

GROUP XI — SPECIAL PRODUCTS LINE

**SECTION E — MF SKI WHIZ
MAINTENANCE AND SERVICE INSTRUCTIONS**

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PART 1—MF SKI WHIZ MAINTENANCE AND SERVICE INSTRUCTIONS

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SPECIFICATIONS

ENGINE SPECIFICATIONS

MODEL (JLO)	L 297 or L 380
TYPE	Gasoline & Oil Mixture, 2 cycle, horizontal crankshaft one cylinder, air cooled
TOTAL DISPLACEMENT:	
L 297	296 ccm (18.1 cu. in.)
L 380	372 ccm (22.7 cu. in.)
BORE:	
L 297	75 mm (2.953 in.)
L 380	80 mm (3.150 in.)
STROKE:	
L 297	67 mm (2.638 in.)
L 380	74 mm (2.913 in.)
COMPRESSION RATIO	11.5:1
DIRECTION OF CRANKSHAFT ROTATION (Facing Drive Pulley)	
Counterclockwise	
IGNITION:	
Make and Type	Auto-Advance Flywheel Magnet, BOSCH SCP IV, with Lighting Coil 12V, 75W
Pole Shoe Break:	
L 297	17.5-22.5 mm (.689-.886 in.)
L 380	18-23 mm (.709-.906 in.)
Contact Breaker Gap	0.35-0.45 mm (.014-.018 in.)
Ignition Timing (With Fully Advanced Cam) B.T.D.C.:	
L 297	3.0-3.5 mm (.118-.138 in.) 21.7°-23.5°
L 380	3.1-3.6 mm (.122-.142 in.) 21.1°-22.8°
Spark Plug Gap	0.4-0.5 mm (Approx. .016-.019 in.)

CARBURETOR (Make and Type):

L 297 HR Series (Tillotson),
Diaphragm with integral
Fuel Pump and Filter,
Dual Venturi

L 380 HD Series (Tillotson),
Diaphragm with integral
Fuel Pump and Filter,
Dual Venturi

STARTER SYSTEM Manual Start with Emer-
gency Starting Pulley
(Electric Starter Kit
Available as Accessory)

FUEL AND OIL MIXTURE (Ratio of Gas : Oil) Regular Grade Gasoline-
20 parts—Two-Cycle
Engine Oil—1 part
(20:1)

TIGHTENING TORQUES

CYLINDER HEAD NUTS 18-21 Ft. - Lbs.

SPARK PLUG 29 Ft. - Lbs.

FLYWHEEL NUT 79-86 Ft. - Lbs.

6mm Screws 6.5-7.0 Ft. - Lbs.
(78-84 in. - lbs.)

8mm Screws 16-18 Ft. - Lbs.

10mm Screws 31-33 Ft. - Lbs.

TORQUE VALUES FOR MILD STEEL
FASTENERS (BELOW SAE GRADE 5*)

Coarse and Fine Thread

NOMINAL SIZE	FOOT-POUNDS TORQUE
1/4"	5-6
5/16"	10-12
3/8"	18-21
7/16"	30-34
1/2"	45-52
9/16"	65-75
5/8"	90-105
3/4"	160-185

**NOTE: These values may also be
used when low strength nuts (such as
weld nuts, jam nuts and slotted nuts)
are used with SAE Grade 5 fasteners.*

Fig. 1 — Torque Chart Below SAE Grade 5 — Standard Application Unless Otherwise Given

FOOT-POUNDS					
<i>Torque Values for SAE Grade 5 and SAE Grade 8 Bolts Coarse and Fine Thread</i>					
SAE Grade 5* 			SAE Grade 8 		
NOMINAL SIZE	NON-RIGID JOINT**	RIGID JOINT***	NOMINAL SIZE	NON-RIGID JOINT**	RIGID JOINT***
1/4"	5-6	8-10	1/4"	8-10	12-14
5/16"	10-12	15-18	5/16"	16-20	24-28
3/8"	19-22	30-35	3/8"	29-35	43-49
7/16"	33-38	50-55	7/16"	47-56	70-79
1/2"	47-53	76-85	1/2"	70-85	105-129
9/16"	65-73	115-125	9/16"	100-125	150-175
5/8"	100-125	155-170	5/8"	140-175	210-240
3/4"	175-200	270-300	3/4"	250-300	375-425
7/8"	260-310	400-450	7/8"	400-475	600-675
1"	400-475	600-675	1"	600-725	900-1025
1-1/8"	525-625	800-900	1-1/8"	850-1025	1275-1450
1-1/4"	750-900	1125-1275	1-1/4"	1225-1450	1825-2050
1-3/8"	1000-1200	1450-1650	1-3/8"	1600-1900	2400-2700
1-1/2"	1300-1550	1950-2200	1-1/2"	2100-2500	3150-3550

*NOTE: These torque values do not apply for SAE Grade 5 bolts used with weld nuts (or other low strength nuts). See chart for mild steel fasteners below SAE Grade 5.

**NOTE: Tightening torques for non-rigid joints may be used when damage to the jointed members of the assembly may occur (and specific torque recommendation has not been made). Use of thick and highly compressable gaskets, nonflat unmachined seating surfaces for the bolt head or nut, nonflat or nonparallel joint faces are examples of conditions under which these torques may be used.

***NOTE: Tightening torques for rigid joints may be used when all of the following conditions exist (and specific torque recommendation has not been made):

1. Damage will not occur to the joined members of the assembly.
2. It is desirable to use this higher clamping force to ensure tightness.
3. Fastener thread is not lubricated prior to assembly.

Fig. 2 — Torque Chart SAE Grade 5 and Grade 8 — Standard Application Unless Otherwise Given

TROUBLE-SHOOTING

A thorough check should be made before any overhaul procedures are taken. Following this practice will help eliminate unnecessary repairs.

SYMPTOM:**1. Engine Fails To Start Or Starts With Difficulty**

Possible Cause	Remedy
No fuel in tank	Fill tank with clean, fresh fuel and oil mixture.
Obstructed fuel line or filter	Clean fuel filter and line. If necessary remove and clean carburetor.
Fuel tank cap vent hole obstructed	Open vent hole.
Water in fuel	Drain tank. Clean carburetor and fuel lines. Dry spark plug electrodes. Fill tank with clean, fresh fuel and oil mixture.
Engine over-choked ("flooded")	Turn engine over several times with choke "IN". Refer to symptoms No. 8 through 15.
Improper carburetor adjustment	Adjust carburetor.
Loose or defective magneto and/or wiring	Check magneto wiring for shorts or grounds. Check timing, point gap, and adjust or repair as necessary. See also "Trouble-Shooting Ignition System".
Spark plug fouled	Clean and regap spark plug.
Spark plug porcelain cracked	Replace spark plug.
Poor compression	Check compression and make necessary repairs. See "Checking Engine Compression".

2. Engine Knocks

Possible Cause	Remedy
Carbon in combustion chamber	Remove cylinder head and clean carbon from head and piston.
Loose or worn connecting rod (or rod bearing)	Replace crankshaft assembly.
Loose flywheel	Check flywheel key and keyway; replace parts if necessary. Tighten flywheel nut to 79-89 ft.-lbs. torque.
Worn cylinder	Replace cylinder.
Incorrect magneto timing	Time ignition. See "Trouble-Shooting Ignition System".

SYMPTOM:

3. Engine Misses Under Load

Possible Cause	Remedy
Spark plug fouled or improper gap	Clean and regap spark plug.
Spark plug porcelain cracked	Replace spark plug.
Loose or defective magneto and/or wiring	Check timing, point gap and wiring for defects. See "Trouble-Shooting Ignition System".
Improper carburetor adjustment	Adjust carburetor. See symptoms No. 8 through 15.

4. Engine Lacks Power

Possible Cause	Remedy
Choke practically closed	Open choke.
Improper carburetor adjustment	Adjust carburetor. See symptoms No. 8 through 15.
Magneto improperly timed	Time engine. See "Trouble-Shooting Ignition System".
Loss of compression	Check compression and make necessary repairs. See "Checking Engine Compression".
Carburetor dirty or damaged	Clean and repair carburetor.

5. Engine Overheats

Possible Cause	Remedy
Engine improperly timed	Time engine. See "Trouble-Shooting Ignition System".
Carburetor improperly adjusted (lean)	Adjust carburetor.
Cooling fins clogged	Clean cooling fins.
Excessive load on engine	Check operation of associated equipment. Reduce excessive load.
Carbon in combustion chamber	Clean carbon from head and piston.
Improper gasoline-to-oil mixture	See "Engine Specifications" for mixture ratio.

6. Engine Surges Or Runs Unevenly

Possible Cause	Remedy
Fuel tank cap vent hole clogged	Open vent hole.
Carburetor throttle linkage or throttle shaft and/or butterfly binding or sticking	Clean, lubricate or adjust linkage and deburr throttle shaft or butterfly.
Carburetor not properly adjusted	Adjust carburetor. See symptoms No. 8 through 15.

SYMPTOM:**7. Engine Vibrates Excessively**

Possible Cause	Remedy
Engine not securely mounted	Tighten mounting bolts.
Bent crankshaft	Replace crankshaft.
Drive or drive pulleys defective	See "Operational Check of Drive Pulleys".

8. Carburetor Floods

Possible Cause	Remedy
Damaged or worn inlet needle or seat (or dirt in seat assembly). Inlet seat gasket damaged.	Service carburetor as recommended.
Diaphragm damaged or incorrectly installed	Service carburetor.
Inlet control lever stuck, incorrectly adjusted, tight on fulcrum pin, fulcrum pin loose, or spring not seating on lever dimple.	Service carburetor.
Fuel tank pressure build-up	Check and open tank vent.
Damaged or faulty choke stop (allowing choke to close)	Replace choke shaft assembly if necessary.

9. Carburetor Runs Rich With Mixture Screw Shut Off

Possible Cause	Remedy
Ruptured pump diaphragm	Replace diaphragm.
Welch plugs not sealing	Reseat or replace Welch plugs.
Carburetor floods	See symptom No. 8. Correct as required.

10. Carburetor Runs Lean In All Speed Ranges

Possible Cause	Remedy
Inlet filter screen plugged or dirty	Clean or replace screen.
Inlet control lever incorrectly adjusted	Readjust lever per carburetor servicing instructions.
Diaphragm cover plates loose	Tighten screws.
Air leak into the metering system	Service carburetor and make sure all channel plugs, plug screws, and Welch plugs are tightly sealed.
Inlet tension spring stretched or damaged	Replace spring.
Fuel pump not operating properly	Service carburetor as recommended.

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SYMPTOM:

**10. Carburetor Runs Lean In All Speed Ranges
(Cont.)**

Possible Cause	Remedy
Carburetor loose on mounting, or leaking gasket	Tighten mounting screws and/or replace gasket as necessary.
Air leak in fuel lines	Correct as required.
Fuel line plugged	Clean all fuel lines.
Fuel tank vent plugged or not operating	Repair as necessary.
Pump pulse channel plugged or not aligned to engine — (L 297)	Clean or correct all alignment.
Pump valve flippers damaged or bent off ports	Service carburetor and replace diaphragm.
Clogged fuel channels	Clean (and service) carburetor.

11. Engine Will Not Accelerate, Or Lean Acceleration

Possible Cause	Remedy
Idle mixture set too lean	Adjust idle mixture.
Fuel channels plugged	Clean (and service) carburetor.
Power valve ball check stuck closed	Remove Welch plug and steel ball, then blow channel clean with air.
Low inlet lever setting	Readjust lever per servicing instructions.
Diaphragm cover plate loose or leaking diaphragm gasket	Tighten cover plate screws and/or replace gasket as necessary.
Carburetor loose on mounting or leaking gasket	Tighten mounting screws and/or replace gasket as necessary.

12. Engine Runs Lean At Idle Speed

Possible Cause	Remedy
Idle mixture set too lean	Adjust idle mixture.
Dirt in fuel channels	Clean and Service carburetor.
Welch plugs not sealing properly	Reseat or replace Welch plugs.
Inlet control lever incorrectly adjusted	Readjust per instructions.
Main fuel check valve not sealing	Service carburetor and repair as necessary.

SYMPTOMS:**13. Engine Runs Rich At Idle Speed**

Possible Cause	Remedy
Carburetor flooding	See symptom No. 8. Correct as necessary.
Throttle shutter cocked in throttle bore	Adjust shutter correctly.
Idle air bleed plugged	Clean and service carburetor.
Idle adjustment screw damaged	Replace adjustment screw.
Idle adjustment hole damaged or casting cracked near the adjustment point	Replace carburetor.

14. Engine Runs Lean At Operating And/Or High Speeds

Possible Cause	Remedy
Mixture adjustment set too lean	Adjust mixture.
Inlet control lever incorrectly adjusted	Readjust per instructions.
Main fuel check valve damaged or not sealing	Service carburetor per instructions.
Dirt in nozzle system or supply channels. Channel plugs not sealing.	Clean and service carburetor.
Power valve ball stuck closed. (Applies if engine runs lean at intermediate speeds.)	Service carburetor, remove Welch plug and steel ball, blow out channels and replace parts as necessary.
Adjustment packing damaged. (Applies to symptom at high speed)	Replace packing.

15. Engine Runs Rich At Operating And/Or High Speeds

Possible Cause	Remedy
Mixture adjustment set too rich	Adjust mixture.
Carburetor flooding	See symptom No. 8.
Inlet control lever incorrectly adjusted	Readjust per instructions.
Power valve ball check not seating (Applies if symptom is at high speed).	Remove Welch plug and ball, then blow channel clean. Replace parts as required.
Main fuel check valve Welch plug not sealing. (Applies if symptom is at intermediate speeds.)	Reseat or replace Welch plug.
Choke valve partially closed. (Applies if symptom is at intermediate speeds).	Check choke friction springs and ball. Repair carburetor as necessary.

TROUBLE-SHOOTING IGNITION SYSTEM

To thoroughly check the ignition system for possible malfunctions. Follow the systematic procedures under this heading.

1. Visually check the spark plug for its condition, then clean and test it using a suitable cleaning and testing unit. Measure the electrode gap and readjust as necessary. If spark plug proves to be defective, replace it with a new one of the correct heat value.

Service Information:

For proper engine performance, the spark plug should always be clean (free from oil and carbon deposits). Use of a spark plug with the proper heat range is important. This will allow the plug to become hot enough to burn itself clean of carbon deposits but not so hot that it overheats and burns the electrodes. If the plug gets dirty continuously in a short period of time, it usually indicates that the engine has been run for long periods under light or partial loads . . . a hotter plug should be used in this case. If the plug shows evidence of burned electrodes, or bright surfaces, and there are indications of lead fouling and engine knock it usually indicates that the engine has been run for long periods under heavy loads (while using a hot plug) . . . a colder plug should be used in this case.

2. Check all visible wiring for possibility of shorting and make sure all connections are tight.

3. Check breaker point gap and ignition timing per instructions under "Ignition Timing".

4. Check condenser and coil armatures for defective operation using suitable testing equipment. Follow the procedures recommended by the test equipment manufacturers.

CHECKING ENGINE COMPRESSION

It is difficult to check engine compression accurately. The following procedures are simple tests which should indicate possible malfunctions.

Forcing air into cylinder:

1. Remove spark plug and install a suitable air adapter into cylinder head.

2. Rotate engine to place piston at TDC, then force approximately 60 lbs. of air into the cylinder and listen for evidence of blown gaskets.

Turning crankshaft by hand or with manual starter:

1. Disconnect the spark plug wire, then turn the crankshaft by hand. A definite resistance should be noticed on each revolution of the crankshaft.

2. Give the flywheel a quick twist by hand or with the manual starter. If compression is satisfactory, the flywheel will spring back. If compression is poor, there will be little or no resistance and the flywheel will not spring back.

OPERATIONAL CHECK OF DRIVE PULLEYS

Make certain that the drive belt is properly aligned between the pulleys. See "Adjusting Pulley Alignment".

1. Place suitable stands at rear of Ski Whiz so that engine can be operated safely at various speeds without causing machine to move or to endanger personnel.

NOTE: Do not operate engine above idle unless the engine torque can be transmitted to the track (i.e. track should impose load upon engine at speeds above idle).

2. Start and idle the engine . . . the drive pulley should not cause the drive belt to move the driven pulley . . . OR . . . the driven pulley should be easily stopped by lightly applying the brake. Stopping driven pulley should not put a load on the engine.

3. Slowly increase engine speed . . . drive belt (driven pulley) should be engaged at slightly above idle speed and immediately disengage when throttle is released.

IF PULLEY FAILS TO FULLY DISENGAGE . . . low idle speed may be too high, pulley compression spring may be weak or broken, moving sheaves (pulley faces) may be binding or the drive and driven pulley may be out of alignment.

IF ENGAGEMENT IS ERRATIC . . . pulley mechanism may be binding.

IF ENGAGEMENT SPEED IS TOO HIGH . . . mechanisms may be binding, compression spring may be too strong or not correctly adjusted.

IF ENGAGEMENT SPEED IS TOO LOW . . . compression spring may be too weak or broken.

4. Shut off engine and correct as necessary.

ENGINE SERVICING

The only time it will be necessary to remove the engine for servicing (overhaul) is when the crankshaft and rod assembly, or the crankshaft bearings require replacement. In either of these two cases, the crankcase will have to be separated. All other servicing can be performed with the engine mounted.

Figs. 3 and 4 show special tools and equipment necessary for engine overhaul.

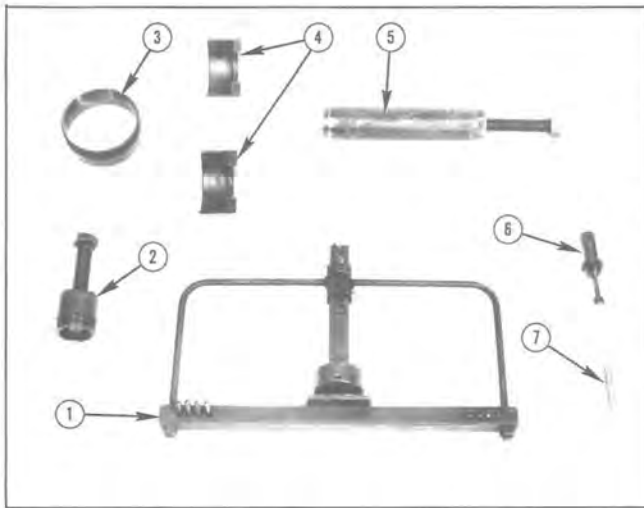


Fig. 3 — Special Tools for Engine Servicing — available through your nearest JLO Distributor.

1. 444.31-863-10 (Clamping Device for Recoil Starter)
2. 444.31-825-0 (Puller for Flywheel)
3. 444.31-071-0 (Used with No. 4 and No. 5)
4. 444.31-073-1 (Used with No. 3 and No. 5)
5. 444.31-807-0 (Used with No. 3 and No. 4 to remove crankshaft bearings)
6. 444.31-875-00 (Timing Gauge)
7. 444.31-666-00 (Pin for holding cam advance when timing ignition)

ENGINE REMOVAL AND INSTALLATION

Figs. 5, 6 and 7 show views of the model L 380 engine installed. The basic procedures for removal and installation will be the same regardless of the model engine installed.



Fig. 4 — Additional Equipment Needed for Engine Servicing

1. Pipe — to tap crankshaft seal or bearing into position.
2. Metal Strap — to compress piston rings.
3. Pipe — to protect seal when removing crankshaft.
4. Bent Rod — to advance cam through hole in flywheel.
5. Wood Support — to prevent damage to piston or crankcase.
6. Propane Torch — to heat crankcase when removing or installing crankshaft.
7. Timing Light — to check ignition timing.
8. Thermometer — to check oil temperature when heating crankshaft bearings.
9. Hot Plate — to heat oil so crankshaft bearings can be easily installed.

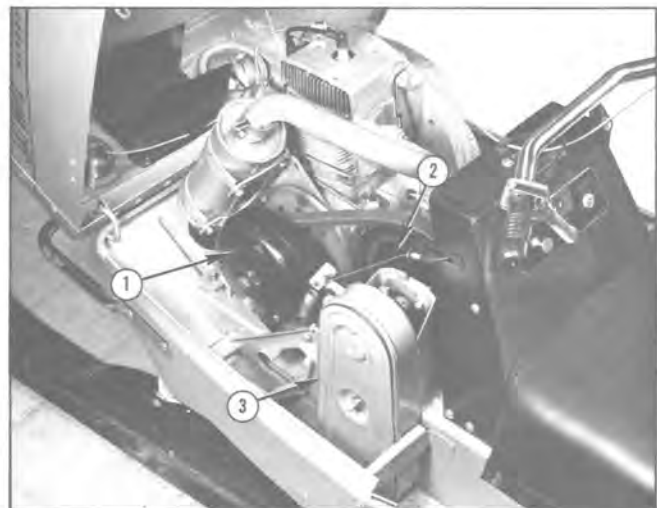


Fig. 5 — View of Left-Hand Side of Engine and Drive Compartment (L 380 Engine Shown)

1. Drive Pulley
2. Driven Pulley
3. Chain Case

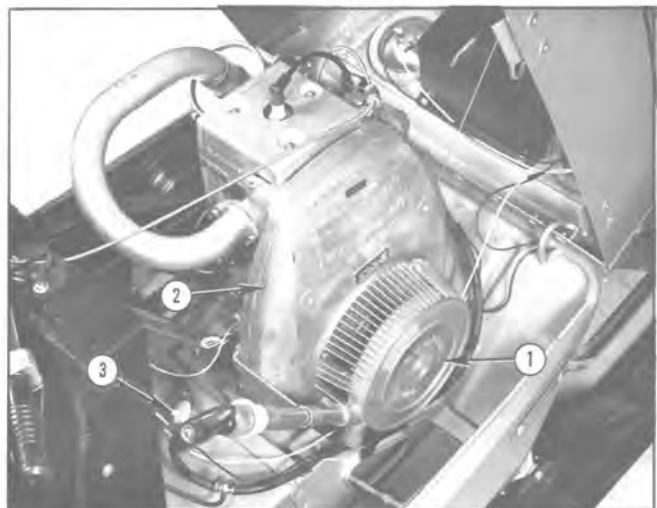


Fig. 6 — View of Right-Hand Side of Engine and Drive Compartment (L 380 Engine Shown)

1. Recoil Starter Assembly
2. Outer Flywheel Cover
3. Fuel Filter

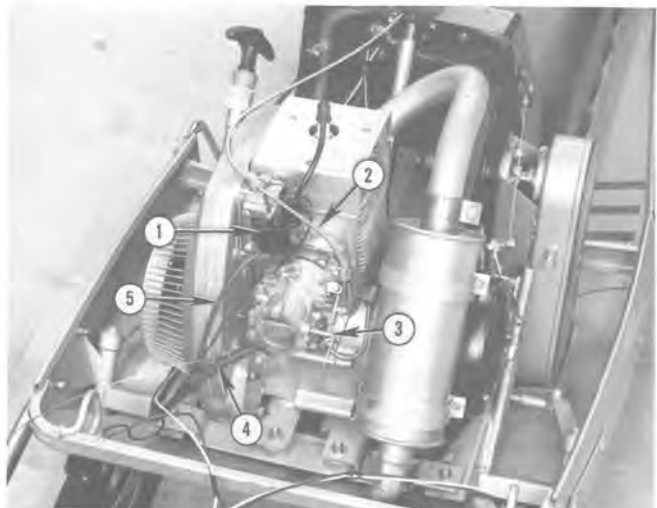


Fig. 7 — Front View of Engine With Hood Removed (L 380 Engine Shown)

1. Ignition Coil
2. Throttle Cable
3. Choke Control Rod
4. Main Fuel Line
5. Fuel Primer Line



Fig. 8 — Removing Drive Belt from Driven Pulley (L 380 Engine Pulley Arrangement Shown)

Removal:

1. Open hood, disconnect light wiring and hood retaining cable, remove hood locking pins then remove hood assembly from the Ski Whiz.
2. Disconnect the spark plug wire from the plug.
3. Remove drive belt from driven pulley as shown in Fig. 8.
4. Remove drive belt from drive pulley as shown in Fig. 9, maneuvering belt around muffler bracket and brake assembly.
5. Disconnect choke rod and throttle cable from carburetor. Also disconnect the throttle cable clamp from top of ignition coil.
6. Disconnect fuel lines from carburetor.



Fig. 9 — Removing Drive Belt from Drive Pulley (L 380 Engine Pulley Arrangement Shown)

7. Remove engine mounting bolts from center mounting brackets then lift complete engine assembly, center mounting brackets, muffler and drive pulley from the Ski Whiz.

Installation:

Reinstallation of the engine is basically the reverse of the removal procedures.

ENGINE OVERHAUL

The engine does not have to be removed for servicing unless the crankshaft bearings or the rod and crankshaft assembly must be replaced. The majority of the pictures used as reference within the engine servicing text show the model L 380 engine installed. When differences between the L 297 engine and the L 380 engine require different procedures, it will be noted in the appropriate steps.

The overhaul procedures have been divided into steps for reference purposes.

1. Replace head gasket as follows (see Figs. 10, 11 and 12):
 - a. Remove cowlings from top of cylinder head. (It is necessary to remove the exhaust pipe and the carburetor from the L 297 engine so that cowlings can be removed.)
 - b. Remove cylinder head hold down nuts and washers (and spacers on the L 380 engine), then carefully lift head from cylinder.
 - c. Remove the old head gasket and replace it with a new one.

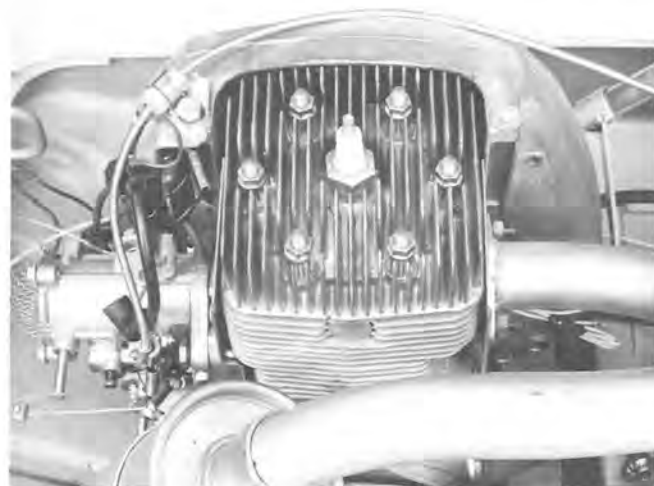


Fig. 10 — View of Cylinder Head with Cowling Removed (L 380 Engine)



Fig. 11 — Cylinder Head & Gasket On L 380 Engine

1. Metal Band



Fig. 12 — Cylinder Head & Gasket On L 297 Engine

1. Metal Band

NOTE: Gasket is directional. The metal band around center of gasket is wider on one side than it is on the other. The side with the widest metal band is to be next to the cylinder head.

d. Place cylinder head over studs.

NOTE: Make sure that the head used on the L 380 engine is positioned as shown in Fig. 11. The side of the head with the deeper cavity should be toward the carburetor side of the cylinder.

e. Install washers (and spacers on the L 380 engine) and nuts and alternately tighten them to 18-21 ft.-lbs. torque.

f. Install cowl on top of cylinder head.

g. See steps No. 1, 2, 3, 5, 6 and 7 under "Ignition Timing" and proceed as directed.

2. Replace piston, piston rings, piston pin and/or bearing as follows (see Figs. 13, 14, 15, 16, 17, 18, 19 and 20):

a. Disconnect spark plug wire then the fuel lines, throttle cable and choke rod from the carburetor.

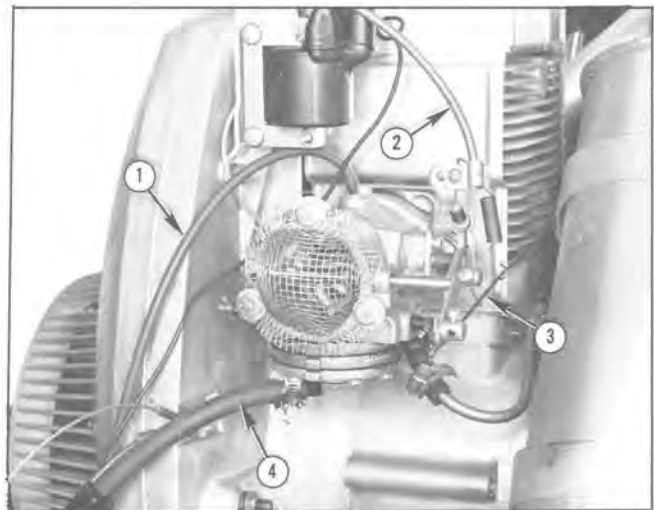


Fig. 13 — View of Carburetor Mounted on Engine (L 380 Engine)

1. Fuel Primer Line
2. Throttle Cable

3. Choke Rod
4. Main Fuel Line

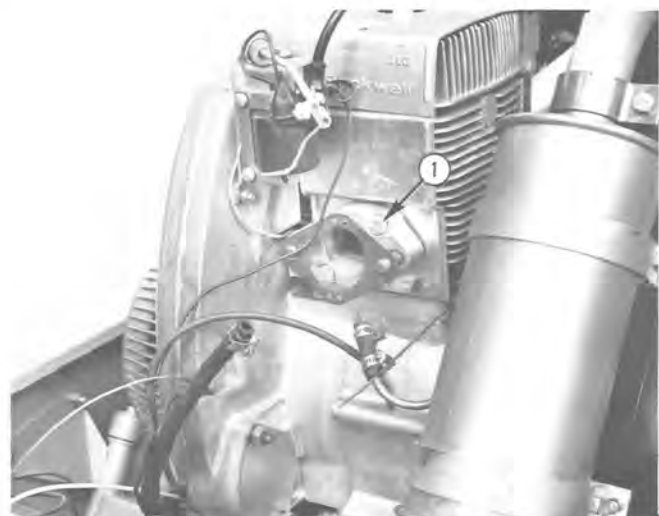


Fig. 14 — Carburetor Mounting Adapter (L 380 Engine)

1. Retaining Screws

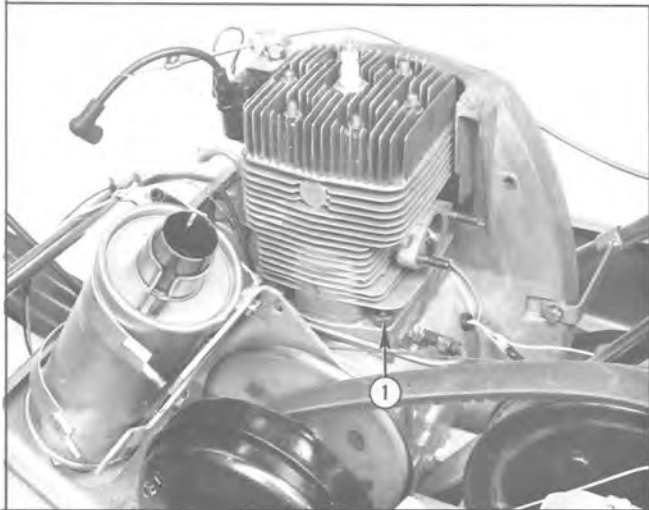


Fig. 15 — Exhaust Pipe and Cowling Removed from Engine (L 380)

1. Cylinder Assembly Retaining Nuts and Washers



Fig. 18 — Removing / Installing Piston Pin Bearing and Retainers

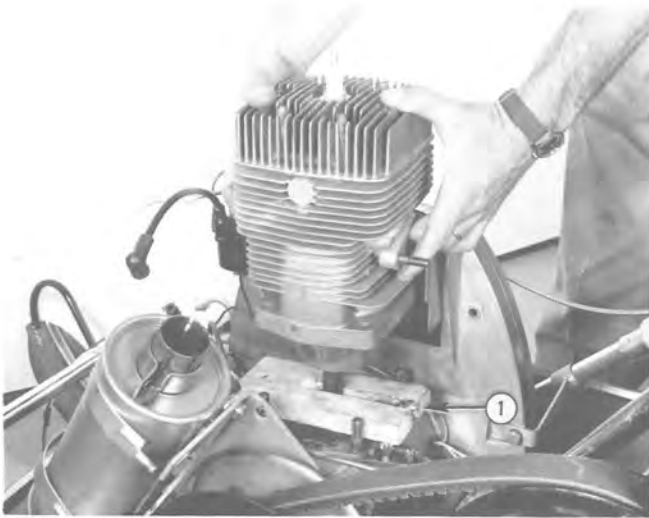


Fig. 16 — Removing / Installing Cylinder Assembly

1. Notched Wooden Block

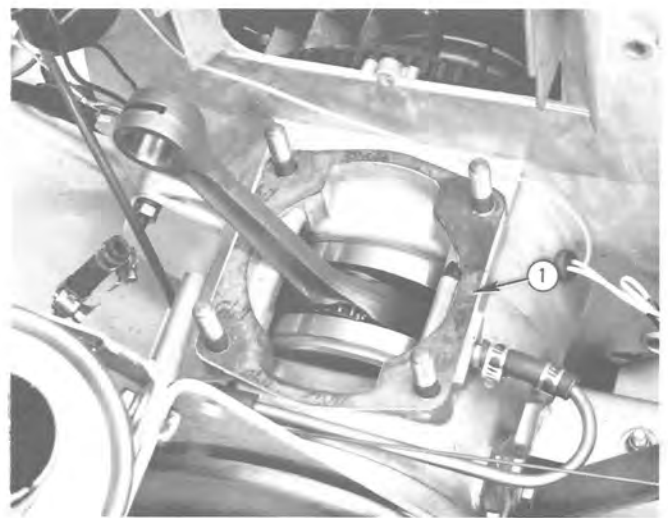


Fig. 19 — View of Engine Crankcase and Rod

1. Gasket

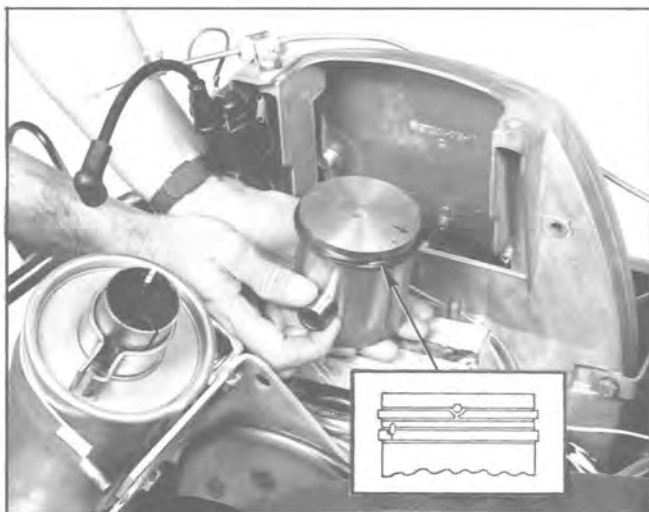


Fig. 17 — Removing / Installing Piston Pin

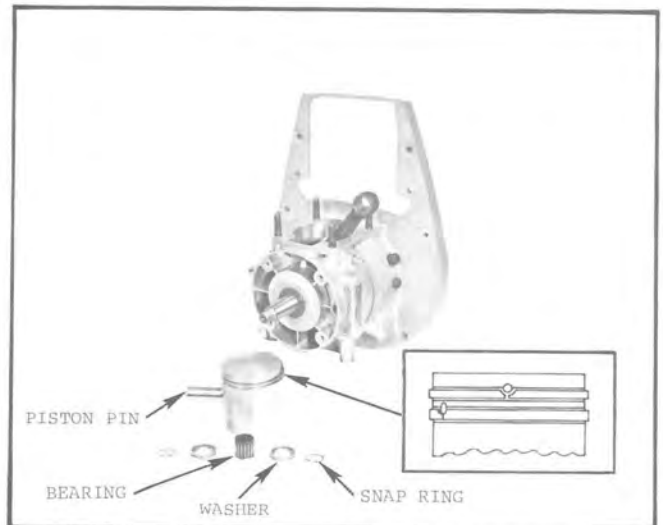


Fig. 20 — Piston and Related Parts — L 297 Engine (Engine — Workbench)

