

# GALE

GALE PRODUCTS DIVISION OF  
OUTBOARD MARINE CORP.  
P. O. Box 470, Galesburg, Illinois

## CONDENSED SERVICE DATA

Series Year Produced	5 hp	
1955.....	5D11	5S11
1956.....	5D12-5D13	5S12-5S13
1957.....	5D12-5D13- 5D14B	5S12-5S13
1958.....	5D15B-5D16B	5S14B
1959.....	5D15B-5D16B	.....
1960.....	5D17B	.....
1961.....	5D18B-5D19B- 5D21B	.....
1962.....	5D20B	.....
1963.....	5D22B	.....

Note: The letter "L" in model number denotes long shaft model.

**TUNE-UP**

	5.0 @ 4000	5.0 @ 4000
Hp @ rpm.....	5.0 @ 4000	5.0 @ 4000
Bore—Inches.....	1 $\frac{1}{8}$	1 $\frac{1}{8}$
Stroke—Inches.....	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Number of Cylinders.....	2	2
Displacement—Cu. In.....	8.84	8.84
Spark Plug		
Champion.....	J6J	J6J
Auto-Lite.....	A3X	A3X
Electrode Gap.....	0.030	0.030
Magneto		
Point Gap.....	0.020	0.020
Timing.....	See Text	See Text
Carburetor		
Make.....	Own	Own
Adjustment.....	See Text	See Text
Fuel—Oil Ratio.....	24:1	24:1

**SIZES—CLEARANCES**

**POWER HEAD**

	5D11	5D11
Piston Rings		
End Gap.....	0.005-0.015	0.005-0.015
Side Clearance.....	0.001-0.0035	0.001-0.0035
Piston Skirt Clearance (5D11).....	0.002-0.0035	.....

**POWER HEAD (Cont'd)**

All Others.....	0.0013-0.0023	0.0015-0.003
Crankshaft Bearing Diameter		
Main Bearing.....	0.8080-0.8085	0.8080-0.8085
Crankpin.....	0.8100-0.8105	0.8100-0.8105
Crankshaft Bearing Diametral Clearance		
Top Main Bearing.....	0.001-0.002	0.0015-0.0025
Center Main Bearing.....	0.001-0.002	0.0015-0.0025
Lower Main Bearing.....	0.001-0.002	0.002-0.003
Crankpin.....	0.0009-0.002*	0.0005-0.0015
Piston Pin Diametral Clearance In Rod.....	0.0003-0.001	0.0003-0.001

\*Except late motors and late replacement power heads which use needle bearings.

**LOWER UNIT**

Drive Shaft Diameter (5D11).....	0.4365-0.4375	.....
All Others.....	0.427-0.428	0.437-0.438
Diametral Clearance (5D11).....	0.0015-0.003	.....
All Others.....	0.001-0.0025	0.001-0.003
Propeller Shaft Diameter (At Bearings)		
Front.....	0.5535-0.5540	0.5615-0.5620
Rear.....	0.5535-0.5540	0.5615-0.5620
Propeller Shaft Bearing Diametral Clearance		
Front.....	0.0005-0.0015	0.0015-0.003
Rear.....	0.001-0.002	.....

**TIGHTENING TORQUES**  
(All Values in Inch-Pounds)

Connecting Rod.....	60-66	60-66
Crankcase Halves.....	60-84	.....
Flywheel.....	480-540	480-540
Spark Plug.....	240-246	240-246
Bypass or Exhaust Cover.....	24-36	24-36
Intake Manifold.....	24-36	24-36
Exhaust Hsg. to Power Head or Gearcase.....	60-84	60-84

### LUBRICATION

The power head is lubricated by oil mixed with the fuel. Use 1/2 pint of outboard motor oil (or a good grade of SAE 30, "Type MM" motor oil) to each gallon of gasoline. Mix gasoline and oil thoroughly, using a separate container, before pouring mixture into fuel tank.

The lower unit gears and bearings are lubricated by oil contained in the gear case. Special "Outboard Marine Corporation, Type C Lubricant" should be used. This lubricant is supplied in a tube and filling procedures are as follows: Remove upper and lower gearcase plugs and, with motor in upright position, fill gearcase from lower plug hole until lubricant reaches level of upper (vent) plug hole. Reinstall vent plug; then remove lubricant tube and reinstall lower plug. Tighten both plugs securely, using new gaskets if necessary, to provide an oil and water tight seal. If OMC

Type C lubricant is not available, gear case may be temporarily filled with outboard motor oil through vent (upper) plug opening. If outboard oil is used, drain and refill with OMC Type C lubricant as soon as possible. Lower gear lubricant should be maintained at level of vent plug, and drained and renewed every 100 hours of operation.

### FUEL SYSTEM

**CARBURETOR.** Float type carburetors are used on all models. Refer to the appropriate following paragraphs for adjustment and overhaul notes.

Models 5S11 through 5S14B; 5D11: These models are equipped with an integral float type carburetor similar to that shown in Fig. G15. The float valve seat is machined into bottom of carburetor body (8). If seat is damaged, carburetor body must be renewed. Float valve extends through float

(6) and bowl cover (5), and is manually depressed by primer lever (23) to supply the starting fuel.

To disassemble the carburetor, remove high speed knob (26) and primer cam (24); then slip primer lever (23) from high speed needle. Remove carburetor bowl cover (5) and strainer plug (11). Use a soft, light hammer or other light tool and tap float valve (10) flush with top of float (6); then withdraw float valve downward out of carburetor. Lift float (6) and lower lock (7) from carburetor bowl. Remove the follower lever (13) from carburetor by removing cotter pin and unscrewing lever. Remove the three screws retaining throttle valve cover (16) to carburetor, then withdraw throttle valve assembly as a unit. Shut-off needle assembly (22) is used on 5S Series carburetors only.

Assemble by reversing the disassembly procedure. Insert float valve through bottom of bowl and install lower lock (7) in

lower groove in shaft. On most carburetors, the float level is positively fixed by machined grooves in float valve shaft. If shaft is not grooved, set float locks so that top of float is 1/2-inch below top of float bowl with valve held in closed position. Install and lightly seat the high speed needle (25) then back needle out 1/2-turn. Without moving needle, install primer lever (23) and spring; then install primer cam (24) with cam pointing upward as shown in Fig. G16. Leave 1/8-inch clearance between primer cam and primer lever as shown at (C—Fig. G17). Install knob (K) with arrow pointing upward.

After carburetor is installed, warm engine and move operating lever (L—Fig. G17) to high speed position. Turn high speed knob (K) either way until engine operates smoothly. Move operating lever (L) to slow speed position and turn slow speed adjusting screw (A) in or out until smoothest slow speed operation is obtained.

Models 5D12 through 5D22B: These models are equipped with a hinged float type carburetor similar to that shown in Fig. G18. On motors built before 1960, knobs on control panel were attached directly to the high and low speed needles (33 & 26). On 1960 and later motors, both needles are

controlled by a link and arm arrangement from separate control knobs which permit only a part-turn final adjustment of needles. If more adjustment is needed after final assembly, arm must be removed from needle and repositioned.

Normal initial setting for both the high speed and low speed needles is 3/4-turn from the closed position.

To set the carburetor float level, remove the shroud; then unbolt and remove the carburetor. Remove the float chamber (31) and invert the carburetor body (18). The upper surface of float (lower, when assembly is inverted) should be horizontal with gasket surface of carburetor body. Adjust by bending the hinge arm if float is off more than 1/8-inch. Before assembling, make sure that hole in float is centered around nozzle, and that float does not drop more than 1 1/4-inches below gasket surface of carburetor body when body is turned to correct operating position. If float drop is more than 1 1/4-inches, adjust by bending the small tab stop on float hinge.

**SPEED CONTROL LINKAGE.** The speed control lever on all models rotates the magneto armature plate to advance the timing. The throttle valve is synchronized with the armature plate to open the throttle the

proper amount as timing is advanced. To adjust the speed control linkage, refer to the appropriate following paragraphs:

Models 5S11 through 5S14B: A cam (S—Fig. G17), attached to the armature plate, moves the cam follower (F) to open the throttle. Synchronization of ignition and carburetor throttle is fixed and not adjustable. Make sure that all throttle linkage is free and does not bind; also, that primer lever (23—Fig. G16) does not contact needle valve (10) when high speed needle is adjusted for operation.

Model 5D11: Synchronization of ignition and carburetor throttle is fixed and not adjustable. Follow the precautions outlined for 5S models when installing carburetor. Speed control mechanism is cable controlled through a pulley arrangement from the speed control shaft. Some adjustment or renewal of the cable or pulleys may be required.

