

TM 5-8025

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

GEREGISTREERD
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BOAT BRIDGE ERECTION GASOLINE-POWERED ALUMINUM, TWIN- SCREW, 2-SECTION 27-FOOT (LESS ENGINES)



DEPARTMENT OF THE ARMY • FEBRUARY 1955

SAFETY PRECAUTIONS

Never leave a stranded boat overnight.

Operate at reduced speed in unfamiliar areas.

At least two manila lines of one-half inch minimum size must be used to anchor the boat in a current. Restrict the boat movement as much as possible.

Never anchor the boat in a current above a floating bridge.

Keep the engine speed under 2,500 rpm except in an emergency.

Never operate the boat less than 1,000 feet above a floating bridge in currents exceeding 3 feet per second.

Never leave shore with a dead engine in a current.

Never beach the boat on rocks. Always stop the boat dead before beaching it.

Operate the boat slowly and use a sounding stick frequently in shallow water.

To extricate a grounded boat, operate the engines alternately in forward and reverse. Do not race the engines.

Examine the slings carefully to make sure they are in good condition before attempting to lift the boat.

Be careful when operating the boat near lines and cables in the water to prevent fouling the propellers.

A second man must accompany the operator at all times to handle lines.

Be careful to secure anchored rafts offshore in such a manner that changes in the water level will not ground them.

Life preservers must be worn by all personnel boarding the boat.

Always disconnect the propeller shaft from the engine at the coupling before launching or hoisting the boat from the water.

TECHNICAL MANUAL }
 No. 5-8025 }

DEPARTMENT OF THE ARMY
 WASHINGTON 25, D. C., 18 February 1955

**BOAT, BRIDGE ERECTION, GASOLINE POWERED, ALUMINUM,
 TWIN-SCREW, 2-SECTION, 27-FOOT (LESS ENGINES)**

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom this 27-foot bridge erection boat is issued. They contain information on the operation, organizational maintenance, and field and depot maintenance of the boat, as well as a description of the major units and their functions in relation to other components of the materiel. They apply to boat serial number 50-190 and other boats of the 50 and 51 series manufactured by Higgins, Incorporated.

b. Supply manuals, technical manuals, and other publications applicable to the equipment covered by this manual are listed in Appendix I. Appendix II tabulates the replaceable parts available for the equipment. Appendix III lists the tools and publications issued with and carried on or with the boat.

c. In general, the prescribed maintenance procedures will apply as reflected by the allocation of spare parts in the appropriate columns of the current ENG 7 & 8 supply manual pertaining to this boat. In all cases, however, personnel should confirm the availability of spare parts before proceeding with organizational or depot maintenance.

2. Record and Report Forms

Maintenance record forms listed and briefly described in *a* through *k* below will be used in the maintenance of this equipment.

a. *DD Form 110, Vehicle and Equipment Operational Record.* This form is used by equipment operators for reporting the accomplishment of daily preventive maintenance services, and for reporting any equipment deficiencies observed during operation.

b. *DA Form 464, Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment.* This form is used by personnel of the using organization and higher echelons for reporting the results of preventive maintenance services and technical inspections.

c. *DA Form 460, Preventive Maintenance Roster.* This form is used for scheduling preventive maintenance services at proper intervals.

d. DA Form 478, Organizational Equipment File. Major repairs or rebuilding, replacement of major unit assemblies, and accomplishment of equipment modifications are recorded on this form.

e. DA Form 468, Unsatisfactory Equipment Report. This form is used for reporting manufacturing, design, or operational defects in the materiel, with a view to correcting such defects; it is also used for recommending modifications of the materiel. DA Form 468 is not used for reporting failures, isolated materiel defects, or malfunctions of materiel resulting from fair wear and tear or accidental damage. DA Form 468 is not used to report issue of parts and equipment, or for reporting replacement and/or repairs.

f. DD Form 6, Report of Damaged or Improper Shipment. This form is used for reporting damages incurred in shipment.

g. DA Form 9-81, Exchange Part or Unit Identification Tag. This form is used to accomplish the direct exchange of unserviceable for serviceable parts.

h. DA Form 811, Work Request and Job Order. This form is used to request work done by higher echelon organizations.

i. DA Form 867, Status of Modification Work Order. This form is used to maintain records of all modification work performed on equipment.

j. DA Form 5-13, Spot Check Inspection Report of Organizational Maintenance of Engineer Equipment. Organizations having engineer field maintenance responsibility use this form for reporting the results of seminannual spot check inspections.

k. DA Form 5-14, Annual Technical Inspection Report of Engineer Equipment. Organizations having engineer field maintenance responsibility use this form for reporting the results of annual technical inspection.

Section II. DESCRIPTION AND DATA

3. Description

a. Boat Nomenclature. The terms "left," "right," "front," and "rear" as used in this manual refer to the helmsman sitting in his normal position in the helmsman's seat. The left side of the boat is the port side; the right side is the starboard side; the front is the bow, fore, or forward end; the rear is the stern, aft, or after end.

b. General Information. This manual is written specifically for the 27-foot bridge erection boat, serial number 50-190 (figs. 1 and 2), but also covers other boats of the 50 series, and boats of the 51 series (fig. 3). These boats are built to push and tow floating bridge sections into place during bridge erection operations. The boats are fabricated of aluminum alloy and are built in two sections for lightness and ease of transportation. The two sections of the boat are trans-

ported separately and are coupled together manually in the water when the boat is ready to be used.

c. Stern Section. The stern section of the boat (fig. 4) contains the two engine compartments, the operating controls, the towing bitt (20, fig. 3), and a bilge pump. The stern section normally is coupled to the bow section when in use but may be used independently.

d. Bow Section. The bow section of the boat (fig. 5) contains a small forward cargo hatch (5, fig. 1), the two pushing knees (1) and a bilge pump. The cargo hatch in the 51 series boats (fig. 3) is wider than that in the 50 series boats. In addition the 51 series boats contain a mooring bitt (3) mounted at the forward end of the cargo hatch.

e. Engines. The boat is powered by two gasoline driven, six-cylinder, four-cycle, liquid-cooled, L-head engines. A generator, starting motor, distributor, oil filter, carburetor, and other accessories are mounted on each engine. A planetary-type reverse gear and clutch, and a reduction gear are mounted on the rear of each engine.

4. Identification Information

a. Engine Nameplate. The engine nameplate (fig. 6) is located between the engine and the reduction gear on top of the reverse gear housing cover. It lists the manufacturer, engine serial number, and model.

b. End Item Nomenclature Plate. The end item nomenclature plate (fig. 7) is located at the starboard side of the cockpit on frame 9. The end item nomenclature plate lists pertinent information on the boat such as dimensions, weight, serial number, model, and manufacturer.

c. Forward Section Loading Diagram Identification Plate. The forward section loading diagram identification plate (fig. 8) is located on the frame of the bow section transporting cradle, aft of the forward sling. It illustrates how the bow section of the boat should be mounted on its pole-type trailer for transportation.

d. Stern Section Loading Diagram Identification Plate. The stern section loading diagram identification plate (fig. 9) is located on the frame of the stern section transporting cradle, forward of the stern sling. It illustrates how the stern section of the boat should be mounted on a 2½-ton dump truck for transportation.

e. C-O-Two Fire Extinguisher Instruction Plate. The C-O-TWO fire extinguisher instruction plate (fig. 10) is located at the starboard side of the cockpit on frame 9. The instruction plate lists directions for the maintenance of the C-O-Two fire extinguishing system.

f. Blower-Caution Identification Plate. The blower-caution identification plate (fig. 11) is located on the electrical panel below the steering wheel. The blower-caution identification plate warns the operator to run the blower for 5 minutes before starting the engines.

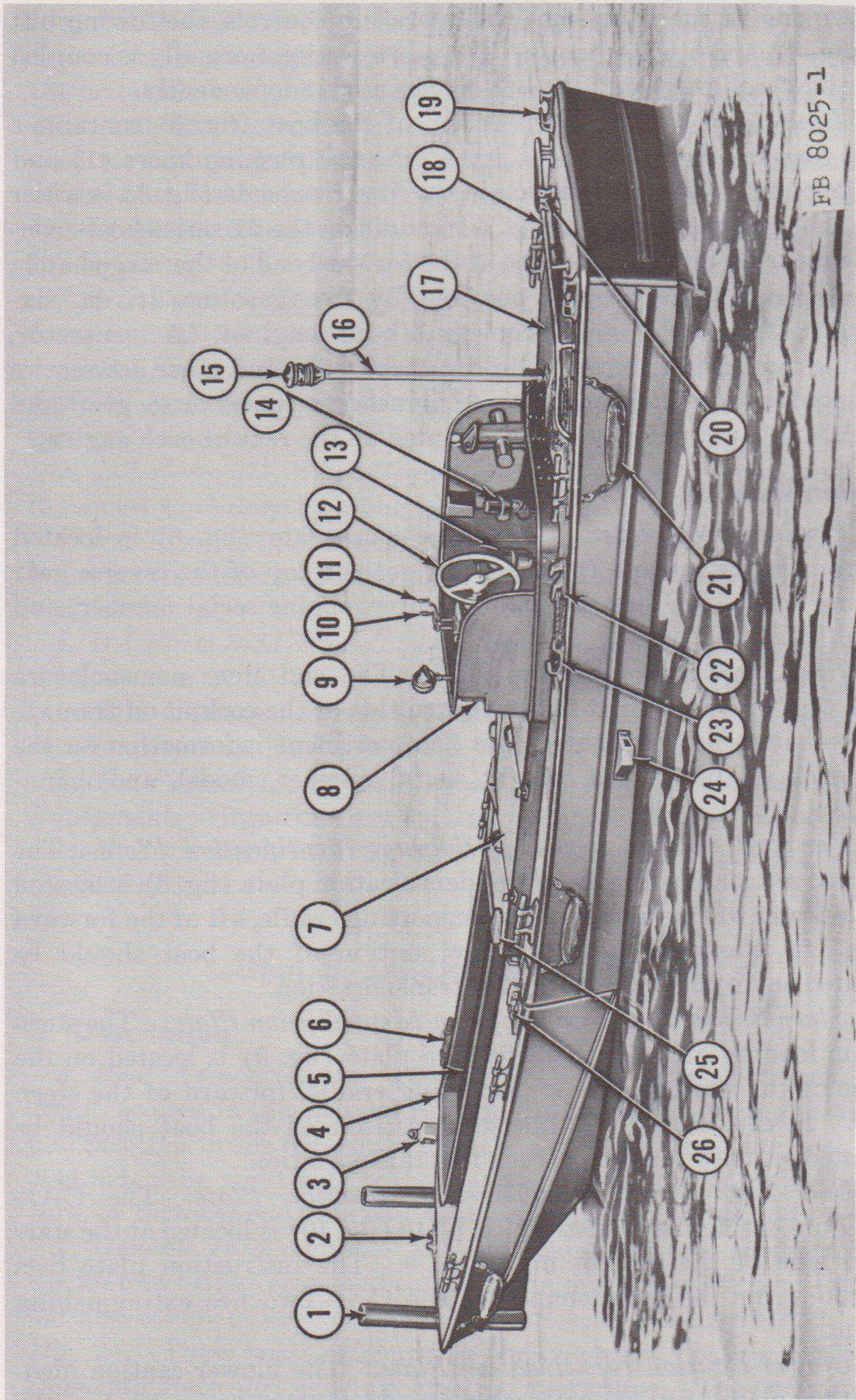
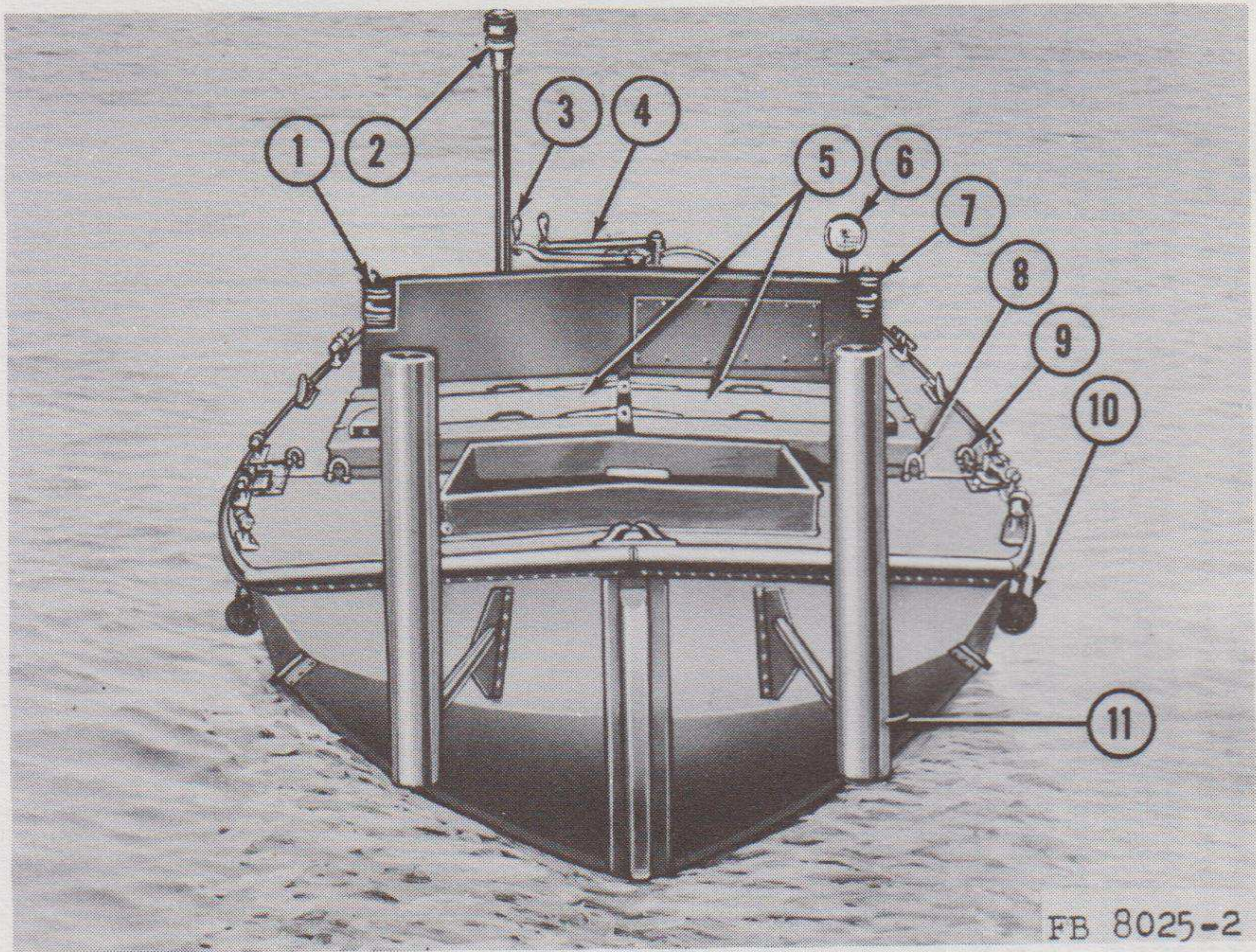


Figure 1. 27-foot bridge erection boat, 50-190, three-quarter port side view.

FB 8025-1

- | | | | |
|----|---|----------------------------|--|
| 1 | Pushing knee | | |
| 2 | Bow chock | | |
| 3 | Bow oil light | | |
| 4 | Deck coaming | | |
| 5 | Forward hatch | | |
| 6 | Cleat | | |
| 7 | Engine hatch cover | | |
| 8 | Port side running light | | |
| 9 | Searchlight | | |
| 10 | Port reverse lever crank | | |
| 11 | Starboard reverse lever crank | | |
| 12 | Steering wheel | | |
| 13 | C-O-Two fire extinguisher | | |
| 14 | Engine compartment vent blower assembly | | |
| 15 | Mast light assembly | | |
| 16 | Stern light mast | | |
| 17 | Stern hatch cover | | |
| 18 | | Stern rail | |
| 19 | | Roller chock | |
| 20 | | Stern chock and slide bolt | |
| 21 | | Fender | |
| 22 | | Haul chock | |
| 23 | | Haul tackle jam cleat | |
| 24 | | Exhaust deflector | |
| 25 | | Engine hatch cover vent | |
| 26 | | Deck coupling | |

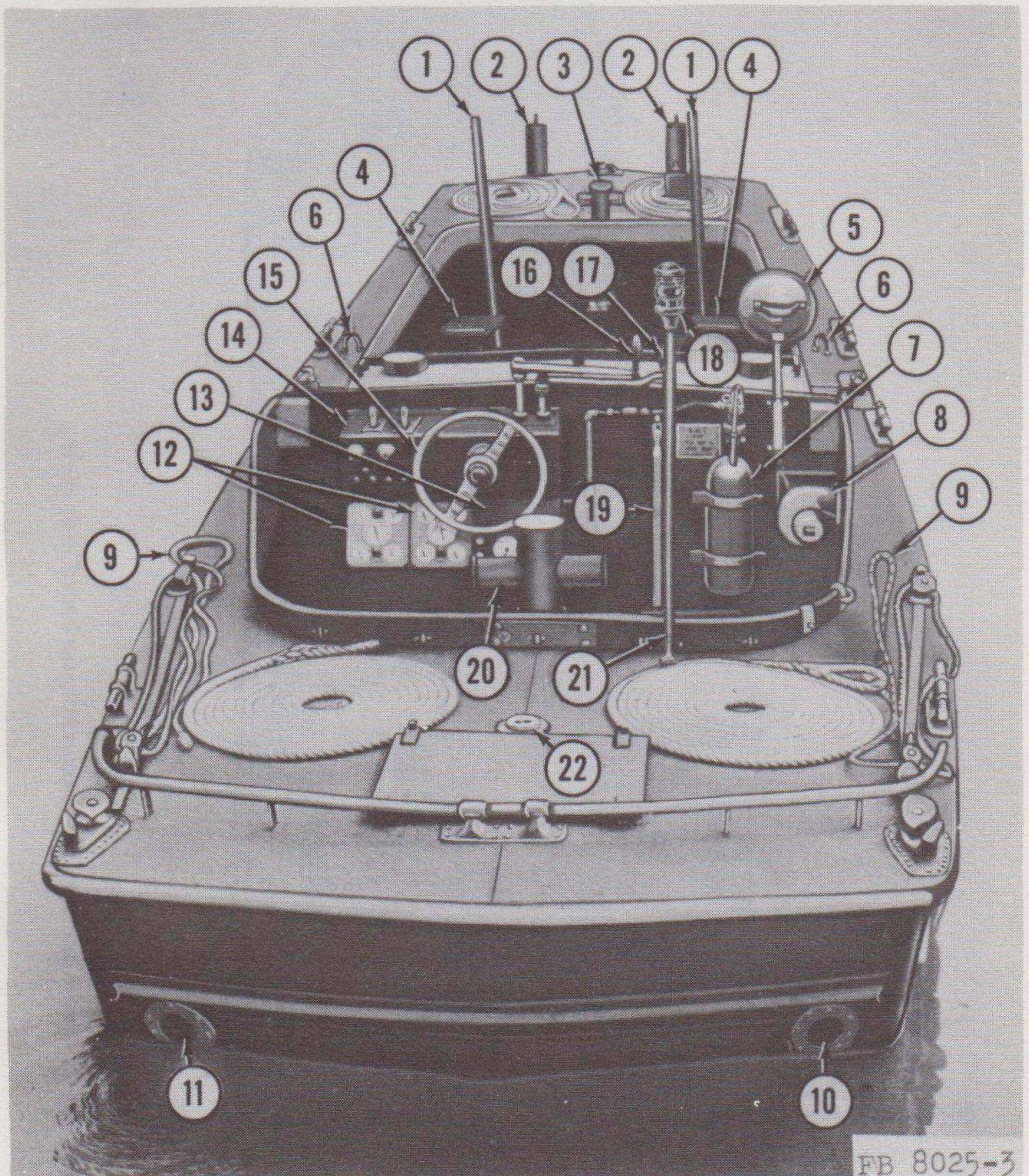
Figure 1—Continued.



FB 8025-2

- | | |
|---------------------------------|---------------------------|
| 1 Starboard side running light | 7 Port side running light |
| 2 Mast light assembly | 8 Bow sling U-bolt |
| 3 Starboard reverse lever crank | 9 Stern sling U-bolt |
| 4 Port reverse lever crank | 10 Fender |
| 5 Engine hatch cover | 11 Pushing knee |
| 6 Searchlight | |

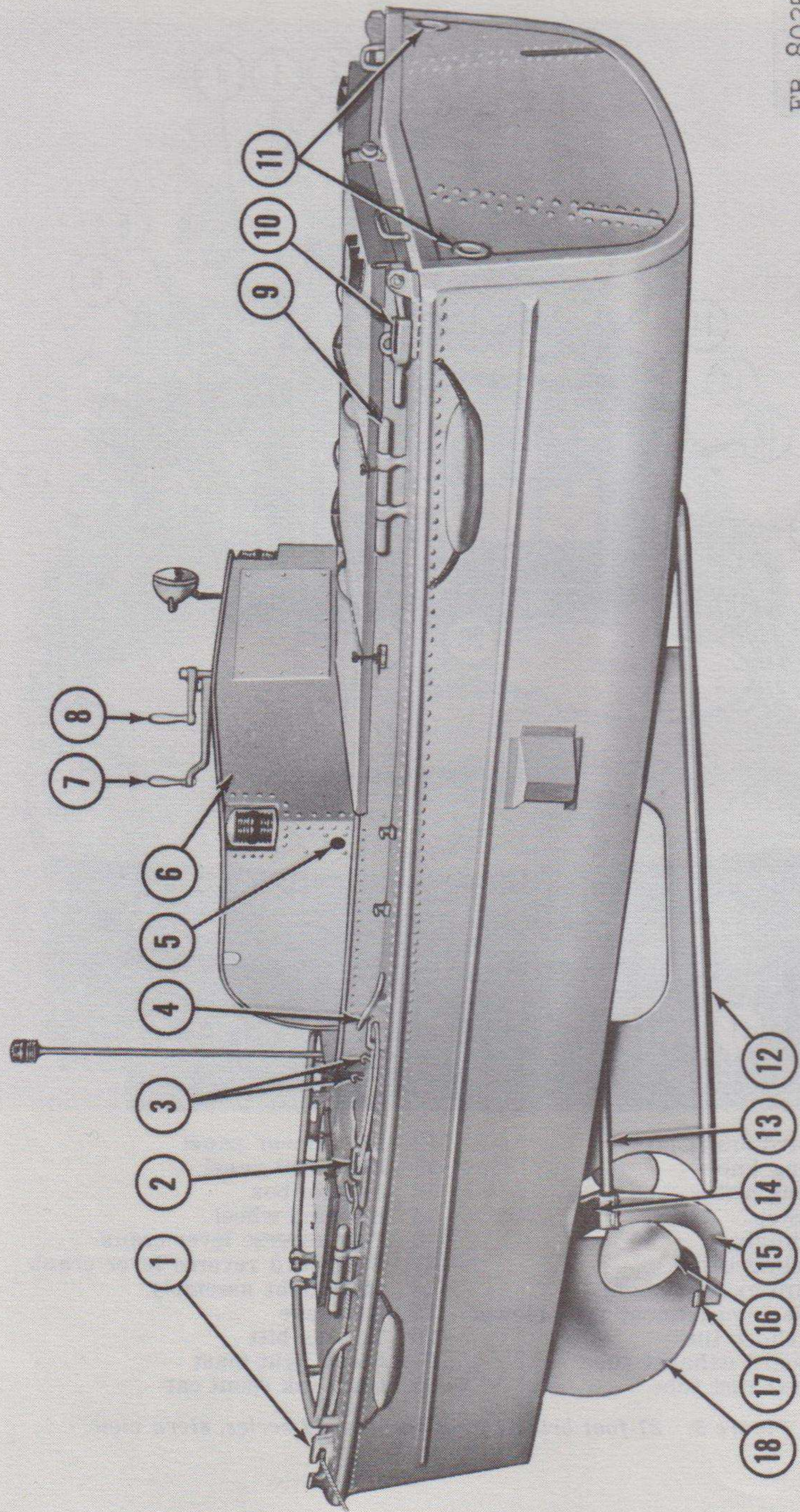
Figure 2. 27-foot bridge erection boat, 50-190, bow view.



FB 8025-3

- | | |
|-------------------------------------|----------------------------------|
| 1 Forward assist post | 12 Instrument panel |
| 2 Pushing knee | 13 Electrical panel |
| 3 Mooring bitt | 14 Control box |
| 4 Bow Step | 15 Steering wheel |
| 5 Searchlight | 16 Port reverse lever crank |
| 6 Bow sling U-bolt | 17 Starboard reverse lever crank |
| 7 CO ₂ fire extinguisher | 18 Mast light assembly |
| 8 Engine compartment vent blower | 19 Gas gage |
| 9 Haul chock line | 20 Towing bitt |
| 10 Starboard exhaust tube | 21 Stern light mast |
| 11 Port exhaust tube | 22 Gas tank spout cap |

Figure 3. 27-foot bridge erection boat, 51 series, stern view.

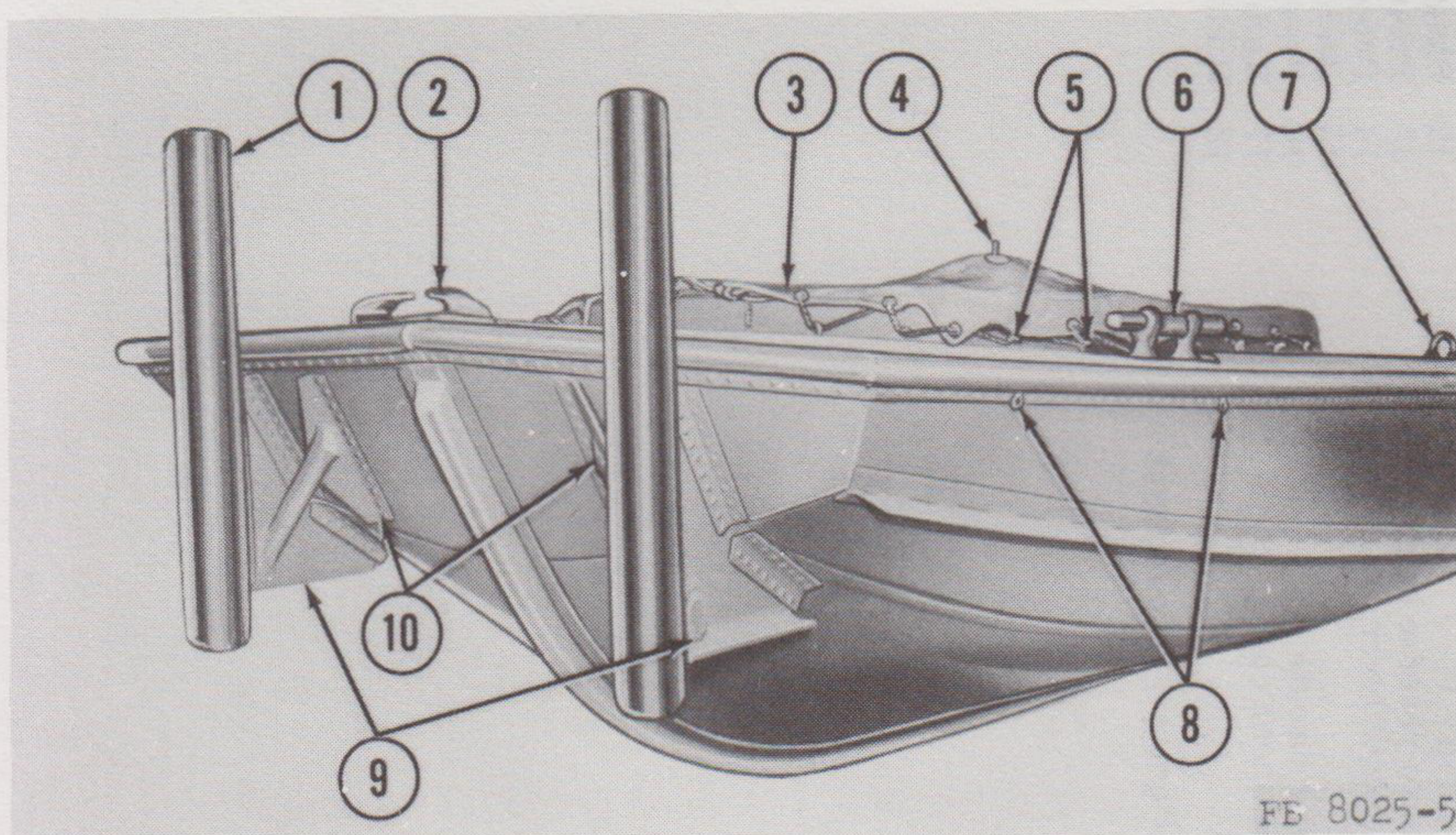


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Figure 4. Stern section, three-quarter starboard side view.

- | | | | |
|----|---------------------------------------|--|--|
| 1 | Roller chock | | |
| 2 | Haul chock | | |
| 3 | Cover lashing hook | | |
| 4 | Haul tackle jam cleat | | |
| 5 | Engine compartment vent blower outlet | | |
| 6 | Windshield | | |
| 7 | Starboard reverse lever crank | | |
| 8 | Port reverse lever crank | | |
| 9 | Cleat | | |
| 10 | Coupling handle | | |
| 11 | Female shear cup | | |
| 12 | Skeg | | |
| 13 | Propeller shaft | | |
| 14 | Propeller strut | | |
| 15 | Rudder strut | | |
| 16 | Propeller | | |
| 17 | Rudder pivot | | |
| 18 | Rudder plate | | |

Figure 4—Continued.



FE 8025-5

- | | | | |
|---|-----------------------|----|------------------------------|
| 1 | Pushing knee | 6 | Cleat |
| 2 | Bow chock | 7 | Bow sling U-bolt |
| 3 | Forward walkway cover | 8 | Shouldered eyebolt |
| 4 | Cover pole | 9 | Pushing knee outside support |
| 5 | Cover lashing hook | 10 | Pushing knee inside support |

Figure 5. Bow section, three-quarter starboard side view.

**GRAYMARINE
EXPRESS
SIX-244**

WITH INDIVIDUAL PORTING

ENG
NO

[Redacted engine number]

GRAY MARINE MOTOR CO
DETROIT MICHIGAN

when ordering parts always
give model and engine number

LUBRICATION

WE RECOMMEND ANY HIGH GRADE
OIL OF #30 S.A.E VISCOSITY

IMPORTANT

RENEW LUBRICATING OIL
FREQUENTLY

FB 8025-6

Figure 6. Engine nameplate.

**CORPS OF ENGINEERS
U S ARMY**

SERIAL - [REDACTED]

CONTRACT N° DA-11-184-ENG-4468

MANUFACTURER, *Higgins* INC.

HIGGINS BOAT N° [REDACTED]

DATE OCT. 1950.

MODEL T-1-50

OVERALL LENGTH 27'-0 $\frac{1}{2}$ "

OVERALL WIDTH - 8'-2"

PROPELLER

MAXIMUM DRAFT 2'-10"

WEIGHT (FORE SECTION) 1150 LB.

WEIGHT (AFT SECTION) 4700 LB.

ENGINE, GRAY - MODEL SIX 244

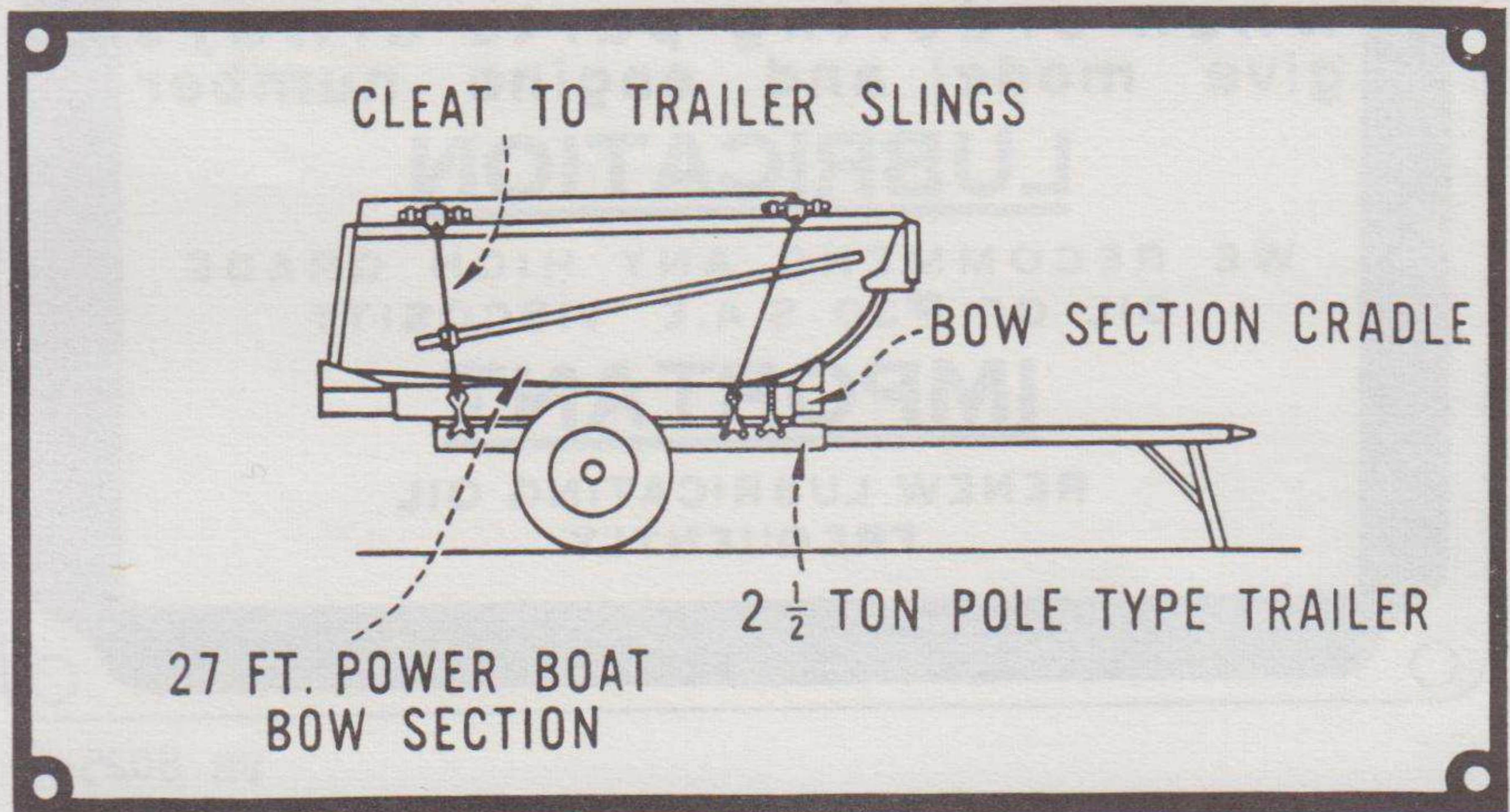
EXPRESS - 102 H.P. @ 3200 R.P.M.

REDUCTION 3 TO 1

29" DIA. X 19 PITCH - R.H.

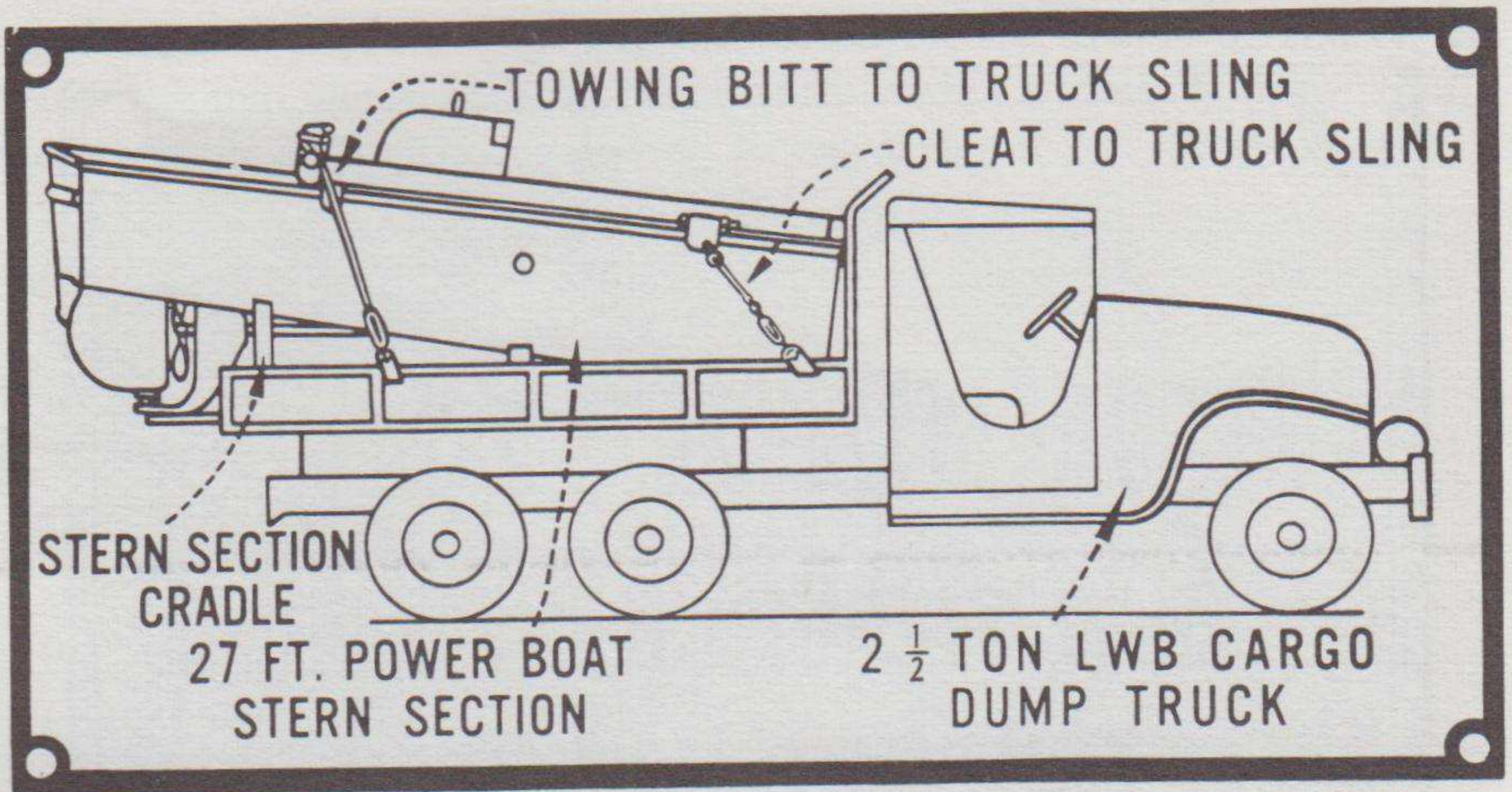
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Figure 7. End item nomenclature plate.



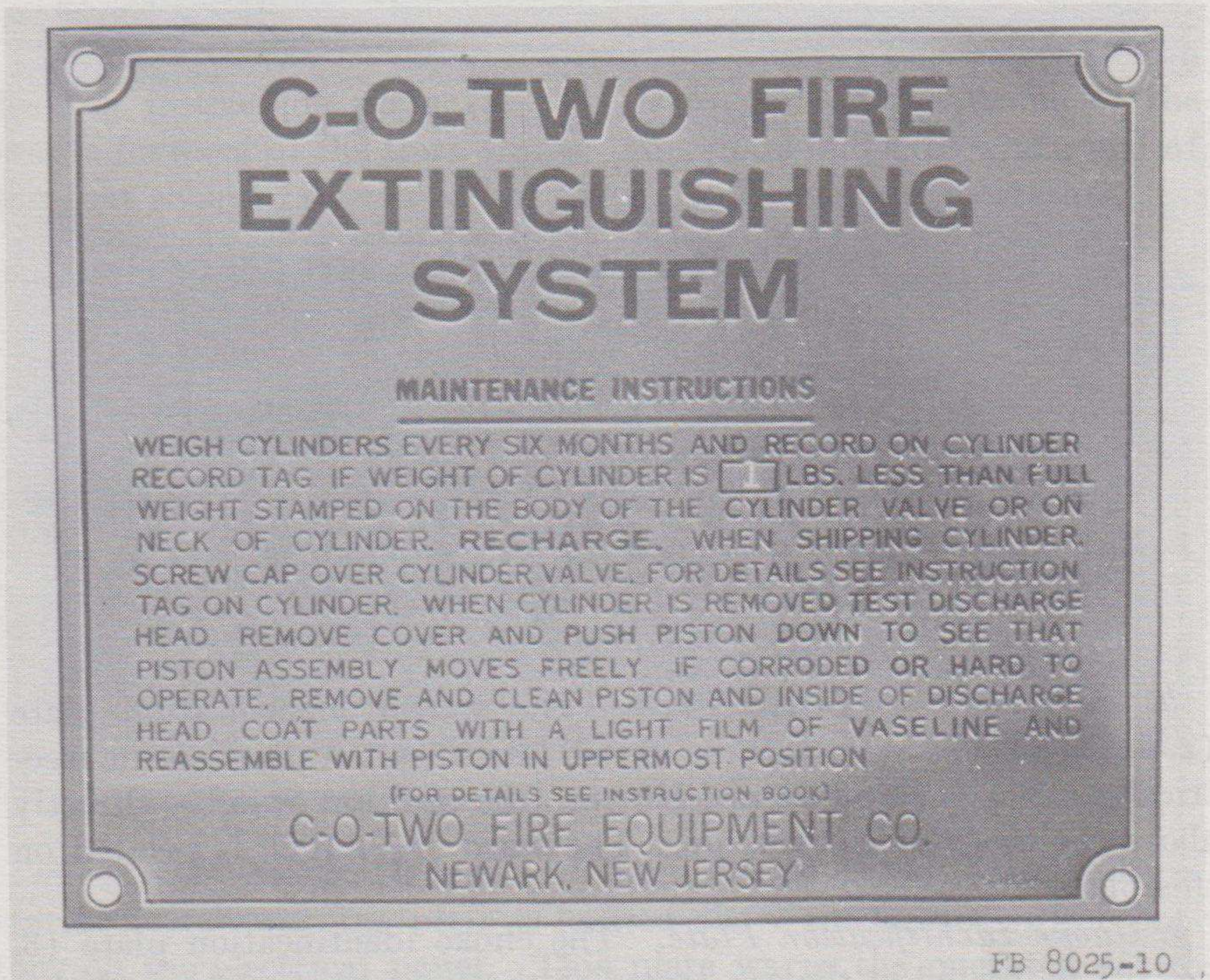
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Figure 8. Forward section loading diagram identification plate.



FB 8025-9

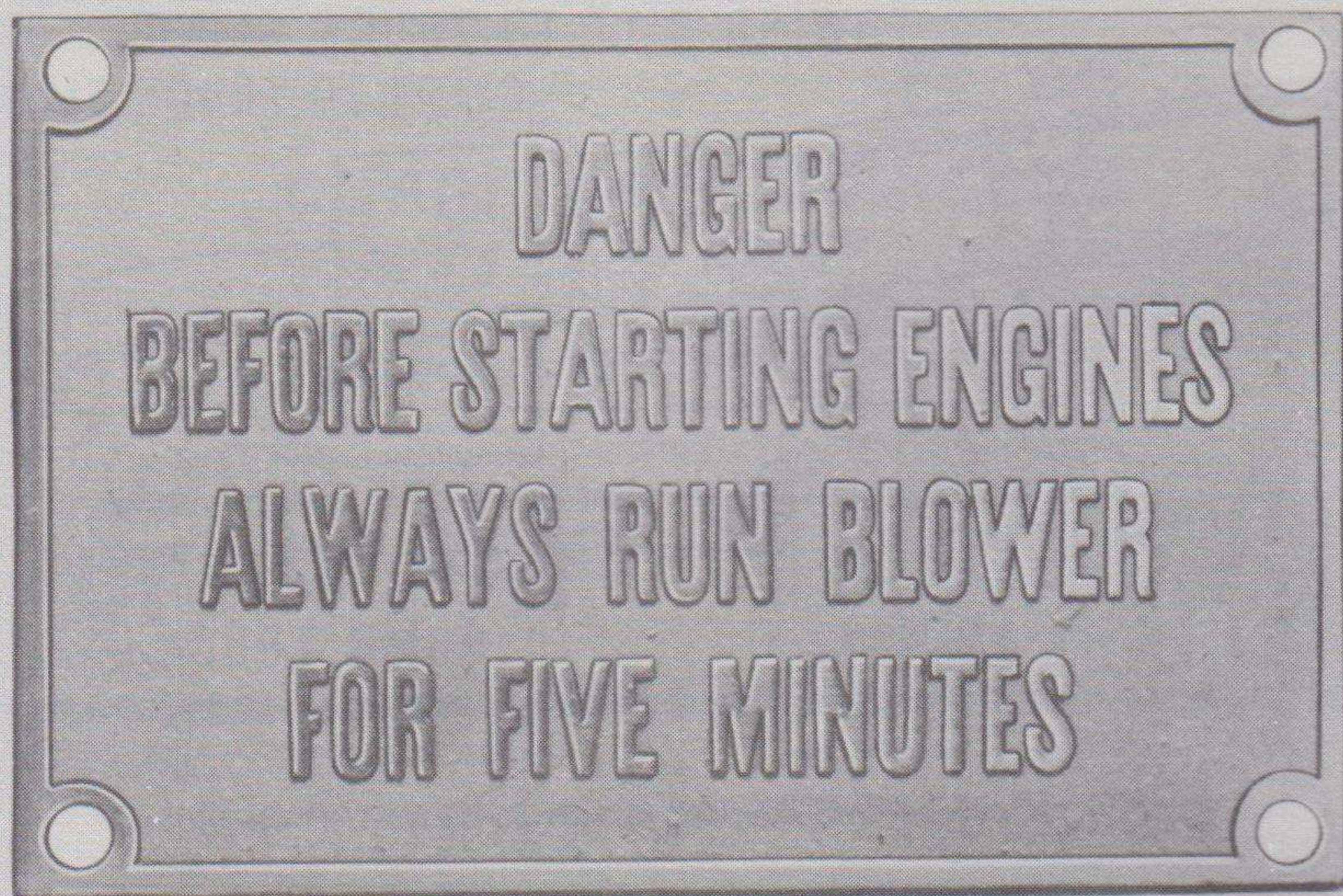
Figure 9. Stern section loading diagram, identification plate.



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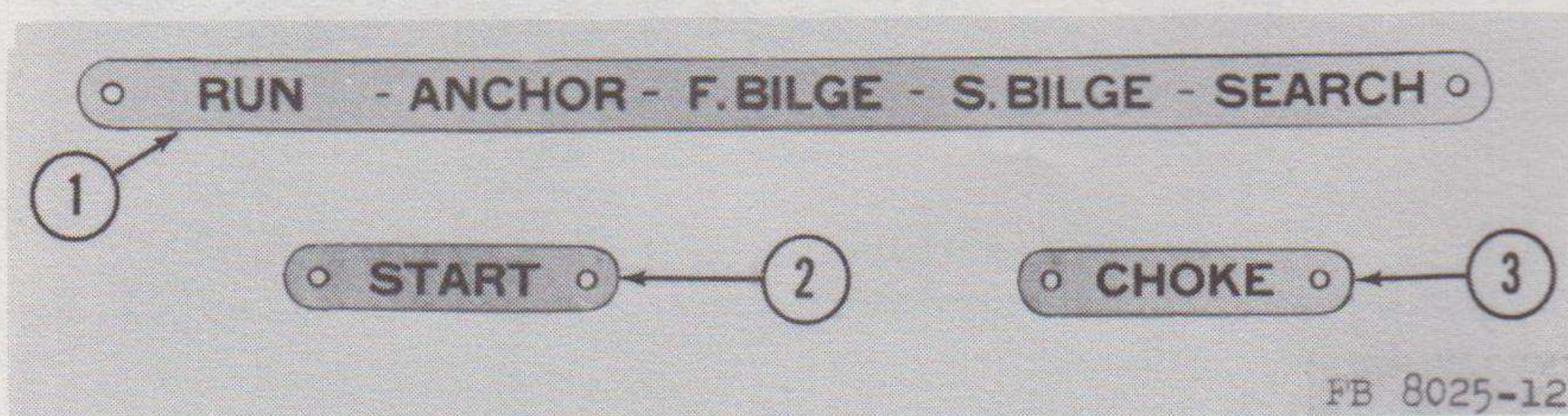
Figure 10. C-O-Two fire extinguisher instruction plate.

g. Run, Anchor, F. Bilge, S. Bilge, Search Identification Plate. The Run, Anchor, F. Bilge, S. Bilge, Search identification plate (1, fig. 12) is located on the electrical panel below the steering wheel. The respective light and pump switches are located below the words "RUN," "ANCHOR," "F. BILGE," "S. BILGE," and "SEARCH" on the plate.



FB 8025-11

Figure 11. Blower-caution identification plate.



FB 8025-12

- | | |
|---|---------------------------------|
| 1 Run, Anchor, F. Bilge, S. Bilge, Search identification plate. | 2 Starter identification plate. |
| | 3 Choke identification plate. |

Figure 12. Switch, starter, and choke identification plates.

h. Starter Identification Plate. The starter identification plate (2, fig. 12) is located below the switch identification plate on the electrical panel. It is positioned between the ignition switches directly above the two starter switches. The word "START" is printed on this plate.

i. Choke Identification Plate. The choke identification plate (3, fig. 12) is located at the top center of the two instrument panels between the two choke controls. The word "CHOKE" is printed on this plate.

j. Ignition Identification Plate. The two ignition identification plates are located on the electrical panel directly above the ignition and blower switch levers (14, fig. 31). The word "IGNITION" is printed on these plates.

k. Bow Section Loading Instruction Plate. The bow section load-

ing instruction plate (fig. 13) is located on the frame of the cradle below the pad eye. This plate indicates which end of the boat should face the pole of the trailer during transportation.

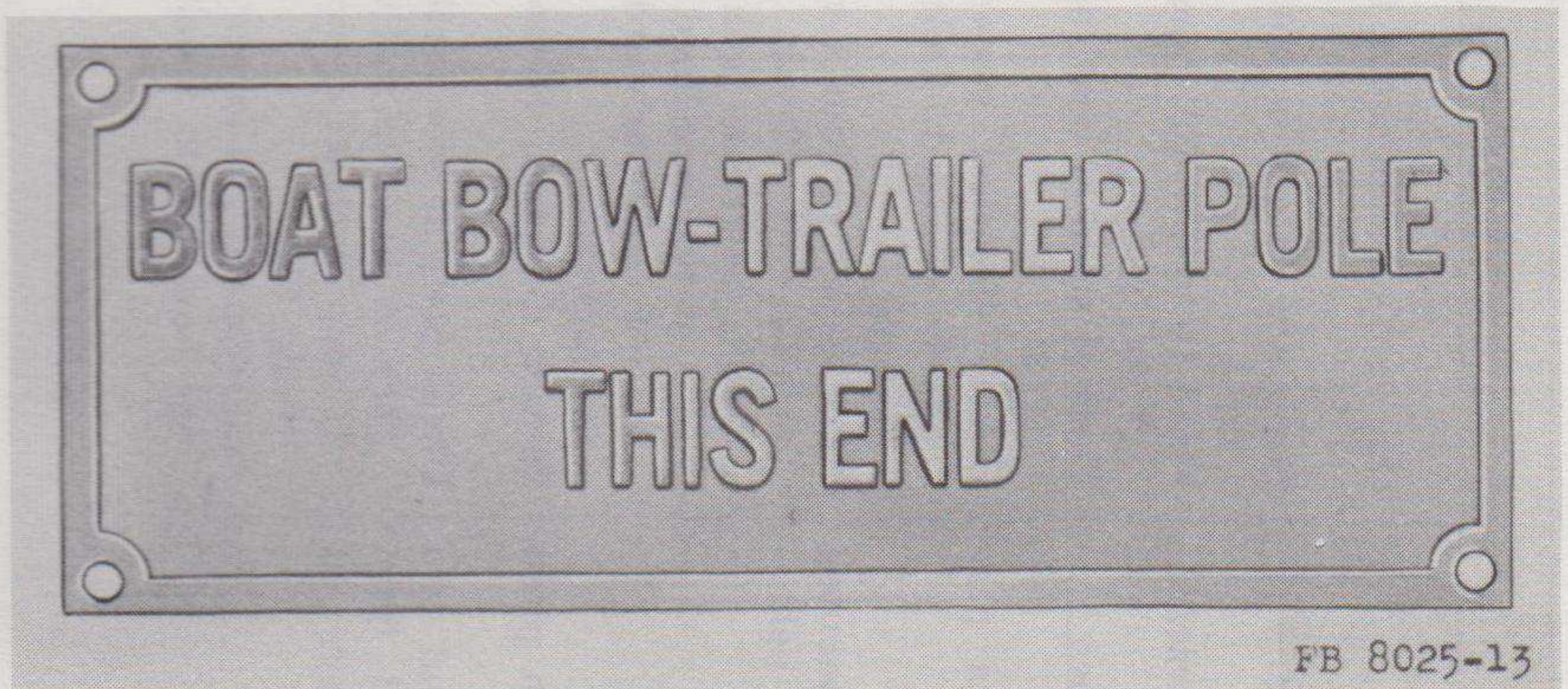


Figure 13. Bow section loading instruction plate.

l. *Stern Section Loading Instruction Plate.* The stern section loading instruction plate (fig. 14) is located on the frame of the cradle forward of the stern sling. This plate indicates which end of the boat should face the cab of the truck during transportation.