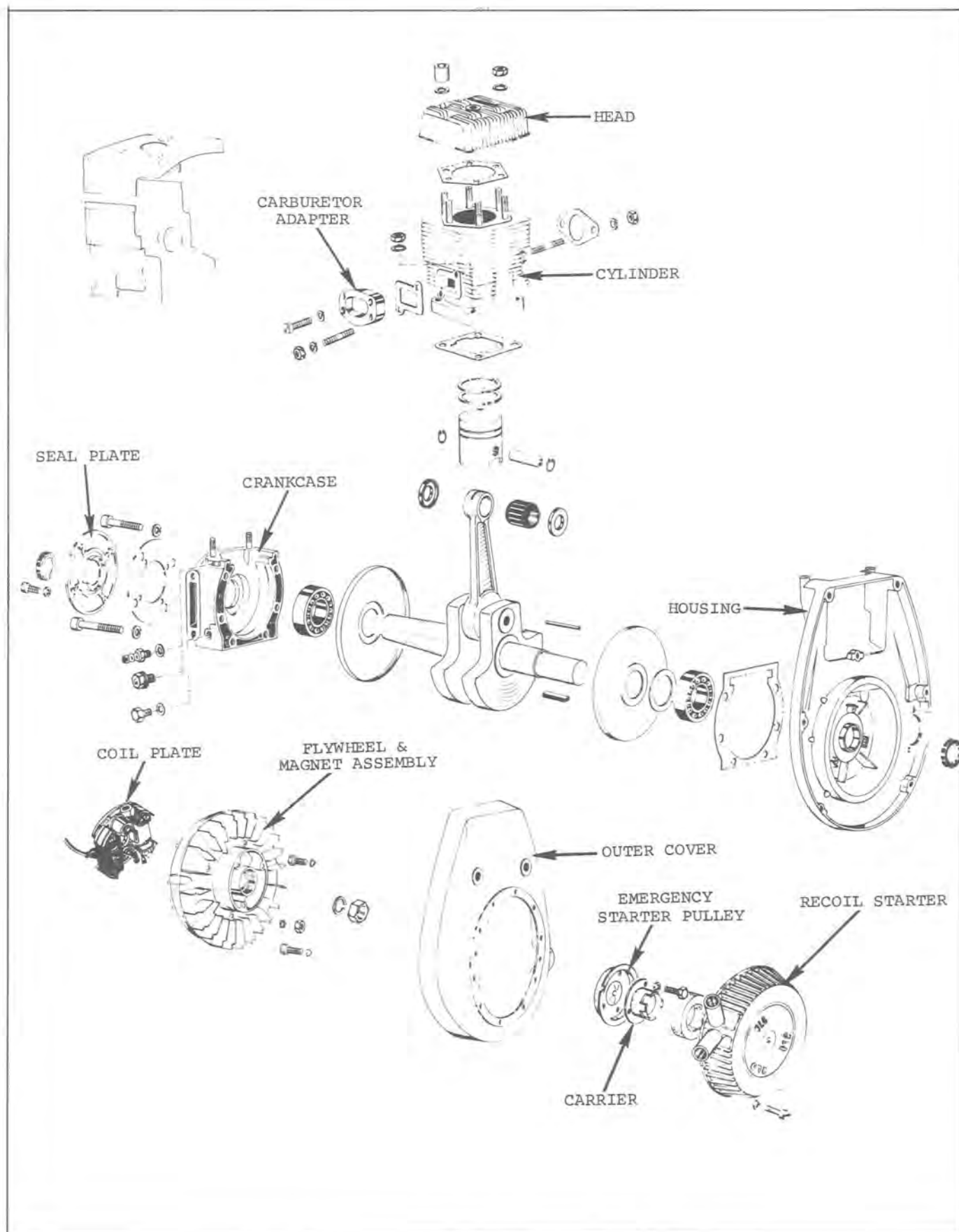


Fig. 21 — Identification of Parts — Model L 380 Engine

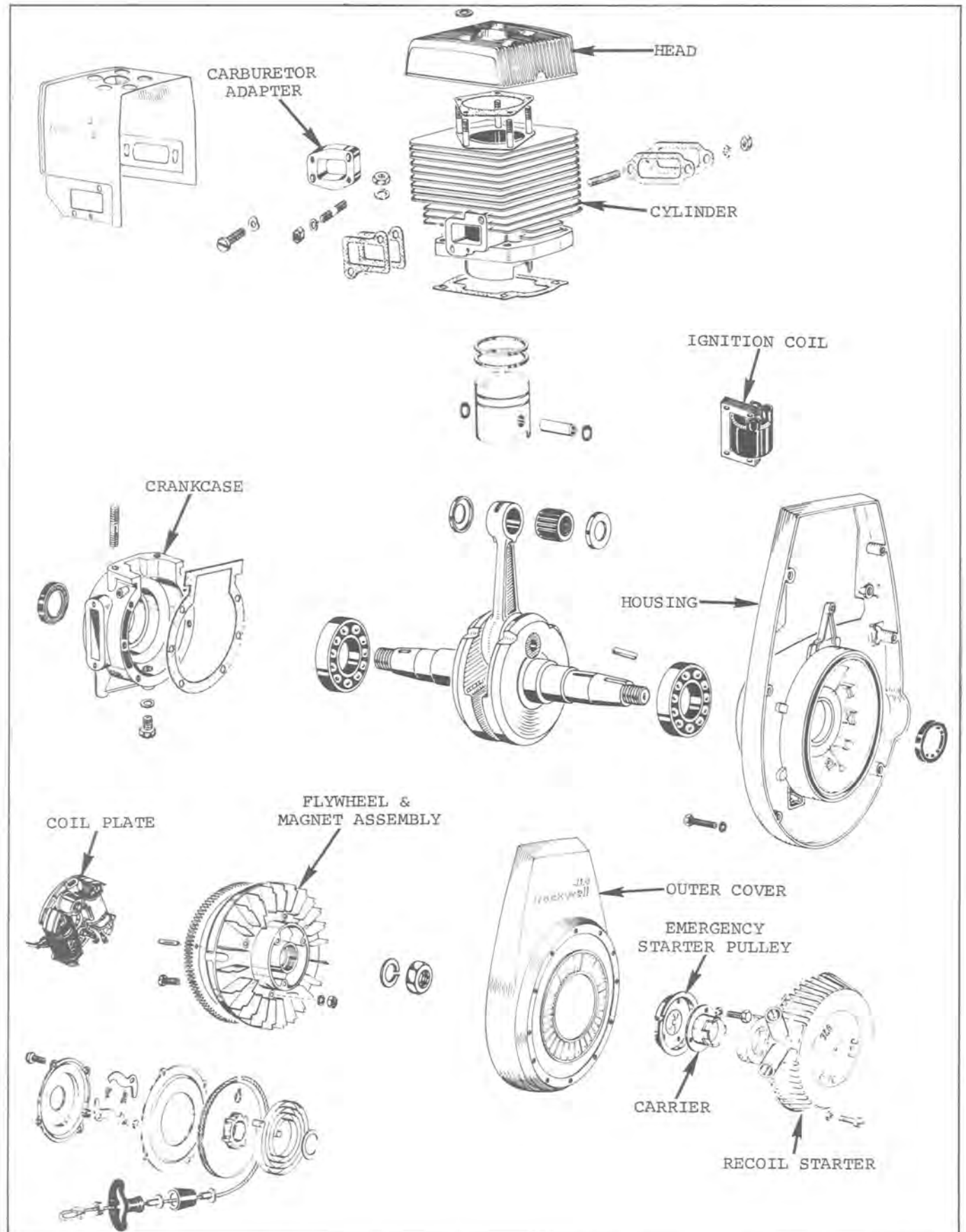


Fig. 22 — Identification of Parts — Model L 297 Engine

- b. Remove carburetor from adapter and mounting adapter from engine.
- c. Remove exhaust pipe from engine then remove the engine cowl.
- d. Remove the cylinder assembly mounting nuts then carefully lift cylinder assembly from engine as shown in Fig. 16.

NOTE: Use the notched piece of wood as shown, and as the cylinder is lifted from the engine, rotate the engine crankshaft until the piston is resting on the wood block.

- e. Remove the piston pin retaining snap ring at the "pulley side" of the piston, then remove piston pin as shown in Fig. 17.
- f. If the rings are to be replaced, remove them from the piston.
- g. Remove piston pin bearing and retainers (washers) as shown in Fig. 18.
- h. Remove old cylinder assembly gasket from surface of crankcase. Also check the rod bearing for evidence of damage or wear. (The rod and crankshaft are available as an assembly only. The engine will have to be removed from the Ski Whiz if this assembly is to be replaced.)
- i. Insert the piston pin bearing into the rod and position one retainer on each side of the bearing. Retainers are to have their flat surfaces away from bearing.
- j. Position the piston over rod and insert piston pin as shown in Fig. 17. Install snap ring retainers to secure the piston pin. (Snap ring nearest the flywheel is more easily installed before the piston is connected to the rod.)

NOTE: The arrow on top of the piston must point towards the exhaust side of the engine.

- k. Position new cylinder assembly gasket on crankcase, making sure that the wooden block is under the piston.
- l. If rings have been removed, replace them. Also check that wires to ignition coil are routed properly so they will not be pinched by cylinder assembly.
- m. Make certain that piston rings are positioned as shown in the insets in Figs. 17 and 20. Use a suitable metal band to compress the rings and carefully guide cylinder assembly over the piston and into place against the crankcase. Ignition wires are to be below the cylinder's cooling fins.
- n. Install the cylinder assembly mounting washers and nuts and tighten them securely.

- o. Use new gaskets and reinstall the engine cowl, exhaust pipe, carburetor mounting adapter and carburetor.
- p. Reconnect the choke rod, throttle cable and fuel lines to the carburetor.
- q. See "Ignition Timing" and proceed as directed.

3. Replace crankshaft and rod assembly, crankshaft bearing and seals as follows (*the engine is to be completely disassembled*):

See Figs. 21 and 22.

- a. Remove engine from Ski Whiz. See "Engine Removal and Installation".
- b. Remove drive pulley from crankshaft. See "Removing/Installing Drive Pulley" under "Drive and Driven Pulley Servicing".
- c. Remove exhaust pipe, muffler and muffler mounting bracket from engine.
- d. Remove recoil starter, outer cover, dust seal, starter carrier, shims, emergency starter pulley, flywheel retaining nut and lockwasher. See steps No. 1 through No. 4a under "Ignition Timing" for procedures.
- e. Remove flywheel and magneto coil plate assembly. See steps No. 4b and No. 4c under "Ignition Timing" for procedures.

NOTE: Use care to prevent damage to the coils.

- f. Remove ignition coil, cylinder head and gasket, carburetor, carburetor mounting adapter, cylinder assembly, piston and piston bearing from the engine. See Figs. 11 through 20 and steps No. 1-a through No. 1-c and Steps No. 2-d through No. 2-h for procedures.

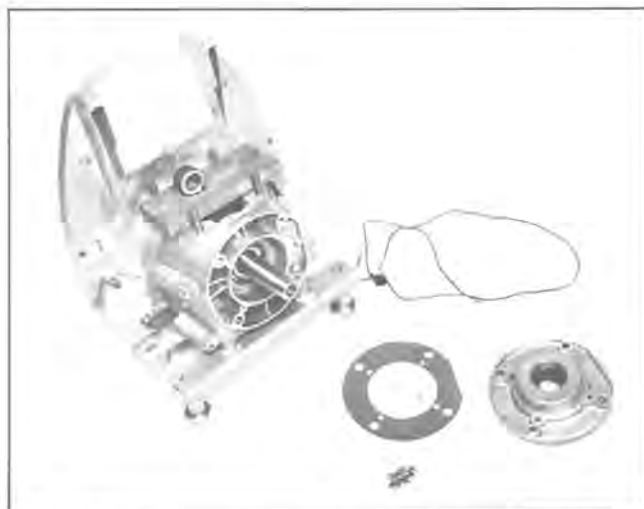


Fig. 23 — Crankshaft Seal Plate and Gasket — L 380 Engine



Fig. 24 — Removing / Installing the Crankcase Assembly Screws (L 297 Engine Shown)

- g. Remove the crankshaft seal plate and gasket from the drive pulley side of the L 380 engine. See Fig. 23.
- h. Remove the six crankcase assembly screws. See Fig. 24.
- i. Position the crankcase housing between two blocks of wood (allowing enough room so that the weight of the crankshaft and pulley side of the crankcase will allow crankshaft bearing to be pulled free of flywheel side of crankcase). Place a 2" OD piece of pipe over the crankshaft so as to protect the seal, then using a torch to heat the bearing area of the housing as shown in Fig. 25, separate crankcase.

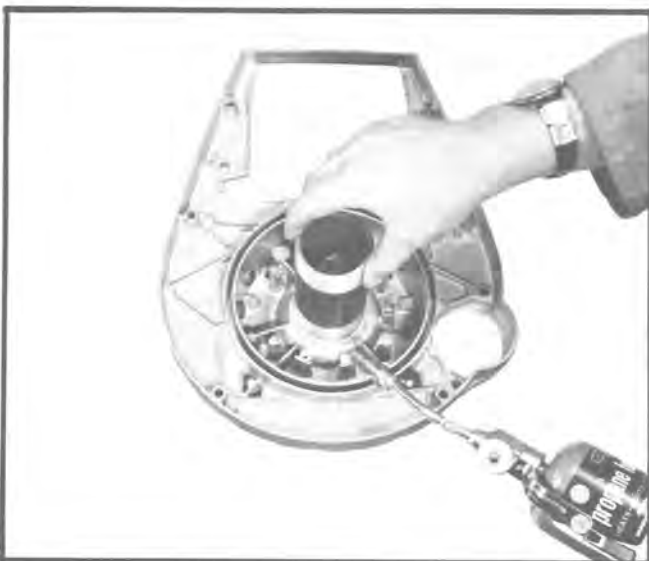


Fig. 25 — Heating Bearing Area of Housing for Removal or Installation of Crankshaft (L 297 Engine Shown)

NOTE: Do not heat the housing too long or the bearing will swell and the housing will not separate. If this happens, wait until temperatures return to normal and repeat procedures more carefully. MAKE SURE THAT MAGNETO COIL PLATE IS NOT DAMAGED.

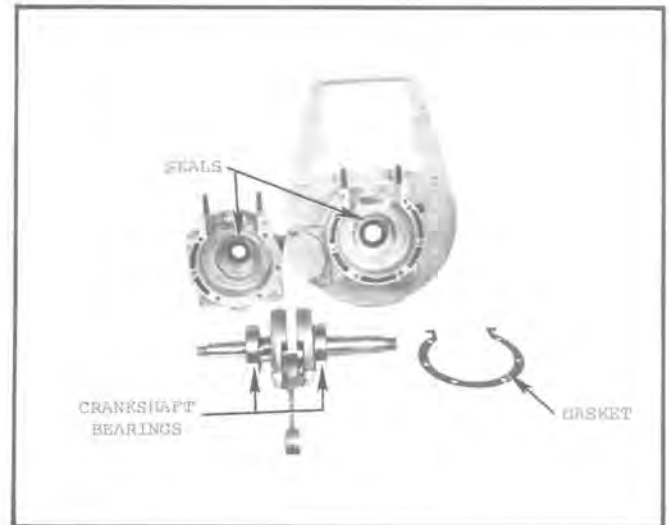


Fig. 26 — Crankcase Separated and Crankshaft Assembly Removed (L 297 Engine Shown)

- j. Turn crankcase over, placing it on the wooden blocks, and allow the weight of the crankshaft to pull bearing free while applying heat to bearing area as in step "i". Fig. 26 shows the crankshaft and rod assembly free of crankcase.
- k. Use special tools as shown in Fig. 27 to remove the crankshaft bearings. Also remove the washer and cover used on the crankshaft of the L 380 engine. See Fig. 28.



Fig. 27 — Removing Crankshaft Bearings

- 1. Special Tool No. 444.31-071-0
- 2. Special Tool No. 444.31-073-1
- 3. Special Tool No. 444.31-807-0

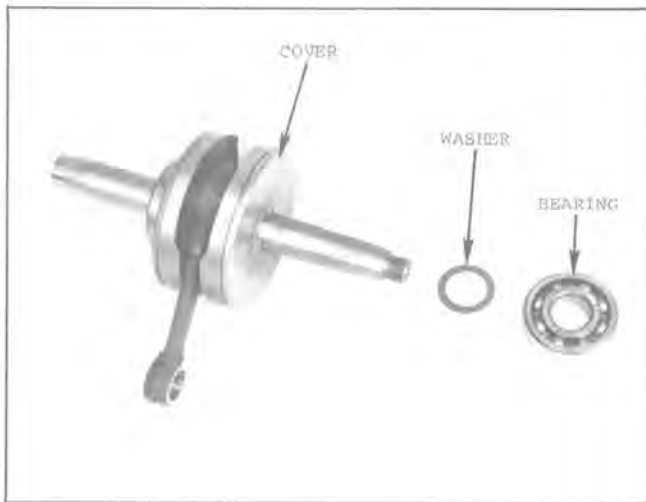


Fig. 28 — Crankshaft Assembly Used on L 380 Engine



Fig. 29 — Heating Crankshaft Bearing Prior to Installation



Fig. 30 — Tapping Heated Bearing Onto Crankshaft

- l. Inspect all parts for wear or damage. Pay particular attention to the crankshaft oil seals. Replace parts as necessary. Install new seals flush with the housing (or plate) surfaces. Make sure that their sealing lips (spring side of seal) is facing inward to crankcase.
- m. Heat bearing in oil to approximately 220° F. for about five minutes (see Fig. 29). Make sure that cover and washer are installed on crankshaft of L 380 engine, then place crankshaft between two wooden blocks. Drop heated bearing over crankshaft and tap into place as shown in Fig. 30. Turn crankshaft over and install remaining bearing the same way.

NOTE: Tap on the inner race of the bearings only. If bearings do not easily tap into place, remove them from the crankshaft, reheat them in oil then reattempt installation. Make sure that the heat of bearings have not been transferred to the crankshaft, as this will cause the crankshaft to swell also and make installation difficult. (Or it may remove heat from the bearing too rapidly, causing it to shrink before installation can be completed.)

- n. Remove burrs from crankshaft key (flywheel side of crankshaft) and apply a thin film of petroleum jelly to both ends of crankshaft. Check that seals have been properly installed and are in good condition. Also make sure that bearings have cooled to normal temperature.
- o. Position crankshaft between the wooden blocks with its drive side upward (the side without the keyway). Then position crankcase carefully over shaft and downward until it contacts the bearing. Place the 2" OD pipe over the crankshaft to protect the seal (L 297 engine) then heat the bearing area of the crankcase . . . LIGHTLY TAP crankcase into position over bearing. (DO NOT APPLY TOO MUCH HEAT.)

NOTE: If a keyway is located on both sides of the crankshaft, the drive side is the end with the shortest (or half-moon shaped) keyway.

- p. Turn assembly over, placing crankcase on blocks, then position new gasket on crankcase (use a thin film of petroleum jelly to hold gasket in position). Carefully place housing over shaft, place the 2" OD pipe over shaft to protect seal, then apply heat to bearing area of housing . . . LIGHTLY TAP housing onto bearing. (DO NOT APPLY TOO MUCH HEAT.)

NOTE: Do not damage magneto coil plate assembly.

GROUP XI SECTION E — PART 1

- q. Check that crankcase and housing (and gasket) are aligned and are flush at the cylinder mounting base. Install and tighten the six assembly screws (with lockwashers) evenly to 16-18 ft.-lbs. on the L 297 and 31-33 ft.-lbs. on the L 380 engine. Trim the excess gasket at the cylinder mounting base.
- r. Install and tighten the crankshaft seal plate at the drive pulley side of the L 380 engine. Use a new gasket between plate and crankcase.
- s. Reinstall magneto coil plate, aligning marks made during disassembly, install the piston and cylinder assembly per instructions in step No. 2-i through No. 2-o and install the cylinder head per instructions in step No. 1-c through No. 1-f.
- t. Reinstall muffler mounting bracket, drive pulley and muffler onto engine, then reinstall engine into Ski Whiz. (See appropriate instructions under "Drive and Driven Pulley Servicing" and under "Engine Removal and Installation.")
- u. Reinstall ignition coil.
- v. See steps No. 4d through No. 7 under "Ignition Timing" and proceed as directed to complete servicing.

IGNITION TIMING

Ignition timing may be checked and/or adjusted with the engine mounted.

1. Remove the recoil starter, then remove the dust seal and outer cover. See Fig. 31.
2. Remove the spark plug wire, starter carrier, shims and emergency starter pulley from the flywheel. See Figs. 32 and 33.

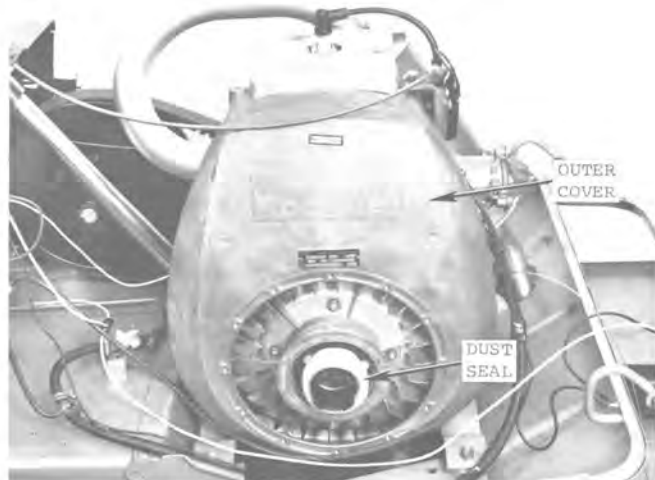


Fig. 31 — Recoil Starter Removed — Engine Mounted in Ski Whiz

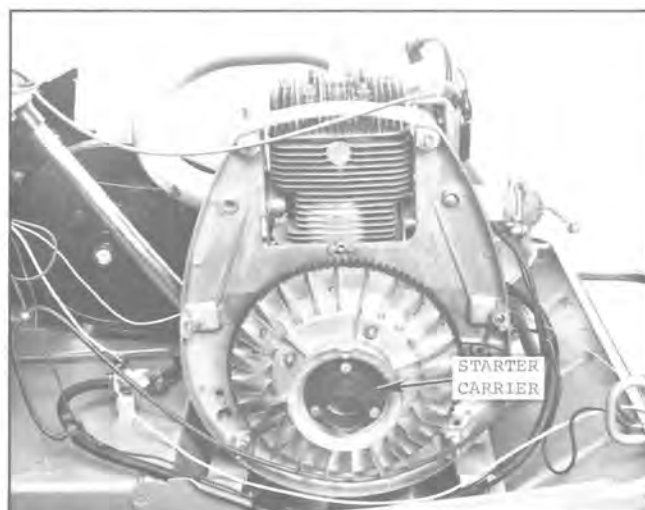


Fig. 32 — Outer Cover Removed from Engine

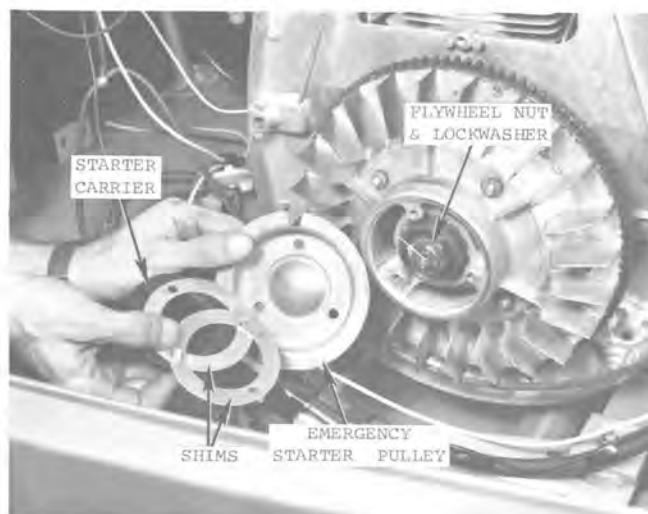


Fig. 33 — Gaining Access to Magneto Assembly and Flywheel Nut



Fig. 34 — Checking Breaker Point Gap

3. If all that is to be done is CHECKING breaker point gap and ignition timing, use timing gauge in spark plug hole to check that piston is at T.D.C., then rotate flywheel until a feeler gauge can be inserted through opening as shown in Fig. 34. Check and adjust point gap, then proceed to step No. 5.

4. If flywheel is to be removed:

a. Remove the flywheel retaining nut and lockwasher. (The flywheel nut is more easily removed by "impact" with the nut turning against engine compression. If difficulty is encountered, the drive pulley bolt may be held to assist in holding crankshaft.)

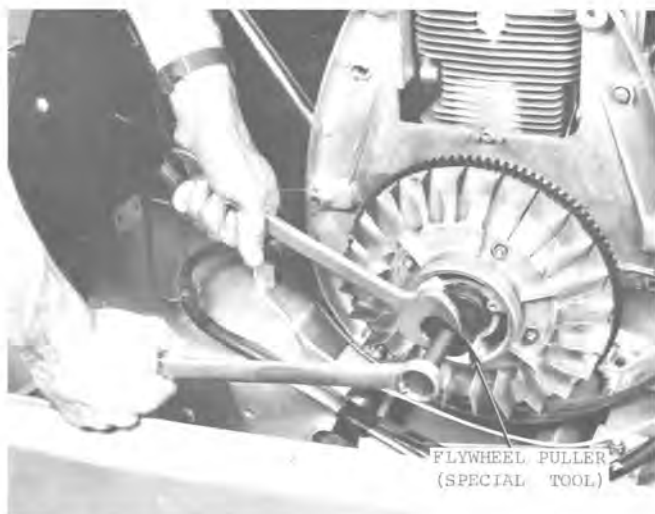


Fig. 35 — Removing Flywheel from Crankshaft

b. Use flywheel puller (special tool no. 444.31-329-0) to remove flywheel as shown in Fig. 35. Fig. 36 shows the flywheel assembly removed and identifies the magneto parts contained within it.

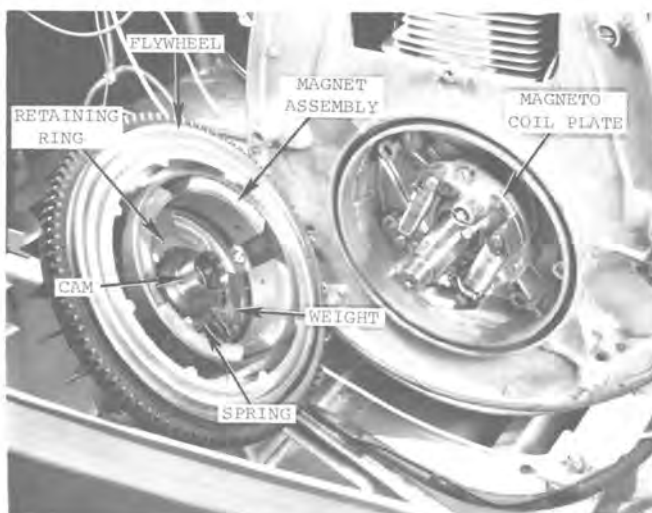


Fig. 36 — Flywheel and Magnet Assembly Removed from Engine

c. Place aligning marks (for easier reassembly) across the magneto coil plate, then remove this plate's retaining screws. Place coil plate out of the way of the crankshaft. See Fig. 37. If any of the parts on the coil plate are to be replaced, use care when unsoldering connections.

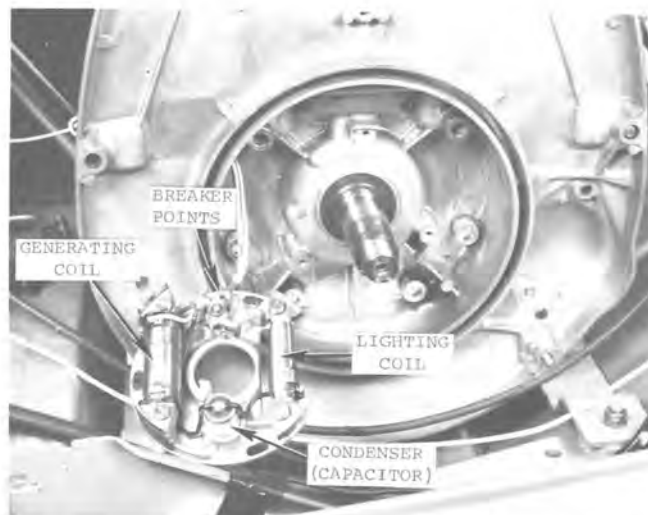


Fig. 37 — Magneto Coil Plate Assembly — Identification of Parts

d. Reinstall magneto coil plate, aligning marks made during disassembly, or turn plate all the way to the right (clockwise) and back off slightly for initial setting.

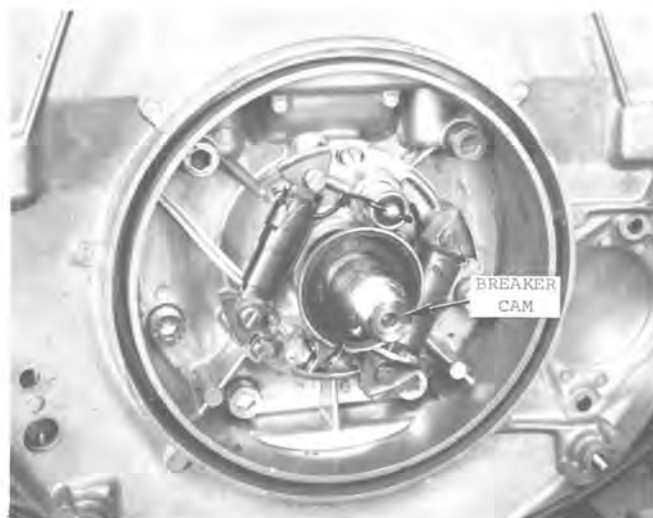


Fig. 38 — Breaker Cam Installed for Breaker Point Gap Setting

e. If desired, cam may be removed from flywheel and placed on crankshaft as shown in Fig. 38. Rotate the cam to open the breaker points and set their gap to .014"-.018" (0.35-0.45 mm) as shown in Fig. 39. After setting has been made, reinstall cam into flywheel.



Fig. 39 — Setting Breaker Point Gap

- f. Reinstall flywheel and key onto crankshaft. Tighten flywheel nut to 79-86 ft.-lbs. torque.
5. Time ignition as follows:
 - a. Check that point gap is correct per step No. 3.
 - b. Remove spark plug and install timing gauge (special tool no. 444.31-875-00) in spark plug hole. Then turn flywheel until piston is at TDC as indicated by timing gauge.

NOTE: This measurement must be done as accurately as possible.

- c. Use a bent wire *carefully* inserted into flywheel hole to move the centrifugal weight until guide pin (special tool no. 444.31-666-00) can be inserted. See Fig. 40.

NOTE: Use care to prevent damage to coils.

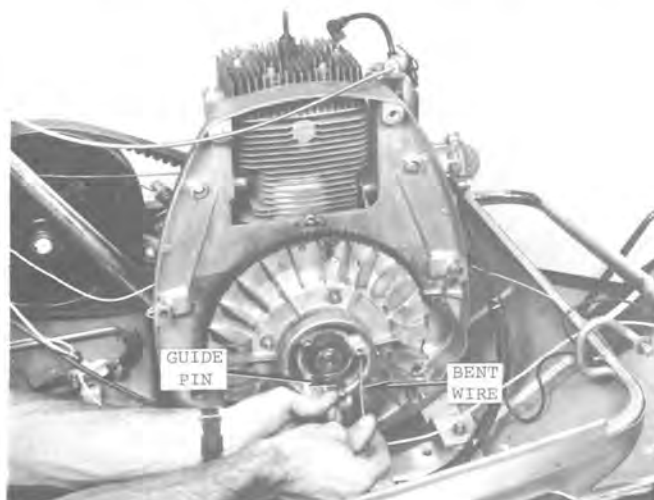


Fig. 40 — Inserting Guide Pin to Hold Centrifugal Weight During Ignition Timing

- d. Disconnect black and blue wires (same connection) from the ignition coil and disconnect the opposite end of the black wire from the ignition switch. Connect a suitable test light to the blue wire (connection near the ignition coil) then rotate the flywheel slowly clockwise (facing flywheel) while noting the timing gauge and the test light. See Fig. 41. If the timing is satisfactory, the light should *dim* when the piston is between:

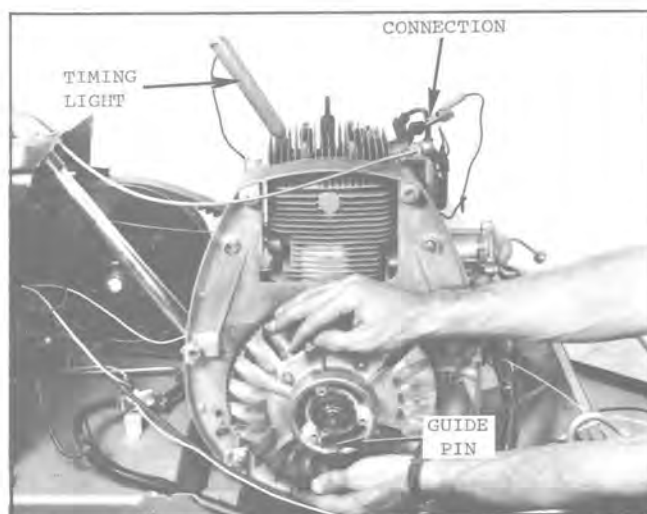


Fig. 41 — Checking Ignition Timing with Suitable Lamp

L 297 engine—3.0-3.5mm (.118"-.138") B.T.D.C.

L 380 engine—3.1-3.6mm (.122"-.142") B.T.D.C.

- e. If timing must be corrected, insert screw driver *CAREFULLY* into webbing in center of flywheel (through which breaker point gap was checked) and loosen screws holding magneto coil plate. Rotate coil plate counterclockwise, if timing is to be advanced; or, rotate plate clockwise, if timing



Fig. 42 — Checking Starter Carrier Adjustment

is to be retarded. Tighten magneto coil plate securely.

NOTE: Do not damage coils.

- f. After timing is set, remove timing gauge timing light and guide pin. Reinstall spark plug and re-connect wiring to ignition coil and to ignition switch.

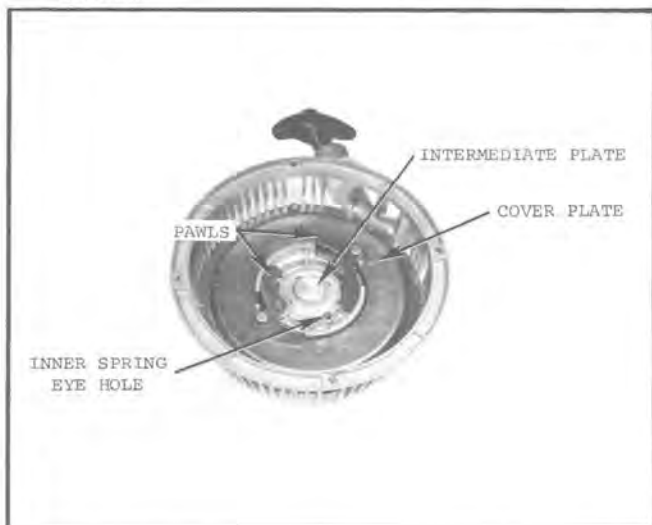


Fig. 43 — Recoil Starter Assembly with Outer Plate Removed

6. Reinstall the outer cover, then reinstall emergency starter pulley shims and starter carrier. Measure the distance between the carrier and the outer cover as shown in Fig. 42. This distance is to be as shown. Add or subtract shims to obtain this measurement.

