TECUMSEH POWER PRODUCTS

TECUMSEH PRODUCTS CO.
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Grafton, Wisconsin 53024

SPLIT CRANKCASE MODELS

A number of small, trolling and fishing motors are powered by Tecumseh motors. Tecumseh V51, V58, V61 and V81 models are of the split crankcase design and are included in this service section. Other (unit block) models are covered in the next service section. The model number is for easy reference only to the general construction. If service parts are required, the type number MUST be used. The type number is located at one of the locations in Fig. T1-1. A correct type number will usually consist of three numbers, a dash followed by two more numbers (such as 633-26).

CONDENSED SERVICE DATA

TUNE-UP	V51	V58	V61	V81
Bore — Inches	2	2.09	2.09	2.50
Stroke — Inches	1⅝	1.68	1.769	1.625
Number of Cylinders	1	1	1	1
Displacement Cu. In.	5.1	5.8	6.1	7.98
Spark Plug				
Champion	J4J	J8J	L4J	J6J
Electrode Gap	0.030	0.030	0.030	0.030
Magneto Point Gap	0.017-0.023	0.015-0.019	0.015-0.019	0.015-0.021
Magneto Timing	See Text	See Text	See Text	See Text
Carburetor Make	Own	Own	Own	Tillotson or Own
Carburetor Adjustment	See Text	See Text	See Text	See Text
Fuel-Oil Ratio	16:1*	16:1*	16:1*	16:1*
*Unless otherwise instructed by outboard motor manufacturer				
SIZES — CLEARANCES				
Piston Rings				
End Gap	0.006-0.011	0.006-0.011	0.006-0.011	0.005-0.013
Side Clearance	0.0015-0.003	Top 0.003-0.005	Top 0.003-0.005	Top 0.003-0.005
	.....	Bottom 0.002-0.004	Bottom 0.002-0.004	Bottom 0.002-0.004
Piston Pin				
Diameter	0.3750-0.3751	0.4997-0.4999	0.4997-0.4999	0.4997-0.4999
Piston Skirt Clearance	0.0049-0.006	0.0047-0.006	0.0047-0.006	0.0067-0.0075
Crankshaft Diameter				
Upper Main Bearing	0.7495-0.750	0.7500-0.7505	0.7500-0.7505	0.7498-0.7501
Lower Main Bearing	0.9995-1.000	0.9995-1.000	0.9995-1.000	0.7871-0.7875
Crankpin—Plain Bearing	0.6860-0.6865	0.8115-0.8120	0.8740-0.8745	.....
Needle bearing	.....	0.7499-0.7502	0.7499-0.7502	0.7499-0.7502
TIGHTENING TORQUES				
(All Values in Inch-Pounds Unless Noted)				
Connecting Rod—Plain Bearing	40-50	40-50	40-50	.....
Needle bearing	.....	70-80	70-80	70-80
Crankcase Halves	35-40	35-40	35-40	35-40
Cylinder to Crankcase Nuts	70-75	70-75	70-75	70-75
Cylinder Head	.....	45-50	50-60	.....
Inlet Manifold	70-75	70-75	70-75	70-75
Flywheel	216-300	216-300	216-300	216-300
Spark Plug	216-264	216-264	216-264	216-264

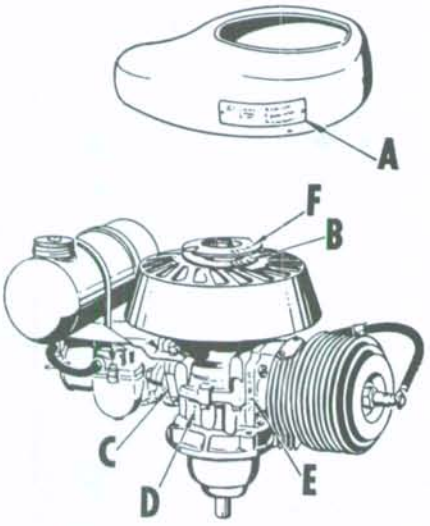

Fig. T1-1—On Tecumseh power heads, the Serial Number and Type Number may be in one of several locations. Type Number will be required for parts procurements.

A. Nameplate on Shroud
B. Plate on Flywheel
C. Plate on Crankcase
D. Stamped on Crankcase
E. Stamped on Cylinder Flange
F. Stamped on Pulley

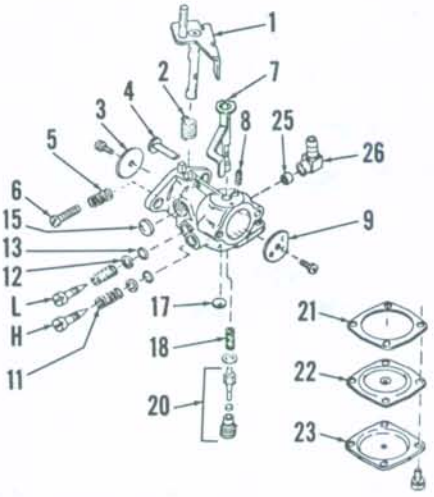

Fig. T1-2 — Exploded view of typical Tecumseh diaphragm carburetor. Gravity feed models will not have parts (4, 25 & 26).

H. Main mixture needle
L. Idle mixture needle
1. Throttle shaft
2. Spring
3. Throttle shutter
4. Pumping element
5. Spring
6. Low speed stop screw
7. Choke shaft
8. Choke positioning spring
9. Choke disc
11. Springs
12. Washers
13. "O" rings
15. Welch plug
17. Welch plug
18. Fuel valve spring
20. Fuel inlet valve
21. Gasket
22. Diaphragm
23. Cover
25. Outlet check valve
26. Inlet check valve

LUBRICATION

The power head is lubricated by oil mixed with the fuel. Follow the recommendations of the motor manufacturer, if known. If manufacturer's recommendations are not known, mix ½ pint of a good grade Outboard or Two Cycle oil with each gallon of regular gasoline. If Outboard or Two Cycle oil is not available use SAE 30, Type MM, Automotive motor oil. Do not use other grades of oil or a highly detergent automotive oil.

