GALE

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

CONDENSED SERVICE DATA

Series	12 hp	15 hp	22 hp	25 hp
Year Produced				
1955	12D11	.....	22D10-22D12	.....
1956	12S12-12D13-12D14	.....	.....	22D11-22D13
1957	12S13-12D15-12DE16	.....	.....	22D14
1958	12S15-12D17	.....	.....	22D15
1959	12D18	.....	.....	22D16
1960	.....	15D10	.....	22D17
1961	.....	15D11-15D12	.....	25D18-25D20
1962	.....	15D13-15D14	.....	25D19
1963	.....	15D15	.....	25D21
NOTE: Letter "E" in model number indicates electric model. Letter "L" in model number indicates "Long" lower unit.				
TUNE-UP				
Hp @ rpm	12.0 @ 4000	15.0 @ 4500	22.0 @ 4000	25.0 @ 4000
Bore—Inches	2¼	2⅜	2¾	2⅞
Stroke—Inches	2¼	2¼	2¾	2¾
Number of Cylinders	2	2	2	2
Displacement—Cu. In.	17.89	19.94	32.6	35.7
Spark Plug				
Champion	J6J	J6J	J6J	J6J
AC	M44C	M44C	M44C	M44C
Auto-Lite	A3X	A3X	A3X	A3X
Electrode Gap	0.030	0.030	0.030	0.030
Magneto				
Point Gap	0.020	0.020	0.020	0.020
Timing	See Text	See Text	See Text	See Text
Carburetor				
Make	Own	Own	Own	Own
Adjustment	See Text	See Text	See Text	See Text
Fuel—Oil Ratio	24:1	24:1	24:1	24:1
SIZES—CAPACITIES				
POWER HEAD				
Piston Rings				
End Gap	0.007-0.017	0.007-0.017	0.007-0.017	0.007-0.017
Side Clearance	0.001-0.0035	0.001-0.0035	0.001-0.0035	0.001-0.0035
Piston Skirt Clearance	0.002-0.0035	0.0025-0.004	0.0035-0.005	0.003-0.0045
Crankshaft Bearing Diameter				
Main Bearings	0.9995-1.000	0.9995-1.000	0.9995-1.000	0.9995-1.000
Crankpin	0.8730-0.8745	1.000-1.0005	1.1818-1.1823	1.1818-1.1823
Crankshaft Bearing Diametral Clearance				
Top Main Brng.	0.0025-0.0035	Roller Brng.	Roller Brng.	Roller Brng.
Center Main Brng.	0.0025-0.0035	Roller Brng.	Roller Brng.	Roller Brng.
Lower Main Brng.	0.0025-0.0035	0.0025-0.0035	Roller Brng.	Roller Brng.
Crankpin	0.0005-0.0015	Roller Brng.	Roller Brng.	Roller Brng.
Piston Pin Diametral Clearance In Rod	0.0003-0.001	0.0003-0.001	0.0003-0.001	0.0003-0.001
LOWER UNIT				
Drive Shaft Diameter	0.499-0.500	0.499-0.500	0.624-0.625	0.624-0.625
Diametral Clearance	0.002-0.0035	0.002-0.0035	0.0005-0.002	0.0005-0.002
Propeller Shaft Diameter (At Bearings)				
Front	0.6250-0.6255	0.6255-0.6260	Roller Brng.	Roller Brng.
Rear	0.6683-0.6688	0.6683-0.6688	Ball Brng.	Ball Brng.
Propeller Shaft Bearing Diametral Clearance	0.001-0.002	0.001-0.002	.....	.....
TIGHTENING TORQUES				
(All Values In Inch-Pounds)				
Connecting Rod	96	180-186	180-186	180-186
Crankcase Halves	120-144	120-144	144-168	144-168
Cylinder Head	96-120	96-120	216-244	216-244
Flywheel	480-540	480-560	720-780	720-780
Spark Plug	240-246	240-246	240-246	240-246

LUBRICATION

The power head is lubricated by oil mixed with the fuel. Use ⅓-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.

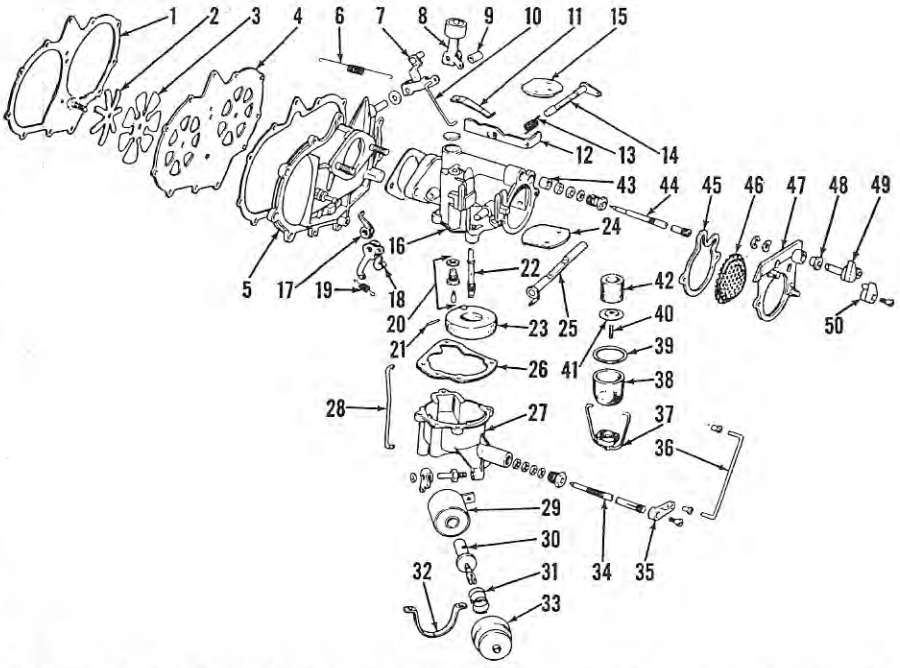


Fig. G46—Exploded view of carburetor used on late model 25 horsepower models with electric start. Early models are similar except for air silencer and controls. Solenoid switch (29 through 33) is not used on models without electric starter.

1. Gasket
2. Reed stop
3. Reed petals
4. Reed plate
5. Inlet manifold
6. Spring
7. Throttle lever
8. Cam follower
9. Spacer
10. Link
11. Spring
12. Choke rod
13. Spring
14. Throttle shaft
15. Throttle valve
16. Body
17. Lever
18. Bellcrank
19. Spring
20. Needle valve & seat
21. Float shaft
22. Nozzle
23. Float
24. Choke valve
25. Choke shaft
26. Gasket
27. Bowl
28. Choke link
29. Solenoid housing
30. Plunger
31. Spring
32. Clamp
33. Boot
34. High speed needle
35. Valve arm
36. Link
37. Bowl clamp
38. Filter bowl
39. Gasket
40. Filter stud
41. Filter nut
42. Filter
43. Bushing
44. Slow speed needle
45. Gasket
46. Screen
47. Control panel
48. Bushing
49. Adjusting Knob
50. Adjusting knob

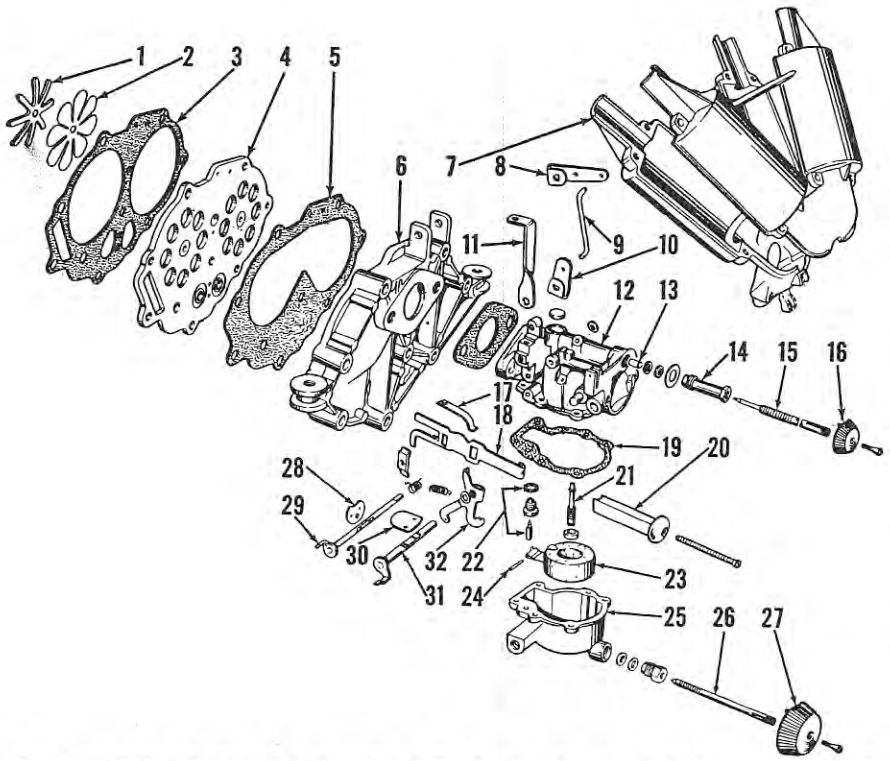


Fig. G45—Exploded view of carburetor of the type used on most 12 horsepower models. Carburetor used on 15 horsepower models is similar except for air silencer and mixture adjustment controls.

