

KNOWLEDGE

MEANS



POWER

FARM EQUIPMENT

SERVICE MANUAL

ALLIS-CHALMERS

TRACTOR GROUP MILWAUKEE, WIS.

MODEL "WC" TRACTOR

MODEL "WF" TRACTOR

MODEL "RC" TRACTOR

ALLIS-CHALMERS MFG. CO.
FARM EQUIPMENT DIVISION
MILWAUKEE, WISCONSIN
U.S.A.

FOREWORD

This book covering the Service and maintenance of the Model "WC", "WF" and "RC" tractors manufactured by "Allis-Chalmers" contains material formerly incorporated in the loose leaf Farm Equipment Service Manual, "Knowledge Means Power".

It is material now seldom used but never the less very valuable when needed. This is the last revision that will be made of these sections and you should retain this book for your permanent file.

For information listed under "General" and "B" - "C" Sections in indexes refer to "General" and "B" - "C" Sections in loose leaf Farm Equipment Service Manual.

This book, like the material in loose leaf Farm Equipment Service Manual "Knowledge Means Power", is printed for the exclusive use of "Allis-Chalmers" Dealers in servicing and maintaining farm equipment manufactured by "Allis-Chalmers".

WC

WF

RC

ALLIS-CHALMERS MFG. CO.
FARM EQUIPMENT DIVISION
MILWAUKEE, WISCONSIN
U.S.A.

MODEL "WC" TRACTOR INDEX

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MODEL "WC" SPECIFICATIONS

ENGINE

Number of Cylinders	4
Bore	4"
Stroke	4"
R.P.M.	
Low Idle	400-500
Full Load	1300
High Idle	1577 to 1622
Firing Order	1-2-4-3
Gasoline Engine	
Compression Ratio	5 to 1
Compression Pressure	95 lbs.
Low Octane Fuel Engine	
Compression Ratio	4.2 to 1
Compression Pressure	75 lbs.
Displacement	201 Cu. In.
Aluminum Piston 217311	
Compression Ratio	5.5 to 1
Compression Pressure	104 lbs.

AIR CLEANER

Type	Oil Bath
Oil Capacity	1 Pint

BREATHER

Wire Mesh	
Location	Top of valve cover

CAMSHAFT

Drive	Gear
Valve Timing	Marked Gear
Journal Diameter	1.874" to 1.875"
Bearing Diameter	1.877"
Bearing Clearance	.002" to .004"
End Thrust	Adjustable Spring

CONNECTING ROD

Bearing	Insert Type
Bearing Length	1.537" to 1.547"
Journal Length	1.749" to 1.752"
Rod Width	1.744" to 1.745"
Bearing Diameter	2.376" to 2.377"
Journal Diameter	2.374" to 2.375"
Bearing clearance	.001" to .003"
Bearing Adjustment	Shims

COOLING SYSTEM

Capacity	
Early Tractor	4 Gallon
74330 and Up	3-1/2 Gallon
Cooled	Pump and Fan
Fan Drive	V Belt
Belt Adjustment	Adjustable pulley or by moving generator
Pump Bearing	Ball
Lubrication	Pre-lubricated
Pump Adjustment	Automatic
Fan-four blade	17" Dia.
Revolutions	27-1/4 to 20 of crankshaft

CRANKSHAFT

Bearing Length	
Front	1.623" to 1.625"
Center and Rear	1.750"
Journal Length	
Front	1.628" to 1.630"
Center and Rear	1.9375"
End Thrust Clearance	.003" to .007"
Bearing Diameter	
Front	2.4376" to 2.4392"
Center and Rear	2.4795" to 2.4807"
Journal Diameter	
Front	2.435" to 2.4365"
Center and Rear	2.477" to 2.478"
Clearance	
Front	.0011" to .0037"
Center and Rear	.0015" to .0037"

FUEL SYSTEM

Carburetor	
Models	124-1/2 TOP, 61 AX7, 161 AX, TSX 159

ADJUSTMENTS

Main Jet	Out for richer
Idle Jet	In for richer
Tank Capacity	15 gal. V.S.
Fuel Filter	Felt and Bowl
Zenith 124-1/2 Top	
Compensator Jet	Size 18
Venturi	Size 16
Idling Jet	Size 11
Fuel Valve and Seat	Size 44
Cap Jet	Size 18
Main Jet	Size 15
Float Level	35/64" top of fuel to top of bowl 1-1/2" float to top of bowl
Zenith 61 AX7	
Well Vent	Size 25
Venturi	Size 18
Main Jet	Size 28
Main Discharge Jet	Size 50
Idling Jet	Size 16
Fuel Valve and Seat	Size 25 or 35
Float Level	7/16" top of fuel to top of bowl. 1-5/32" bottom of float to top of bowl.
Zenith 161 AX	
Well Vent	Size 22
Venturi	Size 18
Main Jet	Size 27
Main Discharge Jet	Size 50
Idling Jet	Size 12
Fuel Valve & Seat	Size 25 or 35
Float Level	Same as 61 AX7
Marvel Schebler TSX 159	
Float Level	7/16" top of fuel to top of bowl. 9/32" nearest edge of float to top of bowl.

Float Valve Seat	.070" Dia. drill
Main Nozzle	.116 Dia. drill idle feed #65 drill
Jet Power #56 Drill	200 C.C. flow
Venturi	23/32" Dia.
Idle Jet	101 C.C. flow

GOVERNOR

Type	Variable speed
Adjustment	Throttle Lever

MAGNETO

Make	Bendix & Fairbanks-Morse
Type	High tension
Models	Scintilla RV4, FMK, FMJ
Rotation	Clockwise
Impulse	Automatic
Log Angle	30"
Advance	30"
Breaker Point Gap	
Bendix-Scintilla	Points open when pointers match
RV4	.012"
FMK & FMJ	.020"

SPARK PLUGS

Size	14MM
Heat Range	
Gasoline	Autolite AN7 or AC 45
Low Octane Fuel	Autolite A9
Point Gap	.030" to .040"

MANIFOLD

Two distant kinds used
One for Gasoline
One for Gasoline and Low Octane Fuel

OIL PUMP

Type	Gear
Pressure - NORMAL	12 lbs.

PISTON

Type	Cam ground
Dia. (large)	3.997"

PISTON RINGS

End Gap	.007" to .017"
Ring Width	
Compression & Scraper	1/8"
Oil Control	3/16"

PISTON PIN

Type	Clamped in Rod
Pin Diameter	.9890" to .9895"
Bushing Diameter	.9897" to .9901"
Pin Clearance	.0002" to .0011"

VALVES

Exhaust Diameter	1-1/2"
Inlet Diameter	1-5/8"
Stem Diameter	.371" to .372"
Stem to Guide Clearance	.0025" to .0045"

VALVES (Cont'd)

Guide - Inside Dia.	.3745" to .3755"
Seat Angle	45°
Seat Width	1/16"
Valve Margin	3/64"
Valve Seat Inserts	
Oversize Exhaust	1.629 O.D.
Oversize Intake	1.817 O.D.

VALVE SPRINGS

Free Length	2-5/16"
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TAPPET CLEARANCE

.010" Hot

VALVE TIMING

Intake opens at T.D.C. closes 40° after B.D.C.
Exhaust opens 40° B.D.C. and closes 10° past T.D.C.