FUEL SYSTEM

CARBURETOR. Several different types of both float and diaphragm type carburetors have been used. Refer to appropriate following paragraphs for servicing and adjustment information for each carburetor:

TECUMSEH DIAPHRAGM CARBURETOR: Clockwise rotation of idle mixture needle (L—Fig. T1-2) and high speed mixture needle (H) leans the fuel mixture. Initial setting is approximately 1 turn open for both needles. Start and run motor until it reaches operating temperature, then adjust mixture to provide smoothest operation in gear. The high speed mixture needle (H) should be adjusted first. Idle mixture needle (L) should be set rich enough to provide smooth acceleration from idle to high speed. Use caution when setting needles to prevent mixture from being too lean and causing engine damage.

NOTE: Several variations of the Tecumseh diaphragm carburetor have been used and differences in servicing procedures will be noted where required in the following paragraph.

Disassembly of carburetor will depend upon type of solvent used for cleaning. Parts (4, 13, 20, 21, 22, 25 & 26) may be damaged by most commercial carburetor cleaning solvents and must be removed. On most models, idle mixture needle (L) and high speed needle (H) are not interchangeable. The fuel inlet fitting (26) is pressed into carburetor body on all models. A fuel filter screen is located in fitting (26) of models **without** fuel pump (4). On models without fuel pump, filter screen can be cleaned by reverse flushing with air through opening in carburetor body for inlet needle and seat (20). On carburetors with fuel pump (4), fitting (26) contains the inlet check valve. To remove outlet check valve (25), first remove inlet fitting and check valve (26), then carefully drill outlet check valve with a 9/64-inch drill to a depth of ⅛-inch as shown in Fig. T1-3. CAUTION: Do not drill too far or carburetor body will be damaged. Thread an 8-32 tap into the outlet check valve, then use the proper size nut and flat washer to convert tap into a puller as shown in Fig. T1-4. Pull the check valve out by tightening nut.

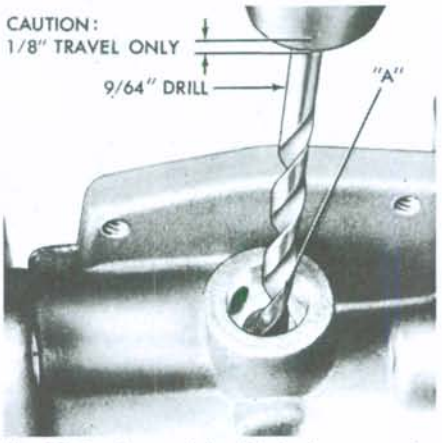

Fig. T1-3—On models with fuel pump, refer to text for removal of outlet check valve.

When assembling, observe the following: If check valve (25—Fig. T1-2) was removed, press valve into carburetor body until face of valve is flush with surrounding base of fuel inlet chamber. On all models, press inlet fitting (26) about ⅛ of the way into carburetor body, coat the exposed ⅜ of fitting shoulder with Grade 'A' Loctite, then press fitting fully into carburetor body.

The throttle plate (3) should be installed with short line stamped on plate to top of carburetor and facing open (engine) end of carburetor. The choke plate (9) should be installed with flat toward fuel inlet side of carburetor as shown. Mark on choke plate should face in and should be parallel with choke shaft.

Diaphragm (22) should be installed with head of rivet toward inlet needle regardless of position or size of metal discs. Make certain that correct diaphragm is used and that gasket (21) is installed between carburetor body and diaphragm (22).

Remove and examine reed plate and valves while carburetor unit is off. Tighten the retaining stud nuts to a torque of 70-75 inch-pounds when installing carburetor.

Tillotson Series HL: Refer to Fig. T1-5. Carburetor contains a built-in fuel pump and a pulse passage must be provided through carburetor mounting flange, flange

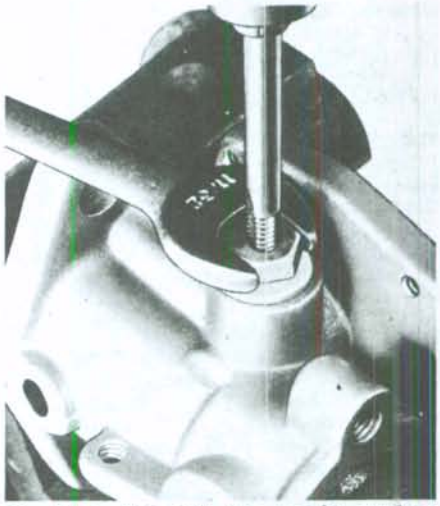

Fig. T1-4—The 8-32 tap can be used as a puller to remove the outlet check valve. Refer to text.

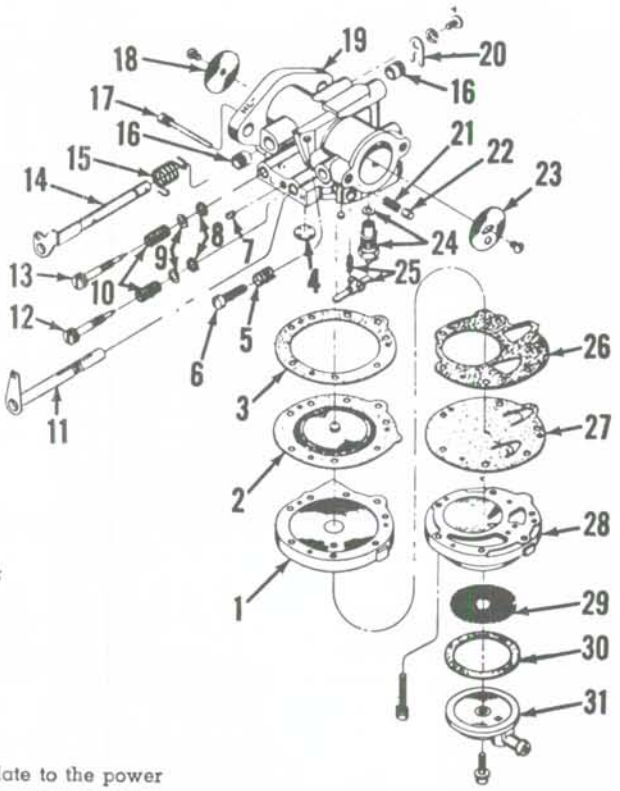

Fig. T1-5—Exploded view of Tillotson Series HL diaphragm type carburetor with integral fuel pump used on some models.

