

The background of the cover features technical line drawings of various mechanical parts from a chain saw, including bolts, nuts, washers, and housing components, arranged in a scattered pattern.

# **HOMELITE<sup>®</sup>**

## **PICTORIAL SERVICE GUIDE FOR E-Z AND E-Z AUTOMATIC CHAIN SAWS**

**FOR THE USE OF HOMELITE DEALERS, PROFESSIONAL  
SERVICEMEN, SERVICE INSTRUCTORS AND TRAINEES.**

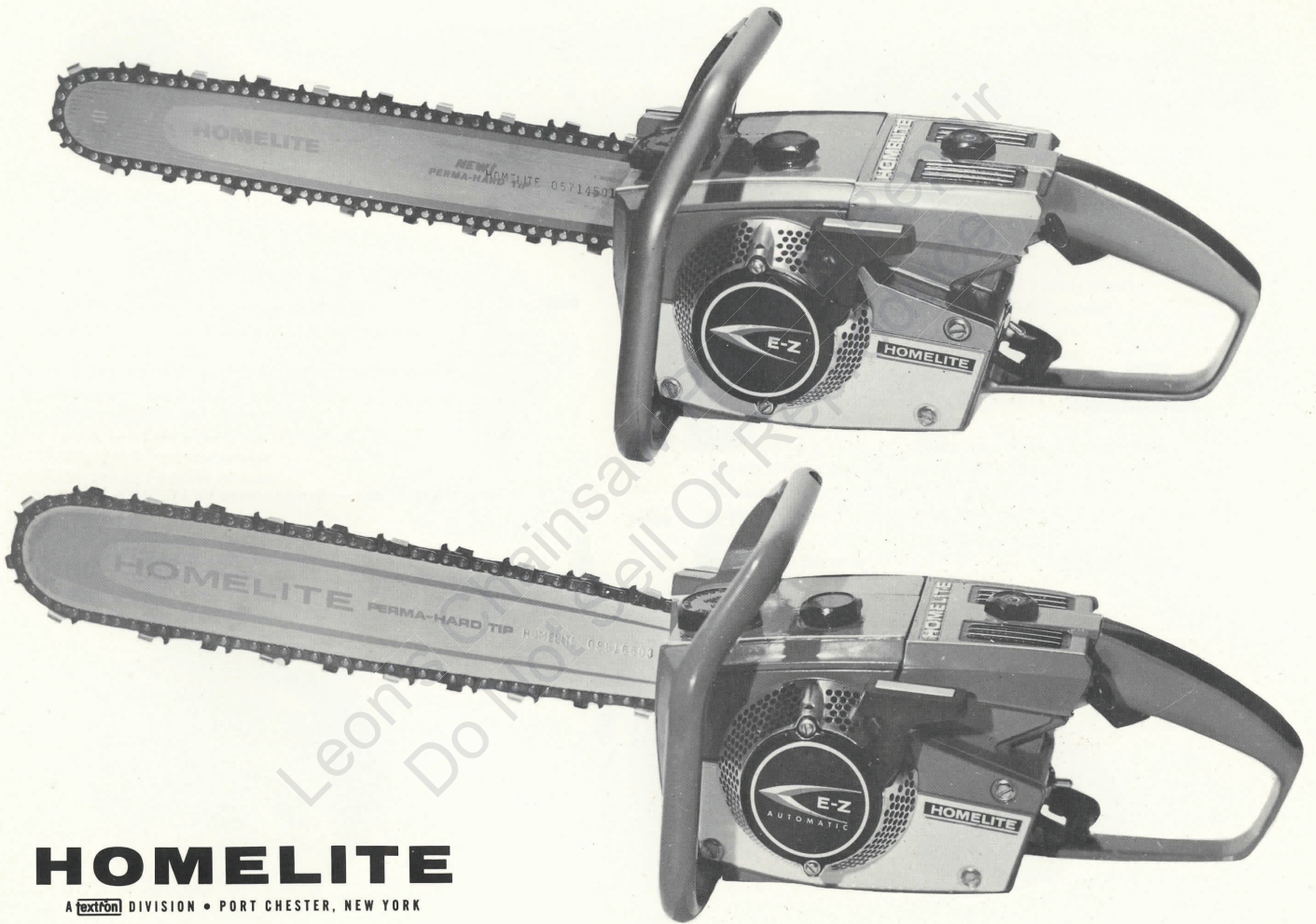
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**PLEASE TAKE NOTE:**

**This guide was prepared for professional servicemen, service instructors and trainees. Because production saws will not be the same as the pre-production saws shown in this manual, always rely on the Service Parts List rather than the Pictorial Guide for correct parts sequences. Although test values may change from model to model, many of the service procedures in this guide can be utilized when servicing other chain saws and small engine equipment.**

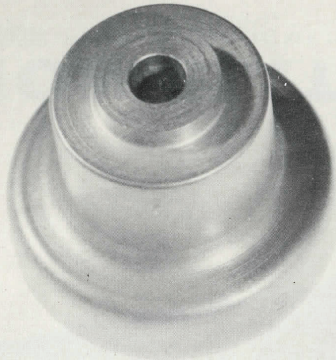
Leon's Chain Saws Parts & Repair  
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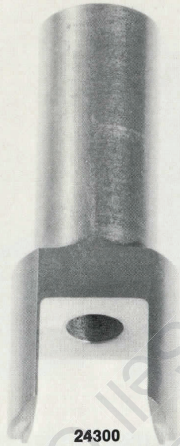


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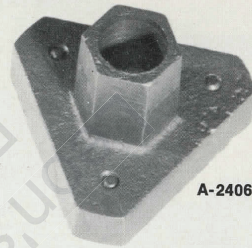
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24299



24300



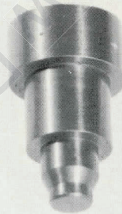
A-24060



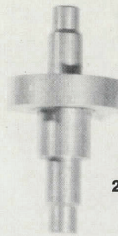
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24298



24292



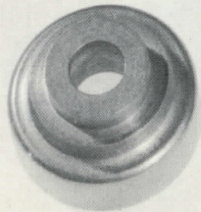
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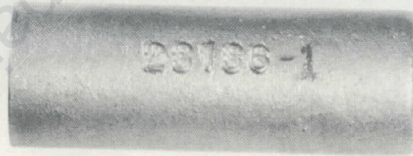
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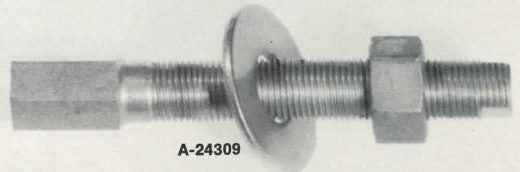
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24295



23136-1



A-24309

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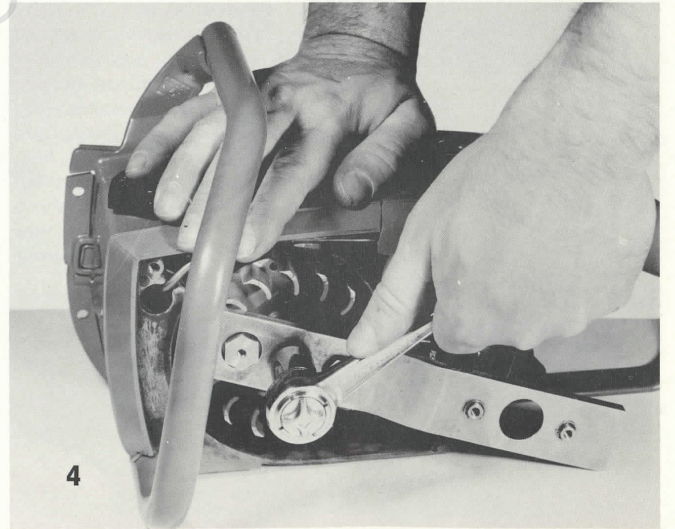
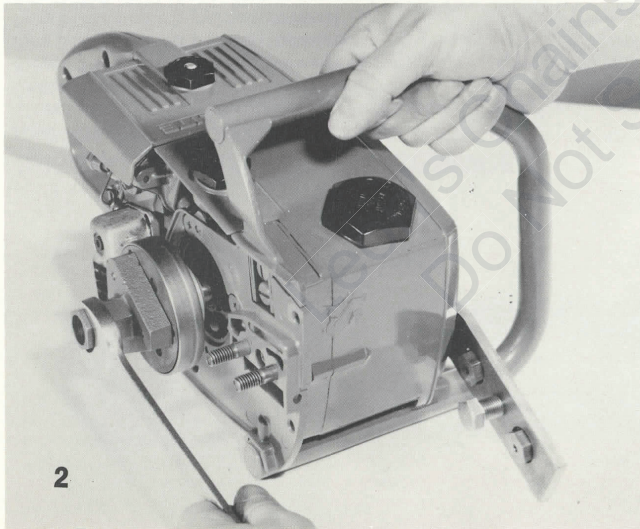
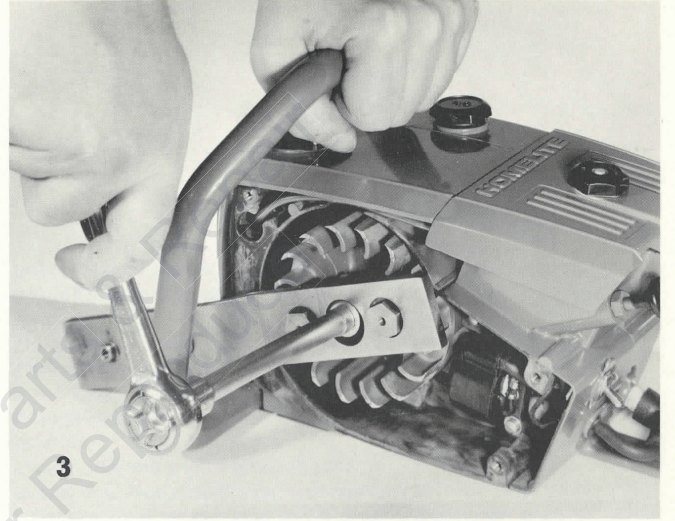
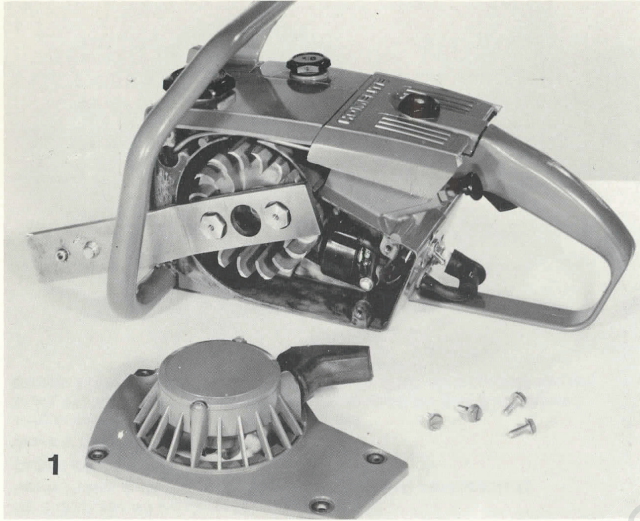


### **SPECIAL TOOLS FOR E-Z SERVICE**

Anvil 24299, support for drive case and shaft  
Sleeve 24300, crankshaft and bearing installation  
Clutch Spanner A-24060  
Sleeve 24291, protects seal in drive case during shaft installation  
Plug 24298, bearing and seal installation  
Plug 24292, bearing and seal removal  
Plug 24294, wrist pin needle bearing assy.  
Bit 24304, for #2 Pozidriv recess  
Bit 24320, for #3 Pozidriv recess  
Rotor Puller A-24290 (not shown above — see paragraph 1)  
Collar 24295  
Sleeve 23136-1  
Jackscrew A-24309 with washer and nut  
Shim 24306, .0125" black plastic for rotor-coil air gap (not shown)  
Gauge 22486, Plastic, for setting points to .015" air gap (not shown)

### **INSTRUMENTS, SHOP EQUIPMENT and MATERIAL FOR SERVICING E-Z CHAIN SAWS**

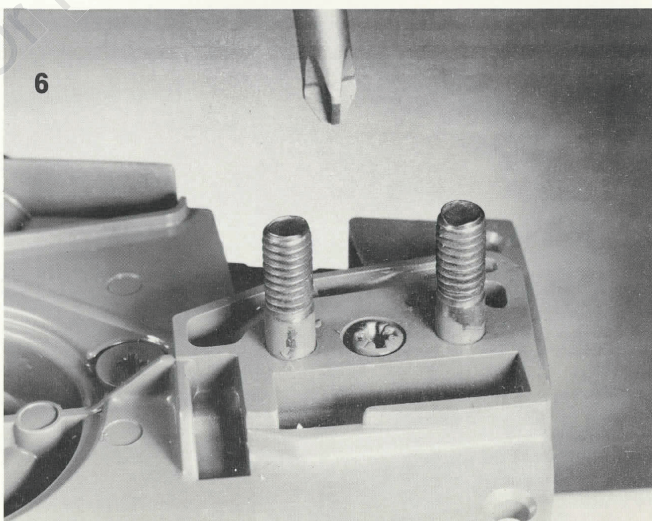
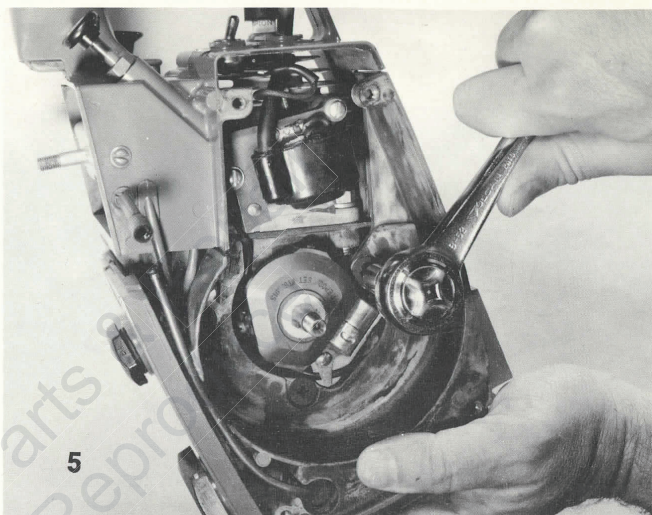
Powr Arm (Wilton)  
Arbor Press  
Brass-Jawed Vise  
Magneto Coil and Condenser Tester  
Ring Compressor (make from 3/8" x 6" spring steel)  
3/8" Drive Torque Wrench (0 to 300 inch-pounds)  
Drive Sockets; Sizes: 1/4, 5/16, 3/8, 1/2, 5/8  
Hex Key Set: particularly 9/64 and 5/32 sizes.  
Open End/Box Wrenches: 5/16, 3/8, 7/16, 5/8, 3/4, 13/16  
Flat Blade Screwdrivers: 1/8, 1/4, 5/16  
Drift Pin, 3" x 19/64" max. dia.  
Fixture, 4" x 2-5/16" I.D. (make from pipe or steel stock)  
Impact Driver (available from Burco Tools, Schenectady, N.Y.)  
Rubber or Plastic Tubing, 1/4" approximate I.D.  
Scotch Tape and Scotch Masking Tape  
Scissors  
Light Steel Hammer  
Awl or Pick  
Long Nose Pliers  
Set of Feeler Gauges  
Motor Oil  
Bearing Assembly Grease or Beeswax  
Any of the High Temperature Greases Mentioned in Paragraph 32.