BELT PULLEY

Diameter	9"
Face	6-1/2"
R.P.M.	1170 at 1300 of crankshaft 1520 to 1477 high idle
Rotation	Clockwise
Location	R. H. Side
Height	31-1/2"

CLUTCH

Type	Single plate-dry disc
Size	10"
Throwout Bearing	Ball thrust
Adjustment	1/4" between release levers and bearing
Lining Thickness	1/8" and 5/32"

BRAKES

Type	Enclosed-contracting
Location	One on each rear axle
Adjustment	Nut

DIFFERENTIAL

Type	Four pinion
Ratio - Std.	4.7 to 1
Ratio - 36" Tires	6.6 to 1
Lubricant Capacity	6 Qt.

DRAWBAR

Type	Swinging
Height	12" to 19-1/4"

FINAL DRIVES

Lubricant Capacity	1 Pint
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FRONT WHEELS

Tire Size	5.50 x 16"
Air Pressure	28 lbs.
Steel Wheel	4" x 24"
Skid Band	1-1/2" x 1-1/2"

POWER TAKE OFF

Type	Clutch
Spline Size	1-3/8" x 6B
R.P.M.	535 at 1300 of engine
Height	20-3/4"
Right of Center Line	7/8"
Distance ahead of hitch point	8-7/8" to 16-3/8"

REAR WHEEL

Tread	65" to 78"
Tire Size	11:25 x 24 prior to WC 81757
	11 x 28 after WC 81757
Air Pressure	12 lbs.
Steel Wheel	
40" x 6"	40 - 5" lugs
40" x 2"	36 - 5-1/16" lugs

SPEEDS

FIRST	2-1/2 MPH
SECOND	3-1/2 MPH
THIRD	4-3/4 MPH
FOURTH	9-1/2 MPH
REVERSE	2 MPH

STEERING

Lubricant Capacity	3 Pt.
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TRANSMISSION

Type	Four Speed
Lubricant Capacity	4 Qt.
	5 with P.T.O.

BATTERY

Capacity	6 Volt 95 ampere hour
Size	13 Plate

INSTRUMENT BOX

Ammeter	
Light Switch	Controls generator charge rate

LIGHTS

Bulbs	6-8 volt single contact
Candle Power	32

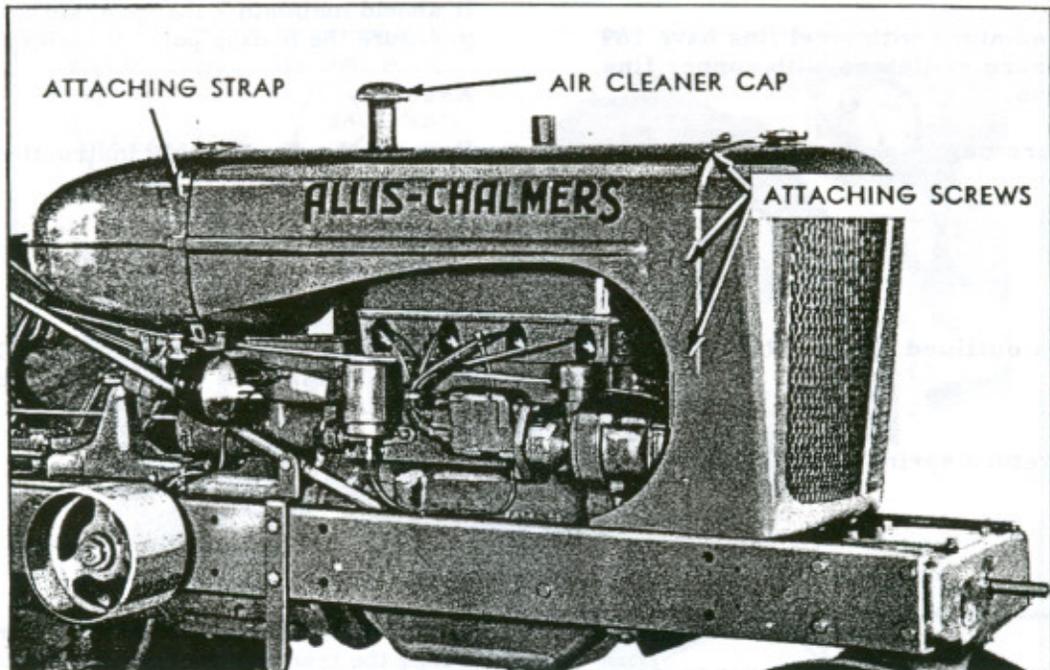
GENERATOR

Type	Third brush
Charging Rate	3 to 13 amperes
Drive	V Belt
Lubrication	Oilers - front and rear
R.P.M.	2600 to 2675 at high idle

STARTER

Switch	Manual control
Drive	Bendix
Lubrication	Oiler at rear

HOOD

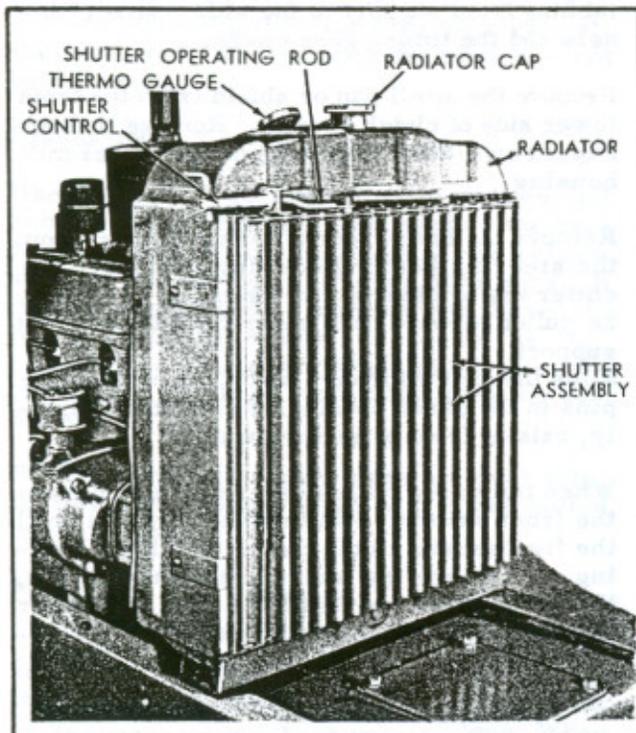


Removal

Remove the air cleaner stack cap, disconnect

the auxiliary fuel tank line and remove the strap at rear of hood. Remove front band or screws attaching hood to the radiator shell.

RADIATOR



Removal

Remove hood, loosen upper and lower hose connections. Bend up capscrew lock on underside of frame channel and remove the two capscrews attaching radiator to the side frame members.

Disassembly

Remove the shutter control handle, the radiator cap and the screws attaching the shell to the radiator. Remove the four screws attaching the shutter to the radiator.

Inspection

Check the radiator for clogging, both inside and outside, check for bent and broken cooling fins, damaged or leaking tubes etc. All radiators must have baffle plates and the overflow tube must be fully soldered where it passes through plate.

Pressure radiators with steel fins should

weigh 27 lbs. Pressure radiators with copper fins should weigh 24-1/2 lbs.

Pressure radiators with steel fins have 169 fins. Pressure radiators with copper fins have 127 fins.

The pressure cap gasket must be in good

condition and seal neck of radiators.

It should maintain 7 lbs. pressure. At 7 lbs. pressure the boiling point of water is 230° F.

Assembly

Reverse the disassembly instructions.