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

FUEL SYSTEM

CARBURETOR. Float type carburetors are used on all models. Refer to Fig. G45 or Fig. G46. On 12 and 15 horsepower models, normal initial setting for both the high speed mixture adjusting needle (26—Fig. G45) and the low speed mixture adjusting needle (15) is ¾-turn from closed position. On 22 and 25 horsepower motors, normal initial setting for the low speed mixture needle (44—Fig. G46) is approximately two full turns from closed position. Initial setting for high speed mixture needle (34) is ¾-turn. On some models, knob or bellcrank arm must be removed from needle to make the initial adjustments. On all models, final adjustment must be made when motor is in operation, by turning knobs on control panel. Clockwise rotation of both needles leans the mixture. On late models, low idle speed can be adjusted by turning the screw on speed control gear shown in Fig. G47.

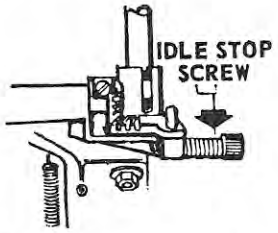


Fig. G47—Late motors have a slow speed stop screw on speed control vertical shaft gear as shown. Screw is on port side of motor.

To set the carburetor float level, remove the shroud and control panel; then unbolt and remove the carburetor. Remove the float chamber and invert the carburetor body with float attached as shown in Fig. G48. The upper surface of float (lower surface when assembly is inverted) should be level and flush with gasket surface of carburetor body as shown. If it is not, carefully bend float lever; then check after assembly, to be sure float does not bind or rub. When in correct operating position and float has dropped, no more than 1½ inches clearance should exist between near edge of float and gasket surface of carburetor body. The amount of drop can be adjusted by bending the small protruding tab on float lever.

Some 22 and 25 horsepower models are equipped with an electrically operated choke which employs a carburetor mounted solenoid (29 through 33—Fig. G46). To adjust the electric choke, loosen band (A—Fig. G49) and pull out manual choke control rod until choke is fully closed. Push solenoid through band as indicated by arrow, until plunger bottoms in housing. Tighten band, then check to see that choke operates properly.

SPEED CONTROL LINKAGE. The carburetor throttle valve is synchronized to open as the ignition timing is advanced. It is very important that ignition timing and throttle valve opening be correctly synchronized to obtain satisfactory operation. To synchronize the speed control linkage, proceed as outlined in the appropriate following paragraphs:

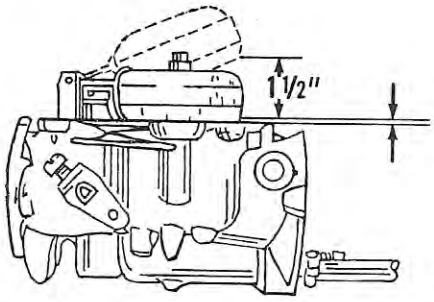


Fig. G48—When carburetor body is inverted, float should be even and flush with gasket surface as shown by arrows. Maximum drop of float should not exceed 1½ inches.

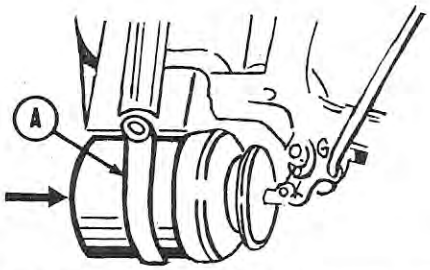


Fig. G49—To adjust the choke solenoid, pull out on manual choke, loosen clamp (A) and push solenoid housing through clamp in direction of arrow until plunger bottoms.

12 and 15 Horsepower Models: The speed control lever rotates the magneto armature plate to advance the timing. A cam (C—Fig. G50), attached to bottom of armature plate (P), acts through cam follower (F) and linkage to open the throttle valve. To adjust the linkage, turn the speed control grip until scribe line (L) on cam aligns with cam follower as shown. Loosen the two cam attaching screws (A), and while holding throttle closed, move cam in slotted attaching hole until all slack is removed from linkage. Tighten the attaching screws, then check to be sure that throttle valve starts to open as cam follower passes the scribe line when speed control is advanced.

22 and 25 Horsepower Models: The throttle valve should just start to open when the scribe line (S—Fig. G51) on armature plate cam (C) passes alignment with the timing pointer (P) cast into the intake manifold. To adjust the linkage, turn the speed control grip until scribe line (S) and pointer (P) are aligned, and loosen the two cam attaching screws (A). While holding the throttle valve closed, move cam in slotted attaching holes as indicated by arrow, until all slack is removed from linkage. Tighten the attaching screws; then check to make sure that throttle valve starts to open when speed control is further moved toward the fast position.

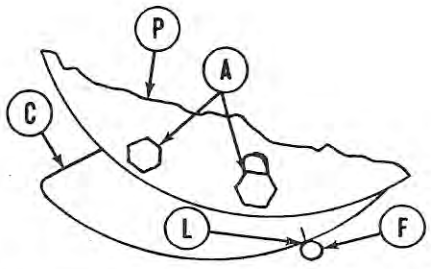


Fig. G50—Schematic view of speed control mechanism used on 12 and 15 horsepower models. Refer to text for method of adjustment.

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

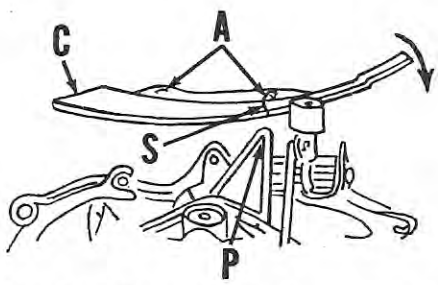


Fig. G51—To synchronize throttle on 22 and 25 horsepower motors, turn speed control grip until scribe line (S) is aligned with pointer (P). Loosen screws (A) securing cam (C) to armature plate, and move end of cam as shown until all slack is removed from throttle linkage. Throttle must be held in closed position.

REED VALVES. The reed type inlet valve unit (1 & 2—Fig. G45 or 2 & 3—Fig. G46) attaches to reed plate (4). The reed valves should be checked whenever the carburetor is removed for service. The reed petals should seat very lightly against reed plate throughout entire length of reed, with the least possible tension. Renew reed petals if broken, cracked, warped, rusted or bent. Do not attempt to bend or straighten reed petals. Seating surface of reed plate must be smooth and flat and reed petals must center over inlet holes in plate when assembled. The extensions on reed stop must be centered on reed petals.

FUEL PUMP. Most models are equipped with a diaphragm type fuel pump as shown in Fig. G52. Pressure and vacuum pulsations in crankcase are directed through a passage to one side of pump diaphragm (11). Vacuum in the crankcase draws the diaphragm inward as shown in View "A", Fig. G53. Fuel is thus drawn from fuel tank past the inlet check valve (5) as shown by arrow. As power head piston moves downward in cylinder (View "B"), pressure is induced to back side of pump diaphragm.