7. Reinstall the dust seal and the recoil starter, then reconnect the spark plug wire.

RECOIL STARTER SERVICING

1. Remove recoil starter from engine.

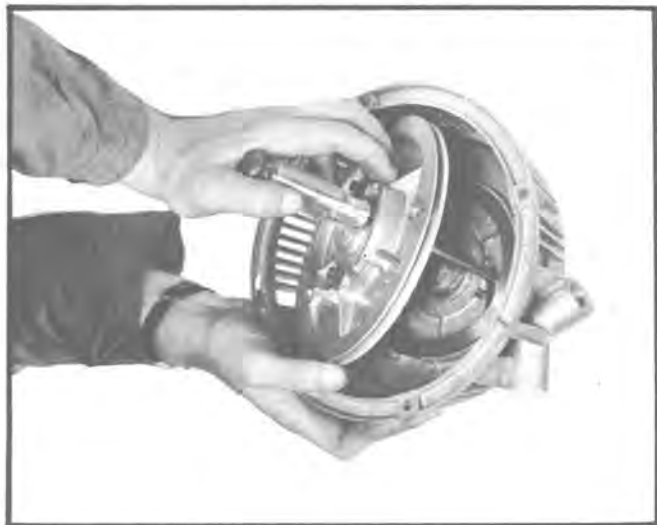


Fig. 44 — Removing Pulley Drum



Fig. 45 — Starter Housing with Recoil Spring Installed

2. Remove outer plate, brake springs and their caps. See Fig. 43.

3. See Fig. 43. Disconnect the pawl retaining springs from the pulley drum, then remove the pawls.

4. Remove the intermediate plate, then clamp starter into the rewind clamping device (special tool no. 444. 31-863-10). Pull out on starter cable and use a screwdriver to stop starter from coiling back while clamped. Disconnect cable from drum, then remove the screwdriver and allow the starter housing to slowly turn until the tension on the recoil spring is relieved.

5. Remove starter from rewind clamping tool and insert screwdriver through hole in drum. Use it to press against recoil spring and remove drum as shown in Fig. 44. Fig. 45 shows spring in housing.

6. Turn housing with its spring side downward on work bench and jar housing to dislodge spring. Remove housing carefully.



Fig. 46 — Replacing Recoil Spring



CAUTION: Use care when lifting housing from bench to prevent injury.

7. Place starter housing into rewind clamping device and clamp special tool in a vise. Hook recoil spring into housing as shown in Fig. 46. Rotate special tool until recoil spring has been wound.

8. Carefully remove starter housing from clamping device, then install pulley drum with a screwdriver through hole in drum, using the screwdriver to hook the inside of the spring over its pin. See Fig. 44.

9. Insert housing into special clamping device, then tightly coil spring aligning cable bore in drum with guide bushing. Insert cable through bores securing it to the drum. Allow the cable to wind itself by the pull of the recoil spring.

10. Remove housing from rewind device, then reinstall the pawls, their retaining springs, brake springs and their caps. See Fig. 43.

11. Reinstall outer plate, then install the starter assembly onto engine.

CARBURETOR OVERHAUL

The carburetor used on the model L 297 engine differs from the one used on the L 380 engine. They may be visually identified by the location of their mixture screws (needles). See Figs. 47 and 48 for identification. However, the overhaul procedures are basically the same. Where differences exist, it will be noted in the instructions.

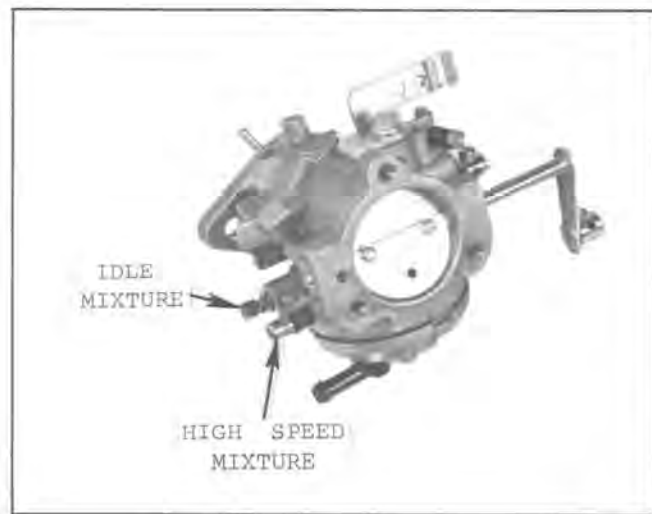


Fig. 47 — Model "HR" Carburetor Used with L 297 Engine



Fig. 48 — Model "HD" Carburetor Used with L 380 Engine

1. Clean carburetor thoroughly, then disassemble as follows: (refer to Figs. 49 through 53):

- a. Remove the fuel inlet and screen and remove the fuel pump retaining screws as shown in Fig. 49.
- b. Remove the parts of the fuel pump as shown in Fig. 50.
- c. Remove the metering diaphragm as shown in Fig. 51.
- d. Remove the inlet control lever as shown in Fig. 52.
- e. Remove the remaining parts of the carburetor as shown in Fig. 53. The idle by-pass ports and main nozzle ball check valve are sealed from the metering chamber by Welch plugs. If the carburetor

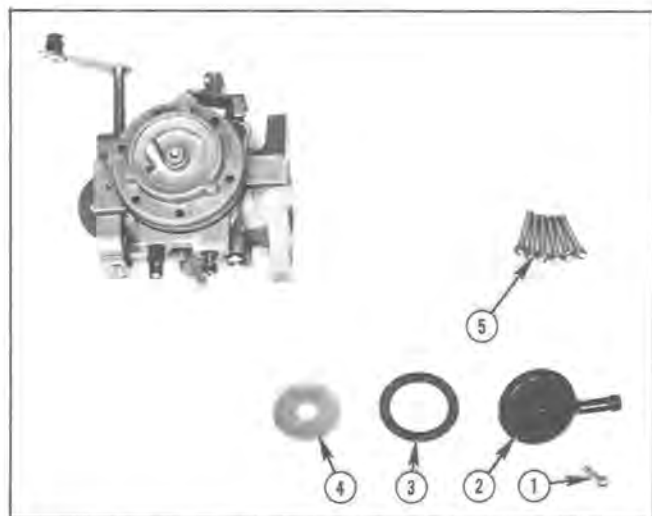
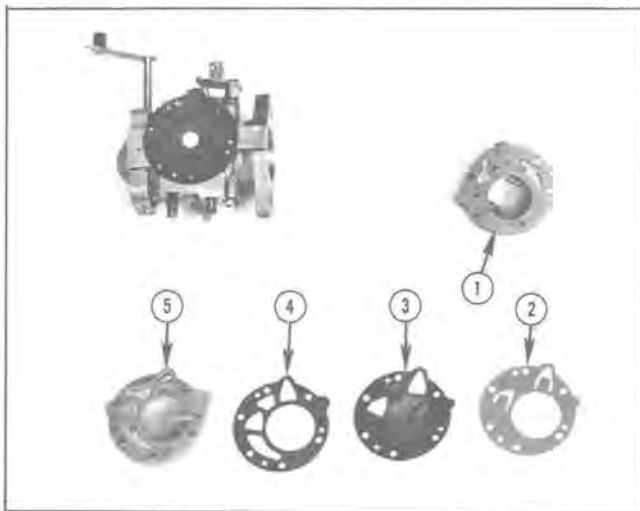
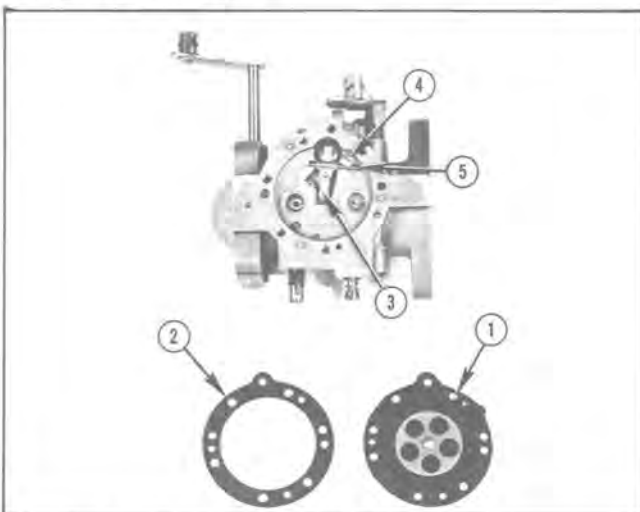


Fig. 49 — Fuel Inlet and Screw Removed

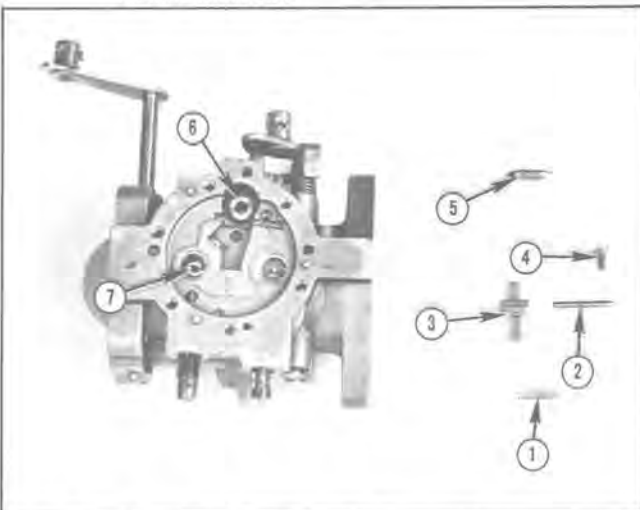
- | | |
|-----------------------------|--------------------------|
| 1. Center Screw | 4. Strainer Screen |
| 2. Inlet and Strainer Cover | 5. Body Retaining Screws |
| 3. Cover Gasket | |

**Fig. 50 — Fuel Pump Parts Removed**

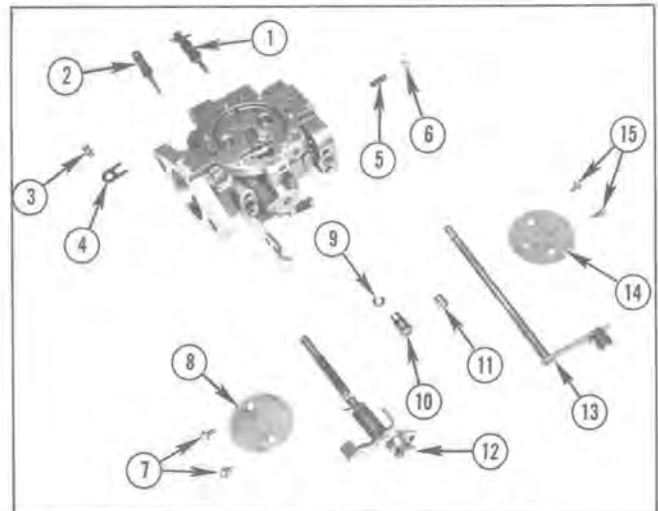
- | | |
|--|-----------------------------|
| 1. Fuel Pump Cover | 4. Gasket |
| 2. Diaphragm — Inlet and Outlet Valves | 5. Diaphragm Cover-Metering |
| 3. Diaphragm — Fuel Pumps | |

**Fig. 51 — Metering Diaphragm Removed**

- | | |
|------------------------|--------------------|
| 1. Metering Diaphragm | 4. Retaining Screw |
| 2. Gasket | 5. Fulcrum Pin |
| 3. Inlet Control Lever | |

**Fig. 52 — Inlet Control Lever Removed**

- | | |
|-------------------------|--------------------------|
| 1. Inlet Tension Spring | 5. Inlet Needle |
| 2. Fulcrum Pin | 6. Inlet Seat and Gasket |
| 3. Inlet Control Lever | 7. Main Fuel Check Valve |

**Fig. 53 — Throttle and Choke Shutters Removed**

- | | |
|------------------------------|-----------------------------|
| 1. High Speed Mixture Needle | 9. Gasket |
| 2. Idle Mixture Needle | 10. Inlet Needle Seat |
| 3. Screw w/Washer | 11. Main Fuel Check Valve |
| 4. Shaft Clip | 12. Throttle Shaft |
| 5. Spring | 13. Choke Shaft |
| 6. Detent Ball | 14. Choke Shutter |
| 7. Shutter Screws w/Washers | 15. Shutter Screws w/Washer |
| 8. Throttle Shutter | |

is unusually dirty and the Welch plugs must be removed, careful work is required. Drill through the Welch plug with an 1/8" drill. Allow the drill to just break through the plug otherwise the casting may be ruined. Pry the plug from its seat with a small punch.

2. Clean all parts of the carburetor and inspect them for wear or damage. Replace all parts necessary.

3. Reassemble the carburetor as follows (refer to Figs. 49 through 53):

- Tighten the inlet seat of the "HD" carburetor to 40-50 inch-pounds torque, and tighten the inlet seat of the "HR" carburetor to 25-30 inch-pounds torque.
- Install new Welch plugs (if removed) into their bore convex side upward. Flatten the plug to make sure it fits tightly into its seat. A correctly installed plug is flat in its seat.
- Reinstall the remaining parts of the carburetor by reversing the disassembly sequence.

CARBURETOR ADJUSTMENTS

The high speed and idle mixture needles are both turned clockwise to lean the mixture and in the opposite direction to enrich the mixture.

NOTE: Do not adjust carburetor exceptionally lean as engine damage can result. A slightly rich mixture is preferable so as to prolong engine life.

1. Close both mixture screws, then open high speed adjustment screw 1-1/2 turns and the idle mixture screw 1 turn for their initial setting.

2. Block up Ski Whiz until track is clear of ground, start engine and allow to warm up to operating temperature. Adjust the idle mixture screw 1/8 turn at a time until a smooth steady idle is obtained.

3. Adjust the idle speed screw until the engine is running at approximately 1900-2000 rpm. Readjust the idle mixture screw until the engine runs smoothly.

4. Shut off the engine, then attempt to restart. Engine should start easily and run smoothly.

5. Adjust high speed mixture screw to provide the best performance for the climatic condition, altitude and type of operation desired.

NOTE: Do not operate engine above idle unless the drive belt is transmitting torque to the drive track.

DRIVE AND DRIVEN PULLEY SERVICING

The drive and driven pulleys used with the L 297 engine are different than those used with the L 380 engine.

REMOVING / INSTALLING PULLEY

1. Disconnect the spark plug wire, then remove the drive belt from the pulley. See appropriate procedure heading.

2. If pulley is to be removed from L 297 engine, proceed as follows:

- a. Remove pulley retaining bolt. (If difficulty is encountered, a chain wrench may be used around



Fig. 54 — Drive Pulley Used with L 297 Engine (Cover Removed to Show Internal Parts)

outer drum of pulley while removing bolt.) See Fig. 54.

- b. Insert a suitable "slug" into hole from where retaining bolt was removed. Install a bolt into threaded end of pulley and use it as a puller to force pulley from shaft.

3. If pulley is to be removed from L 380 engine, proceed as follows (see Fig. 55):

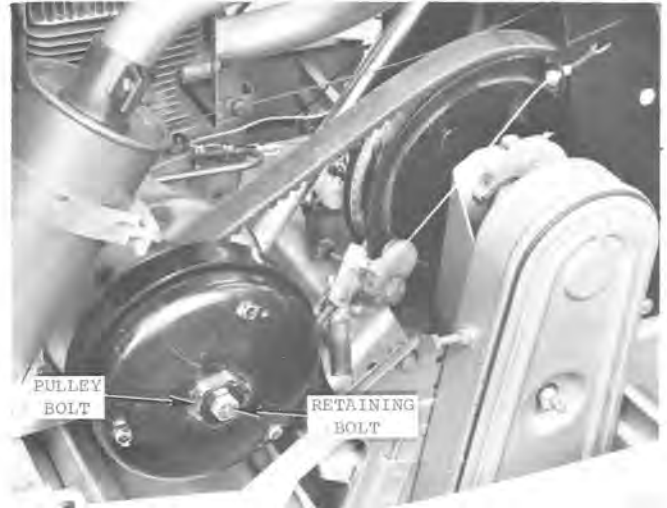


Fig. 55 — Drive Pulley Used with L 380 Engine

- a. Remove drive belt.
- b. Remove center retaining bolt.
- c. Remove pulley bolt while holding outer drum of pulley with a chain wrench.
- d. Slide outer drum assembly and coil spring from crankshaft.
- e. Place a "slug" into inner diameter of pulley (make sure that "slug" is large enough to prevent damage to internal threads of crankshaft) then reinstall pulley bolt and use it as a puller to force pulley from crankshaft. See Figs. 56 and 57.

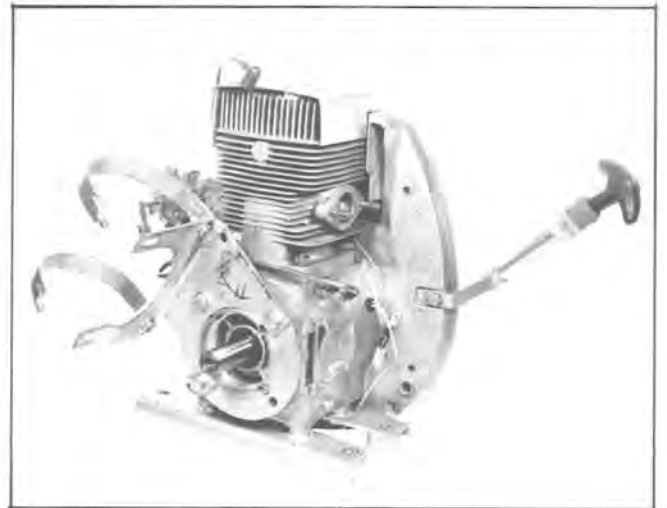


Fig. 56 — Drive Pulley Side of Crankshaft on L 380 Engine

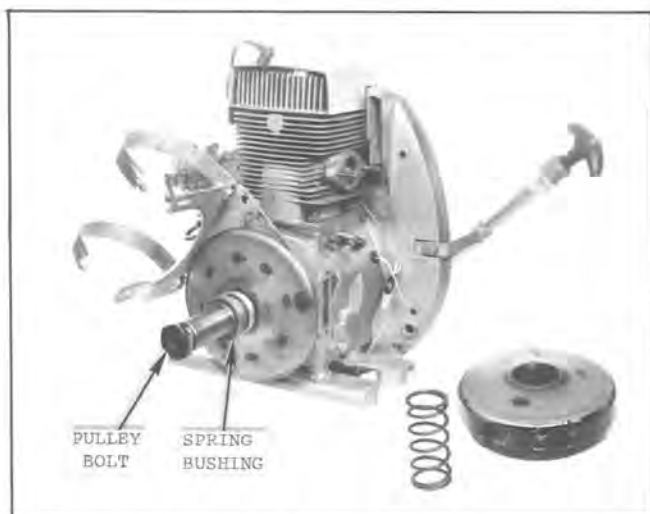


Fig. 57 — Using Pulley Bolt to Force Pulley From Crankshaft — L 380 Engine

4. Reinstall drive pulley (either assembly) by first preassembling it. Position it over crankshaft and install its retaining bolt to secure pulley. See Fig. 58.

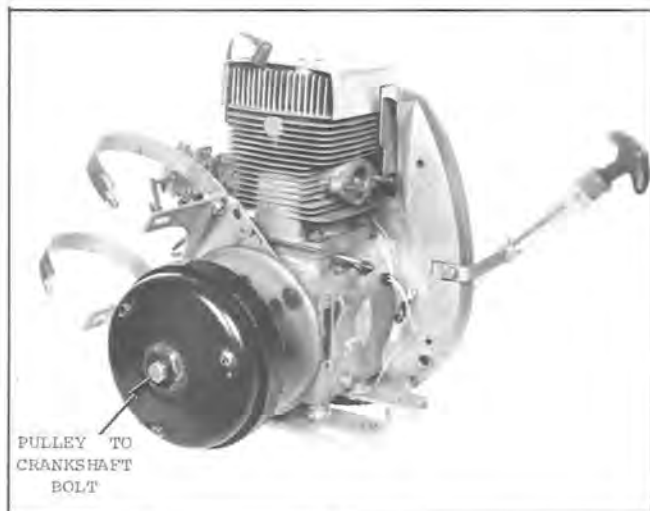


Fig. 58 — Installing Drive Pulley onto Crankshaft — L 380 Engine

5. Reinstall the drive belt and reconnect the spark plug wire.

SERVICING DRIVE PULLEY

1. If drive pulley is the one used on the L 380 engine, proceed as follows (refer to Fig. 59):

- This pulley will be partially separated during removal from crankshaft. Slide the inner bushing, spacers and belt bearing from the inner sheath.
- Remove the outer bushing from the face assembly.
- Remove the screws and their locks, then separate cover from face assembly.

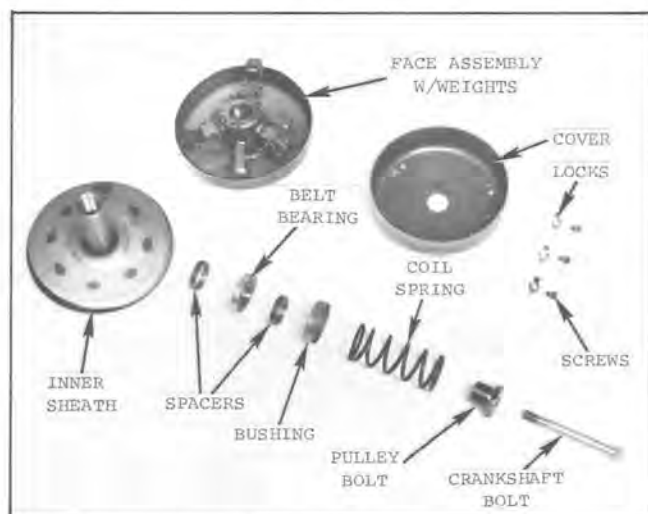


Fig. 59 — Drive Pulley Used on L 380 Engine — Identification of Parts

- Inspect all parts for evidence of wear and damage. Replace as necessary.
- Preassemble face and weight assembly (if disassembled), then reassemble cover to the face assembly with locks and screws. Install bushing into face assembly.
- Place spacer, belt bearing, spacer and inner bushing over shaft of inner sheath.
- Place coil spring into inner bushing, then place face and cover assembly over spring. Press downward on cover and install the pulley retaining bolt securely into pulley.

2. If drive pulley is the one used on the L 297 engine, proceed as follows:

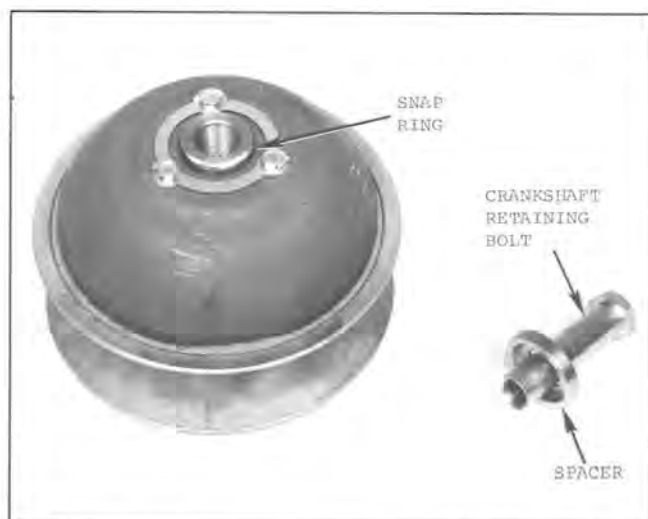


Fig. 60 — Drive Pulley Assembly Used with L 297 Engine

- Refer to Fig. 60. Remove the snap ring from its groove around inner sheath hub assembly.

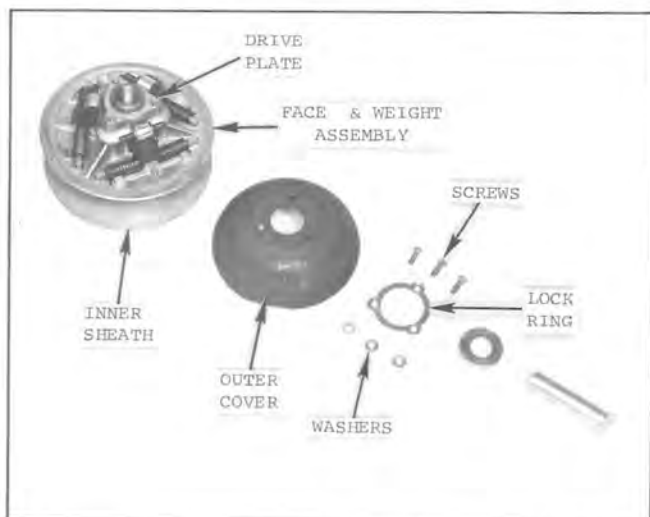


Fig. 61 — Outer Cover Removed From Pulley — L 297 Engine

- b. Remove the screws, lock ring and washers, then lift outer cover from pulley assembly. See Fig. 61.
- c. Disconnect weight springs to relieve their tension, place pulley assembly in a press. Use an arrangement similar to that pictured in Fig. 62 and press inner sheath from face and weight assembly. (Make sure there is enough room to allow clearance for the inner sheath.) Separate drive plate.

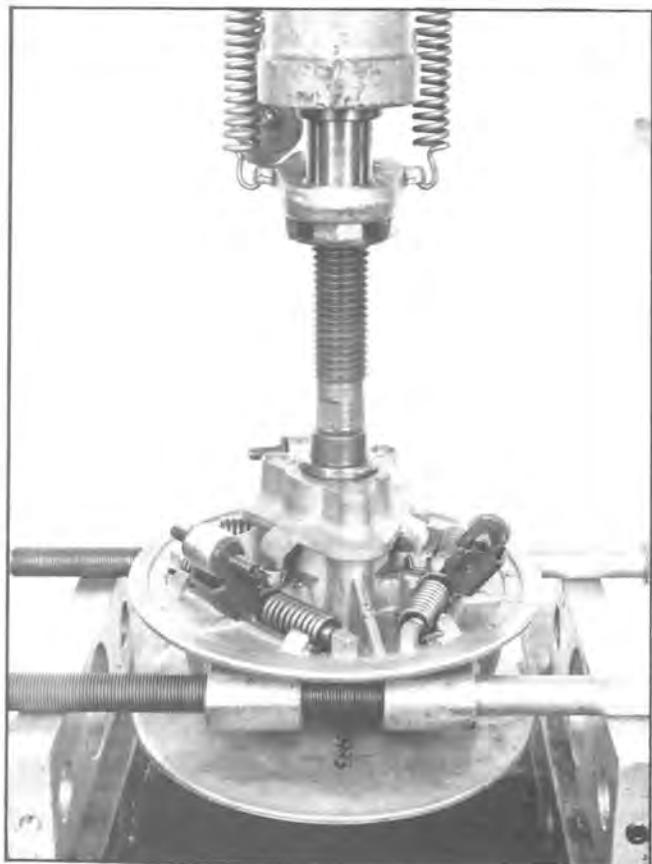


Fig. 62 — Pressing Inner Sheath From Face and Weight Assembly

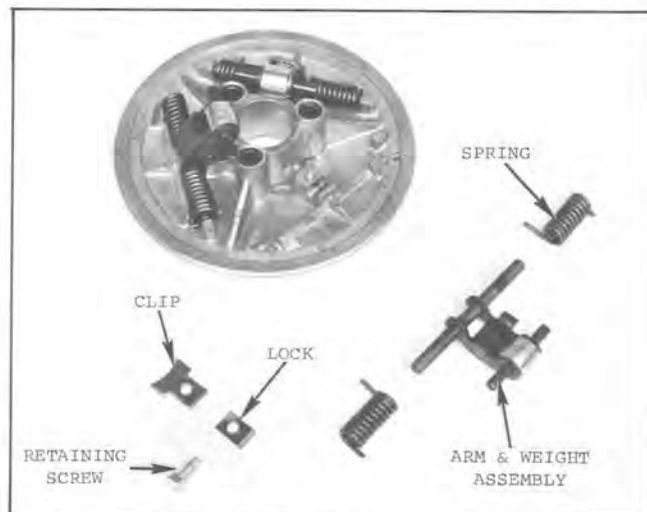


Fig. 63 — Face and Weight Assembly — Identification of Parts

- d. Disassemble the face and weight assembly as shown in Fig. 63.
- e. Preassemble face and weight assembly, slide it over shaft of the inner sheath then use a suitable pressing arrangement as shown in Fig. 64 to press drive plate into position until snap ring can be installed.

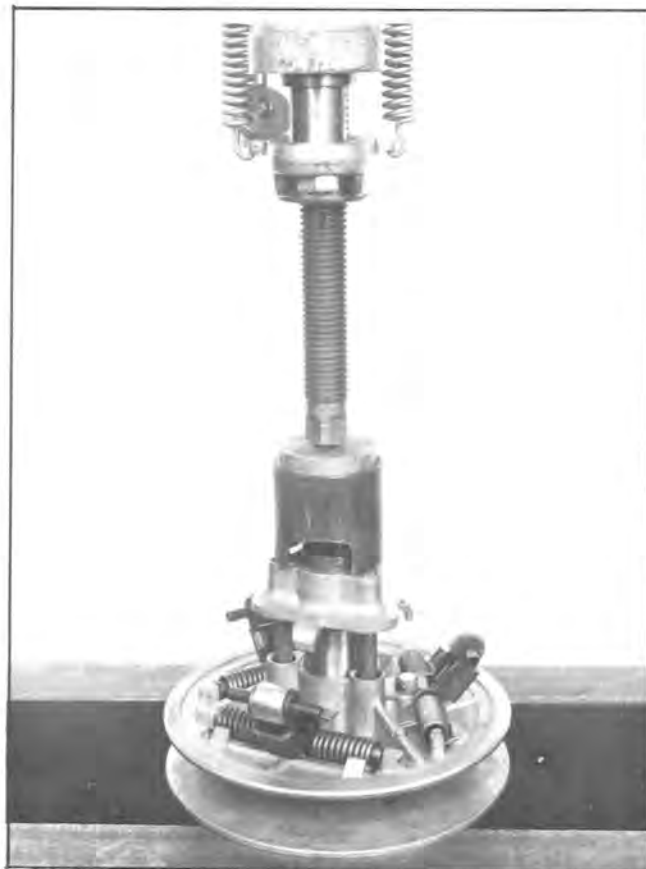


Fig. 64 — Pressing Drive Plate Over Shaft of Inner Sheath

- f. Reconnect the weight springs so they will apply tension, then complete reassembly of pulley by following the reverse of the remaining steps of disassembly.

REMOVING / INSTALLING DRIVEN PULLEY

Fig. 65 shows the inner side of the mounted driven pulley.

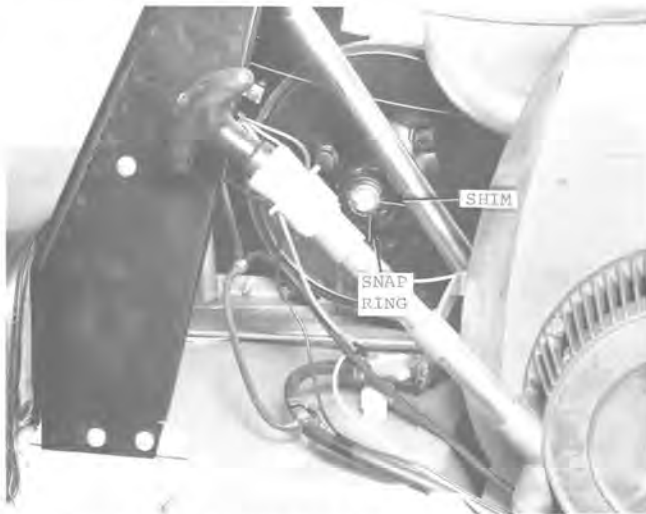


Fig. 65 — Inner Side of Installed Driven Pulley — L 380 Engine

1. Disconnect the spark plug wire, then remove the drive belt from the pulleys. See appropriate procedure heading.
2. Remove the chain case cover, then remove the snap ring securing upper sprocket to its shaft.
3. Loosen chain tension adjusting bolt. See Fig. 66. Move rubbing block away from chain.



Fig. 66 — Removing Shaft From Upper Sprocket

4. Loosen bearing locking collars, then tap shaft inward until upper sprocket can be easily removed. See Fig. 67.

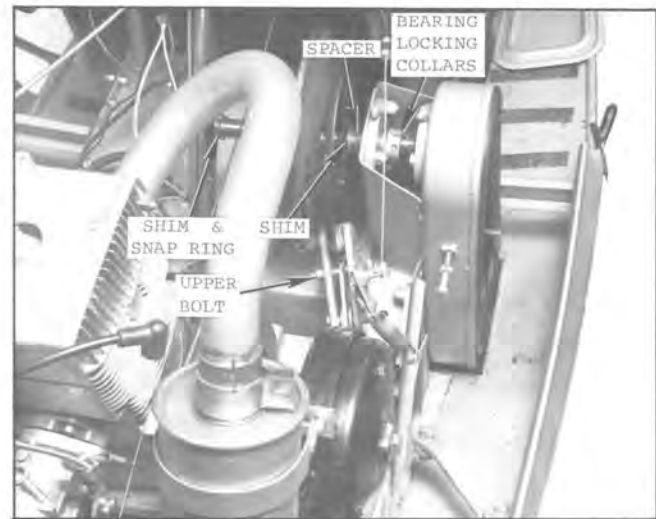


Fig. 67 — Locking Collars Removed From Bearings and Shaft Started From Driven Pulley

5. Remove upper bolt holding the brake assembly together, then move brake free of driven sprocket.
6. Continue to carefully tap shaft from bearings, removing locking collars at the same time. Slide shaft and pulley from Ski Whiz. See Fig. 68. Pay careful attention to arrangement of parts so that reinstallation can be made with ease. Slide shaft from pulley.

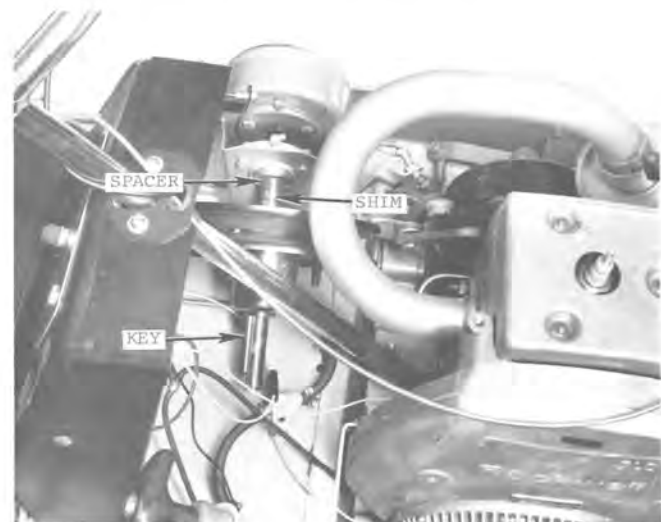


Fig. 68 — Removing Shaft and Driven Pulley From Ski Whiz

7. Reinstall the driven pulley by reversing the removal sequence. Check pulley alignment before completing installation. See "Adjusting Pulley Alignment".



Fig. 69 — Driven Pulley Assembly — Used with L 380 Engine

SERVICING DRIVEN PULLEY

1. If driven pulley is as pictured in Fig. 69, proceed as follows:

- a. Place pulley in a press and use an arrangement similar to that pictured in Fig. 70 to remove snap ring.
- b. Carefully release tension against retainer, then separate parts as shown in Fig. 71.

