CONTENTS

The information in this Service Manual covers theory of operation, design and performance specifications, trouble diagnosis, and dealer service of Homelite Chain Saws.

The data contained have been compiled by the Sales and Factory Service Departments for the benefit of Homelite Dealers. The testing routines and service procedures have been developed and proved by our Homelite Factory Service Representatives.

HOMELITE
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INTRODUCTION

The purpose of this manual is to aid the Homelite Chain Saw Dealer in supplying good dependable service to customers. The contents have been selected and arranged with one thought in mind—that a thorough understand- of chain saws and the establishment of a routine for trouble diagnosis helps to pin-point the trouble. Eliminating haphazard trouble-shooting and disassembly practices keeps the customer satisfied and makes service work highly profitable for the dealer.

Arrangement Of Contents

Homelite Chain Saws, Section 1, is a general treatise covering the theory of operation of internal combustion engines with special reference to the operating principles of Homelite 2-cycle chain saw engines. Model identification sheets and a special reference chart, giving important data on each model Homelite saw are provided. This is basic material on which to build a rich background of practical experience. Just as all Eskimos may at first look alike to an Englishman, chain saw troubles may seem alike to the mechanic, until he learns to look for and distinguish their characteristic symptoms.

Systematic Service, Section 2, describes the recommended routine for handling incoming service work. A check list of symptoms and a series of simple tests lead to quick diagnosis and location of the trouble. Often simple troubles can be remedied on-the-spot without further reference to the manual. If they are only approximately located, however, this section refers to one or more sections of the manual where specific diagnosis, disassembly and detailed service routines can be followed.

The main body of the Service Manual is divided into sections beginning with Systematic Service, Section 3. Other sections contain operational theory, trouble diagnosis, and service of a particular system or group of parts having a common relationship to the unit. Paragraph subdivisions in each section describe the operation and service of each of the important mechanisms within the system.

Assembly Guide, Section 9, gives brief disassembly and assembly steps which the mechanic may follow during service.

Service Tools and Instruments, Section 10, illustrates both required and optional service tools and apparatus, and describes their use.

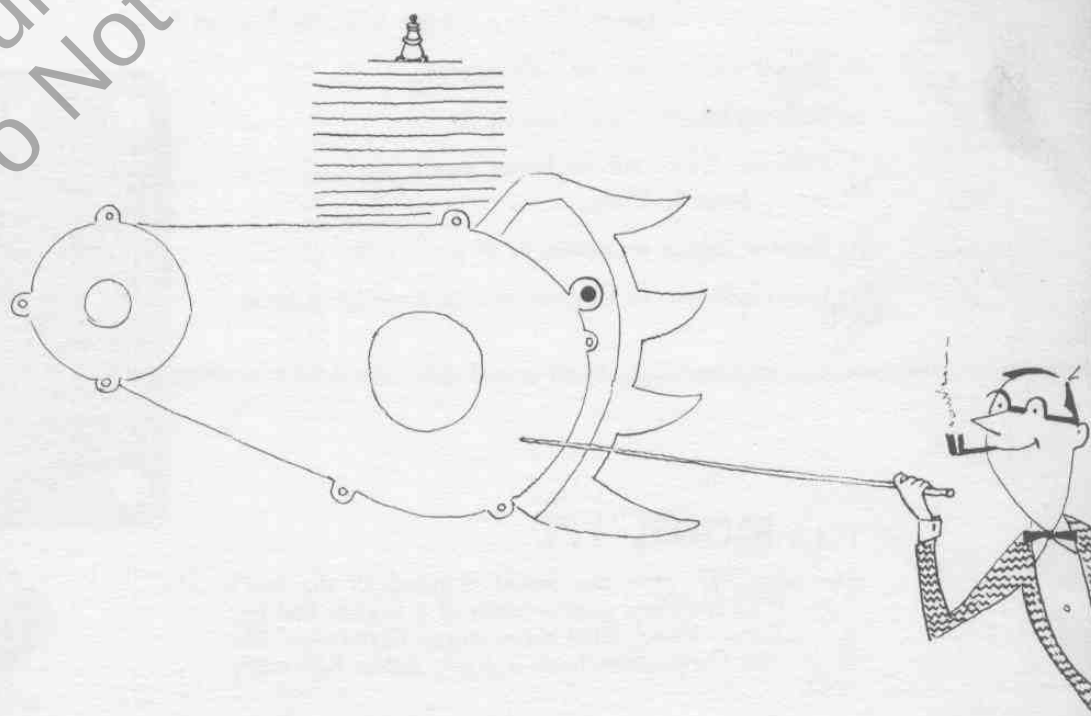
Provision has been made at the beginning of each section to write in the subject title, reference number and date of Dealer Service Memos. Dealer Service Memos should be filed in the Dealer Service Memo Book. Dealers are urged to keep their parts and parts-price literature up to date by procuring latest copies of these lists as they appear from time to time.

Section 1

HOMELITE CHAIN SAWS

(General Principles)

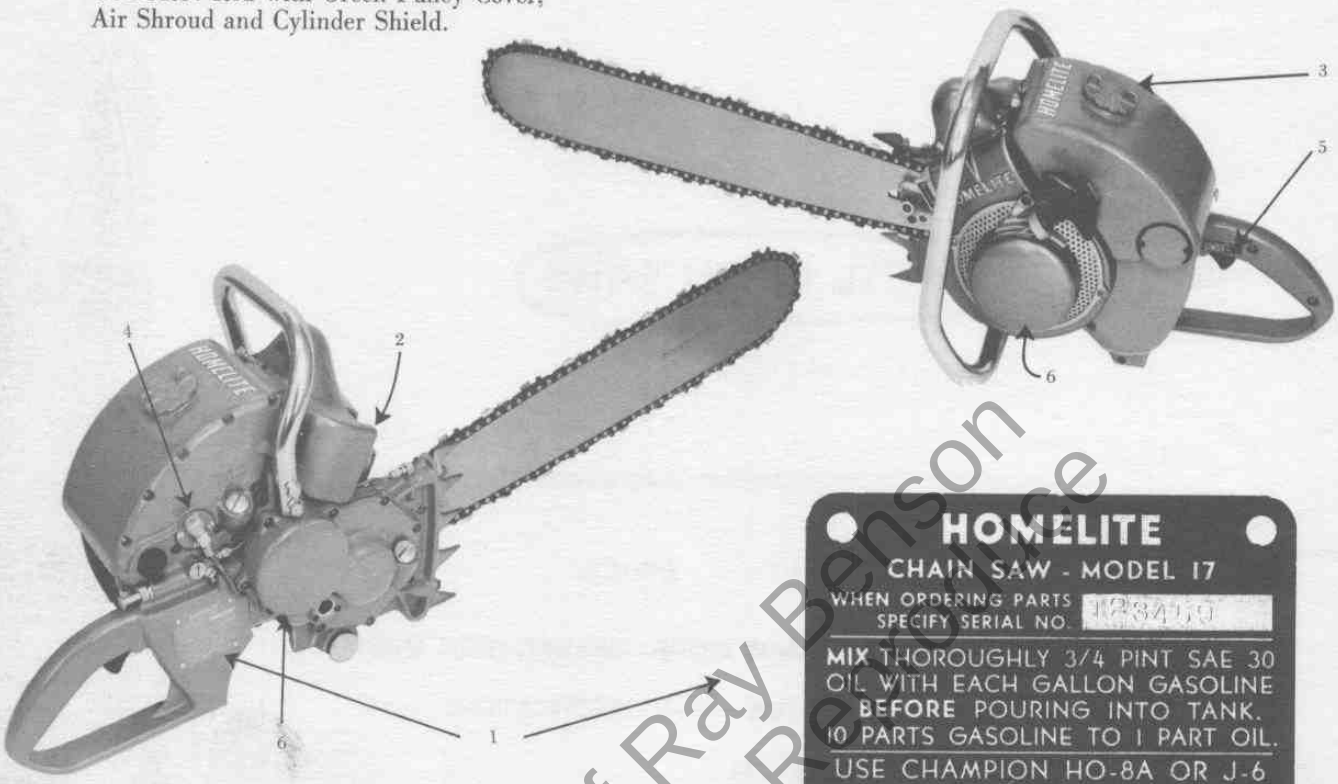
INDEX



1–1.1 MODEL 17

Introduced February, 1954—Superseded July, 1956 by Model 17L

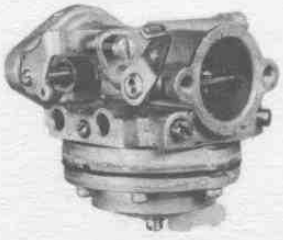
COLORS: Red with Green Pulley Cover,
Air Shroud and Cylinder Shield.



1. Name Plate:
   Model No. 17
   Serial No.—Letter "W" stamped after serial number designates WICO Magneto.
   Letter "P" or no letter indicates PHELON Magneto.
2. Muffler smaller than on 5-20 engines.
3. Fuel cap has relief valve installed.
4. Tillotson Model HP-1B Pump diaphragm carburetor fed by brass fuel line.
5. Throttle trigger on underside of pistol grip.
6. Pulley and gear case covers have no identifying decals.

1–1.2 MODEL 17L

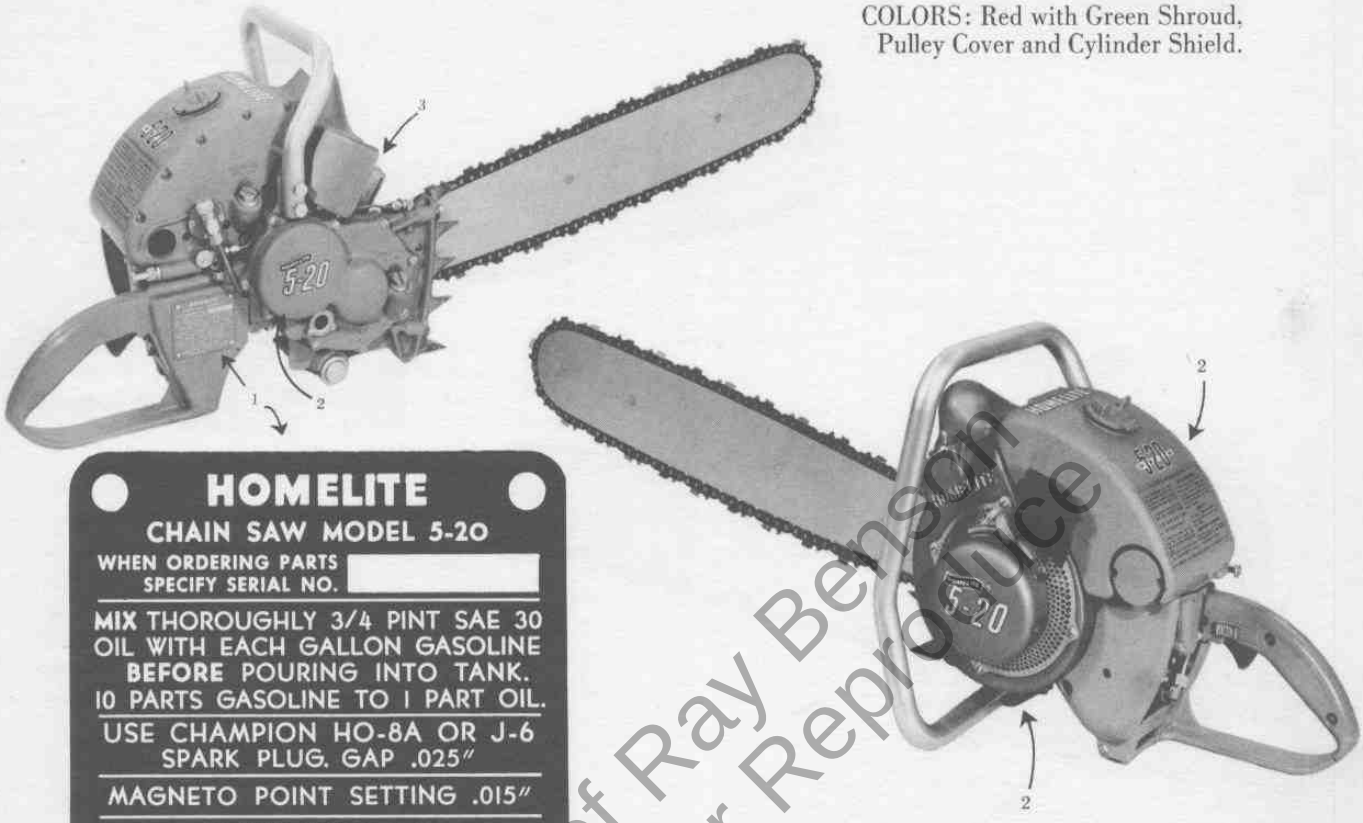
The letter "L" after the Model Number on the Saw's Name Plate indicates incorporation of a flexible fuel line and Tillotson Model HL-4 series pump Carburetor. The Model HL Carburetors have a white nylon fuel pump cover.



1–1.3 MODEL 5-20

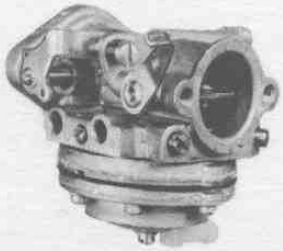
Introduced September, 1955—Superseded April, 1956 by Model 5-20L

COLORS: Red with Green Shroud, Pulley Cover and Cylinder Shield.



1. Name Plate:
   Model No. 5-20
   Serial Number: "W" designates WICO Magneto; letter "P" or no letter designates PHELON Magneto.
2. "HOMELITE 5-20" Decals on pulley cover, gear case cover; "HOMELITE" and "5-20" with starting instructions appear on fuel tank.
3. Muffler larger than on Model 17 saws.

1–1.4 MODEL 5-20L

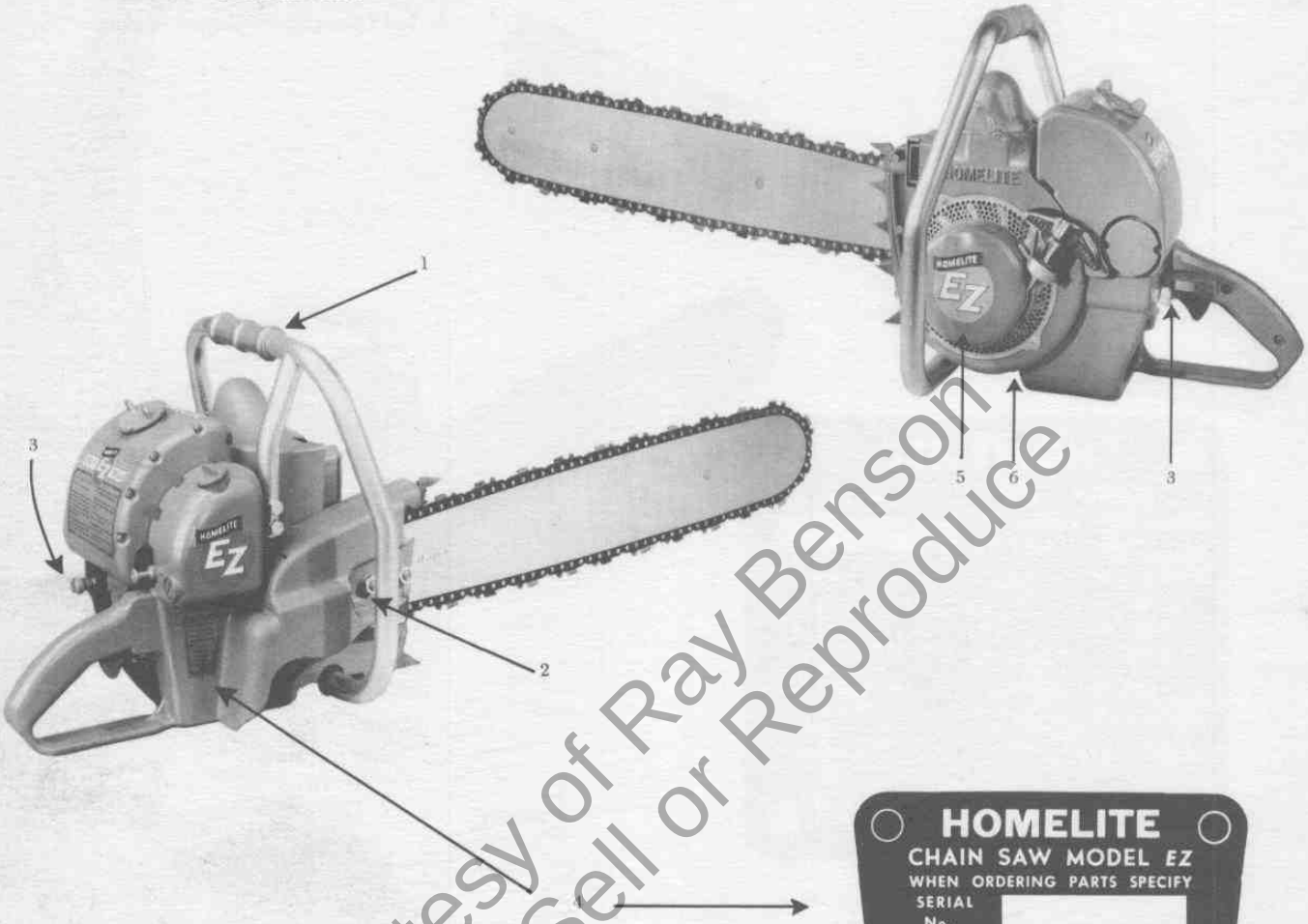


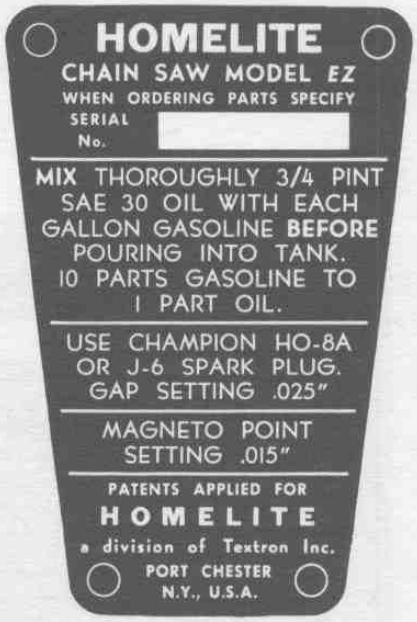
The letter "L" after the Model Number on the Saw's Name Plate indicates incorporation of a flexible fuel line in conjunction with either Tillotson Model HL series or Brown Model CS series Carburetor. The HL type Carburetors have a white nylon fuel pump cover. CS type Carburetors have a metal fuel pump cover. Letter "B" added to saw's serial number indicates CS type Carburetor.

1–1.5 MODEL EZ

Direct Drive Model Introduced March, 1956.

COLORS: Homelite Red





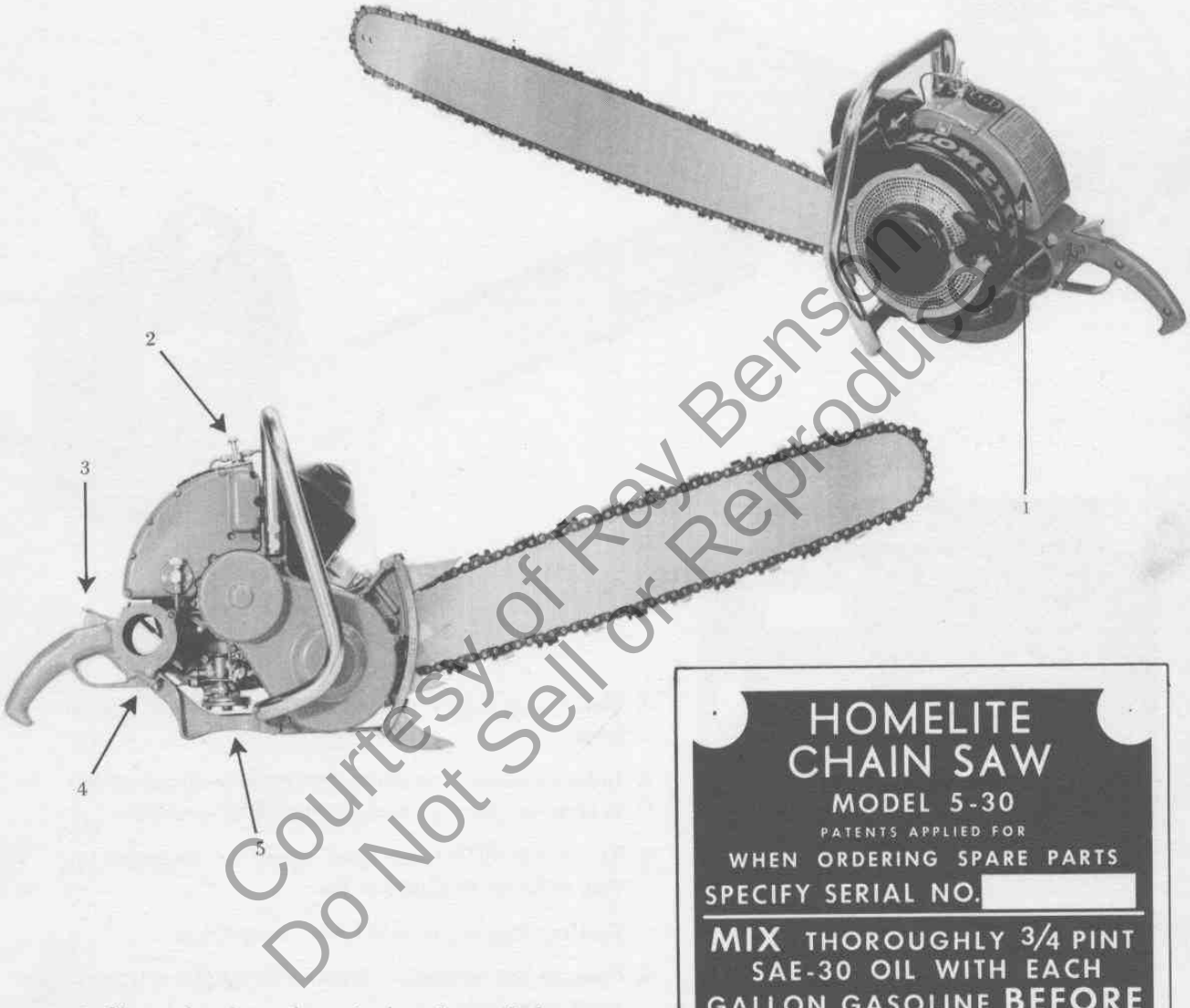
1. Handle bars have plastic grip.
2. Chain and bar mount on clutch side. Gear case cover assembly includes adjusting device.
3. Fuel shut-off located on ignition side. Flexible fuel line runs to inlet of turret-shaped fuel pump cover on either TILLOTSON Model HL series or BROWN Model CS series fuel pump carburetor. Actuator and carburetor supply lines internal on these carburetor models.
4. Irregular trapezoid-shaped name plate under chain oil reservoir. Letter "B" after serial number indicates BROWN Model 5-CS Carburetor.
5. Identified by "EZ" Decals on pulley cover, fuel tank and chain oil reservoir.
6. Engine rotates in same direction as chain.

1–1.8 MODEL 5-30

Original 5 h.p. Diaphragm Carburetor

Chain Saw Introduced August, 1953
Superseded August, 1954 by Model 5-30N

COLORS: Red with Black Air Shroud, Cylinder Shield and Pulley Cover. (Replacement covers are green).



HOMELITE
CHAIN SAW
MODEL 5-30
PATENTS APPLIED FOR
WHEN ORDERING SPARE PARTS
SPECIFY SERIAL NO.
MIX THOROUGHLY 3/4 PINT SAE-30 OIL WITH EACH GALLON GASOLINE BEFORE POURING INTO TANK
10 PARTS GASOLINE TO 1 PART OIL
USE CHAMPION HO-3 OR J-3 SPARK PLUG OR EQUAL
SPARK PLUG GAP .025"
MAGNETO BREAKER POINT SETTING .020"
HOMELITE CORPORATION
PORT CHESTER, N.Y., U.S.A.

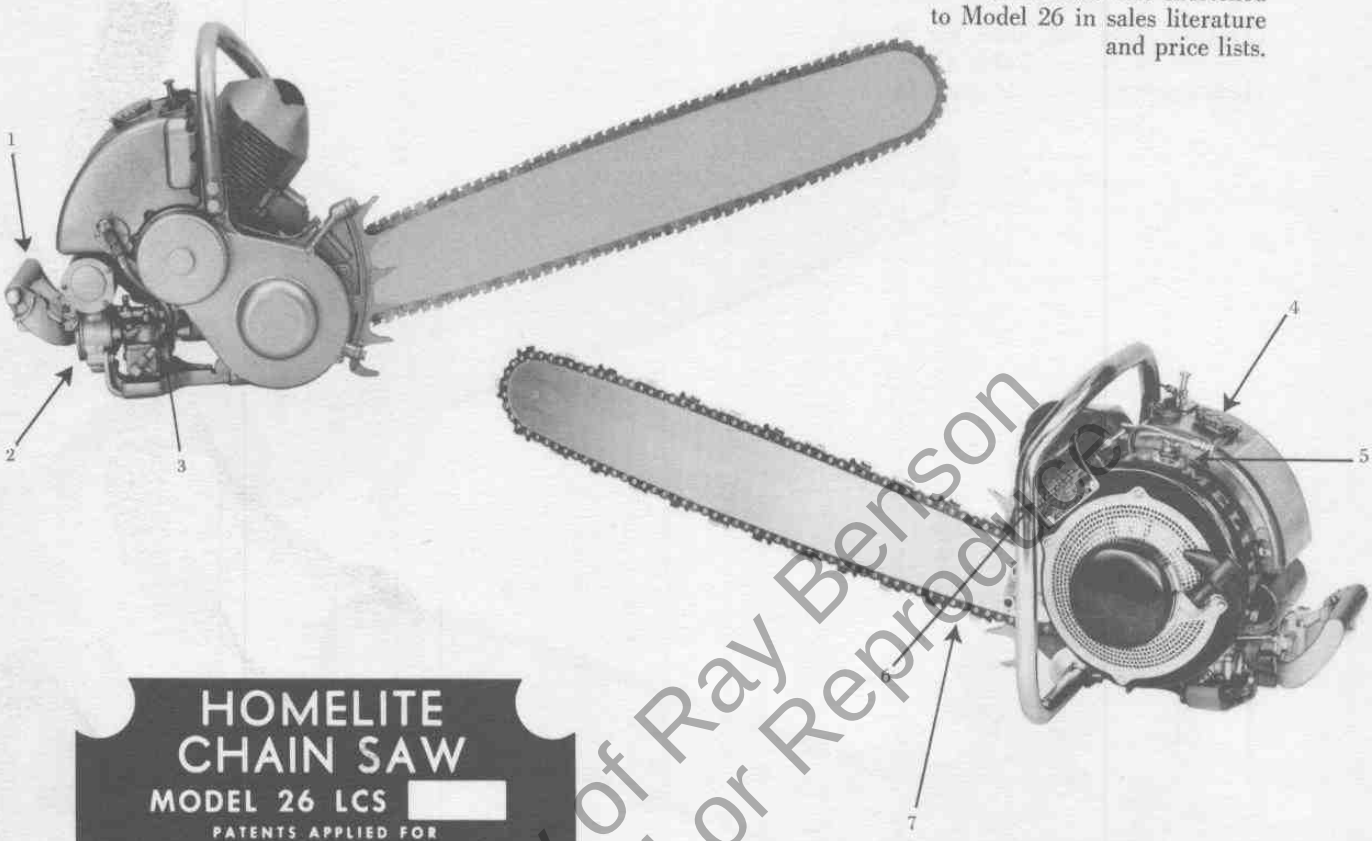
1. Name plate located on air shroud at cylinder.
   Model No. 5-30
   Serial No.
2. Tank with crankcase pressure line, also has pressure relief line with check valve.
3. Pistol grip with throttle trigger on top, first introduced with this saw.
4. Brass fuel line connected directly to carburetor inlet connection.
5. TILLOTSON Model H-6A Diaphragm Carburetor does not have a fuel pump.

1–1.6 MODEL 26LCS*

Introduced April, 1951—Discontinued August, 1953

COLORS: Red with Black Shroud

*This name was shortened to Model 26 in sales literature and price lists.



HOMELITE
CHAIN SAW
MODEL 26 LCS
PATENTS APPLIED FOR
WHEN ORDERING SPARE PARTS
SPECIFY SERIAL NO.
MIX THOROUGHLY 1/2 PINT SAE-30 OIL WITH EACH GALLON GASOLINE BEFORE POURING INTO TANK
16 PARTS GASOLINE TO 1 PART OIL
USE CHAMPION HO-8A OR J-6 SPARK PLUG OR EQUAL
SPARK PLUG GAP .025"
MAGNETO BREAKER POINT SETTING .020"
HOMELITE CORPORATION
PORT CHESTER, N. Y., U.S.A.

1. Shovel type handle with throttle button and indexing lever.
2. Indexing mechanism allows 90° rotation of carburetor to keep float bowl vertical during felling operation.
3. Tillotson MD-56 type float carburetor connected to tank outlet by flexible fuel line.
4. Fuel cap contains no relief valve or vent hole.
5. Pressure line containing check valve maintains tank at slight pressure.
6. Name plate on air shroud at cylinder.
7. Originally equipped with 9/16" pitch slipper sprocket.

1–1.7 MODEL 26LCSA

Superseded Model 26LCS, was in turn discontinued with production of the 5-30 chain saw.

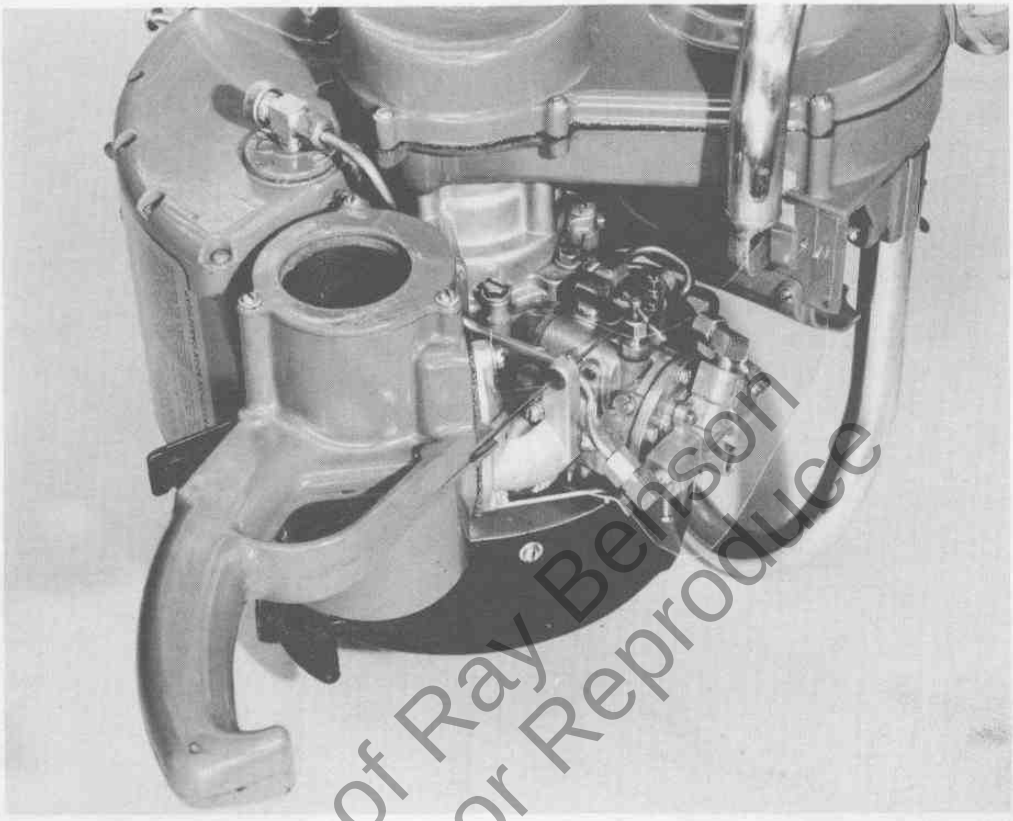
Visual Differences from Model 26LCS

1. Pressure relief line added to fuel tank.
2. Has Tillotson Model H-2A Diaphragm Carburetor (with no fuel pump).

1–1.9 MODEL 5-30N

Replaced Model 5-30 in production, August, 1954

COLORS: Red and Black (same as 5-30).

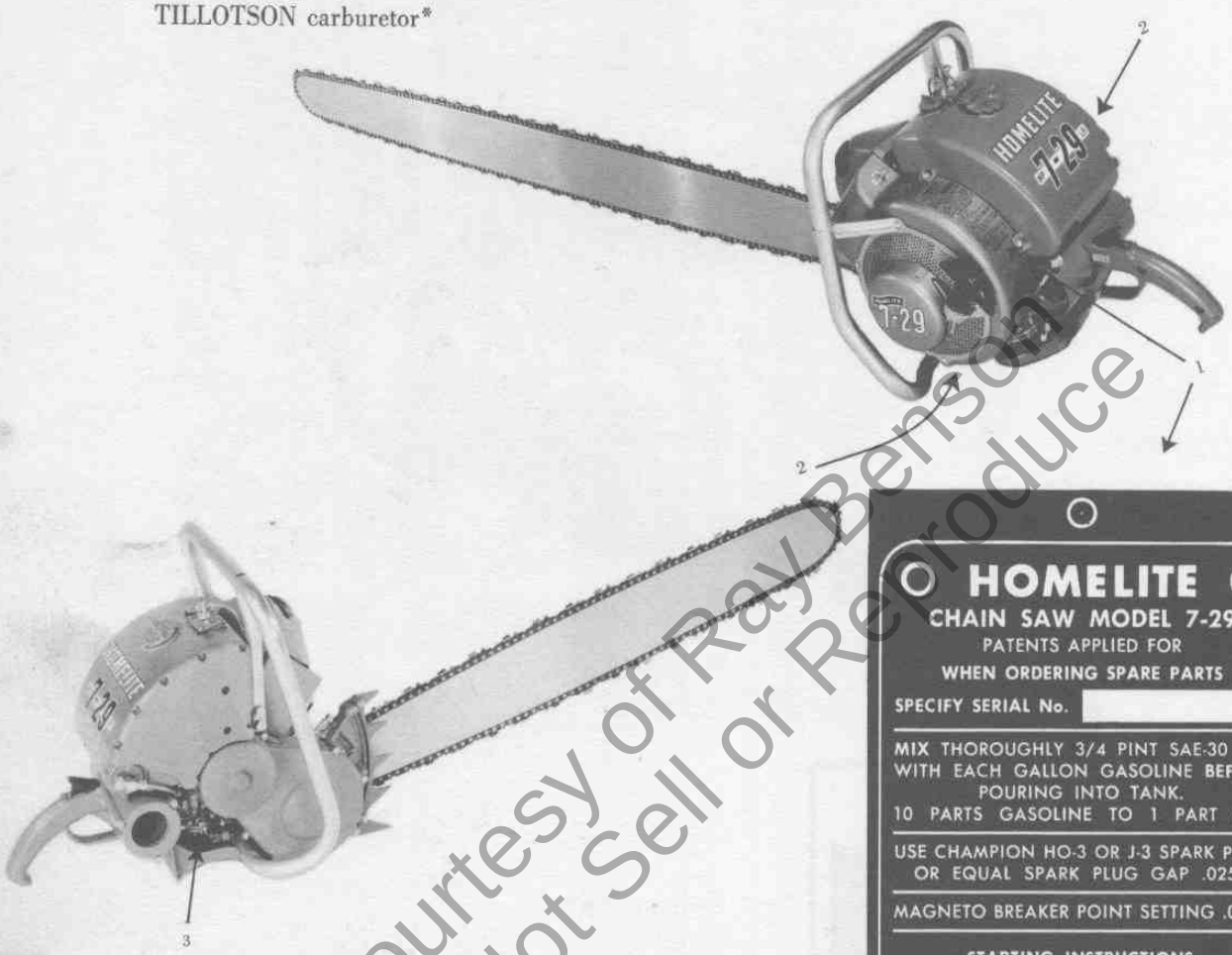


1. Has TILLOTSON HP-6B fuel pump diaphragm carburetor. Brass fuel line connects to pump inlet.
2. Fuel cap has vent hole and pressure relief valve similar to Models 17, 5-20 and EZ. Pressure and pressure relief lines eliminated from fuel tank.
3. Name Plate: Model Number is stamped 5-30N
   Serial Number

1–1.10 MODEL 7-29

Introduced May, 1956
COLORS: Red and Green

Model shown has
TILLOTSON carburetor*

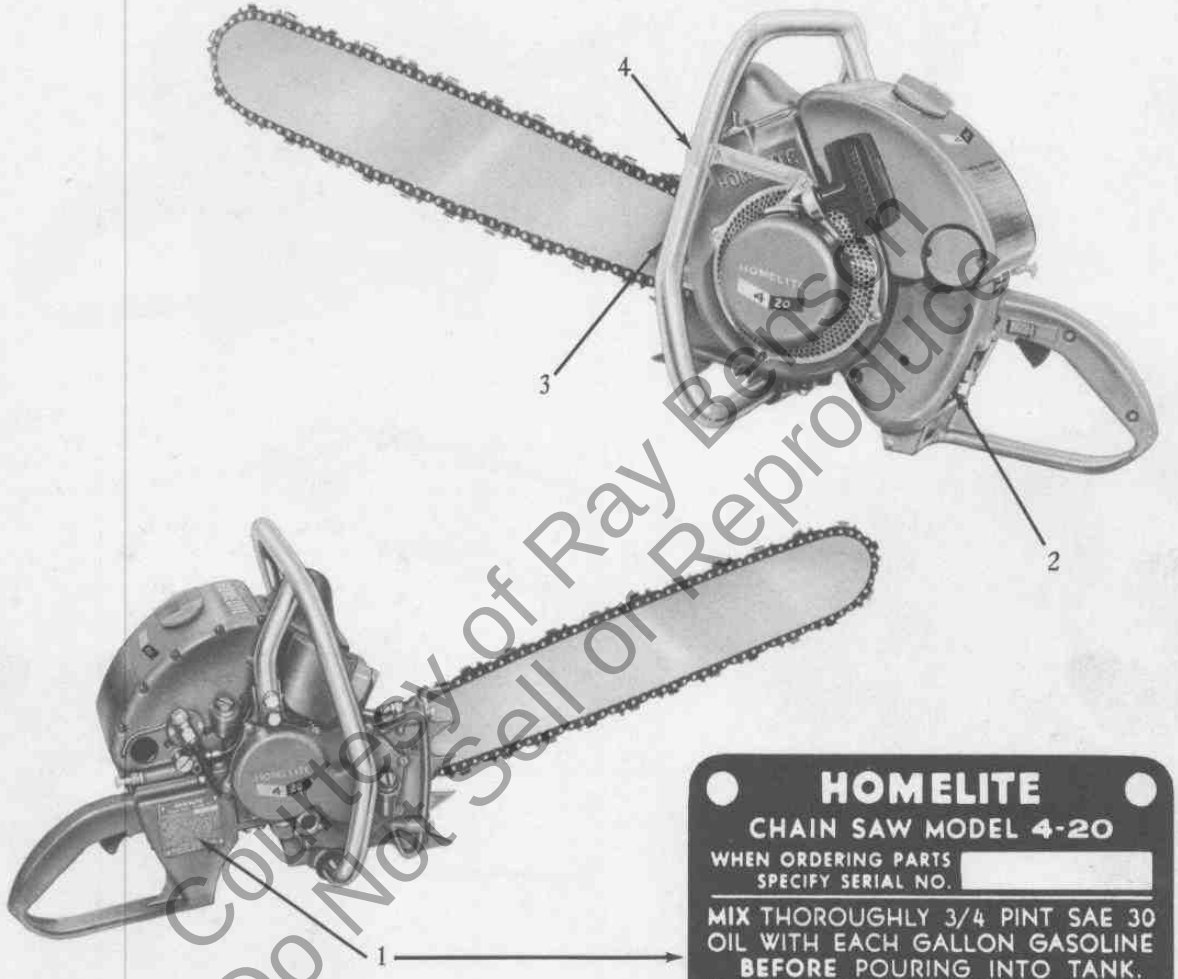


1. Name plate located on air shroud between fuel tank lugs.
   Information—Model No. 7-29
   Serial Number*
   Fuel Mixture
   Starting Instructions
   Spark Plug Information
2. Starter cover and fuel tank carry 7-29 Decals.
3. *May have EITHER TILLOTSON HP-19B or BROWN 1-CS Carburetor. BROWN Carburetor has turret type metal fuel pump cover and flexible fuel line. Serial number may have letter "B" for BROWN Carburetor.

1–1.11 MODEL 4-20

Replaced Model 17L in Production September, 1957

COLORS: Red with Green Pulley Cover and 4-20 Decals.

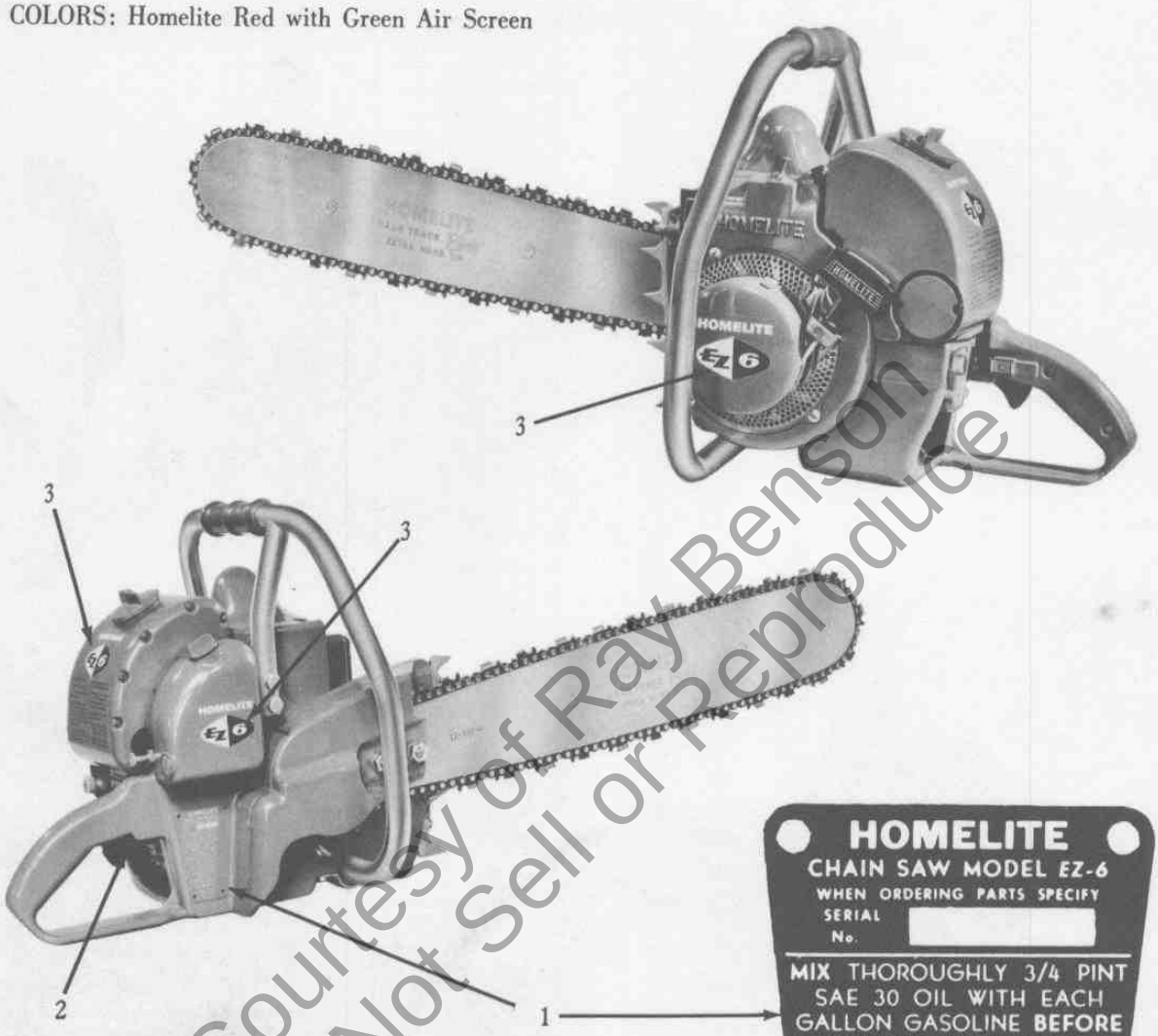


1. Name Plate:
   Model No. 4-20
   Serial Number—Six-digit series has Wico Magneto.
   Seven-digit series has covered Phelon Magneto.
2. Has 4-reed intake valve and Brown 5-CS carburetor; rubber fuel line with nylon clip.
3. Originally factory built with 6-tooth, 1/2″ pitch sprocket.
4. Has handle bar brace.

1–1.12 MODEL EZ-6

Replaced EZ in Production June, 1957*

COLORS: Homelite Red with Green Air Screen



*1. Name Plate:

a) Six-digit serial numbers below 739839; first units built in Port Chester with 5-1/4″ rotor. (See Parts List #23218.)

b) Six-digit serial numbers above 739839; also built in Port Chester, but with 6″ rotor, larger opening in air shroud, longer ball drive, 1/4″ wider handlebar to clear air screen and pulley cover. (See Parts List #23218-1.)

c) Units with seven-digit serial numbers built in Gastonia, feature thicker shaft and larger I. D. main bearing. (See Parts List #23218-2.)

2. All EZ-6 units have Brown 5-CS or Tillotson HL-27B carburetor; 4-reed intake valve design.

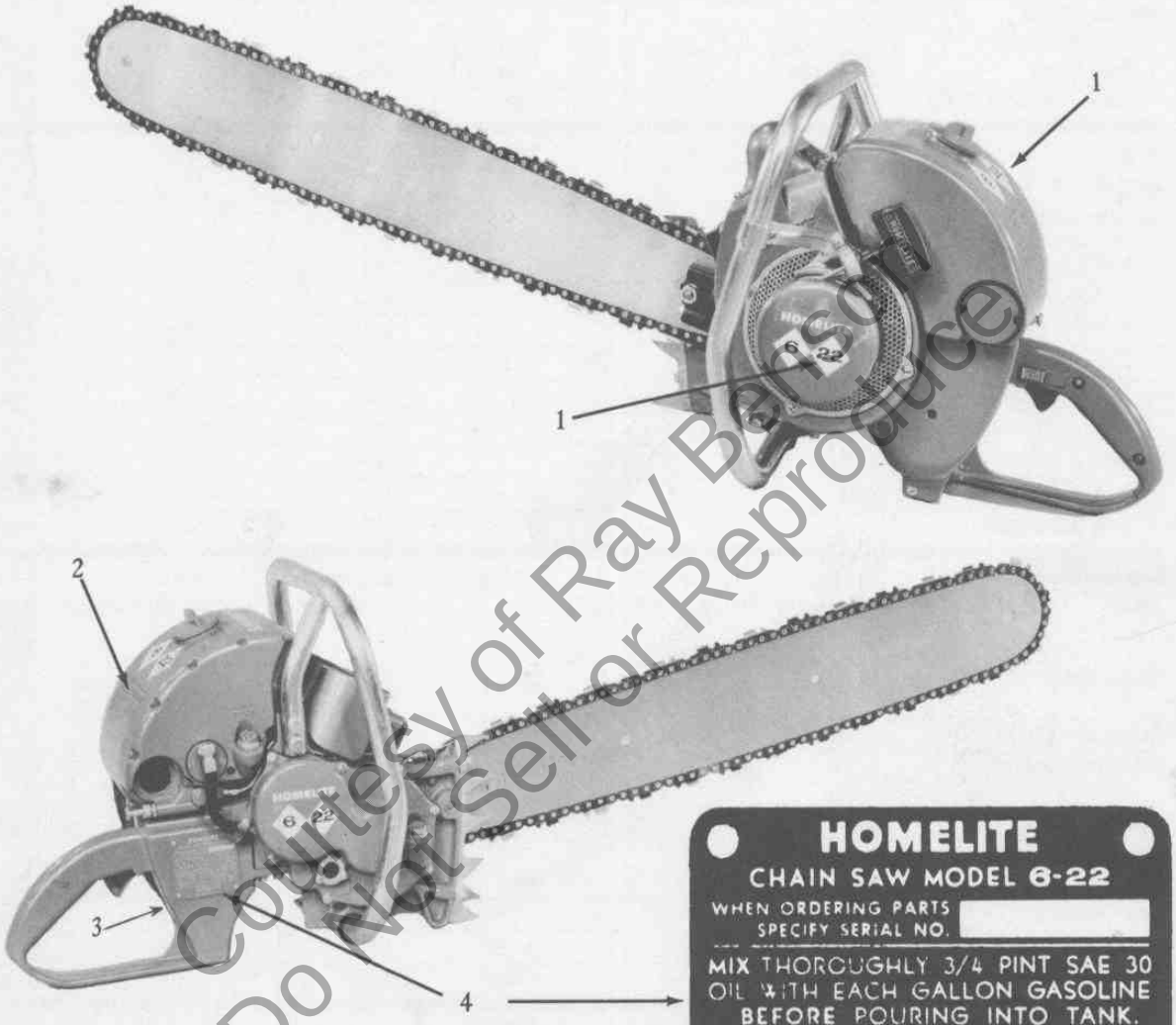
3. EZ-6 foil on sides and tank.