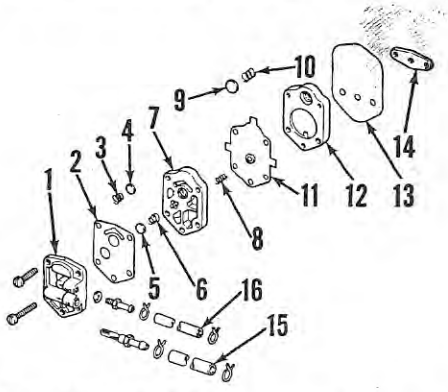


Fig. G52 — Exploded view of diaphragm type fuel pump used on most models.

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

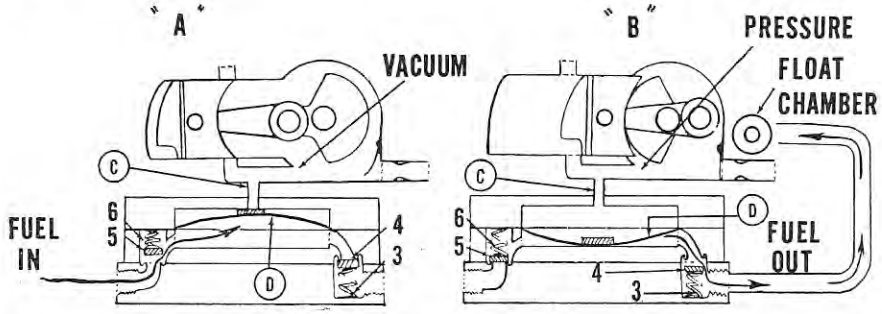


Fig. G53—Schematic view showing operation of the crankcase operated, diaphragm fuel pump. Pressure and vacuum pulsations from crankcase pass through connection (C) to rear of diaphragm (D) which induces pumping action on fuel line as shown.

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

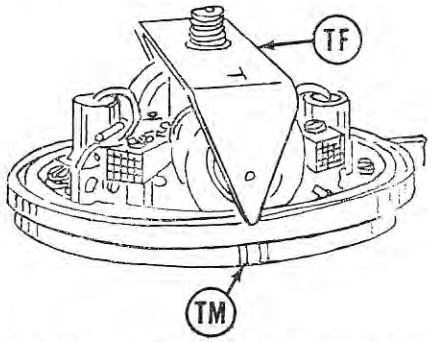


Fig. G56—Timing fixture (TF) installed and aligned with armature plate timing marks (TM) for adjusting points for upper cylinder. Refer to text.

forcing fuel out past the outlet check valve (4) as shown.

All defective or questionable parts should be renewed. Diaphragm (11—Fig. G52) should be renewed if air leaks or cracks are found, or if its condition is in any way questionable.

CRANKCASE BLEEDER VALVE. All models are equipped with a reed type bleeder valve as shown in Fig. G54 or Fig. G55. The bleeder valve is designed to remove any liquid fuel or oil which might accumulate 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 forces the leaf valve (LV) off its seat and blows the liquid out into the exhaust passage.

Access to the bleeder valve on 12 and 15 horsepower models is possible after removing carburetor and inlet manifold. On 22 and 25 horsepower models, bleeder valve is covered by a separate plate which can be removed for service. Check the bleeder valve whenever improper crankcase pressure or vacuum is indicated or whenever the power head is overhauled. The leaf valve (LV) should exert a slight pressure against its seat. Seating surface of crankcase should be smooth and flat. Renew valve leaf and stop if leaf is broken, cracked, warped, rusted or bent. Bleeder passages should be blown out with compressed air whenever motor is overhauled.

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) to be used in adjusting and synchronizing the magneto. The fixture is installed on crankshaft in place of flywheel as shown in Fig. G56, and used in conjunction with a timing light of the type shown in Fig. G57.

To synchronize the points using the timing fixture and light, remove the flywheel and install timing fixture, making sure it is properly fitted over flywheel key. Install timing light by attaching one clip to the insulated point (3—Fig. G58) and grounding the other clip. Bulb should light when points are closed, and go out when points are opened. Turn crankshaft until fixture pointer rests midway between the two embossed armature plate timing marks as shown in Fig. G56. Loosen the breaker point anchor screw (6—Fig. G58) and turn the adjusting screw (4) until points close and bulb lights up. Turn adjusting screw in opposite direction until points barely open as indicated by timing light going out; then tighten anchor screw (6). Turn crankshaft exactly ½-turn until the opposite pointer of timing fixture is aligned; then adjust the other set of points. NOTE: Timing fixture pointer legs are marked "T" and "B" to indicate upper and lower cylinders respectively.

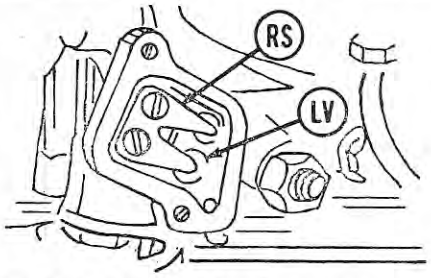


Fig. G55—Crankcase bleeder valve used on 22 and 25 horsepower models. The bleeder valve may be serviced without disassembly of power head by removing the valve plate.

LV. Leaf valve RS. Reed stop

COOLING SYSTEM

WATER PUMP. All models are equipped with a rubber impeller type water pump. Impeller is mounted on and driven by the drive shaft in the lower unit. Refer to Fig. G59.

The main water inlet scoop is located below the exhaust outlet, above and aft of the propeller.

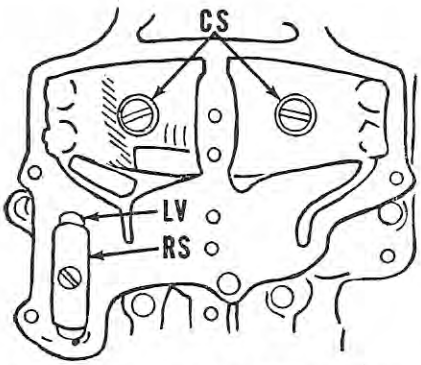


Fig. G54—Crankcase of 12 and 15 horsepower model with carburetor and inlet manifold removed. The reed-type crankcase bleeder valve (LV) and reed stop (RS) can be removed for service after manifold is off. To disassemble the crankcase, the two center main bearing screws (CS) in inlet ports must be removed.

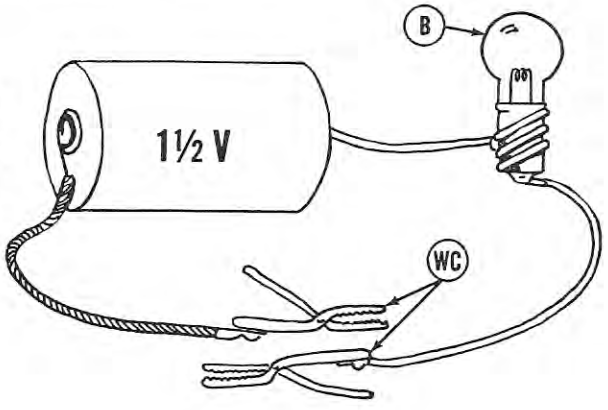


Fig. G57—A timing light such as the one shown, is required to properly synchronize the two sets of points. The light can be made from a flashlight battery, bulb (B), wire clamps (WC) and short sections of wire.

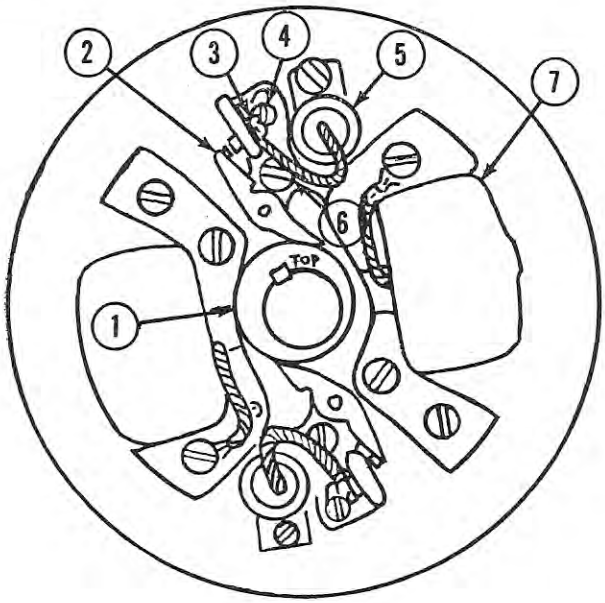


Fig. G58 — Magneto assembly with flywheel removed. Unit contains a separate coil, points and condenser for each cylinder.