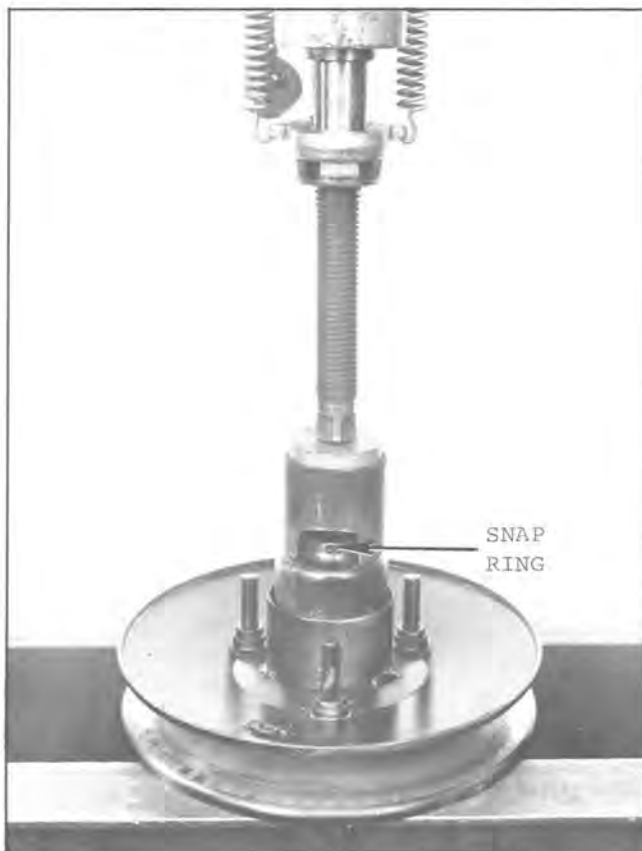


Fig. 70 — Removing Snap Ring From Driven Pulley — L 380 Engine

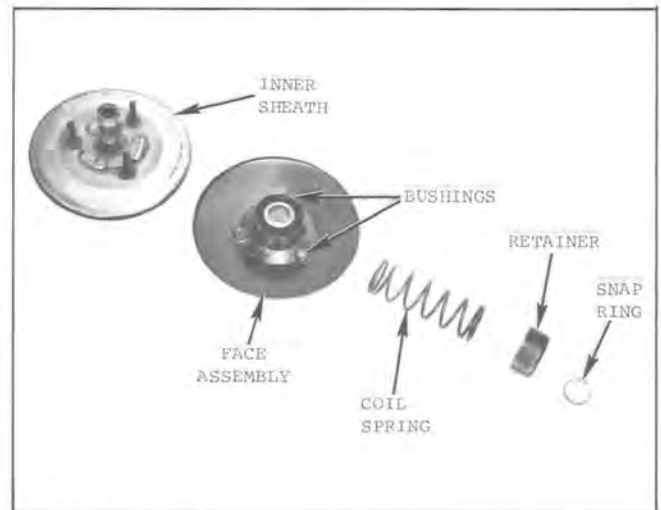


Fig. 71 — Driven Pulley Identification of Parts — L 380 Engine

- c. Check all parts for damage or wear and replace as necessary.
- d. Reassemble pulley by reversing the disassembly sequence.



Fig. 72 — Driven Pulley Assembly Used with L 297 Engine

2. If pulley is as pictured in Fig. 72, proceed as follows:
 - a. Unstake locking ring. Place pulley in a press, use an arrangement similar to that pictured in Fig. 73 and remove locking nuts.
 - b. Carefully release tension against spring, then separate parts as shown in Fig. 74.
 - c. Check all parts for damage or wear and replace as necessary.
 - d. Reassemble pulley by reversing the disassembly sequence.



Fig. 73 — Pressing Pulley So That Locking Nuts Can Be Removed



Fig. 74 — Driven Pulley Identification of Parts — L 297 Engine

ADJUSTING PULLEY ALIGNMENT

The pulley alignment should be checked and adjusted to maintain the dimensions shown in Fig. 75.

BRAKE SERVICING

The brake assembly may be removed for servicing (replacement of shoes) by disconnecting the cable, then removing the two assembly clamping bolts.

ADJUSTING BRAKE

After pulley alignment has been made (or corrected), tighten the locknut on the upper brake assembly bolt (shown in Fig. 67) until a clearance of .002"-.010" remains between the brake shoes (friction surfaces) and the driven pulley.

CHAIN AND SPROCKET SERVICING

REMOVAL / INSTALLATION OF CHAIN

See Fig. 76.

1. Remove tension on chain by loosening its tension adjusting bolt and move rubbing block out of the way.

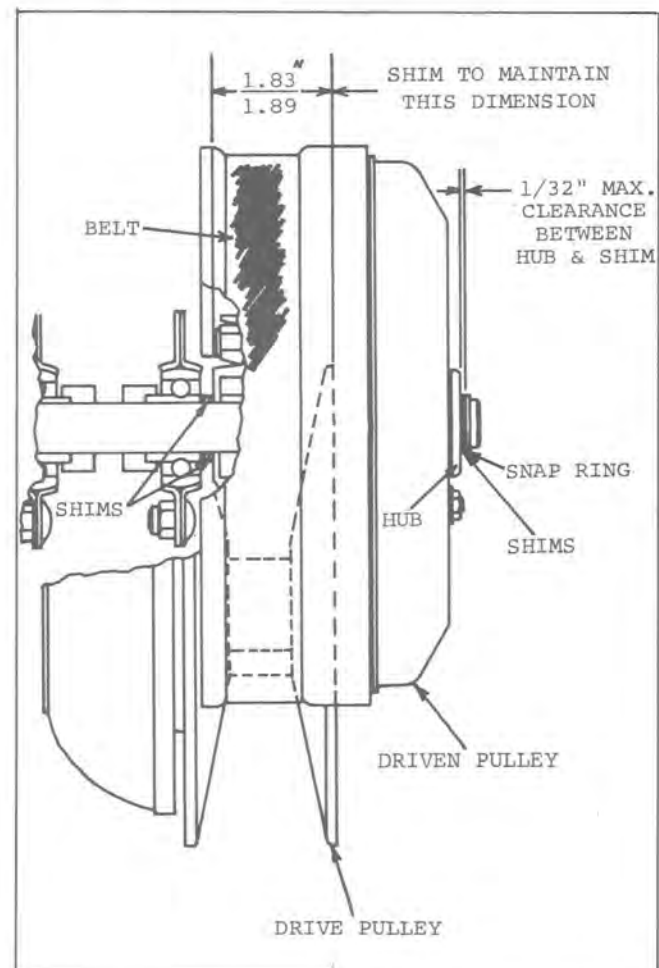


Fig. 75 — Alignment Dimensions of Pulleys

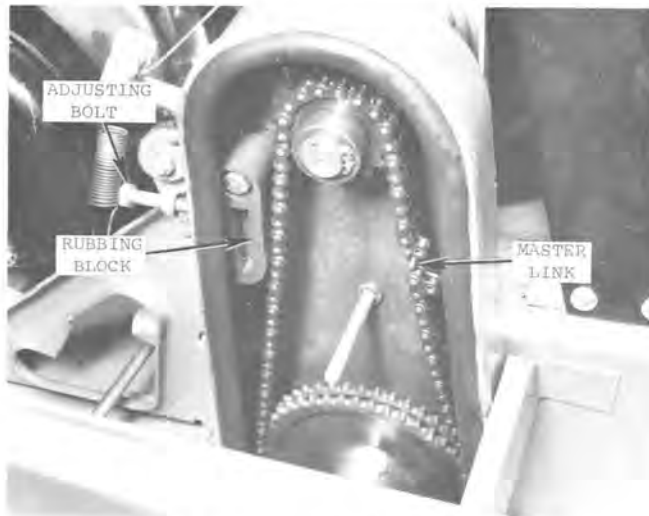


Fig. 76 — Removing / Installing Chain

2. Remove chain master link, then remove chain from sprockets. (If the drive track is blocked clear of ground, the chain can be more easily removed from lower sprocket.)

3. Reinstall chain and its master link, making sure that link is toward the outside of case. Adjust chain tension.

ADJUSTING CHAIN

The drive chain is to be adjusted so that chain is approximately parallel. See Fig. 77. Adjustment is made by the rubbing block adjusting bolt. Bolt is to be tightened until chain is almost taut. Lock bolt in position with locking nut.

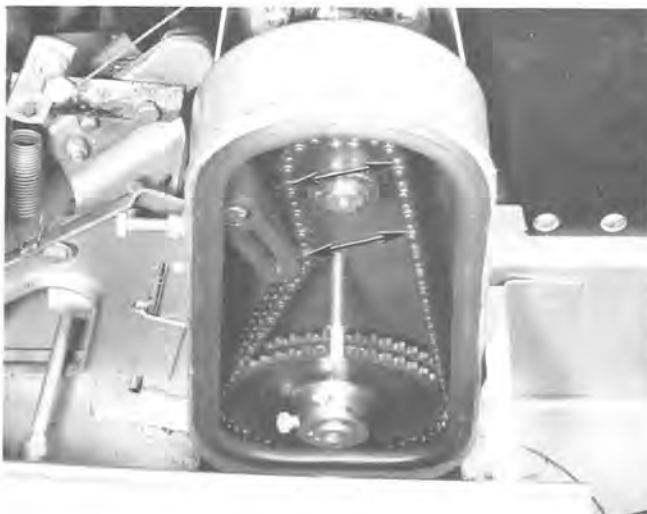


Fig. 77 — Adjusting Drive Chain

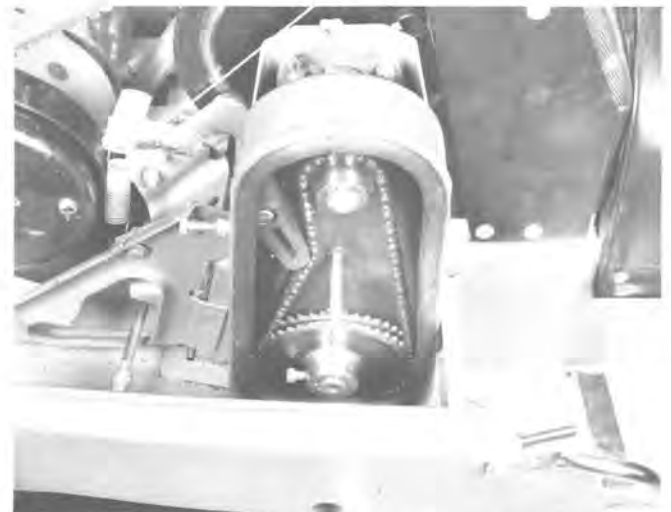
REMOVAL / INSTALLATION OF UPPER CHAIN SPROCKET

See Figs. 66 and 67.

1. Remove upper sprocket as follows:
 - a. Remove the chain case cover, then remove the snap ring securing upper sprocket to its shaft.
 - b. Loosen chain tension adjusting bolt, then move rubbing block away from chain.
 - c. Loosen bearing locking collars, then tap shaft inward until upper sprocket can be easily removed.
2. Reinstall upper sprocket by reversing the removal sequence.

Removal / Installation of Lower Chain Sprocket

1. Remove chain case cover, then loosen the lower sprocket setscrew over the key and remove the other setscrew. See Fig. 78.

Fig. 78 — View of Lower Sprocket with One Setscrew
Removed and the Other One Loosened

2. Loosen chain tension adjusting bolt, then move rubbing block away from chain.
3. Loosen the bearing locking collars on the track's front drive shaft. (See Fig. 83.)
4. Tap shaft inward until lower chain sprocket can be easily removed. Remove spacer behind sprocket.
5. Reinstall lower sprocket by reversing the removal sequence, making sure that the spacer is behind the sprocket. (If difficulty is encountered when placing sprocket into chain, the chain's master link can be disconnected and reinstalled after the sprocket is in place.)

TRACK, AXLES AND BOGIE WHEEL SERVICING

To remove the track, the axle shafts and the bogie wheels must be removed.

1. Remove and service the rear axle shaft suspension brackets (track tension adjusting brackets) as follows:

- a. Loosen the suspension bracket locking nuts, then turn both track tension adjusting bolts completely free of bracket (relieving all tension on track).
- b. Remove snap ring securing suspension bracket to rear axle shaft, then "work" bracket free of shaft to remove. If desired, the complete rear axle shaft with sprockets and bearings may be removed by raising track free of ground and "working" axle assembly from track. See Fig. 79.

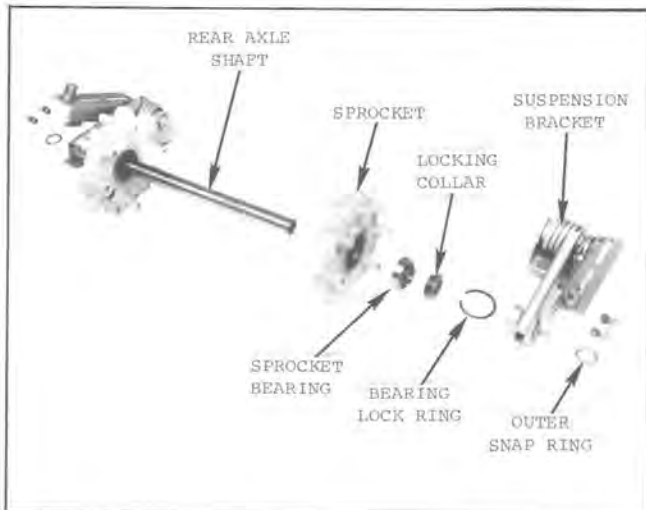


Fig. 79 — Rear Axle Shaft and Related Parts — Identification of Parts

- c. Place bracket in a vise and clamp securely. Remove assembly bolt, washer and lock nut. Carefully remove bracket from vise and separate parts while noting their assembly arrangement. See Fig. 80.
- d. Reverse the proceeding steps to reassemble and reinstall the suspension bracket. Adjust track tension.

2. Remove the complete rear axle assembly by performing step No. 1, then remove shaft. Disassemble shaft by removing the sprocket bearing locking collars and separate parts as shown in Fig. 79.

3. Remove the bogie wheel assemblies as follows:

- a. Block track clear of floor, then remove the bolts securing both ends of the main assembly shaft to the Ski Whiz. See Fig. 81.

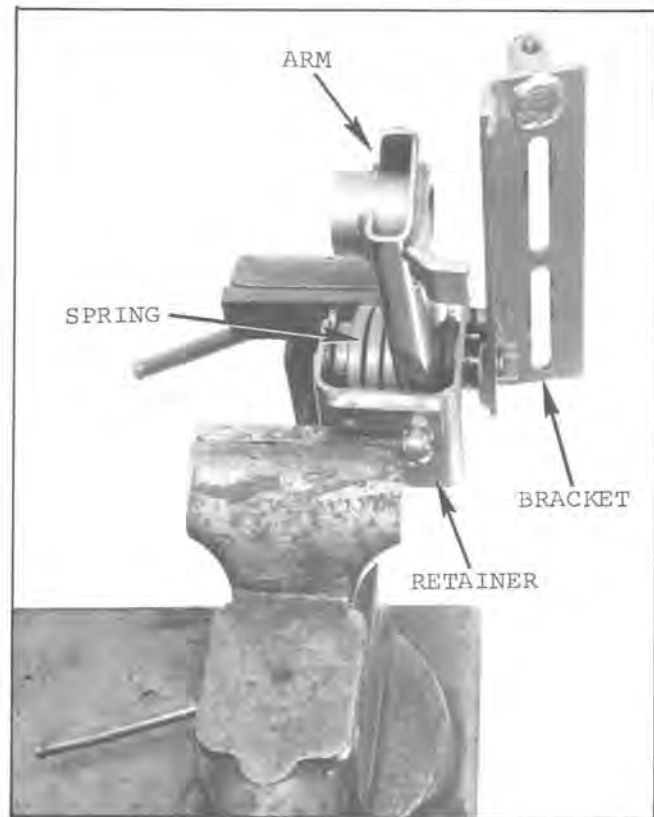


Fig. 80 — Disassembling / Reassembling Rear Suspension Bracket

- b. Remove bogie wheel as a complete assembly. Disassemble as shown in Fig. 82.
- c. Reassemble and reinstall assembly by reversing the preceeding steps. Make certain that springs are installed so that they are coiled as pictured in Fig. 82. Assembly is installed so that the widest span of wheels is forward.
4. Remove the complete front axle shaft assembly as follows:

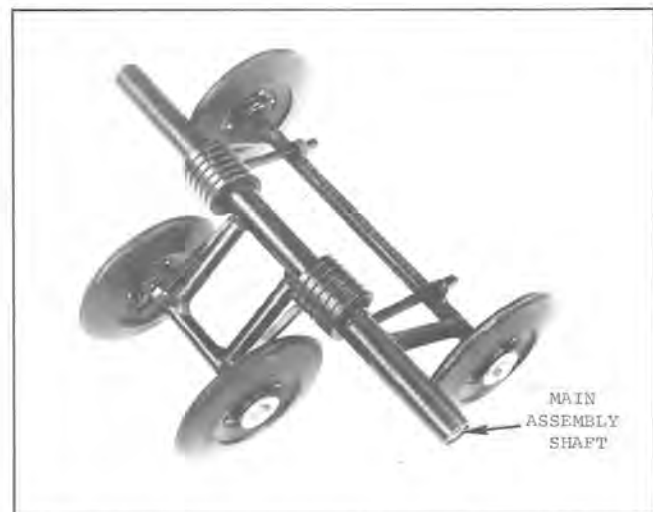


Fig. 81 — Bogie Wheel Assembly

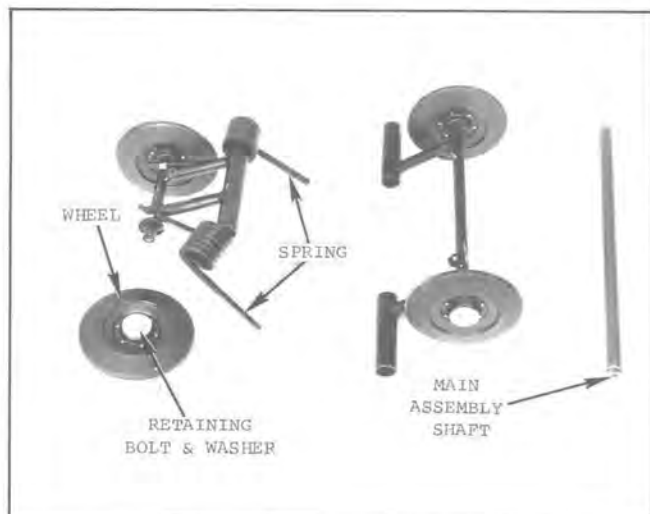


Fig. 82 — Bogie Wheel Assembly — Identification of Parts

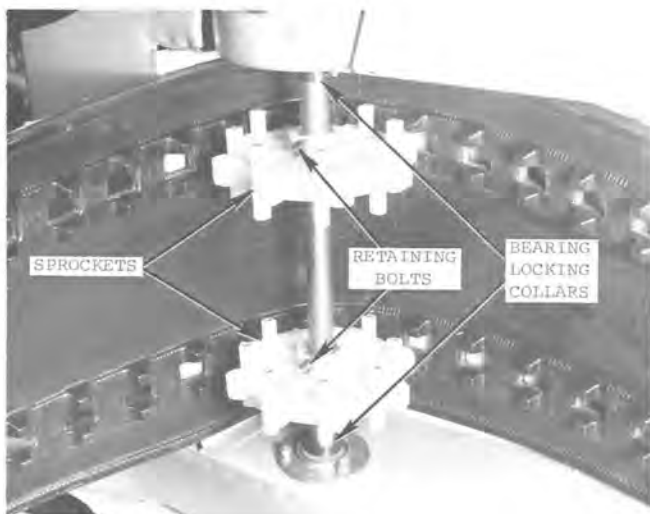


Fig. 83 — Track Front Axle Shaft Installed

- a. Block up the rear of the Ski Whiz until the track clears the floor.
- b. Turn track tension adjusting bolt until track is completely loose.
- c. Remove chain case cover and disconnect the spark plug wire.
- d. Loosen the lower sprocket setscrew over the shaft key and remove the other setscrew. See Fig. 78.
- e. Loosen chain tension adjusting bolt, then move rubbing block away from chain.
- f. Loosen the bearing locking collars on the track's front axle shaft. See Fig. 83. Also remove the axle sprocket retaining bolts, washers and nuts.
- g. Tap shaft inward until lower chain sprocket can be easily removed. Remove spacer behind sprocket.

Shaft will move easier if the bearing flanges are loosened.

- h. Continue to tap shaft inward until it is free from the left-hand bearing. See Fig. 84.
 - i. Lift shaft assembly from Ski Whiz and remove the shaft bearing, if desired. See Fig. 85.
 - j. Reassemble front axle shaft, then reinstall it by reversing the removal procedures.
 - k. Adjust track tension.
5. To remove and reinstall the track, proceed as follows:
- a. Remove the rear axle shaft suspension brackets per step No. 1 while at the same time removing the track's rear axle shaft assembly.



Fig. 84 — Axle Shaft Freed From Left-Hand Bearing

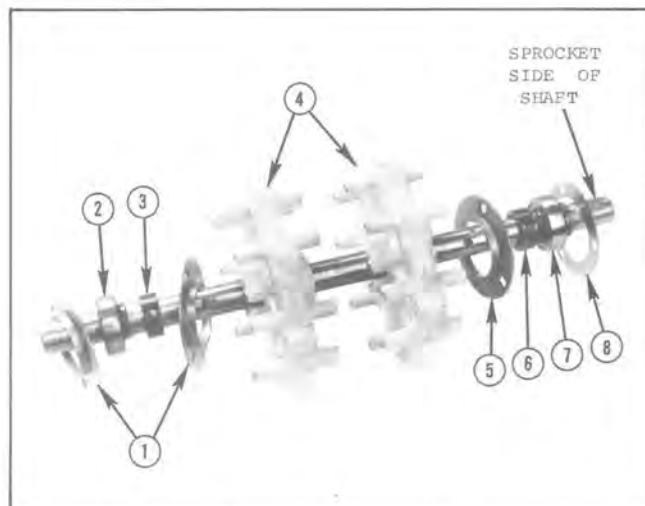


Fig. 85 — Front Axle Shaft and Related Parts — Identification

- | | |
|--------------------|-------------------|
| 1. Bearing Flanges | 5. Bearing Flange |
| 2. Bearing | 6. Locking Collar |
| 3. Locking Collar | 7. Bearing |
| 4. Sprocket | 8. Plate |

- b. Remove the three bogie wheel assemblies per step No. 3.
- c. Remove the complete front axle shaft assembly per step No. 4.
- d. Remove the track.
- e. Reinstall the front axle shaft assembly to the point shown in Fig. 84.
- f. Place Track over the axle shaft, then complete installation of this shaft.
- g. Insert rear axle shaft assembly into track, then loosely secure this axle to the suspension brackets.
- h. Reinstall the three bogie wheel assemblies.
- i. Adjust track tension as recommended.

TRACK TENSION ADJUSTMENT

1. Securely block up Ski Whiz at the rear so that track is clear of ground.
2. Make sure that the suspension bracket mounting bolts are loosened. Then thread the adjusting bolts into their brackets. Make sure that sprockets are adjusted so that the track has approximately equal clearance at the top of its sheet metal channel in Ski Whiz.
3. Adjust tension bolts evenly so that their threads have equal measurements.
4. Start and operate engine at an rpm that just engages drive pulley and causes track to run. Observe the operation of the track. If the tension is not adjusted correctly, the track will run toward the LOOSE side. In this case, loosen other tension adjustment until track runs evenly, and is centered in its channel. Recheck that when the track is pulled downward WITH TRACK NOT RUNNING at its center, it still sags between 1" and 2" away from center bogie wheels.

STEERING LINKAGE AND SKI SERVICING

The steering tie rods are to be used to adjust ski alignment. The ski springs may be repositioned into the ski assemblies to provide desirable weight distribution over varying conditions. Adjusting bolts are located on both rear suspension brackets and are to be used in conjunction with the repositioning of the skis for weight distribution.

ADJUSTING SKI ALIGNMENT

1. Measure the distance between the skis at the front and the rear. These distances should be the same (skis are to be parallel to each other, or *slightly* toed in). If adjustment is necessary, either lengthen or shorten the tie rods until correct distance is obtained. The tie rod length is to be the same on both sides.

ADJUSTING WEIGHT DISTRIBUTION

For good handling at high speed on hard snow, position the forward end of the ski springs in the rear holes of the ski saddle, then back off the adjusting bolts on both rear suspension brackets to allow rear of Ski Whiz to rise.

For good handling on soft snow, position the ski springs in the front holes of the ski saddle. Then turn in the rear adjusting bolt on the suspension brackets to lower the rear of the Ski Whiz.

Adjusting springs into the center hole of the ski saddle, while compensating at the rear suspension brackets, provides an intermediate adjustment for general conditions.

REMOVING / INSTALLING DRIVE BELT

The drive belt may be removed and installed as shown in Figs. 8 and 9.

ELECTRICAL WIRING

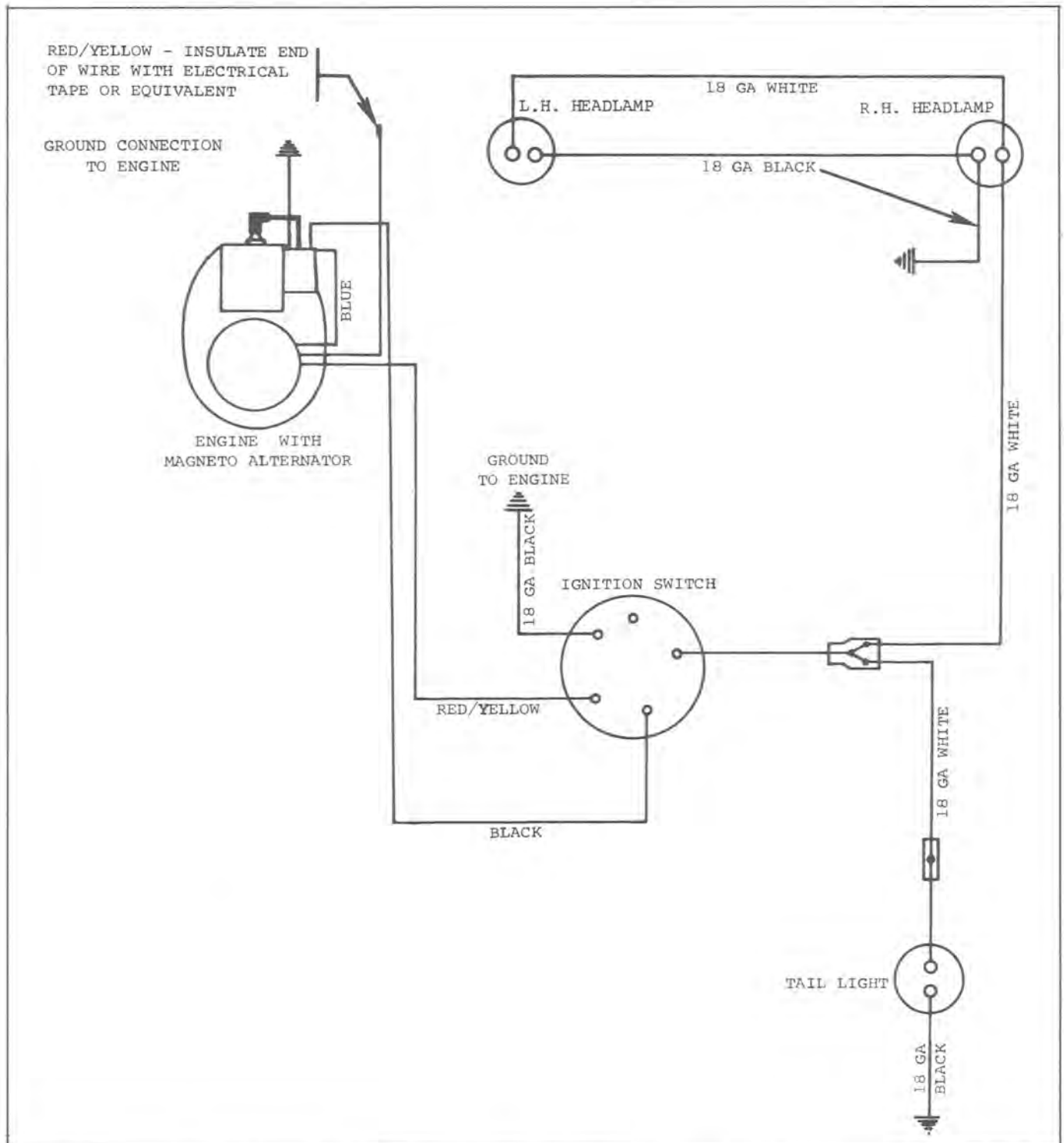


Fig. 86 — Electrical Wiring Diagram — Manual Start

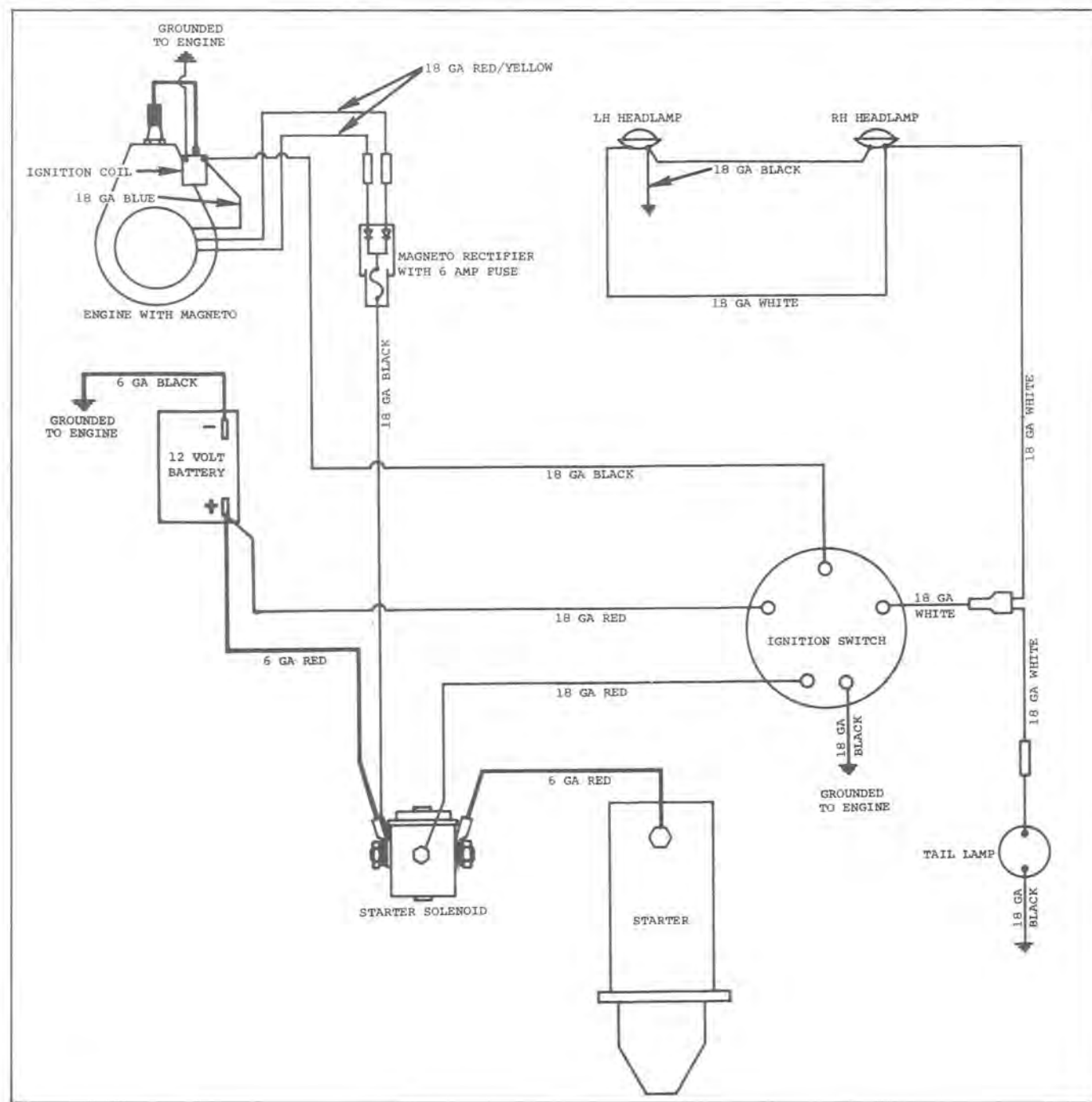


Fig. 87 — Electrical Wiring Diagram — Electric Start

GROUP XI - SECTION E - PART 2

PART 2 — MF SKI WHIZ MAINTENANCE AND SERVICE INSTRUCTIONS ENGINE MODEL L-295 AND L-340

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** Refer to index in Part 1 where indicated. The instructions contained within this part of the Manual pertain only to components which have changed sufficiently to produce changes in service procedures.*

SPECIFICATIONS

ENGINE SPECIFICATIONS

Model (JLO)	L-295 or L-340
Type	Gasoline & Oil Mixture, 2 cycle, horizontal crankshaft, one cylinder, air cooled.
Total Displacement:	
L-295	292 cc
L-340	336 cc
Bore:	
L-295	74,5 mm (2.933 in.)
L-340	80 mm (3.149 in.)
Stroke:	
L-295	67 mm (2.638 in.)
L-340	67 mm (2.638 in.)
Compression Ratio	11.5:1
Direction of Crankshaft Rotation (Facing Drive Pulley)	Counter-Clockwise
Ignition:	
Make and Type	Auto-Advance Flywheel Magneto, BOSCH SCP IV, with lighting coil 12-V, 75 W
Pole Shoe Break	17.5—22.5 mm
Contact Breaker Gap	0.35—0.45 mm (.014—.018 in.)
Ignition Timing (With Fully Advanced Cam) B.T.D.C.:	
L-295	3.0—3.5 mm (.118—.138 in.)
L-340	3.0—3.5 mm (.118—.138 in.)
Spark Plug Gap	0.4—0.5 mm (0.018 in.)
Carburetor (Make and Type):	
L-295 & L-340	HR Series (Tillotson) Diaphragm with Integral Fuel Pump and Filter, Dual Venturi.
Starter System	Manual Start with Emergency Starting Pulley (Electric Start Kit Available as Accessory)
Fuel and Oil Mixture (Ratio of Gas : Oil)	20 parts Regular Grade Gasoline to 1 part two cycle engine oil (20:1)

ENGINE SERVICING

Servicing procedures on the L-295 and L-340 engines are basically the same as on the L-380 engine. Follow the servicing procedures as outlined in Part 1 of this section of the Manual.

External changes between these engines, and the L-380 may be noted by comparing the following photographs with Figs. 5, 6 and 7 of Part 1.

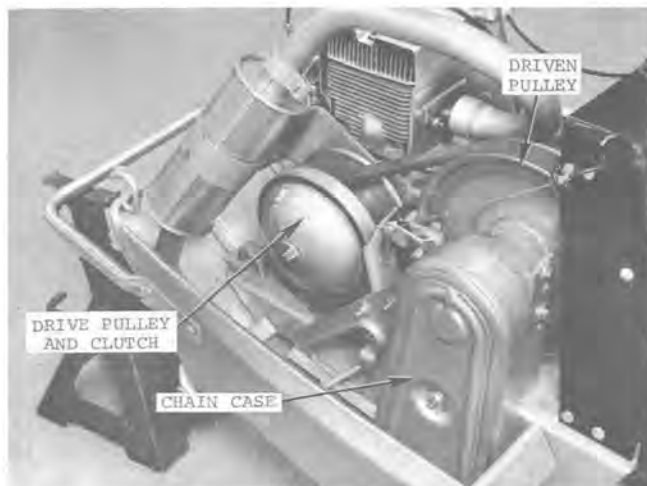


Fig. 1 — Engine and Drive Assembly (Left Side)

IGNITION TIMING

Timing marks are provided on the L-295 and L-340 engines to provide a quick means of checking the timing.

1. Disconnect spark plug wire and remove recoil starter, dust seal, starter carrier, shims and emergency pulley. See Figs. 31, 32 and 33 in Part 1.