1–1.13 MODEL 6-22

Gear Drive Model (3.57:1 ratio) Introduced June, 1957

Gear Drive Model (2:1 ratio) Produced September, 1957 (from Serial No. 758245 and on all 7-digit serial No. units.)

COLORS: Red with Green Cylinder Shield, Air Shroud and Pulley Cover.



1. Black and Green 6-22 foils on tank and sides.
2. Wider fuel tank than on other gear drive models.
3. May have either Brown 5-CS or Tillotson HL-27B pump carburetor; 4-reed intake valve design.
4. Name Plate:
   a) Serial number below 758245—built in Port Chester, with 3.57:1 gear ratio. (See Parts List #23210.)
   b) Seven digit serial numbers and six digit numbers from 758245—built in Gastonia—these units have 2:1 ratio gears, larger bore drive bearing and clutch spider, thicker crankshaft with large I. D. main bearing and new garlock seal. (See Parts List #23210-1.)

Figure 1—1

HOMELITE CHAIN SAW MODEL SPECIFICATIONS

	MODEL	17	5-20	EZ	26	5-30	7-29
ENGINE	**Cylinder**						
	Cu. Inch Displ.	4.32	5.01	5.01	6.63	6.97	7.88
	Bore	2"	2-1/16"	2-1/16"	2-3/8"	2-7/16"	2-1/2"
	Stroke	1-3/8"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-5/8"
	Brake H.P.	3.5	5	5	4	5.5	7
	Max. No. Load RPM	6400	6800	7000	4800	52-5500	52-5500
	Piston Rings						
	Compressed End Gap	Min. .070" Max. .080"	.070" .080"	.070" .080"	.070" .075"	.070" .075"	.008" .018"
	Compression P.S.I.	150	150	150	85	135	140
TRANSMISSION	**Type**	Gear	Gear	Direct Drive	Belt	Belt	Belt
	Reduction Ratio	3.57:1	3.57:1	1:1	2.75:1	2.75:1	2.75:1
	Chain Speed (ft. per min.)						
	9/16 p-6 tooth	945	1023		982	1125	1125
	9/16 p-7 tooth	1102	1185		1146	1312	1312
	9/16 p-8 tooth				1309	1500	1500
	7/16 p-7 tooth			3318			
	1/2 p-6 tooth	840	910		873	1000	1000
	1/2 p-7 tooth	980	1062		1019	1166	1166
	1/2 p-8 tooth	1120	1213		1164	1333	1333
	5/8 p-6 tooth	1050	1137		1091	1250	1250
	5/8 p-7 tooth				1271	1458	1458
FUEL SYSTEM	**Carburetor Type**	HP-1B *HL-4A (17L)	HP-15B *HL-4A (5-20L)	*HL-1A	MD-56A H-2A (26A)	H-6A HP-6B (5-30N)	1-CS Brown or HP-19B Tillotson
	Type Feed	Pump	Pump	Pump	Gravity or Pressure-Gravity	Pressure-Gravity (5-30N Pump)	
	Tank Capacity	40 oz.	40 oz.	45 oz.	47 oz.	47 oz.	62 oz.
	Fuel Mixture (Pts. Oil Per Gal.)	3/4	3/4	3/4	1/2	3/4	3/4
	Break-In Mixture	FIRST FIVE GALLONS ALL SAWS—MIX 1 PINT OIL WITH EACH GALLON					
	Air Filter:						
	Capacity—sq. in.	16.4	16.4	17.7	18.4	25.0	35.0
	Diameter	1-3/16"	1-3/16"	1-1/4"	1-3/8"	1-7/8"	1-7/8"
	Length w/Gasket	4-3/4"	4-3/4"	4-7/8"	4-5/8"	4-5/8"	6-5/16"
	Gasket Thickness	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"
IGNITION SYSTEM	**Magneto**	Phelon or Wico	Phelon or Wico	Phelon or Wico	Wico	Wico	Wico
	Capacity	15 KV	15 KV	15 KV	15 KV	15 KV	15 KV
	Condenser Capacity (MFD)	Phelon .16-.18 Wico .16-.20	(P) .18-.22 (W) .16-.20	(P) .18-.22 (W) .16-.20	(W) .16-.20	(W) .16-.20	(W) .16-.20
	Coil Values Ohms—Primary	.77	(P) .65-.80 (W) .41-.47	(P) .65-.80 (W) .41-.47	.55	.55	.55
	Ohms—Secondary	3500	(P) 75-9000 (W) 35-4500	(P) 75-9000 (W) 35.4500	55-6000	55-6000	55.6000
	Breaker Point Gap Setting	.015"	.015"	.015"	.020"	.020"	.020"
	Spring Tension	Wico and Siamese Type Phelon, 14 to 21 oz. at center line of breaker shoe. Covered Type Phelon 22 to 38 oz.					
	Spark Plug	HO-8A	HO-8A	HO-8A	HO-8A	HO-3	HO-3
	Electrode Gap	.025"	.025"	.025"	.025"	.025"	.025"

*Superseded by HL-27-B or 5-CS Carburetor (interchangeable for service)

4-20	EZ-6	6-22
4.32	5.01	5.01
2"	2-1/16"	2-1/16"
1-3/8"	1-1/2"	1-1/2"
4	6	6
6400	7000	6800
Min. .070" Max. .080"	.070" .080"	.070" .080"
150	150	150
Gear	Direct Drive	Gear
3.57:1	1:1	2:1 (or 3.57:1)
945		1828 (1023)
1102		2041 (1185)
	3318	
840		1625 (910)
980		1896 (1062)
1120		2166 (1213)
1050		2031 (1137)
Brown 5-CS	Brown 5-CS or Till. HL-27B	Brown 5-CS or Till. HL-27B
Pump	Pump	Pump
40 oz.	45 oz.	2 qts.
3/4	3/4	3/4
	FIRST FIVE GALLONS ALL SAWS—MIX 1 PINT OIL WITH EACH GALLON	
16.4	17.7	17.7
1-3/16"	1-1/4"	1-1/4"
4-3/4"	4-7/8"	4-7/8"
3/16"	3/16"	3/16"
Covered Phelon or Wico	Covered Phelon	Covered Phelon
15 KV	15 KV	15 KV
Phelon .18-.22 Wico .16-.20	.18-.22	.18-.22
Phelon .65-.80 Wico .77	.65-.80	.65-.80
Phelon 75-9000 Wico 3500	75-9000	75-9000
.015"	.015"	.015"
	Wico—14 to 21 oz. at center line of breaker shoe. Covered type Phelon—22 to 38 oz.	
HO-8A	HO-8A	HO-8A
.025"	.025"	.025"

1—3 INTERNAL COMBUSTION (THEORY OF ENGINE COMBUSTION)

The internal combustion engine, through combustion, releases the latent energy of fuel and converts it mechanically into usable force. In order to function, the engine must complete a cycle of four operations.

INTAKE—Fuel vapor and air must be introduced into the firing chamber by some means.

COMPRESSION—The charge must be highly compressed to insure rapid combustion and expansion of the gases.

COMBUSTION—Following ignition, the expanding gases must drive the piston in a power stroke.

EXHAUST—The burnt gases must be removed to prepare the firing chamber to accept a fresh charge.

1—3.1 Four-stroke Cycle Engine Operation

If one complete piston stroke were required for each of the above functions, it would require four strokes (up and down, up and down), to complete each cycle. Accordingly, such an engine would be called a four-cycle engine. (See Figure 1—2.)

1—3.2 Two-stroke Cycle Engine Operation

1. A two-cycle engine is one which completes each cycle of operation in two piston strokes—an upstroke and a downstroke. The piston acts as a moving wall which divides the engine cavity into two chambers—the crankcase and the firing chamber. Movement of the piston creates a vacuum condition in one chamber and a high pressure condition in the other chamber. Thus two jobs can be performed on each piston stroke as follows: (See Figure 1—3.)

ON THE UPSTROKE—(a) Air rushes through the air cleaner, through the carburetor barrel where it picks up fuel and enters the crankcase in the form of vapor.

(b) The charge (from previous cycle) in the firing chamber is compressed. Near the top of the stroke this charge is ignited by the spark plug.

ON THE DOWNSTROKE—(c) Combustion, resulting in rapid expansion of the gases in the firing chamber, drives the piston in a power stroke. The descending piston uncovers the exhaust ports, through which the burnt gases escape.

(d) The intake valve in the crankcase is closed during the downstroke, so the charge in the crankcase is precompressed. When the piston descends far enough to uncover the intake by-pass ports, which connect the crankcase and the firing chambers, the vapor escapes into the firing chamber. The entry of the new charge helps to expel the last fumes of burnt gas from firing chamber and places the charge in the chamber for compression on the next upstroke.

NOTE

Unless fuel from a previous cycle of operation is present in the firing chamber, the engine requires cranking through at least three strokes to provide a compressed charge for combustion. The fuel drawn into the crankcase during the upstroke of one cycle is not consumed until the downstroke of the next succeeding cycle.

Figure 1—2 Four Stroke-Cycle Engine Operation

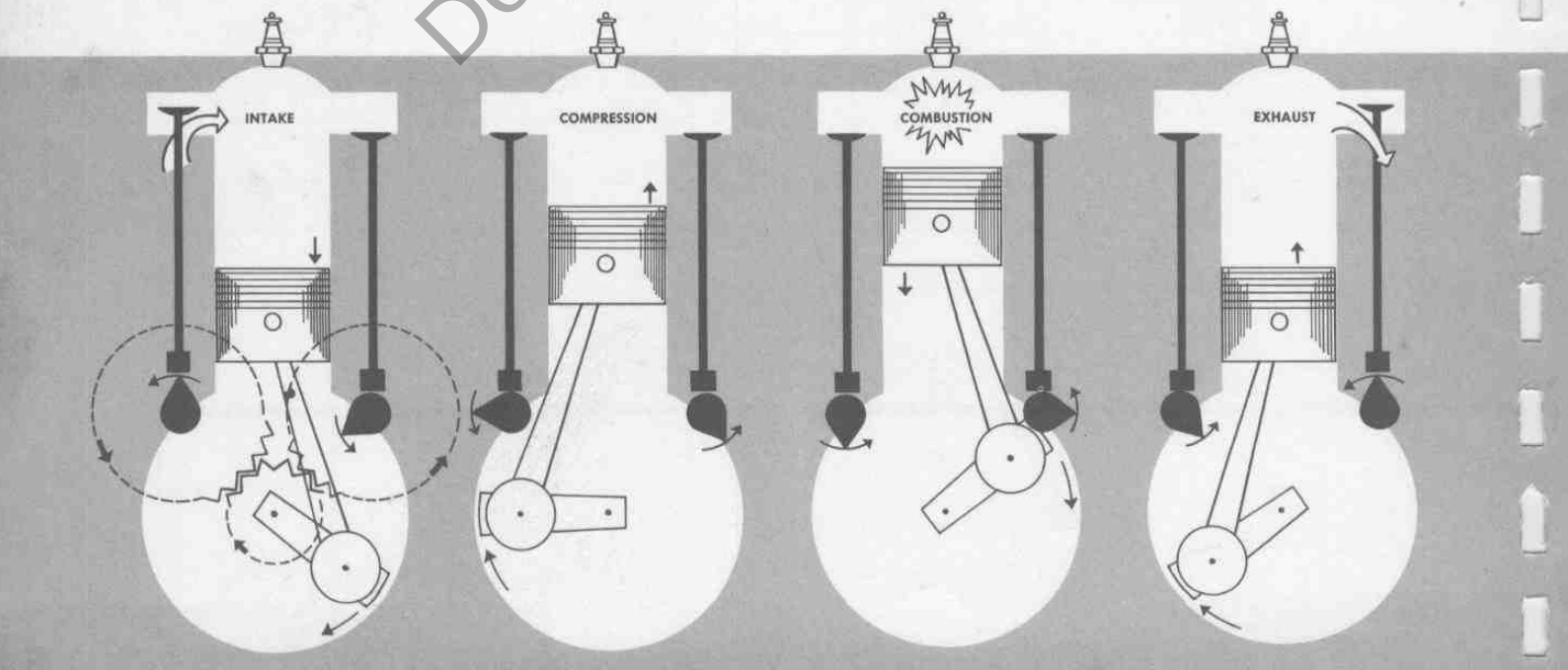
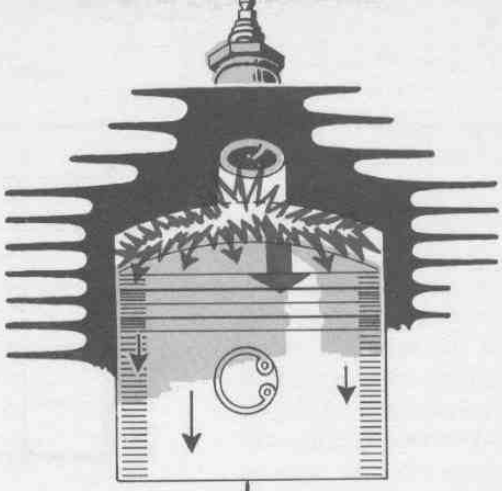
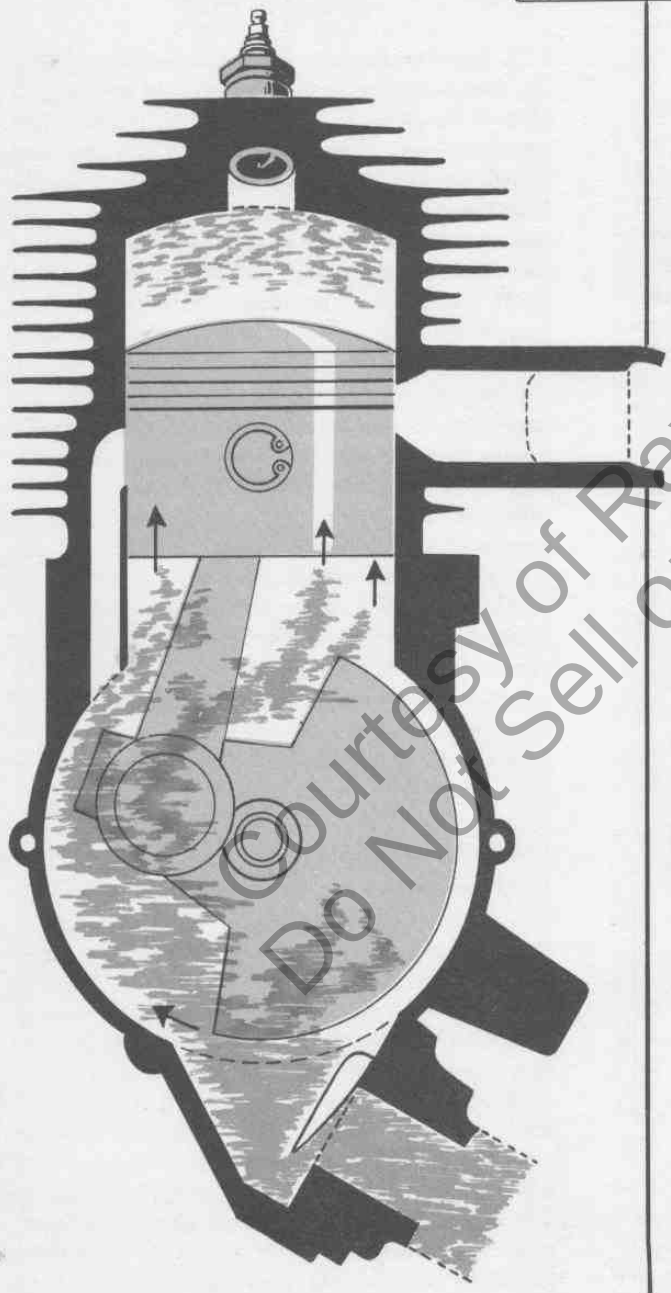


Figure 1—3
Two-Stroke Cycle Engine Operation



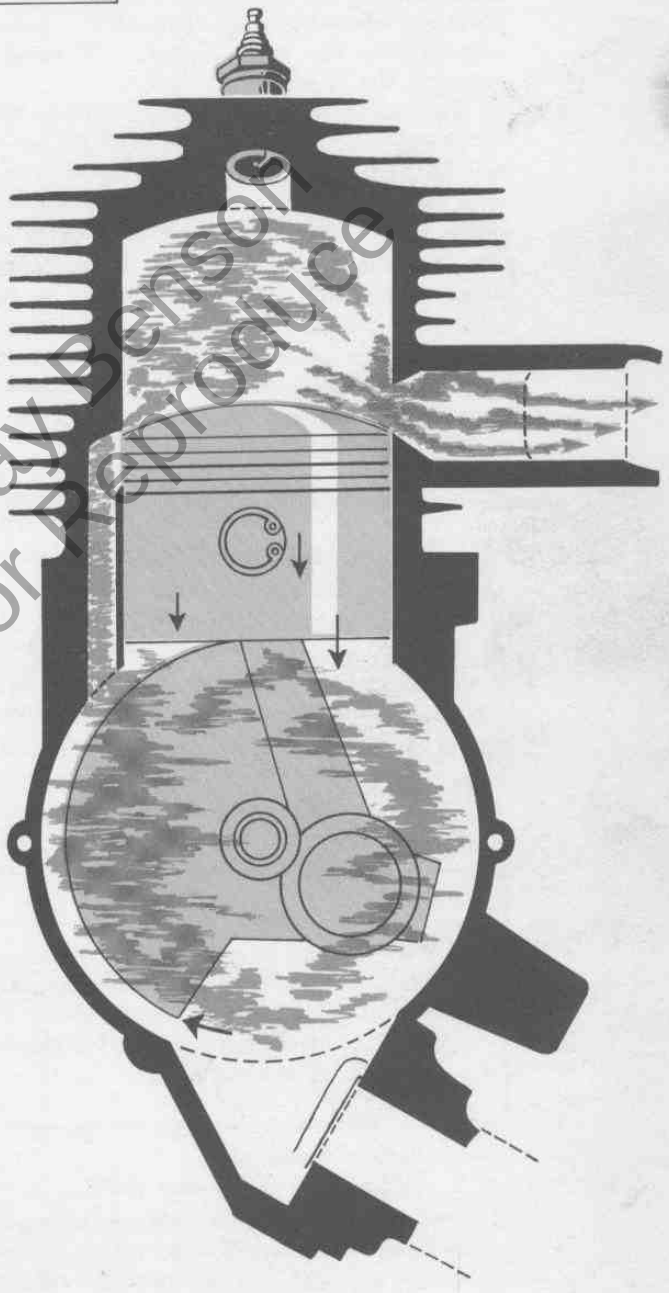
COMBUSTION

Rapid expansion of the combusted charge drives the piston downward.



UP-STROKE

Vacuum condition in crankcase results in entry of fuel through intake valve into crankcase. The charge from a previous cycle of operation is trapped in the firing chamber and compressed. The ignition spark is timed to occur just before completion of the up-stroke.



DOWN-STROKE

The descending piston first uncovers the exhaust ports to expel the burnt charge, then puts the crankcase under compression and uncovers the intake by-pass ports to force vapor in crankcase to enter firing chamber. Entry of the new charge helps expel the last fumes of the burnt charge.

2. Every piston downstroke results in a power stroke. Because of this, the two-cycle engine does not need timing gears and cam shafts to mechanically actuate an intake and exhaust valving system; nor does it require the extremely heavy flywheel necessary to maintain momentum during the three non-power strokes of a four-cycle engine. However, because the two-cycle engine draws fuel into the crankcase on every crankshaft revolution, all internal surfaces of the engine can be kept lubricated by mixing a quantity of oil with the fuel. For chain saw and other applications where lightness, compactness, and maneuverability are prime factors, the two-cycle engine is the logical power choice.

The relatively greater rate of carbon build-up in two-cycle engines results from the oil content in the fuel vapor. Some of this oil is burnt with the fuel, but most of it falls out of the vapor under high compression and heat prior to ignition. Homelite uses Champion HO—series spark plugs with special platinum electrodes to minimize spark plug failure due to carbon. However, inspection and cleaning of the spark plug and the cylinder exhaust ports at regular intervals is necessary to prevent hard-starting and loss of engine power due to carbon.

1—4 ENGINE SPEED GOVERNING

As the speed of the chain saw engine increases past a certain point, the actual cutting power of the unit begins to fall off. (See Figure 1—4.) Homelite Chain Saw engines, therefore, are carefully calibrated and timed to perform within the optimum speed range. The engine is maintained within this optimum range by the action of a governor which automatically controls the amount of the fuel and air fed to the engine.

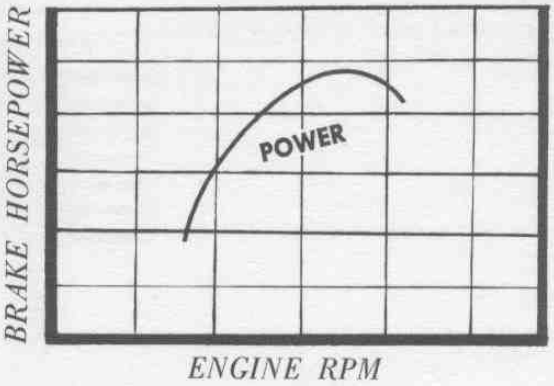
CAUTION

Never attempt to gain power by tampering with or removing the governor. At higher than optimum speeds the engine will sound louder, but the unit will not cut any faster.

1—4.1 Rotary Governor (Models 26, 5-30, and 7-29)

1. For optimum operation and safe maintained engine speed, centrifugal action rotary type governors are supplied only as complete and accurately pre-set assemblies. The rotary governor also functions as an intake valve. In fact, the mechanism could be called an automatic throttling intake valve.

Figure 1—4 Characteristic Horsepower—RPM Curve

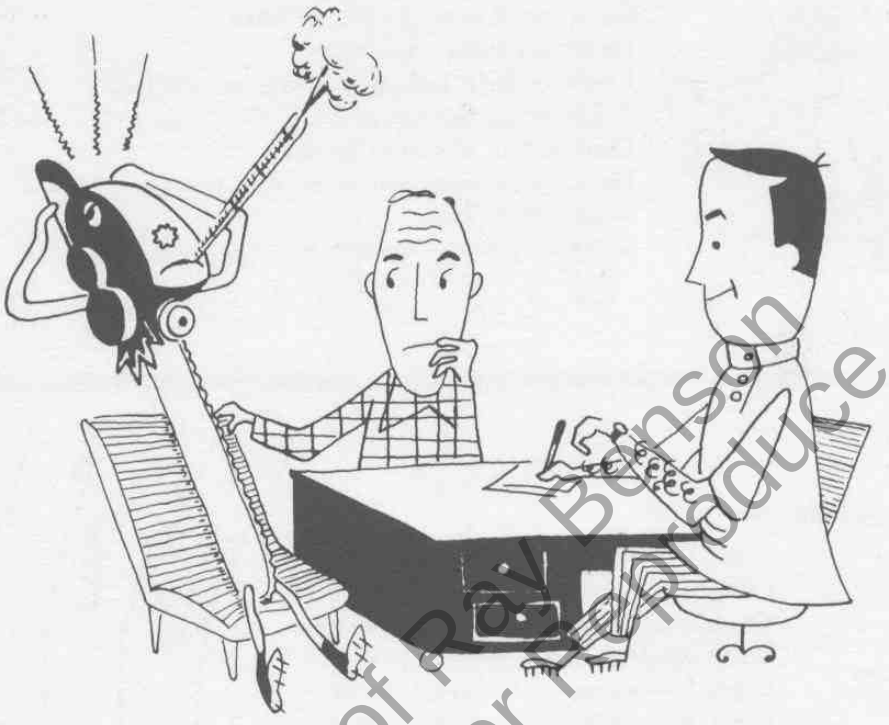


2. A circular intake valve plate, with an opening corresponding with the manifold opening, is pinned in position against the crankcase. The governor valve plate has a similar opening and is held against the intake valve plate by pressure from three springs. The governor is keyed to, and rotates with the engine shaft. It covers the intake manifold opening except on the engine upstroke.
3. At full throttle, an engine without governor control would race, unless enough work load were applied to prevent it. With the Homelite rotary governor-equipped engines at full throttle, the engine speed can be maintained within the optimum range no matter how light the load. As engine speed increases, centrifugal force becomes sufficient to overcome opposing governor spring tension on the governor weight. Accordingly, the leaf-type weight moves to a new position, at which it partially covers the intake opening and throttles the engine. As the throttled engine slows down, the centrifugal force diminishes until the governor spring tension can pull the weight away from the intake opening. Governor speed control is heard as oscillation (series of changes in engine sound).

1—4.2 Air Governor

1. Air governors are incorporated in the Homelite Saws which have reed type intake valves. Homelite air governors all operate on the same principle.
2. When the operator presses the throttle trigger to release the throttle lever, governor spring tension takes over and pulls the throttle open.
3. A small air vane, connected to a shaft and lever assembly on the back plate (the lever is connected to the throttle shaft lever) is located in the air stream created by the spinning rotor. When the air velocity is high enough to overcome the governor spring tension, the governor closes the throttle. The governor is adjustable to provide control at optimum r.p.m. When switching from bar and chain operation to Brushcutter operation, governor spring tension must be reduced to its minimum.

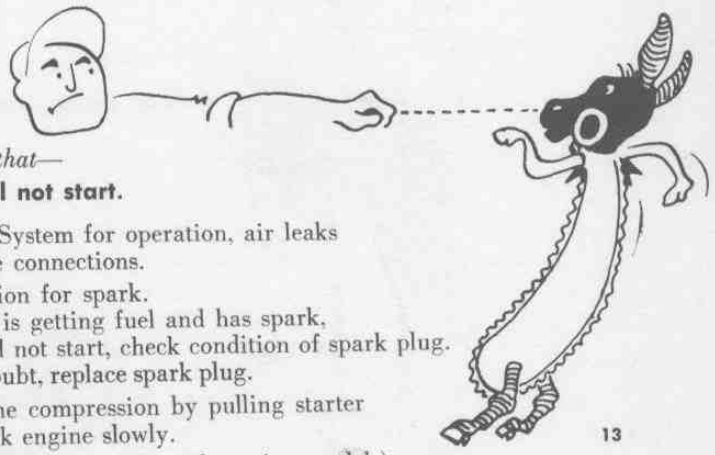
SYSTEMATIC SERVICE



A physician always asks the patient what's wrong and then checks him over systematically before attempting diagnosis and treatment. The chain saw mechanic should use a similar system . . . should never blindly tear down a unit.

Always rely on tests, not testimony, in making trouble diagnosis. When trouble-shooting, always begin by making the checks listed in group 1, below. The results of these tests will almost invariably tell you in which section or system of the saw the trouble lies. Then go on from there until you have pin-pointed the trouble.

Even though you do not rely on the customer's opinion of the trouble, always jot his remarks down on the test ticket when accepting the saw. Later on, you can show him which repairs, if any, were necessary to remedy his particular complaints. This courtesy of hearing the customer out will build confidence in him that you are a trustworthy, top-notch serviceman.



If you find that—

2-1. Saw starts hard or will not start.

Check Fuel System for operation, air leaks or loose connections.

Check Ignition for spark.
If unit is getting fuel and has spark, but will not start, check condition of spark plug. If in doubt, replace spark plug.

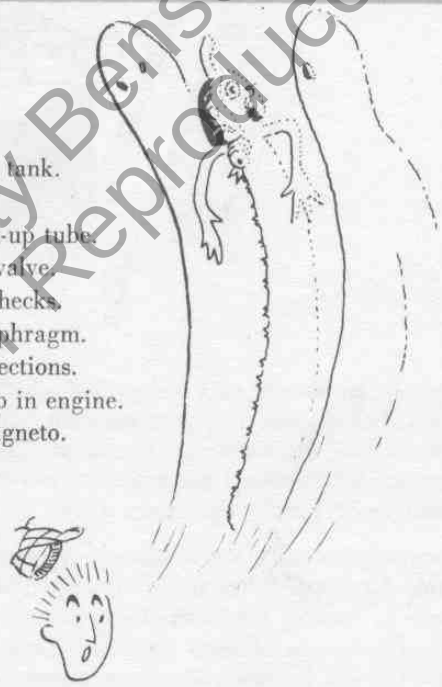
Check engine compression by pulling starter to crank engine slowly.
(Compression varies with each engine model.)

If you find that . . .

2-2. Engine lacks power.

Check for properly sharpened chain including depth gauge setting.
Check for dirty or plugged air filter.
Check carburetor adjustments.
Check for dirty, improperly mixed or stale fuel.
Check for low compression.
Check setting of contact points.
Check for excessive carbon, plugged exhaust ports.
Check for air leaks.
Check air governor for dirt, sticking, faulty adjustment.

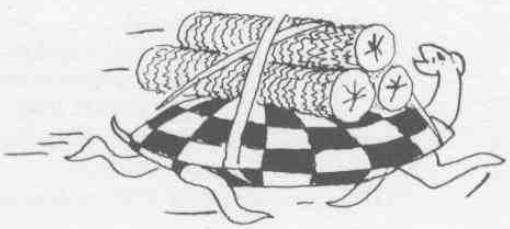
2-3. Saw fades, or cuts-out.

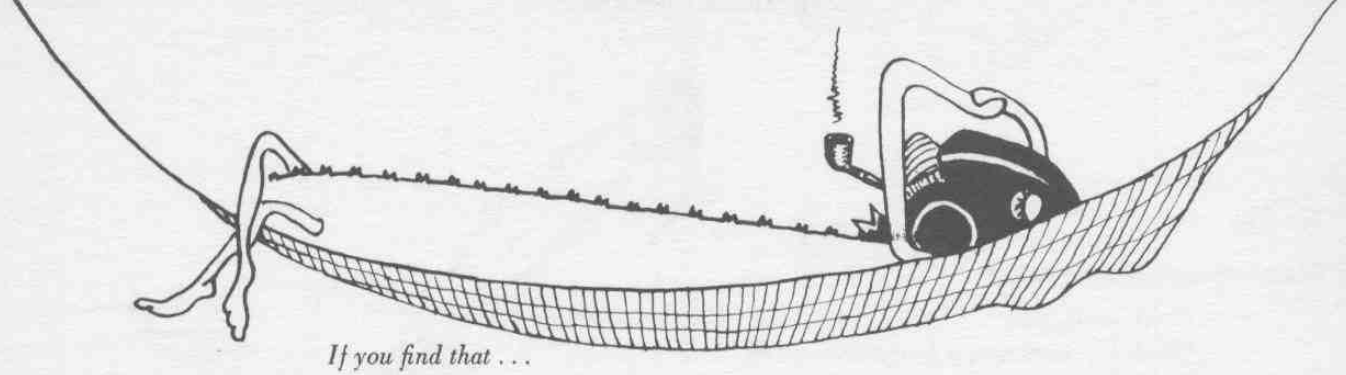


Check for dirty fuel filter and fuel tank.
Check for dirty carburetor.
Check for plugged fuel line or pick-up tube.
Check operation of fuel cap relief valve.
Check for inoperative fuel pump checks.
Check for ruptured fuel pump diaphragm.
Check for air leaks and loose connections.
Check for excessive carbon build-up in engine.
Check for faulty connections in magneto.
Check for leaky high-tension lead.

2-4. Engine leans out under load.

Check for air leaks and loose connections.
Check for porous or slit flexible pick-up tube.
Check for faulty outlet fitting, leaking fuel line.

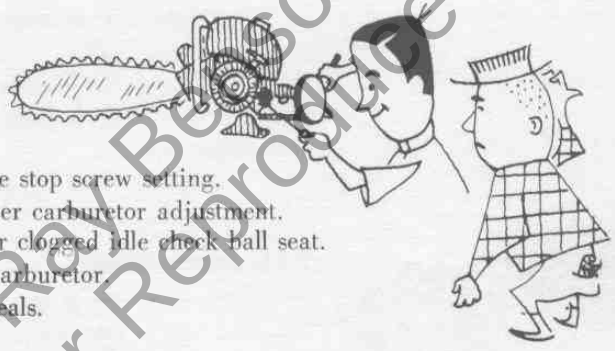




If you find that . . .

2-5. Saw will not accelerate.

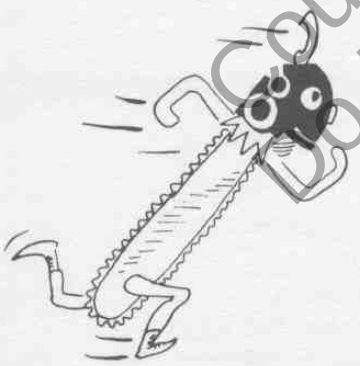
Check carburetor idle (or low speed) adjustment for low setting.
Check for sawdust build-up on Model 17, 5-20 and EZ governor vane.
Check for dirty or plugged air filter.
Check for dirty fuel filter, fuel tank and poorly operating relief valve or check valves.
Check for dirt in carburetor idle system.
Check for plugged exhaust.



2-6. Saw will not idle.

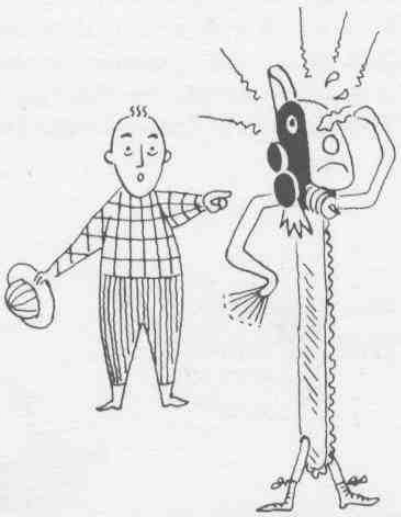
Check for low idle stop screw setting.
Check for improper carburetor adjustment.
Check for dirty or clogged idle check ball seat.
Check for dirty carburetor.
Check for leaky seals.

2-7. Saw idles too fast.

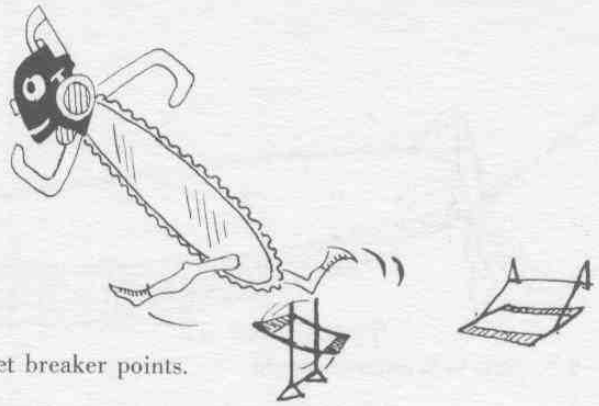


Check idle stop screw setting and for build-up of dirt or twigs under screw.
Check for worn throttle butterfly sticking in orifice.
Check for lean carburetor setting.
Check for leaky seals or air leaks between carburetor and crankcase.

2-8. Engine overheats.

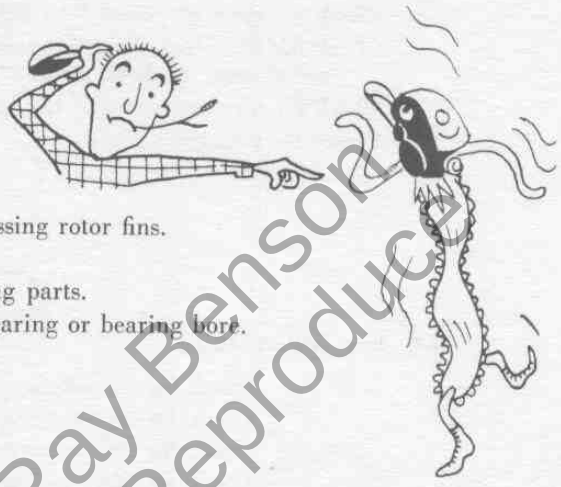


Check chain and bar assembly for sharpness and correct tension.
Check for clogged air screen.
Check for improper fuel mixture.
Check for lean carburetor setting.
Check for aluminum pick-up on piston.



2-9. Engine misses at high speed.

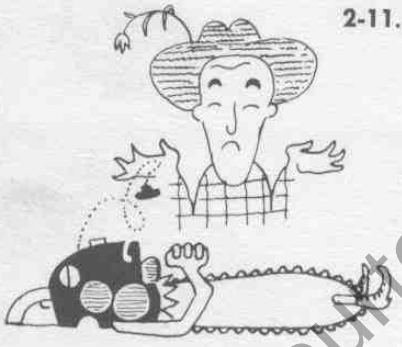
Check spark plug
Check for short circuit in ignition system.
Check for sticking, burned or incorrectly set breaker points.
Check for faulty high-tension lead.
Check magneto for coil failure.



If you find . . .

2-10. Excessive vibration.

Check for loose rotor.
Check for broken or missing rotor fins.
Check for loose clutch.
Check for loose fastening parts.
Check for worn main bearing or bearing bore.
Check engine speed.

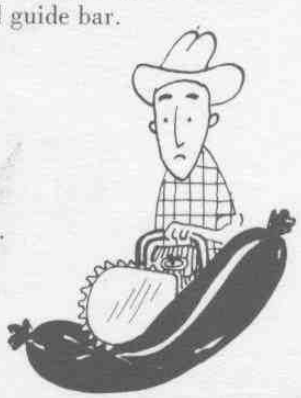


2-11. Starter failure.

Check for proper torque of ball drive hub
Check for dirty drive ball pockets.
Check for lack of spring tension or broken spring.
Check for ratchet teeth wear
Check for worn or missing formica or thrust washers.
Check clearance between pulley and spring housing cover.
Check for sawdust in spring housing
Check for bent ball retainer plate.

2-12. Chain will not rotate.

Check chain for proper tension.
Check for inoperative clutch.
Check for broken drive gears or belt.
Check for sheared sprocket shaft screws.
Check for sheared or missing sprocket shaft keys.
Check for dirty chain and chain guide groove.
Check for worn or damaged guide bar.



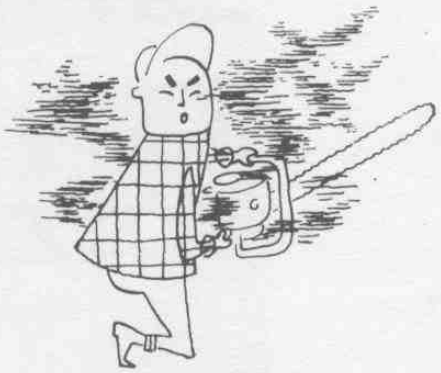
2-13. Chain will not cut.

Check for reversed chain installation.
Check for dull or improperly sharpened chain.

Section 3

LUBRICATION

INDEX



3—1 OIL IN FUEL MIX

The oil in the fuel mixture lubricates the internal parts of the 2-cycle engine. For maximum engine life and performance, adding the exact amount of oil to each gallon of gasoline, and thoroughly pre-mixing the fuel before pouring it into the fuel tank are imperative.

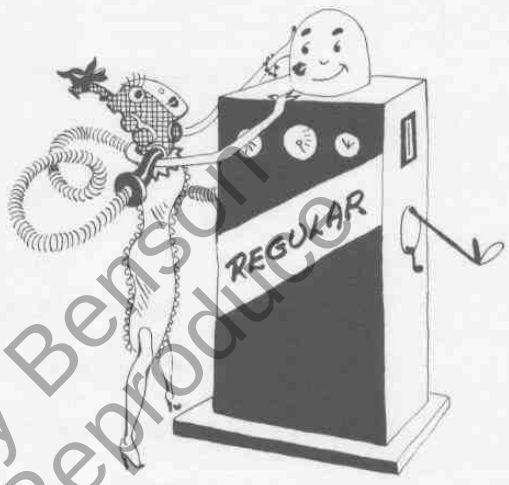
In the crankcase, the connecting rod and rotating crankshaft act as a centrifuge to drive some of the oil out of the vapor. This oil lubricates the crankcase. When the remainder of the charge enters the combustion chamber, heat forces more oil out of the vapor, and this quantity bathes the piston and cylinder. Any oil left in the compressed fuel charge is burnt during combustion.

If the fuel contains too much oil after lubrication, the engine will smoke excessively, and deposits will foul the spark plug, build up on the piston and in the piston ring grooves, and clog the exhaust ports. Restriction of the exhaust causes loss of engine power and hard-starting.

If the fuel does not contain enough oil, the amount forced out of the vapor will be insufficient for proper lubrication. Lack of oil (or poor grade oil) exposes the engine surfaces to excess friction and overheating. Overheating destroys the protective film of lubricant and the engine may seize up.

Unless the fuel is thoroughly agitated the oil and gasoline will not be well mixed. Oil in unmixed fuel settles to the bottom and is drawn out first. Then, becoming leaner and leaner as the tank level drops, the remaining supply of fuel will be nearly all gasoline and the engine might be ruined.

Homelite Chain Saw Engine Oil (See Figure 3—1) or a good grade SAE-30 Engine oil should always be used. The Homelite is a detergent type oil which minimizes the rate of carbon and gum formation in the engine. Since any carbon and gum deposits loosened by detergent action are eliminated in the exhaust of a 2-cycle chain saw engine, switching from regular grade to Homelite detergent oil can be done at any time.



3—2 GASOLINES

Clean, fresh, regular or high test automotive gasoline should be used. Straining the gasoline through chamois will remove moisture condensation and foreign matter from the gasoline prior to mixing. Fuel containers should be rinsed occasionally with clean gasoline or solvent, and drained to remove any water or sediment accumulation. Safety fuel containers are recommended for use.

Figure 3—1 Homelite Detergent Type Chain Saw Oil

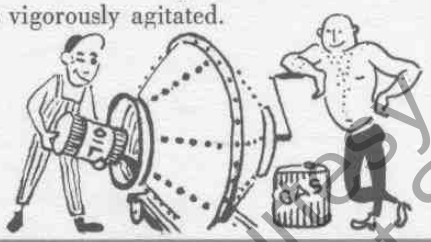
Figure 3—2

FUEL MIXING TABLE

	Pints HOMELITE oil per gallon of gasoline	Quantities for 2½ gallon safety can	Quantities for 5 gallon safety can
Break-in mixture All Saws	1 pt.	2 pts. oil 2 gal. gas	4 pts. oil 4 gal. gas
	USE BREAK-IN MIXTURE FOR FIRST 5 GALLONS ONLY		
Normal mixture For Diaphragm Carburetor Models	¾ pt.	1½ pts. oil 2 gal. gas	3 pts. oil 4 gal. gas
Normal Mixture For Float Feed Carburetor Type Saws (Model 26)	½ pt. per gal.	1 pt. oil 2 gal. gas	2½ pts. oil 5 gal. gas

3—3 FUEL MIXING INSTRUCTIONS

Pour about half the total amount of gasoline to be mixed into the safety can. Pour the required amount of oil into the can, then add the remainder of the gasoline. Shake the can vigorously until you are positive the oil and gas are thoroughly mixed. Thorough mixing is important because oil and gasoline will not combine unless vigorously agitated.



3—4 ENGINE BREAK-IN PERIOD

New engines should be protected by using the special break-in fuel mixture during operation for the first five gallons of fuel only. From then on, use only the normal mixture recommended for the unit. (See Figure 3—3.)

Overhauled engines which have had piston or cylinder replacement should be treated as new, and broken-in with five gallons of break-in fuel.

3—5 GEAR CASE LUBRICATION

On saws such as Models 17 and 5-20, an oil inspection window and a small arrow on the gear case cover make it easy to maintain the gear oil at proper level. Check the oil level frequently and add oil whenever necessary. If the oil level is allowed to drop appreciably, the gears will not have adequate lubrication. Avoid overfilling, however, since the excess oil, in addition to escaping from the bleed hole, may cause the clutch to slip at higher speed than desirable. Principally, the gear case should be drained, cleaned and filled with clean gear oil. With every day use or steady production cutting, the frequency of cleaning should be about once a month; with only occasional cutting operation, the frequency may be every six months.

1. Always use Homelite Gear Oil, Part No. 55291-A in the gear cases of Homelite Saws.
2. Wipe away sawdust and dirt before unscrewing the oil filler plug.
3. Place the saw on a level surface, so you will get an accurate reading of the oil level, as seen through the inspection window. (See Figure 3—3.)
4. Pour oil into the gear case until the level is even with the arrow. Do not over-fill.

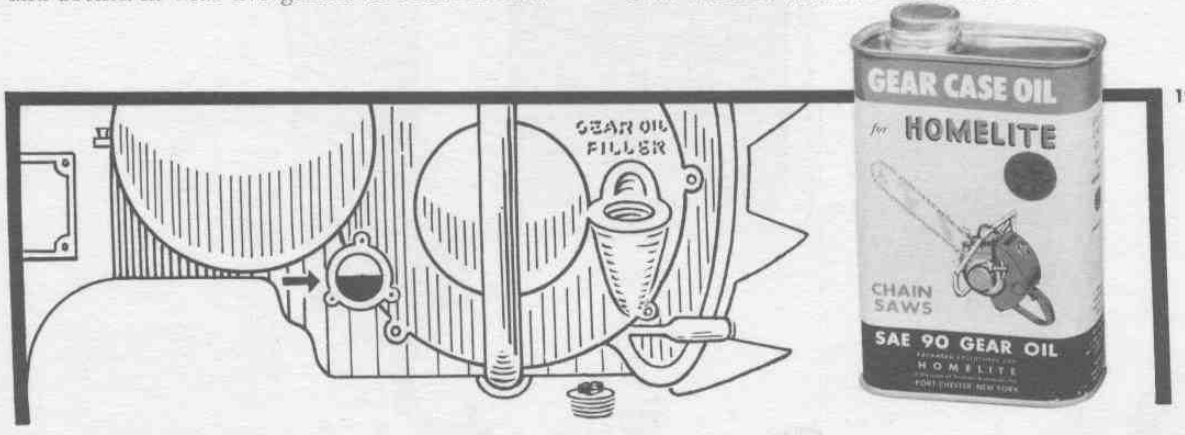


Figure 3—3 Fill to Level of Arrow with Homelite Gear Oil

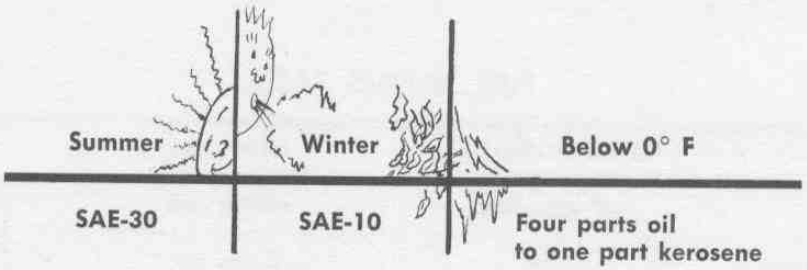


Figure 3—4 Chain Lubrication Chart

3—6 CHAIN LUBRICATION

All Homelite Saws have manually operated chain oil lubricators. To keep friction and wear to a minimum, the chain must be oiled regularly and frequently during cutting. Operation of the plunger button forces oil into the guide bar groove. Chain rotation distributes the lubricant around the entire bar. Although the construction details and parts location may vary with each unit, all Homelite lubricators use the same principle of operation.