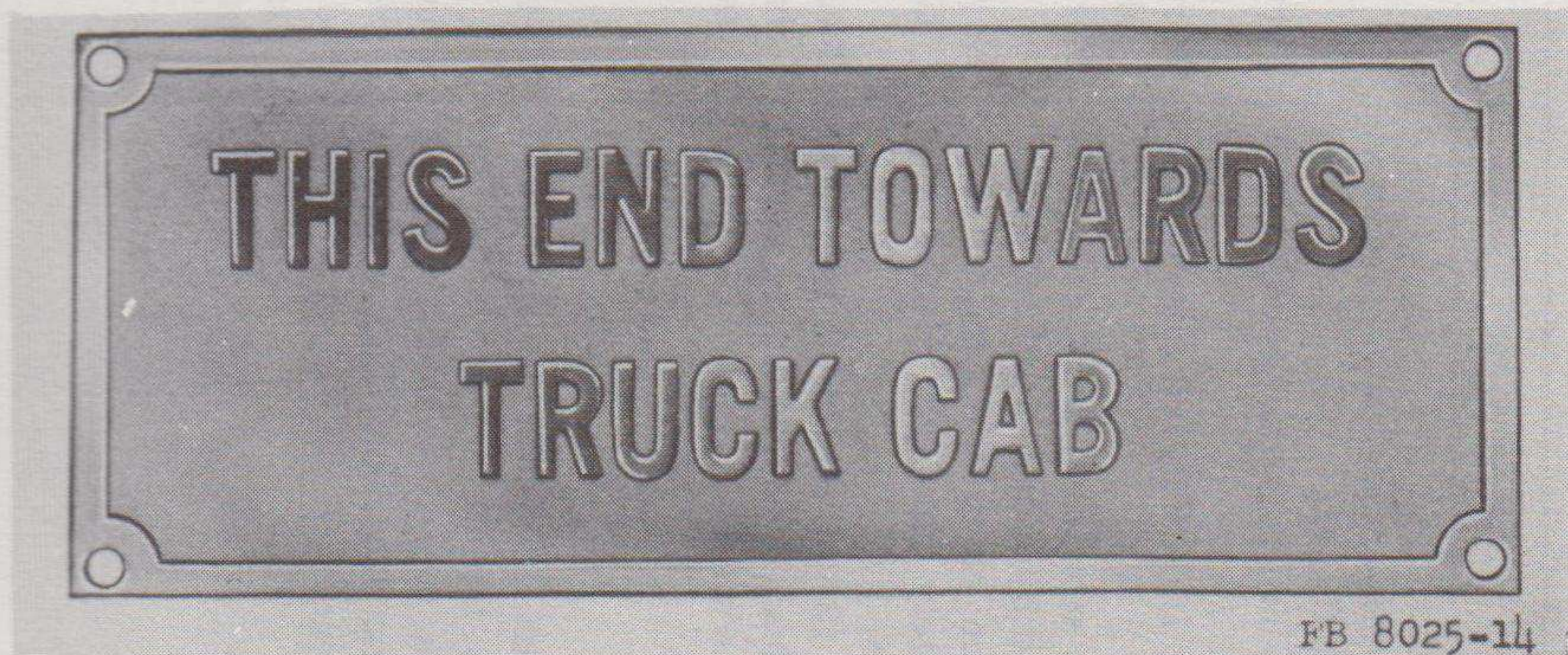


Figure 14. Stern section loading instruction plate.

m. *Starter Switch Warning Plate.* On 51 series boats only, a starter switch warning plate is located above the starter switch buttons on the electrical panel. This plate warns the operator not to press the starter switches if the starting motors are still turning.

5. Differences in Models

Table I indicates the differences in models of 27-foot bridge erection boats. This table covers boat 50-190, other boats of the 50 series, and boats of the 51 series. All boats in the 50 and 51 series do not necessarily have all of the features listed in table I. Individual boats may incorporate features from all three columns.

Table I. Differences in Models

Item	Boat No. 50-190	Other boats 50 series	51 series
Engine hatch cover vents-----	One vent on each cover, forward (25, fig. 1).	No vents-----	One vent on each cover, forward.
Blower location-----	Starboard corner of cockpit (14) (fig. 1).	Forward cockpit coaming-----	Starboard corner of cockpit (8, fig. 3).
Fire extinguisher-----	Fixed 10 lb CO ₂ full release type.	Portable 2 qt carbon tetrachloride hand type.	Fixed 10 lb CO ₂ full release type (7, fig. 3).
Exhaust system-----	Ports at sides of boat, each covered by a deflector (24, fig. 1).	Ports at sides of boat, open-----	Ports at stern of boat, open (11, fig. 3).
Radio suppression shielding-----	Engine electrical system completely shielded, Hallet system.	Engine electrical system partially shielded.	Engine electrical system completely shielded, Delco-Remy system.
Batteries, and battery mountings-----	Two 12-volt batteries mounted in lead lined tray under helmsman's seat.	Two 12-volt batteries mounted in unlined tray under helmsman's seat.	Two 12-volt or four 6-volt batteries. One 12-volt or two 6-volt batteries mounted in each of two lead lined trays at the port and starboard sides of the cockpit.
Propellers-----	29-inch diameter, 19-inch pitch (16, fig. 4).	27-inch diameter, 17-inch pitch.	25-inch diameter, 19-inch pitch.
Bow section sling connection points.	Check plate at bow and two sling U-bolts at deck coupling castings (8, fig. 2).	Check plate at bow and two sling U-bolts inboard from deck coupling castings at cargo hatch coaming.	Check plate at bow further back than on 50 series and two sling U-bolts at cleats on frame five (6, fig. 3).
Forward mooring bitt-----	None-----	None-----	Amidships at the forward end of the bow section hatch (3, fig. 3).

Assist posts-----	None-----	None-----	Two at the forward corners of the bow section hatch (1, fig. 3).
Pushing knees-----	Tubes, 3 ft 3 in. long, capped at both ends. Caps drilled to accommodate a davit (11, fig. 2).	Tubes, 3 ft 3 in. long, capped solidly at both ends.	Tubes, 4 ft long, open at both ends except for bracing blocks (2, fig. 3).
Bow step-----	None-----	None-----	Two, at the forward corners of the bow section hatch (4, fig. 3).
Gratings-----	Five in cockpit, two in bow section hatch.	Three in cockpit, two in bow section hatch.	Three in cockpit, two (large) in bow section hatch.
Bow section side lockers-----	Two, one on each side of bow section hatch.	Two, one on each side of bow section hatch.	None.
Assist post stowage bracket and clip.	None-----	None-----	Forward end of bow section hatch coaming.
Rudder shaft deck bearing-----	None-----	One at the top of each rudder shaft.	One at the top of each rudder shaft.
Rudder strut-----	Extends from propeller strut to bottom of rudder (22, fig. 87).	Extends from propeller strut around rudder and up to stern of boat.	Extends from propeller strut around rudder and up to stern of boat (22, fig. 88).
Strut brace-----	Two braces, one from each propeller strut to the skeg plate (26 and 31, fig. 87).	One brace between the two propeller struts. Brace passes through skeg plate.	One brace between the two propeller struts (31, fig. 88).
Skeg-----	One wide skeg plate in center of boat with a skeg tube running along the bottom (23, fig. 87).	One wide skeg plate in center of boat. Three skeg tubes, one from each rudder strut to the hull and one along the bottom of the skeg plate.	Two narrow skeg plates in line with the propeller shafts, with skeg tubes running along the bottom of each (26, fig. 88).
Fuel tank--	Feeds at bottom front on each side.	Feeds at bottom front on each side.	Feeds at top center.
Helmsman's seat-----	Port side of cockpit-----	None-----	None.

Table I. Differences in Models—Continued

Item	Boat No. 50-190	Other boats 50 series	51 series
Towing bitt-----	Lifting eye on top (1, fig. 44). Bolted to bracket at the base.	Flat cap on top. Secured at the bottom by a lock bar.	Flat cap on top (20, fig. 3). Secured at the bottom by a lock bar.
Stern sling-----	Three fiege fittings, one for each sling U-bolt and one for towing bitt lifting eye.	Two fiege fittings, one for each sling U-bolt and one loop to fit over the towing bitt.	Two fiege fittings, one for each sling U-bolt and one loop to fit over the towing bitt.
Searchlight-----	Port side of control box-----	Windshield, starboard of the control box.	Starboard corner of cockpit.
Cockpit step-----	None-----	None-----	Starboard side of cockpit.
Heat exchanger guards-----	Four, one fore and aft of both sets of heat exchangers.	None-----	Four, one fore and aft of both sets of heat exchangers. A zinc plate is secured to each guard.
Stern chock closure-----	Slide bolt-----	Slide bolt-----	Yoke.
Steering wheel knob-----	None-----	None-----	On wheel rim.
Throttle levers-----	On face of control box-----	On top of control box-----	On face of control box.
Operating switches-----	On electrical panel mounted on control box.	On face of control box. No electrical panel.	On electrical panel mounted on control box (13, fig. 3). Arrangement of switches different from that on boat 50-190.
Rudder levers-----	Square hole to fit rudder shaft--	Round hole keyed to rudder shaft.	Round hole keyed to rudder shaft.
Lashing hooks-----	Quantity 32 (5, fig. 5)-----	Quantity 32-----	Quantity 35.
End item nomenclature nameplate.	In cockpit-----	None-----	In cockpit.
Starter switch warning plate-----	None-----	None-----	Above starter switches on electrical panel.

Hour meters-----	None-----	None-----	Two, one for each engine, on the electrical panel.
Battery paralleling switch-----	None-----	None-----	On electrical panel.
Choke controls-----	Two, one above each instrument panel.	Two, one above the other, below the steering wheel.	Two, both above the port instrument panel.

6. Tabulated Data

a. Boat.

Dimensions :

Overall length ----- 27 ft.
Beam ----- 8 ft.

Draft (from base line) :

Bow ----- 5 in.
Mid (unloaded) ----- 13 $\frac{3}{4}$ in.
Stern (unloaded) ----- 21 $\frac{1}{4}$ in.
Stern (maximum load) ----- 40 in.

Weight (without accessories) :

Bow section ----- 1,150 lb.
Stern section ----- 4,700 lb.
Total displacement ----- 5,850 lb.

Center of gravity (in operating condition) :

Unit assembled ----- 9 in. forward of frame 8.

b. Engine.

Number of cylinders ----- 6.
Bore ----- 3 $\frac{7}{16}$ in.
Stroke ----- 4 $\frac{3}{8}$ in.
Displacement ----- 244 cu in.
Brake horsepower ----- 102 at 3,200 rpm.
Compression ratio ----- 7.7 : 1
Firing order ----- 1-5-3-6-2-4.
Rotation (facing rear of engine) ----- Clockwise.
Oil pressure (at full throttle) ----- 40 lb.
Weight (dry—with accessories) ----- 950 lb.
Height (with accessories) :
 Above shaft ----- 16 $\frac{3}{16}$ in.
 Below centerline ----- 11 $\frac{1}{16}$ in.
Length overall (with reduction gear) ----- 55 $\frac{11}{16}$ in.
Width (with accessories) ----- 23 $\frac{11}{16}$ in.

c. Reverse Gear.

Make ----- Paragon.
Model ----- 3XE-90.
Type ----- Planetary.
Lubrication ----- Engine pressure system.

d. Engine Accessories.

Generator :

Make ----- Delco-Remy.
Model ----- 1102991.
Rotation (facing drive end) ----- Counterclockwise.
Rated output (at 1,175 rpm) :
 Voltage ----- 12 volts.
 Current ----- 10 amp.
 Voltage and current control ----- Generator regulator.
 Bearings (both ends) ----- Ball.
 Brush spring tension (with new brushes) ----- 25 oz.
 Field current (at 12 volts) ----- 2.7-3.0 amp.

Generator—Continued

Starting motor:

Make ----- Delco-Remy.
Model ----- 1108138.
Rotation (facing drive end) ----- Clockwise.
Rated input:
Voltage ----- 12 volts.
Current:
No load (maximum with 11.3 volts input) ----- 70 amp.
Locked armature (with 6.7 volts input) ----- 530 amp.
Brush spring tension (with new brushes) ----- 24-28 oz.
Bearings (1 at each end and 1 in Bendix drive) ----- Absorbent bronze.
Torque (armature locked) ----- 16.0 ft.-lb.
Starter switch:
Type ----- Solenoid.
Location ----- On starting motor.
Motor drive ----- Right-hand outboard Bendix.
Gears:
Number of teeth on flywheel ----- 140.
Number of teeth on starter pinion ----- 9.
Reduction ratio ----- 15.5:1.

Generator regulator:

Make ----- Delco-Remy.
Model ----- 1118708.
Type ----- Three step vibrating.

Ignition switch:

Make ----- Clum.
Model ----- 8889.

Radio interference suppression:

Make:
Boat 50-190 ----- Hallet.
Boats 51 Series ----- Delco-Remy.
Model:
Boat 50-190 ----- 1660.
Boats 51 Series ----- 1111575.

Carburetor:

Make ----- Zenith.
Model:
Boat 50-190 ----- 63M2E12.
Boats 51 series (with governor) ----- 63M2E12R.
Type ----- Updraft.
Throat size ----- 1¹¹/₁₆ in.

Oil cooler:

Make ----- Harrison.
Type ----- Plate.

Exhaust cooling water pump:

Make ----- Marine Products.
Model ----- L30.
Type ----- Impeller.

Engine cooling water pump:

Make ----- Gray Marine.
Model ----- 55097.
Type ----- Impeller.
Capacity (at 3,200 rpm) ----- 55 gpm.
Pump to engine speed ratio ----- 1.27:1.

Heat exchangers :

Engine cooling system :

Make ----- Gray Marine.
Model ----- B842x5.
Type ----- Tubular.

Exhaust cooling system :

Make ----- Gray Marine.
Model ----- B542x5.
Type ----- Tubular.

Oil filter :

Make ----- Fram.
Type ----- Replaceable element.

e. Batteries.

Make ----- Exide.
Model ----- 6-LXWG.
Group size ----- 4B.
Type ----- Lead acid.
Voltage ----- 12 volts.

f. Reduction Gear.

Make ----- Paragon.
Model ----- RC 30.
Type ----- Internal gear.
Reduction ratio ----- 3:1.
Lubrication ----- Engine pressure system.

g. Bilge Pumps.

Make ----- Wilcox-Crittenden.
Model ----- 8002.
Type ----- Impeller.

h. Blower.

Make ----- Wilcox-Crittenden.
Model ----- 8780.
Type ----- Centrifugal.

i. Lights.

Searchlight :

Make ----- Kilborn Sauer.
Model :
Head ----- 1927.
Clevis and handle ----- 1400.

Bow light :

Make ----- Wilcox-Crittenden.
Model ----- 136-A.

Anchor light :

Make ----- Wilcox-Crittenden.
Model ----- 935.

Running lights, port and starboard :

Make ----- Wilcox-Crittenden.
Model ----- 33.

j. Steering System.

Steerer :
Make ----- Kainer.
Model ----- 9005.
Intermediate gear box :
Make ----- Kainer.
Model ----- 9000.
Steering quadrant :
Make ----- Kainer.
Model ----- B.

k. Cutless Propeller Shaft Bearings.

Make ----- B. F. Goodrich.
Model ----- 46M6e.

l. Boat Performance Data.

Speed :
With no load ----- 20 mph.
With 3,000 lb load ----- 17.5 mph.
Towline pull :
Astern (at zero speed) ----- 2,600 lb.
Ahead :
At zero speed ----- 3,900 lb.
At 5 mph ----- 3,200 lb.
At 8 mph ----- 2,600 lb.
At 10 mph ----- 2,000 lb.
At 12 mph ----- 1,500 lb.
At 15 mph ----- 800 lb.
Turning circle :
Full speed ahead ----- 70 ft.
Full speed astern ----- 25 ft.
Fuel consumption per hour per engine ----- 7.5 gal.

m. Capacities.

Cooling system (per engine) ----- 8 gal.
Crankcase (per engine) ----- 10 qt.
Fuel tank ----- 85 gal.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

7. New Equipment

a. General. Protective materials were applied to the various surfaces of the boat before shipment to protect from the harmful effects of rust, corrosion, and fungus action. These protective materials must be removed before the boat is operated. If not removed, they may cause sticking or jamming of working parts. In some cases proper lubrication of the parts may be prevented if the protective material is not removed. After all protective material has been removed, the boat can be assembled and completely lubricated. All parts removed for shipment and a packing list enumerating them are packed in a crate stowed in forward cargo hatch.

b. Removal of Protective Material.

- (1) Remove the storage batteries and battery electrolyte from the stern section crate base through the service door in the crate.
- (2) Remove the crates from around the skid mounted bow and stern sections of the boat.
- (3) Remove the type P-1 preservative from the threaded surfaces on the tie rods, adjusting rods, clevises, bolts, and nuts. Use cleaning solvent.

Note. Unless otherwise specified, all preservative types mentioned are as listed in Specification JAN-P-116.

- (4) Remove the type P-1 preservative from the unpainted surfaces of the linkages, nameplates, grease fittings, anchor, heat exchangers, hose clamps, propeller shafts, boat hook, engine starting hand cranks, cockpit canvas support poles, and other ferrous surfaces which have been exposed by disassembly. Use cleaning solvent.
- (5) Remove the type P-6 preservative from the carburetor linkages, pins, chokes, and throttles. Use cleaning solvent.
- (6) Remove the pressure sensitive tape from the distributors.
- (7) Remove the pressure sensitive tape and greaseproof barrier-material from the battery cables.
- (8) Remove the type P-1 preservative from the unpainted exterior surfaces of the exhaust pipes, elbows, and water tank filler caps. Use cleaning solvent.

- (9) Remove the pressure sensitive tape and plywood pieces covering instrument dial glasses.
- (10) Remove the pressure sensitive tape and greaseproof barrier-material from the bilge pump openings.
- (11) Remove the greaseproof barrier-material from around the bilge pump motors.
- (12) Remove the type P-1 preservative from the exposed surfaces of the propeller shafts and flexible couplings. Use cleaning solvent.
- (13) Remove the greaseproof barrier-material from the reverse lever cranks.
- (14) Remove the pressure sensitive tape from the tachometer cable connectors.
- (15) Remove the pressure sensitive tape securing the masthead socket cords to the hull.
- (16) Remove the pressure sensitive tape from the masthead sockets.
- (17) Remove the type P-3 preservative from the steel pins in the roller chocks. Use cleaning solvent.
- (18) Remove the water-resistant adhesive and waterproof barrier-material from around the canvas covers and fenders.
- (19) Take the demounted lights out of their fiberboard boxes.
Note. All items that were removed for shipment will be found in the wooden box packed in the forward cargo hatch.
- (20) Unpack the life preservers, bell, and whistle.
- (21) Remove the retaining wire and type P-1 preservative from the fire extinguishers. Use cleaning solvent.
- (22) Remove the waterproof barrier-material and type P-1 preservative from the searchlight tube assembly. Use cleaning solvent.

c. Inspection for Damage.

- (1) Carefully inspect the hull of the boat for loose or broken rivets, dents, and punctures of the plating.
- (2) Check the hull for warpage.
- (3) Check the propeller shafts for alinement (par. 131).
- (4) Inspect the deck hardware, hatch covers, towing bitt, and hull connectors for signs of damage.
- (5) Check all controls to see that they are not broken or jammed.
- (6) Inspect the items removed for shipment to see that they were not damaged in transit.
- (7) Check the items removed for shipment against the packing list to see that none were lost.

d. Assembly of Items Removed for Shipment.

- (1) Assemble the mast light and stern light mast (par. 78e).
- (2) Assemble the running lights (par. 77e).
- (3) Mount the searchlight on the searchlight tube.

- (4) Rig the $\frac{3}{4}$ -inch diameter 100-foot long manila anchor line to the anchor.
- (5) Rig the haul chock lines (9, fig. 3).

8. Lubrication

All lubrication services described in paragraphs 52 through 55 must be performed before the boat is operated. Engine oil must not be put in the engine crankcases until the boat is in the water.

9. Setting Up Instructions

a. General. After the protective materials have been removed from the boat and its accessories, and a careful inspection for damage has been made, the boat must be set up. The setup steps must be followed in the given order.

b. Batteries. Carefully pour the battery electrolyte into the battery cells. Cover the plates to a depth of about $\frac{3}{8}$ -inch. Test each cell with a suitable cell voltage tester. Do not use a hydrometer. If the batteries are weak, charge them. Install the fully charged batteries in the boat (par. 89c). The batteries fit in a battery tray under the helmsman's seat in boat 50-190 and other 50 series boats, and in two battery trays on the port and starboard sides of the cockpit in the 51 series boats.

c. Anchor. Stow the anchor and 100-foot anchor line in the bow section forward locker.

d. Cover Poles and Canvas Covers. Stow the bow and stern section cover poles and canvas covers in the port locker in the cargo hatch.

e. Life Preservers. Fold and stow the life preservers in the starboard locker in the cargo hatch.

f. Control Box Cover. Stow the number six canvas duck control box cover in the cockpit.

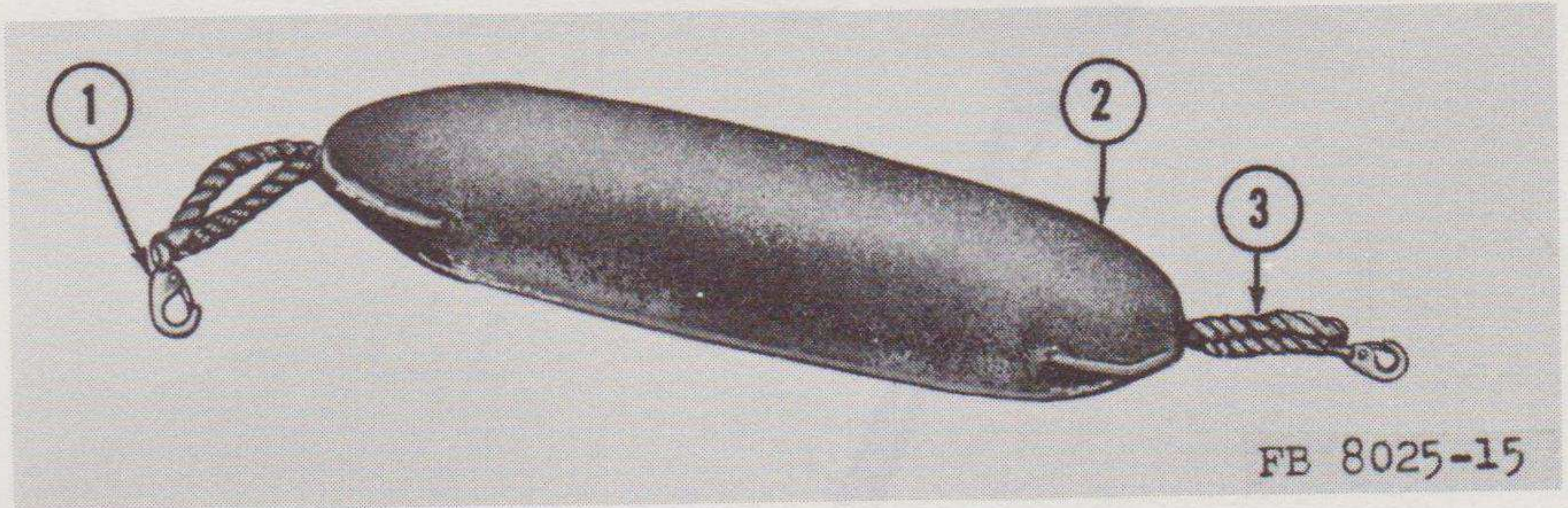
g. Engine Repair Tools. Stow the tool box containing the engine repair tools in the cockpit.

h. Fenders. Install three fenders (fig. 15) on the port side and three on the starboard side of the boat. Fasten the snaphooks (1) to the eyebolts (8, fig. 5) located under the gunwales.

i. Bell. Install the brass bell (fig. 16) by slipping the arm into the bell mounting bracket (7, fig. 31) located to the right of the control box on the windshield.

j. Mast Light Assembly. Install the mast light assembly and stern light mast (fig. 17) in the deck mounting bracket aft of the cockpit coaming (par. 78d).

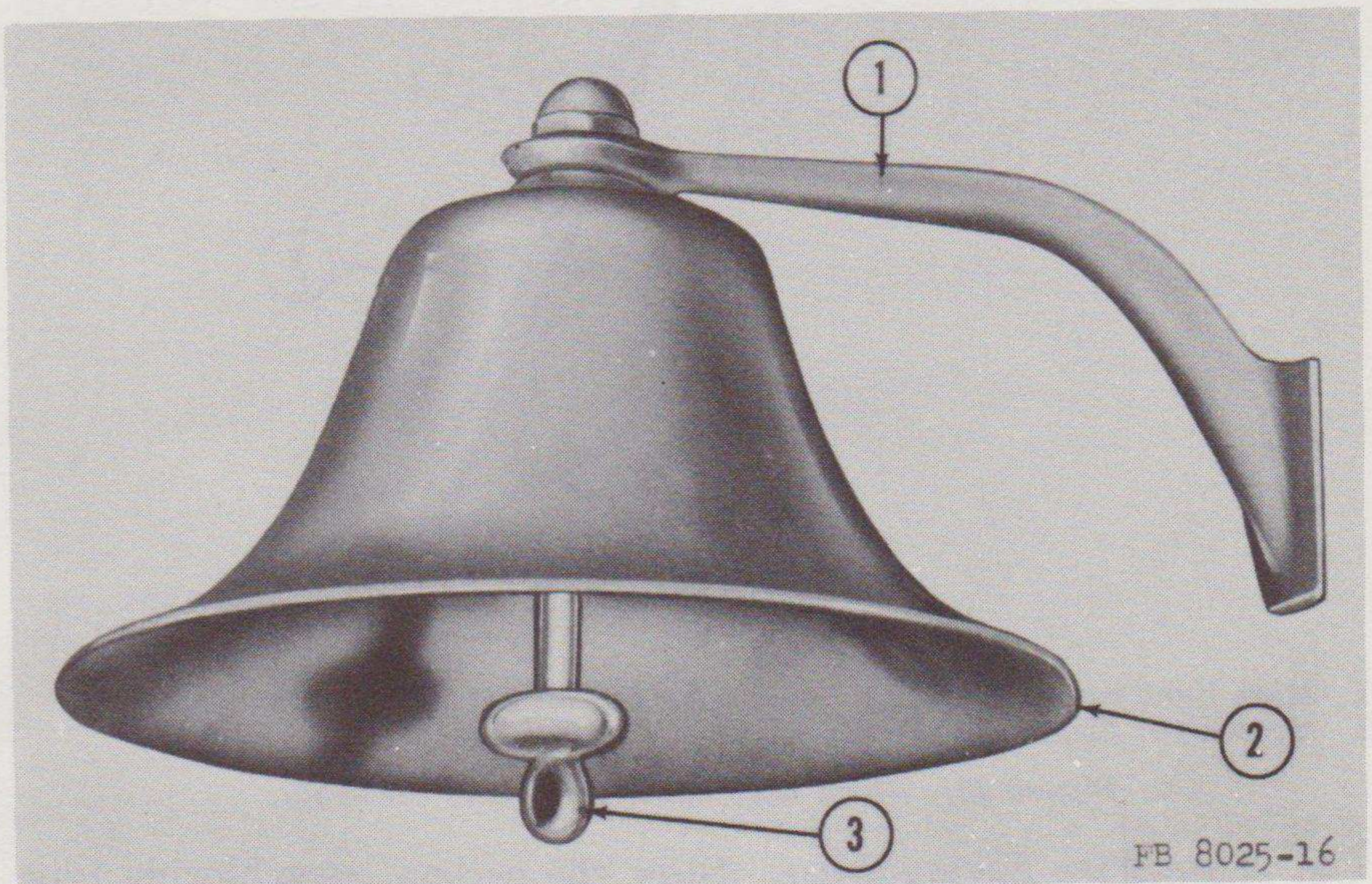
k. Bow Oil Light. Install the bow oil light (fig. 18) in its bracket (3, fig. 19) at the bow of the boat.



- 1 Snaphooks
- 2 Fender

- 3 Rope pendant

Figure 15. Fender.



- 1 Bell mounting arm
- 2 Bell barrel

- 3 Bell clapper

Figure 16. Brass bell.

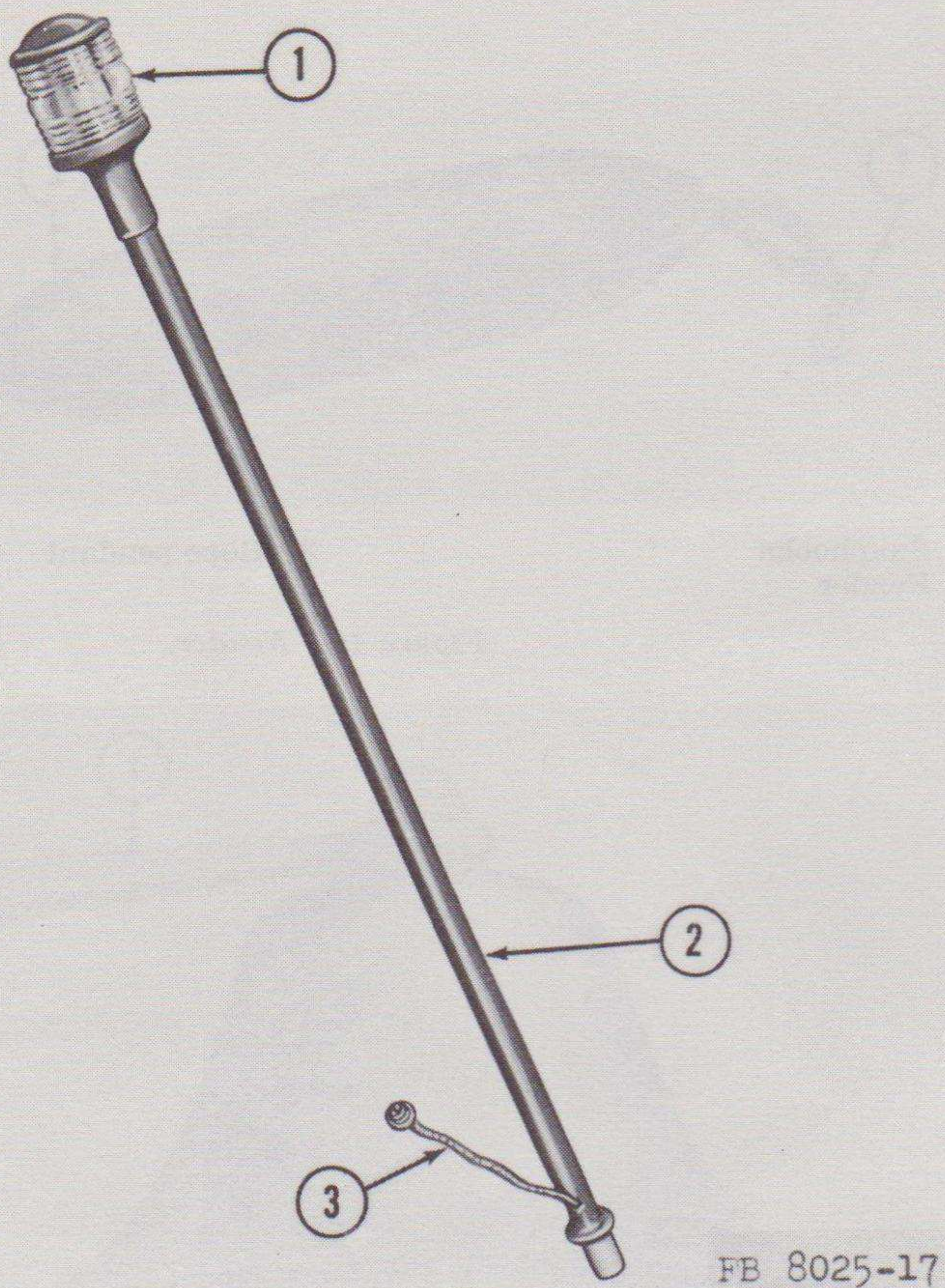
l. Running Lights. Install the running lights (fig. 20) in their brackets at the forward corners of the windshield (par. 77e).

Note. Parts removed for shipment and their mating parts on the boat are identically stencilled with lusterless white enamel markings 2 inches high. The markings are stencilled directly on the parts if the parts are large enough, or on attached tags if the parts are small.

m. Panel Lights. Install the panel lamp bulbs and shields (par. 79d).

n. Searchlight. Install the searchlight (fig. 21) in its bracket on the port side of the control box (par. 80f).

o. Floodlight. Stow the floodlight (fig. 22) in the port locker in the cargo hatch.



1 Mast light assembly
2 Stern light mast

3 Anchor light to receptacle cable

Figure 17. Stern light mast and light assembly.

p. Hand Fire Extinguisher. Stow the carbon tetrachloride type hand fire extinguisher (fig. 23), furnished with 50 series boats, in the starboard locker in the cargo hatch.

10. Launching

a. Attach Slings to Bow Section. Connect the two open-end Fiege fittings (1, fig. 24) of the bow section sling to the two bow sling U-bolts (8, fig. 2) on the port and starboard sides of the deck at frame 6. The eye-end Fiege fitting (4, fig. 24) is permanently connected to the forward lifting eye and requires no attention.

Warning: Do not remove the lashings holding the bow section to the frame of the pole-type trailer until the U-bolts have been removed from the trailer and cradle.

b. Launch Bow Section. After the U-bolts have been removed from the trailer and cradle, remove the lashings. Attach a hoist to the sling lifting yoke (2, fig. 24), and lift the bow section clear of the cradle. Lower the bow section into the water (fig. 25).

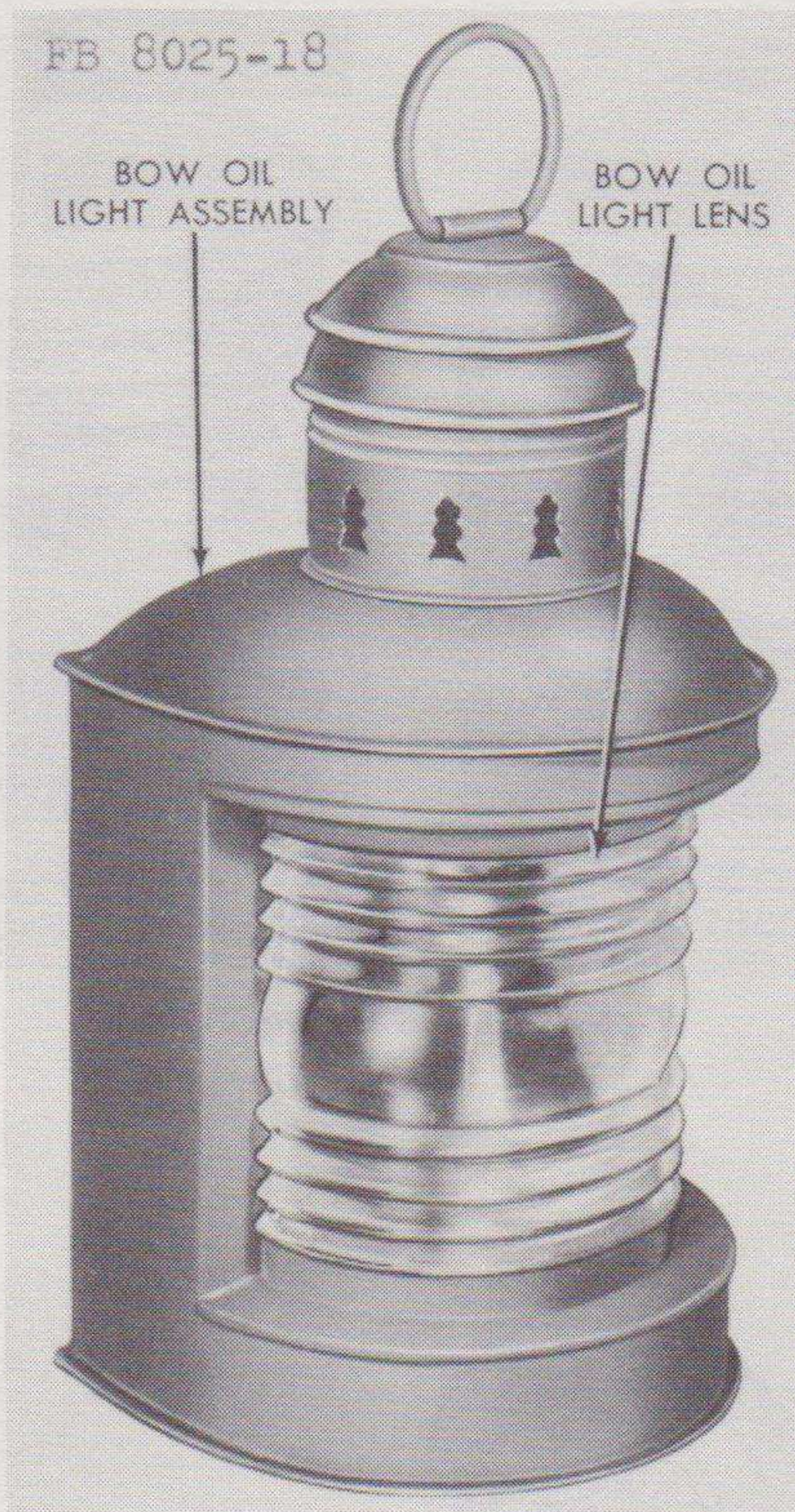
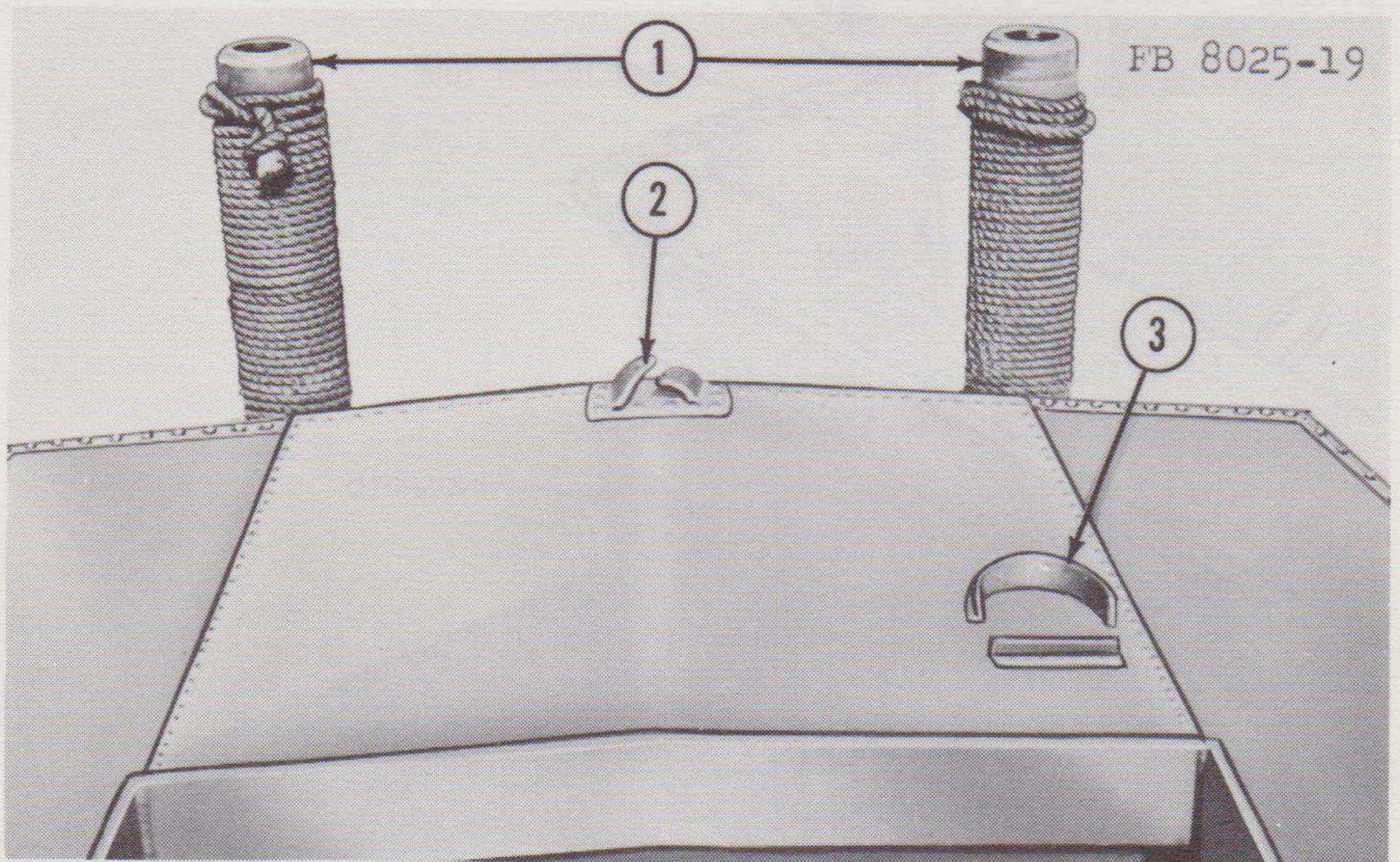


Figure 18. Bow oil light.

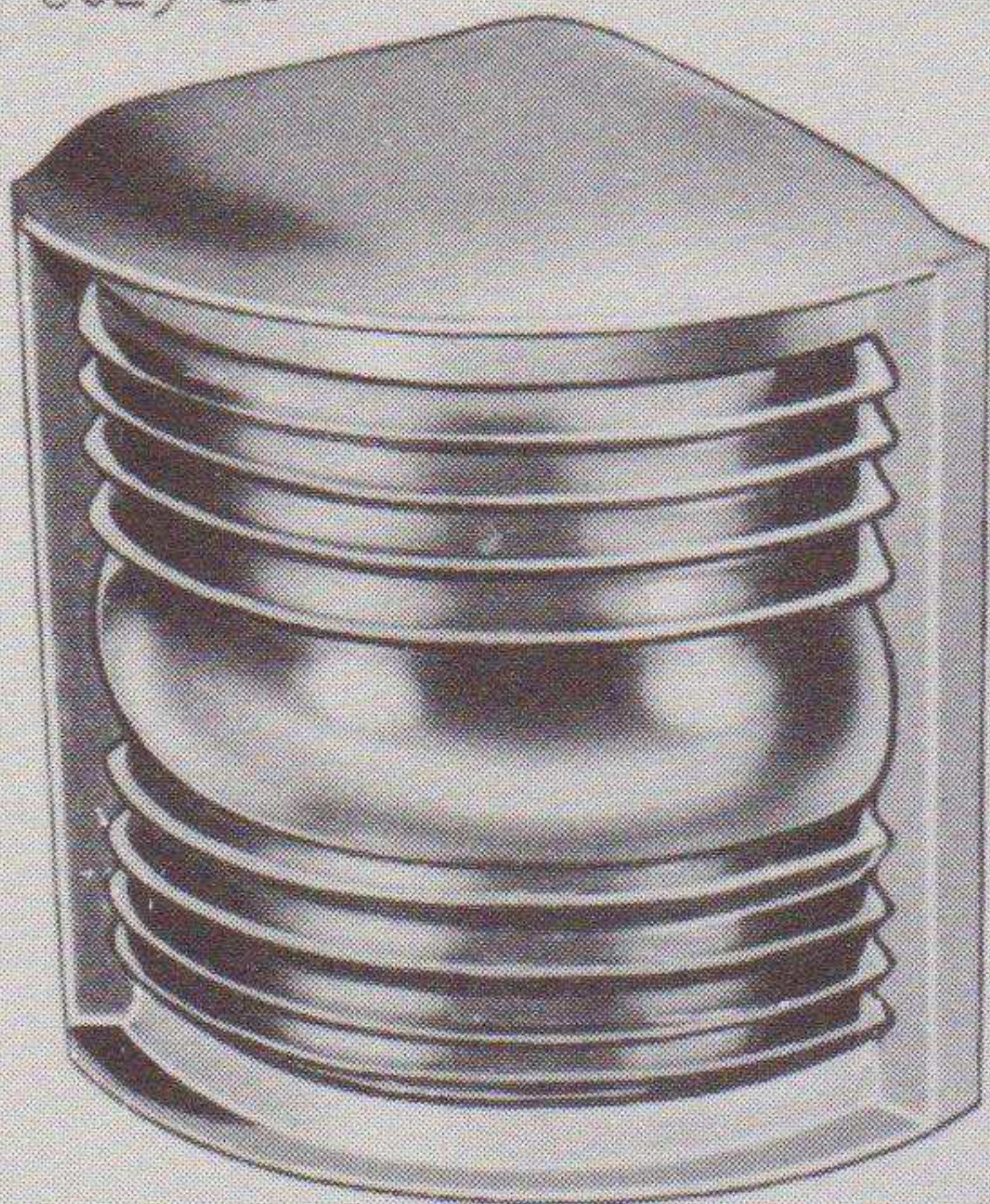


- 1 Pushing knee
- 2 Bow chock

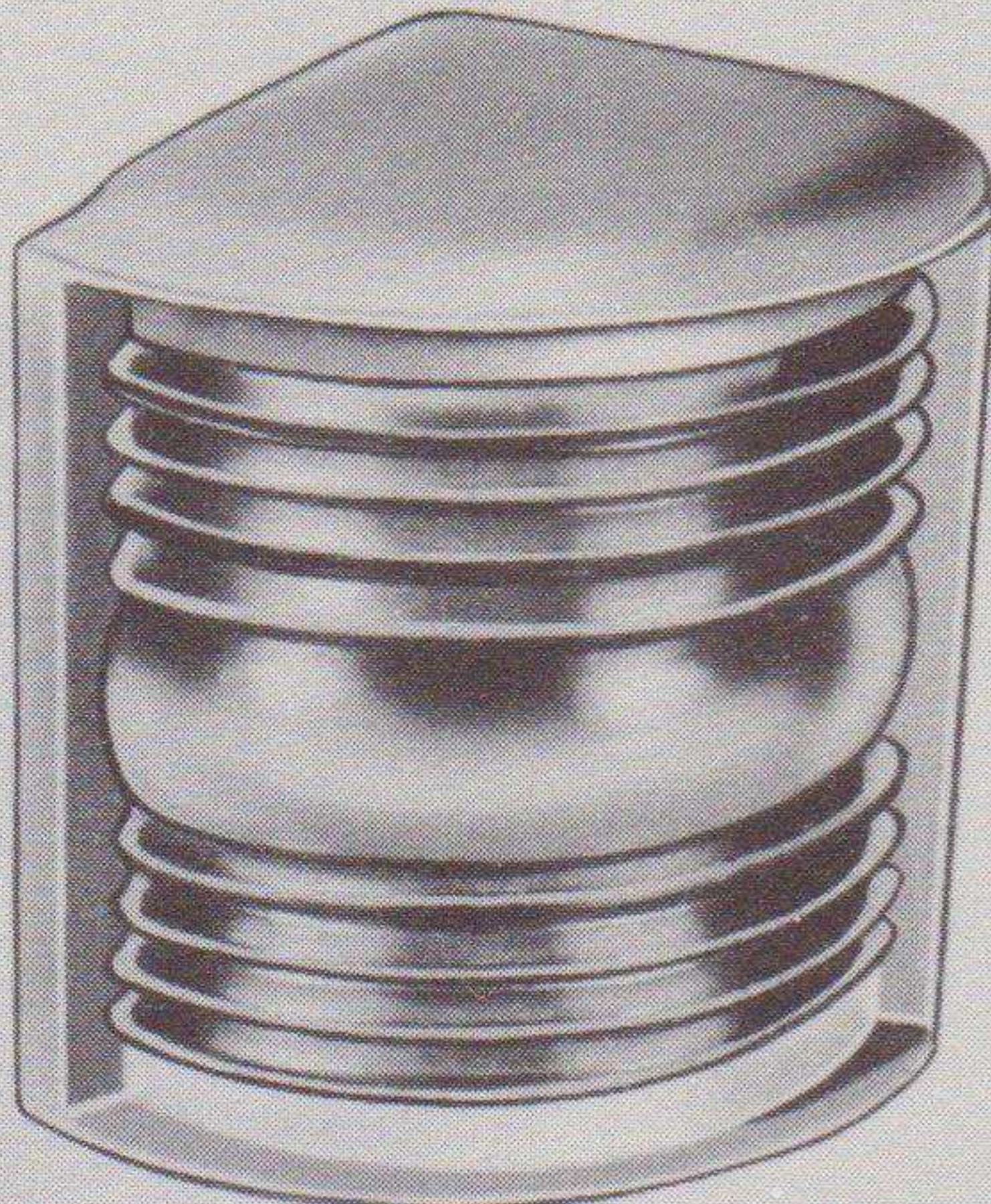
- 3 Bow oil light bracket

Figure 19. Pushing knees, bow chock, and bow oil light bracket installed.

FB 8025-20



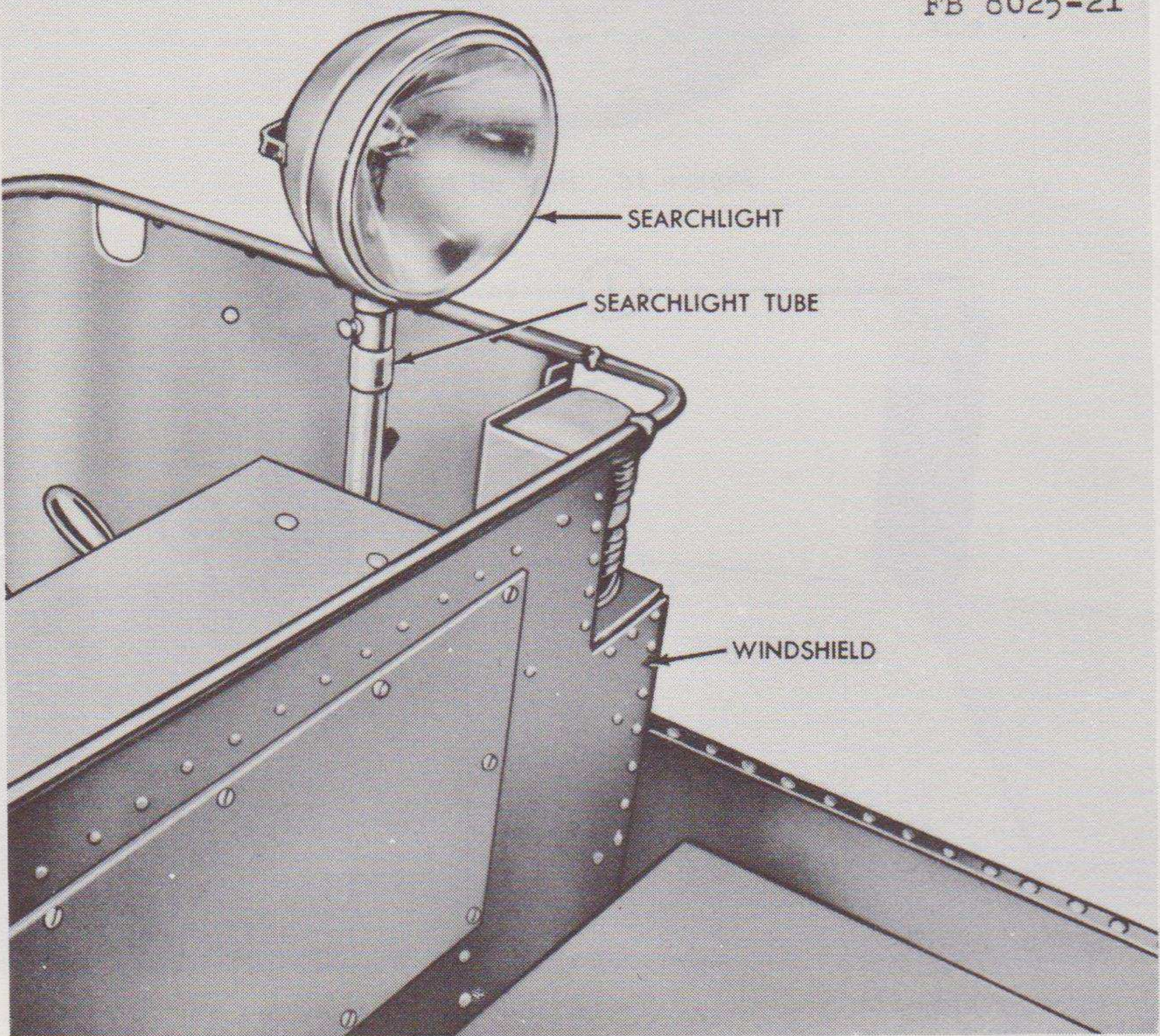
PORT RUNNING LIGHT ASSEMBLY



STARBOARD RUNNING LIGHT ASSEMBLY

Figure 20. Running lights.

FB 8025-21

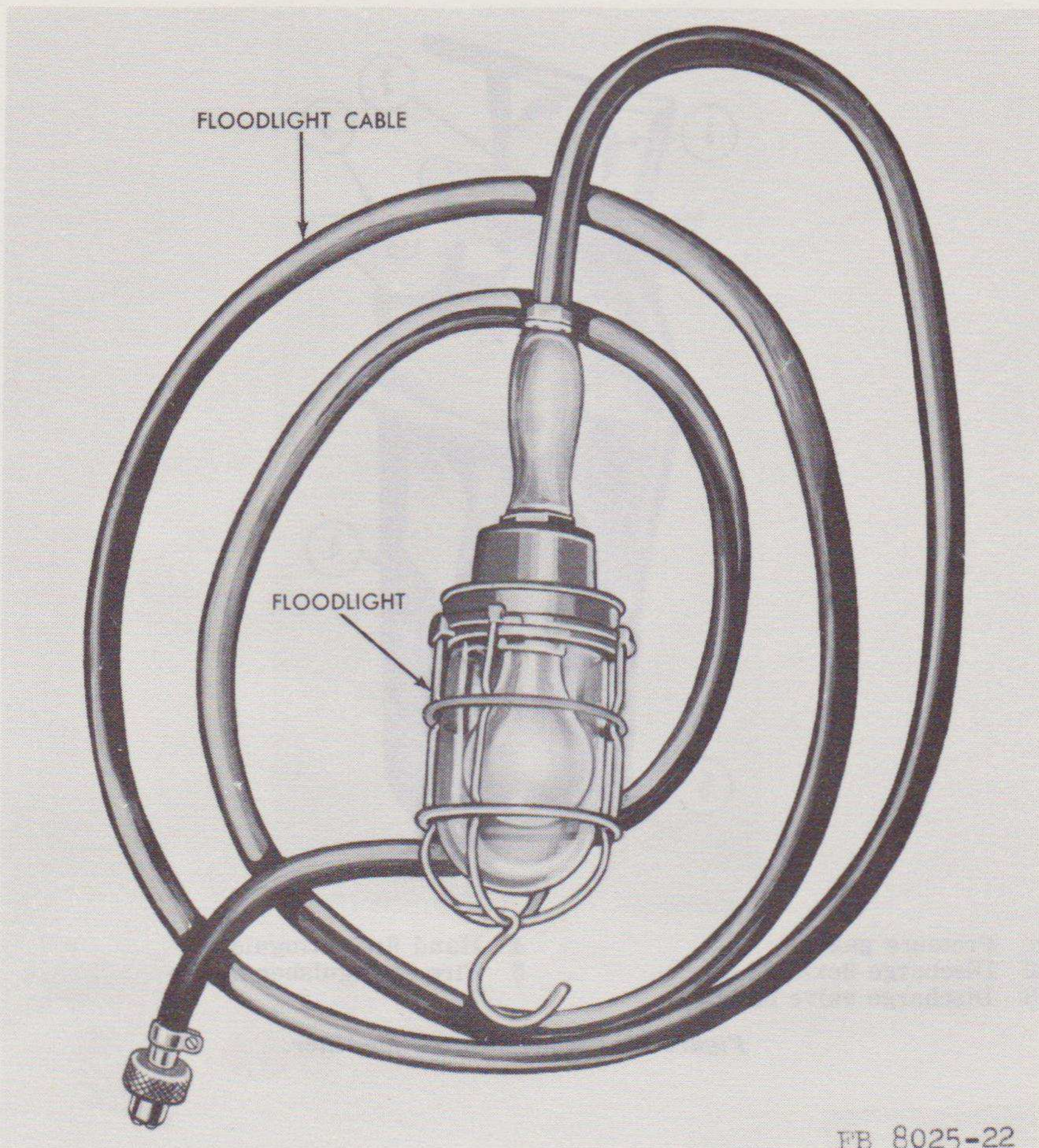


SEARCHLIGHT

SEARCHLIGHT TUBE

WINDSHIELD

Figure 21. Searchlight and tube.