2. Insert a very small screwdriver into hole indicated in

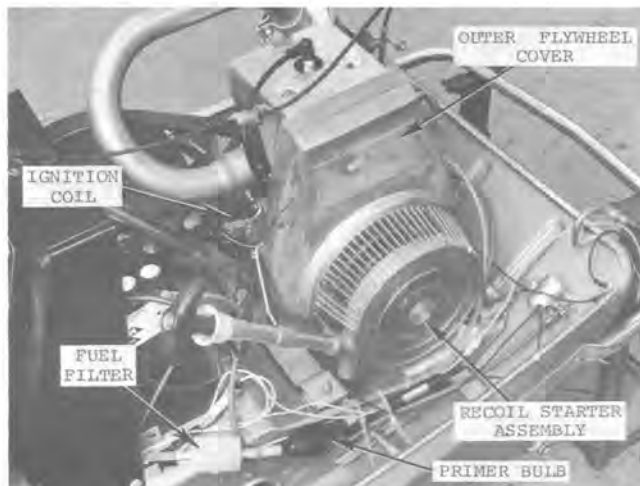


Fig. 2 — Engine (Right Side)

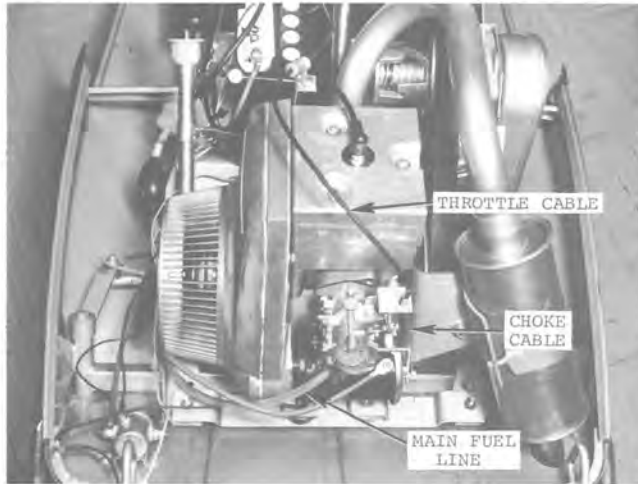


Fig. 3 - Engine (Front View)

Fig. 4 and move centrifugal weight toward outside of flywheel. Hold in place with a larger screwdriver and insert guide pin (Special Tool No. 444.31-660-00).

3. Disconnect black and blue wire connector from ignition coil and turn ignition switch on.

4. Connect a suitable test light to black and blue wire connector (removed from ignition coil) and rotate flywheel slowly clockwise (facing flywheel) while noting timing marks and test light. See Fig. 5. If timing is satisfactory, light will dim when marked fin on flywheel lines up with first mark on flywheel housing.

5. To check timing advance mechanism, remove guide pin securing centrifugal weight and check timing again, as indicated in Step 4. Marked fin on flywheel should line up with second mark on flywheel housing.

6. If timing must be corrected, reinsert guide pin as outlined in Step 2. Insert screwdriver CAREFULLY through opening in center of flywheel and loosen three screws holding magneto coil plate. Rotate coil plate counterclockwise, if timing is to be advanced; or, rotate

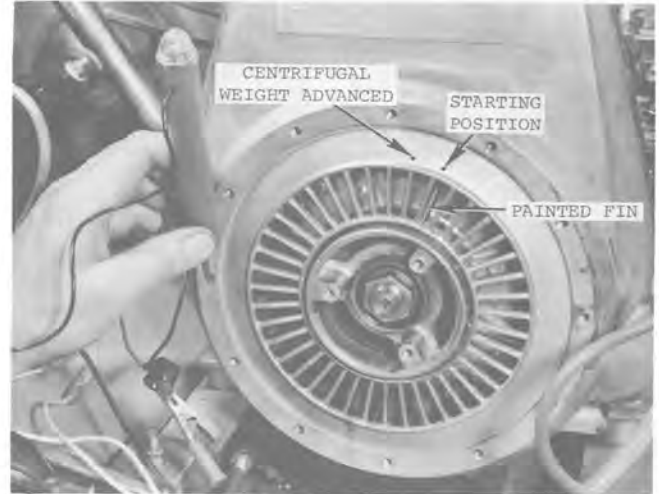


Fig. 5 - Checking Timing

plate clockwise, if timing is to be retarded. Tighten magneto coil plate securely.

IMPORTANT: Do not damage coils.

7. After timing is set, turn ignition switch off, remove timing light and guide pin. Reconnect wiring to ignition coil.

These engines may also be timed as outlined in Part 1, using timing gauge (Special Tool No. 444.31-875-00) in spark plug hole. Points should open at 3.0–3.5 mm (.118"–.138") B.T.D.C.

If further ignition servicing is required, refer to Part 1. All procedures outlined there are applicable to these engines.

RECOIL STARTER SERVICING

Follow servicing procedures as outlined in Part 1. However, after completing step 10, install spring compressing tools on brake springs. See Fig. 6. These tools are easily made and greatly simplify assembly procedure



Fig. 4 - Advancing Centrifugal Weight

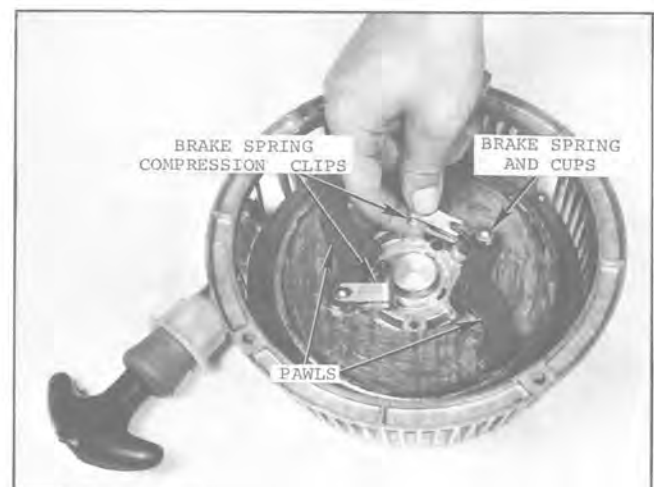


Fig. 6 - Installing Brake Spring Compressing Tools

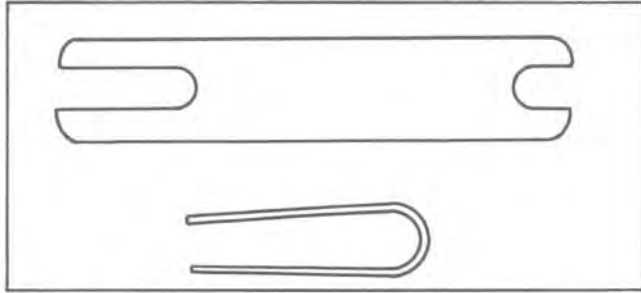


Fig. 7 - Brake Spring Tools (Actual Size)

while eliminating the possibility of improper installation of caps on brake springs. See Fig. 7.

Reinstall outer plate with four screws, then remove spring compressing tools with needle-nose pliers.

CARBURETOR OVERHAUL

The L-295 and L-340 engines are equipped with a Model "HR" carburetor. Follow the repair procedures for the L-297 engine in Part 1.

DRIVE AND DRIVEN PULLEY SERVICING

REMOVING/INSTALLING DRIVE PULLEY

1. Disconnect spark plug wire and remove drive belt from pulleys.
2. Remove pulley retaining bolt.
3. Insert a (7/16" x 4-1/2") "slug" in place of retaining bolt and thread a (9/16"-18 UNF) BOLT into pulley, using it as a puller. See Fig. 8.
4. To reinstall assembly, position it on crankshaft, insert retaining bolt and tighten to 50-60 ft.-lbs. torque.

SERVICING DRIVE PULLEY

1. Remove parts as shown in Fig. 9.

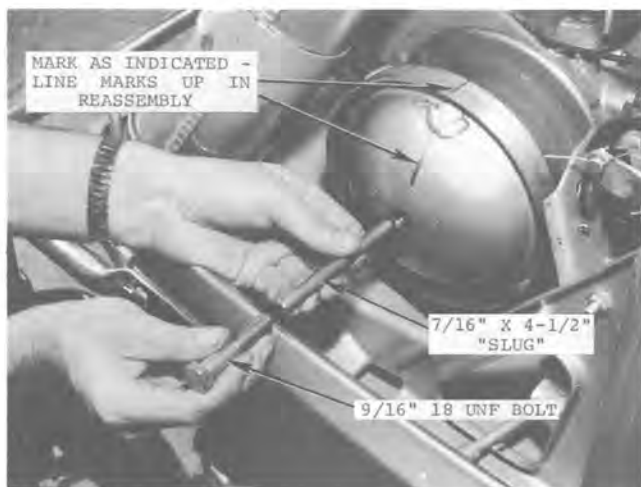


Fig. 8 - Removing Drive Pulley

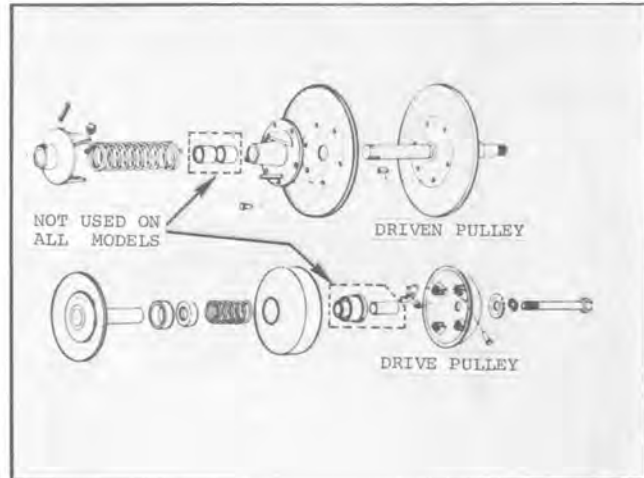


Fig. 9 - Drive and Driven Pulleys Disassembled

2. Inspect and replace as required.
3. Reassembly in order shown in Fig. 9.

REMOVING/INSTALLING DRIVEN PULLEY

1. Disconnect spark plug wire. Remove battery and exhaust system. Remove drive belt from pulleys as shown on Page 11, Part 1 of this Manual.
2. Remove two bolts securing brake assembly to bracket, unhook spring and loosen two floating bolts so assembly may be removed from pulley and placed out of the way.
3. Remove chain case cover. Remove sprocket securing bolt from end of shaft.
4. Remove four adjusting bolts from bearing block assembly and carefully move assembly inward until sprocket and chain can be removed from end of shaft.

IMPORTANT: Be careful when removing sprocket that bushing and shims behind it do not drop into bottom of chain case.

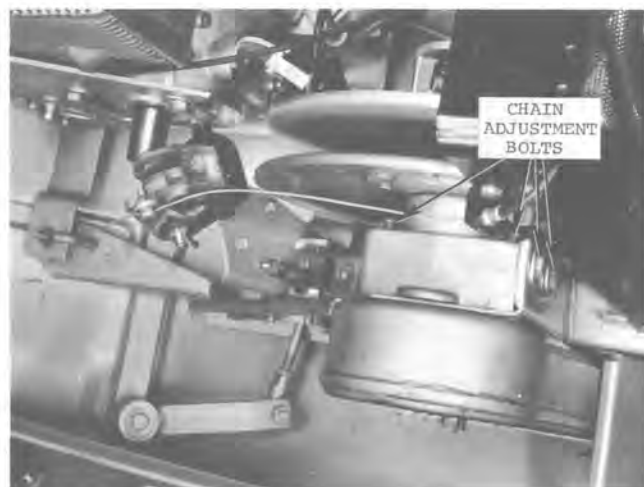


Fig. 10 - Driven Pulley Assembly (Brake Removed)

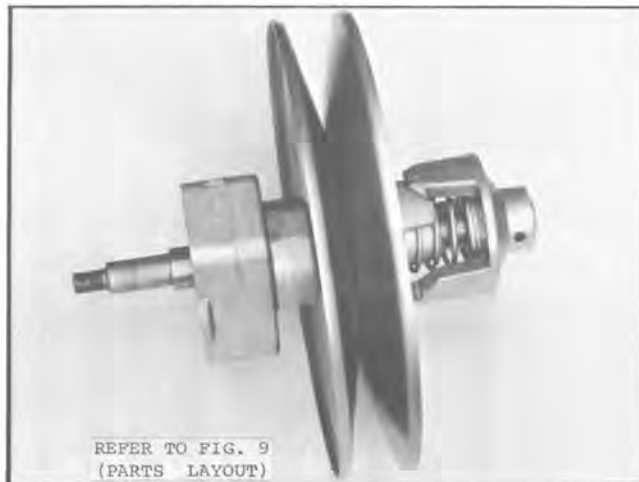


Fig. 11 — Driven Pulley Assembly Removed

5. Remove bushing and shims then remove pulley assembly from the unit.

6. Reverse this procedure to reinstall the driven pulley and other assemblies removed. Check pulleys, sprockets and brake for proper alignment. Refer to "Pulley Alignment", "Brake Servicing" and "Chain and Sprocket Servicing".

SERVICING DRIVEN PULLEY

1. Remove roll pin from retainer while maintaining enough pressure against it to keep it from flying apart.
2. Carefully release pressure and separate parts. Using a press, separate the bearing block from the other end of the shaft.
3. Remove bearings from block assembly and inspect all parts for damage. Replace as required.
4. Reverse this procedure to reassemble.



Fig. 12 — Bearing Block Disassembled

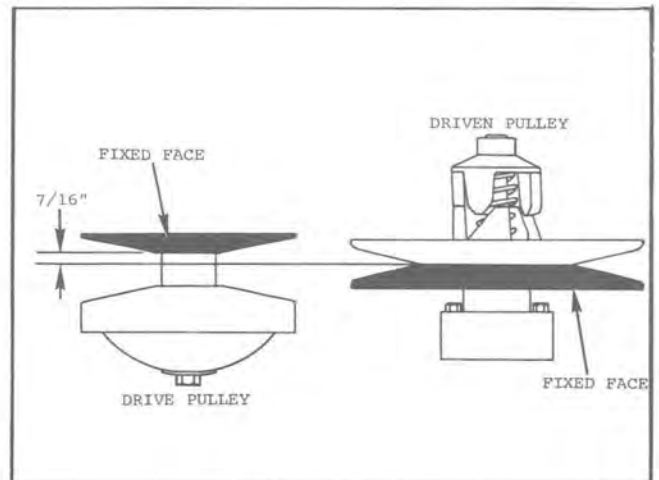


Fig. 13 — Pulley Alignment

PULLEY ALIGNMENT

Check and adjust to maintain dimensions shown in Fig. 13.

BRAKE SERVICING

Disconnect return spring. Remove two floating bolts and spacers from brake assembly. Remove brake shoes from the bracket and replace if required. Reverse procedure to reassemble.

ADJUSTING BRAKE

Check brake shoe alignment with pulley sheave and realign if necessary. Check cable adjustment. The lever should be positioned as shown in Fig. 14, with brake off. Tighten or loosen adjusting nut until .002" to .010" clearance is obtained between brake shoes (friction surfaces) and pulley sheave.

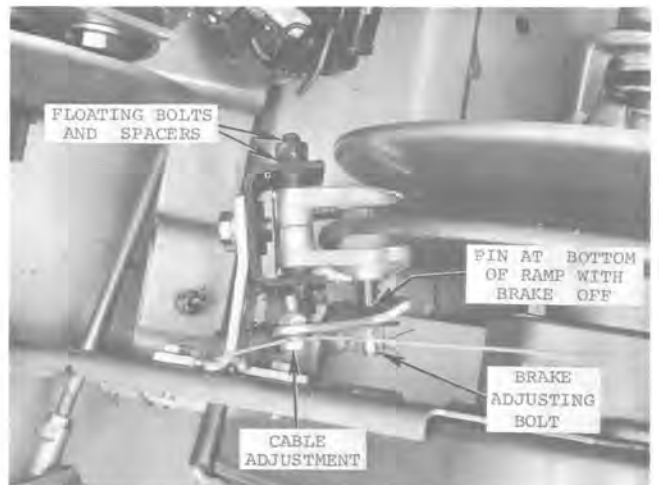


Fig. 14 — Brake Adjustment



Fig. 15 — Removing Chain and Upper Sprocket

CHAIN AND SPROCKET SERVICING

REMOVAL/INSTALLATION OF CHAIN AND UPPER SPROCKET

1. Disconnect spark plug wire. Loosen four adjusting bolts on bearing block and slide block down.
2. Remove sprocket retaining bolt and washer. With master link positioned near upper sprocket, slide sprocket out on shaft until sufficient clearance is obtained to remove master link.
3. Remove master link, then remove chain from sprockets. Remove upper sprocket.
4. Inspect and replace parts as required. Reverse this procedure for reassembly. Adjust chain tension.

ADJUSTING CHAIN

Using a punch as a lever, move the bearing block upward until 1/4" chain movement is obtained at the midpoint of



Fig. 16 — Adjusting Chain Tension

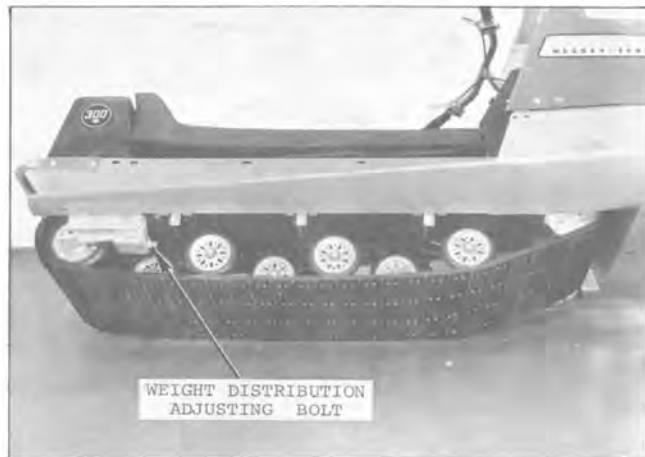


Fig. 17 — Track Assembly

either span. Tighten four bearing block bolts and recheck chain tension. See Fig. 16.

REMOVAL/INSTALLATION OF LOWER CHAIN SPROCKET

Follow servicing procedure as outlined in Part 1. The only change to be noted is in Step 2. The rubbing block has been replaced by an adjustable bearing block. Refer to Fig. 16, this section.

TRACK, AXLES AND BOGIE WHEEL SERVICING

Follow servicing procedures as outlined in Part 1. The only changes affecting servicing procedures are in the rear axle assembly. Compare Fig. 18 with Fig. 79 of Part 1 to note changes. Fig. 17 shows visual changes in track assembly not affecting service procedures significantly.

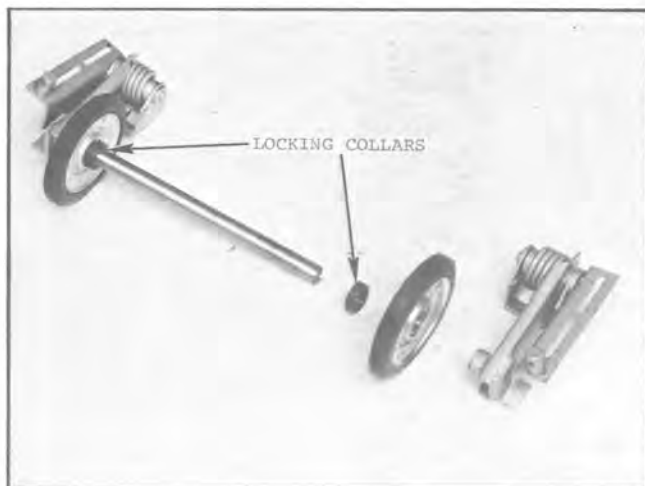


Fig. 18 — Rear Idler Axle Disassembled

ELECTRICAL WIRING

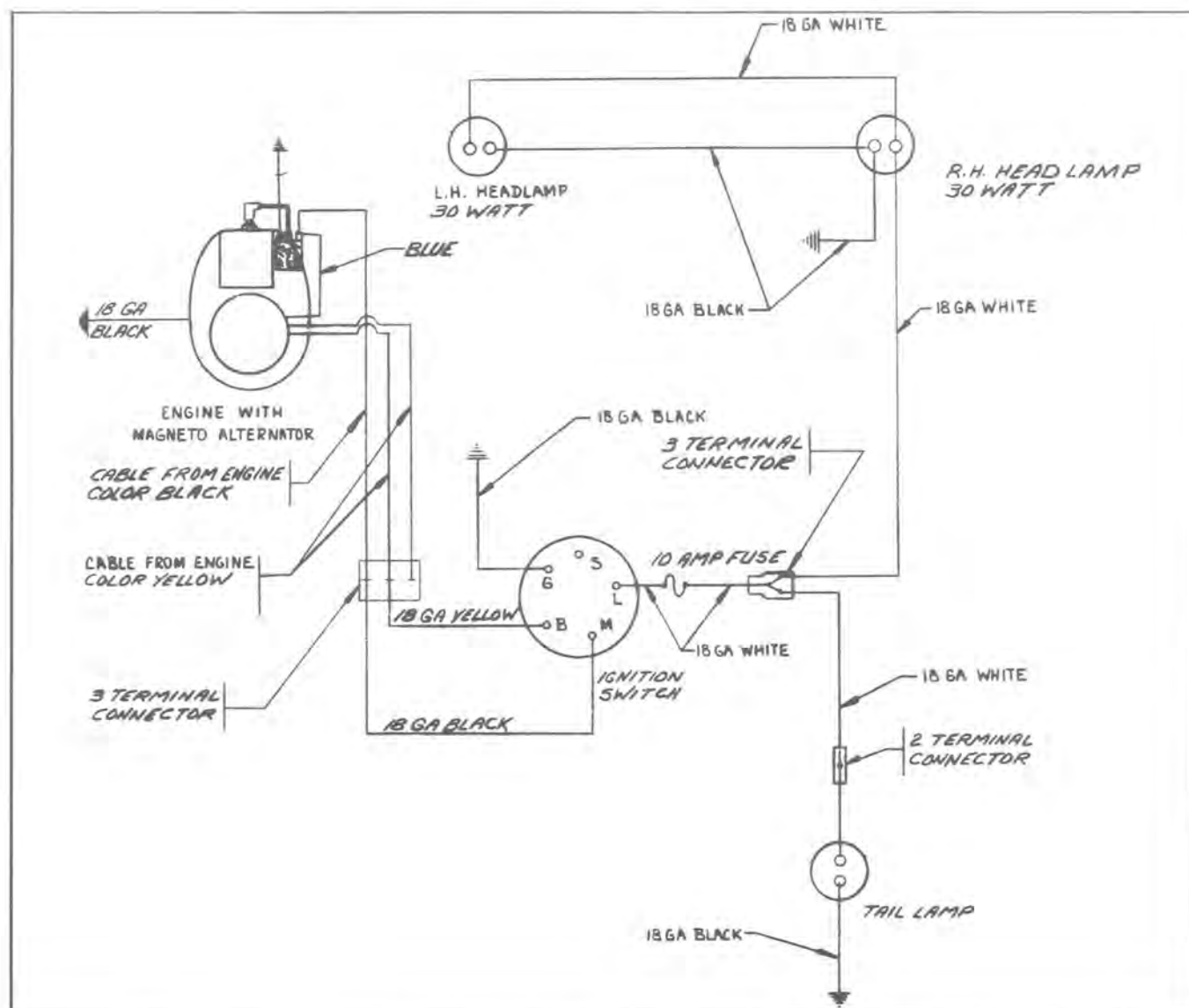


Fig. 19 — Electrical Wiring Diagram — Manual Start

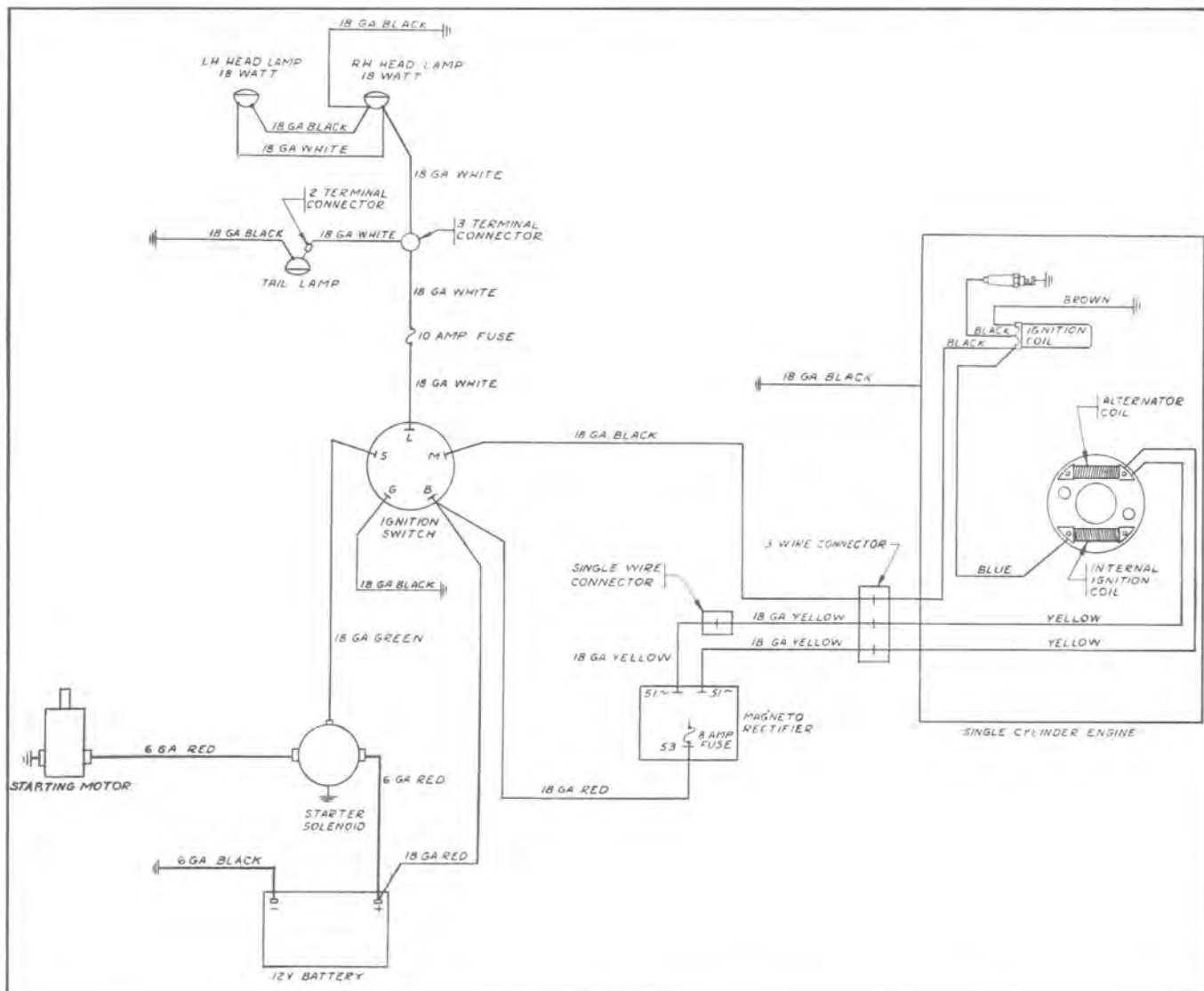


Fig. 20 — Electrical Wiring Diagram — Electric Start

GROUP XI - SECTION E - PART 3

PART 3 — MF SKI WHIZ MAINTENANCE AND SERVICE INSTRUCTIONS ENGINE MODEL L-440 (2 CYL.)

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**Refer to Index in Part 1 or Part 2 where indicated. The instructions contained within this part of the Manual pertain only to components which have changed sufficiently to produce changes in service procedures.*

SPECIFICATIONS

ENGINE SPECIFICATIONS:

Model (JLO)	L-440
Type	Gasoline & Oil, 2 cycle horizontal crankshaft, two cylinder, air cooled
Total Displacement	433,8 cc (26.46 cu. in.)
Bore	69,0 mm (2.716 in.)
Stroke	58,0 mm (2.283 in.)
Compression Ratio	11.5 : 1
Direction of Crankshaft Rotation (Facing Drive Pulley)	Counterclockwise
Ignition:	
Make and Type	Auto-Advance Flywheel Magneto, Bosch RPCIV, 12 V/75W
Pole Shoe Break	20,5–24,0 mm
Contact Breaker Gap	0,35–0,45 mm (.014–.018 in.)
Ignition Timing (With fully advanced cam) B.T.D.C.	3,0–3,5 mm (.118–.138 in.) 21.7°–23.5°
Spark Plug Gap	0,4–0,5 mm (Approx. .016–.019 in.)
Carburetor	HR Series (Tillotson Diaphragm with Integral Fuel Pump and Filter, Dual Venturi)
Starter System	Manual start with emergency starting pulley (Electric Starter Kit available as Accessory)
Fuel and Oil Mixture (Ratio of Gas : Oil)	20 parts – Regular grade gasoline – 1 part two cycle engine oil. 20 : 1

ENGINE SERVICING

Refer to Fig. 3, Part 1, for list of Special Tools required for engine servicing. However, Part No. 444.31-073-10, No. 4, must be replaced by Part No. 444.31-072-00 for the 440 Engine. Fig. 4, Part 1, lists additional equipment required. The torch, No. 6, and pipe, No. 3, are not required on the 440 Engine. An additional wood support, No. 5, is required.



Fig. 1 — Engine and Drive Assembly Installed

ENGINE REMOVAL/INSTALLATION

1. Open hood, disconnect headlight wires and hood retaining cable. Remove hood locking pins, then remove hood assembly.
2. Disconnect spark plug wire.
3. Remove drive belt as shown in Fig. 2. Refer to "Removing/Installing Drive Belt".
4. Disconnect battery ground cable, starter cable and engine-to-chassis ground wire.
5. Disconnect throttle cable, choke cable and fuel line from carburetor.
6. Disconnect exhaust pipe from engine.



Fig. 2 — Removing/Installing Drive Belt



Fig. 3 — Engine Removed

7. Remove engine mounting bolts from center mounting brackets and lift engine out of compartment.

8. Reverse this procedure for reinstallation.

ENGINE OVERHAUL

The following overhaul procedures are divided into three phases. Phases I and II are performed with the engine mounted. Phase III is performed with the engine removed.

Refer to the appropriate phase for the type service required.

I. Replace Head Gasket (Figs. 4 and 5)

1. Disconnect spark plug wires and remove cowling from top of engine.



Fig. 4 — Cowling Removed



Fig. 5 — Head Removed

2. Remove cylinder head hold down nuts, spacers and washers, then carefully lift head from cylinder.

3. Remove old head gasket, make sure head and cylinder surfaces are clean and replace with new gasket.

IMPORTANT: Gasket is directional. Place side with widest metal band upward, or toward cylinder head.

4. Position cylinder head over studs. Side with deepest cavity must be toward carburetor side of cylinder.

5. Install washers, spacers and nuts. Tighten alternately to 30–33 ft.-lbs. torque.

6. Replace cowling and connect spark plug wire.

II. Replace Piston, Piston Rings, Piston Pin and/or Piston Pin Bearing (Figs. 6, 7 and 8)

1. Disconnect spark plug wire.

2. Disconnect fuel line, throttle cable, choke cable, pulse line and remove carburetor.

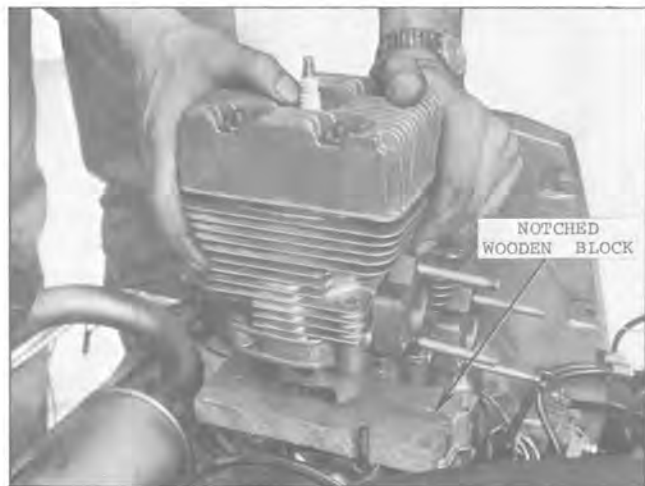


Fig. 6 — Removing/Installing Cylinder Assembly

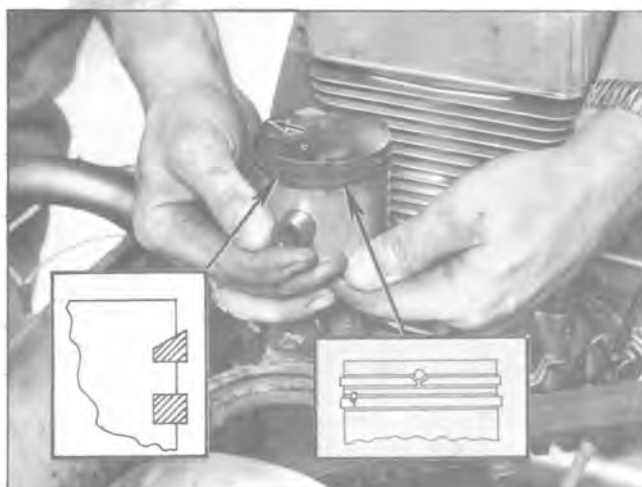


Fig. 7 — Removing/Installing Piston Pin

3. Remove exhaust pipe, manifold and three-piece cowling.

4. Remove cylinder assembly mounting nuts and carefully lift cylinder assembly from engine as shown in Fig. 7.

NOTE: Use a notched piece of wood to rest piston on as cylinder assembly is being removed or installed. Mark pistons and cylinders so they can be reinstalled in the order removed.

5. Remove piston pin retaining snap ring from side of piston facing drive pulley. Remove piston pin as shown in Fig. 8 and remove piston.

6. Remove piston pin bearing and retainers (washers) as shown in Fig. 9.

7. If rings are to be replaced, remove them from the piston and clean piston ring grooves.

8. Remove old cylinder assembly gasket from surface of crankcase. Also check the rod bearing for evidence of



Fig. 8 — Piston Pin Bearing and Retainers

damage or wear. (The rod and crankshaft are available as an assembly only. The engine will have to be removed from the Ski Whiz if this assembly is to be replaced.)

9. Insert piston pin bearing into rod with one retainer positioned on each side of bearing. Recessed side of retainers must be toward bearing.

10. Position piston over rod and insert piston pin as shown in Fig. 8. Install snap ring retainers to secure piston pin.

NOTE: Arrow on top of piston must point towards exhaust side of engine.

11. Position new cylinder assembly gasket on crankcase, making sure that wooden block is under piston.

12. If piston rings have been removed, replace them.

13. Make certain that piston rings are positioned on pins as shown in Fig. 8. Use a suitable metal band to compress the rings. Carefully guide cylinder assembly over the piston and into place against the crankcase.

14. Install cylinder assembly mounting washers and nuts and tighten securely.

15. Use new gaskets and reinstall engine cowl, manifold, exhaust pipe and carburetor.

16. Reconnect choke rod, throttle cable, fuel line and vacuum line to carburetor.

III. Replace Crankshaft and Rod Assembly, Crankshaft Bearing and Seals

1. Remove engine from Ski Whiz. See "Engine Removal and Installation".

2. Remove drive pulley from crankshaft. Refer to "Removing/Installing Drive Pulley" under "Drive and Driven Pulley Servicing".

3. Remove exhaust manifold, carburetor, intake manifold and adapters and three-piece engine cowl.



Fig. 10 — Removing/Installing Fan Case

4. Remove recoil starter, outer cover, starter carrier, flywheel retaining nut and lockwasher. Remove flywheel. Refer to steps No. 4a and 4b under "Ignition Timing" for procedures.

NOTE: Use care to prevent damage to coils.

