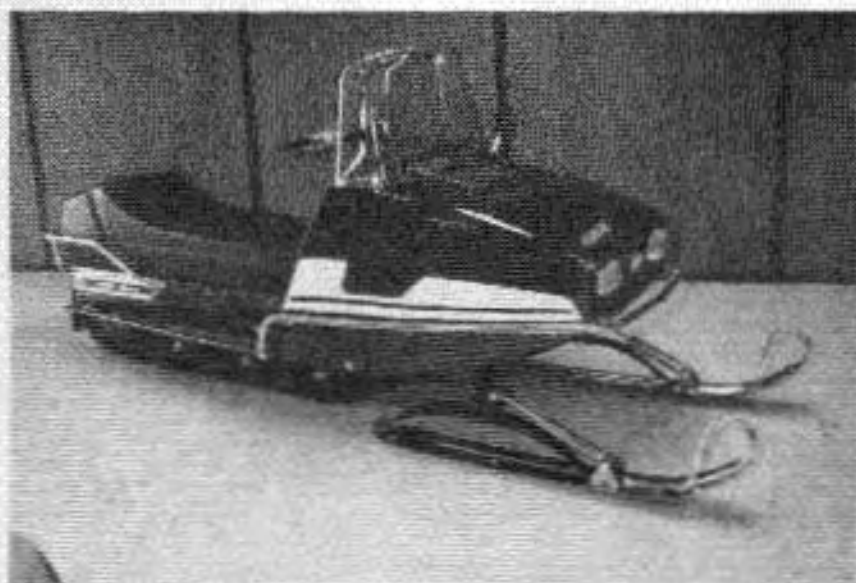

SERVICE MANUAL



SKI WHIZ

MODELS MF 304, MF 304T, MF 344T, MF 404T,
MF 444T, MF 404WT AND MF 444WT

MF

Massey Ferguson

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SPECIFICATIONS

SKI WHIZ MODEL	MF 304	MF 304T	MF 344T	MF 404T	MF 444T	MF 404WT	MF 444WT
Engine Model	JLO 1F-295-7	JLO 2F-295-1	JLO 2F-340-5	JLO 2F-400-7	JLO 2F-440-7	JLO 2F-400-7	JLO 2F-440-7
Engine — 2-Cycle	1 cyl.	2 cyl.	2 cyl.	2 cyl.	2 cyl.	2 cyl.	2 cyl.
Displacement	292CC	285CC	339CC	398CC	428CC	398CC	428CC
Bore	2.93"	2.16"	2.36"	2.56"	2.65"	2.56"	2.65"
Stroke	2.63"	2.36"	2.36"	2.36"	2.36"	2.36"	2.36"
Contact Breaker Gap	.014"-.018"	.014"-.018"	.014"-.018"	.014"-.018"	.014"-.018"	.014"-.018"	.014"-.018"
Ignition Setting Before							
T.D.C.	.118"-.138"	.100"-.114"	.100"-.114"	.100"-.114"	.100"-.114"	.100"-.114"	.100"-.114"
Horsepower (Mfr's	21½ @	27½ @	31 @				
Rating)	6000 rpm	7000 rpm	7000 rpm	38 @ 7000 rpm	40 @ 7000 rpm	38 @ 7000 rpm	40 @ 7000 rpm
Carburetor	HR 162A	HRM 1A	HRM 1A	HD 136A	HD 136A	HD 136A	HD 136A
Spark Plug							
Champion	K-9	N-3	N-3	N-3	N-3	N-3	N-3
Spark Plug Gap	.016"-.020"	.016"-.020"	.016"-.020"	.016"-.020"	.016"-.020"	.016"-.020"	.016"-.020"
Spark Plug Tightening							
Torque	18 ft.-lbs.	14 ft.-lbs.	14 ft.-lbs.	14 ft.-lbs.	14 ft.-lbs.	14 ft.-lbs.	14 ft.-lbs.
Fuel Tank Capacity	5½ gals.	5½ gals.	5½ gals.	5½ gals.	5½ gals.	5½ gals.	5½ gals.
Fuel/Oil Mixutre	20 parts premium fuel to 1 part SAE 40, TWO CYCLE AIR COOLED ENGINE OIL						
Track							
Width	15½"	15½"	15½"	15½"	15½"	18"	18"
Length	118.9"	118.9"	118.9"	118.9"	118.9"	118.4"	118.4"
Area on Ground:							
Hard Surface	600 sq. ins.	600 sq. ins.	600 sq. ins.	600 sq. ins.	600 sq. ins.	690 sq. ins.	690 sq. ins.
Deep Snow	850 sq. ins.	850 sq. ins.	850 sq. ins.	850 sq. ins.	850 sq. ins.	970 sq. ins.	970 sq. ins.
Skis:							
Width	5"	5"	5"	5"	5"	5"	5"
Length	40"	40"	40"	40"	40"	40"	40"
Center-to-Center	26"	26"	26"	26"	26"	26"	26"
Drive Sprocket Ratios							
(Teeth)	17:38	17:38	17:38	21:38	21:38	17:38	17:38
Dimensions (Overall)							
Height (Over							
Windshield)	40¼"	40¼"	40¼"	40¼"	40¼"	40¼"	40¼"
Width	34"	34"	34"	34"	34"	34"	34"
Length	98"	98"	98"	98"	98"	98"	98"
Weight (Approx.)	375 lbs.	390 lbs.	390 lbs.	390 lbs.	390 lbs.	410 lbs.	410 lbs.
Max. Ground Speed	50 mph	60 mph	60 mph	70 mph	70 mph	65 mph	65 mph

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 Nos. 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	Check 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".

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 Nos. 8 through 15.

4. Engine Lacks Power

Possible Cause	Remedy
Choke practically closed	Open choke.
Improper carburetor adjustment	Adjust carburetor. See symptoms Nos. 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 — 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 Nos. 8 through 15.

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 seating	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 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.
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.

10. Carburetor Runs Lean in all Speed Ranges (Continued)

Possible Cause	Remedy
Pump pulse channel plugged or not aligned to engine	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 plug and steel ball, 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.
Carburetor loose on mounting or leaking gasket	Tighten mounting screws and/or replace gasket.

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.

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 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)	Reset 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 ignition system for possible malfunctions, follow systematic procedures under this heading.

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

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 procedures recommended by test equipment manufacturers.

ENGINE

Removal

To remove engine:

1. Disconnect fuel lines at carburetor and fuel primer.
2. Choke and throttle controls.
3. Exhaust pipe and electrical wires from engine.
4. Remove drive belt and disconnect brake control cable.
5. Bolts securing engine to frame and lift engine out.

Installation

1. Position engine on frame and install mounting bolts.
2. Check alignment of drive and driven pulleys, shift engine on mounting bolts to correct any misalignment and tighten bolts securely.
3. Connect and adjust choke, throttle and brake control cables.
4. Reconnect exhaust pipe, electrical wires and fuel lines.
5. Install drive belt.

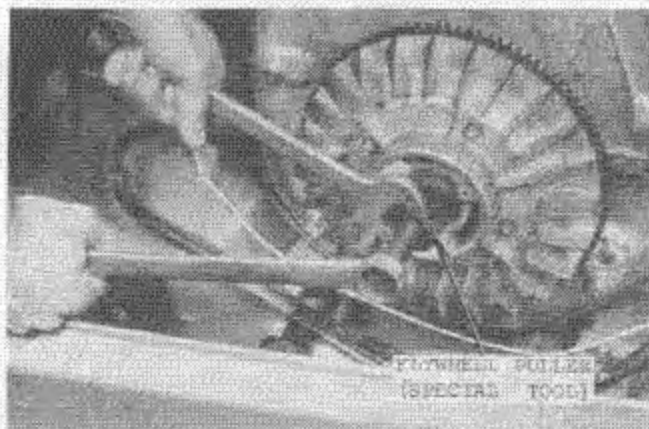


Fig. 1 — Removing Flywheel

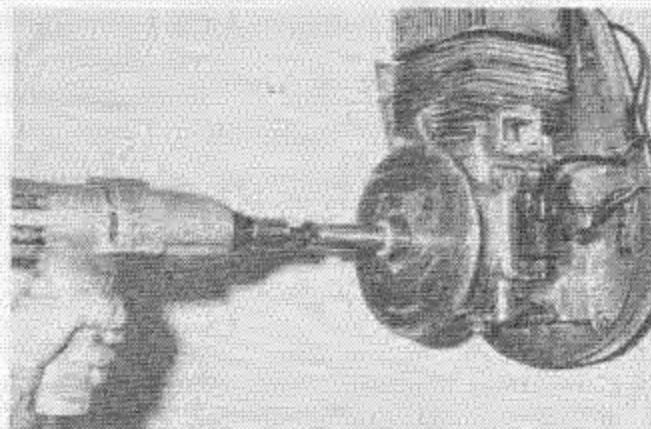


Fig. 3 — Removing Converter Inner Hub

Disassembly — MF 304

1. Remove bolts securing recoil start assembly to fan housing and remove complete assembly.
2. Capscrews and remove recoil start hub.
3. Flywheel cover.
4. Use Special Tool No. 444-31-329-0 and remove flywheel. See Fig. 1.

5. Scribe a mark on magneto coil plate and engine (to aid in reassembly) then remove coil plate. Place plate out of the way of crankshaft. See Fig. 2.

6. Remove drive pulley retainer bolt and slide outer pulley half and coil spring off.

7. Lay engine on its side and fill cavity of inner pulley hub with heavy oil. Thread a suitable bolt into threads of inner pulley hub and tighten with an impact wrench. See Fig. 3. This will force inner pulley hub off shaft.

8. Remove nuts from cylinder head and remove air shroud.

9. Remove spark plug, cylinder head nuts and remove cylinder head.

10. Remove nuts securing cylinder to crankcase and remove cylinder from piston.

11. Remove retaining ring from end of piston pin and drive pin out and remove piston. Use care not to bend rod when removing pin. Remove spacers and bearing from connecting rod.

12. Turn engine on its side with ignition side up. Remove Allen head screws holding crankcase halves

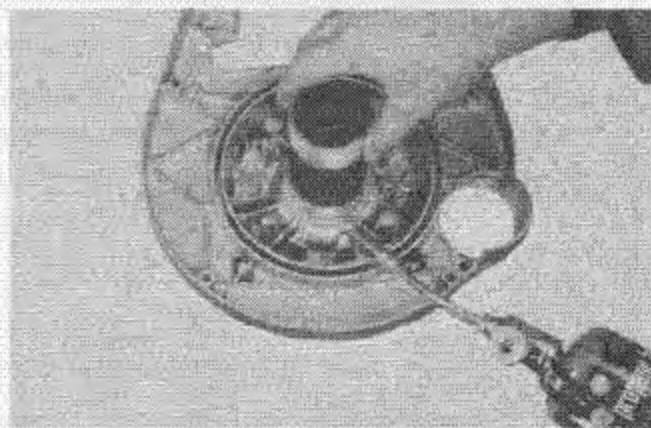


Fig. 4 — Heating Bearing Area for Removal

together. Slide a piece of 2-1/2" pipe over oil seal (to protect it), heat around bearing area as shown in Fig. 4 and lift crankcase half off. Heat other side in same way to remove.