1. Diaphragm cover
2. Fuel diaphragm
3. Gasket
4. Plugs
5. Springs
6. Idle speed stop screw
7. Screw plug
8. Packing
9. Washers
10. Springs
11. Choke shaft
12. Main fuel needle
13. Idle fuel needle
14. Throttle shaft
15. Throttle spring
16. Bushing
17. Diaphragm lever pin
18. Throttle plate
19. Throttle body
20. Retainer
21. Spring
22. Choke detent
23. Choke plate
24. Inlet valve & gasket
25. Diaphragm lever & spring
26. Gasket
27. Pump diaphragm
28. Pump cover
29. Fuel screen
30. Gasket
31. Fuel inlet

gasket, adapter and reed plate to the power head crankcase. Make sure pulse passage is open and clean when installing carburetor or reed plate.

Initial adjustment of main fuel mixture needle (12) is 1¼ turn open from the closed position. Initial adjustment of idle fuel mixture needle (13) is ¾ turn open. Final adjustment of both mixture needles must be made under load with motor at operating temperature.

To disassemble the carburetor, first remove fuel inlet housing (31) and filter screen (29); then unbolt and remove fuel pump and carburetor diaphragms, covers and associated parts. Inlet valve seat (24) should not be removed unless renewal is indicated. Throttle body (19) may be further disassembled as required; carefully note location of parts and use Fig. T1-5 as a guide when reassembling.

Clean metal parts in a suitable solvent and reassemble by reversing the disassembly procedure.

Remove and examine reed plate and valves while carburetor is off. Make sure pulse passage is open when parts are reinstalled. Tighten retaining stud nuts to a torque of 70-75 inch-pounds when installing carburetor.

Tecumseh Float Carburetor: Refer to Fig. T1-6. Clockwise rotation of idle mixture needle (L) and high speed needle (H) leans the fuel mixture. Initial setting is approximately 1 turn open for both needles. Start and run motor until it reaches operating temperature, then adjust to provide smoothest operation in gear. The high speed mixture needle (H) should be adjusted first. Idle mixture needle (L) should be set rich enough to provide smooth acceleration from idle to high speed. Use caution when setting needles to prevent mixture from being too lean and causing engine damage.

NOTE: Several variations of the Tecumseh float type carburetor have been used and differences in servicing procedures will be noted.

Disassembly of carburetor will depend upon the extent of service required. Parts (4, 13, 14, 16, 20, 21, 25 & 26) may be damaged by most commercial carburetor cleaning solvents and must be removed. The fuel inlet fitting (26) is pressed into carburetor body on all models. On models with fuel pump (4), fitting (26) contains the inlet check valve. To remove the outlet check valve (25), first remove fitting and check valve (26), then carefully drill outlet check valve with a 9/64-inch drill to a depth of ⅛-inch as shown in Fig. T1-3. CAUTION: Do not drill too far or carburetor body will be damaged. Thread an 8-32 tap into the outlet check valve, then use proper size nut and flat washer to convert tap into a puller as shown in Fig. T1-4. Pull the check valve out by tightening nut.

On early models (Fig. T1-7), the fuel inlet needle (20-Fig. T1-6) seats against a Viton rubber seat which is pressed into the carburetor body. The seat can be removed on these early models by using a short hooked wire. The seat must be removed before cleaning. When installing seat, the grooved side should be installed first.

On later models (Fig. T1-7), the Viton rubber seat is located in a brass sleeve which is pressed into carburetor body. To remove the seat, turn a 10-24 (or 10-32) tap into the brass sleeve until it grips the sleeve securely. Clamp end of tap in a vise and pull the sleeve from the carburetor body. The seat must be removed for cleaning and must be renewed if removed from carburetor body. When installing, make certain that bore is clean and use a close fitting, flat end punch to drive seat and sleeve into bore in carburetor body.

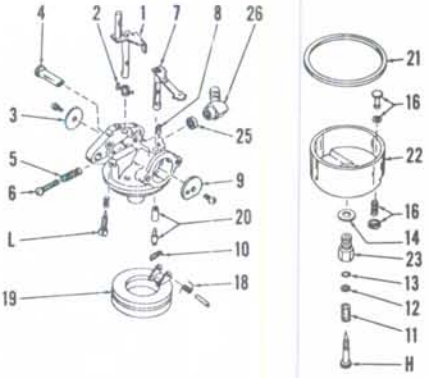

Fig. T1-6 — Exploded view of Tecumseh float type carburetor. Late type with fuel pump (4) is shown; however, other types are similar.

H. High speed mixture needle
L. Idle speed mixture needle
1. Throttle shaft
2. Throttle spring
3. Throttle plate
4. Pumping element
5. Spring
6. Idle speed stop
7. Choke shaft
8. Detent spring
9. Choke plate
10. Valve retainer clip
11. Spring
12. Washer
13. "O" ring
14. Washer
16. Drain
18. Float spring (some models)
19. Float
20. Fuel inlet needle & seat
21. Sealing ring
22. Fuel bowl
23. Bowl retainer
25. Outlet check valve
26. Inlet fitting and check valve

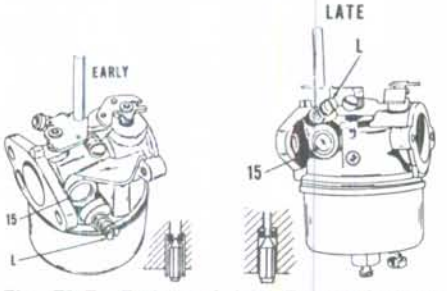

Fig. T1-7—Early and late Tecumseh float type carburetors can be identified by location of the idle mixture needle (L). On early models needle is below plug (15). On late models needle is above plug (15).