3—7 OPERATING PRINCIPLE OF PRESSURE LUBRICATOR

On all models, the chain oil reservoir contains a flexible pick-up tube and strainer (oil finder) which is connected to the oil pump inlet fitting. The pump, in addition, contains a plunger and plunger return spring in its cavity, and an outlet connection and oil line running to the guide bar. The inlet and outlet connections both contain ball check valves. Except for manual actuation (by a plunger instead of by crank-

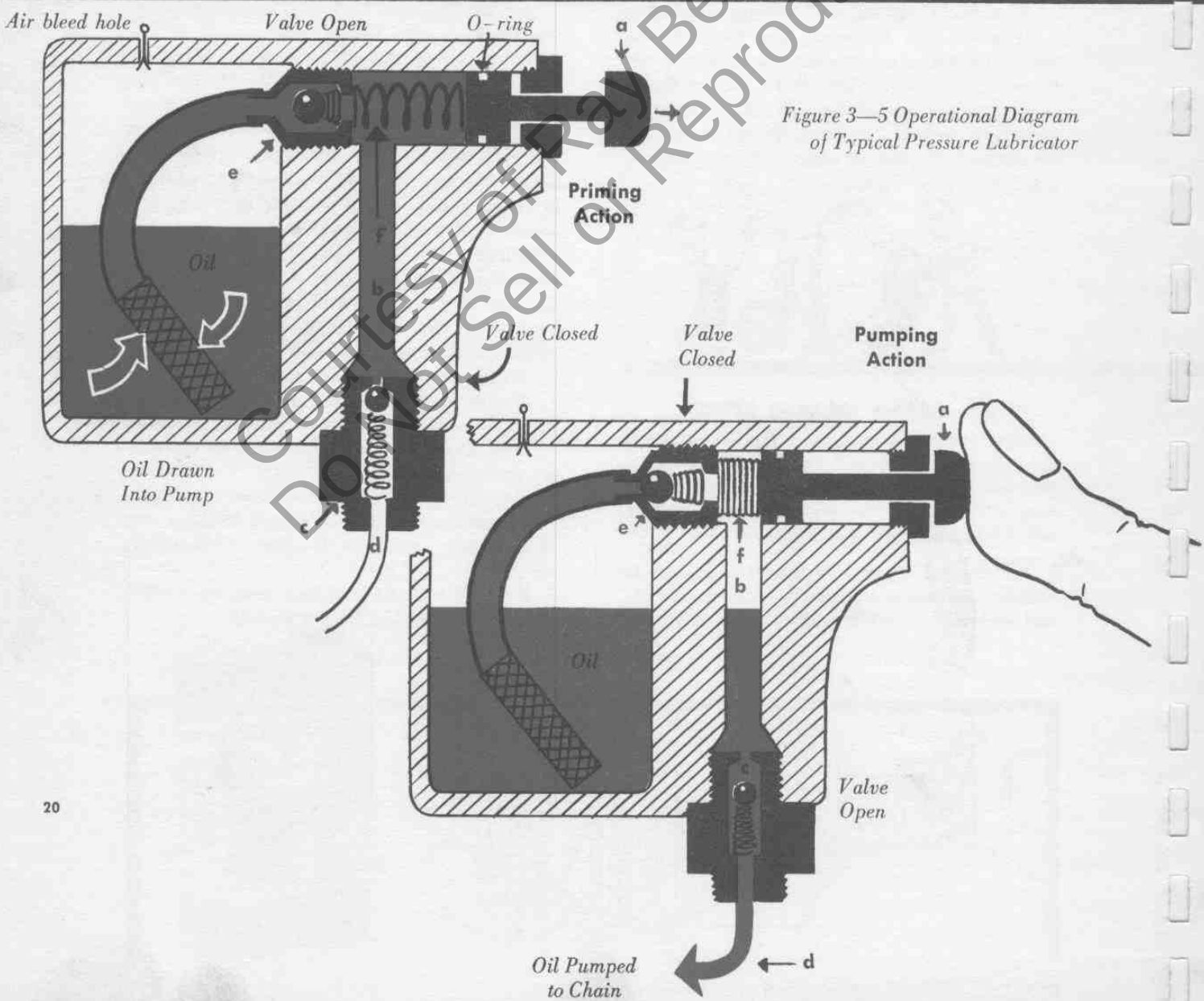


Figure 3—5 Operational Diagram of Typical Pressure Lubricator

case pulsations) the oil pump is similar to the Homelite fuel pumps in operation. (See Figure 3—5.)

(1) Depressing plunger button (a) increases pressure in chamber (b) and opens check valve (c). Any oil in chamber (b) will be forced out through oil line (d) to guide bar. Ball of check valve (e) remains seated during this operation. (2) Releasing plunger button (a) allows return spring (f) to push plunger back out of cylinder. Check valve (c) is closed and check valve (e) is opened by the vacuum in the pump cavity. Oil from reservoir flows through tube and strainer and open check valve into pump chamber (b), from where it will be pumped into oil line the next time button is depressed.

3—8 LUBRICATOR DIAGNOSIS

Pressure lubricator failure is usually due to air leaks or dirt, deterioration or damaged condition of the flexible tube, or to failure of one of the check valves to operate.

3—8. Diagnosis of hard-to-prime condition.

1. Oil too thick for cold weather operation.
2. Loose connections or faulty O-ring gaskets causing air leakage.
3. Failure of pump inlet and outlet check balls to seat properly.
4. Check valve at oil line stuck open.
5. Porous or cracked flexible sleeve leaking air.
6. Pick-up tube and screen assembly not immersed in oil. (Reservoir not full enough).
7. Air bleed clogged, pick-up tube clogged or flexible sleeve kinked or collapsed. (Plunger will not return rapidly).

3—8.2 Diagnosis of failure to pump (Plunger hard to push in)

1. Oil line plugged.
2. Oil entry hole in guide bar plugged.

3—9 PRESSURE LUBRICATOR SERVICE EZ—17—5-20

3—9.1 Disassembly

1. Disconnect oil line and remove check valve from oil pump outlet.
   (a) On Model EZ remove the one-piece check valve assembly.
   (b) On Models 17 and 5-20 remove straight adapter from outlet connection. Hold hand over outlet, turn saw over, and shake out the check valve spring and check ball.
2. Remove supply line cap and gasket to expose the intake check valve assembly. Hold hand over the hole and turn saw over to remove check valve spring and check ball.
3. Use a cabinet type (straight round shank) screwdriver of proper diameter to unscrew the supply line check valve fitting. During removal, be careful to damage neither the female threads of the supply line hole nor the screwdriver slot and check ball seat of the check valve fitting. Remove fitting with flexible sleeve and oil finder (pick-up tube) attached.
4. Unscrew the plunger button assembly. (Apply 15/32" wrench at hex part.) Pull the plunger button with plunger tube and O-ring assembly and the plunger return spring from the pump body.

3—9.2 Inspection and Reassembly 17, 5-20 and EZ

1. Wash and clean all parts thoroughly. Blow air through the disassembled oil line. Be sure bleed holes, pump passages and valve seats are clean. *Do not blow air* through the flexible sleeve.
2. Examine all sealing gaskets and O-rings. These must be perfect for an adequate seal. Pump operation depends on it.
3. Replace the flexible sleeve if it is cracked, porous, kinked or the material has deteriorated. A porous or cracked sleeve or one which does not fit the pick-up tube or check valve fitting snugly will cause an air leak. A kinked or weak-walled sleeve will collapse and prevent oil from being drawn into the pump.
4. The oil finder (pick-up tube) strainer must be clean.
5. The plunger return spring must operate freely with sufficient tension (to push the depressed plunger back out rapidly) to create enough vacuum to draw oil into the pump.
6. Check-valves should operate properly and be correctly installed.
   (a) Test the operation of the EZ outlet check valve assembly by applying lip suction at the end of the valve. The valve should allow air to pass through when lip suction is applied at the oil line connection end, and should not allow air to pass when lip suction is applied to the pump connection end.

(b) Check-balls used in assembling outlet check valve assemblies on Models 17 and 5-20, and for all pump outlet (supply line) installation should be perfectly round and free of wear. Check-valve-springs should have proper shape and length.

(c) Replace the supply line fitting if the recessed check ball seat is worn or damaged and check ball does not seat properly.

7. Place gasket on supply line fitting, and complete oil supply line assembly by attaching flexible sleeve and oil finder. Drop oil finder and sleeve into oil reservoir and screw fitting into position with a cabinet screw-driver. Be sure fitting is tight.
8. Install check balls and springs (small end of single-tapered springs to ball) in proper assembly order for proper direction of flow. Complete assembly of pressure lubricator by reversing the order of disassembly. Be sure all fittings and connections are tight.

3—10 PRESSURE LUBRICATOR SERVICE 26, 5-30 and 7-29

3—10.1 Disassembly

1. Disconnect oil line at tank. (On pressure tank models 26LCSA and early 5-30, also disconnect pressure relief line.)
2. Remove four screws and lift complete oil pump assembly and gasket from tank.
3. Bend down ears of pump locking plate. Turn hex fitting counterclockwise to unscrew plunger button assembly from pump body. Lift plunger assembly, plunger tube and spring out of pump body.
4. If necessary, remove oil line connectors (connector adapter, 90° elbow and straight adapter. Pump locking plate and lubricator body cover can then be separated from pump body.
5. Remove screw plug to expose the outlet check valve in short side of pump body. Remove valve spring and check ball.
6. Disconnect flexible sleeve and pick-up tube and screen assembly (oil finder) from long (inlet) side of pump body. Disconnect assembly consisting of two 90° elbows and straight adapter, and remove the check ball and spring from long (inlet) side of pump body.

3—10.2 Lubricator Inspection and Reassembly 26, 5-30 and 7-29

1. Wash all disassembled parts in solvent and clean them thoroughly. Blow air through the pump body passages, air bleed holes, and through the oil line. Do not blow air through the flexible sleeve.
2. The plunger return spring must be perfectly formed and have enough tension to assure prompt return movement of the plunger. The pump plunger must fit the pump chamber well enough for efficient priming and pumping action. If there is too much clearance, replace worn parts.
3. Check balls should be round and free of wear. The pump will not operate efficiently if the check balls or valve seats in the pump body are worn or damaged. Check ball springs should have proper shape and tension.

   (a) Drop a check ball into the outlet (short) side of pump body. Install a check ball spring, small-end-to-ball, and complete outlet check valve assembly by installing the plug screw, tightening securely.

   (b) Drop large end of remaining check ball spring into pump inlet opening, drop check ball in on top of spring, and reassemble the cleaned connectors (two 90° elbows and one adapter) at pump inlet connection.
4. Be sure flexible sleeve is in perfect condition. Replace deteriorated, pinched, kinked, cracked, porous or loose-fitting sleeves. Attach sleeve and (oil finder) pick-up tube assembly to inlet connection, and make sure all fittings and connections are tight.
5. Install lubricator in tank by reversing order of parts assembly.

Section 4

FUEL SYSTEM

INDEX

THE FUNCTION OF THE FUEL SYSTEM is to keep the engine supplied with a combustible vapor of fuel and air. The fuel system includes a fuel tank, air and fuel filters, a carburetor and an intake manifold, plus all connecting fuel and pulse lines.

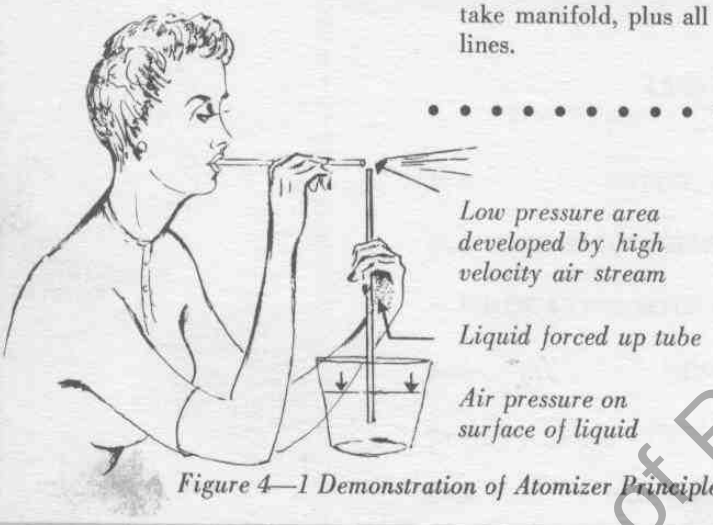
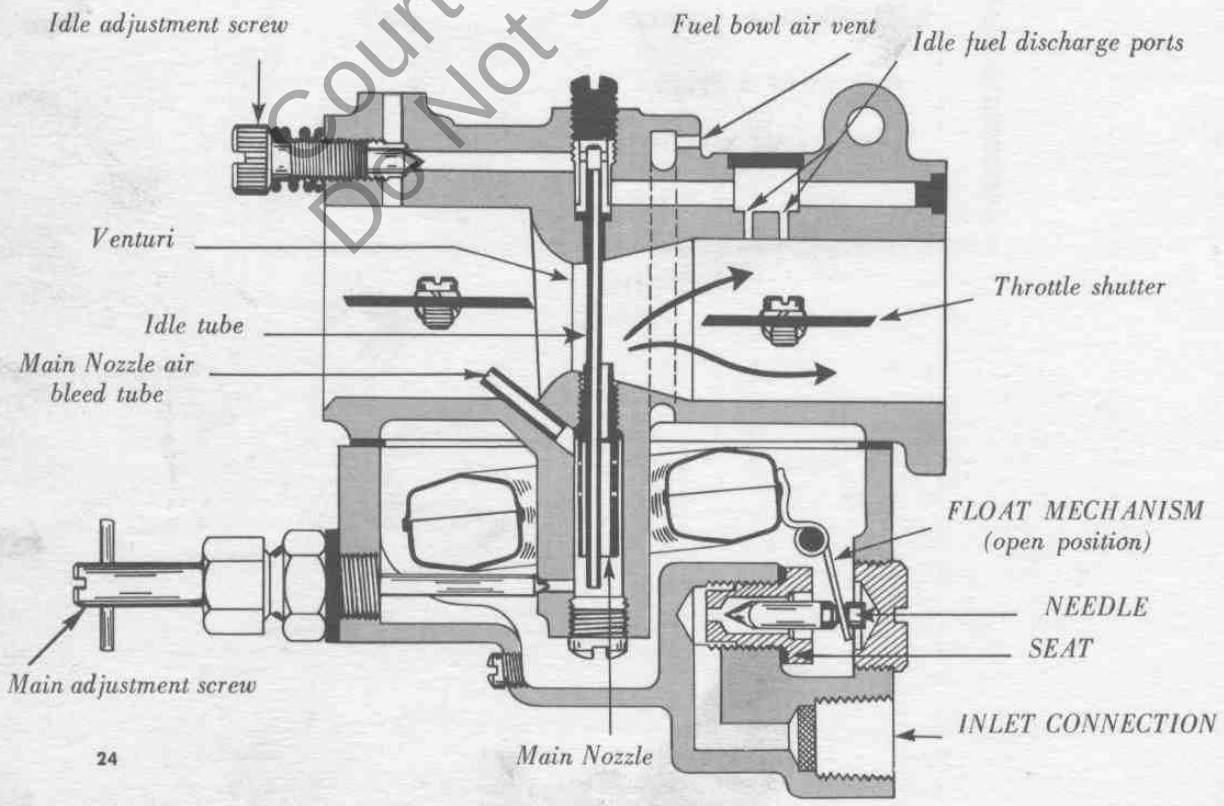


Figure 4—1 Demonstration of Atomizer Principle

4—1 OPERATION OF FUEL SYSTEM

Every intake or upstroke of the engine results in a vacuum inside the crankcase. Air, at atmospheric pressure, rushes into the crankcase to replace this vacuum. Therefore, if a carburetor is connected to the engine intake manifold, the air will rush through the carburetor on its way into the engine. The carburetor is nothing more than a complex atomizer which mixes a quantity of fuel with the air to form a combustible vapor. (See Figure 4—1.)

Figure 4—2 Float Control of Fuel Inlet Needle



4—1.1 Different Systems of Supplying Fuel to Carburetor.

Three different means of delivering fuel from tank to carburetor can be used—they are (1) fuel may be fed by gravity, or (2) it may be forced out by running a pressure line from the crankcase to the tank to keep the tank under slightly greater than atmospheric pressure; or (3) it may be pumped out of the tank and pumped into the inlet needle and seat by a fuel pump, which is activated by crankcase pressure pulsations. In cases (1) and (3) the fuel tank must be vented.

4—1.2 Inlet Control by Float or Diaphragm

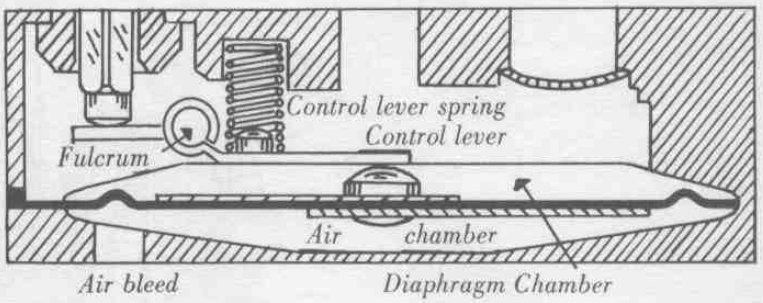
The carburetor fuel intake consists of an inlet needle and seat controlled by either float or diaphragm action. In a float type carburetor a constant level of fuel must be maintained in a float chamber by action of the float (See Figure 5—2), whereas, fuel in a diaphragm carburetor is more or less admitted directly—through action of a pressure-sensing diaphragm—without resort to a fuel storage chamber.

4—2 FLOAT FEED CARBURETOR OPERATION

4—2.1 Idle (Slow-Speed) Operation

1. The inlet needle and seat, and the float maintain a constant level of fuel in the float chamber. When the fuel level is low, the float is also low and the inlet needle is open; fuel enters the float bowl. As the fuel level rises the float rises also, and shuts off the flow of fuel. At idle (throttle butterfly almost closed), fuel passes through the main adjustment orifice into the channel which extends from the upper half of the carburetor into the float bowl. In addition to the main nozzle, the channel also contains an idle tube.
2. Fuel, seeking its own level in the channel, is drawn through the idle tube by the vacuum created in the crankcase. At the top of the idle tube, it is mixed with air—the amount of air controlled by setting of the idle mixture adjustment (or low speed) screw.
3. A small amount of the fuel-air mixture is discharged directly into the barrel through the idle discharge port, located directly over the top of the throttle butterfly. This volume then mixes with additional air being drawn past the (almost closed) throttle butterfly.

Figure 4—3 Diaphragm Inlet Control



4—2.2 High Speed Operation (Full Power)

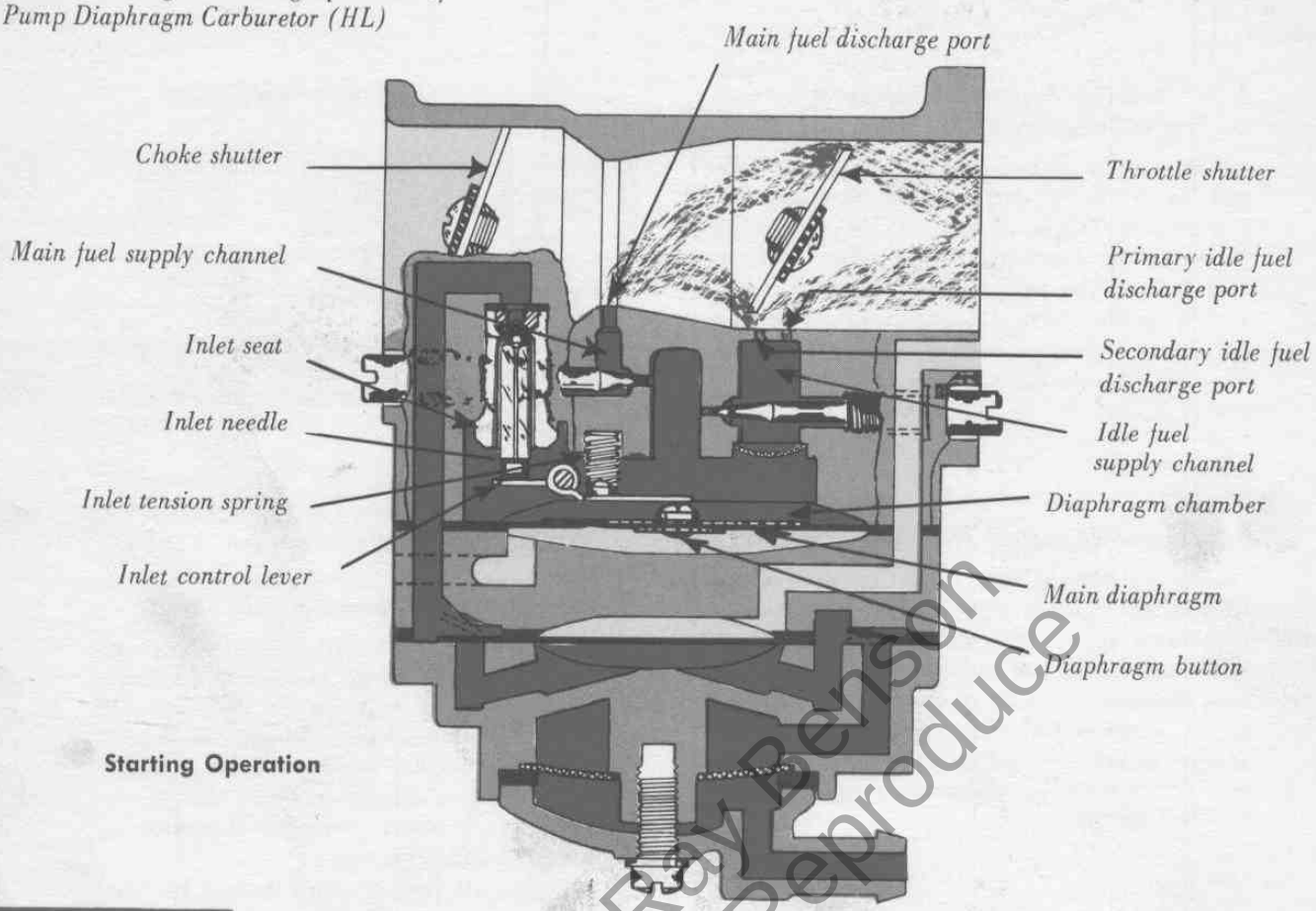
1. At high speed the throttle butterfly is open. This reduces the suction at the idle discharge port, accordingly reducing the discharge not only at the idle discharge port but also through the flexible idle line to the crankcase. Furthermore, the open throttle increases flow of air through the venturi (cone-shaped portion of barrel) to a high velocity.
2. The high velocity flow of air through the venturi acts as a siphon on the main nozzle to pull fuel around the high speed needle and up through the main nozzle into the barrel.
3. The proper proportion of air is bled into this fuel through the high speed air bleed, located on an angle on the air intake side of the carburetor just before the main nozzle.

4—3 DIAPHRAGM CARBURETOR OPERATION

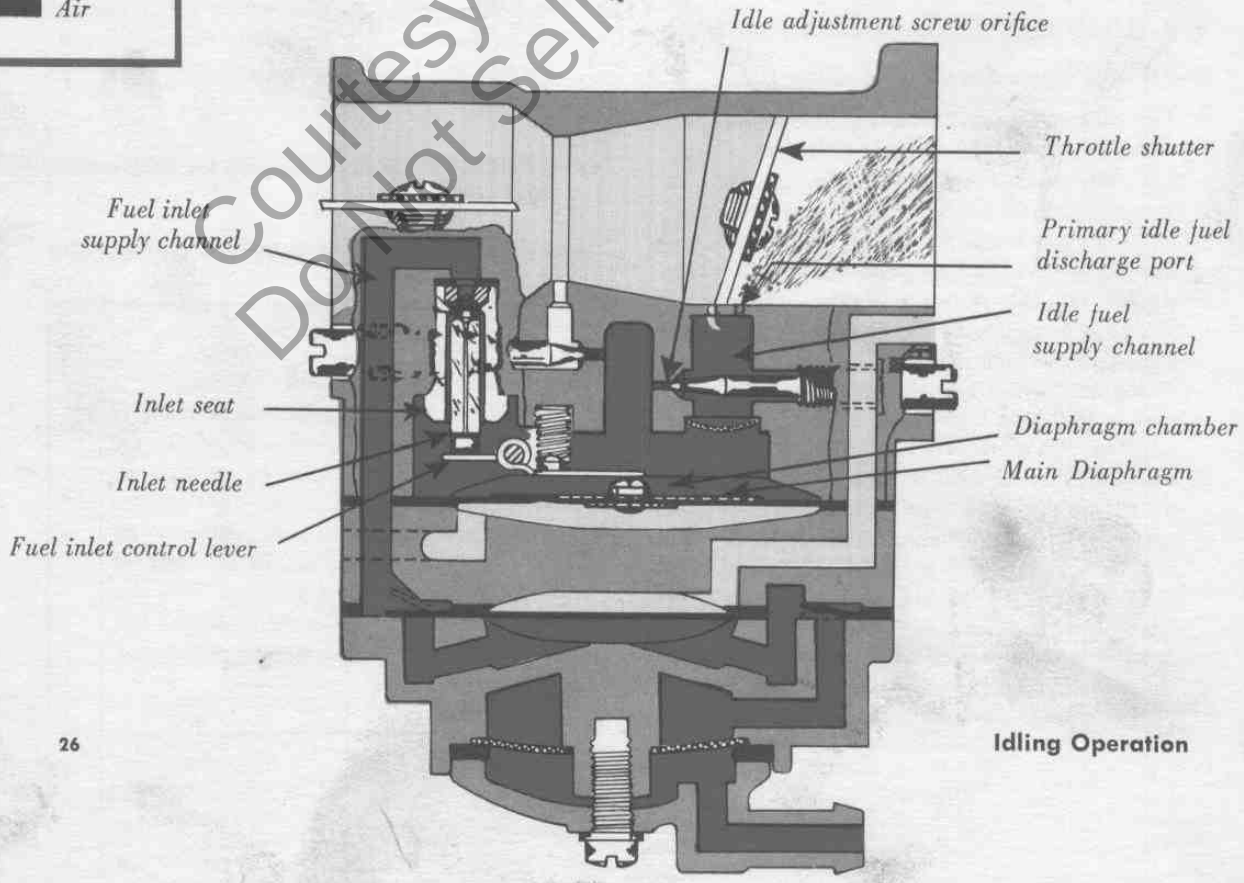
NOTE

Although design and construction may vary somewhat between types, the basic operating features of type H, HP, HL and CS carburetors are the same. The fuel pump, although attached to the carburetor is regarded as part of the fuel delivery. This discussion begins with the intake of fuel and air into the diaphragm carburetor.

Figure 4—4 Starting and Idling operation of Pump Diaphragm Carburetor (HL)



Starting Operation



Idling Operation

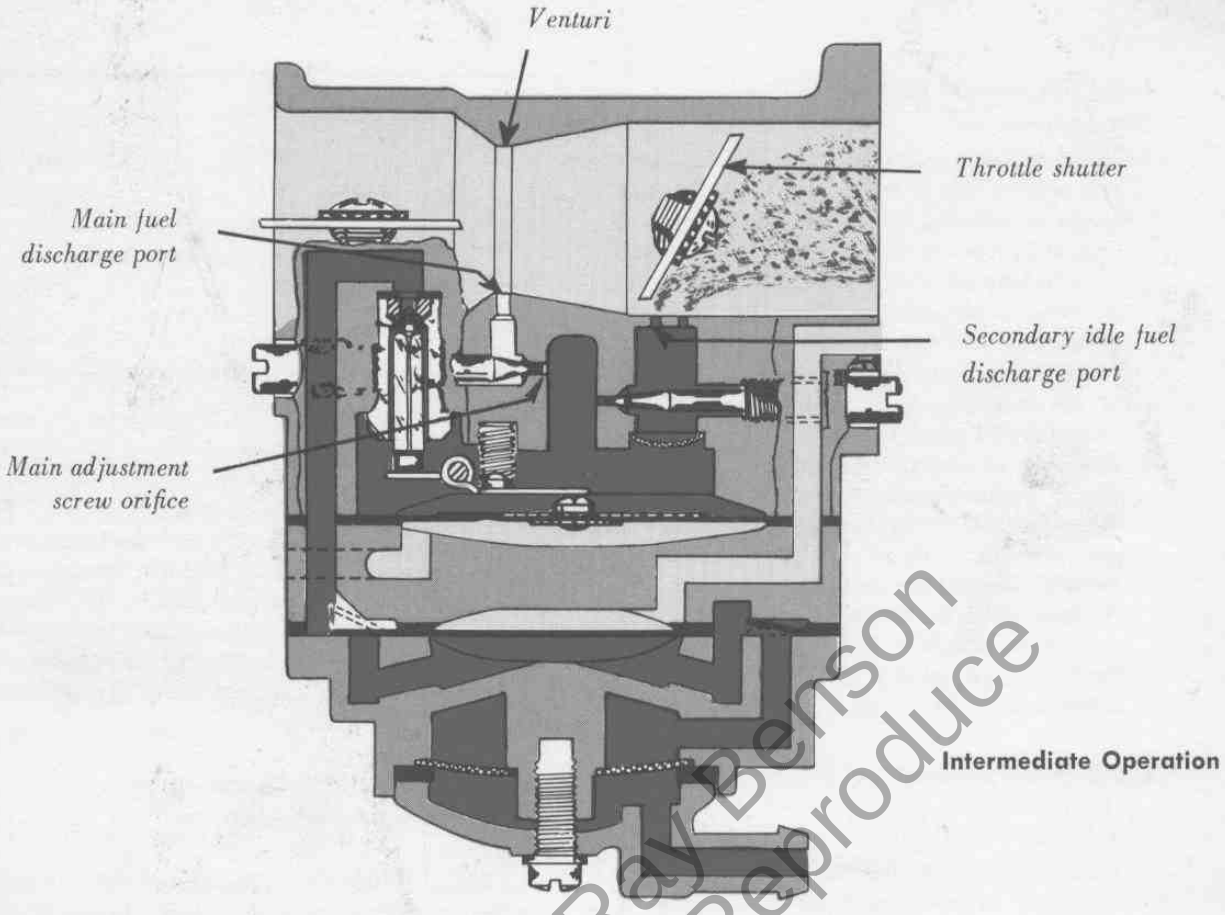
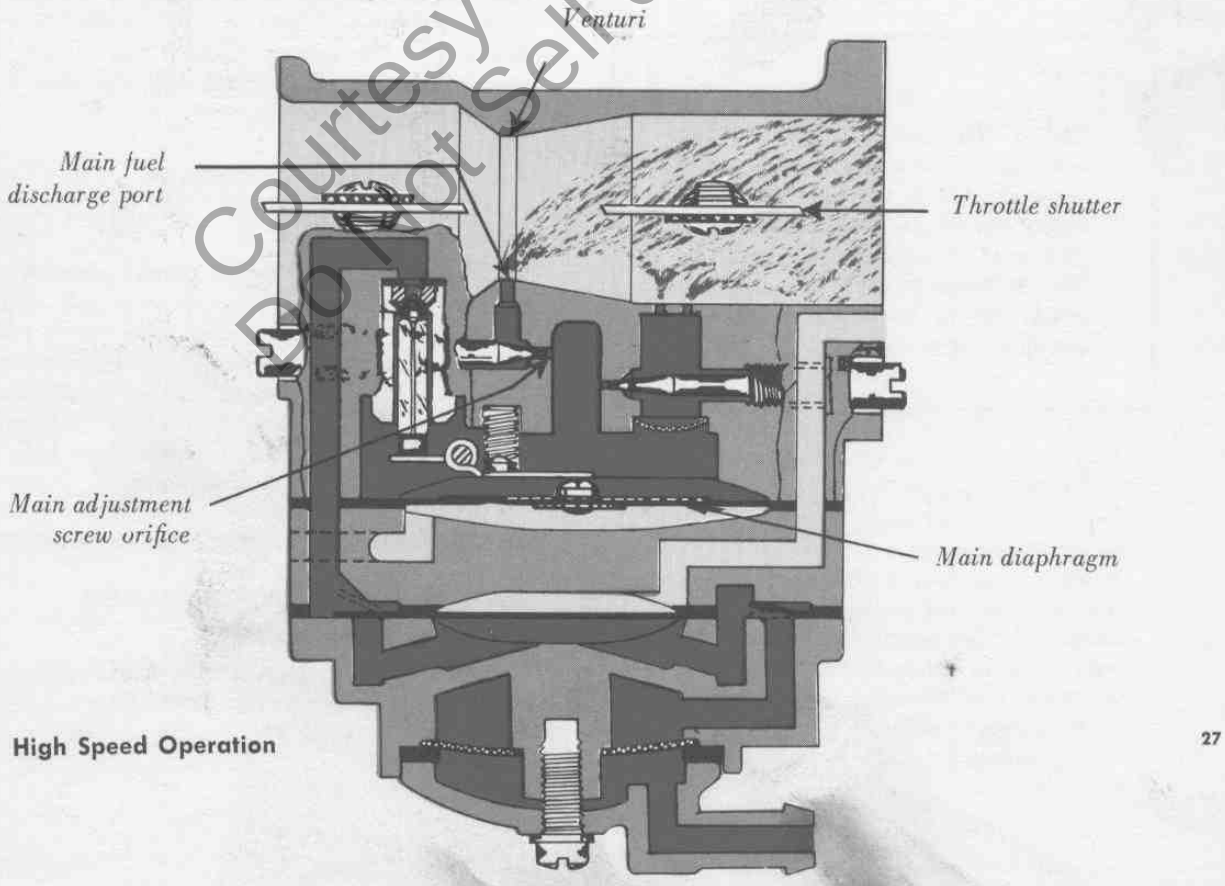


Figure 4—4.1 Intermediate and High Speed Operation of Pump Diaphragm Carburetor (HL)



4—3.1 Diaphragm Inlet Control

(See Figure 4—3.)

1. The diaphragm carburetor uses an inlet needle and seat to admit fuel. Control of the inlet needle is achieved by an inlet control lever. A tension spring exerts tension on the control lever to keep the inlet needle seated. Action of the main diaphragm, in response to engine demand, relieves enough of this tension to allow the inlet needle to be unseated by the weight of the incoming fuel. (The tension of this spring should never be altered.)
2. The main diaphragm is a pressure-sensing device of rubberized nylon cloth which divides the carburetor cavity into two chambers. Engine vacuum reduces the pressure in the (upper) diaphragm chamber. Whenever this chamber is so vacuumized, atmospheric pressure on the underside of the diaphragm pushes the diaphragm upward so that it contacts and actuates the inlet control lever.

4—3.2 Idling Operation of Diaphragm Carburetor

(See Figure 4—4.)

1. During idling the throttle butterfly is in a "cracked" or partly open position. Engine vacuum is transmitted to the fuel side of the *main diaphragm*. This vacuum holds the main nozzle check ball seated, preventing air from bleeding in and breaking the vacuum.

NOTE

On the "HL" and "CS" type carburetors, which have neither a main nozzle nor a check ball, the size of the main orifice and the idle channel have been calibrated to a point where any air bled in through the main orifice is insufficient to break the vacuum in the diaphragm chamber.

2. Fuel is drawn from the diaphragm chamber up the idle passage. In the idle passage there is a check ball and seat, the function of which is to prevent the unit from flooding when idled in the upside-down position. The check valve seat has one fuel passage in the center and another smaller passage to the side. Although both passages are open during normal idling operation, only the small side passage is open during inverted idling.

NOTE

Since neither "HL" nor "CS" type carburetors contain an idle check valve and seat, the engine cannot be idled upside-down.

3. The fuel is then mixed with air from the rear or secondary port, located just to rear of the partially open throttle butterfly. (On the Model 5-30, and on "HP" carburetor equipped 7-29 saws, where there is only one discharge port in the barrel, the air is taken in by means of a valving system incorporated in the throttle shaft. This "valving" action results in a smooth idling characteristic rather than an abrupt acceleration type discharge from the primary idle port.

4—3.3 Intermediate Operation of Diaphragm Carburetor

(See Figure 4—4.1.)

When the throttle is opened to the point where both the primary and secondary idle ports are ahead of the butterfly (but not open enough to draw fuel from the main orifice), fuel will be drawn and discharged through *both* ports. This fuel is mixed with the air rushing past the partly opened butterfly. There is still insufficient air pressure in the venturi (barrel restriction) to unseat the main nozzle check ball (on units incorporating this feature).

4—3.4 Full Throttle Operation of Diaphragm Carburetor

(Figure 4—4.1.)

With the throttle butterfly opened completely, the upstroke of the piston causes an inrush of air through the carburetor barrel. This draws fuel through the main nozzle into the carburetor barrel where it is atomized, or mixed with the air, and then drawn into the engine. On type "H" and "HP" Carburetors, the main nozzle check ball is drawn off its seat by this same force.

4—4 FUEL PUMP OPERATION

4—4.1 Fuel Pump System

The fuel pump is a simple device utilizing pressure changes or pulsations from the crankcase to draw fuel from the tank (on the upstroke) and

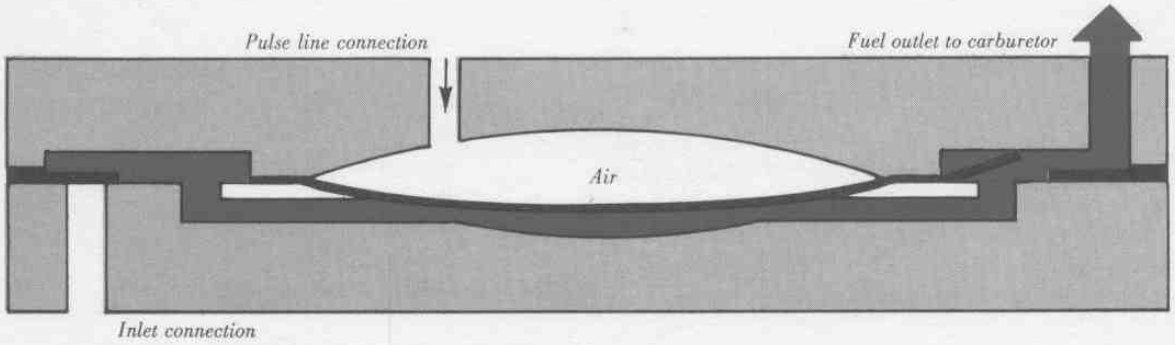
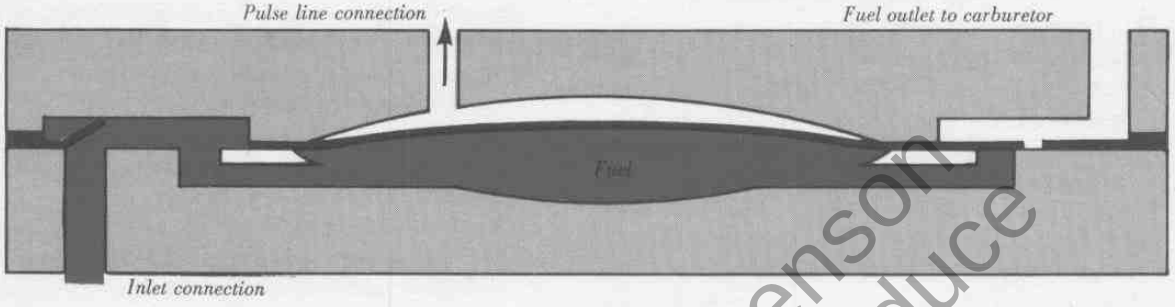


Figure 4—5 Fuel Pump Operation



push fuel to the inlet needle and seat (on the downstroke). The fuel pump consists of a pulse line from the crankcase, an inlet check valve and an outlet check valve, plus a rubberized cloth diaphragm which divides the pump body into two cavities.

4—4.2 Check Valves

Check valves are devices which allow the flow of gasses or fluids in one direction and block the flow in the opposite direction. The check valves in the fuel pumps are either the ball, seat and spring type (See Figure 4—6) or the flapper valve type. (See Figure 4—5.) The flapper type valve is more dependable since dirt does not restrict its operation.

4—4.3 Fuel Pump Diaphragm

1. On the piston upstroke, the diaphragm is drawn upward. This unseats the in-check valve and seats the out-check valve. Fuel is taken into the fuel pump.
2. On the piston downstroke, the conditions are reversed. The in-check valve is closed (so fuel cannot be pushed back into tank) and the out-check valve is opened. Fuel is delivered from the pump to the inlet needle and seat.

NOTE

Early Model 5-30 saws utilize a pressurized tank instead of a fuel pump to deliver fuel to the diaphragm carburetor. Fuel tank pressure in this type system is maintained at the desired level by a system of in-check and out-check valves located at the fuel tank.

4—5 REED VALVE OPERATION

Homelite saws with externally mounted air governors have reed valves. When the crankcase is under vacuum conditions (on the upstroke), atmospheric pressure outside the valve, forces the flexible steel reed to open, permitting intake. Crankcase pressure on the downstroke forces the reed closed against the reed valve adapter, effectively blocking blow-back, and assuring transfer of the charge from the crankcase to the cylinder.

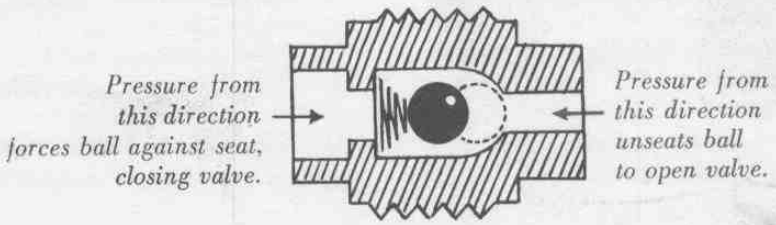


Figure 4—6 Check Valve Operation

4—6 ROTARY VALVE OPERATION

On the Models 26, 5-30 and 7-29, a rotary valve, which opens and closes the intake port in the crankcase, accomplishes the same purpose as a reed valve. Incorporated with the rotary valve is the governor. (See Section I for explanation of governor operation for all units.)

4—7 FUEL SYSTEM DIAGNOSIS

In diagnosing fuel system troubles, first be sure the air filter and fuel filter are clean, and a sufficient supply of fuel is available. Then check whether all fuel lines and connections are tight. Remember that air leaks and dirt are the arch enemies of proper carburetion. Cleaning a particular part, such as a check valve, will help only temporarily. If you find dirt, follow by a complete cleaning of the entire fuel system. (Also flush out fuel mixing container.) In diagnosing troubles be sure the carburetor adjustments are set within the proper range recommended for the particular type carburetor. (See Figure 4—7.)

Carburetor troubles can usually be grouped in one of the following categories:

1. Carburetor floods.
2. Engine will not accelerate.
3. Engine will not idle.
4. Engine runs out lean in cut.
5. Carburetor runs rich with the main adjustment shut off.

4—7.1 Diagnosis of Flooding

Carburetor flooding is usually due to failure of some part of the inlet system and is nearly always traceable to one or more of the following causes:

1. Diaphragm Carburetors:
   a. Inlet needle being held open by dirt.
   b. Loose plug under main nozzle, or faulty nozzle plug gasket.
   c. Distorted diaphragm plate resulting in constant tension on inlet control lever.
   d. Dirty or burred inlet control lever binding on pinion.
   e. Improperly adjusted or bent inlet control lever.
   f. Tension spring missing or improperly seated on inlet control lever.
   g. Flushing pin stuck in flushing position (H & HP Types).
2. Float Carburetors:
   a. Inlet needle being held open by dirt.
   b. Improper setting of float level.
   c. Improperly installed body gasket preventing float from rising far enough to seat the inlet needle.
   d. Worn yoke (slotted end of float lever) or float lever pinion, causing failure of inlet needle to seat.
   e. Collapsed or leaking float.

4—7.2 Diagnosis of Failure to Accelerate

The inability to accelerate from idle is usually caused by lean operation, traceable to improper (lean) setting of the idle adjustment, or to one or more of the following causes:

1. Diaphragm Carburetors:
   a. Fuel pump check valves dirty.
   b. Improper setting of diaphragm lever preventing inlet lever from opening completely.
   c. Inlet needle binding.
   d. Loose diaphragm cover screws or faulty main diaphragm gasket causing air leak.
   e. Main nozzle check ball stuck in closed position, preventing high speed operation. (H & HP)
   f. Main orifice restricted.
2. Float Feed Carburetors:
   a. Dirty main nozzle.
   b. Plugged high speed air bleed.

4—7.3 Diagnosis of Failure to Idle

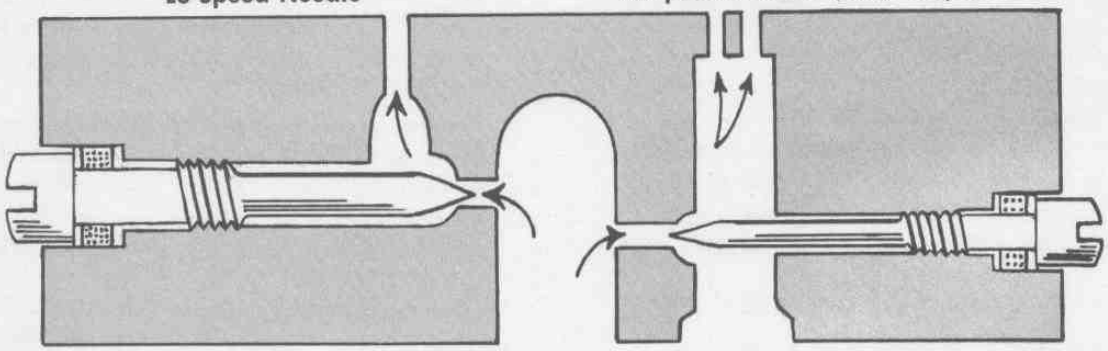
Failure to idle can usually be traced to incorrect adjustment of the idle mixture (lo-speed) needle, or to one or more of the following:

1. Diaphragm Carburetors:
   a. Idle discharge ports or channels clogged.
   b. Loose idle discharge port plug screws.
   c. Dirty idle check valve holes. (H & HP)
   d. Main nozzle check ball leaking. (H & HP)
   e. Main nozzle loose. (H & HP)
   f. Missing main nozzle gasket. (H & HP)
   g. Main diaphragm lever incorrectly set.
   h. Throttle shutter hitting side of barrel.
   i. Welch plug covering idle discharge ports not sealing (HL).
      (Engine idles with idle adjustment shut-off.)
   j. Air leak between carburetor and engine.
2. Float Carburetor
   a. Idle tube plugged or loose.
   b. Idle discharge port plugged.
   c. Porous idle fuel line.
   d. Swivel gasket not sealing.
   e. Air leak between carburetor and engine.

4—7.4 Diagnosis of Running Out Lean in a Cut

When a saw fades or runs out lean in a cut, the

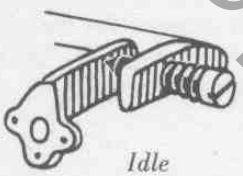
Figure 4—7 How to Adjust Carburetor



Approximate turns of Lo-Speed Needle from Closed Position	Carburetor Model (Saw Model)	Approximate turns of Hi-Speed Needle from Closed Position
½ to ¾	HP-1B (17)	½ to ¾
¾ to 1	HP-15B (5-20)	½ to ¾
¾ to 1	HL-4A (17L—5-20L)	1 to 1¼
½ to ¾	HL-27B (17L—5-20L and EZ)	½ to ¾
¾ to 1	HL-1A (EZ)	1 to 1¼
½ to ¾	5-CS (17—5-20—EZ)	½ to ¾
¾ to 1	1-CS (7-29)	1 to 1¼
¾ to 1	HP-14B (7-29)	1 to 1¼
1 to 1½	MD-56A (26LCS)	1 to 1½
¾ to 1	H-2A (26LCS)	¾ to 1
½ to ¾	H-6A (5-30)	¾ to 1
½ to ¾	HP-6B (5-30N)	¾ to 1

HOW TO ADJUST CARBURETOR FOR BEST PERFORMANCE

1. Make approximate settings given for carburetor model in above table.
2. Start the saw and make sure engine is warm. Then adjust Idle Stop Screw for the highest idle obtainable without causing chain rotation. (If stop screw cannot be turned in far enough to contact the stop lever, bend stop lever carefully toward the screw.)