To renew the cable, refer to Fig. G19. Remove fuel tank and shrouds, loosen clamp screw (4) on speed control pulley (3), and remove clamp screw (5) on the magneto pulley. Control cable can now be removed. Install new cable with flat center section under clamp screw (5) and tighten the screw. Thread cable through pulleys (P) as

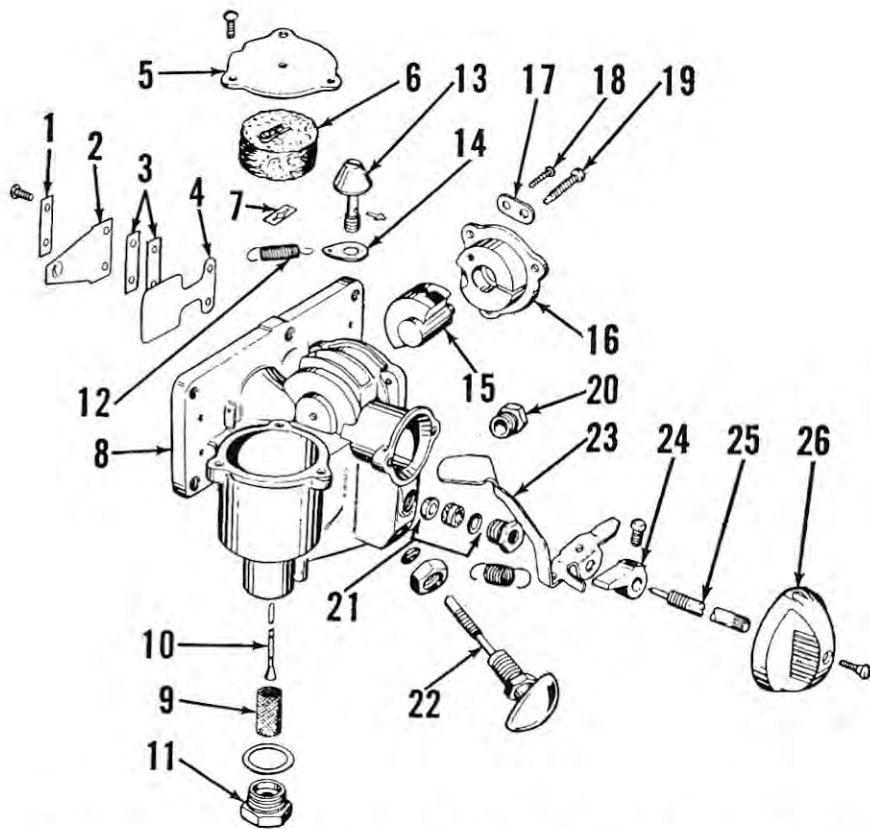


Fig. G15—Exploded view of carburetor used on models 5S11 through 5S14. 5D11 is similar except that shut-off needle (22) is not used.

- |               |                  |                     |                       |
|---------------|------------------|---------------------|-----------------------|
| 1. Plate      | 8. Body          | 14. Lug             | 20. Gland             |
| 2. Upper reed | 9. Strainer      | 15. Throttle valve  | 21. Packing           |
| 3. Spacer     | 10. Inlet needle | 16. Cover           | 22. Shut-off needle   |
| 4. Lower reed | 11. Plug         | 17. Friction plate  | 23. Primer lever      |
| 5. Bowl cover | 12. Spring       | 18. Cover screw     | 24. Primer cam        |
| 6. Float      | 13. Cam follower | 19. Adjusting screw | 25. High-speed needle |
| 7. Float lock |                  |                     | 26. Knob              |

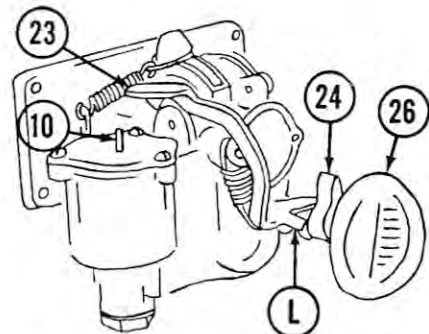


Fig. G16—Carburetor is primed for starting by turning knob (26) counter-clockwise until primer cam (24) contacts tab (L) on primer lever (23). Lever depresses inlet needle (10) to flood carburetor.

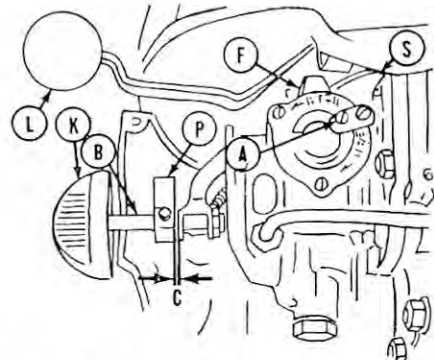


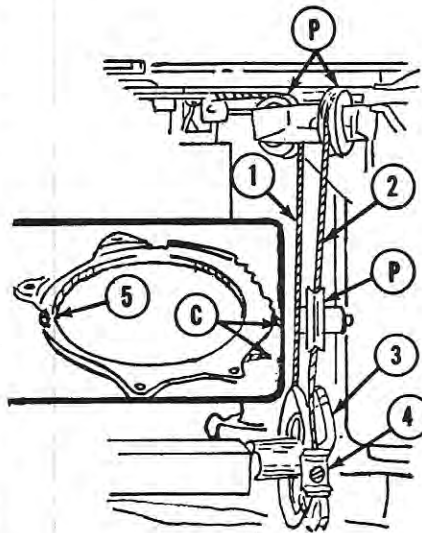
Fig. G17—View of carburetor showing points of adjustment.

- |                          |                        |
|--------------------------|------------------------|
| A. Slow speed adjustment | K. Knob                |
| B. High speed needle     | L. Speed control lever |
| C. Clearance             | P. Primer cam          |
| F. Cam follower          | S. Armature plate cam  |

shown. Turn control grip to "Fast" position and pull cable end (1) until magneto armature contacts advance stop and insert free end under clamp (4) with all slack removed. While holding armature plate against stop, pull on cable end (1) until slack is removed, insert cable end (2) under clamp (4); remove slack and tighten clamp. Rotate control grip from "Fast" to "Slow" positions a few times and make sure that armature plate contacts stop at each end of travel.

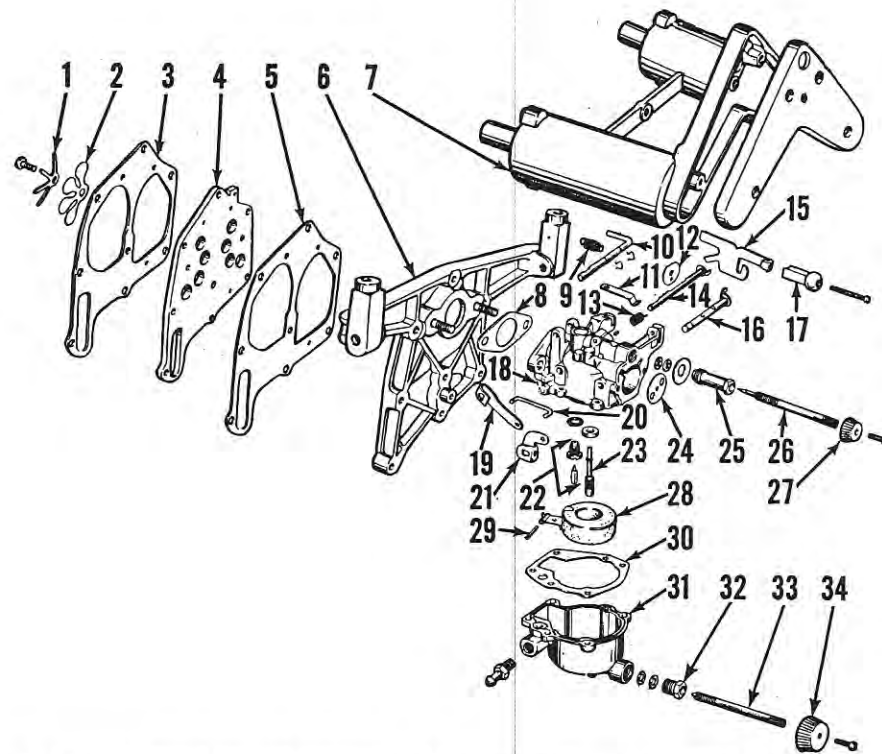
To adjust cable, follow the same general procedure, without removing cable or loosening clamp screw (5).

**Models 5D12 through 5D22B:** An adjustable cam is attached to the bottom of the magneto armature plate. When the speed control grip is turned to move the armature plate, a follower and linkage opens the carburetor throttle. To synchronize the linkage refer to Fig. G20. Turn the speed control grip until scribe line (L) on throttle cam (C) aligns with cam follower (F) as shown. Make sure choke button is pushed all the way in, loosen the two clamping screws (A) and move the cam in or out until all slack is removed from throttle linkage and throttle valve is just ready to open. Recheck the adjustment after screws (A) are tightened by turning the speed control grip. If



**Fig. G19—Schematic view of the cable type speed control mechanism used on model 5D11. Refer to text for method of adjustment.**

- |                      |                           |
|----------------------|---------------------------|
| 1. Cable (Slow)      | 5. Clamp (armature plate) |
| 2. Cable (Fast)      | C. Cable                  |
| 3. Control pulley    | P. Idler pulleys          |
| 4. Clamp (free ends) |                           |



**Fig. G18—Exploded view of carburetor of the type used on models 5D12 through 5D21B. Late models use a remote linkage to adjust mixture needles.**

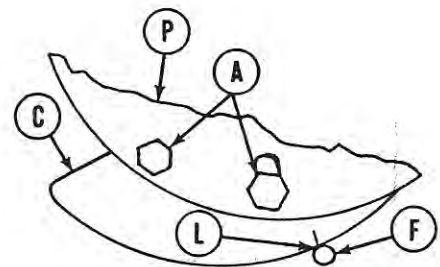
- |                   |                    |                        |                       |
|-------------------|--------------------|------------------------|-----------------------|
| 1. Reed stop      | 10. Cam follower   | 18. Body               | 26. Slow speed needle |
| 2. Reed petals    | 11. Spring         | 19. Lever              | 27. Knob              |
| 3. Gasket         | 12. Throttle valve | 20. Link               | 28. Float             |
| 4. Reed plate     | 13. Spring         | 21. Lever              | 29. Float shaft       |
| 5. Gasket         | 14. Throttle shaft | 22. Inlet valve & seat | 30. Gasket            |
| 6. Inlet manifold | 15. Choke rod      | 23. Nozzle             | 31. Bowl              |
| 7. Air silencer   | 16. Choke shaft    | 24. Choke valve        | 32. Nut               |
| 8. Gasket         | 17. Choke knob     | 25. Nut                | 33. High speed needle |
| 9. Spring         |                    |                        | 34. Knob              |

## OUTBOARD MOTORS

throttle fails to close, check linkage for binding and spring (9—Fig. G18) for weakness.