On all models, install throttle plate (3—Fig. T1-6) with stamped lines facing out (toward engine) and at 12 and 3 o'clock positions. Install choke plate (9) with flat side toward bottom of carburetor. Float setting should be 7/32 inch, measured with body and float assembly inverted, between free end of float and rim of carburetor body. Sealing rings (21) on some carburetors are square while others are round. Make certain that correct type seal ring (21) is installed. When installing fuel bowl (22), the flat under side should be located below the fuel inlet fitting (26).

SPEED CONTROL LINKAGE. Two types of speed controls have been used. On some models, the ignition timing mechanism is fixed in position, and a flywheel mounted governor is used as shown in Fig. T1-8.

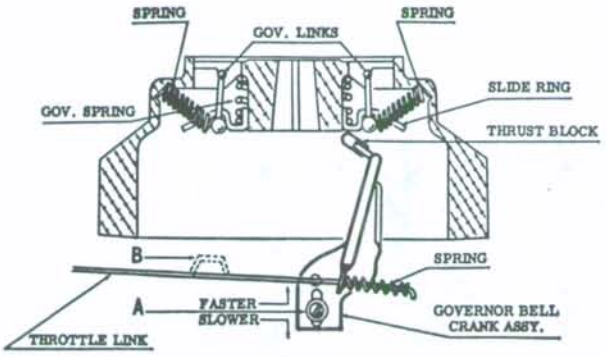

Fig. T1-8 — Schematic view of centrifugal governor used on some models. Make major speed adjustment by raising or lowering bell crank at (A). Make minor adjustment by bending link (B).

GOVERNED MODELS. Major speed adjustment is made by loosening the retaining screw (A—Fig. T1-8) and moving governor bellcrank assembly toward or away from flywheel as shown. Make minor speed adjustments by bending throttle link as shown at (B). NOTE: Remove link before bending, to avoid damage to remainder of governor linkage. A speed limiting device is incorporated into the magneto breaker box on most governed models. This unit grounds the magneto at 4500-4700 rpm, thus limiting the top speed. Refer to Fig. T1-9 for an exploded view of breaker box with overspeed mechanism. Plunger (5) must be installed with rounded end up if it is removed. When throttle is in wide-open position, the thrust block on throttle bellcrank must clear breaker box by not more than $\frac{1}{16}$-inch nor less than $\frac{1}{32}$-inch.

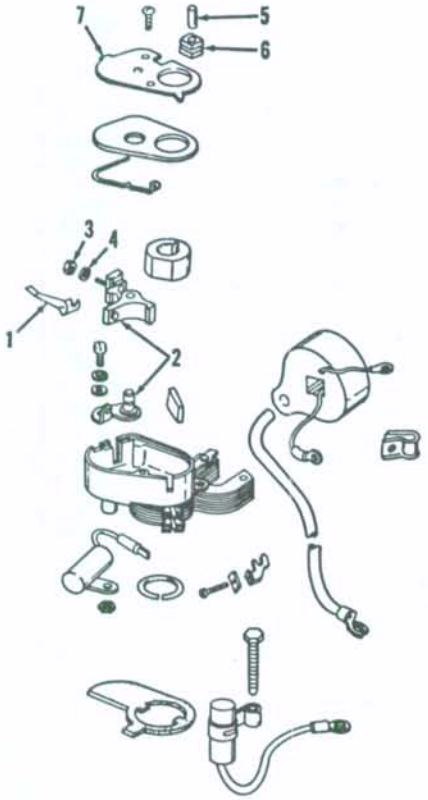

Fig. T1-9—Overspeed mechanism used with centrifugal governor on some models. Refer to text.

SYNCHRONIZED MODELS. On most models, the ignition timing is advanced by the speed control lever as shown in Fig. T1-10; and throttle lever is operated by a synchronizing cam attached to magneto stator mounting plate. To synchronize the throttle, first make sure that magneto is correctly installed and points adjusted as outlined in IGNITION paragraphs. Move speed control lever to "FAST" position. Loosen the two screws retaining synchronizing cam to stator mounting plate, move throttle lever to wide-open position, and slide the cam on mounting screws until edge of cam is firmly in contact with cam follower on throttle arm. Tighten the cam retaining screws and move speed control lever to "SLOW" position. With lever in "SLOW" position the carburetor throttle lever should contact the stop screw (6—Fig. T1-2, T1-5 or T1-6) and synchronizing cam should contact cam follower on throttle arm. Make minor adjustments as necessary so that synchronizing cam is in contact with cam follower throughout speed range, and so that carburetor throttle valve fully opens and fully closes at the two extremes of speed range setting.

REED VALVES. The reed plate is located between the crankcase and carburetor. Reed plate should be examined whenever carburetor is removed for service. The reeds should lie perfectly flat on reed plate, with no more than 0.005 clearance at any point. Check for broken reeds, cracks or distortion. On some models the reed plate assembly is serviced only as a complete unit. If condition is questionable, renew the assembly. Renew mounting gasket whenever reed plate has been removed. On other models the reed plate, reeds, reed stop and baffle are available as service parts.

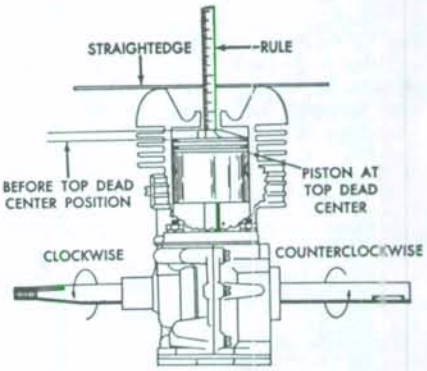

Fig. T1-11—On models with fixed timing, piston position can be measured as shown for correct ignition timing.