5. Remove cylinder head as outlined in Phase I, steps No. 1 through No. 3.

6. Remove cylinder and piston assembly, following procedure outlined in Phase II, steps No. 4 through No. 8.

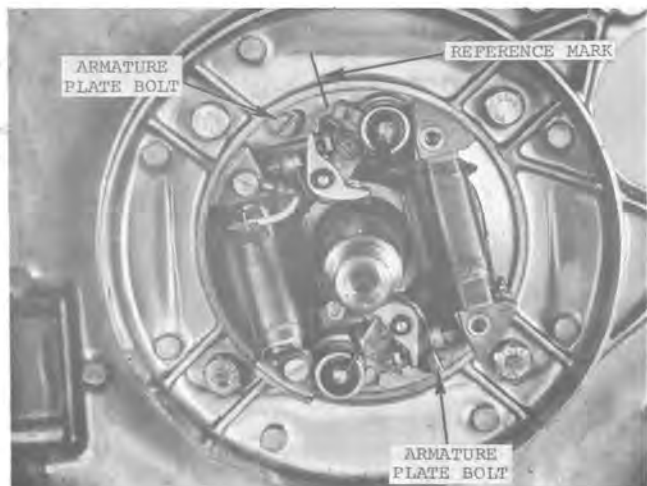


Fig. 9 — Fan Case and Armature Plate Assembly

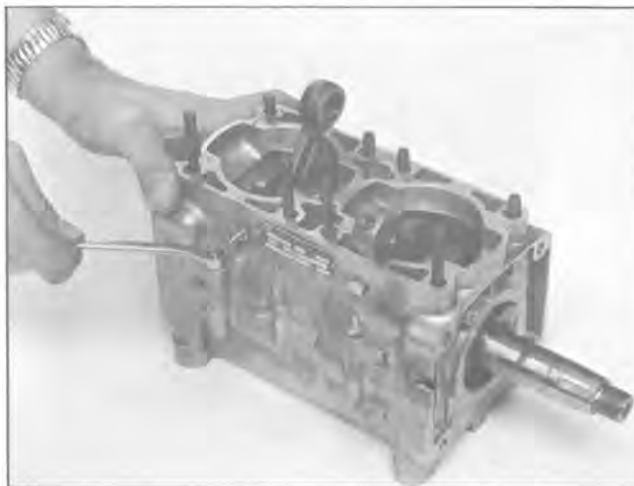


Fig. 11 — Removing/Installing Crankcase Bolts

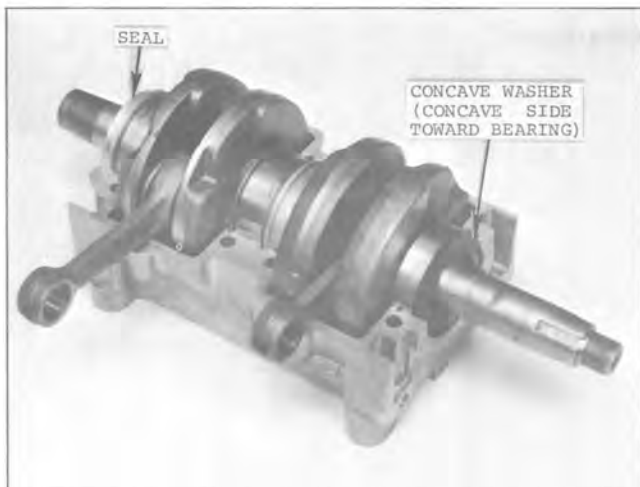


Fig. 12 — Crankshaft Assembly Installed

7. Make reference mark on armature plate and fan case. See Fig. 9. Remove two armature plate bolts and four fan case securing bolts. Remove fan case and armature as a unit. See Fig. 10.

8. Remove four crankcase bolts and separate crankcase. See Figs. 11 and 12. Lift crankshaft from lower half of crankcase.

9. Remove crankshaft bearings with special tool as shown in Fig. 13. Center bearing cannot be replaced.

10. Clean and inspect all parts for wear or damage. Replace parts as required.

11. Heat bearings in oil to approximately 220° F. for about five minutes. See Fig. 14.

12. Position crankshaft on end between two wooden blocks and place a small wooden block between each throw. Drop heated bearing over crankshaft and tap into place. See Fig. 15. **INSTALL SPACER BEFORE BEARING ON DRIVE SIDE OF CRANKSHAFT.**

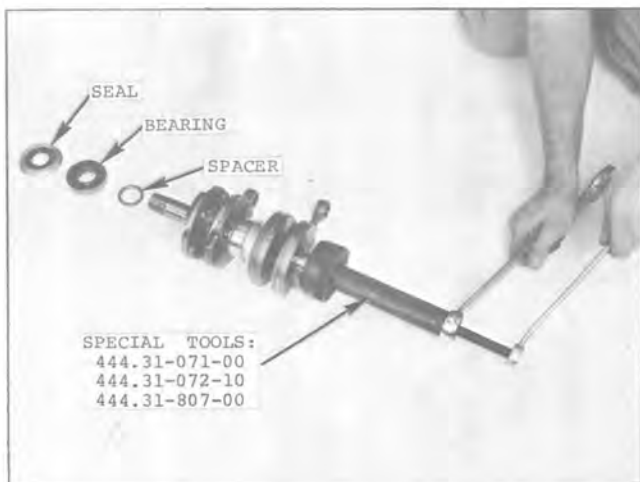


Fig. 13 — Removing Crankshaft Bearings



Fig. 14 — Heating Crankshaft Bearings Prior to Installation

NOTE: Tap on inner race of the bearings only. If bearings do not easily tap into place, remove them from the crankshaft, reheat them in oil, then reattempt installation. Make sure that heat of bearings has not been transferred to crankshaft, as this will cause crankshaft to swell and make installation difficult. (Or it may remove heat from the bearing too rapidly, causing it to shrink before installation can be completed.)



Fig. 15 — Installing Crankshaft Bearings

13. Install seal and concave washer on crankshaft and lower it into crankcase using sealing compound on bearing surfaces. See Fig. 12.

14. Reassemble crankcase using sealing compound. Gasket is not required. Tighten four crankcase bolts using a diagonal pattern. Position four long and four short cylinder mounting bolts in crankcase assembly. See Fig. 11.

15. Attach fan case to crankcase with four bolts. Align reference marks on fan case and armature plate and secure with two armature plate bolts. See Figs. 9 and 10. Replace coil cover (not shown).

16. Replace piston assembly and cylinder, following procedure outlined in Phase II, steps No. 9 through No. 14.

17. Replace cylinder head, following procedure outlined in Phase I, steps No. 4 through No. 6.

18. Replace flywheel, key, lockwasher and nut onto crankshaft, tighten flywheel nut to 80 to 87 ft.-lbs. torque.

19. Replace starter carrier, dust seal, outer cover and recoil starter.

20. Replace three-piece engine cowl, intake manifold and adaptors, carburetor and exhaust manifold.

21. Replace drive pulley, following procedures outlined in "Removing/Installing Drive Pulley" under "Drive and Driven Pulley Servicing".

22. Reinstall engine in Ski Whiz as outlined in "Engine Removal and Installation".

IGNITION TIMING

Timing marks are provided on the L-440 Engine to provide a quick means of checking the timing.

1. Disconnect spark plug wires and remove recoil starter and starter carrier. See Fig. 16.

2. Insert a very small screwdriver into hole indicated in Fig. 17, and move centrifugal weight toward outside of



Fig. 17 — Advancing Centrifugal Weight

flywheel. Hold in place with a larger screwdriver and insert guide pin (Special Tool No. 444.31-660-00).

3. Rotate flywheel clockwise until one set of breaker points is open and feeler gauge can be inserted into points. Check point gap and adjust if required. See Fig. 18. Rotate flywheel one-half turn and adjust other set of points.

4. Proceed with step No. 5, unless flywheel is to be removed. If flywheel is to be removed:

- a. Remove flywheel retaining nut and lockwasher. (The flywheel nut is most easily removed by impact with the nut turning against engine compression.)
- b. Use flywheel puller (Special Tool No. 444.31-329-0) to remove flywheel. See Figs. 19 and 20.
- c. If armature plate must be removed, place reference mark on fan case and armature plate. Remove armature plate bolts and fan case bolts. Remove fan case assembly from engine, then remove wires

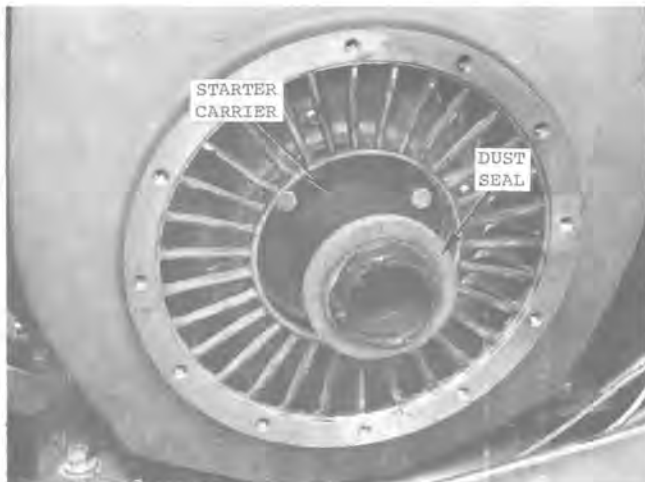


Fig. 16 — Recoil Starter Removed



Fig. 18 — Checking Breaker Point Gap

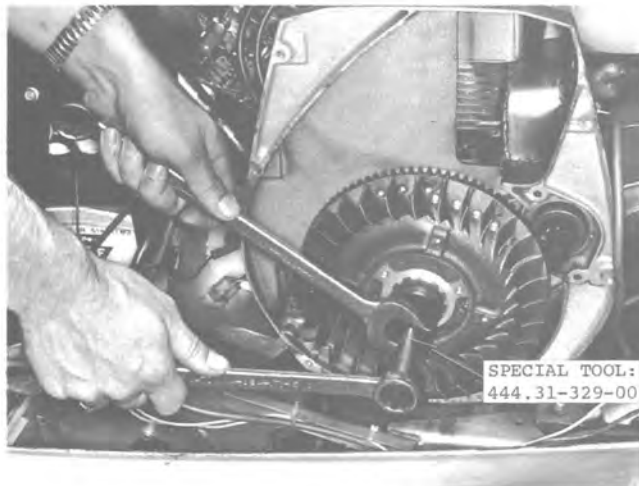


Fig. 19 — Removing Flywheel from Crankshaft

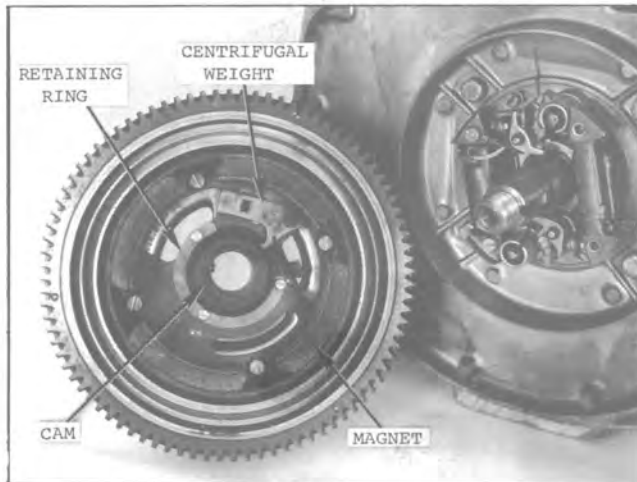


Fig. 20 — Flywheel Assembly Removed from Engine

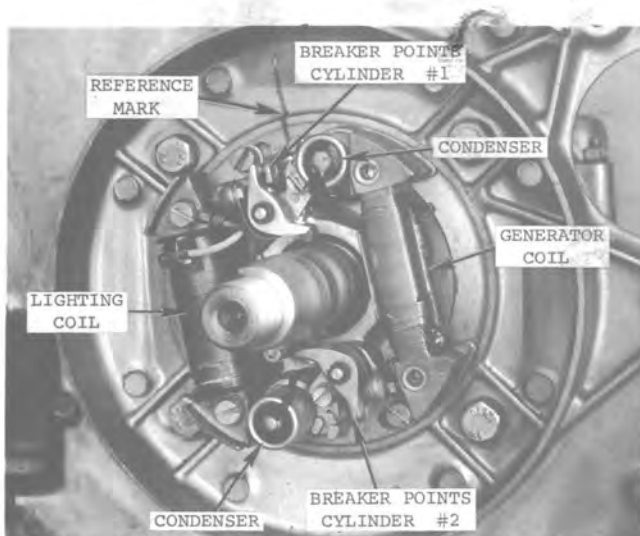


Fig. 21 — Armature Plate Assembly — Identification of Parts

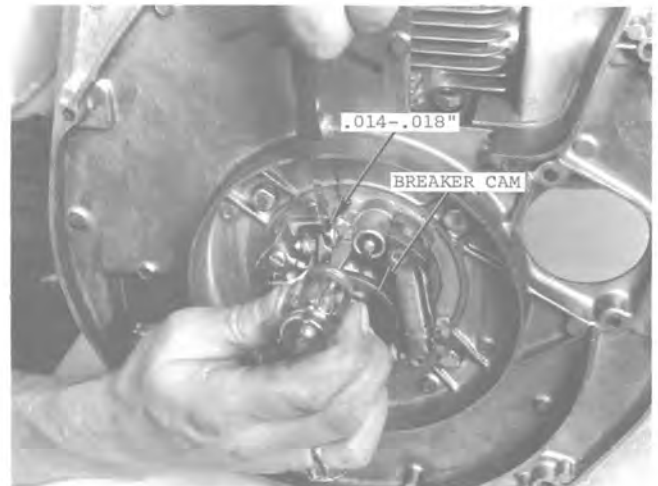


Fig. 22 — Setting Breaker Point Gap (Flywheel Removed)

from coil and remove armature plate. See Figs. 9 and 10.

NOTE: Use care in unsoldering connections to replace components on armature plate.

d. Reverse procedure in step c to replace armature plate.

e. To adjust points with flywheel removed, remove cam from flywheel and position on crankshaft. Rotate cam until breaker points are open. Check

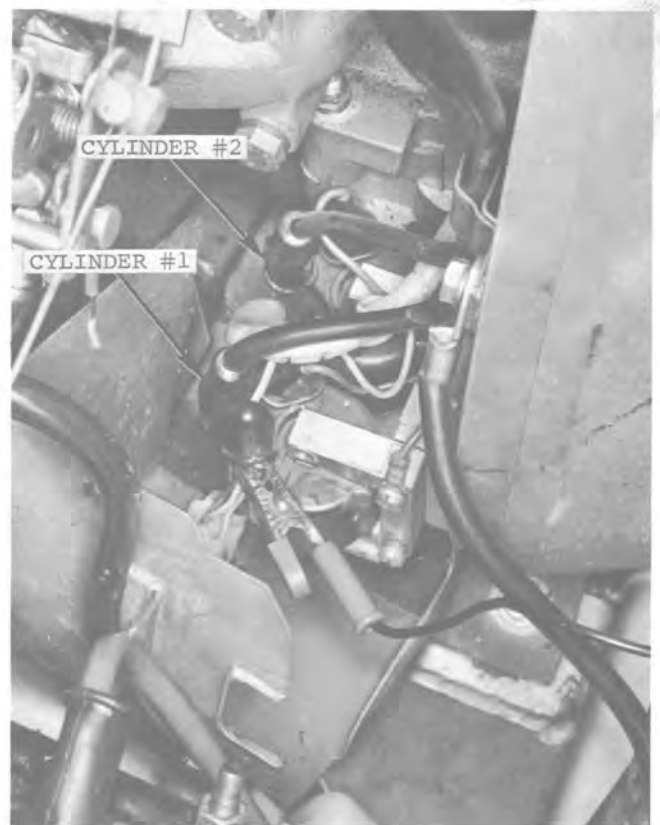


Fig. 23 — Attaching Timing Light to Coils

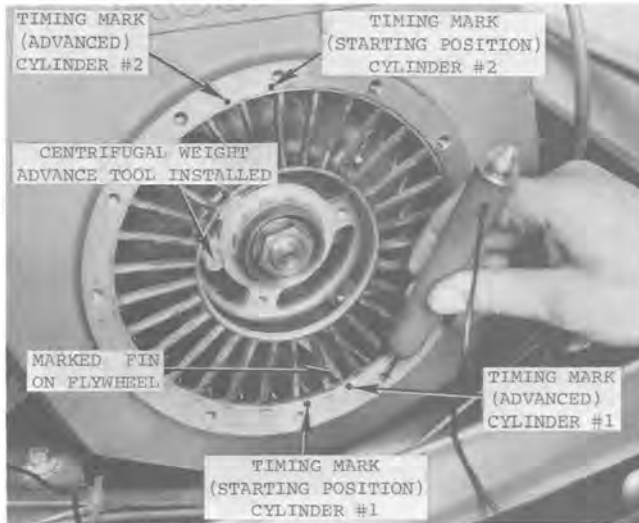


Fig. 24 — Timing Engine (W/Timing Marks)

gap and adjust if required. See Fig. 21. After both sets of points are adjusted, remove cam and reinstall in flywheel.

- f. Reinstall flywheel, key, lockwasher and nut onto crankshaft. Tighten flywheel nut to 80–87 ft.-lbs. torque.

5. To check timing on cylinder number 2, remove coil cover, disconnect black and blue wire from outside coil and attach timing light to it. With Centrifugal Weight Advance Tool installed, turn ignition switch on and rotate engine slowly clockwise (facing flywheel) until light dims. Marked fin on flywheel should line up with first mark (direction of rotation) on top of flywheel housing.

6. If timing is incorrect, reach through flywheel opening with screwdriver and loosen two armature plate bolts, Fig. 9. Move armature plate in opposite direction of engine rotation to retard timing.

7. To check timing on cylinder number 1, remove black and blue wire from inside coil and attach timing light to it. Rotate engine slowly clockwise (facing flywheel) until light dims. Marked fin on flywheel should line up with first mark (direction of rotation) on bottom of flywheel housing.

8. If timing is incorrect, increase breaker point gap (cyl. no. 1), Fig. 21, to advance timing or decrease to retard timing. Maintain point gap of .014"–.018". If additional adjustment is required, move armature plate until cylinder No. 1 is in time, then adjust breaker point gap (cyl. no. 2), Fig. 21, until cylinder No. 2 is in time. If cylinder No. 2 cannot be timed while maintaining .014"–.018" point gap, inspect for worn or damaged parts and repeat steps No. 5 through No. 8.

9. To check timing advance mechanism, remove guide pin securing centrifugal weight and check timing again, as indicated in step 5. Marked fin on flywheel should line up with second mark (direction of rotation) on top of flywheel housing.

10 If timing advance mechanism is not functioning



Fig. 25 — Timing Engine (W/Timing Gauge)

properly, remove flywheel as outlined in step 4 and inspect parts for wear or damage.

NOTE: Timing gauge (Special Tool No. 444.31-875-00) may be used in place of timing marks. Insert in spark plug hole of cylinder being timed and follow procedure outlined in steps 5 thru 8. Timing light should dim when the piston is between .118-.138" (3.0-3.5mm) B.T.D.C. with centrifugal weight advanced.

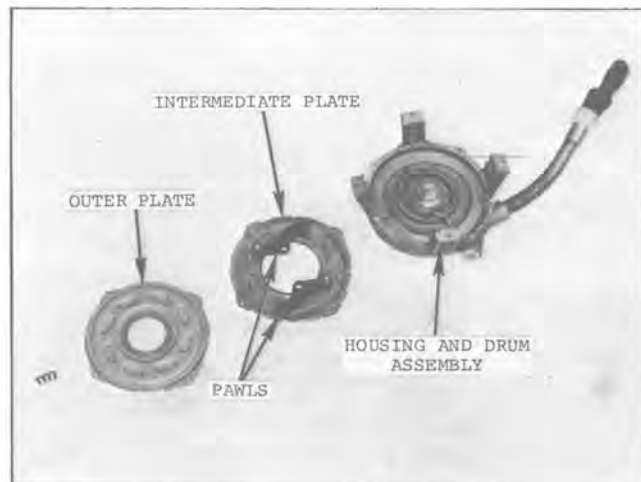


Fig. 26 — Starter Assembly Layout

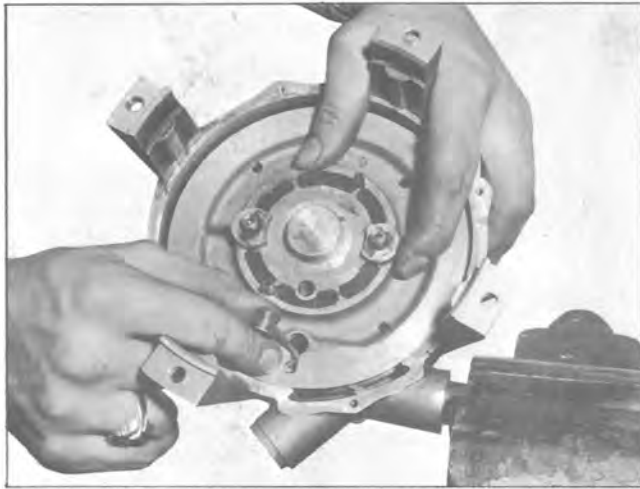


Fig. 27 — Removing Starter Cable

11. Remove guide pin and replace starter carrier and recoil starter assembly.

RECOIL STARTER SERVICING

1. Remove recoil starter from engine.
2. Remove outer plate and intermediate plate assembly. See Fig. 26.

3. Secure starter housing in vise. Pull starter cable all the way out and remove handle. Remove cable from drum. See Fig. 27. Slowly turn drum until all tension is removed from recoil spring.



CAUTION: While performing step 3, hold in on the drum to keep spring seated.

4. Remove starter housing from vise and raise drum slightly from housing. Use an appropriate screwdriver to tap the spring out of its seat in the drum. See Fig. 28.



Fig. 28 — Disengaging Recoil Spring from Drum



Fig. 29 — Removing Drum from Starter Housing

5. Holding spring down with screwdriver, slowly raise drum until finger can be inserted to hold spring in place. See Fig. 29. Remove drum and screwdriver.

6. To remove spring, jar starter housing (open side down) against work bench until spring is dislodged. Using leather gloves, grip spring tightly and carefully remove from housing. **Carefully** let spring unwind.

7. To replace spring, wear leather gloves and carefully wind spring by hand until it can be inserted as shown in Fig. 30.

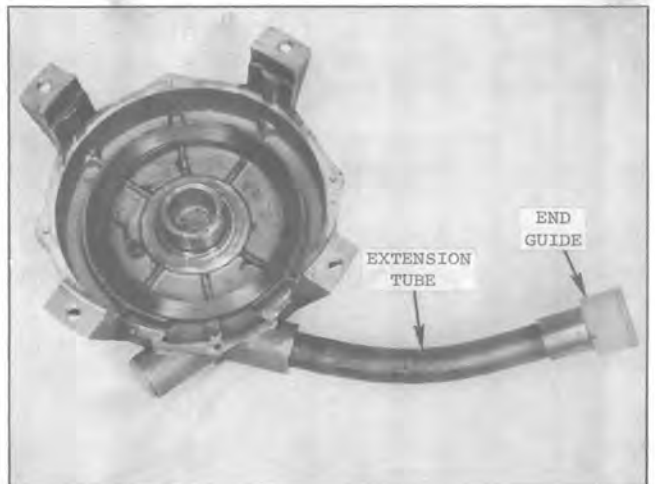


Fig. 30 — Starter Housing With Recoil Spring Installed



Fig. 31 — Installing Brake Spring Compressing Tools

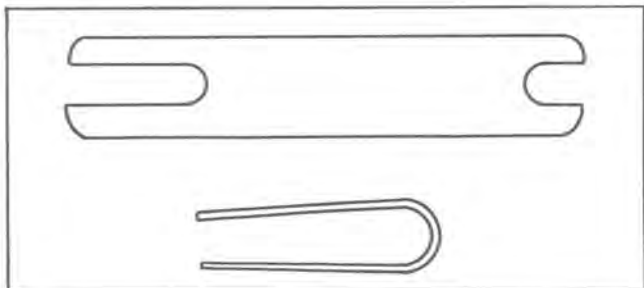


Fig. 32 — Brake Spring Tools (Actual Size)

8. Position drum over housing and insert screwdriver to position spring in its slot then push down on drum until spring is seated.

9. Replace starter housing in vise and carefully wind drum to its limit. Back off until starter cable can be inserted through hole in drum and threaded through extension tube. End guide must be removed from extension tube to insert cable through it. Replace end guide and handle assembly. Slowly release tension on cable and let cable rewind while holding in on drum assembly.

10. Remove starter housing from vise and reinstall intermediate plate, pawls, brake springs and caps.

11. Install spring compressing tools on brake springs as shown in Fig. 31. These tools are easily made. Refer to Fig. 32.

12. Replace outer plate on housing assembly and remove spring compressing tools through center hole with needle nose pliers.

13. Replace starter assembly on engine.

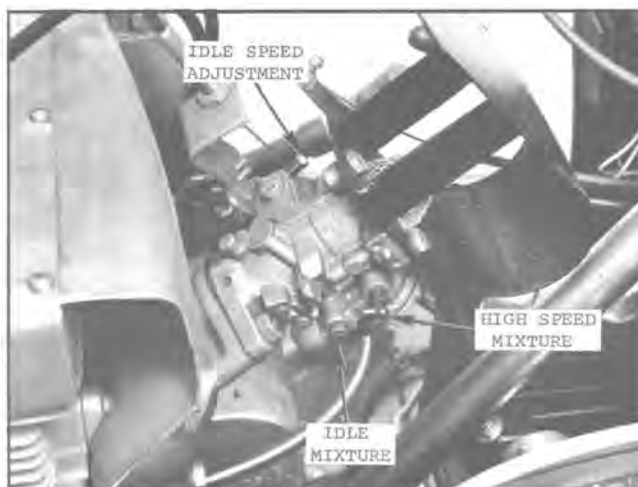


Fig. 33 — Carburetor Adjustments

CARBURETOR OVERHAUL

The L-440 Engine is equipped with a model "HR" carburetor. Follow repair procedures for the L-297 Engine in Part 1.

CARBURETOR ADJUSTMENTS

Both high speed and idle mixture screws are turned clockwise to lean the mixture or counterclockwise to enrich the mixture.

IMPORTANT: Mix fuel as recommended. **DO NOT** run engine on a lean fuel mixture. Serious engine damage may result. A slightly rich mixture is preferable.

1. Close both mixture screws, then open high speed adjustment screw 1-1/2 turns and idle mixture screw 1 turn for their initial setting.

2. Allow engine to warm up to operating temperature, then adjust idle mixture screw 1/8 turn at a time until a smooth steady idle is obtained.

3. Adjust idle speed screw until engine is running at approximately 1900–2000 rpm. Readjust idle mixture screw until engine runs smoothly.

4. Operate Ski Whiz at full throttle under load. If engine runs irregular (4 cycles) close main jet 1/4 turn (clockwise) and operate at full throttle again. If engine still runs irregular close main jet another 1/4 turn and operate at full throttle again.

5. When smooth engine operation is reached at full throttle, open main jet 1/8 turn. **IF MAIN JET IS NOT OPENED THIS 1/8 TURN, THE ENGINE WILL RUN TO LEAN AND POSSIBLY CAUSE SERIOUS DAMAGE TO INTERNAL PARTS.**

REMOVING/INSTALLING DRIVE BELT

Lift up on drive belt, in center of upper span, to spread rear pulley. Slip belt over inside edge of pulley as shown in Fig. 2, and maneuver belt around until it can be removed from the machine.

To reinstall drive belt, install over drive pulley and maneuver into position. Start belt over driven pulley and turn pulley until the belt drops into position.

ELECTRICAL WIRING

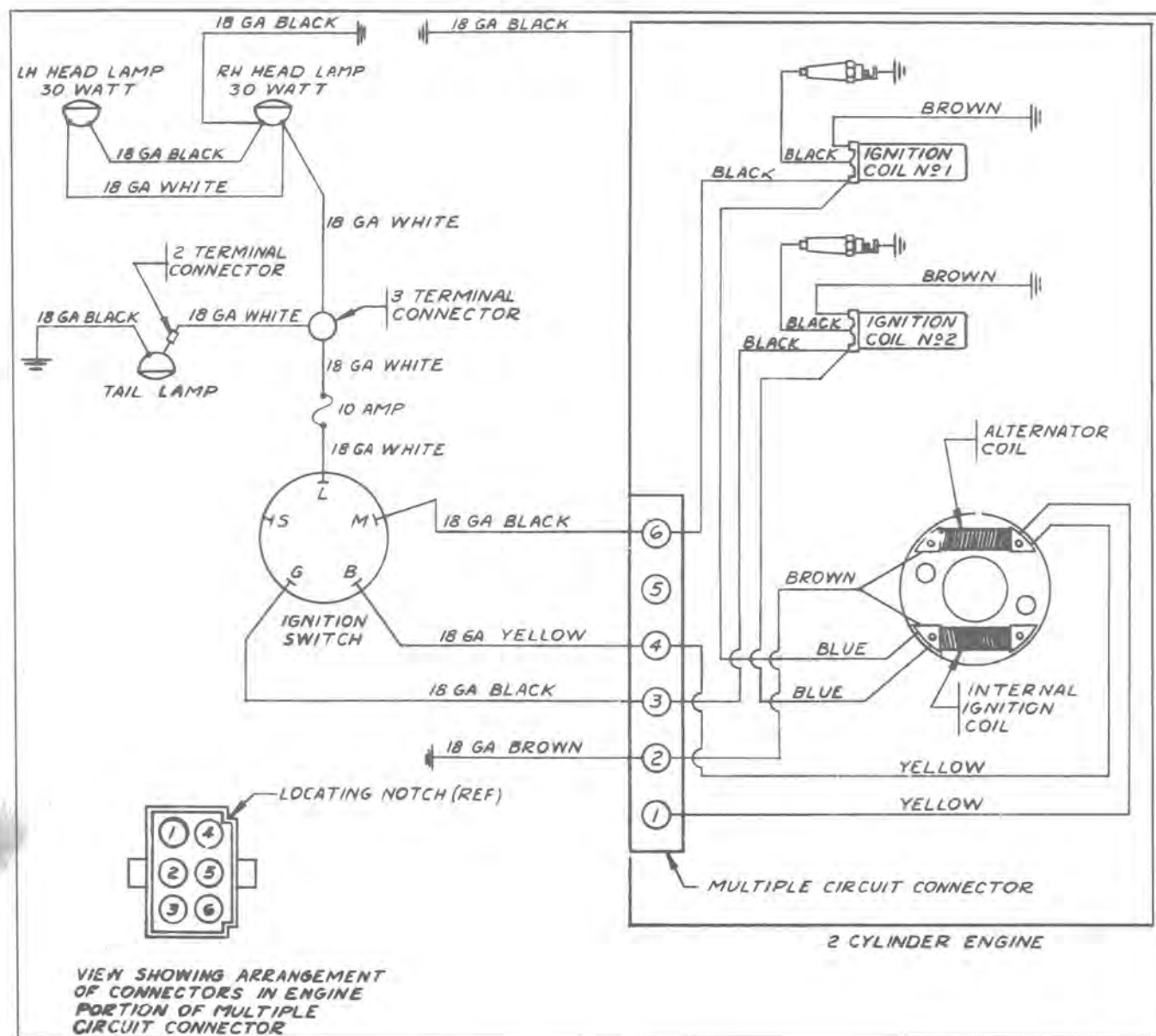


Fig. 34 – Wiring Diagram – Manual Start

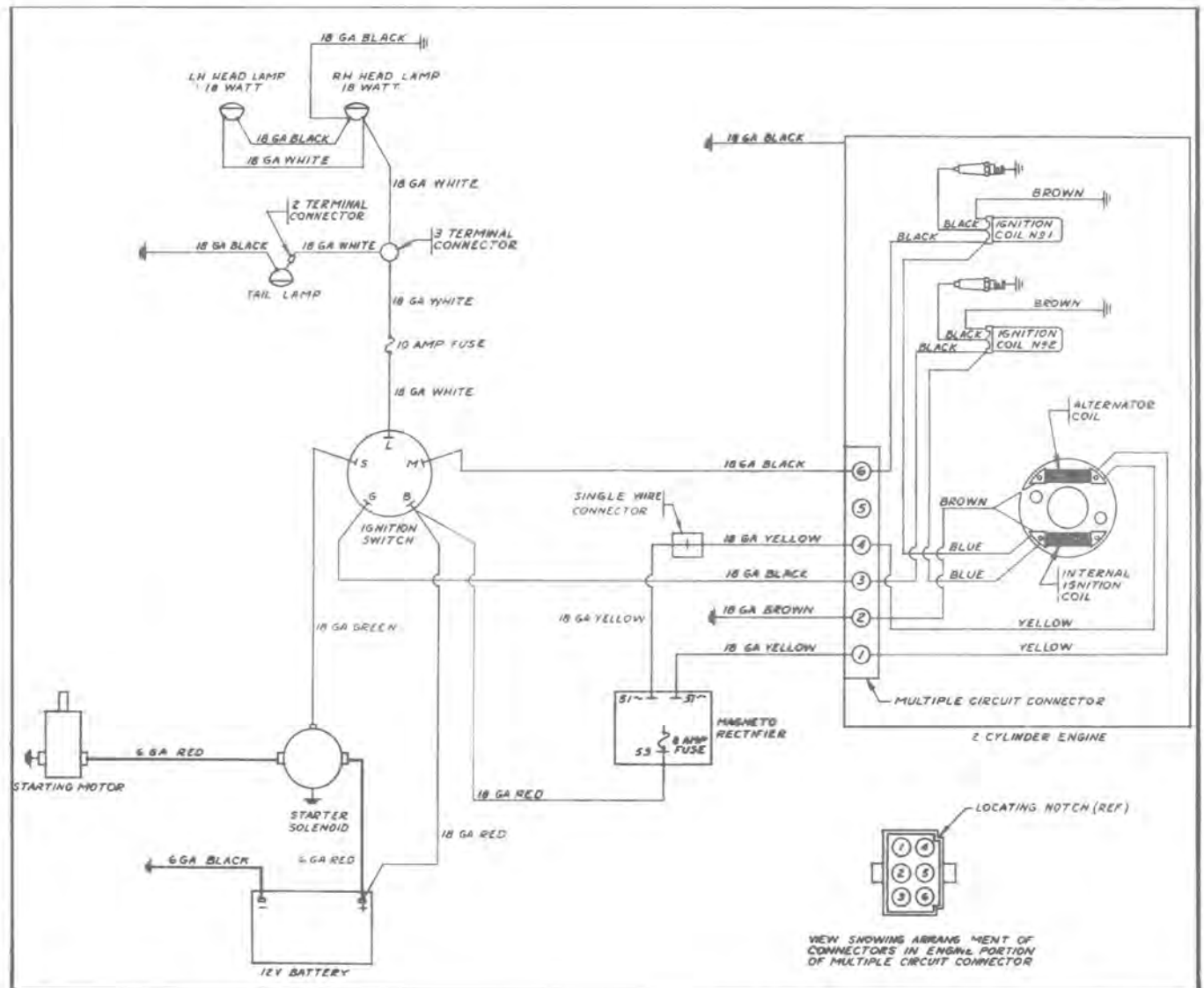


Fig. 35 - Wiring Diagram - Electric Start

GROUP XI — SECTION E — PART 4

**PART 4 — MF SKI WHIZ MAINTENANCE
AND SERVICE INSTRUCTIONS
400SST AND 500SST WITH L340 AND L399 ENGINES**

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*Refer to Part 1 through 3 of this Manual where indicated. The instructions contained within this Part of the Manual pertain only to components which have changed sufficiently to produce changes in service procedures.

SPECIFICATIONS

400SST 500SST

ENGINE SPECIFICATIONS:

Model (JLO)	L340	L399
Type	Gasoline and oil, 2-cycle horizontal crankshaft, 2- cylinder, air cooled	
Total Displacement	339cc	398cc
Bore	2.362"	2.559"
Stroke	2.362"	2.362"
Direction of Crankshaft Rotation (Facing Drive Pulley)	Counterclockwise	
Ignition:		
Make and Type	Auto-Advance flywheel mag- neto, Bosch SCP2V, 12 V/75W	
Pole Shoe Break	20,5-24,0 mm (.807-.945 in.)	
Contact Breaker Gap	0,35-0,45 mm (.014-.018 in.)	
Ignition Timing (with Fully Advanced Cam) B.T.D.C.	02,64-03,15 mm (.104-.124 in.)	
Spark Plug:		
Type	Champion N3 or Bosch W240T2	
Gap	0,4-0,5 mm (Approx. .016- .019 in.)	
Carburetor	HR Series (Tillotson diaphragm with integral fuel pump and filter, dual venturi	
Starter System	Manual start or electric start	
Starter Motor	Bosch AL552V2A, 12 volt, 0.4 hp	
Fuel and Oil Mixture (Ratio of Gas:Oil)	20 parts — regular grade gasoline — 1 part two-cycle engine oil — 20:1	

TIGHTENING TORQUES

Cylinder Base	18 ft.-lbs.
Cylinder Head Nuts	29-31 ft.-lbs.
Spark Plugs	26-30 ft.-lbs.
Flywheel Retaining Nut	44-51 ft.-lbs.
Blower Shaft Pulley Retaining Nut	22-24 ft.-lbs.
Blower Pulley to Flywheel Retaining Bolts	6-1/2-7 ft.-lbs.
Recoil Starter Retaining Bolts	6-1/2-7 ft.-lbs.

