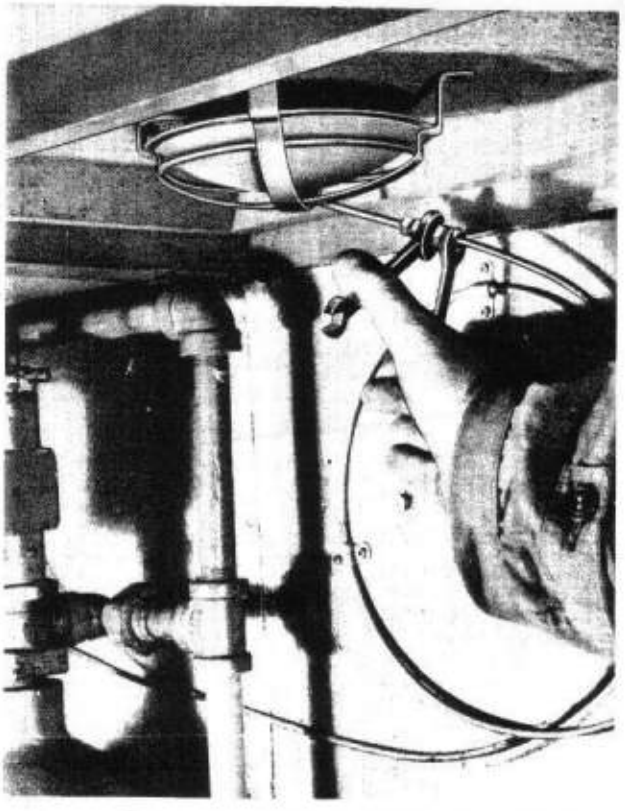


Figure 123—Disconnecting Copper Tubing from Heat Activator



Figure 125—Red Knob Appearing Through Celluloid Cap

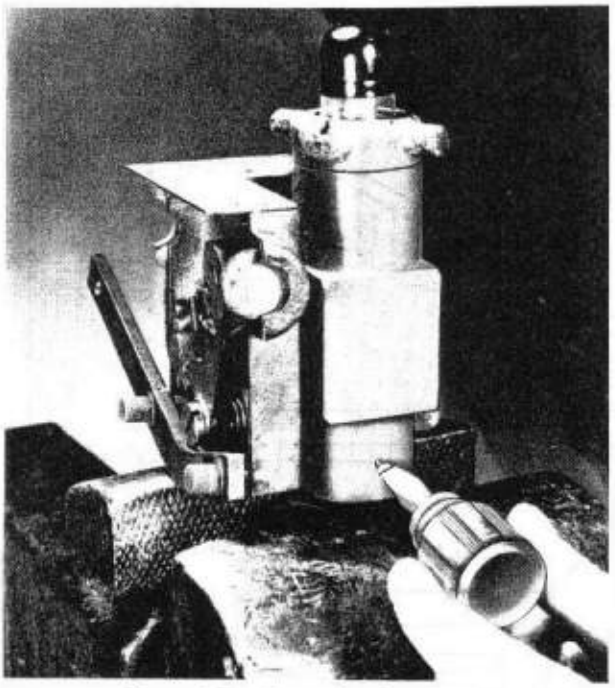


Figure 126—Removing Setscrew

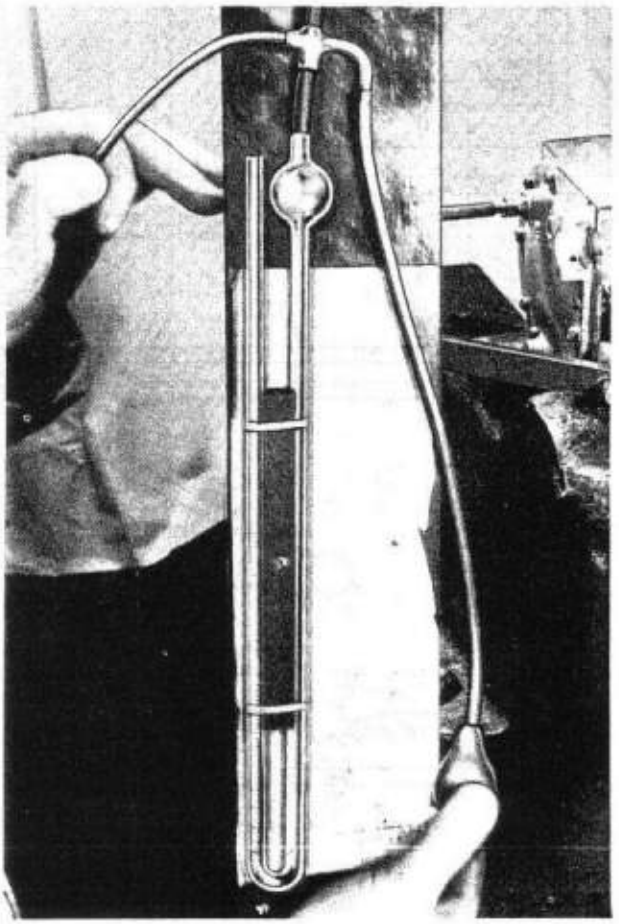


Figure 127—Manometer Test of Pressure Required for Tripping Mechanism

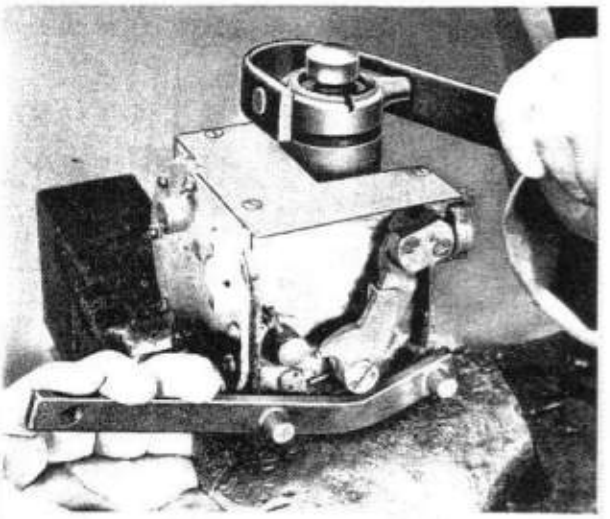


Figure 128—Loosening Cutter Valve Screw

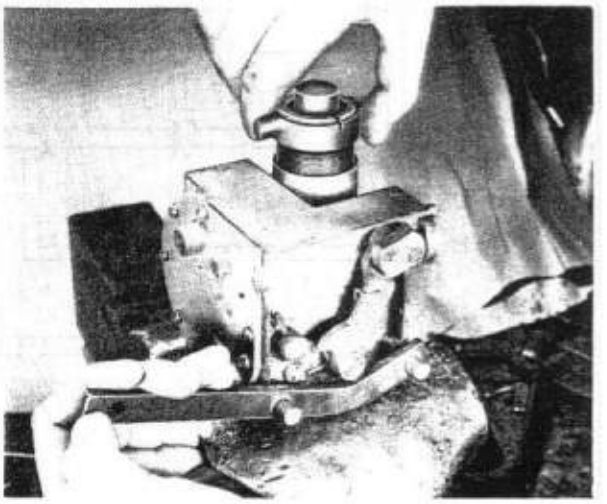


Figure 129—Setting the Mechanism

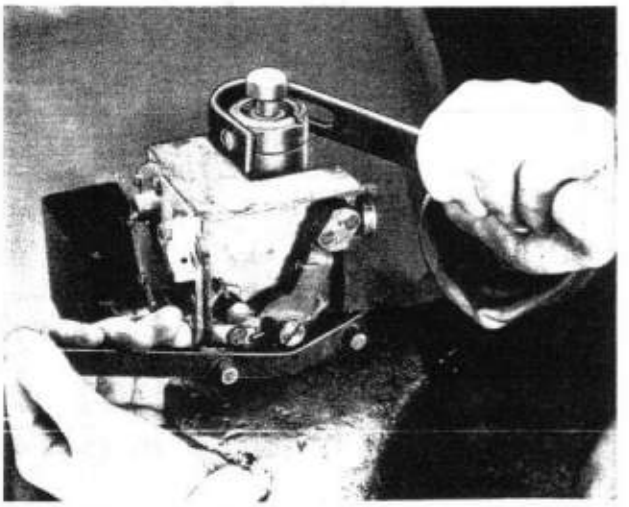


Figure 130—Tightening Cutter Valve Screw After Mechanism Is Reset

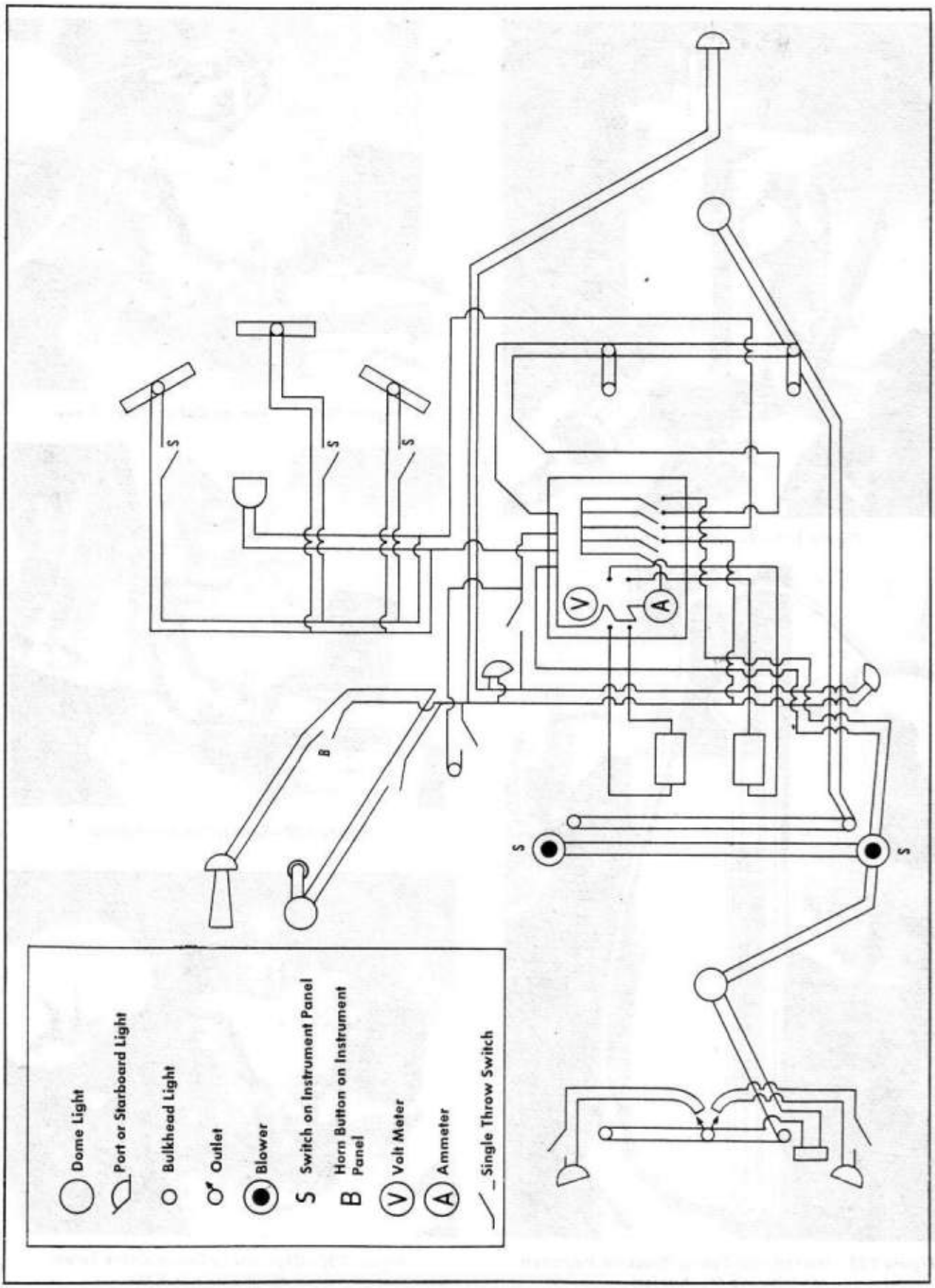


Figure 131—12-volt Electrical System Wiring Diagram

SECTION VI Twelve-Volt Electrical System

1. GENERAL.

The wiring and arrangement of the equipment is similar in all 42-foot boats. The following text will be used as a general guide. *(See figure 131.)*

2. DESCRIPTION.

a. GENERAL.—The 12-volt battery charging system consists of the following items:

(1) Two sets of 12-volt storage batteries, each consisting of two 6-volt batteries wired in series, located in the engine room between the engines and the outside hull. *(See figure 132.)*

(2) Double-pole, double-throw knife switch located on the switch and fuse box and connected to either battery as selected. *(See figure 133.)*

b. ENGINE INSTRUMENT PANEL.—Located on the port side of the pilothouse. *(See figure 134.)*

c. GENERATOR. — A battery-charging, four-pole, four-brush generator is on the driving end of each engine. *(See figure 135.)*

(1) A voltage regulator for each engine is located on the forward engine room bulkhead. *(See figure 136.)*

(2) An overspeed control magnetic switch which automatically cuts the engines when the set rpm is reached is located in the primary and secondary coil box on the forward end of each engine. *(See figure 137.)*

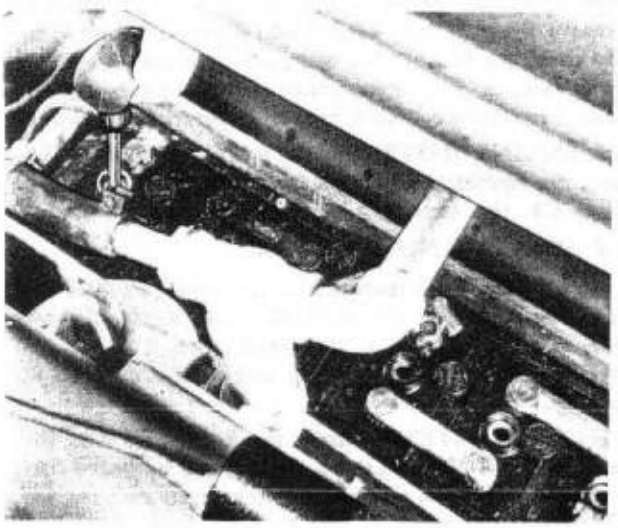


Figure 132—Battery Installation

d. STARTING MOTORS.—One for each engine is located on the outboard sides of the engines between the engine and the hull. *(See figure 138.)*

3. OPERATION INSTRUCTIONS.

Note

Make certain all switches and lights are turned "OFF" before leaving the boat.

a. GENERAL. — Generators automatically charge the batteries when the engines are running. If the engines are not run often enough to maintain the proper

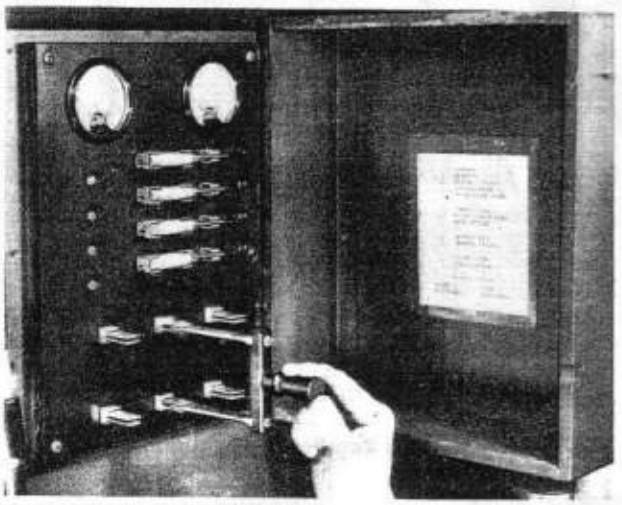


Figure 133—Switch and Fuse Box



Figure 134—Engine Instrument Panel

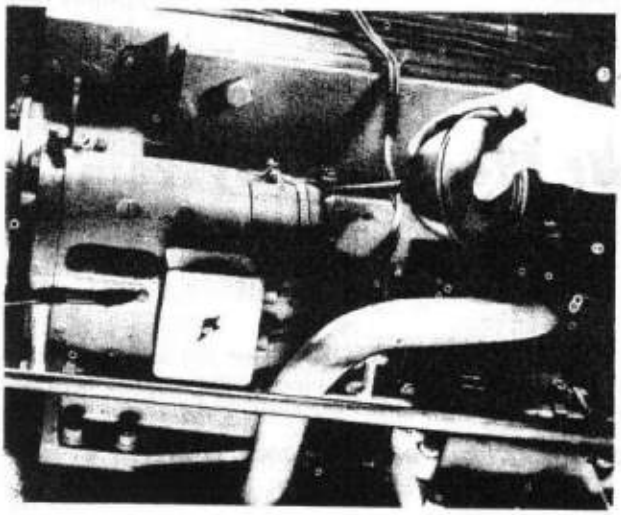


Figure 135—Generator Installed

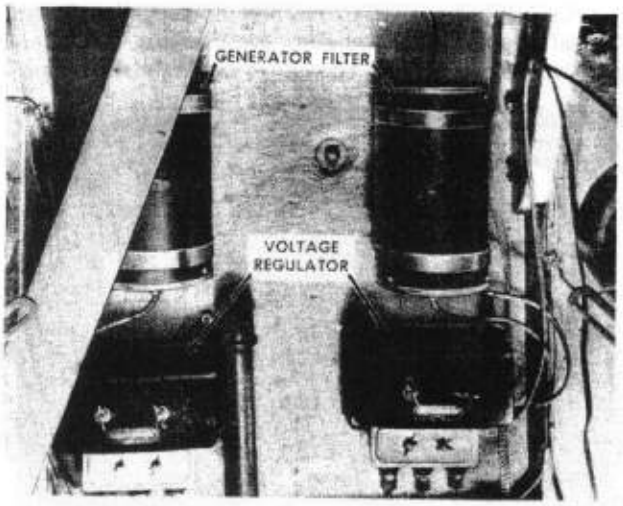


Figure 136—Voltage Regulator and Generator Filter

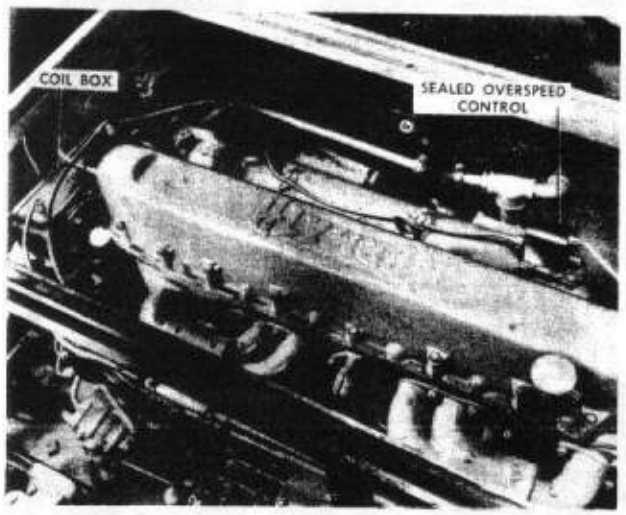


Figure 137—Overspeed Control Switch

battery voltage, the batteries must be charged from a separate source. Make certain that the batteries are securely fastened in place to prevent movement in rough water. Battery box covers should be kept closed to keep out rain and salt spray.

b. TO CHARGE 12-VOLT BATTERIES.—Use the standard procedure for charging batteries.

4. SERVICE AND INSPECTION.

a. BATTERIES.—Normal battery voltage is 10 to 12 volts. When the voltage drops below 10 volts, the batteries must be recharged. The level of the electrolyte should be $\frac{3}{8}$ inch to $\frac{5}{8}$ inch above the top of the separators. Check the water level during 25-hour inspections or at least once each week, and add necessary distilled water. The addition of distilled water to the batteries temporarily reduces the charge. In cold climates, water should be added only after the engines have been warmed up and are easy to start and at a time when a run of sufficient duration to build up the charge will be made.

(1) Check the cable connections for corrosion and loose terminal connections. If corrosion is found, clean cable connections with a wire brush and a solution of baking soda and hot water.

(2) Check for leaks in the cells, and replace the battery if necessary.

(3) Grease the battery terminal connections during every 50-hour inspection with petrolatum, Specification No. AN-P-51.

b. GENERATORS.—The charging current supplied by the generators is indicated on a pair of ammeters on the engine instrument panel. *(See figure 139.)*

(1) Check the ammeters for proper charging. If a voltmeter test shows the battery is well charged and a hydrometer reading shows between 1.220 and 1.250 specific gravity, the ammeters should read between 8 and 12 amperes. No further check is necessary if the reading is correct.

(2) Should the ammeters on the instrument panel show a reading below 8 amperes, proceed as follows: Remove the generator head band *(figure 140)* and visually check the brushes for wear, oil, corrosion, irregular brush face, or dirty commutator. If any of these conditions exist, replace with a properly operating generator.

c. ENGINE INSTRUMENT PANEL.—Visually inspect the ammeters for proper operation. Refer to paragraph 4.*b.*, this section.

d. SWITCH AND FUSE BOX.