NOTE: If crankcase halves separate without heating bearing area, it is an indication that casting is worn.

13. Use special tool as shown in Fig. 5 to remove crankshaft bearings.

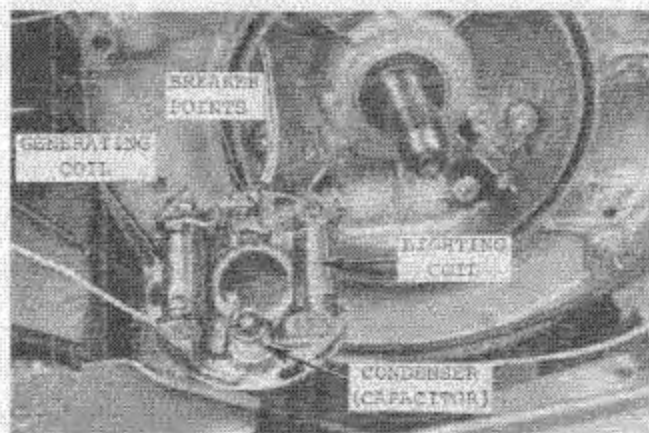


Fig. 2 — Coil Plate Removed

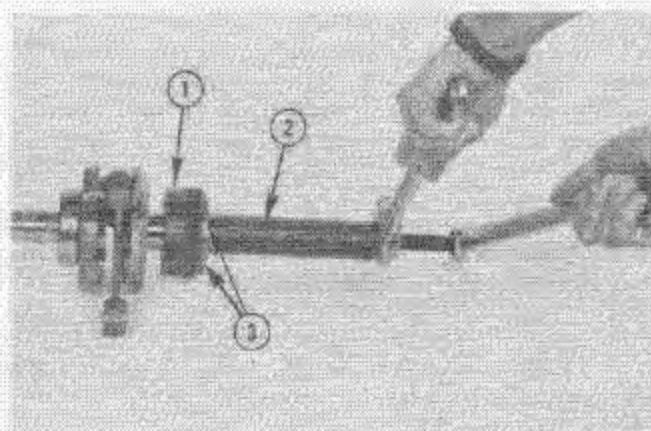


Fig. 5 — Removing Crankshaft Bearings

1. Special Tool No. 444-31-071-0
2. Special Tool No. 444-31-073-1
3. Special Tool No. 444-31-807-0

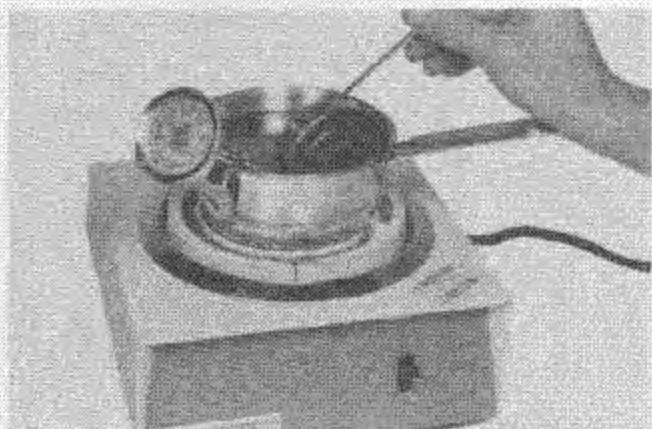


Fig. 6 — Heating Crankshaft Bearings

Reassembly — MF 304

Inspect all parts for wear or damage, replace as required. Replace all seals and gaskets making sure spring side of seal is facing toward inside of engine.

1. Heat crankshaft bearings in oil to approximately 220° F. for about five minutes. See Fig. 6. Place crankshaft between two wood blocks, drop bearing over shaft and tap in place. Fig. 7. Install other bearing in same manner.

2. Position crankshaft between wood blocks with external threaded end down. Place crankcase over shaft until it contacts bearing. Heat bearing area of case and lightly tap over bearing and into place. (Do not apply too much heat.)

3. Turn engine over and install housing over shaft and bearing in same manner. Install new gasket between crankcase and housing.

4. Secure crankcase and housing together with retaining bolts tightened slightly. Check alignment of cylinder mounting surface with a straightedge and tighten bolts to 16-18 ft.-lbs. torque.

5. Install piston on connecting rod with arrow on piston toward exhaust side of engine (opposite coil mounting side of engine). See Fig. 8.

6. Piston rings must be free in their grooves and aligned with locating pins.

7. Place a notched wood block under piston and start cylinder over piston, with exhaust aligned with

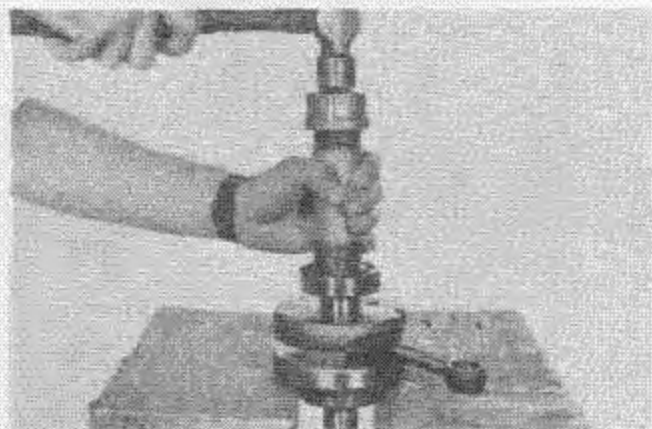


Fig. 7 — Installing Bearing

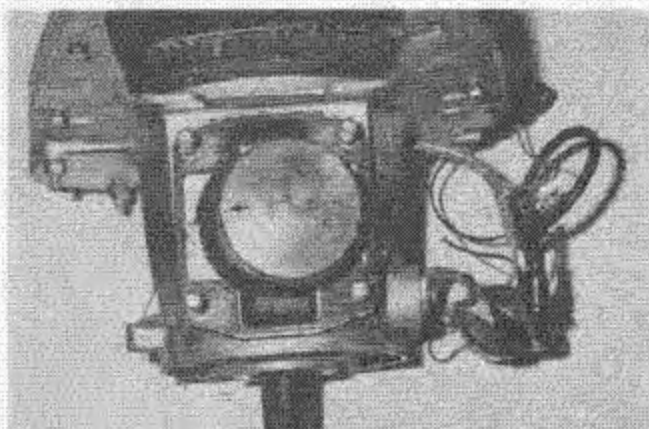


Fig. 8 — Piston Properly Installed

arrow on piston. Compress rings with a suitable compressor and slide cylinder over ring and remove wood block. See Fig. 9.

8. Secure cylinder to crankcase with nuts tightened to 28-32 ft.-lbs. torque.

9. Place new head gasket on cylinder with wide side of metal ring facing up, then install cylinder head with flat portion of combustion chamber toward exhaust side of engine. Fig. 10. Install washers, spacers and nuts tightened to 18-21 ft.-lbs. torque.

10. Install magneto coil plate, align marks made during removal and secure with retaining screws.

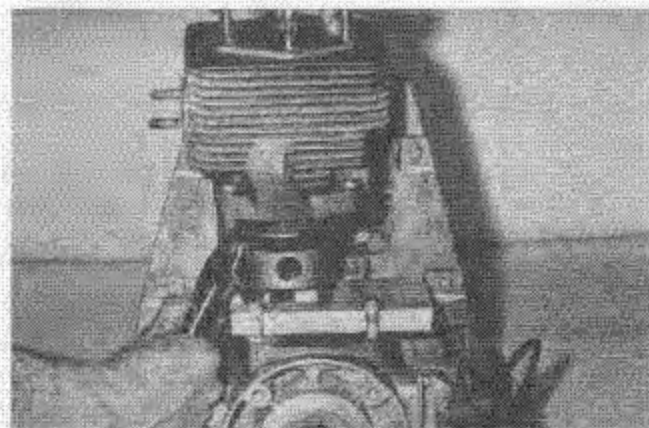


Fig. 9 — Installing Cylinder

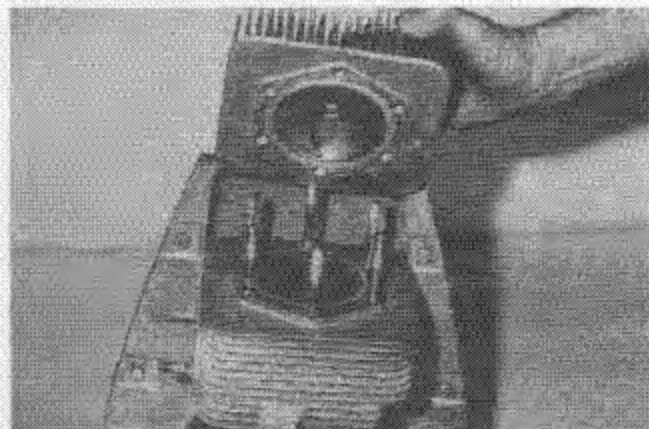


Fig. 10 — Installing Cylinder Head

11. Install flywheel and tighten retaining nut to 80-85 ft.-lbs. torque.
12. Install flywheel cover, recoil starter hub and recoil starter assembly.
13. Install drive pulley with retaining bolt tightened to 80-85 ft.-lbs. torque.
14. Install top shroud with washers on cylinder head. Install side shrouds over manifold studs.
15. Install intake manifold and carburetor.

Disassembly — MF 304T, MF 344T, MF 404T, MF 444T, MF 404WT and MF 444WT

1. Remove clips securing recoil start to fan housing and remove recoil start assembly.
2. Remove bolts securing recoil start carrier and pulley to flywheel and remove carrier, pulley halves and blower belt.
3. Remove flywheel nut, use special pulier and remove flywheel, Fig. 11.
4. Remove carburetor and intake manifold.
5. Remove cover over ignition coils and disconnect blue wire from each coil.
6. Disconnect clip securing spark plug wires to blower fan housing.
7. Remove screws securing blower fan housing to engine and remove housing. See Fig. 12.