Idle stop screw

3. Adjust LO-SPEED (Idle Mixture Adjustment) NEEDLE for smoothest idling, then gun the engine; if engine does not accelerate, open the LO-SPEED NEEDLE, a little at a time, until the engine can accelerate. If the chain creeps at this mixture setting, readjust the IDLE STOP SCREW.
4. Adjust HI-SPEED (Main Adjustment) NEEDLE with saw operating under load. (Stall chain momentarily, in a cut so clutch will slip.) The setting should be reasonably rich to prevent overheating of the engine. If the engine dies out in the stall, the adjustment is too lean; if the engine continues running but smokes excessively, the setting is too rich.

CAUTION: DO NOT FORCE ADJUSTMENT NEEDLES INTO THEIR SEATS. FORCING BENDS THE NEEDLES AND DISTORTS THE METERING POINTS.

5. During operation, gun the engine just before turning it over to a new position. This clears the crankcase of a possible load and stabilizes it to the new cutting position.

Distorted needle

usual trouble is either dirt or an air leak, or lack of pressure in pressurized tank, or inoperative vent in vented tank.

Check the following:

1. Diaphragm Carburetors:
   a. Fuel tank vent not operating properly.
   b. Leak in fuel system from tank to pump.
   c. Ruptured or porous pump diaphragm.
   d. Dirt under one or both pump check valves. (HP)
   e. Main fuel orifice plugged. (HL)

4—7.5 Diagnosis of Rich Operation (with main adjustment shut off)

This condition is caused by fuel which bypasses the main adjustment needle. Look for one or more of the following:

1. Diaphragm Carburetors:
   a. Loose main nozzle channel plug screw, or damaged channel plug screw gasket.
   b. The 1/8″ diameter nozzle channel plug is not sealing. (HL)
   c. Dirty air cleaner. (Runs rich with less than recommended main adjustment setting.)
2. Float Carburetor:
   a. Loose or missing channel plug screw under main nozzle.
   b. Bent or burred main adjustment (hi-speed) needle which fails to line up with the main adjustment needle seat.
   c. Main adjustment needle seat has become enlarged or elongated with wear.
   d. High speed bleed tube in barrel plugged. (Rarely occurs.)

NOTE

Often, two or more troubles existing simultaneously in the carburetor make detection difficult. Whenever the carburetor has been disassembled for for any reason, a complete cleaning and inspection of its component parts should be performed.

4—8 FUEL TANK SERVICE

4—8.1 Fuel Cap and Relief Valve

If the relief valve or the holes in the fuel cap become plugged, no air can be drawn into the tank to replace the fuel being used in the engine. The relief valve and fuel cap assembly should be checked periodically to be sure there is no sawdust or dirt present.

1. Old style relief valves with separate retainers should be reassembled with care. Tighten the three screws evenly to prevent distortion and failure of the valve.
2. Because some of the "power ingredients" which gasoline manufacturers recently added to their fuels tend to swell Hycar, Homelite discontinued Hycar and began using Thiokol, a rubber-like synthetic, as a material for relief valves. When swelling of a Hycar valve is encountered, proper venting can be reestablished by drilling a .040″ hole through the Hycar material with a #60 drill. This hole should be located in the circular depression of the valve, and just opposite the prick-punch mark. (See Figure 4—8.)
3. Old type fuel caps with one .021″ diameter venting hole were improved in production by adding a second venting hole. Whenever a cap *of this design* with but one hole is encountered, carefully provide an additional hole with a #75 drill. (See Figure 4—9.)
4. The new design fuel cap which supersedes both caps discussed above (3) has a vertical drill hole which opens upon a hole drilled laterally through the hub of the finger lug. This lateral venting design makes it difficult for melted snow, rain, or dirt to get into the vent.

4—8.2 Fuel Tank and Fuel Line

1. Cleaning
   When dirt has been discovered anywhere in the fuel system, the fuel tank should always be disassembled, drained, and cleaned with a suitable solvent to remove any sediment, gum or varnish deposits. The fuel line and flexible pick-up tube should be immersed in solvent. Use air to blow out the tank, the fuel outlet strainer, the outlet fitting tube and the brass fuel line. Don't blow air through the flexible pick-up tube. A dirty or plugged fuel filter should be replaced with a clean one.

4—8.3 Leaking Tank

A leaking fuel tank is a fire hazard. Because of the difficulty of obtaining a perfect seal, the fuel tank body and cover have been assembled and factory checked under pressure to guard against leakage. The red-painted screws holding the cover to the tank should never be removed. On pressurized tank systems, leakage due to extreme high tank pressure, caused by failure of the pressure relief check valve, may be prevented by cleaning or replacing the check valve. In tanks with integral chain oil reservoirs, a leak between

Figure 4—8 Repairing Relief Valve

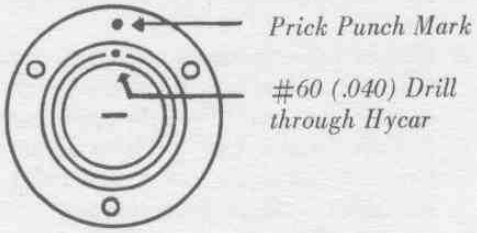


Figure 4—9 Adding Second Vent to Fuel Cap

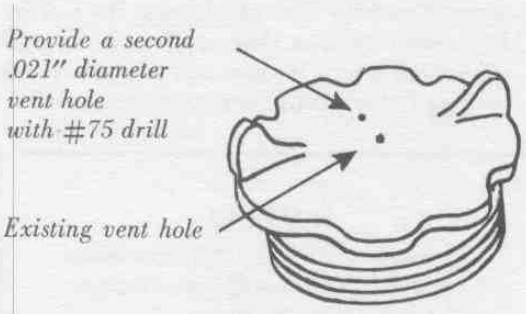
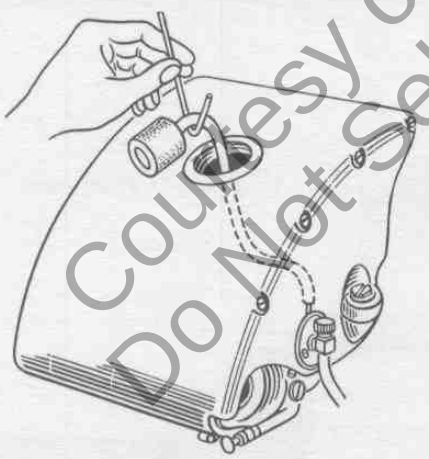


Figure 4—10 Changing Fuel Filter



1. *Use a wire hook to lift fuel strainer out through fuel filler hole.*
2. *Pull dirty filler plug out of strainer and discard.*
3. *Push new filter plug into end of strainer. Allow filter to project 1/16" from end of strainer.*
4. *Drop strainer back into tank.*

the oil reservoir and fuel tank could result in rich operation due to seepage of chain oil into the fuel. Cracked or otherwise leaking fuel tanks should be replaced.

4—8.4 Crankcase Pressure Line

To maintain adequate pressure in the pressurized tank systems, the pressure line from the engine must be open and free from leaks, and the connections tight. The check-valve at the fuel tank must be clean and operating properly.

4—8.5 Fuel Outlet and Filter

When replacing the fuel filter be sure to clean out any sediment collected in the cup of the outlet strainer. Push the filter into the strainer. Allow 1/16" of the filter to project beyond the end of the strainer body. (See Figure 4—10.) The flexible pick-up tube must be "live" and free of kinks and cracks. Clean the outlet fitting and brass tube with air. Reassemble the pick-up assembly, put a perfect gasket over the tank outlet, drop the pick-up assembly through outlet hole, and fasten outlet fitting to tank.

4—8.6 Shut-Off Valve

The fuel shut-off valve is a valve-and-seat type. A packing nut and packing around the valve stem prevent leakage. If the valve leaks, tighten the packing nut slightly. (But only enough to stop leakage, since over-tightening will make the valve hard to turn.) A dirty valve which fails to seat can be disassembled and cleaned. However, if the threads are worn or stripped, the valve must be replaced. When the unit is not being used, the shut-off valve should be closed.

4—8.7 Fuel Lines

In all cases the fuel lines should be kept clean and the connections must be fuel and air tight. Especially with fuel pump type deliveries an air leak in the fuel line will cause lean operation. Connecting parts having worn or stripped threads should be replaced.

4—9 CARBURETOR SERVICE

4—9.1 Washing off Carburetor Before Disassembly

Before disassembling, the outside of the carburetor and connections should be cleaned with gasoline to prevent dirt from falling inside the

carburetor during assembly. Also flush tools and hands spotlessly clean. Prepare a clean, hard surface on which to work. Remember, microscopic lint, sawdust and sand are deadly enemies of the carburetor.

NOTE

Do not blow air through any of the carburetor inlets, outlets or air bleed holes until disassembly has been completed.

4–9.2 How to Disassemble and Clean Float Carburetor

The correct order of disassembly of the MD series float carburetors is as follows:

1. IMPORTANT. First remove complete main adjustment screw (T) and gland assembly from float bowl.
2. Remove retaining screws and lockwashers to separate the upper body and float bowl assemblies.
3. Remove the float lever pinion and the float from the float bowl.
4. Remove the large plug screw on inlet side, then remove the inlet needle, seat and gasket assembly from the bowl. (Use large enough screwdriver.)
5. Remove idle adjustment screw and spring, idle tube and gasket, then remove the main nozzle channel plug screw from the upper body.
6. Remove throttle shaft and lever assembly.
7. Before reassembling (in reverse order of disassembly) wash all parts thoroughly in clean gasoline. Then blow air through the main nozzle and air bleed vent tube. Install idle tube and gasket in upper body, then blow the idle fuel supply channel clear by placing an air hose at the hole for the idle adjustment screw. Carefully blow air through the fuel inlet to clean the inlet channel. Be sure the inlet connection screen is clean and in place. Flush each part clean just before installation.

WARNING

Do not blow air into a fully assembled carburetor as this may cause collapse of or damage to the float.

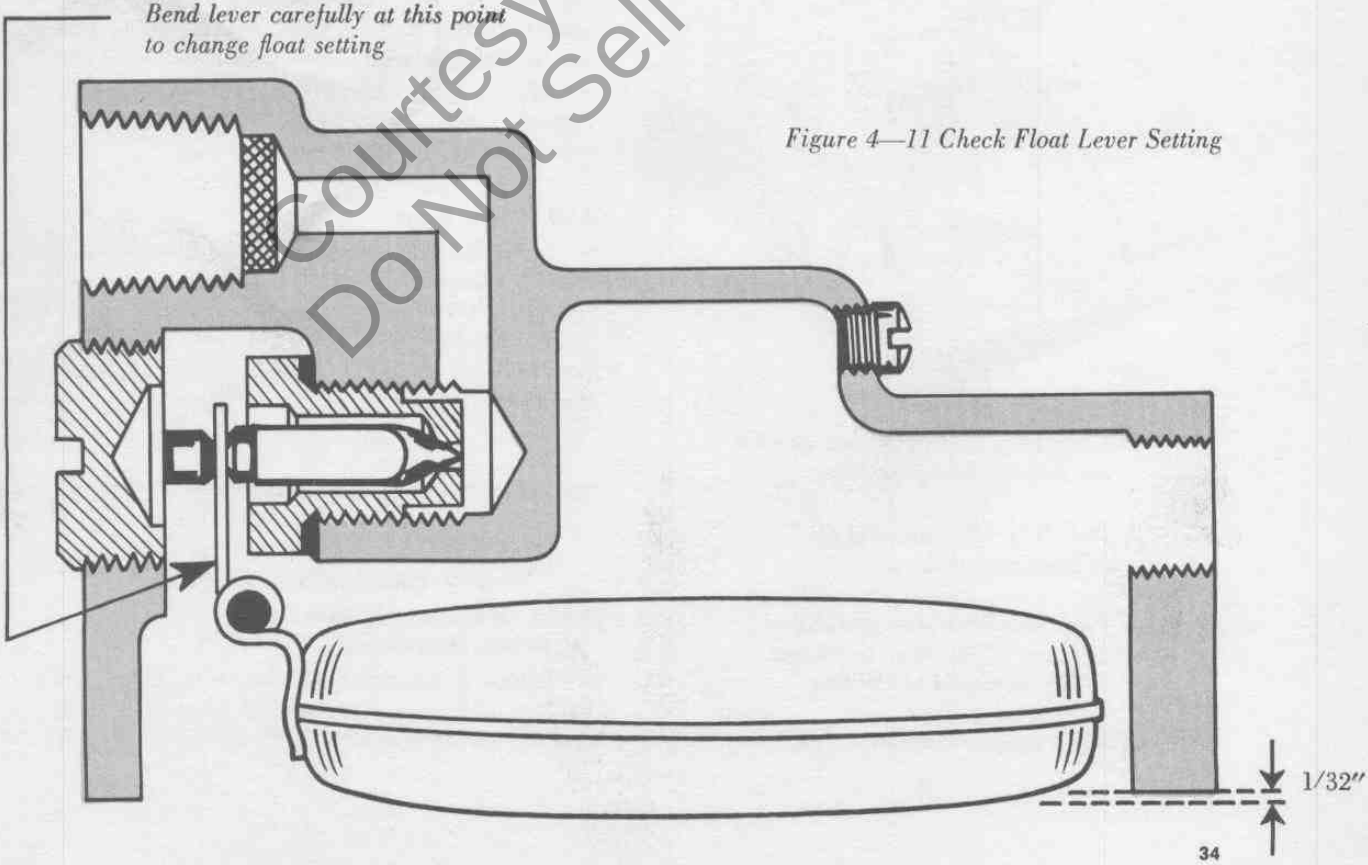


Figure 4—11 Check Float Lever Setting

8. When installing float be sure to engage yoke, or slotted end of the float lever in the groove around the blunt end of the inlet needle so the needle will be controlled by float action.
9. To check float level, invert the float bowl (lower half) and measure the distance between the machined surface of the float bowl (without the gasket) to the bottom of the float at its lowest point. This measurement should be 1/32". (See Figure 4—11.) To adjust the float level, remove the float and use long-nose pliers to bend the vertical flat lever a trifle. The lever should be bent straight across at a point close to the pinion fulcrum to avoid cocking the float.

4—9.3 How to Disassemble H and HP Carburetors

Since many of the component parts, such as the main nozzle, are assembled in deeply threaded holes, the correct size screwdriver must be used. To prevent damage to the female threads, a cabinet type screwdriver should be used to remove the main nozzle. An ordinary blade type screwdriver can be made into a cabinet type by grinding off the excess edge as shown in Figure 4—12. Disassembly of H and HP Carburetors should be made in the following order:

1. IMPORTANT: First remove the complete main adjustment screw and gland assembly from the body.
2. Remove diaphragm cover retaining screws and lockwashers to separate diaphragm cover or fuel pump from body.
3. Remove main diaphragm. Carefully pry off the cap and remove the inlet control lever pinion screw.
4. Remove inlet control lever, inlet needle, and tension spring.
5. Remove inlet needle seat and main nozzle channel plug screw.
6. Remove main nozzle, fuel inlet connection and tension spring retaining screw.
7. Remove Idle Adjustment Screw and spring, and body channel plug screws.
8. Use correct size cabinet type screwdriver to remove the idle check valve.
9. The carburetor should be reassembled by reversing the order of disassembly given above. Care should be taken to tighten the inlet connection securely to prevent leakage. Also be very careful not to cross-thread the main nozzle plug screw.

Figure 4—12 How to make a Cabinet Screw Driver

4—9.4 How to Disassemble CS and HL Carburetors

The outside of the carburetor should be cleaned of all dirt and sawdust before the carburetor is disassembled. Do not blow air through the air bleed holes or discharge ports until disassembly has been completed. Disassemble as follows:

1. Remove fuel pump cover (1 screw).
2. Remove fuel strainer gasket and screw.
3. Remove fuel pump body (6 screws).
4. Remove fuel pump diaphragm and gasket.
5. Remove main diaphragm cover plate.
6. Remove main diaphragm gasket.
7. Remove main diaphragm.
8. Remove inlet control lever pinion screw, control lever and tension spring. Then remove the inlet needle.
9. With a thin wall 5/16" hex socket wrench, carefully remove the inlet seat. Be careful not to turn up any brass chips when removing or replacing seat.

NOTE

The seat should not be removed unless persistent flooding of carburetor indicates a faulty seat, in which case the complete inlet needle, seat, and gasket assembly should be replaced. Care should be used to avoid cross-threading the seat.

10. Remove LO-speed and HI-speed needles. Before reassembling the carburetor (in reverse order as outlined above) wash all component parts in clean gasoline and clean with air through the idle (LO-speed) and main adjusting (HI-speed) orifices. Clean all fuel passages in the three castings with air. (Make sure fuel inlet control lever is set flush with casting surface as shown in Figure 4-13.)

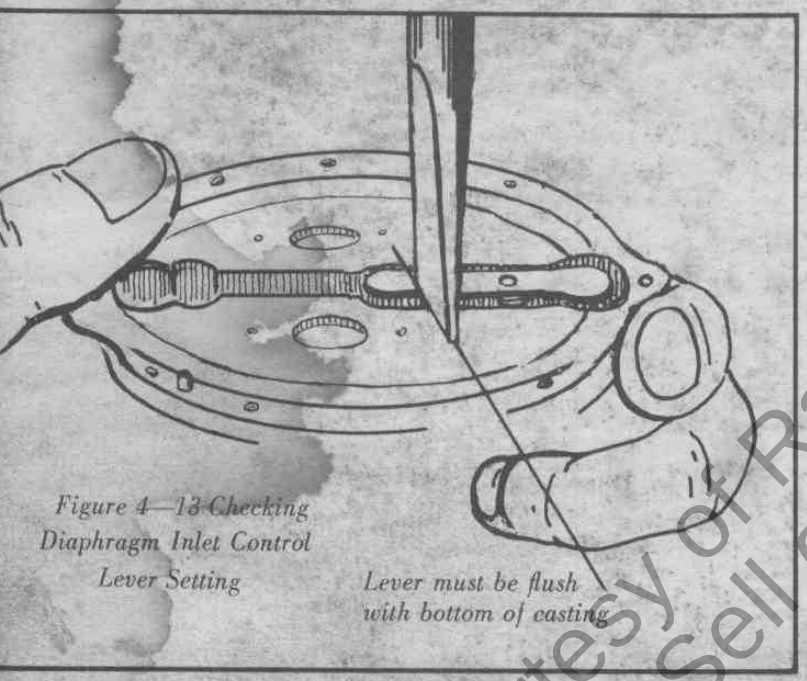
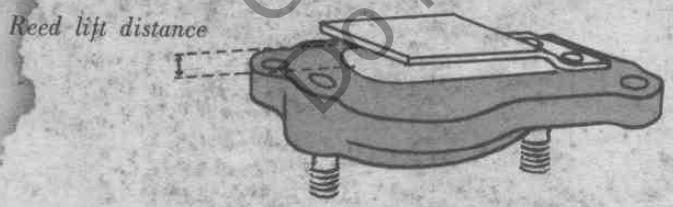


Figure 4—13 Checking Diaphragm Inlet Control Lever Setting

Figure 4—14 Checking Reed Lift Distance



Model	Lift in Inches
17	.160
5-20	.180
EZ-1	.180

4—10 FUEL PUMP SERVICE

The fuel pump components must be clean. The gasket assembled over the fuel inlet screen must be in perfect condition. The pump diaphragm must be in good condition with no pin holes or porous spots. Ball type check valves can become plugged with dirt or sediment. To remove the IN-check and OUT-check valves, remove the adapters in the fittings, then unscrew the valves from the fittings. (Be careful not to damage threads with screwdriver, or leave any brass chips in the casting or assembly, when re-installing.)

1. The IN-check valve should permit air to pass through when lip suction is applied to its inner end, but should permit no air passage when suction is applied to its outer (slotted) end.
2. The OUT-check valve should permit air to pass through when lip suction is applied to its outer (slotted) end, but should permit no air to pass when suction is applied to its inner end.

4—11 REED VALVE SERVICE

The condition of the reed valve adapter assembly should be checked periodically. Whenever the carburetor must be removed for cleaning or service, always take the opportunity to check the reed valve carefully.

1. On reed adapters where screws are used to assemble the reed, reed spring and limit clamp, check the screws for tightness. If these screws have loosened up during operation, the screw holes may have become enlarged and the screws may have lost their holding power. In this case, it is advisable to install one of the newer riveted reed adapter assemblies.
2. The reed and adapter should be checked for signs of wear. Remember that the reed is forced once against its seat, and once against the limit stop during each revolution of the engine. For instance, if the engine R.P.M. is 6000, the reed hits 12,000 times each minute . . . there is bound to be wear.
3. Never use a reed that has been loose or has the two screw holes elongated. It will lead only to costly repairs at a later date. If any part of the reed valve adapter assembly is worn or damaged, always replace with a complete riveted adapter assembly.

NOTE

Always install the proper reed valve and adapter assembly for each particular unit. Two may look alike but the lift of the reed varies. Improper lift will affect performance.

4—11.1 Pyramid Reed Valve Service

(See Figure 4-15)

The Pyramid Reed Valve, developed for the Homelite Power Twins EZ-6 and 6-22, is a smooth-breathing, easy-flow design with the capacity to satisfy fuel demands of the chain saw engine at all times. The four tapered reeds give larger area for fuel passage than the single reed valve. Because of their angular mounting, the reeds of the pyramid require less lift distance, offer less resistance to the fuel-vapor stream, create less turbulence in the crankcase, and, in turn, wear less against the valve seats than the single large reed.

Whenever the fuel system is stripped down for cleaning or service, always take the opportunity to check the reed valve carefully.

1. Inspect all four reeds. Replace any reeds which are cracked, broken or worn.
2. Be sure all reeds are free to seat flush against their respective valve seats. Dirt may gradually accumulate beneath the reeds, preventing them from seating.
3. Inspect the valve seats of the reed valve adapter. Replace the adapter if *any* of the seats are badly worn.
4. Always be sure to tighten all eight of the screws during inspection and reassembly.

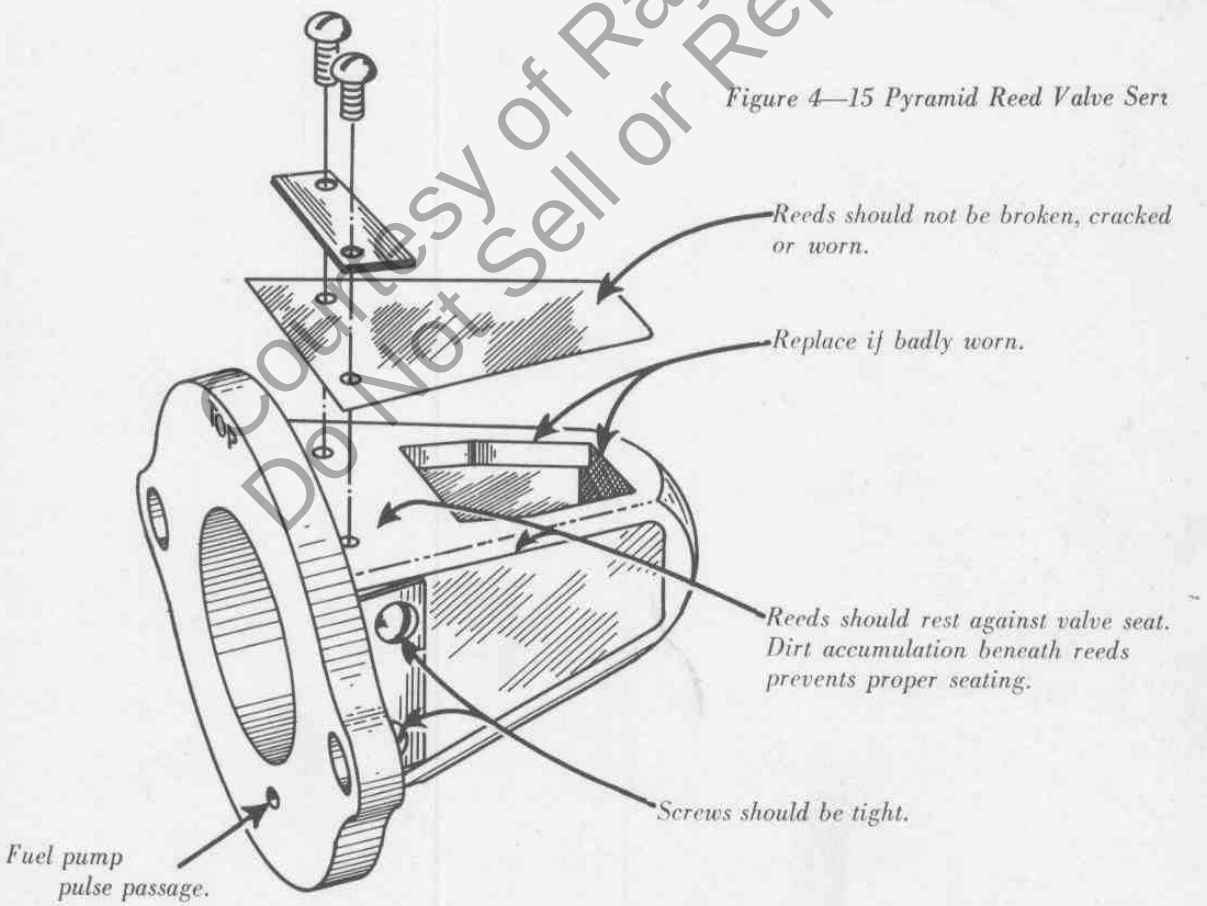


Figure 4—15 Pyramid Reed Valve Sert

Section 5

REWIND STARTER

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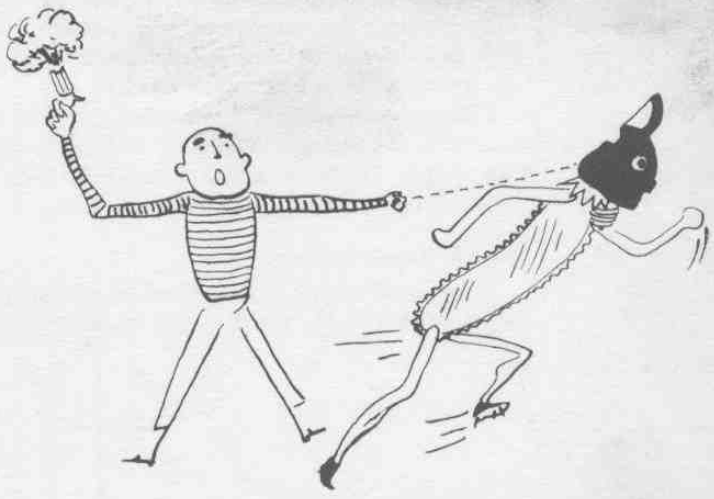


5—1 OPERATION OF REWIND STARTER

The Homelite starter is a centrifugal ratchet type which engages during cranking, and disengages during operation or rewinding. The recoil spring is wound by the rotation of the starter pulley during cranking. The spring rewinds the starting cord on the pulley. For safety in the event the engine backfires, a slipping clutch is incorporated between the ratchet hub and the crankshaft.

5—1.1 Ratchet and Ball Mechanism

The ball drive plate is screwed to the magneto rotor. During starting, the drive balls, contained in elongated pockets of the drive plate, drop to the bottom of the pockets and engage the teeth of the ratchet hub (connected to the starter pulley).

The ratchet teeth have sloped rear edges which cannot be engaged by the drive balls while the starter is being recoiled.

When the engine starts and picks up speed, centrifugal force throws the drive balls to the extreme outer position of the drive plate pockets, where they are completely out of contact with the ratchet.

NOTE

Care must be taken, as part of the starting technique, to insure positive engagement of the drive balls and ratchet teeth before cranking the engine. Improper starting technique will cause excessive wear of these parts.

5—1.2 Ball Drive Slipper Mechanism

The ball drive ratchet fits inside a split hub, to which the starter pulley is connected. The long screw through the side of hub is used to adjust the torque of the slipper mechanism. Tightening this screw reduces the inside diameter of the hub, thereby increasing friction between the hub and the ratchet. The proper torque is set at the Factory. (See Paragraph 5—4.1.)

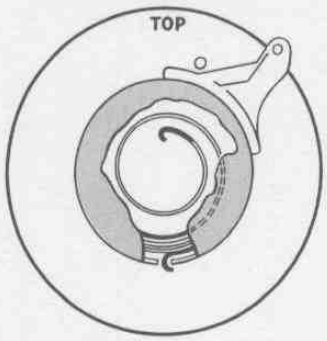
Slipping should not occur during cranking except if the engine should kick. Ball drive slipper torque should be adjusted carefully with a torque wrench.

5—1.3 Recoil Spring

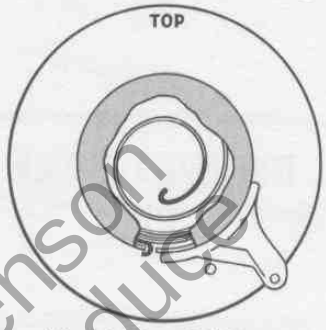
The recoil spring is housed under continuous slight tension in the recoil spring housing which is part of the air screen. The outer end of the recoil spring is hooked in a slot in the rim of the spring housing.

The pin in the end of the starting pulley protrudes through a small hole in the ratchet hub and engages the hooked end of the recoil spring's inner loop.

Figure 5—1 Rewind Starter



EZ, 26LCS, 5-30 and 7-29 saws
Hook must face to the Right



Model 17 and 5-20 saws
Hook must face to the Left

5—2 RECOIL STARTER DIAGNOSIS

1. Improper ball drive slipper tension.
2. Dirty pockets.
3. Lack of spring tension.
4. Too much spring tension
5. Worn, burred ratchet teeth, or pockets.
6. Bent ball retainer plate.
7. Worn or missing thrust washers.
8. Improper clearance between pulley and recoil housing.
9. Sawdust in spring housing.

5—3 REPLACEMENT OF RECOIL SPRING

1. Pry off spring housing cover and remove recoil spring a loop at a time, starting with the inner loop.

Figure 5—2 Checking ball drive torque

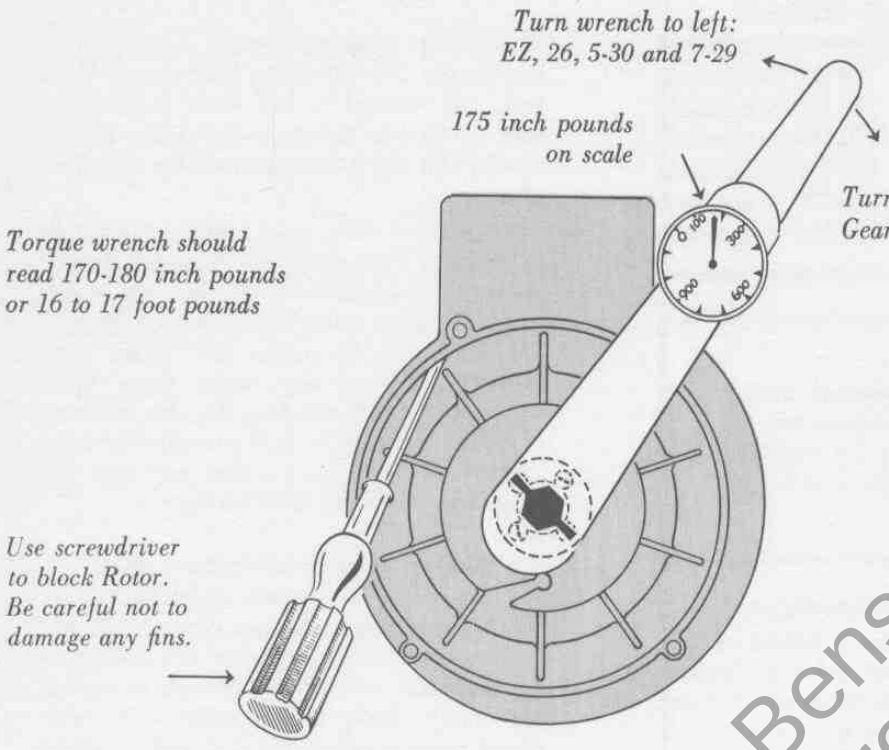
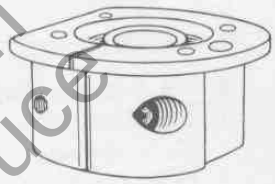


Figure 5—3
Ball drive torque adjustment



Location of Torque Adjusting Screw

Caution

Remember the recoil spring is under tension. Use extreme caution to prevent the spring from uncoiling or snapping out of place suddenly.

Note

Winding more than two turns tension on starting pulley will cause recoil spring to coil too tightly, straightening out end loops.

2. Clean the spring housing and coat the inner surfaces with a small amount of DC-4 compound for lubrication.
3. On direct drive or belt driven models, the extending loop should point toward the bracket and bushing assembly. On gear driven models, the loop should point away from the bracket. (See figure 5—1).
   Place outer hook of spring in slot of spring housing. Push down on spring—use edge of housing to remove the band or wire which holds the coils in place.
4. Install spring housing cover. Use shims to get 1/32" minimum clearance between pulley and spring housing cover. Fasten pulley to ball drive hub.
5. Wind starting cord counterclockwise on Models EZ, 26, 5-30 and 7-29; wind cord clockwise on gear driven Models 17 and 5-20. Pull starter cord out about two feet past starter bracket, hold pulley from turning and wind no more than two additional turns onto pulley.

5—4 BALL DRIVE ASSEMBLY SERVICE

You will need a torque wrench and a ball drive adapter to perform ball drive assembly service properly. (See Section 10, Special Tools and Instruments.)

5—4.1 Ball Drive Torque Adjustment

The ball drive torque setting may be quickly checked after removal of the starter cord and two opposing screws in pulley. Remove air screen and lock the rotor against the back plate. Insert a ball drive adapter (See Section 10, Special Tools and Instruments) in these two screw holes. (See figure 5—2) Exert a steady pull with the torque wrench. Unless the dial reading is within the range specified below when slippage occurs, the ball drive slipper must be adjusted. Tightening the small screw through the split hub increases tension; loosening the screw decreases tension. (See figures 5—3 and 5—4.)

Figure 5—4

BALL DRIVE TORQUE SETTINGS

Model 17	170-180 inch-pounds
Model 5-20	170-180 inch-pounds
Model EZ	170-180 inch-pounds
Model 26	170-180 inch-pounds
Model 5-30	170-180 inch-pounds
Model 7-29	170-180 inch-pounds

Note

When the rotor is blocked during torque adjustments, extreme caution should be exercised so the rotor fins will not be broken or the high-tension lead damaged.

5—4.2 Improved Type Ball Drive Plates

1. Ball drive plates now being produced have a slot in the outer wall of each drive ball pocket.
2. Older type plates should be improved by filing a 1/8″ slot into each of the pockets as shown in figure 5—5. Be sure to file the slot close to the trailing wall of the pocket, and slant it so it becomes a continuation of the pocket floor. (See figure 5—5.)
3. Centrifugal force will tend to clean out the slotted pockets whenever the saw is in operation. Naturally, it is still important to keep the plate, drive balls, and ratchet dry so sawdust and oil will not mix to a thick, sticky paste which would clog the starter.

5—4.3 Dirty Ball Drive Plate Pockets

Oil, dirt, and sawdust accumulation in the drive ball pockets restrict the movement of the balls. The ball drive assembly should be removed from the saw for cleaning.

1. Hold the hub vertically in one hand and rotate the ball drive plate to see whether the drive balls drop freely from the ball pockets. If they do not, further disassembling is required in order to clean and inspect the ball drive mechanism.

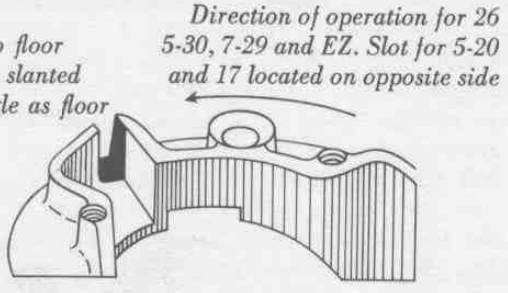


Figure 5—5 Detail of slotted ball drive plate pocket

2. To facilitate cleaning the ball drive pockets, remove the three small flat head screws which hold ball retainer to ball drive plate. Using care not to lose the three steel balls, lift the ratchet hub and ball retainer off the ball drive plate.
3. Clean the ball drive plate and the drive balls thoroughly. Then check the balls and the ball drive plate pockets for excessive wear, ridges or galled spots which could cause failure of the drive balls to engage the ratchet teeth properly. Replace any faulty parts. Keep ratchet teeth, ball and plate dry. No lubricant of any kind should be used on either the drive balls or the pockets. Sawdust and dirt will build up rapidly on oiled surfaces.

5—4.4 Faulty Ball Drive Ratchet and Hub

1. Use air or a clean cloth to clean the ratchet before inspection. (Do not dip ratchet and bearings in solvent.) Replace the ratchet if the teeth are worn badly enough to engage improperly. Badly worn ratchet teeth with sloped forward edges will slip past the drive balls.
2. Check thrust washers and the formica washer. On Model 17 and 5-20 saws the formica washer is bonded to the ratchet face.

The outside of the ratchet drum and the inside of the hub should be checked for dents, ridges and other signs of wear. To do this, completely remove the torque adjusting screw through side of hub and lift the hub off the ratchet drum.

Note

Always leave the inner race (or races) in the ratchet drum to protect the bearings and seals. If the inner races remained on the shaft when ball drive was removed, slip the races back in the ratchet drum carefully (from the rotor end to pass the seals safely). The ratchet bearings and seals seldom require replacement without accompanying ratchet failure. It is accordingly recommended that replacement consist of the complete ratchet and bearing assembly.

5—4.5 Bent or Worn Ball Retainer

A bent or worn ball retainer must be replaced to assure proper engagement of the drive balls and ratchet.

Section 6

IGNITION SYSTEM

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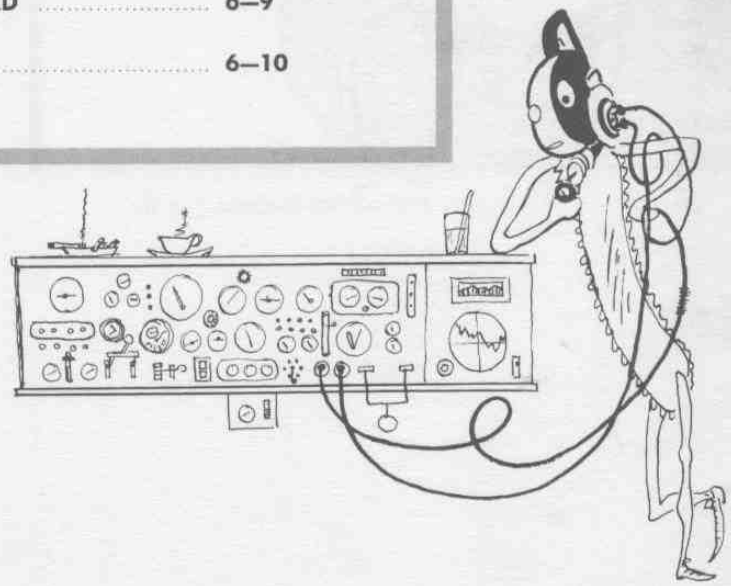


THE IGNITION SYSTEM generates low voltage current in the primary circuit of the magneto, steps it up to the required high voltage in the secondary, and produces a hot spark across the spark plug gap at the proper instant for combustion and power to result.

6–1 CHECKING IGNITION SPARK

All Homelite Chain Saws are equipped with a flywheel type magneto. Always check for ignition spark before attempting disassembly of the ignition system. (See Figure 6—1.) Disconnect the high-tension lead from the spark plug (Remove spark plug for easier cranking.) Hold the high-tension lead 1/4" from any bare metal surface of the unit and spin the engine rapidly. If the magneto is functioning properly, a strong blue spark will jump this gap.

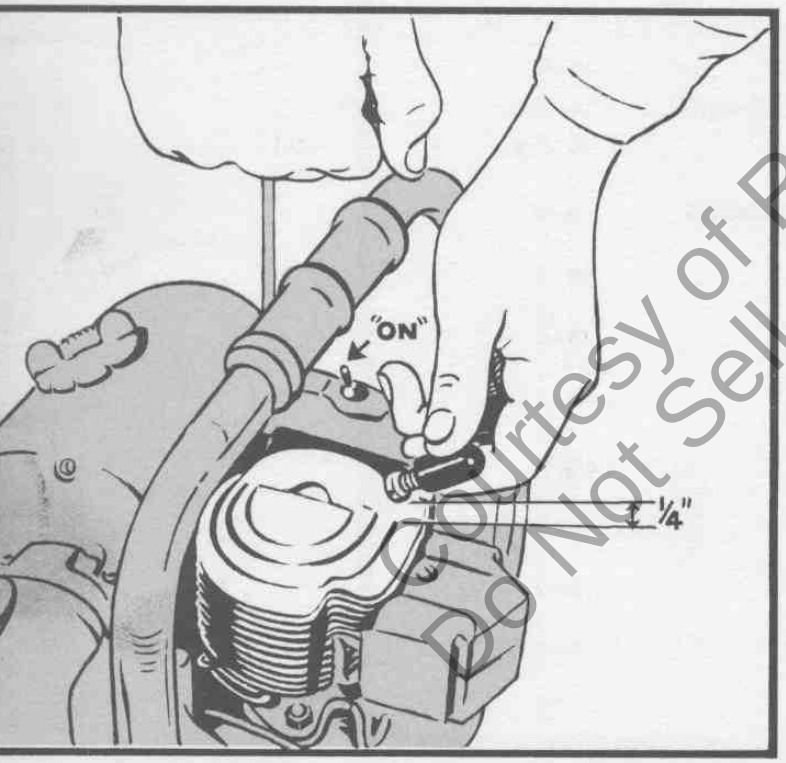


Figure 6—1 Checking Ignition Spark

NOTE

On units with "sparky" connectors, insert a 1/4" x 1" screw in the connector to facilitate the test. Be sure starting switch is on during test for spark.

6–2 OPERATION OF IGNITION SYSTEM

(See Figure 6—2.)

6–2.1 Rotor and Primary Circuit (low voltage generation)

The magneto is actually a permanent magnet generator. Permanent magnets are imbedded in the rotor. The low voltage-generating circuit consists of an insulated winding (the primary coil) wound onto a pole piece which is mounted on the stator plate. This primary circuit also includes a set of breaker points, across which a condenser has been shunted (connected), and a stop switch and ground lead assembly which is used to short the primary circuit when the engine is to be stopped.

As the rotor turns, voltage is induced in the primary winding of the magneto coil and the

Figure 6—2 Practical Diagram showing Primary and Secondary Circuits of Magneto.

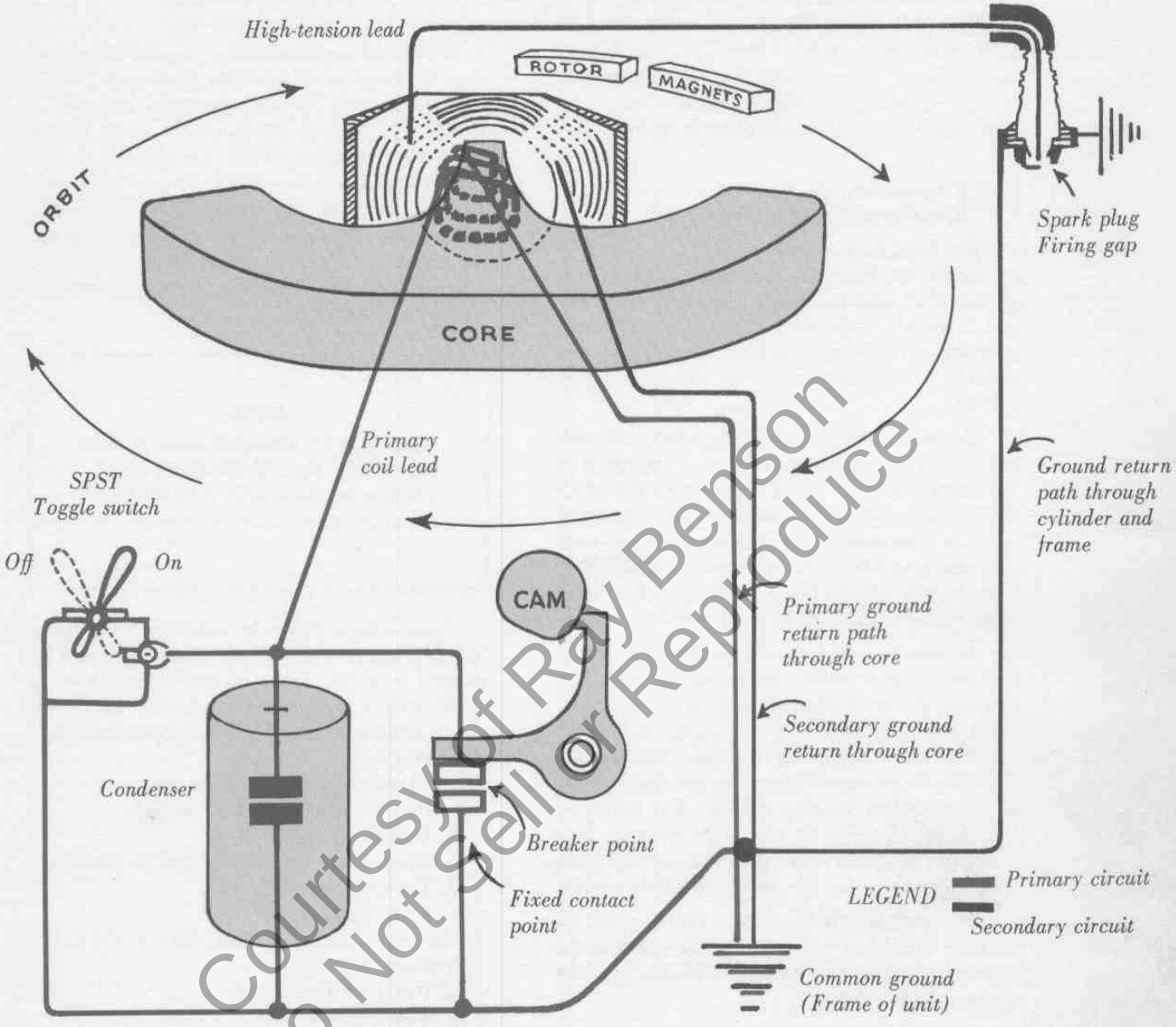
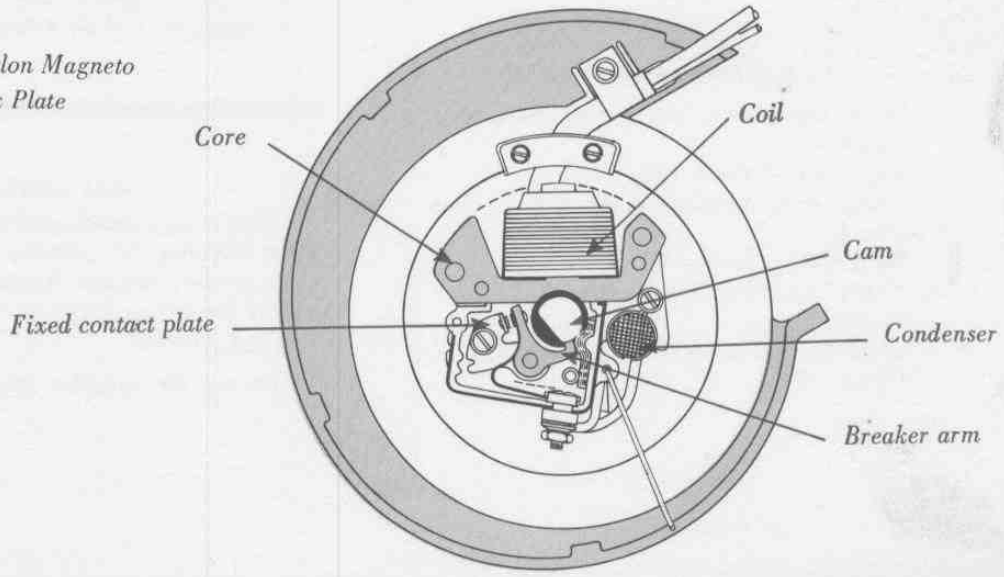


Figure 6—2.1 Phelon Magneto Shown on Back Plate



current flows through the coil, through the closed breaker points, and through the ground-return path. A magnetic field is thus established. This low voltage current must be transformed or stepped-up to higher voltage before it can fire a "hot" spark across the spark plug electrodes.