(1) FUSES.—Unscrew the cap end *(figure 141)* and visually check the refillable (20 or 30 ampere) fuses. Replace the filler, if burned, with a 20- or 30-ampere filler. Screw on the cap and replace the fuse in the clip.

(2) AMMETER.—Throw the knife switch to the starboard side. Measure the voltage of the starboard batteries and the draw on the ammeter. If all switches are "OFF" and the ammeter still shows a drain, there is a

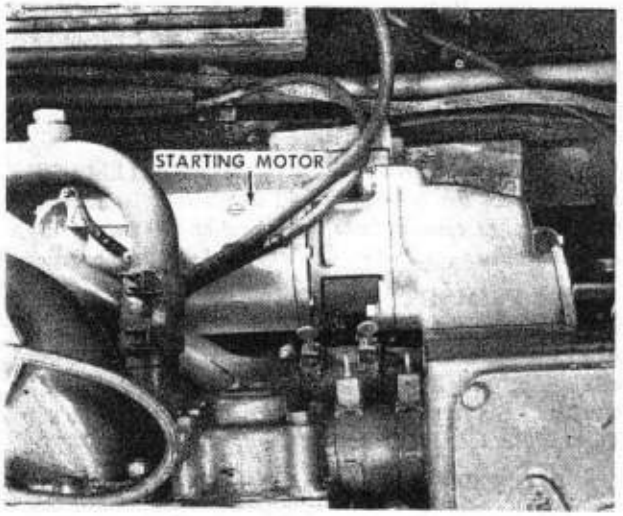


Figure 138—Starting Motor

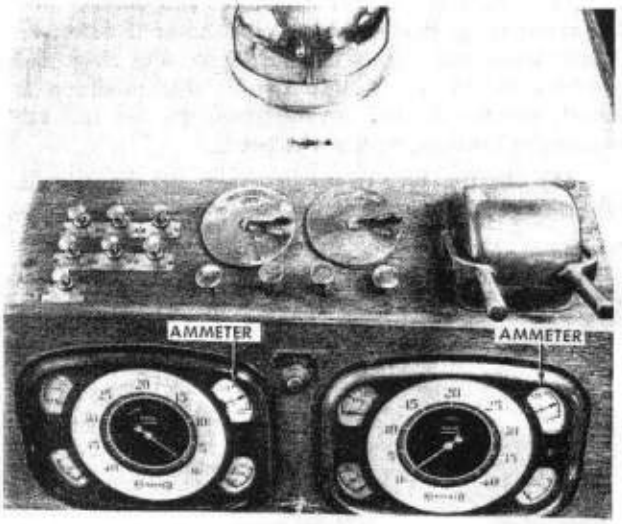


Figure 139—Ammeters on Engine Instrument Panel

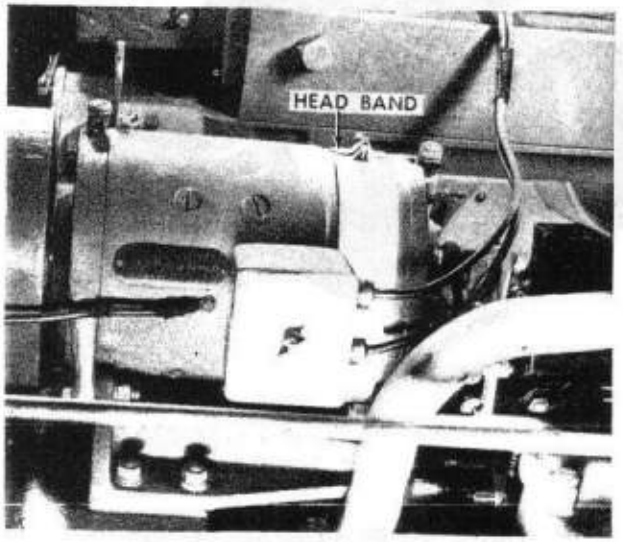


Figure 140—Generator Head Band

leak in the wiring circuit. Repeat this procedure for the port batteries by throwing the knife switch to the port side. *(See figure 141.)*

WARNING

Disconnect the battery terminals before making repairs to wires, insulation, switches, relays, or any other part of the electrical system. This must be done to prevent a spark exploding the bilge fumes and the subsequent injury to personnel.

(a) BROKEN WIRE.—Replace the wire and repeat the ammeter test in paragraph 4.*d.*(2) of this section.

(b) MISSING INSULATION. — Replace the wire and repeat the ammeter test in paragraph 4.*d.*(2) of this section.

e. STARTING MOTORS. *(See figure 138.)*

(1) Inspect the terminals for looseness and corrosion. Tighten the loose connections. Clean the corroded terminals with a battery terminal cleaning tool and grease with petrolatum, Specification No. AN-P-51.

(2) Remove the head band *(figure 142)* and make a visual inspection for dirt and oil on the brushes and armature. If dirt or oil are found, replace the starting motor. Once every 300 hours place a drop of oil, Specification No. VV-O-581, grade 20, in the starter brush head. *(See figure 143.)*

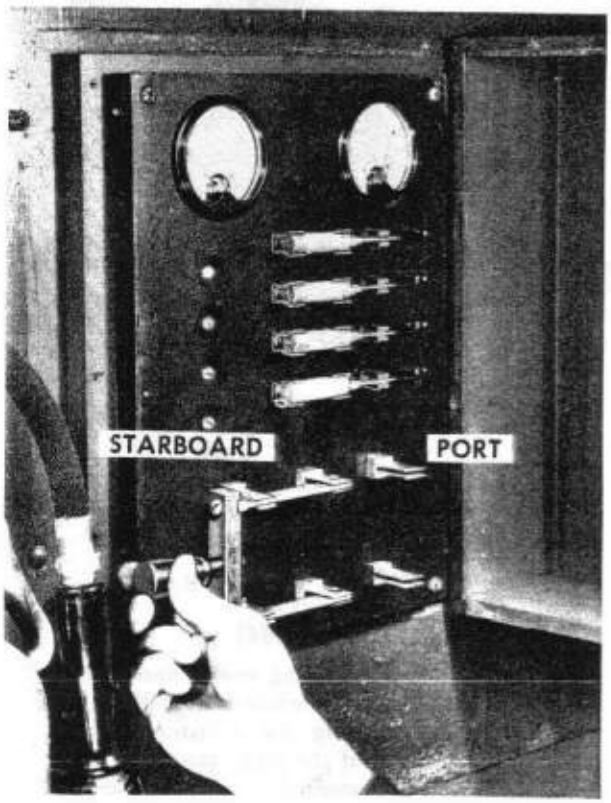


Figure 141—Knife Switch on Starboard Batteries



Figure 142—Removing Starting Motor Head Band

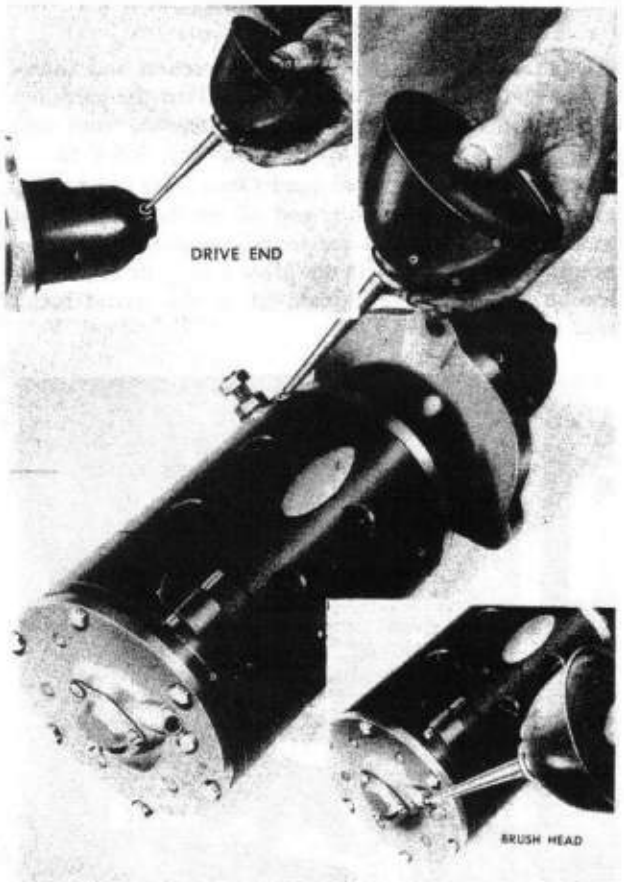


Figure 143—Oiling the Starting Motor

WARNING

Do not remove the starting motor head band and clean the armature while installed in the boat. Brushes touching the armature might cause an explosion of the bilge gases and subsequent injury to personnel.

(3) Occasionally the Bendix drive sticks and requires oiling. Remove the starter and place a few drops of light lubricating oil, Specification No. VV-O-581, grade 30, in the oiler cups *(figure 143)* and on the Bendix drive. *(See figure 144.)* Reinstall.

f. RADIO SHIELDING.

(1) SECONDARY SHIELDING SYSTEM.—Visually inspect for breaks, frayed insulation, leaks in the bakelite high tension insulator, broken or frayed high tension rubber insulators, and for broken fiber brackets.

(2) PRIMARY IGNITION SYSTEM.—Visually inspect the wiring from the ignition switch on the instrument panel to the ignition coils for broken or frayed insulation, for loose terminals, and for broken fiber brackets. Replace the defective wiring and brackets. Tighten the loose terminals.

g. BLOWERS.

(1) Inspect the wiring for breaks or frayed insulation.

(2) Check the blower motor for free turning and for motor drag. Replace the blower motor if defective. Water frequently enters the air intake and clogs and corrodes the blower suction fan. If this condition is found, remove the blower and clean the fan and fan housing by brushing with a wire brush.

(3) Oil the blower motor every 100 hours with lubricating oil, Specification No. VV-O-581, grade 20.



Figure 144—Oiling the Bendix Drive

5. TROUBLE SHOOTING.

TROUBLE	*PROBABLE CAUSE*	*REMEDY*
BATTERY TERMINALS CORRODED	Lack of grease.	Clean with battery terminal cleaner and grease with petrolatum, Specification No. AN-P-51, and tighten connections.
	Loose connections.	Clean with battery terminal cleaner, grease with Specification No. AN-P-51 and tighten connections.
BATTERY WILL NOT CHARGE.	Low acid content.	Replace.
GENERATOR CHARGING AT LOW RATE	Dirty commutator.	Clean with No. 00 sandpaper or fine emery cloth.
	Poor brush contact.	Install new brushes.
	High resistance in charging circuit.	Clean with No. 00 sandpaper and tighten terminals.
	Loose or dirty terminals.	Clean with No. 00 sandpaper and tighten terminals.
	Weak brush springs.	Replace springs.
	Generator belt improperly adjusted.	Tighten belt.
GENERATOR CHARGING AT TOO HIGH RATE	Voltage regulator operating improperly.	Replace.
	Generator governor operating improperly.	Replace.
	Generator belt improperly adjusted.	Loosen belt.
GENERATOR SHELLAC SMOKING	Lack of oil in bearings.	Add lubricating oil, Specification No. VV-O-581, grade 30. If condition still exists, replace generator.
	Bad ground at the battery strap.	Check for corrosion and loose connection. Clean with No. 00 sandpaper and tighten.
	Cut-out relay not working properly.	Remove and replace.
	Weak brush springs.	Replace springs.
INSTRUMENT PANEL AMMETER NEEDLE FLUCTUATING	Loose connections on panel, battery terminals or generator.	Tighten connections.
	Weak brush springs.	Replace springs.
	Burned generator brush.	Replace brush.
	Loose generator belt or pulley.	Tighten.
FREQUENT FUSE BLOW-OUTS	Loose connection or short in circuit.	Check all wiring on that fuse circuit. Tighten connections. Replace shorted wiring.
	Relays sticking.	Check all relays and replace defective ones.
LIGHTING AND SIGNALLING SYSTEMS NOT WORKING YET ALL WIRING AND RELAYS CHECK OK	Corrosion on fuse and clip.	Check fuses and clips. Clean with No. 00 sandpaper and grease with petrolatum, Specification No. AN-P-51.
STARTING MOTOR WILL NOT OPERATE	Loose connections on battery starter or starter switch.	Tighten connections.
	Broken starter spring.	Replace starter spring.
	Discharged battery.	Replace or recharge battery.

TROUBLE	*PROBABLE CAUSE*	*REMEDY*
STARTING MOTOR TURNS TOO SLOWLY	Discharged battery or shorted cell.	Recharge or replace.
	Loose or dirty battery terminals.	Clean with battery terminal cleaner or tighten.
	Dirty commutator.	Clean with No. 00 sandpaper.
	Poor brush contact.	Install new brushes.
	Worn bearings.	Replace.
	Burned starter switch contacts.	Replace switch.
STARTING MOTOR TURNS PROPERLY BUT FAILS TO START ENGINE	Distributor points burned or pitted.	Clean points with a point file or replace.
	Breaker arm stuck on pivot pin.	Clean with No. 00 sandpaper and lubricate with oil, Specification No. VV-O-581, grade 30.
	Breaker arm spring weak.	Replace.
	Points improperly adjusted.	Adjust to .018 to .020 inch clearance.
	Broken porcelain on spark plug.	Replace spark plug.
	Broken insulator on end of plug wire.	Replace insulator.
	Shorted coil.	Replace coil.
	Defective condenser.	Replace.
	Broken primary ignition wire.	Replace wire.
	Blown fuse in primary ignition circuit.	Check fuse and replace.
	Broken or burned distributor caps.	Replace.
	Broken or burned rotary button.	Replace.
SWITCH "ON" BUT BLOWER FAN WILL NOT OPERATE	Broken wires.	Replace.
	Blown fuse in blower circuit.	Replace.
	Bad blower switch.	Replace.
	Bad brushes in blower motor.	Replace brushes.
	Blower suction fan corroded.	Clean with wire brush and reinstall.



SECTION VII

Fresh Water System

1. DESCRIPTION.

a. Fresh water is supplied from a 50-gallon copper water tank under the cockpit floor between the fuel tanks.

b. A line of flexible copper tubing leads from the bottom of the tank to the galley sink pump. The flow of water is regulated by a gate valve near the tank.

c. The tank is filled through a deck plate in the center of the forward cockpit floor.

d. The brass sink pump is of standard design.

2. SERVICING.

a. FRESH WATER TANK.

(1) FILLING THE TANK.

(a) The drinking water should first be checked to make sure it is safe for drinking.

(b) Clean a portion of the deck around the deck plate to prevent dirt from being washed into the tank when the filler cap is removed.

(c) Unscrew the filler cap, using the special key.

(d) Run a hose from the shore connection to the tank. *(See figure 146.)* Do not turn the water on until the hose is in the filler pipe. Water spilled on the deck may wash dirt into the tank.

CAUTION

If it is necessary to carry water in a vessel, make sure that the vessel is clean. Pour into the tank through a funnel.

(e) Replace the filler cap as soon as the tank is filled.

(2) CHECKING SEAMS. — Check the seams of the tank daily to make sure they do not leak.

b. GALLEY PUMP.

(1) PRIMING.—If the pump loses its prime, hold a finger over the spigot to create a vacuum while the handle is operated. *(See figure 147.)* If it still does not prime, check the following:

(a) Examine the check valve near the tank to see that no dirt or foreign deposit is on the seat, preventing the valve from closing tightly and allowing air to pass through.

(b) Check the cup leather gaskets on the plunger. If they have become hardened, they should be replaced.

(2) REPLACING GASKETS.

(a) Remove the bolt connecting the handle to the parallel bars secured to the pump cylinder.



Figure 146—Filling the Water Tank



Figure 147—Priming the Galley Sink Pump

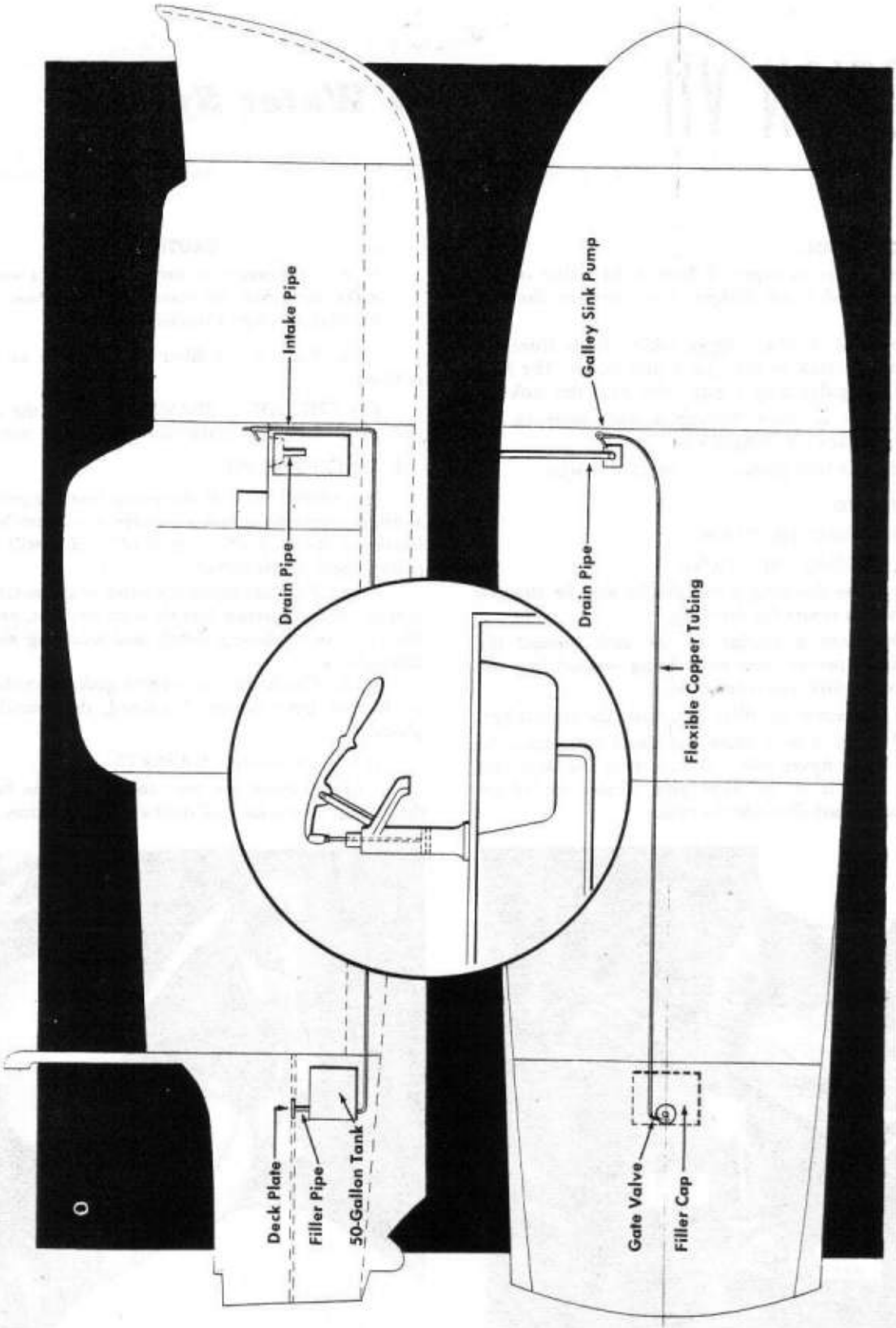


Figure 145—Fresh Water System

CAUTION

Be sure to hold the pump cylinder in place with a strap wrench as in figure 148. This will keep the cylinder from turning and twisting the pipe to which it is connected.

(b) Lift out the plunger and replace the gaskets. (For replacing cup leather gaskets, refer to section VIII, paragraph 4.)

3. TROUBLE SHOOTING.

TROUBLE	*PROBABLE CAUSE*	*REMEDY*
PUMP DOES NOT PRIME OR PRODUCE WATER	Faulty cup leather gaskets. Faulty check valve. Leak in tank seams.	Replace gaskets. Clean seat or replace valve. Repair tank.