1. Remove the drivecase cover, the chain and bar, and the two bar plates. Using either a 5/16 wrench or a screwdriver, take out four Loctite-treated screws and remove the starter/fan housing assembly. If the starter is to be disassembled, refer to recoil starter service, paragraph 33. Fasten the rotor locking and removing tool #A-24290 to the starter pawl studs as shown in #1.
2. Use clutch spanner #A-24060 and a 13/16 open end or box wrench to remove the complete clutch assembly. **NOTE:** Turn clockwise to remove, as this is left hand thread. Apply pressure gradually. Do not attempt to free the clutch by hitting or striking the wrench, because the shoes or clutch plate might fracture. If the model has an automatic oiler, remove the worm, the oiler assembly and three screws, and the O-Ring seals.
3. Insert a 1/2 socket wrench through the hole in the rotor locking and removing tool. Remove the rotor nut and washer. (regular right hand thread)
4. Remove and reposition the tool, this time with the jackscrew butting against the crankshaft. Turn down on the jackscrew with a 5/8 wrench and tap the tool lightly to pop the rotor loose. Remove the handle bar assembly; use a 5/32 hex key for the socket screw at top of handle; remove the two 10-32 shoulder screws at the bottom, and the two sets of shock-absorbing pads, plates and grommets with the handle bar. Removal of handle bar bracket is optional.
5. Remove the air filter cover and filter. Disconnect the "rubber" fuel line from the copper fuel line at the left, rear corner of the tank. Also disconnect the "rubber" oil line from the fitting at the same corner of the tank. Using a #2 bit for Pozidriv screw heads with a type 1A recess, remove three wafer head screws holding the tank to the crankcase on the left.
6. Use a #3 Pozidriv bit to remove the filister head screw (it has a type 1A recess) located between the mounting bolts in the guide bar-mounting pad. Slide the tank off the engine.

**NOTE:** Although Phillips head drivers will fit into POZIDRIV screw head recesses, they do not fit well enough for safe removal of the POZIDRIV type screw. These special screws develop more holding torque than originally adjusted to, and the recesses can be "cammed-out" (damaged) unless care is taken during screw removal. Screws with damaged heads can be started loose with the correct sized POZIDRIV bit fitted to an impact driver — strike the impact driver a light, sharp blow with a small steel hammer. The impact will turn the screw head a few degrees with each blow. When wafer head type POZIDRIV screws have been turned enough for the heads to clear the casting, they can be turned farther and faster by blows from a sharp cold chisel applied at the edges of the screw heads.





7. Remove the air cleaner mounting bracket held by an 8-32 pan head screw at each side of the (air box) throttle handle and carburetor chamber assembly. Disconnect the fuel line at the carburetor. Remove the cotter pin to free the choke rod from the carburetor choke lever. Remove the clamp and rod assembly. With a 5/16 wrench, loosen the two screws at the rear of the carburetor. Angle the carburetor as necessary to remove it — along with the screws, lockwashers and carburetor gasket — from the air box. Using a 1/4" blade screwdriver to remove the two 8-32 pan head screws, remove the cover from the throttle handle grip. Slide the trigger assembly off the pin in the handle. The throttle latch (also called lock button assembly) need not be disassembled from the cover unless required for service. For carburetor disassembly and service, see the HDC carburetor service section.

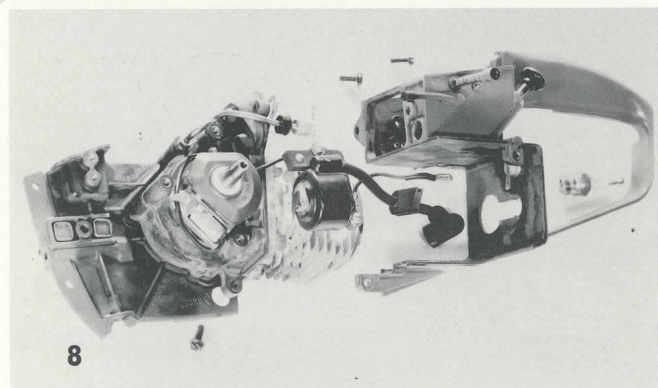
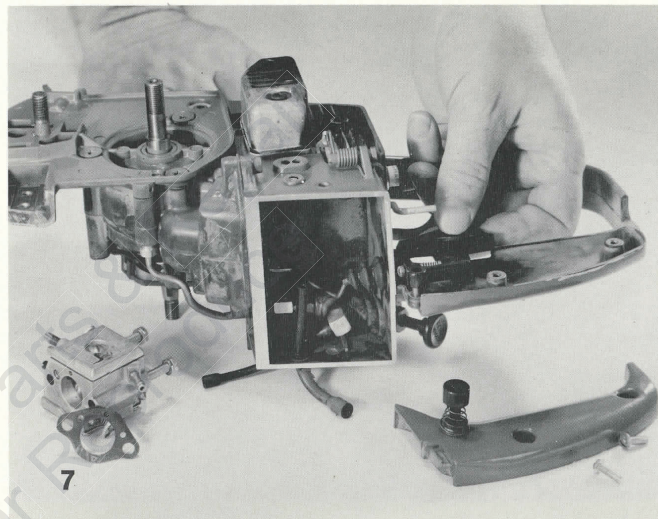
Remove the muffler (disassembly is according to type). Lift the end of the compression release valve spring and lay it beside the valve in the cylinder, then take out the two pan head screws and remove the compression release clamp, plate and rod from the air box. Remove the valve. If desired, the spring can be slid off the mounting post, and the mounting post and nut removed as well.

8. Use combination wrench A-24284 to remove the spark plug. Remove three 10-24 self-locking type hex head screws (one is inside the air box). Disconnect the switch lead wire at the switch terminal tab. NOW work the spark plug lead grommet out of the slot and commence pulling the air box off the engine — loosen the oil line compression nut inside the air box so the line and the split grommet can be pulled out of the air box as the air box is removed.

9. If the breaker box and components are to be disassembled: remove the breaker box cover and also the screw and nut holding the condenser and coil primary leads and the breaker point spring to the insulated terminal in the wall of the box. Otherwise, just loosen the screw enough to slip out the coil primary lead. Remove screws and washers holding (a) condenser, (b) the fixed breaker plate, and (c) the breaker box in position. Remove the box and the free parts including the felt seal between the breaker box and the crankcase.

The felt which is in the breaker box is part of the breaker point assembly, and should be removed if new points are to be installed. At this point, if the short copper oil line is likely to be in the way, remove it from the crankcase.

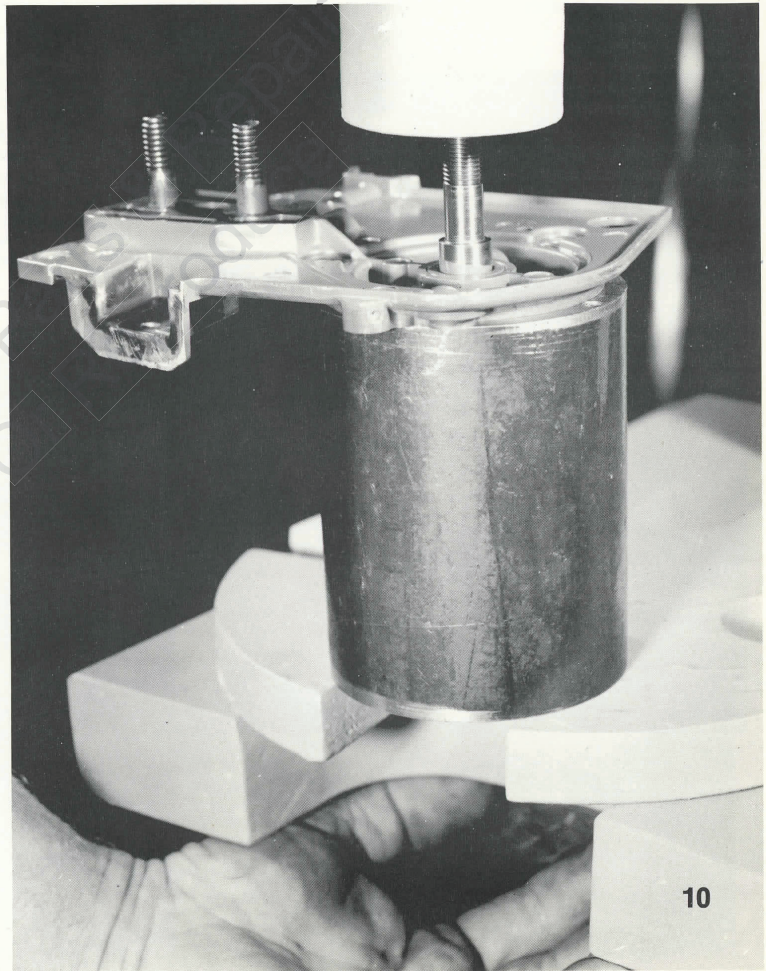
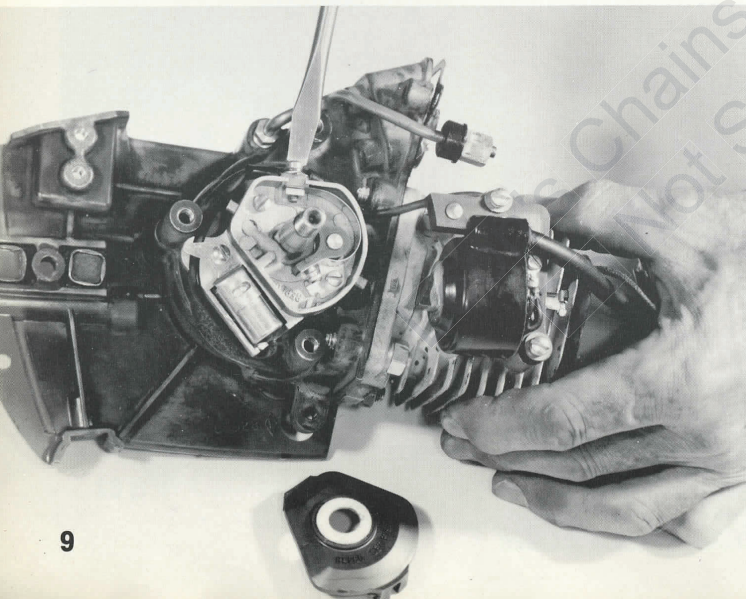
A 1/4" socket wrench or a screwdriver are required for removal of the three reed valve assembly screws. The removal sequence is: screws, damper (intake manifold); gasket, heat dam, and the gasket and valve assembly composed of plastic valve seat, four steel reeds, and a black "rubber" reed retainer. (Note: later models with an intake manifold replacing the damper have one of the gaskets and the heat dam eliminated).



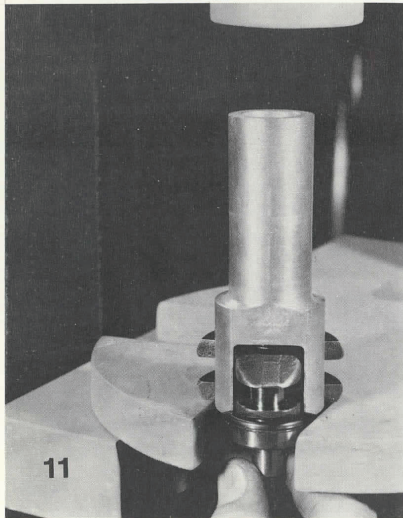


With a 7/16 wrench, remove the four cylinder nuts and lock washers. Lift off the cylinder. The cylinder/intake manifold gasket can now be removed. Using a 9/64 hex key, remove the con rod cap screws. Lift out the piston and rod and be sure to recover all 28 of the crankpin bearing needles as well as the bottom of the con rod. Use a 19/64" (maximum O.D.) drift pin to push out the Rulon plugs and the piston pin.