RADIATOR SHUTTER

Removal

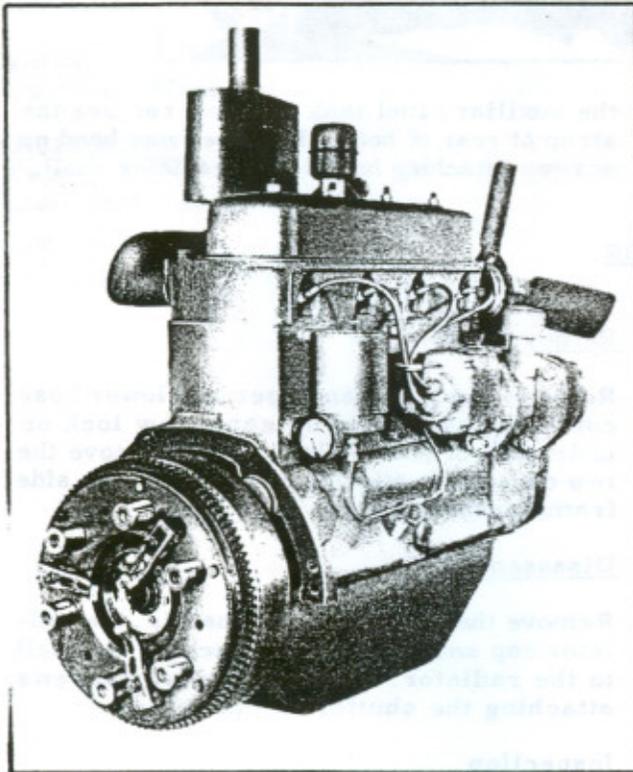
Proceed as outlined under "Radiator".

Inspection

Check the return spring and spring anchor.

Check hinge pivots of louvers. Check the control handle and bolt for worn or rusted threads.

ENGINE



Removal

Remove the hood and radiator. Disconnect fuel line, air cleaner hose and generator wire. Remove the drain cock from the cylinder

block. Disconnect choke rod and throttle rod. Place the tractor under the hoist and connect the hoist to two of the rocker arm support studs. Take up all slack in hoist etc.

Remove the pin from the front section of the steering shaft universal joint. Pull shaft and joint to the rear about 9 inches.

Remove the two capscrews and two bolts attaching front support to the side frame channels and the timing gear cover.

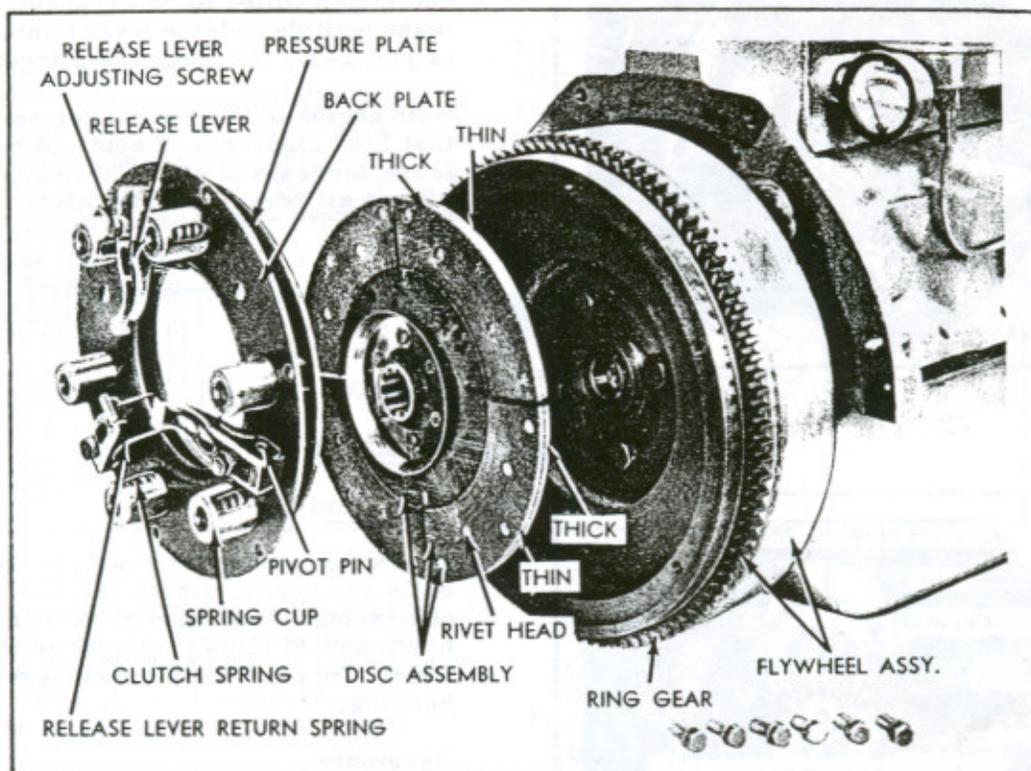
Remove the small pan or shield from the front lower side of clutch housing. Remove the four capscrews attaching engine to the clutch housing.

Remove the crank return spring bracket from the steering bearing housing. Remove the cotter key or pin from the crank, so crank may be pulled forward until under the edge of front support.

Slide the engine forward until free of the dowel pins in the clutch housing. Raise hoist slightly, raising front of engine most.

When fan drive pulley on crankshaft clears the front support, slide engine forward until the flywheel and clutch clears the clutch housing. Raise engine above frame members, tipping towards the left hand side of tractor if necessary, to clear steering shaft.

CLUTCH



Removal

Remove the engine. Remove the six cap-screws attaching the clutch to the flywheel. Remove evenly so that pressure plate will not be distorted.

Disassembly

Use three "C" clamps equally spaced and compress the pressure plate against the back plate. Remove the release lever return springs and the release lever pivot pins. It may in some cases be necessary to loosen the lever adjusting screw. Release the "C" clamps evenly. After the clamps are removed the springs and cups may be removed.

If "C" Clamps or a press are not available, the levers can be removed with clutch bolted to the flywheel.

Inspection

Check the clutch springs for length. They should be 1-13/16" long. If they are more than 1/16" too short or uneven they should be replaced. The cup is 1-9/16" long. When replacing full circle lining with the segment

type the springs and cups should also be changed.

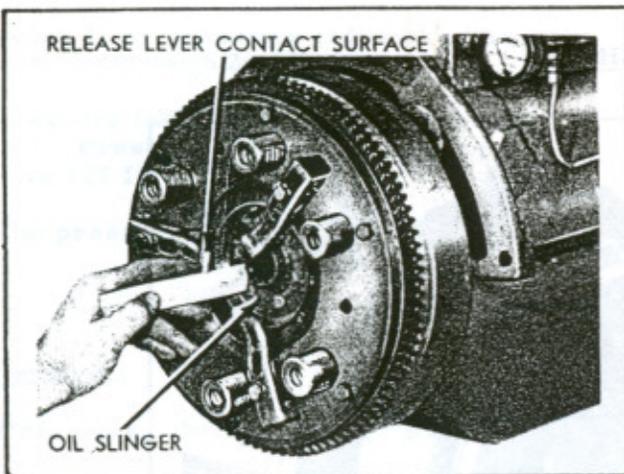
Check the pressure plate for warping, scoring or cracks.

The clutch plate should be checked for loose, worn or oil soaked lining. Check the plate for loose rivets and worn splines. The plate must not be bent. A bent plate, tight fitting splines or oil soaked lining will cause the clutch to stick, causing hard gear shifting.