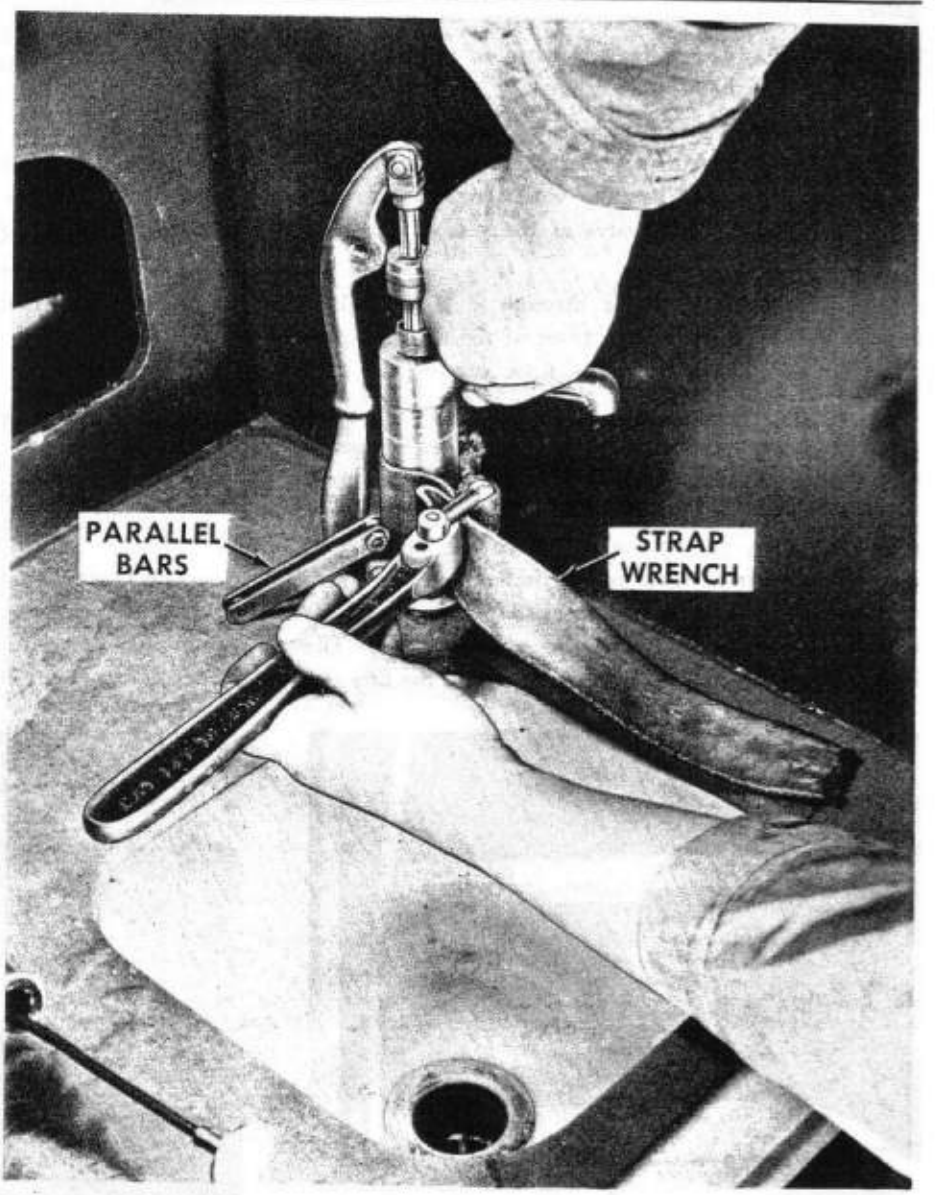


Figure 148—Unscrewing Spigot from Pump Cylinder

SECTION VIII

Sanitary System

1. DESCRIPTION.

The sanitary system consists of the toilet and the galley sink drain.

a. TOILET.—The toilet is located in the after starboard corner of the forward cabin.

(1) Intake is made through a line of ¾-inch lead tubing connecting with a seacock through the hull between the galley and lavatory compartment. This line is controlled by a gate valve at the seacock opening. *(See figure 149.)*

(2) Discharge is made through a 1¼-inch lead pipe to a seacock directly in front of the toilet. A gate valve controls this line at the floor connection. *(See figure 150.)*

(3) A shut-off valve in the intake line is opened by a foot pedal and the bowl filled by a hand pump. At the upstroke of the handle, the piston is forced down in the cylinder, raising the ball from the check valve and allowing raw water to be drawn into the valve chamber. *(See figure 151.)* At the downstroke of the handle, the piston is forced up in the cylinder. The ball drops and allows water to pass through the line and into the bowl. The bowl empties into the discharge line through a flap valve and into the cylinder bottom. Another flap valve in the outlet allows water to flow through the discharge line to the seacock. The downstroke of the handle closes the discharge line valve, opens the bowl valve, and draws the water from the bowl into the pump cylinder. The upstroke of the handle closes the bowl valve, opens the discharge line valve, and drives the water into the discharge line.

b. GALLEY SINK DRAIN.—The galley sink drain is a line leading directly to the seacock with a shut-off valve at the hull connection.

2. OPERATION.

a. TOILET.—Keep the seacock valves open.

(1) Open the intake valves by stepping on the foot pedal which releases the valve spring, allowing water to pass through the intake line.

(2) Operate the pump until the bowl is flushed. If the bowl does not empty, release the foot pedal and pump until emptied. Be sure to leave water in the bowl. If necessary, pump raw water into the bowl again.

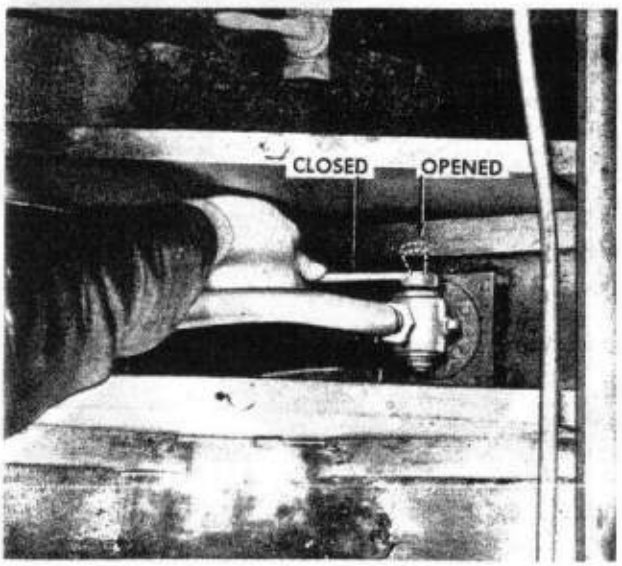


Figure 149—Toilet Intake Line Gate Valve

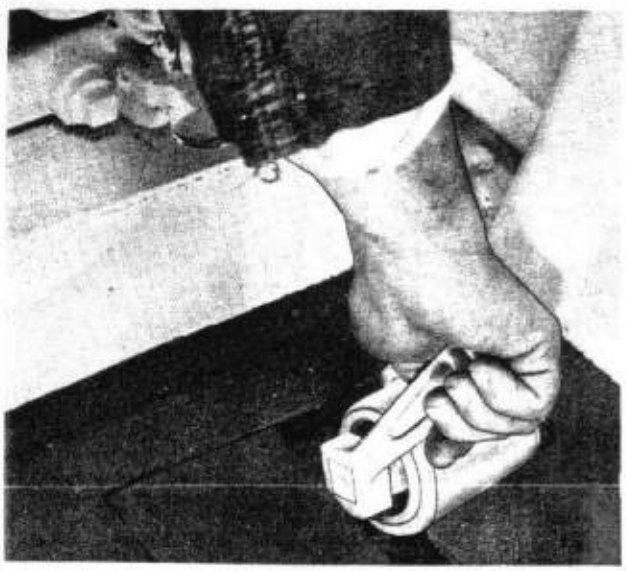


Figure 150—Toilet Discharge Line Gate Valve (Opened)

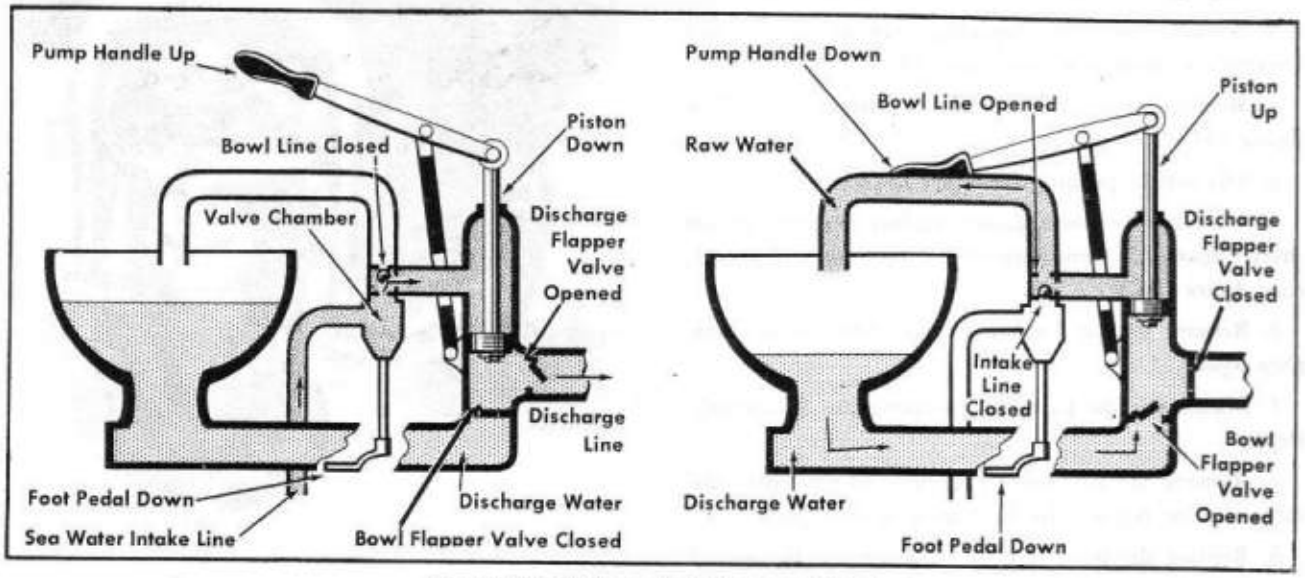


Figure 151—Schematic Diagram of Toilet

CAUTION

Do not throw matches, wads of paper, or other foreign matter into the toilet bowl. They will plug the discharge line. Matches, especially, often catch in the flap valves and prevent them from closing completely.

b. GALLEY SINK DRAIN. — Normally, the gate valve at the hull connection should be left open.

CAUTION

Do not pour into the sink grease, paint, or other materials which will coat or clog the pipes.

3. SERVICING.

In case of a leak or a break in the pipe line between the toilet or sink and a through-hull connection, turn off the gate valve near the hull to prevent water entering the seacock from splashing out through the break in the pipe.

a. TOILET.

(1) The most frequent trouble with the toilet is due to faulty flap valves. Salt water hardens the leather, allowing water and air to pass through. They become hardened also if the toilet is allowed to dry. In such cases they must be replaced. When replacing, grease them with salt waterproof grease, Specification No. AN-G-4, grade AA. This will prolong the use of the flap valves.

(2) A faulty ball-check valve is due to nicks in the ball or dirt deposits on the valve seats. In such cases, replace the ball *(figure 158)* or clean the valve body.

(3) Leaking piston gaskets should be replaced.

(4) Keep the packing nut around the piston rod tightened so it does not leak. When necessary, renew the packing under the nut. Ordinary cotton string is suitable for packing.

(5) If the toilet loses its prime and fails to pump, pour a pail of water into the bowl and flush it down.

(6) If the boat lies idle for a long time and the toilets are not used, the seacock grate may become clogged with marine growth and must be cleaned out.

(7) Kits are made available for servicing the sanitary system. These kits contain the proper ball-check valves, piston gaskets, flap valves, and other parts which are frequently replaced.

(8) All fittings on the toilet should be brass. Salt water will rust and corrode other metals in a short time.

b. GALLEY SINK DRAIN.

(1) If the flow of water out of the drain is sluggish, remove and clean the strainer.

(2) If the drain is still sluggish, flush it out with a lye solution.

(3) Flush out the drain with a lye solution at the time of every overhaul.

(4) Make repairs in pipes, valves, and fittings as in section III, paragraph 5.*e.*

4. PROCEDURE FOR REPAIRING TOILET PUMP.

a. Remove the cotter keys from the clevis pins and remove the clevis pins. *(See figure 152.)*

b. Remove four screws from the cylinder top. *(See figure 153.)*

c. Lift out the piston. *(See figure 154.)*

d. Unscrew the lower gasket retainer from the piston shaft *(figure 155)* and remove the retainer and gasket. *(See figure 156.)*

e. Remove the cup leather gaskets from the retainers. *(See figure 157.)*

f. Reassemble the pump by reversing the disassembly steps.

g. Remove the ball valve *(figure 158)* and clean the valve seat or replace the ball valve if damaged.

h. Replace the bowl flapper valve on the bottom of the cylinder. *(See figure 159.)*

i. Replace the discharge flapper valve. *(See figure 160.)*

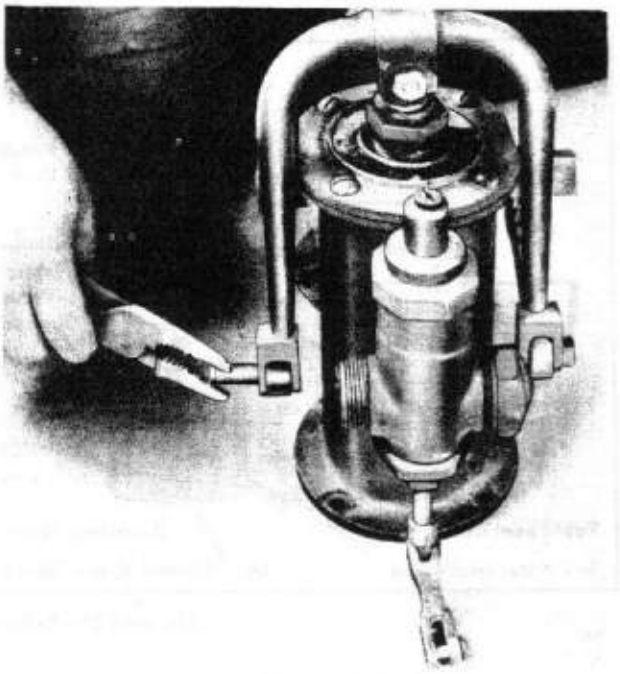


Figure 152—Removing Clevis Pin

5. TROUBLE SHOOTING.

TROUBLE	*PROBABLE CAUSE*	*REMEDY*
TOILET PUMP WILL NOT PRIME	Intake seacock closed.	Open seacock.
	Toilet dry.	Pour water in bowl and flush.
	Faulty ball-check valve.	Refer to paragraph 3.*a.*(2), this section.
	Faulty piston cup leather.	Replace cup leather.
	Plugged intake line seacock.	Clean seacock.
	Broken intake line.	Close intake shut-off valve and repair line.
TOILET PRIMES BUT DOES NOT SEND WATER TO BOWL	Faulty ball check valve.	Refer to paragraph 3.*a.*(2), this section.
	Faulty piston cup leather.	Replace cup leather.
TOILET BOWL FILLS WITH WATER FASTER THAN IT IS PUMPED OUT	Outlet seacock closed.	Open seacock.
	Faulty flap valves.	Clean or replace flap valves. (Refer to paragraphs 4.*g.* and *h.*, this section.
	Clogged outlet line.	Turn off intake shut-off valve and operate pump.
SINK DOES NOT DRAIN OR DRAINS SLOWLY	Seacock closed.	Open seacock.
	Sink strainer clogged.	Clean strainer.
	Line clogged.	Flush line with lye solution.
BREAK IN DRAIN LINE		Close seacock; do not use sink until break is repaired.

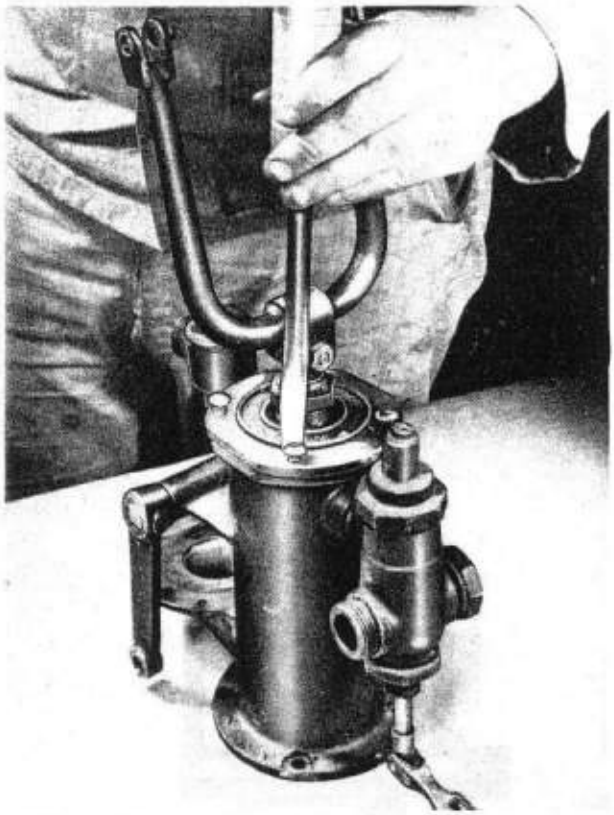


Figure 153—Removing Screws from Cylinder Top



Figure 154—Lifting Piston from Cylinder

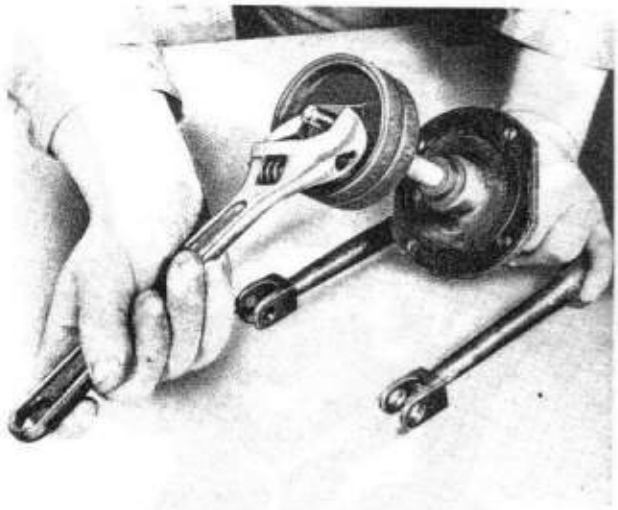


Figure 155—Unscrewing Gasket Retainer from Piston Shaft

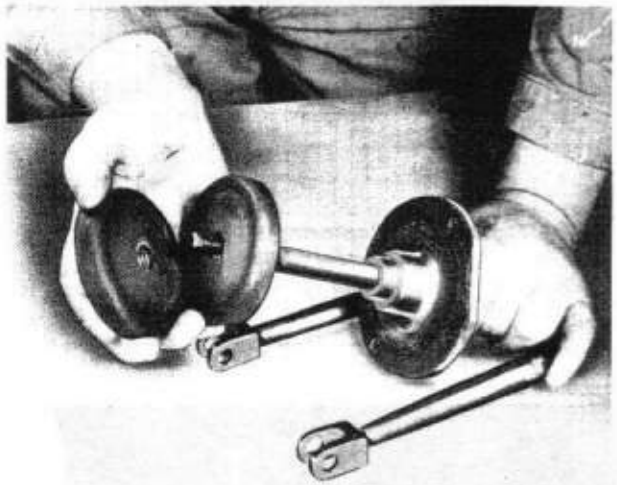


Figure 156—Removing Retainer and Gasket



Figure 157—Removing Cup Leather Gaskets from Retainers



Figure 159—Replacing Flap Valve on Cylinder Bottom



Figure 158—Removing Ball from Valve Chamber

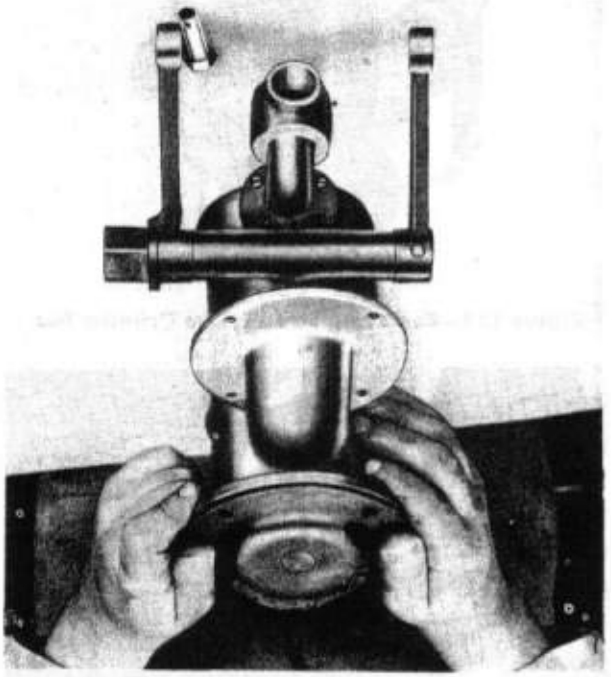


Figure 160—Replacing Flap Valve Over Discharge Line

SECTION IX Bilge Pumping System

1. DESCRIPTION.

a. The bilges are pumped by a rotary hand suction pump *(figure 162)* mounted on the after bulkhead of the forward cabin under the companion ladder. *(See figure 163.)* The intake pipe connects on the engine compartment side of this bulkhead. At the bottom of the pipe a rubber hose connection between the pipe and strainer allows for vibration. (See inset, *figure 161.*) A bilge strainer box on the end of the hose connection keeps foreign matter from entering the system and plugging it or damaging the pump.

b. Bilge water drains from all compartments to the lowest part of the boat, at the engine compartment forward bulkhead, through limber holes in each frame. Two-way shut-off valves allow water to drain through each watertight bulkhead. *(See figure 164.)*

c. The discharge pipe passes through the galley and out a through-hull connection. It has a short length of flexible hose inserted just inside the hull to allow for vibration.

d. A portable bilge pump with a hose attachment is provided for emergencies or for pumping the bilge in places from which the rotary pump does not pull the water.