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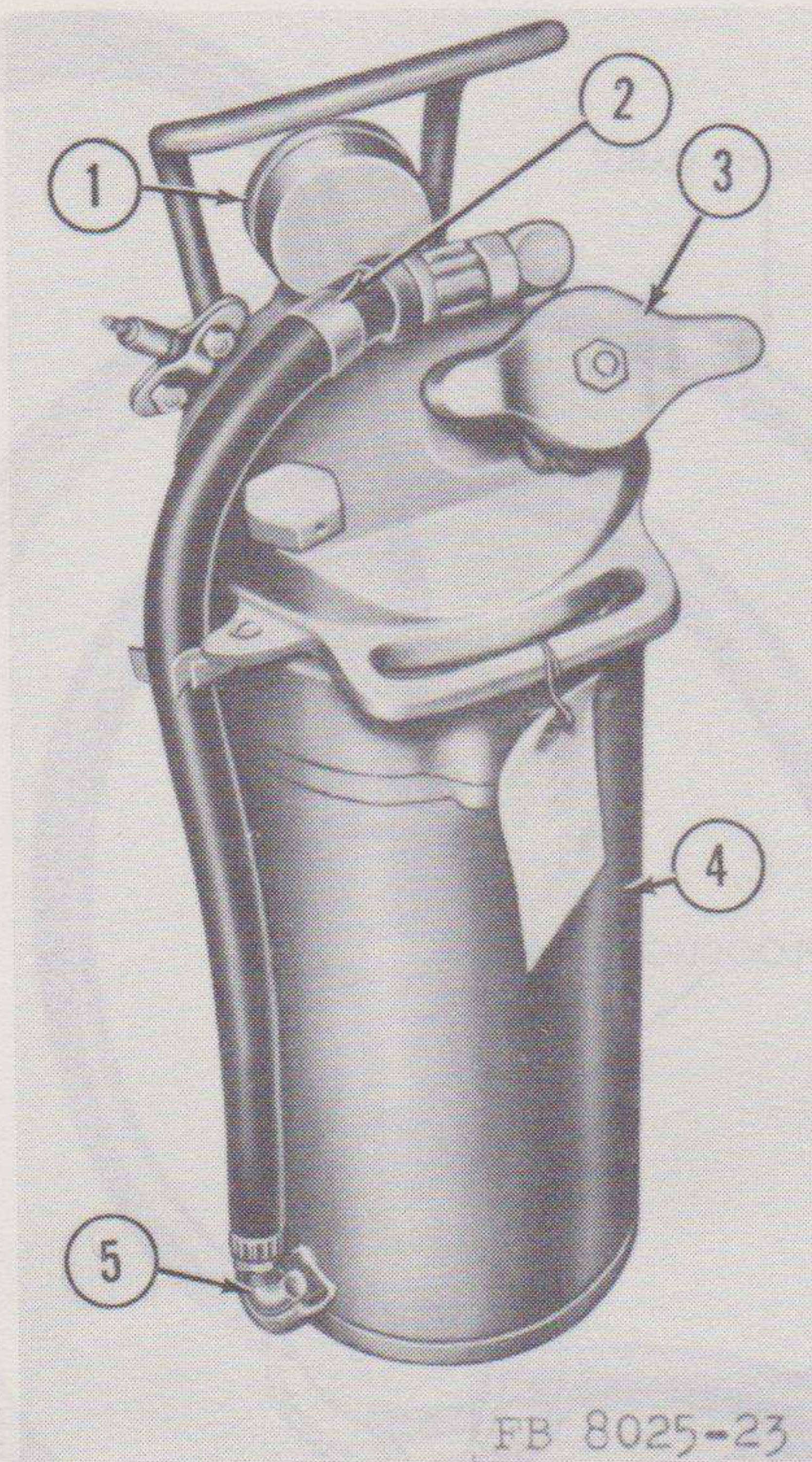
Figure 22. Floodlight.

c. Attach Slings to Stern Section. Connect the two open-end Fiege fittings of the stern section sling (1, fig. 24) to the port and starboard stern sling U-bolts (9, fig. 2) on deck at frame 6. Connect the eye-end Fiege fitting to the lifting eye on top of the towing bitt (1, fig. 44). Remove the lashings holding the stern section to the truck.

Warning: Always disconnect the propeller shaft from the engine at the coupling before launching.

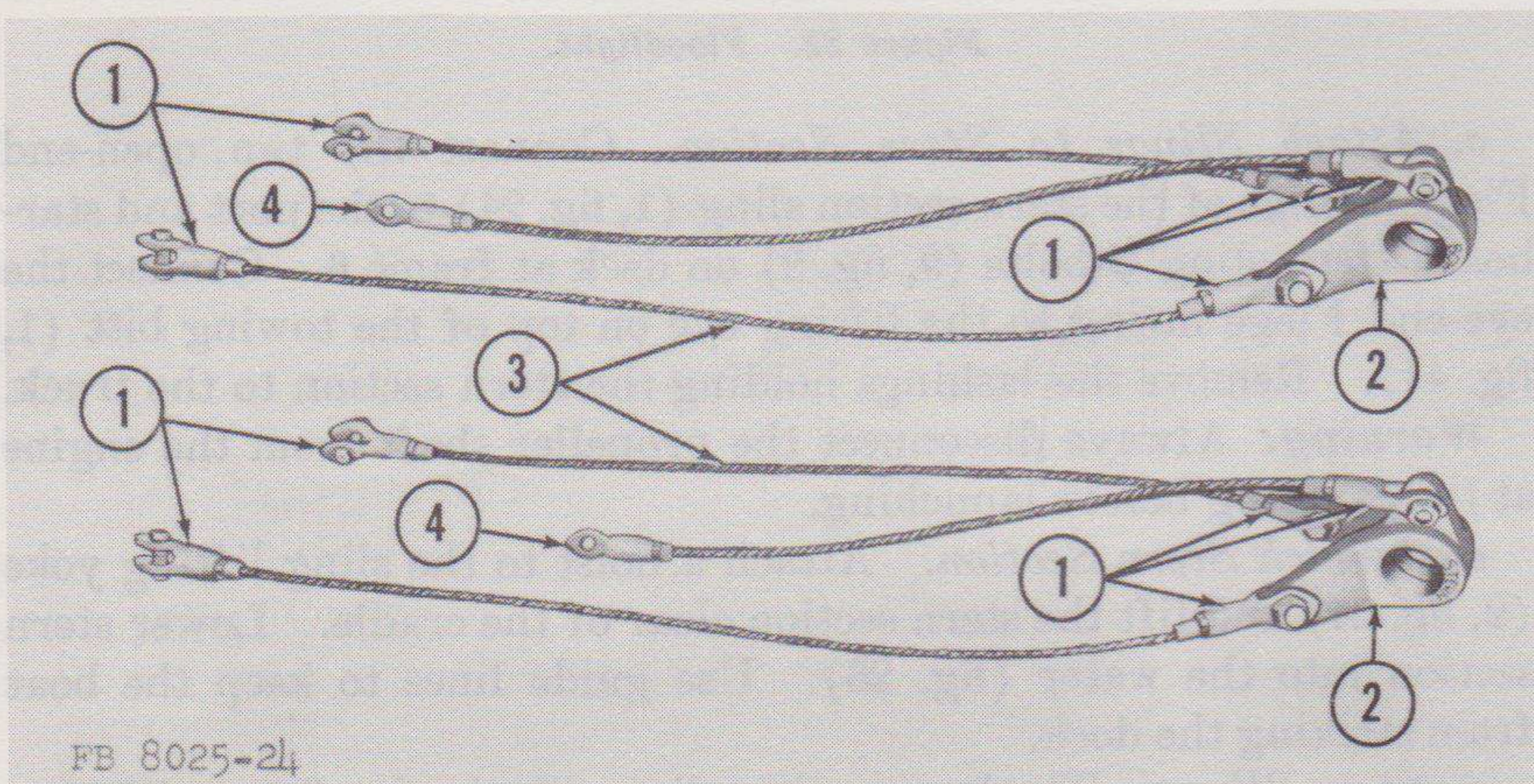
d. Launch Stern Section. Attach a hoist to the sling lifting yoke (2, fig. 24) and lift the stern section clear of the cradle. Lower stern section into the water (fig. 26). Use guide lines to keep the boat from striking the dock.

e. Stow Slings. The bow section sling goes in the forward locker in the cargo hatch. The stern section sling goes on brackets on the forward wall of the engine compartment.



- | | |
|---------------------------|----------------------------|
| 1 Pressure gage | 4 Hand fire extinguisher |
| 2 Discharge flexible hose | 5 Fire extinguisher nozzle |
| 3 Discharge valve handle | |

Figure 23. Hand fire extinguisher.



- | | |
|--------------------------|-------------------------|
| 1 Open-end fiece fitting | 3 Plow steel cable |
| 2 Lifting yoke | 4 Eye-end fiece fitting |

Figure 24. Bow and stern slings.

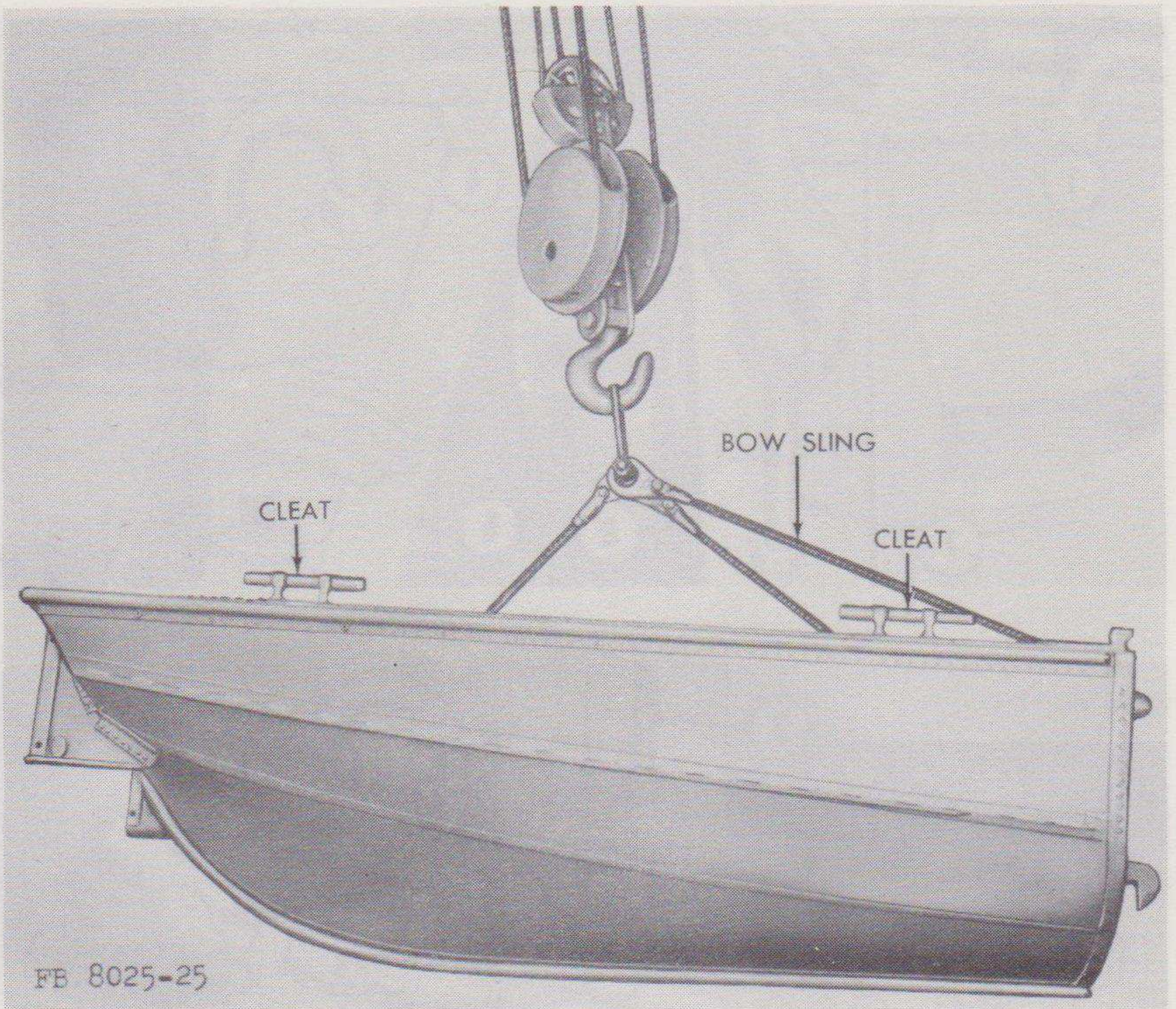


Figure 25. Bow section on hoist.

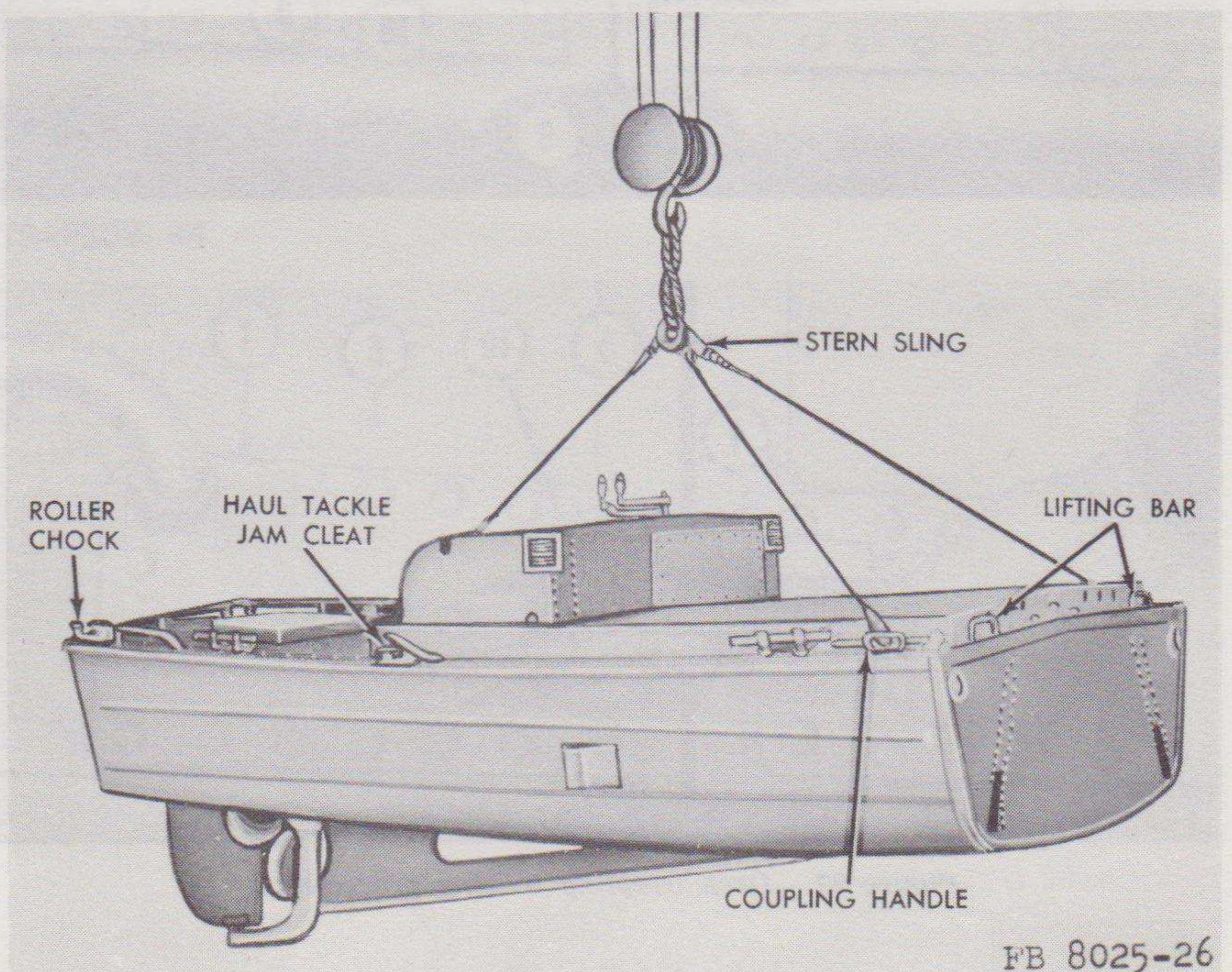
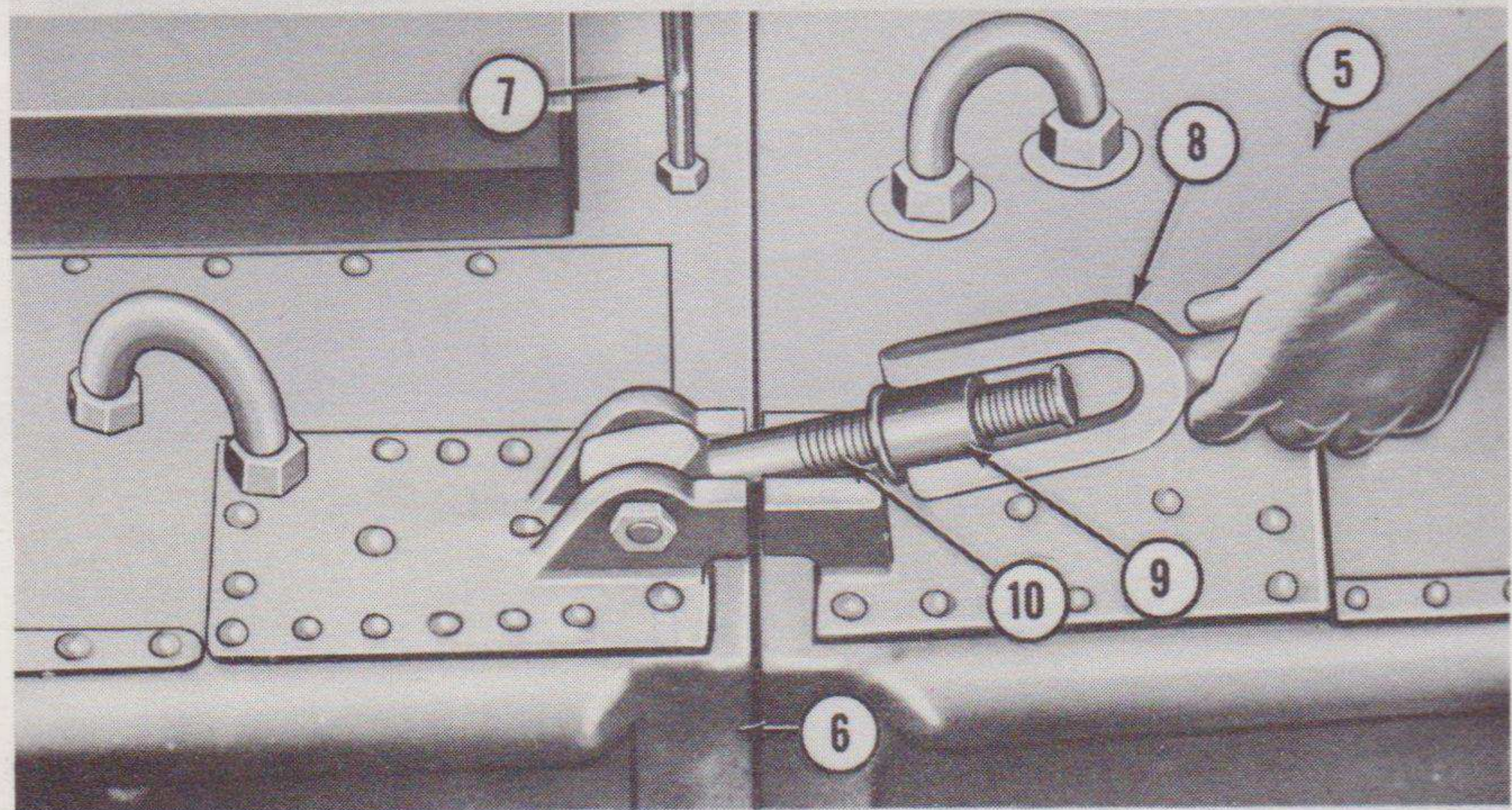
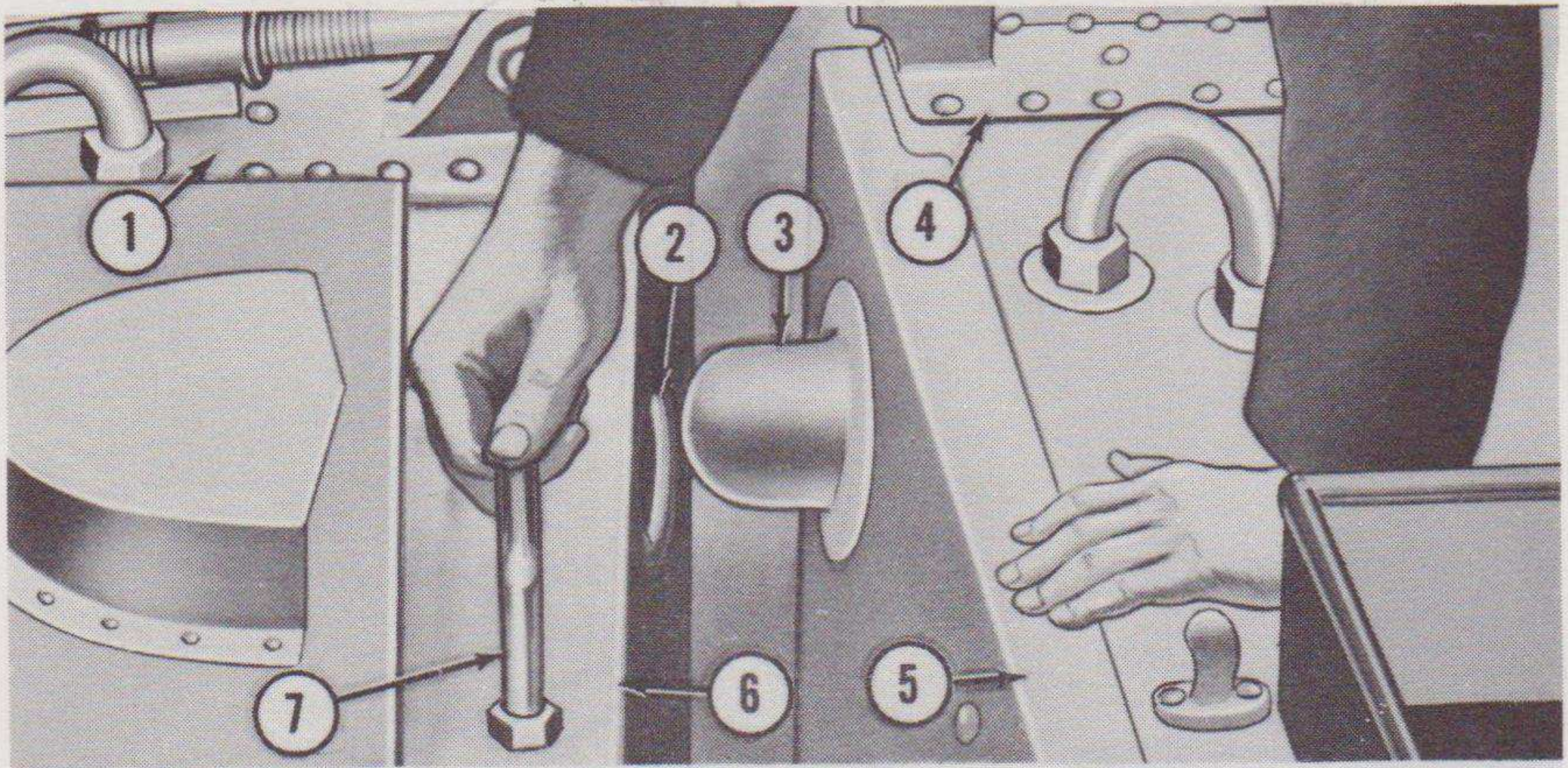


Figure 26. Stern section on hoist.



FB 8025-27

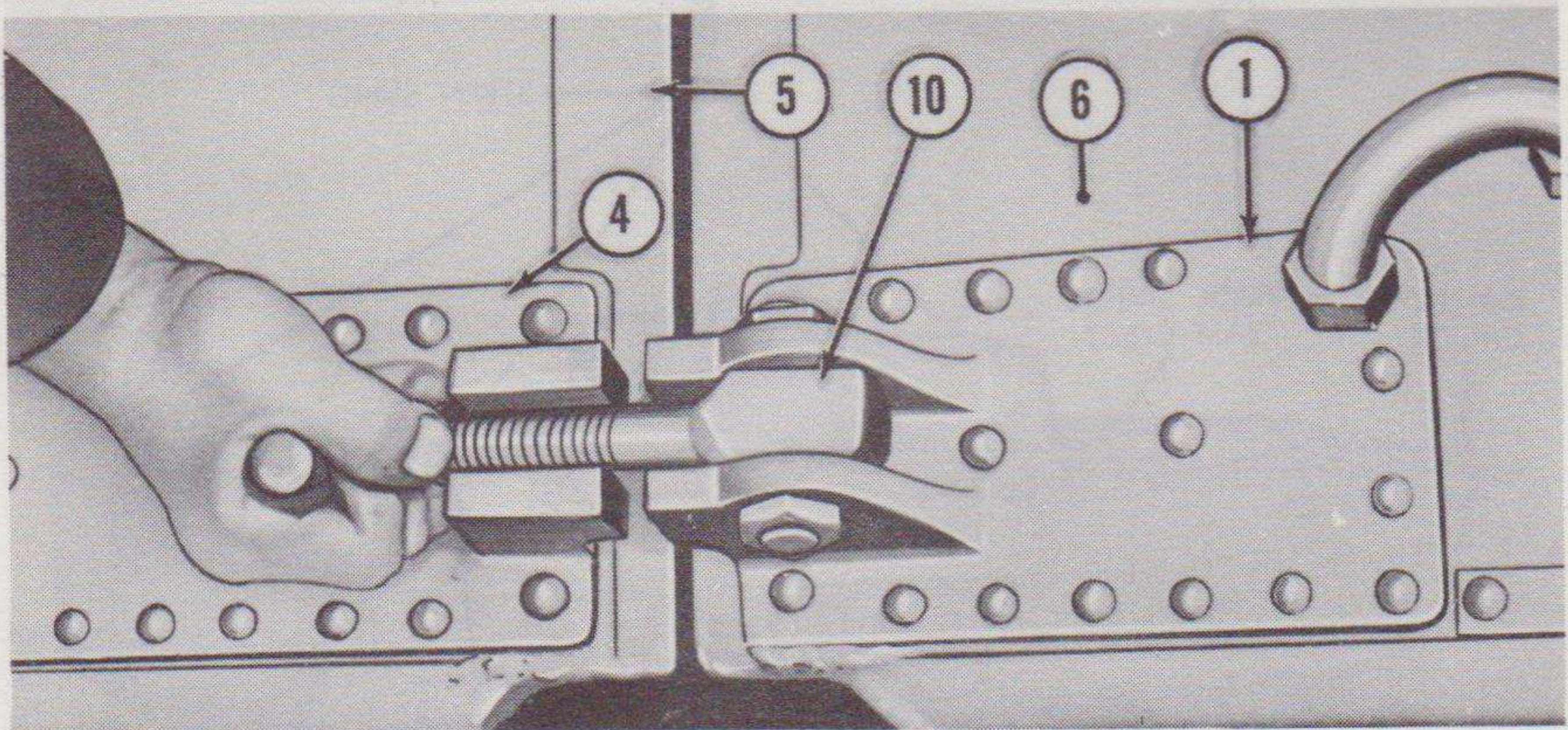


Figure 27. Deck coupling locking procedure.

11. Coupling Bow and Stern Sections

Caution: Do not attempt to couple the bow and stern sections in rough water. The shear forces set up are large and the boat might be damaged severely. Be sure to remove all debris from between the bow and stern sections before attempting to couple the two sections together.

a. The coupling operation must be performed by two men. One man stations himself on deck at the rear of the bow section. The other man stands in the hatch at the rear of the bow section.

b. The stern section floats lower in the water than the bow section. Therefore, the man on deck must bear down heavily on the bow section while lifting on the stern section lifting bar (7, fig. 27), in order to engage the shear cups (2 and 3).

c. When the shear cups are engaged, the man on deck connects the deck couplings by hooking the coupling nut to the lug on the forward deck coupling plate (4, fig. 27).

d. The man in the hatch raises the coupling hook handle (1, fig. 28) to engage the bow section coupling hook with the stern section coupling pin. Always engage the deck coupling and coupling hook on the same side of the boat at the same time.

e. When the coupling hook has engaged the coupling pin, the man in the hatch locks the coupling hook handle (1, fig. 28) by inserting the handle lock chain cotter pin (4) through the handle U-clip (2).

f. The man on deck locks the deck coupling by turning the coupling handle to hand tightness (fig. 27) and pushing the handle forward until it is flush with the forward deck coupling plate.

g. After the deck coupling is secured, the man on deck must climb down inside the stern section to see that the coupling hook connection is tight. He must adjust the yoke adjusting nut (5, fig. 28) to hand tightness, if necessary.

h. When the coupling of one side of the boat has been completed, the procedure must be repeated for the couplings on the other side.

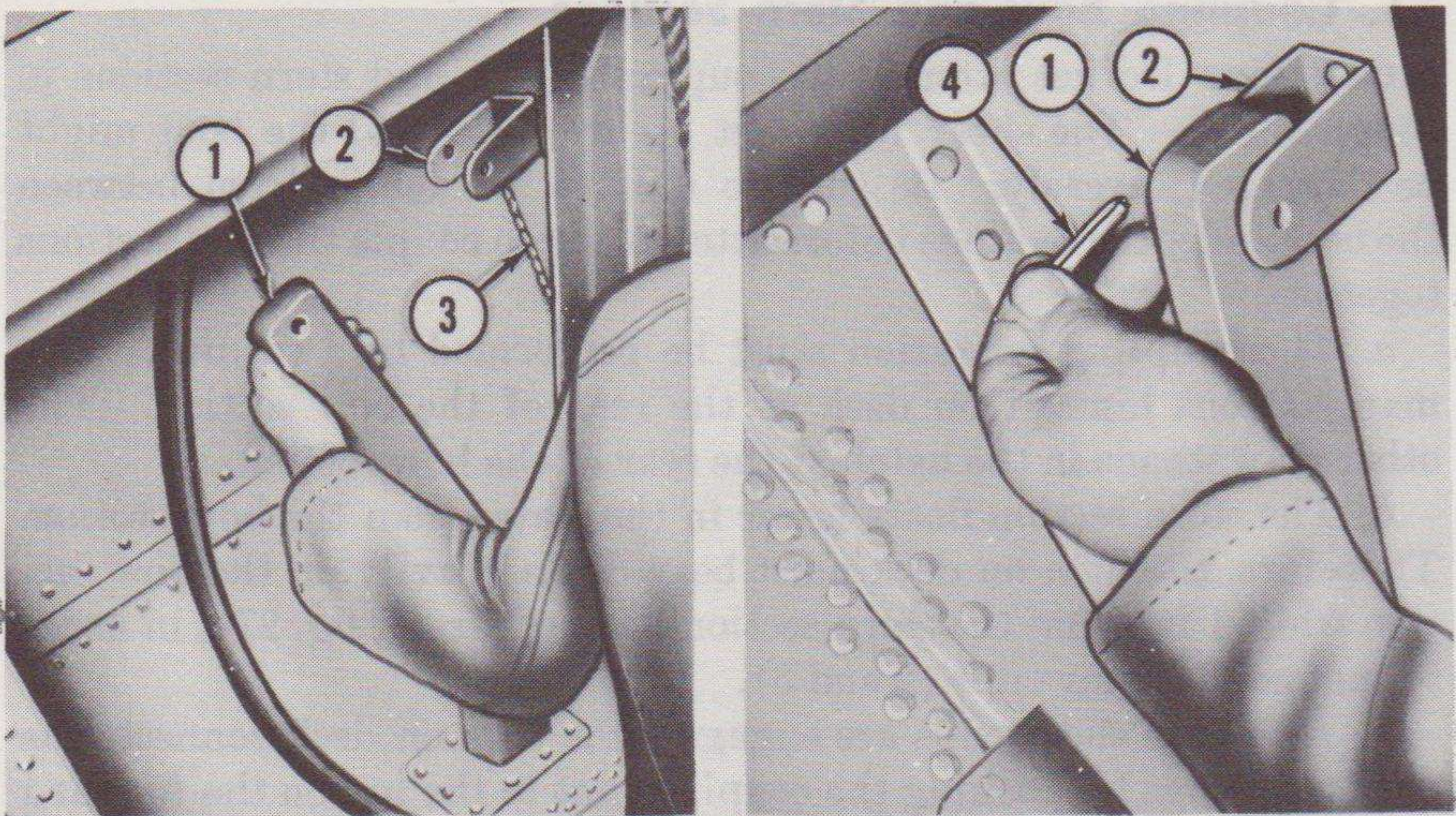
12. Preparation for Operation

The following services must be performed to prepare the boat for operation.

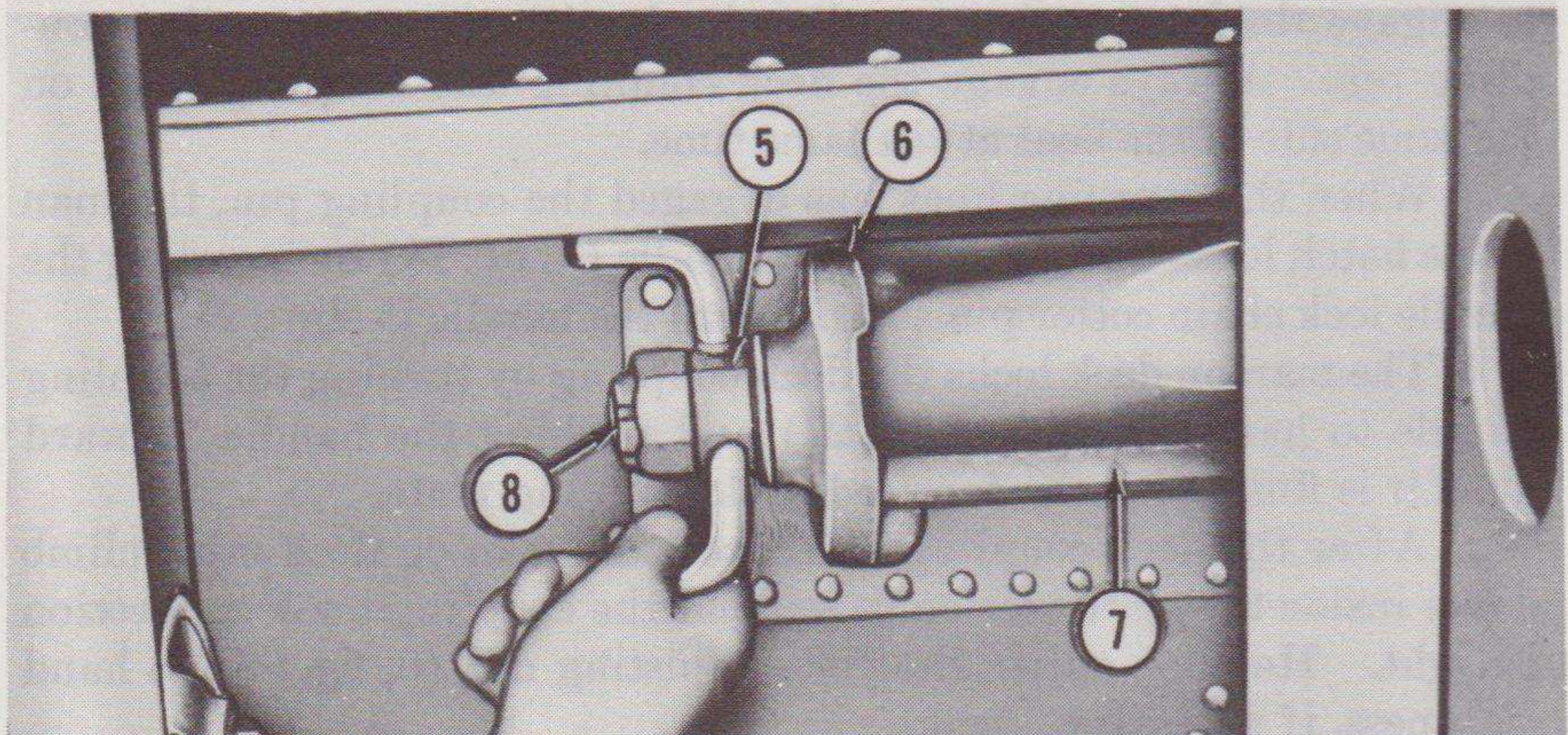
a. *Fill the Cooling Systems.* Remove the water tank filler caps (2, fig. 29) from each water tank (8, fig. 30). Fill the engine and ex-

1 Aft deck coupling plate (port)	5 Bow section
2 Female shear cup	6 Stern section
3 Male shear cup	7 Lifting bar
4 Forward deck coupling plate (port)	8 Coupling handle
	9 Coupling nut
	10 Coupling eyebolt

Figure 27—Continued.



FB 8025-28



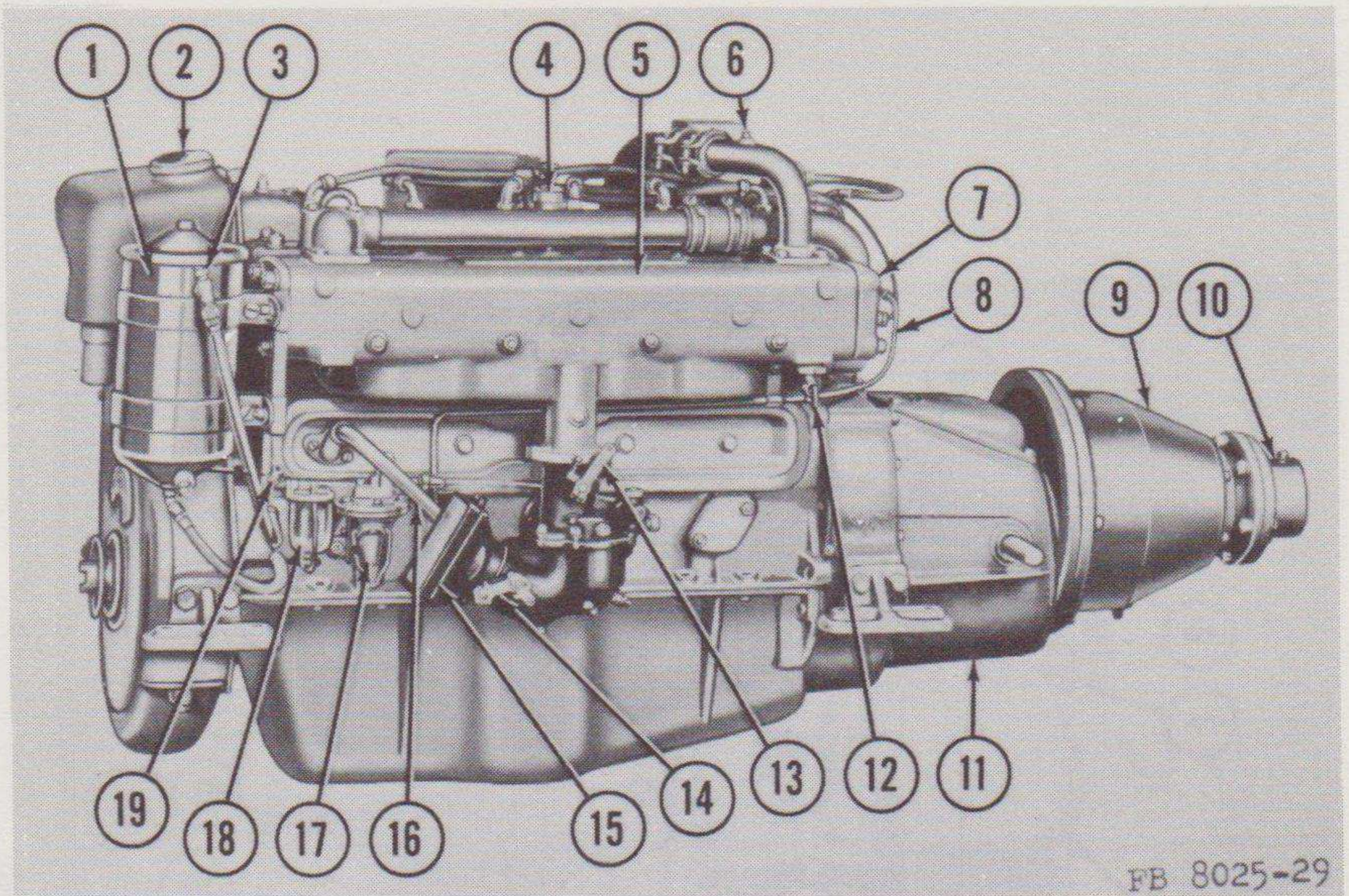
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|--------------------------------|--------------------------------------|
| 1 Hook handle | 5 Yoke adjusting nut |
| 2 Handle U-clip | 6 Aft coupling packing retainer disk |
| 3 Handle lock chain | 7 Aft coupling casting (starboard) |
| 4 Handle lock chain cotter pin | 8 Castellated nut |

Figure 28. Coupling hook locking procedure.

haust cooling systems of each engine (par. 100). Use clean water in the summer and a proper antifreeze solution for winter operation.

b. Fill the Crankcases. Fill the crankcases with the correct grade of engine oil. Refer to LO 5-8025.

c. Perform Preventive Maintenance Services. Lubricate the boat as specified in LO 5-8025. Perform the preventive maintenance services described in paragraphs 56 through 59.



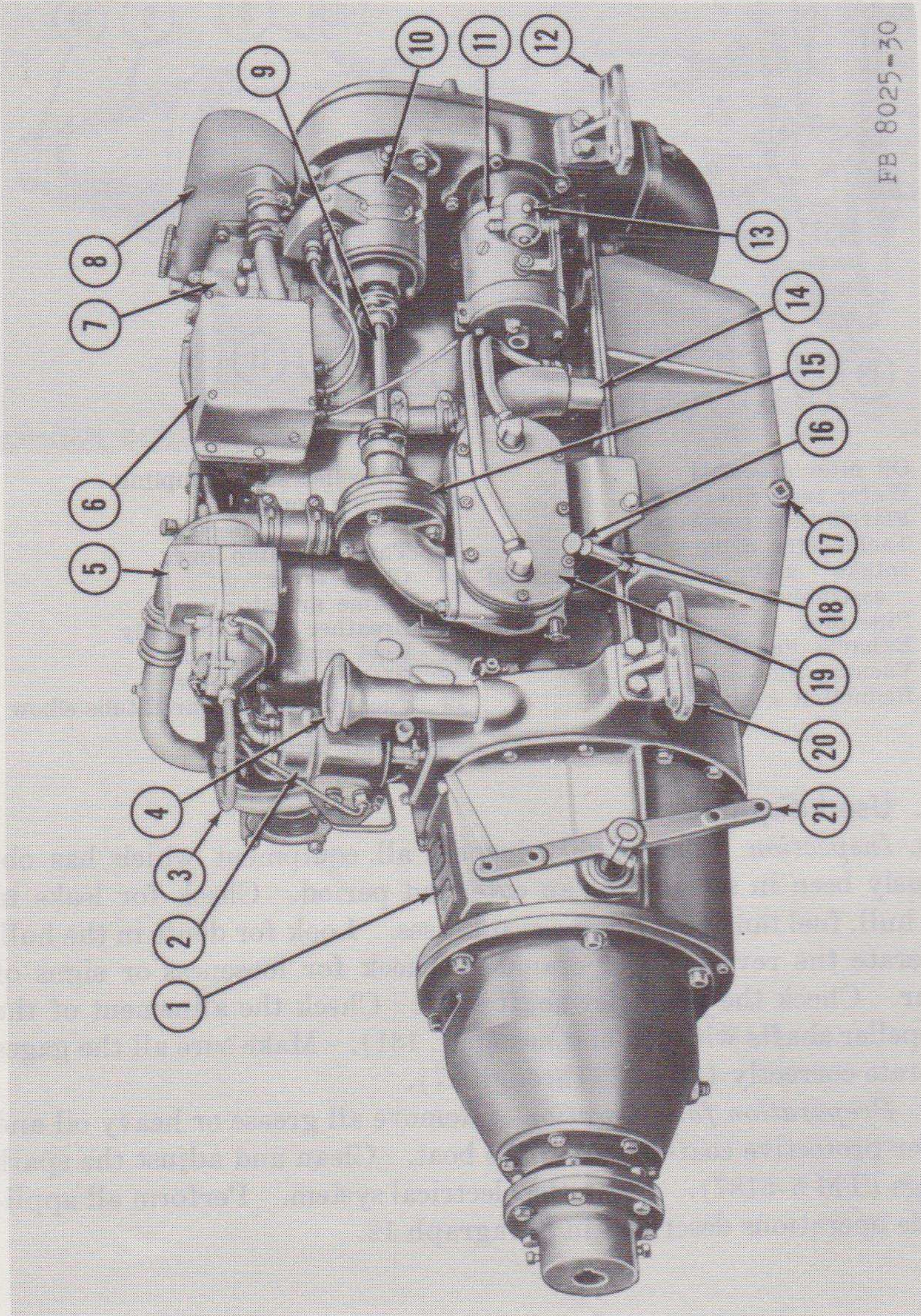
- | | |
|--|--------------------------------------|
| 1 Oil filter assembly | 10 Propeller shaft coupling |
| 2 Water tank filler cap | 11 Clutch housing |
| 3 Flared tube connector | 12 Manifold drain cock |
| 4 Tachometer drive | 13 Throttle clamp lever. |
| 5 Intake and exhaust manifold assembly | 14 Choke lever |
| 6 Pipe plug | 15 Flame arrestor |
| 7 Exhaust flange | 16 Breather tube assembly |
| 8 Vacuum line | 17 Fuel pump assembly |
| 9 Reduction gear housing | 18 Glass sediment bowl |
| | 19 Fuel pump inlet flared tube elbow |

Figure 29. Engine, port side view.

13. Used Equipment

a. Inspection. Thoroughly inspect all equipment which has obviously been in service for an extended period. Check for leaks in the hull, fuel tank, and engine crankcases. Look for dents in the hull. Operate the reverse lever cranks to check for looseness or signs of wear. Check the propeller shaft seals. Check the alinement of the propeller shafts with the engines (par. 131). Make sure all the gages operate correctly (pars. 22 through 27).

b. Preparation for Operation. Remove all grease or heavy oil and other protective coatings from the boat. Clean and adjust the spark plugs (TM 5-5187). Clean the electrical system. Perform all applicable operations described in paragraph 12.



FB 8025-30

Figure 30. Engine, starboard side view.

- 1 Engine nameplate
- 2 Distributor shield assembly
- 3 Coil to distributor high tension lead
- 4 Oil filler and cap assembly
- 5 Ignition coil shield assembly
- 6 Generator regulator shield assembly
- 7 Cylinder head water outlet
- 8 Water tank
- 9 Center shaft coupling assembly
- 10 Generator assembly
- 11 Starting motor

- 12 Engine forward mounting block (star-board)
- 13 Solenoid magnetic switch
- 14 Oil cooler water inlet elbow
- 15 Engine cooling water pump assembly
- 16 Oil depth bayonet gage
- 17 Pipe plug
- 18 Oil depth gage sleeve
- 19 Oil cooler
- 20 Engine rear mounting block (star-board)
- 21 Reverse gear lever

Figure 30—Continued.

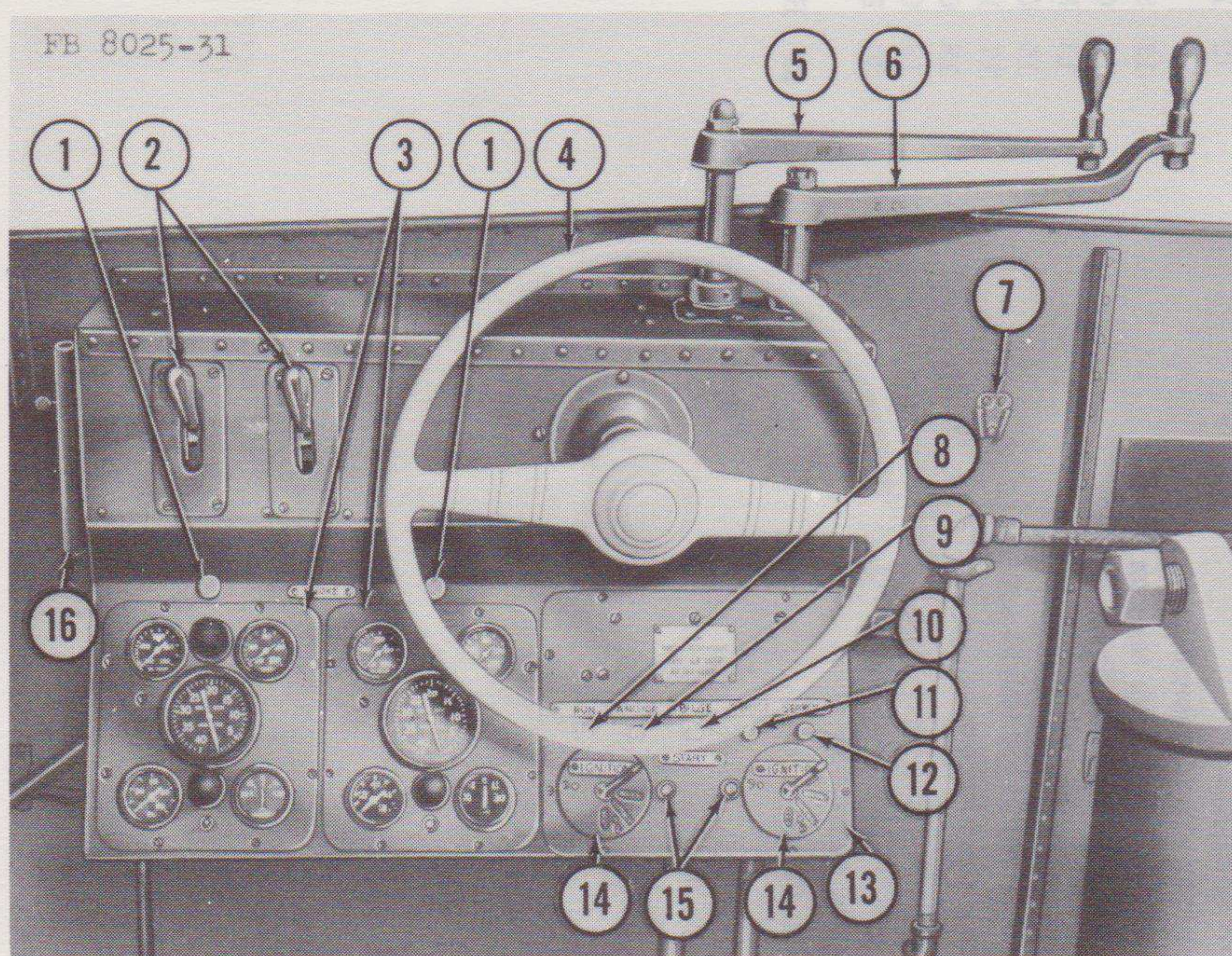
Section II. CONTROLS AND INSTRUMENTS

14. General

This section describes, locates, illustrates, and furnishes the operator sufficient information about the various controls and instruments for the proper operation of the boat.

15. Switches

a. Ignition and Blower Switches. The ignition and blower switches (14, fig. 31) are located at the lower right and left corners of the electrical panel. The left switch controls the port engine ignition and the blower motor. The right switch controls the starboard engine ignition and the blower motor. The four positions of each switch are—OFF, BLOWER, BLOWER AND IGNITION, and IGNITION. Each ignition and blower switch operates the magnetic fuel valve for its own engine.



- | | | | |
|---|-------------------------------|----|----------------------------|
| 1 | Choke control | 9 | Mast light switch |
| 2 | Throttle control | 10 | Forward bilge pump switch |
| 3 | Instrument panel | 11 | Stern bilge pump switch |
| 4 | Steering wheel | 12 | Searchlight switch |
| 5 | Port reverse lever crank | 13 | Electrical panel |
| 6 | Starboard reverse lever crank | 14 | Ignition and blower switch |
| 7 | Bell mounting bracket | 15 | Starter switch |
| 8 | Running lights switch | 16 | Searchlight bracket |

Figure 31. Boat operating controls.

b. Running Lights Switch. The push-pull type running lights switch (8, fig. 31) is located directly above the port engine ignition and blower switch. It is identified by the word "RUN" on the panel. The running lights switch turns the boat running lights on or off. The switch is off when it is pushed in against the panel and on when it is pulled out.

c. Mast Light Switch. The push-pull type mast light switch (9, fig. 31) is located to the right of the running lights switch. It is identified by the word "ANCHOR" on the panel. The mast light switch turns the boat mast light on or off. The switch is off when it is pushed in against the panel and on when it is pulled out.

d. Forward Bilge Pump Switch. The push-pull type forward bilge pump switch (10, fig. 31) is located to the right of the anchor light switch. It is identified by "F. BILGE" on the panel. The forward bilge pump switch turns the forward bilge pump on or off. The switch is off when it is pushed in against the panel and on when it is pulled out.

e. Stern Bilge Pump Switch. The push-pull type stern bilge pump switch (11, fig. 31) is located to the right of the forward bilge pump switch. It is identified by "S. BILGE" on the panel. The stern bilge pump switch turns the stern bilge pump on or off. The switch is off when it is pushed in against the panel and on when it is pulled out.

f. Searchlight Switch. The push-pull type searchlight switch (12, fig. 31) is located to the right of the stern bilge pump switch. It is identified by the word "SEARCH" on the panel. The searchlight switch turns the searchlight on or off. The switch is off when it is pushed in against the panel and on when it is pulled out.

g. Starter Switches. The two pushbutton type starter switches (15, fig. 31) are located between the ignition and blower switches on the electrical panel. They are identified by the word "START" on the panel above them. When pushed, the starter switches energize the starter solenoid magnetic switches which in turn energize the starting motors. The left starter switch operates the port engine starting motor. The right starter switch operates the starboard engine starting motor.

16. Brass Disk Fuel Valves

A brass disk fuel valve (fig. 32) is located at the side of each engine behind frame 7. The valve may be closed to shut off the supply of fuel from the tank to the engine. The brass disk fuel valve is shown diagrammatically in figure 69.

17. Choke Controls

A choke control for each engine (1, fig. 31) is located above each instrument panel. The right choke control is for the starboard engine.