10. Use the #2 POZIDRIV bit to remove the three wafer head screws holding the drivecase to the crankcase. While separating the drivecase from the crankcase, remove the large (.034 National) main O-ring, and the small (.007) O-ring that is in the oil line connection at the bottom of the drivecase. At this point the crankcase contains four cylinder studs and one or more register pins plus a shaft support bearing and a seal. The crankshaft is in the drivecase. Use a long-bladed screwdriver to remove the main bearing-retaining screws and washers. A fixture to support the drivecase on an arbor press should be made. It should be at least 4" long and have an I.D. of 2 5/16". Support the crankcase side of the drivecase on the fixture and press out shaft and bearing. To prevent scratching (and future fracture) tape the shaft with Scotch Tape before removing the bearing-retaining snap-ring.





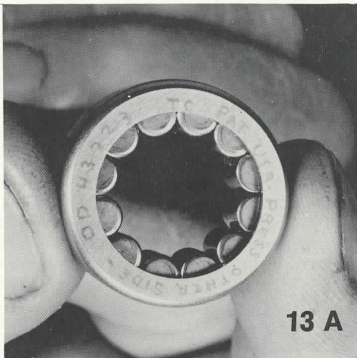


11. A guillotine type commercial puller can be used to remove the old bearing from the shaft. Another way is to slide the forked end of Sleeve #24300 over the timing end of the crankshaft to straddle the crankthrow, and press the bearing as far from the counterweight as this sleeve #24300 will allow. Then, insert steel strips between bearing and counterweight, put the timing end of the shaft into the *homemade* 2 5/16" I.D. fixture (described in paragraph 10); and with the fixture supporting the steel strips, press the shaft out of the bearing.

12. Seal plug #24292 can be used as shown to push the seal and bearing out of the crankcase, and also the seal from the back plate at this time.



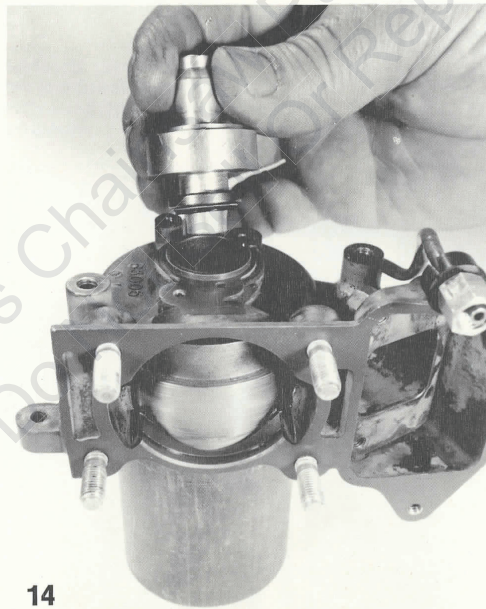
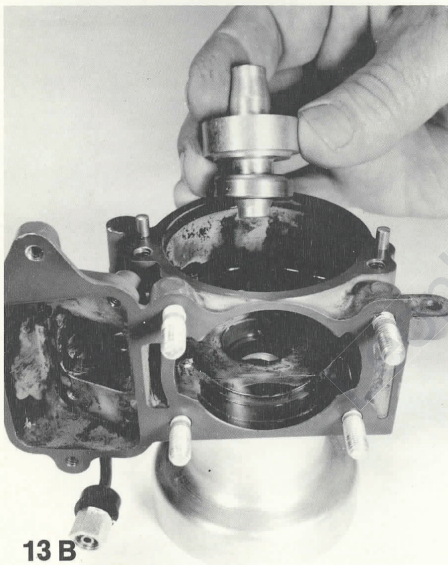
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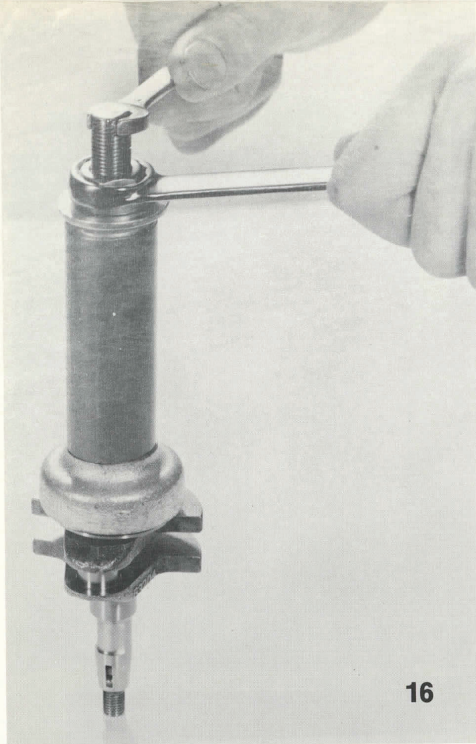


13. Oil the caged roller bearing. Put its non-lettered side (See #13A) up against the shouldered end of plug #24298. Support the crankcase on anvil 24299 as shown. Press the bearing straight into the bearing bore.

14. Turn the crankcase over and support it on the same homemade fixture as in paragraph 10. Oil a seal, put it on the non-shouldered end of plug 24298, and press it open-side-first into the crankcase.

15. Oil another seal and put it open-side-out onto the non-shouldered end of plug 24298. Support the drivecase properly and press the seal open-side-first into the shaft bore.

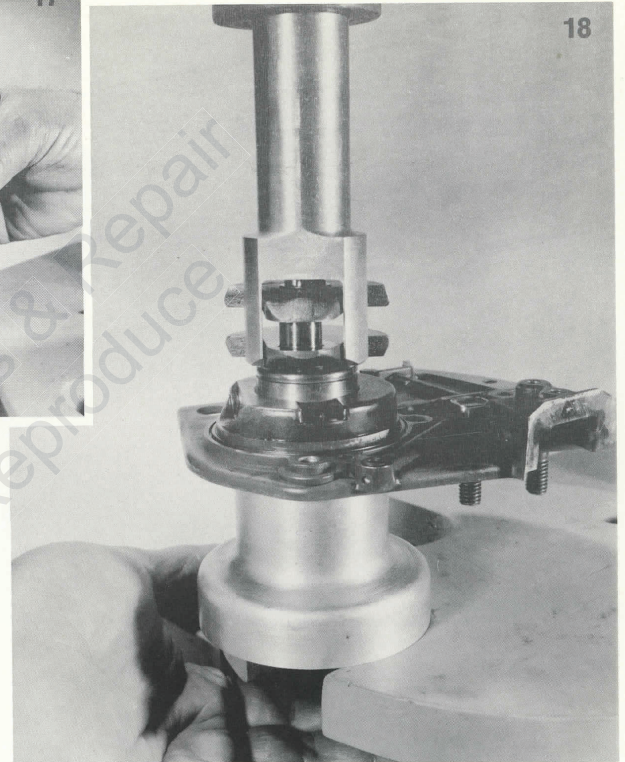




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16. Hold the main bearing so the grooved end is closest to the crankthrow. Start the bearing onto the clutch end of the shaft by hand. Put collar #24295 on the shaft, then screw the jackscrew portion of A-24309 onto the shaft. Hold shaft from turning after this. Slide Sleeve #23136-1 onto the jackscrew and add the jackscrew assembly washer and nut from A-24309. **IMPORTANT:** Hold the jackscrew with a  $\frac{3}{8}$ " wrench and do not let it turn as the nut is being turned with a  $\frac{3}{4}$ " wrench to draw the bearing into position on the shaft. Remove all the tools. Tape the shaft with "Scotch" tape to prevent scratching the crankshaft during snap-ring installation. Remove the tape afterwards.

17. **IMPORTANT:** Interference fits between the bearing and bearing bore are quite tight in the models. Therefore, the bearing bore and the bearing should always be prelubricated with SAE-30 to SAE-90 oil before the shaft and main bearing are started into the drivecase. In addition, seal protecting sleeve #24291 should be slid on the clutch end of the shaft and oiled to protect the drivecase seal.

18. Put anvil #24299 onto an arbor press and locate the drivecase on it. Start the clutch end of the shaft through the drivecase seal and the anvil. Slide forked assembly sleeve #24300 onto the shaft until the forked ends touch the outer race of the bearing.

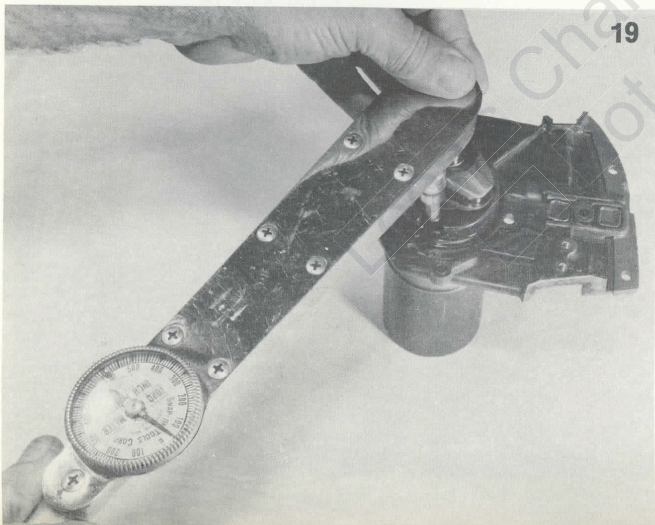


19. When everything is aligned, press the shaft and bearing home in the drive case and remove all tools. Using new retaining screws and washers torqued to 45-50 inch pounds, lock the bearing in place. Using new O-rings, oil them with SAE-30 oil first. Then, install the large one in the drivecase sealing groove and the small one in the recess for the chain oil passage connection. Oil the sealing surface of the crankshaft and fit the crankcase carefully into register against the drivecase. NOTE: there may be one or two register pins in the register face. Now lock the assembly together with three new wafer head screws tightened to 75 inch-lbs. Rotate the crankshaft to be sure there is no binding.

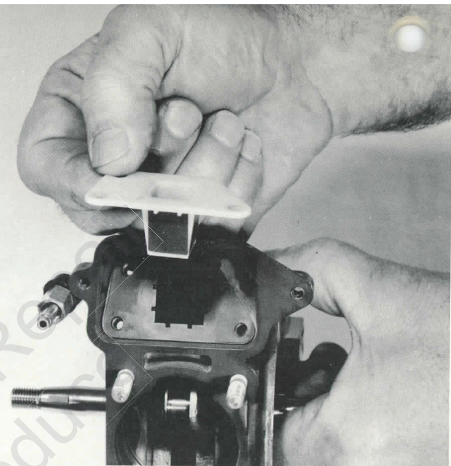
20. When installing the reed valve parts, always fit the black "rubber" reed retainer into register first. Then oil the four reeds so they adhere to the reed valve seat. Assemble reeds and fit valve seat into the retainer. Now, assemble the parts behind the valve seat. These will vary with production. The first production group sequence is: gasket, heat dam, second gasket, reed adapter. A variation calls for: gasket, reed adapter and an intake manifold which replaces the heat dam, adapter and second gasket. Fasten the parts in place with three slotted hex head self locking screws torqued to 30-36 inch-pounds.

NOTE: At this point of assembly, a pressure test can be made to check for possible leakage. Refer to Assembly Test Section for details.

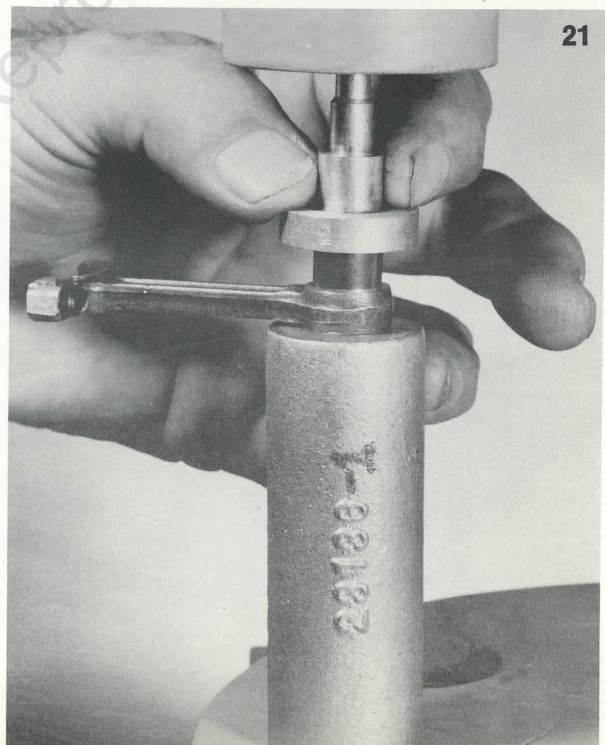
21. If the needle bearing in the connecting rod is to be replaced, press out the old one with the wide-shouldered end of plug #24294 and install with the other end of the same plug. The sleeve 23136-1, usually used during main bearing assembly, can be employed here as a con rod support.