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

When 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.

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 driveshaft. Refer to Fig. G60 or Fig. G61 for an exploded view of the power head assembly.

Unbolt and remove the cylinder head (1). Remove the upper bearing oil line (15—Fig. G60 or 21—Fig. G61). Drive out the two tapered aligning pins (17—Fig. G60 or 16—Fig. G61) and remove the armature support (3—Fig. G60 or 4—Fig. G61); then unbolt and remove the crankcase front half. NOTE: Two of the retaining cap screws (14—Fig. G60 or 19—Fig. G61) are accessible through the intake ports as shown in Fig. G54. If crankcase half is stuck, tap it lightly with a soft hammer, DO NOT use a pry between the crankcase and cylinder assembly.

Pistons, rods and crankshaft are now accessible for removal and overhaul as outlined in the appropriate following paragraphs.

When reassembling, follow the procedures outlined in the following ASSEMBLY paragraph.

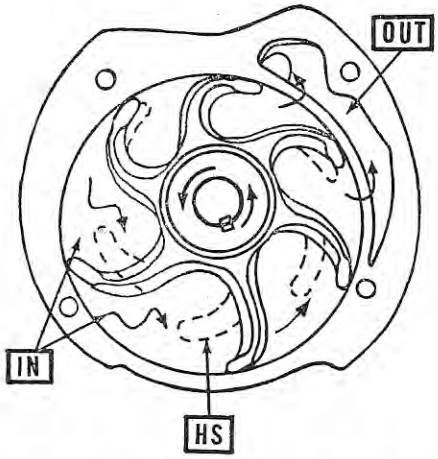


Fig. G59—Schematic view of the rubber impeller type water pump used on all models. Impeller mounts on lower unit drive shaft and rotates in offset pump housing. Water is drawn into pump (IN) as area between blades increases, and is forced into power head (OUT) as area narrows. At high speeds, blades remain curved as shown by broken lines (HS) and pump operates by centrifugal action.

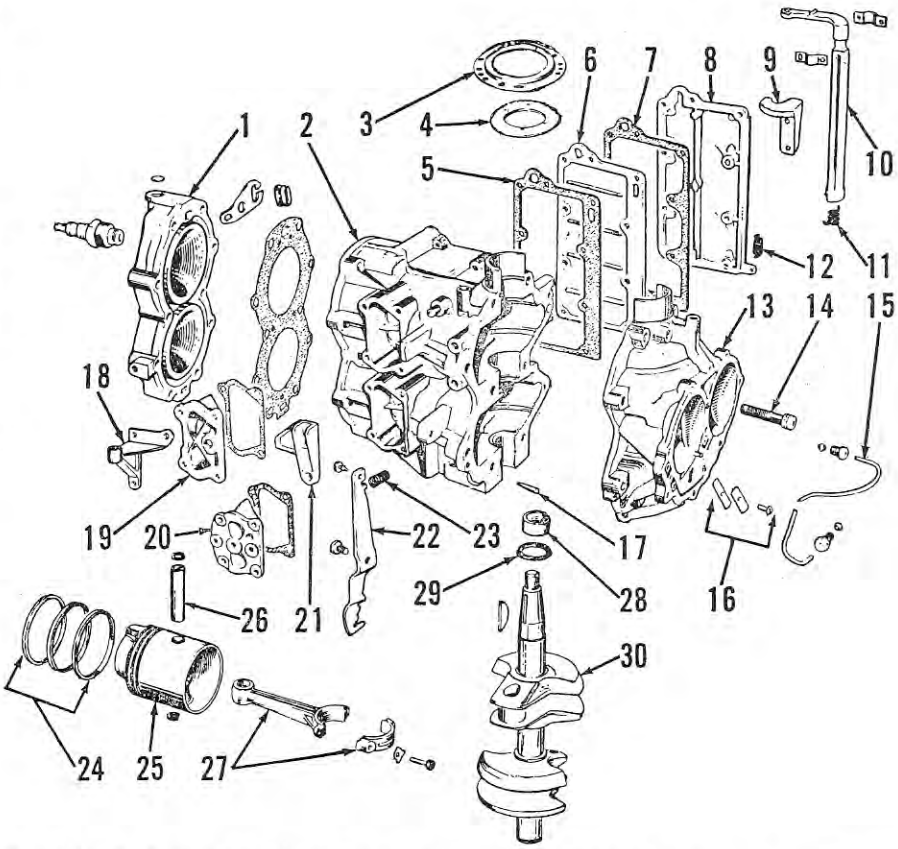


Fig. G60—Exploded view of the power head used on 1955, 12 horsepower models. All other 12 horsepower models are similar. Fifteen horsepower models are similar except anti-friction bearings of the type shown in Fig. G61, are used on connecting rod and the two upper main bearings.

1. Cylinder head
2. Cylinder half
3. Support
4. Retainer
5. Gasket
6. Exhaust cover
7. Gasket
8. Exhaust cover
9. Bracket
10. Speed control lever
11. Spring
12. Spring
13. Crankcase half
14. Bearing screw
15. Oil line
16. Bleeder valve
17. Taper pin
18. Bracket
19. Transfer port cover
20. Transfer port cover
21. Bracket
22. Shift lock
23. Spring
24. Piston rings
25. Piston
26. Piston pin
27. Connecting rod
28. Magneto cam
29. Oil slinger
30. Crankshaft

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

Whenever 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. The cylinder head, head end of cylinder block, or mating surfaces of manifold and crankcase 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 plate glass. Lay a sheet of No. 00 emery paper on the lapping block, then place the surface to be lapped on the emery paper. 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 paper. Thoroughly clean the parts with new oil and a clean, soft rag; then wash with soapsuds and clean rags. Mating surfaces of crankcase may be checked on the lapping block, and high spots or nicks removed, but surface must not be lowered. If extreme care is used, a slightly damaged crankcase can be salvaged in this manner. In case of doubt, renew the crankcase assembly.

The crankcase halves are positively located during assembly 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 extreme force.

When reassembling crankcase on models using sealing strips (15—Fig. G61), install strips in grooves of cylinder half and trim ends of strips to extend approximately 1/16-inch into bearing bores.

The mating surfaces of crankcase halves must be sealed during assembly 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 to cylinder half only, then immediately install crankcase front half. Install the locating dowel pins, then install and tighten the crankcase screws.

All gasket surfaces must be sealed, using a non-hardening type cement such as "Perfect Seal No. 4." Tightening torques are listed in the CONDENSED SERVICE DATA table.

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 and rings are available in standard size and oversizes of 0.020 and 0.040 for 25 horsepower models. For other engines, parts are furnished in standard sizes only.

The recommended piston ring end gap is 0.007-0.017 for all models. Ring to groove clearance is 0.001-0.0035. The recommended piston to cylinder wall clearance is 0.002-0.0035 for models 12D11 through 12D18; 0.0025-0.004 for models 15D10 through 15D15; 0.0035 to 0.005 for models 22D10 and 22D12; and 0.003-0.0045 for all 25 horsepower motors. Renew piston, rings and/or cylinder assembly if clearance is excessive.

When reassembling, piston should be installed with long, tapering side of piston head toward exhaust port side of cylinder. Refer to Fig. G62. On 12 and 15 horsepower motors, exhaust is located on port side of cylinder block; on 22 and 25 horsepower models, exhaust is on starboard side. Thoroughly lubricate all friction surfaces during assembly.