6—2.2 Secondary Circuit (transformation to high voltage)

The secondary circuit contains an insulated secondary winding of the magneto coil, the high-tension lead, and the spark plug. The secondary coil is wound on the coil core in proximity to the primary coil winding. Together, the primary and secondary coil function as an induction transformer.

The amount the voltage induced in the secondary circuit is stepped-up, is in the proportion of the number of turns in the secondary coil to each turn in the primary coil, less a certain amount of loss. For instance, if the primary voltage were 10 volts, a winding ratio of 10 to 1 would induce close to 100 volts in the secondary; and a 100:1 ratio would induce nearly 1000 volts.

At just the right point, before the piston reaches top dead center, the breaker points open. Because of the continued rotation of the rotor, the opposite sign magnets now approach the pole pieces of the coil, and the magnetic field (which has been kept from collapsing by the choke-action of the coil) now reverses rapidly. This induces a very high voltage in the secondary winding. This voltage is sufficient to jump the gap at the spark plug electrodes, and fire the combustible charge.

The condenser has one main function. By absorbing current, it helps quench the spark at the breaker points so that burning and pitting of the points is prevented.

6—3 IGNITION DIAGNOSIS

1. Dirty, defective or wrong type spark plug. (See 6—4)
2. Inoperative Switch. (See 6—5)
3. Faulty, dirty, misaligned, or burned points. (See 6—6)
4. Weak Coil. (See 6—7)
5. Faulty Condenser. (See 6—8)
6. Broken Leads.
7. Open, shorted or leaky high-tension lead. (See 6—9)

6—4 SPARK PLUGS

(See Figure 6—3)

Maximum engine efficiency requires that spark plugs be in excellent condition. Champion HO-8A spark plugs with platinum electrodes are used in Models 17, 17L, 5-20, 5-20L, and EZ under normal operating conditions. When the above saws are used at high ambient temperatures, or when they are equipped with long bars for heavy duty work, HO-3 spark plugs should be used in place of the HO-8A. The Champion HO-3 spark plugs, also with platinum electrodes, should always be used in Models 5-30 and 7-29.

NOTE

Champion J-6 spark plugs may be substituted for the HO-8A. However, the J-6 is more susceptible to fouling and burning of the center electrode.

Spark plugs should be removed periodically for cleaning and inspection. Deposits should be scraped from the electrodes and the gap reset to .025" with a wire gauge. Porcelain should be clean and free of cracks. The spark plug terminals should be tight.

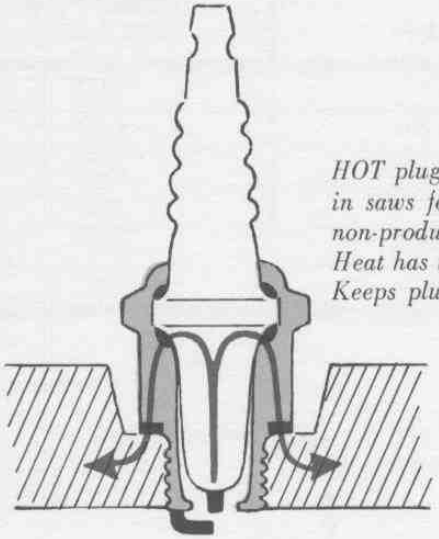
1. Spark plug does not fire or is weak
   a. Porcelain carbonized or burned
   b. Porcelain cracked
   c. Moisture or dirt accumulated on porcelain
   d. Improper electrode gap
   e. Weak ignition coil
2. Electrodes and porcelain burned after few hours of operation
   a. Using too hot a plug
   b. Poor grade of fuel
3. Fouled plug
   a. Use of too "cold" a plug
   b. Improper gas-oil ratio (too much oil)
   c. Improper fuel-air mixture (too rich)

6—5 SWITCH

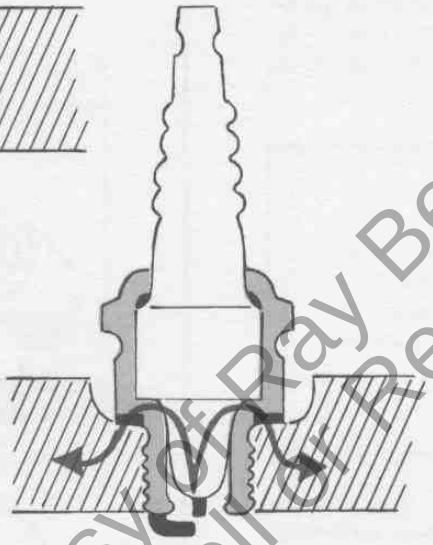
Flipping the starting switch to the "OFF" position grounds the primary circuit so that no spark can be generated. When the switch is flipped on, the grounding circuit is broken, and the magneto can function.

To test the installed switch, disconnect the

HOT AND COLD SPARK PLUGS

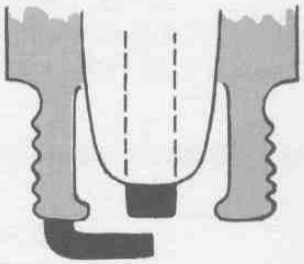


HOT plug design used in saws for occasional or non-production cutting. Heat has to travel further. Keeps plug hotter.

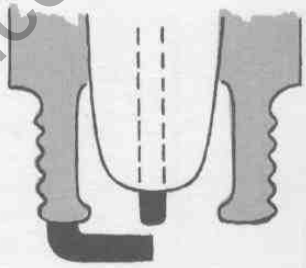


COLD plug design dissipates heat quickly. Used for heavy duty operation. Keeps engine cooler.

HO AND J SERIES SPARK PLUG ELECTRODES



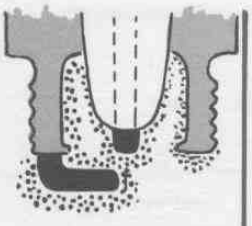
J-TYPE
Wide electrode easy to foul



HO-TYPE
Thin platinum center electrode

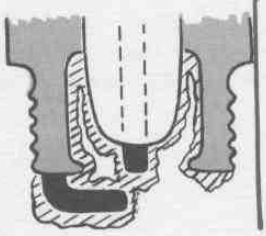
Figure 6–3 SPARK PLUGS

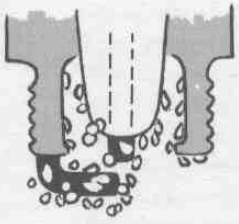
FOULING AND BURNING



Cold fouling with soft black carbon—mixture too rich or plug too cold.

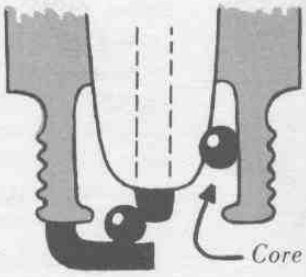
Hard Yellow-Brown deposit—mixture too rich or plug too hot





Spark Plug wet with fuel: Check for spark.

LEADED SPARK PLUGS



Electrodes bridged with shiny lead ball.

ground wire. Connect one lead of test instrument (circuit tester or ohmmeter) to the switch terminal, and the other lead to ground. With switch in "ON" position, no reading should be observed; with switch in "OFF" position, a continuity reading should be obtained.

6—6 CONTACT POINTS

The contact points are a cam-actuated device which, by breaking the circuit at the proper time, enable a spark to be produced. Contact points should be inspected periodically for proper gap setting, normal wear, alignment, dirt, oxidation and deposits.

NOTE

Contact points can be checked in the unit by disconnecting the condenser and primary lead, reconnecting the tension spring, and applying a circuit tester to the terminal.

To test, place one lead on the fixed contact, the other lead on the movable contact, and rotate the crankshaft. When the points separate, the test lamp should go out. If the light fails to light when the points close, some foreign material is preventing completion of the circuit.

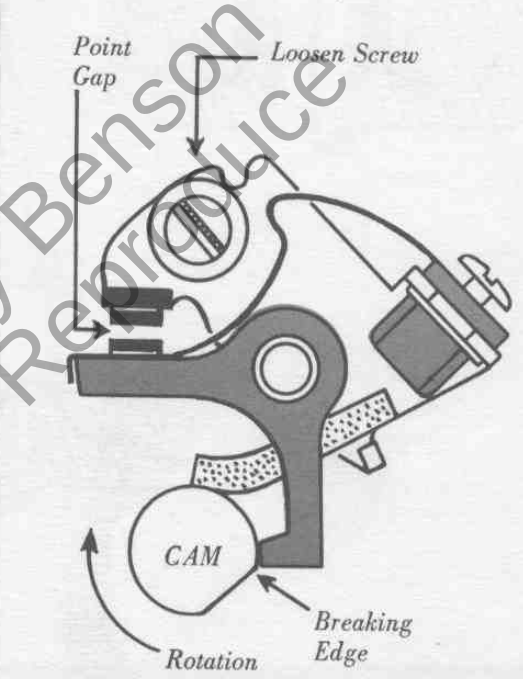
Dirty contact points can be cleaned by inserting a thin piece of clean cardboard (such as matchbook cover) between closed points to remove any metal filings or foreign material. Corroded, pitted, or worn points should be replaced with a new set, carefully aligned and adjusted.

The contact point spring should always be installed first, before attaching the primary and ground leads, so that proper spring tension will be maintained. On Models 26, 5-30 and 7-29, the contact point-actuating cam is a separate part (removable from crankshaft). Caution should be taken to install the cam with the arrow in view. If the cam is installed backwards, poor spark will result and timing will be incorrect.

Adjust points to the recommended gap. (See Figure 6—4.) After setting gap, put points in closed position and snap them once or twice to dislodge any loose dust or dirt.

Figure 6—4 Adjusting Contact Points

Model	Contact Point Gap Setting
17	.015″
5-20	.015″
EZ	.015″
26	.020″
5-30N	.020″
7-29	.020″



Turn Cam so that Cam Follower rests just past breaking edge.

6—7 COIL AND CORE

Lack of spark or weak spark can sometimes be caused by a faulty coil. Coil failures can be caused by moisture in the windings, open or shorted primary windings, broken or shorted primary lead, or shorted turns in the secondary. Magneto coils can be tested using any good magneto coil tester. (See Figure 6—5.) The magneto coil can be tested either in or out of the magneto. However, all coils must be tested on the core.

NOTE

On magnetos with siamese coils, the cores must be connected with a "jumper" wire before testing the coils, or the primary winding will be burnt out during test.

When installing replacement coils in Model 17, 5-20 and EZ magnetos, be sure the machined surfaces of the core shoes are perfectly aligned with the machined surfaces of the mounting pads of the back plate. On the above units *using the Wico magneto*, the air gap between the rotor and the pole shoe is so slight that any deviation from the above instructions will cause the rotor to rub against the pole shoe.

When a new high-tension lead or replacement coil is installed on a Model 26, 5-30N or 7-29 saw, the new high-tension lead should be pulled through the back plate in such manner that the high-tension lead will not interfere with the spinning rotor or rub on the cylinder fins.

6—8 CONDENSER

The condenser is a device which absorbs the current when the contact points open. It is not always necessary to change the condenser each time new points are installed. Condensers can be tested with a condenser tester (See Figure 6—6). Occasionally the terminal on the pigtail of the condenser becomes broken. This is difficult to detect because the connector is covered with insulation. Condensers should be installed so the pigtail does not interfere with the spinning rotor.

6—9 HIGH TENSION LEAD

Weak spark or lack of spark can often be traced to a shorted or open high-tension lead. On the Model 17, 5-20 and EZ engines, the "Sparky" connector should be checked to be sure the pin of the terminal spring is contacting the high-tension wire. Replace the "Sparky" terminal if the insulation is faulty as shown in Figure 6—5. On Models 26, 5-30N and 7-29 (which do not have "Sparky") check the metal grommet on the end of the high-tension lead and cylinder. On all saw models, high-tension lead insulation which has become water or oil impregnated, will also cause high voltage leakage.

NOTE

Further checking of the high-tension lead must be done after removal of the starter mechanism and the rotor. (For the proper rotor puller for each saw model, see Section 10.

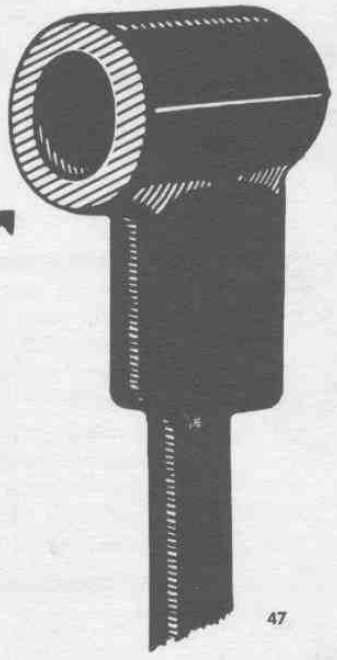
After removing the rotor, inspect the high-tension lead for insulation cracks or damage caused by contact with cylinder fins or the rotor (on improperly installed lead).

The high-tension lead can be checked for continuity by using an ohmmeter or similar continuity testing instrument. The high-tension lead connection at the coil should be checked.

6—10 MAGNETO ROTOR

The magneto rotor has several important functions. It supplies the magnetism for production of the high-voltage spark. It also provides cooling air for the engine, and in Models 17, 5-20 and EZ, this air also actuates the governor. Rotors on all units should be inspected for broken fins. Broken or missing fins affect governor performance and cause an unbalanced condition which will ultimately lead to excess vibration.

Figure 6—5 Checking "Sparky" Terminal



CHECK here for cracks or hardening and drying of the rubber. Replace if elasticity of rubber is gone.

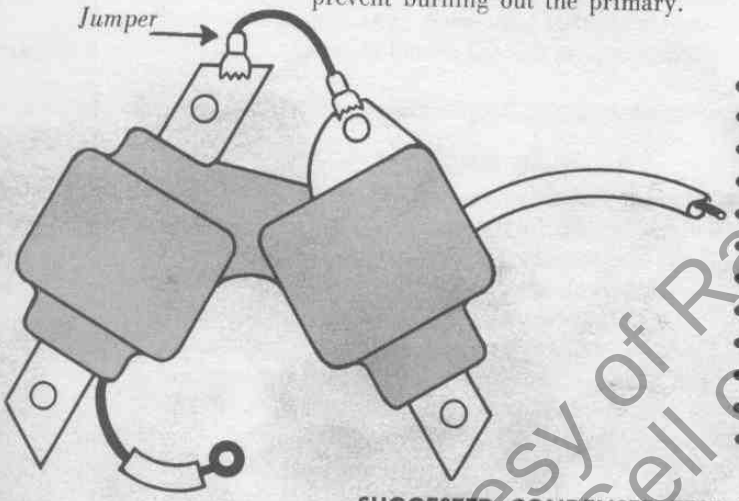
Figure 6—6 Suggested Test Values using King Coil and Condenser Tester

SUGGESTED COIL TEST VALUES

Coil Part No.	Coil Set Position	Test Position	Reading on top scale
28038	4	Coil	Appr. 5
72397	5½	Coil	Appr. 4½
32090	5	Coil	Appr. 4½
55232*	5	Coil	Appr. 4½
55403	5	Coil	Appr. 4½
55970	5½	Coil	Appr. 4½

All coils must be tested with pole piece through coil.

*If 55232 (Model 17 Coil) is tested "off" back plate the two pole pieces must be connected (as shown) to prevent burning out the primary.



NOTE:

Suggested test values may not apply to your King Test Instrument. Check equipment by testing several pieces of each part number out of your stock. If the average readings differ from suggested readings, use the average reading obtained in each case with your instrument.

SUGGESTED CONDENSER TEST VALUES

Condenser Part No.	Coil Set Position	Test Position	Reading on bottom scale	Manufacturer's Rated Capacity
28035	**	Cap	..15	.16-.20
30257	**	Cap	.35	.30-.34
32091	**	Cap	.15	.16-.20
72396	**	Cap	.15	.16-.20
55233	**	Cap	.15	.16-.18
55987	**	Cap	.20	.18-.22

**It does not matter, what coil set position is—during condenser test. If no reading at all is obtained—Condenser is open. If needle goes all the way to right—Condenser is shorted. Check ability of Condenser to hold charge as follows:

Turn test dial from "Cap" to "Test" and observe needle. If condenser held a charge, the needle will jump to right. *Repeat this test a few times:* Since the condenser is being charged with AC for only an instant, it may not always pick up a good charge.

6—11 PHELON SERVICE HINTS

Homelite Models EZ-6, 6-22 and Model 4-20 saws with seven-digit serial numbers are supplied with the covered type Phelon Magneto shown in Figure 6—2.1 (page 43). Special service hints for these magnetos are as follows:

6—11.1 Replacing Points

1. Remove the cover. Remove the stop switch lead and Jam-tite assembly from the terminal post. Slide the old breaker arm from the pivot pin, and pull the insulator from the slot in the box. Remove the old fixed contact plate.
2. Install the new fixed contact plate. Slide the new breaker arm onto the pivot pin—at the same time slide the nylon block into the breaker box slot.
3. Depress breaker arm lightly, and operate it a few times to align it. If the breaker arm still does not seat completely, depress the breaker arm SPRING lightly and operate the points again.
4. Replace the contact plate screw and washers; assemble Jam-tite terminal assembly and leads, flat washer, and switch lead, in this order and secure with the terminal nut.

IMPORTANT

Do not depress spring so far that there is danger of causing a short between spring and fixed contact plate. NEVER HIT the fiber or spring with a hammer, punch or screwdriver.

5. Set the point gap at .015" and tighten the breaker screw. Recheck after tightening.

6—11.2 Replacing Condenser

1. The condenser should test between .18 and .22 microfarads.
2. Cut the lead off the old condenser as shown in Figure 6—5. Replacement condensers have their own terminal.
3. Remove the terminal nut and put the new condenser terminal over the switch lead terminal. Fasten with the terminal nut.

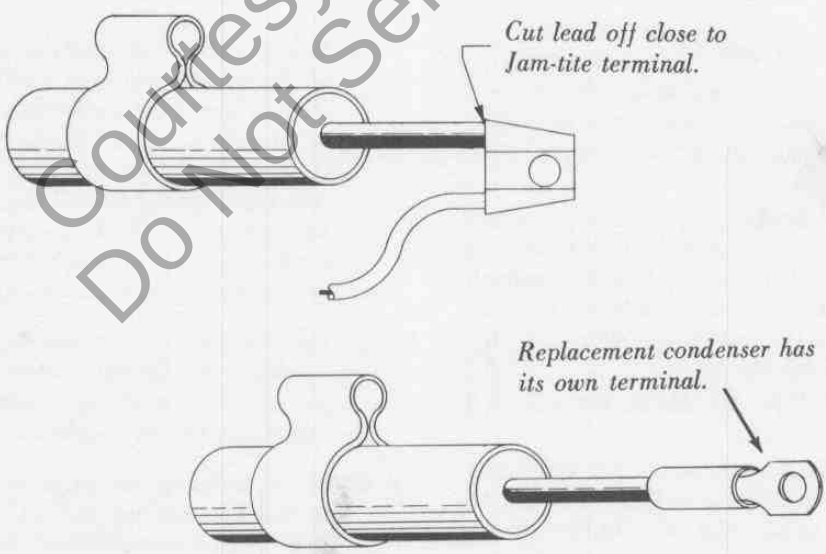
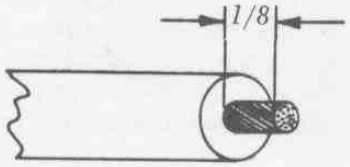
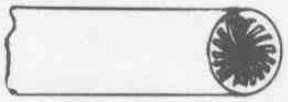


Figure 6—5 Replacing Condenser in Covered Phelon Magneto



1. Cut insulation off about 1/8" from end of the high-tension lead.



2. "Fan" the wire strands against the insulation.

3. Form a sealing ring with DC-4 compound applied 1/4" from the end of the lead. End must not be coated.

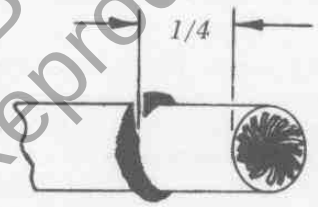


Figure 6—6 Installing High-Tension Lead In Coil After Parts Replacement

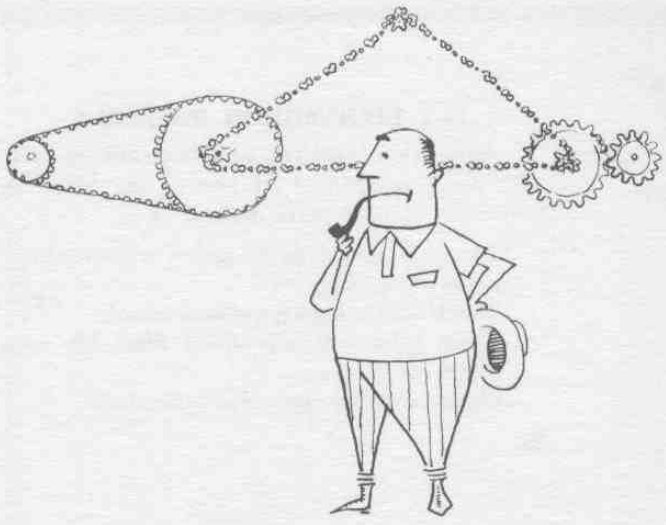
6—11.3 Replacing Coil

1. The primary circuit resistance should read between .65 and .80 ohms; the secondary circuit resistance should be between 7500 and 9000 ohms.
2. To remove a faulty coil; remove the stator from the back plate, loosen terminal nut and pull primary lead out of the Jam-tite terminal. (This lead may be cut off close to the terminal.) Remove the ground lead screw from the core and pull the old coil off.
3. PRESS—DO NOT HAMMER the new coil into place.
4. Remove terminal nut and put primary terminal over the switch lead terminal on the stud. Replace and tighten the nut. Put the ground screw back into the core.
5. Lay the insulated coil primary lead and the stop switch lead between the stator hub and the condenser UNDER the felt seal.
6. Strip about 1/8" of insulation off the inner end of the high-tension lead, and fan-out the protruding strands of wire. Make a moisture seal by forming a ring of DC-4 compound around the lead, 1/4" from the end. Do not let the compound spread toward the end of the lead, however, or the DC-4 compound (an effective insulator) may interrupt current flow from coil to lead. (See Figure 6—6.)
7. Push the high-tension lead into the coil socket FIRMLY BY HAND. (Make sure it seats all the way in.) Use no sharp tools or pliers which might damage the insulation.
8. Before securing the stator to the back plate, be sure no leads are pinched. Also be sure the stator group seats *absolutely flat* against all the mounting bosses.
9. Set contact points to .015". Recheck gap after tightening terminal nut.

Section 7

TRANSMISSION

INDEX



7–1 OPERATION OF CHAIN DRIVE TRANSMISSION

The transmission is the means of transmitting the engine power to the cutting chain for work application. It includes a chain drive sprocket. This sprocket may be mounted directly on the engine shaft (direct drive), or it may be mounted on its own shaft, driven by a reduction gear (gear driven) or by a special belt (belt drive).

Homelite uses two types of reduction transmissions. Models 17 and 5-20 have meshed gears, operated in an oil-filled gear case. Models 26, 5-30 and 7-29 have belt drive transmissions operated in a "dry" drive case.

Homelite saws with reduction gear or belt transmissions have the "lugging power" necessary to perform saw log and other heavy work applications where long guide bars are used for large cuts.

Direct drive saw models, such as the EZ, have high chain speeds. Used with very slight feed-pressure, they perform exceedingly well, especially when the cutting chain is correctly sharpened and the rakers have been filed to get the proper cutting depth.

The direct drive chain sprocket is an integral part of the clutch drum assembly. Installed with a needle bearing on the crankshaft, the sprocket and drum assembly does not rotate until the automatic clutch engages.

All Homelite Saw transmissions incorporate crankshaft-mounted centrifugal action safety clutches which disengage during idling (so chain does not rotate), engage the chain when the engine reaches sufficient speed, and slip to prevent engine damage in case safe operating torques are exceeded (such as when a closing cut pinches the chain).

7–2 TRANSMISSION DIAGNOSIS

Aside from breakage, most transmission troubles are accompanied by one of the following symptoms of poor performance:

Transmission binds or makes a "squealing" noise when idling.
Clutch slips at high speed under load.
Chain rotates at idle speed after idle stop screw adjustment.
Clutch skips or chatters in operation.

7–2.1 Diagnosis of binding or squealing

1. Dry needle bearing in Model EZ sprocket and drum assembly.
2. Clutch shoes were not replaced as a set; high shoes bind against clutch drum.
3. Dry, dirty and binding sprocket shaft bearings.
4. Belt in Models 5-30 and 7-29 has stripped teeth.
5. Reduction gears in Models 5-20 and 17 are broken.

7–2.2 Diagnosis of slipping clutch condition

1. Worn clutch shoes.
2. Solid type shoes installed in clutch assemblies calling for lined shoes.
3. Glazed condition of lined clutch shoes.
4. Solid shoes oil soaked.

7–2.3 Diagnosis of Chain Rotation during idling

NOTE

In belt driven saws, the grease in new clutch drum bearings is sometimes stiff enough to cause the drum and chain to rotate even though clutch is disengaged.

1. Broken or weak clutch retaining springs.
2. Thrust washer made up against bearing or sprocket instead of inner race (EZ).
3. Faulty clutch drum bearing.

7–2.4 Diagnosis of skipping or chattering clutch

1. One or more clutch shoes are too high.
2. Clutch drum out of round.
3. Chain, bar and sprocket troubles.

7.3 CLUTCH

7–3.1 Disassembling clutch for service

1. Remove chain, guide bar, adjusting plate and guide bar shim. (Model EZ has inner and outer shims and adjusting plate is part of the drive case cover.)

2. On gear case model saws, drain gear oil.
3. Remove gear case or drive case cover, with cover gasket.
4. Disassemble clutch as follows (according to unit).

   (a) Direct Drive (Model EZ): Remove flex locknut, flat washer, large thrust washer, sprocket and drum assembly, inner race and small thrust washer from crankshaft. Use Puller #A-23131 (See Special Tools, Section 10.) to remove the clutch spider assembly. Remove two keys and the clutch cover from the shaft.

   (b) Gear Drive (Models 17 and 5-20): Remove the flex-lock nut, clutch washer and clutch cover. Pull clutch spider assembly with Puller #A-23131. Remove the two keys and the inner thrust washer, and slide the clutch drum and drive gear assembly from the shaft. Remove the bronze brushing and remaining thrust washer.

   (c) Belt Drive (Models 26, 5-30 and 7-29): Remove the flex-lock nut, washer, and clutch cover. Use Puller AA-22803 to remove the clutch spider assembly. Remove the two clutch keys. Turn the sprocket pulley continuously through at least four turns, to prevent damage to belt, and pull the clutch drum and sprocket assembly from the shaft. Use Puller AA-22803 if necessary.

CAUTION

While pulling the clutch drum and sprocket assembly, always rotate the sprocket pulley continuously through at least four turns, so the drive belt will work off the pulley gradually.

5. If the drive case on belt driven saws is to be disassembled from the unit, either for replacement or to facilitate crankcase service, remove four sets of screws and lockwashers (near crankshaft) and tap drive case lightly until drive case is free of unit.
6. Disassembly and assembly of bearings and spacers should be performed as necessary, during parts inspection.

7–3.2 Clutch spider and shoe assembly inspection (All Models).

1. Clutch shoes for "dry" transmission saws (EZ, 26, 5-30 and 7-29) are of Oilite bronze construction. Clutch shoes for oil-filled transmission saws (17 and 5-20) are made of Super Oilite and have a Raybestos brake lining. The correct type and size shoes should always be used in each saw model.
2. Clutch shoes are supplied in sets of six shoes. When any of the shoes in the unit are worn to the point where replacement is indicated, always replace the complete set. Mixing new and worn shoes may cause the high shoes to chatter, bind or toe against the clutch drum.
3. Any burrs or high spots on clutch braking surface should be removed. On shoes with Raybestoes brake lining, be sure lining is properly bonded to the shoe. Linings are approximately 1/16" thick on new shoes.
4. Inspect the aluminum clutch spider for wear, burrs or high spots at points of contact with the clutch shoes. Try the clutch keys in the two keyways of the spider. The keys should not be loose.

NOTE

During operation of the saw, if the clutch slips at high speeds under load, check for excessive wear of clutch shoes. If clutch engages at engine idle speed adjustment, check for broken, weak, distorted or improperly installed clutch retaining springs.

5. If open, the clutch spring end loops should be closed with needle nose pliers before installation. Uncoiled or distorted springs should be replaced. When assembling clutch, be sure the end loops of the clutch springs are located at the center of a clutch shoe. This will prevent the loops from being caught between shoe and spider during the expansion-contraction operation of the clutch assembly.

7–3.3 Clutch sprocket and drum assembly (Model EZ)

1. The needle bearing in the Model EZ sprocket and drum assembly should be cleaned and

oiled monthly, weekly or as often as necessary —depending on cutting conditions and frequency of operation.

2. Inspect the needle bearing for signs of wear. If the needles can be separated more than the width of one needle, or if there is a flat visible on any needle, the bearing must be replaced. Use sprocket Bearing Tool #23139 (See Special Tools, Section 10) for removal or insertion of bearing. Remember to press on lettered end of needle bearing race to prevent damage to the bearing cage.
3. Inspect the clutch drum for cracks and for out-of-round or bent condition. Replace clutch drum if cracked or severely bent.
4. If there is a binding condition between clutch drum bearing and the inner race (after installation of a new bearing) replace the inner race.
5. Replace the sprocket and drum assembly if the chain drive sprocket teeth are worn out of pitch. (See CUTTING ATTACHMENTS, SECTION 11 for more detailed sprocket service and inspection.)

7—3.4 Drive gear and drum, sprocket and drum inspection (Models 17, 5-20, 26, 5-30 and 7-29)

1. Check for broken, worn or burred sprocket or gear teeth.
2. Inspect clutch drum for out-of-round (bent or cracked shell).
   Replace drum if cracked or badly bent.
3. Check bronze bearings on Models 17 and 5-20 for excessive wear. Excessive wear can cause mis-mating of gear teeth, and chatter in mesh.
4. Check meshing of gears (17 and 5-20) when transmission has been assembled. Work the gears, one against the other, to see if there is excessive play or backlash. Excessive backlash causes breakage of gear teeth.
5. Clutch drums on Models 26, 5-30 and 7-29 contain two shielded bearings and bearing spacer. If the bearings are worn or damaged and require replacement, remove bearings and install a new pair as follows.
   (a) Place the assembly, drum face down, on a flat working surface. Use the slot in the spacer to locate a punch against the inner race of bearing. To protect the sprocket bore from being gouged or distorted during bearing removal, keep rotating the spacer 180° and tap alternately against one side, then the other of the bearing race—so bearing comes out straight. Remove spacer and drive out the second bearing with Remover #22692.
   (b) Assemble the first bearing flush with the top of the sprocket bore. Turn the drum over on the sprocket end, drop in the spacer, and press in the second bearing flush with the inner face of the clutch drum recess. These shielded bearings are sealed and require no maintenance.

7—4 BELTS AND DRIVEN COMPONENTS

7—4.1 Drive belt

1. Drive belts with worn lugs, worn lining, or visible break-through of the steel strands, must be replaced.
2. With the belt assembled on the unit, the tension should be enough that the belt cannot be made to touch the wall of the drive case when thumb pressure is applied. (See Figure 7—1.)
3. If the used belt is still in good condition, the mechanic, with the approval of the customer, may wish to re-impregnate the belt by soaking it in DC-200 compound for at least six hours. Belt life may also be improved by soaking the sprocket part ONLY of the clutch drum overnight in DC-200 compound. Both original and replacement sprockets and belts are impregnated with DC-200 silicone at the factory.

7—4.2 Sprocket shaft and pulley (26, 5-30, and 7-29)

1. Use Tool #22750 to lock the chain drive sprocket. Remove flex-lock nut, sprocket spacer, outer flange, sprocket, two keys (Model 26 has only one key), inner flange and remaining spacer.
2. Block the drive case carefully to avoid cracking it during sprocket shaft removal. Press the sprocket shaft and pulley assembly from the drive case. If an arbor press is not available, screw the flex-lock nut back on shaft to protect threads, and remove shaft with a soft mallet.
3. The sprocket shaft and pulley (26, 5-30, and 7-29) are assembled with four slotted, flat head screws. The head of the sprocket shaft has been pin-punched at the ends of each screw slot. This keeps the screws staked in position. To free the screw slots for screw removal, tap the swaged metal from the screw slots with a chisel. An impact type screwdriver makes removal of these screws easy. (See Figure 7-2.)

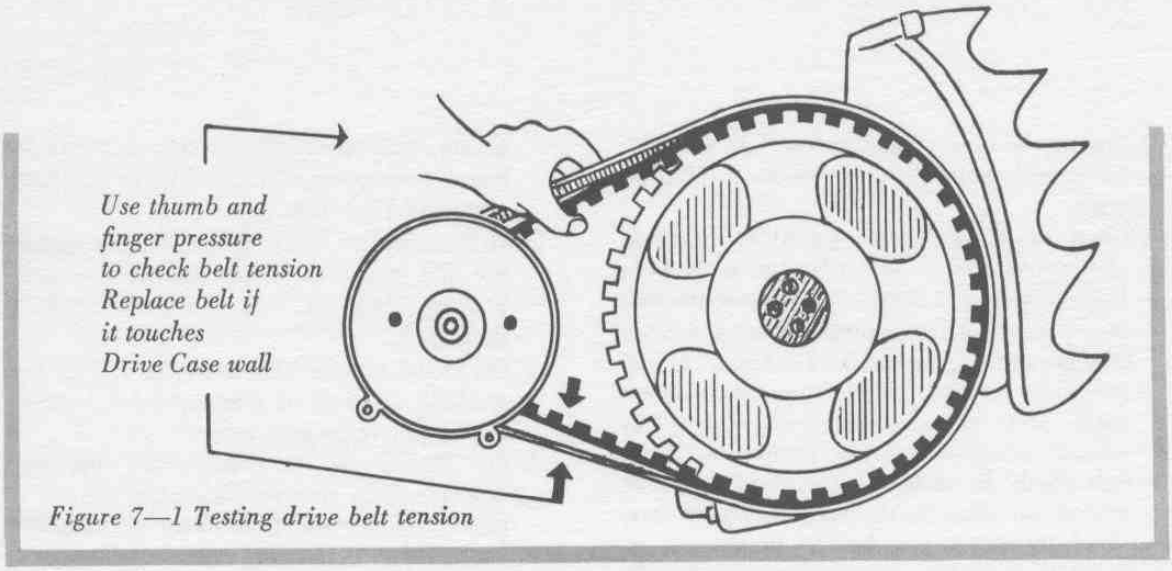


Figure 7—1 Testing drive belt tension

4. After screw removal, as above, press the shaft from the pulley.
5. Check the belt pulley for broken, worn and rounded teeth, and for cracks in radius legs or hub of pulley. If faulty, replace pulley.
6. Inspect the sprocket shaft for damaged threads, enlarged keyways and for cracks around the countersunk holes of the shaft head.

NOTE

During assembly, the screw slots should be turned past the old punch marks on the shaft head so they can be staked with new metal. To stake, pin-punch the shaft head at the ends of each screw slot.

7—4.3 Sprocket shaft and driven gear (17 and 5-20)

1. Lock chain drive sprocket with tool #22750. Remove flex-lock nut, outer washer, chain drive sprocket, two keys, inner washer and sprocket spacer.
2. Press the sprocket shaft out of the gear case carefully.
3. Remove the four screws with a 1/8" Allen Wrench #22220, and press the sprocket shaft from the driven gear hub.

NOTE

On early Model 17 and 5-20 transmissions, slotted flat head screws were used to assemble the driven gear to the shaft head. The shaft head was pin-punched at the screw slots, to stake the screw heads in place. Screw removal with an impact type screw driver is easily accomplished after the swaged metal has been removed from the screw slots with a chisel. During assembly, swage the shaft head with a pin punch near the ends of each screw slot.

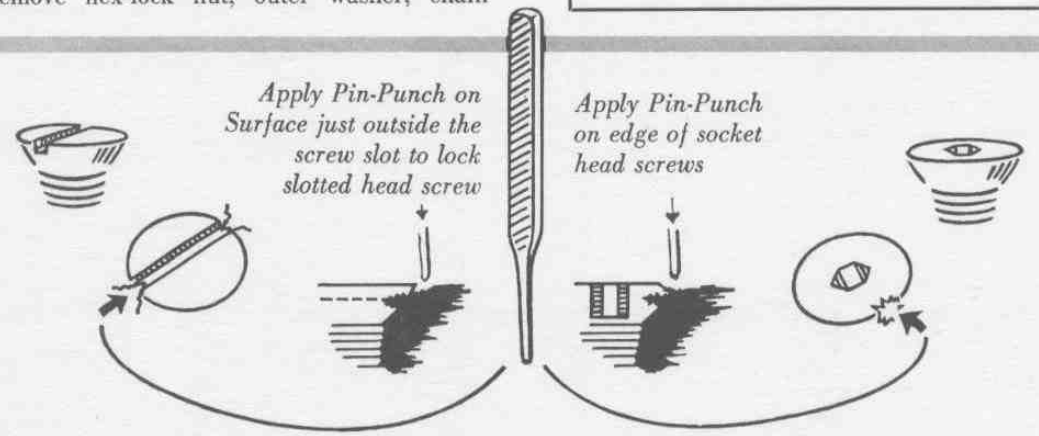


Figure 7—2 Staking screw heads with pin-punch

4. The driven gear should be checked carefully for burred, worn, cracked, broken or chipped teeth.
5. Check the driven gear assembly for warpage of the ring gear, which is riveted to the hub. If the ring gear is warped away from the hub at any point, or if the rivets are loose, replace the driven gear assembly. Loosening of the rivets and warping of the ring seldom occurs unless wear of drive and driven gears has caused excessive backlash conditions. Backlash should be checked by working one gear against the other in the assembled gear case.
6. Check the driven gear hub for cracks.
7. Check the sprocket shaft for damaged threads, enlarged threads, and for cracks in the head near the countersunk screw holes.

7—5 GEAR CASE AND DRIVECASE INSPECTION

Because of the one piece die cast construction of Models 17 and 5-20, gear case inspection is made along with the internal engine service in Section 8 of this manual. Inspection and replacement of sprocket shaft bearings, however, are done below as well as complete inspection of drive case castings on Models 26, 5-30 and 7-29.

7—5.1 Sprocket shaft bearings—all models

1. Sprocket shaft bearings are the shielded type and require no lubrication. Bearings should rotate smoothly. If a bearing is rough-turning, or has excessive radial play, replace it. As a general precaution, always keep disassembled bearings wrapped. (Dust and grime will harm unwrapped bearings.)
2. If bearings are to be removed from casting, use #3 snap-ring Pliers #22726 to remove bearing retaining ring from the sprocket shaft bore.
3. On Model 17 and 5-20, use large end of Tool #22833 to drive or press sprocket bearings and spacer from gear case.
4. On Models 26, 5-30 and 7-29, use Tool #22692 from sprocket side of drive case to press bearings and spacer from sprocket shaft bore (only if replacement is necessary).
5. After removal of shaft bearing, inspect the bearing bore for roughness or scoring or any condition of wear which could cause a poor fit of the new bearing in the bore.
6. Before reassembly of the transmission, detachable drive cases (Models 26, 5-30 and 7-29) should be inspected for enlarged or stripped screw holes, worn guide bar key, loose or burred studs, dented or nicked sealing edges, and for cracks at all stress points.

NOTE

Never submerge or wash drive case with sprocket bearings installed. This will dilute the grease and lead to bearing failure.

TRANSMISSION
SERVICE SUPPLEMENT

NOTES

No supplementary instruction is required in this Section for servicing Model 4-20 and EZ-6 chain saws. The 4-20 transmission is the same as the 5-20L. The EZ-6 and EZ transmissions are also identical, except as follows: On EZ-6 units with seven-digit serial numbers, the clutch must be assembled with a 3/32" thick washer between the clutch and the clutch drum.

Model 6-22 engines below serial No. 758245 have the same (3.57:1 ratio) gear system employed in the Model 5-20. For transmission service of 6-22 engines below serial No. 758245, refer to Model 5-20 instructions. For parts replacement see Parts List No. 23210.

Model 6-22 engines with seven-digit or six-digit serial numbers *above* 758245 have the new, large O. D. sprocket shaft and bearing assembly and the new 2:1 reduction gear system. (Unless customer requested 3.57:1 gearing). For disassembly, service and installation of the sprocket shaft and bearings on these units, follow instructions below.

Repair parts for 2:1 gear ratio saws are in Parts List No. 23210-1 dated September, 1957.

7—5.2 Sprocket shaft bearings—6—22 units with six-digit serial numbers above S/N 758245 or with seven-digit serial numbers.

1. Remove the chain drive spocket and press out the sprocket shaft and driven gear assembly. (Refer to Section 7—4.3 for complete details).
2. Use snap-ring Pliers #22726 to remove the retaining ring from the sprocket shaft bore.
3. One shielded type ball bearing and one roller bearing with removable inner race are used in this assembly. Neither dip a casting containing a shielded bearing in solvent, nor attempt to clean a shielded bearing with solvent; because solvent will dilute the grease inside the self-lubricating bearing. After bearing removal, however, both the bearing bore and the open roller bearing may be cleaned, inspected and repacked with grease.
4. Bearings should rotate smoothly. If a bearing is rough-turning, or has excessive radial play, replace it. As a general precaution always keep the disassembled bearings wrapped in paper.
5. Use the 1-1/8" diameter end of Tool #23228 to press the old bearings from the gear case.
6. After cleaning the old grease from the sprocket shaft bearing bore, fill the lubricating groove inside the bore with Regal Starfak #2 grease (Homelite RM #4568) or Lubriplate. (Do not clean the ball bearing with solvent.)
7. Repack roller bearing cage and rollers with Regal Starfak #2 grease or Lubriplate, and grease the bearing surfaces of the inner race.
8. Now take the small end of Tool No. 23228—slide the ball bearing, the completely assembled and greased roller bearing, and a *NEW* formica washer onto the small end of the tool. Press these parts into the bearing bore carefully. Remove the tool and install the retaining ring in the groove.
9. Support the gear case on the sprocket shaft assembly Anvil No. 23267 (Backplate must be removed from engine for working room.) and press the assembled sprocket shaft and driven gear into the bearings.

WARNING

The components in this assembly will be damaged if the proper tools, recommended in this Section are not carefully used. For instance, if the bearings are pressed home without support of Anvil No. 23267, the inner race will be driven through the seal.

Section 8

ENGINE SERVICE (Internal)

INDEX

Whenever the engine is to be opened for inspection or overhaul, the unit must be disassembled. Complete disassembly, service and reassembly can be facilitated with the use of the Special Service Tools and other recommended shop instruments and equipment. The "press-in, push-out" type tools (See Master Equipment List, Section 10) are necessary for proper removal or installation of the crankcase seals and bearings. It is preferable to use an arbor press whenever practical in conjunction with these tools. Crankshafts should always be installed with the jack screw type assembly tools.

8—1 BASIC ENGINE CONSTRUCTION

8—1.1 The basic frame of Models EZ, 17 and 5-20 is a one-piece die casting which includes both the crankcase and the gear case or drive case. The Model EZ casting also includes the pistol grip and chain oil reservoir. Though not a part of the casting, the EZ oil reservoir cover is sealed to the reservoir at the factory, and supplied as part of the service crankcase assembly. (Cover and seal also supplied separately.) All service crankcases for the above models include installed garlock seals and all necessary inserts and mounting studs.

8—1.2 On models 26, 5-30 and 7-29 the crankcase is formed by two castings—the front half and the rear half crankcases—which are bolted together in register. The front half crankcase contains a bronze shaft bushing (except Model 7-29 which has two needle bearings) and is sealed against leakage. The magneto back plate is registered against and fastened to the front half crankcase and the drive case is similarly fastened to the rear half crankcase. With this type construction, the crankshaft and main bearing, piston and connecting rod should be assembled and pulled into the rear half before the front half crankcase is added to the unit.

8—2 ENGINE INTERNAL DIAGNOSIS

The symptoms of internal engine failure are difficult to distinguish from those purely external in nature. Before attempting diagnosis, the normal series of tests for chain and bar condition, and for engine fuel supply and spark production should be conducted. While the spark plug is out, the serviceman may get some clue to the general engine condition by noting the amount of carbon on the piston dome. He should look further for carbon by removing the muffler and checking both the muffler and the exhaust ports for carbon. He may also check the engine compression by applying a compression tester at the spark plug hole and cranking the engine. Certain problems, such as a cracked or porous crankcase (gear oil level drops rapidly, engine smokes badly and black oil oozes from muffler) may be detected during performance. Most internal faults, however, require disassembly and careful parts inspection during overhaul.

8—3 CRANKCASE INSPECTION—ALL MODELS

1. During overhaul and before inspection, the crankcase castings should be cleaned to facilitate careful inspection. If the crankcase contains sprocket bearings, do not immerse the casting in solvent or the solvent may dilute the bearing grease.
2. Threaded screw or stud holes which have become enlarged or stripped, can be restored to original size by installing Heli-coil inserts. A Homelite Heli-coil Repair Kit, Part No. A-22920, containing sets of drills and taps,

Heli-coils, and special assembly tools, can be obtained for shop use.

3. Be sure all pressure line, actuator line, and idle line passages through the crankcase are clean and clear.
   a) Front-half crankcases of Models 5-30 and 7-29 contain an idle line passage which runs from the intake manifold register through the intake valve plate register face, into the engine. Carbon and gum sometimes restrict this passage. Clean with a piece of wire, if necessary, and blow passage clear.
   b) On Model 26 Saws only, the idle line connection is a 90° elbow fitted in the side of the front-half crankcase. The passage from this fitting enters the crankcase through the intake valve plate register. Clean the passage. Be sure the fitting is tight and elbow is neither stripped nor cross-threaded.
   c) On pressurized fuel tank Models, (26 and 5-30 without fuel pump), be sure the passage for the tank pressure line is clear.
   d) On all fuel pump equipped models, be sure the passage for the actuator line is clear.
4. The main bearing bore and the seat for the crankcase sealing gasket must be in perfect condition. If there are any rough, scratched, gouged or worn spots, or if the bearing bore is worn, replace the crankcase casting. A loose fit allows the bearing and the sealing gasket to rotate in the crankcase and gives the worn metal surfaces a "lapped" or shiny gray appearance. If this condition is apparent the crankcase and main bearing may both require replacement in order to obtain a press fit.
5. The surface for the cylinder gasket must be smooth and free of nicks, scratches, and burrs. The mating faces of two-piece crankcases should, likewise, be smooth and free of scratches, nicks, burrs and high or low spots, in order to mate perfectly. Bits of the old cylinder gasket should be scraped off with care. Deep scratches or nicks, especially those running all the way across, necessitate replacement of the damaged casting. If the damage is only slight, file off the burrs with a fine flat file. Remove all filings, then fill the low area with non-hardening type Permatex compound.
6. Models 26 and 5-30 have a bronze bushing, whereas the Model 7-29 has two needle bearings in the front-half crankcase.
   a) If the bronze bushing is badly scored or worn, replace the front-half crankcase (5-30 and 26). If you reuse the original casting during overhaul, install a new garlock seal (rubber lip inward) in the front-half crankcase. Use narrow end of Tool #23176 to install seal.
   b) Check the needle bearings in Model 7-29 front-half crankcase. The needles must be free. If the needles can be separated more than the width of one needle bearing, or if there is a flat visible on any needle, they are worn and the bearings must be replaced. (See Figure 8—1.) Use large end of Tool #23176 from inside crankcase to push out bearings and seal. See Special Tools, Section 10 for proper procedure to install new bearings and garlock seal in the front-half crankcase. When installing needle bearings, always press against the lettered end of the bearing race.