NOTE: If fan requires any servicing, refer to heading "Fan Housing" under "Servicing of Individual Components".

8. Remove spark plugs and remove cylinder head nuts.
9. Mark cylinder heads and corresponding cylinder to aid in reassembly and remove cylinder heads.

NOTE: Cylinder nearest to PTO end of engine is always considered No. 1 cylinder.

10. Remove ignition coils and wires.
11. Remove nuts from bottom of crankcase securing cylinder to crankcase and carefully remove cylinders.

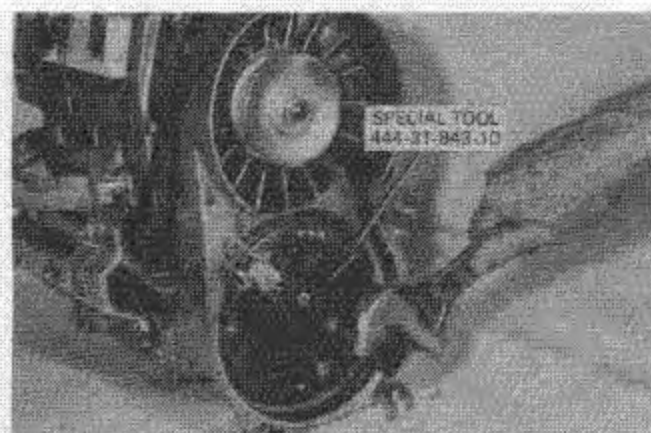


Fig. 11 — Removing Flywheel

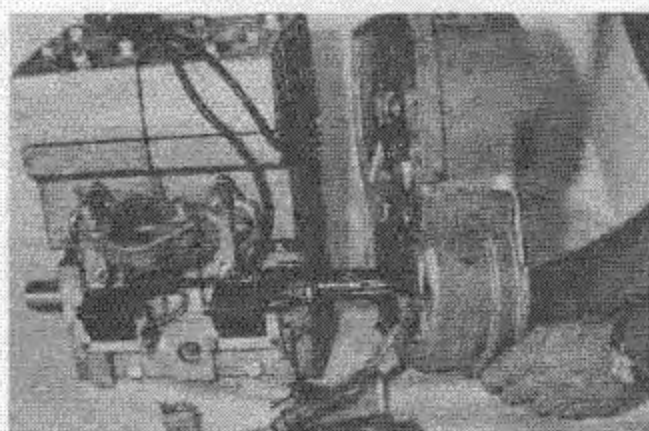


Fig. 12 — Removing Blower Housing

NOTE: Use care when sliding cylinder off piston. Piston rings may catch on intake ports of cylinder and damage piston or rings.

12. Mark each piston in relation to cylinder it mates with. Remove retaining ring at end of piston pin and carefully drive pin out and remove piston. Use care not to bend rod when removing pin. Remove spacers and bearing from connecting rod.
13. Tap sides of crankcase with a rubber hammer to break sealing surfaces and separate halves.
14. Remove crankshaft, bearing and connecting rods as an assembly.
15. Remove oil seal and alignment washer from PTO end of crankshaft. If bearings require replacement use special tool to remove, Fig. 13.

NOTE: Center bearing cannot be replaced. If center bearing, seal or connecting rods or bearings require replacement, complete crankshaft, bearings and rods must be replaced as an assembly.

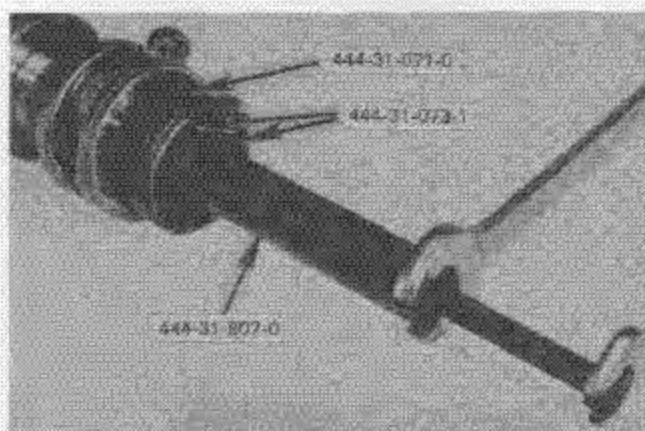


Fig. 13 — Removing Bearing from Crankshaft

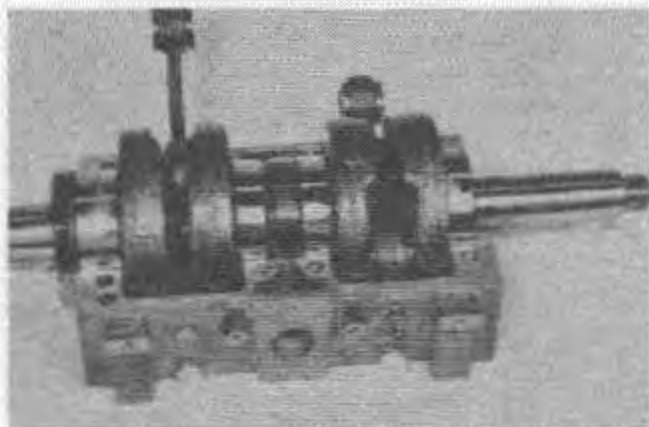


Fig. 14 — Crankshaft Positioned in Lower Crankcase

**Reassembly — MF 304T, MF 344T,
MF 404T, MF 444T,
MF 404WT and MF 444WT**

Inspect all parts for wear or damage and replace as required.

1. Heat crankshaft bearings in oil to approximately 220° F. for about five minutes. Place crankshaft between two wood blocks, drop bearing over shaft and tap in place.

2. Clean crankshaft halves, removing any old sealant or burrs. Apply a coating of sealing compound to bearing bores and mating surfaces of crankshaft halves and place crankshaft into position in lower half, Fig. 14. Rotate shaft to check seal and bearing alignment and install upper half of crankcase by tapping it lightly.

3. Install pistons and cylinders as follows.

a. Clean pistons and check that rings move freely in their grooves. Mate pistons to corresponding cylinder.

b. Place bearing and spacers in rod and position piston over rod with arrow on piston toward exhaust port (opposite ignition coil mounting) and install pin, Fig. 15. Secure piston pin with retaining ring.



Fig. 15 — Piston Properly Installed



Fig. 16 — Installing Cylinder

c. Install gasket over cylinder base studs. Place a notched block of wood under piston. Align rings with pin in piston and compress rings with a ring compressor. Install cylinder over piston and push down until rings just enter cylinder. Remove ring compressor, Fig. 16.

d. Use a pointed soft object, such as a lead pencil and work through intake port of cylinder to push end of ring in to clear intake port, Fig. 17.

e. Install cylinder base nuts and tighten lightly. Install other cylinder in same manner.

f. Install intake manifold and tighten nuts securely to align both cylinders. Install fan housing and tighten retaining bolts to align crankcase halves.

g. Tighten cylinder base nuts crosswise to 16-18 ft.-lbs. torque.

4. Install ignition coils, connect blue wire to each coil and install cover. Attach spark plug wires to fan housing so ignition coil nearest PTO end of engine connects to No. 1 spark plug (PTO end).

5. Install flywheel and tighten retaining nut to 80-85 ft.-lbs. torque.

6. Check and adjust engine timing, refer to heading "Ignition Timing".

7. Install cylinder head gaskets with wide side of metal ring facing up and install heads with flat

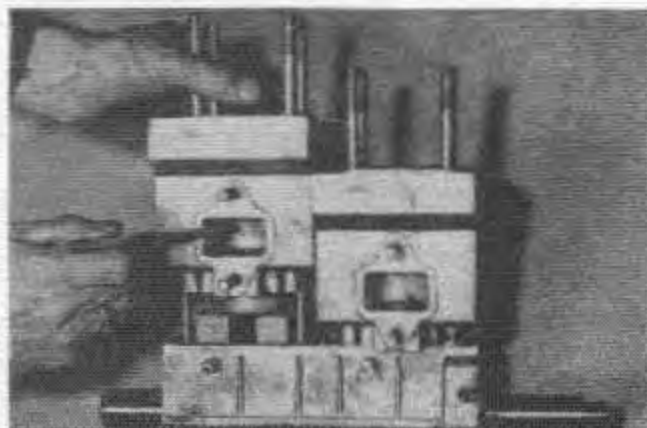


Fig. 17 — Positioning Rings to Clear Intake Port

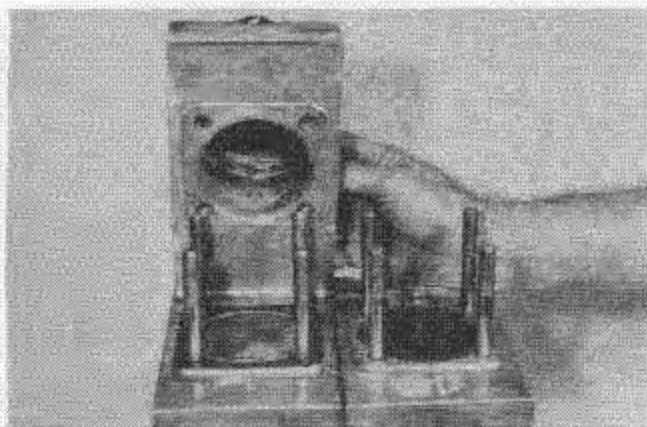


Fig. 18 — Installing Cylinder Head

portion of combustion chamber toward exhaust side of engine. See Fig. 18. Install washers and nuts tightened to 25-30 ft.-lbs. torque.

8. Install lower pulley, belt and carrier. Tighten bolts while rotating crankshaft to prevent damage to belt. Install dust seal.

9. Install recoil starter assembly.

10. Install drive pulley and secure with retaining bolt tightened to 80-85 ft.-lbs. torque.

SERVICING OF INDIVIDUAL COMPONENTS

Cylinder Head

Cylinder head can be removed without removing engine. To remove and install cylinder head, proceed as follows:

1. Remove air baffle over cylinder head.
2. Remove spark plug and remove cylinder head.
3. Clean carbon from head and piston.
4. Install new head gasket with wide side of metal ring facing up.
5. Install cylinder head with flat portion of combustion chamber toward exhaust side of engine, Fig. 18. Secure head using washers, spacers and nuts tightened to 18-21 ft.-lbs. torque MF 304 and MF 304T — all others tighten 25-30 ft.-lbs. torque.

Piston and Cylinder

Pistons and cylinders can be removed without removing engine (if desired).

Clean carbon from piston and check that rings move freely in their grooves. Inspect piston and cylinder for wear or damage. Replace as required.