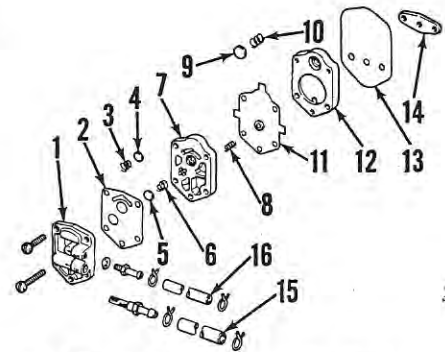
**REED VALVES.** On early motors with integral float type carburetor, the reed valve unit (1 through 4—Fig. G15) is attached directly to the carburetor body. On later units with hinged float carburetor, the reed valve unit (1 & 2—Fig. G18) attaches to reed plate (4). On all models the reed valve should be checked whenever the carburetor is removed for service. The reed petal (or petals) should seat very lightly against reed plate or carburetor body throughout entire length of reed, with least possible tension. Renew reed if petals are broken, cracked, warped, rusted or bent. Do not attempt to bend or straighten reed petals. Seating surface of carburetor or reed plate must be smooth and flat.

**FUEL PUMP.** Motors after 1957 (except 5S14B) are equipped with a diaphragm type fuel pump as shown in Fig. G21. Pressure and vacuum pulsations in crankcase are directed through a passage to one side of the pump diaphragm (11). Vacuum in the crankcase draws the diaphragm inward as



**Fig. G20—Schematic view of speed control mechanism used on later models. Refer to text.**

- |                         |                   |
|-------------------------|-------------------|
| A. Cam adjusting screws | L. Scribe line    |
| C. Speed control cam    | P. Armature plate |
| F. Cam follower         |                   |



**Fig. G21—Exploded view of the diaphragm type fuel pump used on most models after 1957.**

- |                       |                   |
|-----------------------|-------------------|
| 1. Valve housing      | 9. Support        |
| 2. Gasket             | 10. Spring        |
| 3. Spring             | 11. Diaphragm     |
| 4. Outlet check valve | 12. Outer housing |
| 5. Inlet check valve  | 13. Deflector     |
| 6. Spring             | 14. Gasket        |
| 7. Inner housing      | 15. Inlet hose    |
| 8. Spring             | 16. Outlet hose   |

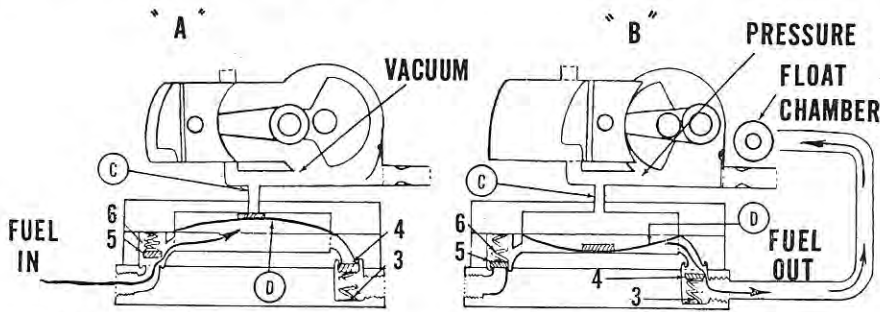


Fig. G22—Schematic view showing operation of the crankcase operated, diaphragm fuel pump. Pressure and vacuum pulsations from crankcase pass through connection (C) to rear of diaphragm (D) which induces pumping action on fuel line as shown.

3. Valve spring      4. Outlet check valve      5. Inlet check valve      6. Valve springs

shown in View "A", Fig. G22. This diaphragm movement draws fuel past the inlet check valve (5) as shown by arrow. As piston moves downward in cylinder (View "B"), pressure is induced to the back side of the diaphragm, forcing fuel out past the outlet check valve (4) as shown.

All defective or questionable parts should be renewed. Diaphragm (11—Fig. G21) should be renewed if air leaks or cracks are found, or, if its condition is in any way questionable.

**CRANKCASE BLEEDER VALVE.** All power heads with the split type crankcase are equipped with a reed type bleeder valve as shown in Fig. G23. The bleeder valve is designed to remove any liquid fuel or oil which might build up in crankcase; thus providing smoother operation at all speeds and lessening the possibility of spark plug fouling during slow-speed operation.

There is a small passage leading from the bottom of each crankcase to the bleeder valve. Any condensed liquid accumulates

in the bleeder pocket and passage until piston travels its downward stroke. Crankcase pressure caused by the downward stroke of piston forces the leaf valve (LV) off its seat and blows the liquid out into the exhaust passage.

When engine is overhauled, bleeder passages should be blown out with compressed air. The leaf valve (LV) should exert a slight pressure against its seat. Seating surface of crankcase should be smooth and flat. Renew the valve leaf and stop if leaf is broken, cracked, warped, rusted or bent.

**IGNITION**

Breaker point gap should be 0.020 and both sets of points should be synchronized so that they open exactly 180° apart. The manufacturer provides a timing fixture (OMC Part No. 376969). This fixture is to be installed on the crankshaft in place of the flywheel as shown in Fig. G24, and used in conjunction with a timing light of the type shown in Fig. G25.

To synchronize the points using the timing fixture and light, remove the flywheel and install the timing fixture, making sure it is properly fitted over the flywheel key. Install the timing light by attaching one clip to the insulated point (3—Fig. G26) and grounding the other clip. The bulb will light

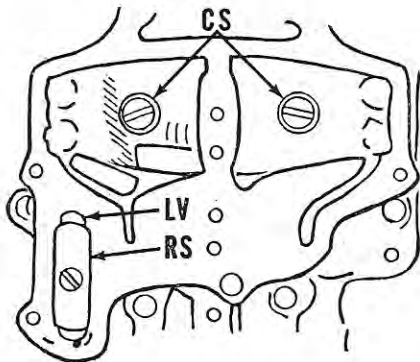


Fig. G23—Crankcase with carburetor and inlet manifold removed. The reed-type crankcase bleeder valve (LV) and reed stop (RS) can be removed for service after manifold is removed. To disassemble crankcase, the two center main bearing capscrews (CS) in inlet parts must be removed.

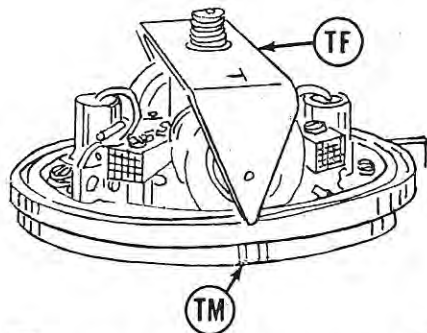


Fig. G24—Timing fixture (TF) installed and aligned with armature plate timing marks (TM) for adjusting points for upper cylinder. Refer to text.

Fig. G25—A timing light such as the one shown, is required to properly synchronize the two sets of points. Light can be made from a battery, light bulb (B), wire clamps (WC) and short sections of wire.

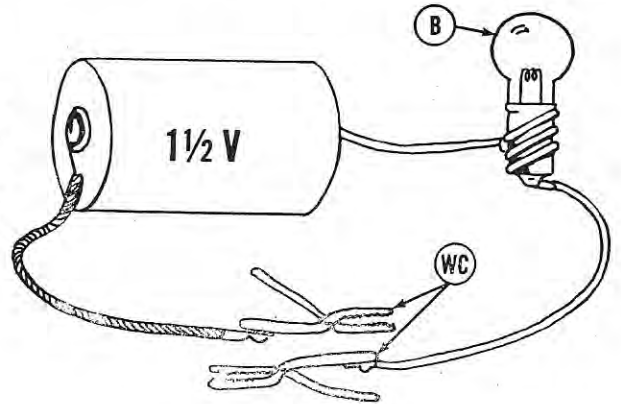
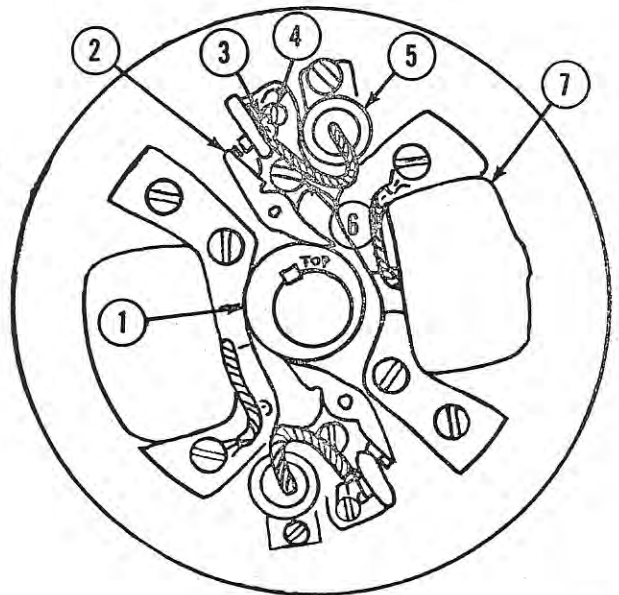


Fig. G26 — Magneto assembly with flywheel removed. Unit contains a separate coil, points and condenser for each cylinder.