Assembly

When installing lining, use alternate thick and thin sections. Place a thick section opposite a thin section and then continue with alternate thick and thin sections. Each segment will have a thick and thin section. This gives a plate with uniform lining thickness but each segment is staggered. This gives a soft action to the clutch, reducing the tendency to chatter or grab. A new lining is 1/8" and 5/32" thick respectively.

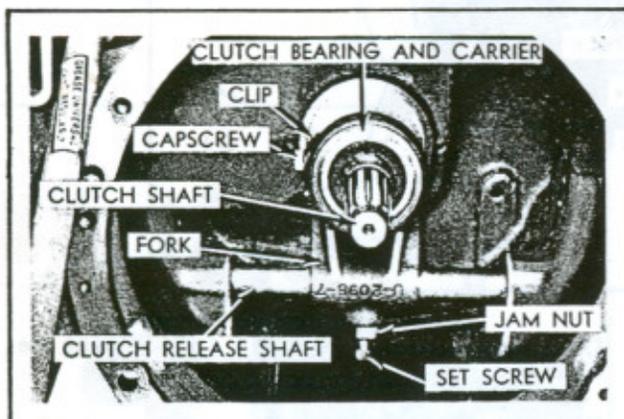
Place the rivet head in the thin section and rivet over in the thick section using a special tubular rivet punch. The clutch plate is installed with the grease slinger away from flywheel.



Two methods of clutch adjustment can be used. With the engine removed from tractor and clutch bolted to the flywheel, adjust release until the release lever contact surface is just $1-31/32$ " from the slinger surface.

With engine in tractor set release levers so that $1/4$ " clearance is obtained between release levers and clutch throwout bearing. Adjust all levers exactly alike.

CLUTCH THROWOUT BEARING



Inspection

Check the bearing for rough, broken or worn balls and races. Check the side movement of bearing. Side movement will not do any harm until it allows retainer to touch inside race. This indicates considerable wear on bearing.

Assembly

The bearing carrier must be assembled with the grease fitting down on all tractors equipped with electric starters. On tractors prior to WC-74330 the grease fitting is towards the top. Adjust release levers as outlined under clutch.

It helps in reaching the fitting with the grease gun to lock clutch pedal forward.

Removal

Remove the engine and clutch. Remove the small clip attached to bearing carrier by a capscrew. Pull carrier from carrier tube. The bearing may be pressed from the carrier.

CLUTCH RELEASE SHAFT AND FORK

Removal

Disconnect the clutch pedal rod and remove the clutch shaft arm. Remove the fork return spring and loosen the fork jam nut and set screw. Drive shaft through the fork far enough to remove the woodruff key. After

key is removed slide shaft from tractor.

Inspection

Check the fork contact surface for wear. Check the shaft bearings for wear.

CLUTCH HOUSING

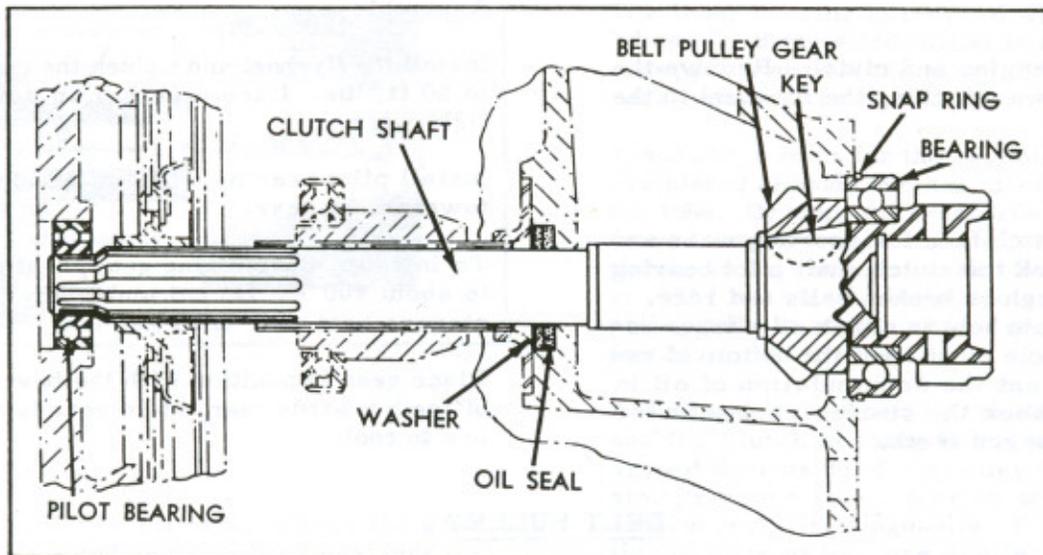
Removal

Remove one side frame member, loosen opposite member, and remove the radiator and

fuel tank, air cleaner etc.

Remove the engine, clutch housing and transmission as a unit, or if desired remove engine separately.

CLUTCH SHAFT



To install the clutch shaft oil seal with the engine removed, remove the bearing carrier. Disconnect the clutch pedal rod. Turn fork down and remove the two capscrews attaching the carrier tube to the clutch housing.

Removal

Remove the rear axle and transmission. The clutch shaft can be moved forward out of the transmission.

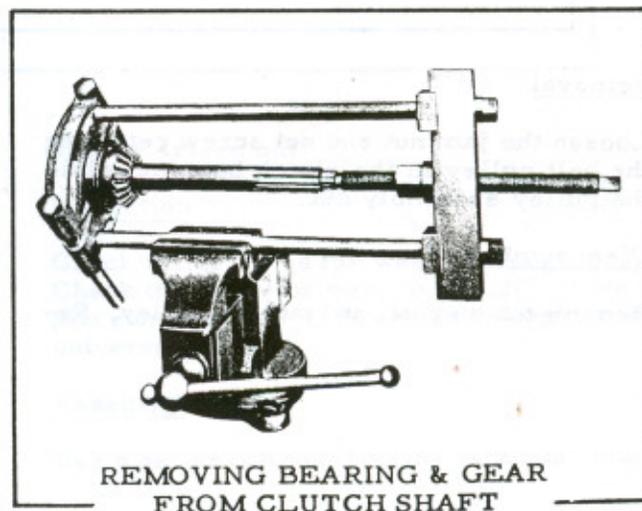
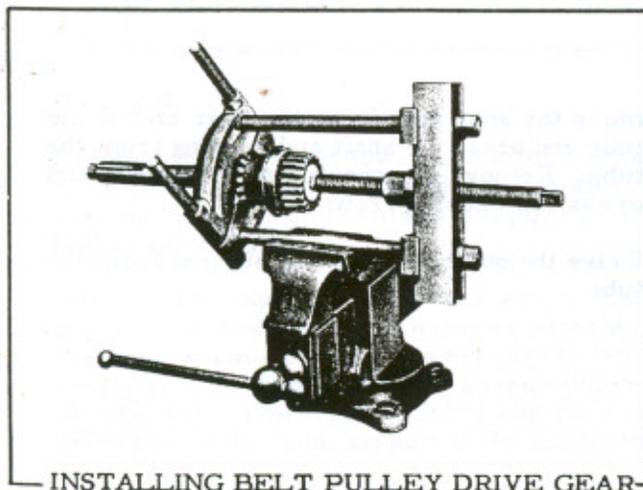
Remove the snap ring from the shaft and press the belt pulley gear and the bearing from the shaft.

Inspection

Check the splines on shaft for wear also fit of pilot bearing on the shaft. Check the gear teeth for wear or chipping. Check the bearing for rough, worn or broken balls and races.

Assembly

Install the bearing with the snap ring groove towards front of shaft. Be sure main shaft pilot bearing and spacer are reinstalled.