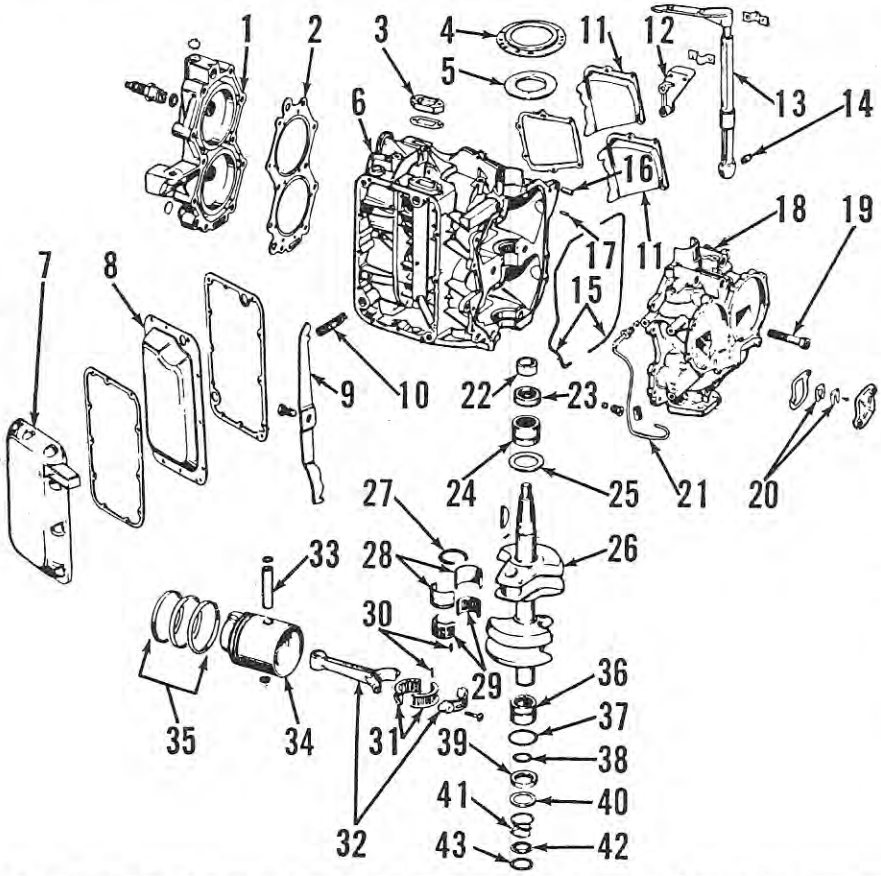


Fig. G61—Exploded view of late model 25 horsepower power head assembly. Early 22 and 25 horsepower models are similar.

1. Cylinder head
2. Gasket
3. Water pasage cover
4. Support
5. Retainer
6. Cylinder half
7. Exhaust cover
8. Exhaust cover
9. Shift lock
10. Spring
11. Transfer port cover
12. Bracket
13. Speed control lever
14. Pin
15. Sealing strips
16. Taper pin
17. Dowel pin
18. Crankcase half
19. Bearing screw
20. Bleeder valve
21. Oil line
22. Magneto cam
23. Oil seal
24. Upper bearing
25. Thrust washer
26. Crankshaft
27. Retaining ring
28. Outer race
29. Bearing cage
30. Needle roller
31. Bearing cage
32. Connecting rod
33. Piston pin
34. Piston
35. Piston rings
36. Lower bearing
37. "O" ring
38. Seal ring
39. Carbon seal
40. Washer
41. Seal spring
42. Retainer
43. Retaining ring

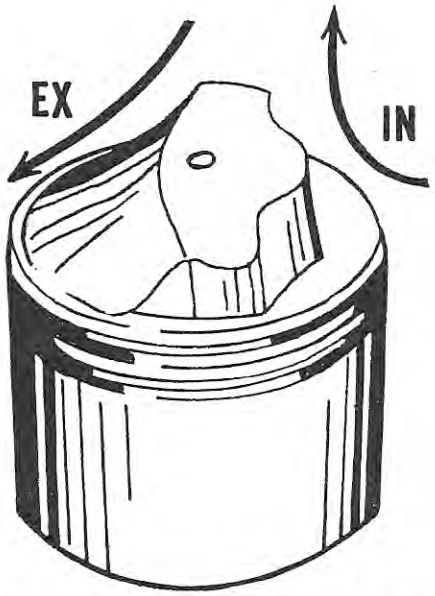


Fig. G62—Baffle on top of piston head is designed to direct the flow of incoming mixture for proper scavenging. Piston must be installed as shown with relation to cylinder ports.

EX. Exhaust port IN. Inlet port

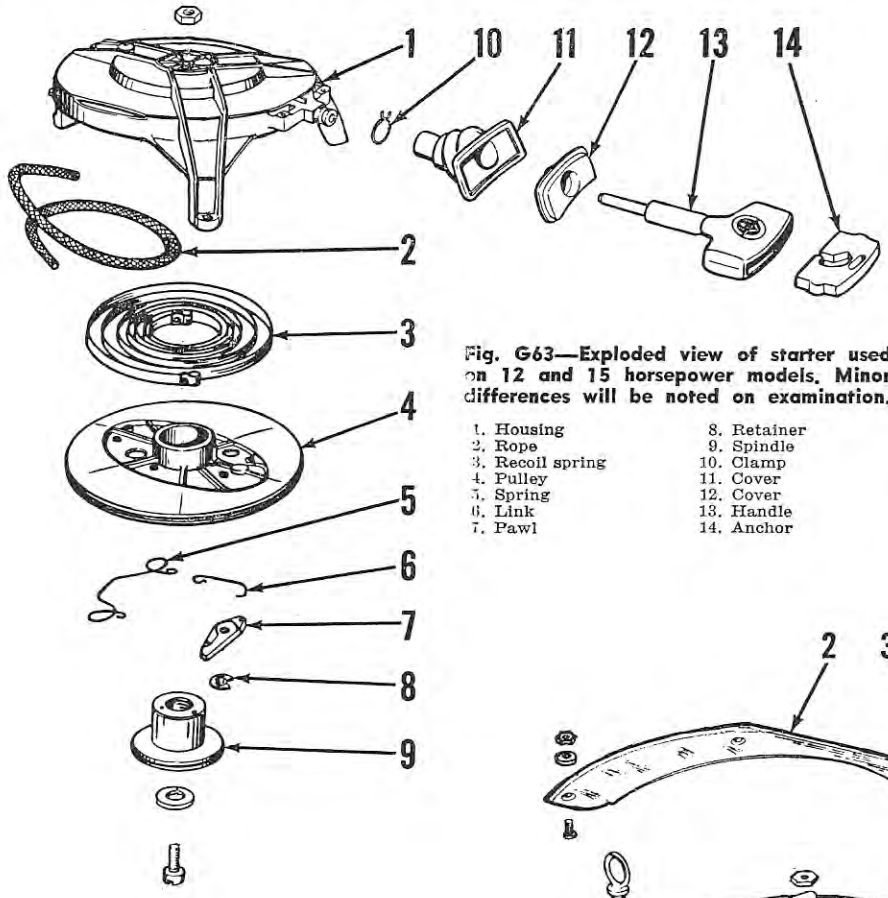


Fig. G63—Exploded view of starter used on 12 and 15 horsepower models. Minor differences will be noted on examination.

1. Housing
2. Rope
3. Recoil spring
4. Pulley
5. Spring
6. Link
7. Pawl
8. Retainer
9. Spindle
10. Clamp
11. Cover
12. Cover
13. Handle
14. Anchor

MANUAL STARTER

Fig. G63 and Fig. G64 show starters typical of those used. When installing a new starter cord or spring, invert the removed starter assembly in a vise and wind the spring by turning the starter pulley counter-clockwise until spring is completely wound. Reverse the pulley one turn and install the cord. All 22 and 25 horsepower models are equipped with a starter latch which is mechanically linked to carburetor cam follower to prevent starting the motor when throttle is set for high speed. To adjust the starter latch, set shift lever in neutral position and speed control at the fast limit recommended for starting. Loosen the set screw in stop collar (A—Fig. G65) and adjust collar up or down on link until inner end of latch (B) just clears the cast lugs on starter pulley. Tighten the set screw with collar in this position.

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

On all 12 horsepower motors (1955-1959), the connecting rod rides directly on the crankshaft crankpin. All 22 and 25 horsepower motors and 1960-1961, 15 horsepower models are fitted with split-cage needle bearings in rod at crankshaft end.

On 12 horsepower motors, the crankshaft is carried in three bronze bushings which are cast into the crankcase halves. On 15 horsepower models, the upper main bearing is a caged needle bearing, the center main bearing is a split-cage needle bearing and the lower bearing, a bronze bushing cast into the crankcase halves. On 22 and 25 horsepower motors, the upper and lower main bearings are caged needle bearings while the center crankshaft journal rides in a split-cage type needle bearing.