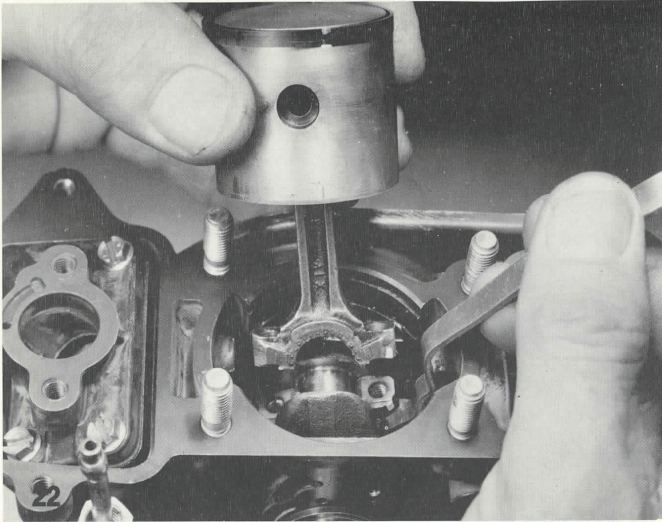
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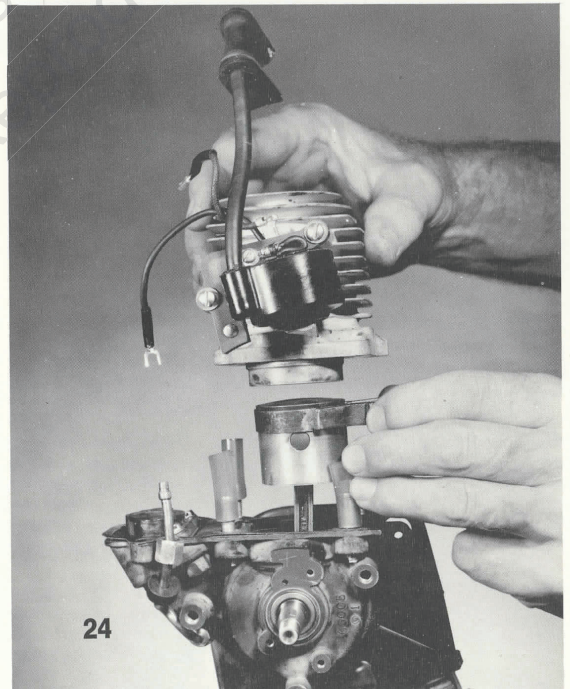
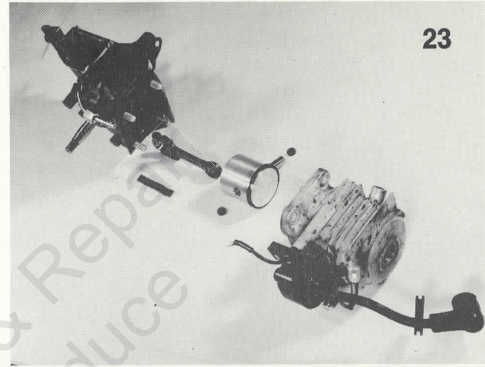




22. The connecting rod has match marks on it because it was made into two pieces by the fracture method and fits properly only one way. Using wax or heavy grease, assemble 14 needles in the lower part of the rod and 14 in the top (total 28 needles). Use a hex key or other support to hold the lower part in position around the crankpin. Lower the rest of the rod in position (with marks rematched) and use new screws to hold the rod together. Before tightening the screws, make sure the assembly is correct and does not bind. Torque the screws to 55-60 inch-lbs. and test to see that the assembly turns freely. Put the cylinder intake valve sealing gasket in place on the cylinder studs.

23. This series of engines has two types of piston, piston ring, and cylinder assemblies. One has the Schneurle loop-scavenging design with convex piston top, matching cylinder dome and two piston rings. The other type has a bell or UFO-shaped inner cylinder dome and a convex piston top with one L-shaped piston ring installed at the top edge of the piston. The latter is known as "squish chamber" configuration, the L-shaped rings are "dyke rings". Using the fingers or a ring expander, install the piston ring or rings in the ring grooves. Note that a pin in each ring groove locates and fixes the open end of the ring so it does not rotate during operation.

The open end of the piston ring (or rings) should be toward the starter side of the engine. Orient the piston in this manner, then assemble it on the connecting rod with the piston pin (wrist pin). Pop a Rulon plug into one end of the piston pin bore. Then pop one into the other end and push back and forth with the fingers to center the pin.





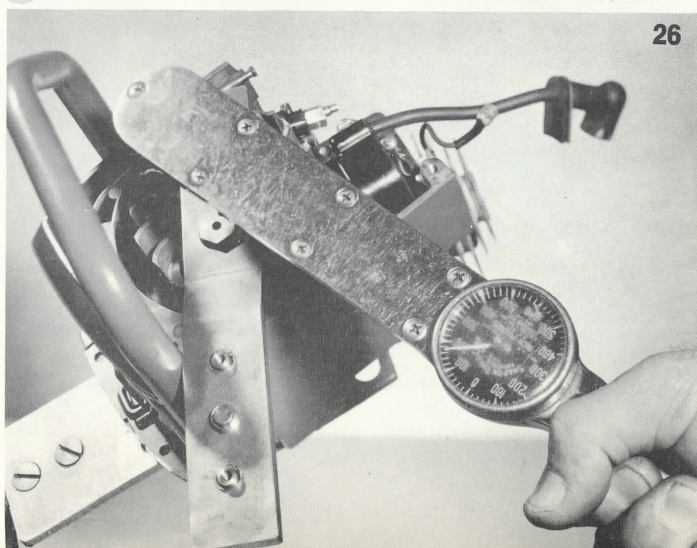
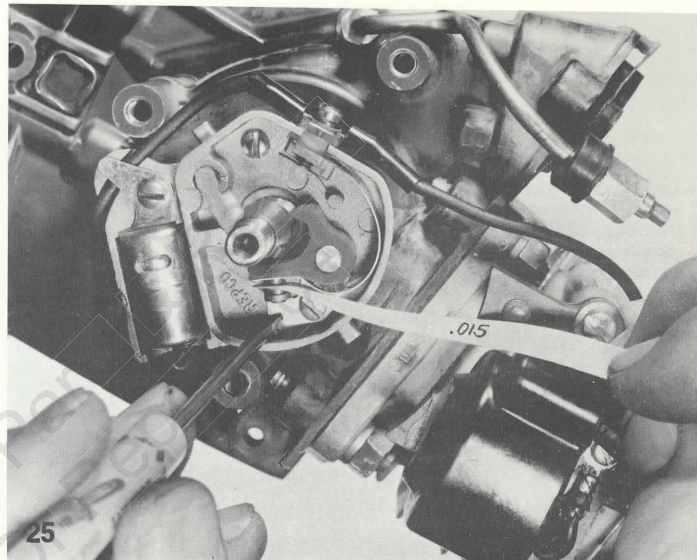
24. Once the piston is in place, put it to top dead center, then put  $\frac{1}{4}$ " I.D. rubber or plastic tubing over the cylinder studs so the piston will not hit them accidentally. Make a ring compressor by bending a six inch strip of (approx.  $\frac{3}{8}$ " wide) spring steel. Oil the sides of the piston and the cylinder. Remove the tubing. Place the compressor around the rings and squeeze them into the ring grooves. At the same time start the cylinder down on the piston — work it down until the rings are inside the cylinder. Remove the ring compressor. Fasten the cylinder to the crankcase with the lockwasher and the four cylinder nuts, *tightened alternately* so the cylinder registers properly.

25 If the coil and core were removed, attach the core to the cylinder with two flat washers and 8-32 filister head screws. Put a new felt washer on the timing end of the shaft. Register the breaker box in place against the crankcase and hold it with one washer and screw. Fasten the condenser in place. Install the insulated switch terminal. Put the terminal screw through the condenser lead connection, then through the terminal. Assemble the breaker points in the box with one screw and washer. Put the spring on the terminal screw and hold it with the square nut. Slide the coil primary lead connector under the terminal screw head. Now, before tightening the terminal screw and nut, align the breaker spring to be sure it does not ground against the box at any point (or it will short out). Set the breaker points to  $.015$ " gap in the conventional manner. Snap the cover on over the breaker box, put the felt washer on the shaft, and check that the rotor key is in the crankshaft.

Fit the fuel tank into place on the crankcase and secure with three wafer head POZIDRIV screws torqued to 75-80 inch-lbs. Fasten drive case to tank with a filister head POZIDRIV screw torqued to 75-80 inch-lbs. Connect the "rubber" fuel line to the metal fuel line, and the oil line to the tank oil line fitting. Assemble the shock-mounting and the front handle bar to the drive-case and fuel tank.

NOTE: The wafer head screws require a #2 POZIDRIV bit, and the filister head POZIDRIV screw a #3 POZIDRIV bit. Do not Loctite these screws, but torque them carefully to 75 inch-lbs.

26. Start the rotor onto the crankshaft taper by hand. Then affix rotor locking and removing tool A-24290 to the rotor, put the rotor washer and nut on the shaft and tighten the nut to draw the rotor onto the taper. Tighten the rotor nut to 150-200 inch pounds. Remove the tools.





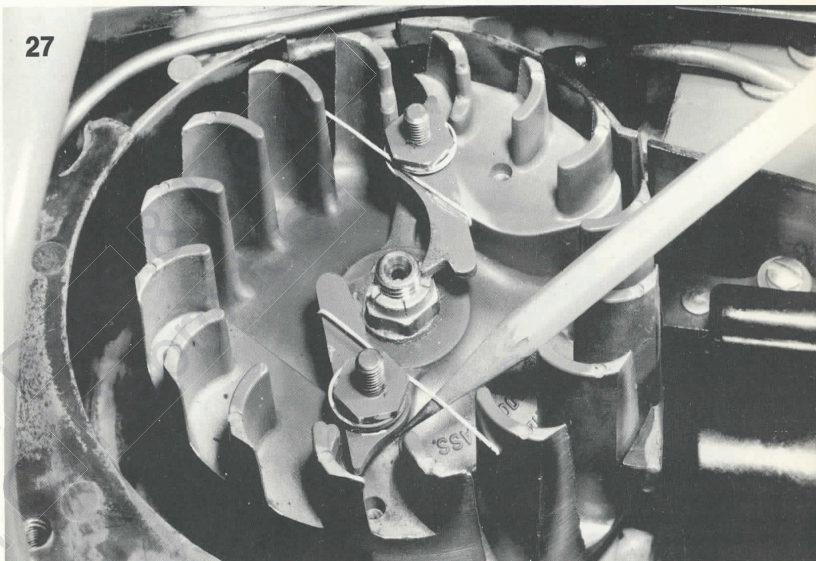
27 If the starter pawl had been disassembled, reassemble and restore spring tension by putting the spring end in contact with the first full rotor fin (not the cut-out fins next to the spring posts).

28. The proper air gap between the coil and core legs and the rotor magnet is critical for good magneto output. It should be set to .008"-.012", but this requires a piece of .0125" thick (black color coded) shim stock available as part #24306. Loosen the core-mounting screws and pull the core away from the rotor; insert the #24306 shim between the rotor and both legs of the core. Now rotate the rotor until magnetism pulls the coil and core toward the rotor. Tighten the screws and remove the shim. Check the air gap with a feeler gauge — when set as above, it should be close to the desired .008" gap and within the .008"-.012" range.

29. If previously disassembled, put the elongated grommet on the spark plug lead and install the terminal spring and insulator boot on the end. While fitting the air box into place on the unit, slide the grommet into the mounting slot in the air box; Also install the compression release valve plunger in the cylinder, install the valve spring on the spring post, and lay the end in the groove of the plunger. Before fastening the air box, install the manual oil pump in-check and out-check valves; start the oil line into position inside the air box, and screw the fitting on the other end into the crankcase. Connect the oil line inside the air box to the out-check valve. Stuff the split grommet in around the oil line to close the hole in the air box. Now, fasten the air box to the engine with three screws. Assemble the long (10-32 x 1 11/16") screws, lockwashers, carburetor, and carburetor gasket. Angling the carburetor is necessary to connect the throttle rod and start the needles through the grommets in the air box, put gasket and carburetor in register against the intake face, and tighten the two screws. Snap the grommet section of the rubber oil line into place and connect the line to the (90°elbow) in-check valve. Connect the fuel line to the carburetor inlet in the same fashion. Push the ignition switch lead onto the flag terminal at the coil.

Put the trigger on the trigger pin and assemble the cover to the air box throttle grip. When doing this be sure to engage the compression release lever in the slot of the trigger latch (throttle lock button).

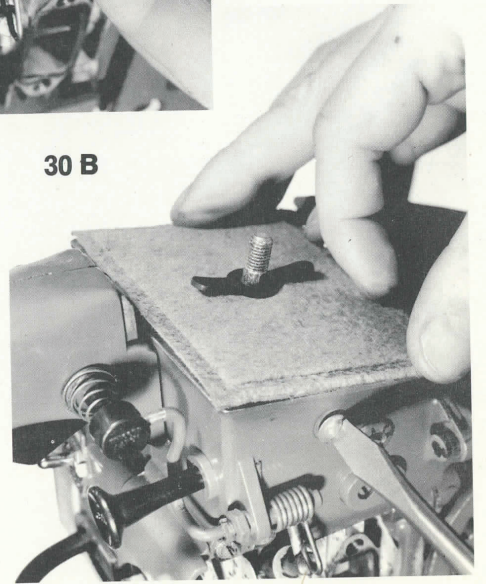
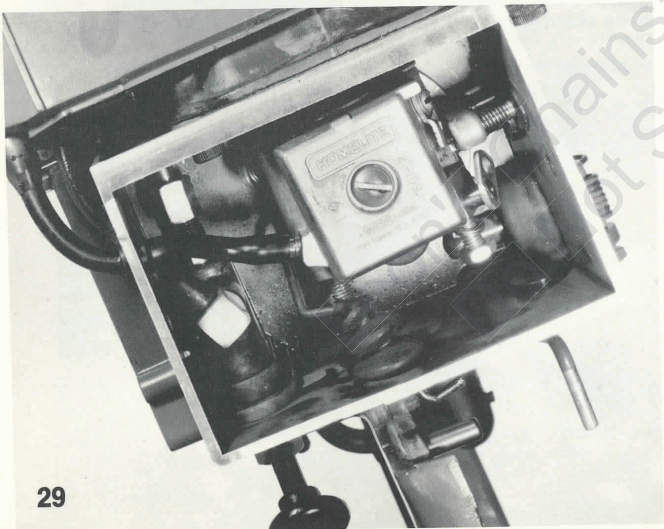
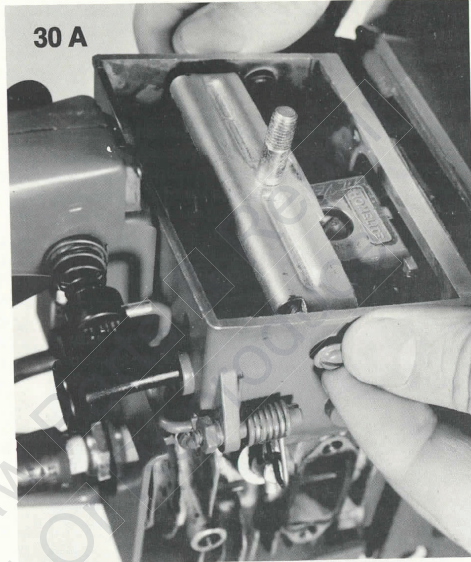
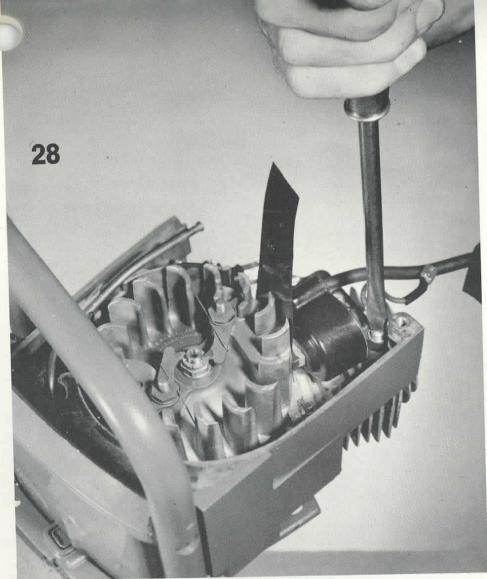
Install the spark plug. Cold torque is 120-180 inch-lbs. Connect the spark plug lead to the plug. Install the choke rod, hook the end to the carburetor choke lever and lock it in place with the clamp. Install the muffler.