NOTE: When cylinder and head is installed a clearance of .059"-.071" between head and piston must be maintained. To insure this clearance insert a bent piece of solder about 1/8" diameter into spark plug hole. Turn crankshaft over T.D.C. several times, then measure squeezed portion of solder. Any

deviations from this clearance can be corrected by adding shim gaskets under cylinder base. On twin cylinder engines this clearance should be as near the same as possible for both cylinders.

Crankshaft and Connecting Rod

Crankshaft or connecting rod cannot be replaced separately. If either crankshaft, rod or crank to rod bearing requires replacement they must be replaced as an assembly. This requires engine removal and crankcase separation. Refer to disassembly and reassembly of engine.

Fan Housing (Twin Cylinder)

Fan housing can be removed without removing engine, however, for ease of servicing it may be desirable to remove engine.

1. To remove fan housing proceed as follows:
 - a. Remove recoil start assembly.
 - b. Disconnect ignition coils from engine block.
 - c. Remove bolts securing pulley to flywheel and remove pulley.
 - d. Remove flywheel.
 - e. Remove bolts securing fan housing to engine and carefully remove housing with ignition coils and wires connected.
2. Remove fan, shaft and bearings as follows.
 - a. Insert a punch into hole in housing and hole in fan hub and remove nut as shown in Fig. 19.
 - b. Tap shaft out of housing and bearings.
 - c. With a punch through one bearing and spacer, drive other bearing out and remove spacer. Drive second bearing out from other side of housing.
3. To reinstall bearings and shaft proceed as follows.
 - a. Two retaining rings are in housing to locate bearings. Install bearings in housing against retaining snap ring with spacer between them. Install bearings with sealed side out and fill cavity with grease.
 - b. Install fan and shaft through bearings in housing and install washers and pulley in sequence shown in Fig. 20.

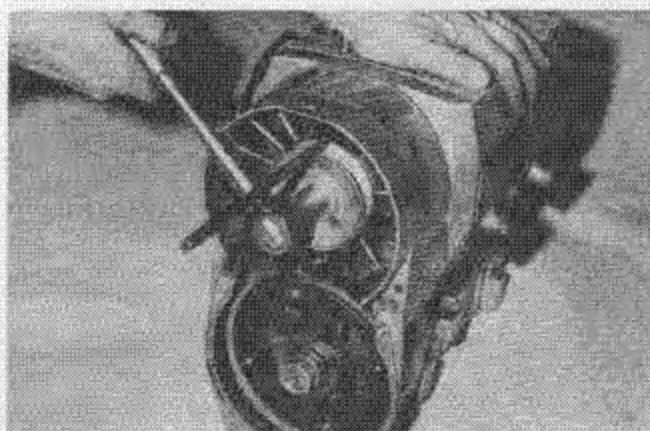


Fig. 19 — Removing Blower Pulley Nut

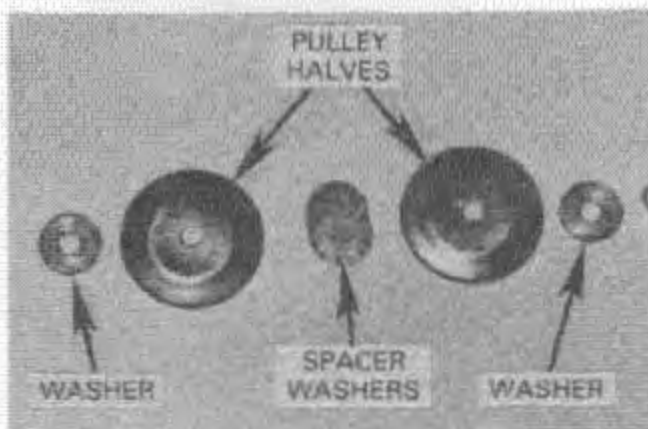


Fig. 20 — Blower Pulley and Shim Arrangement

- c. Install pulley, washer and nut on shaft, insert punch into pulley hub and tighten nut.
4. To reinstall fan housing proceed as follows:
 - a. Secure fan housing to block with four cap screws.
 - b. Reconnect coils to side of engine and connect spark plug wires to fan shroud.
 - c. Install flywheel and secure with washer and nut.
 - d. Install fan belt and pulley.
 - e. Install recoil starter.

IGNITION SYSTEM

When checking ignition system start with the components that require the most frequent servicing. Hard starting, low power and erratic operation are often caused by faulty ignition. Spark plug, ignition coil, points and condenser must be in good condition and spark must occur at proper time to maintain good performance. A simple test will help determine if ignition is at fault.

Quick Ignition Check

Remove high tension wire from spark plug. Turn engine in direction of rotation while holding wire



Fig. 21 — Flywheel Removed

about 1/8" away from cylinder block. If a sharp, snappy spark jumps this distance, it is an indication ignition system is working satisfactorily. Try a new spark plug. If spark does not occur, check ignition components and wiring.

Breaker Points and Condenser

Point condition and gap will affect engine operation. If points are burned or badly oxidized, little or no current will flow through ignition system. Point gap will also affect ignition timing.

To install points proceed as follows:

1. Remove recoil starter and flywheel. See Fig. 21
2. Remove retaining ring from point pivot post and remove point retaining screw.
3. Lift points out and remove wires from points.

NOTE: On twin cylinder engines it will be necessary to remove screw at end of lighting coil before upper set of points can be removed.

4. Connect wires to new points and slide into place over pivot pin. Secure points with retaining screw and set gap to .014"-.018". Remove cam from flywheel and slide over crankshaft to hold points open for setting gap.

5. Reinstall cam in flywheel and install flywheel.

6. Check and adjust ignition timing as outlined under heading "Ignition Timing" for engine being serviced.

If magneto, coil or condenser require replacement it will be necessary to unsolder and resolder connecting wires. To replace a condenser, armature plate must be removed and condenser pressed out and a new one pressed in. On twin cylinder engines, blower housing must be removed to gain access to armature plate so condenser can be removed and installed.

Ignition Timing — Single Cylinder Engine

Ignition timing can be performed in two different methods; either by use of a dial indicator or by use of timing marks on engine. The most accurate method is with a dial indicator.

To check and adjust ignition timing using a dial indicator proceed as follows:

1. Remove recoil start assembly and hub.

NOTE: Timing can be checked and adjusted without removing flywheel, but it is difficult to adjust points with flywheel in place. Condition of points can also be checked while flywheel is removed.

2. If flywheel is removed proceed as follows:
 - a. Remove point cam from flywheel and slide on crankshaft.
 - b. Rotate cam to align notch in cam with breaker point pivot pin, then pull cam out approximately 1/4" to place points in their operating position and fully open.



Fig. 22 — Installing Timing Advance Pin
(Tool No. 444-31-660-00)

- c. Adjust point gap .014" to .018" with a feeler gauge.
- d. Reinstall cam in flywheel and install flywheel.
3. If flywheel is not removed, adjust point gap through opening in flywheel.
4. Move centrifugal advance weight to advanced position with a small screwdriver and insert timing advance pin. See Fig. 22.
5. Remove spark plug, attach a one inch plunger extension and an 18mm adaptor to dial indicator and install into plug opening.
6. Turn flywheel until piston contacts plunger and moves dial hand to its highest reading (piston at T.D.C.) and zero dial indicator.

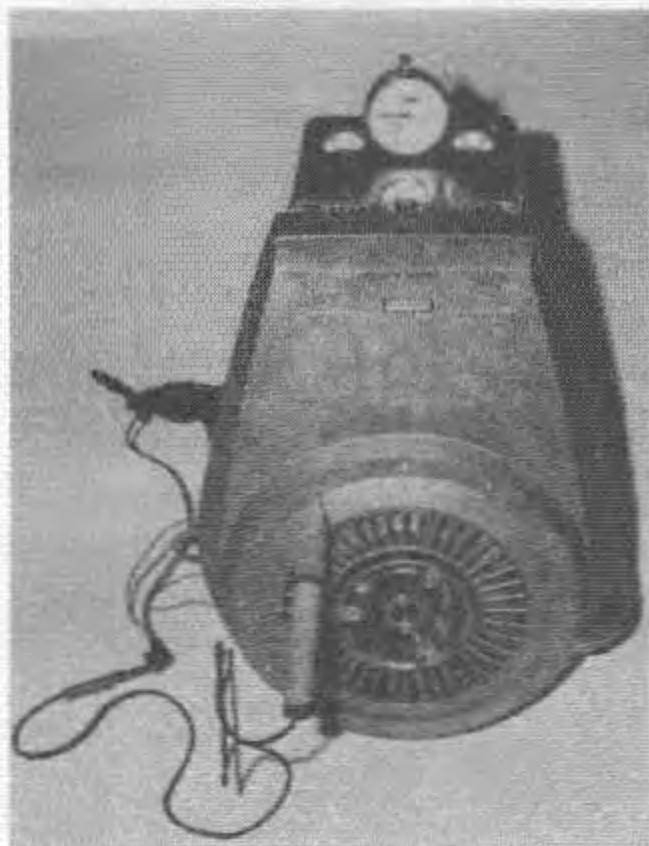


Fig. 23 — Checking Timing on Single Cylinder Engine

7. Remove black and blue wire lead from ignition coil and attach timing light wire to it. Ground light to flywheel housing, Fig. 23.

NOTE: If engine is installed in Ski Whiz, turn ignition switch to open ground circuit.

8. Turn flywheel counterclockwise slowly until timing light burns brightly. Then turn flywheel clockwise slowly until light dims. Dial indicator should read .118"-.138" before T.D.C. If timing is correct.
9. If timing is incorrect, loosen armature plate retaining screws through flywheel opening and rotate armature plate.
10. Turn engine so MFN 263 timing gauge reads .118"-.138" B.T.D.C. Then slowly rotate armature plate with a screwdriver until timing light dims. Tighten screws and recheck timing.

NOTE: Rotate armature plate counterclockwise to advance timing and clockwise to retard.

11. Remove timing advance pin and rotate flywheel clockwise. Timing light should now dim when piston is near T.D.C. indicating advance mechanism is operating properly.
12. Remove dial indicator, timing light, install spark plug and reconnect wires to ignition coil.
13. Install recoil start hub and starter assembly. To check and adjust timing using timing marks on flywheel and cover proceed as follows.
 1. Remove recoil start assembly and hub.
 2. Install timing advance pin as shown in Fig. 22.
 3. Disconnect black and blue wire from coil and turn ignition switch on.
 4. Connect timing light to wire removed from coil.
 5. Rotate flywheel clockwise while noting timing light and timing marks. Timing is satisfactory if light dims when marked fin on flywheel aligns with first mark on flywheel housing.
 6. If timing requires changing, loosen screws on armature plate and rotate to correct.