FLYWHEEL

Removal

Remove the engine and clutch. Remove the four capscrews attaching the flywheel to the crankshaft.

Inspection

Check the clutch face for scoring, wear and cracks. Check the clutch shaft pilot bearing for worn, rough or broken balls and race. Check the drain hole in clutch oil slinger recess. This hole must meet the bottom of recess to prevent the accumulation of oil in flywheel. Check the starter ring gear for worn or damaged teeth.

Assembly

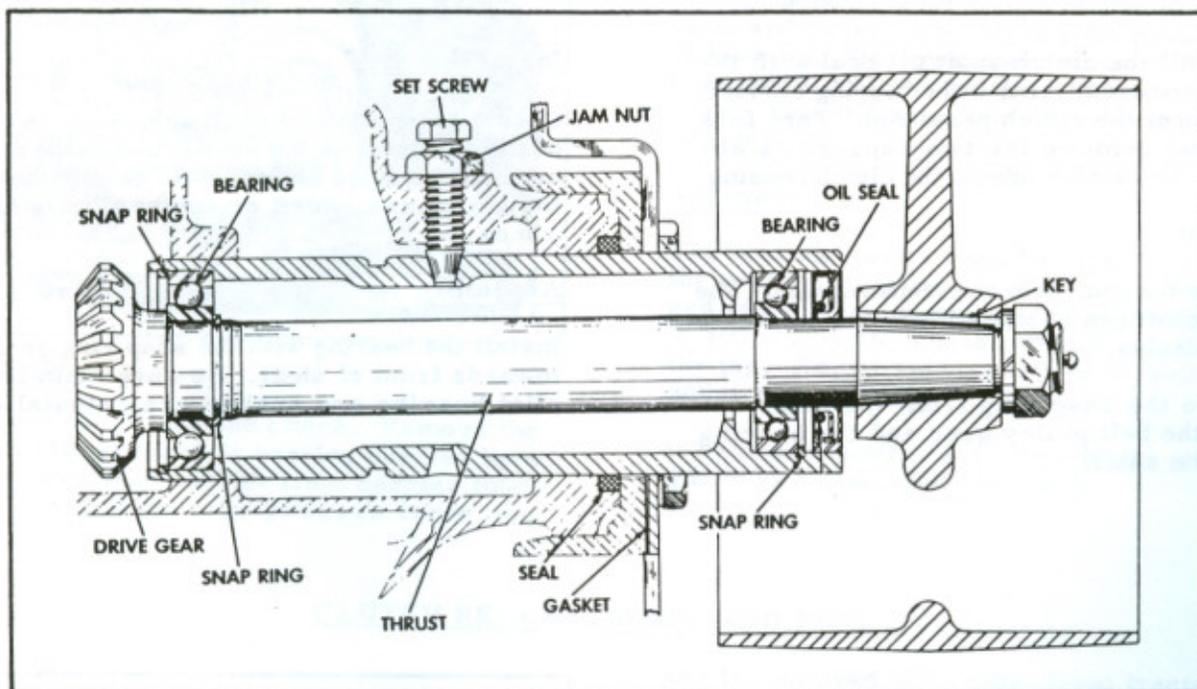
Install the flywheel and tighten the capscrews to 50 ft. lbs. Lace together in pairs with light wire.

Install pilot bearing with the shielded side towards the rear.

To install a starter ring gear, heat the gear to about 400°F. Do not under any circumstances heat gear until red hot.

Place gear in position with the beveled side of teeth towards rear, while gear is hot. Allow to cool.

BELT PULLEY



Removal

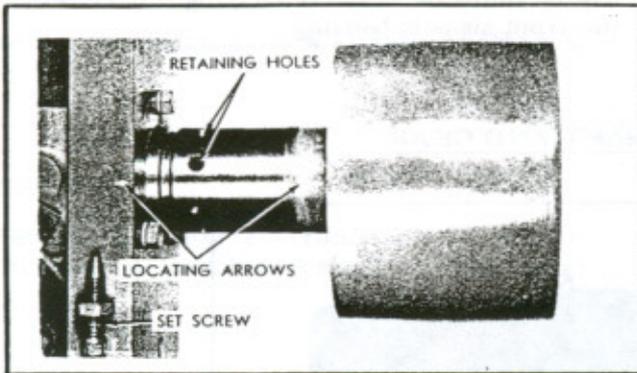
Loosen the jam nut and set screw retaining the belt pulley in the clutch housing, slide the pulley assembly out.

Disassembly

Remove nut on shaft and pull the pulley. Re-

move the snap ring from the gear end of the tube and press the shaft and bearing from the tube. Remove the snap ring from shaft and press the bearing from shaft.

Drive the outer bearing and oil seal from the tube.



Inspection

Always use a new oil seal. Check the gear for worn or rough teeth. Check bearings for rough, worn or chipped balls and races.

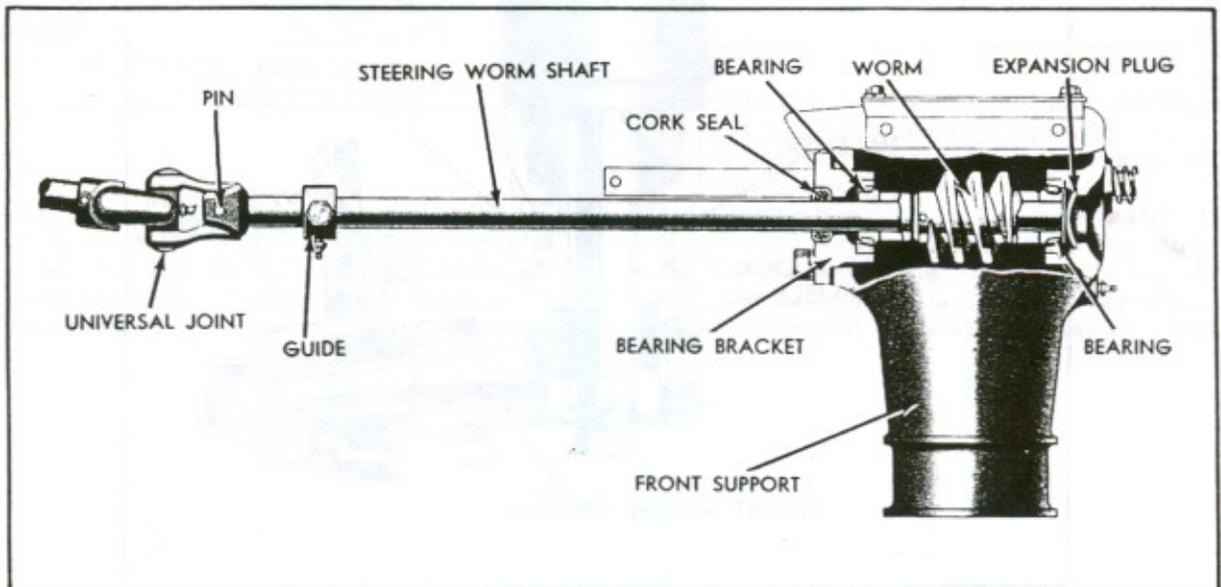
Assembly

The inner bearing is marked with the word "thrust". If the word thrust is on the inner race, place against the gear. If on the outer race turn away from the gear.

A number of holes for the retaining set screw are placed around the outer circumference of the tube. By using different holes the tube is moved into or out of tractor, thus giving a tighter or looser gear mesh. Set gear mesh to .005" backlash. Relocate arrow on the pulley tube to match arrow on the tractor frame.