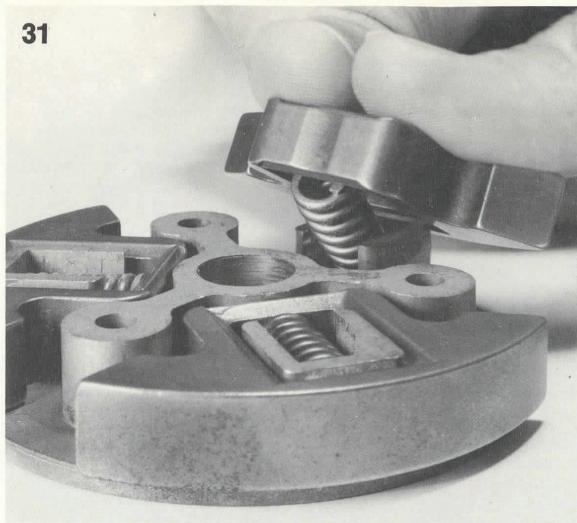


30. Assemble the air filter cover mounting bracket to the air box with an 8-32 self-locking, pan head screw on each side. Before tightening the bracket, fit the filter flush on the air box so there will be no edge leaks. Install the filter cover.

If the model has an automatic oiler, oil and insert the two O-rings in the inlet and outlet connection recesses; and if the pump was serviced, install the check valve ball, spring, gasket and retaining screw in that order. Install the pump piston, cap and two screws. Then install the gasket and the cam screw — the one that engages the cam slot cut in the piston. Finally, press in a new seal if the old one had to be removed, and install the worm. Fasten the pump in place with three self-locking pan head screws.







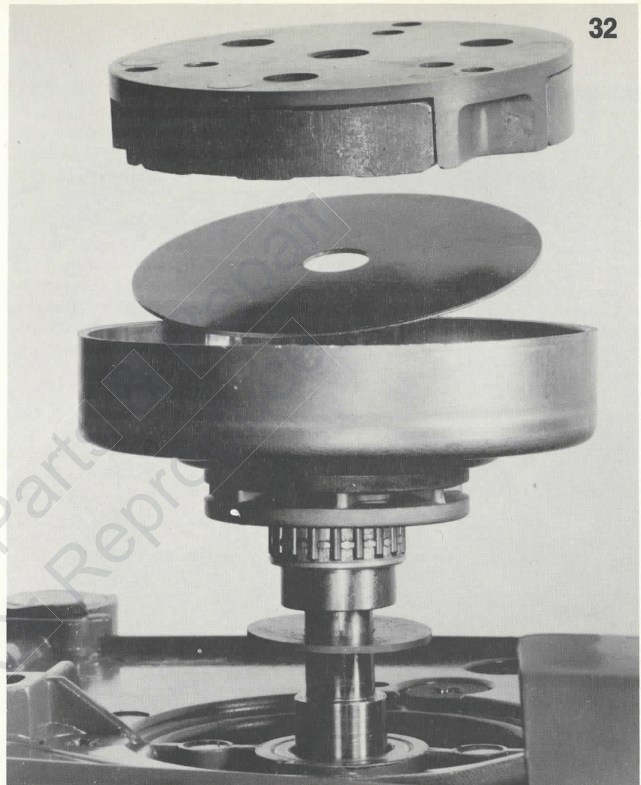
31. If the clutch shoes and springs have been disassembled, install them on the clutch plate. An easy method of installation is shown in photo #31: Put one end of spring in spring compartment, barely catch shoe over the back of the compartment, place the other end of the spring in contact with the inside edge of the shoe. Now push down with both thumbs to snap spring and shoe into place.

32. The bearing and inner race inside the clutch drum assembly should be lubricated with a high temperature grease after each 100 hours of operation, or whenever the clutch has been pulled down for cleaning and service. Put the small thrust washer on the shaft first, followed by the bearing and race, and the sprocket and drum, then the clutch cover (large thrust washer). The clutch cover goes inside the drum and the clutch plate is assembled last. The sides shown go toward the engine. Spin the clutch plate onto the shaft in a counterclockwise direction (l. h. thread) *NOTE: Recommended high temperature greases are:*

*Aero Shell # L 14*  
*Aero Shell # 5*

If not available try:

*Texaco Unitemp #500*  
*Humble (Esso) Nebula EPI*

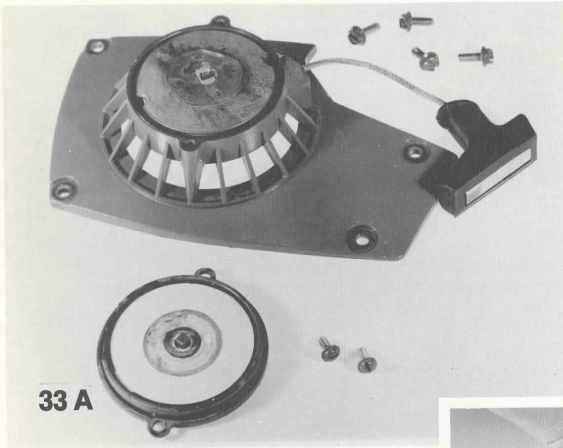


Using tool A-24290 to hold rotor from turning and clutch spanner #24060 plus a 13/16 wrench to turn the clutch, tighten to a torque of 250-300 inch-lbs. *CAUTION: Do not strike the wrench a sharp blow as this could fracture the clutch.*

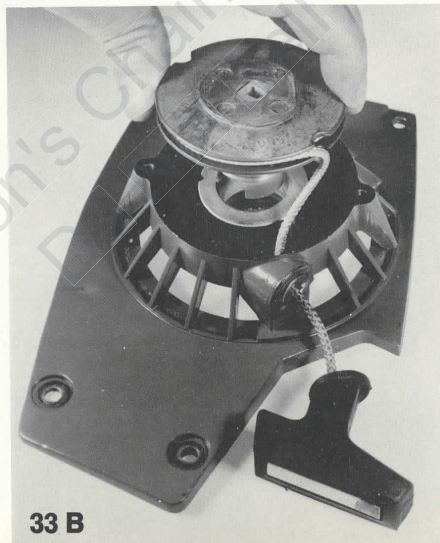
Unless it is to be disassembled, install the starter fan housing. Press housing lightly against the engine. Pull cord out a way and release it until the starter pawls swing out of the way and housing registers against the tank. Fasten with four screws Loctited and torqued to 40 inch-pounds.

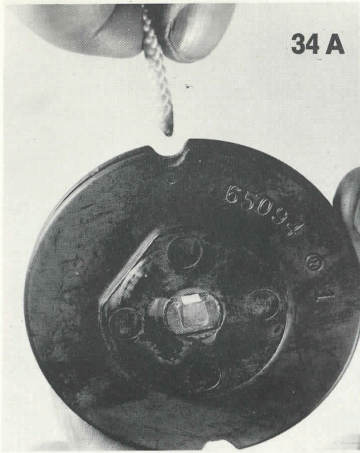


## RECOIL STARTER SERVICE

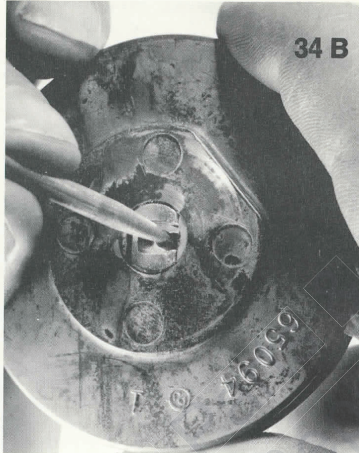


33. Hold down the rewind spring cover and remove the cover screws. Let the cover turn to relieve spring tension. Lift off the cover. Line up rope and side notches in pulley. Lift the pulley out of the housing. Pull the cord part way out of the pulley cup for examination. If the cord is frayed or damaged, remove the old cord. Clean the housing and inspect the keyed bushing, flat washer and pulley. If the fit is too loose, the bushing and possibly the pulley contact surface may be worn. Replace any worn parts.

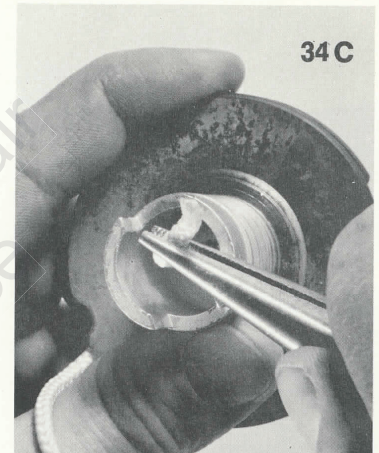




34 A



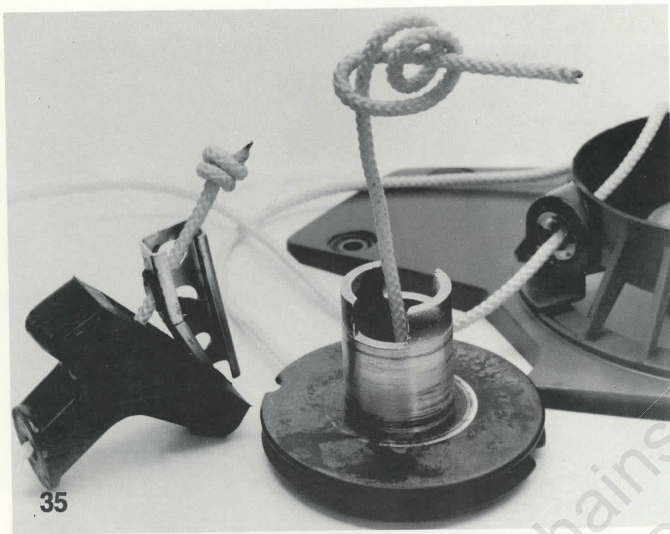
34 B



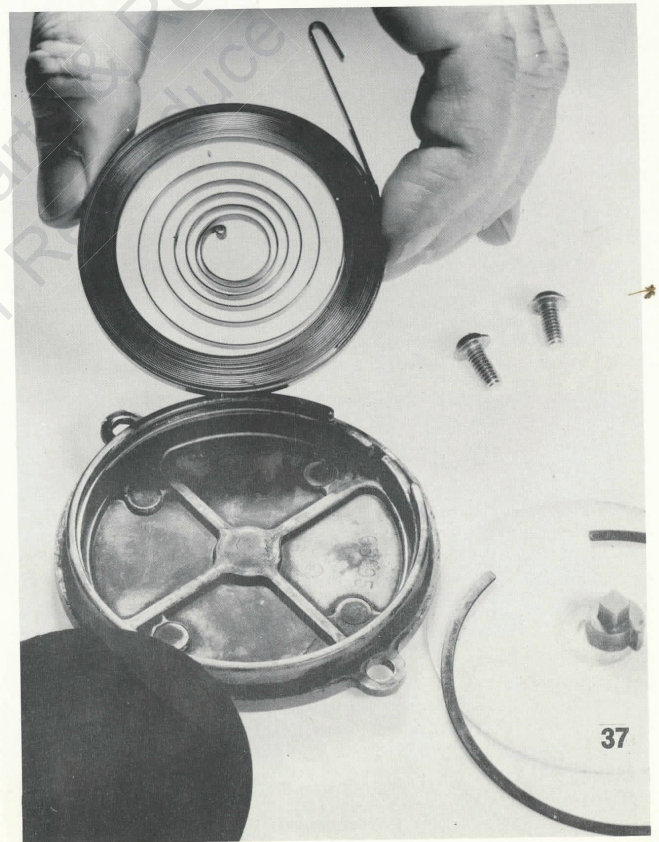
34 C

34. When installing a new cord, feed one end through the small hole in the pulley hub. Use a pick or awl to push the end through to where it can be pulled out at the notched (starting pawl - engaging) end of the pulley hub with long nosed pliers.
35. Knot the end as shown and insert a "glob" of DUXSEAL (waterproof sealer) into the hub; then draw the knotted end tightly into the hub. Feed the other end through the bushing in the housing, the starter grip, and finally the grip insert. Then, tie a knot in this end of the cord. Apply DUXSEAL to the starter grip recess and grip insert before pulling the knotted end of the cord into the insert and fitting the insert into the grip. Assemble the keyed bushing, washer and pulley in the housing.
36. Compress and remove the large snap-ring from the rewind spring cover. Remove the plastic outer spring shield. Carefully pick out the small brass spring lock from the center of the coiled spring. NOW — work the hooked outer end of the spring off with long nosed pliers. Remove the spring and the inner spring shield.
37. New springs have been lubricated and drained. Old springs which have been cleaned should be lubricated by soaking in a light machine oil. **WARNING:** as too much oil will cause the spring coils to stick together, the springs should be hung to drain for 12 to 24 hours after dipping. Lay the solid outer shield in the spring cover. Orient the spring so the outer end is bent back clockwise. Hook the bent end in the notched area provided in the housing. Complete assembly by installing the small spring lock to engage the inner coil of the spring, covering the spring with the inner spring shield, and holding the parts in place with the snap-ring.
- TENSIONING:** Turn the pulley counterclockwise until the cord is wound on the pulley and the grip is drawn up to the housing. Put the cover and spring assembly on the housing and rotate the cover until you feel the spring tension build up (spring lock has engaged spring). Let it unwind slowly, if it wants to. Now, wind 3 turns extra tension on the spring and install the cover fastening screws.