Ignition Timing — Twin Cylinder Engine

The most accurate method of timing is by the use of a dial indicator. However, timing can be performed by use of timing marks on engine.

To check and adjust ignition timing using a dial indicator proceed as follows:

1. Remove recoil start assembly, drive hub, pulley halves and blower drive belt.
2. Remove flywheel and remove point breaker cam from flywheel.
3. Turn cam while sliding it on crankshaft so it will slip over rub blocks of breaker points.
4. Align notches in cam with pivot pin of lower No. 2 cylinder breaker points. Pull cam outward approximately 1/4" so it will be in operating position.
5. Set point gap to .014"-.018" on both sets of points.
6. Remove cam, install in flywheel and install flywheel.
7. Insert JLO timing advance pin in hole in flywheel to hold weight in advanced position.

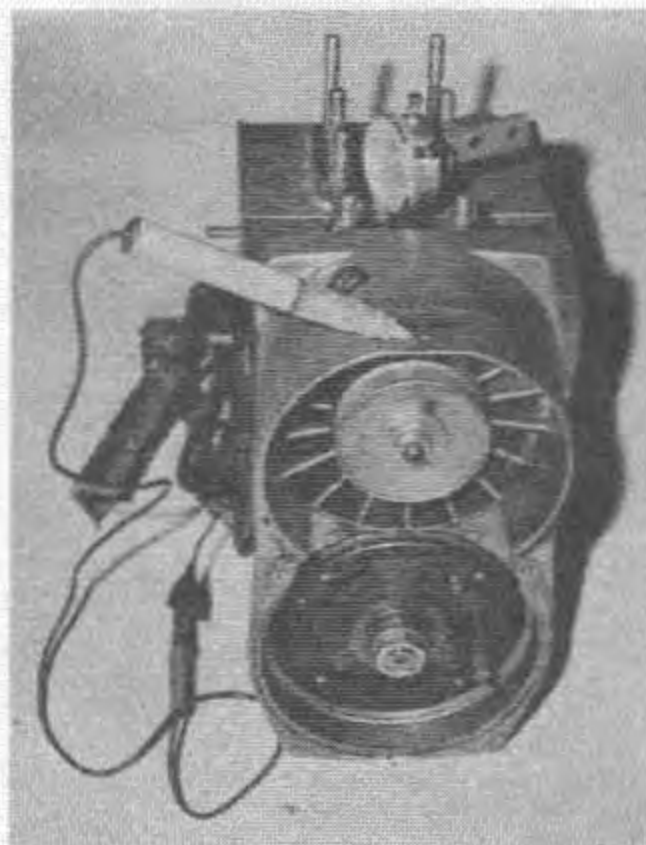


Fig. 24 — Checking Timing on Twin Cylinder Engine

NOTE: Original JLO timing pin requires grinding off on one side before it can be installed.

8. Remove cylinder heads and attach a dial indicator on one of the head bolts.

9. Position No. 2 cylinder at T.D.C. and zero dial indicator.

10. Remove blue and yellow stripped wire from No. 2 ignition coil and attach to timing light and ground light to engine. See Fig. 24.

11. Rotate flywheel counterclockwise slowly until light burns lightly. Then turn flywheel clockwise slowly until light dims. Dial indicator should read 100°-114° B.T.D.C.



Fig. 25 — Checking Timing with Engine Running



Fig. 26 — Fuel Filter

12. If timing is incorrect, loosen armature plate and rotate to correct.

NOTE: Rotate armature plate counterclockwise to advance timing and clockwise to retard.

13. Remove timing light lead and connect to solid blue wire from No. 1 coil. Check as outlined for No. 2 cylinder. If an adjustment is required, increase or decrease No. 1 point gap.

14. Remove timing advance pin. Timing light should now dim when piston is near T.D.C. indicating advance mechanism is operating properly.

15. Remove timing light and dial indicator. Reinstall parts previously removed.

NOTE: With engine installed in Ski Whiz, timing can be checked with a conventional timing light as shown in Fig. 25. Connect light to any battery and to either spark plug.

FUEL SYSTEM

Fuel system consists of a tank with line and filter, primer and a carburetor with a fuel pump assembly. Fuel filter is attached to a plastic line inside tank. To replace filter, remove fuel tank cap, use a wire hook and pull line and filter out of tank. See Fig. 26. Remove filter from line and clean or replace.

Carburetor

Carburetor is designed with a diaphragm type integral fuel pump with filter. HR model is used on MF 304, MF 304T and MF 344T Ski Whiz and HD model is used on all other twin cylinder engine.

IMPORTANT: If complete overhaul of carburetor is to be performed, it is recommended that an overhaul kit be used. Complete instructions are supplied with each kit.

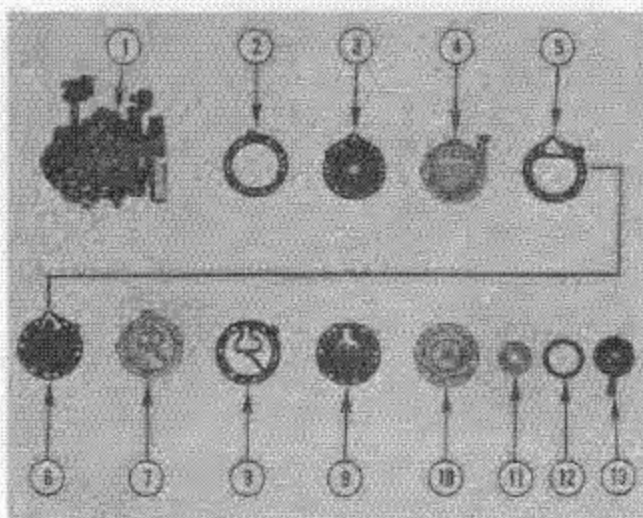


Fig. 27 — HR Carburetor (Identification of Parts)

- | | |
|---------------|----------------|
| 1. Carburetor | 7. Pump Body |
| 2. Gasket | 8. Gasket |
| 3. Diaphragm | 9. Diaphragm |
| 4. Cover | 10. Valve Body |
| 5. Gasket | 11. Screen |
| 6. Diaphragm | 12. Gasket |
| | 13. Cover |

Carburetor Disassembly and Reassembly

Disassembly and reassembly of either model carburetor is basically the same.

Following procedures may be performed if carburetor is to be cleaned and checked.

1. Clean carburetor externally and disassemble as follows.

a. Refer to Figs. 27 or 28, depending on model

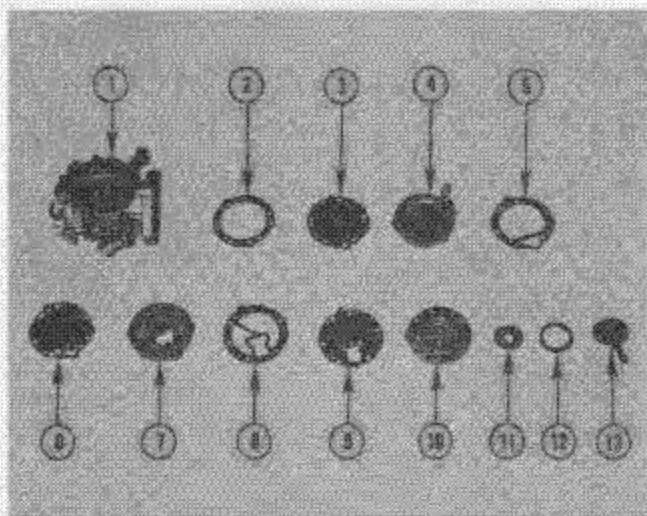


Fig. 28 — HD Carburetor (Identification of Parts)

- | | |
|---------------|----------------|
| 1. Carburetor | 7. Pump Body |
| 2. Gasket | 8. Gasket |
| 3. Diaphragm | 9. Diaphragm |
| 4. Cover | 10. Valve Body |
| 5. Gasket | 11. Screen |
| 6. Diaphragm | 12. Gasket |
| | 13. Cover |

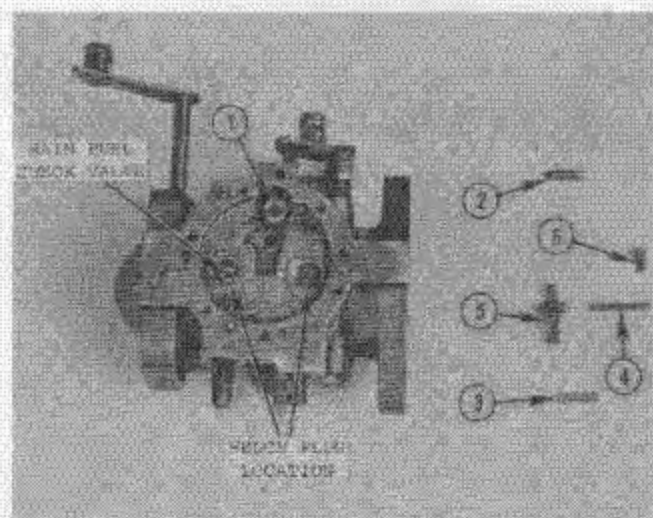


Fig. 29 — Inlet Control Lever Removed — HR Carburetor

- | | |
|--------------------------|--------------------|
| 1. Inlet Seat and Gasket | 4. Pin |
| 2. Inlet Needle | 5. Control Lever |
| 3. Spring | 6. Retaining Screw |

and remove parts in reverse of number sequence given to parts for disassembly.

b. Refer to Figs. 29 or 30 and remove parts in reverse of number sequence for disassembly.

c. If carburetor is unusually dirty and Welch plugs are to be removed, careful work is required. Referring to Fig. 30, drill through plugs with a small drill and pry plug from its seat.

NOTE: Allow drill to just break through plug or damage could result.

2. Clean all parts and inspect for wear or damage. Replace necessary parts and reassemble carburetor as follows:

a. Refer to Figs. 29 or 30 and install parts in sequence number given to the parts (1 through 6).