1. Breaker cam
2. Breaker points
3. Insulated connection
4. Adjusting screw
5. Condenser
6. Anchor screw
7. Coil



when points are closed, and go out when points are open. Turn the crankshaft until fixture pointer rests midway between the two embossed armature plate timing marks as shown in Fig. G24. Loosen the breaker point anchor screw (6—Fig. G26) and turn the adjusting screw (4) until points close and bulb lights up. Turn adjusting screw in opposite direction until points barely open; then tighten anchor screw (6). Turn crankshaft exactly 1/2-turn and adjust the other set of points in the same manner, using the opposite pointer on timing fixture. NOTE: Timing fixture legs are marked "T" and "B", to adjust breaker points for upper and lower cylinders, respectively.

**COOLING SYSTEM**

**WATER PUMP.** Standard models up to and including 1958 are cooled by a positive displacement, rubber rotor type water pump, mounted on rear of lower unit gear housing and driven by the propeller shaft. Deluxe models are equipped with a rubber impeller type water pump which is mounted on and driven by the lower unit drive shaft. For operation and service on the two types of pumps, refer to the appropriate following paragraphs:

**Models 5S11 through 5S14B:** An eccentric cam (2—Fig. G27) mounts on propeller shaft (1), and rotates to move the rubber rotor (3) back and forth in the machined housing (4). Water enters the pump through an inlet hole in the propeller and is prevented from recirculating by the projecting lug on the rotor. As rotor moves in housing, the water is forced into water tube leading to the power head.

When cooling system troubles are encountered, first remove the propeller and check inlet holes in propeller and water pump rear cover for plugging or partial stoppage. Water pump can be serviced

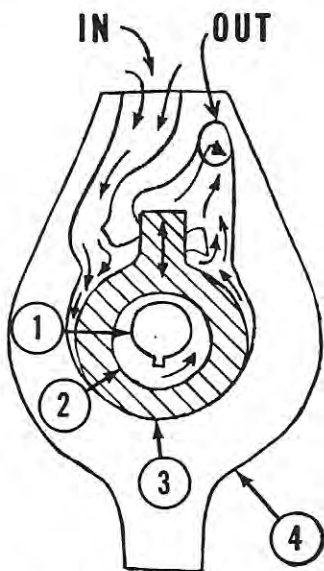


Fig. G27—Schematic view of rubber rotor type water pump showing method of operation. Rotor (3) oscillates in housing (4) due to shape of cam (2) on propeller shaft (1).

after propeller and rear cover are removed. Check also, for leakage in water tube and passages by disassembling the lower unit as outlined in the appropriate paragraphs.

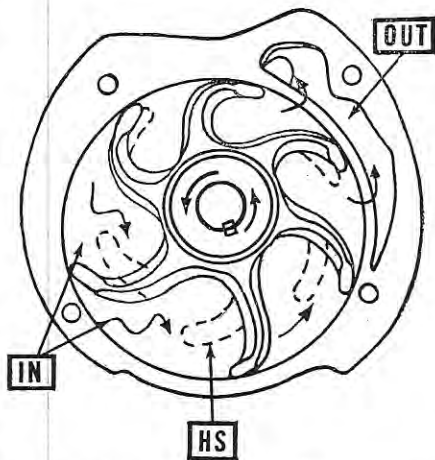


Fig. G28—Schematic view of the rubber impeller type water pump used on late models. Impeller mounts on lower unit drive shaft and rotates in offset pump housing. At slow speeds, impeller blades follow outline of housing. Water is drawn into pump (IN) as area between blades increases, and is forced into power head (OUT) as area narrows. At high speeds, blades remain curved as shown by broken lines (HS) and pump operates by centrifugal action.

Models 5D11 through 5D22B: Refer to Fig. G28 for a schematic view of pump operation, and to Fig. G36 for an exploded view of pump parts.

When cooling system problems are encountered, first check the water inlet for plugging or partial stoppage; then, if not corrected, remove the lower unit as outlined in the appropriate section and check the condition of the water pump, water passages, gaskets and sealing surfaces. The main water inlet scoop is located below the exhaust outlet, above and aft of the propeller.

**POWER HEAD**

**R&R AND DISASSEMBLE.** Clamp the motor to a convenient support and remove the shroud, flywheel, magneto assembly and carburetor assembly. A convenient bench stand for the power head can be quickly constructed from a pipe flange and short piece of one-inch pipe. Bolt the flange to bench and screw pipe into flange. Insert the upper portion of an old drive shaft into pipe with a few inches of upper end extending. Unbolt power head from lower unit and fit crankshaft over old drive shaft. Refer to the appropriate following paragraphs for further disassembly and service.

**Models 5S11 through 5S14B; Model 5D11:** Refer to Fig. G29. Remove the stud nuts retaining the cylinder assembly (1) to the crankcase (8) and carefully withdraw the cylinder assembly from crankcase and pis-

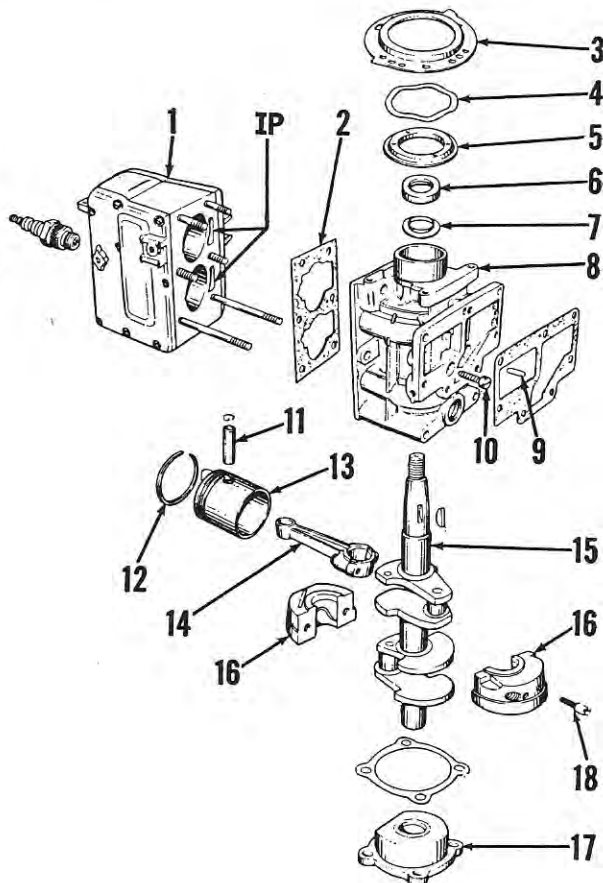


Fig. G29—Exploded view of power head used on models 5S11 through 5S14. Model 5D11 is similar.

- 1. Cylinder
- 2. Gasket
- 3. Support
- 4. Wave washer
- 5. Retainer
- 6. Oil seal
- 7. Oil slinger
- 8. Crankcase
- 9. Dowel pin
- 10. Center bearing screw
- 11. Piston pin
- 12. Piston ring
- 13. Piston
- 14. Connecting rod
- 15. Crankshaft
- 16. Center bearing
- 17. Lower bearing
- 18. Screw
- IP. Intake ports

tons. Make sure the connecting rods and caps are marked for proper reassembly to each other and in the proper cylinder; then unbolt and remove the connecting rod and piston assemblies. Do not attempt to remove the cylinder side covers. These covers only provide access to the water passages and ports, and establishing a satisfactory seal is almost impossible in the shop.

To remove the crankshaft, remove the lower bearing (17), remove the center bearing retaining screw (10) and dowel pin (9); then withdraw crankshaft assembly downward out of crankcase. NOTE: Lower bearing (17) may need to be pried from crankcase. If it does, work slowly all the way around the bearing flange to prevent damage to crankcase or bearing.

When reassembling, follow the procedures outlined in the following ASSEMBLY paragraph. Service the cylinder, pistons, rods, crankshaft and bearings as outlined in the appropriate following paragraphs.

Models 5D12 through 5D22B: Refer to Fig. G30. Original equipment power heads are not equipped with the pictured, needle roller bearing type connecting rod before model 5D18. The pictured power head (Part No. 503435) is, however, recommended as a replacement for all models beginning with model 5D12.

To disassemble the power head, tap-out the two tapered dowel pins (22), then unbolt and remove the crankcase front half (15). NOTE: Two screws (21) are located in the inlet ports and must be removed. Pistons, connecting rods and crankshaft can be removed as a unit after crankcase front half has been removed.