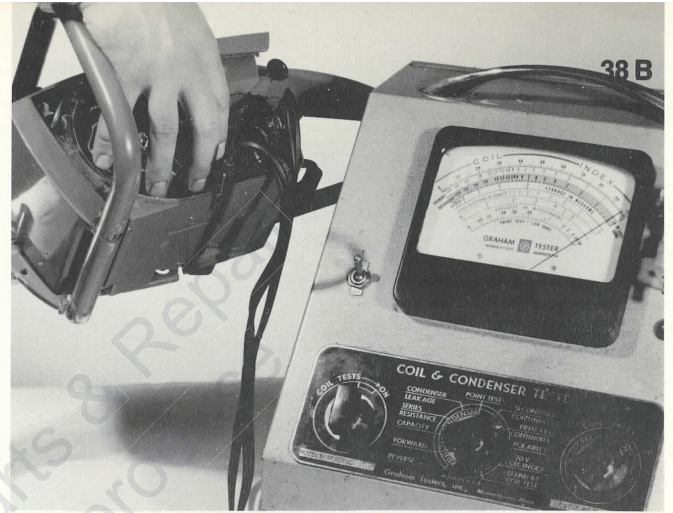
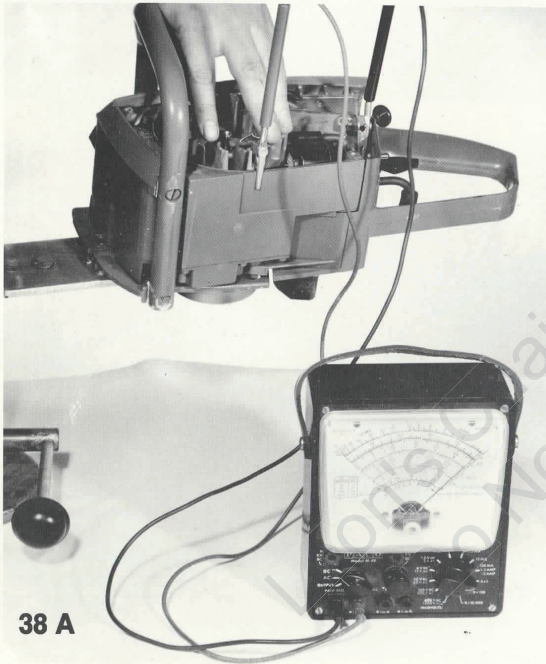


**CAUTION:** A coiled spring is dangerous when out of the housing. Take precautions not to let the coils fly apart during servicing. Before disposing of a recoil spring, either wire or tape the coils together or let it come apart inside a container.



## IGNITION SYSTEM SERVICE AND TESTING

Ignition trouble generally occurs in this order: spark plug, breaker points, loose or shorted wiring, coil-to-rotor air gap, condenser, coil, ignition switch and magnets. Proper parts assembly and setting of the breaker point and coil-to-rotor air gaps is discussed in the assembly section. If ignition trouble is encountered, be sure that the spark plug is in firing condition; that is, electrodes clean, unpitted, properly shaped and gapped (to .025"), and the porcelain insulator undamaged. Also check for frayed, cracked or broken lead wires in both the primary and secondary circuits. Be sure, for instance, that the condenser lead has not been damaged by contact with the rotor.

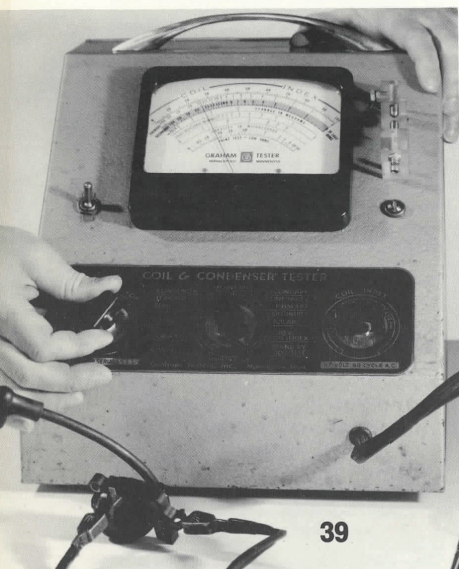


38. The primary circuit can be tested while the magneto is still in the engine; but it is important to disconnect the coil ground lead (coil-to-pole piece ground) to isolate the primary from the secondary. Then, using either a volt/ohmmeter or a coil and condenser tester (tester shown is a Graham #51), connect the (+) or (-) lead (it doesn't matter which one) to engine frame and the other to the switch lead tab, put the pointer of the Graham tester to "PRIMARY CONTINUITY". Observation: when rotor is rotated, the needle of the instrument should read near "0" resistance with points closed, and should swing over to an infinity reading (100 ohms on your dial) as the points open. If there is no definite needle deflection when rotor is turned, there is a short in the primary, or the points are not opening; if the needle stays at infinity, the primary circuit is "open" — look for frayed or broken wire to ground.

### TEST VALUES ON GRAHAM 51 TESTER:

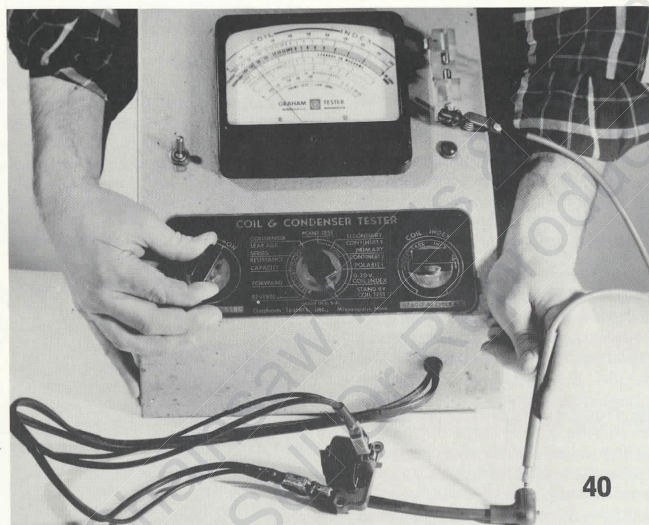
Primary	— Approx. 1 ohm
Coil Index	— 75
Gap Index	— 75
Minimum Coil Test	— 18
Secondary Continuity	— 10,000 ohms
Condenser Leakage	— 0
Series Resistance	— less than 1 ohm
Capacity	— approx. .2 mfd.





39. **MINIMUM COIL TEST:** Remove the coil from the engine. Reconnect the coil ground lead to the coil pole piece. Set the center dial knob of the tester to "0-20 V. COIL INDEX." Hold the Coil Test knob (left dial) to "ON" and rotate the Coil Index knob (right dial) until the needle reads 75 on the tester's top scale. This coil index is a specific amount of voltage fed into the primary circuit of the coil. Actually, the coil is a transformer which steps up the applied voltage in the secondary windings. *CAUTION: Do not let anyone touch the coil during a test unless the center dial pointer is put to "0-20V. Coil Index".* Connect one lead of the tester to the switch ground lead tab on the coil, and the other tester lead to the core laminations. On the Graham 51 tester, an acceptable coil should read at least 18 on the top scale when the test knob is turned to "ON".

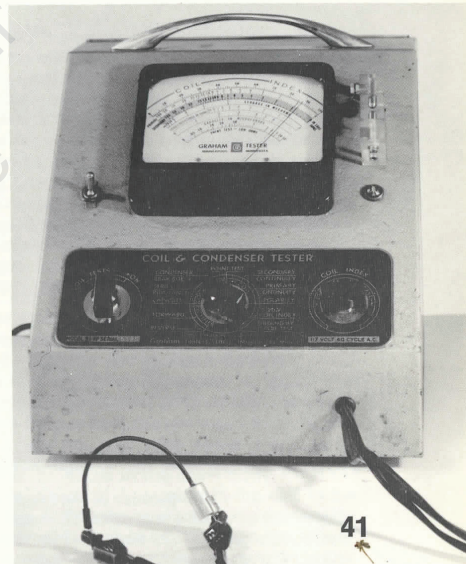
40. **TESTS WITH A PROBE:** Connect the tester to the coil and set the knobs for a coil index of 75 as in paragraph 39. Connect the test probe to the spark gap terminal of the tester and move the center knob of tester from "0-20V Coil Index" to "Stand by coil test". Now, insert the probe into the spark plug



boot and turn the tester dial to "ON". **OBSERVATION:** A continuous series of sparks should be fired across the air gap of the tester.

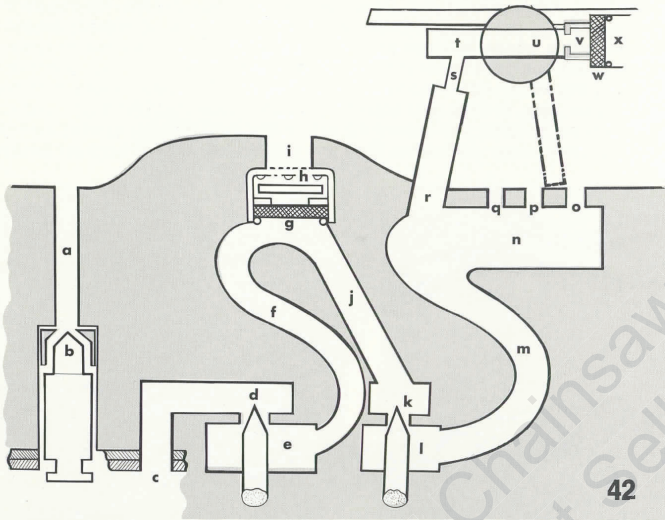
During firing, the tester needle should show some reading, but the value is unimportant. What is important is that the needle does not move; if it fluctuates, spark is intermittent. If the high-tension lead wire insulation is leaking it can be discovered by moving the test probe along the lead wire. At the leak, the spark will jump from secondary to the probe. The coil insulation can be tested in the same manner with the probe.

41. **CONDENSER TESTS:** There are three tests to be made. Connect one lead to the condenser lead. When the center knob is turned to "CONDENSER LEAKAGE" the reading on the "LEAKAGE IN MEGOHMS" dial should be 0 or close to it. When the pointer is put at "SERIES RESISTANCE", the reading should be less than 1 ohm. When the pointer is moved to "CAPACITY", a dial reading of approximately .2 or more microfarads should be obtained.



## HDC CARBURETOR SERVICE

42. **DESCRIPTION:** Homelite HDC carburetors have a minimum of parts. This simplifies disassembling and cleaning. In addition, the gaskets, diaphragms and cover plates will fit only the correct way. This saves time in servicing and assembling. Performance was not sacrificed to simplicity.



**OPERATION:** The carburetor has four circuits which may be called **INLET**, **MAIN**, **IDLE THROTTLE**, and **CLEARING**. Incoming fuel always passes through the main adjustment needle and main circuit at least as far as the screen covering the disc-type check valve in the main jet; but whether

- |                            |                                   |
|----------------------------|-----------------------------------|
| a. inlet passage from pump | m. idle fuel channel              |
| b. inlet needle            | n. idle port                      |
| c. fuel take-off           | o. idle (discharge) port hole     |
| d. main needle seat        | p. idle (air bleed) port hole     |
| e. main needle well        | q. idle (air bleed) port hole     |
| f. main channel            | r. cross-drilled clearing channel |
| g. main jet screen         | s. restriction in r.              |
| h. main check valve        | t. clearing channel               |
| i. main jet                | u. throttle shaft valve (open)    |
| j. channel f to k          | v. limiting jet                   |
| k. idle needle seat        | w. screen                         |
| l. idle needle well        | x. engine pulse hole              |

it is blocked by the valve or discharged from the main jet depends on the throttle position. When blocked by the valve (during idle throttle setting) the fuel flows right past the screen into the idle circuit where it is metered by the LO-Speed needle and discharged through the idle port holes. During idling, the clearing circuit is inoperative. When the throttle is opened, the clearing circuit clears the idle circuit of fuel and blows the fuel out through the main jet for smooth acceleration. During open throttle operation, the clearing circuit exerts engine pulse pressure on the idle circuit to keep it empty of fuel. This is desirable because the time it takes for the circuit to fill up and discharge, prevents flooding the engine during deceleration. Here is how fuel is supplied by the carburetor to match the engine's appetite.

**INLET:** Engine pulsations transmitted via a pulse channel operate the fuel pump. The pump moves fuel from the tank to the carburetor inlet needle valve. Instead of a single large air chamber, this pump has a small main chamber and two surge chambers providing a steadier, smoother flow. The inlet needle is opened by the inlet lever actuated by movement of the metering diaphragm. The diaphragm moves in response to vacuum conditions transmitted through the main jet or idle port when the engine is operating. The inlet lever spring keeps the needle seated at other times.