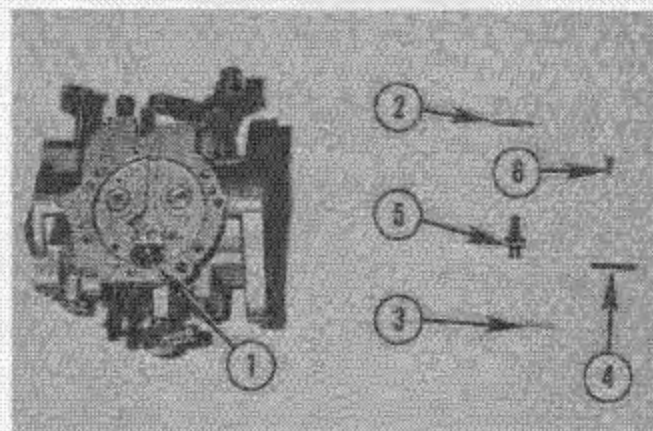


Fig. 30 — Inlet Control Lever Removed — HD Carburetor

- | | |
|--------------------------|--------------------|
| 1. Inlet Seat and Gasket | 4. Pin |
| 2. Inlet Needle | 5. Control Lever |
| 3. Spring | 6. Retaining Screw |

b. Install new Welch plugs (if removed) into their bore with convex side upward. Make sure plugs fit tightly in their seats. A correctly installed plug is flat in its seat. See Fig. 31.

c. Refer to Figs. 27 or 28 and install remaining parts into carburetor in sequence of numbers given (2 through 13).

Service Information

1. If throttle shaft is removed, return spring should have approximately 1-1/4 windup turns when reinstalled.

2. If choke is disassembled, install choke shutter with hole toward diaphragm side.

3. If main fuel check valve is replaced, tighten to 20-25 in.-lbs. torque and clean with compressed air after assembly.

Carburetor Adjustments

For carburetor adjustments, Ski Whiz can be operated on a pad to provide sufficient load to prevent engine from overspeeding. A pad can be constructed out of outdoor carpeting. Fold carpet over at one end to make a loop and bolt together. Cut notches in fold section, so rear of skis can be attached to pad, with a piece of 3/4" pipe.

Before running Ski Whiz, wet inside of track and run water on carpet while running Ski Whiz. This will help keep track and carpet cool and provide lubrication for track.

To adjust carburetor proceed as follows — also refer to "Carburetor Adjustment Chart":

1. Open high speed mixture screw 1-1/2 turns and idle mixture screw 1-1/4 turns. This is an initial adjustment and engine should run.

2. Place machine on a dynamometer or a carpet with water and attach a tachometer.

3. Start engine and let it warm up.

4. Rock unit from side to side to break track loose from carpet while gradually opening throttle.

5. With engine running at full throttle, turn high speed mixture screw in 1/8 turn at a time until maximum speed is obtained.



CAUTION: Manufacturer's rated speed is 2500-7000 rpm on twin cylinder engines and 2500-6000 rpm on single cylinder engines.

IMPORTANT: High speed screw adjustments leaner than 1-1/4 turns can result in piston burning.

6. With engine running, turn idle speed screw out until engine runs very slowly.

7. Adjust idle mixture screw until engine runs smooth. Readjust idle speed screw to a point just before converter pulley contacts drive belt.

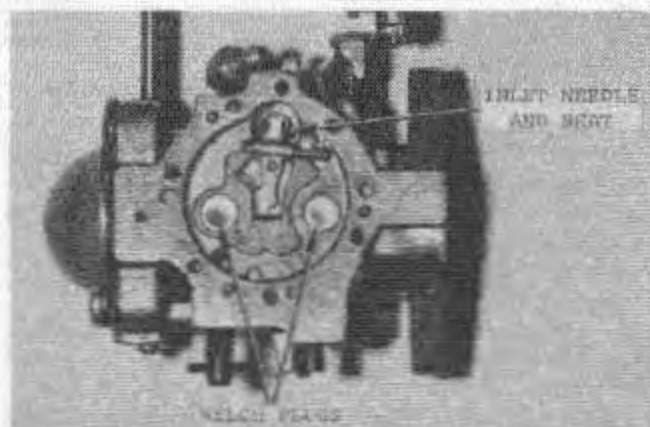


Fig. 31 — Carburetor with Fuel Pump and Metering Diaphragms Removed

CARBURETOR ADJUSTMENT CHART

SKI WHIZ MODEL	CARBURETOR NUMBER	HIGH SPEED SCREW ADJUSTMENT	IDLE SPEED SCREW ADJUSTMENT
Single Cylinder MF 304	HR 162A	1 1/4 to 1 1/2 turns open	1 1/4 to 1 1/2 turns open
Twin Cylinder MF 304T and MF 344T	HRM 1A	3/4 to 1 1/2 turns open	1 1/4 to 1 turns open
Twin Cylinder MF 404T, MF 444T, MF 404WT and MF 444WT	HD 136A	1 to 1 1/4 turns open	3/4 to 1 1/2 turns open

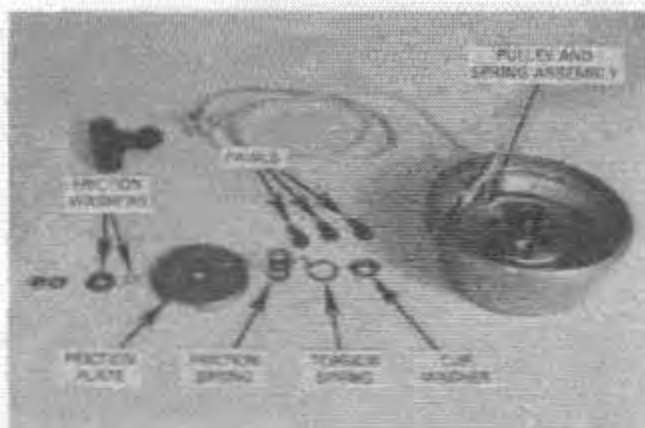


Fig. 32 — Recoil Starter (Identification of Parts)



Fig. 34 — Winding Spring into Housing

SERVICING RECOIL STARTER

Following procedures are for servicing recoil starter on twin cylinder engines. Fig. 32 shows component of assembly.

1. Remove recoil start assembly from engine.
2. Pull rope at inside of housing, insert into notch in pulley and unwind spring (approximately five turns).

3. Push down on friction plate and remove nut and washer.

4. Lift friction plate up, rotate counterclockwise and remove from end of spring.

5. Remove two small springs and cup washer from pulley hub.

6. With a small screwdriver push down on end of recoil spring and remove pulley, Fig. 33.

7. If recoil spring requires replacement, carefully unwind and remove from housing.

8. Inspect all parts for wear or damage and replace as required.

9. If spring was removed, reinstall by placing end of spring on pin in housing and carefully wind into place, Fig. 34.

10. Insert rope through opening in housing and install pulley making sure end of spring is over lug on pulley.

11. Refer to Fig. 35 and install cup washer and springs into pulley hub.



Fig. 35 — Pulley Cup Washer and Spring Installed

12. Use a pointed tool and position end of torsion spring into slot in friction plate, Fig. 36.

13. Rotate friction plate clockwise to first pawl and push down into place.

14. Hold plate down and install washers and nut, Fig. 37.

15. Install handle on rope, place rope in notch in pulley and rotate pulley approximately five turns counterclockwise, Fig. 38.

16. Carefully feed rope into pulley and release tension.



Fig. 33 — Removing Rope Pulley



Fig. 36 — Installing Friction Plate

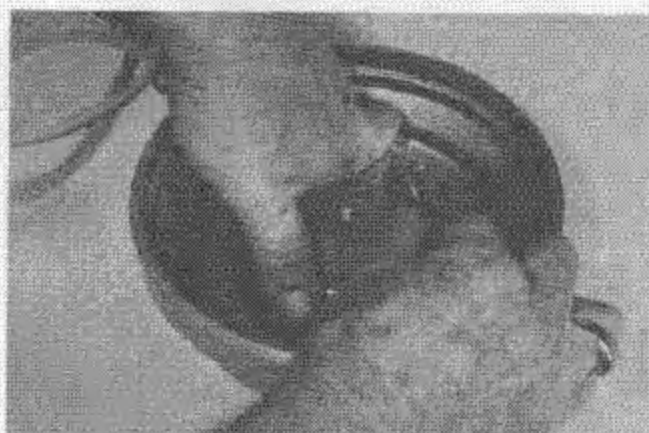


Fig. 37 — Holding Friction Plate Prior to Installing Nut

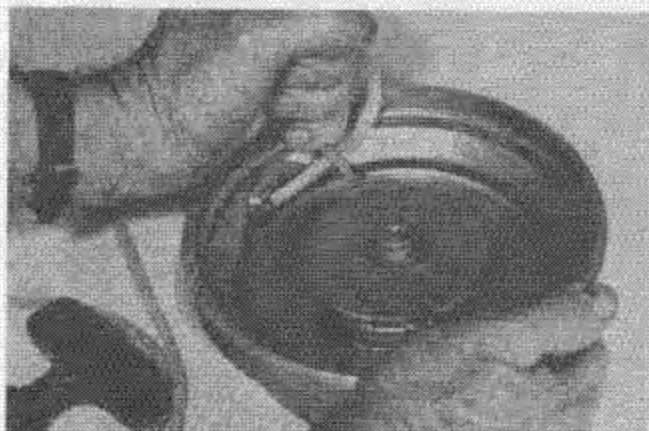


Fig. 38 — Winding Recoil Spring

TRACK AND DRIVE MECHANISM

Track Adjustment

The track should be tight enough to maintain its proper position when in operation.

To adjust track tension proceed as follows:

1. Set rear idler adjusting cam (if equipped) in its center position.
2. Raise machine until track is free of the ground.
3. Loosen locknuts and turn adjusting bolts to obtain $3/4$ " clearance between bogie wheels and track. See Figs. 39 and 40. Tighten lock nuts.
4. Start engine and run track slowly. Observe track at front to see if it is running in approximately center of machine. If not centered it can be corrected by stopping machine and loosening lock collars on bearings. Then bump drive shaft through bearings to relocate drive sprockets in track. Lock bearing lock collars and tighten setscrews; then re-check clearance.

NOTE: Bearing lock collars on drive shaft must be locked in direction of shaft rotation.

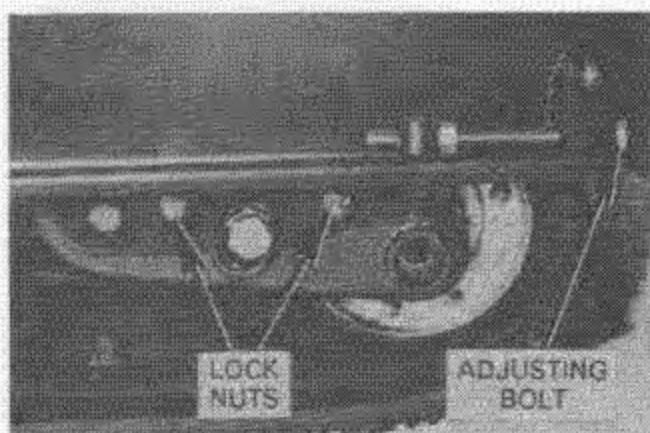


Fig. 39 — Track Tension Adjustment

5. With engine stopped, check clearance between rear idler wheels and track lugs. Wheels must clear lugs on both sides approximately $1/4$ ". If this clearance is incorrect proceed as follows:

- a. Lower machine to ground, loosen track tension and remove brackets from each side.
- b. Slide rear idlers and shaft out from side of track.
- c. 18" Wide Track Model — Set outside idler wheels $13-1/2$ " apart, center to center with equal spacing from end of shaft. Place third wheel in center.
- d. Add enough spacers at end of shaft to prevent shaft from moving to either side in brackets, Fig. 41.
- e. 15-1/2" Track — Set idler wheels $8-7/8$ " apart, center to center with equal spacings from end of shaft.