An oil seal is used between the tractor frame and the clutch housing to prevent leakage around the outside of the pulley tube. To install, remove side frame or loosen frame and cut cork ring diagonally. Place cut section of cork at top, use shellack to hold in place.

STEERING WORM AND SHAFT



Removal

Remove the pin from lower end of universal joint. Remove the nut from the center steering shaft bearing. Remove support from frame of tractor.

Remove the capscrew from the worm shaft guide. Remove the two capscrews attaching the rear worm shaft bearing bracket to front support. Pull worm and shaft assembly from the tractor. The front bearing cup may be driven from the front support if the expansion

plug is driven out.

Inspection

Check the bearings for wear or roughness. Check the worm for wear and scuffing. Replace any or all worn bearings or shafts and universal joints.

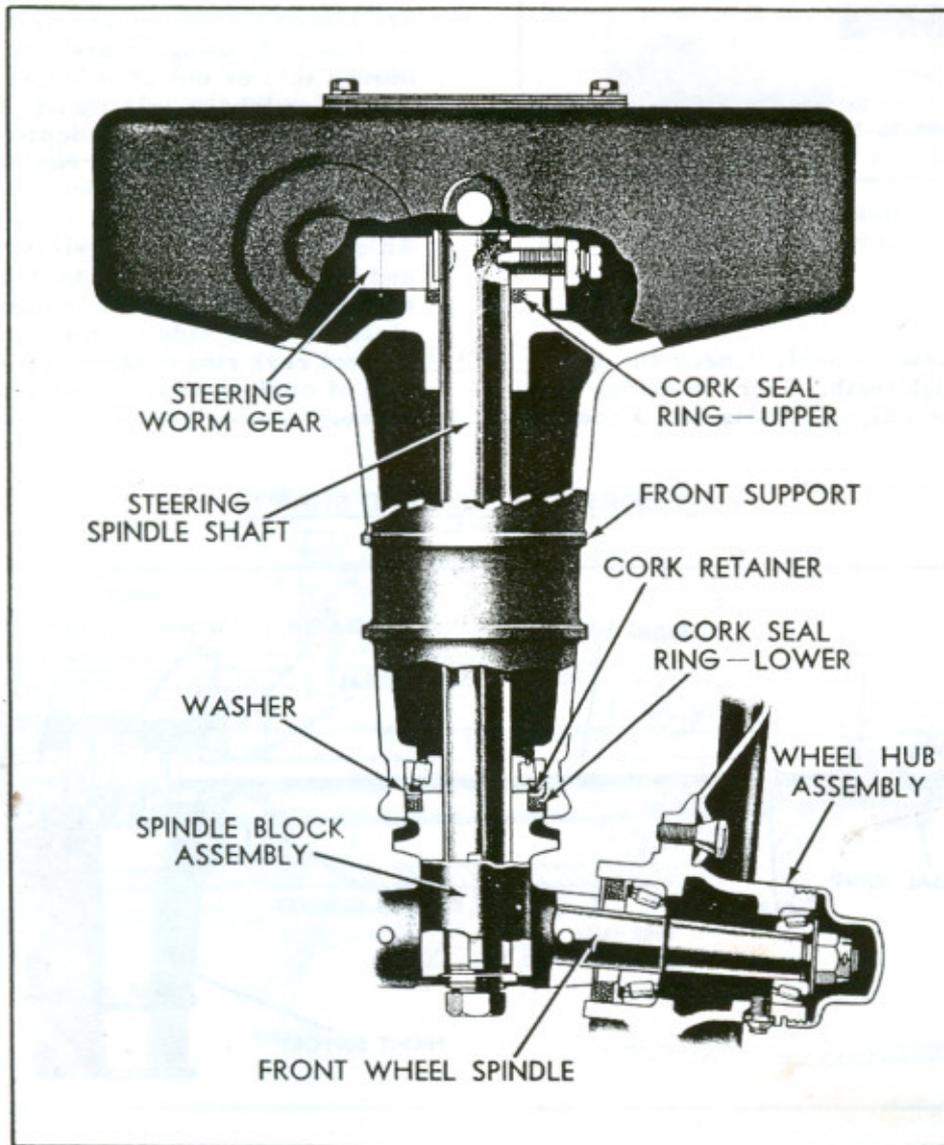
Assembly

Use a sealer compound on the expansion plug

in front support. Adjust the worm bearings to a free rolling fit without end play or binding. Bearing adjustment is secured by the

use of shims between the bearing bracket and the front support housing.

STEERING SPINDLE SHAFT AND GEAR



Removal

Remove the front wheels and hubs. Remove the capscrew, washer and shims from lower end of verticle spindle and pull spindle block. Remove the cover from the top of front support. Remove crank. Pull the verticle spindle and segment gear up out of support. Loosen jam nut and remove set screw from the segment gears. It may now be pressed from the shaft. The wheel spindles may be pulled from the spindle block by removing

the spindle retaining pin and adapting a combination puller.

Inspection

Check the segment gear for wear and scored teeth. Check verticle spindle for wear at lower end and in keyway. Check bearings for wear and roughness. Check spindles for looseness in the spindle block. Check spindle block for fit on the verticle spindle. Always use new oil seals.

Assembly

Adjust the bearings to a slightly preloaded

fit by use of correct number of shims between the spindle block retaining set screw and lower end of spindle.

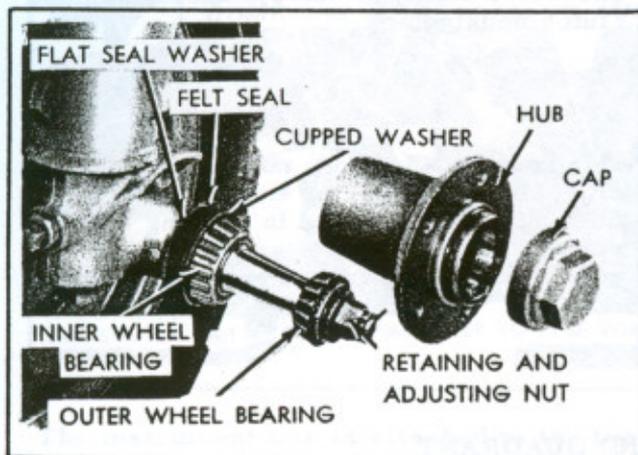
FRONT SUPPORT

Removal

Remove the capscrew from one side of radiator and one side frame member. Disconnect

the steering shaft universal joint. Remove front wheels. The front support can now be removed by removing the four capscrews attaching it to the opposite side frame.

FRONT WHEELS



The bearing cups may be driven from the hub. The inside bearing spacer and flat seal washer may be driven or pulled from the spindle.

Inspection

Check the bearings for wear, cracked or chipped rollers, inner races and cups. Always use new oil seal.

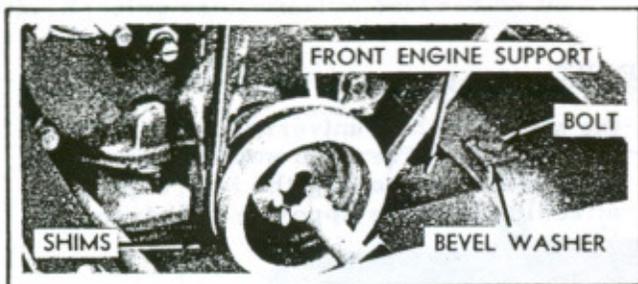
Assembly

Place the flat washer on spindle and drive or press seal spacer onto spindle. Put oil seal in place. Lubricate the bearings with #2 wheel bearing grease. Place inner bearing in hub and install the cupped seal washer in hub with the cupped side towards bearing or flat side towards seal. Install on spindle. Adjust bearings to a free rolling fit without end play or binding.