2. OPERATION.

a. All valves should be closed when the pump is not being operated. They are accessible through floor hatches and are located as follows: *(See figure 161.)*

(1) Forward bulkhead of forward cabin.

(2) After bulkhead of forward cabin.

(3) After bulkhead of engine compartment.

(4) After bulkhead of the after cabin.

b. If the bilge water in the engine compartment becomes higher than the water in the adjoining bilges, pump out the engine compartment first to prevent oil or gasoline in the engine room bilge from getting into other compartments.

c. It is not necessary to pump rapidly, for the suction draws water faster than it drains through the limber holes. Pumping slowly will eliminate the danger of pumping the pump dry, causing it to lose its prime.

d. The portable bilge pump may be used to drain the bilge water from any part of the boat. A bucket may be used as shown in figure 165 if the hose is not long enough to reach overboard.

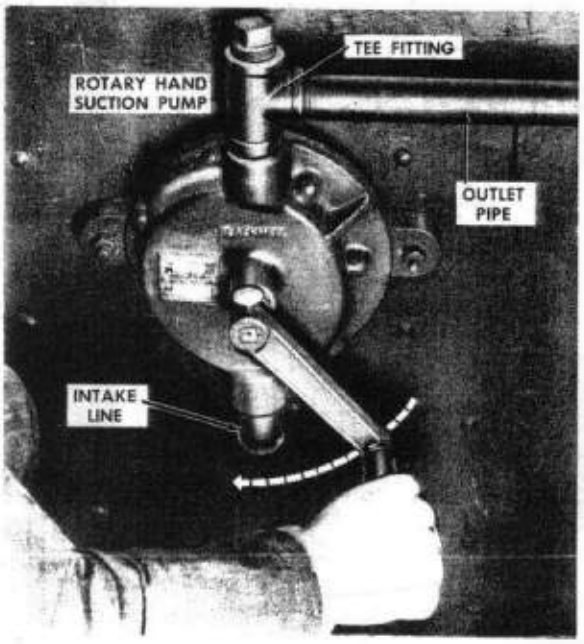


Figure 162—Operating the Bilge Pump



Figure 163—Removing Companion Ladder Over Bilge Pump

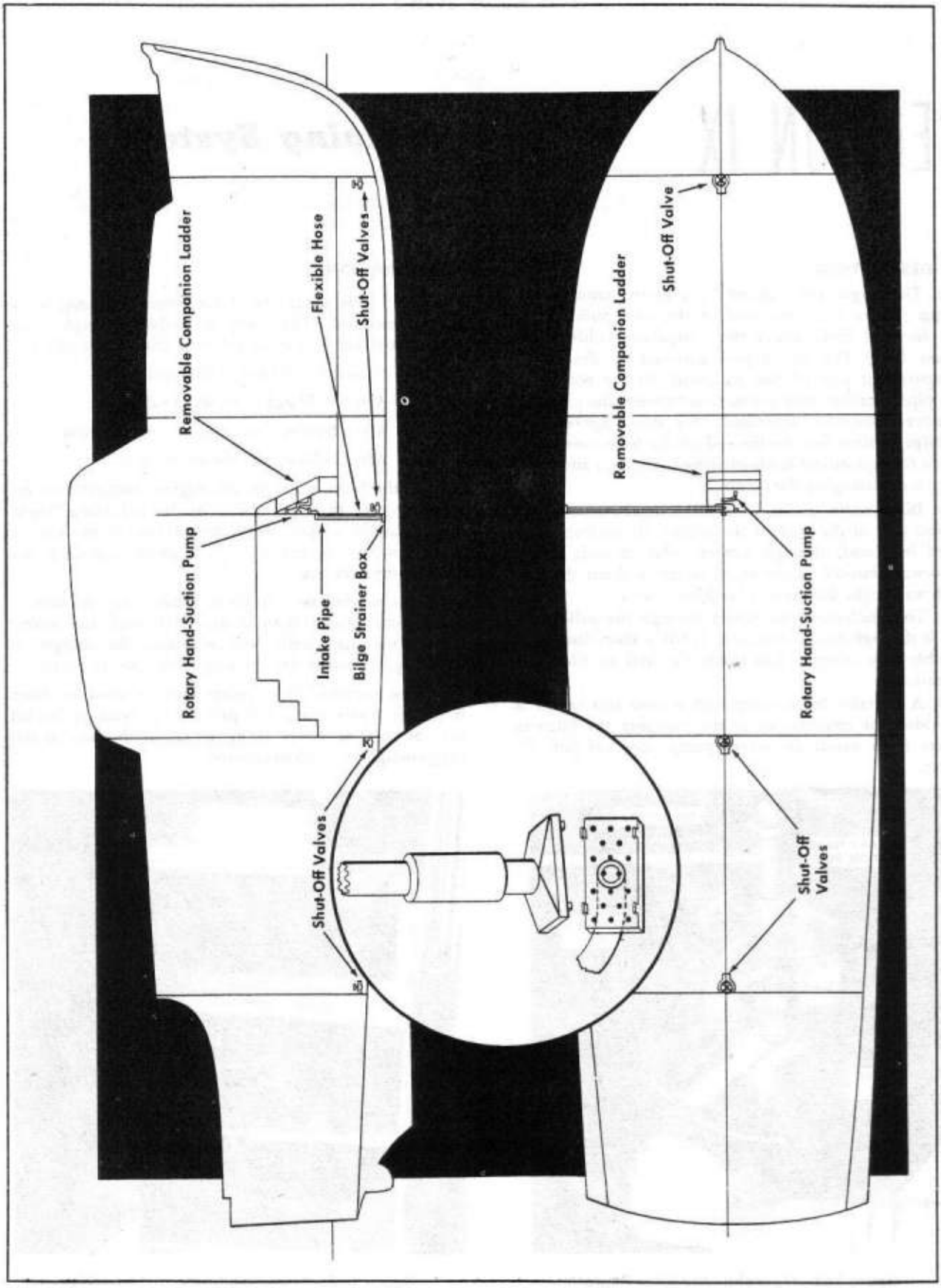


Figure 161—Bilge Pumping System

3. SERVICING.

A tee fitting *(figure 162)* should be installed in every pump to simplify lubrication. Otherwise it is necessary to remove the outlet pipe line. Frequent removal and the use of wrenches will damage the pipe.

a. CLEANING. — The strainer should be cleaned during every 50-hour check. Since the strainer is attached to a flexible hosing, it is easily accessible. (See inset, *figure 161.*) Wipe it clean with the hand, a rag, or a stick.

b. LUBRICATION.—The bilge pump is lubricated through the tee fitting. Use a heavy cup grease, Specification No. AN-G-4, grade AA. Proceed as follows:

(1) Remove the plug from the tee.

(2) Fill the tee with grease. *(See figure 166.)*

(3) Turn the pump handle several times to distribute grease throughout the pump.

(4) Replace the plug.

c. PRIMING. — When the pump loses its prime, grease as in the preceding paragraph. If it does not prime following a greasing operation, pour water into the tee *(figure 167)* and pump it through.

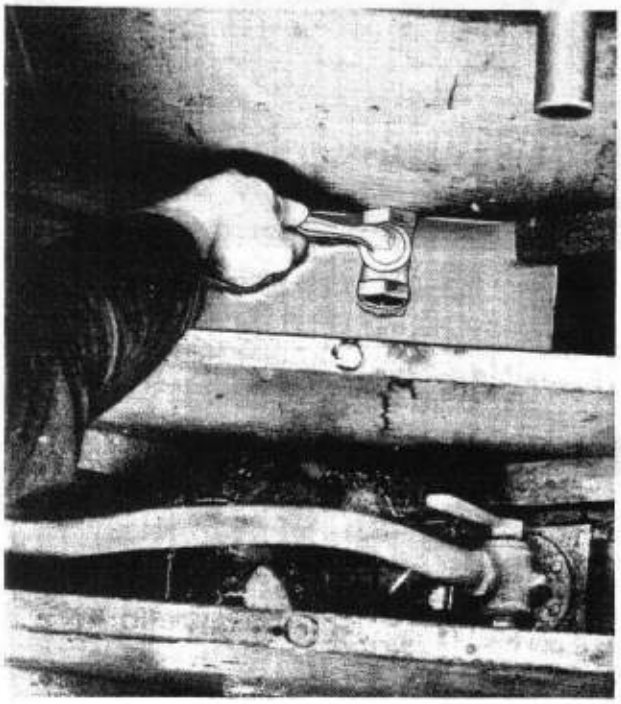


Figure 164—Two-way Shut-off Valve (Opened)

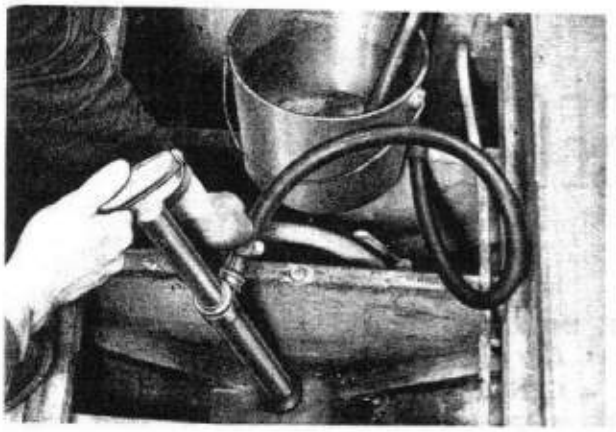


Figure 165—Portable Bilge Pump

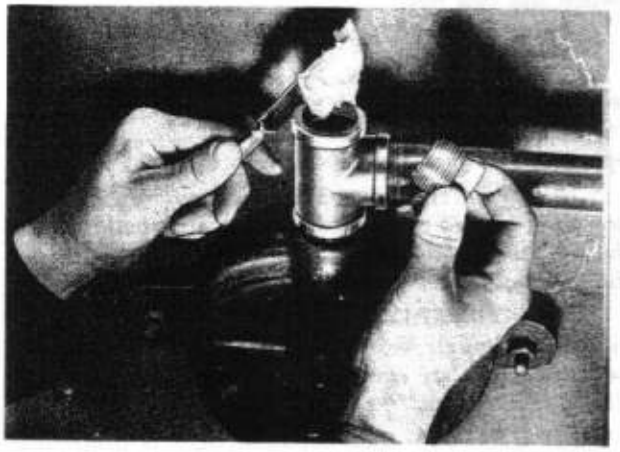


Figure 166—Greasing the Bilge Pump

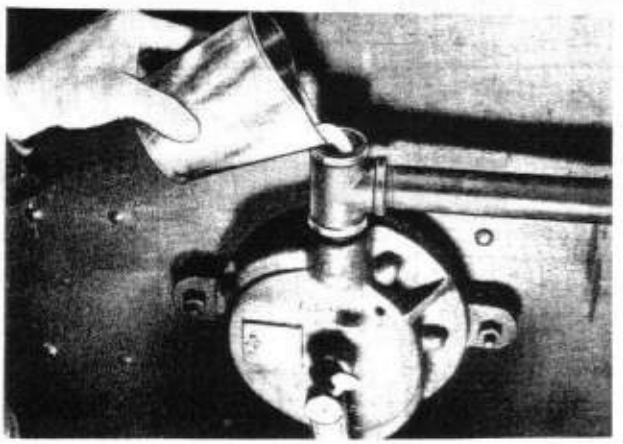


Figure 167—Priming the Bilge Pump with Water

4. TROUBLE SHOOTING.

TROUBLE	*PROBABLE CAUSE*	*REMEDY*
PUMP WILL NOT PRIME	Pump dry.	Fill tee with grease. Pour water in tee fitting.
BILGES PUMPING SLOWLY	Strainer clogged. Leak or break in intake or outlet pipe.	Clean strainer. Repair pipe.

SECTION X *Lighting and Signalling System*

1. INTERIOR LIGHTING.

(See figure 168.)

a. GENERAL.—The 12-volt interior lighting system is operated directly from either the starboard or port batteries as selected by the knife switch in the switch and fuse box.

b. DESCRIPTION AND OPERATION.

(1) AFTER CABIN. — The dome light is controlled by a toggle switch in the light socket *(figure 169)*. A bulkhead light in each radio compartment is operated by a turn button switch in the light socket.

(2) PILOTHOUSE.—Two bulkhead lights *(figure 170)*, located on the sides of the after bulkhead of the pilothouse, are worked by a turn button switch in the light socket.

(3) FORWARD CABIN.—One dome light is operated by a toggle switch in the light socket, and two bulkhead lights are equipped with turn-button switches in the light sockets.

(4) GALLEY.—One bulkhead light is controlled by a turn-button switch and equipped with a plug-in receptacle. *(See figure 170.)*

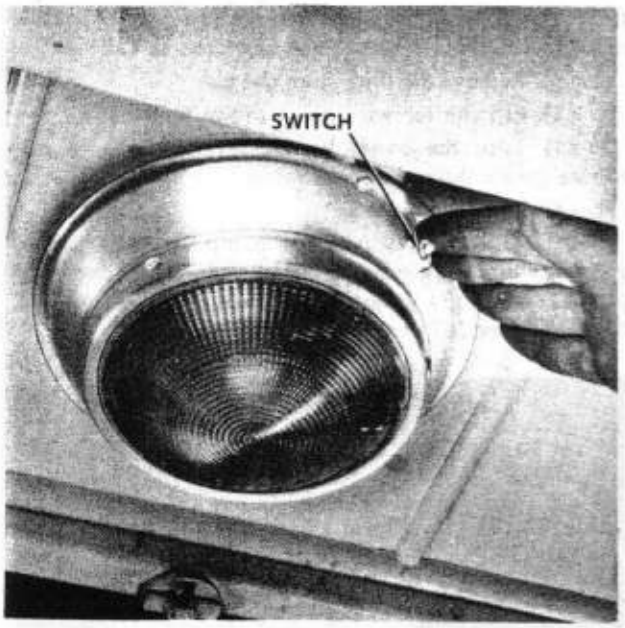


Figure 169—Dome Light and Toggle Switch

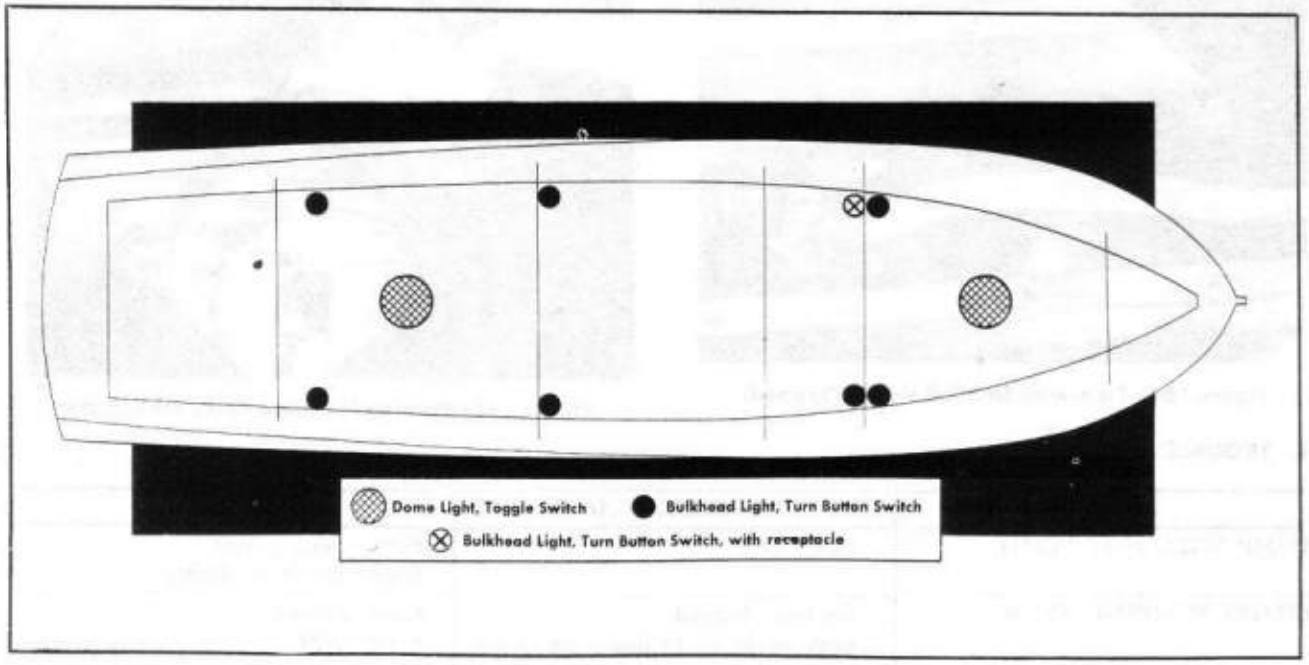


Figure 168—Location of Interior Lights

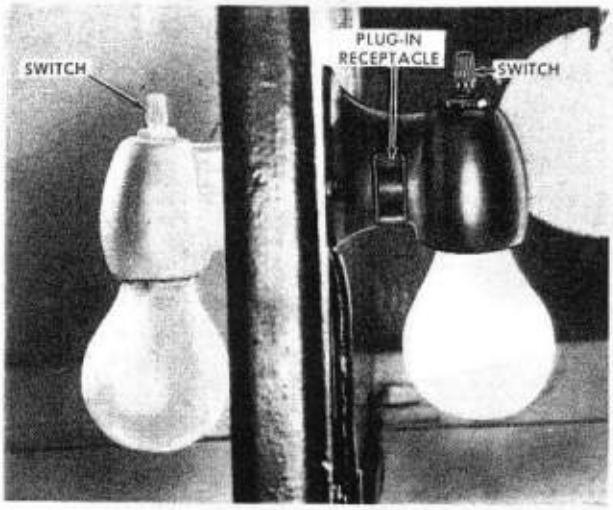


Figure 170—Bulkhead Light and Turn Button Switches

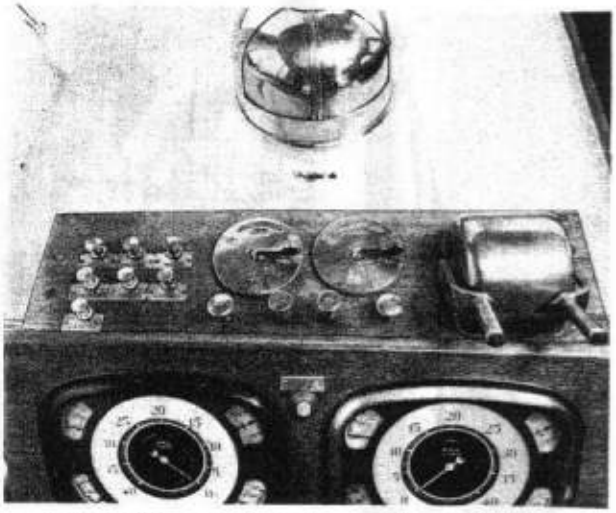


Figure 172—Exterior Light and Signal Switches

(5) TOILET. — One bulkhead light is controlled by a turn-button switch in the light socket.

c. SERVICE AND INSPECTION.—Unless the lights are inoperative, daily maintenance is not required. The lights should be checked daily, burned-out bulbs replaced, the switches operated, and the fuses visually inspected. If a light will not operate after switches, bulbs, and fuses have passed inspection, trace the wiring for frayed insulation or breaks. Replace any defective wiring found.

2. EXTERIOR LIGHTS.

(See figure 171.)

a. GENERAL.—The 12-volt exterior lighting system is operated directly from either the starboard or port batteries as selected by the knife switch in the switch and fuse box. All exterior lights are controlled from the instrument panel. *(See figure 172.)*

b. ANCHOR OR BLINKER LIGHT. — A white, 2½-inch globe *(figure 173)*, mounted at the top of the mast, is controlled with a push-pull switch *(figure 172)* on the engine instrument panel. This light can be used for "blinker" messages by pulling the anchor light switch to the "ON" position *(figure 173)* and moving the key cut-out switch *(figure 174)* to starboard. The anchor light can then be operated by the sending key. Moving the key cut-out switch to the port side *(figure 175)* will close the circuit and allow the anchor light to be controlled by the push-pull switch on the engine instrument panel.