On all models, refer to the CONDENSED SERVICE DATA table for dimensional data and recommended tightening torques. If bearing surface of rod and cap is rough, worn, scored, or shows evidence of overheating, renew the connecting rod. 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.

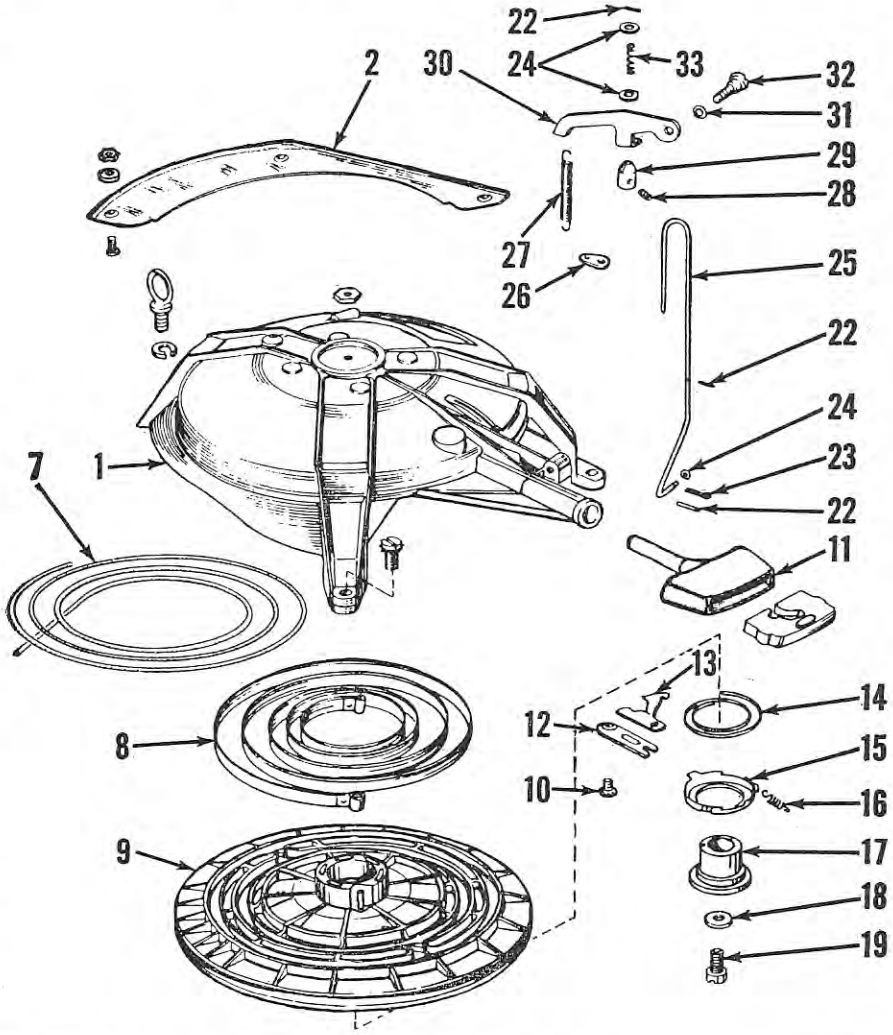


Fig. G64—Exploded view of starter of the type used on late 25 horsepower models. Early models are similar.

1. Housing
2. Guard
7. Rope
8. Spring
9. Pulley
10. Screw
11. Handle
12. Retainer
13. Pawl
14. Friction spring
15. Cup
16. Spring
17. Spindle
18. Washer
19. Screw
22. Pin
23. Cotter pin
24. Washer
25. Rod
26. Anchor
27. Spring
28. Set screw
29. Collar
30. Lock
31. Bow washer
32. Screw
33. Spring

1. Cover plate
2. Shift lever
3. Shift rod
4. Exhaust plate
5. Exhaust housing
6. Shifter shaft
7. Adjusting lever
8. Shift handle
9. Rubber mount
10. Cover plate
11. Lower mount
12. Lower mount
13. Grommet
14. Water tube
15. Spring
16. Stern bracket
17. Reverse lock
18. Spring
19. Throttle shaft
20. Bushing
21. Gear cover
22. Bushing
23. Steering handle
24. Spring
25. Friction block
26. Throttle grip
27. Throttle shaft
28. Throttle pinion
29. Throttle gear
30. Adjusting screw
31. Bushing
32. Steering bracket
33. Pilot shaft
34. Thrust washer
35. Liner
36. Spacer
37. Plate
38. Stern bracket
39. Clamp
40. Lever arm
41. Adjusting screw
42. Link
43. Link
44. Tilt lever
45. Swivel bracket
46. Shock absorber
47. Thrust washer

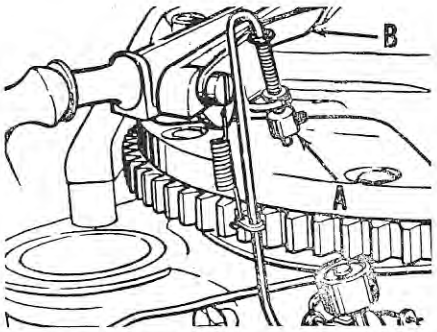


Fig. G65—To adjust the starter latch, first set speed control grip at the fast speed recommended for starting, loosen stop collar (A) and adjust latch (B) until it just clears starter pulley lugs.

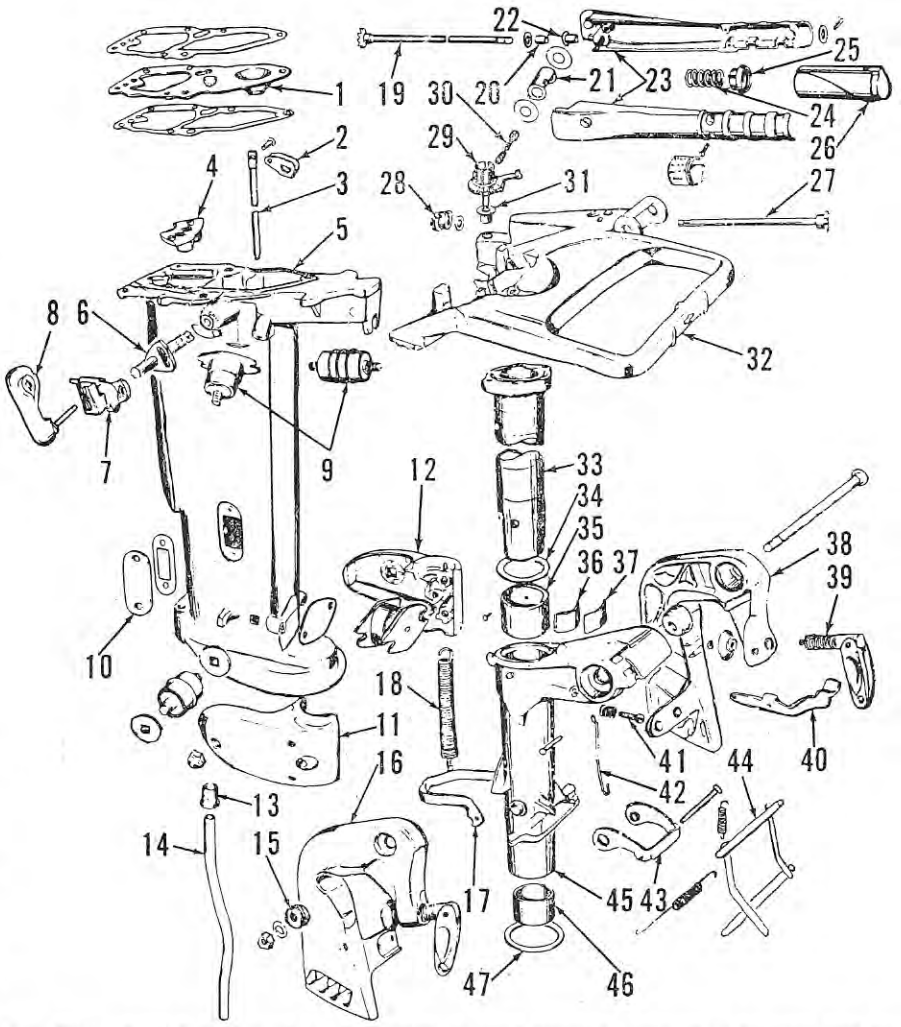


Fig. G67—Exploded view of stern bracket, exhaust housing, drive shaft housing and associated parts used on 1959 production 12 horsepower models. Other models are similar.