IGNITION

Breaker point gap at maximum opening should be set before adjusting the ignition timing. Refer to the following specification data:

V51 Models—
Breaker point gap 0.017-0.023
Max. advance ignition timing
(piston position BTDC) 11/64 (0.175) inch
V58 Models—
Breaker point gap 0.015-0.019
Max. advance ignition timing
(piston position BTDC) ..3/32 (0.095) inch
V61 Models—
Breaker point gap 0.015-0.019
Max. advance ignition timing
(piston position BTDC) ..... 0.100 inch
V81 Models—
Breaker point gap 0.015-0.021
Max. advance ignition timing
(piston position BTDC) 11/64 (0.175) inch

On governor equipped models, the timing position is stationary. To time the magneto, adjust the points to recommended gap, and rotate crankshaft until piston crown is correct distance before TDC. The position can be measured with a straight edge and rule as shown in Fig. T1-11, however a dial indicator is preferable if available. With crankshaft in this position, rotate stator plate until points just begin to open, then lock in place.

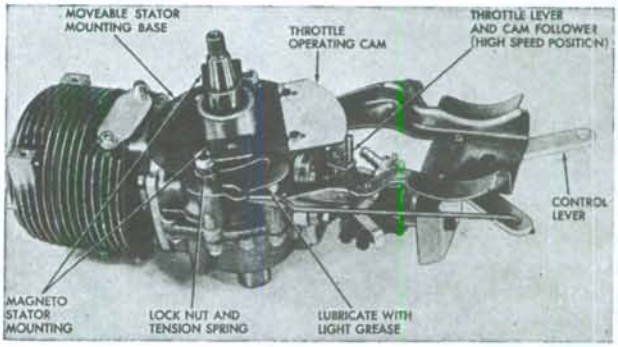

Fig. T1-10—On some models, ignition timing is adjustable and synchronized with throttle as shown.

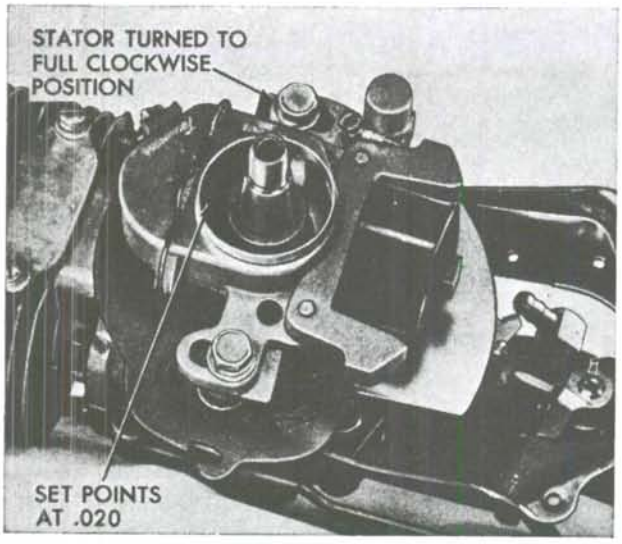

Fig. T1-12—Magneto installation on some models with synchronized controls. Refer to text.

NOTE: Match marks should be scribed on stator laminations and crankcase. On some models a match mark is placed on crankcase to align with split of laminations. If match marks are aligned, timing can usually be assumed as correct.

On synchronized models without governor, refer to Fig. T1-12. When installing magneto stator to mounting plate, first install the screws loosely, then turn stator fully in a clockwise direction as shown, and tighten the clamp screws securely.

On some models with Tecumseh magneto, a condenser may or may not be used in connection with the breaker points. On models without a condenser, capacitance is built into the magneto coil, and a condenser is not required. The magneto coil furnished as repair parts for all Tecumseh magnetos may or may not require the use of a separate condenser. Specific instructions are included with the replacement coil, and should be followed carefully.

POWER HEAD

DISASSEMBLY. Model V51 power heads use a closed end cylinder as shown in T1-14. Models V58 and V61 units have a detachable cylinder head (34—Fig. T1-15), a needle roller lower main bearing (35) and other differences apparent on examination or on reference to Figs. T1-14 and T1-15. Some V58 and V61 units use a steel connecting rod and loose needle rollers at crankpin and piston end. Model AV81 uses a steel rod with anti-friction bearings, a needle roller upper main bearing and a ball-type lower bearing. Refer to Fig T1-16 for an exploded view of typical AV81 engine. These differences will be noted where they materially alter overhaul procedure.

To disassemble the power head, remove flywheel, magneto, carburetor, spark plug, transfer port cover (or plug); and any other components which are accessible and more easily removed while cylinder and crankcase is assembled. The cylinder head screws on V58 and V61 power heads are installed with LOCTITE; it may be necessary to heat the screw heads with a soldering iron or other method to break the sealant bond.

Scribe correlation marks on cylinder and crankcase for convenience in assembly, remove the stud nuts, and carefully withdraw cylinder from the piston. On V51 power heads, piston and connecting rod assembly can be removed from crankshaft at this time by removing connecting rod screws and cap. On V58, V61 and AV81, removal is more convenient after disassembly of crankcase, because of difficulty of access to connecting rod screws. Crankcase halves can usually be separated after removal of screws. Check to be sure all screws, reed plate gasket, cylinder gasket, etc. are removed; then tap lightly with a soft hammer if stuck. DO NOT use a pry in separating the crankcase halves.