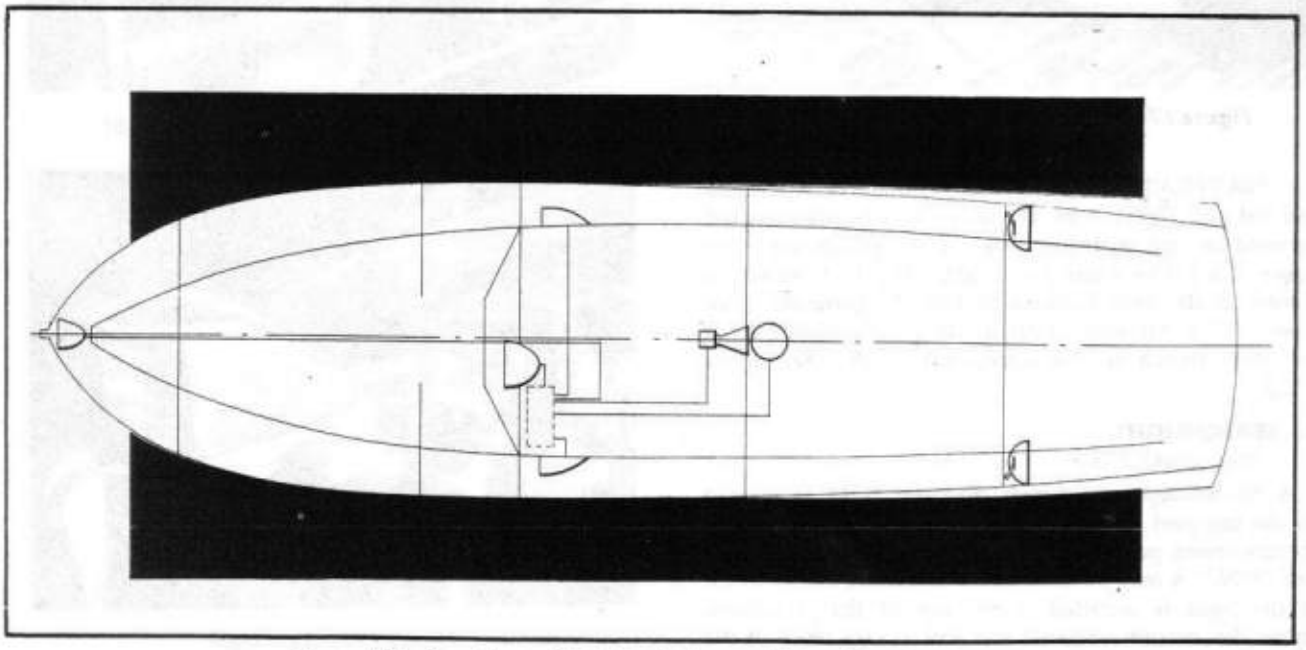


Figure 171—Location of Exterior Lights and Signalling Equipment

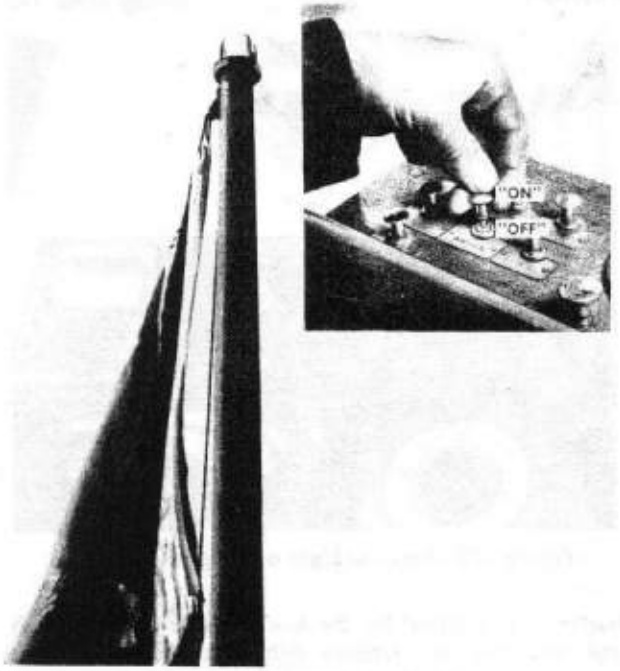


Figure 173—Anchor Light and Switch

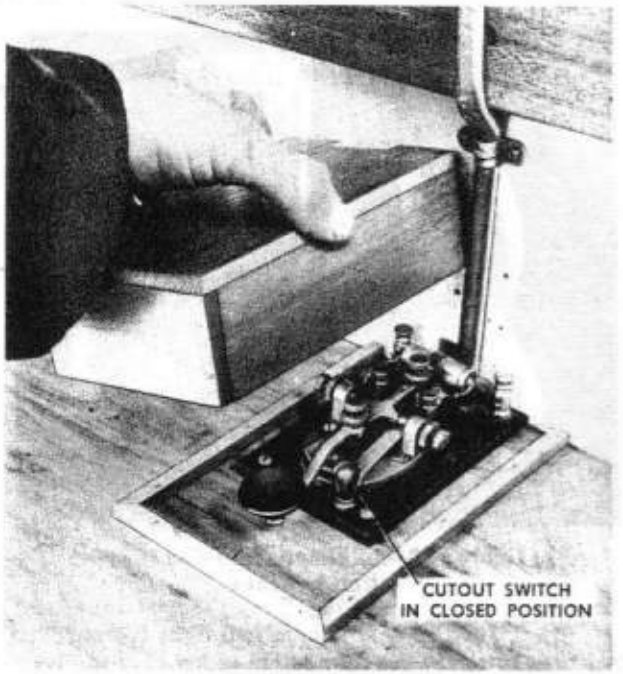


Figure 175—Key Cut-out Switch Closed

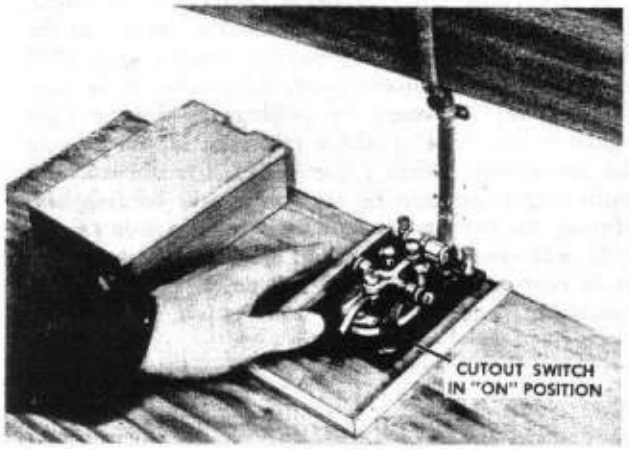


Figure 174—Anchor Light Sending Key and Cut-out Switch

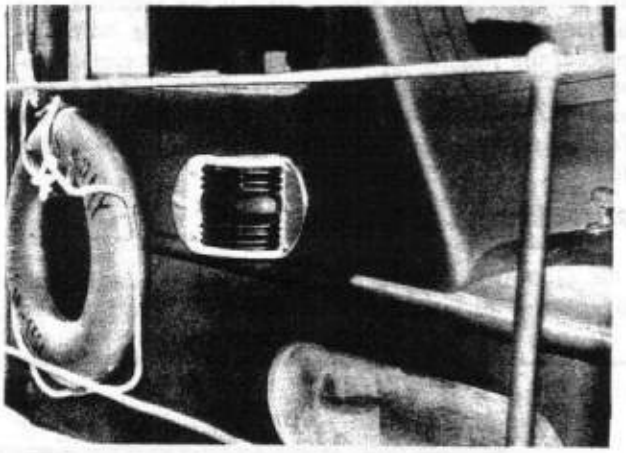


Figure 176—Starboard Navigation Light

c. NAVIGATION LIGHTS.—The green starboard and red port lights, 6 by 4½ inches in size, are installed forward on the outboard sides of the pilothouse. *(See figure 176.)* The white bow light, 5½ by 9 inches, is placed on the most forward part of the gunwales. *(See figure 177.)* All navigation lights are controlled by a pull-push switch on the instrument panel. *(See figure 172.)*

3. SEARCHLIGHT.

(See figure 178.)

A 50-candlepower, 8-inch diameter light is located on the top port side of the cabin. A push-pull switch on the instument panel *(figure 172)* turns the light "OFF" and "ON." A manual control for adjusting the position of the light is installed in the top of the pilothouse above the instrument panel and within easy reach of the

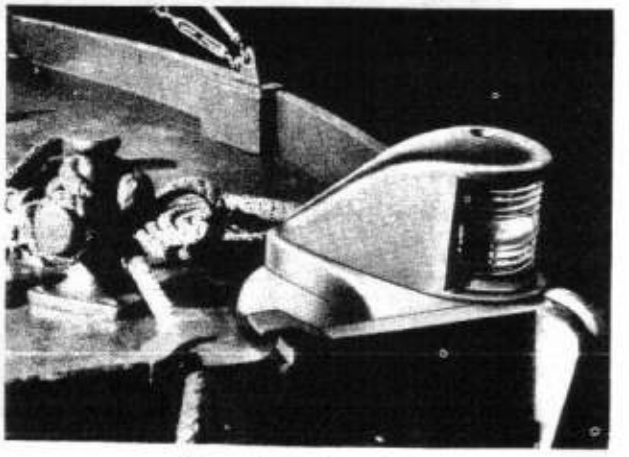


Figure 177—Bow Light

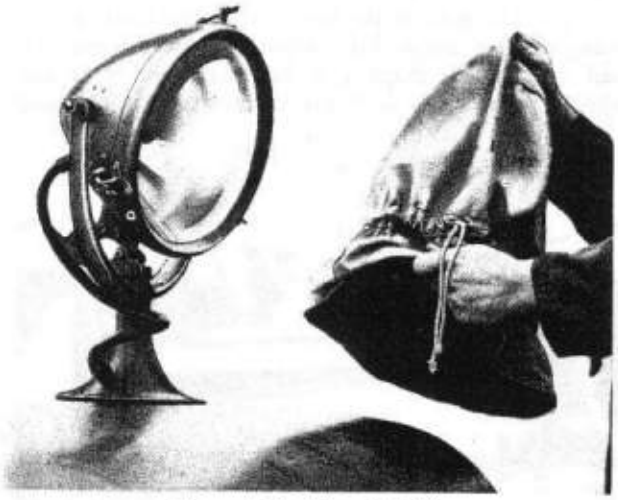


Figure 178—Searchlight

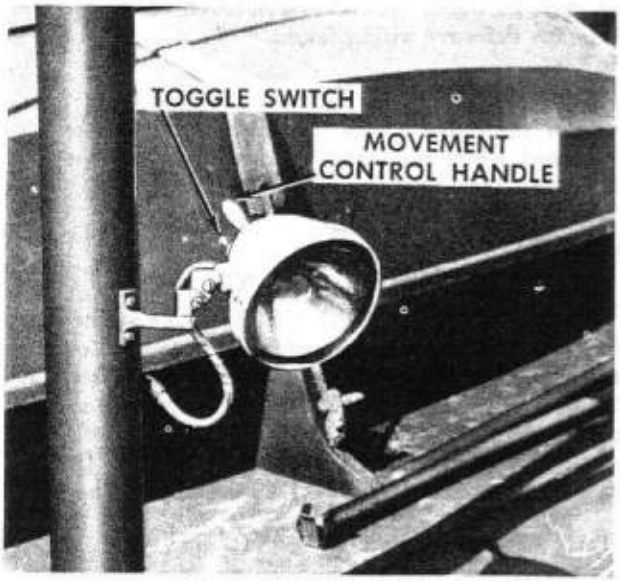


Figure 180—Floodlight

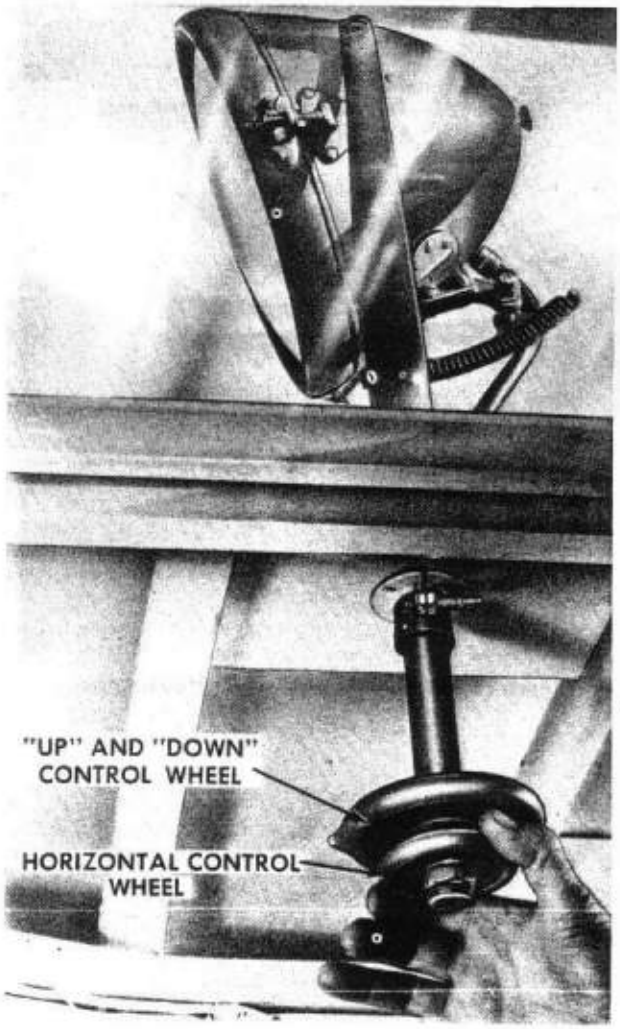


Figure 179—Searchlight Position Controls

master. Two wheel controls adjust the movement of the searchlight. *(See figure 179.)* The lower wheel moves the light sidewise; the upper wheel controls "UP" and "DOWN" movement. The position of the searchlight is visible through a skylight in the pilothouse top.

4. FLOODLIGHTS.

a. DESCRIPTION. — Two 32-candlepower, 6-inch diameter floodlights are attached to the galvanized iron ventilator posts in the forward corners of the cockpit. *(See figure 180.)* The "ON-OFF" toggle switch and handle for adjusting each light's position are both built into the lamp framework.

b. SERVICING.—The lights and switches should be checked daily, burned-out bulbs and fuses replaced, and lenses wiped clean. If a light will not operate after the

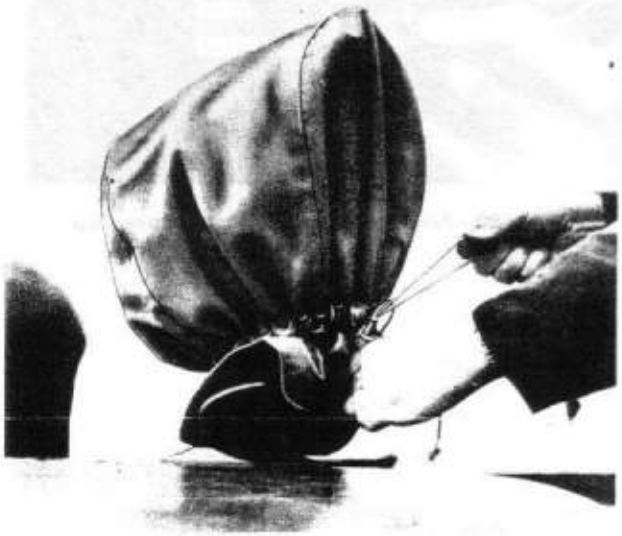


Figure 181—Searchlight Cover

switches, bulbs, and fuses have passed inspection, wiring must be traced for frayed insulation or breaks. Replace any defective wiring found.

Note

All protective covers should be securely fastened when the lights are not in use. *(See figure 181.)*

5. HORN.

(See figure 183.)

a. DESCRIPTION AND OPERATION.—The air-blown and electrically-operated horn is mounted on the after center of the pilothouse roof facing the stern. A 12-volt electric motor which drives a rotary-vane-type compressor is installed on the engine room after bulkhead. *(See figure 182.)* A button on the front face of the instrument panel *(figure 172)* actuates the horn.

b. SERVICE AND INSPECTION.

(1) Keep the oil reservoir on the horn motor *(figure 182)* filled with a light lubricating oil.

(2) Check the grease cup on the horn motor *(figure 182)* for proper level and fill with cup grease.

(3) If the horn does not respond to pressure on the "HORN" button, check the electrical wiring and the air line. Replace defective wiring and repair or replace broken air line.

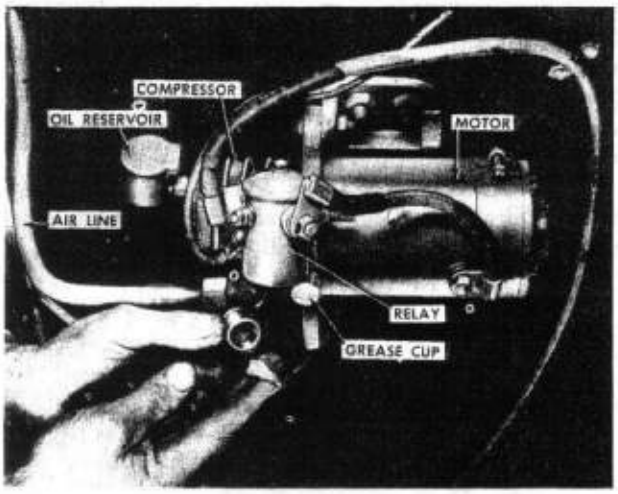


Figure 182—Filling the Horn Motor Grease Cup

(4) Occasionally salt water enters the horn and corrodes the diaphragm, in which case the horn will not operate. Remove the diaphragm housing and diaphragm. Clean or replace the diaphragm.

(5) The tone of the horn can be adjusted by loosening the lock nut and the adjusting screw *(figure 183)* and turning the diaphragm housing inwards or outwards *(figure 184)* until the desired tone is obtained.

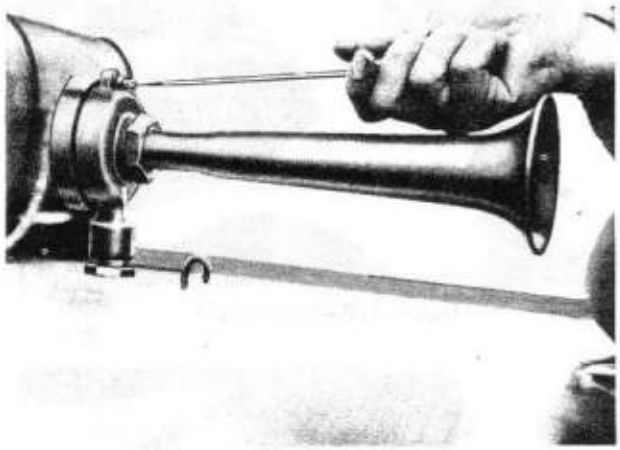


Figure 183—Loosening the Lock Nut and Adjusting Screw

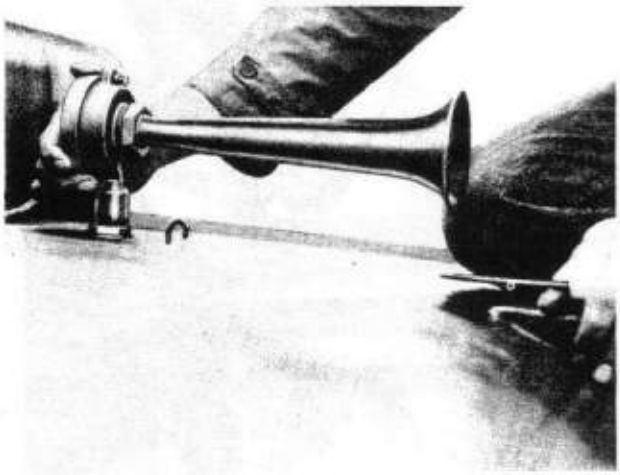


Figure 184—Moving Diaphragm Housing for Tone Adjustment

SECTION XI

Radio

1. GENERAL.

The radio equipment on some 42-foot boats may differ from that listed herein. Standard installations consist of the following:

a. One Bendix 3801 transceiver, loudspeaker, dynamotor, whip antenna, and two 12-volt batteries. *(See figures 185, 186, and 187.)*

b. Two BC-224 receivers, two loudspeakers, inverted L-wire antenna, and two 12-volt batteries. *(See figures 188, 189, and 190.)* Reference should be made to Handbook No. AN 08-10-180.

c. A ground plate *(figure 191)* located on the starboard side of the hull amidship.

2. BENDIX 3801 TRANSCEIVER AND ANTENNA.

a. DESCRIPTION.

(1) The Bendix 3801 transceiving equipment is located in the starboard radio compartment. It consists of the transceiver unit, one Magnavox LS-3 loudspeaker, one dynamotor, one Bendix 3407 jack box, one SW-109 microphone, and a CW key unit. *(See figure 192.)*

(2) The two 12-volt batteries are stowed in a small cabinet immediately below the radio equipment.

(3) An 18-foot whip antenna located on the starboard corner of the forward end of the cockpit is used for both transmitting and receiving.

b. OPERATION.

(1) Erect the whip antenna. *(See figure 193.)*

(2) Attach the battery leads to the battery. *(See figure 187.)*

(3) Make certain that the speaker, microphone and CW key plugs are plugged into the jack box. *(See figure 194.)*

(4) Throw the "OFF-ON" power switch *(figure 195)* to the "ON" position. Allow the set to warm up for 1 to 2 minutes.