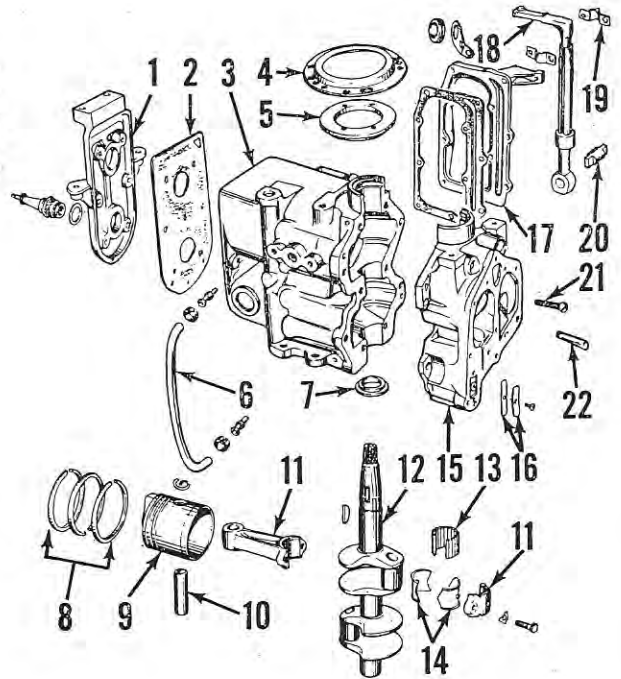
Cylinder head is an integral part of the cylinder assembly. The removable cover (1) is a part of the water jacket and may be removed for inspection or to renew a leaking gasket.

When reassembling, follow the procedures outlined in the following ASSEMBLY paragraph. Service the cylinder, pistons, rods, crankshaft and bearings as outlined in the appropriate following paragraphs. For service on the fuel pump or crankcase bleeder valve, refer to the appropriate paragraphs in the FUEL SYSTEM section.

**REASSEMBLE.** Because of the two-cycle design, crankcase and intake manifold must be completely sealed against both vacuum and pressure. Exhaust manifold must be sealed against water leakage and pressure, and cylinder cover must be sealed against water or air leakage. Mating surfaces of water intake and exhaust areas between power head and lower unit must form a tight seal.

Whenever the power head is disassembled, it is recommended that all gasket surfaces and the mating surfaces of crankcase halves be carefully checked for nicks and burrs or warped surfaces which might interfere with a tight seal. Gasket surfaces may be checked, and lapped if necessary, to provide a smooth surface. For lapping, use a regular lapping block or a sufficiently large piece of smooth, flat plate glass. Lay a sheet of No. 00 emery cloth on the lap-

**Fig. G30—Exploded view of 5D18 and late replacement power head. Models 5D12 to 5D17 are similar except needle type connecting rod bearing is not used.**



1. Cover
2. Gasket
3. Cylinder half
4. Support
5. Retainer
6. Oil line
7. Oil slinger
8. Piston rings
9. Piston
10. Piston pin
11. Connecting rod
12. Crankshaft
13. Bearing needles
14. Bearing liners
15. Crankcase half
16. Bleeder valve
17. Exhaust cover
18. Speed control lever
19. Clamp
20. Throttle pin
21. Screw
22. Taper pin

ping block then place the surface to be lapped on the emery cloth. Apply a very light pressure and use a figure-eight motion, checking frequently to determine progress. Do not remove any more metal than is necessary. Finish lap using lapping compound or worn emery cloth. Thoroughly clean the parts with new oil on a clean, soft rag, then wash with soapsuds and clean rags.

Mating surfaces of crankcase halves may be checked on the lapping block, and high spots removed, but surface must not be lowered. If extreme care is used, a slightly damaged crankcase may be salvaged in this manner. In case of doubt, renew the crankcase assembly.

The crankcase halves are positively located to each other by the use of two tapered dowel pins. Check to make sure that the dowel pins are not bent, nicked or distorted, and that dowel holes are clean and true. When installing dowel pins, make sure they are fully seated, but do not use excessive force.

The mating surfaces of crankcase halves must be sealed during assembly by using a hardening cement, such as Sealer 1000 (available from Marprox Corporation, P. O. Box 955, Sheboygan, Wisconsin). Make sure that all old cement is removed and that surfaces are flat and free from nicks and burrs. Apply cement sparingly and evenly to cylinder half of crankcase only; then immediately install front half. Install the locating dowel pins; then install and tighten the crankcase screws.

When installing gaskets, check to make sure correct gasket is used and that ALL water passage holes are open and not covered. All gasket surfaces must be sealed,

using a non-hardening type cement such as Perfect Seal No. 4. Recommended tightening torques for each model and application are given in the CONDENSED SERVICE DATA section.

**PISTONS, PINS, RINGS AND CYLINDERS.** Before detaching connecting rods from crankshaft, make certain that rod and cap are properly marked for correct assembly to each other and in the correct cylinder.

Each aluminum piston is fitted with three rings which are interchangeable and may be installed either side up. Pistons, pins and rings are available in standard size only. The recommended piston ring end gap is 0.005-0.015 for all models. Ring to groove clearance should be 0.001-0.0035. The recommended piston to cylinder wall clearance is 0.0015-0.0030 for Models 5S11 through 5S14B; 0.002-0.0035 for Model 5D11; and 0.0013-0.0023 for all other models. Renew pistons, rings and/or cylinder assembly if clearance is excessive.

When reassembling, piston should be installed with long, tapering side of piston head toward exhaust side of cylinder as shown in Fig. G31. On models 5S11 through 5S14B, and model 5D11, exhaust ports are located on the starboard side of power head. On all other motors, exhaust ports are on port side.

One pin boss in piston is a press fit while the other boss is a slip fit to prevent distortion of piston as motor warms up. Loose pin boss is indicated by an embossed "L" as shown in Fig. G32. When removing piston pin, remove both retaining rings and drive from marked boss of piston. Install pin through loose boss first.

Special piston ring compressors (OMC Part No. 552482) are required when assembling Models 5S11 through 5S14B and Model 5D11 power heads. Thoroughly lubricate and completely assemble crankshaft, bearings, rods and piston assemblies. Install ring compressors and turn crankshaft until pistons are approximately equal in height. Hold a piece of shim stock over one of the short cylinder stud holes in crankcase (8—Fig. G29) so that stud will not enter hole, then install cylinder (1) over pistons, using the long studs as a guide. When short stud contacts shim stock, work ring compressors down over skirt of pistons. Remove upper ring compressor from side of power head and lower ring compressor from below. Remove shim stock and assemble cylinder to crankcase assembly.

On other models, install piston and rod assemblies individually into cylinders, compressing rings with fingers; then install crankshaft, rod bearing caps and front crankcase half. Thoroughly lubricate all friction surfaces with clean motor oil before assembly.

**CONNECTING RODS, BEARINGS AND CRANKSHAFT.** Before detaching connecting rods from crankshaft, make sure rods and caps are properly marked for correct assembly to each other and in the correct cylinder.

Refer to the CONDENSED SERVICE DATA tables for dimensional information and recommended torque values. If bearing surface of rod and cap is rough, scored, worn

or shows evidence of overheating, renew the connecting rod. If cast-in bearings are scored or worn, renew the housings concerned. Inspect crankpin and main bearing journals. If scored, out-of-round, or worn,

renew the crankshaft. All bearings and friction surfaces should be lubricated during assembly. Renew crankshaft seals whenever power head is disassembled.

**MANUAL STARTER.** Fig. G33 shows a starter typical of the type used. The starter rope can be renewed on most models without disassembly of starter or removal of pulley (4) from housing. To renew the rope, first remove the starter assembly. Pull out the rope until it is fully extended; then insert a pin or punch in hole in pulley to prevent recoil spring from unwinding. Pry out the rope anchor (15) and remove anchor and handle (14). Grasp the anchor or knot at inner end of rope and pull rope out from underside of pulley. Install rope by reversing removal procedure.

To renew starter spring, pry out rope anchor (15) and feed the rope into pulley housing until spring is fully unwound. Remove the bolt and nut through pulley hub and carefully remove hub; then lift off pulley, being careful that spring (3) remains in recess in housing. Protect hands with gloves or other means and remove spring carefully to prevent injury by the uncoiling spring. With housing inverted, attach outer end of spring to housing anchor, then coil spring into recess in a counter-clockwise direction. Lubricate with a high-temperature grease then install pulley and hub. Completely wind the spring, back-off until pulley anchor slot is aligned with rope hole, then install starter rope.

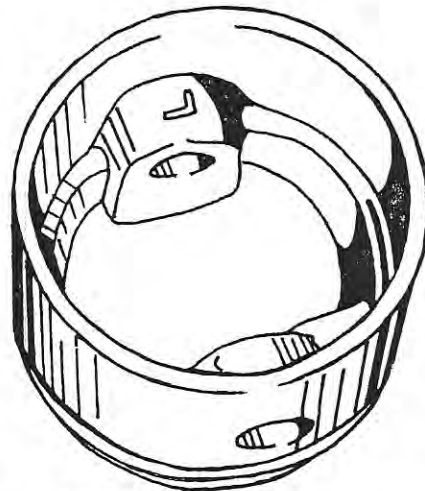


Fig. G32—View of lower side of piston showing the "L" marking which indicates the "Loose" piston pin boss. See text for details.