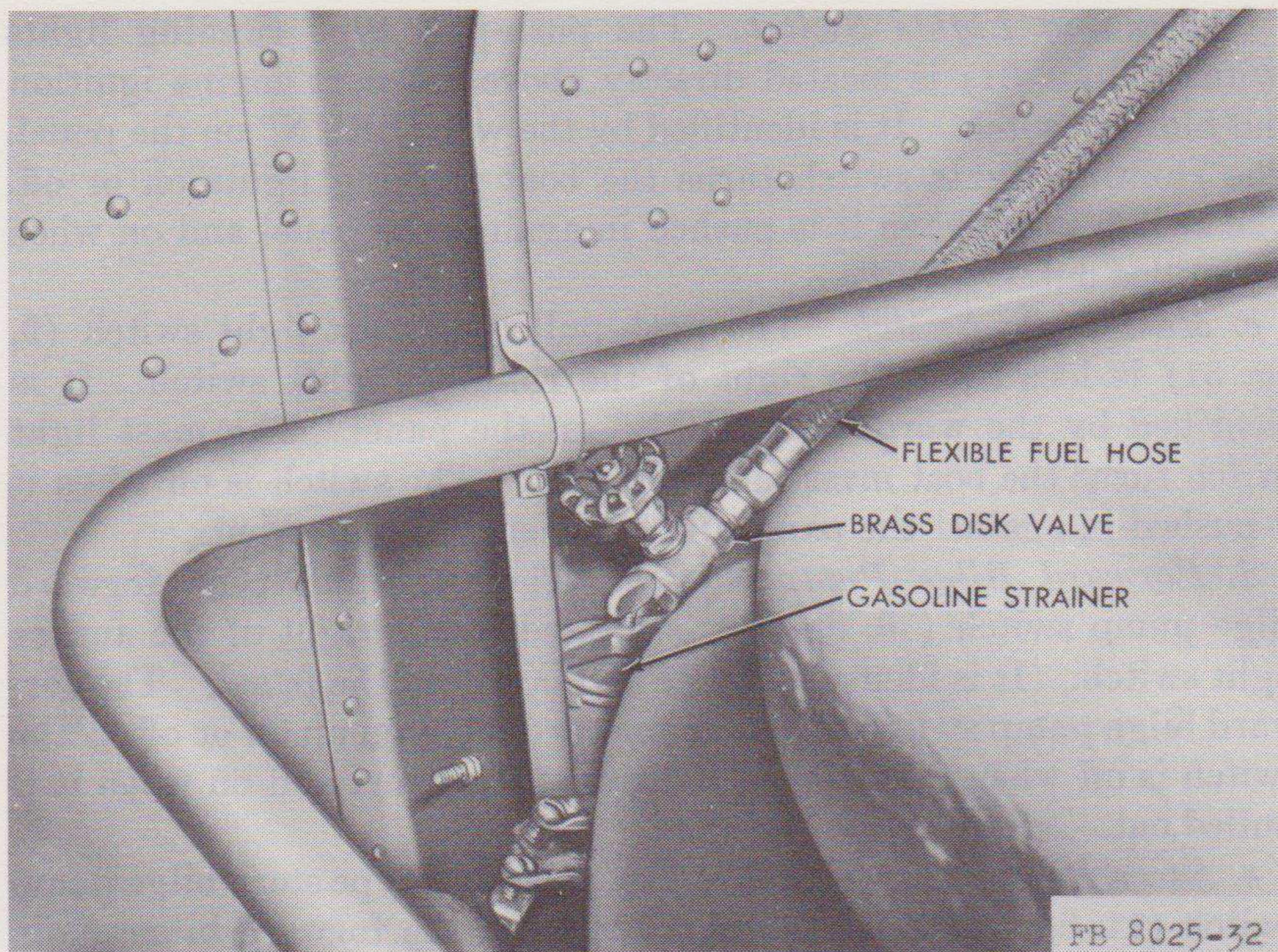


Figure 32. Brass disk valve installed.

The left choke control is for the port engine. With the choke control pushed in against the panel, the carburetor choke valve is wide open. Pulling the choke control back from the panel as far as possible closes the carburetor choke valve.

18. Throttle Controls

A throttle control for each engine (2, fig. 31) is located to the left of the steering wheel. The right throttle control is for the starboard engine. The left throttle control is for the port engine. Placing the throttle controls all the way down closes the carburetor throttle valves. Placing the throttle controls all the way up opens the carburetor throttle valves wide.

19. Reverse Lever Cranks

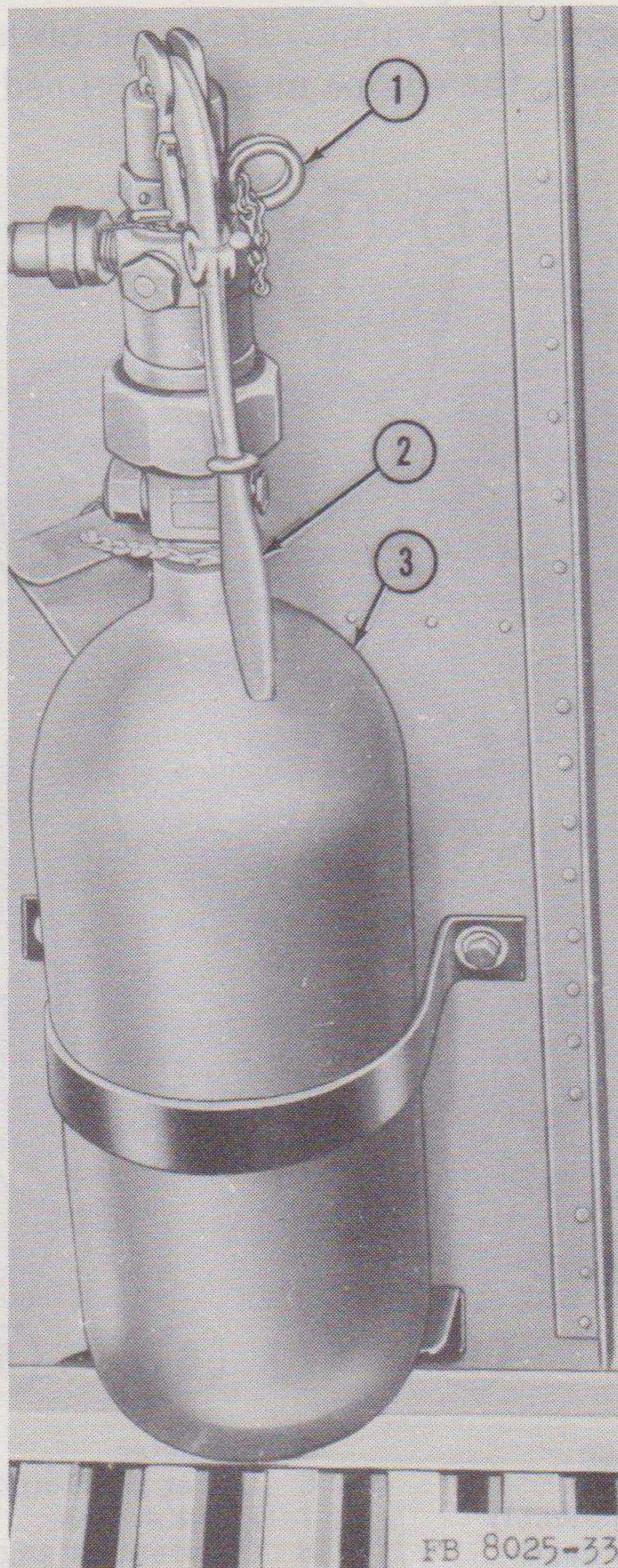
A reverse lever crank for each engine is located on top and at the right of the control box. The port reverse lever crank (5, fig. 31) is for the port engine. The starboard reverse lever crank (6) is for the starboard engine. In the extreme forward position the reverse lever crank engages the clutch and provides forward drive. In the neutral position, the reverse lever crank disengages the clutch and the gears run idle. In the extreme rear position, the reverse lever crank clamps the reverse band around the drum and reverse drive is provided through the gear train. The reverse lever crank handles are close enough together to be operated simultaneously with the right hand.

20. Steering Wheel

The steering wheel (4, fig. 31) is mounted on the face of the control panel. The steering wheel is used in conjunction with the steering tubes and gears to turn the rudders. Turning the steering wheel to port turns the rudders and the boat to port. Turning the steering wheel to starboard, turns the rudders and the boat to starboard.

21. C-O-Two Fire Extinguisher Control

The C-O-Two fire extinguisher control is a lever (2, fig. 33) mounted on top of the extinguisher cylinder. To operate the extinguisher, remove the lock wire (1) and pull up on the lever. The entire engine compartment will then be filled with a carbon dioxide fog.



1. Lock wire

2. Operating lever

3. Cylinder

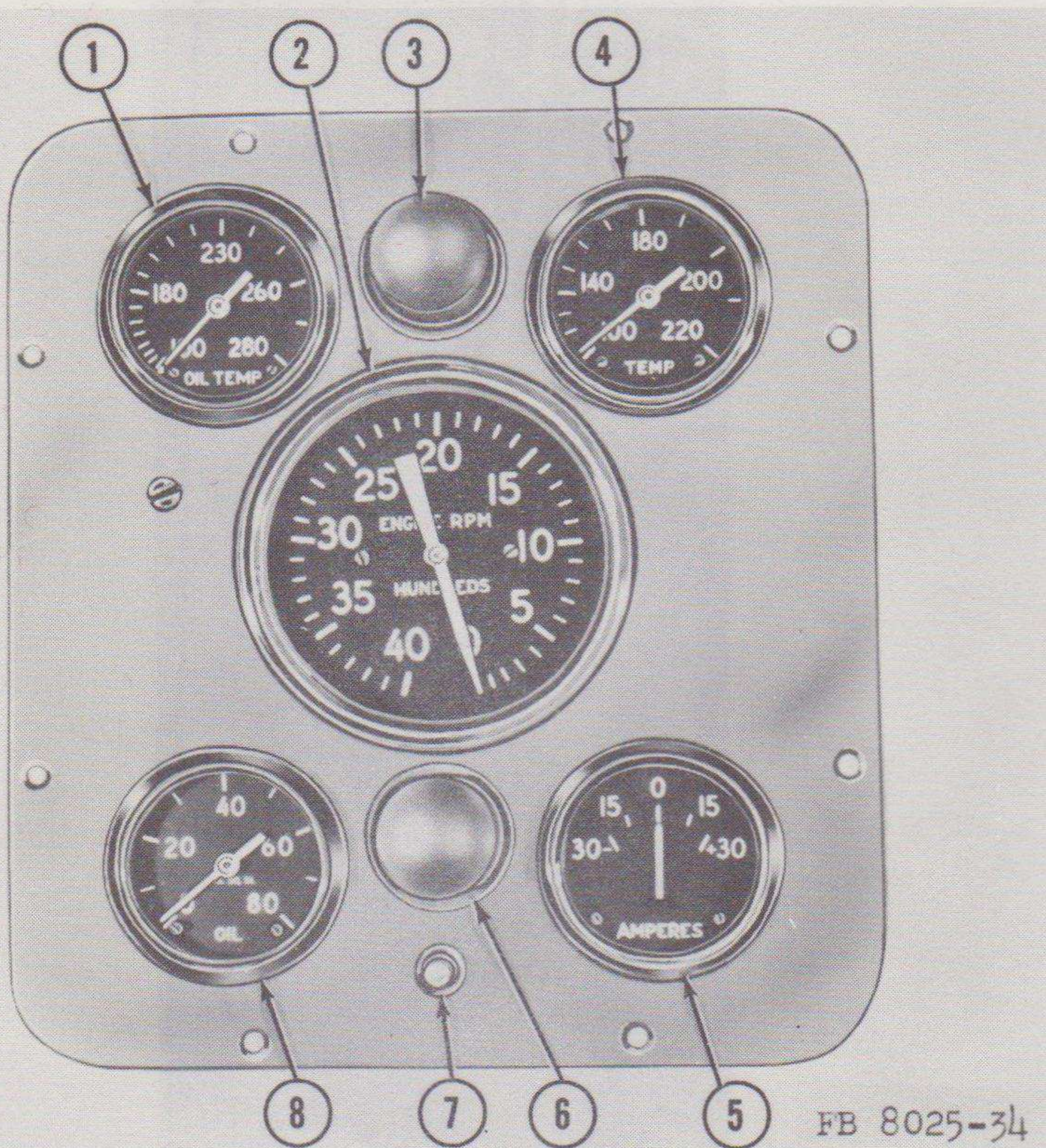
Figure 33. C-O-Two fire extinguisher.

22. Tachometers

The two tachometer heads (2, fig. 34) are located on the instrument panels (3, fig. 31) to the left of the electrical panel. The left tachometer head indicates port engine speed. The right tachometer head indicates starboard engine speed. The tachometer heads are driven through flexible cables connected to drives on the oil pump shafts.

23. Oil Pressure Gages

The two Bourdon tube-type oil pressure gages (8, fig. 34) are located on the instrument panels. The left oil pressure gage indicates port engine oil pressure. The right oil pressure gage indicates starboard engine oil pressure. The oil pressure gages should read between 30 and 40 psi at operating speed, and between 5 and 15 psi at idle speed when the engines are warm. If the oil pressure goes below 20 psi at operating speed, the engine must be stopped and the cause de-



- | | |
|------------------------------|------------------------------|
| 1 Oil temperature gage | 5 Ammeter |
| 2 Tachometer head | 6 Lower panel light assembly |
| 3 Upper panel light assembly | 7 Light switch |
| 4 Water temperature gage | 8 Oil pressure gage |

Figure 34. Instrument panel.

terminated. Refer to TM 5-5187. Always check the oil pressure gages when the engines are started and frequently during operation.

Caution: Stop the engine if the oil pressure falls below 20 psi at operating speed and do not start it again until the cause has been determined and corrected.

24. Oil Temperature Gages

The two oil temperature gages (1, fig. 34) are located on the instrument panels. The left gage indicates port engine oil temperature. The right gage indicates starboard engine oil temperature. The oil temperature gages should read between 180° and 230° F. when the engines are warmed up. If the oil temperature rises above 250° F., the engine must be stopped and the cause determined. Refer to TM 5-5187. Check the oil temperature gages frequently during operation of the boat.

Caution: Stop the engine if the oil temperature rises above 250° F. and do not start it again until the cause has been determined and corrected.

25. Water Temperature Gages

The two water temperature gages (4, fig. 34) are located on the instrument panels. The left gage indicates port engine coolant temperature. The right gage indicates starboard engine coolant temperature. The water temperature gages should read about 170° F. when the engines are warmed up. If the coolant temperature rises above 200° F., the engine must be stopped and the cause determined. Refer to TM 5-5187. Check the water temperature gages frequently during operation of the boat.

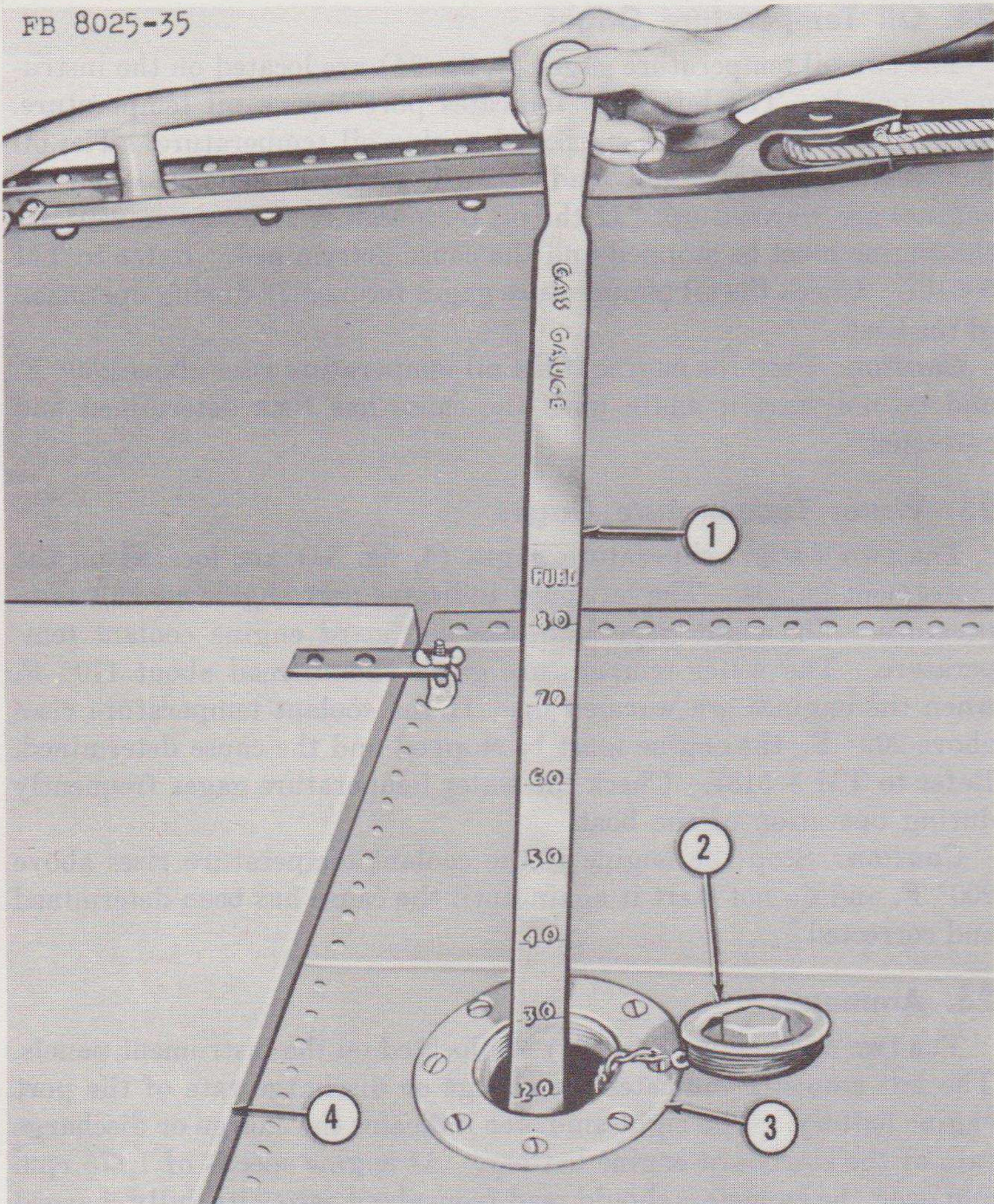
Caution: Stop the engine if the coolant temperature rises above 200° F. and do not start it again until the cause has been determined and corrected.

26. Ammeters

The two ammeters (5, fig. 34) are located on the instrument panels. The left ammeter indicates the charge or discharge rate of the port engine battery. The right ammeter indicates the charge or discharge rate of the starboard engine battery. At engine speeds of 1,175 rpm and over, the ammeters should read from about zero with fully charged batteries to a maximum of 10 amperes charge when the batteries are not fully charged. If the ammeters indicate a high rate of charge when the batteries are fully charged or a low rate of charge when the batteries are weak, with no accessories operating, trouble is indicated. Refer to paragraphs 67, 68, and 69 and to TM 5-5187.

27. Stick-Type Gas Gage

The stick-type gas gage (1, fig. 35) is an aluminum dipstick which is calibrated in gallons. The gage is stored on a bracket located on the starboard side of the cockpit bulkhead.



1 Stick-type gas gage
2 Gas tank spout cap

3 Gas tank spout
4 Stern hatch cover

Figure 35. Checking fuel level in gasoline tank.

Section III. OPERATION UNDER USUAL CONDITIONS

28. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the 27-foot bridge erection boat.

b. It is essential that the operator know how to perform every operation of which the boat is capable. This section gives instructions on starting and stopping the boat, instructions on the basic motions of the boat, and instructions on how to coordinate the basic motions to perform the specific tasks for which the boat is designed. Since nearly every job presents a different problem, the operator may have to vary the given procedure to fit the individual job.

29. Starting and Stopping

Caution: Run the blower for at least 5 minutes before attempting to start either engine. If gasoline fumes are present do not start the engines until fumes have been dissipated and cause located and corrected.

a. *Pre-Starting Instructions.* Before attempting to start the boat engines, the "before-operation services" (par. 57c) must be performed. Be sure that the reverse lever cranks are in the neutral (middle) position. Open the throttles no more than one-quarter of their full travel. Run the blower for 5 minutes. Open the engine compartment hatch covers and leave them open till the engines start. Check the engine compartment for gasoline and gasoline fumes. *If fumes are present do not start the engines.* Find the source of the gasoline or gasoline fumes and repair the leak. Remove all trace of gasoline which has leaked into the engine compartment. Check again to see that the reverse lever cranks are in neutral and that the throttles are no more than one-quarter open. Crank the engines a couple of times with the hand crank to see that everything works freely.

b. *Starting Engines.* Pull the port engine choke control out all of the way. Turn the port engine ignition and blower switch to BLOWER AND IGNITION. Push the port engine starter switch. As soon as the engine starts, push the choke control in about one-third of the way and release the starter switch. Adjust the choke control for best engine operation. Return the choke control to the control box panel as soon as the engine is warm enough to operate smoothly. An excessively rich mixture causes oil dilution and the formation of sulphurous or sulphuric acid in the crankcase. The acid is formed by the combination of free sulphur (some of which is present in all engine oil) and water, a by-product of combustion. Repeat the starting procedure for the starboard engine.

Caution: Do not operate the starting motor longer than 30 seconds. If the engine does not start refer to paragraphs 61 and 62.

c. Overchoking. If the engine becomes flooded by too much choking, it must be dried before it will start. To do this open the throttle wide and push the choke control in to the control panel. With the ignition on, crank the engine a half dozen times with the starting motor. Only air will be drawn through the carburetor because the idling jet will be inoperative at full throttle and the engine speed will be insufficient to operate the main jet.

d. Stopping Engines. Set the throttles to the idle position. Set the reverse lever cranks in neutral. Turn the ignition switches OFF. Perform "after-operation services" (par. 57f).

30. Anchor

a. Dropping Anchor. Before attempting to drop the anchor, be sure that all headway has been lost, i. e. the boat has stopped. Drop the anchor over the bow. Run the anchor line through the bow chock and take one turn around either the port or starboard cleat at frame. 2. Be careful not to foul the line. Pay out enough line to allow the anchor to "dig in." Run the boat slow astern and pay out the line slowly until the line becomes taut. Take bearings to make sure that the boat is not drifting. Secure the line to the cleat. When dropping the anchor, be sure to run the line through the bow chock. This prevents chafing the line and fouling it on the pushing knees.

b. Weighing Anchor. To weigh the anchor, run the boat slow ahead, taking in the anchor line by hand, until the boat is directly above the anchor. Pull the anchor up. This procedure reduces the danger of fouling the line while raising the anchor.

31. Boat Hook

The boat hook is used to fend off the boat from the dock as the boat is brought alongside the dock. The boat hook is also used to push the boat clear when getting under way in a restricted area.

32. Bilge Pumps

The bow section and stern section bilge pumps are turned on or off by switches located on the electrical panel (par. 15d and e). The bilge pumps are used to remove water which may accumulate in the bottom of the hull.

33. Lights

The bow light is an oil lantern. It must be lighted and secured to its bracket (par. 9k). All other lights on the boat are electric. Push-pull type switches on the electrical panel control these lights individually (par. 15).

34. Fenders

Three fenders are attached by snap rings to eyebolts on each side of the boat. The eyebolts are located forward, amidships, and astern.

35. Lines

a. Anchor Line. The anchor line is a $\frac{3}{4}$ -inch diameter manila rope, 100 feet long. It is coiled and stowed in the bow locker in the cargo hatch.

b. Haul Chock Line. The haul chock line is a $\frac{1}{2}$ -inch diameter manila rope, 22 feet long. It is used to tighten the steering lines when the boat is pushing a raft.

c. Steering Lines. The two steering lines are 1-inch diameter manila ropes, 60 feet long.

d. Mooring Lines. The four mooring lines are $\frac{3}{4}$ -inch diameter ropes, 40 feet long. They are used to tie the boat to the dock.

e. Tow Line. The tow line is a $1\frac{1}{4}$ -inch diameter manila rope, 125 feet long. It is fitted at one end with a bridle and loop to secure the line to the towing bitt.

36. General Operating Details

a. General. Navigation rules for the operation of the boat are covered in United States Coast Guard pamphlets "Motor Boat Act of April 25, 1940" and "Pilot Rules August 1, 1950." The control positions for each basic motion of which the boat is capable are indicated in table II.

b. Getting Under Way Ahead From Dock.

- (1) From a port-side-of-the-boat-to-the-dock position, turn the rudder half right. Push the port engine reverse lever crank to its extreme forward position. Leave the starboard engine reverse lever crank in neutral (middle position). Give the port engine one-third throttle. Leave the starboard engine throttle at idle. When the boat is clear of the dock, push the starboard engine reverse lever crank to its extreme forward position and give the starboard engine one-third throttle.
- (2) From a starboard-side-of-the-boat-to-the-dock position, turn the rudder half left. Push the starboard engine reverse lever crank to its extreme forward position. Leave the port engine reverse lever crank in neutral (middle position). Give the starboard engine one-third throttle. Leave the port engine throttle at idle. When the boat is clear of the dock, push the port engine reverse lever crank to its extreme forward position and give the port engine one-third throttle.

c. Getting Under Way Astern From Dock.

- (1) From a port-side-of-the-boat-to-the-dock position, turn the rudder half right. Pull the port engine reverse lever crank

to its extreme rear position. Leave the starboard engine reverse lever crank in neutral (middle position). Give the port engine one-third throttle. Leave the starboard engine throttle at idle. When the boat is clear of the dock, pull the starboard engine reverse lever crank to its extreme rear position and give the starboard engine one-third throttle.

- (2) From a starboard-side-of-the-boat-to-the-dock position, turn the rudder half left. Pull the starboard engine reverse lever crank to its extreme rear position. Leave the port engine reverse lever crank in neutral (middle position). Give the starboard engine one-third throttle. Leave the port engine throttle at idle. When the boat is clear of the dock, pull the port engine reverse lever crank to its extreme rear position and give the port engine one-third throttle.

d. Getting Under Way From a Mooring or Anchorage. Leave both reverse lever cranks in neutral and both throttles at idle. Weigh anchor (par. 30*b*) or untie from mooring. Pull both reverse lever cranks to the extreme rear position and give both engines just enough throttle to move the boat back from the mooring or other obstruction.

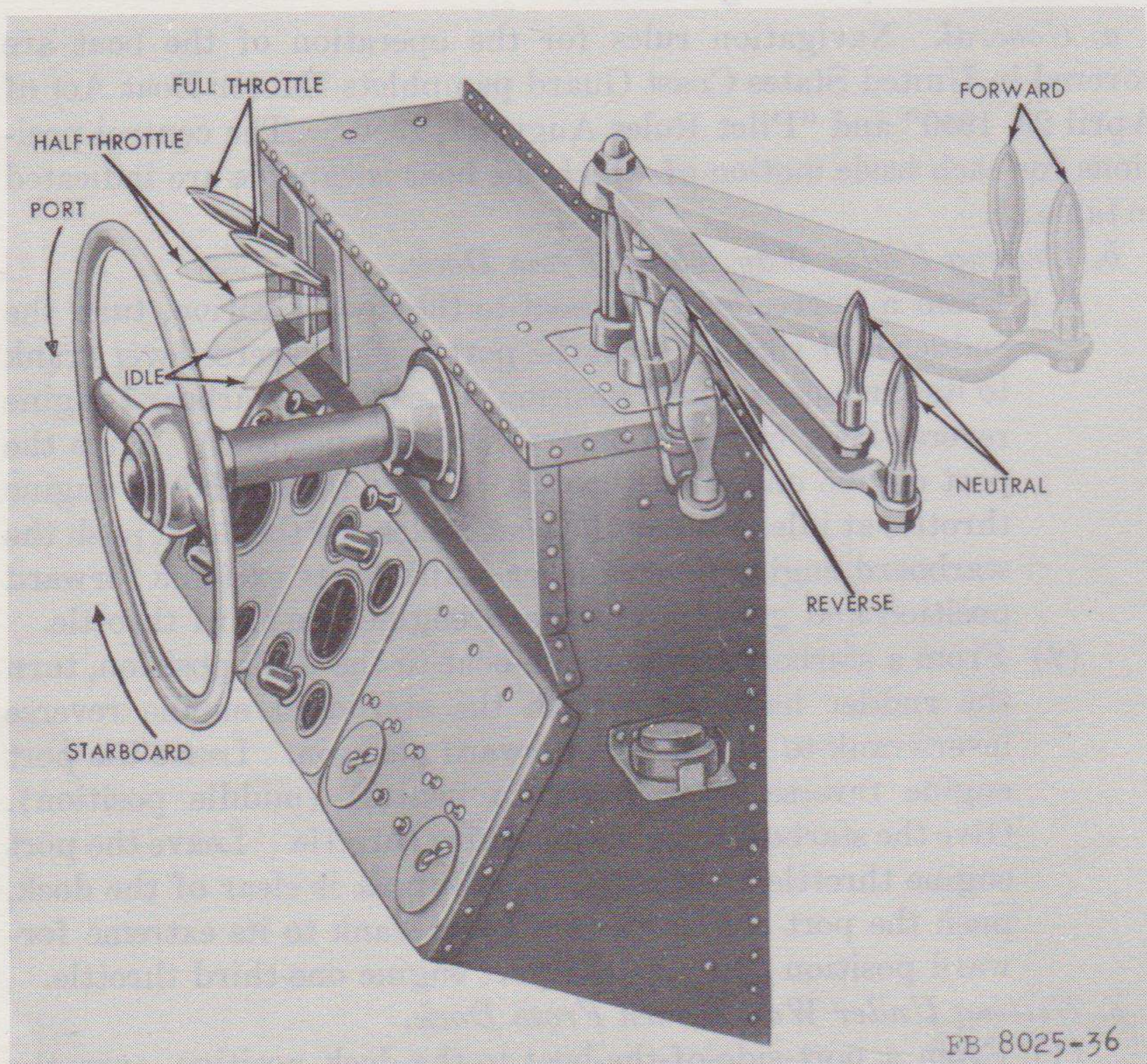


Figure 36. Controls positions.

Table II. Control Positions for Basic Boat Motions

Basic motion	*Throttle position		*Reverse lever crank position		*Steering wheel position
	Port throttle	Starboard throttle	Port crank	Starboard crank	
Stand still	Idle	Idle	Neutral	Neutral	Any
Ahead:					
Full-----	Full-----	Full-----	Forward -	Forward -	Straight ahead.
Half-----	Half-----	Half-----	Forward -	Forward -	Straight ahead.
Slow-----	Quarter--	Quarter--	Forward -	Forward -	Straight ahead.
Astern:					
Full-----	Full-----	Full-----	Reverse--	Reverse--	Straight ahead.
Half-----	Half-----	Half-----	Reverse--	Reverse--	Straight ahead.
Slow-----	Quarter--	Quarter--	Reverse--	Reverse--	Straight ahead.
Power turn:					
To port:					
Hard--	Half-----	Full-----	Reverse--	Forward -	Hard to port.
Half--	Idle-----	Half-----	Reverse--	Forward -	Hard to port.
To starboard:					
Hard--	Full-----	Half-----	Forward -	Reverse--	Hard to starboard.
Half--	Half-----	Idle-----	Forward -	Reverse--	Hard to starboard.
Normal turn----	Turn steering wheel the desired amount in the desired direction, leaving all other controls as they are. Turn the wheel to port to turn the boat to port; turn the wheel to starboard to turn the boat to starboard.				

*The controls and positions are illustrated in fig. 36.

Caution: Do not operate the boat at high speed except in case of an extreme emergency.

e. Getting Under Way After Being Adrift. Extreme caution must be exercised in getting under way after being adrift. The boat may have grounded or drifted upon some underwater obstruction. Take soundings to determine if the boat is in open water. If the soundings show the boat to be in the clear, start the engines and proceed forward or astern. To proceed forward, push both reverse lever cranks to the extreme forward position. Open both throttles simultaneously to the desired engine speed. To proceed astern, pull both reverse lever cranks to the extreme rear position. Open both throttles simultaneously to the desired engine speed.

f. Maneuvering in Close Quarters. Extreme caution must be exercised when maneuvering in close quarters. The boat must be oper-

ated at slow speed at all times. Slow speed operation is necessary so that the direction of motion may be reversed quickly.

g. Mooring. Pass the mooring line through the bow chock and make the line fast to either the starboard or port cleat at frame 2. Take the free end of the line and stand ready. Bring the boat forward to the mooring very slowly. Upon reaching the mooring, pull both reverse lever cranks to neutral. Make the mooring line fast to the mooring. Turn both ignition and blower switches OFF.

37. Specific Operation

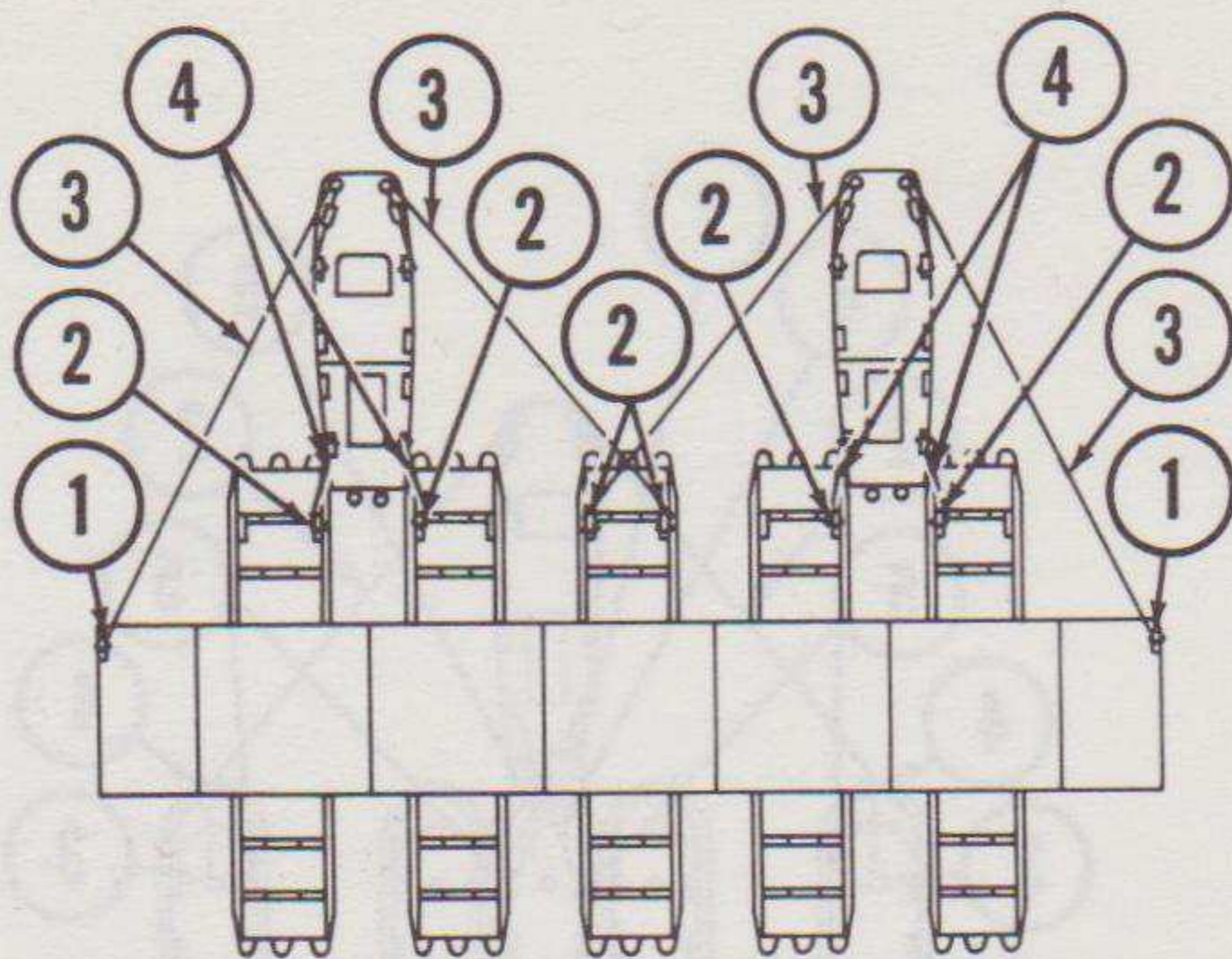
a. General. This paragraph tells in detail exactly how the boat is to be operated when performing its designated functions. It gives information on pushing and towing division floating bridge rafts, and on docking and casting off the tow.

b. Pushing. The boat will normally be used to push rafts or other objects since this method provides the maximum stability and maneuverability. Approach the raft to be pushed in the position indicated in figures 37 and 38. Make lines fast as shown. Always use a pushing balk and clamps (7, fig. 38) when pushing between pontoons, and a pushing bracket when pushing against a pontoon. These fittings are found in the raft. The spring lines (5, fig. 37) need be used only in case of high winds or currents. Tighten the steering lines by swinging the stern of the boat under power and pulling on the haul tackle lines at the same time. Station one man on the raft, one on the boat to man the lines and one at the helm (fig. 39). Proceed cautiously. Refer to the safety precautions in the front of this manual.

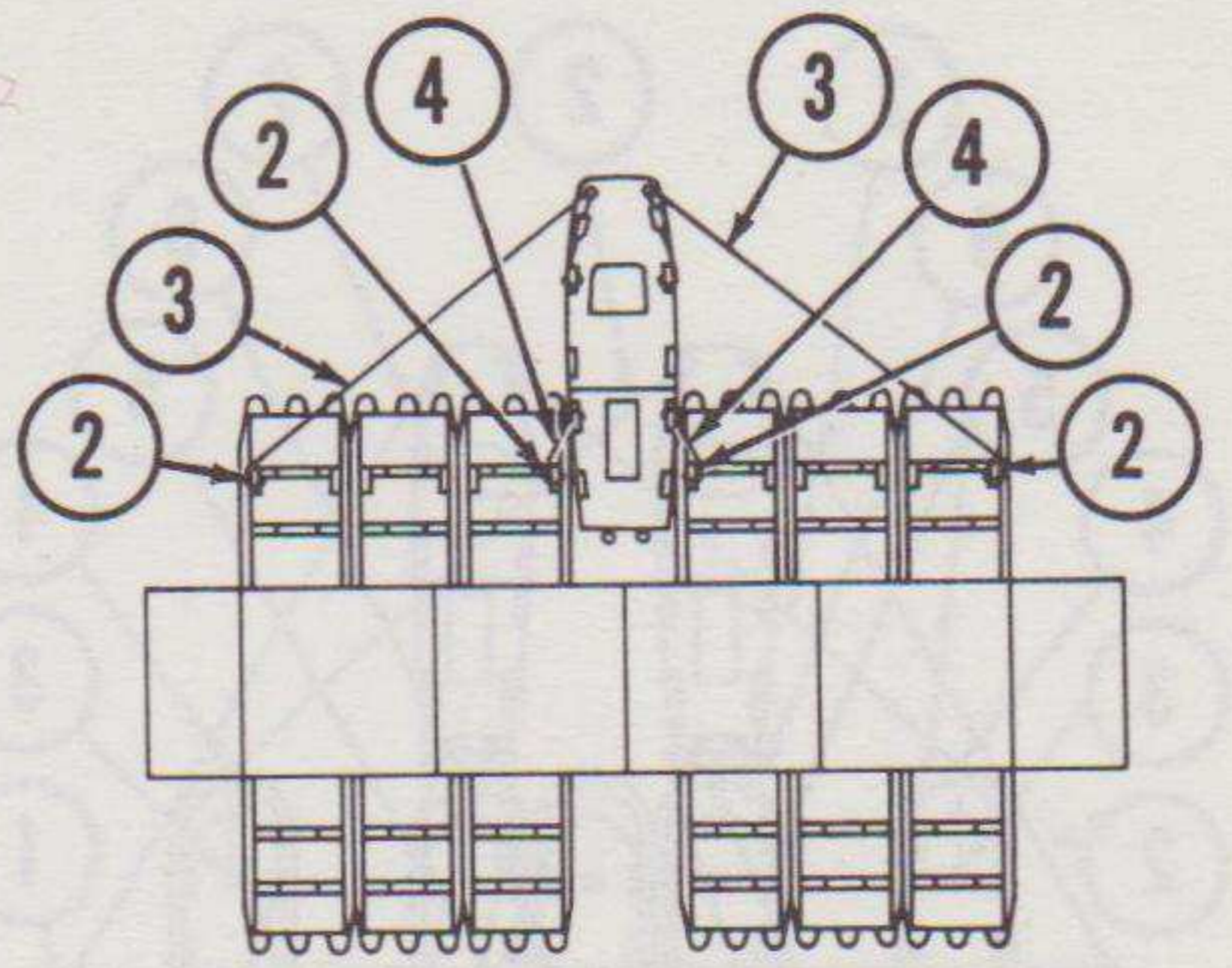
c. Towing astern. Use the 125-foot tow line for this operation. Place the single loop over the towing bitt and make the two loops at the other end of the line fast to the ends of the towed object (fig. 40). Proceed at moderate speed.

d. Towing Alongside. Approach the object to be towed with either stern quarter of the boat. Make a 1-inch diameter manila line fast to the deck cleat at frame 7. Make the other end of the line fast to a point amidships on the object to be towed. Make a 1-inch diameter manila line fast to the deck cleat at frame 12. Make the other end of the line fast to the same point amidships on the object to be towed. Make a 1-inch diameter manila line fast to the deck cleat at frame 2. Run the other end of the line between the pushing knees and make it fast at a point forward on the object to be towed. Proceed at moderate speed. This procedure minimizes the slack in the lines for all types of maneuvers. The operator can retain absolute control of the object being towed.

e. Docking a Pushed Object. Make the approach at right angles to the dock. This will bring the forward part of the raft or other object being pushed into the dock. Have another man make the bow of the pushed object fast. Maneuver the stern of the pushed object

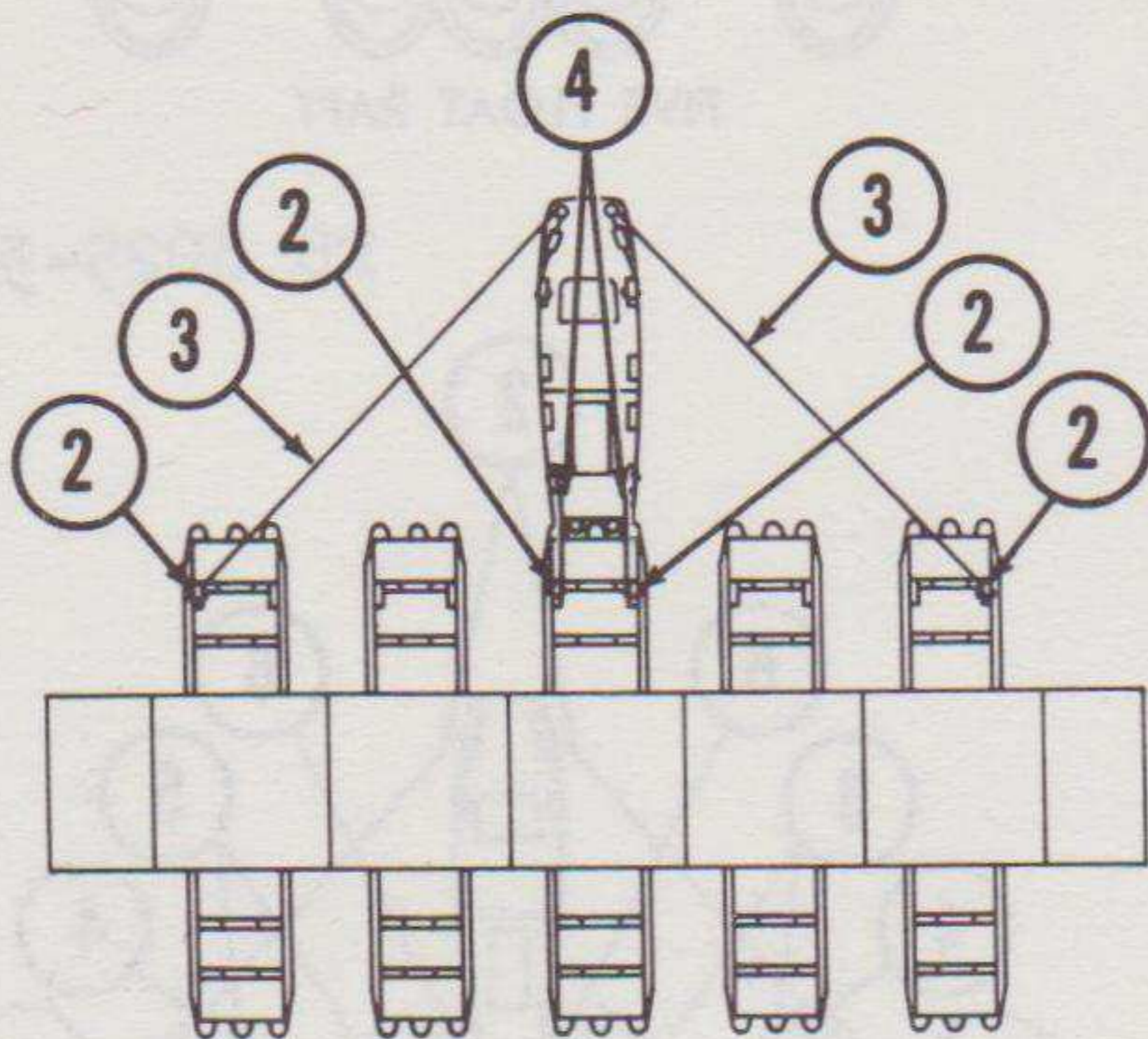


FIVE PONTON RAFT WITH TWO BOATS

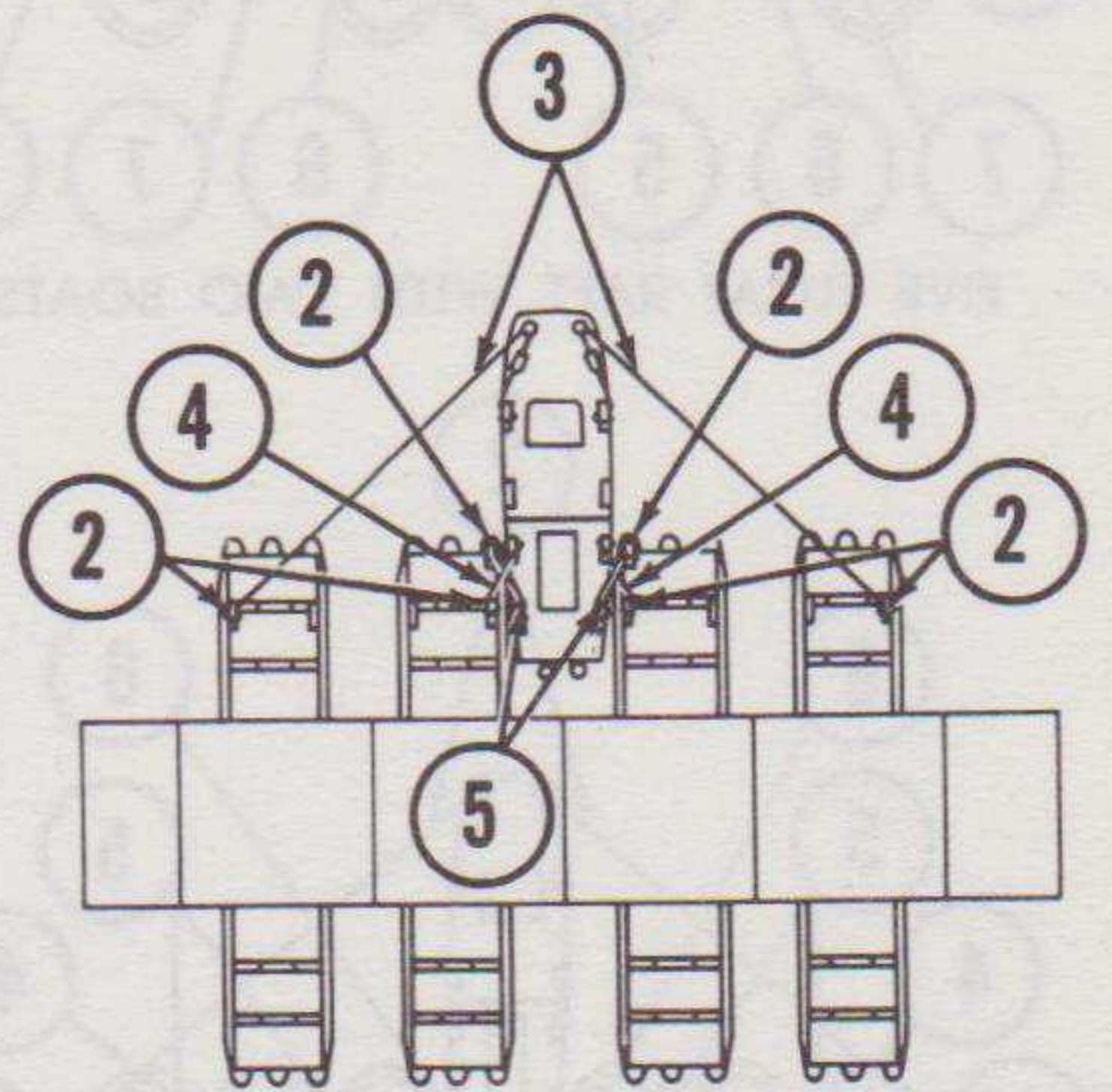


SIX PONTON RAFT

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FIVE PONTON RAFT



FOUR PONTON RAFT

- 1 Cleat on bridge section
- 2 Cleat on float
- 3 Steering line

- 4 Backing line
- 5 Spring line

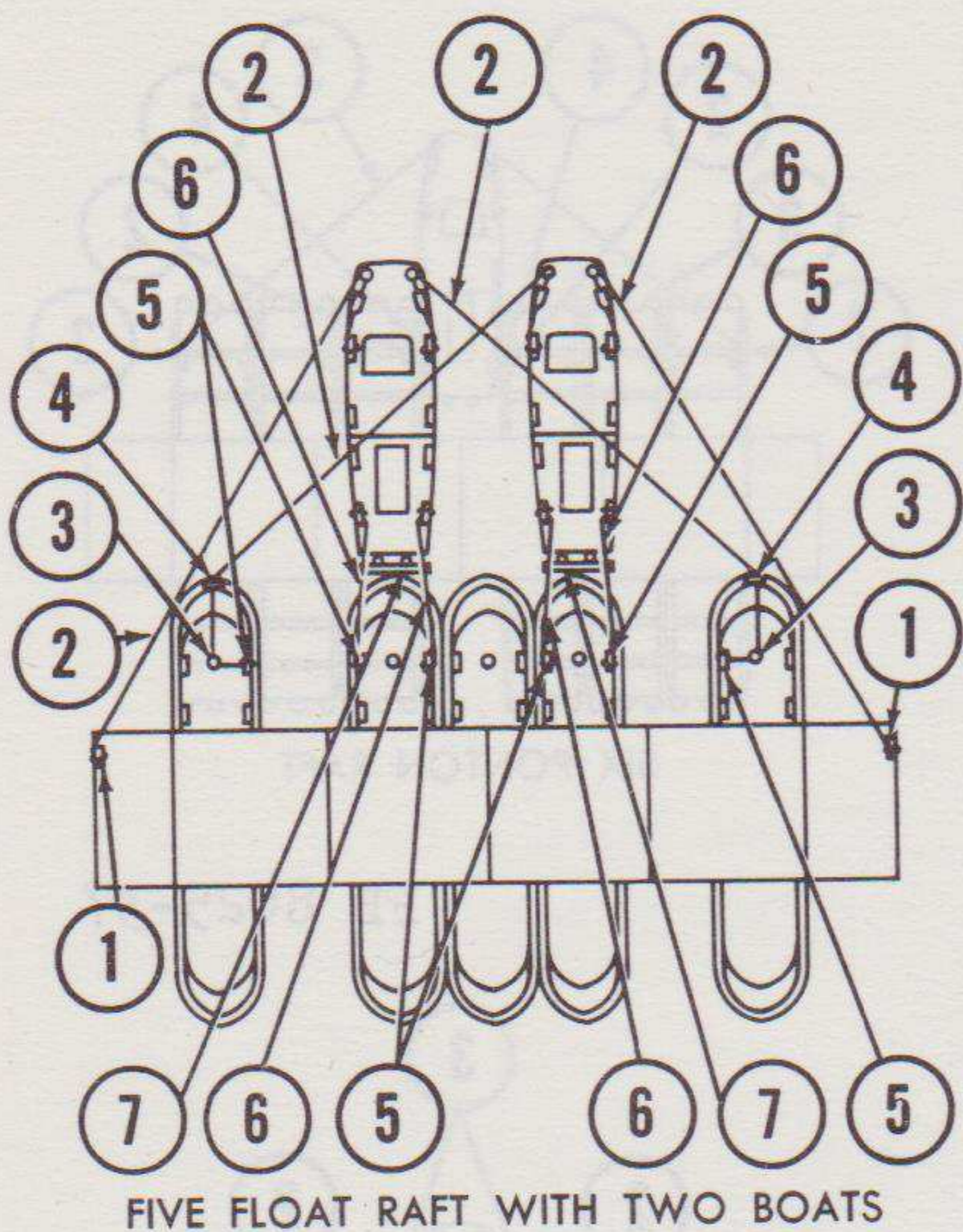
Figure 37. Line arrangements for pushing M4 rafts.

alongside the dock. Have the other man make the stern fast to the dock. Be sure to consider the wind and current conditions on the approach to the dock.