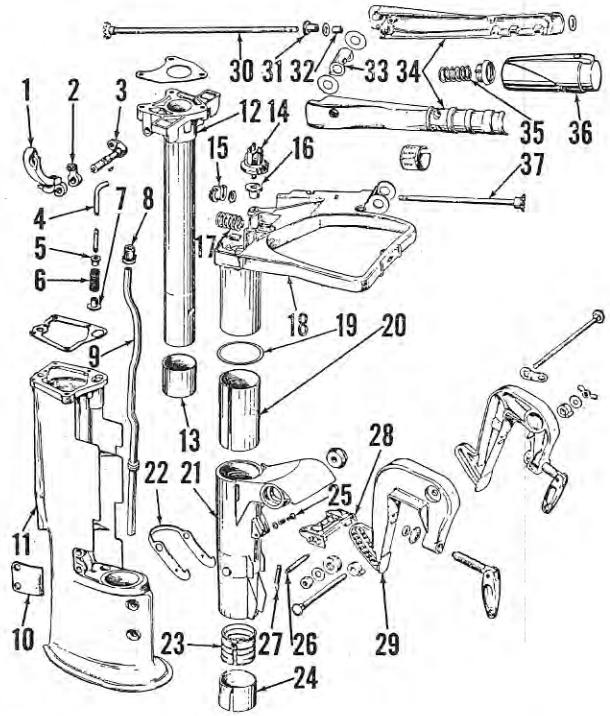


Fig. G66—Exploded view of drive shaft housing, exhaust housing and stern bracket used on models 12D11, 12S12, 12S13, 12-S14 and 12S15.

1. Shift lever
3. Shifter shaft
4. Shift rod
5. Sleeve
6. Spring
7. Sleeve
8. Grommet
9. Water tube
10. Cover plate
11. Exhaust housing
13. Liner
14. Throttle gear
15. Throttle pinion
16. Bushing
17. Spring
18. Steering bracket
19. Thrust washer
20. Liner
21. Swivel bracket
22. Reverse lock
23. Rubber bushing
24. Spacer
25. Adjusting screw
26. Lock rod
27. Spring
28. Thrust socket
30. Throttle shaft
31. Bushing
32. Bushing
33. Gear cover
35. Spring
36. Throttle grip

LOWER UNIT

PROPELLER AND DRIVE PIN. Protection for the propeller and drive unit is provided by a cushioning and slip clutch built into the propeller hub. Service consists of renewing propeller.

Propeller clutch slippage can be tested using a torque wrench and a suitable holding fixture and adapter. Slippage should occur at a torque of 65-100 ft.-lbs. on 12 and 15 horsepower models; and 150-210 ft.-lbs. on 22 and 25 horsepower motors.

REMOVE AND REINSTALL. Most service on the lower unit can be performed by detaching the gearcase housing from driveshaft and exhaust housing. When servicing 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 may also permit the inside of driveshaft casing to fill 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

Model	Propeller Dia.	Pitch	No. Blades	Drive Pin Dia.	Length	Material	Part No.
12D11, 12S12, 12D13	9	11	3	$\frac{3}{16}$	$1\frac{3}{16}$	Brass	301923
All other 12 hp models	9	11	3	$\frac{3}{16}$	$1\frac{3}{16}$	Stainless Steel	203663
15D10	9	10	3	$\frac{3}{16}$	$1\frac{3}{16}$	Stainless Steel	203663
15D11 through 15D15	9	10	3	$\frac{3}{16}$	$1\frac{3}{8}$	Stainless Steel	307949
22D10, 22D11, 22D12	$10\frac{3}{8}$	$12\frac{1}{2}$	3	$\frac{1}{4}$	$1\frac{1}{8}$	Brass	302566
22D13 through 25D21	$10\frac{3}{8}$	$12\frac{1}{2}$	3	0.260	$1\frac{3}{8}$	Stainless Steel	304575

lubricant. Look for water leaks if the gearcase requires an abnormal amount of lubricant. Use appropriate exploded views (Fig. G66 through Fig. G69) 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 Permatex No. 1 or Perfect Seal No. 4. All joints without gaskets must be smooth, 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, Sheboygan, Wisconsin. Refer to CONDENSED SERVICE DATA table for repair specifications and recommended tightening torques.

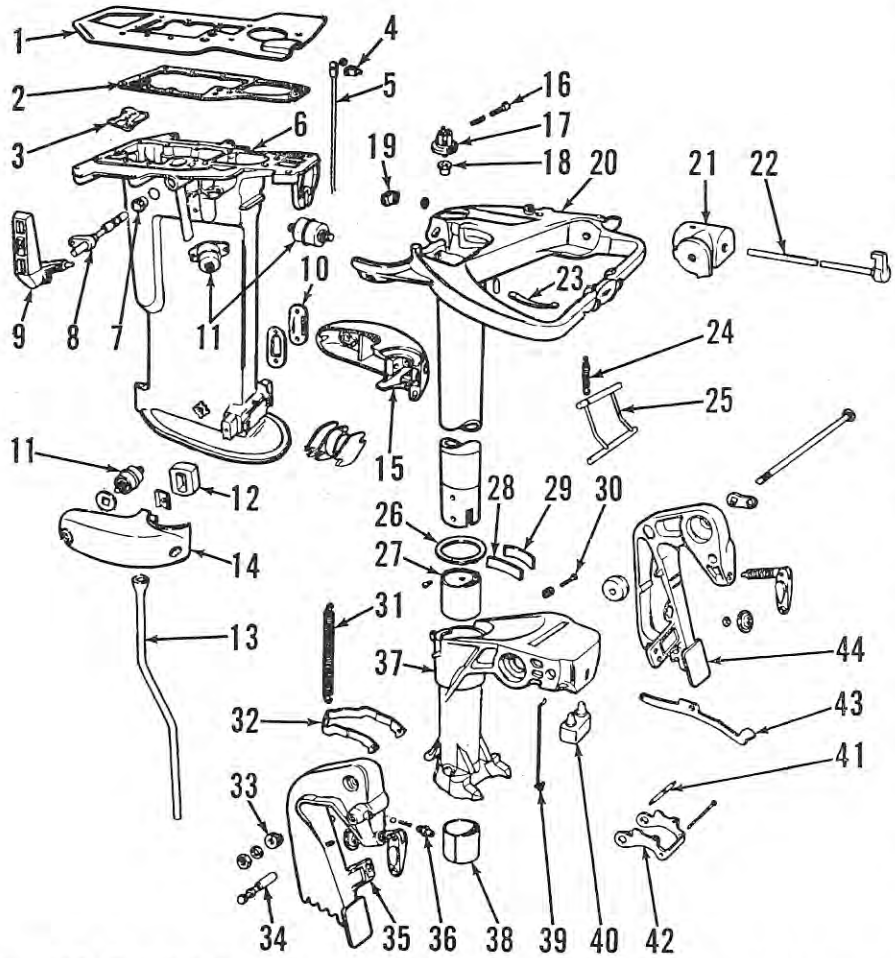


Fig. G68—Exploded view of stern bracket, exhaust housing, drive shaft housing and associated parts used on late 25 horsepower models. Other 22 and 25 hp models are similar.

1. Cover plate
2. Gasket
3. Exhaust plate
4. Clevis
5. Shift rod
6. Exhaust housing
7. Bushing
8. Shifter shaft
9. Shift handle
10. Cover plate
11. Rubber mount
12. Bumper
13. Water tube
14. Lower mount
15. Lower mount
16. Adjusting screw
17. Throttle gear
18. Bushing
19. Throttle pinion
20. Steering bracket
21. Throttle cover
22. Throttle control
23. Ground spring
24. Spring
25. Tilt lever
26. Thrust washer
27. Liner
28. Spacer
29. Plate
30. Adjusting screw
31. Spring
32. Reverse lock
33. Spring
34. Tilt lock
35. Stern bracket
36. Detent
37. Swivel bracket
38. Shock absorber
39. Link
40. Bumper
41. Lock pin
42. Link
43. Lever arm
44. Stern bracket

The propeller shaft (53—Fig. G69) and drive gears can be removed after first draining lubricant from gear compartment, removing the pivot screw or pin (38); then unbolting and removing gearcase lower housing (21S). To remove the drive pinion, it is first necessary to remove snap ring (44S) or retaining strap on roller bearing models.