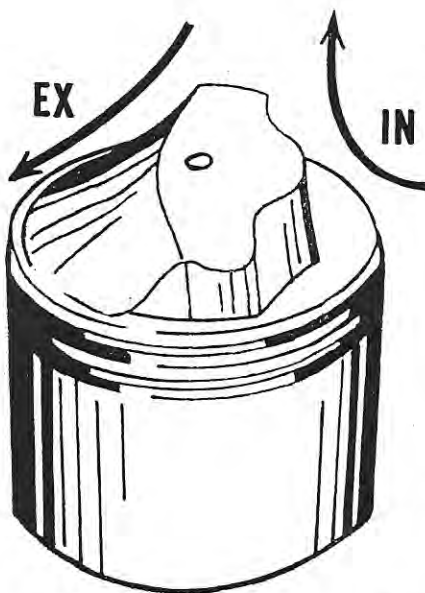
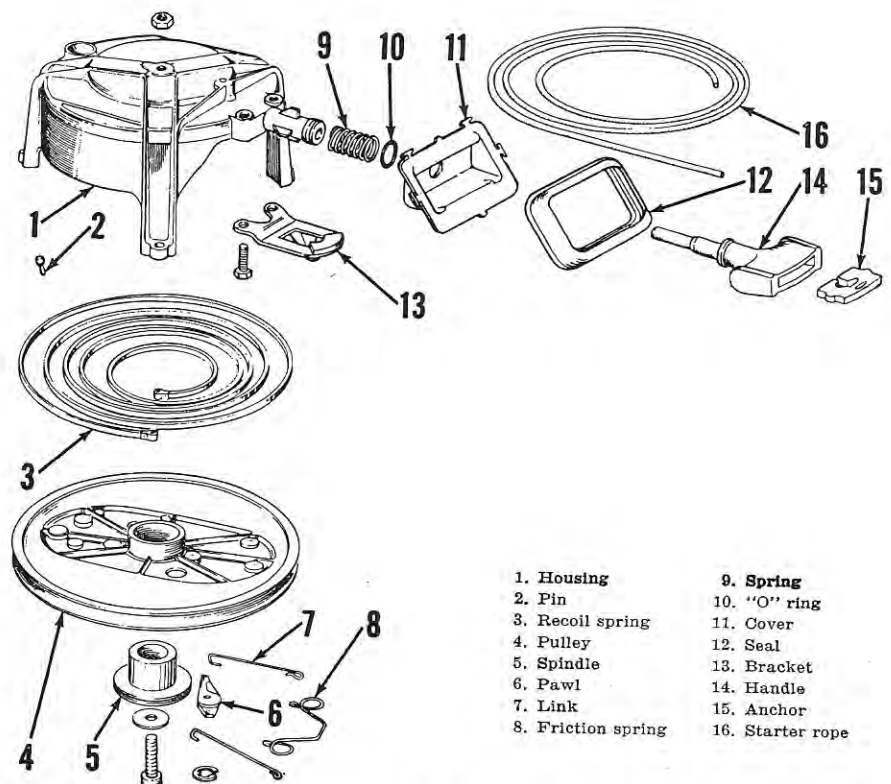


Fig. G31—Baffle on top of piston head is designed to direct the flow of incoming mixture for proper scavenging. Piston must be installed as shown with relation to cylinder ports.

IN, Inlet port

EX, Exhaust port

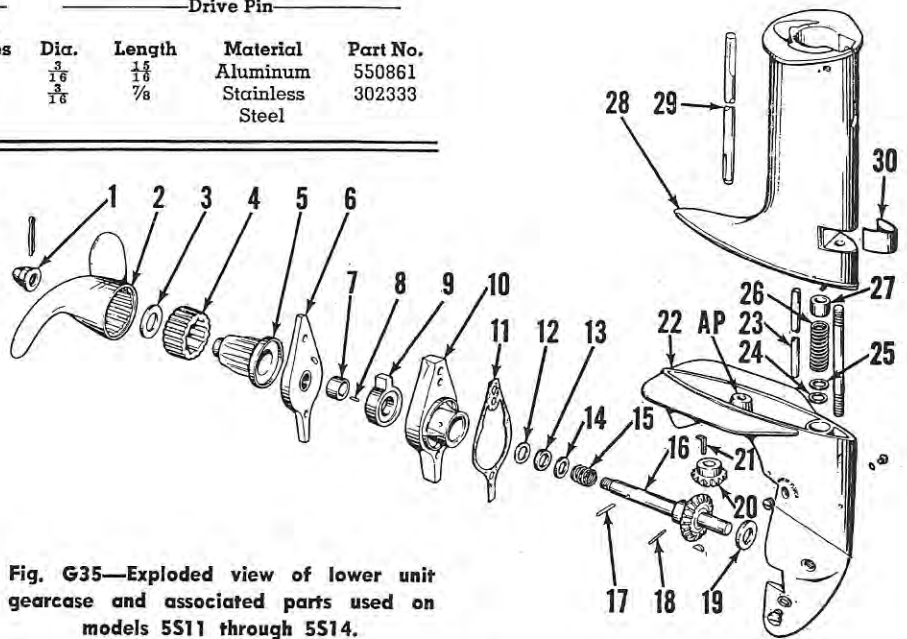


- |                    |                  |
|--------------------|------------------|
| 1. Housing         | 9. Spring        |
| 2. Pin             | 10. "O" ring     |
| 3. Recoil spring   | 11. Cover        |
| 4. Pulley          | 12. Seal         |
| 5. Spindle         | 13. Bracket      |
| 6. Pawl            | 14. Handle       |
| 7. Link            | 15. Anchor       |
| 8. Friction spring | 16. Starter rope |

Fig. G33—Exploded view of manual starter of the type used on late models. Early models are similar.

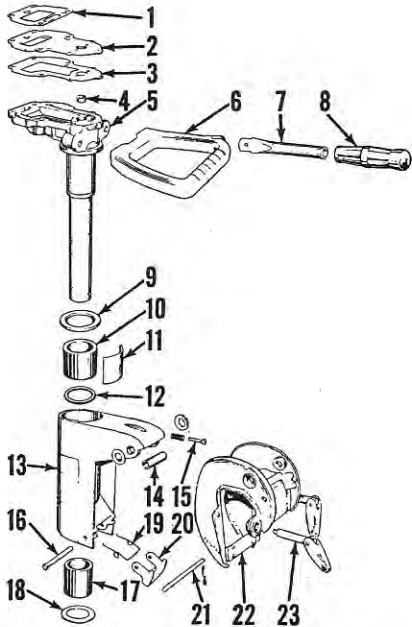
Model	Propeller			Drive Pin			
	Dia.	Pitch	No. Blades	Dia.	Length	Material	Part No.
5S11 through 5S14B	7½	7¼	2	⅜	1½	Aluminum	550861
5D11 through 5D22B	8	7¼	2	⅜	¾	Stainless Steel	302333

**PROPELLER AND DRIVE PIN.** Cushioning protection for propeller and drive unit is provided by a slip clutch in propeller on 5S models; or by a cushioning clutch built into pinion shaft (10—Fig. G36) on 5D motors. Service consists of renewing clutch ring (4—Fig. G35) or pinion shaft (10—Fig. G36).



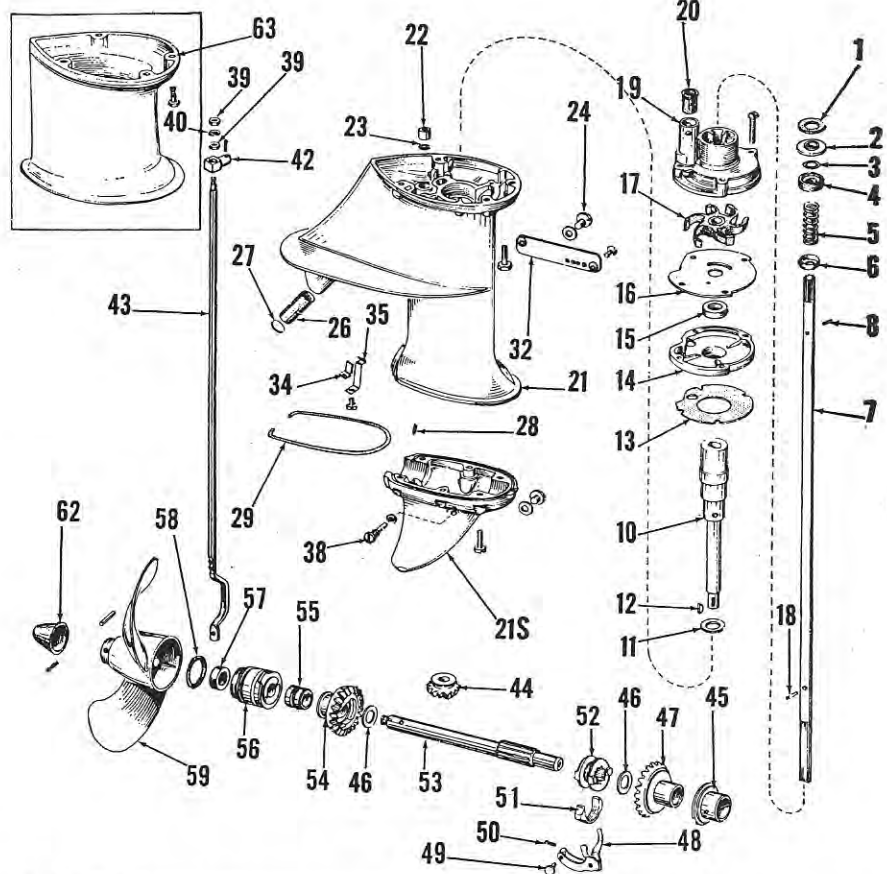
**Fig. G35—Exploded view of lower unit gearcase and associated parts used on models 5S11 through 5S14.**