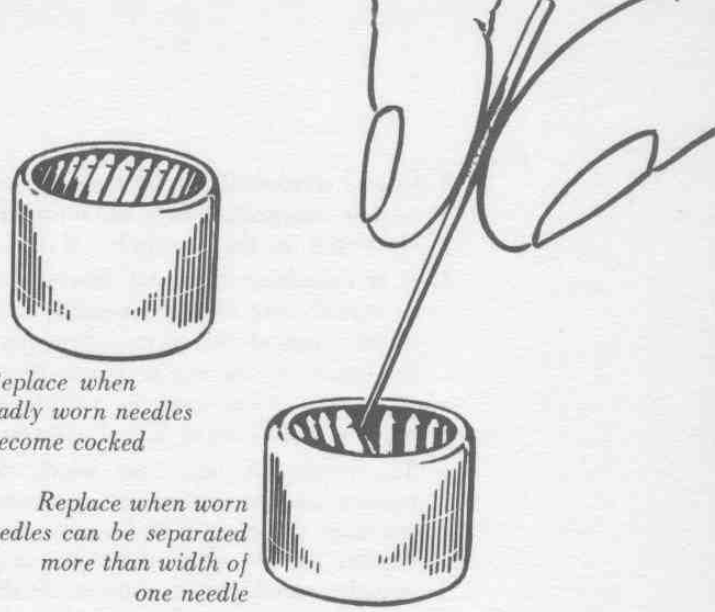


Figure 8—1 Needle Bearing Wear

8—4 CRANKSHAFT AND MAIN BEARING INSPECTION—ALL MODELS

1. Inspect the main bearing by rotating it on the crankshaft. If it is rough turning, or has excessive radial play (or "wobble"), or if there is any indication that the bearing has been turning in the crankcase, it must be replaced.
2. For bearing removal, pry the retaining ring from the crankshaft. Use Remover #A-23180 to pull the bearing from the shaft. Use the Special Tools and techniques shown in Section 10 to pull the new bearing onto the shaft. Then put the retaining ring back into the shaft groove. Be sure the ring is properly installed in the groove.

3. Inspect crankshaft for damaged threads, damaged or enlarged keyways, and for wear at spots mentioned in the remainder of this section.
4. It is especially important that the crankpin be entirely free of wear or galled spots. Look for first signs of wear on the side which receives the impact on the engine power stroke. Even slight wear at the crankpin indicates the shaft may fail before many hours' operation.
5. The crankshaft taper, on which the rotor mounts, must be undamaged. Any condition of the taper or keyway which causes the rotor to register too far up on the taper, or prevents straight assembly of the rotor on the shaft, may cause the rotor to hit the magneto coil core. If the saw has performed erratically, look for worn spots on the inside of the rotor where it may have been hitting the coil core. Assemble the rotor on the crankshaft taper. For proper fit, the rotor should be snug on the taper with the taper recessed slightly below the outer face of the rotor.
6. If the rotor and the crankshaft fit together properly, but the rotor does not turn true, the crankshaft may be bent. This condition is called "run-out". Shaft run-out up to .003" is allowable. The amount of run-out can be checked simply with the crankshaft installed in the crankcase. Fasten a dial indicator to one of the cylinder studs, and check for shaft run-out near or on the bearing surface. If a dial indicator is not available, a pointer of some sort can be substituted and a reading obtained with clearance gauges.
7. If the shaft has a considerable amount of run-out, it could result in damage to the seals. Unfortunately, however, many cases of leakage diagnosed as shaft failure, are actually the result of faulty bearing and seal installation.
8. Following inspection, the crankshaft and bearing should be assembled in the crankcase on Models EZ, 17 and 5-20 only.
   a) On Models EZ, 17 and 5-20 replacement crankcases have garlock seals installed. To change seal, see Special Tools, Section 10.
   b) Oil the crankcase sealing gasket and install it in the crankcase. (To assemble crankshaft in rear-half crankcase on Model 26, 5-30 and 7-29, See Paragraph 8—8.10.) Put garlock seal protecting sleeve (beveled end out) on shaft. Start the crankshaft and main bearing through the crankcase bore by hand.
   c) Use the special tools and techniques listed in Section 10 to pull the main bearing and shaft into the crankcase.
   d) Install main bearing retaining screws and lockwashers *NOW*. Use new screws and washers to lock bearing.

8—5 CYLINDER INSPECTION

1. Clean the cylinder both inside and out. If the cylinder is cracked, or if more than three or four of the critical cylinder fins are broken off, replace the cylinder.
2. Scrape carbon and gum deposits from the roof of the combustion chamber and from the exhaust ports. When scraping carbon, be careful not to damage the finely chamfered edges of the exhaust ports. Any flashing or carbon accumulation at the edges of the spark plug hole should be removed carefully, leaving a smooth edge. This will eliminate the problem of incandescence (prolonged burning of these foreign elements) which could cause pre-ignition.
3. If the cylinder is worn or badly scored, replace it. When the chrome has been scored or scratched through, the soft aluminum underneath wears rapidly, and sometimes cakes on top of the chrome. This condition gives the cylinder bore a rough, flaky appearance. Especially when the engine has had insufficient lubrication, aluminum from the piston is also deposited on the cylinder. Try to remove the aluminum with a rubber-impregnated grinding wheel on a ¼" electric drill. After removing the aluminum deposits, run a screwdriver tip over the cleaned surface. If the surface cannot be marked by the screwdriver, the chrome is intact, and the cylinder is usable.
4. If the engine is to be asembled with a new piston and cylinder assembly, check the fit of the piston in the cylinder before installing the piston rings. Insert the piston in the cylinder, (ring retaining pin facing away from exhaust ports.) To check fit of piston, invert the cylinder and observe how the piston slides out. If the piston does not fall freely, replace the piston or cylinder, whichever is out of size.

8—6 MUFFLER INSPECTION

Always be sure the muffler is not clogged, and the muffler element (if it uses one) is in good condition. A clogged muffler which retards evacuation of the exhaust gases prevents the engine from developing full power.

1. Some muffler assemblies on Model 26 engines do not contain a muffler element. The exhaust slot and the interior surfaces of this muffler must be kept clean. After cleaning be sure to remove all loose carbon particles before assembling muffler on engine.
2. All mufflers except on Model 26 assembly have a screen-type muffler element. Clean carbon from all parts of the assembly, and be careful to remove the loose carbon scrapings before reassembling.
3. Replace badly clogged, partially disintegrated, or blown out muffler elements. The engine can be damaged by bits of carbon or screen from the muffler.
4. Clean the muffler element retainers and be sure they are perfectly flat. Warped, buckled or blown out retainers will not keep the element in place.
5. On all assemblies using two element retainers, always sandwich the element between the retainers.

8—7 PISTON AND RING INSPECTION

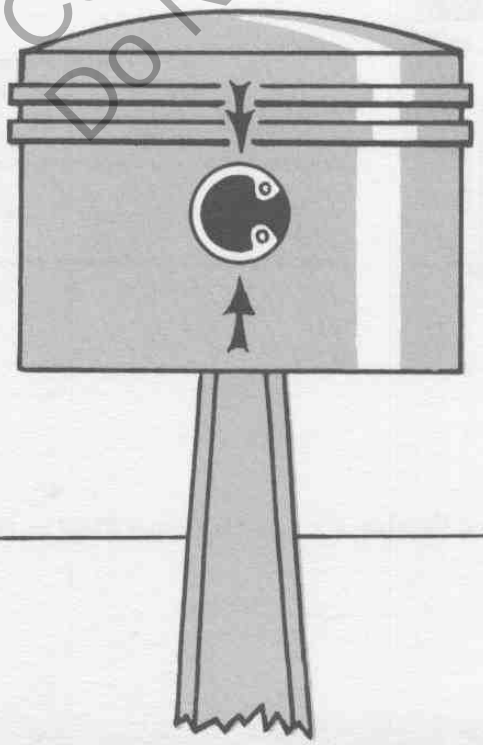
1. Before disassembling the piston and connecting rod, check for a snug fit between the piston and piston pin. (See Figure 8—2.) If there is any vertical (up and down) play, replace the piston and pin assembly.

NOTE

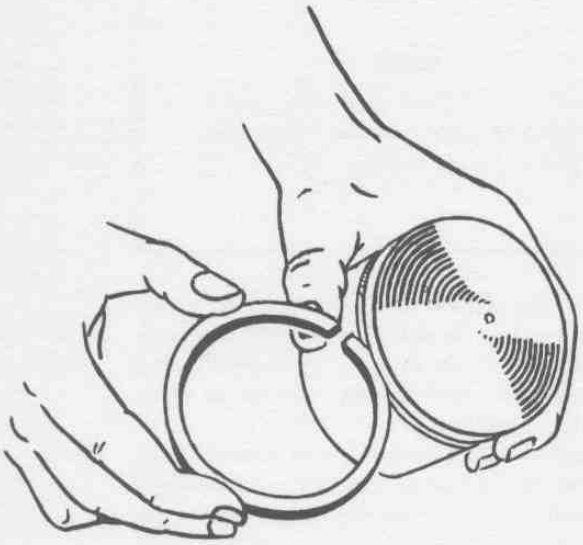
Check for vertical play again after completing inspection and reassembly of piston and connecting rod.

2. Piston rings should always be installed same-side-up, and in the same groove from which removed. Remove the piston rings carefully, and note which is which, with respect to their assembly positions.
3. Pistons become discolored and stained with use but should not be cleaned unless carbon is actually built up on the metal. Clean the piston ring grooves, then scrape off any hard carbon deposits built up on the piston dome or sides. (DO NOT USE A WIRE WHEEL.) Replace the piston if the ring grooves have been enlarged with wear.
4. Inspect the piston for cracks, wear, and also for holes in the dome. Air leaks, (usually from loose spark plug) directly into the firing chamber, cause lean operation and overheating. As a result, a hole is sometimes burnt in the top of the piston.
5. The piston's side walls should be smooth. Replace badly scored or worn pistons. Slight scoring at top or bottom does not matter unless the scratches are connected and permit a substantial amount of "blow-by".

Figure 8—2 Testing for Vertical Play between Piston and Pin



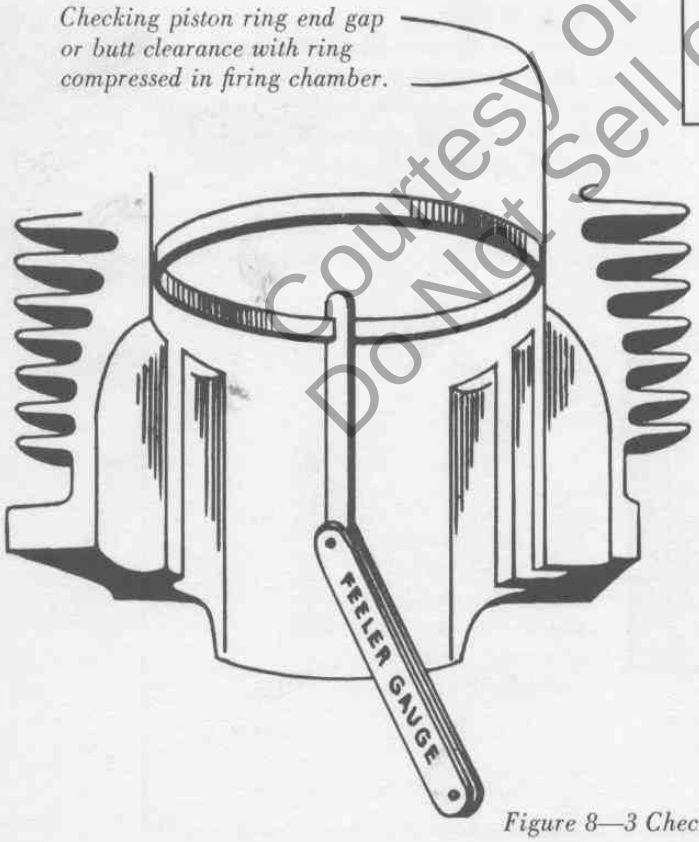
Push against the connecting rod. If you can see the piston pin move in direction of arrows, replace both piston and pin.



Check fit of piston ring in ring groove. Rotate ring around groove.

6. Rough sides of the piston indicate some of the aluminum may have rubbed off onto the cylinder. If this has occurred, replace the piston and test the cylinder to see whether the aluminum pick-up can be removed without marring the chrome. (See Cylinder Inspection, Section 8—5.)
7. Piston rings should not be cracked. They should be clean and smooth, the edges free of burrs, and the sealing surfaces smooth and unscored.
8. Inspect the piston ring retaining pin in the piston dome. Replace piston if the pin has worn thin at the ring grooves. (See Figure 8—4.)
9. Before assembling on the piston, the piston rings should be checked for wear by measuring the amount of end or butt play with the rings in place in the firing chamber. To do this, put ring in cylinder bore and use the piston to push ring to a position between the exhaust ports and the spark plug hole. Measure clearance between the butt ends of the rings with a feeler gauge. See Figure 8—3 for allowable amounts of butt clearance for each saw model.
10. Assemble each piston ring, same-side-up and in the same groove from which it was removed. Maximum clearances between rings and the side walls of the ring grooves are given in Figure 8—3.

Checking piston ring end gap or butt clearance with ring compressed in firing chamber.



Piston Ring
End or Butt Clearance

	17	5-20	EZ	26	5-30	7-29
Min.	.070″	.070″	.070″	.070″	.070″	.008″
Max.	*.080″	*.080″	*.080″	*.075″	*.075″	.018″

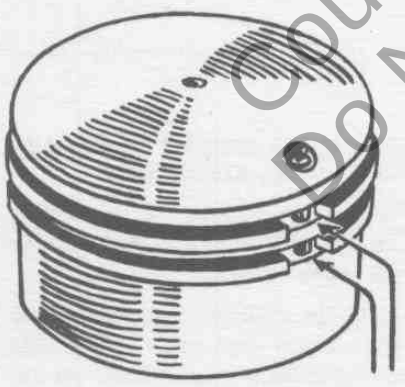
*Up to .100″ allowable

Figure 8—3 Checking Clearance of Piston Rings in Piston and Cylinder

8–8 CONNECTING ROD AND NEEDLE ROLLER INSPECTION

Two-piece construction connecting rods are used in all present model Homelite saws.

1. The connecting rod must not be bent, nor should the screw holes for the Allen Cap Screws be distorted.
2. Inspect the surfaces of the connecting rod and cap which, together, form the outer race for the needle rollers at the crank-pin. These surfaces must be smooth and free of wear. Inspect the formica thrust washers which are connected to the backs of the connecting rod journal. They must be smooth and completely bonded to the rod.
3. Clean the piston pin needle bearing in solvent and blow it dry. Inspect the needle bearing for signs of wear. If the needle rollers can be separated more than the width of one needle, or if there is flat visible on any needle, the bearing must be replaced. Oil and install the needle bearings in the connecting rod immediately after inspection.
4. After assembling connecting rod and piston assembly, install new snap rings to retain the piston pin. (Use #1 snap-ring pliers #22828). Be sure they are fitted inside the snap ring grooves of the piston.



If worn thin replace piston and pin.

Figure 8—4 Worn Piston Ring Retaining Pin

NOTE

On Models EZ, 17, and 5-20, which have one piece construction crankcases, the crankshaft and main bearing assembly must be installed in the crankcase before the connecting rod is connected to the shaft. (See Crankshaft Inspection.)

5. When overhauling unit always install new needle rollers. If any of the rollers are bent or have flat sides, they must be replaced. Always replace the needle rollers as a complete set.

CAUTION

Models EZ, 17, and 5-20 require 27 needle rollers in the crankpin bearing. Models 26, 5-30 and 7-29 require 31 needles. Always be sure not to leave any needles which may have dropped inside the crankcase during assembly or disassembly. Be sure the connecting rod is assembled with the exact number of rollers required for the engine model.

6. Homelite packages needle rollers in strips of 27 and 31 rollers respectively.
7. When installing the needle rollers, be sure the mating marks on the connecting rod and cap are aligned, and assembly is made with the intake side of the piston, (the side with ring-retaining pin) away from the exhaust side of the engine. If assembly is made with the open ends of the rings at the exhaust side, the assembled engine will start and operate, but the rings will catch in the exhaust ports. Severe damage will result.
8. Be sure the correct number of rollers, (27 for EZ, 17 and 5-20) (31 for 26, 5-30, and 7-29) have been assembled in the crankpin connection and that none of the rollers are overlapping one another. Use NEW Allen Cap Screws, tightened evenly, to secure the connecting rod and cap.
9. Test the operation of the connecting rod and crankshaft assembly to be sure none of the

rollers are binding or overlapping, and the action is free.

10. On Models 26, 5-30, and 7-29, the crankshaft, connecting rod and piston assembly should now be installed in the rear-half crankcase. Oil and install the crankcase sealing gasket. Then use the special tools and techniques shown in Section 10 to pull crankshaft and bearing into rear-half crankcase. Lock main bearing in position NOW. Use new bearing retaining screws and lock washers.

8—9 GOVERNOR & INTAKE VALVE ASSEMBLY (26, 5-30 & 7-29)

8—9.1 Inspection

The governor and intake valve assembly should be inspected before completing assembly of the crankcase.

1. Test the governor weight and spring mechanism by moving the weight back and forth. The assembly should not stick or bind at any point.
2. The governor assembly must be replaced if any of the following conditions exist:
   a) Face of intake valve assembly is badly worn or scored.
   b) Spring posts are loose or are visible on the valve surface.
   c) Governor pivot post beginning to wear through surface of valve.
3. If the governor intake valve face is only slightly worn or scored, it may be restored to usable condition by careful polishing. Use a surface plate such as a flat piece of glass. Cover the glass with fine emery cloth and lay the governor, face-down, on the emery. Keep pressure evenly distributed on the valve and vary the grinding pattern to obtain an even polishing job.
4. The governor wear plate (intake valve plate, formica) should not be scored or badly worn. If wear is slight it may be used again.
5. Whenever a new governor is installed, always use a new wear plate with it. Soaking the wear plate in oil for 24 hours prepares it for installation and assures flatness of this part.

8—9.2 Installing in Engine

> **NOTE**
> *Be sure crankcase is clean before installing intake valve wear plate.*

1. Oil the intake valve wear plate and locate it on the pins in the recess of the front-half crankcase. Be absolutely sure the plate is registered on the pins. Also be sure these pins do not protrude beyond the plate.
2. Hold the governor weight in open position and slide the governor on the shaft. Align the three springs with the three sockets in the crankshaft counterweight.
3. Hold governor in position on shaft. Put garlock seal protecting sleeve #22721 (See Special Tools, Section 10) on shaft, beveled end out, and slide the front-half crankcase assembly onto the shaft.
4. Push front and rear-half castings together. Be sure the register pins and holes are aligned. Secure crankcase halves with seven bolts and lockwashers.
5. Remove the garlock sleeve protecting sleeve.

8—10 REASSEMBLING ENGINE ASSEMBLY AFTER SERVICE—ALL MODELS

1. Apply a light film of grease to the sealing face for the cylinder and put the cylinder gasket on the studs.
2. Squirt oil onto the cylinder walls. Compress piston rings in piston ring grooves and slide cylinder straight down over piston. Be careful not to twist or bend the connecting rod.
3. Lock cylinder to crankcase with four cylinder nuts and lockwashers, tightened alternately and evenly on studs.
4. Continue assembly of saw unit by following steps of Assembly Guide, Section 9.

Section 8

ENGINE SERVICE SUPPLEMENT

This supplement contains basic construction and internal inspection information on saw models which have been produced since publication of this Service Manual.

• • • • • • • • • • • • • • • • • •

8—11 BASIC ENGINE CONSTRUCTION

(Supplement to Section 8—1)

8-11.1 The basic frame of Model 4-20 is a one-piece die casting which includes both crankcase and gear case. Internal inspection of the Model 4-20 is the same as that for the Model 17, which has been covered in Section 8.

8-11.2 The basic frame of Model EZ-6 is the same as that of the Model EZ. However, Model EZ-6 crankcases have an Oilite bushing installed in the crankcase, and do not contain garlock seals. Oilite bushings are factory installed, integral parts of service crankcase assemblies and are not available separately. Crankshafts in EZ-6 units with seven-digit serial numbers are thicker on the clutch end than the shafts used in units bearing six-digit numbers. As a result, units with this thicker shaft also have a larger bore crankcase assembly, larger I.D. clutch cover and spider, and larger I.D. main bearing and snap-ring. (See Parts List #23218-2.)

Bearing adapter #23138-1 must be used for main bearing assembly on the *thicker* type shaft. Adapter #23138 is still used on the *thinner* shaft and bearing assembly. (See Section 10.)

8-11.3 The basic frame of the Model 6-22 Chain Saw is the same as that of the Model 5-20 except that crankcase construction varies according to the diameter of the crankshaft used in the 6-22 unit assembly. (See below.)

1. Service crankcases for 6-22 Saws *below* serial number 758245 have garlock seals installed back-to-back in the crankshaft bore. (See instructions in Section 10 on use of tools #22830 and #22831 to assemble the main bearing and crankshaft and install the assembly in the crankcase: use bearing adapter #22820 and seal protecting sleeve #22819.) (See Section 10.)

2. Model 6-22 Saws with six-digit serial numbers above 758245, or with seven-digit serial numbers have a thicker crankshaft than those of earlier manufacture. Service crankcases for this group have a single new type garlock seal which contains a "garter" spring. (See parts list #23210-1.) Special Tool #23233, Sleeve #23232, and bearing Adapter #22820-1 must be used for crankcase seal, main bearing, and crankshaft installation in this group of units. (See EZ-6—6-22 Tool Board Extension, Section 10.)

Section 9

ASSEMBLY GUIDE

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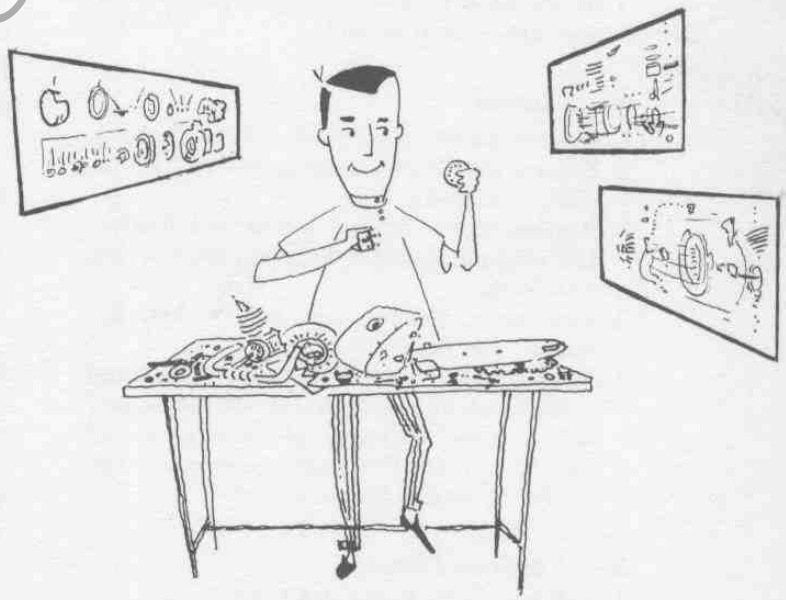


This Section is intended as a guide only, in disassembling and assembling the various saw units. Always refer to the other Sections of the Manual where disassembly and disassembly techniques are thoroughly covered in conjunction with detailed inspection routines.

9–1 DISASSEMBLY–MODEL EZ

9–1.1 Drive Case

1. Remove two 3/8-16 nuts, washers and drive case cover assembly. Remove chain, guide bar and the two guide bar plates.
2. Remove the flex-lock nut, flat washer, thrust washer, sprocket and drum assembly, inner race and thrust washer.
3. Pull clutch assembly with puller #A-23131. Remove two clutch keys and the clutch cover.

9–1.2 Fuel System

1. Remove the air cleaner adapter, adapter gasket and air elbow gasket held by two sets of screws.
2. Remove carburetor shield.
3. Close fuel shut-off valve, then remove fuel line.
4. Remove the 10-32 screw, loosen the two 1/4-20 hex head screws, and lift the fuel tank off the unit.
5. Remove governor spring from unit.
6. Remove three 10-32 screws, which hold carburetor and reed valve assembly (with gasket) to unit. Unhook governor arm from throttle shaft lever while removing reed valve and carburetor from unit.

9–1.3 Starter

1. Remove starter pulley cover and starting cord.
2. Remove four fillister head screws and lift off pulley and plastic shim.
3. Remove screws holding screen and bracket. Lift off screen and bracket, with recoil spring and cover.
4. Lock rotor. Remove nut, lock washer, flat washer, and thrust washer.
5. Remove three 1/4-20 flat head screws and countersunk lock washers. Lift off ratchet and hub assembly. Remove two inner races and thrust washers. Put inner races back into ratchet to protect bearings.

9–1.4 Ignition System

1. Pull rotor with Puller #AA-22560.
2. Remove cylinder shield.
3. Disconnect high-tension lead from spark plug, and remove the spark plug and gasket.
4. Remove handle bar, rubber cushion and clamp.
5. Remove six 10-32 screws and lift back plate and air shroud off engine. (Be sure governor arm has been disconnected.)

9–1.5 Engine

1. Remove heat damper.
2. Remove four 1/4-28 hex nuts and washers holding cylinder to crankcase. Lift cylinder with gasket off engine.
3. Use Allen wrench #22220 to remove Allen cap screws. Remove upper half connecting rod with piston and connecting rod cap. Be sure to recover all 27 of the needle rollers.
4. Remove two main bearing retaining screws and washers.
5. Press or tap crankshaft from crankcase. Remove crankcase sealing gasket.

9–2 ASSEMBLY–MODEL EZ

9–2.1 Engine

1. Oil and install a new crankcase sealing gasket.
2. Pull crankshaft and main bearing into crankcase. Use special tools to protect seals and insure straight assembly. (See Section 10.)
3. Use new retaining screws and lockwashers to lock main bearing in crankcase.
4. Assemble connecting rod and piston assembly to crankshaft. Use new set of (27) needle rollers and new Allen cap screws in connecting rod.
5. Assemble cylinder gasket and cylinder to crankcase.
6. Fasten heat damper over muffler.

9–2.2 Ignition

1. Install back plate and air shroud assembly, with gasket, to crankcase.
2. Assemble rubber cushion, handle bar, and clamp to engine.

3. Install spark plug with gasket in cylinder, and connect high tension lead to spark plug.
4. Start rotor onto crankshaft taper by hand. Use steel washers, sleeves from ball drive assembly, and shaft nut to draw rotor securely onto shaft taper.

9–2.3 Starter

1. Put steel thrust washer, and inner races on shaft. Slide ratchet and hub assembly (with formica washer) on shaft over races. Put steel thrust washer, flat aluminum washer, lockwasher and nut on crankshaft. Lock rotor and tighten shaft nut.
2. Fasten ball drive assembly to rotor with three countersunk lockwashers and large flat head screws.
3. Assemble air screen and bracket assembly (with recoil spring) to air shroud.
4. Add shims for 1/32″ minimum clearance between starter pulley and spring housing. Fasten pulley to ball drive hub.
5. Wind starting rope on pulley; wind two more turns tension on pulley and push pulley cover onto air screen.

9–2.4 Fuel System

1. Lock throttle lever (in pistol grip) in full throttle position to insure correct position for carburetor installation. Fasten reed valve and carburetor assembly with gasket to engine and, *at same time*, hook governor arm through upper hole of throttle stop lever. (Be sure reed valve adapter is not locked or binding, before tightening screws.)
2. Hook large loop of governor spring through lower hole of throttle stop lever. Open end of hook must face away from carburetor or the spring will wear. Connect other end of spring to governor adjusting slide.
3. Assemble fuel tank on engine.
4. Install air cleaner adapter and gaskets between carburetor and fuel tank.
5. Assemble carburetor shield and cylinder shield to engine.

9–2.5 Drive Case

1. Put clutch cover on crankshaft, fit the clutch keys into the keyways (snug fit), fit clutch assembly on shaft over keys. Then add steel thrust washer, inner race, sprocket and drum, thrust washer, flat washer and flex-lock nut. Lock shaft to tighten nut.
2. Assemble inner guide bar plate, guide bar and chain, outer guide bar plate and drive case cover. Hold with lockwashers and nuts on studs. Adjust chain tension; then lock assembly in place.

9–3 DISASSEMBLY–17 and 5-20

9–3.1 Remove Chain and Bar

1. Remove nuts and washers. Relieve tension, lift off adjusting plate, and remove chain, guide bar and shim.

9–3.2 Remove Pistol Grip

1. Remove three screws on right side of grip and one holding carburetor guard to air shroud. Depress throttle trigger and lift pistol grip and carburetor guard of unit.

9–3.3 Remove Fuel Tank

1. Remove two elbow-to-carburetor screws.
2. Disconnect oil line at fuel tank.
3. Remove screw from tank to gearcase.
4. Close the fuel shut-off valve and disconnect fuel line at shut-off valve.
5. Remove pressure line from carburetor to crankcase.
6. Loosen two hex head screws at base of tank, and lift tank off unit.

9–3.4 Remove Starter

1. Remove pulley cover.
2. Remove starting cord.
3. Remove starting pulley and plastic shims.
4. Remove screws holding air screen and bracket assembly and handle bar bracket to air shroud.
5. Remove handle bar, clamp and rubber cushion. Lift air screen and bracket assembly with recoil spring off air shroud.
6. Remove shaft nut. Remove three large flat head screws and countersunk lockwashers. Lift ball drive assembly off shaft. If the inner races stayed on the shaft, remove them and insert them in ball drive to protect bearings.

9–3.5 Disassemble Ignition

1. Use puller #AA-22810 to remove rotor from crankshaft.
2. Remove cylinder shield, pull Sparky connector off spark plug and remove spark plug.
3. Remove 6 screws and lift backplate and shroud assembly just enough off engine to facilitate disconnecting governor spring from both governor slide and throttle stop lever.
4. After unhooking governor spring at both ends, lift backplate assembly, with backplate gasket, off engine.

9–3.6 Remove Carburetor and Reed Valve

1. Loosen three screws through reed valve adapter and lift carburetor and reed valve assembly, with gasket, off engine.

9–3.7 Disassemble Gearcase

1. Drain gearcase.
2. Remove gearcase cover and gasket.
3. Lock engine shaft and remove the flex-lock nut, clutch washer and clutch cover.
4. Pull clutch spider assembly with puller #A-23131.
5. Remove two clutch keys, thrust washer, clutch drum, bronze bushing and the remaining thrust washer.
6. Lock chain drive sprocket with Tool #22750. Remove sprocket lock nut, outer washer, sprocket and keys, inner washer and sprocket spacer.
7. Press sprocket shaft out of shaft bore carefully. If arbor press is not available use rawhide mallet.
8. Use #3 Pliers #22726 to remove the bearing retaining ring from sprocket shaft bore.
9. Use large end of Tool #22833 (See Section 10) to drive or press sprocket bearings and spacer from gearcase (only if replacement is necessary.)

9–3.8 Disassemble Crankcase

1. Remove four lock-nuts and washers from cylinder studs. Lift cylinder off engine. Remove cylinder gasket.
2. Use a 1/8" Allen wrench #22220 to unscrew the two connecting rod cap screws. Remove the connecting rod cap, needle rollers, and connecting rod and piston assembly from the crankshaft. Discard the Allen screws, since new ones should be used for reassembly. Make sure all 27 needle rollers have been recovered from the crankcase.
3. Remove the two main bearing retaining screws and lockwashers.
4. Press or knock out crankshaft from crankcase; use arbor press or rawhide mallet.

> **NOTE**
>
> *Perform other disassembly of unit in conjunction with parts inspection.*

9–4 ASSEMBLY–MODELS 17 and 5-20

9–4.1 Crankcase

1. Oil and install crankcase sealing gasket.
2. Pull main bearing and crankshaft assembly into crankcase. (See Section 10, Special Tools.)
3. Lock bearing and shaft assembly in crankcase with new lock-washers and retaining screws.
4. Assemble connecting rod and piston assembly to crankshaft. Use new set of 27 needle rollers and new Allen cap screws.
5. Assemble cylinder gasket and cylinder to crankcase.
6. Assemble heat damper on muffler assembly.

9–4.2 Gearcase

1. Assemble first bearing, bearing spacer, second bearing in sprocket shaft bore and lock with snap-ring. (See Section 10, Special Tools.)
2. Press sprocket shaft and driven gear assembly into shaft bore. Stake the four screws in place.
3. Put small spacer and inner washer on sprocket shaft and fit keys into sprocket shaft (tight fit). Slide chain sprocket on shaft over keys and put outer washer over sprocket.
4. Hold sprocket with Tool #22750 while putting flex-lock nut on shaft.
5. Put thrust washer, bronze bearing, clutch drum assembly and thrust washer on crankshaft. Fit clutch keys into crankshaft, assemble clutch spider and shoe assembly over keys, add clutch cover, washer and nut. Lock crankshaft to tighten nut.
6. Assemble gearcase cover gasket and cover to gearcase. Fill gearcase with gear oil.

9–4.3 Ignition

1. Assemble backplate gasket and backplate to crankcase.
2. Adjust contact point gap to .015" clearance.
3. Install spark plug with gasket.
4. Connect high-tension lead to spark plug and install cylinder shield over cylinder.
5. Start rotor onto crankshaft taper by hand.

9–4.4 Starter

1. Replace thrust washer, inner race, ball drive with formica washer, thrust washer, flat washer, lock washer, and nut.
2. Fasten ball drive to rotor with three pan head screws. (Rotate hub: make sure it is free.)
3. Lock rotor and tighten nut securely.
4. Assemble air screen to air shroud, fasten rubber cushion, handle bar and clamp to unit, fasten brace assembly to air screen.
5. Fasten pulley to ball drive hub using shims for 1/32" minimum clearance between spring housing and starter pulley.
6. Install starter cord, use only two turns tension on starter cord. Fasten pulley cover to air screen assembly.

9–4.5 Fuel

1. Connect governor arm to throttle stop lever, hook governor arm spring to governor slide.
2. Fasten reed valve and carburetor assembly to crankcase.
3. Install Fuel Tank. Connect fuel line (and pressure lines to HP type carburetor).
4. Assemble pistol grip.
5. Fasten bar and chain and adjust tension.

9–5 DISASSEMBLY–26, 5-30 and 7-29

9–5.1 Remove Chain, Guide Bar, Adjusting Device and Shim

9–5.2 Remove Fuel System– Models 5-30 and 7-29 ONLY

1. Remove three hex nuts, one lockwasher and long screw holding the carburetor guard and handle bar to drive case. Remove the carburetor guard.
2. Disconnect choke rod from choke lever, and loosen the set screw to free throttle wire from the throttle roller.
3. Remove two screws—air cleaner elbow to carburetor. Remove the two hex nuts holding pistol grip and fuel tank to crankcase. Remove pistol grip and air elbow with gasket, from the engine.
4. Disconnect oil line at fuel tank.
5. Close fuel shut-off valve. Disconnect fuel line at fuel tank.
6. Remove the screw—fuel tank to drive case. On early Model 5-30 saws with pressure tank, disconnect the pressure line at left side of tank. Lift fuel tank off unit.
7. Disconnect actuator line at carburetor. (Fuel pump equipped Models only.)
8. Remove the two manifold screws and lock washers, and lift the carburetor and manifold assembly, with manifold gasket, off the engine.

9–5.3 Remove Fuel System, Throttle Handle and Bracket Assembly–Model 26LCS ONLY

1. Disconnect left hand throttle rod.
2. Close fuel shut-off valve and disconnect flexible fuel line at tank.
3. Remove the flexible idle line between carburetor and carburetor swivel flange.
4. Remove screw and lockwasher holding carburetor guard to drive case.
5. Remove the two screws holding swivel handle bracket and fuel tank to crankcase. Remove carburetor guard and swivel flange. Remove handle and bracket assembly with carburetor guard attached.
6. Remove muffler assembly, held by three nuts and lock washers. Remove manifold and gasket from engine.
7. Remove screws through the two lugs on the left side of fuel tank and lift off tank.

9–5.4 Disassemble Drive Case– Models 26, 5-30 and 7-29

1. Remove the handle bar.
2. Remove dust guard. (5-30 and 7-29 only.)
3. Remove drive case cover and gasket.
4. Block shaft from turning, and remove clutch lock nut, flat washer and clutch cover.
5. Pull clutch spider assembly with the two inside screws of Puller #AA-22803. Remove two clutch keys.

> **NOTE**
>
> *When pulling clutch sprocket and drum assembly, turn the sprocket pulley continuously through at least four turns, so the drive belt will work itself off the pulley gradually.*

6. Use the two outside screws of Puller #AA-22803 to pull the clutch drum. (See above note.) Remove the drive belt.
7. Remove three screws and lock washers (near crankcase.) Free the drive case from the crankcase by tapping it lightly, and lift it off the unit.
8. Lock the chain drive sprocket with sprocket locking Tool #22750. Remove chain drive sprocket as follows:
   (a) On 5-30 and 7-29, remove flex-lock nut, sprocket spacer, outer flange, sprocket and two keys, inner flange and the remaining spacer.
   (b) On Model 26, remove shaft lock nut, slipper sprocket assembly and one key, and sprocket spacer.
9. Tap the sprocket shaft and pulley assembly from drive case with a rawhide mallet.
10. Use #3 Snap-ring Pliers #22726 to remove sprocket bearing retaining ring.
11. Use Tool #22692 from ignition side to push out sprocket bearings and spacer. If an arbor press is used, block hub of bearing bore carefully to avoid cracking drive case.

9—5.5 Disassemble Starter— Models 26, 5-30 and 7-29

1. Remove starter pulley cover and starting cord.
2. Remove the starter pulley with pin and plastic shims.
3. Remove four screws holding air screen to shroud. Lift the screen and bracket assembly off the unit.
4. Hold rotor from turning. Remove lock nut, lock washer, flat washer and thrust washer from crankshaft.
5. Remove the three flat head screws and countersunk lock washers from the ball retainer, and remove ball drive assembly, with formica washer, from the unit. If the inner races stayed on the shaft, remove and insert them in the ball drive to protect the bearings. Remove the remaining thrust washer.

9—5.6 Remove Ignition— Models 26, 5-30 and 7-29

1. Remove cylinder shield, disconnect high-tension lead from spark-plug terminal, and remove spark plug from engine.
2. Use Puller #AA-22560 to pull rotor from crankshaft.
3. Remove the spring washer and rotor key.
4. Remove lead clamp on rear of back plate. Disconnect ground lead from starting switch terminal. Pull the high-tension and ground leads through the grommeted hole in the back plate. Remove the rotor, cam and key. Remove the stator group, held by two screws and lockwashers.
5. Remove the remaining screw holding the back plate to the crankcase. Lift air shroud and back plate assembly off the unit.

9—6 ASSEMBLY—26, 5-30 and 7-29

9—6.1 Crankcase

1. Oil and install crankcase sealing gasket in rear half crankcase.
2. Assemble main bearing and crankshaft in rear half crankcase. (See Section 10, Special Tools.)
3. Fasten main bearing in place with lockwashers and retaining screws.
4. Assemble connecting rod and piston assembly to crankshaft.
5. Put governor on crankshaft.
6. Install wear plate in front half crankcase.
7. Assemble front half and rear half crankcase.
8. Fasten the cylinder gasket and cylinder to the crankcase.
9. Install spark plug gasket and spark plug.
10. Assemble muffler and heat damper to cylinder.

9—6.2 Drive Case

1. Assemble drive case to crankcase.
2. Install sprocket shaft bearing, spacers, second bearing and retaining ring in drive case.
3. Assemble sprocket shaft to sprocket pulley.
4. Press sprocket shaft and pulley into drive case.
5. Assemble spacer, flange washer, two keys, sprocket, second flange washer and nut on sprocket shaft.
6. Assemble spacer and bearings in clutch drum.
7. Place clutch drum on crankshaft; at the same time feed drive belt onto pulley and clutch sprocket.
8. Place keys in shaft keyways, assemble clutch, clutch cover, washer and nut on shaft.
9. Fasten drive case cover gasket and cover to drive case.

9—6.3 Ignition

1. Assemble back plate and air shroud to crankcase.
2. Fasten stator plate to back plate.
3. Connect ground lead to switch.
4. Connect high tension lead to spark plug.
5. Install cam key, cam, rotor key, spring washer and rotor on crankshaft.
6. Install thrust washer, inner races, ball drive, thrust washer, flat washer, lock washer and nut on crankshaft.
7. Fasten air screen to air shroud.
8. Assemble handle bar to unit and fasten handle bar bracket assembly to screen.
9. Assemble starter pulley, starting cord and pulley cover.
10. Install cylinder shield on unit.

9—6.4 Fuel System

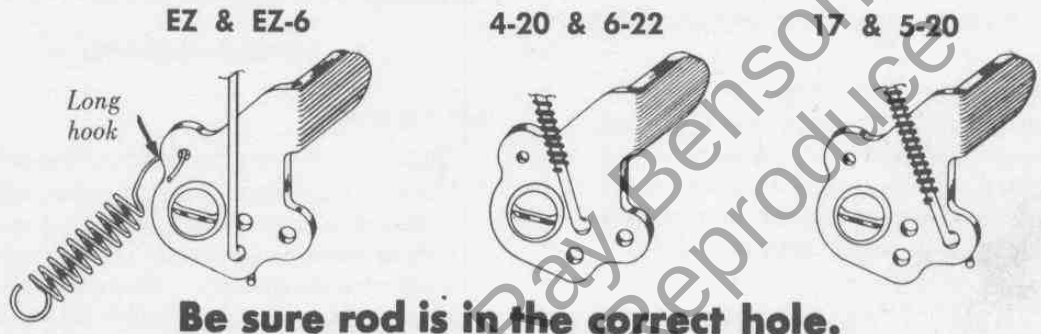
1. Fasten fuel tank to air shroud and drive case, oil line from tank to drive case.
2. Assemble dust guard to crankcase and drive case. (5-30 and 7-29 only.)
3. Assemble intake manifold and carburetor to crankcase, pump activator line to crankcase, fuel line to carburetor.
4. Fasten pistol grip to crankcase, choke rod and throttle shaft to carburetor. (On 26LCS assemble carburetor, swivel bracket and swivel handle.)
5. Fasten carburetor guard to crankcase and drive case.

9—6.5 Bar and Chain

1. Assemble guide bar and chain.
2. Adjust tension of chain on bar.

4-20, EZ-6, 6-22 ASSEMBLY GUIDE

Select the sketch which applies to saw.
Hook up governor as shown.



Be sure rod is in the correct hole.

Figure 9—1 Correct Governor-to-Stop Lever Hook-up on Models with 5-CS or HL-27B Carburetor

9—7 DISASSEMBLY AND ASSEMBLY MODEL 4—20

9—7.1 4—20 saws with six-digit serial number

Model 4-20 chain saws with six-digit serial numbers contain a pyramid reed valve and Brown 5-CS carburetor assembly, and a Wico magneto. The assembly and disassembly routines on these units are the same as given for Models 17 and 5-20. (See Sections 9—3 and 9—4.)

9—7.2 4—20 saws with seven-digit serial number

Model 4-20 chain saws with seven-digit serial numbers were produced in Gastonia, N. C. This production group has a covered type Phelon magneto and back plate assembly which is very similar to that of the 6-22 chain saw.

1. For Phelon Magneto service hints, see Section 6—11.
2. For disassembly and installation of backplate bearing and seals, see Special Tools. (Section 10.)
3. For remainder of disassembly and assembly, see Sections 9—3 and 9—4.

9—8 DISASSEMBLY—MODEL EZ-6

9—8.1 Drive Case

1. Remove drive case cover assembly, chain, bar and two guide bar plates.
2. Block the crankshaft from turning by inserting a rod or pin through the small hole in the

bottom of the air shroud to contact a rotor fin. Remove the flexlock nut, flat washer, thrust washer, sprocket and drum assembly, inner race and thrust washer.

3. Pull the clutch assembly with Puller #23131; remove two clutch keys and clutch cover. Remove the rod or pin used to block the shaft.

9—8.2 Fuel System

1. Remove the air cleaner adapter, adapter gasket and air elbow gasket, held by two sets of screws.
2. Remove carburetor shield.
3. Close fuel shut-off valve, then remove fuel line.
4. Remove the 10-32 screw, loosen the two 1/4-20 hex head screws, and lift the fuel tank off the unit.
5. Remove the governor spring from the unit.
6. Remove three 10-32 screws which hold the carburetor and reed valve assembly to unit. Unhook the governor arm from the throttle shaft lever while you remove the carburetor and reed valve assembly from the unit.

9—8.3

1. Remove starter pulley cover and starting cord.
2. Remove four fillister head screws and lift off pulley and plastic shim.
3. Remove screws holding screen and bracket. Lift off screen and bracket, with recoil spring and cover.
4. Lock rotor. Remove nut, lock washer, flat washer, and thrust washer.
5. Remove three 1/4-20 flat head screws and countersunk lock washers. Lift off ratchet and hub assembly. Remove two inner races and thrust washers. Put inner races back into ratchet to protect bearings.

9—8.4 Ignition System

1. Pull rotor with Puller #AA-22560.
2. Remove cylinder shield.
3. Disconnect high-tension lead from spark plug; remove spark plug and gasket.
4. Remove handle bar, rubber cushion and clamp.
5. Remove six 10-32 screws and lift back plate and air shroud off engine.
6. If needle bearing and seals must be removed from the backplate, follow instructions in Special Tools Supplement, Section 10.)

9—8.5 Engine

1. Remove heat damper.
2. Remove four 1/4-28 hex nuts and washers and lift the cylinder, with gasket, off the engine.
3. Use Allen wrench #22220 to remove two cap screws from connecting rod. Remove piston and connecting rod assembly plus the connecting rod cap and the needle rollers. Be sure to recover all 27 of the rollers.
4. Remove two main bearing retaining screws and washers.
5. Press or tap crankshaft from crankcase. Remove crankcase sealing gasket.

9—9 ASSEMBLY—MODEL EZ-6

9—9.1 Engine

1. Oil and install a new crankcase sealing gasket.
2. The EZ-6 crankcases contain an Oilite bushing —do not contain garlock seals. Use special tools to assemble crankshaft and bearing and insure straight assembly of the crankshaft into the crankcase. (See Supplement, Section 10.)

> **NOTE**
>
> *For seven-digit serial number saws, be sure to use Bearing Adapter #23138-1.*

3. Use new retaining screws and lockwashers to lock main bearing in crankcase.
4. Installation of new piston pin bearing, if necessary, should be made with Tool #23234. (See Section 10.)
5. Assemble connecting rod and piston. Use a new set of (27) needle rollers and new Allen cap screws; assemble piston and rod assembly on crankshaft.
6. Assemble cylinder gasket and cylinder to crankcase.
7. Fasten heat damper over muffler.

9—9.2 Ignition

1. If bearing and seals in backplate must be changed, refer to Special Tool Supplement for EZ-6 and 6-22. (Section 10.)
2. Install backplate and air shroud assembly, with gasket, to crankcase.

3. Assemble rubber cushion, handle bar and clamp to engine.
4. Install spark plug with gasket in cylinder, tighten completely and connect high tension lead to spark plug.
5. Start rotor onto crankshaft taper by hand. Use steel washers, sleeves from ball drive assembly and shaft nut to draw rotor securely onto the crankshaft taper.

9—9.3 Starter

1. Put steel thrust washer and inner races from ball drive on shaft. Slide ratchet and hub assembly (with formica washer) on shaft over the races. Put remaining steel thrust washer, flat aluminum washer, lockwasher and nut on crankshaft. Lock the rotor and tighten the shaft nut.
2. Fasten the ball drive assembly to the rotor with three countersunk lockwashers and large flat head screws.
3. Assemble air screen and bracket assembly (with recoil spring) to air shroud.
4. Add shims for 1/32″ minimum clearance between starter pulley and spring housing. Fasten pulley to ball drive hub.
5. Wind starting rope counterclockwise onto pulley; wind two more turns on pulley to set proper recoil spring tension and push pulley cover onto air screen.

9—9.4 Fuel System

1. Lock throttle lever (in pistol grip) in full throttle position to insure correct position for carburetor installation. Fasten pyramid reed valve and carburetor assembly, with gasket, to engine and, *at same time*, hook governor arm through the lowest position hole of throttle stop lever. Be sure assembly is perfectly aligned before tightening.
2. Hook large loop of governor spring—open end out—through the forward hole of throttle stop lever. Hook other end to governor adjusting slide. (See Figure 9—1.)
3. Assemble fuel tank on engine.
4. Install air cleaner adapter and gaskets between carburetor and fuel tank.
5. Assemble carburetor shield and cylinder shield to engine.