ASSEMBLY. Because of the two-cycle design, crankcase must be completely sealed against vacuum and pressure. Whenever power head is disassembled, it is recommended that all gasket surfaces and the mating surfaces of crankcase halves which do not use a gasket, be carefully inspected for nicks, burrs or warped surfaces which might interfere with a tight seal. Flatness can be checked and slight irregularities removed by using a sheet of No. 00 emery paper, or lapping compound, on a lapping block or sufficiently large piece of smooth plate glass. Apply very light pressure and

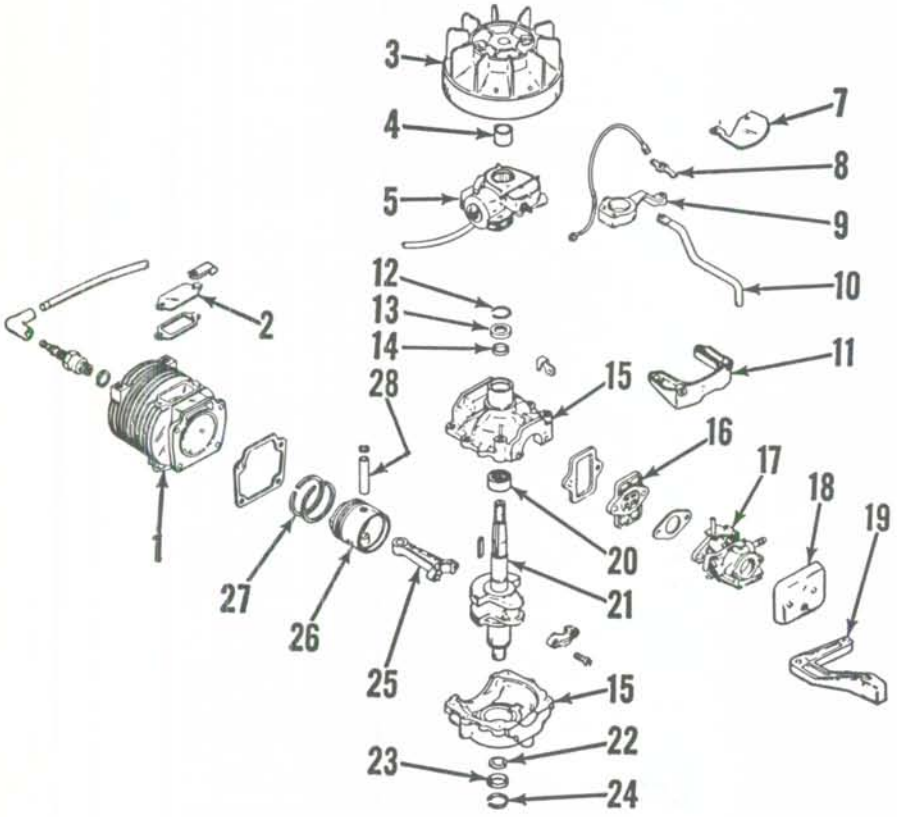

Fig. T1-14—Exploded view of Model V51 power head especially designed for outboard motor application.

1. Cylinder
2. Transfer port cover
3. Flywheel
4. Magneto cam
5. Magneto
7. Synchronizing cam
8. Cutoff clip
9. Stator mounting arm
10. Control link
11. Bracket
12. Snap ring
13. Retainer
14. Seal
15. Crankcase
16. Inlet reed valve
17. Carburetor
18. Air baffle
19. Control lever
20. Needle bearing
21. Crankshaft
22. Seal
23. Retainer
24. Snap ring
25. Connecting rod
26. Piston
27. Piston rings
28. Piston pin

1. Cylinder
2. Transfer port plug
3. Flywheel
4. Magneto cam
5. Magneto
7. Synchronizing cam
9. Stator mounting bracket
11. Bracket
12. Snap ring
13. Retainer
14. Seal
15. Crankcase
16. Reed plate
17. Carburetor
21. Crankshaft
22. Seal
23. Retainer
24. Snap ring
25. Connecting rod
26. Piston
27. Piston rings
28. Piston pin
29. Adapter plate
30. Valve reeds
31. Reed stop
32. Baffle
34. Cylinder head

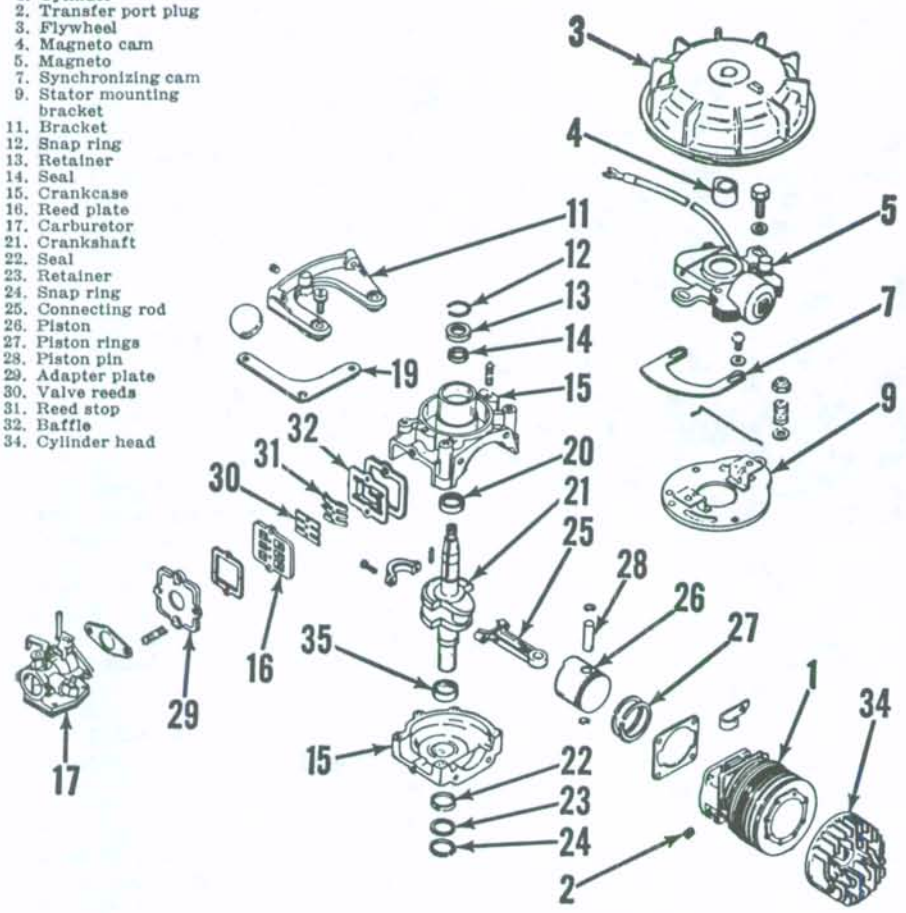

Fig. T1-15—Exploded view of power head, typical of V58 and V61 models.