- |                |                     |                   |                        |
|----------------|---------------------|-------------------|------------------------|
| 1. Nut         | 9. Pump rotor       | 17. Pin           | 25. Washer             |
| 2. Propeller   | 10. Water pump      | 18. Pin           | 26. Spring             |
| 3. Washer      | 11. Gasket          | 19. Thrust washer | 27. Pilot dowel        |
| 4. Clutch ring | 12. Seal disc       | 20. Drive pinion  | 28. Driveshaft housing |
| 5. Clutch hub  | 13. Packing         | 21. Key           | 29. Drive shaft        |
| 6. Rear cover  | 14. Packing cup     | 22. Gearcase      | 30. Cover              |
| 7. Pump cam    | 15. Spring          | 23. Water tube    | AP. Attaching point    |
| 8. Key         | 16. Propeller shaft | 24. Seal          |                        |



**Fig. G34—Exploded view of stern bracket, drive shaft housing and associated parts used on models 5S11 through 5S14.**

- |                       |                     |
|-----------------------|---------------------|
| 1. Gasket             | 13. Pivot housing   |
| 2. Manifold plate     | 14. Spacer          |
| 3. Gasket             | 15. Adjusting screw |
| 4. Driveshaft seal    | 16. Lock pin        |
| 5. Driveshaft housing | 17. Bushing         |
| 6. Carrying handle    | 18. Thrust washer   |
| 7. Steering handle    | 19. Spring          |
| 8. Grip               | 20. Reverse lock    |
| 9. Thrust washer      | 21. Pin             |
| 10. Bushing           | 22. Stern bracket   |
| 11. Clamp             | 23. Clamp screws    |
| 12. Seal ring         |                     |



**Fig. G36—Lower unit gear case and water pump assembly used on models 5D11 up.**

- |                     |                     |
|---------------------|---------------------|
| 1. Gasket           | 29. Seal            |
| 2. Plate            | 32. Cover           |
| 3. "O" ring         | 34. Spring          |
| 4. Seal             | 35. Spring          |
| 5. Spring           | 38. Pivot pin       |
| 6. Washer           | 39. Nut             |
| 7. Drive shaft      | 40. Lock washer     |
| 8. Pin              | 42. Connector       |
| 10. Pinion shaft    | 43. Shift rod       |
| 11. Thrust washer   | 44. Pinion gear     |
| 12. Woodruff key    | 45. Bearing         |
| 13. Gasket          | 46. Thrust washer   |
| 14. Bearing housing | 47. Forward gear    |
| 15. Seal            | 48. Shift yoke      |
| 16. Plate           | 49. Pin             |
| 17. Impeller        | 50. Cotter pin      |
| 18. Pin             | 51. Cradle          |
| 19. Housing         | 52. Clutch dog      |
| 20. Seal            | 53. Propeller shaft |
| 21. Gear case       | 54. Reverse gear    |
| 21S. Lower housing  | 55. Gear bushing    |
| 22. Bushing         | 56. Gearcase head   |
| 23. "O" ring        | 57. Seal            |
| 26. Screen          | 58. "O" ring        |
| 27. Plug            | 59. Propeller       |
| 28. Dowel pin       |                     |



**REMOVE AND REINSTALL.** Most service on the lower unit can be performed by detaching the gearcase housing from driveshaft housing or exhaust housing. When servicing the lower unit, pay particular attention to water pump and water tubes with respect to air or water leaks. Leaky connections may interfere with proper cooling of the motor. Water leaks also may permit the inside of driveshaft casing to fill up with water which can eventually find its way into motor crankcase through the lower bearing, and/or into the gearcase where it washes out the lubricant. Look for

water leaks if the gearcase requires an abnormal amount of lubricant.

Use the appropriate exploded views (Fig. G34 through Fig. G39) as a guide when overhauling the lower unit, together with the special precautions listed below. All gasket surfaces must be smooth, free from nicks and burrs, and assembled using a non-hardening type sealer such as Perfect Seal No. 4. All joints without gaskets must be smooth and free from nicks, burrs and old cement, and sealed with a hardening sealer such as Sealer 1000, available from Marprox Corporation, P. O. Box 955, She-

boygan, Wisconsin. Refer to the CONDENSED SERVICE DATA table for repair specifications and recommended tightening torques.

**Models 5S11 through 5S14B:** Service on the water pump or propeller shaft can be performed by removing propeller and water pump. To detach the gearcase housing (22—Fig. G35) from the driveshaft housing (28), snap off the cover (30) from forward side of driveshaft housing and remove the exposed stud nut. Remove the screw from lower side of exhaust outlet at point (AP) and withdraw gearcase housing, being

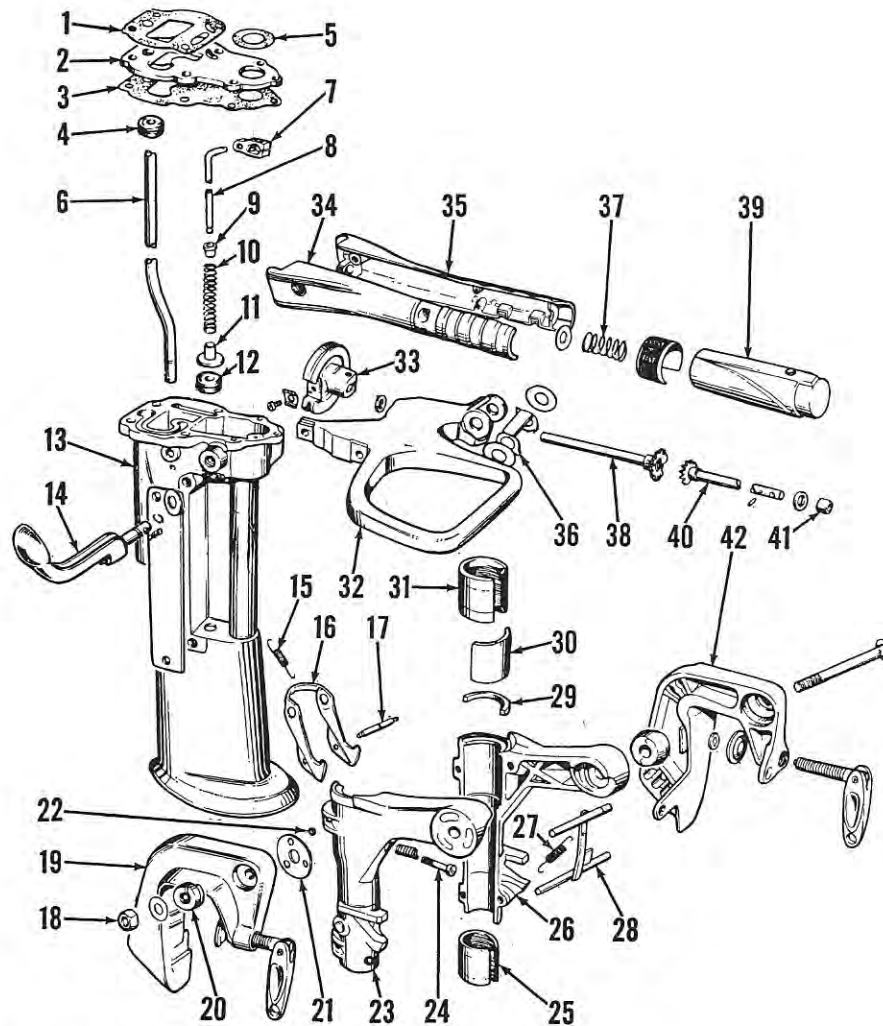


Fig. G37—Exploded view of model 5D11 stern bracket, exhaust housing and associated parts.

- |                     |                     |                     |
|---------------------|---------------------|---------------------|
| 1. Gasket           | 15. Spring          | 29. Thrust washer   |
| 2. Cover plate      | 16. Reverse lock    | 30. Friction plate  |
| 3. Gasket           | 17. Lock rod        | 31. Shock absorber  |
| 4. Grommet          | 18. Nut             | 32. Carrying handle |
| 5. Gasket           | 19. Stern bracket   | 33. Throttle pulley |
| 6. Water tube       | 20. Spring          | 34. Steering handle |
| 7. Shift lever      | 21. Shim            | 35. Steering handle |
| 8. Shift rod        | 22. Ball            | 36. Gear cover      |
| 9. Sleeve           | 23. Swivel bracket  | 37. Spring          |
| 10. Spring          | 24. Adjusting screw | 38. Throttle shaft  |
| 11. Sleeve          | 25. Shock absorber  | 39. Throttle grip   |
| 12. Grommet         | 26. Swivel bracket  | 40. Throttle shaft  |
| 13. Exhaust housing | 27. Spring          | 41. Bushing         |
| 14. Shift lever     | 28. Tilt lever      | 42. Stern bracket   |

careful not to damage the water tube (23). To remove the lower driveshaft housing (28), remove the screw from upper port side of housing and loosen screw at front of housing. Housing will then slip down off of driveshaft tube (5—Fig. G34).

Models 5D11 through 5D22B: The propeller shaft (53—Fig. G36) and drive gears (54 and 47) can be removed for service after first draining lubricant from gear housing, removing pivot screw (38) and unbolting and removing gearcase lower housing (21S).

On Model 5D11, shifter rod (43) is a two-piece unit, with a connecting clamp located

at upper part of gearcase housing (21). On all other models, shifter rod (43) is one piece as shown. To separate gearcase housing from exhaust tube on Model 5D11, shift the lever into reverse and remove the four screws attaching gearcase (21) to exhaust housing. Slide the gearcase unit down slightly until shifter rod clamp is exposed, disconnect the clamp and remove the gearcase assembly. On all other models, to separate gearcase housing from exhaust housing, proceed as follows:

First remove the power head from lower unit. Remove the two nuts retaining shifter swivel (7—Fig. G38 or 3—Fig. G39) to

shifter rod, then unbolt and remove the gearcase housing and shifter rod. When reassembling, adjust the nuts on swivel until shift lever (3—Fig. G38 or 6—Fig. G39) moves the same distance on each side of the "Neutral" detent position and clutch dog (52—Fig. G36) is centered between forward and reverse gears when shift lever is in neutral.