(5) Move the channel selector knob *(figure 195)* to the desired frequency. The numbers "1," "2," and

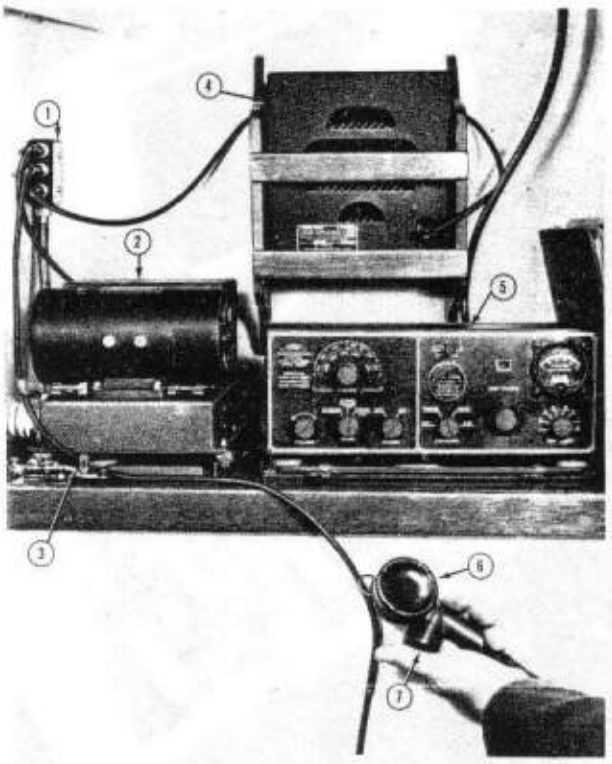


Figure 185—Bendix 3801 Transceiver and Related Equipment

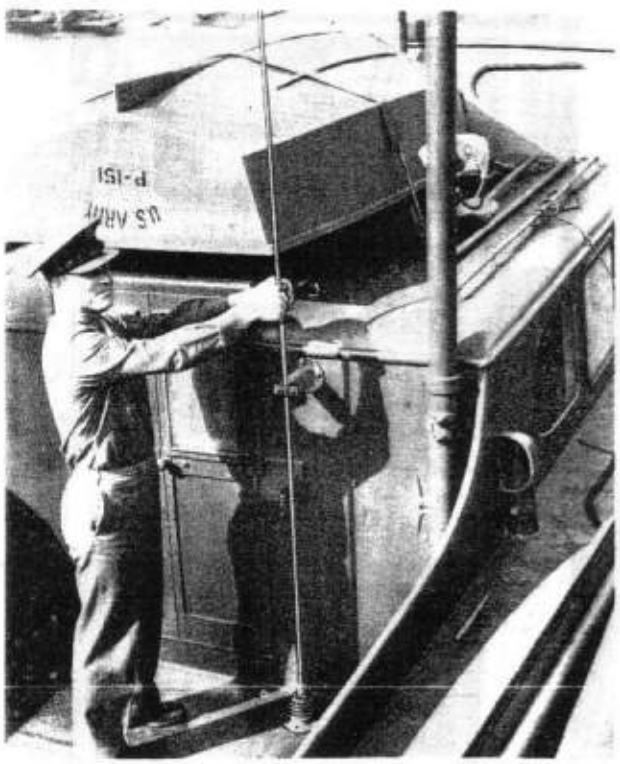


Figure 186—Whip Antenna for Bendix 3801 Transceiver

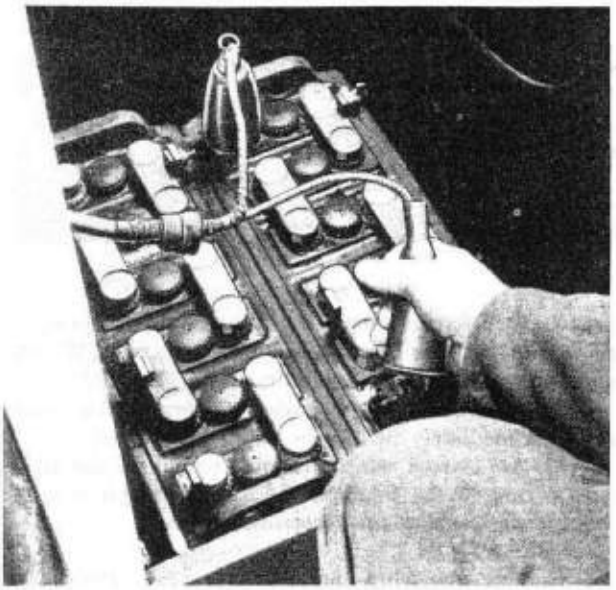


Figure 187—Batteries for Bendix 3801

"3" correspond to the three frequencies listed below the channel switch.

(6) Turn the emission switch *(figure 195)* to the "PHONE," position. (If CW will be used, the emission switch *(figure 196)* should be turned to the "CW" position.)

(7) Turn the band selector switch *(figure 195)* to the "COMM PHONE" position. (For CW sending this

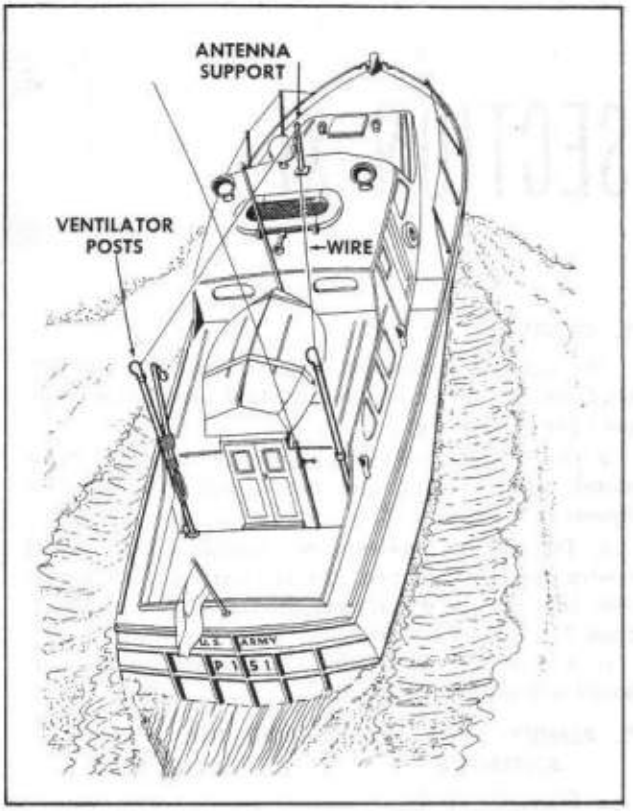


Figure 189—L-Wire Antenna Installation for BC-224 Receivers

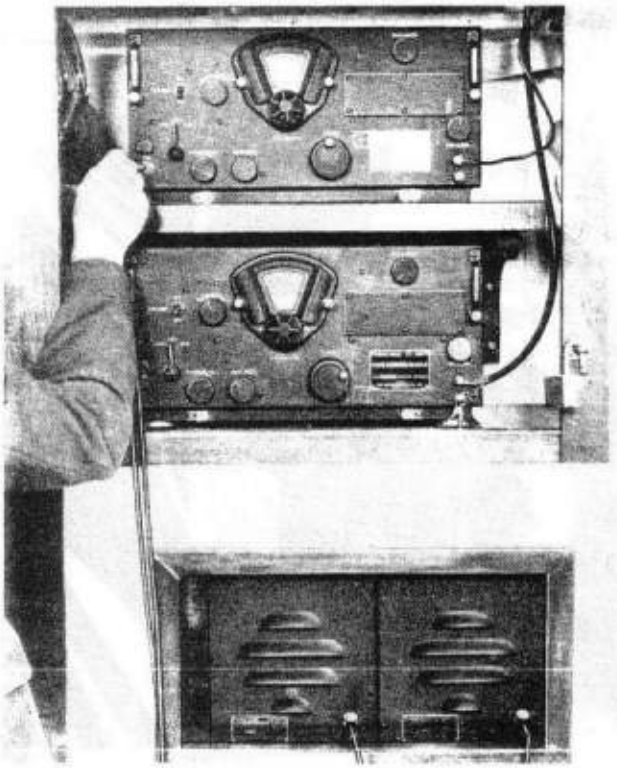


Figure 188—BC-224 Receivers and Loud-Speakers

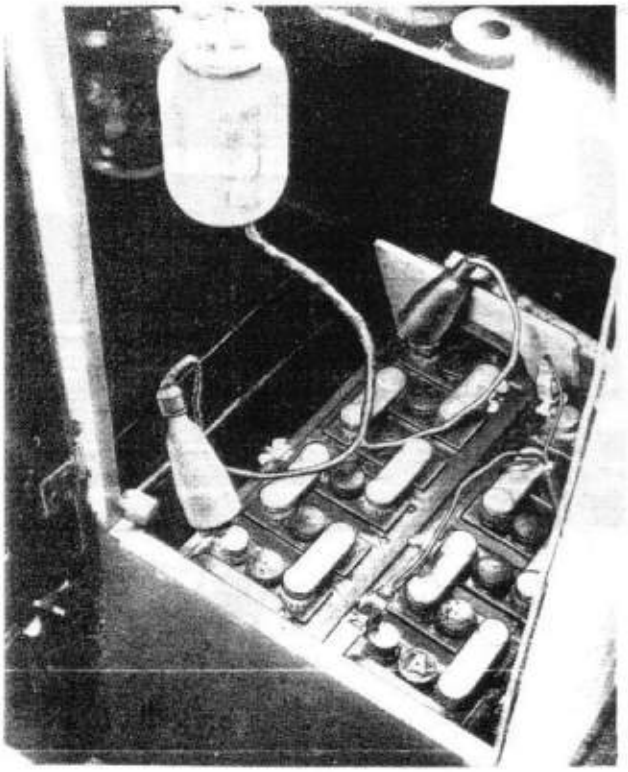


Figure 190—Batteries for BC-224 Receivers

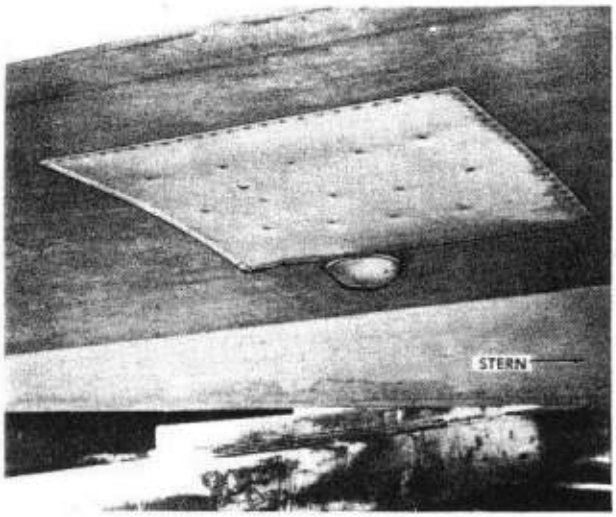


Figure 191—Radio Ground Plate

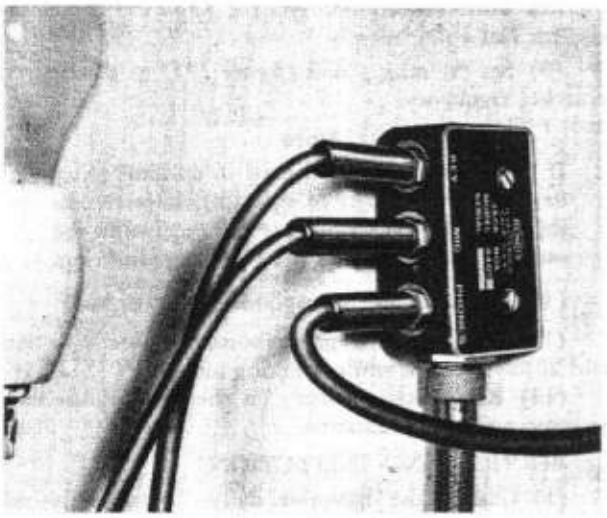


Figure 194—Plugs in Jack Box

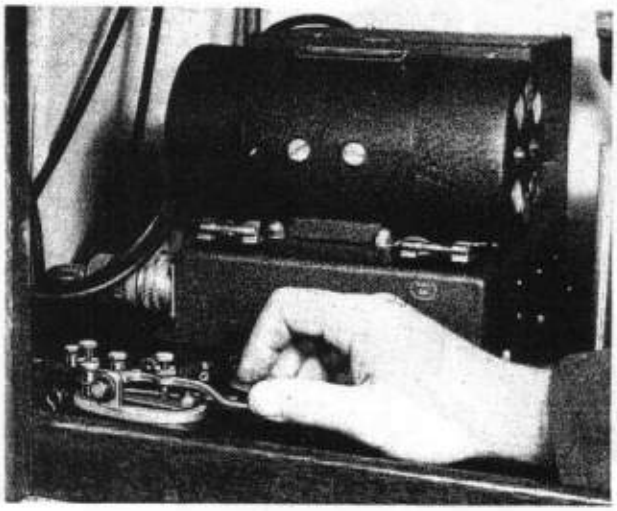


Figure 192—CW Sending Key

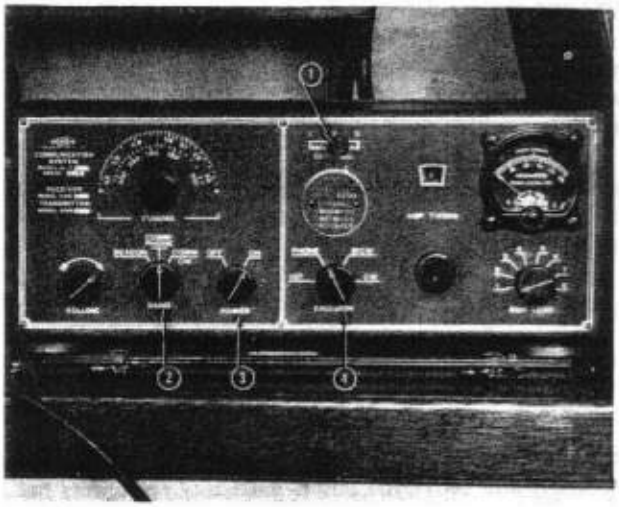


Figure 195



Figure 193—Erecting the Whip Antenna

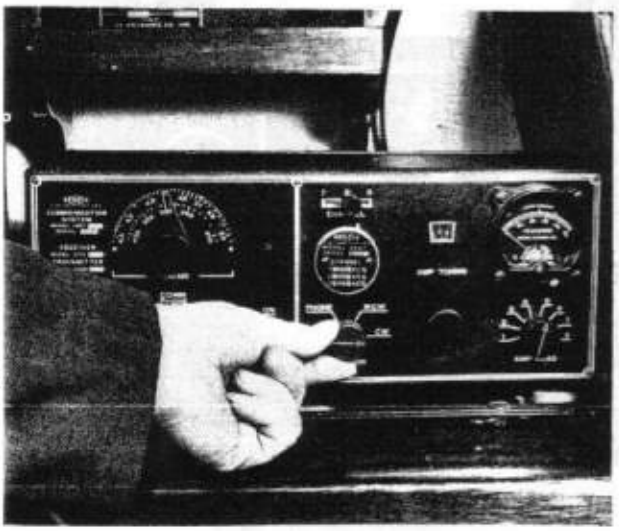


Figure 196—Emission Switch in "CW" Position

switch should be moved to "COMM CW" position.)

(8) Turn the volume control *(figure 197)* clockwise for full volume.

(9) Set the tuning dial *(figure 197)* to the desired receiving frequency.

Note

If these instructions are used in an emergency or by an inexperienced operator, it is recommended that the set be tuned to receive on the same frequency being used for transmitting.

(10) Remove the microphone from its hook.

(11) Press the microphone button *(figure 185)* and hold in this position while speaking message.

(12) Release the pressure on the microphone button upon end of transmission.

c. SERVICE AND INSPECTION.

(1) Charge the batteries daily. Immediately replace any battery which will not charge to full strength.

(2) Check the two fuses on the dynamotor *(figure 198)* and replace defective fuses.

(3) Check all the connections leading from the dynamotor to the transceiver for tightness and corrosion. Tighten loose connections. Remove corrosion with carbon tetrachloride.

(4) Check the antenna lead-in *(figure 199)*, the ground connection and all plugs for clean and tight connections. If the plugs are dirty, clean with burnishing paste and a soft cloth.

(5) Dust the exterior of the dynamotor, transceiver, and loudspeaker daily.

3. BC-224 RECEIVERS AND ANTENNAS.

a. DESCRIPTION.

(1) The two 8-tube, 6-band superheterodyne receivers are located in the port radio compartment *(figure 188)*, one above the other. Each receiver covers the

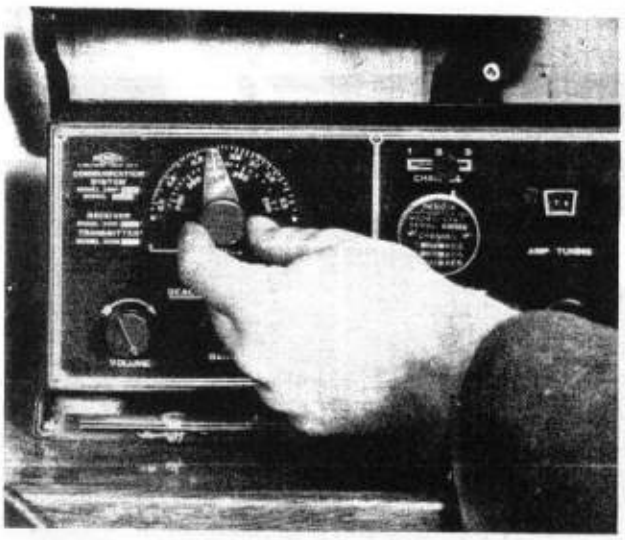


Figure 197—Tuning Dial and Volume Control, Bendix 3801

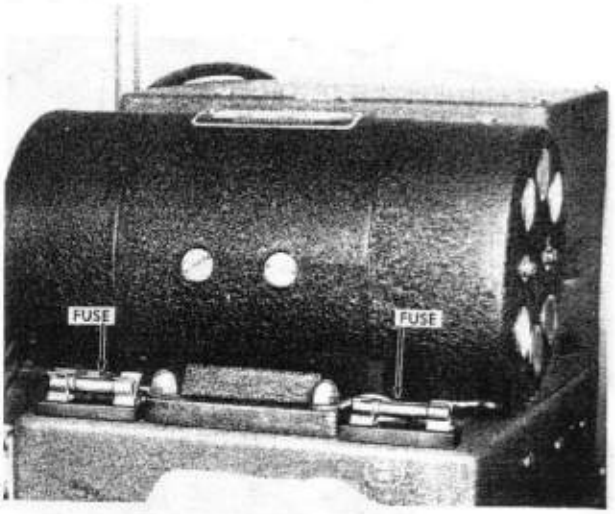


Figure 198—Dynamotor Fuses

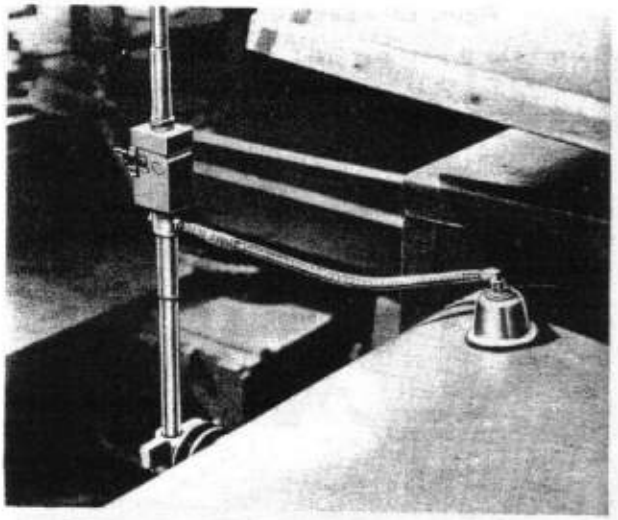


Figure 199—Antenna Lead-in for Bendix 3801 Transceiver

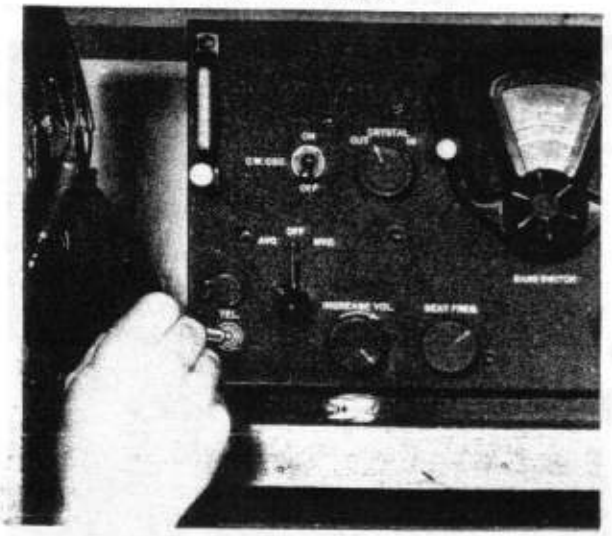


Figure 200—Plugging Speaker Into Jack

frequency range .2 to .5 mc and 1.5 to 18 mc. Two LS-3 speakers are used. The two 12-volt batteries are stowed in a small cabinet *(figure 190)* immediately below the receivers.

(2) A "flat-top" or inverted L-wire antenna is located above the pilothouse and after cabin. *(See figure 189.)*

b. OPERATION.

(1) Plug the speakers into the jacks marked "TEL." *(See figure 200.)*

(2) Set the receiver switch *(figure 201)* to "MVC" and turn the dial lights *(figure 202)* to the desired illumination.