Removal

Remove the five special capscrews attaching the wheel to the hub. Remove the hub cap, and the cotter key and nut from end of spindle. Pull hub and bearings from the spindle. Use puller if necessary.

FRONT ENGINE SUPPORT



Keep all bolts tight. With engine bolted solidly to clutch housing, tighten front support to

side frames only. Place as many shims as possible between front support and timing gear case. Loosen frame bolts, install shims adding one .005" shim to amount previously determined.

Install capscrews and tighten securely.

A loose front support causes excessive vibration and noise. The incorrect amount of shims between support and engine places an excessive strain on the cylinder block and clutch housing.

SEAT

Remove the tail light. Remove the capscrew attaching the seat to rear axle housing.

Assembly

Make sure the seat spring fits the pad on

axle housing. If it does not, use the special clip between the spring and the housing. If difficulty is encountered in starting the capscrew, loosen the upper end of the steering post brace. Do not use a bent capscrew.

THROTTLE LEVER AND QUADRANT

The spring loaded lever pivot must be free to move in the quadrant. If it does not move easily the notches on quadrant will wear rapidly.

To adjust throttle rod, place the lever in the extreme full throttle position. Loosen the rod set screw and pull rod back as far as possible.

Tighten in this position. This will give engine the maximum speed. Operate engine at idle and if low idle speed cannot be obtained, with all parts of the governor and carburetor linkage adjusted, lengthen the rod slightly.

If the high idle speed is too high, lengthen rod to reduce speed.

HEADLIGHTS

Remove the tape and the bolt from the headlight wire junction under fuel tank. Loosen the thumb screws and pull the light assembly from tractor.

The lights use single contact bulbs. Make sure a good ground is made between the

reflector and the housing. Early type lights had a small screw near edge of reflector to provide a ground contact. Present style is grounded by use of a short length of copper wire. Always use a new sealing gasket between the lens and the reflector.

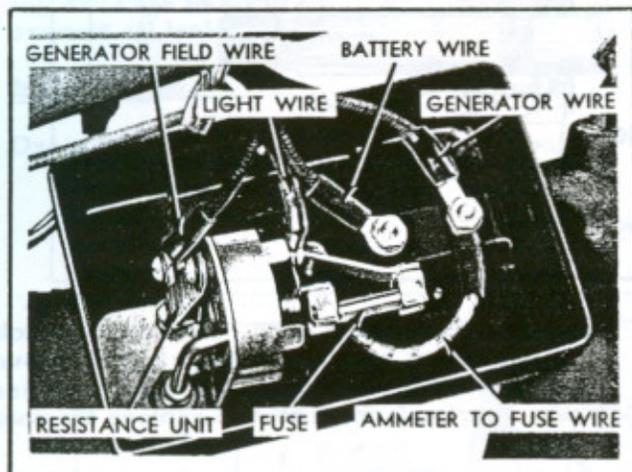
TAIL LIGHT

Remove the rear half of the instrument box and disconnect the tail light wire from the light switch. Remove the clip attaching wire to the frame. Remove nut and lock-washer attaching the lamp to the seat bra-

cket. Pull light assembly and wire from tractor.

The ground connections are the same as on the headlights.

INSTRUMENT BOX



The instrument box is attached to the fuel tank support by two capscrews. The front and rear sections are fastened together by two self tapping screws.

The instrument box contains the light switch, fuse and ammeter. (See wiring diagram for wiring connections.)

The fuse is of 15 ampere capacity, however, the drain on the lighting circuit is only about 5 amperes.

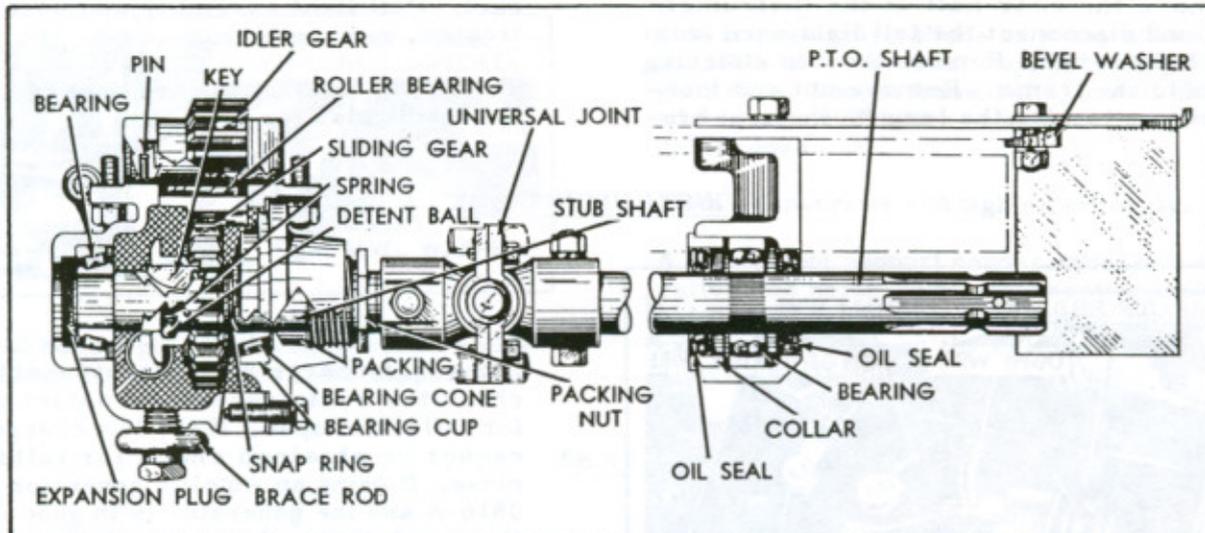
If the high charge rate cannot be obtained check the resistance unit contact points for failure to open. If the low charge rate cannot be obtained check for failure to close. If using an Autolite generator GMB-0816-A and the generator is in good condition, motor speed correct, belt not worn and the low charging rate cannot be increased without increasing the high charging rate, about 3 turns can be removed from the resistance unit.

The third brush setting should be adjusted to give about 10 amperes. When the light switch is pushed all the way "in" the resistance unit is in series with the field winding of generator and limits the amount of current flowing through the field coils. When the lights are on, the resistance unit is removed from the circuit and the generator output will increase to maximum, however the ammeter reading will not show any noticeable increase because of the amount of current consumed by the lights. When the light switch is pulled all the way out the lights are off and generator on high charge and will give a true reading on ammeter.

FENDERS

The fenders are attached to the brake covers by three bolts. On older tractors a long bolt was used to brace fender to the frame. The two crank carrying clips are attached to the

left hand fender bolts. Vibrating fenders are sometimes mistaken for differential and final drive noises.



The mower power take-off for front driven mowers turned 750 R.P.M. This PTO can only be used for early type mowers. This PTO contains different gears etc. and used a spacer between the PTO and the transmission.

The rear mounted PTO has used two different main shaft, two universal joints and two extension shafts. There is a difference in length of these shafts and the proper ones must be used together.

Removal

Remove the two capscrews attaching the rear shaft bearing and PTO shield to the drawbar platform. Remove the bolt from the front section of the universal joint. Pull shaft from the PTO. If the shaft passes through the drawbar plate, the drawbar must also be removed or the universal joint removed from the extension shaft. Remove brace rod to left hand frame member.