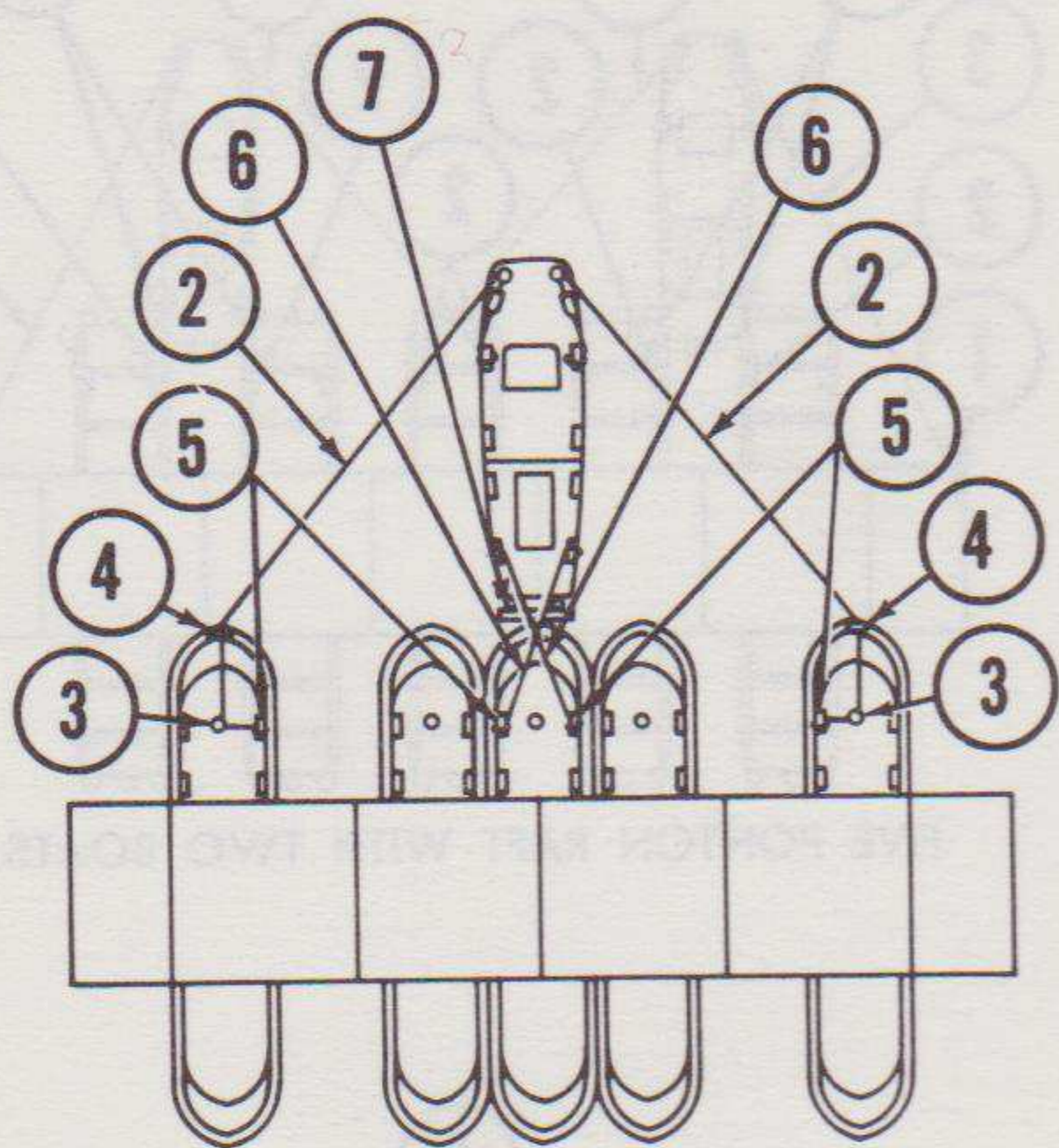
f. Casting Off a Pushed Object From the Dock. Arrange the boat and lines for pushing (*b* above). Have another man cast off the forward lines of the pushed object. Allow the bow of the pushed object to swing out, away from the dock. Have the other man cast off the stern lines of the object being pushed. Proceed at moderate speed.

38. Detailed Use of Deck Hardware

a. Haul Chock and Slide. A haul chock and slide (22, fig. 1) are located on each side of the deck. A haul chock line (9, fig. 3) runs from the haul chock around the sheave on the haul tackle jam cleat, and back around the sheave on the haul chock. The free end of this line is made fast to the haul tackle jam cleat (*b* below). The steering

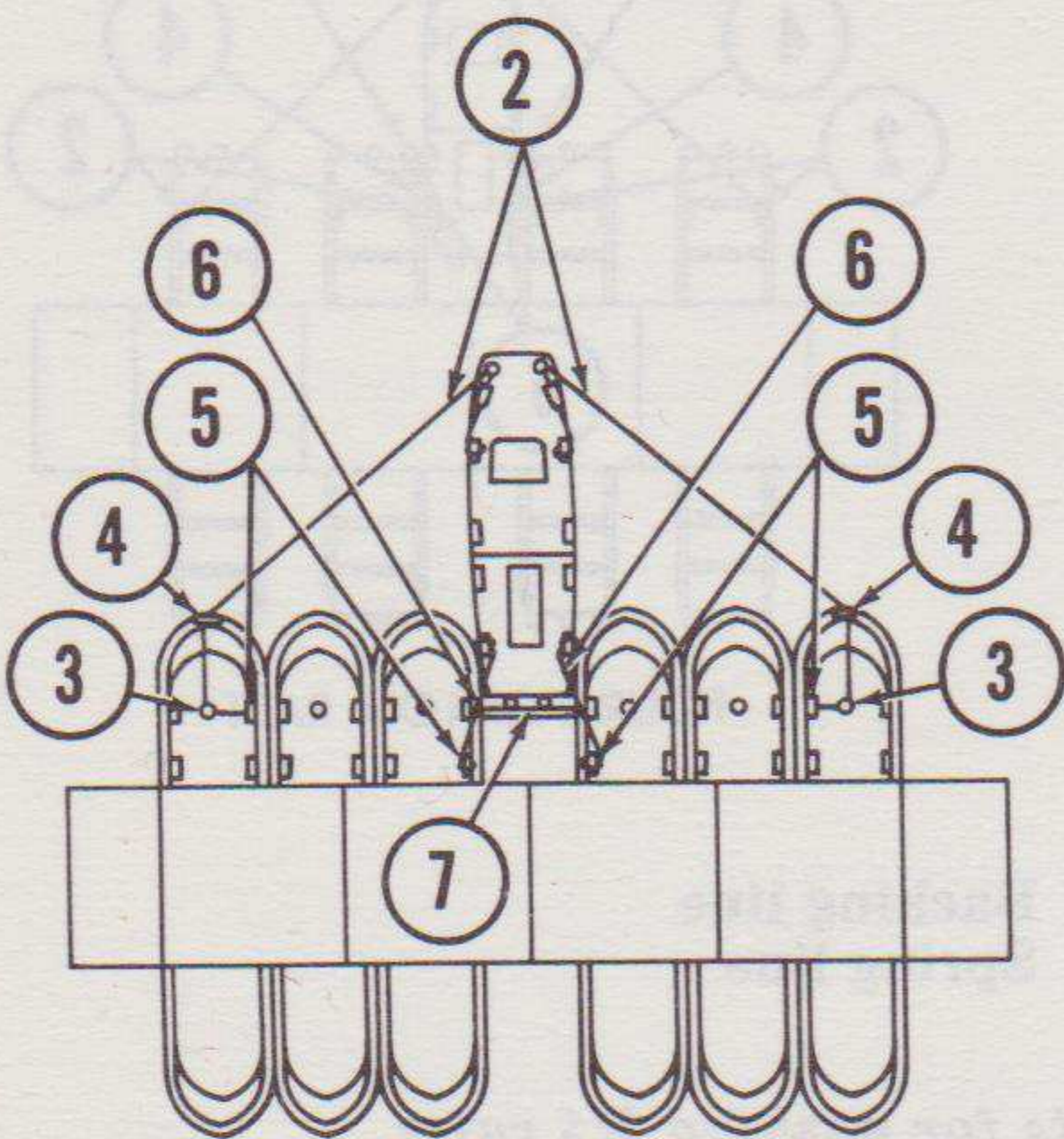


FIVE FLOAT RAFT WITH TWO BOATS

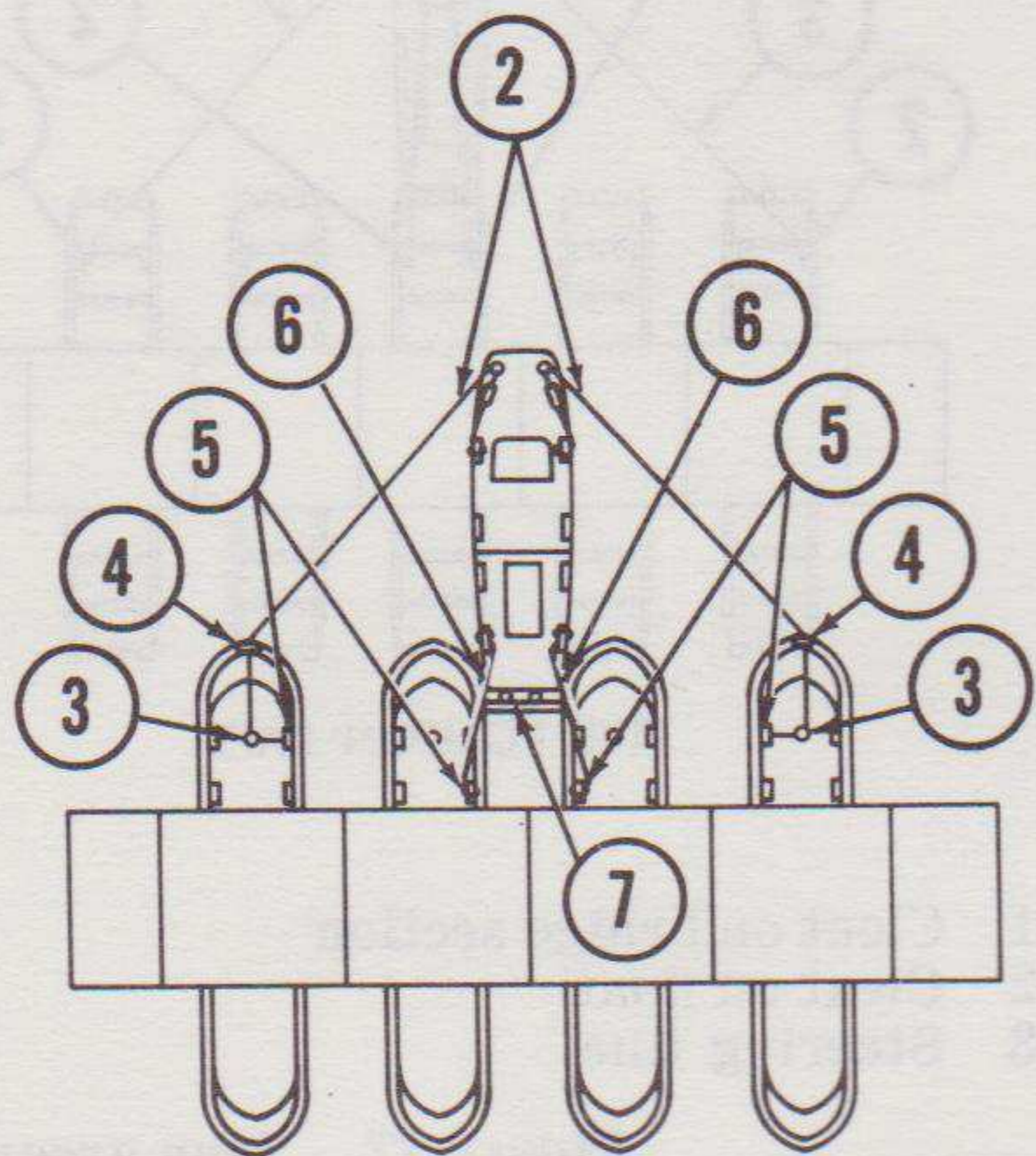


FIVE FLOAT RAFT

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SIX FLOAT RAFT



FOUR FLOAT RAFT

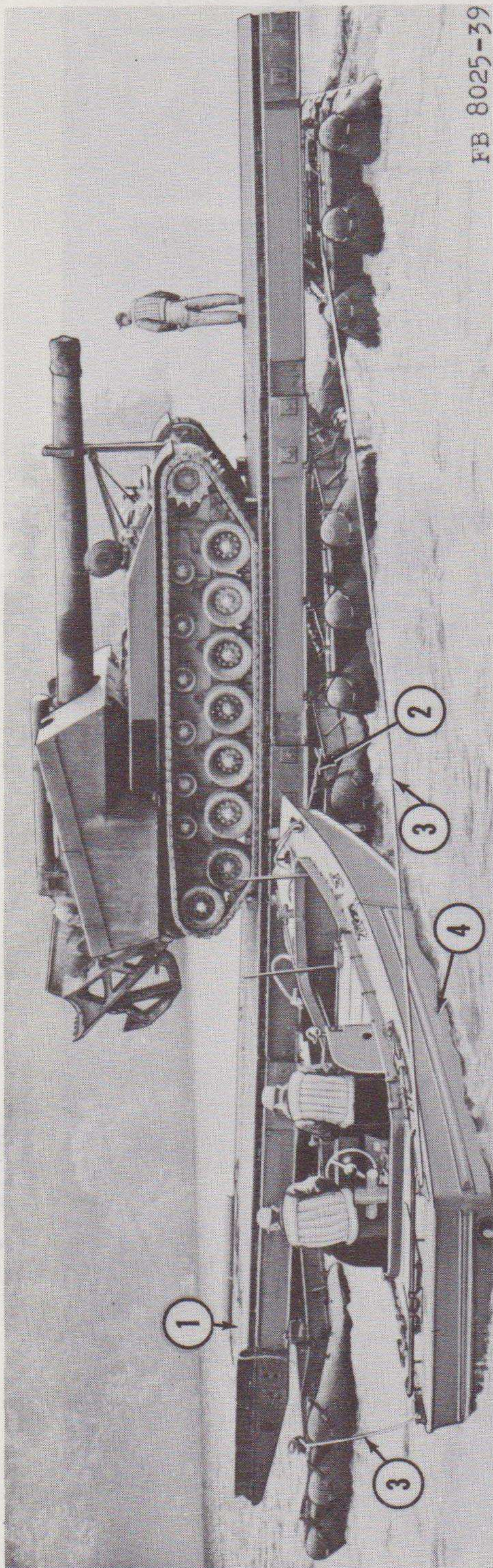
- 1 Cleat on bridge section
- 2 Steering line
- 3 Winch
- 4 Chock

- 5 Cleat on float
- 6 Backing line
- 7 Pushing balk

Figure 38. Line arrangements for pushing class 60 division rafts.

lines run from the haul chocks around the sheaves in the roller chocks and to the object being pushed. Tightening the haul tackle lines tightens the steering lines by pulling on the haul chocks. Simultaneously, the stern of the boat must be swung from side to side under power.

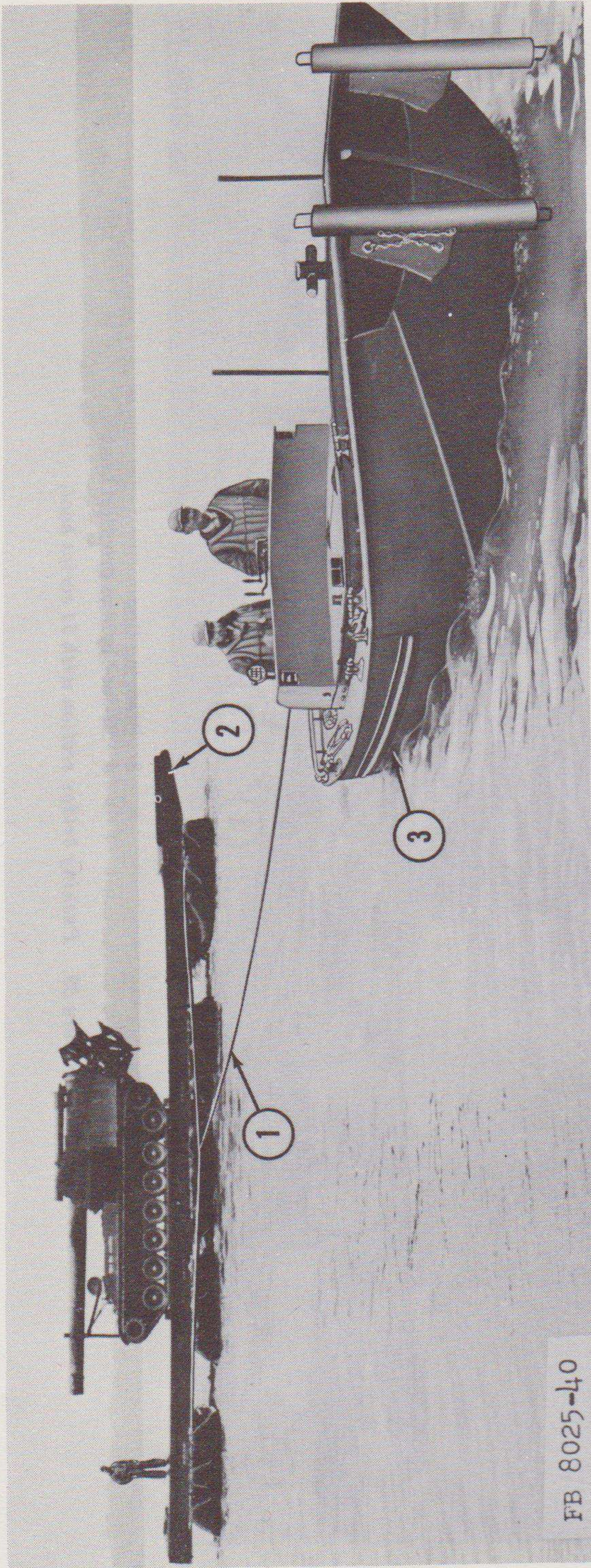
b. *Haul Tackle Jam Cleat.* A haul tackle jam cleat (fig. 41) is located on each side of the boat at frame 10. The haul tackle jam cleat is used in conjunction with the haul chock and slide to tighten the steering lines and to secure the haul tackle line.



- 1 M4 raft
- 2 Backing line

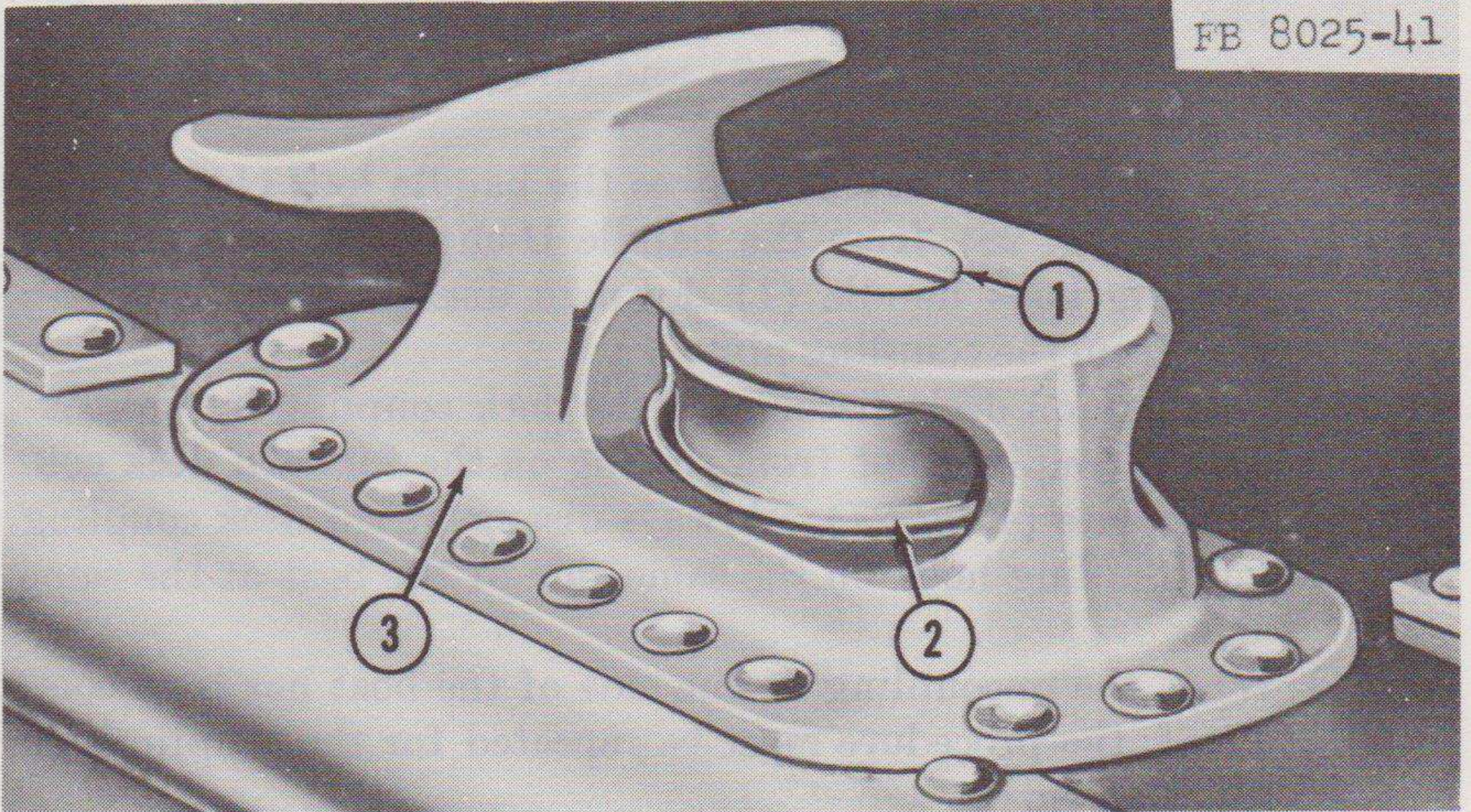
- 3 Steering line
- 4 27-foot bridge erection boat

Figure 39. Pushing bridge section with 51 series boat.



- 1 Towing line
- 2 M4 raft
- 3 27-foot bridge erection boat
- 3 27-foot bridge erection boat

Figure 40. Towing bridge section with 51 series boat.



1 Sheave stud
2 Sheave

3 Haul tackle jam cleat base

Figure 41. Haul tackle jam cleat.

c. Bow Chock. A bow chock (fig. 42) is located midway between the pushing knees at the bow of the boat. Lines from points on the bow section of the boat are passed through the bow chock to prevent fouling or chafing.

d. Roller Chock. A roller chock (19, fig. 1) is located on each side of the boat astern of frame 14. The steering lines are run around the roller chock base sheaves to the haul chocks.

e. Cleats. Each side of the boat has four cleats (fig. 43) riveted to it at frames 2, 5, 7, and 12. The cleats are made of aluminum alloy. They are used to make lines fast to the boat.

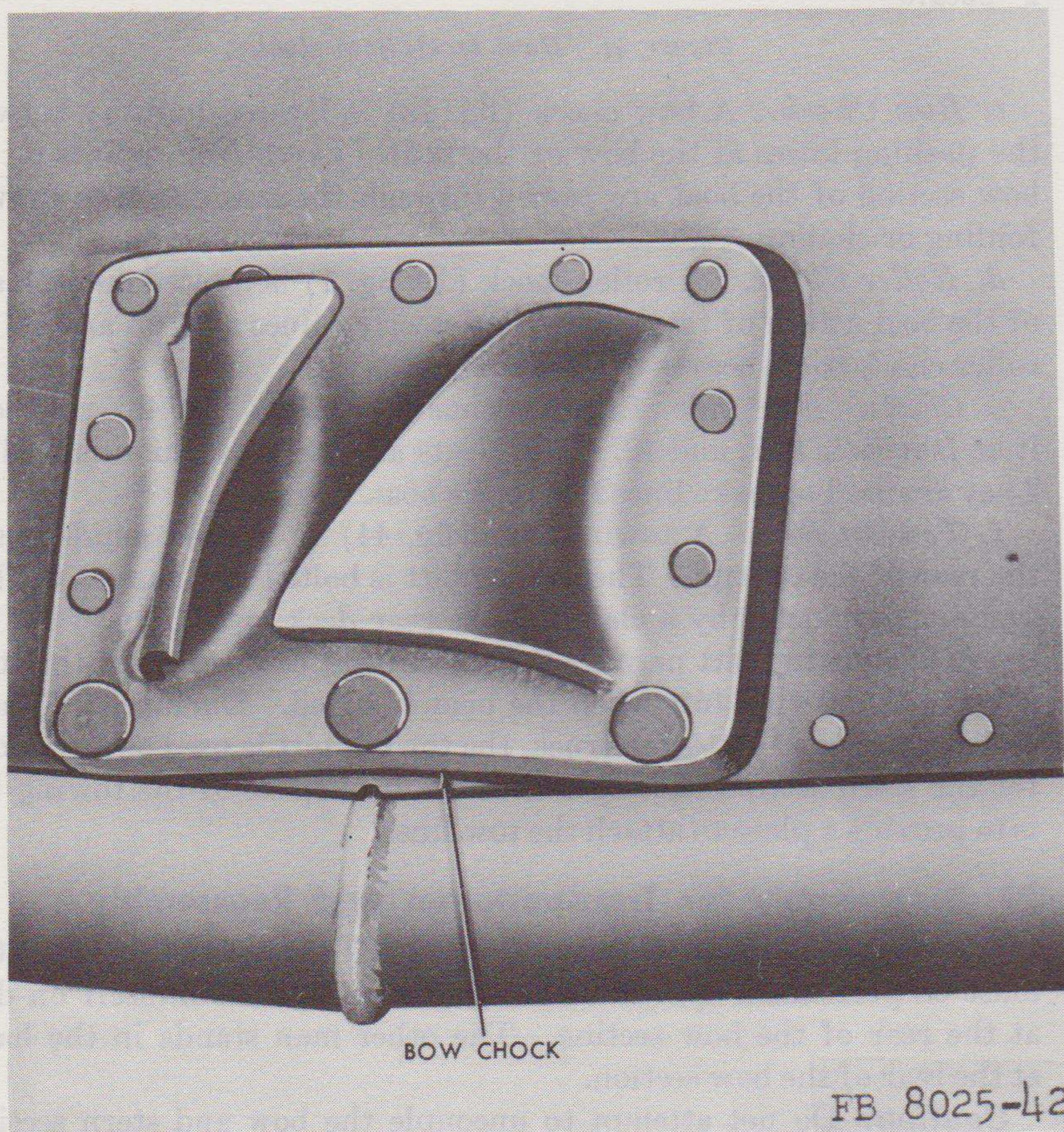
f. Towing Bitt. A towing bitt (fig. 44) is located amidships at the rear of the cockpit. The towing bitt is bolted to a base at the bottom and supported by a clamp at the rear deck level. An eye at the top of the towing bitt permits the attachment of one line of the stern sling to the towing bitt when the boat is lifted. During land transportation aboard a 2½-ton truck, the towing bitt is used as a tie-down for the stern section lashings. The main purpose of the towing bitt is to provide a place to attach the tow line.

39. Disassembly for Transportation and Reassembly

a. Uncouple Bow and Stern Sections. The uncoupling operation must be performed by two men. One man stations himself on deck at the rear of the bow section. The other man stands in the hatch at the rear of the bow section.

Caution: Do not attempt to uncouple the bow and stern sections in rough water. The shear forces set up are large and the boat might be damaged severely.

- (1) The man on deck loosens the deck coupling by lifting the coupling handle (8, fig. 27) and turning it towards the port side of the boat.
- (2) The man in the hatch removes the handle lock chain cotter pin (4, fig. 28) from the handle U-clip (2) and pulls the coupling hook handle (1) down to disengage the coupling hook from the coupling pin.
- (3) The man on deck disconnects the deck coupling by unhooking the coupling nut from the lug on the forward deck coupling plate (4, fig. 27). Always disengage the deck coupling and coupling hook on the same side of the boat at the same time.
- (4) When the uncoupling of one side of the boat has been completed, the procedure must be repeated for the couplings on the other side.



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Figure 42. Bow chock.

- (5) Both men push the two halves of the boat apart, one standing on each side of the bow section. Since the stern section floats lower in the water than the bow section, the men must lift on the stern section lifting bars (7, fig. 27) while pushing the two sections apart.

Warning: Always disconnect the propeller shaft from the engine before hoisting the stern section from the water.

b. Cradle Bow and Stern Sections. Disconnect the batteries and pump out the bilges, then hoist the bow section with its cradle aboard a 2½-ton pole-type trailer (3, fig. 45). Lash in place as shown on the forward section loading diagram identification plate (fig. 8). Hoist the stern section with its cradle aboard a 2½-ton LWB cargo dump truck (4, fig. 45). Lash in place as shown on the stern section loading diagram identification plate (fig. 9). Figure 45 shows the bow and stern sections mounted and ready for transport.

c. Overhead Clearances. The bow section of the boat, mounted on a 2½-ton pole-type trailer, requires an overhead clearance of 8 feet. The stern section of the boat, mounted on a 2½-ton LWB cargo dump truck, requires an overhead clearance of 11 feet.

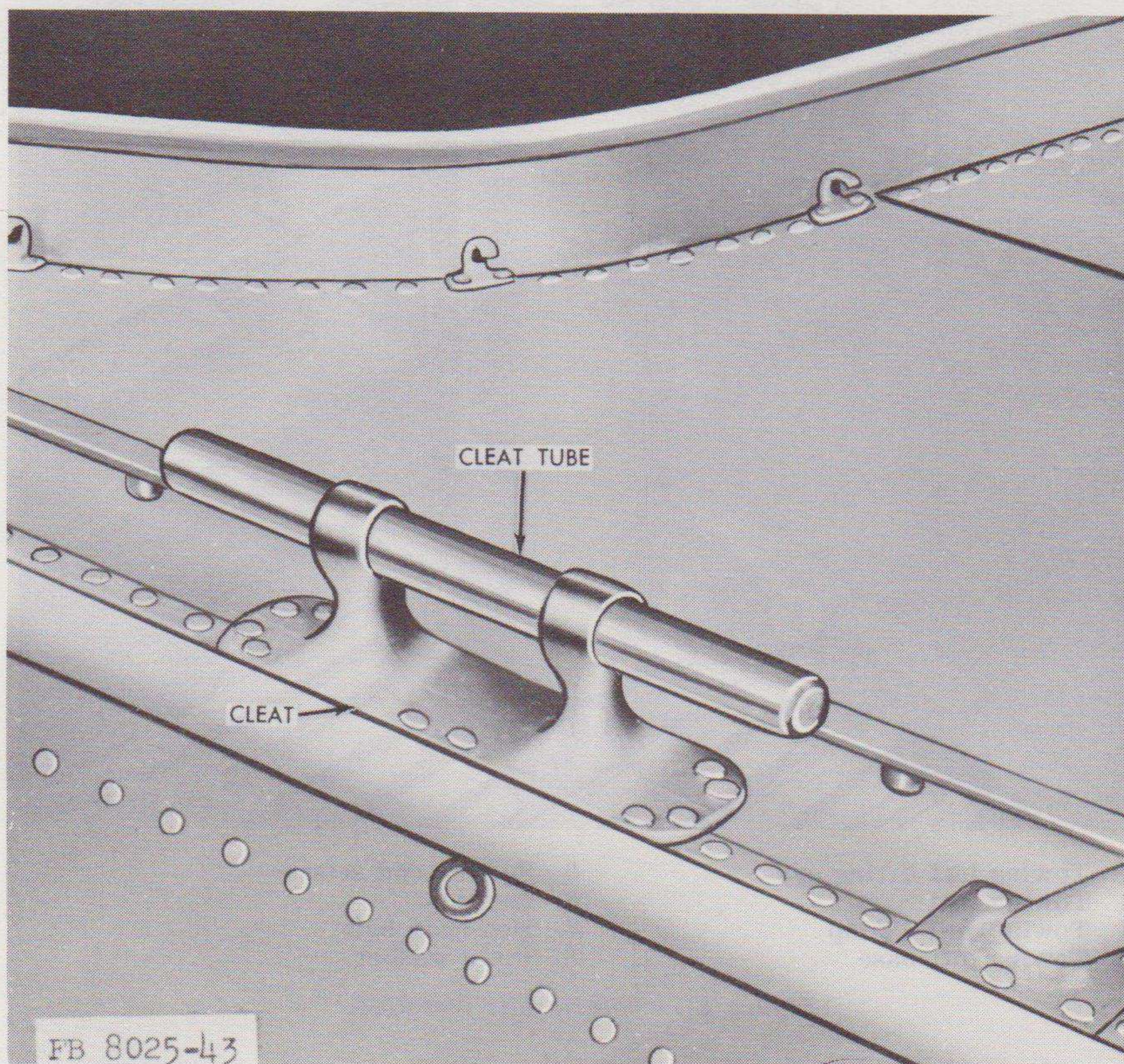
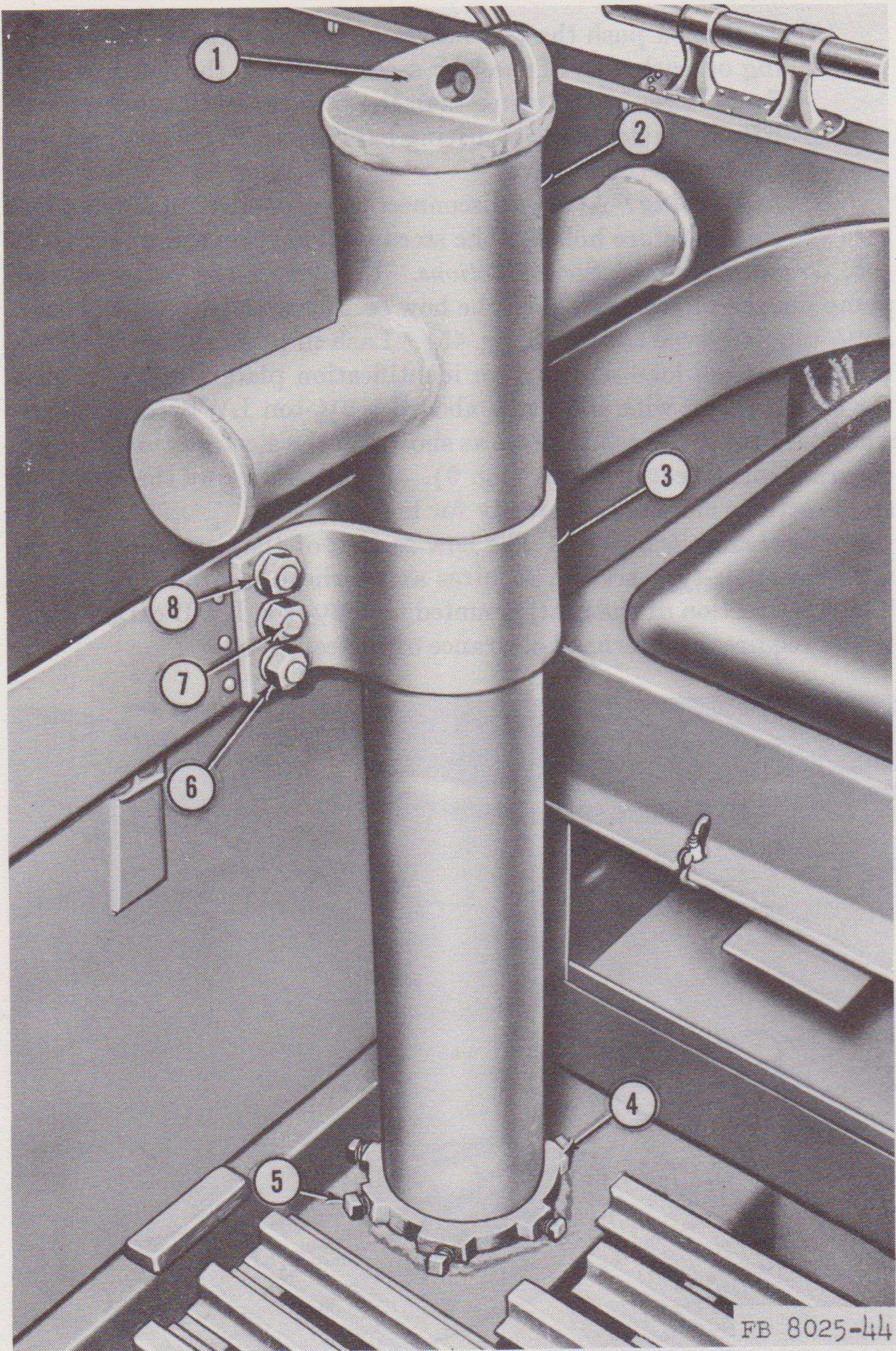
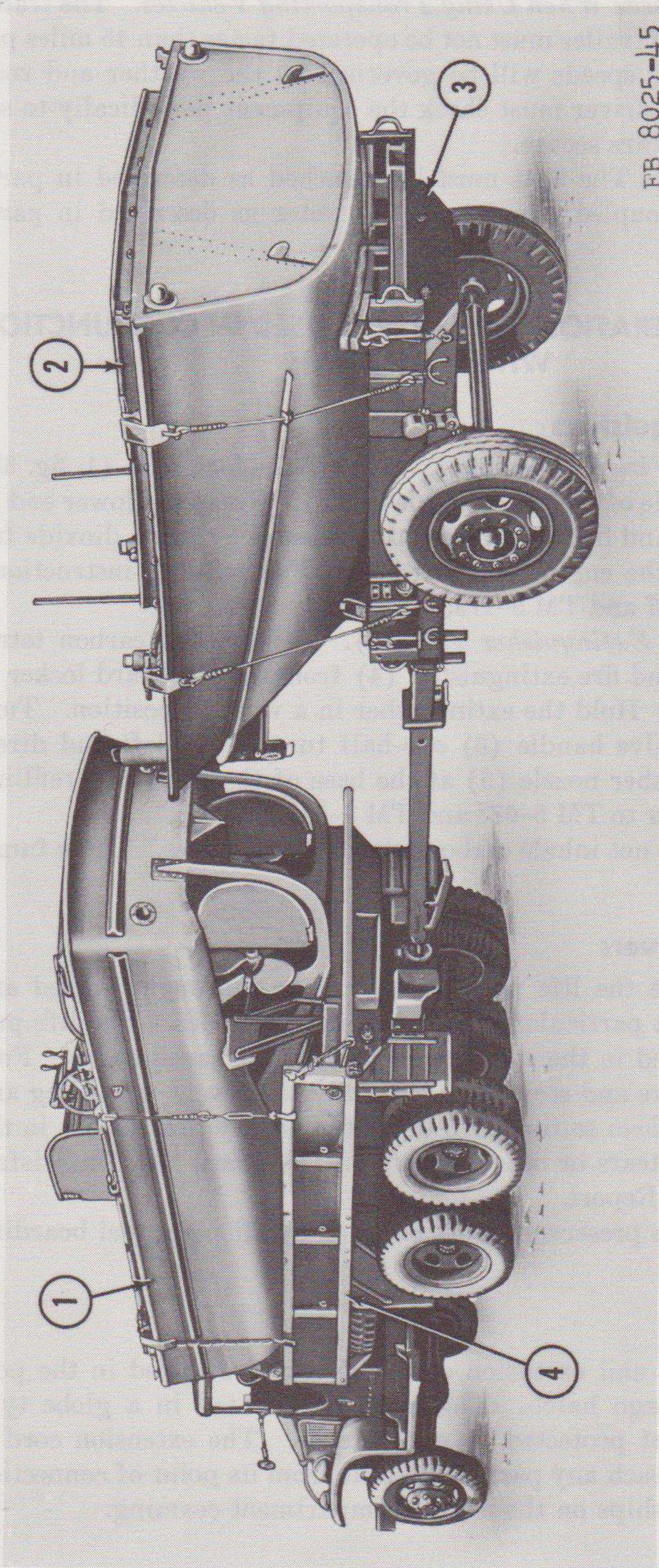


Figure 43. Cleat.



- | | |
|---------------------------|-----------------------|
| 1 Towing bitt lifting eye | 5 Squarehead setscrew |
| 2 Towing bitt | 6 Hex nut |
| 3 Towing bitt clamp | 7 Hex-head bolt |
| 4 Towing bitt base | 8 Plain washer |

Figure 44. Towing bitt installed.



FB 8025-45

- 1 27-foot bridge erection boat stern section
- 2 27-foot bridge erection boat bow section
- 3 2½-ton pole-type trailer
- 4 2½-ton LWB cargo dump truck

Figure 45. Bow and stern sections mounted for transportation.

d. Towing Speeds When Using Transporting Vehicles. The transporting truck and trailer must not be operated faster than 45 miles per hour. Operating speeds will be governed by the weather and road conditions. The driver must check the equipment periodically to see that the lashings are secure.

e. Reassembly. The boat must be launched as described in paragraph 10, and coupled together in the water as described in paragraph 11.

Section IV. OPERATION OF MATERIEL USED IN CONJUNCTION WITH THE BOAT

40. Fire Extinguishers

a. C-O-Two Fire Extinguisher. Remove the lock wire (1, fig. 33) located on the side of the operating lever (2). Grasp the lower end of the lever firmly and lift up. This action releases a carbon dioxide fog which blankets the engine compartment. For refilling instructions, refer to TM 5-687 and TM 9-1799.

b. Hand Fire Extinguisher (fig. 23). Remove the carbon tetrachloride type hand fire extinguisher (4) from the starboard locker in the cargo hatch. Hold the extinguisher in a vertical position. Turn the discharge valve handle (3) one-half turn to the left and direct the fire extinguisher nozzle (5) at the base of the fire. For refilling instructions, refer to TM 5-687 and TM 5-1799.

Warning: Do not inhale carbon tetrachloride fumes. These fumes are deadly.

41. Life Preservers

After each use the life preservers must be thoroughly dried and inspected. Look particularly for tears and loose ties. The life preservers are stowed in the starboard locker in the cargo hatch. Fold the life preservers and stow them carefully to prevent wrinkling and tearing. Stow them so they will not catch on any protrusions in the locker. Report tears or other defects on DA Form 468, Unsatisfactory Equipment Report.

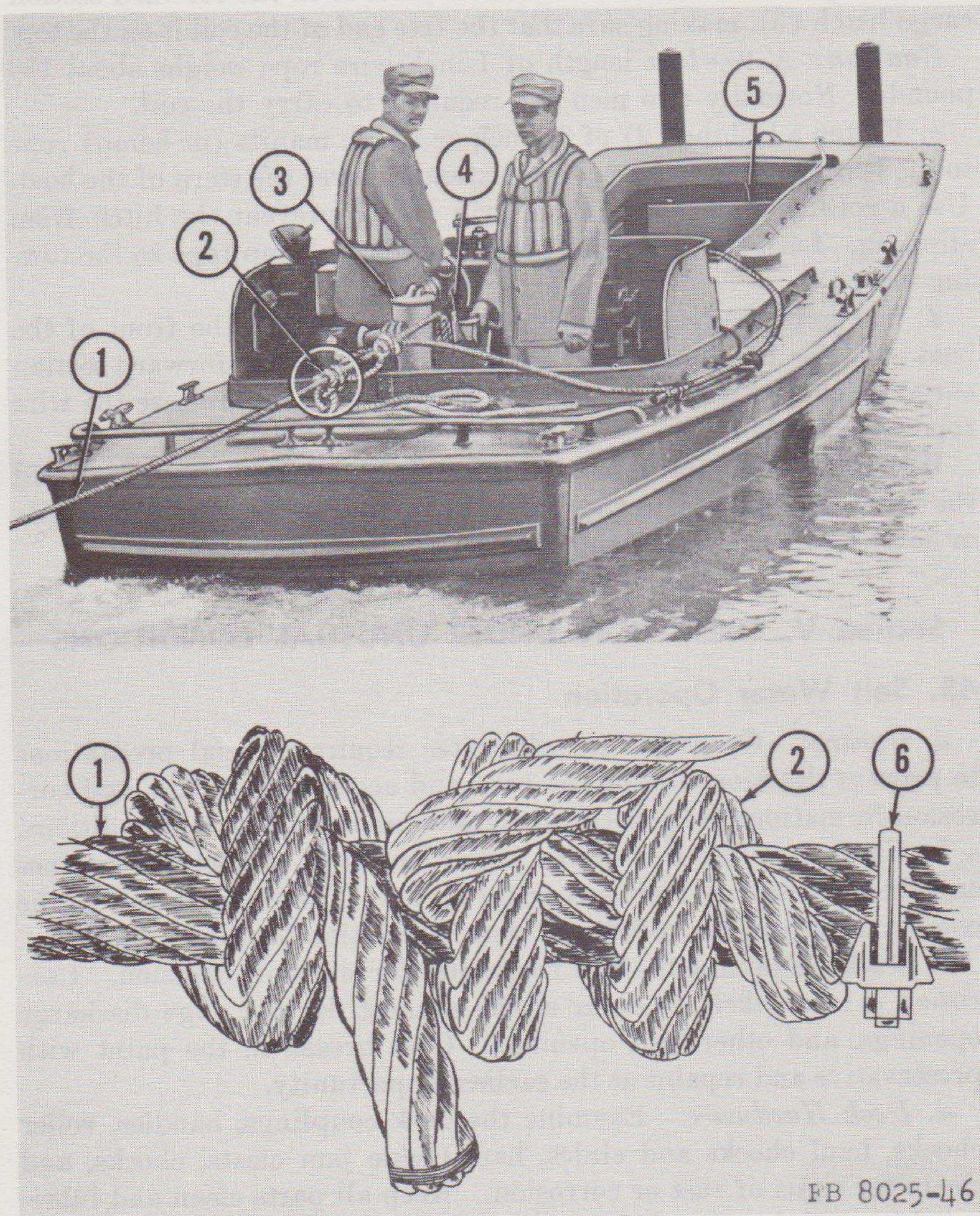
Caution: Life preservers must be worn by all personnel boarding the boat.

42. Floodlight

The floodlight and extension cord (fig. 22) are stored in the port locker in the cargo hatch. The lamp is mounted in a globe type waterproof socket protected by a wire cage. The extension cord is long enough to reach any part of the boat from its point of connection at frame 6 amidships on the engine compartment coaming.

43. Marking Lights on Pushed or Towed Objects

In addition to the lights carried on the boat for night operation, additional lights must be provided for marking pushed or towed objects. U. S. Coast Guard International, Inland, and Pilot Rules cover the regulations concerning these lights. A copy of this publication should be carried with the boat at all times and the operator must be familiar with the regulations.



- 1 Wire rope
- 2 Lashing
- 3 Towing bitt

- 4 Hatchet
- 5 Forward section cargo hatch
- 6 Cable grip

Figure 46. Stringing wire rope.

44. Stringing Wire Rope

(fig. 46)

a. Mount a reel of wire rope in a reel stand placed on the near shore. While on the shore, slowly pay out about 100 feet of the wire rope (the length depending on the amount required on the far shore) and form a coil of fairly large diameter. Block the coil by wrapping it at four points with wire or heavy cord.

b. Carry the coil onto the boat and place it in the forward section cargo hatch (5), making sure that the free end of the coil is on the top.

Caution: A 100-foot length of 1-inch wire rope weighs about 180 pounds. Normally two men are required to carry the coil.

c. Fasten a lashing (2) of $\frac{3}{4}$ -inch or 1-inch manila (or hemp) rope to the length of the wire rope (1) extending over the stern of the boat. Use a rolling hitch and a cable grip (6) to prevent the hitch from slipping. Lash the other end of the manila or hemp rope to the towing bitt (3).

d. Navigate the boat in a forward direction until the front of the boat is on the far shore. Pull the wire rope from the forward section cargo hatch and secure the end to a deadman. Then release the wire rope from the boat.

Warning: Keep clear of all rope coils and tensed strands. Hold the hatchet (supplied in the tool box) in readiness to cut the manila or hemp lashing in case of emergency.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

45. Salt Water Operation

a. General. Operation in salt water requires special precautions to prevent deterioration of the boat and accessories. Rust and corrosion formations are greatly accelerated under salt water conditions.

b. Engine. Close the engine hatch covers to protect the engines and their accessories from salt water spray. The vents on the engine compartment covers provide sufficient ventilation for the engines.

c. Hull. Examine the hull frequently for signs of corrosion. Corrosion is most likely to occur at the exhaust flanges, bilge discharge openings, and other hull openings. Coat breaks in the paint with preservative and repaint at the earliest opportunity.

d. Deck Hardware. Examine the deck couplings, handles, roller chocks, haul chocks and slides, haul tackle jam cleats, chocks, and cleats for signs of rust or corrosion. Keep all parts clean and lubricated in accordance with LO 5-8025.

e. Accessories. Examine the running lights, mast light and mast, searchlight, bilge pumps, fire extinguishers, blower system, coupling bar and hook, and all electrical connections for signs of corrosion.

46. Cold Weather Operation

a. Hull and Decks. Examine the hull carefully for evidence of ice damage. Pay particular attention to the bow and stern section coupling assemblies. Check the bilge pumps and lines. Thaw them out with hot water if necessary. Examine the deck hardware to see that the moving parts are not jammed or damaged. Check the entire steering system to see that all the parts work freely. Check the steerer tube universals, intermediate gear box, and steerer quadrant for signs of misalignment. Turn the steering wheel from extreme left to extreme right and back to extreme left to check for binding or excessive free play. Refer to paragraph 106g (3) for steering system adjustment.

b. Engines and Accessories. Check the carburetors, fuel pumps, generators, starter motors, water pumps, radio suppression shields, drip pans, and other exterior parts of the engines for ice damage. Crank the engines a few times with the hand crank to see that everything moves freely. Check the batteries to see that they have not frozen (*f* below).

c. Cooling Systems. Be sure that sufficient antifreeze is present in the cooling systems after each operation (table III, par. 100c, and *d*).

Table III. Freezing Points, Composition, and Specific Gravities of Military Antifreeze Materials

Lowest expected ambient temp °F.	Pints of inhibited glycol per gal of coolant ¹	Compound, antifreeze, Arctic ²	Ethylene glycol coolant solution specific gravity at 68° F. ³	
+20	1½	Issued full-strength and ready mixed for 0° to -65° F. temperatures for both initial installation and replenishment of losses.	1.022	
+10	2		1.036	
0	2¾		1.047	
-10	3¼		1.055	
-20	3½		1.062	
-30	4		1.067	
-40	4¼		1.073	
-50	Arctic anti-freeze preferred.		DO NOT DILUTE WITH WATER OR ANY OTHER SUBSTANCE.	
-60				
-75				

¹ Maximum protection is obtained at 60 percent by volume, that is 4.8 pints of ethylene glycol per gallon of solution.

² Military Specification MIL-C-11755 Arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines for protection against freezing primarily in Arctic regions where the ambient temperature remains for extended periods of time close to -40° F. or drops below, to as low as -90° F.

³ Use an accurate hydrometer. To test hydrometer, use 1 part ethylene glycol type antifreeze to 2 parts water. This should produce a hydrometer reading of 0° F.

Note. Fasten a tag near the radiator filler cap indicating the type of antifreeze.

d. Lubrication. Refer to LO 5-8025 for the correct winter lubricants. Be sure the boat has been lubricated for winter operation.

e. Fuel. No change of fuel is necessary for winter operation; however, it will be necessary to add one quart of grade III denatured alcohol to each full tank of gasoline. The alcohol mixes readily with any water present in the gasoline tank and prevents the water from freezing. Keep the gasoline tank full to prevent water from condensing inside the tank.

f. Batteries. It is very important to keep the batteries fully charged in cold weather. A battery can deliver only half the energy at 15° F. that it can at 80° F. Oil thickens and makes cranking the engine much more difficult. Gasoline becomes less volatile and a hotter spark is necessary to ignite the fuel charge. Only a fully charged battery in good condition can operate satisfactorily under these conditions. If it is necessary to add water to the batteries, run the engines or charge the batteries for at least 1 hour after adding the water. This mixes the fresh water with the electrolyte. If the fresh water is not mixed, it will lie on top of the electrolyte and will freeze.

Caution: A discharged or partially discharged battery will freeze and be ruined at very low temperatures.

g. Boat Handling. The boat may be operated in cold weather as long as there is open water. It is imperative that the boat be operated slowly to prevent damage from floating ice. Remember that two thirds of an ice cake is under water and therefore invisible.

Caution: It is possible to use the boat as an ice-breaker for a few inches of ice but this may be done only in cases of emergency. In such cases, operation in breaking ice will depend on the use of good judgment by the unit commander and the operator. Operate the boat very slowly and with extreme caution. After operation, inspect the hull for leaks.

Warning: Guard against the possibility of slipping or falling on ice coatings formed from spray or freezing rain. Always wear gloves to prevent contacting cold metal with the bare flesh.

47. Hot Weather Operation

a. Hull and Decks. Corrosion and rust form more readily in hot weather than under normal conditions. The hull, decks, and their complementary hardware must be inspected frequently. Corrective measures (par. 55) must be taken at the first signs of rust or corrosion. Watch for signs of water leakage if the air and water temperatures differ greatly. Uneven expansion of the hull plates can cause seams to buckle.

b. Engines and Accessories. Leave the engine hatch covers open during operation. The hatch covers are held open by the braces provided. Be sure that the correct grades of lubricants are used as in-

licated by LO 5-8025. Examine the engine and accessories frequently for signs of rust and corrosion. Check the distributor, wire insulation, and other organic materials for fungus growth. Check the oil and water temperature gages frequently during operation to be sure the engines are not overheating.

Caution: If the engines overheat, shut them off. Do not start them again until the cause of the overheating has been found and corrected.

c. Cooling System. Check the coolant frequently to see that it is clean and at the proper level (par. 100). Coolant evaporates more rapidly in hot weather than under normal conditions; also, since the thermostat is open a greater percentage of the time coolant circulation increases. When the coolant circulates rapidly, air is drawn into the cooling system. This accelerates rust and corrosion. Be sure to add an approved inhibitor to the system when refilling (par. 100). Watch for signs of thermostat failure. Refer to TM 5-5187.

d. Lubrication. Be sure that the correct grades of lubricants for the temperatures encountered are used. Refer to LO 5-8025.

e. Batteries. Inspect the batteries frequently. They require water much more frequently during hot weather operation than normally. Check the terminals and connectors for signs of corrosion. Clean away any corrosion and coat the connections with a film of general purpose grease.

f. Fuel. No special fuel is necessary for hot weather operation.

48. Operation in High Currents

a. General Information. There is no substitute for experience in handling boats in swift currents. This paragraph lists some information which will prove helpful but the boat is to be operated in high currents only by thoroughly experienced operators. Water in the main channel is usually faster and rougher than water along the shores. The helmsman and crew of the boat must be prepared to meet the full force of the current as the boat approaches the main channel. If they are not prepared, the boat may be swept downstream out of control. Under some conditions, such as during flooding, water near the shores which is usually quiet may speed up and become very dangerous for boat operation.

b. Current Changes. A sluggish stream may become a torrent in a few hours or even minutes as the result of a sudden and heavy rainfall. This is most likely to happen in tropical or arid regions but can occur in temperate regions as the result of unusual storms or thaws. Boat crews and boats must be prepared for such sudden changes.

c. Debris. Swift streams often carry large quantities of logs, brush, and other debris. This is especially true during floods, when

material along the banks is carried away as the river rises. In cold weather, floating ice may be present. Debris is a serious hazard to the boat. Even single pieces of debris can foul the propellers or puncture the hull. During operation under these conditions, at least one man must be stationed at the bow with a boat hook to fend off floating debris.

d. Engine Failure. The helmsman must be prepared to drop the anchor instantly in case of engine failure. If only one engine fails, the difficulty of maneuvering the boat in a strong current with the remaining engine precludes anything but emergency operation.

e. Safety Precautions.

- (1) Do not launch the boat upstream from a bridge.
- (2) Keep the bilges pumped out. Even small quantities of water greatly reduce the stability of the boat.
- (3) Keep the boat heading into the current. This is particularly important when casting off or landing.
- (4) Be sure the engines are in good condition and that the propellers are turning before casting off.
- (5) Be sure the engines are running fast enough at all times to prevent their stalling.
- (6) Do not operate the boat unless it is equipped with properly coiled and secured anchor and guy lines.
- (7) Never operate the boat less than 1,000 feet above a floating bridge in currents exceeding 3 feet per second.
- (8) Be sure the lines used for pushing or towing are the proper size and in good condition.
- (9) Secure the lines to the cleats in such a manner that they can be released quickly in case of an emergency.
- (10) Know the nature of the currents and/or tides in the area of operation before attempting to operate the boat.
- (11) Reduce the boat load when operating in high currents.
- (12) Station the crew as near the centerline of the boat as possible to provide added stability.