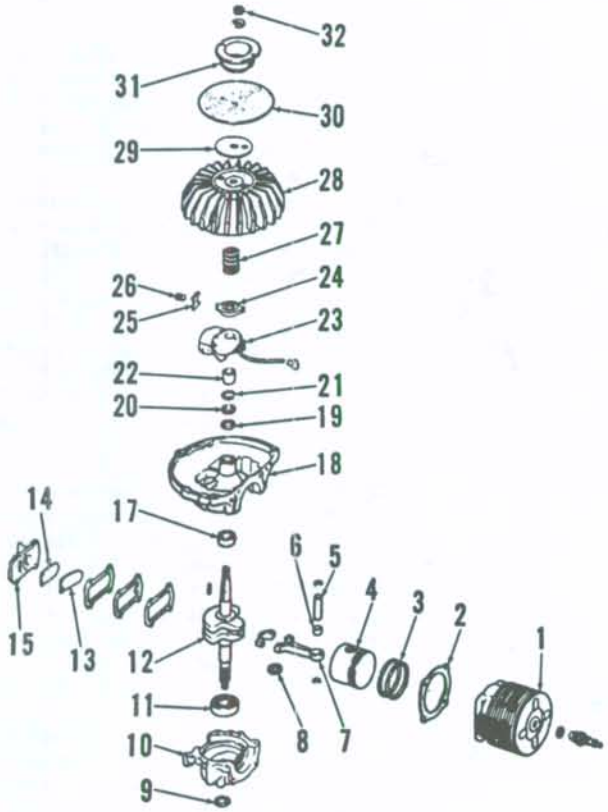

Fig. T1-16 — Exploded view of AV81 power head used on some motors.

1. Cylinder
2. Gasket
3. Piston rings
4. Piston
5. Piston pin
6. Needle bearing
7. Connecting rod
8. Needle rollers
10. Crankcase half
11. Main bearing
12. Crankshaft
13. Leaf stop
14. Reed petal
15. Reed plate
17. Main bearing
18. Crankcase half
19. Seal
20. Retainer
21. Snap ring
22. Magneto cam
23. Magneto
24. Slide ring
25. Governor weight
26. Spring
27. Spring
28. Flywheel
29. Washer
30. Screen
31. Starter cup
32. Nut

use a figure-eight motion, checking frequently to determine progress. Only high spots must be removed. Do not lower the surface. Finish lap using lapping compound or worn emery paper; then thoroughly clean the parts with new oil on a clean soft rag. Wash with soapsuds and clean rags to make sure all metal filings, lapping compound or emery dust are completely removed.

Refer to the appropriate paragraphs for inspection and reassembly of power head components. Apply a thin coating of hardening sealant to mating surfaces of crankcase halves and carefully assemble by reversing the disassembly procedure. Use new gaskets and do not use gasket cement, on joints using gaskets. Before tightening the screws joining the crankcase halves, check carefully at the joints where cylinder and reed plate attach. The joints must be flat and smooth to provide a good mounting surface for cylinder and reed plate. After aligning the crankcase halves, tighten the retaining screws to a torque of 35-40 inch-pounds.

PISTON, PIN, RINGS AND CYLINDER. Before detaching rod from crankshaft, check the correlation marks on rod and cap. If rod and cap are not marked, scribe a line to indicate proper assembly position.

Model V51 power heads, use an aluminum piston with a deflector cast into piston crown. The piston must be installed in power head with long, sloping side of deflector downward toward the exhaust ports. The two piston rings are identical, and should have an end gap of 0.006-0.011 in the cylinder. Side clearance in piston grooves should be 0.0015-0.003. Recommended piston to cylinder wall clearance is 0.0049-0.006. Oversize pistons, rings and cylinder are not available, renew the units if excessively worn or otherwise damaged.

On V58 and V61 power heads, piston has a flat crown. Lower edge of piston skirt is cut out slightly on one side. The cut out side must be installed toward transfer port side of cylinder. The two piston rings are identical, however, top ring groove is approximately 0.001 wider than lower groove, allowing a slightly greater side clearance for top ring. Piston rings should have an end gap of 0.006-0.011. Top ring should have a side clearance of 0.003-0.005, and bottom ring a side clearance of 0.002-0.004 in their respective piston groove. Recommended piston to cylinder wall clearance is 0.0047-0.006. Piston rings and cylinder are available in standard size only.

On AV81 power head, the flat-crowned piston uses two $\frac{1}{16}$-inch piston rings which are identical although the top groove is approximately 0.001 wider than the lower groove. Piston rings should have an end gap of 0.005-0.013 and a side clearance of 0.003-0.005 and 0.002-0.004 in top and bottom ring grooves, respectively. Piston, rings and cylinder are available in standard size only.

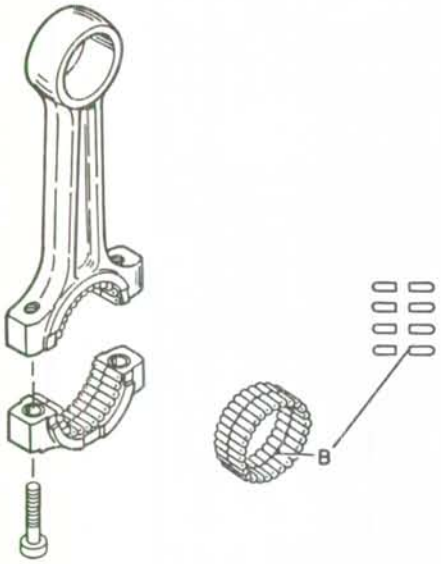

Fig. T1-16A—On some models, 56 loose needle rollers are used for crankpin bearing. Rollers are placed in two rows of 28 each. Be sure that flat ends of rollers are butted together as shown at (B).