9—9.5 Drive Case

1. Put clutch cover on crankshaft, fit clutch keys into the keyways (snug fit), fit clutch assembly on shaft over keys. Then add steel thrust washer, inner race, sprocket and drum, thrust washer, flat washer and flex-lock nut. Lock shaft to tighten the nut.
2. Assemble inner guide bar plate, guide bar and chain, outer guide bar plate and drive case cover. Hold with lockwashers and nuts on studs. Adjust chain tension; then lock assembly at this tension.

9—10 DISASSEMBLY—MODEL 6—22

9—10.1 Remove Chain and Bar

1. Remove units and washers, relieve tension, lift off adjusting plate; remove chain, guide bar and shim.

9—10.2 Remove Pistol Grip

1. Remove three screws on right side of grip and one screw which holds carburetor guard to the air shroud. Depress throttle trigger and lift grip and guard assembly off the unit.

9—10.3 Remove Fuel Tank

1. Remove two elbow-to-carburetor screws.
2. Disconnect oil line at fuel tank.
3. Remove the tank-to-gear case screw.
4. Close the fuel shut-off valve and disconnect fuel line at valve.
5. Loosen two hex head screws at base of tank, and lift tank off unit.

9—10.4 Remove Starter

1. Remove pulley cover.
2. Remove starter cord.
3. Remove starting pulley and plastic shims.
4. Remove screws holding air screen and bracket assembly and handle bar bracket to air shroud.
6. Remove shaft nut. Remove three-large pan head screws and lift the ball drive assembly off the shaft. If the inner races stay on the shaft, remove and reinsert them in the ball drive to protect the bearings.

9—10.5 Disassemble Ignition

1. Use Puller #AA-22810 to remove the rotor from the crankshaft.
2. Remove cylinder shield; pull Sparky connector off the spark plug and remove the spark plug and gasket.

3. Remove 6 screws and lift backplate and air shroud assembly just enough off the engine to facilitate disconnecting the governor spring from both the governor slide and the throttle stop lever.
4. After unhooking the governor spring at both ends, lift the backplate assembly, with back plate gasket, off the engine.
5. If necessary, remove the backplate bearing and seals with Tool #22831. (See Section 10.) Work carefully from the magneto side.

9—10.6 Remove Pyramid Reed Valve and Carburetor

1. Loosen three screws through reed adapter spacer. Lift reed valve and carburetor assembly, with gasket, off the engine.

9—10.7 Disassemble Gearcase

1. Drain gear oil from gearcase.
2. Remove gearcase cover and gasket.
3. Lock the engine shaft and remove the flex-lock nut, clutch washer and clutch cover.
4. Pull clutch spider assembly with Puller #A-23131.
5. Remove two clutch keys, thrust washer, clutch drum, bronze bushing and the remaining thrust washer.
6. Lock the chain drive sprocket with Tool #22750. Remove sprocket lock-nut, outer washer, sprocket and keys; inner washer and sprocket spacer.
7. Press sprocket shaft out of the shaft bore carefully. If an arbor press is not available use a rawhide mallet.
8. Use #3 Pliers #22726 to remove bearing retaining ring from the sprocket shaft bore.
9. Use the 1-1/8 diameter end of Tool #23228 (See Section 10) to drive or press the old bearings and formica washer from the gear case. (Only if replacement is necessary).

9—10.8 Disassemble Crankcase

1. Remove four lock-nuts and washers from cylinder studs. Lift cylinder off engine. Remove the cylinder gasket.
2. Use a 1/8″ Allen wrench #22220 to unscrew the two connecting rod cap screws. Remove the complete piston and rod assembly (with connecting rod cap and all 27 needle rollers) from the crankshaft. Discard the old Allen cap screws, since new ones will be used for reassembly. Be sure all 27 needle rollers have been recovered from the crankcase.
3. Remove the two main bearing retaining screws and lockwashers and discard them.
4. Press or tap crankshaft from crankcase; use arbor press or rawhide mallet. Remove crankcase sealing gasket.
5. On units with six-digit serial numbers, push out the old garlock seals with large end of Tool #22831 applied from clutch side.
6. On units with seven-digit serial numbers only —use the small end of Tool #23233 to push out the single seal from the engine side toward the gear case side. Be sure the "garter" spring, which this type seal contains, has been removed with the seal.

NOTE

Perform other disassembly in conjunction with parts inspection.

9—11 ASSEMBLY—MODEL 6—22

9—11.1 Crankcase

1. Oil and install crankcase sealing gasket.
2. Install main bearing and crankshaft in crankcase.

NOTE

6-22 units with six-digit serial numbers below #758245 require use of bearing adapter #22820 for main bearing assembly; Tool #22831 to press seals from crankcase; Tool #22830 to press seals into crankcase; and seal protecting sleeve #22819 during crankshaft installation. (See Section 10.)

6-22 units from Serial #758245; also those bearing seven-digit serial numbers have a thicker diameter crankshaft, larger I.D. main bearing, and a new type garlock seal which contains a "garter" spring. To change seal and assemble shaft and main bearing in crankcase, see use of special tools #23233, 23232, and 22820-1. (Section 10.)

3. Use new lock washers and retaining screws to lock bearing and shaft assembly in crankcase.
4. Be sure to use a *new set* of 27 needle rollers

and *new* Allen cap screws when assembling piston and rod assembly to crankshaft.

5. Assemble cylinder gasket and cylinder to crankcase.
6. If muffler was disassembled, reassemble and fasten heat damper in place over muffler.

9—11.2 Gear Case

1. Install sprocket shaft and driven gear in gearcase. (See Transmission Supplement, Section 7, for notes and detailed instructions on installing sprocket bearing, shaft and gear components of either 3.57:1 or 2:1 gear ratio design.)
2. The four screws used to assemble the sprocket shaft and driven gear should be staked in place. (See Figure 7—2.)
3. Put the small spacer and inner sprocket washer on the sprocket shaft and fit keys into the shaft keyways. (Tight fit.) Slide chain sprocket on shaft, over keys, and put outer washer on shaft over sprocket.
4. Using Tool #22750 to lock the sprocket, tighten the flex-lock nut on the shaft.
5. Put thrust washer, bronze bearing, clutch drum assembly, and second thrust washer on crankshaft. Fit clutch keys into keyways. Assemble clutch spider and shoe assembly on shaft over the keys; add clutch cover, washer and nut. Lock rotor from turning—tighten the flex-lock nut.
6. Assemble gear case cover gasket and cover to gearcase. Fill gearcase with gear oil as recommended in Section 3—5.

9—11.3 Ignition

1. If necessary to install new backplate bearing and seals, see tools for Phelon magneto-equipped 6-22 in Section 10.
2. If magneto was disassembled, see Phelon Service Hints, Section 6—11.
3. Assemble backplate gasket and the backplate and air shroud assembly to the crankcase.
4. Adjust contact point gap to .015".
5. Install spark plug with gasket. (Spark plug gap must be .025".)
6. Connect high-tension lead to spark plug and install cylinder shield over cylinder.
7. Start rotor onto crankshaft taper by hand.

9—11.4 Starter

1. Slide thrust washer, inner race, ball drive with formica washer, thrust washer, flat washer, lock washer and nut on the shaft.
2. Fasten ball drive to rotor with three pan head screws. (Rotate hub: make sure it is free.)
3. Lock rotor and tighten the shaft nut securely.
4. Assemble air screen to air shroud; fasten rubber cushion, handle bar and clamp to engine; fasten handle bar brace assembly to air screen.
5. Using shims for 1/32" minimum clearance between spring housing and starter pulley, fasten pulley to ball drive hub.
6. Wind starter cord clockwise on pulley—use only two turns tension—fasten pulley cover to air screen.

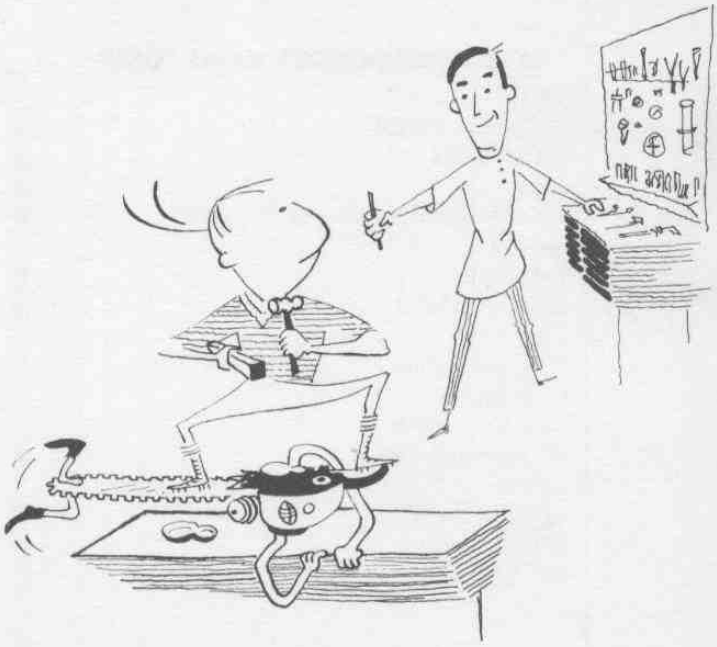
9—11.5 Fuel

1. Connect governor arm to throttle stop lever, hook governor arm spring to governor slide. (See Figure 9—1.)
2. Fasten pyramid reed valve and carburetor assembly to crankcase.
3. Install fuel tank. Connect fuel line from pump inlet to shut-off valve. Remove one screw from gear case cover and fasten fuel line to gear case with nylon clip installed under this screw head.
4. Assemble pistol grip to unit.
5. Mount bar and chain on unit and adjust chain tension.

Section 10

SPECIAL TOOLS & INSTRUMENTS

INDEX



Sections 10—1, 10—2, and 10—3 list various shop fixtures, hand tools and test instruments as a guide to the Dealer in equipping his service department for efficient, profitable operation. Although purchase of all this equipment is not necessary, the service-minded Dealer will want to keep most of it on hand to utilize his mechanics' time to the fullest extent.

• •

10—1 RECOMMENDED SHOP FIXTURES

Work Bench and Vise (with brass jaws)
Arbor Press (small)
Grinder and Wire Wheel
Power Arm
Compressor and Air Hose
Cleaning Tank
Parts Bins (36″ x 12″ x 6′ high)
Parts Drawers (for above bins)
Special Saw Tool Board (min. equipt. kit)
Chain Sharpening Vise
Chain Breaker and Anvils
Fastening Parts Drawers or Cabinet

10—2 RECOMMENDED TEST EQUIPMENT

Torque Wrench
Coil and Condenser Tester
Tachometer
Compression Tester
Engine Test Equipment
Ohmmeter (optional)

10—3 RECOMMENDED HAND TOOLS

Drills
- 3/8″ Electric Drill
- Set of Drills

Gauges
- Set of Feeler Gauges—.001″ to .025″

Hammers
- Ball Peen
- Rawhide Mallet

Pliers
- 6″ Combination
- 6″ Long Nose
- Vise Grip Pliers
- 6″ Diagonal Cutter

Punches
- 1/4″ Pin Punch
- Center Punch
- 5/8″ Chisel

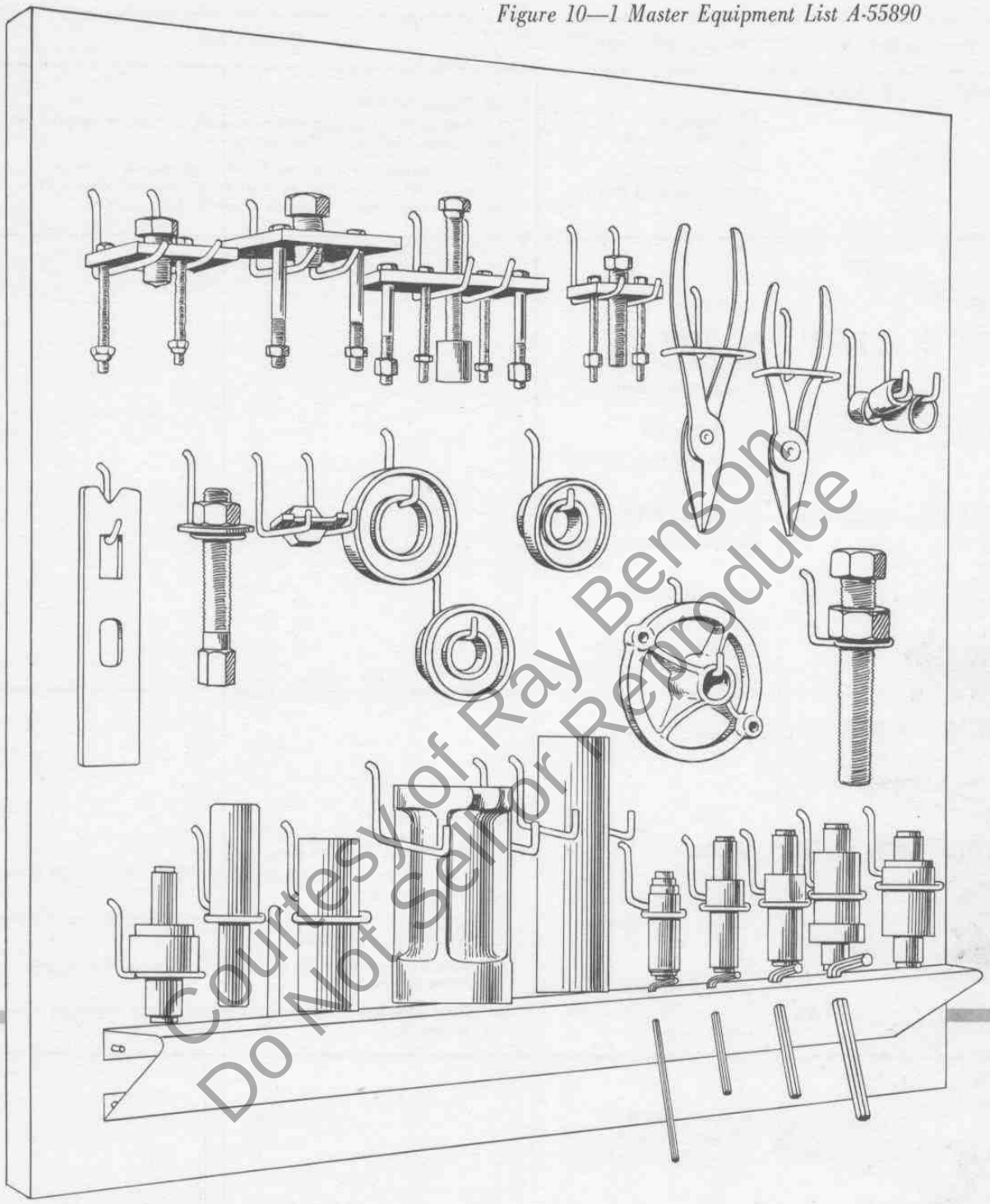
Screw Drivers
- Offset
- 5″ Screw Driver
- Screw Driver Set (3″, 6″, 7″, 10″, and 12″)
- 6″ Thin Blade x 3/16″ Dia.
- 3″ Thin Blade x 3/16″ Dia.

Taps:
- Tap Handle
- Tap Sizes: 6-32, 8-32, 10-32, 7/32-32, 1/4-32, 5/16-32, 1/4-20, 5/16-18, 1/8″ (pipe)

Wrenches
- Open End—Box (short handle)
- Sizes: 5/16″ (2), 3/8″, 7/16″ (2), 1/2″, 9/16″, 5/8″, 3/4″ and 7/8″.
- Adjustable 6″ Wrench
- Socket Wrench Set—3/8″ Drive:
- Ratchet w/3″ and 6″ Extensions (universal)
- 3/8″ Drive Socket Sizes: 5/16″ (thin wall) Deep, 3/8″, 7/16″, 1/2″, 9/16″, 5/8″, 3/4″, 7/8″, 13/16″.
- Set of Allen Wrenches

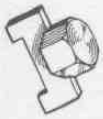
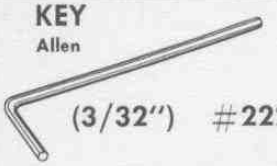
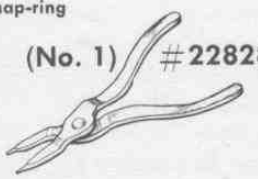
Piston Ring Expander
Piston Ring Compressor
Hack Saw
Set of "EZ-Outs"
Main Bearing Puller

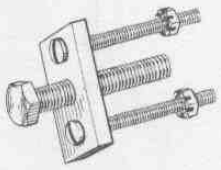
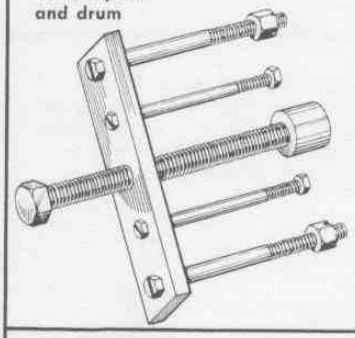
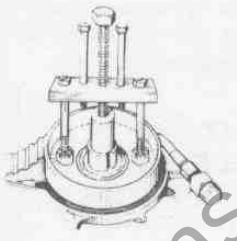
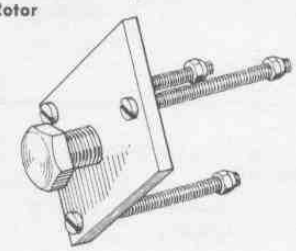
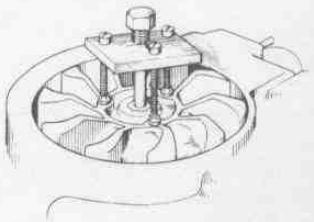
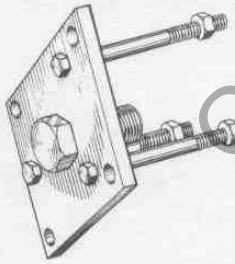
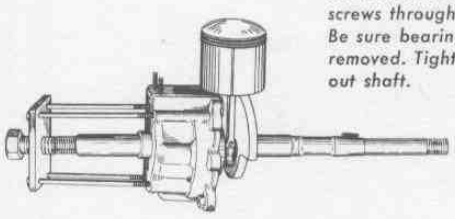
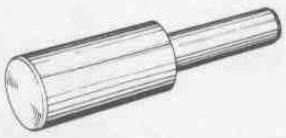
Figure 10—1 Master Equipment List A-55890



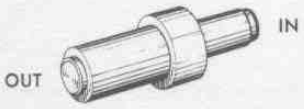
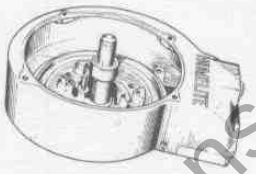
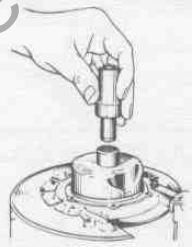
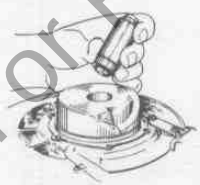
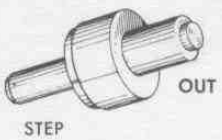
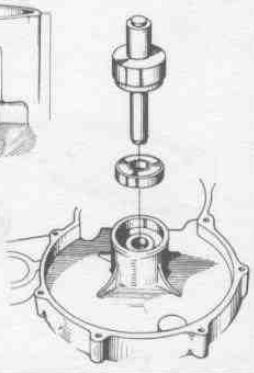
10—4 MASTER EQUIPMENT KIT TOOLS (Required for Dealer Service)

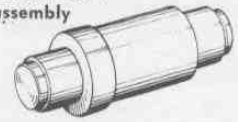
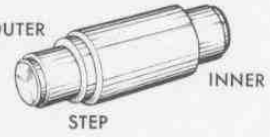
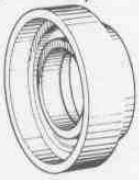
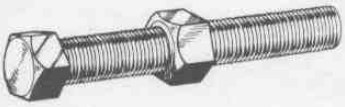
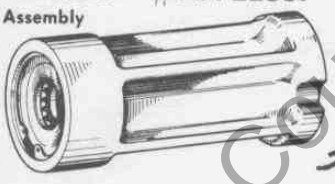
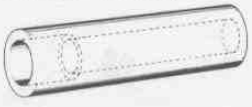
This Section illustrates and describes the use of the Special Service Tools contained in the Master Equipment List for Homelite Chain Saw Dealers. Manufactured by Homelite, these tools are necessary for the efficient repair of Homelite Chain Saws. Accordingly, each dealer is set up with a kit of these tools at the time he becomes a Homelite Dealer.

Tool Name & Part No.	Where—How Used	Procedure
ADAPTER #AA-22224 Ball drive 	**17, 5-20, EZ** **26, 5-30, 7-29** Adapts torque wrench to ball drive.	*TO CHECK TORQUE* *1. Remove two opposing screws in starter pulley. Fit adapter into screw holes. Block shaft from turning.* *2. Place torque wrench on the ¾" drive of adapter and exert steadily increasing pressure on wrench until the ball drive slips. Reading on dial indicates torque at which slipping occurs.*
KEY Allen 		
(3/32") #22221	**ALL SAWS** Ball drive tension screw adjustment.	
(1/8") #22220	**17, 5-20, EZ** Conn. rod cap screws.	
(5/32") #22126	**26, 5-30, 7-29** Conn. rod cap screws.	
(7/32") #22965	**BRUSHCUTTER** Cap screws in handlebar bracket, upper and lower heads.	
PLASTIC GAUGE  		
(.015") #22486	**17, 5-20, EZ** Setting .015" contact point gap on Wico or Phelon magnetos.	*TO SET CONTACT POINT GAP* *1. Turn shaft until cam-follower rests on highest point of cam surface (just past breaking edge).* *2. Loosen fixed contact plate fastening screw. Insert correct thickness plastic gauge between points.* *3. Move fixed contact plate until points are snug around gauge, then tighten screw.* *4. Check gap with same gauge. Tightening screw sometimes changes setting.*
 		
(.020") #22969	**26, 5-30, 7-29** Setting .020" contact point gap.	
TOOL #22750 Sprocket locking 	Locks sprocket on all saws except direct drive models.	
PLIERS Snap-ring 		
(No. 1) #22828	**17, 5-20, EZ** Piston pin retaining ring.	
	ALL SAWS EXCEPT DIRECT DRIVES Compress sprocket shaft bearing ret. ring for ass'y or disass'y.	
(No. 3) #22726		

Tool Name & Part No.	Where—How Used	Procedure
PULLER #A-23131 Clutch spider 	**17, 5-20, EZ** Pulls clutch spider.	1. Thread the puller screws into the two holes in spider to depth of lock nuts (so puller bar is parallel to spider). 2. Tighten jackscrew to pull spider from shaft. 
PULLER #AA-22803 Clutch spider and drum 	**26, 5-30, 7-29** Pulls clutch spider and clutch drum.	 1. Pull spider as shown above (right). Use two inside screws of puller. 2. Use outside screws through holes in drum. Tighten jackscrew to pull clutch drum.
PULLER #AA-22810 Rotor 	**17, 5-20** Pulls rotor from tapered front end of shaft.	1. Thread screws to equal depth in rotor so puller plate is perpendicular to shaft. 2. Block rotor from turning. Be careful not to damage magneto leads. Tighten jackscrew to pull rotor. 
PULLER #AA-22560 	**EZ, 26, 5-30, 7-29** Pulls rotor from tapered front end of shaft. also on **26, 5-30, 7-29** Pushes crankshaft from rear half crankcase.	1. TO PULL ROTOR use three screws of puller same as shown above. 2. TO PUSH CRANKSHAFT FROM REAR HALF use four 3½" x ¼—20 screws through outer holes of rear half. Be sure bearing retaining screws are removed. Tighten jackscrew to push out shaft. 
REMOVER #22692 	**26, 5-30, 7-29** Removes sprocket shaft bearings and spacer. Assembles small, then large sprocket shaft bearing.	1. TO REMOVE (after removing retaining ring) use remover from starter side to push bearing and spacers from sprocket shaft bore. Block drive case carefully around bore to prevent breaking. 2. TO ASSEMBLE slide small bearing onto shaft of remover and press bearing into drive case. Drop spacer into drive case. Then use remover in same manner to press large bearing into drive case.

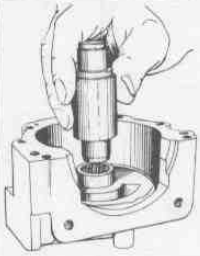
NOTE: In all cases where jackscrew butts against the crankshaft, screw shaft nut back on to protect end of shaft while using tool.

Tool Name & Part No.	Where—How Used	Procedure
TOOL #23139 **Sprocket bearing** 	**EZ** Press sprocket bearing out of drive sprocket.	*1. TO PUSH OUT use large end of tool.* *2. TO PUSH IN use small end, as shown, to push bearing into sprocket bore.* 
NOTE: When assembling bearings always push against the lettered end of bearing—never against the plain end.		
TOOL #22831 **Bearing assembly** 	**EZ, 17, 5-20** Press out back plate bearing and seals or crankcase seals, also press bearing into back plate (after assembling seals).	*1. TO PUSH OUT BACK PLATE BEARING use large end of tool from magneto side. (On wico magneto, have flat side of tool aligned with boss for contact plate pivot post.)*  *2. TO PUSH OUT SEALS FROM CRANKCASE use large end of tool from clutch side.* *3. TO PUSH NEW BEARING INTO BACK PLATE use small end of tool from the engine side. (Caution: first use tool #22830 to install both garlock seals).* 
TOOL #22830 **Garlock seal assembly** 	**17, 5-20, EZ** Press first seal into crankcase or back plate, also press second seal into crankcase or back plate.	 *FIRST SEAL IN BACKPLATE OR CRANKCASE* *1. Put closed side of seal on end of tool having wide step.* *2. Assemble in crankcase from clutch side or in back plate from engine side.* *NOTE: Seals may be assembled in backplate from magneto side if needle bearing is not to be disassembled.* *SECOND SEAL IN BACKPLATE OR CRANKCASE* *1. Put open side of seal on end of the tool with narrow step.* *2. Assemble in crankcase from the clutch side, or in backplate from engine side.* 
TOOL #22833 	**17, 5-20** Press out sprocket shaft bearings and spacers, also press in small, then the large sprocket shaft bearing.	*1. Use large end from sprocket side to push bearings and spacers from sprocket shaft bore (after removing snap-ring).*  *2. ASSEMBLE SMALL BEARING—use stepped end of tool to push small bearing in from gear side.* *3. ASSEMBLE LARGE BEARING—drop in spacers, then push large bearing into shaft bore with stepped end of tool.* 

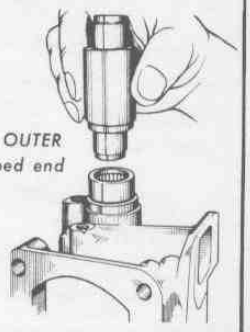
Tool Name & Part No.	Where—How Used
TOOL #23176 Garlock seal assembly 	**7-29** Press bearings and seal from front half crankcase or push seal into front half.
TOOL #23174 Needle bearing assembly 	**7-29** Press bearings into front half crankcase.
ADAPTER #22678 bearing assembly  **JACKSCREW #AA-22680**  **FIXTURE #AA-22557** Assembly 	**26, 5-30, 7-29** Pull main bearing onto crankshaft. **26, 5-30, 7-29** Pull shaft into rear half crankcase.
SLEEVE #22720  **TOOL #22764** Garlock seal assembly 	**26, 5-30, 7-29** Press seal into rear half.
SLEEVE #22721 	**26, 5-30, 7-29** Assembling crankcase Halves.

1. *TO PUSH OUT use large end of tool from inside crankcase to push out bearings and seal.*

2. *TO ASSEMBLE SEAL (after assembly of bearings) use small end of tool to push seal (open end in) into crankcase in front of outer bearing.*



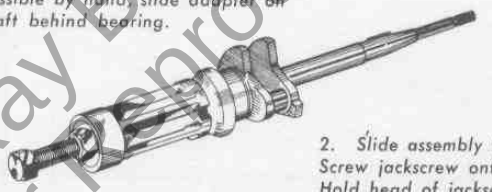
1. *TO ASSEMBLE OUTER BEARING use stepped end of tool.*



2. *To assemble inner bearing use non-stepped end of the tool from inside crankcase.*

TO ASSEMBLE BEARING ON SHAFT

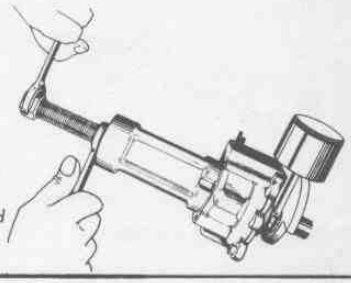
1. *Slide bearing on shaft as far as possible by hand, slide adapter on shaft behind bearing.*

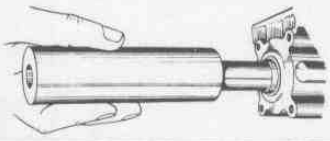


2. *Slide assembly fixture on jackscrew. Screw jackscrew onto end of shaft. Hold head of jackscrew from turning and tighten hex nut to pull bearing into place.*

TO PULL SHAFT INTO CRANKCASE

1. *Oil and install sealing gasket in crankcase.*
2. *Assemble main bearing retaining ring in shaft groove.*
3. *Start shaft through crankcase carefully—as far as possible by hand.*
4. *Attach fixture and jackscrew as above, and tighten nut to pull shaft and bearing into the rear half crankcase.*

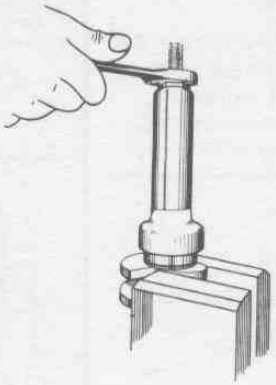
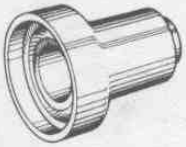
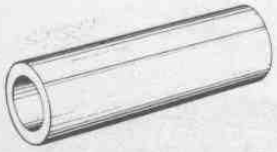
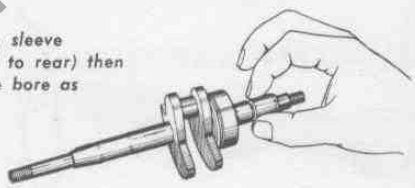
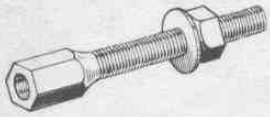
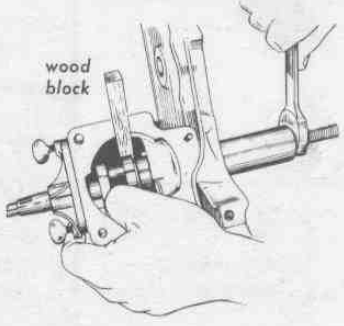
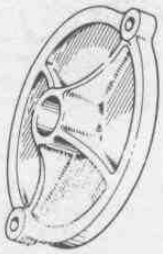




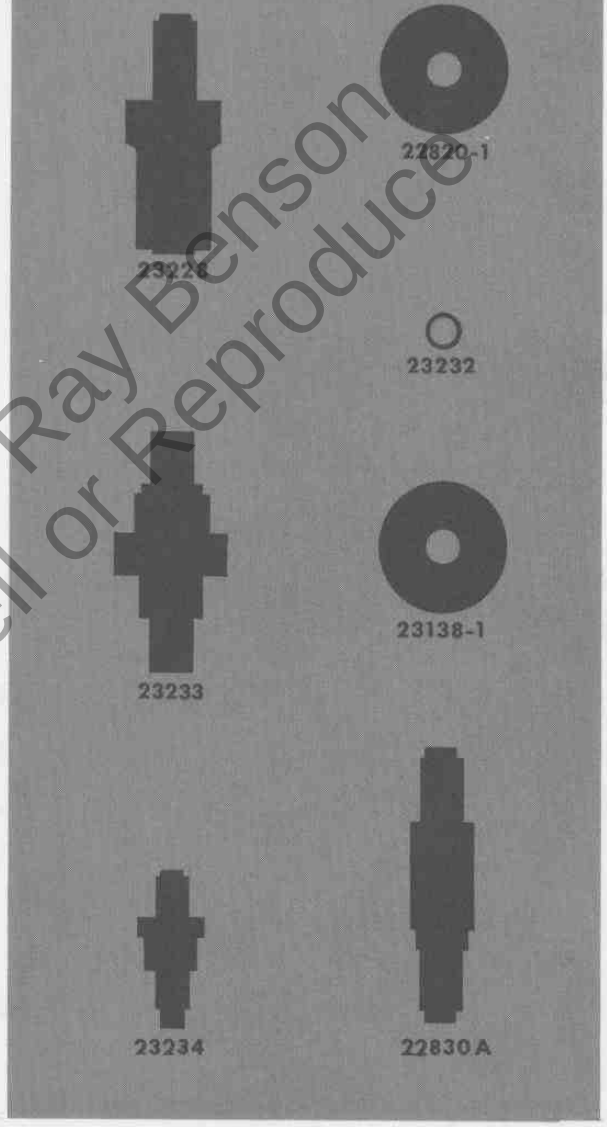
TO ASSEMBLE SEAL IN REAR HALF CRANKCASE

1. *Slide sleeve #22720, beveled end out, on shaft. Put garlock seal, open end toward crankcase, on the shaft and slide it past sleeve #22720.*
2. *Use large bore end of tool #22764 to press seal into crankcase. Remove tool and sleeve.*

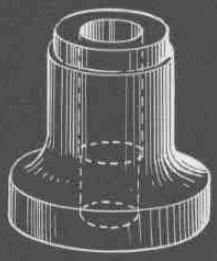
TO ASSEMBLE CRANKCASE HALVES slide sleeve, beveled side out, on magneto end of shaft. Slide front half crankcase on shaft carefully. After securing crankcase halves, remove sleeve from shaft.

Tool Name & Part No.	Where—How Used	Procedure
ADAPTER #22820 Main bearing 	17, 5-20 Pull main bearing onto shaft.	 *TO PULL BEARING ONTO SHAFT* *1. Slip bearing onto shaft as far as possible by hand. Slide recommended adapter on shaft behind bearing, and screw jackscrew onto shaft threads.* *2. Remove nut and washer from jackscrew and put assembling fixture body on jackscrew. Then put washer and nut back on jackscrew.* *3. Hold shaft at rear crankthrow in vise with brass jaws. Tighten hex nut to pull bearing onto shaft.*
ADAPTER #23138 Main bearing 	EZ Pull main bearing onto shaft.	
BODY #23136 Assembling fixture 	17, 5-20, EZ	*TO PULL SHAFT INTO CRANKCASE* *(After assembling garlock seal)* *1. Oil crankcase sealing gasket and place in crankcase. Assemble snap ring in groove behind bearing.* *2. Slide seal protecting sleeve #22819 on shaft (bevel to rear) then start shaft into crankcase bore as far as possible by hand.* 
JACKSCREW #A-23137 Assembly 	17, 5-20, EZ	*3. Slide aligning plate on magneto end of shaft and fasten plate to crankcase face with two 10-32 screws.* *4. Thread jackscrew on shaft, slide body on jackscrew. Put washer and hex nut on jackscrew.* *5. Use a wooden block at rear crankthrow to keep shaft from turning. Tighten hex nut to pull shaft and bearing into crankcase.*  *wood block*
SLEEVE #22819 Garlock seal assembling 	17, 5-20, EZ	
PLATE #22812 Crankshaft aligning  (10-32 thumb screws not furnished)	17, 5-20, EZ	

TOOL BOARD EXTENSION

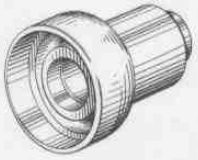
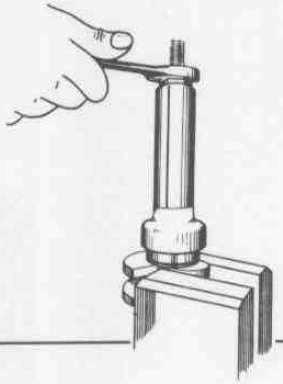
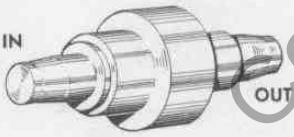
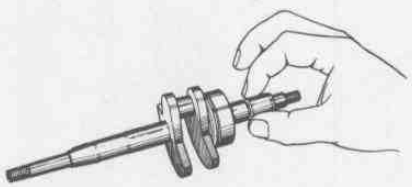


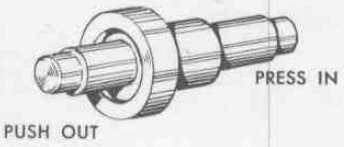
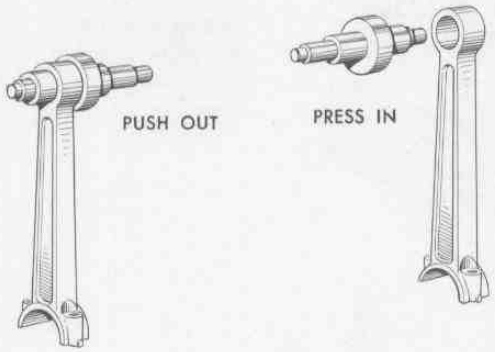
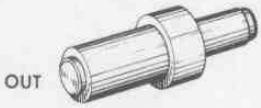
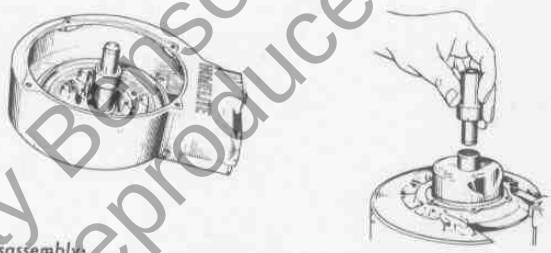
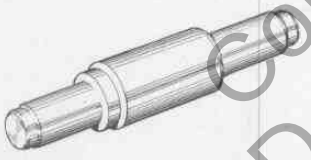
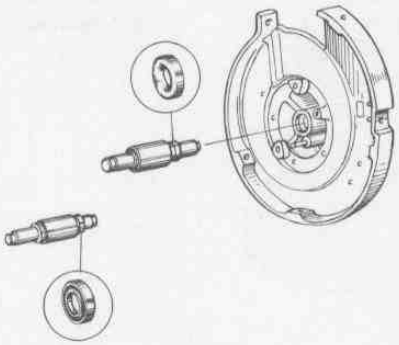
Part #23268



ANVIL 23267

(Not Part of TOOL BOARD EXTENSION)

Tool Name & Part No.	Where—How Used	Procedure
ADAPTER #23138-1 	EZ-6 Units with 7-digit, serial # *only*, pull main bearing onto shaft.	 *The Model EZ-6 wtih large O.D. shaft and large I.D. main bearing requires use of adapter #23138-1 (in place of 23138 which is used on EZ-6 units with 6 digit serial #'s).*
ADAPTER #22820-1 	6-22 from serial # 758245 up and all 7-digit serial #'s only, pull main bearing onto shaft.	*This adapter is of correct length for use in assembling the new large O.D. crankshaft and bearing on the Model 6-22. Use Body #23136 and jackscrew #A-23137 with this adapter. Note: See sleeve #23232 and tool #23233 (below) for use in installing garlock seal and crankshaft in crankcase of 6-22 units with 7-digit serial #'s.*
TOOL #23233 **Seal Assembly** 	6-22 w/7-digit serial #'s only. Remove old seal, install garter type seal.	*Disassembly:* *1. Use small end of #23233 from clutch side to push out old garlock seal.* *2. Clean and inspect crankcase bore.* *Assembly:* *1. Garlock seal #56134, used in these engines, contains a "garter" spring. Be careful not to dislodge this spring during assembly. Never strike the seal.* *2. Use the larger end of Tool #23233 to install the seal with lip facing toward main bearing.*
SLEEVE #23232 	6-22 w/7-digit serial #'s only. Protect crankcase seal during shaft installation.	 *3. Use protecting sleeve #23232 on crankshaft to protect seal during shaft installation.*

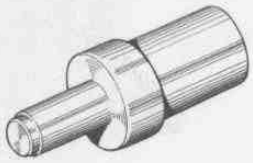
Tool Name & Part No.	Where—How Used	Procedure
TOOL #23234 **Bearing Assembling** 	EZ-6, 6-22 and other units with AA-55195 Connecting Rod. Remove or install needle bearing at wrist pin.	
TOOL #22831 **Bearing Assembling** **(For 17, 5-20 and EZ usage, see page 74)** 	EZ-6 and 6-22 Install backplate bearing.	 *Disassembly:* *Insert tool #22831 carefully from magneto side of back plate; push seals and bearing out of backplate. Tool must not be cocked or damage to bore will result.* *Assembly:* *1. Use small end of tool #22831 to press the needle bearing into EZ-6 or 6-22 backplate from engine side.*
TOOL #22830-A 	Install backplate seals on EZ-6, 6-22 and other units with covered Phelon magneto only. See note.	 *2. Use tool #22830-A from magneto side. Lubricate seals with "lubriplate" before installation.* *3. Assemble first seal—lip toward engine—with wide step end of 22830-A.* *4. Assemble second seal—lip away from engine—with narrow step end of 22830-A.*

NOTE

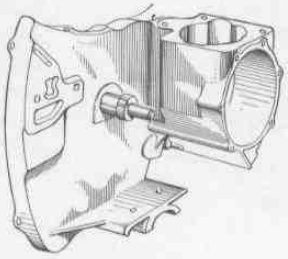
Backplates used with covered Phelon magneto have a small recess on the seal side and require use of tool #22830-A. Units with Wico or other type magneto require use of tool #22830.
(See instructions page 74).

Tool Name & Part No.	Where—How Used	Procedure

TOOL #23228
Sprocket Shaft Bearing



6-22 ONLY
Disassemble and assemble sprocket shaft and bearing assembly.

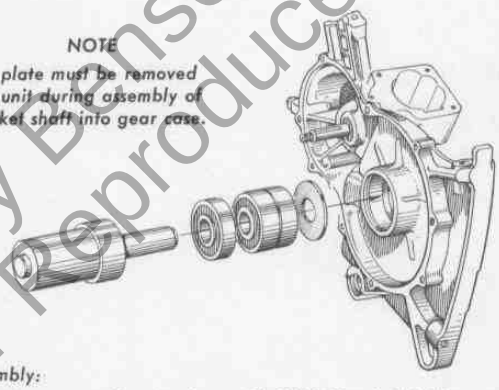


Disassembly:

1. *Remove chain sprocket; drive the shaft and gear assembly out of bearings.*
2. *Remove snap-ring with pliers #22726.*
3. *Use 1⅛" diameter end of tool #23228 to press old bearings from gear case.*
4. *Clean old grease from bearing bore.*

NOTE

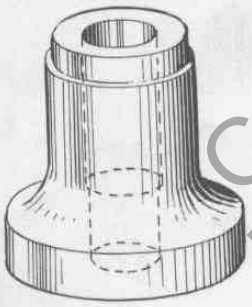
Back plate must be removed from unit during assembly of sprocket shaft into gear case.



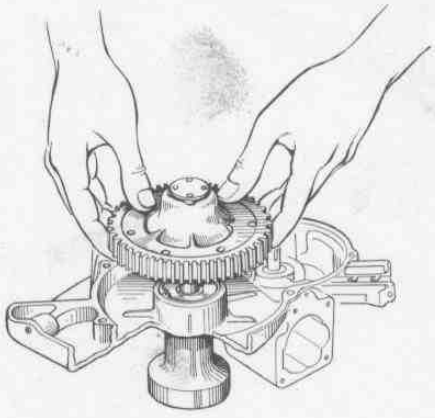
Assembly:

1. *Fill groove in bearing bore with RM4568 or Lubriplate grease; pack roller bearing cage with RM4568 or Lubriplate grease.*
2. *Slide ball bearing; completely assembled and greased roller bearing, and NEW formica washer onto small end of tool #23228. Press these parts into the bearing bore, remove tool #23228 and install snap-ring in groove.*
3. *Support gear case on Anvil #23267 and press sprocket shaft and gear assembly into bearings.*

ANVIL #23267



6-22 ONLY
Support gear case when installing sprocket shaft and gear assembly.



CAUTION

Do not attempt shaft installation without using Anvil 23267. Proper use of this tool keeps the inner race of the roller bearing from breaking the formica washer. After installation, always check formica washer for damage.

Section 11

CUTTING CHAIN & ATTACHMENTS

INDEX

11—1 CHAIN OPERATION

Properly maintained chain should cut smoothly and rapidly. The combination of depth gauge setting and manner in which the cutters are filed should produce a chain which feeds not only smoothly but willingly. That is, the chain should help feed itself into the wood to the degree that heavy operator pressure is not required for cutting. Such chain actually pulls itself away from the bar as it planes through the wood. This action, plus careful tension adjustment and frequent lubrication, keeps friction, heat and wear to a minimum, and lengthens the life expectancy of the entire saw unit. Very often, faulty chain maintenance lies behind chronic failure such as persistent drive belt breakage. Failure, in these cases, ceases when the owner learns to maintain his chain properly.

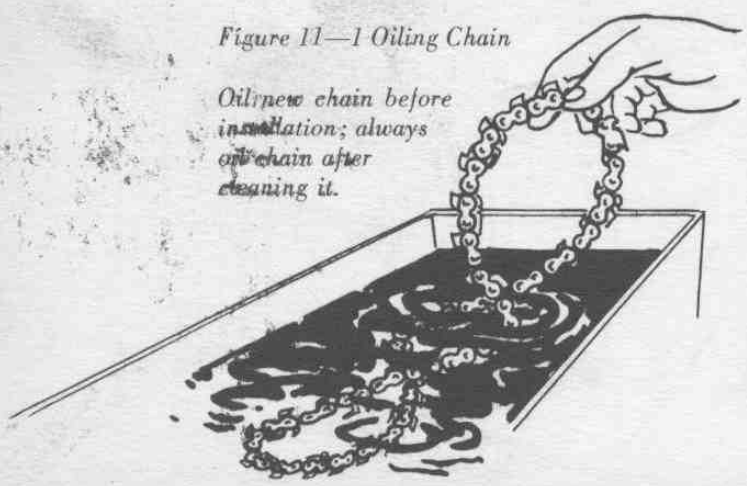
11—2 TEST UNITS BY CUTTING WOOD

Wherever it is possible for the dealer or serviceman to do so, the unit should be tested by actually cutting wood with the saw. Testing engines by applying an artificial load on a test stand is recommended practice, but it will not prove how well the chain can cut wood.

Many times, after whipping the engine into top shape, the mechanic or dealer releases the unit to the customer, but neglects to impress upon him the importance of chain maintenance and filing to the life and performance of the whole unit. The customer who tries the unit out on the job, finds it cuts poorly and still seems to lack power (because of incorrectly filed chain) brings it back and accuses the mechanic of doing a poor engine job. Unless this customer is tactfully instructed to maintain his chain properly, he will sooner or later, trade his saw in for another make. For the dealer this is a great tragedy, since it takes ten times the effort to gain a new customer than it does to keep the old one satisfied.

Figure 11—1 Oiling Chain

Oil new chain before installation; always oil chain after cleaning it.



11—3 CHAIN MAINTENANCE

11—3.1 Chain Lubrication

1. Lubricate a new chain thoroughly before installing it on the bar. The chemical that appears on new chain, as taken from the package, is a rust preventive, not a lubricant.
2. See that chain oiler operates. Always operate the oiler with chain slowly turning, never at high speed.
3. Chain should be lubricated regularly and frequently during operation. Use oil freely for the first half hour to break-in a new chain. (See Figure 11—1.)

11—3.2 Keep Bar and Chain Clean

1. Do not run chain into the dirt while cutting.
2. Clean chain thoroughly and soak it in oil, every so often, to remove chain filings, dust, sawdust, and to prevent rust.
3. Clean guide bar groove periodically to remove sawdust, grime, and pitch.