49. Rafting After Dark

Be sure that the running lights on the boat are operating. Have the correct number and kind of marking lights on the object being pushed or towed (par. 43). Take frequent soundings, especially in unfamiliar waters. Exceptional skill and good judgment are necessary for after dark operations.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

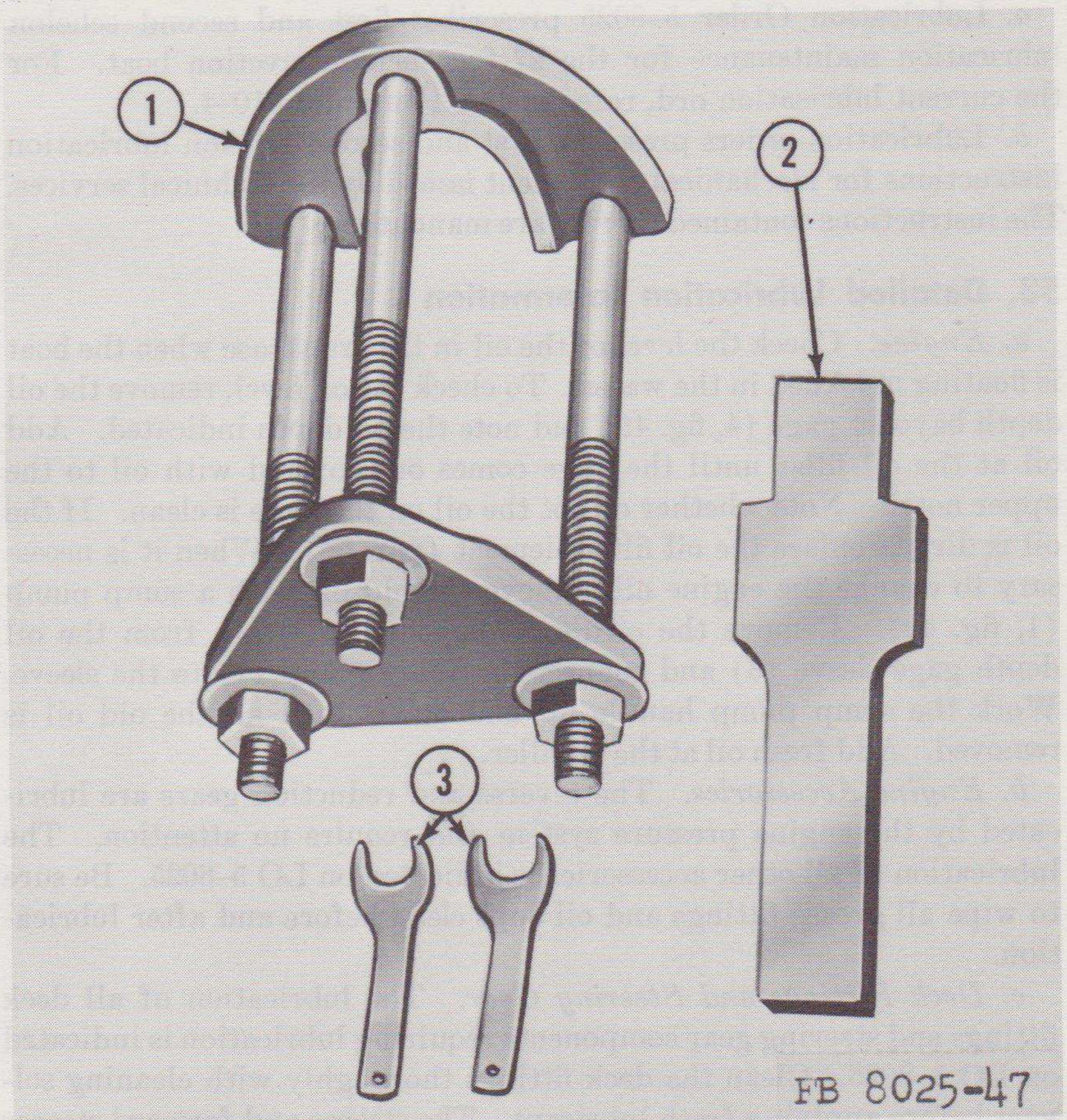
Section I. SPECIAL ORGANIZATIONAL TOOLS AND EQUIPMENT

50. General

A tool box and a set of tools are issued with each boat. These items are listed in Department of the Army Supply Manual ENG 7 & 8 8025. The specially designed tools in the set are listed and described in paragraph 51.

51. Special Organizational Tools

a. *Wheel Puller.* The wheel puller (1, fig. 47) is used to remove the



1 Wheel puller
2 Bearing removal punch

3 Radio suppression wrench

Figure 47. Special organizational tools.

propellers and shaft couplings. The slotted plate is slipped over the shaft behind the item to be removed. The nuts are pulled up against the solid plate until the item being removed is pulled loose from its tapered shaft.

b. Bearing Removal Punch. The bearing removal punch (2, fig. 47) is used to remove the cutless bearings from the propeller struts. The end of the punch is inserted in the slot in the propeller strut. The punch is struck with a hammer until the bearing is driven out.

c. Radio Suppression Wrenches. The radio suppression shielding wrenches (3, fig. 47) are used to remove the shielding connections from the spark plugs.

Section II. LUBRICATION AND PAINTING

52. General Lubrication Information

a. Lubrication Order 5-8025 prescribes first and second echelon lubrication maintenance for the 27-foot bridge erection boat. For the current lubrication ord, refer to DA Pamphlet 310-4.

b. Lubrication orders prescribe first and second echelon lubrication instructions for mechanical equipment issued by the technical services. The instructions contained therein are mandatory.

53. Detailed Lubrication Information

a. Engine. Check the level of the oil in the crankcase when the boat is floating unloaded in the water. To check the oil level, remove the oil depth bayonet gage (4, fig. 49) and note the oil depth indicated. Add oil at the oil filler until the gage comes out covered with oil to the upper notch. Note whether or not the oil on the gage is clean. If the oil is dirty, replace the oil filter element (par. 54). When it is necessary to change the engine oil, remove the old oil with a sump pump (1, fig. 49). Remove the oil depth bayonet gage (4) from the oil depth gage sleeve (3) and connect the sump pump (1) to the sleeve. Work the sump pump handle up and down until all the old oil is removed. Add fresh oil at the oil filler.

b. Engine Accessories. The reverse and reduction gears are lubricated by the engine pressure system and require no attention. The lubrication of all other accessories is indicated on LO 5-8025. Be sure to wipe all grease fittings and oil cups clean before and after lubrication.

c. Deck Fittings and Steering Gear. The lubrication of all deck fittings and steering gear components requiring lubrication is indicated on LO 5-8025. Clean the deck fittings thoroughly with cleaning solvent before applying fresh lubricant. The steerer and forward steerer tube bevel gears and the intermediate gear box are packed with lubricant by the manufacturer and require no further lubrication. The

LUBRICATION ORDER

LO 5-8025

20 April 1954 (Supersedes LO 5-8025 8 May 1952)

BOAT, BRIDGE ERECTION, GASOLINE POWERED, ALUMINUM, TWIN SCREW, TWO SECTIONS, 27-FT. WITH GRAY MARINE ENGINES, EXPRESS SERIES (MODEL 6-244)

Reference: TM 5-8025, TB 5-8025-1

Intervals given are for normal 8-hour day operation. For abnormal conditions or activities, intervals should be shortened to compensate.

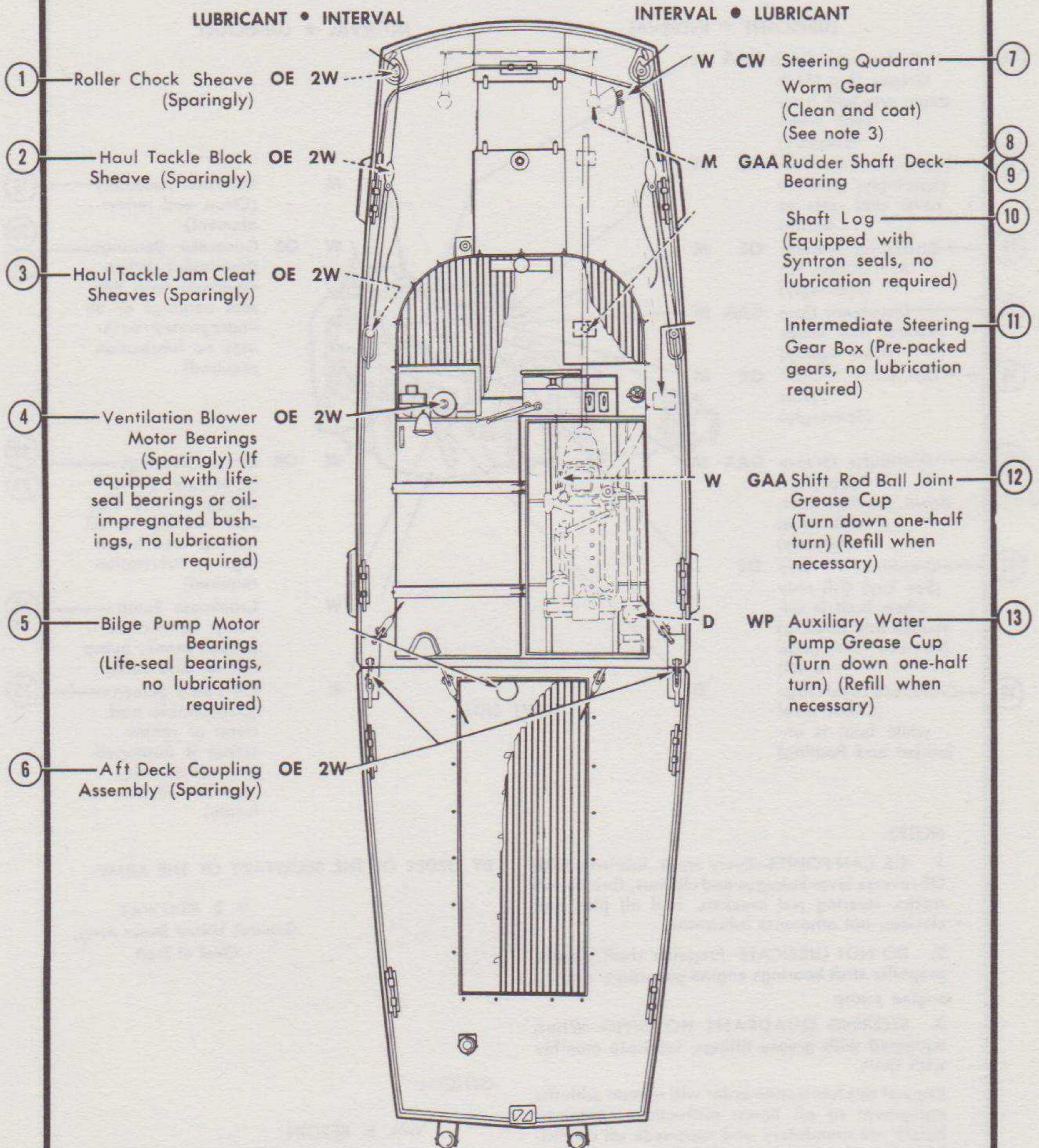
Clean fittings before lubricating.

Clean parts with SOLVENT, dry-cleaning, or with

OIL, fuel, diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of the equipment.

Drain crank and gear cases only when hot after operation; check level and replenish when cool.



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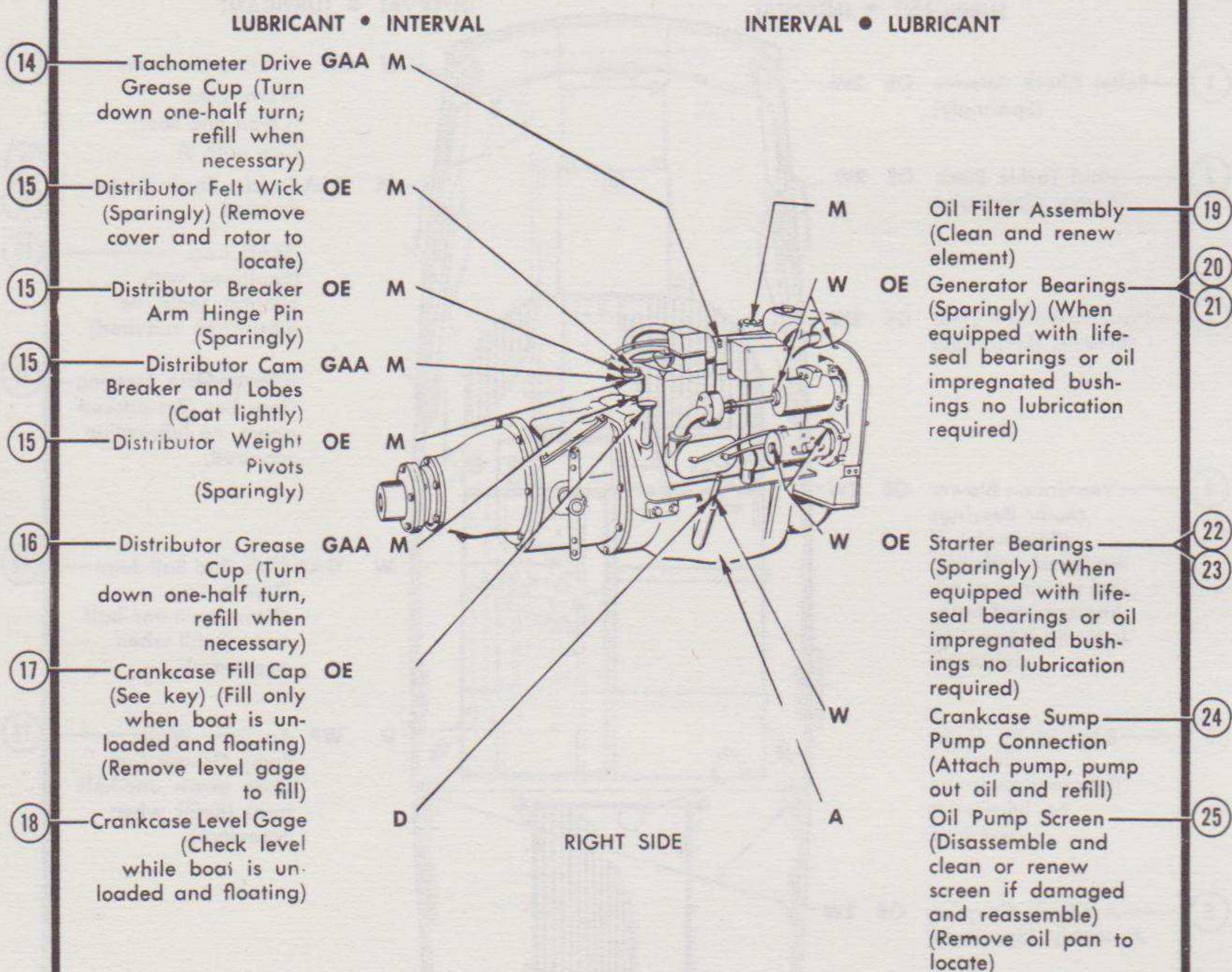
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Figure 48. Lubrication Order 5-8025.

CONTINUED FROM
PRECEDING PAGE

— KEY—

LUBRICANT	CAPACITY	EXPECTED TEMPERATURE		INTERVALS
		Above +32°F	Below +32°F	
OE—OIL, engine				D—Daily
Crankcase	10 qts.	OE 30 or NS 9250	OE 10 or NS 9110	W—Weekly
Other Points				
GAA—GREASE, automotive and artillery.		GAA	GAA	M—Monthly
WP—GREASE, water pump or NS 14L11. All temperatures.				A—Annually
CW—LUBRICANT, open gear, chain and wire rope. All temperatures.				



NOTES:

1. OIL CAN POINTS—Every week, lubricate with OE reverse lever linkages and clevises, throttle rod tracks, steering rod brackets, and all pins and clevises, not otherwise lubricated.
2. DO NOT LUBRICATE—Propeller shaft glands, propeller strut bearings engine governors and engine pump
3. STEERING QUADRANT HOUSING—When equipped with grease fittings, lubricate monthly with GAA.

Copy of this lubrication order will remain with the equipment at all times; instructions contained herein are mandatory and supersede all conflicting lubrication instructions dated prior to the date of this lubrication order.

BY ORDER OF THE SECRETARY OF THE ARMY:

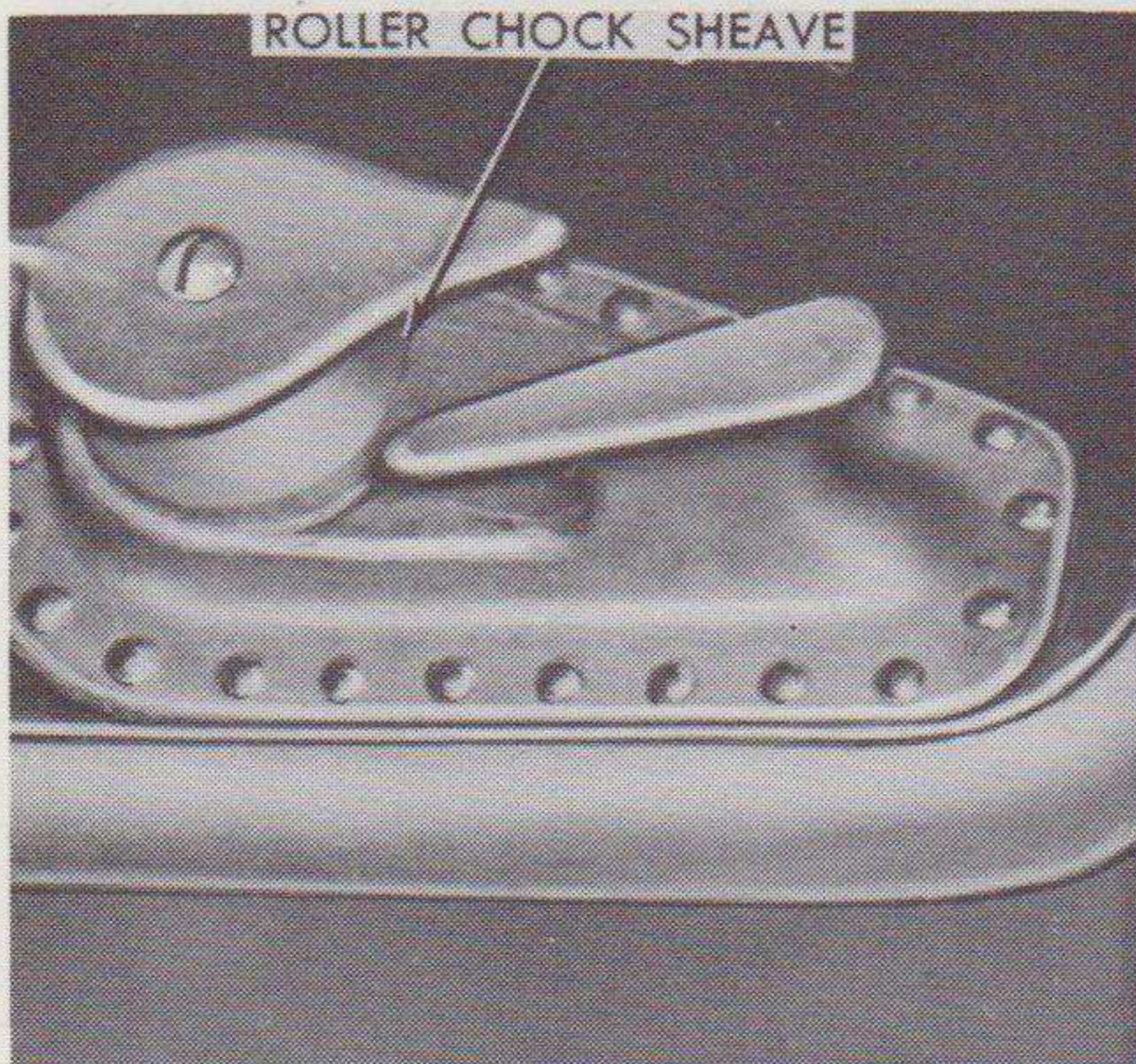
M. B. RIDGWAY
General, United States Army,
Chief of Staff

OFFICIAL:

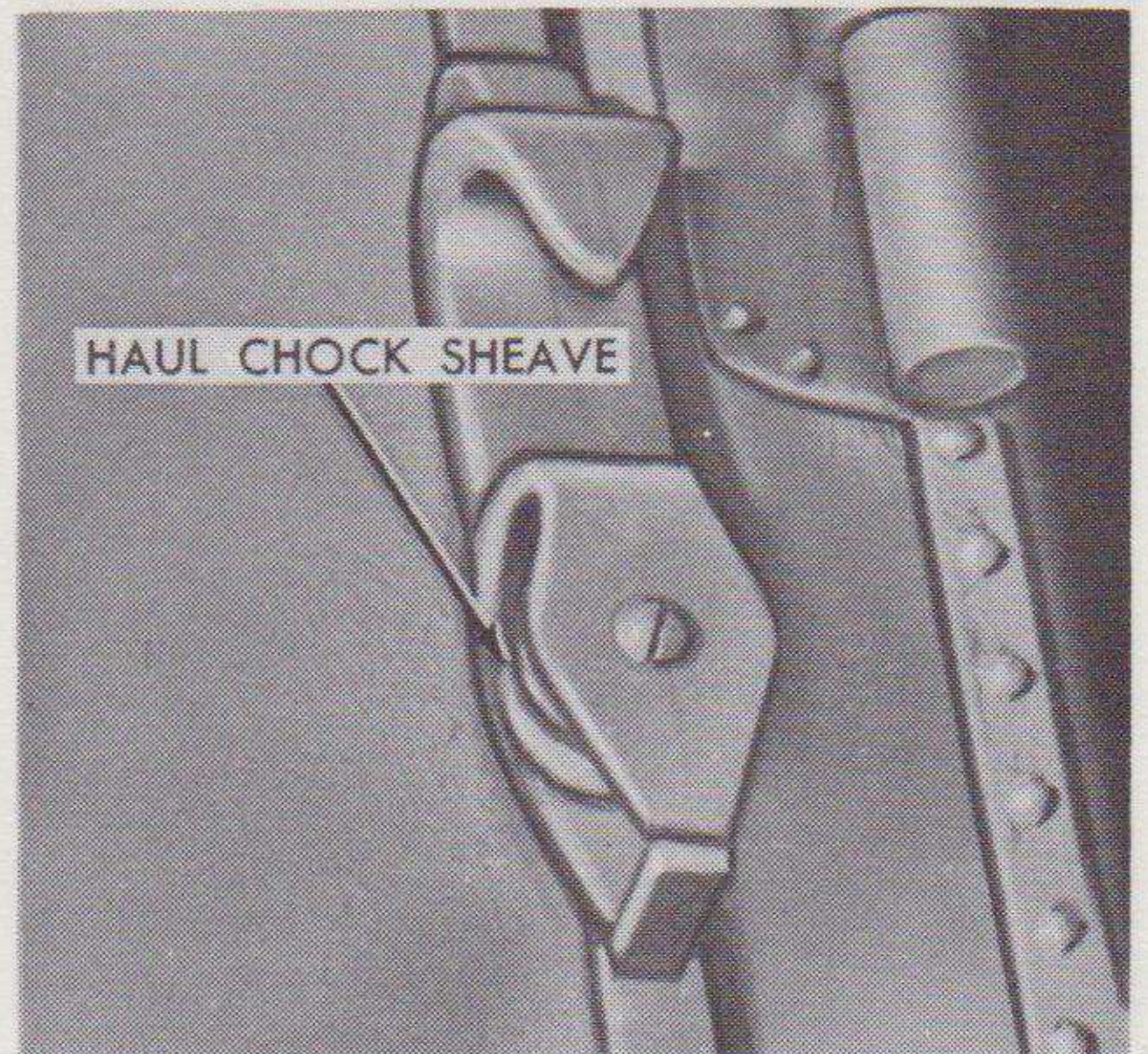
WM. E. BERGIN
Major General, United States Army,
The Adjutant General

FB 8025-48/2

Figure 48. Lubrication Order 5-8025—Continued.



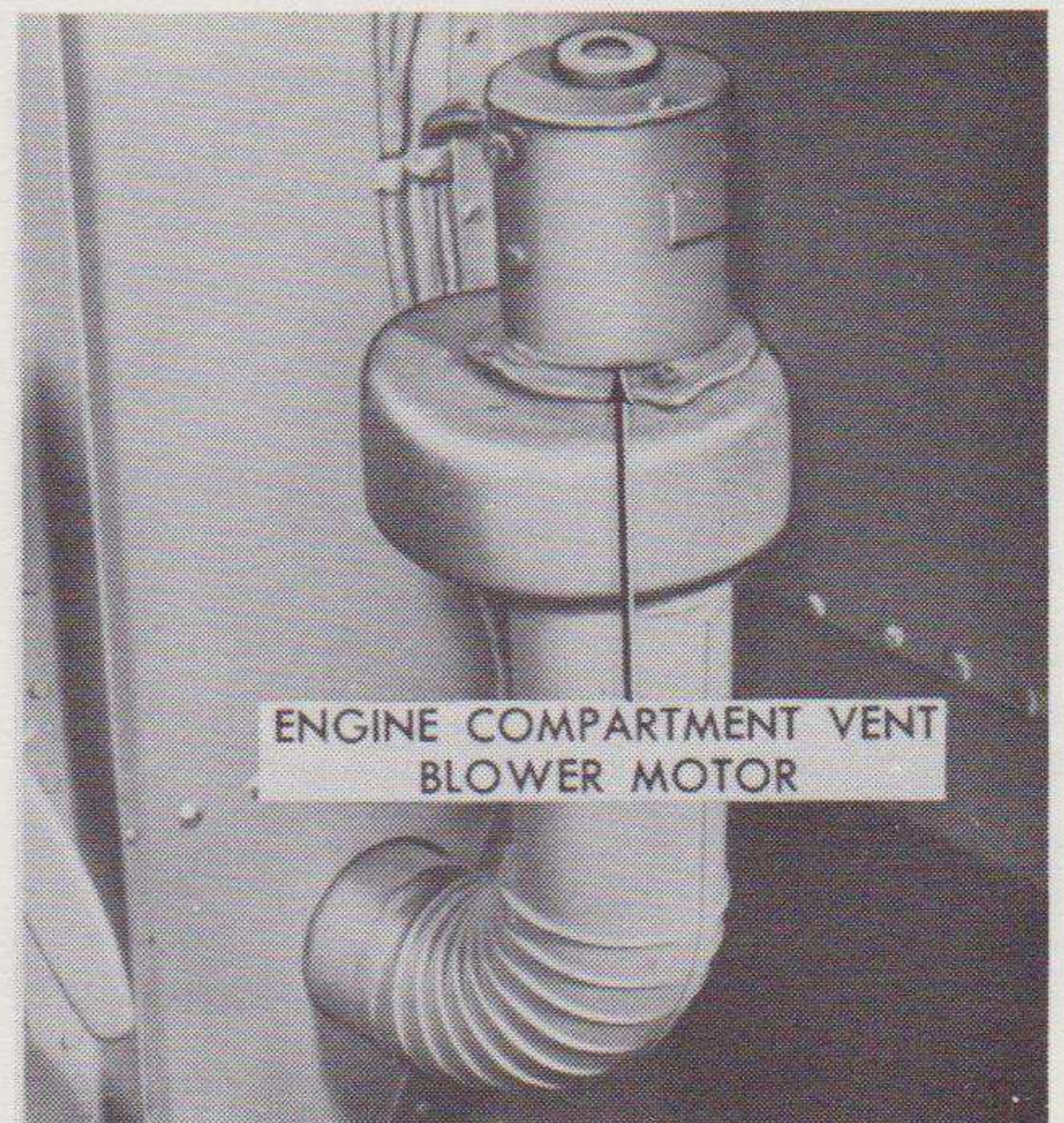
1 Roller chock. (Clean sheave and lubricate sparingly)



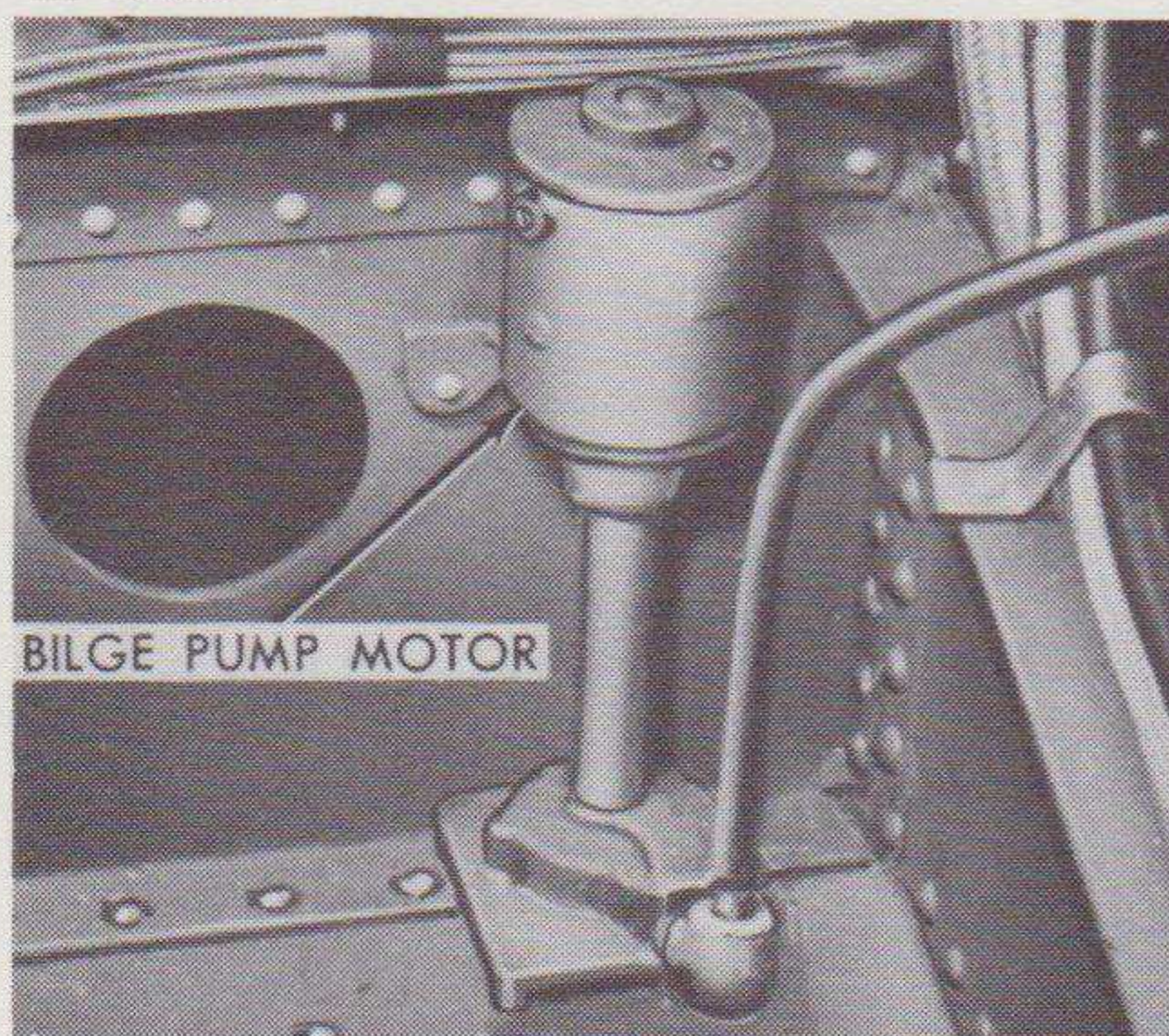
2 Haul chock sheave. (Clear sheave and lubricate sparingly)



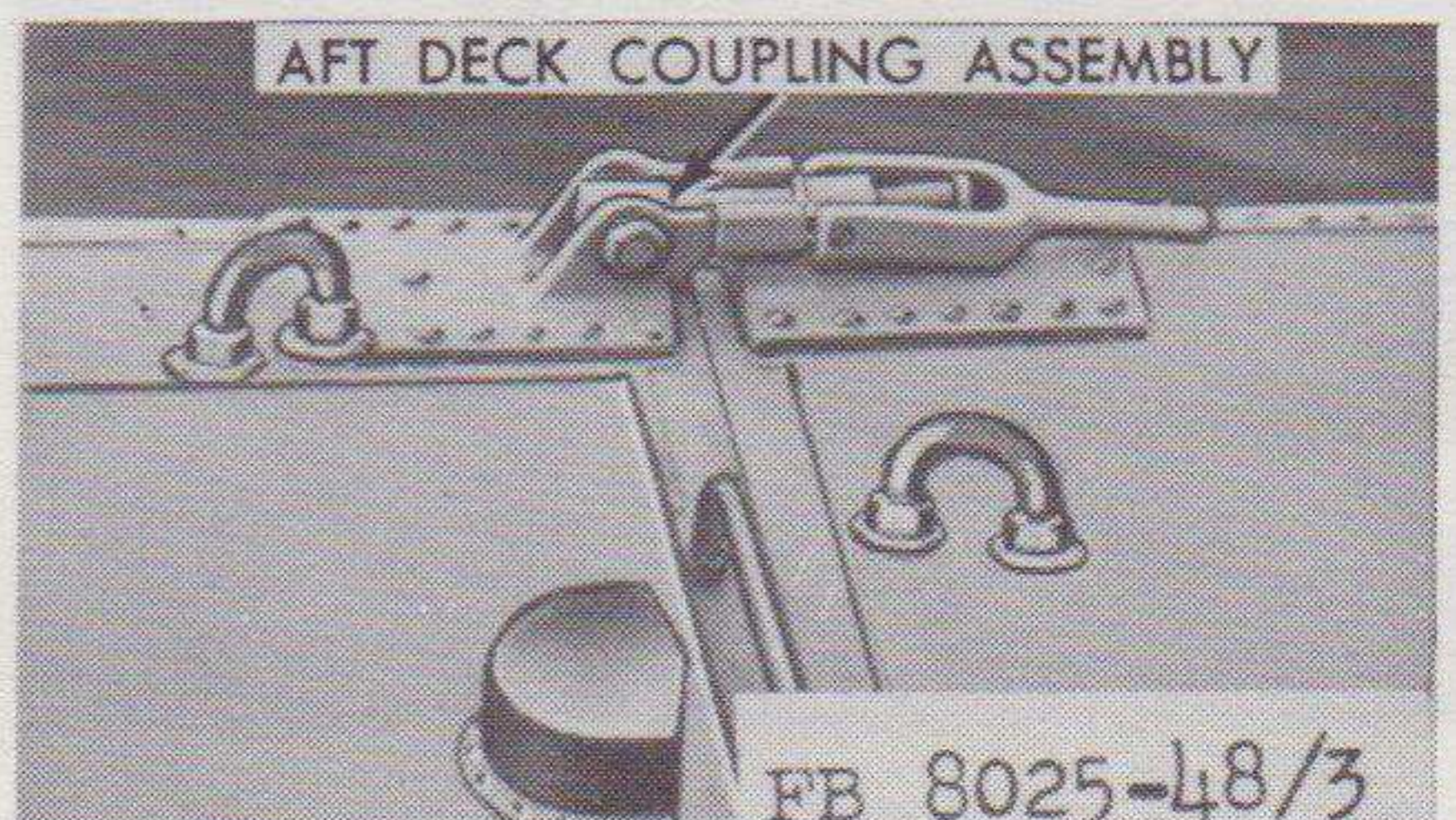
3 Haul tackle jam cleat sheave. (Clean sheave and lubricate sparingly)



4 Engine compartment vent blower motor bearings. (Insert oil can spout between motorframe and blower. If equipped with life-seal bearings or oil impregnated bushings, no lubrications is required)

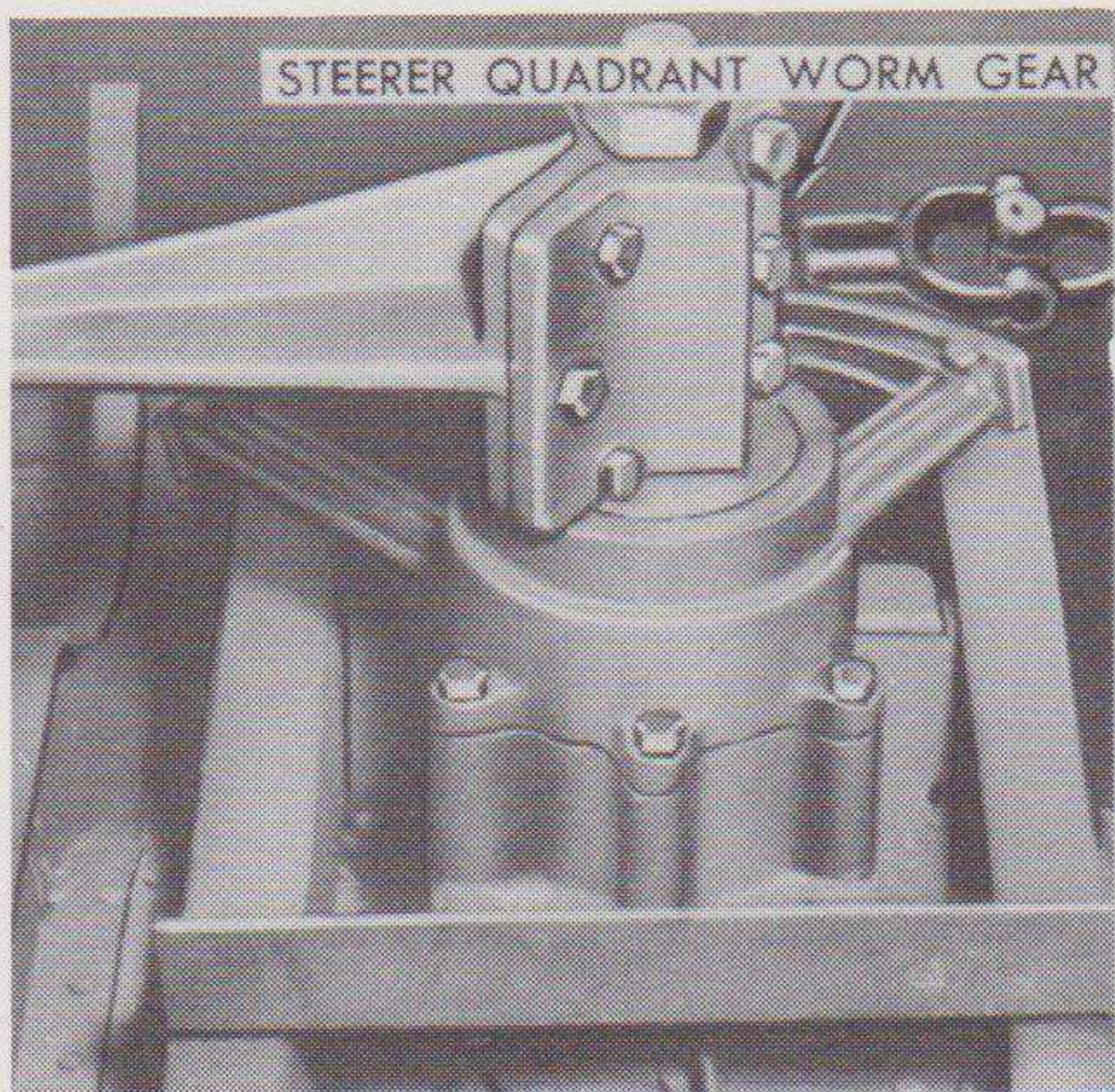


5 Bilge pump motor bearings. (Life-seal bearings are used in the bilge pump. Additional lubrication is not required)

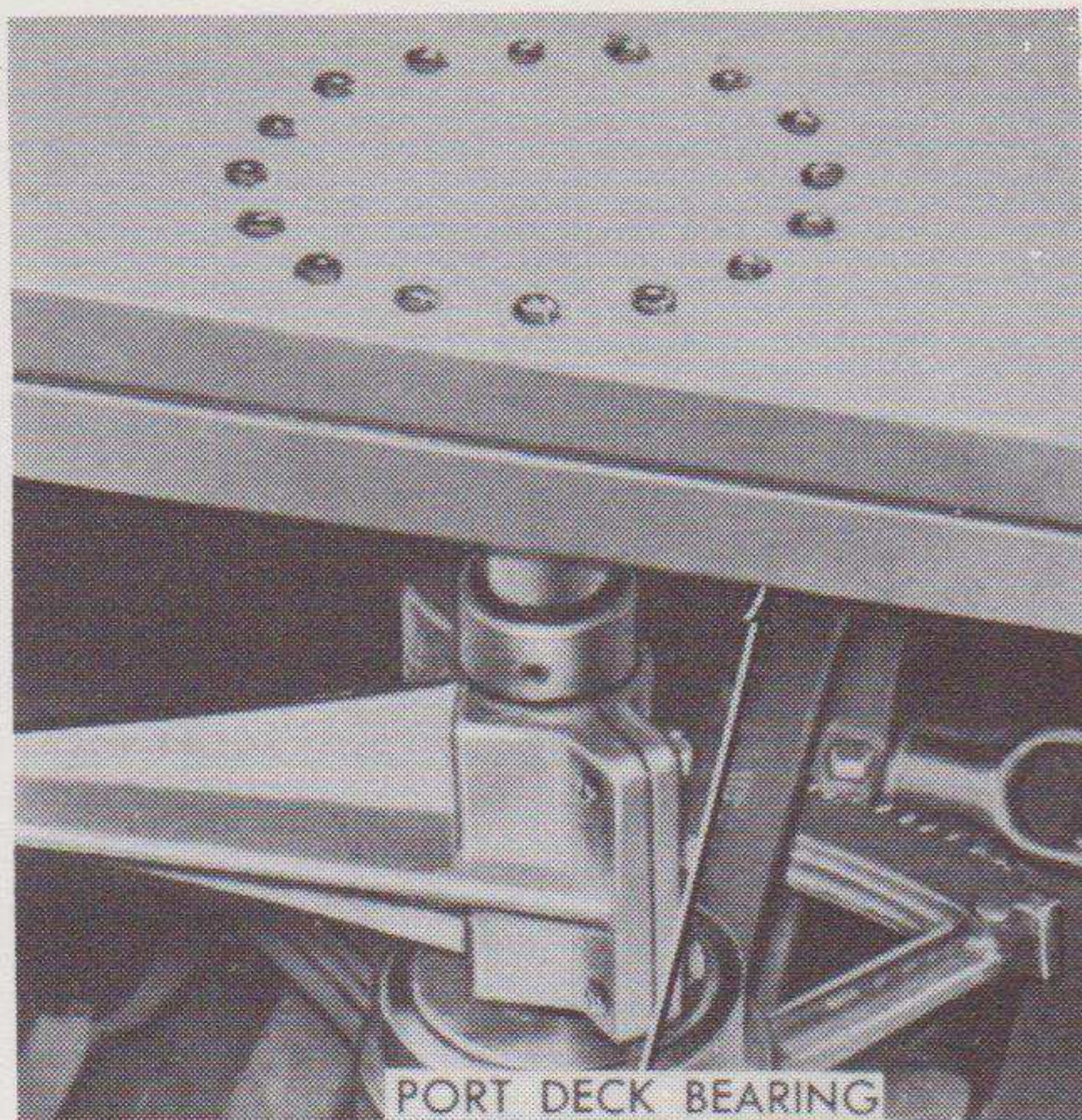


6 Aft deck coupling assembly. (Clean thoroughly and lubricate sparingly)

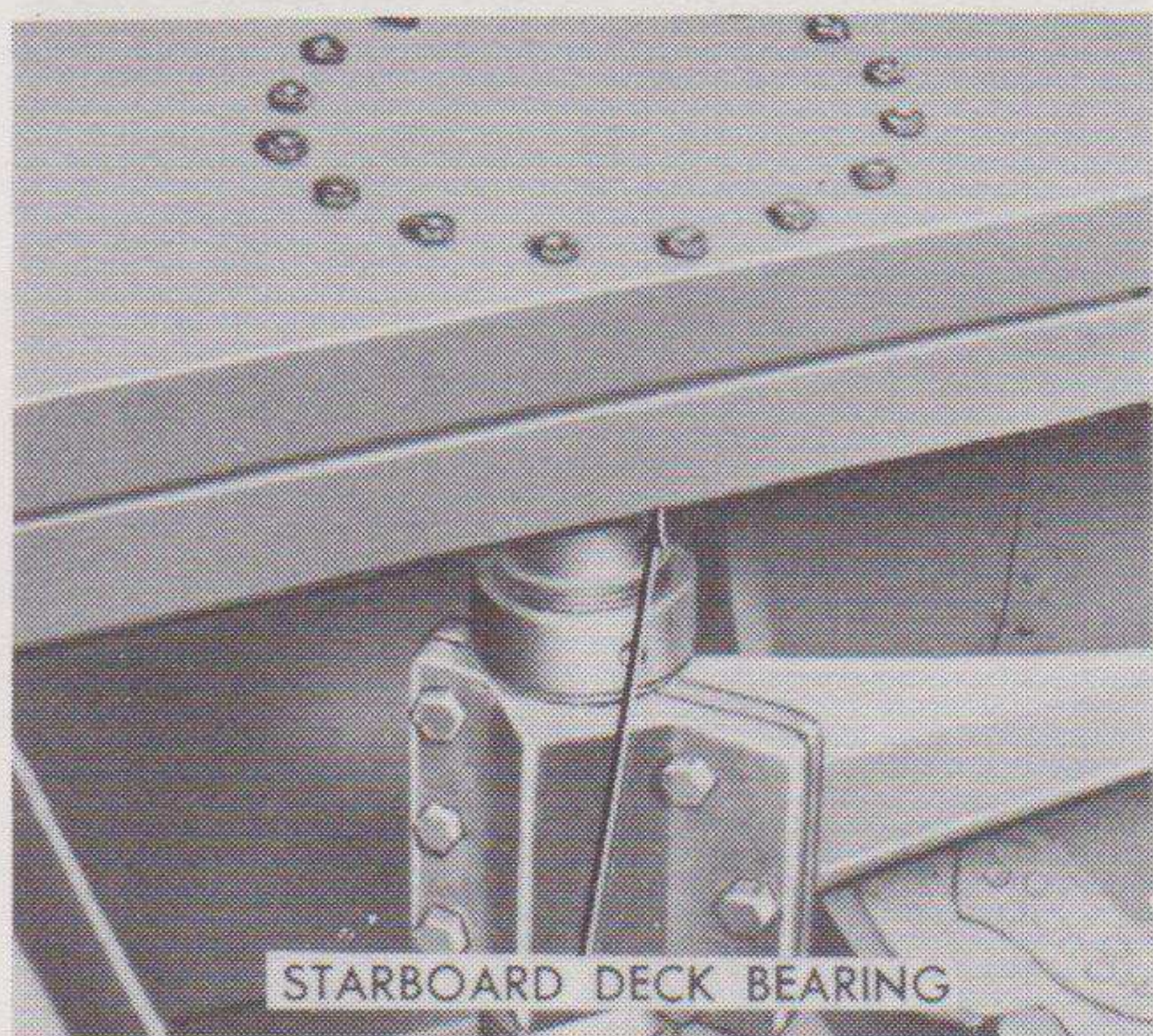
Figure 48.—Continued.