Refer to Torque Charts on Pages 2 and 3 of Part 1 for torque values of all other bolts.

ENGINE SERVICING

SPECIAL TOOLS AVAILABLE (FIG. 1)

1. Crankshaft Bearing Puller . . . JLO 444.31.807.00
JLO 444.31.072.00
JLO 444.31.071.00
2. Magneto Flywheel Puller . . . JLO 444.31.843.10
3. Timing Advance Pin JLO 444.31.666.00
4. Timing Light
5. Dial Indicator

ENGINE OVERHAUL

The following overhaul procedures are divided into three phases. Phase I is performed with the engine mounted. Phases II and III are performed with the engine removed.

Refer to the appropriate phase for the type service required.

NOTE: The series of photographs pertaining to "Engine Overhaul" are in sequence for complete tear down. Photographs referred to in Phases I and II may show some components removed that need not be removed. Follow the text carefully.

I. Replace Head Gasket

1. Disconnect spark plug wires.
2. Mark heads, if both are to be removed, so they may be reinstalled on same cylinder they were removed from.
3. Remove cylinder head hold down nuts and washers, then carefully lift head from cylinder, Fig. 4.
4. Remove old head gasket, make sure head and cylinder surfaces are clean and replace with new gasket.

IMPORTANT: Gasket is directional. Place side with widest metal band upward, or toward cylinder head.

5. Position cylinder head over studs. Side with deepest cavity must be toward carburetor side of cylinder.
6. Install washers and nuts. Tighten alternately to 29-31 ft.-lbs. torque.

7. Connect spark plug wires.

II. Replace Piston, Piston Rings, Piston Pin and/or Piston Pin Bearing

1. Remove engine from Ski Whiz. See "Engine Removal and Installation", Part 3, Page 2.

2. Remove ignition cover and carburetor-intake manifold assembly, Fig. 8.

3. Remove exhaust manifold, if still attached to engine.

4. Cylinder heads may or may not be removed at this point, as desired. Refer to Phase I.

5. Remove cylinder base nuts and spring washers from bottom of crankcase, Fig. 10.

6. Carefully lift cylinder from crankcase assembly, Fig. 11.

NOTE: Use a notched piece of wood to rest piston on as cylinder is being removed or installed. Mark pistons and cylinders so they may be reinstalled in the order removed. Figs. 11 and 12.

7. Remove snap ring, piston pin and piston, Fig. 12.

8. Remove piston pin bearing and retainers (washers) from rod, Fig. 12.

9. If rings are to be replaced, remove them from the piston and clean piston ring grooves.

10. Remove old cylinder assembly gasket from surface of crankcase. Also check the rod bearing for evidence of damage or wear. (The rod and crankshaft are available as an assembly only. If damage is evident, continue procedure outlined in Phase III.)

11. Insert piston pin bearing into rod with one retainer positioned on each side of bearing. Recessed side of retainers must be toward bearing.

12. Position piston over rod and insert piston pin. Install snap ring retainers to secure piston pin.

NOTE: Arrow on top of piston must point towards exhaust side of engine.

13. Position new cylinder assembly gasket on crankcase, making sure that wooden block is under piston.

14. If piston rings have been removed, replace them.

15. Make certain that piston rings are positioned on pins as shown in Fig. 11. Use a suitable metal band to compress the rings. Carefully guide cylinder assembly over the piston and into place against the crankcase.

16. Install cylinder base washers and nuts and tighten to 18 ft.-lbs. torque, using the tightening sequence shown in Fig. 10.

17. Use new gaskets and reinstall carburetor, intake manifold assembly and ignition coil cover on engine.

18. Replace engine in Ski Whiz. See "Engine Removal and Installation", Part 3, Page 2.

III. Replace Crankshaft and Rod Assembly, Crankshaft Bearing and Seals

1. Remove engine from Ski Whiz. See "Engine Removal and Installation", Part 3, Page 2.

2. Remove drive pulley from crankshaft. Refer to "Removing/Installing Drive Pulley" under "Drive and Driven Pulley Servicing", Part 2, Page 4.

3. Remove ignition coil cover, intake manifold with carburetor and exhaust manifold, if not previously removed.

4. Remove recoil starter from engine.

5. Remove starter carrier and fan drive pulley from magneto flywheel. Remove fan belt.

6. Working against engine compression (spark plugs must be installed), use a wrench and rubber hammer to break magneto flywheel securing nut loose. Remove nut and lockwasher. Fig. 5.

7. Attach puller, Special Tool #444.31.843.10, to magneto flywheel. Working against compression, use a wrench and rubber hammer to tighten puller tool bolt until flywheel breaks loose. Remove flywheel. Figs. 6 and 7.

8. Remove wires from each coil as shown in Fig.

8, and remove spark plug wire retaining clip from fan housing.

9. Remove 4 bolts securing fan housing to engine block and remove fan housing, being careful not to damage seal on crankshaft keyway, Figs. 9 and 18.

10. Remove cylinder heads as explained in Phase I, Steps 1 through 4.

11. Remove cylinders and pistons as outlined in Phase II, Steps 5 through 10.

12. Grasp crankcase by upper half and hold slightly off work bench. Tap downward on ends of crankshaft with rubber hammer to separate crankcase. Remove upper half. Figs. 13 and 14.

13. Use same procedure as above to remove crankshaft from lower half of crankcase.

14. Remove crankshaft bearings with special tool as shown in Fig. 15. Center bearing cannot be replaced.

15. Clean and inspect all parts for wear or damage. Replace parts as required.

16. Heat bearings in oil to approximately 220° F. for about five minutes. Fig. 16.

17. Position crankshaft on end between two wooden blocks and place a small wooden block between each throw. Drop heated bearing over crankshaft and tap into place. Fig. 17.

18. Install washer and seal on crankshaft and lower it into crankcase using sealing compound on bearing surfaces. Fig. 14.

19. Reassemble crankcase using sealing compound. Gasket is not required. Tap upper half of crankcase into position with a rubber hammer.

20. Replace pistons and cylinders as outlined in Phase II, Steps 11 through 16.

21. Replace heads as outlined in Phase I, Steps 4 through 6.

22. Check seal and "O"-Ring in fan housing for serviceability and replace if required. Replace fan housing on engine block, being careful not to damage seal on crankshaft keyway. Be sure rubber grommet on wiring harness is positioned properly, then tap

fan housing into position. Tighten 4 bolts securely.

23. Attach coil wires, Fig. 8, and secure spark plug wires to fan housing.

24. Replace magneto flywheel on engine and tighten nut to 44 to 51 ft.-lbs. torque.

25. Replace belt, fan drive pulley and starter carrier on magneto flywheel. Rotate crankshaft while tightening 3 bolts to keep from pinching the belt.

26. Replace recoil starter.

27. Replace intake manifold/carburetor assembly and ignition coil cover.

28. Replace drive pulley, following procedures outlined in "Removing/Installing Drive Pulley" under "Drive and Driven Pulley Servicing", Part 2, Page 4.

29. Reinstall engine in Ski Whiz as outlined in "Engine Removal and Installation", Part 3, Page 2.

FAN DISASSEMBLY

Remove fan housing as outlined in Step 2 of "Ignition Timing", Fig. 18. Place a punch through the hole in the fan housing into the hole provided on the impeller to keep the fan from turning, Fig. 21. Remove the nut, washers and pulleys, noting how they are positioned. Tap the shaft and impeller assembly out of the housing with a rubber hammer. Replace parts in the order shown in Fig. 19.

NOTE: If spacer shown in Fig. 19 is not positioned between fan and bearing in fan housing, excessive high pitched noise will result.

ADJUSTING FAN BELT

Place a punch through the hole in the fan housing into the hole in the impeller to keep the fan from turning, Fig. 21. Remove the nut, washers and outer half of pulley. Remove washers from between pulley halves to tighten belt, Fig. 20. Place spare washers on outside of outer half of pulley for use when a new belt is installed. Maintain 7/16" belt deflection between pulleys when 17 lbs. pressure is applied. Tighten pulley retaining nut to 22 to 24 ft.-lbs. torque.

IGNITION TIMING

Timing marks are provided on the L340 and L399 Engines to provide a quick means of checking the timing.

1. Disconnect spark plug wires and remove recoil starter, starter carrier and fan drive pulley.

2. Proceed with Step No. 3, unless flywheel is to be removed. If flywheel is to be removed:

a. Remove magneto flywheel retaining nut and lockwasher. (The flywheel nut is most easily removed by impact with the nut turning against engine compression, Fig. 5.)

b. Use magneto flywheel puller (Special Tool # 444.31.843.10) to remove flywheel, Fig. 6.

c. If armature plate must be removed, remove ignition coil cover, Fig. 8, and disconnect wires from harness to coils. Remove fan case bolts, then remove fan case assembly from engine. Figs. 9 and 18. Remove 2 screws and remove armature plate from fan housing.

NOTE: Use care in unsoldering connections to replace components on armature plate.

d. Reverse procedure in step c to replace armature plate.

e. To adjust points with flywheel removed, remove cam from flywheel and position on crankshaft. Rotate cam until breaker points are open. Check gap and adjust if required, Figs. 7 and 22. After both sets of points are adjusted, remove cam and reinstall in flywheel.

f. Reinstall flywheel, key, lockwasher and nut onto crankshaft. Tighten flywheel nut to 44 to 51 ft.-lbs. torque.

3. Rotate flywheel clockwise until one set of breaker points is open and feeler gauge can be inserted into points. Check point gap and adjust if required, Fig. 23. Rotate flywheel one-half turn and adjust other set of points.

4. Reach through opening in magneto flywheel and move centrifugal weight toward outside of flywheel. Insert guide pin (Special Tool # 444.31.666.00) in hole provided, Fig. 24.

5. To check timing on cylinder number 1, remove coil cover, disconnect blue and yellow wire from number 1 cylinder coil and attach timing light to it, Fig. 25. With Centrifugal Weight Advance Tool installed, turn ignition switch on and rotate engine slowly clockwise (facing flywheel) until light dims. No. 1 stamped into flywheel should line up with first mark (direction of rotation) on top of flywheel housing, Fig. 25.

6. If timing is incorrect, reach through flywheel opening with screwdriver and loosen two armature plate bolts, Fig. 7. Move armature plate in opposite direction of engine rotation to retard timing.

7. To check timing on cylinder number 2, remove blue wire from inside coil and attach timing light to it. Rotate engine slowly clockwise (facing flywheel) until light dims. No. 2 stamped into flywheel should line up with first mark (direction of rotation) on top of flywheel housing, Fig. 25.

8. If timing is incorrect, increase breaker point gap (cyl. no. 2), Fig. 7, to advance timing or decrease to retard timing. Maintain point gap of .014"-.018". If additional adjustment is required, move armature plate until cylinder no. 2 is in time, then adjust breaker point gap (cyl. no. 1), Fig. 7, until cylinder no. 1 is in time. If cylinder no. 1 cannot be timed while maintaining .014"-.018" point gap, inspect for worn or damaged parts and repeat steps No. 5 through 8.

9. To check timing advance mechanism, remove guide pin securing centrifugal weight and check

timing again, as indicated in Step 5. No. 1 stamped into flywheel should line up with second mark (direction of rotation) on top of flywheel housing.

10. If timing advance mechanism is not functioning properly, remove flywheel as outlined in Step 2 and inspect parts for wear or damage.

NOTE: A dial indicator may be used in place of, or to check timing marks. An adapter must be made to support the dial indicator as shown in Fig. 26. Follow the procedure outlined in Steps 5 through 8. Timing light should dim when the piston is between .104"-.124" B.T.D.C. with centrifugal weight advanced.

11. Remove guide pin and replace fan drive pulley, belt and starter carrier. Rotate crankshaft while tightening 3 bolts to avoid pinching the belt.

12. Replace recoil starter assembly.

CARBURETOR OVERHAUL

The L340 and L399 Engines are equipped with a model "HD" carburetor. Follow repair procedure outlined in Part 1, Page 23, on the "HD" carburetor used with L380 Engine.

CARBURETOR ADJUSTMENT

Use procedure outlined in Part 3, Page 10. Refer to Fig. 27 for adjustment screw locations.

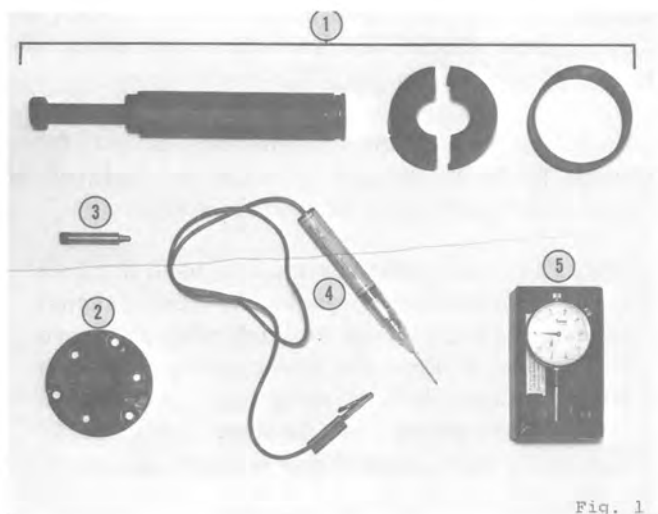


Fig. 1



Fig. 2

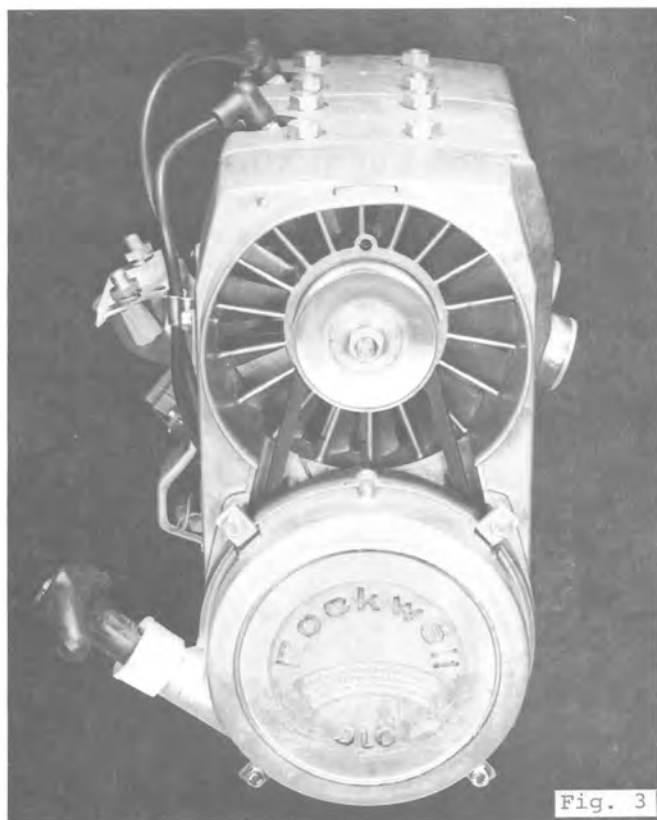


Fig. 3

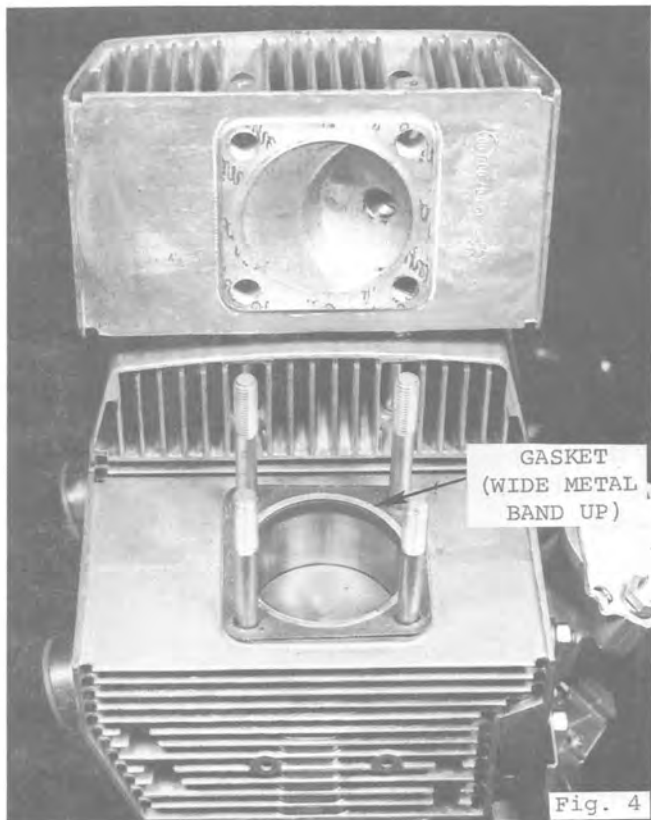
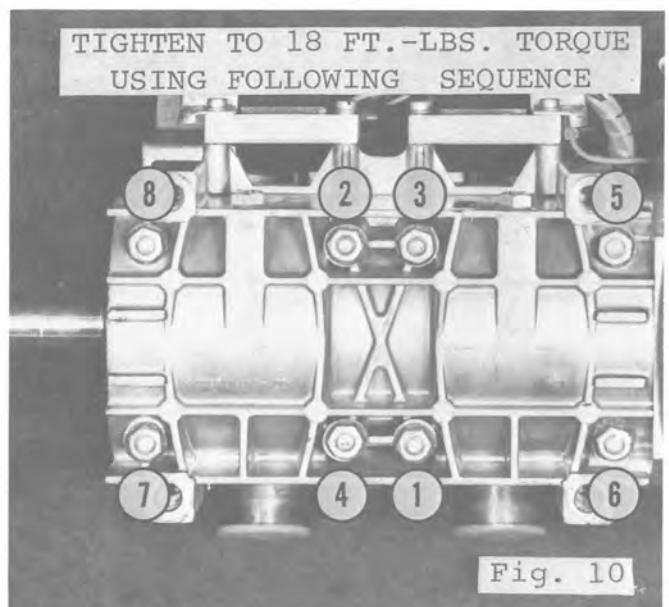
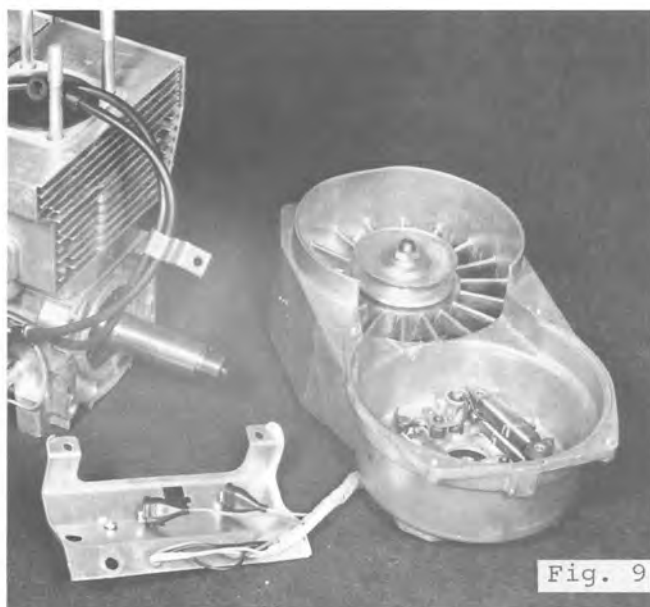
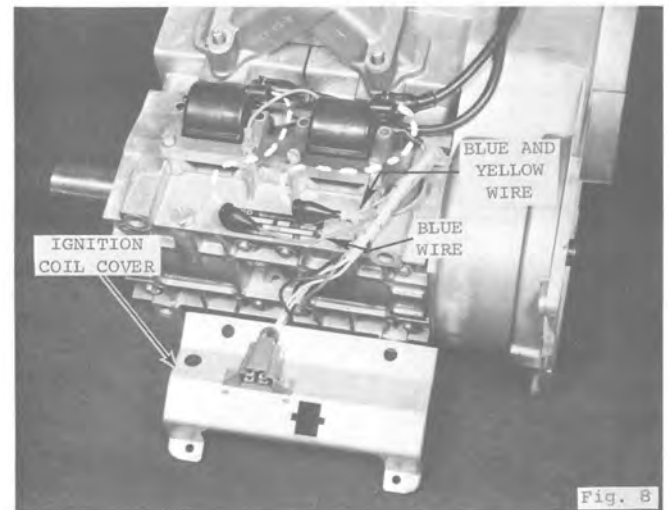
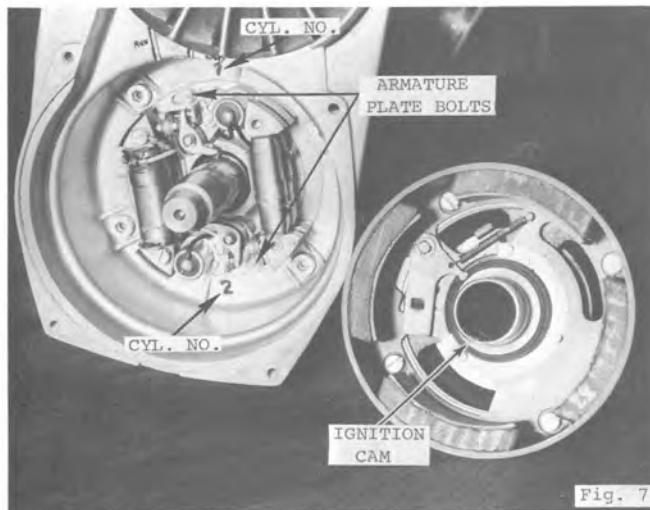
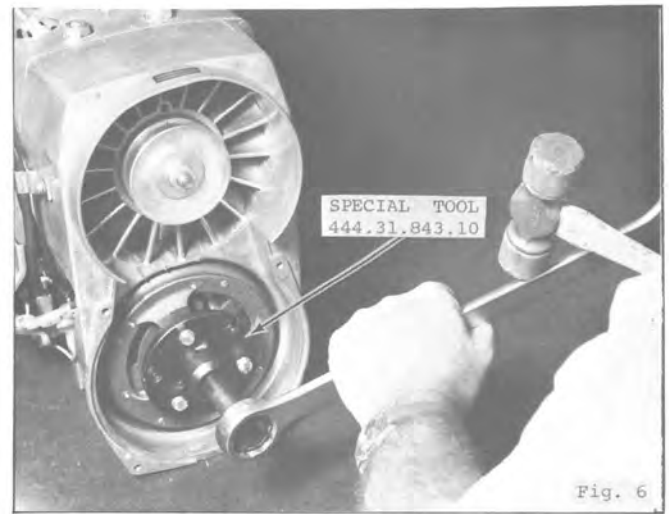
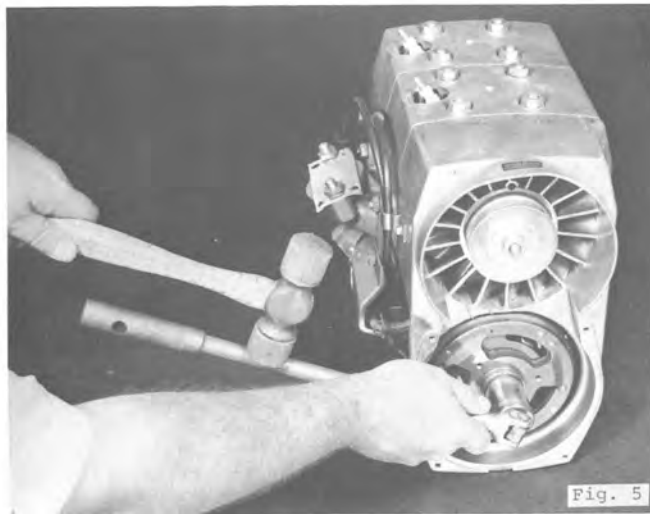
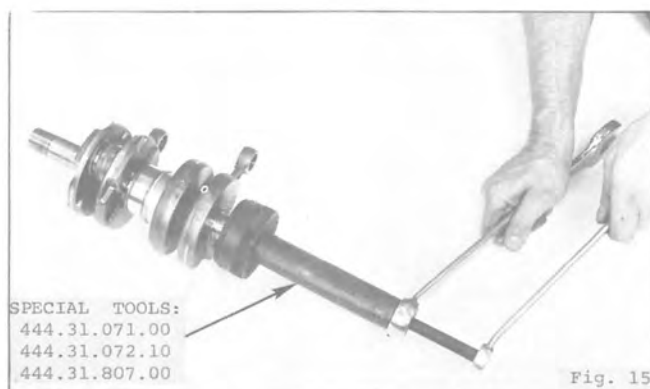
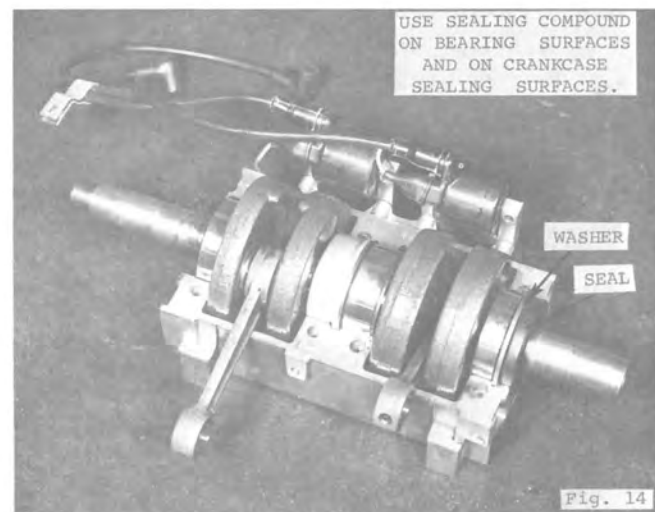
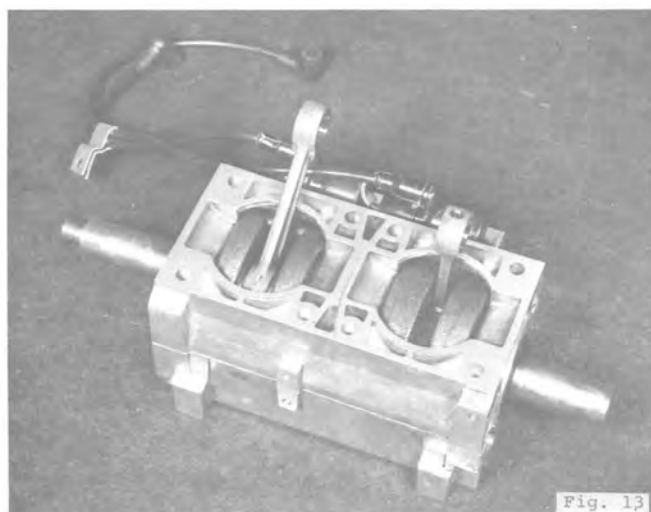
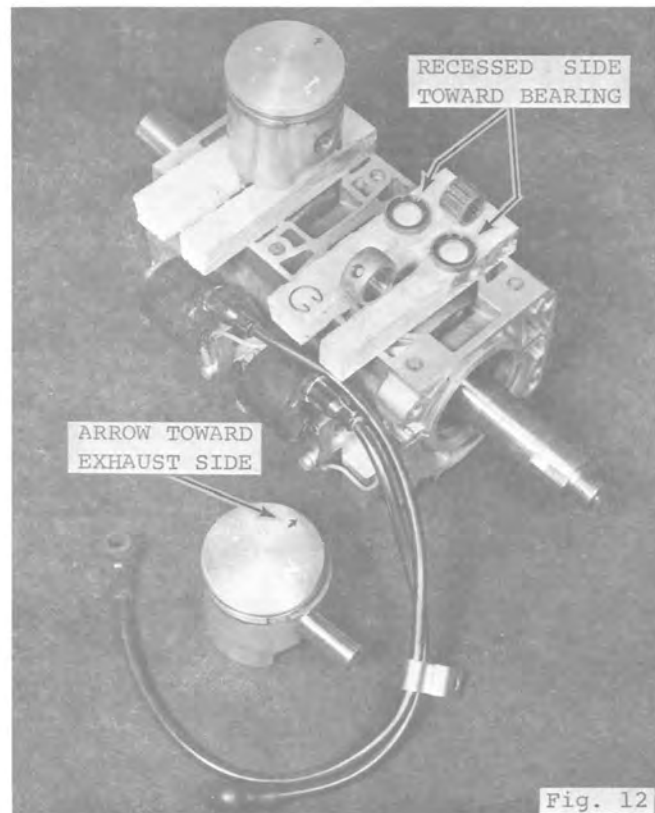
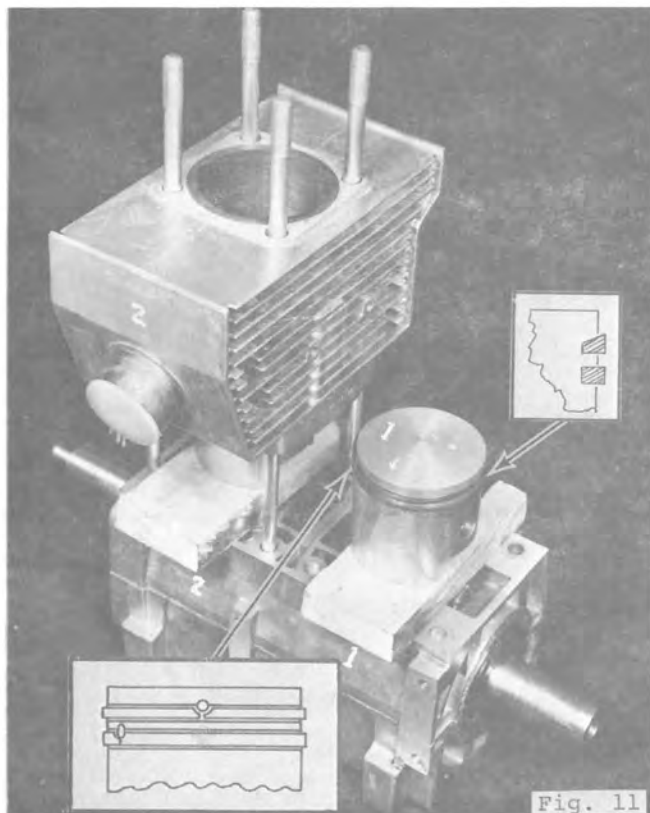


Fig. 4





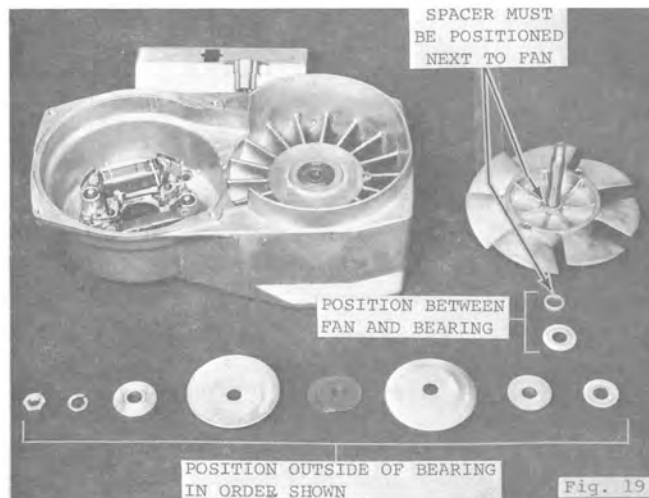
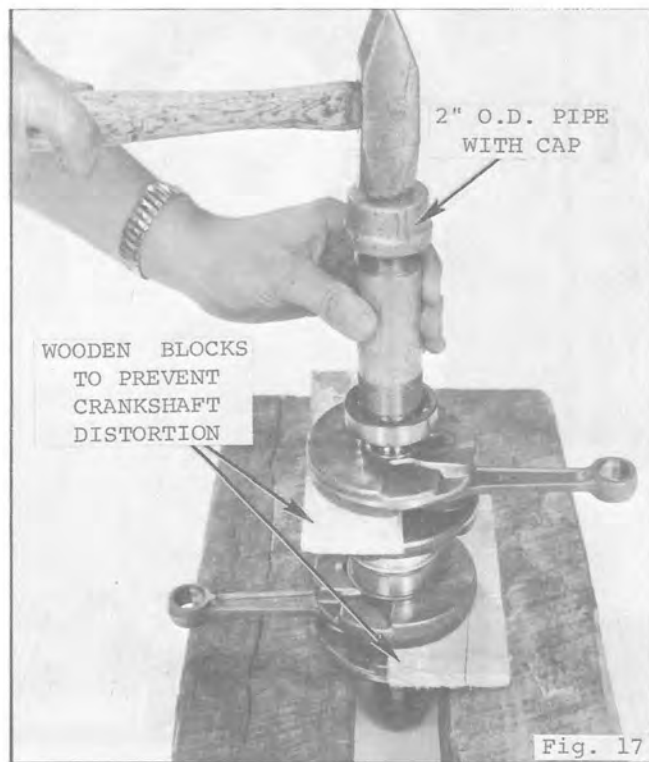
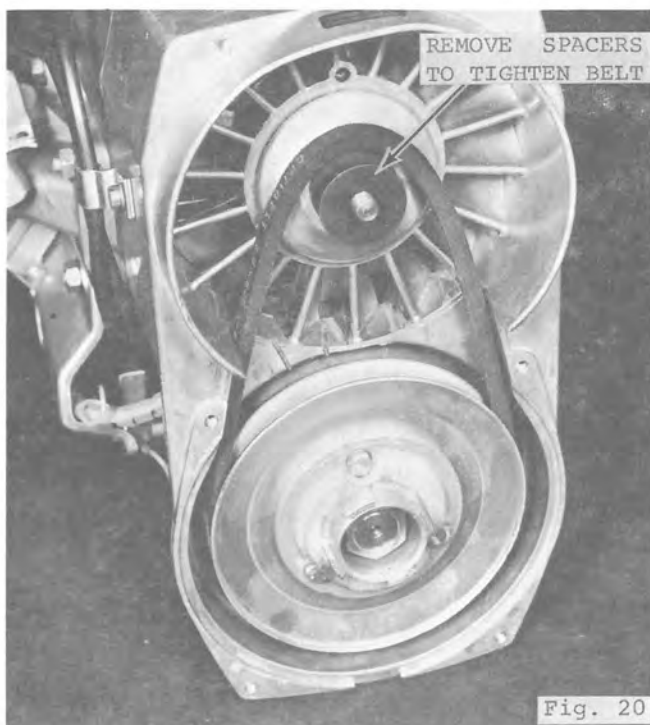