(3) Turn volume control clockwise *(figure 203)* for increased volume.

(4) The crystal switch should be in the "OUT" position *(figure 203)* and the "BEAT FREQ" control pointing up and near the zero beat position. *(See figure 203.)*

(5) Select band and tune in station. *(See figure 204.)*

(6) For CW reception the procedure is the same with the exception that the CW OSC switch is placed in the "ON" position and tuning is done with the "BEAT FREQ" control set near the zero beat position (arrow on knob pointing up). After tuning in the signal, the "BEAT FREQ" control may be varied and the frequency of the beat note adjusted as desired.

c. SERVICE AND INSPECTION.

(1) Charge batteries daily. Immediately replace any battery which will not charge to full strength.

(2) Remove the two thumb screws *(figure 205)* and pull the set out of the cabinet *(figure 206.)* Check the 10-ampere fuse *(figure 207)* and replace if defective.

(3) Check the antenna lead-ins *(figure 208)*, the ground connections and all plugs for clean and tight connections. If plugs are dirty, clean with burnishing paste and a soft cloth.

(4) Dust the exterior of the dynamotor, transceiver, and loudspeaker daily.

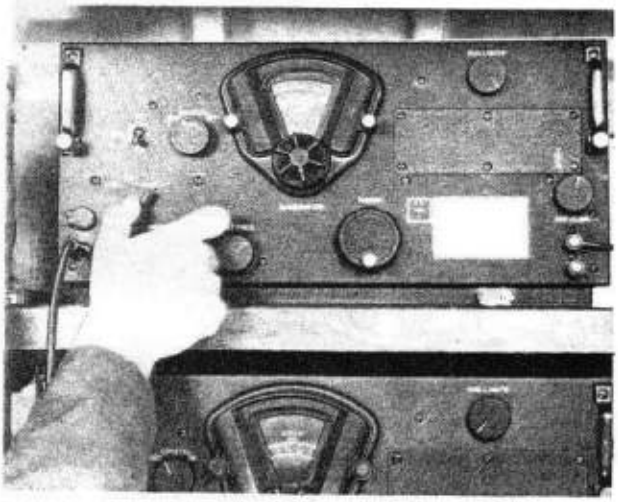


Figure 201—BC-224 Receiver Switch



Figure 202—BC-224 Dial Lights and Switch Cover Plate Removed

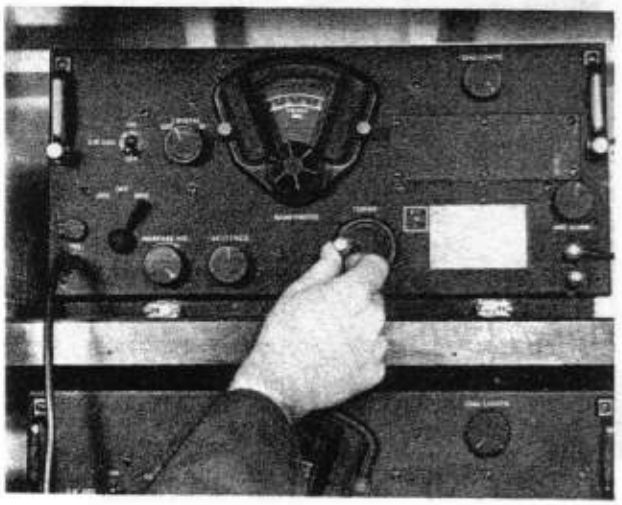


Figure 203—Crystal Switch, Volume Control, and Beat Frequency Control

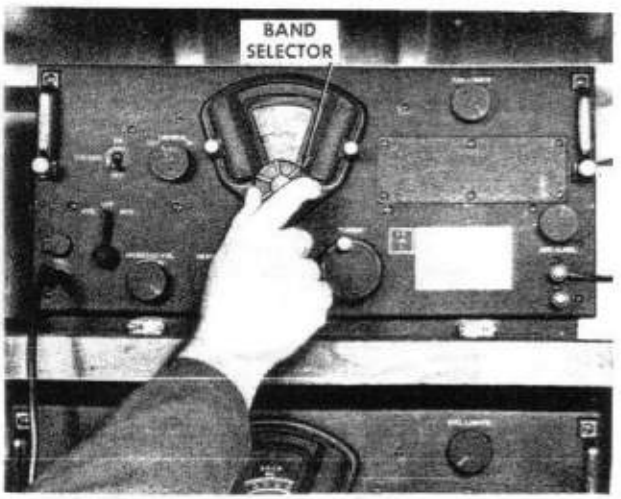


Figure 204—Receiving Band and Tuning Knob



Figure 205—Loosening Thumbscrews

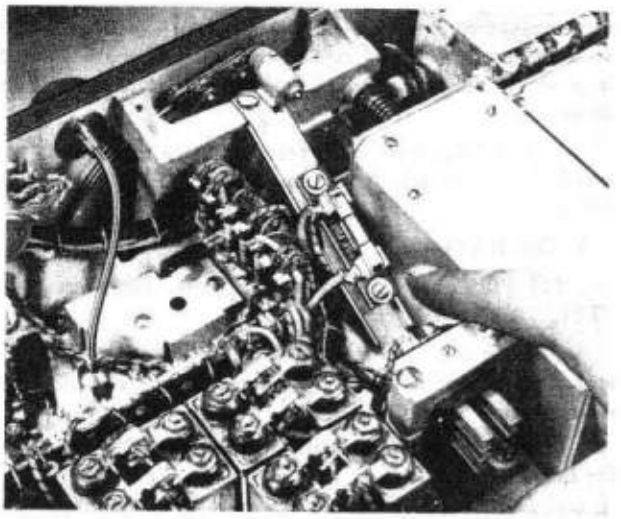


Figure 207—Checking the Fuse



Figure 206—Removing Set from Cabinet

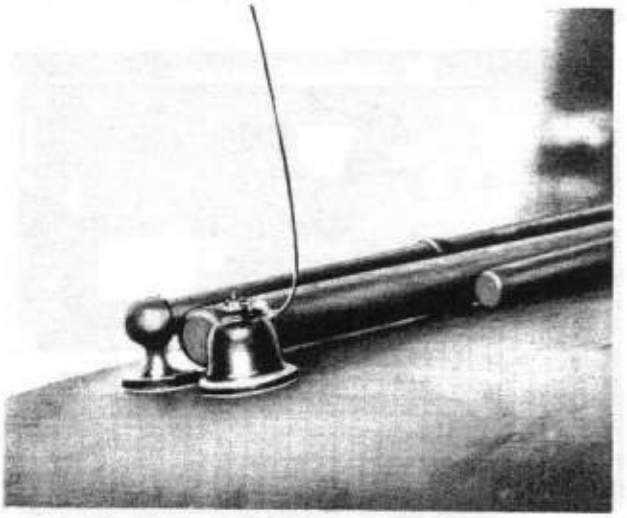


Figure 208—BC-224 Antenna Lead-in



SECTION XII

Miscellaneous

1. GALLEY STOVE.

a. DESCRIPTION.—The galley is equipped with a one-burner alcohol stove.

b. OPERATION.

(1) Fill the fuel tank with alcohol. *(See figure 209.)*

(2) Operate the pump *(figure 210)* several strokes to build up pressure in the tank.

(3) Open the valve *(figure 211)* and light the fuel that flows into the generating cup. Reopen and light the burner when the fuel pipe has been heated.

c. SERVICING.—If the pump fails, unscrew and remove the plunger *(figure 212)* and replace the worn leather cup gasket with a new one.

d. CLEANING.—To clean carbon from the burner and fuel lines, proceed as follows:

(1) Loosen the four screws that hold the rail brackets to the top of the stove. *(See figure 213.)*

(2) Turn the loosened brackets and lift the rails from their sockets. *(See figure 214.)*

(3) Remove the two screws from the burner flange. *(See figure 215.)*

(4) Disconnect the fuel line from the fitting at the rear of the stove. *(See figure 216.)*

(5) Unscrew the fitting from the straight fuel pipe leading to the burner. *(See figure 217.)*

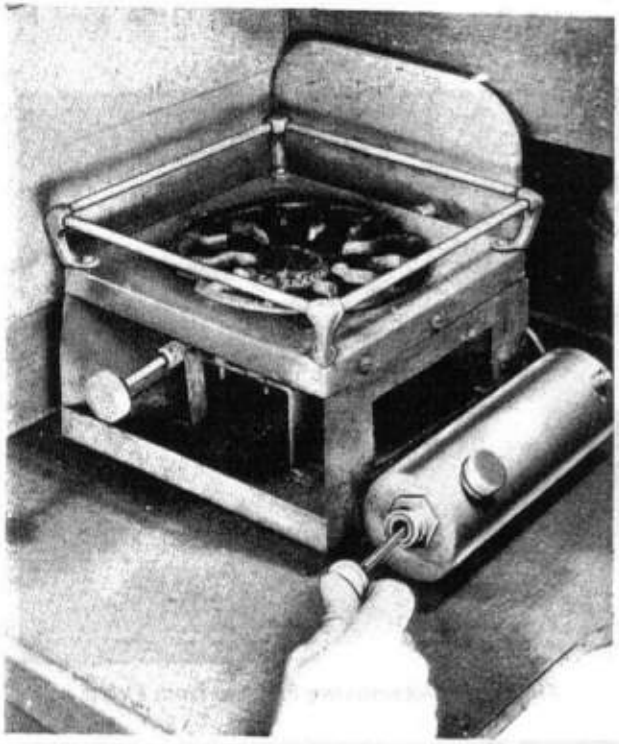


Figure 210—Pumping Up Tank



Figure 209—Filling Fuel Tank

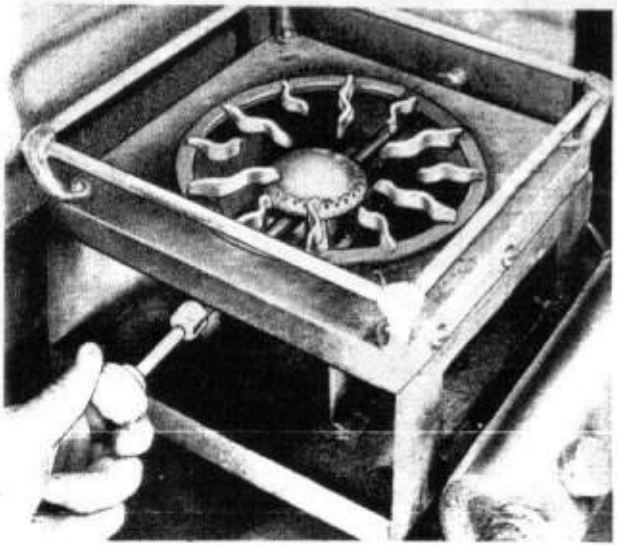


Figure 211—Opening Valve

(6) Lift out the burner assembly. *(See figure 218.)*

(7) Unscrew and remove the valve assembly. *(See figure 219.)*

(8) Blow out the fuel pipe with compressed air. *(See figure 220.)*

(9) Remove the screw for adjusting the flow of fuel *(figure 221)*, and blow out the screw hole. *(See figure 222.)*

(10) Separate the burner and the generating cup *(figure 223)* and clean them with a wire brush. *(See figure 224.)*

(11) Reinstall the cleaned parts of the stove by reversing the disassembly steps.

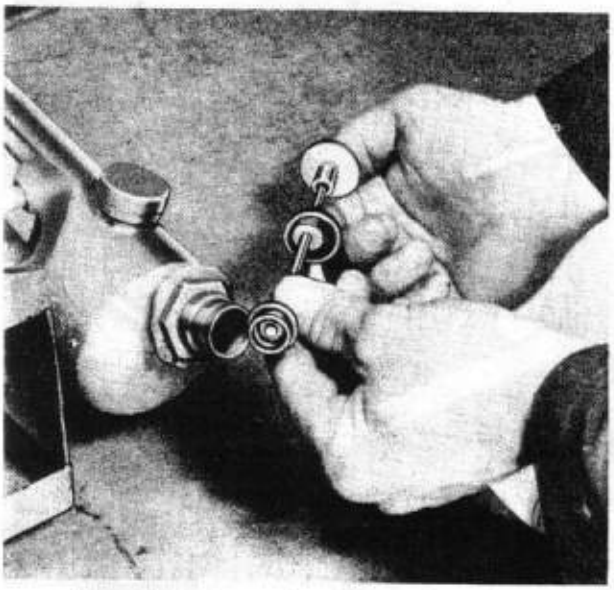


Figure 212—Removing Plunger from Pump

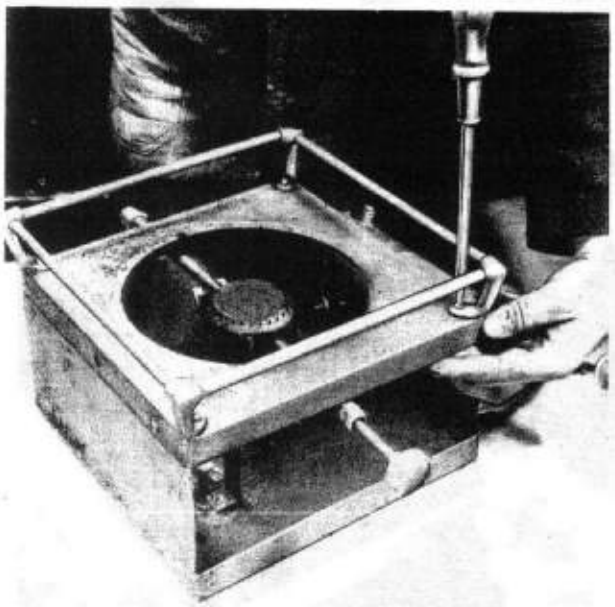


Figure 213—Loosening Bracket Screws

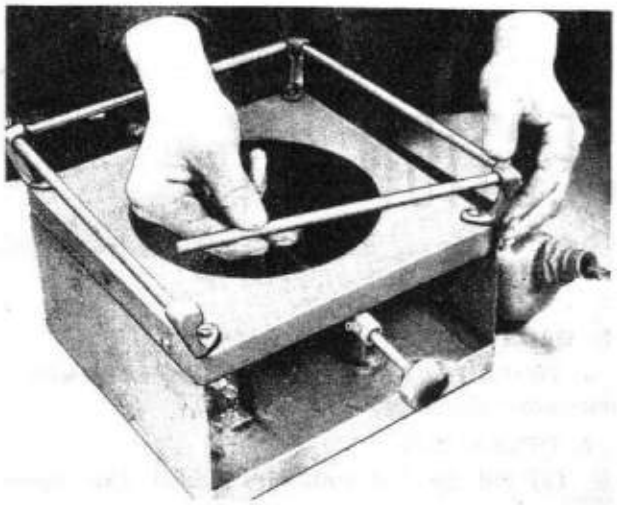


Figure 214—Lifting Out Rail

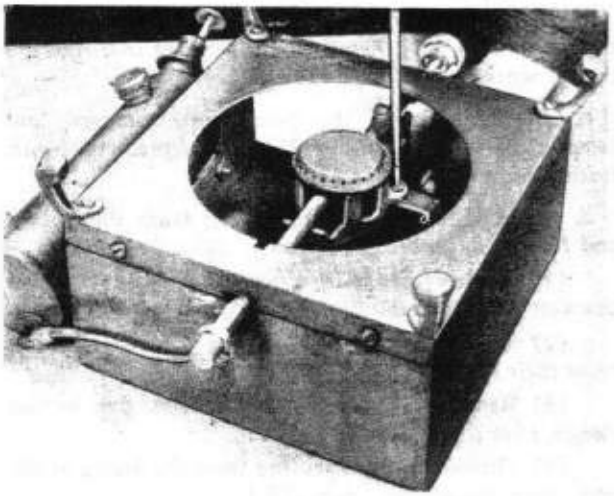


Figure 215—Removing Screw from Burner Flange

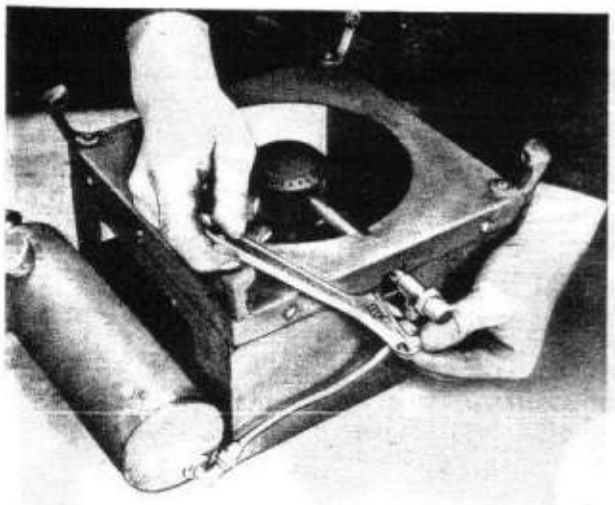


Figure 216—Disconnecting Fuel Line



Figure 217—Unscrewing Fitting

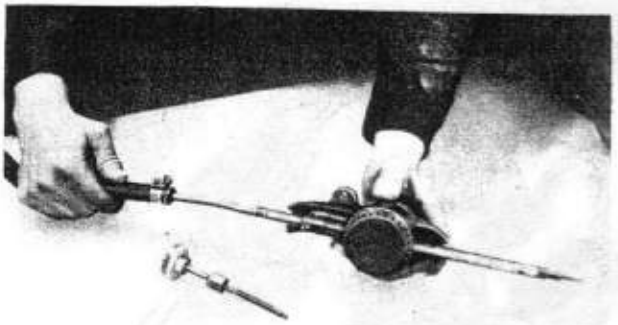


Figure 220—Blowing Out Pipe

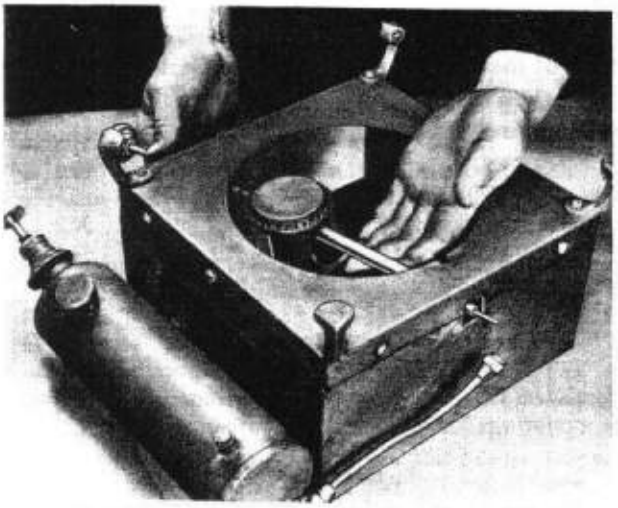


Figure 218—Lifting Out Assembly

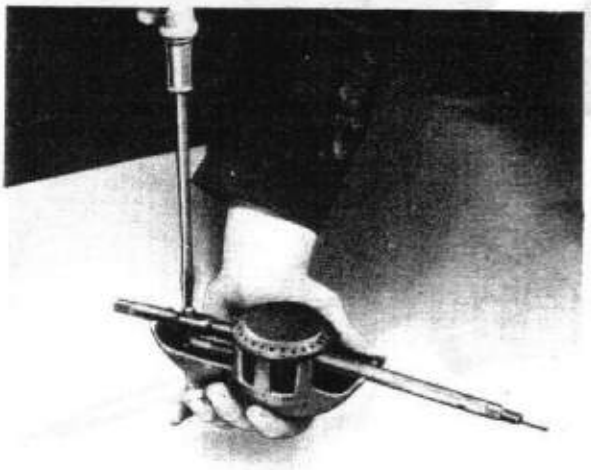


Figure 221—Removing Fuel Adjusting Screw

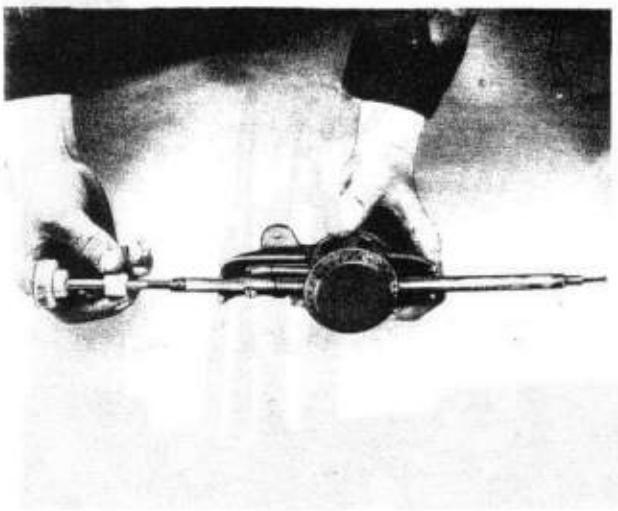


Figure 219—Removing Valve

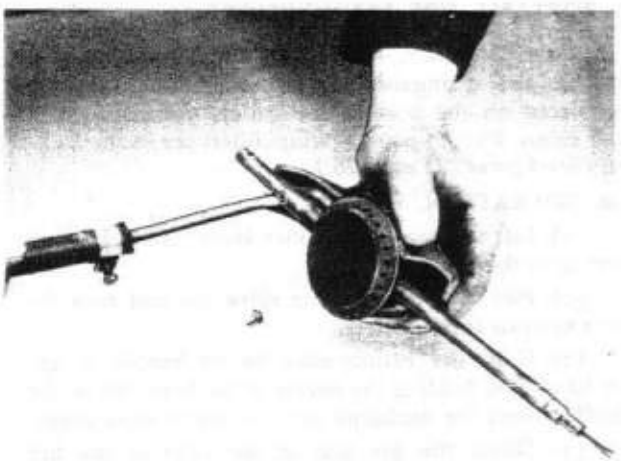


Figure 222—Blowing Out Screw Hole

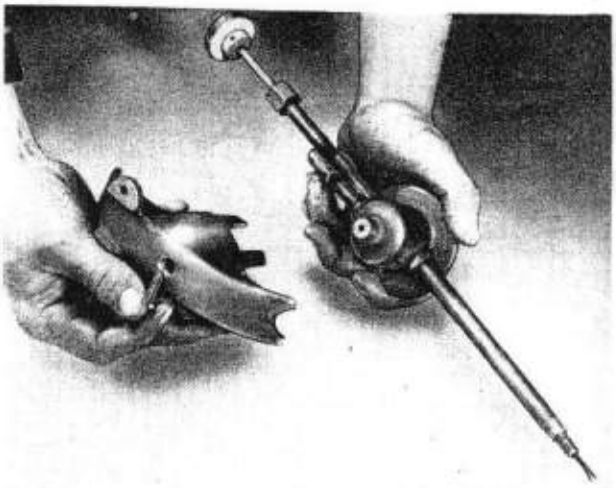


Figure 223—Separating Burner and Cup

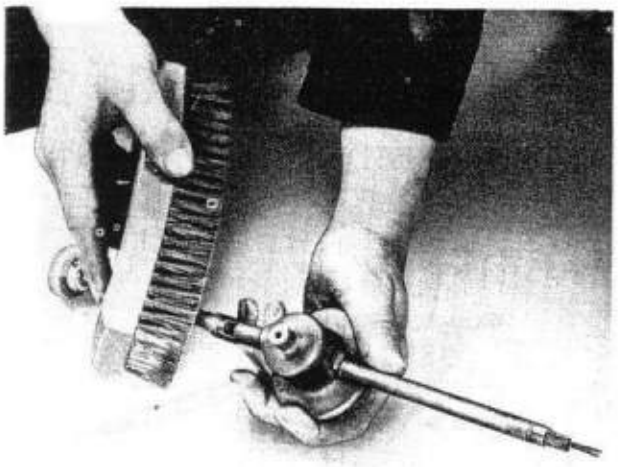


Figure 224—Cleaning with Brush

2. PORTABLE FIRE EXTINGUISHERS.

a. DESCRIPTION. — Three 4-pound hand-operated portable fire extinguishers containing carbon dioxide are placed on the boat in the galley, pilothouse, and after cabin. Two 15-pound extinguishers are in the cockpit. *(See figures 225 and 226.)*

b. OPERATION.