To separate gear case from the exhaust and drive shaft housing, it is necessary to remove cover (10—Fig. G66, Fig. G67 or Fig. G68), then loosen the shift rod clamp screw.

The shifting linkage must be adjusted to provide full engagement of the shifter collar with the forward and reverse gears. To make the adjustment on models 12D11, 12S12, 12S13, 12S14 or 12S15, proceed as follows: With the motor not running, set the shift lever at "Neutral" and the speed control at "Slow." Rotate the propeller by hand while moving the shift lever (1—Fig. G66) slowly in each direction to the point where lower unit clutch dog contacts the gear projections. Mark shift lever location on shroud at point of contact. Travel should be same distance each side of neutral position to point of contact. If it is not, loosen shaft clamping screw in shift lever (1), loosen adjusting screw securing shift lever to adjusting lever (2), and move adjusting lever (2) and shaft (3) a slight amount on shift lever (1) until travel is equalized. On these models the "Lockout" which prevents speed control grip from being advanced to "Fast" position when shift lever is in neutral can be adjusted by loosening the two shaft clamping screws and moving levers (1 & 2) in or out on shifter shaft (3). If the screw which clamps these two levers together is not loosened, shift adjustment will not be changed.

On all other models, shift lever travel is equalized in the same manner, but "Lockout" mechanism is fixed and not adjustable.

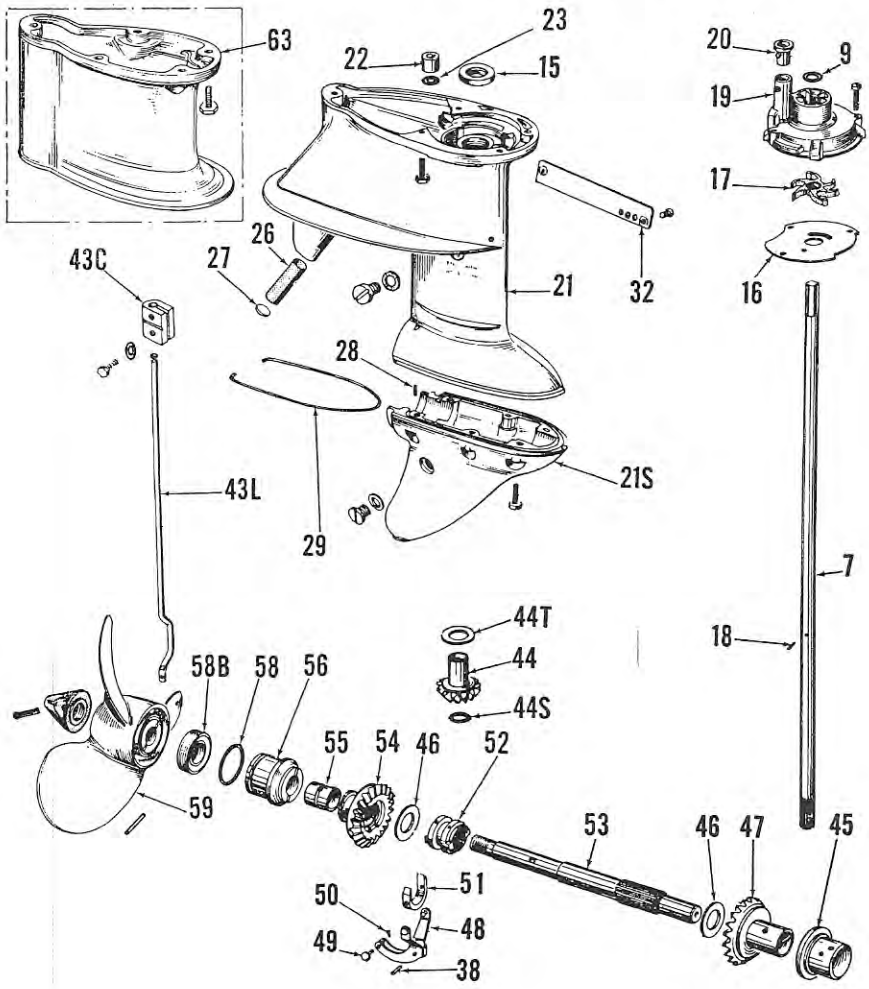
STEERING TENSION. Steering tension can be adjusted by turning adjusting screw (25—Fig. G66, 41—Fig. G67 or 30—Fig. G68) in or out until motor is easy to steer, but will maintain a set course.

ELECTRICAL UNITS

Some models use an electrical starting system. The negative battery terminal is grounded on all models. A 6 volt system was used on all models before 1957, and a 12 volt system 1957 and later. A generator is not supplied for any of the motors in this horsepower class. Refer to Fig. G70 for a typical wiring diagram, and to ELECTRICAL SYSTEM at end of GALE SECTION for overhaul data on units.

Fig. G69 — Exploded view of lower unit gearcase, water pump and associated parts of the type used on 12 and 15 horsepower models. Other motors are similar, except taper roller bearings are used.

7. Drive shaft
9. "O" ring
15. Seal
16. Plate
17. Impeller
18. Pin
19. Housing
20. Seal
21. Gear case
21S. Lower housing
22. Bushing
23. "O" ring
26. Screen
27. Plug
28. Dowel
29. Sealing strip
32. Cover
43C. Clamp
43L. Shift rod
44. Drive pinion
44S. Snap ring
44T. Thrust washer
45. Bearing
46. Thrust washer
47. Forward gear
48. Shift yoke
49. Pin
50. Cotter pin
51. Cradle
52. Clutch dog
53. Propeller shaft
54. Reverse gear
55. Gear bushing
56. Gearcase head
58. "O" ring
58B. Seal
59. Propeller
63. Extension



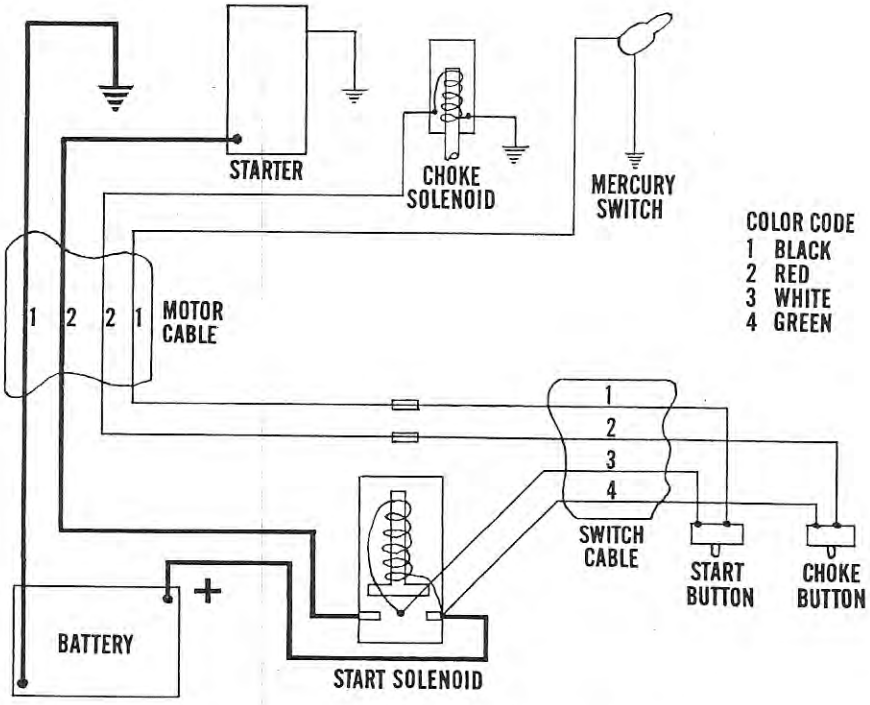


Fig. G70 — Wiring diagram used on models with electric starter.