NOTE: Tighten locking collars on bearings opposite bearing rotation then tighten setscrews.

- f. Reinstall rear idlers and shaft and readjust track tension.



Fig. 40 — Checking Track Tension

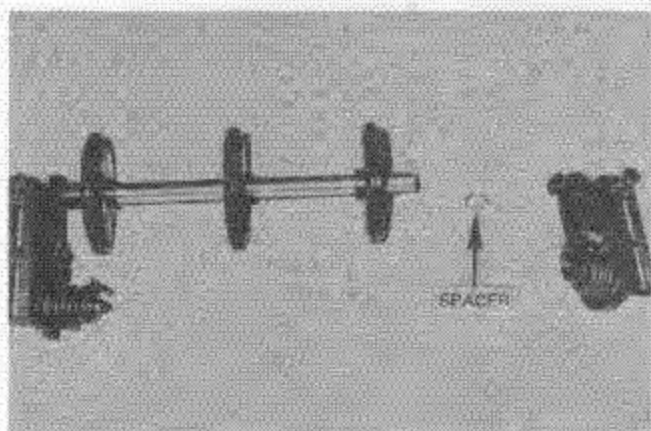


Fig. 41 — Rear Idler Assembly (Wide Track)

Track and Track Drive Replacement

To remove track proceed as follows:

1. Loosen track tension and remove brackets from each side of rear idler shaft, Fig. 42. Remove idler wheels and shaft assembly.
2. Loosen bolts on right side of machine securing bogie wheel pivot shafts and remove bolts on left side.
3. Slide bogie wheels off pivot shafts.

NOTE: For ease of reassembly, bogie wheels and shafts can be removed together by removing bolts from both sides of machine.

4. Loosen nuts securing bearing flange at right-hand side of machine and end of drive shaft.
5. Remove bolts securing sprockets to drive shaft and loosen both bearing lock collars, Fig. 43.
6. Remove chain cover and loosen chain tension.
7. Loosen setscrews in drive chain sprocket and drive shaft toward right-hand side of machine, Fig. 44.
8. Continue driving shaft out of sprocket and through bearings until shaft is out of left-hand bearing.
9. Slide shaft, bearing lock collars and sprockets out of right-hand bearing as shown in Fig. 45, and remove track.

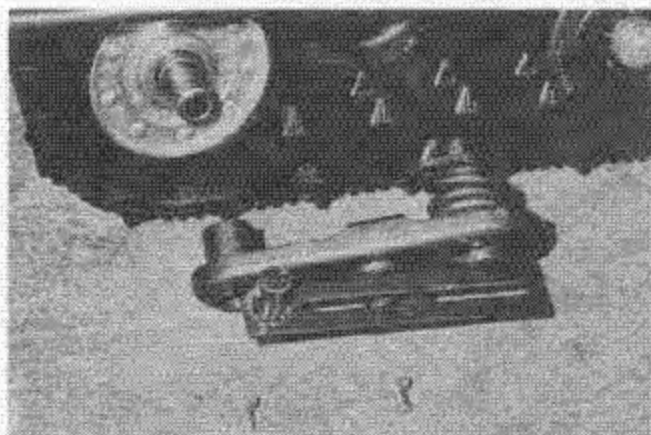


Fig. 42 — Rear Idler Shaft Bracket Removed

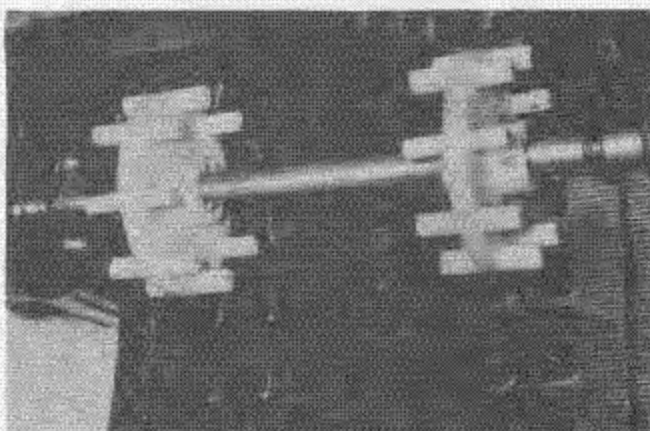


Fig. 43 — Track Drive Shaft and Sprockets

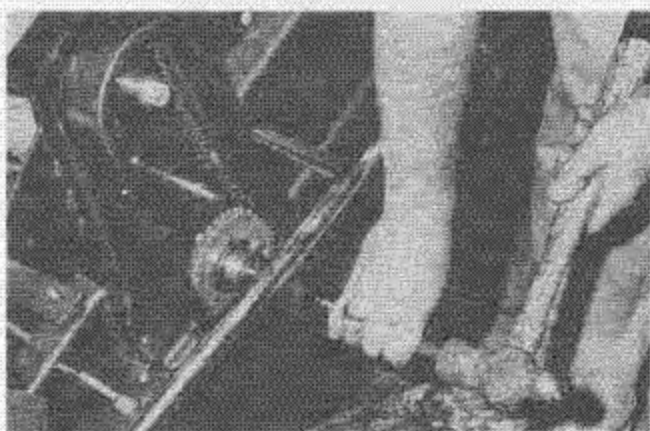


Fig. 44 — Driving Shaft from Sprocket

To reinstall track proceed as follows:

1. Position track over bogie wheel pivot shafts and into place at front of machine.
2. Place sprockets and bearing locks on shaft with bolt holes in hub of sprocket toward outside.
3. Install shaft into right-hand bearing as shown in Fig. 45.
4. Continue pushing shaft through right bearing until other end will start into left-hand bearing.

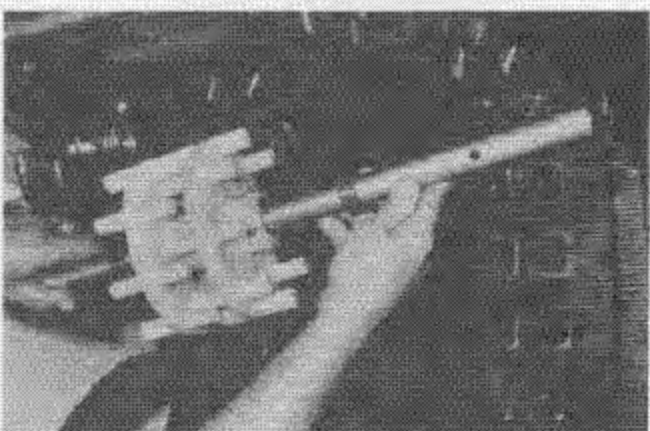


Fig. 45 — Removing or Installing Drive Shaft and Sprockets

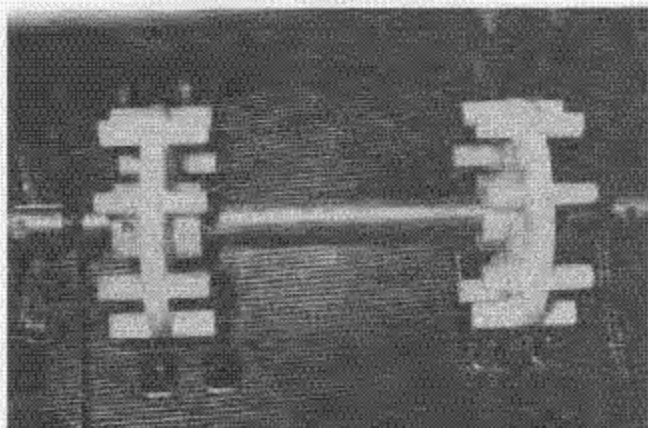


Fig. 46 — Sprockets Aligned with Track Lugs

5. With shaft started into left-hand bearing, align sprockets with lugs on track and holes in shaft. Fig. 46.

6. Hold chain sprocket in place and start shaft into sprocket.

7. Install bolts in sprocket hubs and through shaft.

8. Position sprockets, shaft and track in center of housing and lock bearing collars. Track must have same clearance on each side.

9. After track has been located be sure bearing lock collars are tight, install key in drive chain sprocket and tighten setscrews.

NOTE: Bearing lock collars must be locked in direction of shaft rotation.

10. Tighten drive chain until approximately 1/4" deflection is obtained on slack side, then tighten bolts on upper bearing block. Fig. 47.

11. Fill chain case with SAE 80 oil until lower 1" of chain is submerged and install case cover.

12. Reinstall boggie wheels.

13. Install rear idler shaft and wheel assembly and adjust track tension.

Upper Drive Shaft Assembly

Complete drive shaft, pulley and bearing can be removed as an assembly for servicing. However, if

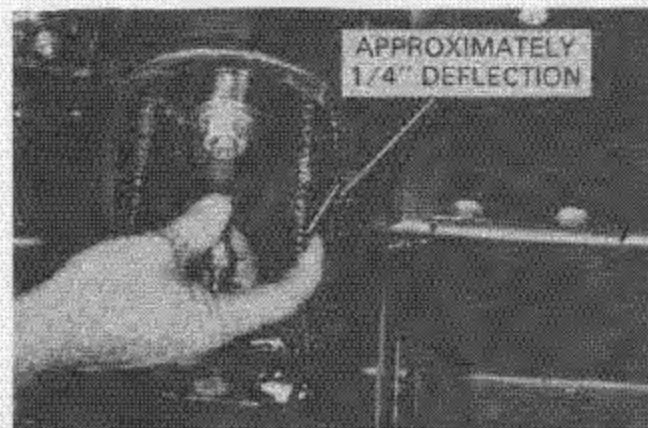


Fig. 47 — Checking Drive Chain Tension



Fig. 48 — Removing Roll Pin from Cam

only cam or spring requires replacement, they can be removed without disturbing shaft and bearing.