(1) Lift the fire extinguisher from its bracket and carry it to the fire.

(2) Pull the pin from the valve cap and turn the valve to open it completely.

(3) Hold the extinguisher by its handle in the left hand and, holding the nozzle at the hose end of the handle, direct the discharge into the fire at close range.

(4) Direct the gas first at the edge of the fire nearest the operator, or, if the fire is on a vertical surface, at the bottom of the fire.

(5) As the flame is extinguished on the nearer edge or bottom of the fire, slowly advance the discharge farther toward the center of the fire. Be sure that the first portion of the fire is out before advancing farther.

(6) Continue the discharge after all flames are out in order to coat the hot material with the snowlike precipitation from the gas.

(7) Close the valve and insert the pin, which is attached to the neck of the extinguisher by a chain, to safety the valve cap.

(8) Have the cylinder recharged at the earliest opportunity.

(9) Observe the following precautions in operating the portable extinguishers:

(a) Do not open the valve until in position to direct the discharge onto the fire.

(b) Do not stand the extinguisher on the deck. Always hold it by the carrying handle.

(c) Do not hold the nozzle near the discharge end.

(d) Do not at first direct the discharge at the center of the fire and then attempt to work to the edge.

(e) Do not direct the discharge haphazardly over various sections of the fire.

(f) Do not shut off the extinguisher just as soon as the fire is out, but wait until the heated material is thoroughly coated with the precipitate.

(g) Do not forget to have used extinguishers recharged at the earliest opportunity.

c. SERVICING.

(1) When not in use, keep the portable fire extinguishers installed upright in their mountings. Inspect the mountings for security at every overhaul.

CAUTION

Do not let the cylinders lie on their sides or remain in any position but upright.

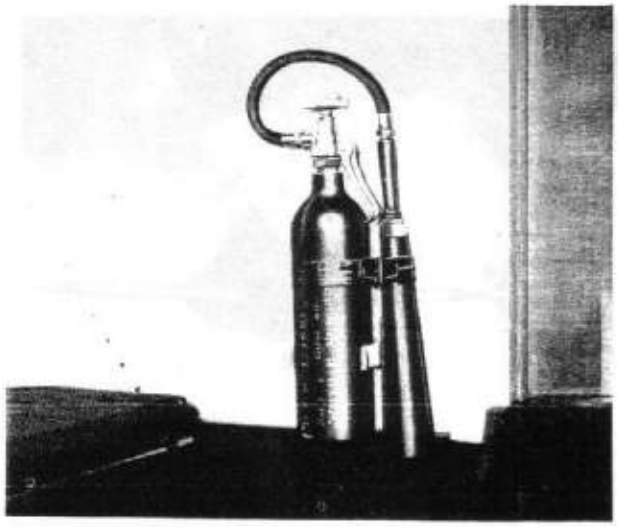


Figure 225—Four-pound Extinguisher

(2) To make sure that every portable fire extinguisher will be ready for emergencies, weigh them at every major overhaul period or at least every 6 months, and record the weight on the tag attached to each extinguisher. For example, the small extinguisher with a full charge of 4 pounds of gas will weigh 18½ pounds. Recharge fully when its weight drops to 18 pounds or less. If the hose and nozzle are removed from the extinguisher before weighing, the fully-charged extinguisher will weigh 1½ pounds less, or 17 pounds. Test the large extinguishers in the same way, and refill when the total weight indicates that the cylinders do not contain a full charge.

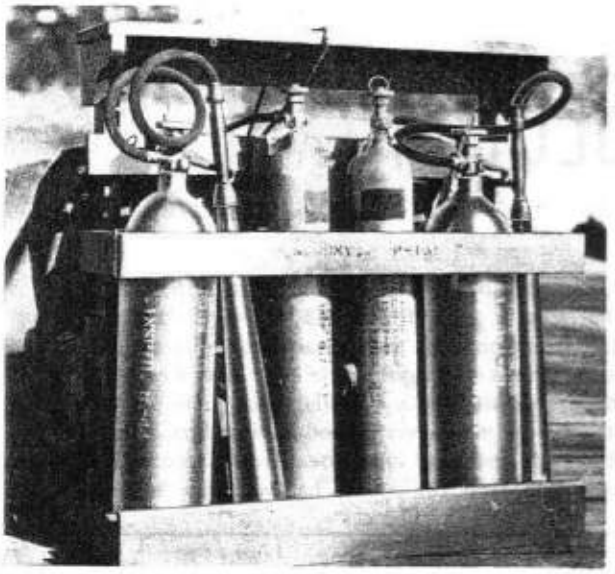


Figure 226—Fifteen-pound Extinguishers



SECTION XIII

Inspection and Maintenance Periods

1. The following inspection and maintenance chart is offered as a guide for the 42-foot AAF Rescue Boat.

2. Inspection and maintenance periods are suggested on the basis of engine time (the first five columns of the chart) and on a calendar basis (the last four columns). Use whichever period expires first. For example, the chart indicates that the throttle control is to be lubricated after the engine has been run 50 hours (column 3) or weekly (column 7). If steady running of the boat accumulates 50 hours of engine time before the week elapses, the throttle control is to be lubricated at once. However, if the boat is at the dock most of the time and the engines are not run 50 hours within the 7-day period, then lubricate the controls weekly. A new period on engine time and calendar basis begins at the time that the throttle control is lubricated.

SYSTEM	PRETRIP and EN ROUTE	ENGINE TIME 25 HOURS	50 HOURS	100 HOURS	200 HOURS	DAILY	WEEKLY	MONTHLY	90 DAYS
ENGINE CONTROLS									
Throttle			L	A		I	L	A	
Clutch			I	A			I	A	
Primer and Choke		I					I		
ENGINE INSTRUMENT									
Instrument	I								
IGNITION AND WIRING									
Spark Plugs		I		R				I	
Wiring				I				I	
Distributor Points			I						
Distributor Rotor			I				I		
Distributor Cap			I				I		
Distributor Timing				A					A
Ignition and Blower Switches				I					I
Condensers				I					I
Distributors			L				L		O
Coils			I					I	
Shielding		I			O			I	O
FUEL SYSTEM									
Fuel Pumps		I	C	L	O				O
Autopulses			I		O				O
Sediment Pots		I		C					
Fuel Strainer			C						
Fuel Lines	I					I			
Fuel Tanks						I			

KEY: I-Inspection L-Lubricate C-Clean A-Adjust O-Overhaul R-Replace

SYSTEM	PRETRIP and EN ROUTE	ENGINE TIME 25 HOURS	50 HOURS	100 HOURS	200 HOURS	DAILY	WEEKLY	MONTHLY	90 DAYS
Fuel Valves	I					I			
OIL SYSTEM Pressure Oil Gages	I								
Sumps	I								
Oil Lines		I					I		
Sump Pump					I				
Pressure Pump					I				
Strainer			C						
COOLING SYSTEM Coolant Tank						I			
Coolant Pump			I			L	I		
Coolant Lines		I					I		
Salt Water Pump			I			L			
Salt Water Lines						I			
Scoops									I
Temperature Gage	I								
MANIFOLDS Intake Manifold Nuts	I							I	
Exhaust Manifold	I							I	
Manifold Gaskets		I						I	
STUFFING BOXES & SHAFTS Stuffing Boxes			A		O	I			O
Shaft Log			I				I		
Main Shafts					I				I
Check Alignment of Engine and Prop Shaft Flange couplings				I					I
GENERAL & MISCELLANEOUS Starter Commutator			I					C	
Brushes			I						
Bearings				L					
Generator Mount		I					I		
Terminals & Connections		I					I		
Commutator			I					I	
Voltage Regulator Contact Points			C					C	
Open Circuit Voltage				I				I	
Engine Mount Bolts				I				I	

KEY: I-Inspection L-Lubricate C-Clean A-Adjust O-Overhaul R-Replace

SYSTEM	PRETRIP and EN ROUTE	ENGINE TIME 25 HOURS	50 HOURS	100 HOURS	200 HOURS	DAILY	WEEKLY	MONTHLY	90 DAYS
BILGE SYSTEM Bilge Pump							IL		
Bilge Strainers	I		C			I			
Bilge Compartments	I					I			
Blowers			IL						
STEERING MECHANISM Chain and Sprocket	I		L	A		I	L	A	
Worm Gear			I	L			I	L	
Packing Glands				A				A	
Tie Rod and Joints			I	A				A	
HULL AND DECK Hull Underwater									ICO
Hull Above Water						I			
Deck General						IC			
Superstructure						IC			
Framing					I				I
Bulkheads				I				I	
Hull Paint						I			O
Deck Paint						I			O
GEAR Lines, Fenders						ICO			
Life Preservers						ICO			
Rafts, etc.						ICO			
QUARTERS Forward Cabin						IC			
Pilothouse						IC			
After Cabin						IC			
Head (Toilet)						IC			
Lockers						IC			
GALLEY Stove						IC			
Galley Equip.						IC			
Stowage Lockers						IC			
FRESH WATER SYSTEM Strainer				I					
Sump				I				I	
RESCUE EQUIPMENT Dinghy						IC			
Crash Kit							I		

KEY: I-Inspection L-Lubricate C-Clean A-Adjust O-Overhaul R-Replace

SYSTEM	PRETRIP and EN ROUTE	ENGINE TIME 25 HOURS	50 HOURS	100 HOURS	200 HOURS	DAILY	WEEKLY	MONTHLY	90 DAYS
Hoisting Tackle							I		
Flares							I		
FIRE EQUIPMENT CO_2 Cylinders			I	(Weigh every 6 months and pressure-test every 5 years)					
Heat Activator				(Test every 6 months)					
Cylinder Head								I	
Nozzles			IC				IC		
Piping and Control				I	(Clean every 2 years)			I	
Hand Extinguisher									I
NAVIGATION Charts, etc.						I			
Compass						I			Swing
Chronometer						I			
COMMUNICATION Transmitter					O	I			O
Receivers					O	I			O
Dynamotor					IO				IO
Miscellaneous						O			O
VENTILATION SYSTEM Blowers			I	(Lubricate at 300 hours)					
Screens							I		
Ventilator Cowls						IC			
Ducts						IC			
UNDERWATER MECHANISM Struts and Bearings									IO
Propellers									IO
Rudders									I
Zinc Plates									IR
Scoops									IO
Ground Plate									I
MEDICAL EQUIPMENT Splints			I				I		
Surgical Instruments			I				I		
Drugs			I				I		
Accessories			I				I		
EXHAUST PIPES Flange Joints					IO				IO

KEY: I-Inspection L-Lubricate C-Clean A-Adjust O-Overhaul R-Replace

SYSTEM	PRETRIP and EN ROUTE	ENGINE TIME 25 HOURS	50 HOURS	100 HOURS	200 HOURS	DAILY	WEEKLY	MONTHLY	90 DAYS
Hose Connections					IO				IO
Thru-Hull Rings					IO				IO
ROPE LOCKER Stowage						I			
Rag Supply						I			
BATTERIES Electrolyte		I					I		
Terminals		I					I		
Voltage		I					I		
Connections			I					I	
SALT WATER SYSTEM Heat Exchanger					C				
Sea Strainers				I		(Grease every 6 months)			
Salt Water Pump				(Grease occasionally)					

KEY: I-Inspection L-Lubricate C-Clean A-Adjust O-Overhaul R-Replace

GLOSSARY

Abeam—At right angles to the center line (keel).

Amidships—Either midway between the bow and stern or in the line of the keel midway between the sides.

Aft—Toward the stern.

Aloft—Upward, overhead or above deck.

Apron or Keelson—Timber fastened either above or outboard of the keel to strengthen it.

Autopulse—An electric fuel pump.

Batten—A strip of wood used to fasten objects together.

Beam—Extreme width of a vessel.

Beams—Transverse supports running from side to side to support the deck.

Bilge—The portion of the boat's hull just below the waterline which connects the sides with the keel.

Bilges—The deepest part of the hull inside along the keel.

Binnacle—The mounting and protective casing for the compass.

Blower—A ventilating fan.

Bow—The front or forward part of the boat.

Breast hooks — A triangular-shaped reinforcing knee fitted as a bracket behind the stem structures.

Bulkhead—A watertight partition extending from the bottom to the deck, so constructed that in case of accident in one compartment, damage is confined to that compartment.

Bulwarks—The part of the topsides carried above the deck.

Bungs—Wooden plugs.

Carlines—Fore-and-aft timbers placed between deck beams.

Caulking—Filling in the seams for the purpose of watertightness.

Check Valve—A device that permits passage of a fluid or gas in one direction only. It stops (or checks) reverse flow.

Chines—That longitudinal member of a V-bottom vessel that forms the dividing line between the bottom and topsides.

Chocks—Deck fittings through which mooring lines are passed so as to lead them in the proper direction toward the deck.

Chronometer—An accurate clock so adjusted as not to be disturbed by temperature.

Cleat—A small device with two arms used for belaying lines.

Coamings—A frame around cockpits, hatches, etc., for the purpose of stiffening the edges of the opening and also for preventing water on the main deck from washing down to the deck below.

Companionways or Companion Ladders—Stairways or steps leading up to the deck from below.

Cradle—A framework of timbers moving upon ways or rollers, used to support, lift, or carry boats.

Deadwood—The solid timber above the keel at the stern connecting the keel with the end timbers.

Draft—Depth of water required to float a boat.

Electrolyte—A solution of sulphuric acid and distilled water, normally having a specific gravity of 1300, used in storage batteries.

Engine Bed—Longitudinal beams supporting the engine.

Ethylene Glycol—An intermediate alcohol between ordinary ethyl alcohol and glycerol, used as an antifreeze.

Fairwater Nut—An acorn-shaped nut used on the propeller shaft to keep the castle retaining nut from backing off and to prevent an abrupt change in the streamlines.

Fender—Portable wooden or braided rope bumpers hung over the side during landings to protect the hull.

Fender Guard—A longitudinal timber projecting beyond the outside line of the hull planking, often metal faced, to protect the hull.

Filler Pipe—Fuel intake pipe.

Filter Cartridge—Element in filter through which lubricating oil or fuel oil passes and which retains the impurities of the oil.

Flare—Outwardly incline of forward topsides.

Flush Decks—A deck whose topside is flush, unbroken by either cockpits or deck erections.

Forward—Toward the bow or front.

Frame—Skeleton of the hull.

Frames or Ribs—Transverse members of the frame to which the planking is fastened.

Freeboard—Height of boat's topsides from waterline to deck.

Galley—Ship's kitchen.

Garboard Strake—Lowest strake of outside planking next to the keel.

Gland—A collar or nut which compresses the packing in a stuffing box.

Gunwale—Upper part of the sheer strake or the top plank of the topsides.

Hard Over—As far as the rudders will turn in one direction.

Hatch—Deck openings.

Head—Toilet.

Heat Activator—A chemically active mechanism for automatic operation of the engine fire extinguishing system.

Horn Timber—The after longitudinal strength member used to fasten the shaft log and the transom knee together.

Hull—The principal body of the boat not including mast, rigging, etc.

Imperial Gallon—A British unit of liquid measurement.

Inboard—In or toward the center of the boat.

Inverted L-wire Antenna—Wire antenna which is erected horizontally and which forms an "L."

Jacket—An outer metallic casting forming a space around the cylinder liners to permit the circulation of water for cooling purposes.

Keel—The main longitudinal timber, first laid in construction.

Keelson—Timber fastened either above or outboard of the keel to strengthen it.

Knee—Used to reinforce the joints between structural members butting or intersecting at or near a right angle.

Limber Holes—Holes cut in the timbers to allow drainage to the deepest part of the hull.

Mooring—Securing a vessel in position by lines.

Outboard—Away from the center line.

Packing—A material used to seal a joint against leakage.

Palms—A flat surface on a strut to which is secured plating or upon which plating, beams, or the like, are supported.

Paying—Filling the seams with white lead or seam composition.

Planks—Timber laid outside of frames in the construction of the hull.

Port—Left-hand side of the boat, looking forward.

Rabbet—Refers to that part of a structural member which has a recess or cut into it of the proper size to accommodate other members.

Rail (Wire)—A wire cable passed through the deck railing stanchions.

Raw Water—Sea water run into the boat for flushing purposes.

Replace—To remove an unserviceable part, subassembly, or assembly, and install a new, reconditioned or rebuilt part, subassembly, or assembly.

RPM—Revolutions per minute.

Rudder Stock—The shaft of the rudder. (Also called "rudder post.")

Scarf—The lapped joint made by bevelling together and bolting of pieces of wood, used in forming an apron or keelson when one-piece timbers running the full length of the keel are not available. (Also spelled "scarph.")

Scuppers—Holes permitting water to drain overboard from decks or cockpits.

Seacock—An opening through the hull for intake or outlet.

Sea Scoop—A device for drawing water into the salt water intake pipe.

Sea Strainer—A device for separating seaweed, etc., from water in the salt water system.

Shaft Log—Through-hull fitting which accommodates the propeller shaft.

Sheer—Term used to designate the upward curvature or sweep of the deck of the vessel toward the bow and stern.

Slings—Gear made of wire rope and close-linked chain for handling boats at booms or cranes.

Spliced—The joining of the ends of lines to make one continuous line by tucking strands under without knotting.

Sprocket wheel—A wheel with tooth-like projections shaped to engage with the links of a chain.

Stanchion—Vertical post supporting the cable rail.

Starboard—Right-hand side of the boat looking forward.

Stem—The upright timber in the forward part of the boat joined to the keel by the knee.

Stern—After part of the boat.

Stowed—Stored.

Strake—A continuous line of planks from bow to stern.

Stringer—A longitudinal timber or stiffener inside the hull. Depending on their location, stringers are known as bilge stringers, side stringers, hole stringers, etc.

Strut—A bracket support between two parts or a metal brace used as a support on construction.

Stuffing Box—A gland containing packing to prevent leakage of water.

Superstructure—Any cabins, deck houses, etc., built above deck.

Transom—The planking across the stern.

Tiller—A lever for turning the rudder of a boat.

Topsides—Side planking of a boat between the waterline and deck or rail.

Thermostat—An automatic temperature-control mechanism.

Transceiver—Combined radio receiver and transmitter.

Whip Antenna—A flexible antenna shaped like a buggy whip.