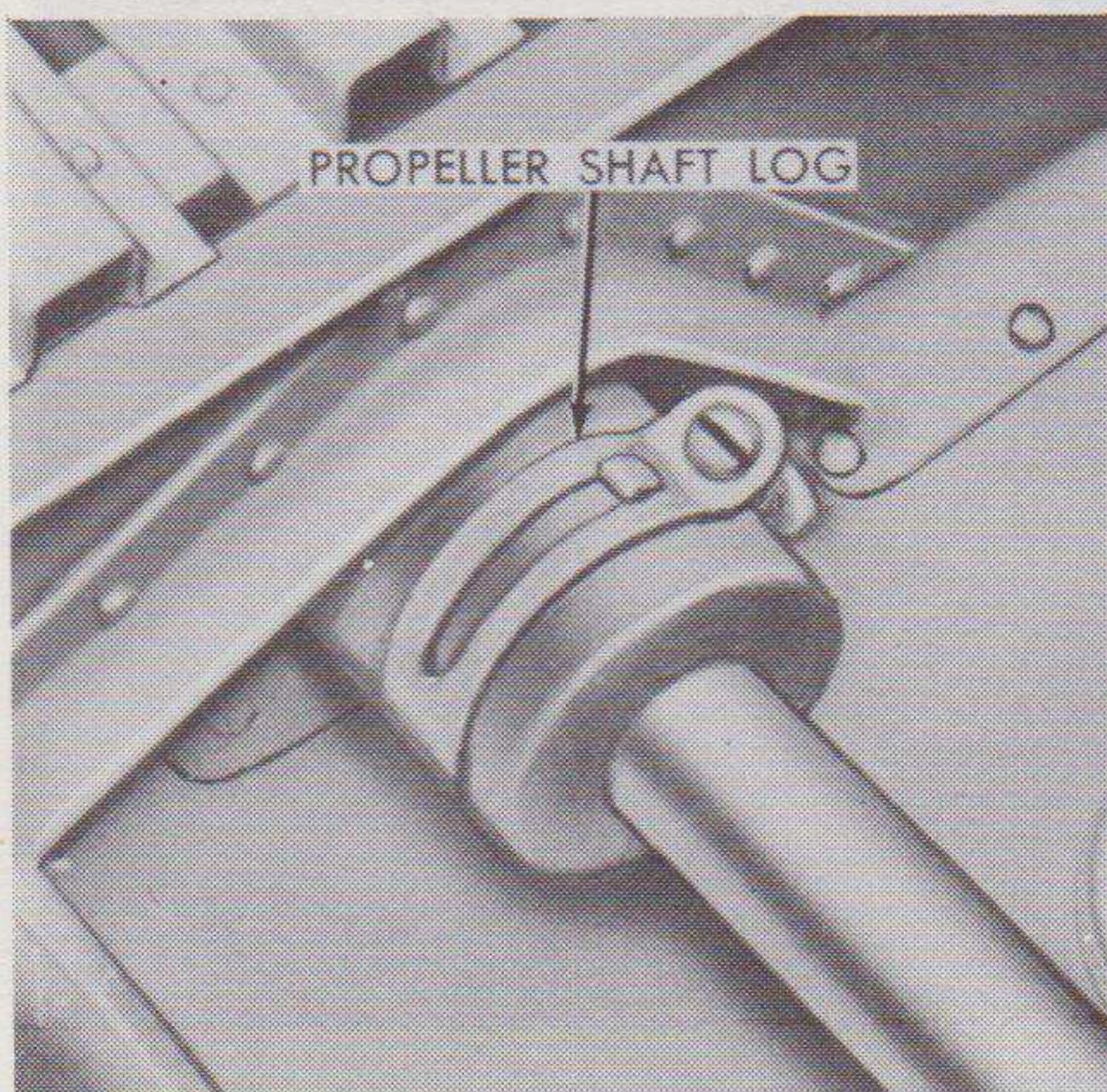
7 Steerer quadrant worm gear. (Clean thoroughly, remove pipe plug, and insert lubricant)



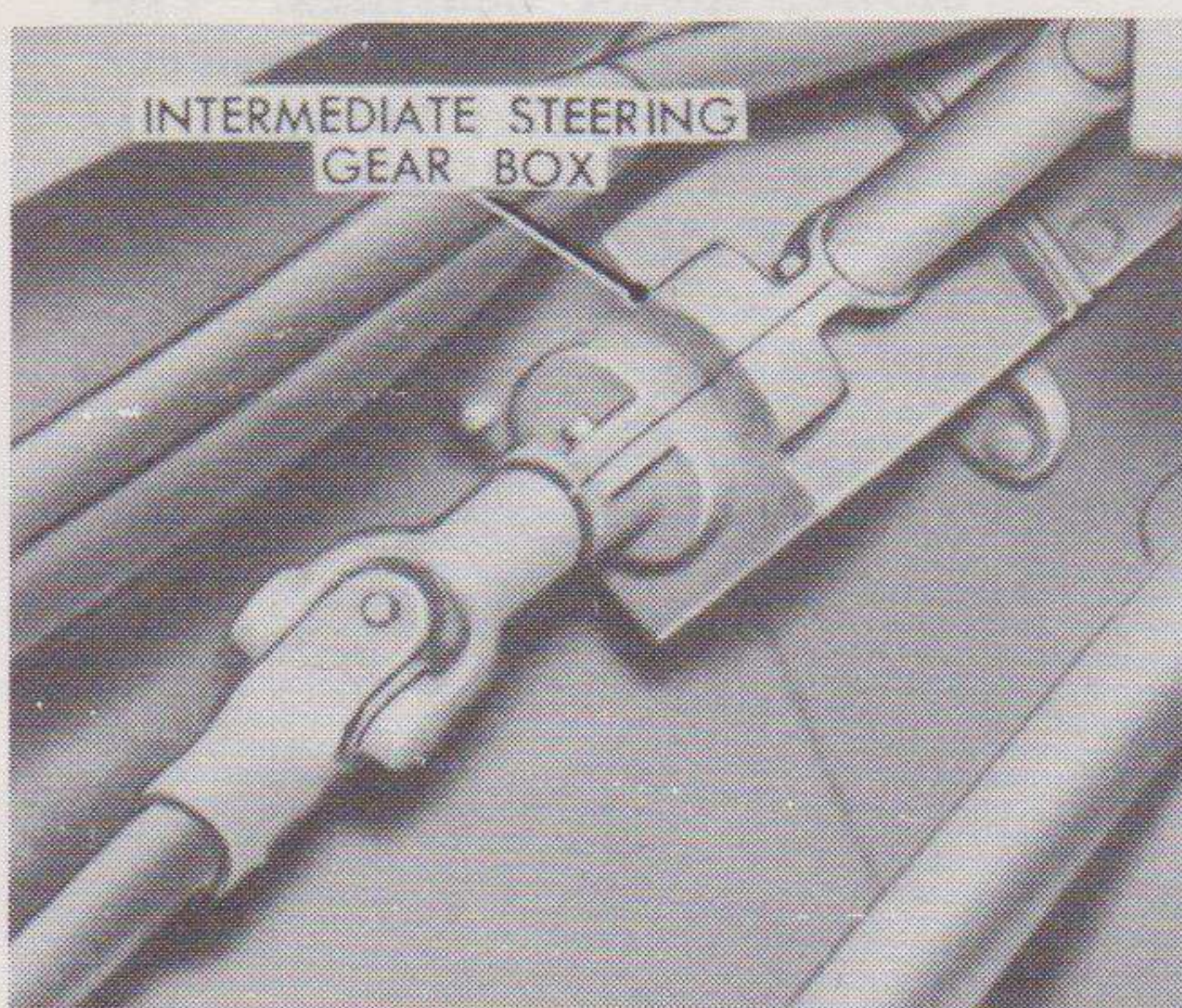
8 Port deck bearing. (Clean and lubricate (51 series boats only))



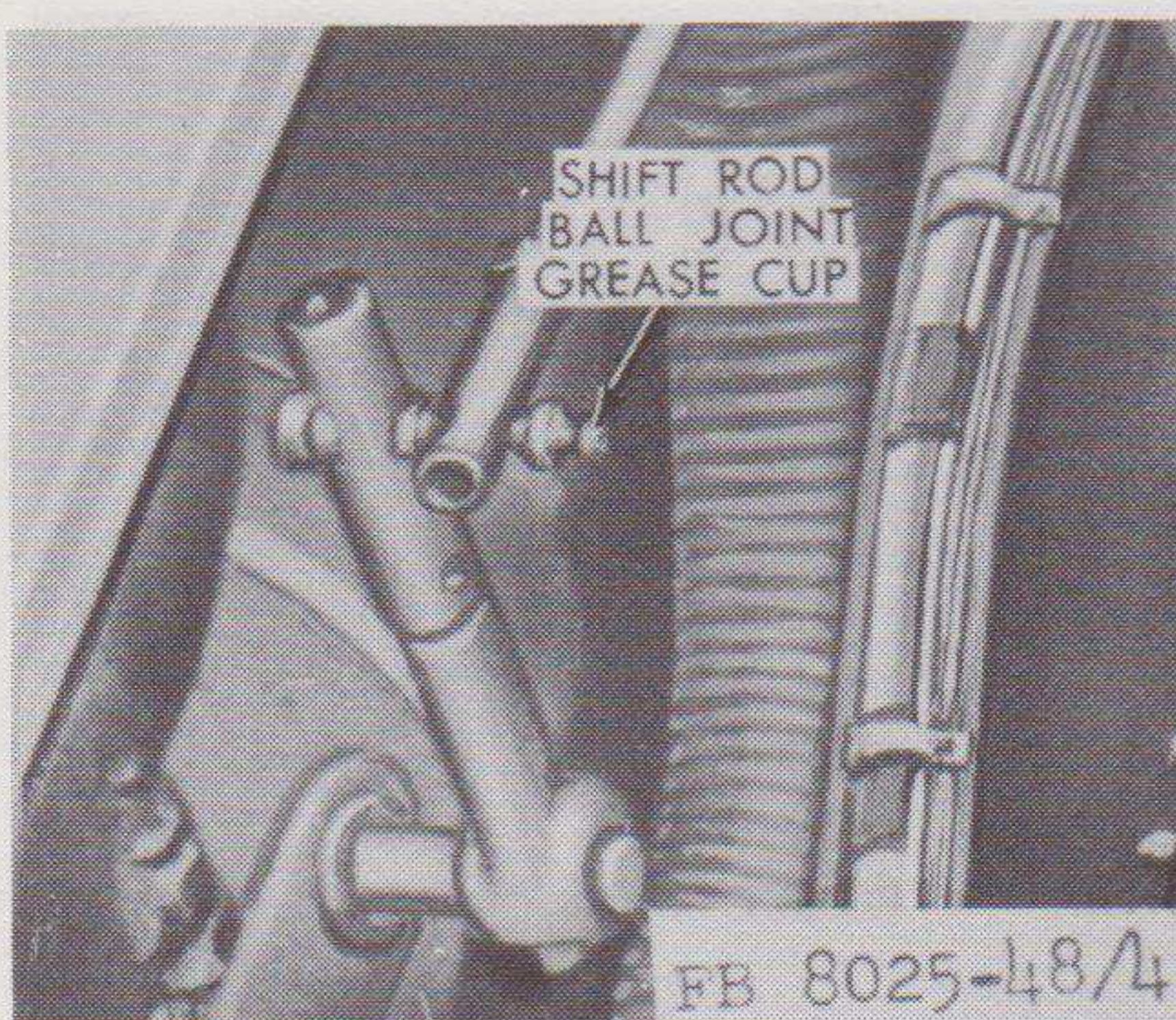
9 Starboard deck bearing. (Clean and lubricate (51 series boats only))



10 Propeller shaft log. (Do not lubricate)

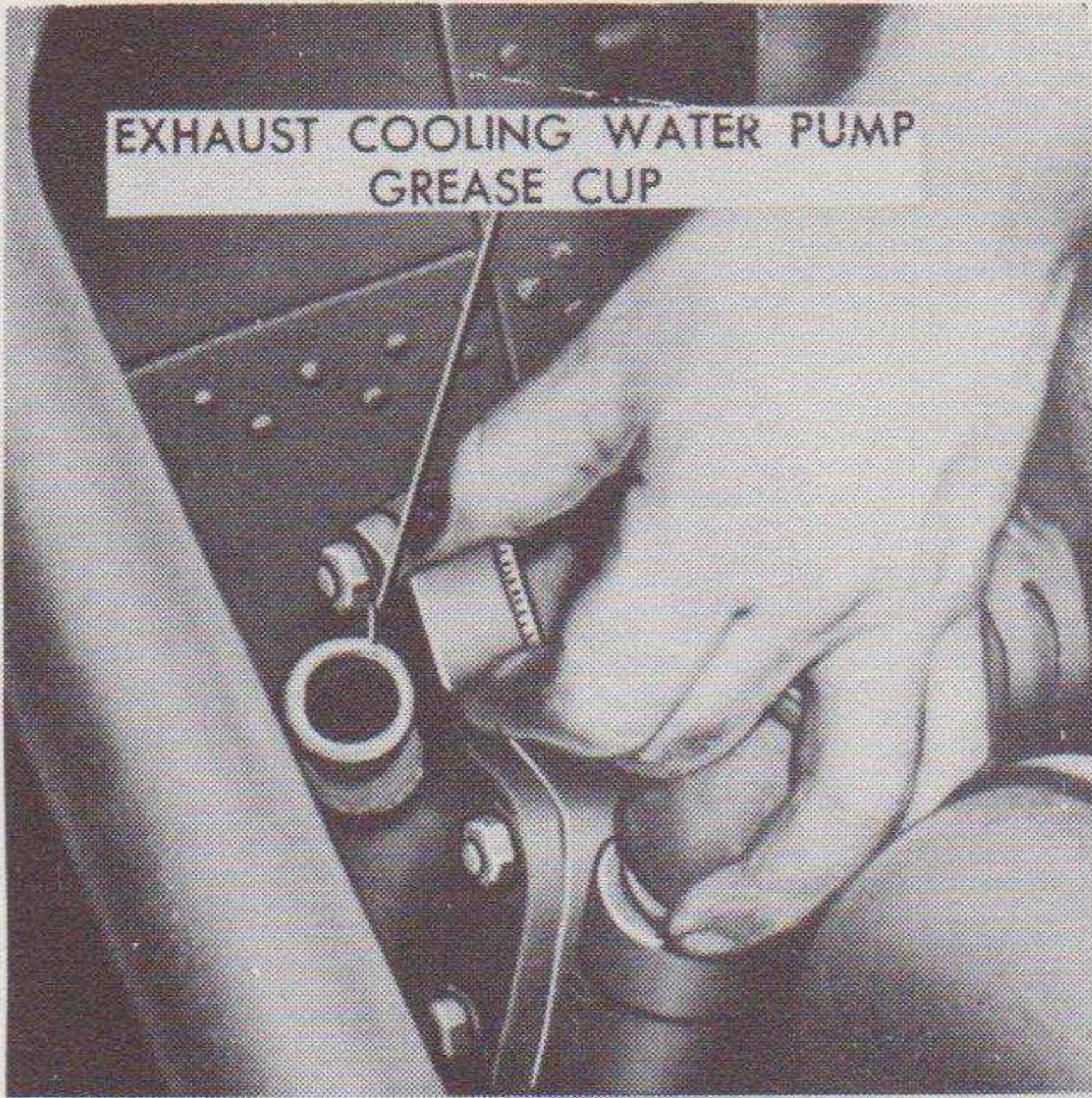


11 Intermediate steering gear box. (Equipped with prepacked gears. Do not lubricate)

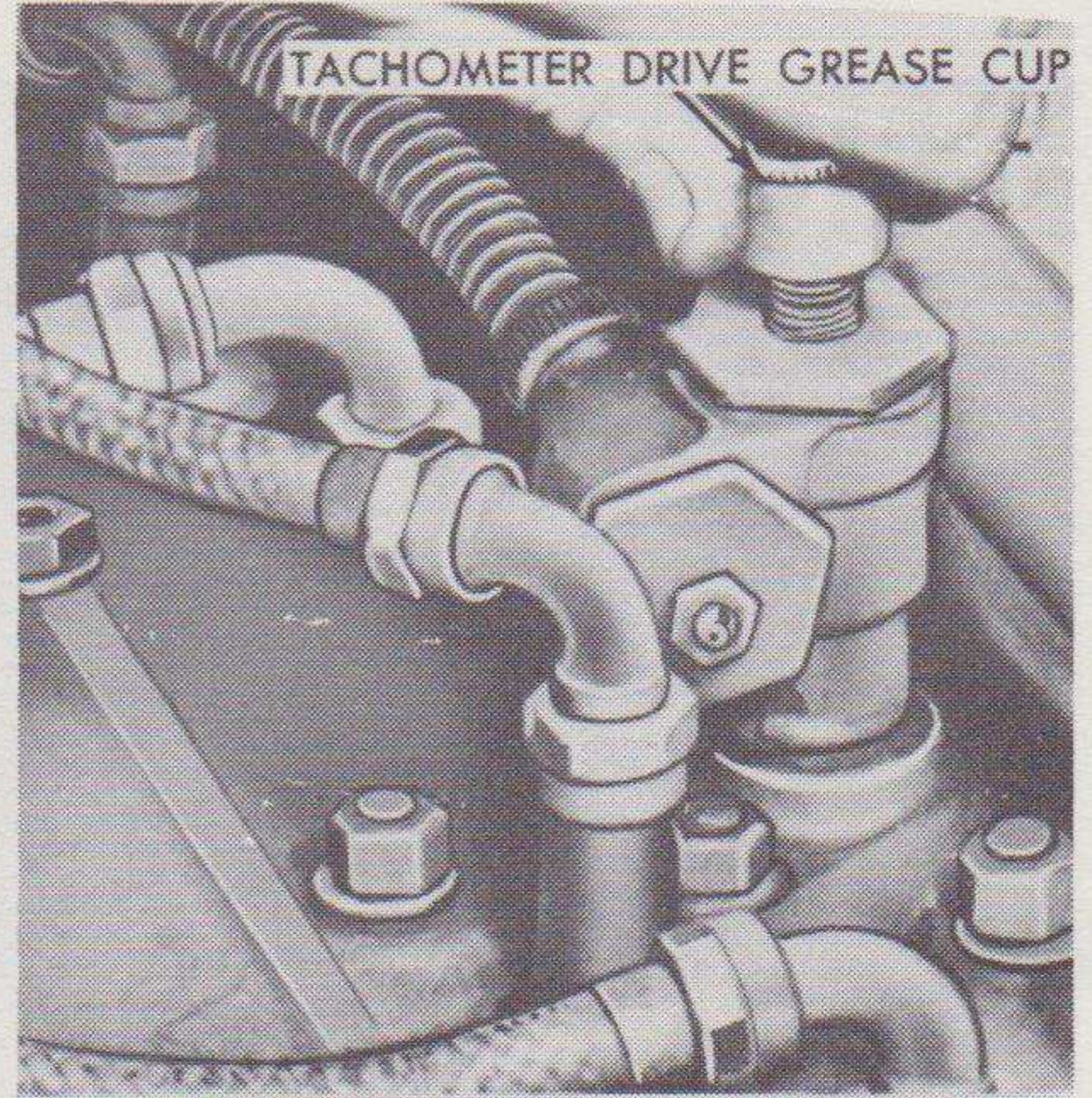


12 Shift rod ball joint grease cup. (Clean fitting and refill when necessary)

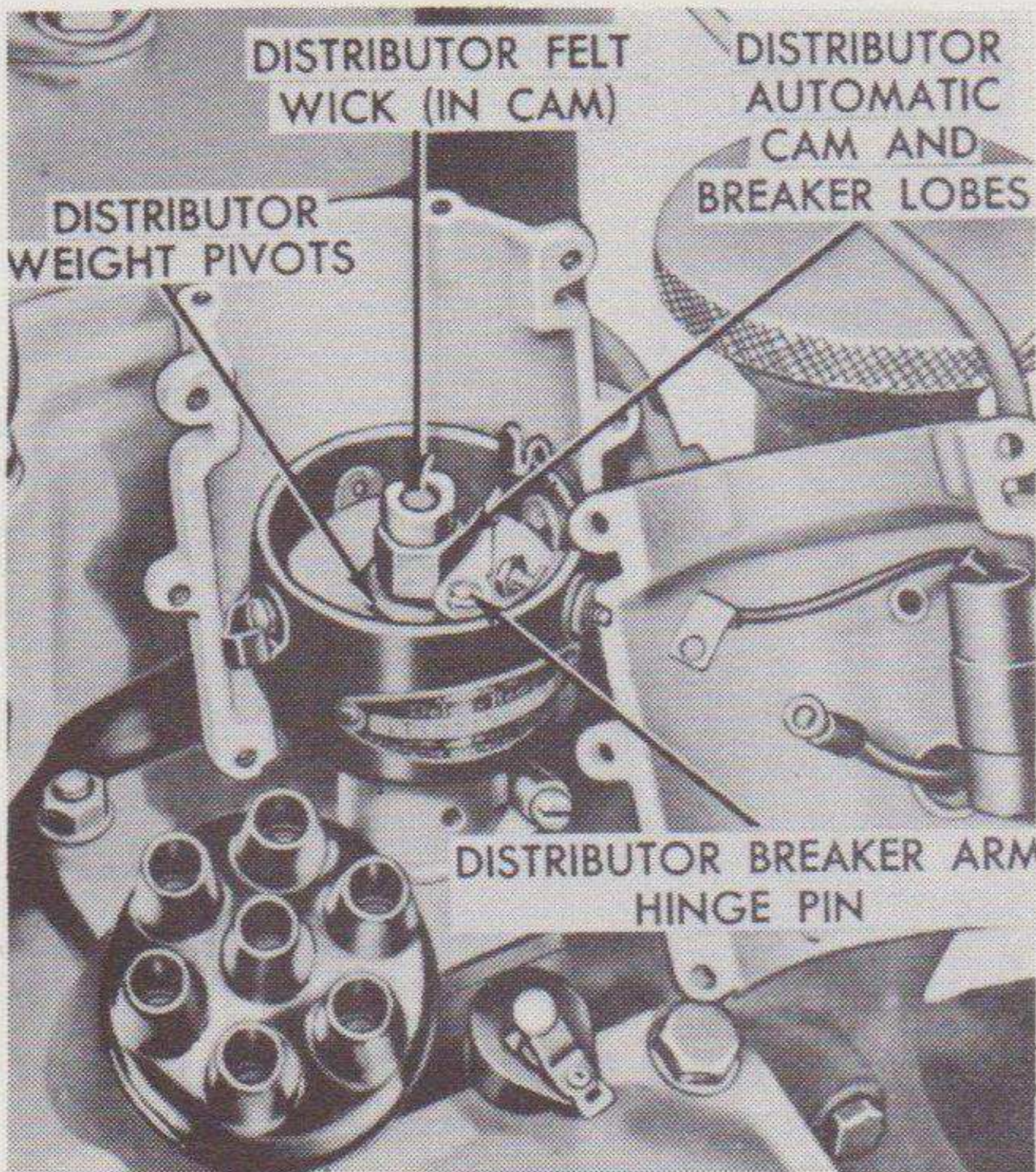
Figure 48—Continued.



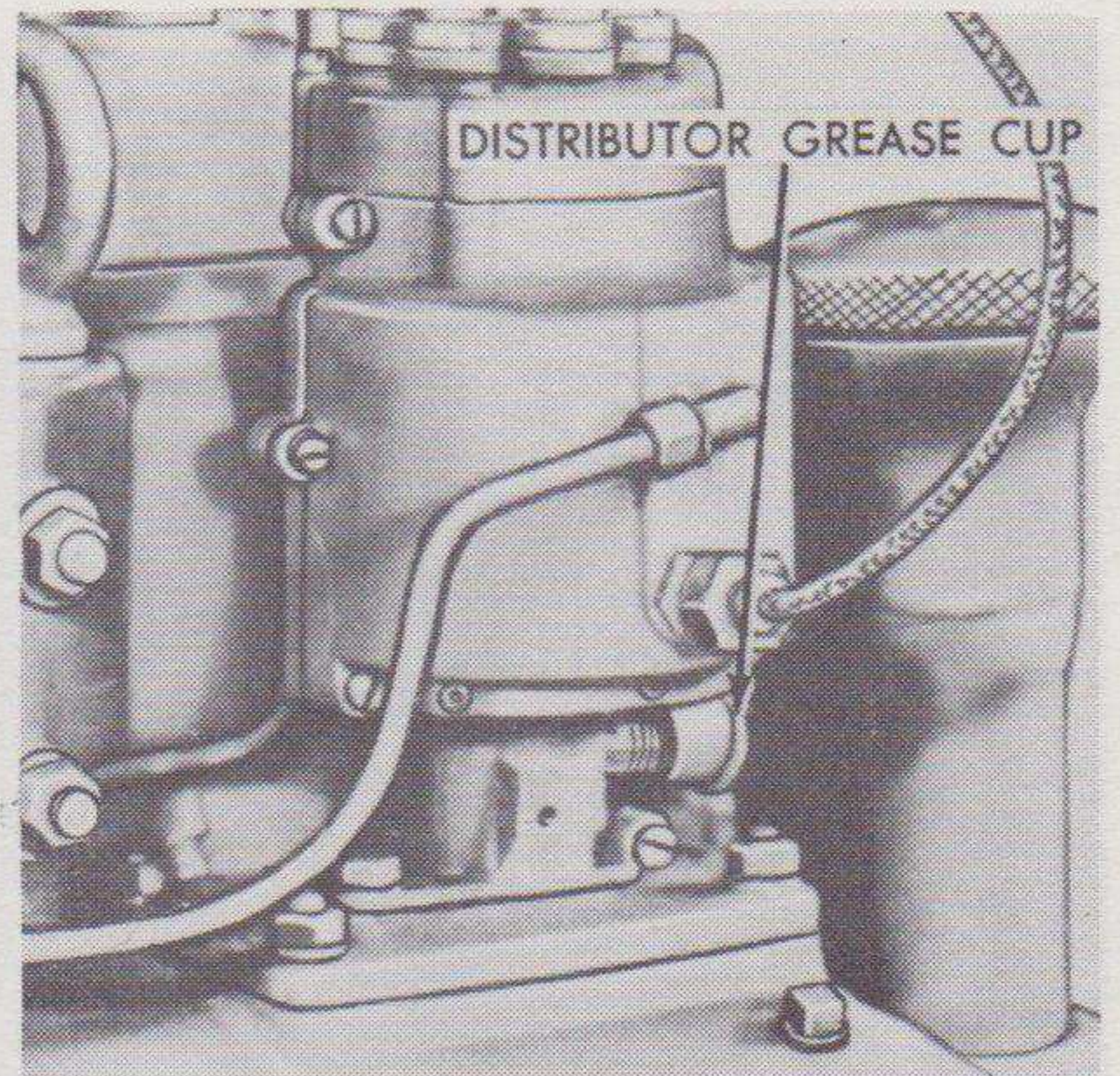
13 Exhaust cooling water pump grease cup. (Clean fitting and refill when necessary)



14 Tachometer drive grease cup. (Clean fitting and refill when necessary)



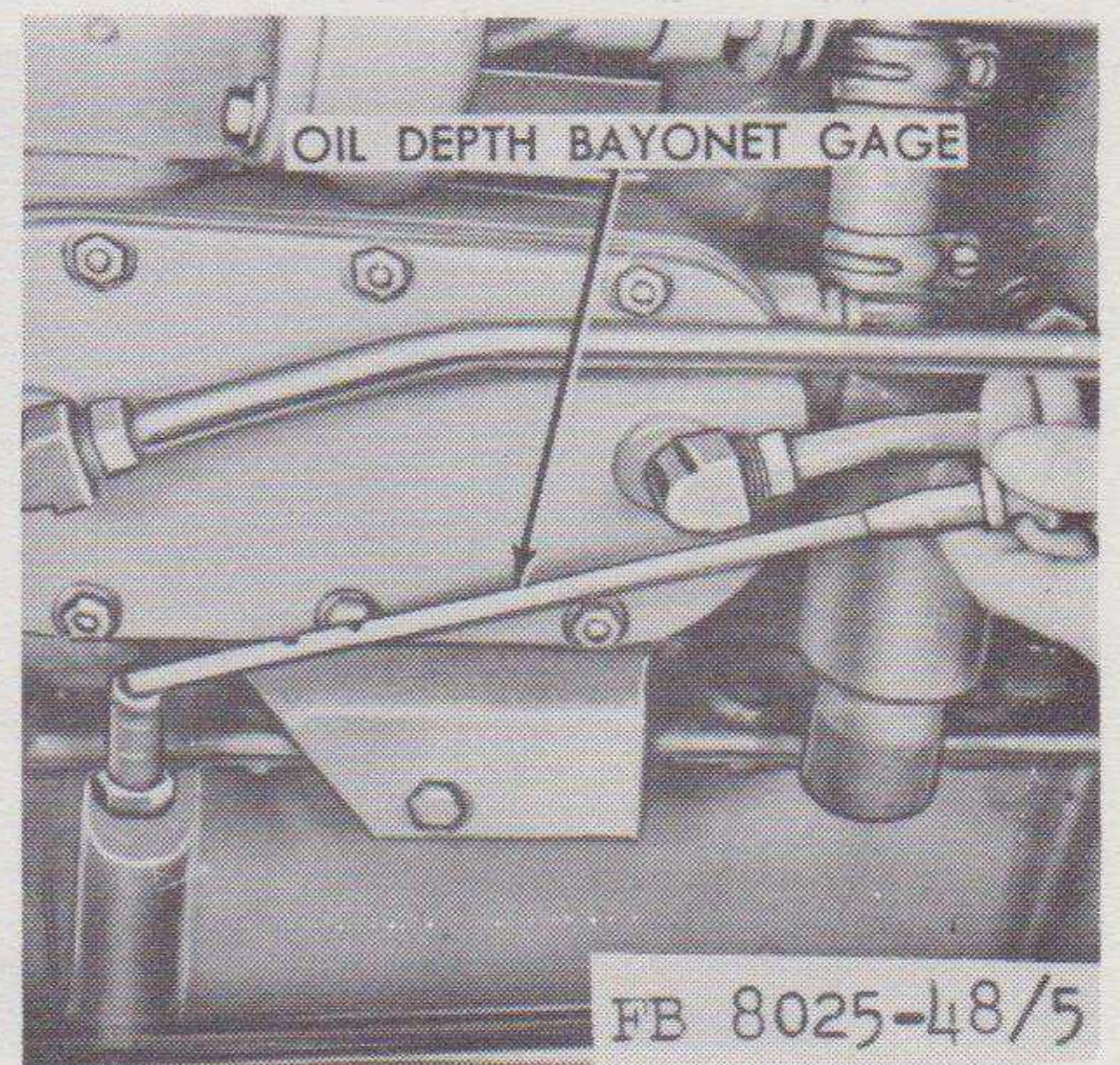
15 Distributor felt wick (in cam), distributor breaker arm hinge pin, distributor automatic cam and breaker lobes, and distributor weight pivots. (Clean and lubricate sparingly)



16 Distributor grease cup. (Clean fitting and refill when necessary)

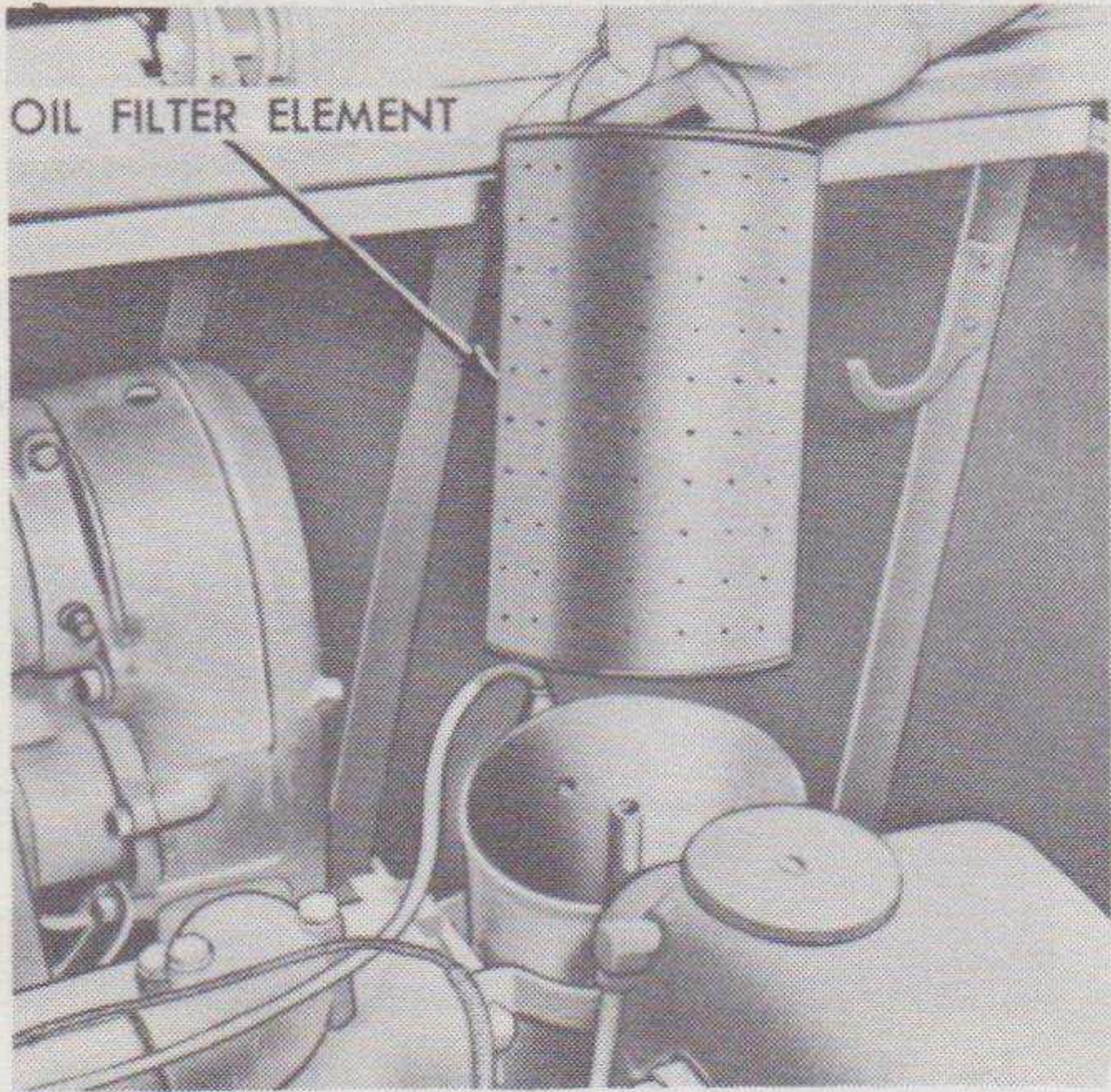


17 Oil filler. (Add oil only when boat is unloaded and in water)

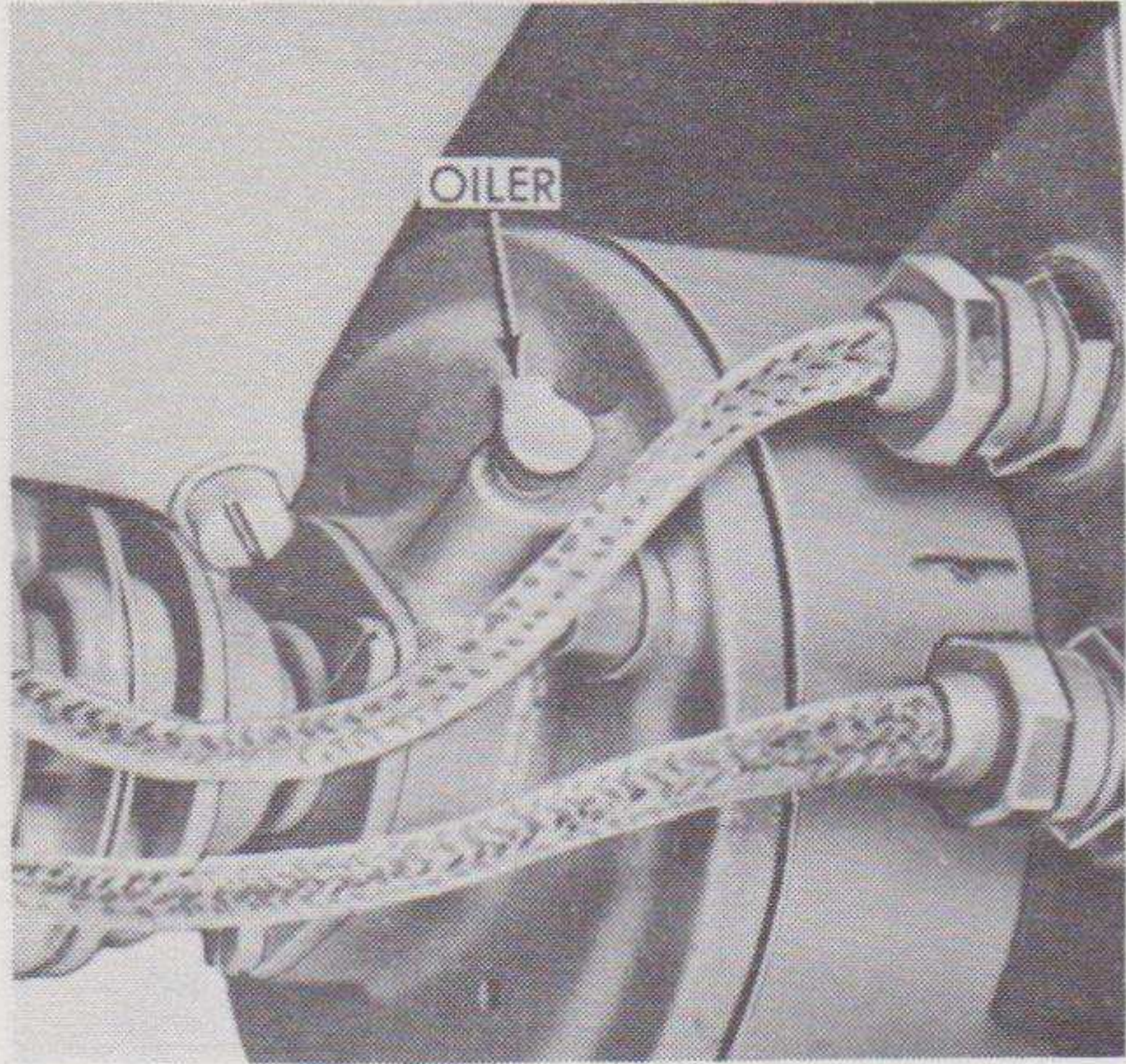


18 Oil depth bayonet gage. (Check oil level while boat is floating and unloaded)

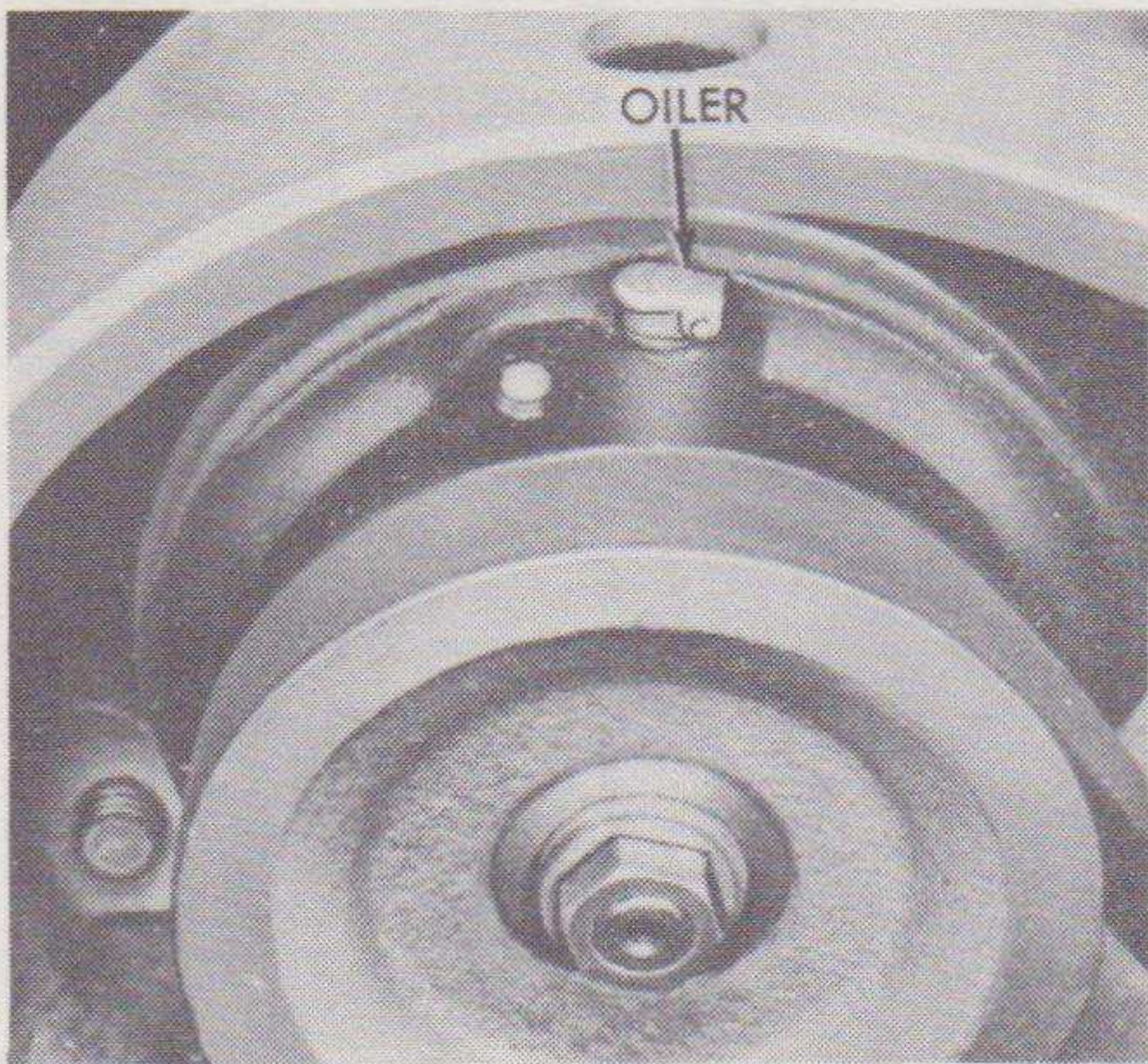
Figure 48.—Continued.



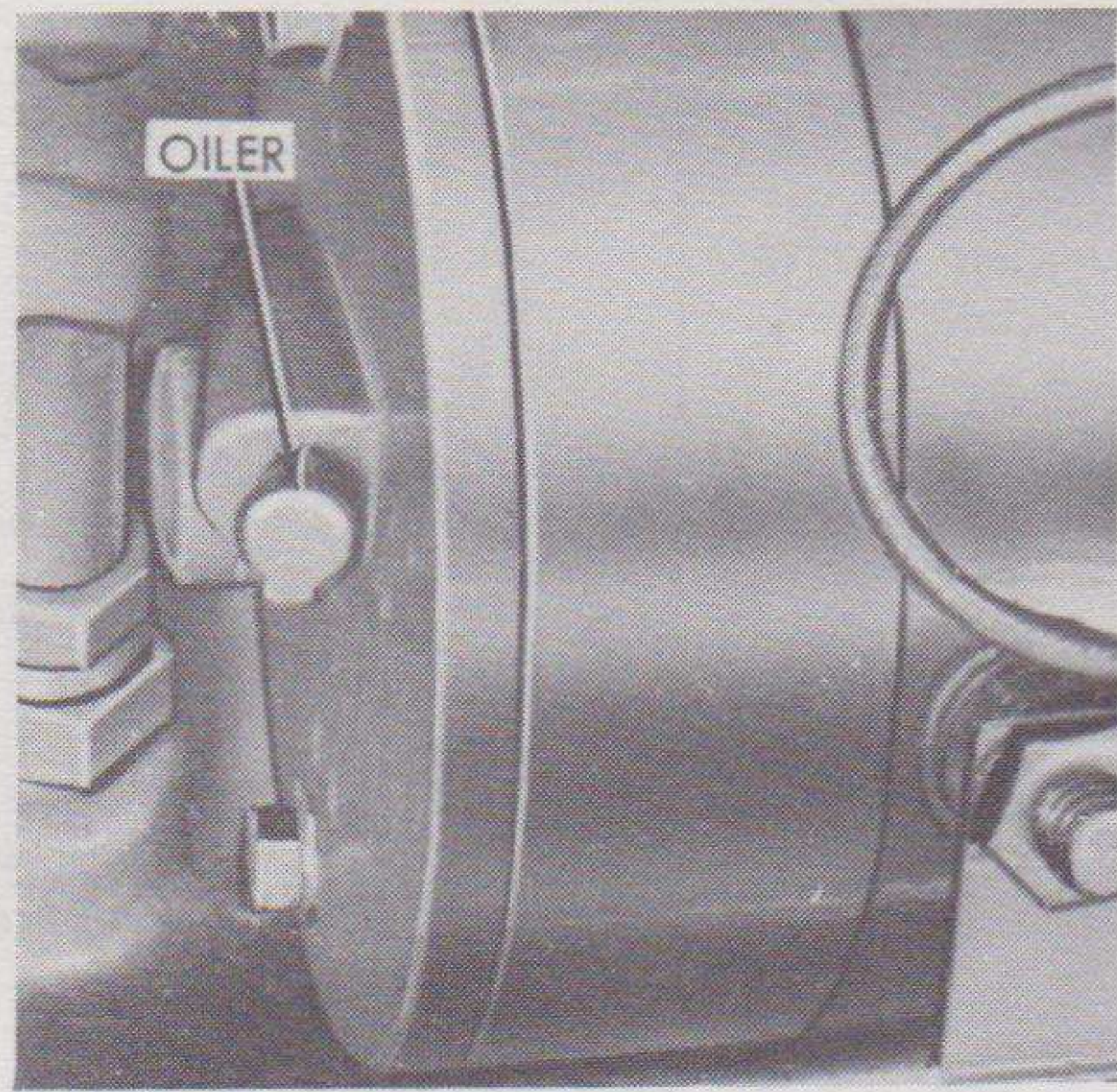
19 Oil filter. (Clean filter and renew element)



20 Generator ball bearing (commutator end). (Clean fitting and lubricate sparingly)



21 Generator ball bearing (drive end). (Clean fitting and lubricate sparingly)

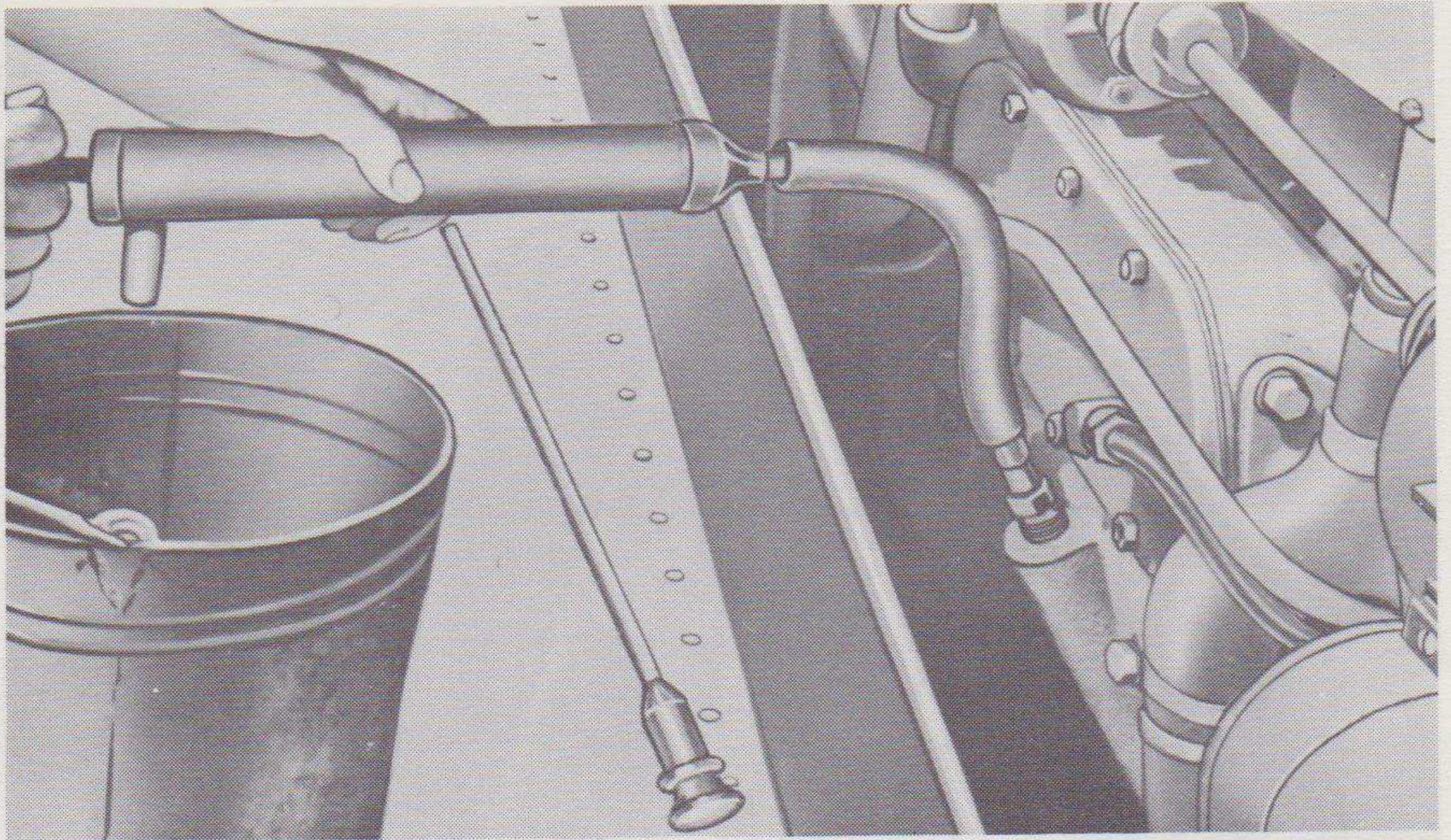


22 Starter commutator end bushing. (Clean fitting and lubricate sparingly)

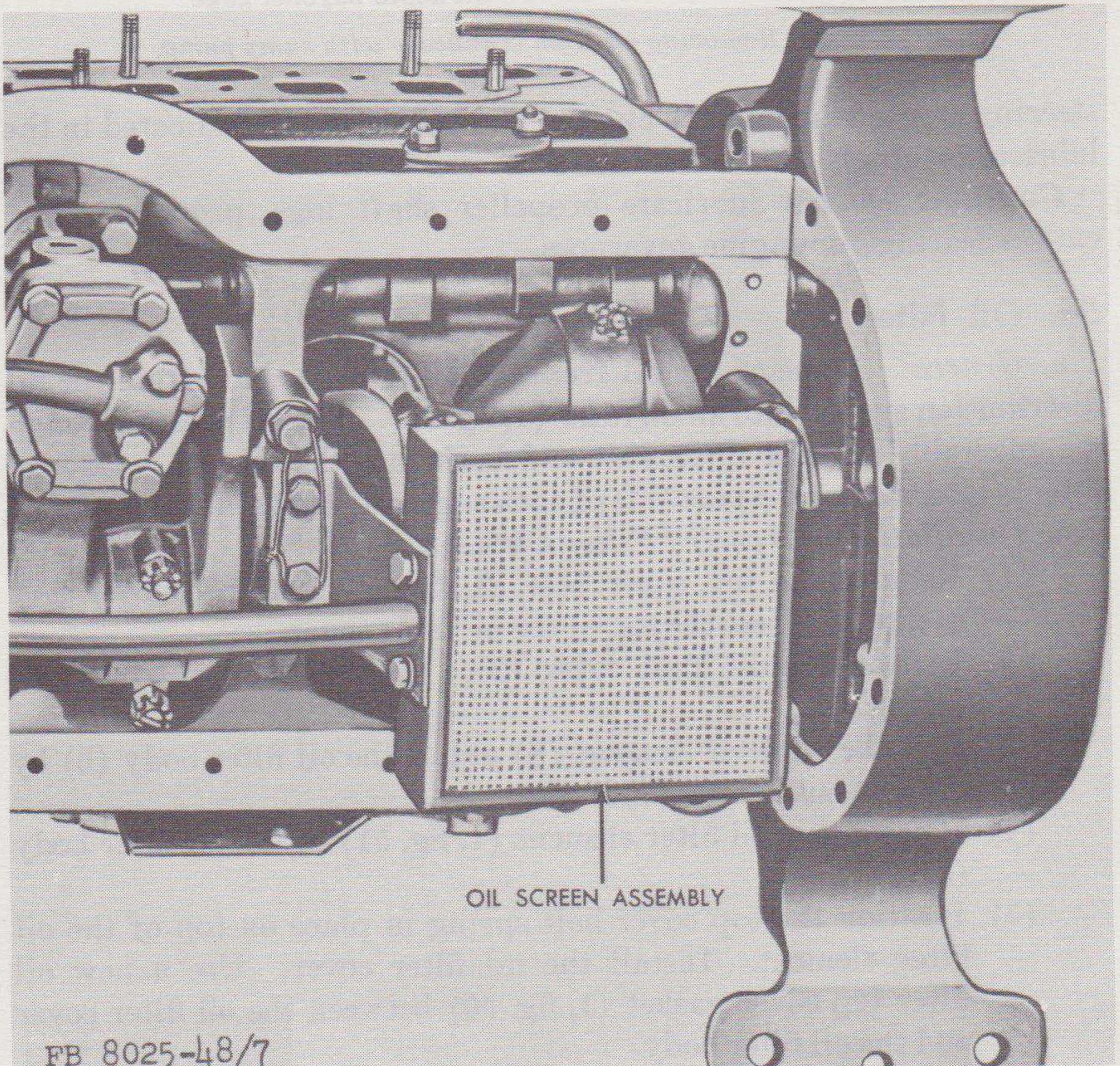


23 Starter drive housing bushing. (Clean fitting and lubricate sparingly)

Figure 48—Continued.

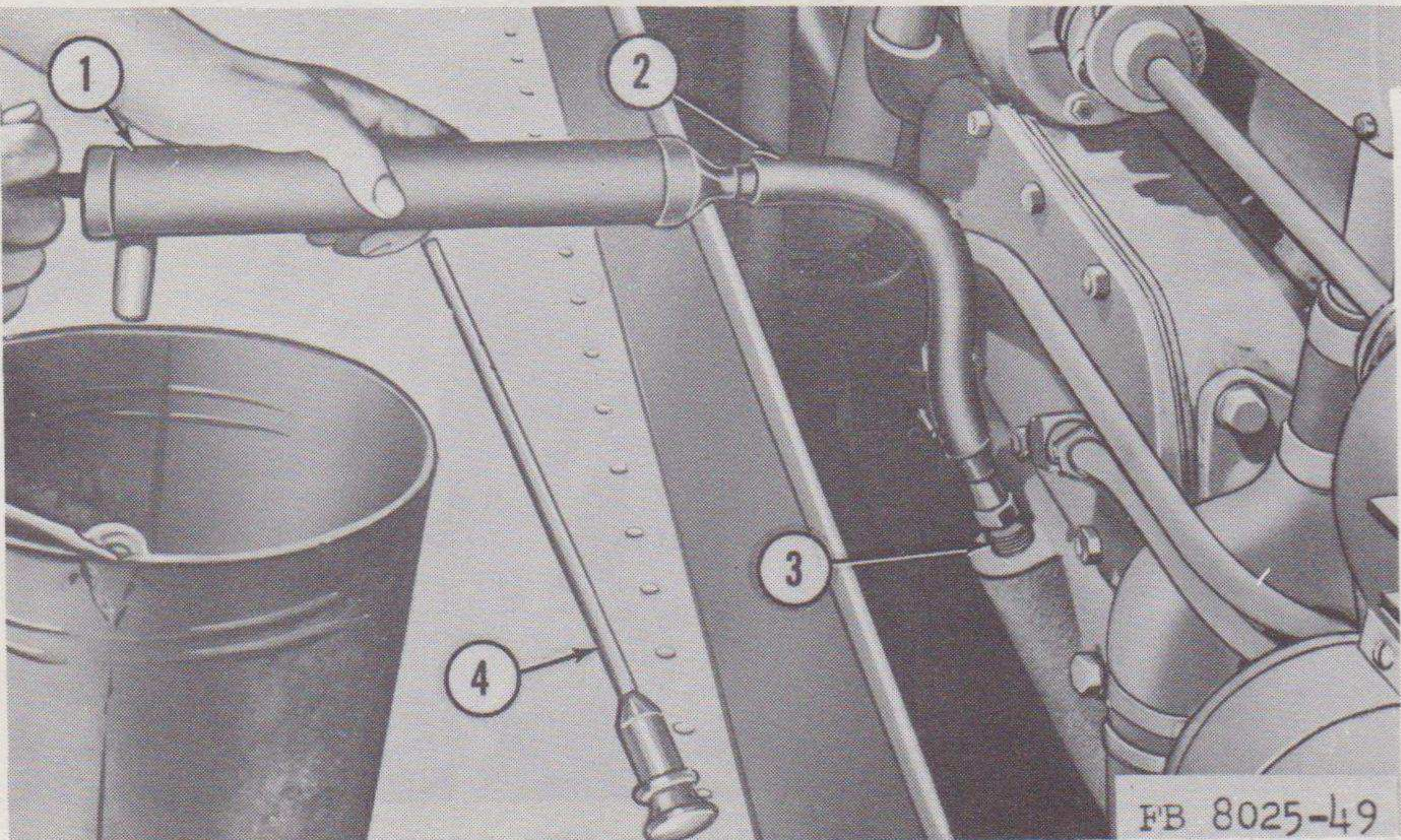


24 Crankcase sump pump connection. (Clean connection, attach pump, pump out oil, and refill crankcase)



25 Oil pump screen assembly. (Disassemble and clean or renew)

Figure 48.—Continued.



- | | |
|------------------|--------------------------|
| 1 Sump pump | 3 Oil depth gage sleeve |
| 2 Sump pump hose | 4 Oil depth bayonet gage |

Figure 49. Removing oil from crankcase with sump pump.

steering worm gear must be cleaned and lubricated as indicated in the lubrication order.

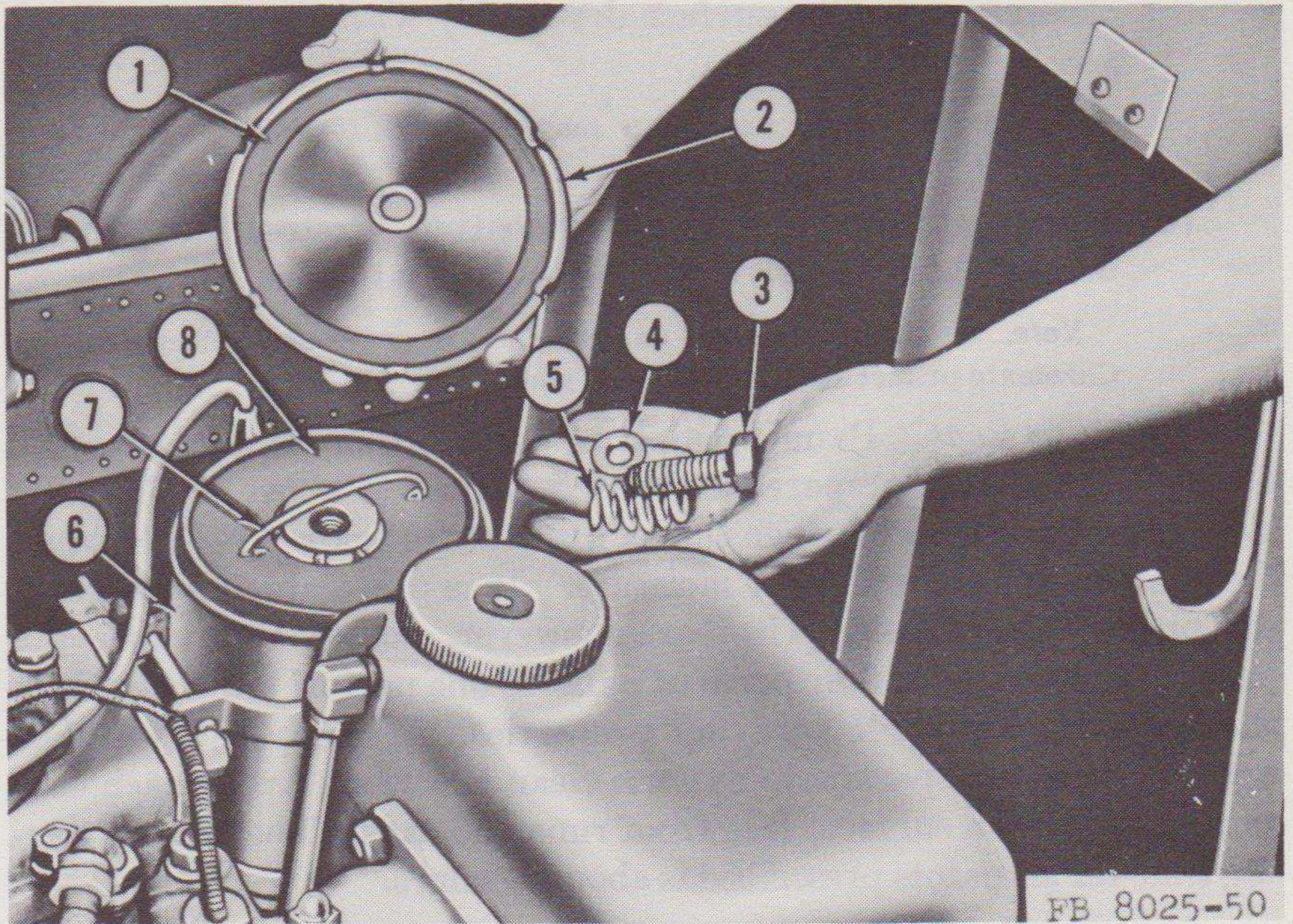
Caution: Do not lubricate propeller shaft logs, propeller strut cutless bearings, or engine governors.