To replace spring or cam proceed as follows:

1. Remove drive belt.

2. Drive roll pin out of cam as shown in Fig. 48.

3. Hold tension on spring and tap cam off shaft and key far enough to clear nylon tabs, Fig. 49. Let spring unwind and remove cam and spring.

4. Align spring ends with holes in pulley and cam as shown in Fig. 50.

5. Start cam on shaft and over key, turn pulley to first notch on cam to wind spring. Continue pushing cam on shaft and install roll pin.

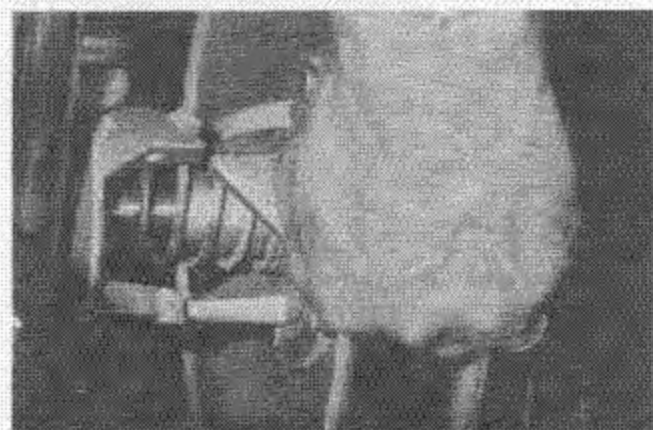


Fig. 49 — Removing Cam and Spring

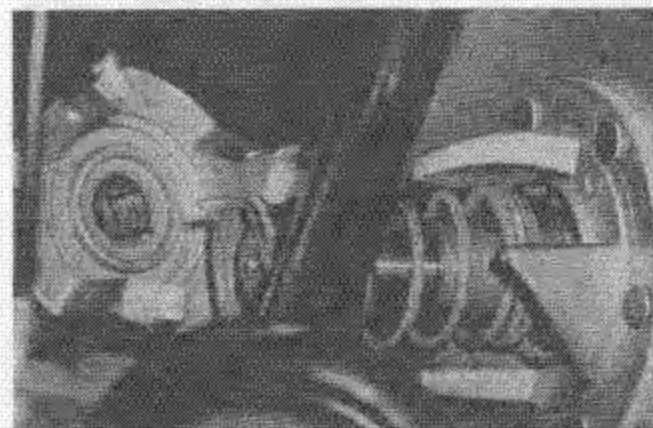


Fig. 50 — Installing Spring and Cam

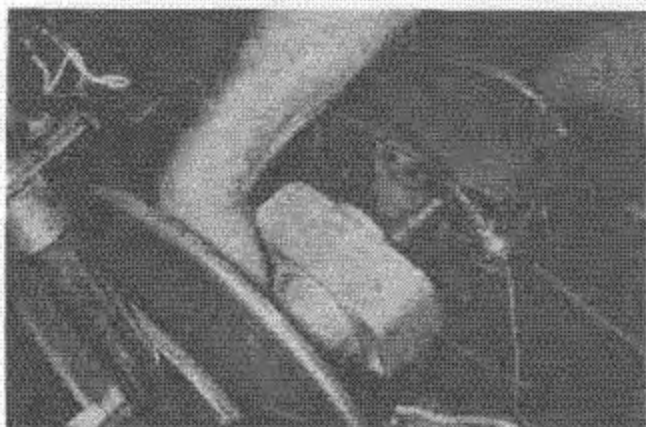


Fig. 51 — Sliding Shaft Out of Gear Case

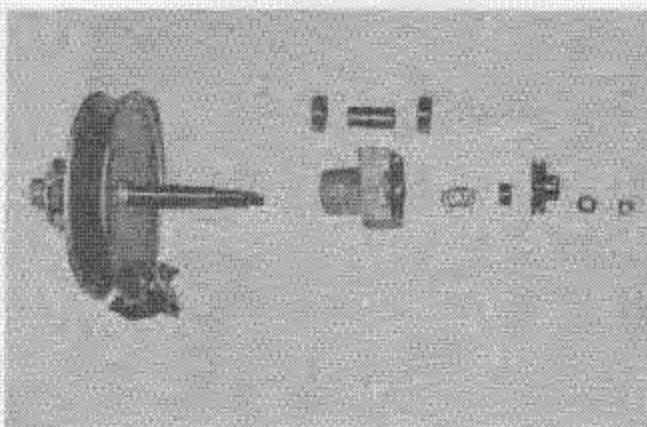


Fig. 53 — Upper Drive Shaft Assembly
(Sequence of Parts)

6. Reinstall drive belt

To remove complete drive shaft assembly proceed as follows:

1. Remove drive belt.
2. Disconnect brake retaining bolts and let brake drop down out of the way.
3. Remove chain cover and remove bearing mounting bolt nuts.
4. Remove nut from end of shaft and bump shaft out of gear and case, Fig. 51.
5. Slide shaft assembly out as shown in Fig. 52.

NOTE: It may be necessary to remove bolts from steering shaft bearing and push shaft to right side to gain extra clearance.

6. Inspect all parts for wear or damage. Replace as required. Notice amount of shims behind sprocket and between pulley and bearing block to aid in re-assembly.

Refer to Fig. 53 for reassembly and proceed as follows:

1. Install bearing and spacer into bearing block, then slide pulley and shaft assembly with shims into bearings.
2. Hold assembly together and install into machine as shown in Fig. 52.

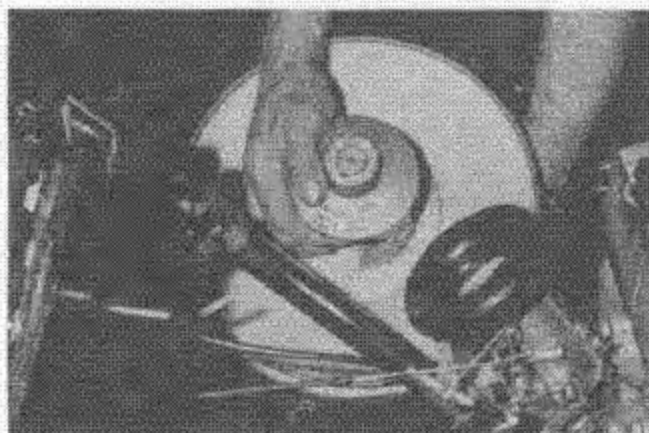


Fig. 52 — Removing or Installing Shaft Assembly

3. Secure bearing block to case with retaining bolts and install shim, spacer and sprocket. Secure sprocket with washer and nut.

4. Check belt pulley alignment as follows, see Fig. 54:

- a. Spread driven pulley halves apart and place a straightedge between them. Inner faces of fixed pulleys should misalign $1/2''$ on all two cylinder engine machines and $7/16''$ on one cylinder engines.

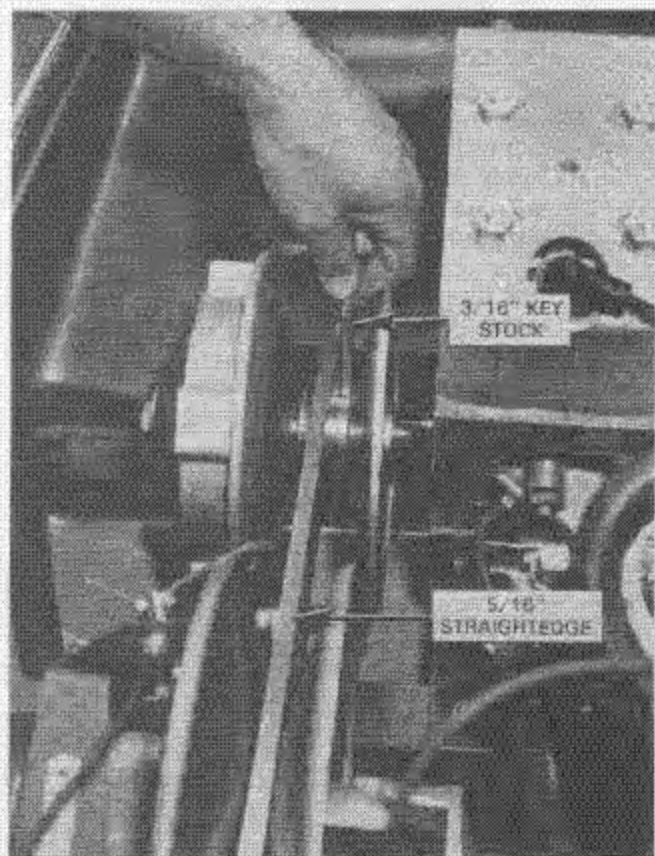


Fig. 54 — Checking Alignment of Pulleys on
Twin Cylinder Unit

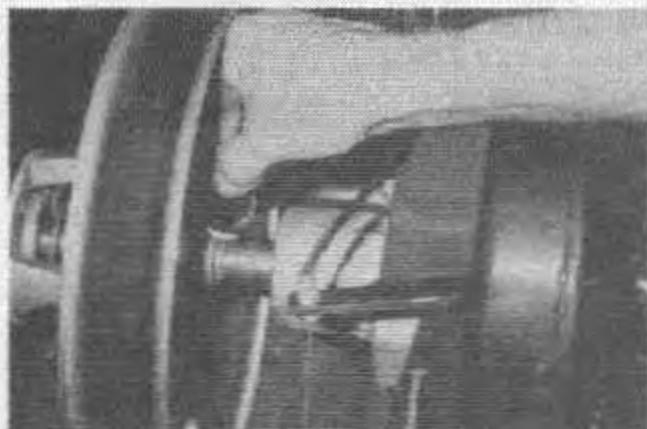


Fig. 55 — Inserting Shims Between Pulley and Bearing



Fig. 56 — Checking Sprocket Alignment

b. Use a suitable piece of key stock that will total either $1/2''$ or $7/16''$ when added to straight-edge thickness.

c. To correct measurement, loosen engine mounting bolts and slide engine. If alignment cannot be obtained by moving engine, add or remove shims between pulley and bearing block.

NOTE: Shims can be added by sliding shaft out about 2" and splitting shims, Fig. 55.

5. Check alignment of drive sprockets as shown

in Fig. 56. Correct alignment by adding or removing shims behind top sprocket.

6. Hold up on shaft and bearing block to remove slack in drive chain and tighten bearing block bolts.

7. Check chain tension. Chain should have approximately $1/4''$ deflection on slack side.

8. Install chain cover.

9. Position brake assembly in place and secure with retaining bolts. Leave bolts loose, squeeze brake control lever and tighten bolts. Adjust brake so pulley will not turn when lever is applied halfway and so pulley is free to turn when released.