**OPEN THROTTLE:** The disc type check valve in the main jet is unseated, actuating the main diaphragm to open the fuel inlet valve. Fuel flows through the fuel "take-off" and circuit gasket past the metering point of the main (HI speed) adjustment needle to a compartment from where it is channeled through a curved circuit to the screen covering the main jet. While the throttle is open, there is no discharge through the idle port holes because engine positive pulse pressure, transmitted through the screened limiting jet and throttle shaft valving hole, back-flushes the idle circuit.

**DECELERATION ("Come-Down") AND IDLING:** Closing of the throttle puts the valving hole in the shaft out-of-line with the limiting jet, blocking pulse to the idle circuit. It also stops air from rushing through the venturi section of the barrel, and this results in the closing of the valve in the main jet. Fuel starts off on the same path as in open throttle operation, but it cannot get by the valve into the main jet. Instead, it flows right across the main jet screen, down a hole and through the LO-Speed Needle adjustment into a curved idle fuel circuit to the idle ports. As the idle system was empty at start of deceleration, this path of delay prevents a period of "rich operation" that occurs in carburetors without this advantage. The air that mixes with the idle fuel enters through the second & third (idle air bleed) port holes and is drawn out the first port hole with the LO-Speed fuel. During idling operation the metering diaphragm is actuated by pressures transmitted through the first idle hole.

**ON ACCELERATION:** The main jet valve opens to start fuel discharge through the main jet, and the throttle shaft valve also opens to restore a positive pulse pressure that "reverse-flushes" fuel in the idle circuit back for discharge also through the main jet. This extra fuel prevents faltering during acceleration.



**DISASSEMBLY:** Unscrew the large cover screw and lift off the fuel pump cover. Remove the pump gasket and the diaphragm. Remove four screws and external tooth lock washers. Lift off the metering diaphragm cover. Remove the metering diaphragm and gasket. A circuit plate having a positioning tab is visible. The plate holds down the inlet needle, lever and spring assembly. Remove two flat head circuit plate screws and lift off the plate. Remove the inlet needle, lever and spring. Remove the thick, black circuit gasket, exposing all fuel passages and idle ports. Remove the HI and the LO fuel needle and spring assemblies.

Normally, it will never be necessary to remove the screen-retaining rings and the screens covering the limiting jet or the main jet check valve. If the throttle shaft is to be replaced, remove the screw and the throttle valve (butterfly); also the screw and the throttle stop. Pull the throttle shaft and lever assembly out of the carburetor body. Do not lose the throttle-return spring.

If the choke friction spring and ball, or the choke shaft or valve need replacement, remove choke valve from the shaft. With your finger, cover the hole through which the choke shaft can be seen. Then pull out the shaft. Remove the ball and the spring from the hole.

**CLEANING AND INSPECTION:** For best results, soak the body and the metal parts in a regular solvent, not a "carburetor cleaner" solution. Cracked gaskets, and torn, frayed or porous diaphragms must be replaced. If the carburetor has been in service for a long period, it is best to renew all the gaskets and diaphragms anyway. The carburetor is not repairable if it has a damaged or worn out main jet check valve, inlet needle valve seat, or limiting jet.

Inspect the inlet needle, lever and spring. Look for needle wear at the tip and also at the lever contact area. Replace worn parts. Make sure the limiting jet is clean and open by blowing through the limiting jet with the throttle in open position. Examine the three fine screens. They should be open and perfectly clean. The choke friction ball should be perfectly round.

#### **SERVICE PROCEDURE FOR FLOODED CARBURETORS**

- Diaphragm lever set too high — lever should be set flush with bottom flange of carburetor.
- Dirt under inlet needle valve — remove and clean.
- Circuit gasket leaking — replace.
- Metering lever spring not seated in dimple in metering lever — assemble properly.
- Fuel pump diaphragm leaking — replace.
- Dirt in second and third idle holes — clean.

#### **SERVICE PROCEDURE FOR LEAN CARBURETORS**

- Metering Lever too low — set flush with bottom flange of carburetor.
- Dirt in idle channels — remove circuit gasket; clean channels.
- Leaky metering diaphragm — replace diaphragm.
- Pulse line from crankcase to carburetor plugged — remove obstruction.
- Leaky manifold gaskets — replace gaskets.
- Fuel pump diaphragm check valves worn — replace fuel pump diaphragm.

**REBUILDING THE CARBURETOR — NOTE:** The manufacturer calls for torquing all outside screws (except pump cover screw) to 6½" pounds during assembly.

Drop the friction spring and ball into the hole that crosses the choke shaft bore. Push the shaft into place in the bore. Work the choke lever to see that the friction device holds the choke in the open and closed position. The edges of the choke valve are beveled to fit the carburetor barrel (see drawing). Install the choke valve on the shaft with one valve screw. Make sure the valve closes off the barrel perfectly and does not stick or bind when the lever is worked.

If previously removed, slide the throttle return spring onto the throttle shaft. The hooked end should engage the notch in the shaft lever. Push the shaft into the body. Engage the straight end of the spring in the slot in the body. Assemble the throttle stop to the end of the shaft with one screw (the same as the valve screws). The stop should come in contact with the adjustment screw. The throttle valve has beveled edges to fit the carburetor barrel. Assemble the throttle valve to the shaft with the remaining valve screw. Be sure there is no binding and that the fit is perfect.

Turn the carburetor over. Drop the inlet needle valve into the valve seat. Locate the (inlet) metering lever spring in the spring recess of the chamber. Position the circuit gasket in the carburetor fuel chamber. Fit the lever under the fulcrum pin of the circuit plate. NOW, locate the spring on the dimple of the lever and slide the fork of the lever onto the needle while installing the circuit plate. Hold down the plate and check action of the needle, lever and spring assembly. Fasten the plate in place with two flat head screws. Be sure the spring has not come off the dimple. Assemble the metering diaphragm gasket, diaphragm and the cover (in that order) to the carburetor with four external tooth lockwasher and screw assemblies. Assemble a fuel pump gasket, a pump diaphragm and the pump cover (in that order) to the body with the large cover screw. The carburetor should be tested for leaks (see "Pressure Testing and Leakage Repairs", next section.) Install and adjust the carburetor for proper performance.

## PRESSURE TESTING AND LEAKAGE REPAIRS

There are two objectives: a) to find if an assembly leaks, and b) to determine whether a valve is working properly. This section deals with the crankcase and shaft seals, and the fuel system including the carburetor and the chain oil reservoir in the fuel tank.

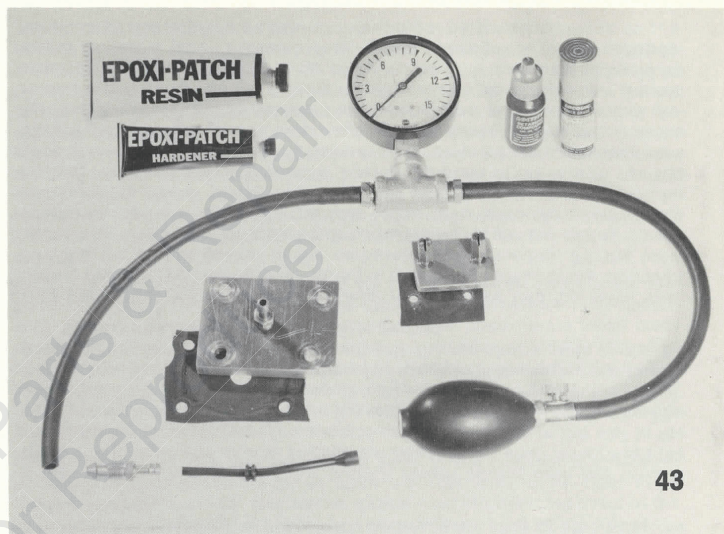
43. **CRANKCASE TEST WITH CRANKSHAFT INSTALLED:** Seal off the intake manifold and the cylinder register face. (Use homemade plates and gaskets and install a #57652 fitting in the cylinder register sealing plate). Connect the pressure tester to the fitting and pressurize the crankcase to 15-20 psi. A brand new assembly should be able to hold 15 psi for an hour, and a rebuilt assembly for several minutes, but a leak at a rate not exceeding ½ pound per minute is acceptable. If the crankcase loses pressure rapidly, immerse the pressurized crankcase in water and look for bubbles to disclose the leak. Here are some possible sources of leaks along with suggested causes and remedies:

a. Between seal and shaft — the seal could be installed backwards, be worn out or damaged; the remedy is to install a new seal properly.

b. Between seal and the casting — the casting may have been scratched during seal removal, or seal installed improperly; disassemble and check. You may be able to fill in a scratch with Part #24199 PERMATEx Aviation Type 3 Formagasket and press a new seal in while the compound is still tacky.

c. Small cracks or porous spots in a casting — These can often be sealed by preparing the surface and applying a fast-dry type epoxy as in a HYSOL Epoxy Patch Kit. Sometimes leaks on a diagonal through the casting into a threaded screw hole may be stopped by coating the threaded holes with GASOLA or LOCTITE before installing the screws.

44. **FUEL TANK ASSEMBLY TEST:** Disconnect the rubber fuel line from the metal fuel line on the left side of the tank. Using a #57652 fitting and spare fuel line to make the connection, hook up the pressure tester to the tank. Using a new gasket if necessary for a seal, screw the fuel cap tightly to the tank and unscrew the oil cap. Pressurize to 15 psi and observe the dial. If the pressure drops faster than a pound per minute, it could be through the "duckbill" relief valve in the cap. To find out, fit a length of ¼" ID tubing over the valve mount and plug the tubing with a drift pin or pencil stub. If leakage continues at the same rate, put the engine on its right side and pour water into the recess where the fuel line enters the tank. Bubbles here, will indicate a leaking grommet. If no leakage is found, remove the tank from the engine and immerse it in a test tank of water to check for leakage at the gasketed joint between tank and tank cover, or through the walls of the castings. To check for leakage in the common wall between fuel and oil compartments, plug up only the fuel cap, and install the oil cap. Keep the tank under 15-20 psi for several minutes before immersing it. Then, if bubbles escape in a steady stream from the oil cap, there is a flaw in the wall between fuel and oil compartments.

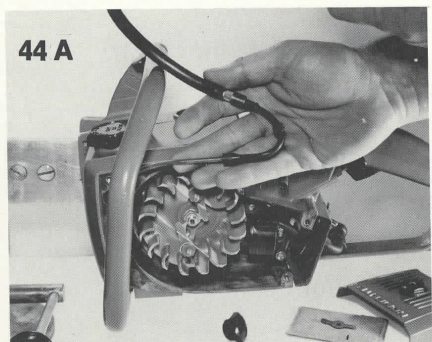


### ITEMS IN ILLUSTRATION

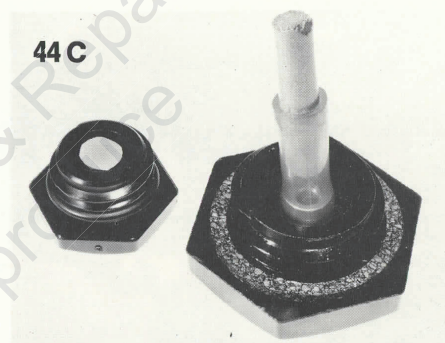
- a Epoxy Patch Kit — fast drying type (purchase locally).  
b Loctite Sealant and Grade T Primer (Homelite #23488 A) available as Homelite Packaged Item  
c Pressure Tester (Burco Tools, Brandywine Sta., Schenectady, N.Y.)  
d Homemade plate and gasket for sealing intake manifold opening during pressure testing  
e Homemade gasket and plate with fitting for attaching compression tester.  
f Extra fuel line useful in making pressure tester connections.  
g Fitting (also shown in e) Homelite #57652  
Not shown: Homelite #24199 Gasket Cement, Permatex Aviation No. 3. (2 oz.)