54. Oil Filter

a. General. Some of the oil from the oil pump is bled from the oil distribution system into an oil filter (1, fig. 29). The oil passes through a replaceable element filter unit and back into the oil pan. One oil filter is mounted on the port side of each engine at the front.

b. Installation of New Oil Filter Element.

- (1) Remove the top cover bolt (3, fig. 50) and top cover bolt gasket (4) from the top of the oil filter cover.
- (2) Lift off the oil filter cover (2). Remove the top cover bolt spring (5).
- (3) Lift the oil filter element (8) out of the oil filter body (6) by the element handle (7).
- (4) Place a new oil filter element (1, fig. 51) in the oil filter body (3).
- (5) Position the top cover bolt spring in place on top of the oil filter element. Install the oil filter cover. Use a new oil filter top cover gasket (1, fig. 50) between the oil filter cover and the oil filter body.
- (6) Secure the oil filter cover with the top cover bolt and top cover bolt gasket.



- | | |
|-------------------------------|-----------------------------|
| 1 Oil filter top cover gasket | 5 Top cover bolt spring |
| 2 Oil filter cover | 6 Oil filter body |
| 3 Top cover bolt | 7 Oil filter element handle |
| 4 Top cover bolt gasket | 8 Oil filter element |

Figure 50. Removing oil filter cover.

55. Painting

a. General Painting Information. Paint serves to protect the boat in two ways. First, it protects against rust and corrosion, and second, it gives camouflage protection. The boat must be completely painted at least once a year. Repair painting must be done as required, or as determined necessary by monthly inspection. Further general painting information will be found in TM 9-2851.

b. Preparation of Boat for Painting.

- (1) Clean the boat thoroughly. Pay particular attention to marine growths, slime, and other foreign matter on the bottom of the hull.
- (2) Wire brush, scrape, and sand all rusted and corroded areas to the *bare metal*. Remove all traces of loose paint in a similar manner.

Note. The edges of all remaining paint surrounding a sanded area must be feather edged.

- (3) Remove all traces of oil, grease, and dirt from the entire surface to be painted. Use mineral spirits, varsol, alcohol, carbon tetrachloride, or a suitable degreasing solution. After

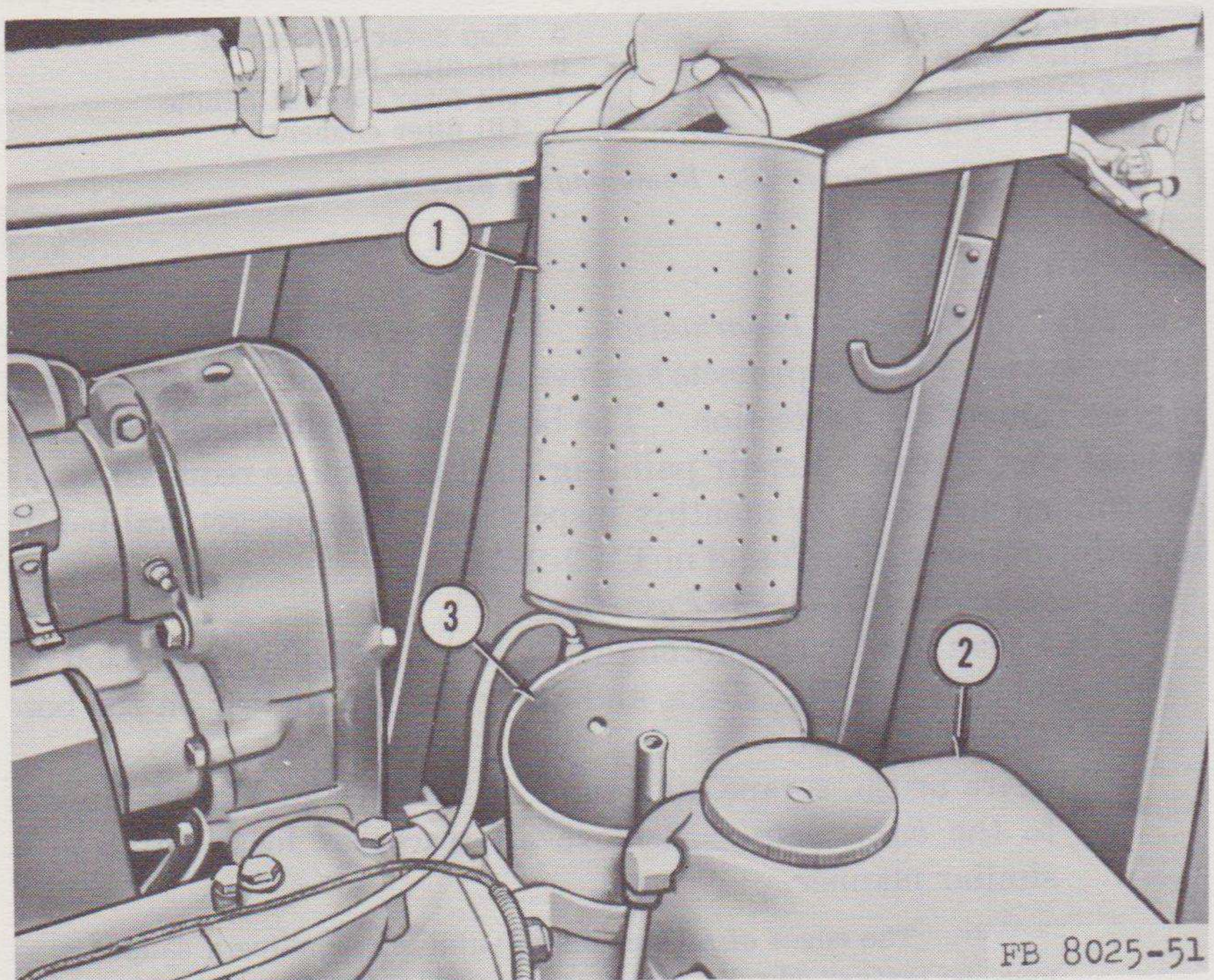
cleaning, wipe the surface dry or dry with clean compressed air.

Note. Hot water and soap may be used for cleaning but not kerosene.

- (4) Spray or brush one coat of "Coating, Pretreatment (Formula 117 for Metals)" on the bare metal areas.

Note. If this material is unavailable use one coat of Phenolic Zinc Chromate primer (MIL-P-12742, Type I).

c. Painting Boat. Painting must be done as soon as possible after the surface has been prepared and patch primed (*b* above). Painting should not be attempted when the temperature is below 50° F. or when the boat is exposed to dust or moisture. It is preferable to use spray equipment if available. Use care, however, not to overreduce the paint. A mixture of four parts of paint to one part of mineral spirits should provide suitable spraying properties. If spray equipment is not available, it is permissible to use clean brushes. Apply each coat to form a smooth surface, free from runs and sags. The normal drying time for all paints prescribed is about 24 hours.



1 Oil filter element
2 Water tank

3 Oil filter body

Figure 51. Replacing oil filter element.

- (1) Apply two coats of Phenolic Zinc Chromate primer (MIL-P-12742, Type I) to the areas previously coated (b(4) above).

Note. If Zinc Chromate primer was used for the first coat apply only one additional coat.

- (2) Apply one coat of "Enamel, Phenolic, Lusterless, Outside (MIL-P-12507), Color No. 3412 Olive Drab" to the entire area.

Caution: Do not paint the heat exchangers, the propeller shafts, the rudder shafts, the steerer quadrant, rotating, sliding, lubricated parts, bearings, nuts, bolt threads of the deck couplings or hatch covers and the like, the exhaust manifold, anchor, rope, canvas, rubber gaskets, electrical wiring and equipment, and instruction and nameplates.

Section III. PREVENTIVE MAINTENANCE SERVICES

56. General

The operator or crew of the boat and the organizational maintenance personnel must perform preventive maintenance services regularly, to make sure the boat operates properly and lessen the chances of mechanical failure.

57. Operator or Crew Maintenance

a. Inspections. Inspections must be made before operation, during operation, at halts, and after operation, as described in this section. All inspections of assemblies, subassemblies, or parts must include inspection of any supporting members or connections and must determine whether the unit is in good condition, correctly assembled, secure, and not excessively worn. Any mechanical condition which may result in damage to the unit must be corrected before the equipment is operated. The terms "good condition," "correctly assembled," and "secure" are explained as follows:

- (1) The inspection for "good condition" is usually an external visual inspection to determine if the unit is damaged beyond safe or serviceable limits, or if it is in such condition that damage will result from operation. The term "good condition" is further defined as: not bent or twisted; not chafed or burned; not broken or cracked; not bare or frayed; not dented or collapsed; not torn or cut; adequately lubricated.
- (2) Inspection of a unit to see that it is "correctly assembled" is usually an external visual inspection to determine whether it is in its normal assembled position in the equipment.
- (3) Check of a unit to determine if it is "secure" is usually an external inspection, a hand-feel, or a pry-bar or wrench check

for looseness in the unit. Such an inspection should include brackets, lockwashers, locknuts, locking wires, or cotter pins used in the assembly.

- (4) "Excessively worn" means worn close to or beyond serviceable limits, a condition likely to result in a failure if the affected parts are not replaced before the next scheduled inspection.

b. Reporting Deficiencies. The operator will report all deficiencies on DD Form 110.

c. Before-Operation Services. The following services will be performed to determine if the condition of the boat has changed since it was last operated, and to make sure it is ready for operation. All deficiencies must be corrected or reported to the proper authority before the unit is put into operation.

- (1) *Fuel.* Check fuel supply. See that fuel tank is full. Check reserve supply and replenish if necessary.
- (2) *Oil.* Check oil level in engine crankcases. See that oil is at proper level. Add oil if necessary.
- (3) *Fire extinguishers.* See that fire extinguishers are in good condition, fully charged, and securely mounted near the operator's control station. The amount of charge in the carbon tetrachloride type of extinguisher can usually be determined by tilting the extinguisher from side to side and judging from sound and weight whether it is full. The carbon dioxide type of extinguisher must be weighed to determine its state of charge. Full and empty weights are stamped on valve body.
- (4) *Instruments.* Check all gage readings. At normal operating speed, gages should read approximately as follows: engine oil pressure, 30 to 40 pounds; maximum coolant temperature, 140° to 170° F.; oil temperature, 200° F.; tachometer, not over 2,600 revolutions per minute for continuous operation and a maximum of 3,200 revolutions per minute for short periods. The ammeter should be in the CHARGE range, with a maximum of 20 amperes.
- (5) *Leaks, general.* Check engines and fuel tank for leaks, paying particular attention to lines and connections. Recheck oil, water, and fuel lines after engines are started. Remove floorboards and lift hatch covers; check for leaks in hull at propeller shaft-log seal. Correct all leaks which require only tightening of bolts or connections. Report all leaks not corrected to proper authority. See that bilge pump is in good working order. Pump out bilge if necessary. If oil or gasoline has leaked into bilge, be sure to bail out all water not removed by the pump and wipe the bilge dry with rags or waste before starting the engines. Do not start engines

when gasoline fumes are apparent in bilge. Remove fumes by operating blower for 5 minutes. Leakage in propeller shaft-log seals or through rudder shaft bearings indicates the need for replacement of the shaft seals.

Caution: If gasoline has leaked into the bilge, first remove fumes by operating exhaust blower. Then locate and repair the leak before operating boat in order to prevent fire.

(6) *Engine warmup.* Before starting the engines, open the engine hatches to permit air circulation. See that reverse lever cranks are in neutral position. Be sure all engine drains are closed. Each engine has four (some models, six) drain cocks or plugs, all painted red. Check the drains at the following points: right side of cylinder block, water pump, oil cooler, bottom of exhaust manifold, and heat exchangers. Allow the engines to warm up to approximately 140° F. at 1,000 revolutions per minute. Do not race cold engines. If possible, run the boat during the warmup period, because operating the engines with reverse lever cranks in neutral greatly increases wear on clutches.

(7) *Visual inspection.* Make a general check of each engine for loose or missing bolts and nuts. Check to make sure grease cups are in place and are tight on water pumps. Check engines for unusual sounds or other unsatisfactory characteristics.

d. During-Operation Services. The operator is responsible for correcting or reporting unusual sounds or odors, deficiencies in performance, or other signs of abnormal operation.

(1) *Instruments, gages.* Check all gage readings frequently. If an oil pressure indicator shows an unusual drop or no pressure, or if a heat indicator continues to point to red or danger range, stop engine immediately and report irregularity to proper authority. Do not operate until failure is corrected.

(2) *Unusual operation and noises.* Check engines for any unusual noise, lack of power, and failure to respond to controls. If any unusual noise is noticed, report deficiency to proper authority. Check for indications of improper operation, such as noise from reversing gears, and slipping of clutches and reversing bands. Except in an emergency, always throttle engines down to idling speed before reversing propellers. Check steering linkage for indications of excess play. See if rudders respond properly to the movements of the wheel.

e. At-Halt Services. During halts, even for short periods, the operator should make a general check of the equipment, and correct or report all deficiencies noticed, in addition to performing the following specific duties:

- (1) *Fuel.* Check fuel supply. Add fuel if necessary.
- (2) *Oil.* Check oil levels. Add oil if necessary.
- (3) *Water.* Check cooling systems. Add water or antifreeze if necessary.
- (4) *Heating.* Check reversing-gear housings for overheating. If reversing bands are too tight, reversing gears or clutch housing will overheat.
- (5) *Propeller shafts.* If propeller shafts vibrate during operation, check for shaft misalignments, loose bolts and nuts, strut bearing failures, bent shafts, or fouled propellers. Report all deficiencies which are not corrected to proper authority.
- (6) *Leaks, general.* Check entire unit for leaks, paying particular attention to fuel, oil, and water lines and connections. Correct or report all leaks noticed to proper authority.
- (7) *Visual inspection.* Make a general check of the boat for bent, cracked, or split ribs, and for split or cracked seams. Check for loose or missing bolts and nuts, paying particular attention to propeller-shaft wedges.

f. After-Operation Services. To insure that the boat is ready to operate at any time, the following services must be performed by the operator or crew immediately after each operating period of 8 hours or less. All deficiencies must be corrected or reported to proper authority.

- (1) *Shutdown precautions.* Move boat to an area where there is the least danger of its being damaged. Tie fenders or bumpers to the side which might be damaged by rubbing or bumping. Run engines at idling speed for a few minutes before stopping, to allow them to cool gradually. See that reverse lever cranks are left in neutral.
- (2) *Fuel, oil, and water.* Fill fuel tank with clean fuel. Check oil level in engine crankcases. Add oil if necessary. If there is danger of freezing, drain all water from cooling system and refill with a coolant containing the proper amount of antifreeze. Make sure drain cocks are not clogged with sediment. Each engine has four (some models, six) drain cocks or plugs, all painted red.
- (3) *Clean equipment.* Remove all oil, gasoline, and water from bilge. Clean all oil and grease from exterior of engine. Clean battery connections and see that caps are tight.
- (4) *Tools and equipment.* See that all tools and equipment assigned to the boat are clean and properly stowed or mounted.
- (5) *Lights.* See if lights operate properly. Check condition and mounting of lights. See that they are clean.
- (6) *Propeller shafts.* If vibration of propeller shafts was no-

ticed during operation, check for loose engine-mounting and propeller-shaft coupling bolts, misaligned, bent or sprung propeller shafts, worn strut bearings, and nicked or damaged propellers.

(7) *Lubrication.* Refer to LO 5-8025.

(8) *Visual inspection.* Check engines and fuel tanks for leaks, paying particular attention to lines and connections. Remove floorboards and lift hatch covers. Check for leaks in hull. Correct or report all leaks. Check condition and tension of generator-drive belts; they should have a 1-inch deflection, under normal thumb pressure, measured midway between pulleys.

58. Maintenance and Safety Precautions

a. Correct or report all mechanical deficiencies that may result in damage to the boat if its operation is continued.

b. Always stop the engine before making repairs or adjustment on any part of the power train.

c. Avoid operating the boat close to the upstream side of a bridge, to a low anchor cable, or to any obstruction in a current.

d. Always use a safety line when operating boat immediately upstream from a bridge.

e. Always have anchors at hand to hold boat if engines fail.

f. Keep engine speeds below 2,700 revolutions per minute when operating unloaded boat.

g. Always operate at reduced speed in water less than 5 feet deep.

h. Always engage or disengage reverse lever cranks fully to prevent slipping and heating of reversing bands.

i. Always disconnect the propeller shaft from the engine before launching or hoisting the boat from the water.

j. Always keep engines aligned with propeller shafts.

k. Always check the propellers as soon as possible after any operation in which there was danger of their being fouled.

l. Be sure to pump out bilge before lifting boat from water.

59. Organizational Maintenance

a. Organizational preventive maintenance is performed by organizational maintenance personnel, with the aid of the operator, at weekly and monthly intervals. The weekly interval will be equivalent to 60 hours of use. The monthly interval will be equivalent to 4 weeks or to 240 hours of use, whichever occurs first.

b. The technical inspection column is provided for the information and guidance of personnel performing technical inspection, and constitutes the minimum inspection requirements for the equipment.

c. The preventive maintenance services to be performed at these regular intervals are listed and described below. The numbers ap-

pearing in the columns opposite each service refer to a corresponding number appearing on DA Form 464, and indicate that a report of the service should be made at that particular number on DA Form 464. These numbers appear in the second, the third, or in both columns, as an indication of the interval at which the service is to be performed.

Tech- nical inspec- tion	Service		
	Monthly	Weekly	
GENERAL			
1	1	1	<i>Before-operation services.</i> Check and perform services required in paragraph 57c.
2	2	2	<i>Lubrication.</i> Inspect entire unit for missing or damaged lubrication plugs and grease cups and for indications of insufficient lubrication.
	2	2	Lubricate if necessary. Refer to LO 5-8025. Replace missing or damaged fittings and grease cups.
3	3	3	<i>Tools and equipment.</i> Inspect condition of all tools and equipment assigned to the boat.
	3	3	See that all tools and equipment are clean and properly stowed or mounted. See that tool boxes or compartments are in good condition and that they close and fasten properly.
4	4	4	<i>Fire extinguishers.</i> Inspect for full charge, proper working order, and secure mounting of extinguishers.
	4	4	See that all deficiencies noticed are corrected or reported to proper authority.
5	5	5	<i>Publications.</i> See that copies of this technical manual, TM 5-5187, TB 5-8025-1, LO 5-8025, and Standard Form 91 Operator's Report of Motor Vehicle Accident are on the boat and in serviceable condition.
6	6	6	<i>Appearance.</i> Inspect the general appearance of the boat, paying special attention to cleanness, legibility of identification markings, and condition of paint. Paint engine cooling-system drain plugs red if paint is worn off or peeling.
7	7	7	<i>Modifications.</i> See that all available modification work orders applying to this boat have been completed and are recorded on DA Form 478 (Organizational Equipment File).
ENGINE AND ACCESSORIES			
11	11	11	<i>Cylinder heads, manifolds, and gaskets.</i> Inspect cylinder heads and manifolds for cracks, leaks, loose bolts, and defective gaskets. Check condition and mounting of exhaust pipes.
	11	11	Tighten loose manifold or exhaust-pipe mounting bolts and replace defective gaskets. On new engines, check all cylinder-head bolts for tightness at the first weekly servicing. The correct torque-wrench pull is 35 to 40 foot-pounds (TM 5-5187). Warm up engines to operating temperatures before checking head bolts.

Technical inspection	Service	
	Monthly	Weekly
12	12	12
	12	12
13	13	-----
	13	-----
14	14	14
	14	14
15	15	15
	15	15
17	17	17
	17	17
18	18	18
	18	18
38	38	38

ENGINE AND ACCESSORIES—Continued

Valve mechanism. Check valve adjustment if loss of power or excessive tappet noise is apparent. The correct tappet clearances while engine is cold are: intake, 0.017 inch; exhaust, 0.020 inch.

Adjust valve tappet clearance if necessary (TM 5-5187). Clean valve-cover breather pipes before replacing covers, making certain that valve cover gaskets are in good condition and that covers fit securely.

Compression test. Test compression of all cylinders. Normal compression pressure reading at 125 rpm, or cranking speed, is 105 to 115 pounds. When making compression tests, be sure that engine is at operating temperature (140° to 170° F.), that all spark plugs are removed, and that throttle is in wide-open position.

Record compression test readings on DA Form 464.

Crankcase. Inspect crankcase for leaks, and check the oil level.

Add oil if necessary; refer to lubrication order. If leaks cannot be repaired, report condition to proper authority.

Oil filters and oil coolers. Inspect oil filters, coolers, and connecting lines for leaks while engines are running.

Service oil filters as specified in lubrication order. Drain sludge from filter cases before removing elements. After servicing oil filters, check carefully for leaks while engines are running.

Water pumps, water lines, and hoses. Inspect condition and mounting of water pumps, water lines, and hose. Check engine operating temperature. If coolant temperature stays below 160° F. or rises above 200° F. during operation, thermostat may be defective.

Tighten loose bolts, screws, or connections on pumps and water lines. If pumps leak around seals, replace these seals. Be careful not to damage seals when removing or installing pump shaft. Replace thermostats if necessary.

Belts and pulleys. Inspect condition and tension of generator water-pump drive belts. Belts should have about 1-inch deflection. Check condition and alinement of pulleys.

Adjust tension of belts if necessary (par. 98d and TM 5-5187). Replace frayed, cracked, or badly worn belts.

FUEL SYSTEM

Fuel pumps. Inspect fuel pumps for leaks and for loose mounting bolts and connections. Check sediment bowls for water and dirt.

Technical inspection	Service		
	Monthly	Weekly	
			FUEL SYSTEM—Continued
	38	38	Tighten loose bolts and connections. Clean sediment bowls if they contain water or dirt. Check screens each time bowls are removed and clean if necessary. Make sure gaskets are in good condition before replacing bowls. Use hand primer on fuel pump to fill sediment bowls and then check for leaks. Repair or replace defective pumps (TM 5-5187).
39	39	39	<i>Carburetors and linkage.</i> Check carburetors and lines for gasoline leaks or air leaks. See if cap screws holding carburetor to intake manifold or screws holding throttle body to bowl assembly are loose. Check condition and operation of linkage.
	39	39	See that all mounting and assembly screws are tight and that linkage connections are secure. Repair or replace leaky gasoline lines. Clean carburetor screen if necessary (TM 5-5187). Use the proper size wrench to remove the strainer head, being careful not to damage the screen. Report other deficiencies noticed to the proper authority.
41	41	41	<i>Air cleaner (flame arrestor).</i> Inspect condition and mounting of flame arrestors.
	41	41	See that flame arrestors are in good condition, clean, and securely mounted. To clean arrestors, remove and wash in cleaning solvent. See that arrestors are dry before reinstalling (TM 5-5187).
43	43	43	<i>Tank, caps, and gaskets.</i> Inspect condition and mounting of gasoline tank. Check tank and fuel lines and connections for leaks.
	43	43	See that tank is securely mounted, that air vents are open, and that filler caps are clean and tight fitting. Repair or replace leaky or damaged fuel lines.
			ELECTRIC SYSTEM
46	46	-----	<i>Spark plugs.</i> Inspect condition and adjustment of spark plugs. Correct point gap is 0.025 inch.
	46	-----	Remove and clean spark plugs and adjust point gap. See that plugs and gaskets are in good condition before reinstalling.
47	47	47	<i>Batteries.</i> See if batteries and cables are clean, in good condition, and securely mounted. Check level of solution, it should be about one-half of an inch above the plates. Check solution with hydrometer and record readings on DA Form 464. Readings from 1.275 to 1.300 indicate a fully charged battery; readings of 1.225 or less indicate that battery should be recharged or replaced.

Technical inspection	Service		
	Monthly	Weekly	
			ELECTRIC SYSTEM—Continued
	47	47	Clean batteries and terminals with brush or dampened cloth. Apply a thin film of chassis grease over terminals after clamping them tightly. Add clean water if needed but do not overfill. See that batteries are securely mounted, that caps are tight, and that ventholes are open.
48	48	48	<i>Generators and starters.</i> Inspect starters and generators for loose mounting bolts and wiring connections.
	48	-----	Inspect commutators and brushes for excessive wear, dirt, and oil deposits. See if brushes are free in their holders and contacting commutators, and if brush wires are secure.
	48	48	See that starters and generators are securely mounted. Replace brushes, and clean commutators if necessary (par. 86).
49	49	-----	<i>Distributors.</i> Remove Caps. Check caps and rotors for cracks, burned contacts, and corroded terminals. Inspect condition and adjustment of breaker points. The correct point gap is 0.020 inch.
	49	-----	Remove and clean caps, and adjust breaker points if necessary. Replace burned or pitted points and defective caps and rotors (TM 5-5187). See that all parts are properly assembled and secure.
50	50	50	<i>Coils, wiring, and switches.</i> Check coils for loose mounting and cracked insulation. Inspect wiring for oil-soaked, cracked, or frayed insulation, broken wires, and loose and corroded connections. Check operation of switches.
	50	50	Replace defective coils, switches, and wires (TM 5-5187). See that all wires are clean and that connections are clean and tight.
52	52	52	<i>Lights.</i> Test all lights. See if all reflectors and lenses are in good condition and secure.
	52	52	See that all defective lights are repaired or replaced with new ones.
			CONTROL SYSTEM
56	56	56	<i>Steering gear assembly.</i> Check entire steering system for excessive wear, loose or missing bolts, screws, and locking pins, and bent or damaged shafts and arms. Pay particular attention to bevel gear boxes and lubrication of gears. Check gear mounting bolts and clevis joints on steering linkage. Check rudder-bearing seals for leaks.
	56	56	Tighten or replace all loose or missing bolts, screws, and locking pins. Replace excessively worn and damaged parts.

Technical inspection	Service		
	Monthly	Weekly	
			CONTROL SYSTEM—Continued
57	57	57	<i>Gages.</i> Check condition and mounting of all gages.
	57	57	See that all gages and connections are secure. Replace or report defective gages.
			FRAME AND MOUNTINGS
80	80	80	<i>Frame (engine mounting).</i> Inspect condition of engine bed and see if all mounting bolts and screws are tight.
	80	80	Tighten loose mounting bolts and screws.
			DRIVE SYSTEM AND HULL
95	95	95	<i>Master clutches and reversing bands.</i> Check condition and adjustment of clutches and reversing bands. Clutches and bands should operate smoothly, hold securely under load and have no undue drag when reverse lever cranks are in neutral. When adjustment is correct, a firm pressure, without forcing or jerking, is required to make the cranks snap into forward or reverse locking positions.
	95	95	Adjust clutches and reversing bands if necessary. If the cranks must be forced or jerked to make them lock in forward or reverse positions, the adjustment is too tight. See that all connecting pins, bolts, and locks are in place and secure. If clutches and reversing bands slip when properly adjusted, bands and disks may need to be replaced. See that reversing-band lining is replaced before it becomes so worn that rivet heads are likely to contact drums (TM 5-5187).
110	110	110	<i>Reduction gears and cases.</i> Inspect for loose mounting bolts and oil leaks. Check for unusual noise during operation.
	110	110	Tighten all loose mounting bolts. Correct or report other deficiencies.
111	111	111	<i>Propeller shafts and drive couplings.</i> Check propeller-shaft alinements. The shaft should turn by hand when clutch levers are in neutral. Check for loose propeller-shaft coupling bolts, bent or sprung shafts, and worn strut bearings. See that propeller-shaft logs are securely mounted. Check propeller shaft-log seals for leaks.
	111	111	Realine propeller shafts if necessary (par. 131). Realignment should always be done with the boat in the water and under normal load. When alining shafts, be sure the coupling flanges come together evenly, all the way around, without forcing. There should not be more than a 0.002 inch clearance between the flanges at any point. See that propeller-shaft logs are securely mounted. Replace shaft seals if necessary (par. 110).

Technical inspection	Service		
	Monthly	Weekly	
DRIVE SYSTEM AND HULL—Continued			
112	112	-----	<i>Struts (propeller shafts and rudders).</i> Raise rear of boat from water and inspect for loose or missing strut cap screws and rudder pivot screws.
	112	-----	Tighten or replace loose or missing strut cap screws and rudder pivot screws.
133	133	133	<i>Bilge pump.</i> Check bilge pump for secure mounting and proper operation.
	133	133	See that bilge pump is in good operating condition and securely mounted. Replace defective hose.
137	137	137	<i>Hull.</i> Open all hatches and compartments. Inspect interior of hull for leaks, and for loose bolts and screws. See if pushing knee, rope fenders, lifting cleat, lifting shackle, haul tackle, roller chock, mooring cleats, and towing bitt are in serviceable condition and are securely mounted.
137	137	-----	Inspect outer surface of hull for dented and scraped areas and for cavities. Check condition and mounting of propellers, rudders, propeller struts, skeg shoes, and towing eyes.
	137	137	Pump out bilge and swab up excess moisture. Open all hatches and remove lower-deck flooring to allow compartments to air. Tighten and replace all loose or missing bolts and screws. Replace unserviceable rope fenders and rope on pushing knees. See that all deck fittings are in serviceable condition and securely mounted.
	137	-----	Repair all dented and scraped areas and small cavities in the hull. Paint all repaired surfaces.

Section IV. TROUBLESHOOTING

60. Use of the Troubleshooting Section

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the bridge erection boat or any of its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

Note. All references in this section to paragraphs 132 through 161 pertain to operations which are responsibility of the field and depot maintenance personnel. Organizational maintenance personnel should not proceed without proper authority.

61. Starting Motor Will Not Crank Engine

<i>Probable cause</i>	<i>Possible remedy</i>
Defective battery.	Recharge or replace battery (par. 89).
Defective starting motor.	Repair or replace starting motor (par. 141). See note in paragraph 60.
Dirty or burned solenoid magnetic switch contacts.	Replace switch (par. 87).
Dirty or corroded battery cable connections.	Clean battery cable connections (par. 89).
Battery cables eaten thin by corrosion.	Replace battery cables.
Loose battery or ground connection.	Tighten connections.
Defective starter switch on electrical panel.	Replace starter switch (par. 113).
Mechanical seizure of parts.	Replace engine (pars. 128 through 131).
Water in cylinders due to—	
Defective cylinder head gasket.	Replace cylinder head gasket (TM 5-5187).
Cracked or warped cylinder head.	Replace cylinder head (TM 5-5187).
Cracked cylinder block.	Replace engine (pars. 128 through 131).
Incorrect oil viscosity.	Replace oil with correct grade (LO 5-8025).

62. Starting Motor Cranks Engine but Engine Will Not Start

<i>Probable cause</i>	<i>Possible remedy</i>
Ignition switch defective.	Replace ignition switch (par. 113).
Ignition coil open or shorted.	Replace ignition coil (TM 5-5187).
Distributor points out of adjustment or badly burned.	Adjust or replace distributor points (TM 5-5187).
Distributor rotor burned or broken.	Replace distributor rotor (TM 5-5187).
Condenser defective.	Replace condenser (TM 5-5187).
Bad connection or broken wire in ignition system.	Tighten connection or replace wire.
Improperly gapped spark plugs.	Adjust spark plug gaps (TM 5-5187).
Fouled spark plugs.	Clean or replace spark plugs (TM 5-5187).
Clogged fuel hose.	Blow out fuel hose (par. 96).
Faulty fuel pump.	Replace fuel pump (TM 5-5187).
Dirty fuel filter screen.	Clean fuel filter screen (TM 5-5187).
Loose fuel line fittings.	Tighten fittings.
Carburetor choke inoperative.	Repair choke. (TM 5-5187).
Carburetor jets clogged.	Clean carburetor. (TM 5-5187).
Carburetor float level incorrect.	Adjust float level. (TM 5-5187).
Flame arrestor clogged.	Clean flame arrestor. (TM 5-5187).
Valves improperly adjusted.	Adjust valves. (TM 5-5187).
Valves badly burned.	Replace burned valves. (TM 5-5187).
Leaky intake manifold or carburetor gasket.	Replace intake manifold or carburetor gasket. (TM 5-5187).

63. All Lights Fail to Operate

Probable cause
Port ammeter burned out.
Loose or broken wiring.

Short circuit.

Defective port battery.

All lamp bulbs burned out.

Possible remedy
Replace port ammeter (par. 114).
Tighten connections or replace broken wires.
Isolate and correct. Replace wires having worn or bare spots.
Recharge or replace port battery (par. 89).
Tighten battery ground straps and replace lamp bulbs.

64. All Lights Dim

Probable cause
Defective port battery.

Loose or corroded port battery terminals.
Loose connections.

Possible remedy
Recharge or replace port battery (par. 89).
Clean and tighten port battery terminals (par. 89).
Tighten connections.

65. Individual Lights Inoperative

Probable cause
Lamp bulb burned out.
Loose connections.
Broken or grounded wiring.
Defective switch.

Possible remedy
Replace applicable lamp bulb.
Clean and tighten connections.
Replace defective wiring.
Replace applicable switch.

66. One or More Lamps Burn Out Repeatedly

Probable cause
Port battery ground strap broken or loose.
Port engine generator regulator incorrectly set.

Possible remedy
Replace or tighten ground strap.
Adjust generator regulator (TM 5-5187).

67. Generator Fails to Charge

Probable cause
Battery fully charged.

Brushes worn, sticking, or shorted.

Loose connections.

Broken or worn drive belt.
Loose drive belt.
Burned out or otherwise faulty generator.
Defective generator regulator.

Defective ammeter.

Possible remedy
No corrective action is necessary. The generator regulator will cause the generator to resume charging when the battery discharges.
Replace brushes, or correct short (par. 88).
Tighten connections at generator, generator regulator, and ammeter.
Replace drive belt (par. 88).
Adjust drive belt (par. 88).
Repair or replace generator (par. 140). See note in paragraph 60.
Replace generator regulator (TM 5-5187).
Replace ammeter (par. 114).

68. Generator Constantly Charges at a High Rate

<i>Probable cause</i>	<i>Possible remedy</i>
Defective battery.	Recharge or replace battery (par. 89).
Defective generator regulator.	Adjust or replace generator regulator (TM 5-5187).

69. Generator Constantly Charges at a Low Rate

<i>Probable cause</i>	<i>Possible remedy</i>
Loose connections.	Tighten all generator circuit connections.
Dirty commutator.	Clean commutator (par. 88).
Worn or sticking brushes.	Replace brushes (par. 88).
Partially burned out or otherwise defective generator.	Repair or replace generator (par. 140). See note in paragraph 60.
Defective generator regulator.	Adjust or replace generator regulator (TM 5-5187).

70. Excess Backlash in Steering System

<i>Probable cause</i>	<i>Possible remedy</i>
Wear in longitudinal steerer tube universal joint.	Replace universal joint (par. 104b).
Excess gear wear in steerer.	Replace steerer (par. 102).
Excess gear wear in intermediate steering gear box.	Replace intermediate steering gear box (par. 103).
Excess gear wear in steerer quadrant.	Replace steerer quadrant (par. 106).
Loose steerer tube end connections.	Tighten connections.

71. Steering System Binds

<i>Probable cause</i>	<i>Possible remedy</i>
Forward or longitudinal steerer tube bent.	Replace forward or longitudinal steerer tube (par. 104).
Steerer quadrant assembly warped.	Replace steerer quadrant assembly (par. 106).
Longitudinal steerer tube universal joint worn.	Replace universal joint (par. 104b).
Dirt in gear teeth.	Clean applicable gears.

72. Boat Will Not Turn Sharply in One Direction

<i>Probable cause</i>	<i>Possible remedy</i>
Steerer quadrant assembly warped.	Replace steerer quadrant assembly (par. 106).
Transverse steerer tube bent.	Replace transverse steerer tube (par. 104).
Damaged tooth on steerer quadrant.	Replace steerer quadrant (par. 106).

73. Excessive Vibration of Boat

<i>Probable cause</i>	<i>Possible remedy</i>
Propeller shaft bent.	Replace propeller shaft (par. 110).
Engine mountings loose.	Tighten mounting bolts.
Propeller damaged.	Replace propeller (par. 109).

74. Boat Out of Trim

<i>Probable cause</i>	<i>Possible remedy</i>
Cargo weight improperly distributed.	Redistribute cargo weight.
Compartment flooded.	Repair hull (par. 119).

75. Boat Tends to Veer in One Direction

<i>Probable cause</i>	<i>Possible remedy</i>
Engines running at different speeds.	Change engine throttle settings.
Rudders out of alinement.	Aline rudders (par. 104g (3)).
Boat out of trim.	Refer to paragraph 74.

Section V. ELECTRICAL SYSTEM

76. Description of Accessory Electrical System

The electrical system of the 27-foot bridge erection boat consists of two complete 12-volt systems, one for each engine. The accessories are divided into two groups, lights and motors. The lights are operated from the port engine electrical system. The motors are operated from the starboard engine electrical system. The positive terminal of each 12-volt battery is grounded. An ammeter for each system is located on the instrument panels. Fuses for each light and motor circuit are located under the control box. Figure 52 is a wiring diagram of the electrical system.

77. Running Lights

a. Description. The running lights are located in cutouts in the port and starboard forward corners of the windshield (1 and 7, fig. 2). A red light is carried in the port cutout and a green light is carried in the starboard cutout. Each running light is mounted on the boat by a tongue which fits a bracket on the side face of the running light cutout.

b. Removal of Running Lights.

- (1) Lift the entire light unit until the tongue is clear of the bracket (fig. 53).
- (2) Disconnect the two wires from the terminals on the light.
- (3) Lift the light clear of the boat.

c. Removal of Lamp Bulbs From Running Lights.

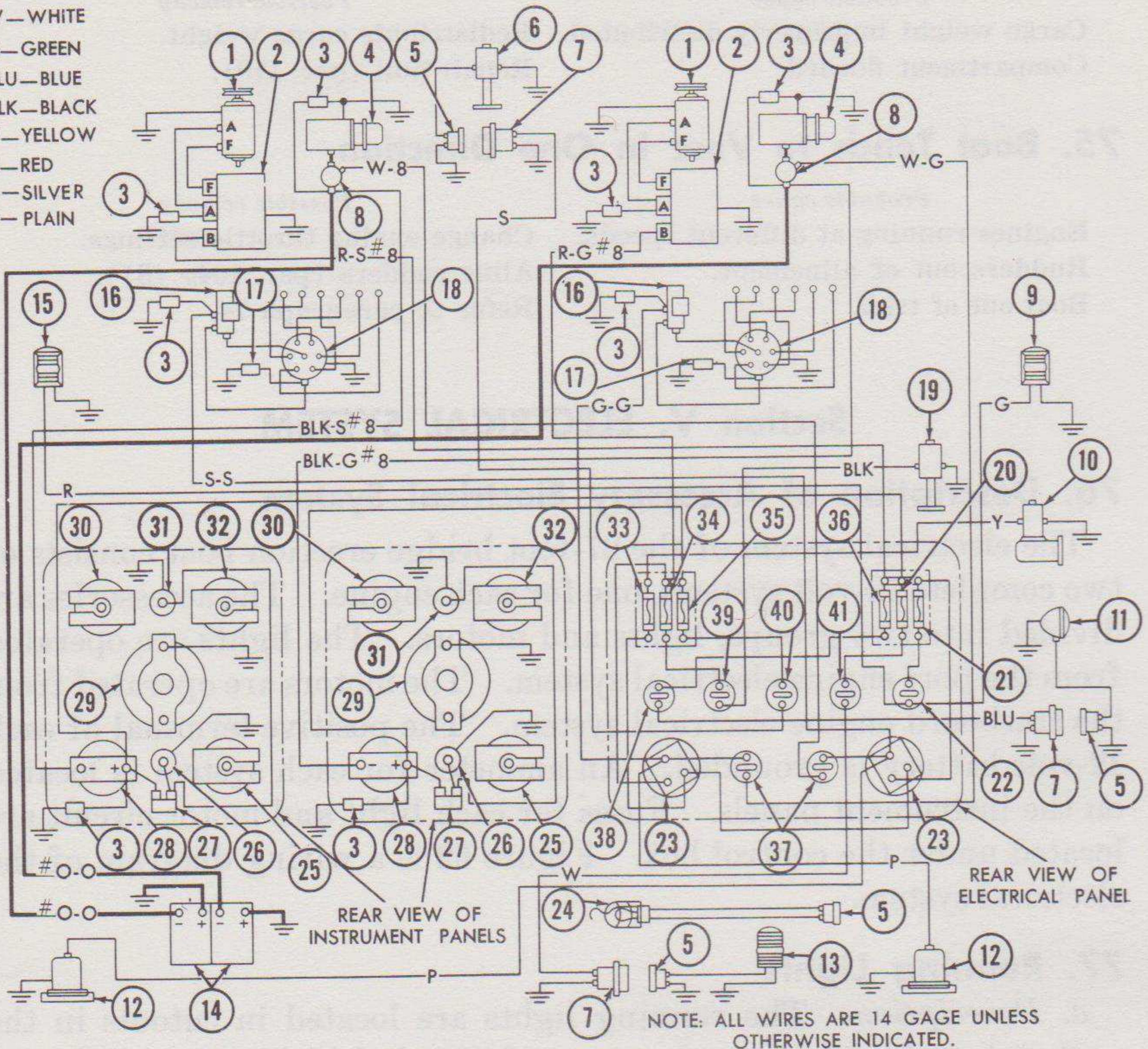
- (1) Squeeze the base retaining clip on the bottom of the running light base (fig. 54) and remove the base (fig. 54).
- (2) Press the lamp bulb into the socket and turn counterclockwise.
- (3) Remove the lamp bulb (fig. 55).

d. Cleaning of Running Lights.

- (1) Clean all parts of the light thoroughly with cleaning solvent.
- (2) Remove all traces of rust and corrosion. If the running light is badly rusted or corroded, replace it.

LEGEND

- W—WHITE
- G—GREEN
- BLU—BLUE
- BLK—BLACK
- Y—YELLOW
- R—RED
- S—SILVER
- P—PLAIN



- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Generator 2 Generator regulator 3 Lead and capacitor 4 Starting motor assembly 5 Cable plug 6 Forward bilge pump assembly 7 Deck socket 8 Solenoid magnetic switch 9 Starboard running light assembly 10 Engine compartment vent blower assembly 11 Searchlight 12 Magnetic fuel valve 13 Mast light assembly 14 Storage battery 15 Port running light assembly 16 Ignition coil 17 Distributor condenser 18 Ignition distributor 19 Stern bilge pump assembly 20 Mast light fuse 21 Running lights fuse | <ul style="list-style-type: none"> 22 Running lights switch 23 Ignition and blower switch 24 Floodlight 25 Oil pressure gage 26 Lower panel light assembly 27 Panel light switch 28 Ammeter 29 Tachometer head 30 Water temperature gage 31 Upper panel light assembly 32 Oil temperature gage 33 Engine compartment vent blower fuse 34 Stern bilge pump fuse 35 Forward bilge pump fuse 36 Searchlight fuse 37 Starter switch 38 Searchlight switch 39 Stern bilge pump switch 40 Forward bilge pump switch 41 Anchor light switch |
|--|--|

Figure 52. Wiring diagram, boat electrical system.

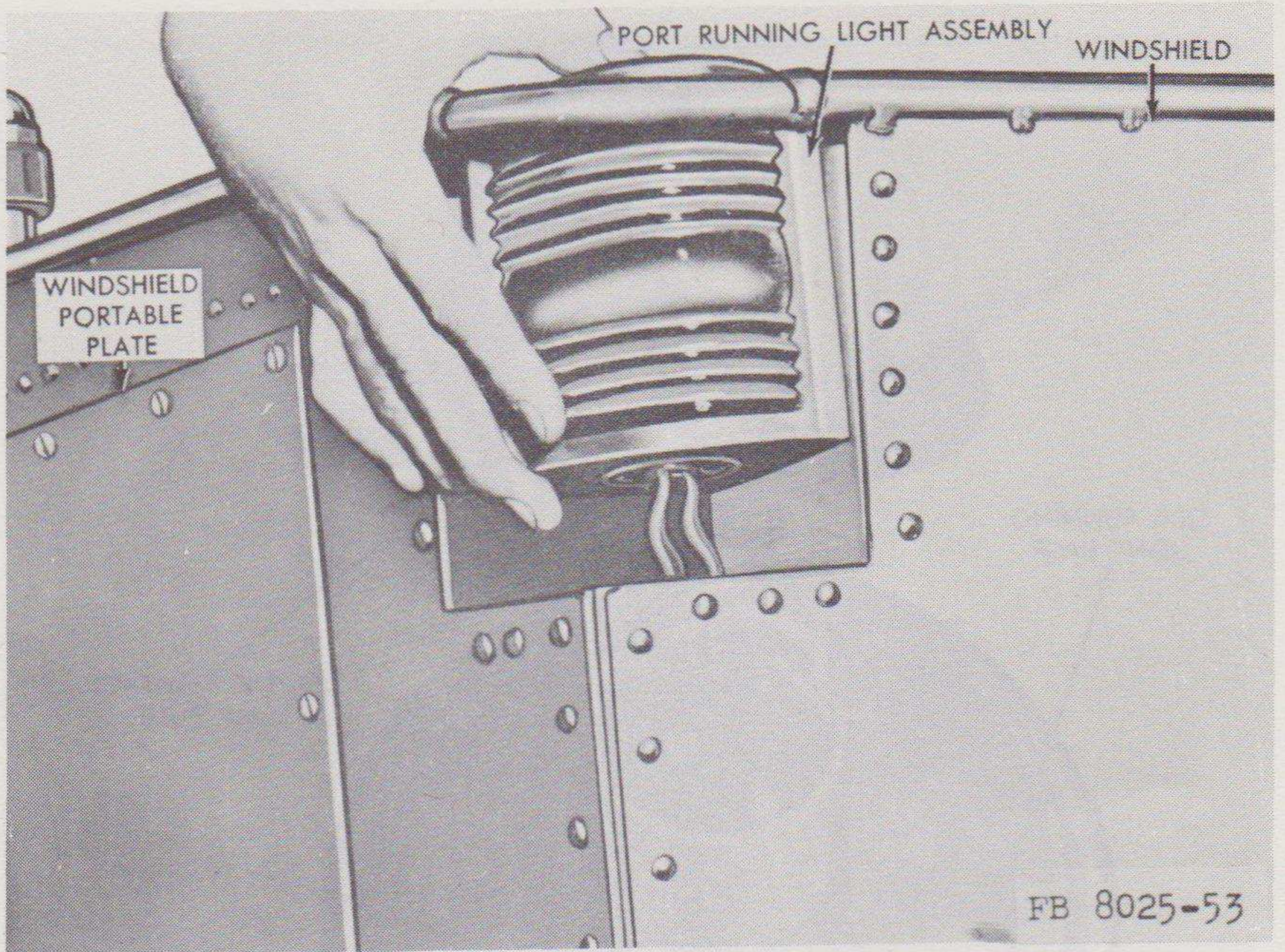


Figure 53. Removing port running light.

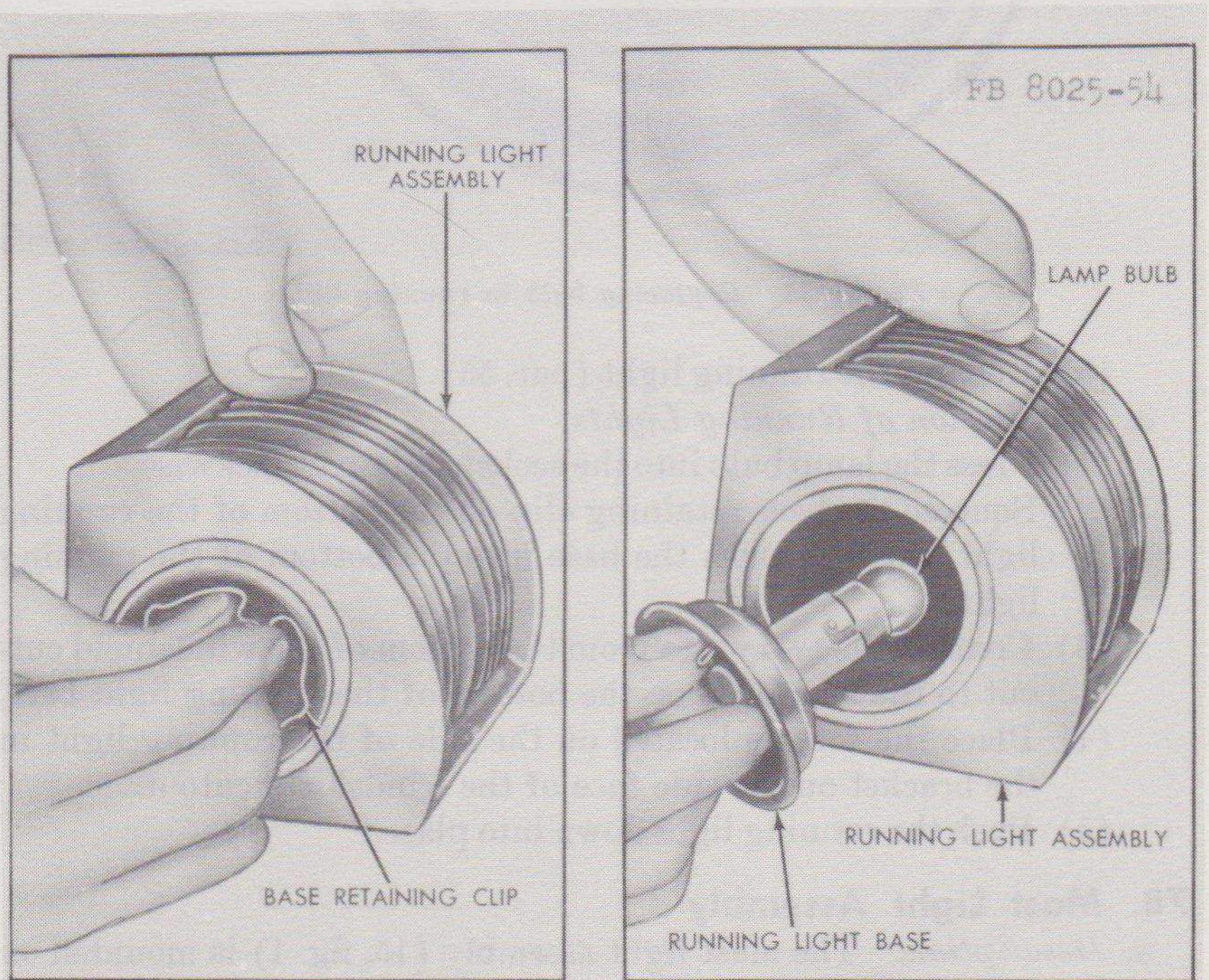


Figure 54. Removing running light base.

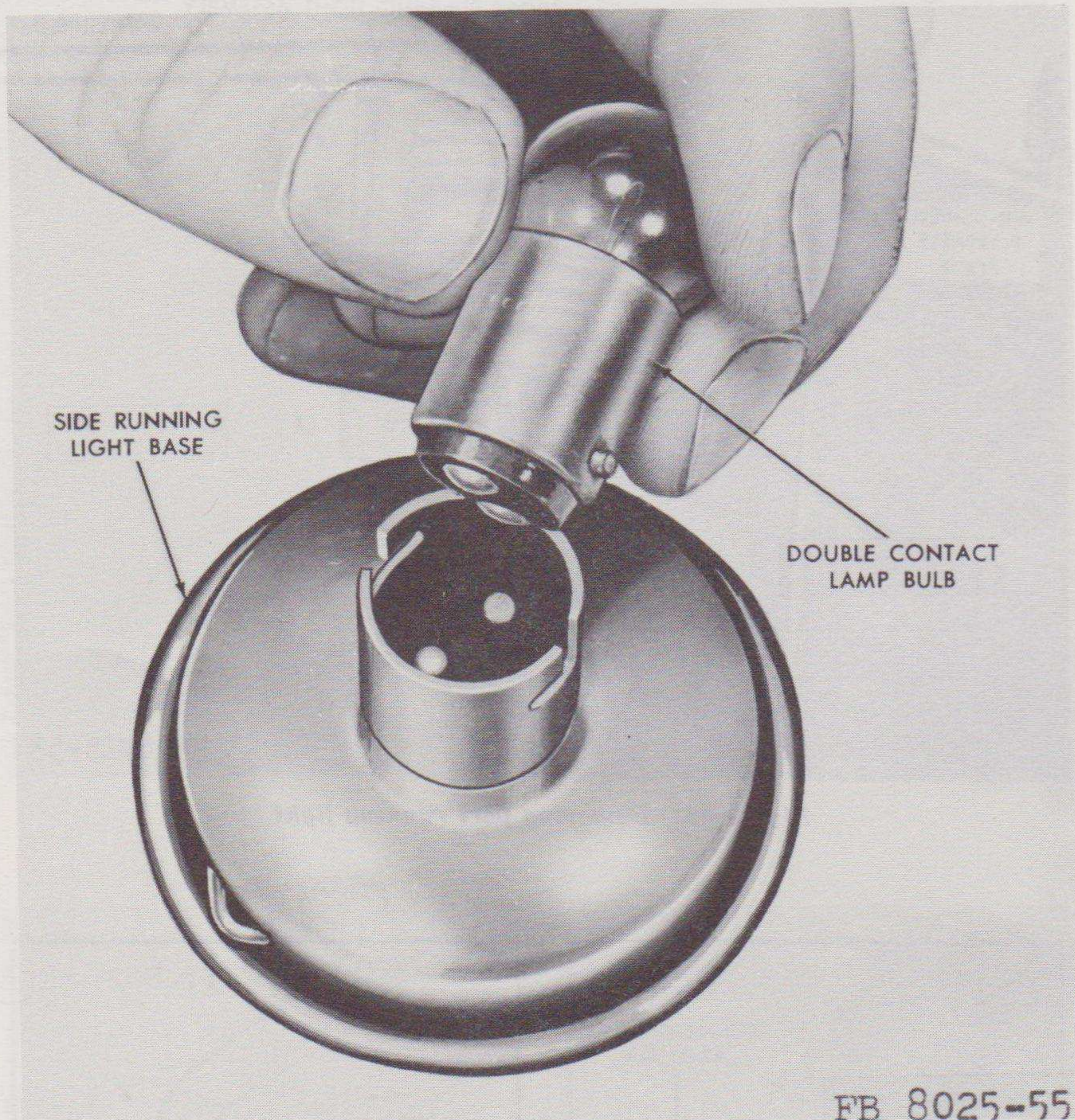


Figure 55. Replacing bulb in running light.

(3) Repaint the running light (par. 55).

e. Installation of Running Lights.

- (1) Press the lamp bulb into the socket and turn clockwise.
- (2) Squeeze the base retaining clip on the bottom of the running light base and push the base into the bottom of the running light.
- (3) Connect the two wires from the bottom of the windshield cut-out to the terminals on the bottom of the running light base.
- (4) Place the tongue located on the side of the running light in the bracket on the side face of the windshield cutout.
- (5) Push the running light down into place.

78. Mast Light Assembly

a. Description. The mast light assembly (15, fig. 1) is mounted on top of the stern light mast (16) directly behind the cockpit coaming. It is a white light visible in all directions from the boat.