Fig. 22



Fig. 23



Fig. 24

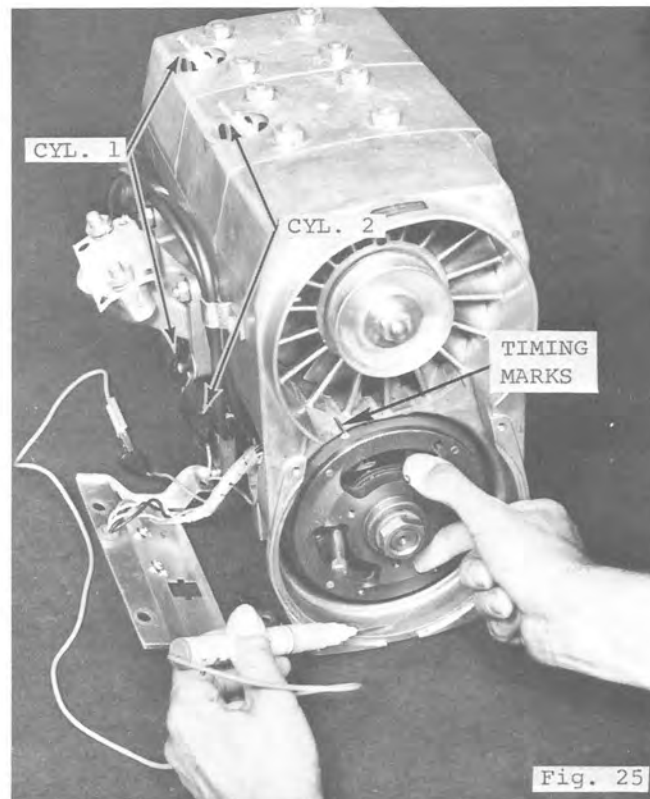
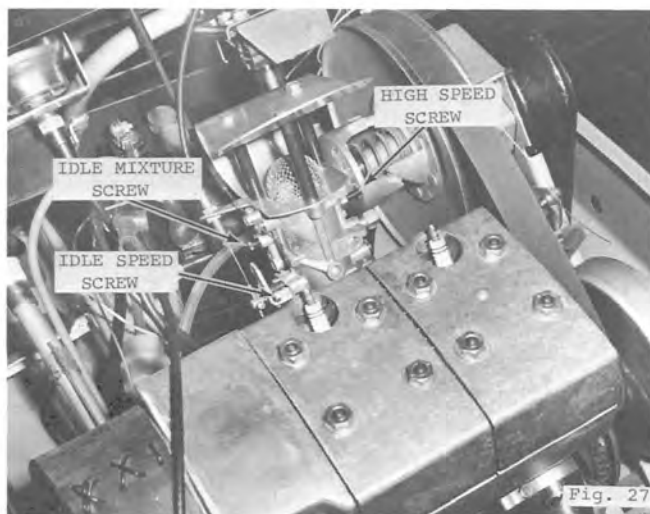
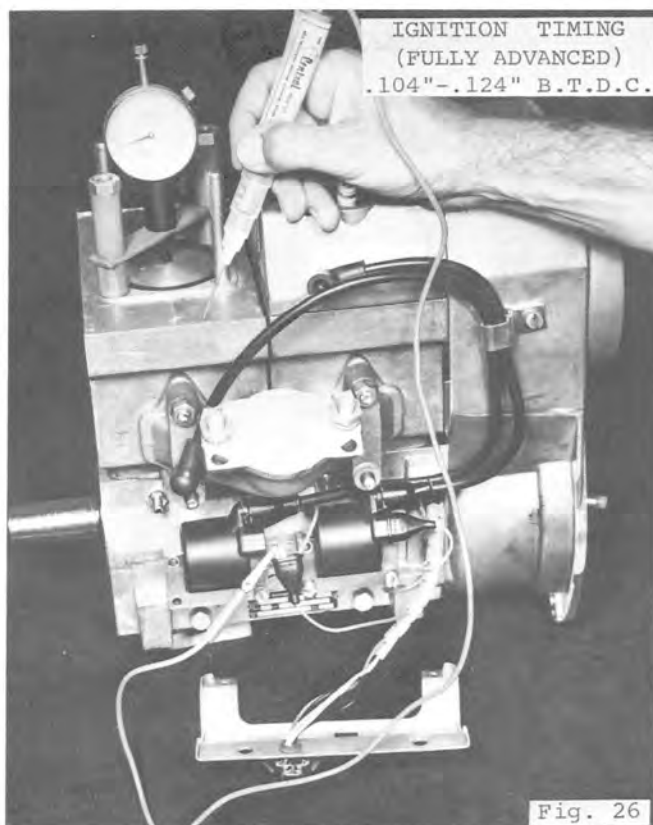


Fig. 25



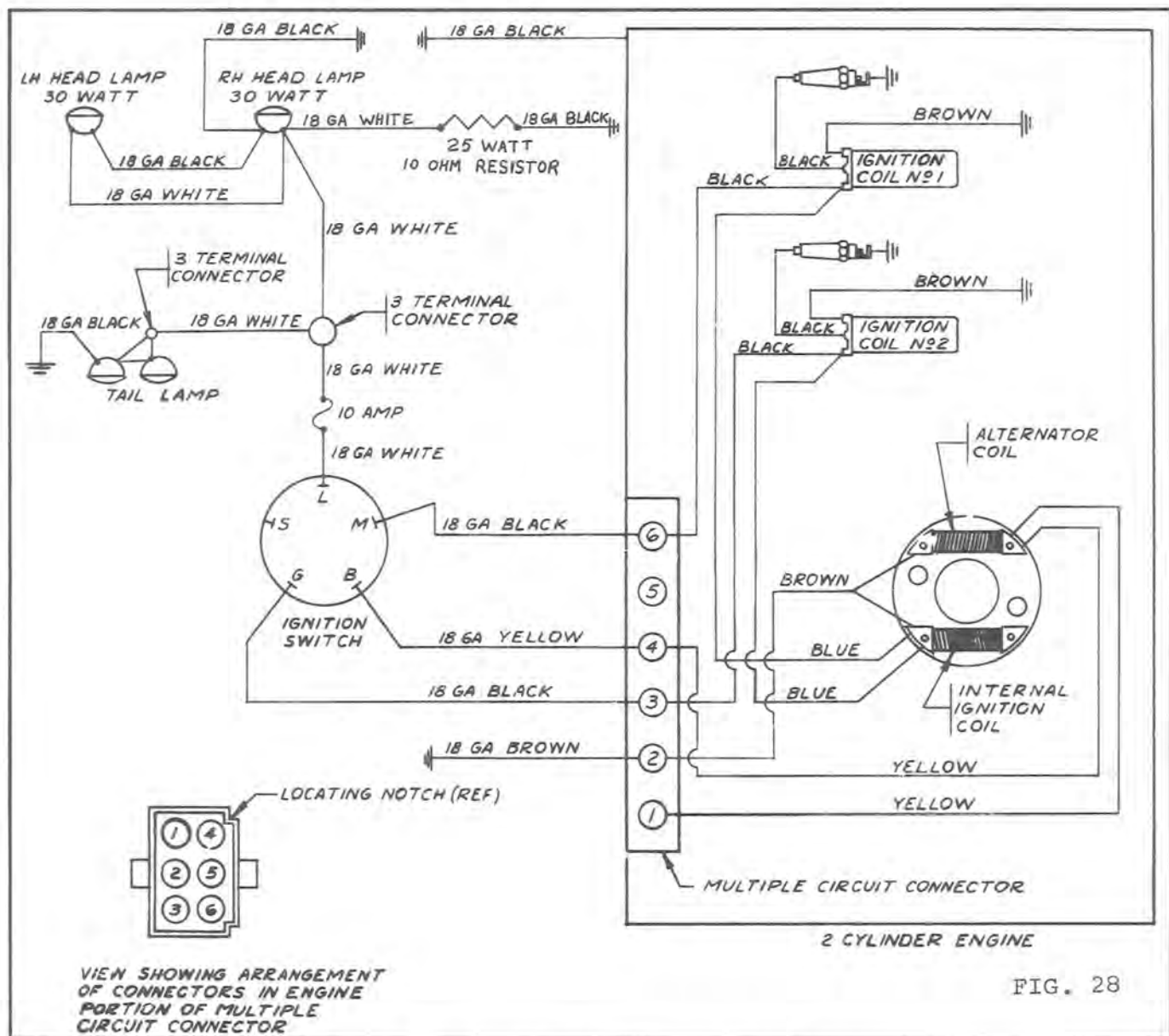


FIG. 28 — MANUAL START WIRING DIAGRAM



MF 227 SNOW THROWER**CONTENTS**

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TOOLS	2
AUGER DRIVE GEAR BOX	2
DRIVE CHAINS	5
SELF-ALIGNING BEARINGS	5
ADJUSTMENTS	10
CLUTCH DISC	11
TROUBLE-SHOOTING	12

For Engine Specifications, Trouble-Shooting, Overhaul Procedures, Ignition System and Fuel System, refer to Group O — Section V — Part 6 thru 10 in the 5 Volume Technical Maintenance Manual. In the Special Products Service Manual, the same material will be found under Section D — MF 7 Lawn Tractor.



CAUTION: Always disconnect spark plug cable from spark plug before inspecting, adjusting or repairing Snow Thrower.

TOOLS

Tools required to service the auger drive gear box are shown in Fig. 1.

1. Torque wrench calibrated in inch-pounds, with 9/16" socket.
2. Seal and bearing driver (universal).
3. Spanner wrench.
4. Offset screwdriver.
5. Tool used for measuring rolling torque. Fabricated from 1 in. (inside diameter) pipe. Cap and 9/16 in. bolt head welded on end.



Fig. 1

AUGER DRIVE GEAR BOX

1. To remove auger drive gear box, remove auger and rotor housing assembly, shown in Figs. 2 and 3.

2. Remove pulley and speed disc assembly by loosening two Allen head setscrews located on pulley hub, see Fig. 2. Remove Woodruff key from input shaft.

3. Remove auger and rotor assembly from housing, Fig. 4, by removing bolts from auger flanged bearings.

4. Remove augers. Remove rotor and 3/4" flatwashers, one on each side of rotor, Fig. 5.

NOTE: There is a right and left auger, Fig. 3. There is also a shear pin for each auger, and they are special (soft) bolts. Do not replace with any other type pins.

5. Remove input shaft (with worm gear) from gear box after removing Woodruff key and gear box end plate. See Fig. 6 and 7.

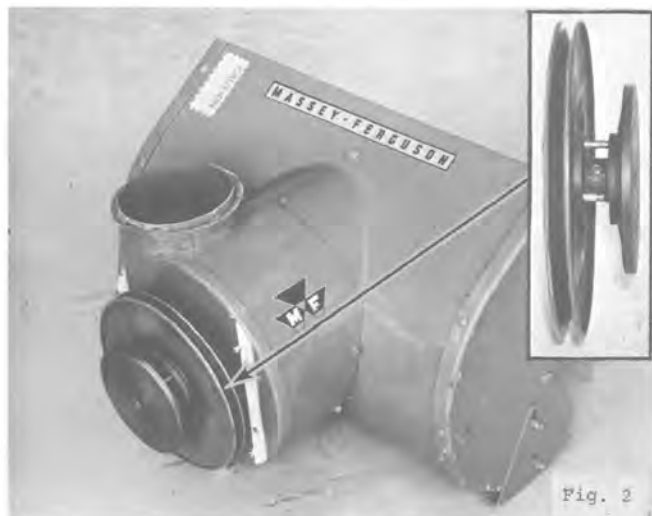


Fig. 2



Fig. 3

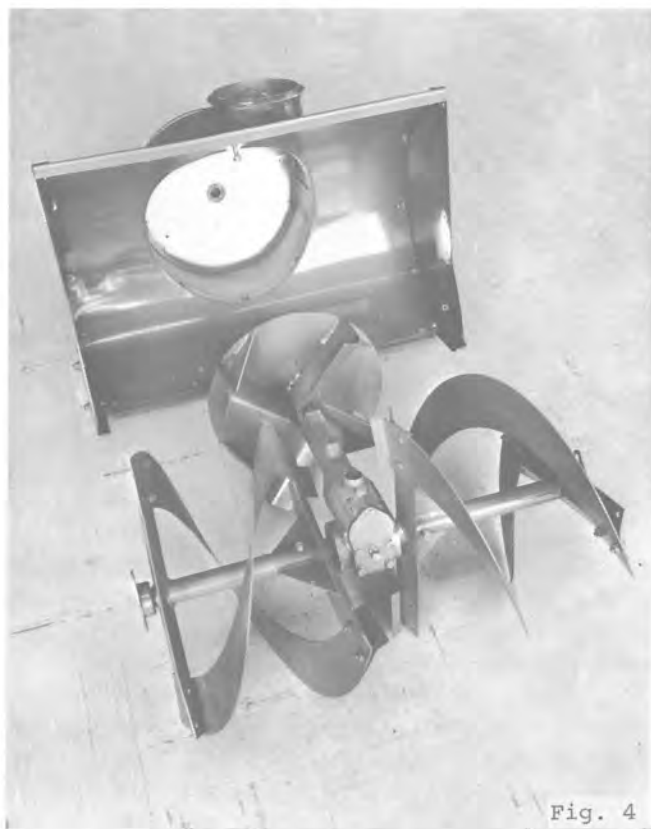


Fig. 4

6. Remove bearing adjusting nut, Fig. 6. Remove shaft with gear and bearings (also right-hand bearing outer race) by tapping on left-hand side of shaft.

7. Remove bearing outer race on left-hand side using offset screwdriver.

8. Do not remove auger shaft seal on left-hand side unless it is to be replaced with new seal.

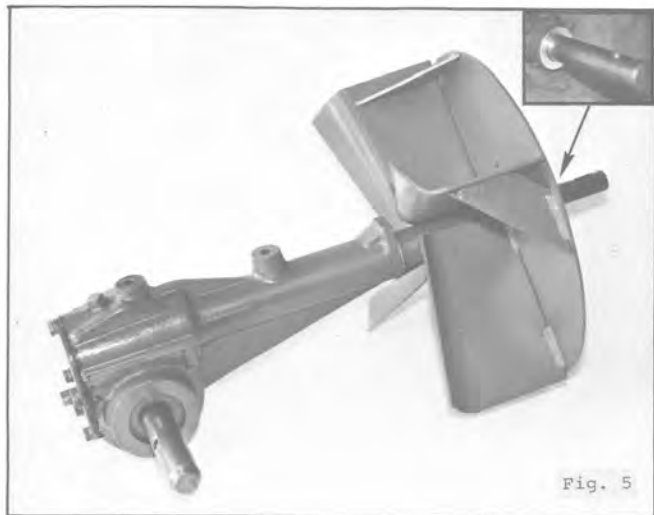


Fig. 5



Fig. 6

9. Remove input shaft bushing and seal. Use a bushing and seal driver with a 3/4" pilot and a 1" driver. Drive out bushing with seal by driving from inside toward outside of gear case.

10. The input shaft bearing outer race can be removed using a drift and driving from back side of race.

11. When replacing input shaft bushing and seal, use a bushing driver with a 3/4" pilot and a 1-1/8" driver for both bushing and seal. See Fig. 8. Drive bushing in until it bottoms. Drive seal in flush with outside of gear case.

12. Replace input shaft bearing outer race.

13. Install new seal and outer bearing race in left-hand side of gear case. Install new right-hand seal in adjusting nut, Fig. 7. Replace "O"-



Fig. 7



Fig. 8

ring seal.

14. Install auger shaft assembly, complete with gear, bearings and seals. Lubricate bearings with SAE 30 engine oil.



Fig. 9

15. Tighten auger shaft adjusting nut to 40 ft.-lbs. See Fig. 9. Check auger shaft rolling torque. It should be approximately 10 in.-lbs. Lock adjusting nut with cotter key.

16. Replace input shaft, being careful to not damage seal.

17. Reassemble and install auger and rotor housing assembly reversing disassembly and removal procedures. Do not forget to install belt guide Fingers, Fig. 12.

18. Fill gear box to plug level with SAE 30 engine oil.

DRIVE CHAINS

Chains contain a master link and pin to facilitate removing and replacing the chain. See Fig. 10.



Fig. 10

SELF-ALIGNING BEARINGS

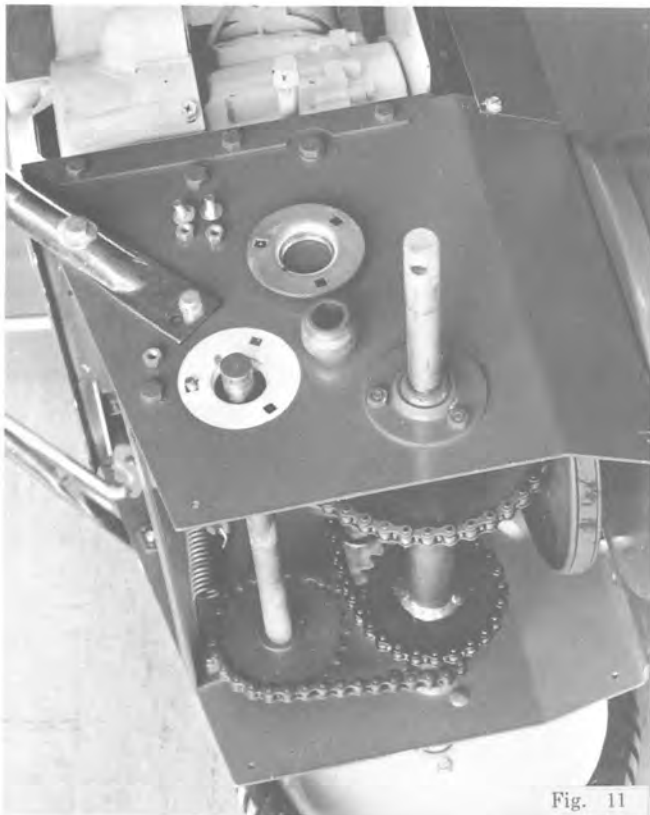


Fig. 11

Bearings can be removed and replaced by removing three nuts securing bearing retainer. See Fig. 11.

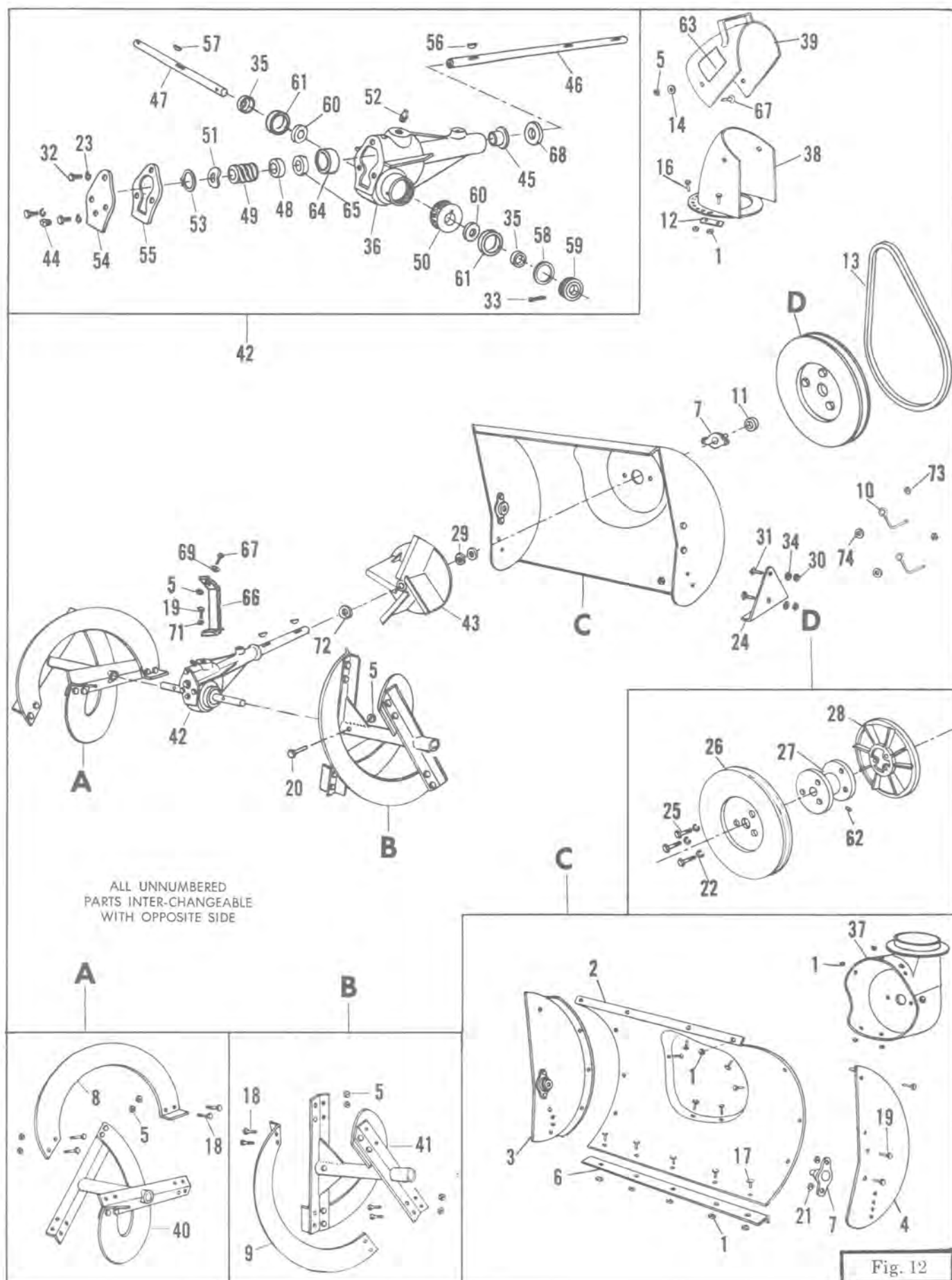


Fig. 12

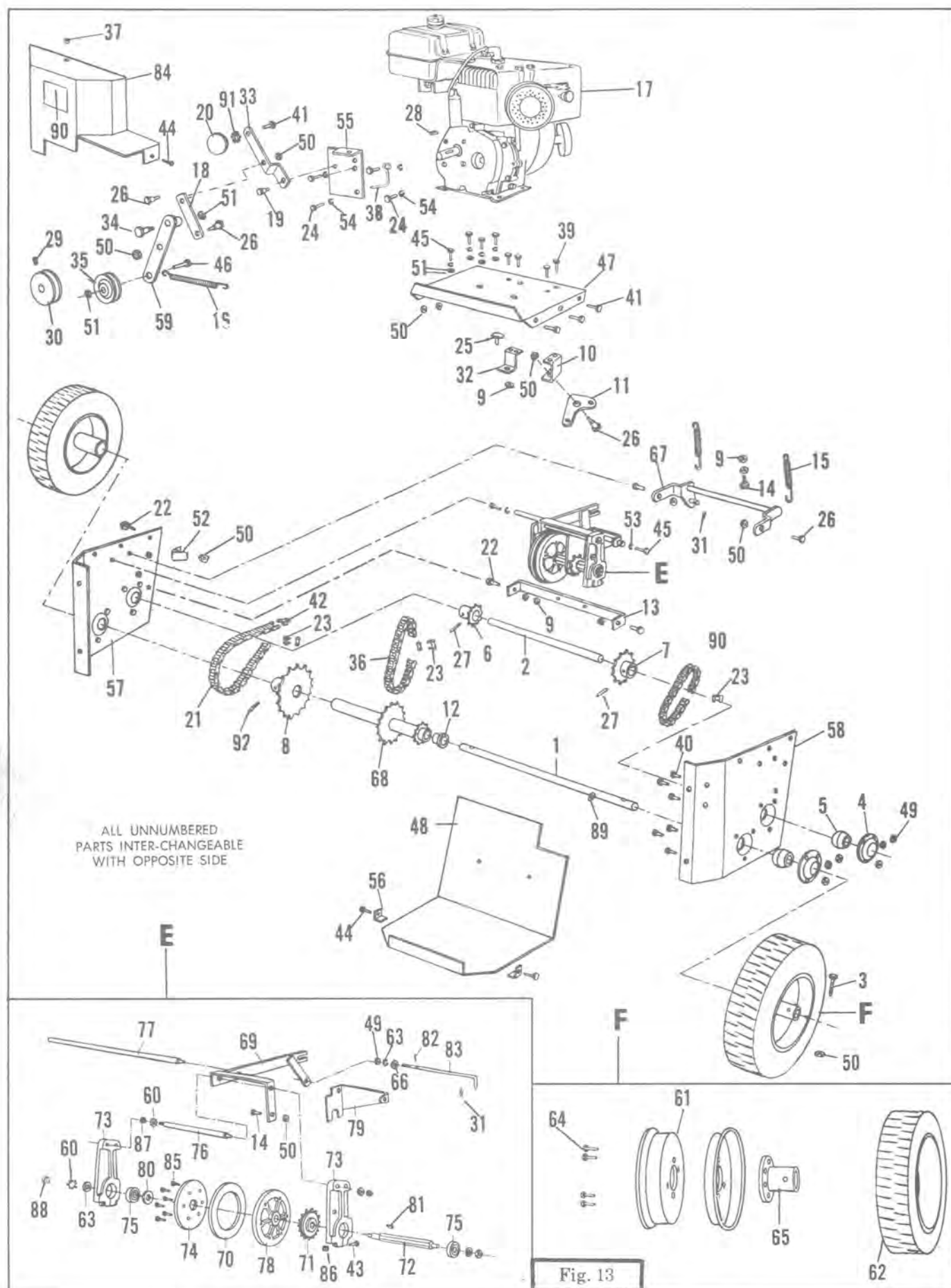
MASSEY-FERGUSON

GROUP XI — SECTION F

MAINTENANCE & SERVICE INSTRUCTIONS

PARTS LIST FOR FIGURE 12

Key No.	Description	Key No.	Description
1	*1/4"-20 Locknut	38	Bottom Chute Assembly
2	Auger Cover	39	Top Chute Assembly
3	Auger Housing End R.H.	40	Auger Assembly R.H.
4	Auger Housing End L.H.	41	Auger Assembly L.H.
5	*5/16"-18 Locknut	42	Gear Case Assembly
6	Blade	43	Rotor Assembly
7	Flanged Bearing	44	1/4" Pipe Plug
8	Auger Blade R.H.	45	Bearing
9	Auger Blade L.H.	46	Long Shaft
10	Belt Guide	47	Shaft
11	Spacer	48	Spacer
12	Chute Clip	49	Worm Gear
13	Belt	50	Gear
14	Spring Washer	51	Spring Washer
15	Hi-Pro Key # 606	52	3/8" Pipe Plug
16	*1/4"-20 x 1/2" Hex Hd. Screw	53	Retaining Ring
17	*1/4"-20 x 1/2" Carriage Bolt	54	Cover Plate
18	*5/16"-18 x 5/8" Hex Head Screw	55	Gasket
19	*3/8"-16 x 3/4" Hex Hd. Screw	56	No. 9 Woodruff Key
20	*5/16"-18 x 1-3/4" Hex Hd. Sc.	57	Hi-Pro Key
21	*3/8"-16 Locknut	58	"O"-Ring
22	*5/16" Lockwasher	59	Adjusting Nut
23	*1/4" Lockwasher	60	Bearing Cone
24	Skid	61	Bearing Cup
25	*5/16"-18 x 2" Hex Hd. Sc.	62	*5/16"-18 x 1/4" Setscrew
26	Sheave	63	Chute Caution Decal
27	Flange Disc	64	Bearing Cup
28	Speed Disc	65	Bearing Cone
29	Washer	66	Support Strap
30	*5/16"-18 Locknut	67	*5/16"-18 x 3/4" Hex Hd. Screw
31	*5/16"-18 x 3/4" Carriage Bolt	68	Differential Bearing Seal
32	*1/4"-20 x 5/8" Hex Hd. Sc.	69	*5/16" Plain Washer
33	*1/16" x 1/2" Cotter Pin	70	*5/16"-18 x 1" Hex Hd. Screw
34	*5/16" Washer	71	*3/8" Lockwasher
35	Oil Seal	72	*3/4" Plain Washer
36	Gear Case	73	*3/8"-16 Center Locknut
37	Rotor Cover Assembly	74	*3/8" Washer
*Standard Hardware Items			



MASSEY-FERGUSON

GROUP XI — SECTION F

MAINTENANCE & SERVICE INSTRUCTIONS

PARTS LIST FOR FIGURE 13

Key No.	Description	Key No.	Description
1	Axle Shaft	47	Engine Mount Plate
2	Jack Shaft	48	Bottom Cover
3	Special Screw	49	*1/4"-20 Lock Nut
4	Bearing Retainer Disc	50	*5/16"-18 Lock Nut
5	Self-Aligning Bearing	51	*3/8"-16 Lock Nut
6	11-Tooth Sprocket	52	Spring Bracket
7	24-Tooth Sprocket	53	*3/8" Lock Washer
8	36-Tooth Sprocket	54	*5/16" Lock Washer
9	*5/16"-18 Lock Nut	55	Idler Mount Plate
10	Support	56	Clip
11	Bell Crank	57	Side Frame Assembly, R.H.
12	Flange Bearing	58	Side Frame Assembly, L.H.
13	Tie Strap	59	Idler Arm Assembly
14	*5/16"-18 x 1-1/8" Hex Hd. Sc.	60	3/8" Internal Lock Washer
15	Spring	61	Wheel Half
16	Spring—Belt Tension	62	Tire
17	See Reference on Page 1	63	*3/8" Wrought Washer
18	Throwout Link	64	*1/4"-20 x 5/8" Hex Hd. Tap Screw
19	Shoulder Bolt	65	Flange Assembly
20	Knob	66	*1/4" Wrought Washer
21	Chain Assembly	67	Engagement Rod Assembly
22	*5/16"-18 x 1" Hex Hd. Sc.	68	Idler Assembly
23	Connector Link	69	Fork and Strap Assembly
24	*5/16"-24 x 3/4" Hex Hd. Screw	70	Rubber Disc
25	Neutral Stop Bolt Assembly	71	12-Tooth Sprocket
26	Shoulder Bolt	72	Drive Shaft
27	1/4" x 1-3/8" Roll Pin	73	Drive Shaft Support
28	3/16" x 1" Square Key	74	Retainer Plate
29	*5/16"-18 x 1/4" Set Screw	75	Bearing
30	Sheave	76	Disc Support Spacer
31	*3/32" x 1" Cotter Pin	77	Support Shaft
32	Neutral Bracket	78	Retainer Casting
33	Throwout Arm	79	Retainer Fork
34	Idler Stud	80	*Washer
35	Idler Pulley	81	No. 505 Woodruff Key
36	Chain Assembly	82	1/8" x 1" Roll Pin
37	Plug	83	Link Shift
38	Belt Guide	84	Belt Cover Assembly
39	*1/4"-20 x 5/8" Hex Head Screw	85	*1/4"-20 x 5/8" Self-Tap Screw
40	*1/4"-20 x 5/8" Carriage Bolt	86	*No. 10-32 Lock Nut
41	*5/16"-18 x 5/8" Hex Head Sc.	87	*3/8"-16 Hex Nut
42	Offset Link	88	*3/8"-24 Hex Nut
43	*No. 10-32 x 1" Lock Screw	89	Grease Fitting
44	No. 10-24 x 3/8" Lock Screw	90	Chain Assembly
45	*5/16"-18 x 1-1/2" Hex Hd. Sc.	91	5/16" Lock Washer
46	*3/8"-16 x 1-1/2" Hex Hd. Screw	92	1/4" x 1-1/2" Spiral Pin
*Standard Hardware Items			

ADJUSTMENTS

SHIFT ROD

When the speed control lever is placed in "Neutral", the shift fork will be resting on an adjustable ramp preventing the rubber driven disc from making contact with the metal driving disc. See Fig. 14.

When the speed control lever is placed in "Reverse", the shift fork is moved to the left, clearing the neutral ramp and allowing the driven disc to make contact with the driving disc. The same thing happens when the control lever is placed in 1st gear, except the shift fork and disc are moved to the right.

When the speed control lever is placed in 2nd, 3rd and 4th position, the driven disc is moved progressively farther toward the outer circumference of the driving disc.

The following procedure is recommended whenever shift rod adjustment is required:

1. Place shift lever in "Neutral" position. Check shift fork position in relation to the neutral ramp, Fig. 14. Shift fork should be resting on ramp.
2. Place shift lever in both "1st" and "Reverse" positions. Release clutch and check to see that shift fork clears neutral ramp in both positions. If shift fork clears ramp in one position, but not the other, lengthen or shorten shift rod as required. See adjusting nuts shown in Fig. 15.

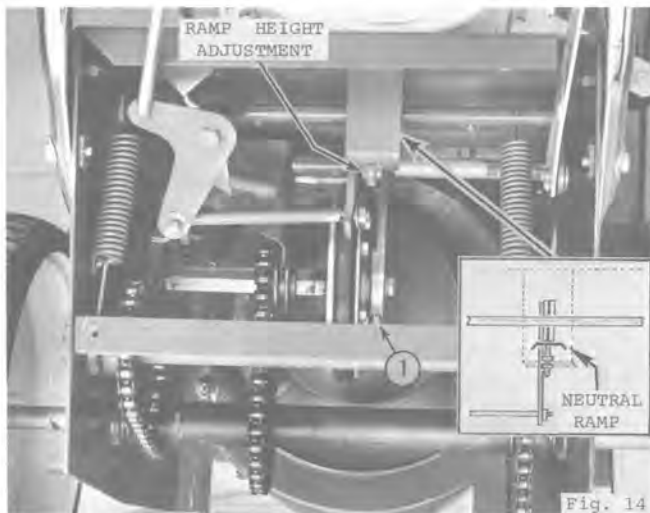


Fig. 14



Fig. 15

NEUTRAL RAMP

Height of the neutral ramp is adjustable. Adjust ramp to provide for approximately 1/8 in. clearance between rubber driven disc and metal driving disc with shift control lever in "Neutral" position.

Adjust by loosening nuts and raising or lowering ramp as required, Fig. 14.

CLUTCH LIMITING STOP

Adjust clutch limiting stop, Fig. 16 to provide approximately 1/8 in. clearance between shift fork and neutral ramp with clutch disengaged.

Adjust by loosening nuts and moving stop in or out as required.

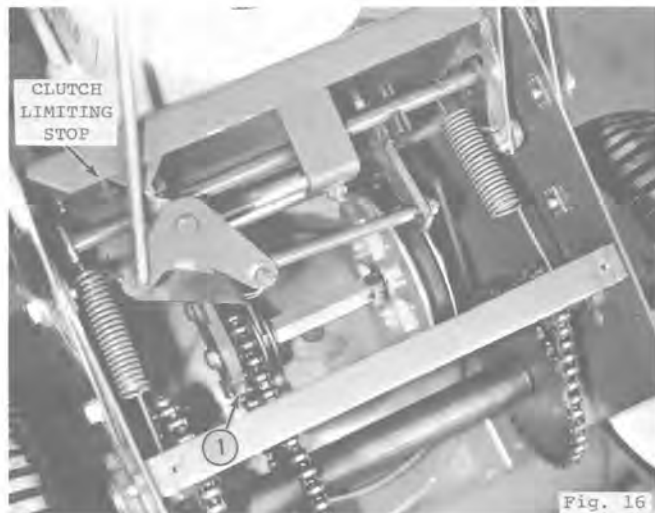


Fig. 16

CLUTCH DISC

To replace the rubber clutch disc, proceed as follows:

1. Place the shift control lever in "Neutral" position.
2. Remove six bolts, No. 85, Fig. 13, securing retaining disc on right-hand side of clutch disc.
3. Loosen two screws, No. 1, Figs. 14 and

15, securing bearings and shaft.

4. Slide shaft to the left until bearing and shaft clears bearing retainer on right-hand side.

5. Remove old rubber disc by slipping around end of shaft.

6. Install new rubber disc by reversing procedure. Be sure that bearings are centered in bearing retainers, and screws that hold bearings in place are tightened.

TROUBLE-SHOOTING

Trouble	Look For	Remedy
Unit Won't Propel Itself	Sheared key in gear box shaft Rubber disc worn Broken or thrown drive chain Grease or oil on drive discs	Replace key Replace disc Replace chain if necessary Remove lubricants from discs with solvent
Engine Runs but Auger Won't Turn	Defective belt Gear box trouble Broken shear bolt	Replace defective belt Check gear box for broken or bound parts Rotor jammed with foreign object. Stop engine, remove spark plug wire and remove object. Replace shear bolt
Engine Hard to Start	Cold engine Choke inoperative	Store unit in warm place Check choke for correct operation

**MASSEY-FERGUSON
REPAIR TIME SCHEDULE — SKI WHIZ**

INDEX

PART 1 — Sheet Metal, Windshield, Cushion and Lights

PART 2 — Engine

PART 3 — Drive Train and Related Parts

PART 4 — Steering Linkage and Skis

PART 5 — Tune-Up

PART 6 — Pre-Delivery

This is a new Ski Whiz RTS covering all models through 1970 production. Please destroy your present Ski Whiz RTS dated 11/68 and replace with this bound copy.