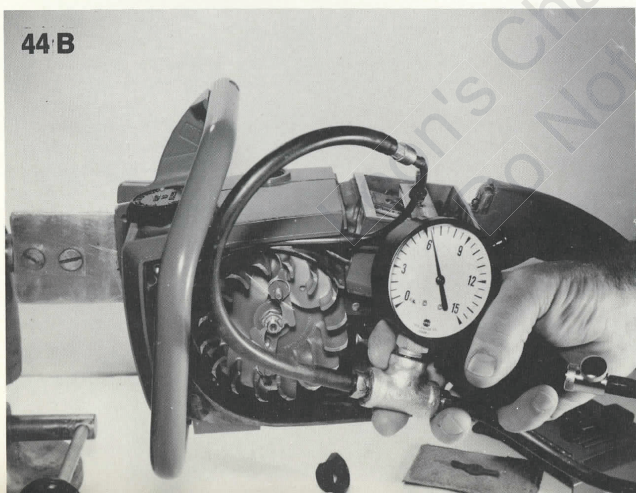
44 A



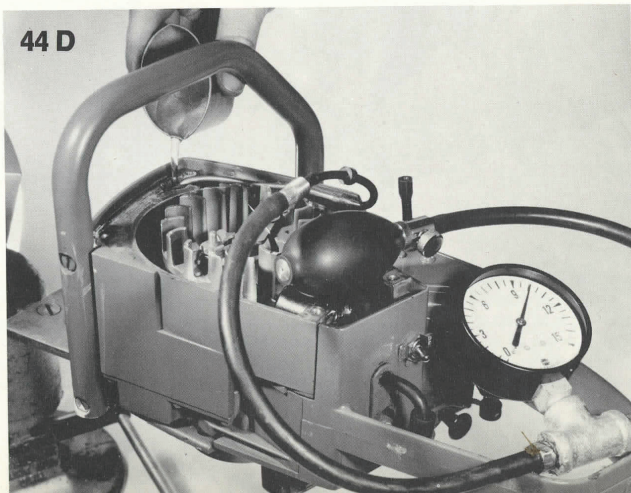
44 C



44 B

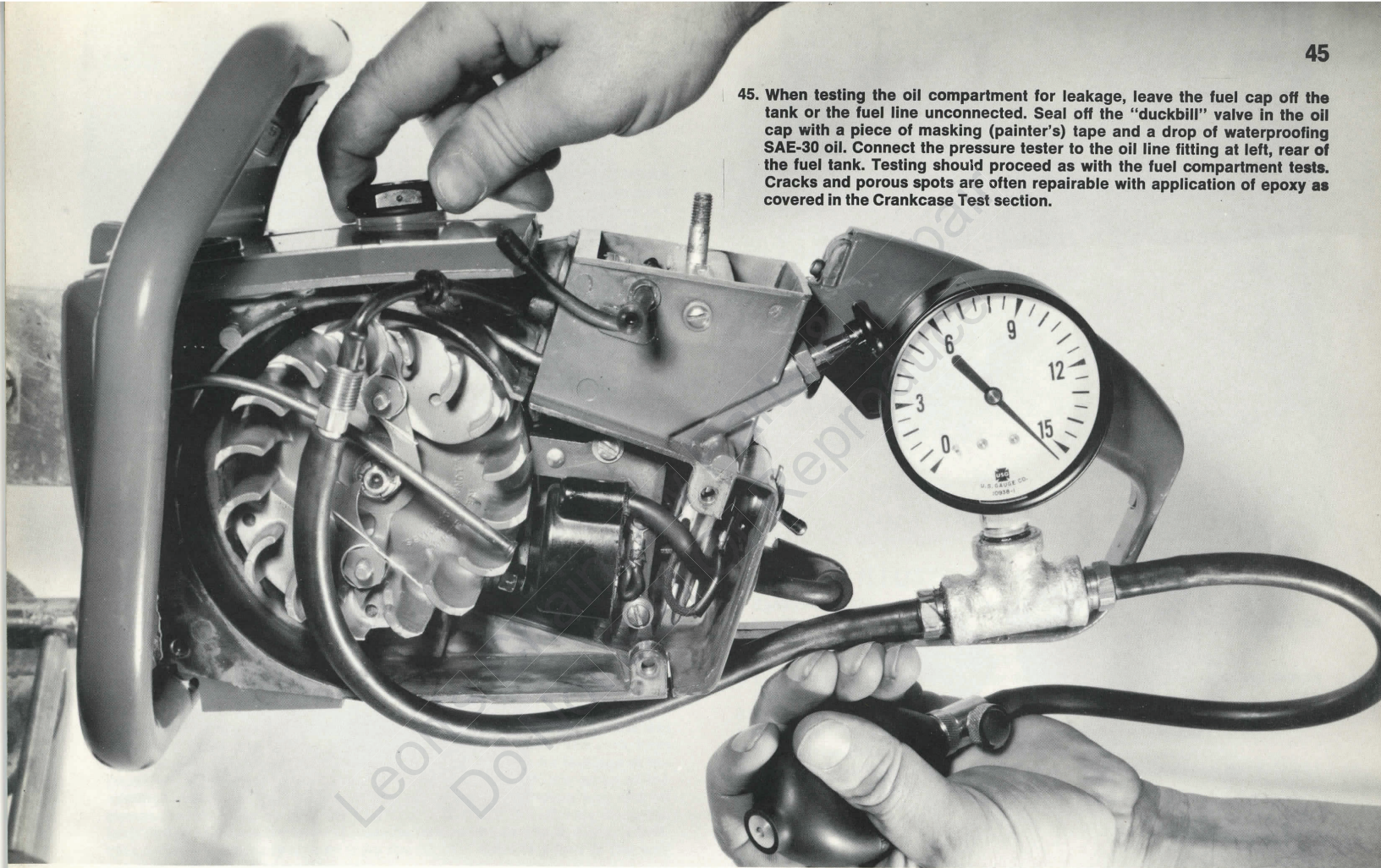


44 D





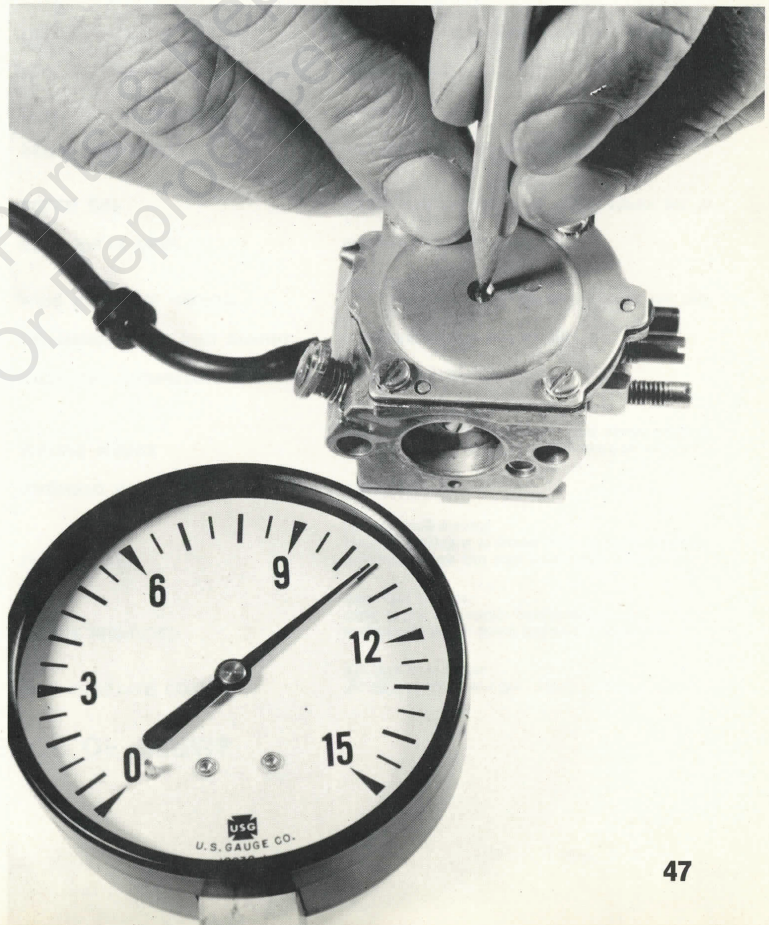
45. When testing the oil compartment for leakage, leave the fuel cap off the tank or the fuel line unconnected. Seal off the "duckbill" valve in the oil cap with a piece of masking (painter's) tape and a drop of waterproofing SAE-30 oil. Connect the pressure tester to the oil line fitting at left, rear of the fuel tank. Testing should proceed as with the fuel compartment tests. Cracks and porous spots are often repairable with application of epoxy as covered in the Crankcase Test section.





46. **TESTS FOR CARBURETOR LEAKAGE:** The carburetor fuel inlet circuit can be checked without removing the carburetor from the air box. Connect the tester to the fuel line (or if carburetor has been removed, directly to the fuel pump inlet). Squeeze the bulb to put 5 psi on the tester dial. If gauge holds pressure, the fuel pump, inlet needle and seat, and the metering diaphragm are not leaking. **NOTE:** A new or rebuilt carburetor will leak at the gaskets and diaphragms until the carburetor has been in use for a half-hour or more. The carburetor is built to sustain pressure at 10 psi. If pressure does not hold, then immerse carburetor in a test tank and make a bubble test.

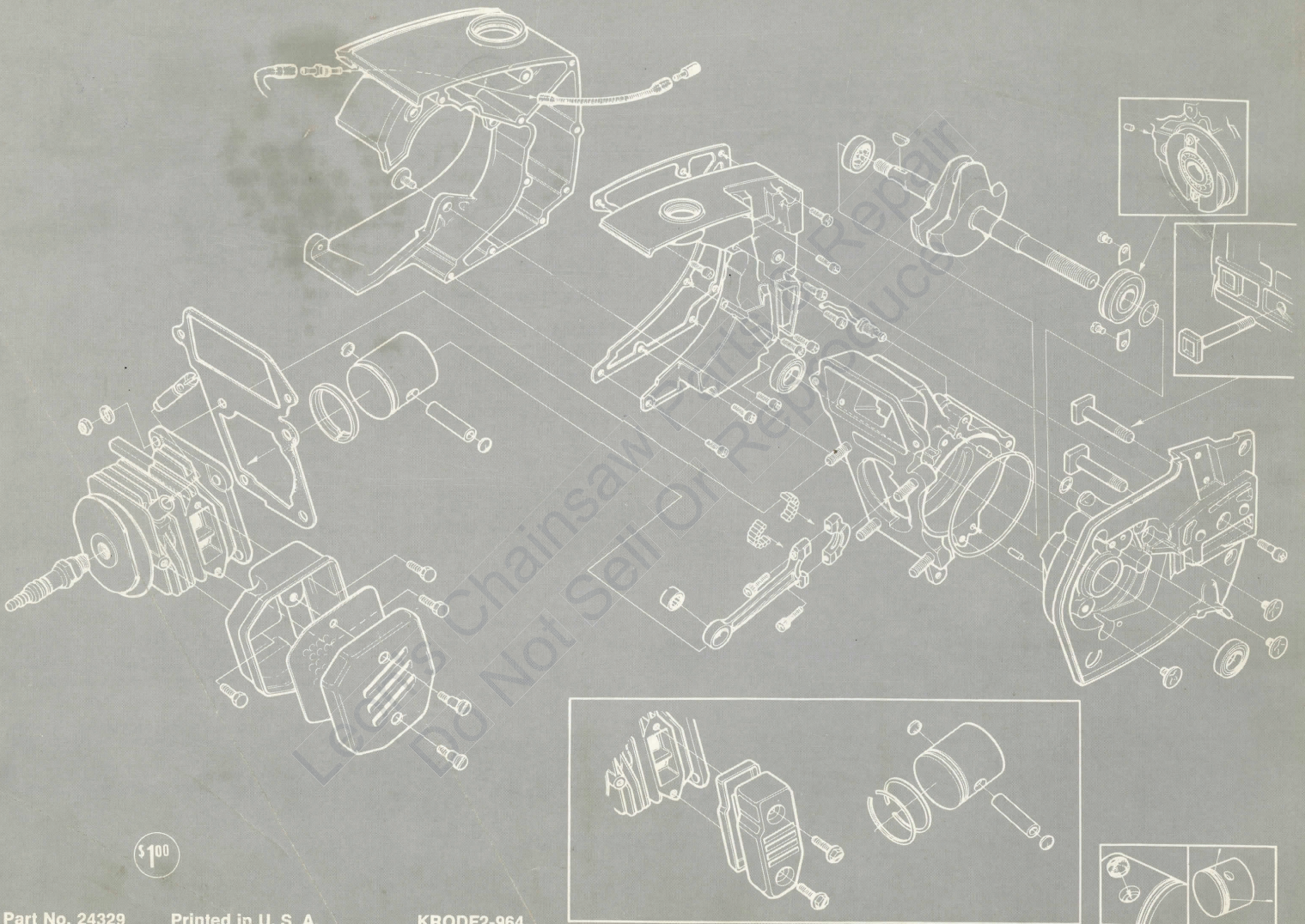
47. One more test can be made on this carburetor. Pump up above 10 psi on the gauge, then depress the carburetor metering diaphragm with a pencil point or pin. This should unseat the inlet needle, causing gauge to return immediately to zero. If this does not occur, the inlet mechanism is inoperative or the needle is stuck.



## CROSS REFERENCE OF TERMS

AIRBOX	the throttle handle and carburetor chamber assembly or casting.	IDLE THROTTLE CIRCUIT	the idle circuit from the main jet screen through the idle port holes.
BREAKER POINTS	contact points of magneto ignition.	INTAKE MANIFOLD	a casting; when used between carburetor and reed valve assembly, replaces damper or heat dam and spacer.
CHOKE VALVE	choke shutter or choke butterfly.	LIMITING JET	restriction cup put into a passage to limit flow; chiefly, installed in pulse hole of HDC carburetor clearing circuit.
CLEARING CIRCUIT	throttle shaft-valved pulse circuit clearing the idle system during acceleration and high speed operating.	MAGNETO ROTOR	flywheel or fan.
COMPRESSION RELEASE	Compression relief device, part of Simplex Starting System.	MATING MARKS	matchmarks or witness marks used to match up parts properly, as the upper and lower parts of the connecting rod.
DISC-TYPE CHECK VALVE	the free floating "rubber" check valve in the carburetor main jet.	METERING DIAPHRAGM	main diaphragm.
DYKE RING	piston ring, L-shaped in cross-section.	METERING LEVER AND SPRING	inlet control lever and spring.
FUEL FILTER ASSY.	the fuel pick-up or "finder" inside the tank.	MAIN THROTTLE CIRCUIT	the main carburetor fuel circuit from the fuel take-off to the main jet.
FUEL FILTER SHAFT	the fuel pick-up or metal body on which the fuel filter is mounted.	REED VALVE SEAT	the reed cage or pyramid.
FUEL TAKE-OFF	Hole through circuit plate and gasket and especially the matching hole in the carburetor body leading to the main adjustment (Hi Speed) needle.	RULON CAP	plastic cap, two used to retain piston pin in piston.
HEAT DAM	a gasket or spacer of poor heat conductance placed between carburetor and engine.	SQUISH CHAMBER	new bell-shaped firing chamber.
HEX KEY	"Allen" wrench.	STARTER/FAN HOUSING	air shroud.
HIGH-TENSION LEAD	Spark plug wire.	STARTER PAWLS	starter fingers.
IDLE AIR BLEED HOLE	the third idle port hole (nearest the venturi).	THROTTLE LATCH	the throttle trigger lock button, part of Simplex Starting System.
		THROTTLE VALVE	throttle shutter or butterfly.
		TIMING END	the tapered, rotor-mounting end of the crankshaft.





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