The piston pin is retained in piston by two snap rings. Piston pin should have a tight, thumb push fit in piston at room temperature, and a slightly looser fit in unbushed aluminum connecting rod. In models with steel rod and needle roller bearings, renew the pin if bearing surface is scored, ridged or heat-discolored.

CONNECTING ROD, BEARINGS AND CRANKSHAFT. On models using an unbushed aluminum connecting rod, fit at crankpin end should be such that rod will not drop of its own weight (without piston) when raised to a horizontal position on oiled crankpin, but should turn freely without binding on shaft (0.0009-0.0014). Rod to crankpin clearance may be reduced slightly by filing mating surfaces of rod and cap, provided surfaces remain square and not more than 0.002 of metal is removed. If fit cannot be thus restored, renew the rod and/or crankshaft.

On models using a steel rod and needle roller bearings, inspect bearing surfaces of rod and crankpin for ridging, scoring or heat discoloration. The installed rod and bearings should turn smoothly and freely on shaft without binding. Crankpin needle rollers should be renewed in a set if any of the rollers are damaged. On some models, a set consists of 56 loose needle rollers which are installed in two rows of 28 rollers each, with flat ends of rollers together as shown at (B—Fig. T1-16A). On other models, the bearing rollers extend the full width of rod. New rollers are serviced in a strip which can be installed by wrapping strip around crankpin. The wax retaining new roller strips should be flushed out with solvent, dried, then oiled after installation of connecting rod. When reinstalling used rollers, place the loose rollers in rod and cap and retain by using a non-fibrous grease until cap can be secured.

Connecting rod cap retaining screws should be tightened to a torque of 40-50 inch-pounds on models using an unbushed aluminum rod; or 70-80 inch-pounds on models using a steel rod and anti-friction bearings.

Crankshaft main bearing journals should not be out-of-round or tapered more than 0.0005. Connecting rod journal should not be out-of-round or tapered more than 0.001. Refer to condensed service data for journal dimensions. Upper main bearing is of needle roller type on all motors. Some upper main bearings may contain 28 loose rollers which can be held in place with a non-fibrous grease when assembling crankshaft. A needle roller lower main bearing is used on V58 and V61 motors; a ball bearing on AV81 motors; while crankshaft rides directly in unbushed crankcase on V51 models. Renew upper and lower crankshaft seals whenever crankcase is disassembled.

MANUAL STARTER

Recoil starters similar to the one shown in Fig. T1-17 are used on most models. The impulse starter shown in Fig. T1-18 may be used.

To overhaul the recoil starter, remove and invert the assembly. Pull starting rope until notch in rope pulley is aligned with rope eyelet in housing. Hold pulley with notch so aligned by grasping pulley and housing firmly; and feed rope into inside of housing until enough slack is obtained to unwind two turns of rope from pulley groove. Slowly release pulley and allow recoil spring to completely unwind. Remove pulley retaining screw (1—Fig. T1-17) and withdraw pulley assembly, making sure recoil spring (9) remains in recess in pulley. When reassembling, pre-load the recoil spring (9) two full turns when handle (12) is resting against rope guide (11).

To disassemble the impulse starter shown in Fig. T1-18, first pull release lever (21) and allow spring to unwind; then, unbolt and remove starter assembly from power head. Remove centering pin (1) and brake screw (2). NOTE: Brake screw (2) has a left-hand thread. Note the position of spring (4) with relation to cover (8), while lifting off retainer (3). When retainer is removed, check to see that brake (5) is friction tight on hub of retainer (3) and check starter dog (6) for wear. Spring and keeper assembly (10) is available only as an assembly and should not be disassembled. Clean the parts thoroughly, renewing any which are damaged or worn. Lock dog spring (13) should hold lock dog (12) firmly away from wall of hub in housing (11). Coat the parts with a light, waterproof grease when reassembling, and make sure that lock dog (12) engages notches in spring and keeper assembly (10).

Be sure centering pin (1) is in place when starter assembly is reinstalled on power head.

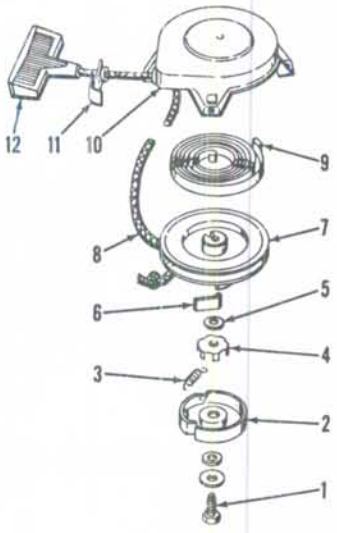

Fig. T1-17—Exploded view of recoil starter typical of that used on most models.

1. Cap screw
2. Retainer
3. Spring
4. Brake
5. Washer
6. Pawl
7. Sheave
8. Rope
9. Recoil spring
10. Housing
11. Rope guide
12. Handle

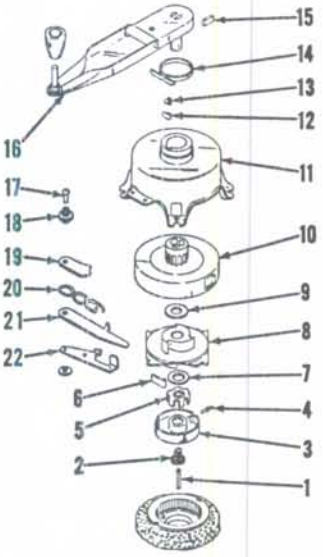

Fig. T1-18 — Exploded view of impulse starter used on some models.

1. Centering pin
2. Brake screw
3. Retainer
4. Spring
5. Brake
6. Dog
7. Washer
8. Cover
9. Washer
10. Spring & keeper
11. Housing
12. Lock dog
13. Spring
14. Clip
15. Pawl
16. Handle
17. Pin
18. Bushing
19. Release dog
20. Spring
21. Release lever
22. Release lock