**STEERING TENSION.** Steering tension can be adjusted by turning the adjusting screw (24—Fig. G37, 40—Fig. G38 or 25—Fig. G39) until motor is easy to steer, but will maintain a set course.

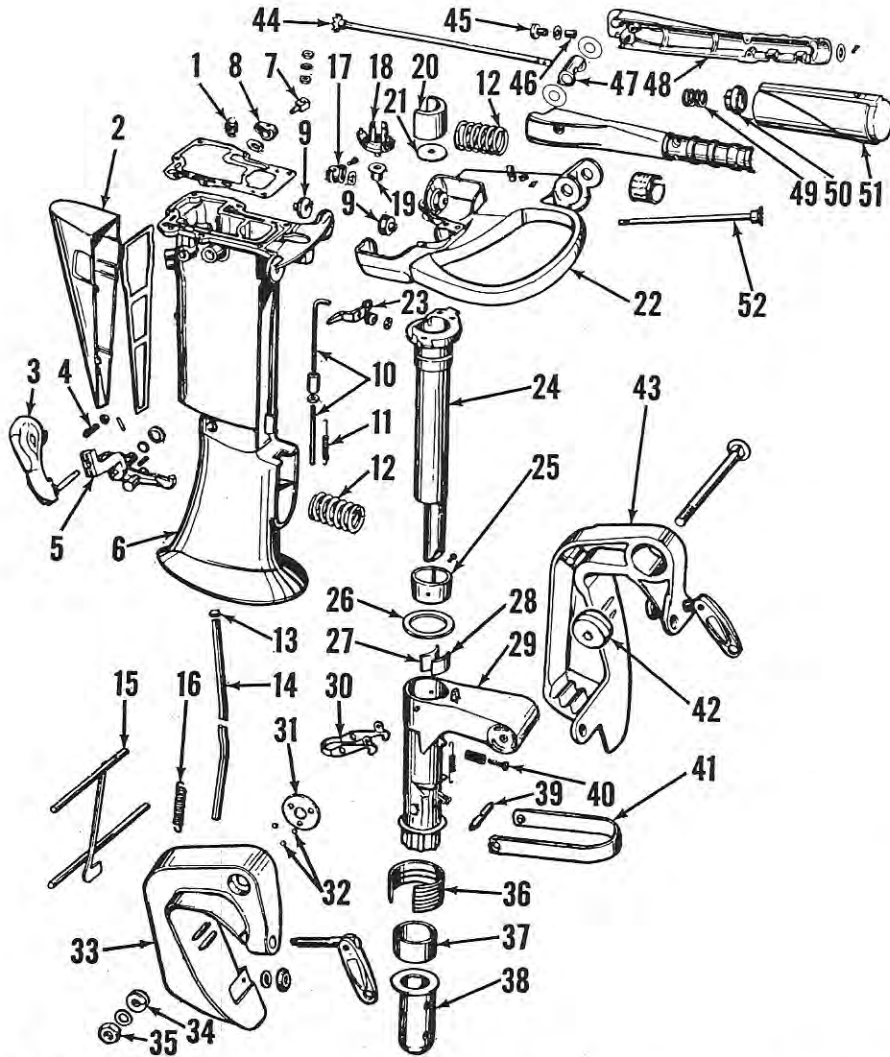


Fig. G38—Exploded view of drive shaft housing, stern bracket and associated parts used on models 5D12 through 5D16.

- |                     |                     |                     |
|---------------------|---------------------|---------------------|
| 1. Nut              | 18. Throttle gear   | 36. Shock absorber  |
| 2. Exhaust cover    | 19. Bushing         | 37. Sleeve          |
| 3. Shift lever      | 20. Support         | 38. Retainer        |
| 4. Spring           | 21. Plate           | 39. Lock rod        |
| 5. Shift lever      | 22. Carrying handle | 40. Adjusting screw |
| 6. Exhaust housing  | 23. Lock arm        | 41. Band            |
| 7. Connector        | 24. Pilot shaft     | 42. Conical washer  |
| 8. Shift lever      | 25. Liner           | 43. Stern bracket   |
| 9. Retainer         | 26. Thrust washer   | 44. Throttle shaft  |
| 10. Shift rod       | 27. Spacer          | 45. Bushing         |
| 11. Spring          | 28. Plate           | 46. Bushing         |
| 12. Spring          | 29. Swivel bracket  | 47. Gear cover      |
| 13. Gland           | 30. Reverse lock    | 48. Steering handle |
| 14. Water tube      | 31. Shim            | 49. Spring          |
| 15. Tilt lever      | 32. Balls           | 50. Friction block  |
| 16. Spring          | 33. Stern bracket   | 51. Throttle grip   |
| 17. Throttle pinion | 34. Spring          | 52. Throttle shaft  |
|                     | 35. Nut             |                     |

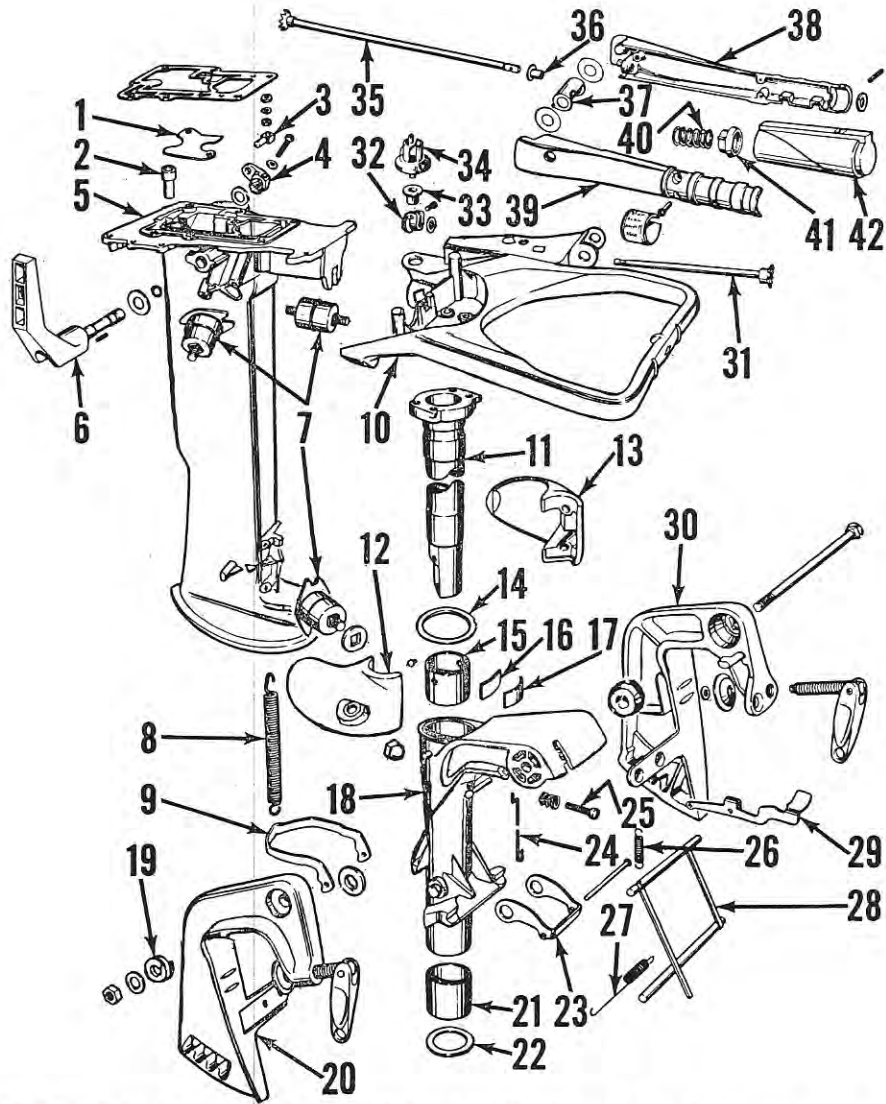


Fig. G39—Exploded view of stern bracket, exhaust housing and associated parts used on 5D17 and later models.

- 1. Cover plate
- 2. Restrictor
- 3. Connector
- 4. Shift lever
- 5. Exhaust housing
- 6. Shift lever
- 7. Rubber mount
- 8. Spring
- 9. Reverse lock
- 10. Steering bracket
- 11. Pilot shaft
- 12. Housing
- 13. Housing
- 14. Thrust washer

- 15. Liner
- 16. Spacer
- 17. Plate
- 18. Swivel bracket
- 19. Spring
- 20. Stern bracket
- 21. Shock absorber
- 22. Thrust washer
- 23. Link
- 24. Link
- 25. Adjusting screw
- 26. Spring
- 27. Spring
- 28. Tilt lever

- 29. Arm
- 30. Stern bracket
- 31. Throttle shaft
- 32. Throttle pinion
- 33. Bushing
- 34. Throttle gear
- 35. Throttle shaft
- 36. Bushing
- 37. Gear cover
- 38. Steering lever
- 39. Steering lever
- 40. Spring
- 41. Friction block
- 42. Throttle grip