11—3.3 Keep Chain Properly Tensioned

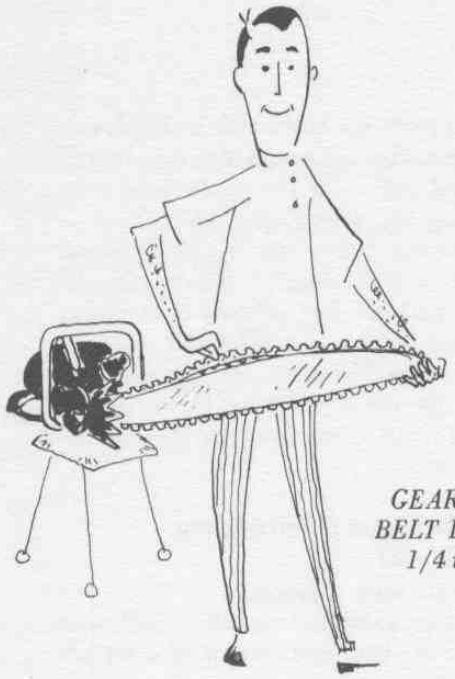
(See Figure 11—2.)

1. Chain tension on direct drive saw models should be set so the bottoms of the connecting links hang down about 3/16″ from the bar rail. (Or as shown in Figure 11—2.)
2. Tension on Homelite saws other than the direct drive models should be set so the connecting links can be pulled with ease about ¼″ away from the guide bar rails at a point midway along the top of the bar.
3. Too much tension wears the chain and bar excessively.
4. Hold tip of bar up while adjusting tension. This will keep the bar from shifting on the mounting studs and changing the tension. Hold bar in this upward position until the stud nuts have been tightened.

11—3.4 Maintain Proper Depth Gauge Setting and Shape

(See Figure 11—3.)

1. Always check depth gauge settings before using new chain. Original settings made by the manufacturer may not be adequate for the particular engine unit and work application.
2. Set depth gauge clearance according to engine power and type of wood to be cut. Set depth gauge clearance after every fourth or fifth sharpening.
3. Keep all depth gauges uniformly filed. Use an adjustable depth gauge or "GAUGIT" for accurate filing.



GEAR and BELT DRIVE 1/4 inch

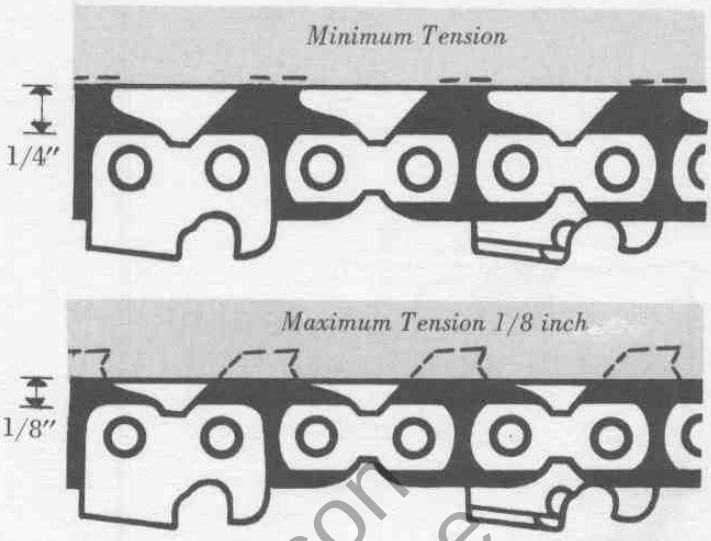


Figure 11—2 Maintain Proper Chain Tension

4. After filing to correct depth, round off the front third of the top edge on all gauges.

11—3.5 Keep chain sharp—file properly

1. "Chipper" and "Chamfer" type chains should be filed with a round chain saw file of proper diameter to match the pitch of the chain.

   7/16" Pitch chain requires 7/32" dia. file.

   1/2" Pitch chain requires 1/4" dia. file.

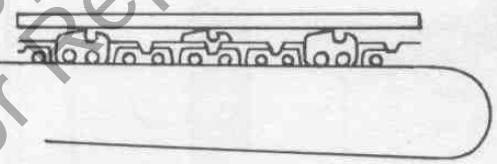
   9/16" and 5/8" Pitch chains require 9/32" dia. file.

2. Use of a file holder with 35° guide lines aids in filing equal top plate angles on both left and right cutters.
3. Hold file level and at a 35° angle to chain. Take an equal amount of strokes on each tooth to keep all teeth uniform. Use a straight filing motion. Do not allow the file to rock during the filing stroke. Control the filing so that approximately 1/5 of the file diameter remains above the top plate of the cutter. This technique will produce a hollow-ground cutter edge of most practical sharpness and durability. Keep the vertical (side plate) edges of the cutters vertical. (See Figure 11—4.)

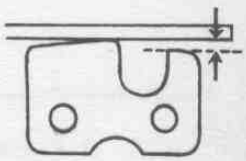
11—3.6 Maintain Proper Chain Parts Assembly

1. Be sure all replacement parts are of correct pitch and gauge. (Do not install #9 links in #10 chain, for example.)

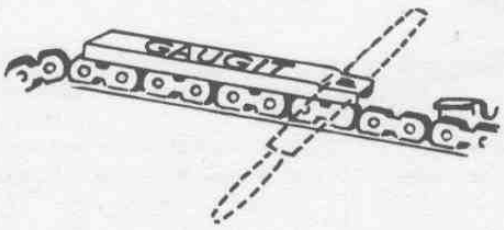
Figure 11—3 Setting Depth Gauge Clearances

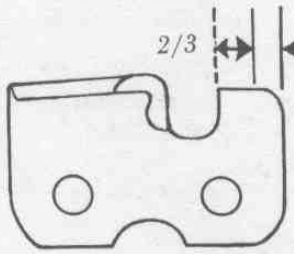


Check depth gauge setting



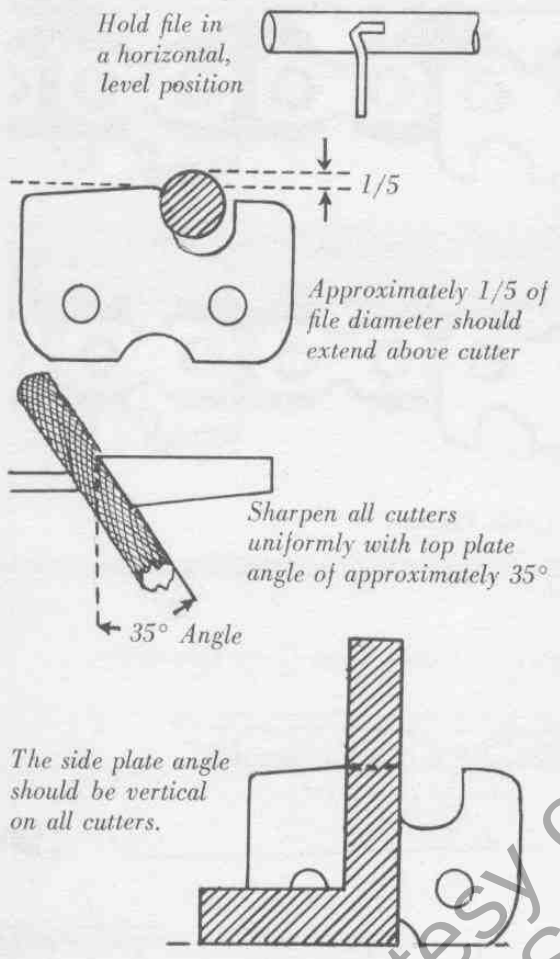
Use adjustable depth gauge or "Gaugit" and flat file.





Round off the front 1/3 of each depth gauge after setting clearance

Figure 11—4 Chain Filing Technique



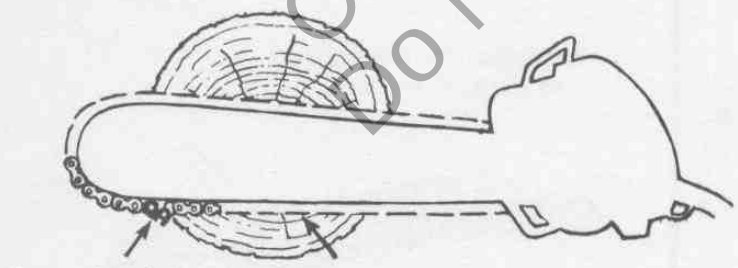
2. Be sure no parts are backwards or inside-out. Install connecting links with flat side in and the rounded side, with the countersunk rivet holes, facing out. (See Figure 11—5.)
3. Always use new rivets when repairing chain. Peen rivets over by tapping lightly with the ball of the hammer. Use as many light strokes as necessary to get a well-formed, rounded rivet head. (See Figure 11—6.) Do not overpeen or strike rivets with hard blows. Always check rivet joints after peening rivets—be sure none are tight.

11—3.7 Check Sprocket Periodically

(See Figure 11—6)

1. Discard badly worn sprockets.
2. If the sprocket exhibits more than slight wear at the time of chain replacement, also replace the sprocket.
3. Be sure the sprocket is correct for the chain being used.
4. On gear and belt-driven saws, the life of the solid sprockets may be prolonged by removing and reversing their position on the sprocket shaft. This technique does not apply to badly worn sprockets.

Figure 11—5 Tight Joints and How to Prevent Them



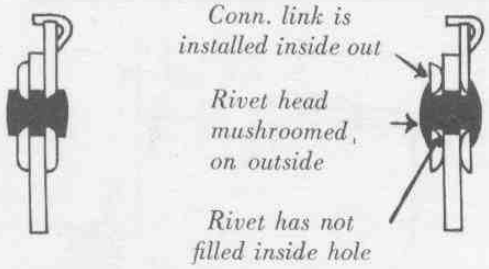
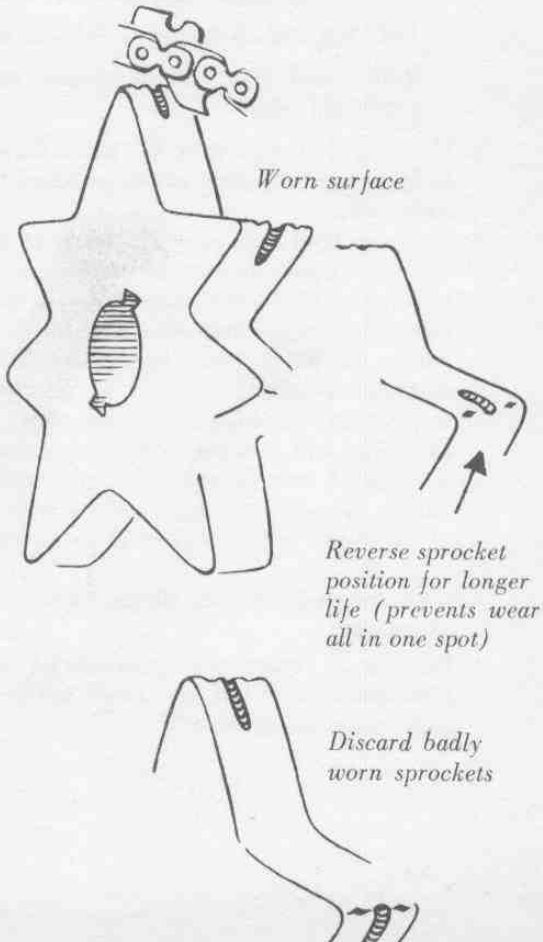


Figure 11—6 Sprocket Wear

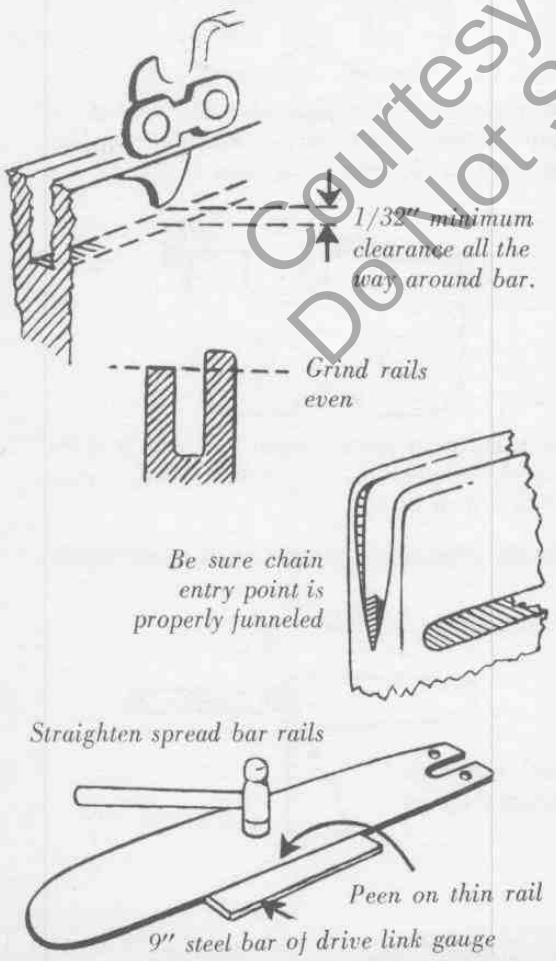


11—3.8 Check Guide Bar

(See Figure 11—7)

1. The depth of the chain guide groove must be adequate for chain clearance on both sides and all the way around the nose.
2. Grind worn bar rails even. Uneven rail height will make chain drift to one side during cutting. After filing down rails, recheck depth of bar groove for proper chain clearance. The chain tangs should have 1/32″ minimum clearance all the way around the bar.
3. See that the chain entry point at the rear of the bar is properly funneled.
4. If the bar rails have been spread apart, they can sometimes be brought back to parallel condition by inserting an 8″ or 9″ steel bar of drive link thickness between the rails, laying bar on a flat surface, and carefully peening the bar on the side having the thinner of the two rails.
5. Avoid excessive use of the bar for boring. Try not to bore more than 10% of time. When boring, use plenty of chain oil.

Figure 11—7 Guide Bar Maintenance



11—4 CHAIN TROUBLE DIAGNOSIS

Any condition which causes chain to cut poorly, chatter, drag, or run excessively hot should be remedied immediately before serious damage occurs.

11—4.1 Chain Does Not Cut Well or Feed Willingly

1. Dull chain.
2. Cutters filed with backslope. (Chain driven away from wood.)
3. Cutters filed too bluntly.
4. Depth gauges are too high.
5. Depth gauges not rounded off. (Gauges perform as cutters.)
6. Cutters on one side have hook and the other backslope.
7. Cutter bar rails worn uneven.

11—4.2 Chain Chatters

1. Depth gauges too high.
2. Drive links bottoming in shallow bar groove.
3. Sprocket teeth badly worn.
4. Chain badly stretched. (More than 1/4″ per foot.)

11—4.3 Chain Dulls Quickly or Cannot Be Successfully Sharpened

1. Thin, feathered top plate edges broken off (File held too low.)
2. Teeth rubbing against wood. (High depth gauges.)
3. Attempt to improve cutting by filing off tops of cutters has ruined chain. (Sounds silly, but people actually try it.)
4. SCORED, DECHROMED CUTTERS. (Caused by hitting rocks, running in dirt or abrasives, operation with extremely high depth gauges.)

11—4.4 Worn Chain—Cracked Links

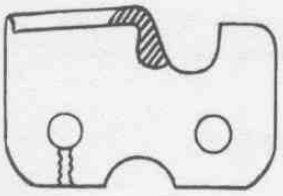
1. Cracked links at rear rivet holes. (Back-sloped or dull cutters are indicated.)
2. Cracks at front rivet holes. (Excessive friction and heat as result of high depth gauges.)
3. Chain worn straight across bottom—both rivet holes cracked (chain correctly filed)—the result of tight chain or poor lubrication.

11—4.5 Chain Breakage

1. Heat and excessive friction.
2. Tight rivet joints (Cocked cutters strike against the wood instead of straightening out and entering the cut. Chain breaks between the offending cutter and the sprocket.)
3. Shock—Chain strikes rear of improperly funneled bar.

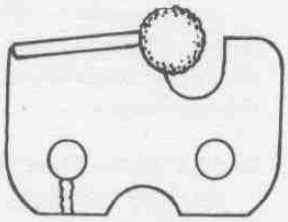
Figure 11—8 Avoid Making These Filing Mistakes

BACKSLOPE

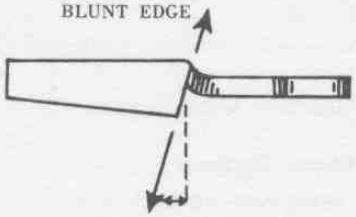


File held too high or tilted upward produces backslope on side plate or blunt edge on top plate . . . tooth pushes out of cut, forces operator to bear down heavily . . . friction and heat cause friction crack under rear rivet hole.

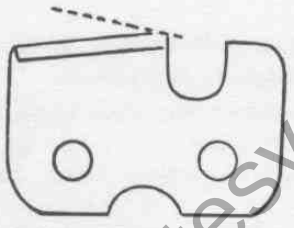
BLUNT TOP PLATE



BLUNT EDGE

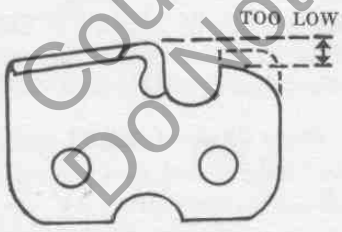


Top plate angle less than 35° . . . tooth holds edge but is too blunt to cut well.



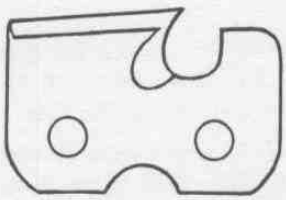
Filing edge off top plate ruins cutters. Teeth cannot cut.

TOO LOW

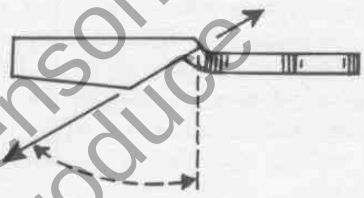


Depth gauge too low, rounded too far back, or filed off at angle . . . too large a bite allowed. Deprived of top area support, gauge sinks into the wood instead of guiding Cutter.

FORWARD HOOK

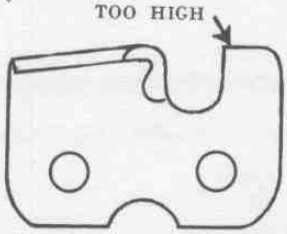


File held too low or tilted downward produces either forward hook or thin, feathered top plate edge (or both) . . . feathered edge breaks off, leaving dull tooth . . . forward hook grabs and jerks, puts extra strain on entire saw.

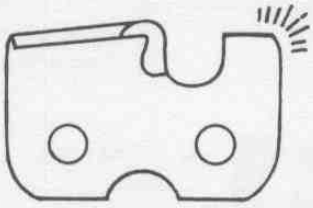


Top plate angle too great . . . cuts well after sharpening, but requires frequent sharpening or touch-up.

TOO HIGH

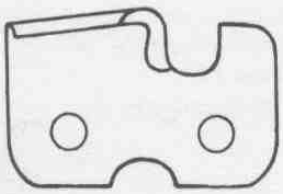


Depth gauge left too high after sharpening . . . chain chatters, won't cut . . . may develop friction cracks under rear rivet holes of cutters.

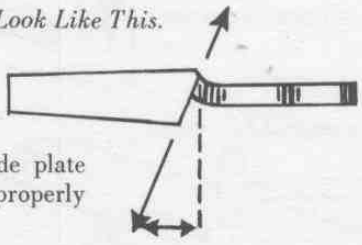


Depth gauge at proper depth but front 1/3 improperly rounded . . . strikes wood, cannot "FEEL" floor of cut.

Figure 11—8.1 Correctly Filed Cutters Should Look Like This.



Hollow ground cutting edge, vertical side plate and 35° top plate angles. Depth gauges properly rounded after setting depth.



11—4.6 Chain Pulls or Drifts to One Side

1. One guide bar rail lower than the other.
2. Teeth on one side have depth gauge settings lower than those on opposite side, therefore, do more cutting.
3. Filing angles (either top plate or side plate) of right cutters differ from those of left cutters.

11—5 CLEARING ATTACHMENT

The Homelite Clearing Attachment can be used in place of a 28″ guide bar on the gear driven saws and still use the same chain. Chain mounting and tensioning practices, and maintenance procedures of the Clearing Attachment are similar to those of conventional guide bar and chain combinations. (See Chain Maintenance, Section 11.)

Figure 11—9 Comparison of Old and New Design Bow Attachments

Bow mounting plate — *Earlier design bow*

Bow drive case cover — *Direct drive bow (new design)*

Special tension device for bow — *New design bow*

11—6 PLUNGE CUT BOW ATTACHMENTS

11—6.1 Construction

(See Figure 11—9)

There are two different designs of Homelite Plunge Cut Bow Attachments in use. The earlier of the two designs has a mounting plate assembly to which the bow guide must be fastened. In the later design, the bow guide, itself, can be mounted directly on the engine, the same as a guide bar.

1. Designs with the separate mounting plate assembly are furnished in two types (according to type mount required) and in two sizes. (Depending on choice of bow guide size.) One mounting plate has two slots to fit the stud arrangement of belt drive saw engines. The other has one long slot for the lateral stud arrangement of gear drive units. The 14″ bow guide uses a 23″ chain loop, while the 18″ guide requires a 28″ chain loop.
2. A more recent Bow Attachment design is marketed with both 14″ (for 23″ chain) and 18″ (for 28″ chain) guides for gear drive saws. A direct drive model Attachment is also available, but in the 14″ size only. (For 21″ size chain.) The guides for direct drive and gear drive application are not interchangeable. The chain tension device included with the Bow Mounting Kit for gear drive saws must be substituted for the regular tension device used for guide bars. Similarly, a modified drive case cover assembly for use with the Bow is supplied in the Kit for direct drive application.
3. The listed size of all Bow Attachments and chain guides refers to the maximum diameter cut the bow guide can accommodate.

11—6.2 Bow Attachment Maintenance

1. See that all connections are tight.
2. See that the plunging spur is mounted on the correct side of the bow guide, so the chain will have clearance.
3. See that none of the chain guards are broken or missing from the Attachment.
4. See that chain is sharp and depth gauges are uniformly lowered to proper depth for efficient cutting.
5. *Check condition of the chain guide*
   a) Just as with a guide bar, the guide grooves must be of proper depth for chain clearance all the way around.
   b) Chain must enter guide groove smoothly, without hitting the back of the guide.
   c) Grind guide rails even if one rail is higher than the other.
   d) Straighten bent guides, be sure guide rails are parallel, and chain has proper side clearance in the groove.

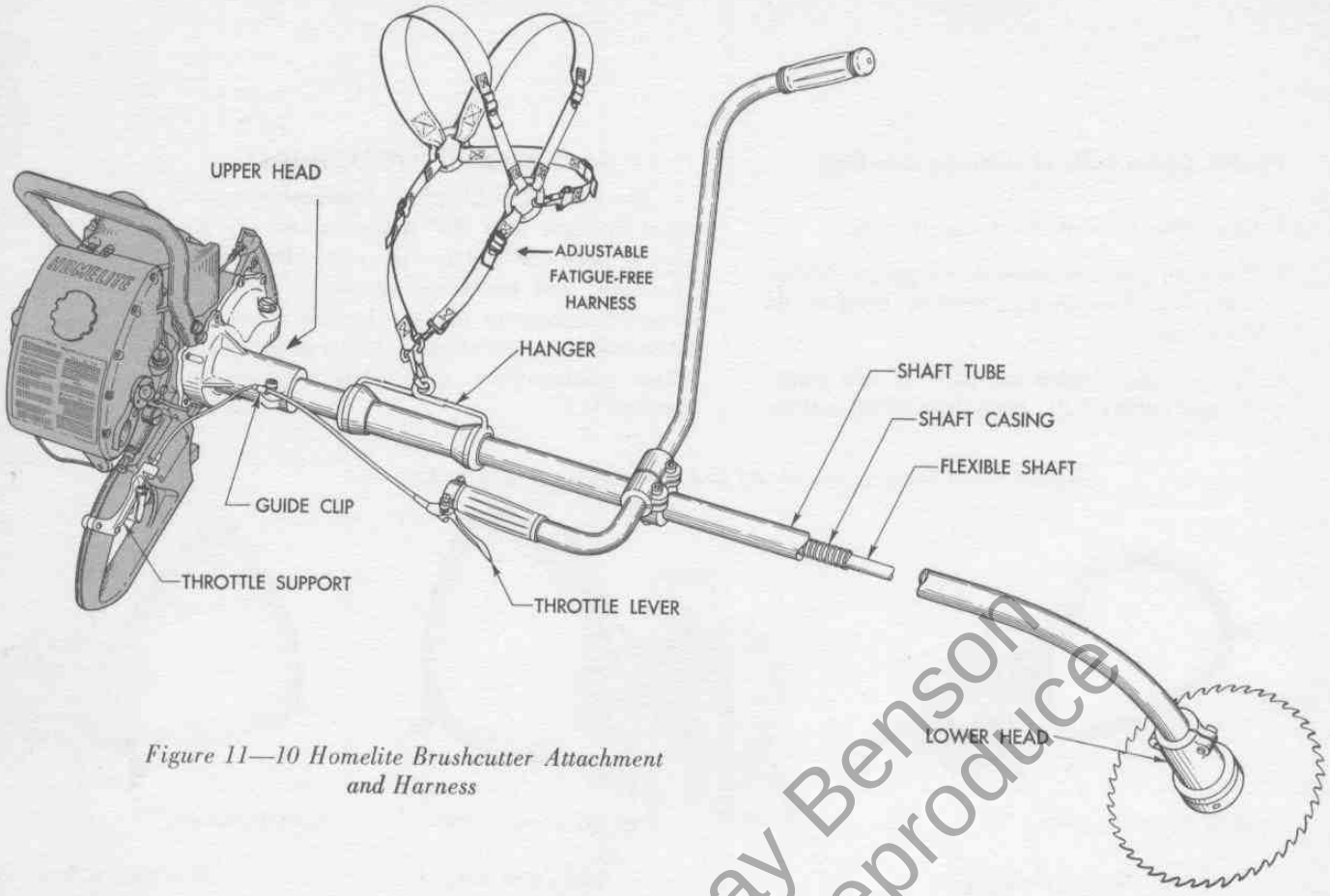


Figure 11—10 Homelite Brushcutter Attachment and Harness

11—7 BRUSHCUTTER INSTALLATION, OPERATION AND SERVICE

(See Figure 11—10)

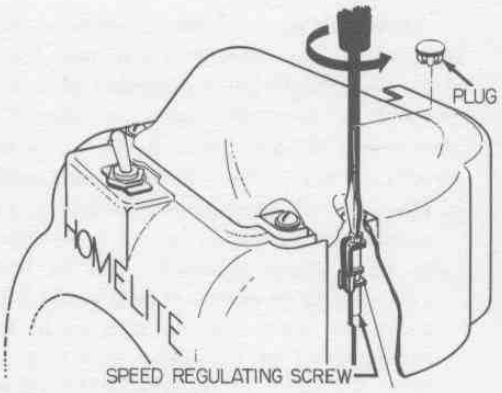
11—7.1 Description

Present Model 17 and 3-20 chain saw engines may be modified for Homelite Brushcutter application. The Brushcutter Attachment has its own clutch drum which is an integral part of the drive shaft coupling. Installation of the Brushcutter involves disassembling the engine clutch assembly and reassembling with some chain saw, and some special Brushcutter clutch assembly parts.

NOTE

For Brushcutter application, the engine speed should be lowered by turning the governor adjusting screw counterclockwise, as far as possible, without forcing. When converting from Brushcutter to chain saw, the governor should be readjusted for optimum cutting speed. (See Figure 11—11.)

Figure 11—11 Adjusting Governor for Brushcutter Operations



1. Remove plug from cylinder shield.
2. Turn speed regulating screw counter clockwise as far as it will go without forcing. Count the number of turns . . . make a note of this number.
3. Push plug back in place.
4. To readjust for chain saw operation, turn screw back to its original position. (Same number of turns noted above.)

11—7.2 Adapting Engine Gear Case for Brush Cutter Use

1. Remove chain and guide bar from engine.
2. Remove spiked bumper plate from engine.
3. Drain gear oil from gear case.
4. Remove gear case cover from engine.
5. Refer to TRANSMISSION, Section 7—3, to remove clutch spider and drum assembly. All parts should be removed from the engine shaft except the flat washer and the bronze bushing.

NOTE

To prevent rusting and deterioration of the chain saw parts which must be stored while the unit is being used as a Brushcutter, clean and oil the chain, guide bar, tension device, chain saw clutch drum and cover, gear case cover and fastening parts, and wrap them in waterproof paper.

11—7.3 Assembling Brushcutter Clutch Assembly

1. Be sure *one* flat washer and the bronze bushing from the chain saw clutch assembly are on the engine shaft.
2. The Brushcutter Attachment has its own clutch drum and flat clutch cover. Put the flat clutch cover on the shaft, then install the clutch spider assembly with the two holes for the clutch puller facing out. Slide the two clutch keys into the keyways, put one more flat washer on the shaft and start the flex-lock nut on the shaft threads.
3. Block the rotor from turning and tighten the flex-lock nut.
4. Insert the nine screws (from the gear case cover) through the holes in the upper head of the attachment. Position the gear case cover gasket on these screws. Put the Brushcutter clutch drum over the clutch spider assembly, align the upper head (and gasket) with the gear case and secure with the nine screws.
5. Place the unit on a level surface and fill the gear case with clean gear oil to the level of the arrow. Put the filler cap back in the gear case.

11—7.4 Assemble Handles

1. Loosen the two Allen screws and insert the two handles in the handle clamp on the aluminum tube. (See Figure 11—12.) The handle for the right hand is shorter than the left handle.
2. The handle ends must both be visible through the center slot of the bracket to be properly clamped. Tighten the two Allen screws.
3. Adjustment of the handle position can be made at any time to suit the individual. With the two set screws at top loosened, the handles can be individually rotated in the clamp. Loosening the set screw at the bottom of the clamp allows the handle and clamp assembly to move up or down to change the balance point.

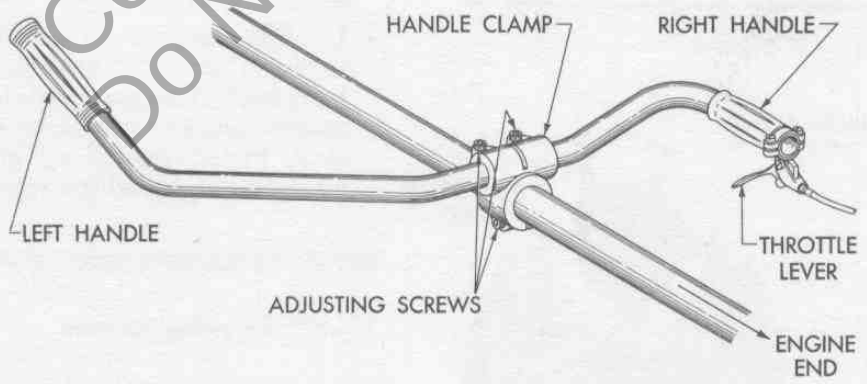


Figure 11—12 Handle Assembly

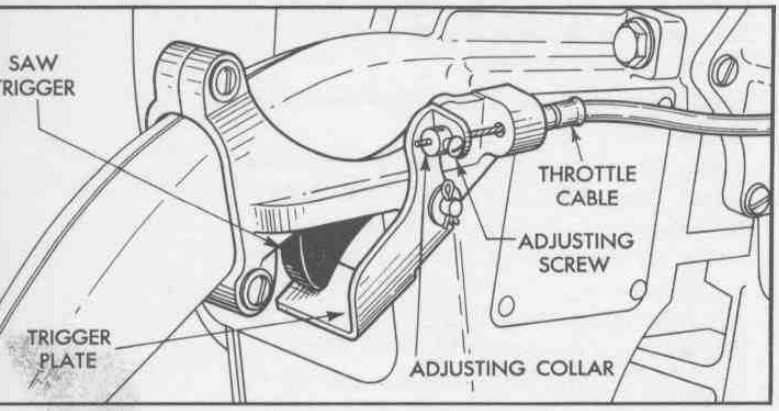


Figure 11—13 Assembling Throttle Support on Pistol Grip of Engine

Figure 11—14 Assembling Saw Blade on Lower Head

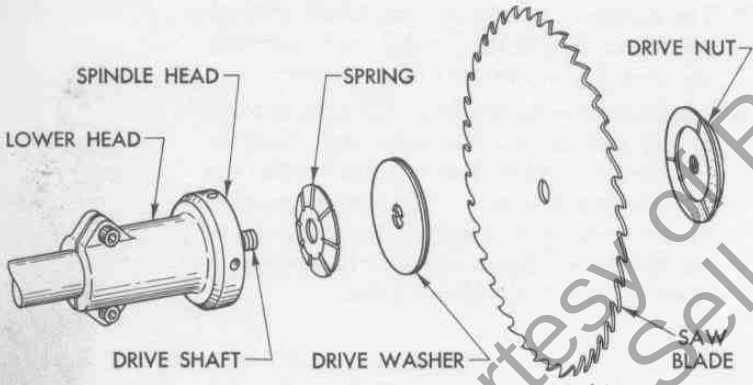


Figure 11—15 Harness

11—7.5 Connecting Throttle Control Assembly

(See Figure 11—13)

1. Connect throttle control lever assembly to right handle as shown in Figure 11—13.
2. Fasten the guide clip of the throttle wire to the upper head by removing a clamping screw and reassembling with the guide clip as shown in Figure 11—13.
3. Remove the throttle support screws. Position support on pistol grip with large trigger plate directly under the saw trigger. Install and tighten the two screws.
4. Loosen the set screw on the collar of the cable. Adjust the trigger plate so it just touches the saw trigger and tighten the set screw.

11—7.6 Installing Saw Blade

(See Figure 11—14)

1. Lock spindle head by inserting ROD #22963 in one of the four holes in the spindle head. Remove drive nut with the combination wrench.
2. If the drive washer and spring fall off the drive shaft adapter, put them back on. The spring must curve away from the spindle head and the brake lining side of the drive washer must face away from the spring. The spring rides freely, but the drive washer has integral keys which fit the keyways of the drive shaft adapter. The drive washer must rotate with the drive shaft.
3. Install the blade so the teeth face in the direction of rotation. (Clockwise—see arrow on lower head.) Lock the spindle head with ROD #22963 and fasten the drive nut securely to shaft. Protect yourself by wrapping a rag around the blade during assembly.

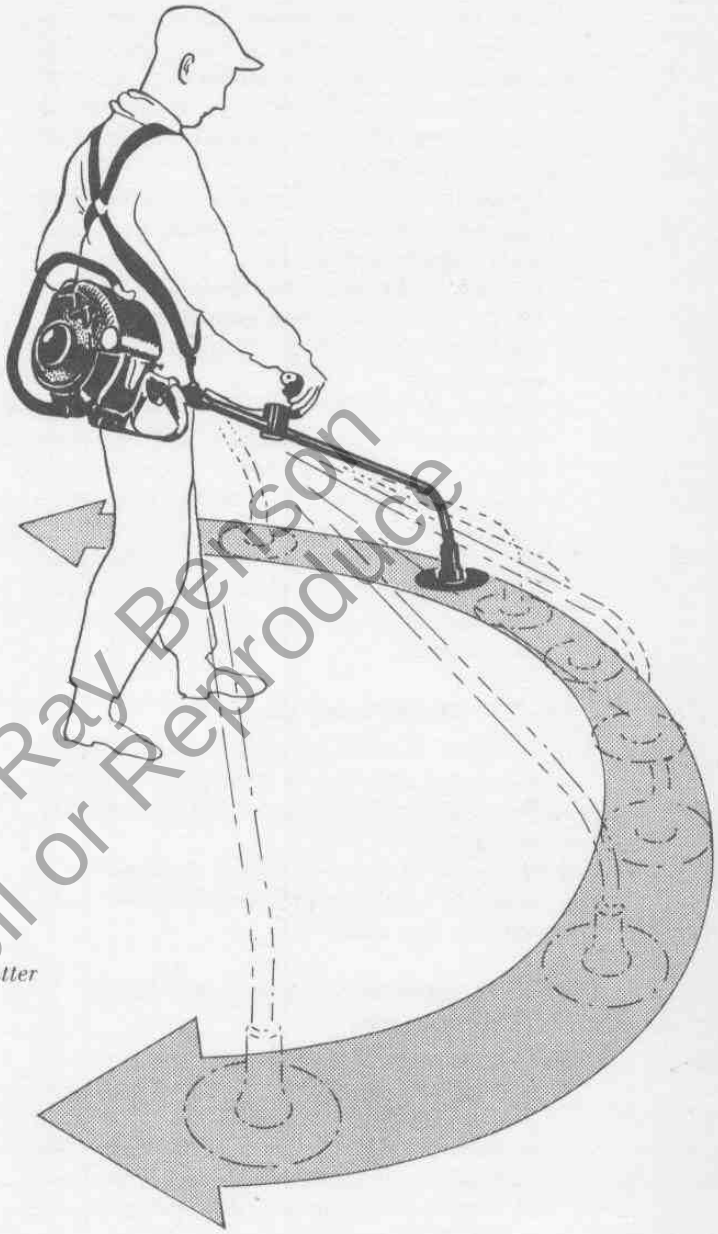
11—7.7 Adjusting Harness

The harness is adjustable for comfort and even distribution of weight. The harness is worn as shown in Figure 11—15. Note that the hanger hook, to which the unit attaches, lies at the operator's right hip.

11–7.8 Starting and Operating

(See Figure 11—16)

1. The Brushcutter blade will rotate with the throttle wide open, and the unit will creep if the blade is in contact with the ground or any obstruction.
2. If the unit must be started with the blade lying on the ground, starting must be done with all controls at idle position. The operator should stand behind the engine and observers should stand behind the operator and a safe distance beyond the radius or sweep of the attachment. PULL CHOKE OUT, BUT BE SURE THROTTLE CONTROLS ARE AT IDLE POSITION.
3. If a cold engine cannot be started at idle position, rest the aluminum shaft tube on a sturdy object so the blade is in the clear. (BE SURE BLADE IS CLEAR OF ALL OBSTRUCTIONS.) Then lock throttle open to start the engine.
4. When engine is running, release the throttle lock so engine idles and set unit down. Pick up the unit at the hanger assembly and hook the harness snap through the eye of the hanger.
5. Some operators can successfully start a hot engine without having to unhook it and set it down. This technique is hard to master and is especially difficult for people with short arms to reach around and pull the starter cord.



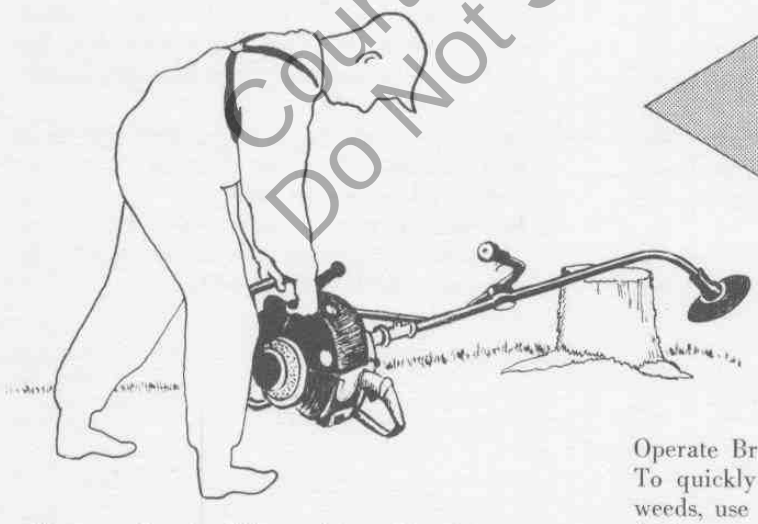


Figure 11—16 Starting and Operating Brushcutter

Start engine in idle position. If cold, engine must be started at full throttle position, rest shaft on some sturdy object so blade is clear of all obstructions.

Operate Brushcutter Attachment at full throttle. To quickly clear out large areas of brush and weeds, use a sweeping pendulum motion. Only a feather touch is required to guide the saw in a scything arc—even to those hard-to-get-at places around posts and poles. On growth over 2″ in diameter, feed the blade into the wood slowly.

11—7.9 Lubrication and Inspection of Flexible Shaft

The flexible shaft should be removed and greased after each full day or equivalent period of operation. To insure maximum service life of the flexible shaft, it is advisable to reverse the position of the shaft, end-for-end, in the shaft casing when reassembling.

1. Loosen the two Allen Screws on the lower head and use a twisting-pulling motion to remove lower head from shaft tube.
2. Remove flexible shaft from shaft tube. Wipe off the old grease, and inspect the shaft.
3. The square shaft ends should not be badly worn or rounded.
4. Replace the flexible shaft if there is excessive "corkscrew." (Wire strands are unwound, broken or badly separated.) Moderate corkscrew or separation of the strands, however, is a normal shaft condition.
5. Grease the entire length of the flexible shaft and insert it into the shaft tube. Push lower head back on shaft tube and tighten the two Allen screws.

11—7.10 Shaft Casing Inspection

1. To inspect the shaft casing, loosen the two Allen screws and separate the aluminum shaft from the upper head. Pull the casing from the aluminum shaft.
2. If the shaft casing has been damaged or its windings have been pulled apart at any point, install a new one.

11—7.11 Inspection of Upper and Lower Head Assembly

1. *The upper head* must be removed from the engine for clutch drum or bearing inspection.
   a) Drain gear oil from crankcase.
   b) Disconnect throttle lever from right handle, and disconnect throttle clip from upper head.
   c) Remove 9 screws and lift upper head, and gasket, from gear case.
   d) Insert ROD #22963 (through a hole in clutch drum) into the drilled hole in upper head to lock the drum and shaft assembly. Use square section wrench to remove shaft coupling. (Right hand thread). Remove drum and shaft assembly.
2. Hold spindle head from turning (with Rod #22963) and use square section wrench to unscrew coupling from lower head. Remove coupling and shaft, and spindle head assembly from lower head.
3. For bearing inspection remove snap-ring from grooves and press bearings and spacers from head assemblies. Bearings are the sealed type, requiring no lubrication. Assemblies in upper and lower heads are identical.
4. The clutch drum should be inspected for the same faults as the regular chain saw drum. (See Clutch Inspection, Section 7—3.)
5. Replace the shaft couplings if the square sockets are worn to the point of excessive play between sprockets and square ends of shaft.
6. Clean all parts in solvent. Oil the bearing boxes in the upper and lower head assemblies. Insert spacer washer. Press first bearing into bore. (Be sure bearings are not cocked during assembly.) Drop in the spacer and press in second bearing. Install a snap-ring in the retaining groove over each bearing assembly.
7. Complete assembly of the cleaned, greased Brushcutter Attachment by reversing the order of assembly.

11—7.12 Converting from Brushcutter to Chain Saw

1. Remove Brushcutter Attachment. (Drain gear oil from gearcase.)
2. Disassemble clutch assembly and assemble clutch with proper parts and correct order for chain saw transmission. (See Assembly Guide, Section 9—4.)
3. Install gear case cover and gasket. Fill gear case with gear oil to level of arrow.
4. Install spiked bumper plate.
5. Readjust governor tension screw for engine operation at optimum rpm for chain saw application. (See Figure 11—11.)

11—8 DIRECT DRIVE BRUSHCUTTER OPERATION AND SERVICE

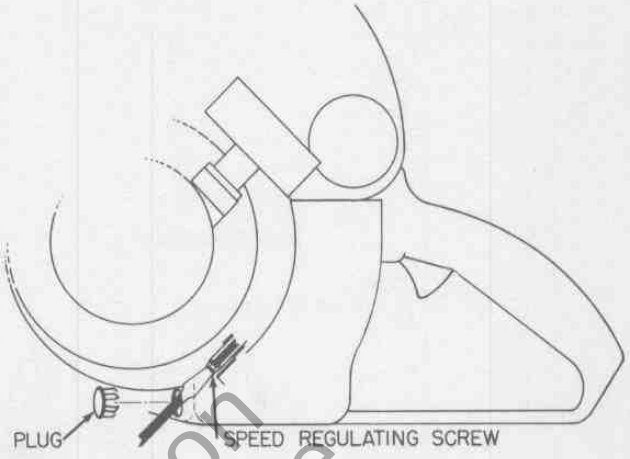
11—8.1 General

The Homelite Brushcutter Attachment, Model EZ-BC is designed for EZ and EZ-6 engine application. Installation, operation and service of the Model EZ-BC unit are the same as for the Model BC Attachment (For gear drive saws — see Section 11—7) *except* for the manner of mounting the Attachment and the counterclockwise rotation of the unit. All threaded shaft connections of the EZ-BC have left hand thread.

NOTE

For Brushcutter application, the engine speed should be lowered by turning the governor adjusting screw counterclockwise, as far as possible, without forcing. When converting from Brushcutter to chain saw, the governor should be readjusted for optimum cutting speed. (See Figure 11—17.)

Figure 11—17 Adjusting Engine Speed for Brushcutter Operation



1. Remove the plug from the carburetor shield.
2. Use a narrow blade screwdriver. Turn the speed regulating screw counterclockwise as far as it will go without forcing.
3. Count the number of turns . . . make a note of this number.
4. Push the plug back into place.
5. If you go back to chain saw operation, turn the speed regulating screw *clockwise*, back to its original position. (The same number of turns noted above.)

11—8.2 Preparing Direct Drive Engine for Brushcutter Use.

1. Remove the drive case cover, outer guide bar shim, guide bar, chain and the inner guide bar shim.
2. Clean all parts thoroughly, especially the chain. Oil the cleaned parts (soak chain in oil) and wrap for storage.
3. Insert a small rod through the hole in the bottom of the air shroud to block the rotor and crankshaft from turning. Remove the flexlock nut from the shaft.
4. Remove the flat washer, large thrust washer, sprocket and drum assembly, inner race, and small thrust washer from the shaft. Wipe off the sprocket and drum assembly with a rag. (Do not use solvent.) Apply a protective film of oil to the drum and wrap it for storage.
5. Put the small thrust washer, inner race, large thrust washer, flat washer and lock nut back on the shaft. Tighten the flexlock nut securely, then remove the rod from the air shroud to free the rotor.
6. Remove the spiked bumper plate from the drive case.
7. Follow instructions in Figure 11—17 to adjust the engine speed for Brushcutter operation.

11—8.3 Assembling Upper Head to Engine

1. Put the upper head of the Brushcutter on the guide bar mounting studs.
2. Hold the upper head temporarily with a lockwasher and 3/8-16 hex nut on each stud. Do not tighten the nuts completely.
3. It is important to check the alignment of the clutch assembly and clutch drum at this point. Make sure the ignition switch is "off", then crank the engine. The Brushcutter spindle head should not rotate. If it does, shift the casting on the mounting studs until it is properly aligned. Now tighten the nuts securely.

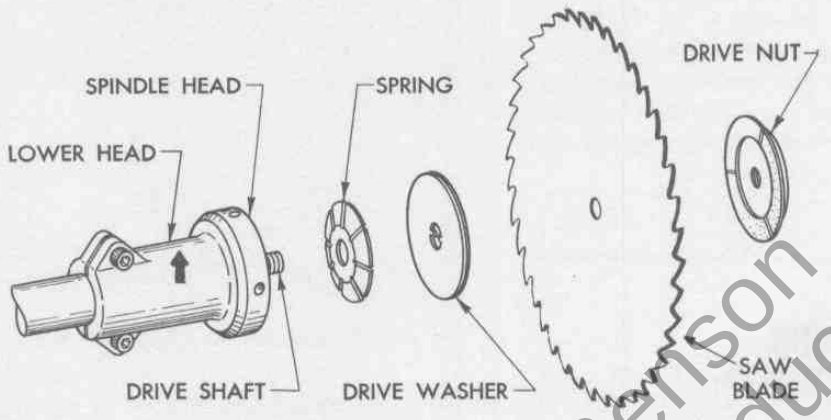


Figure 11—18—Assembling Saw Blade on Lower Head

11—8.4 Assembling Saw Blade

See (Figure 11—18)

1. Lock the spindle head by inserting Rod #22963 into one of the four holes in the spindle head. Remove the drive nut (left hand thread) with the combination wrench.
2. If the drive washer and spring fall off the drive shaft adapter, put them back on. The spring must curve away from the spindle head, and the brake lining side of the drive washer must face away from the spring. The spring rides freely, but the drive washer has integral keys which fit the keyways of the drive shaft adapter. The drive washer must rotate with the drive shaft.
3. Protect yourself by wrapping a rag around the saw blade during assembly. Install the blade so the teeth face in the direction of rotation. (Counterclockwise—see arrow on lower head.) Lock the spindle head with Rod #22963 and fasten the drive nut securely to the shaft. (Left hand thread.)