Drain the PTO and transmission case. Loosen the nuts retaining the PTO to the transmission. They must be removed evenly.

Disassembly

Press the idler gear shaft towards end of case with keyway. If pressed in the opposite direction the idler gear shaft key will ruin the idler gear bearing.

Remove the capscrews attaching the rear bearing cover assembly to housing and pull sliding gear shaft and bearing assembly from the case. Press front bearing from shaft

and remove sliding gear. Be sure to catch the two detent balls and the spring. Remove the special sliding gear drive key. Press rear bearing from shaft and remove the snap ring.

Shaft packing may be replaced by removing the packing nut.

Remove the shifter arm and pull shifter shaft and fork assembly from the case. The spring loaded shifter shaft oil seal may be driven from the case.

Drive the expansion plug and front bearing cup from the case.

Inspection

Inspect the bearings for wear, cracks or roughness. Check gear teeth for wear or chipping. Check the fit of sliding gear on the shaft and drive key. Check the fit of the drive key in shaft. It must be tight. Check the detent spring and balls for wear. Always use new oil seals.

Inspect universal joint for wear. Replace bushings and cross or replace complete joint if worn.

Check the PTO shaft rear bearing for wear and roughness. If worn, remove set screw from side of housing and press from shaft. The bearing and oil seals may be driven from housing.

Assembly

Install the rear bearing oil seal with the lip

towards the bearing.

Make sure the lower shaft drive key fits the groove tightly and install the sliding gear with the shift collar forward, placing the spring in the shaft with a ball on each end next to the gear. It may be necessary to file the key to fit the keyway in the shaft. Adjust the timken roller bearings to a free rolling fit without end play or binding. Use alternate paper and steel shims between bearing housing and case to secure this adjustment and to prevent oil leaks.

Installation

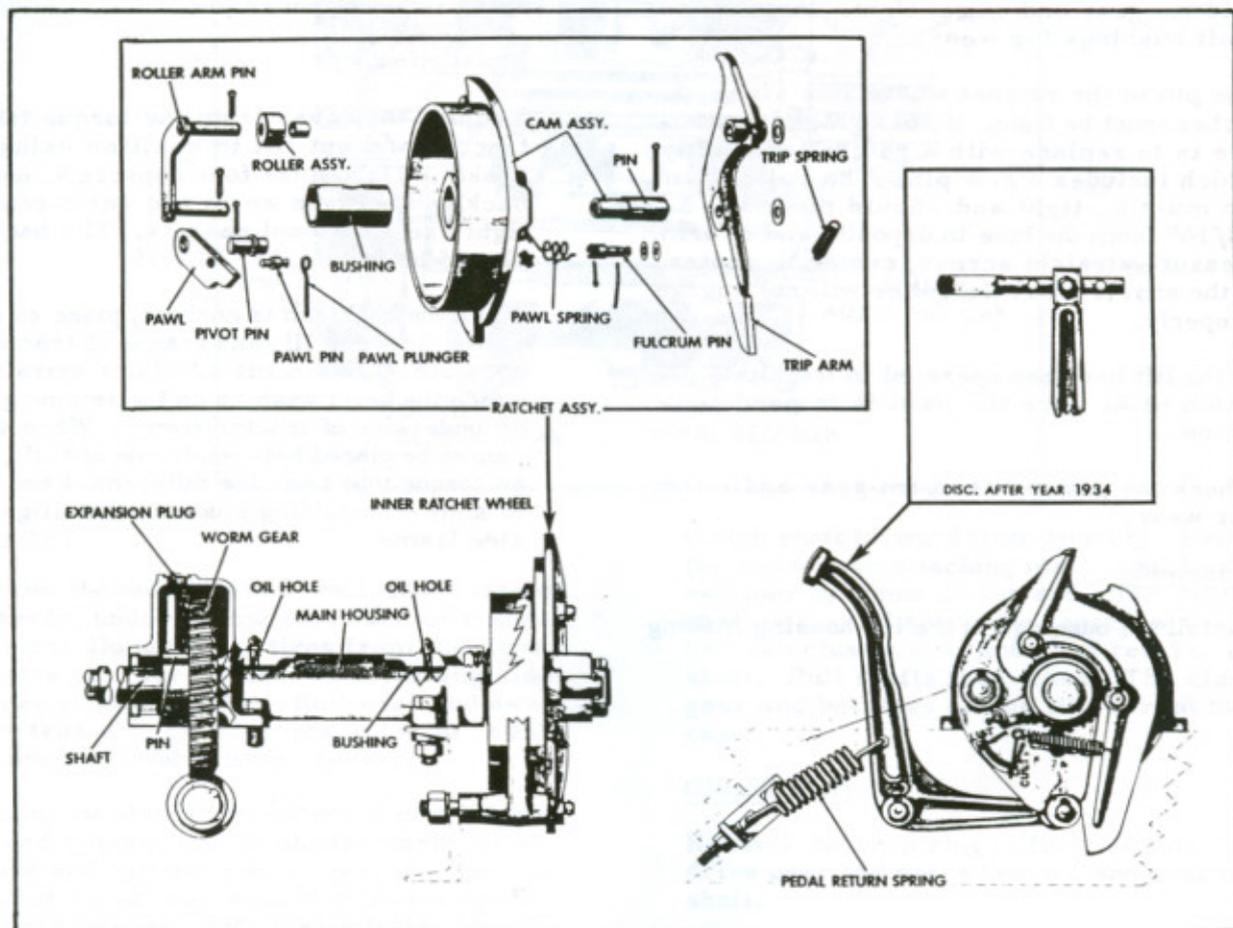
Drain the transmission and remove the bottom

cover. Install the six studs in the transmission case. Use one gasket and bolt the PTO assembly to the transmission. If the backlash between the idler gear of PTO and cluster gear in transmission is less than .004" to .005" place an extra gasket between PTO and transmission.

Attach the shift lever rod to lower end of the steering support column.

Install the special drain plug in the bottom of the PTO housing and install the brace rod from this plug to the left hand frame member. Tighten snugly, but do not force parts out of alignment. The PTO increases the capacity of the transmission from 4 qts. to 5 qts.

POWER LIFT



Removal

Disconnect arm between the connecting pin and the lever mounted on the side of the tractor frame.

Loosen the trip pedal return spring. Remove

the two bolts from the right hand frame channel and the four capscrews attaching the power lift to the torque tube.

Disassembly

Remove the taper groove pin from the collar

on the connecting end of shaft. Pull the ratchet mechanism from the shaft. Remove pin from worm gear. Drive the shaft from the housing. Remove the pin retaining the ratchet wheel to shaft and press the wheel from the shaft.

Remove the pins from the trip arm on the ratchet assembly. Slide the trip arm off and remove the roller arm assembly from inside of ratchet. The lister shift pawl assembly can now be removed.

The bushings may be driven from the main housing.

Inspection

Inspect the shaft for alignment and wear. If the pin holes are worn it will be difficult to hold the gear and wheel tight. Inspect the shaft bushings for wear.

The pin in the ratchet where link strap attaches must be tight. If not tight, best practice is to replace with a ratchet assembly which includes a new pin. The roller arm pin must be tight and should measure 3-13/16" from the hole in opposite end of arm. Measure straight across, center to center. If the arm is short the roller will not engage properly.

If the lift has been operated in the "list" position make sure the pawl is in good condition.

Check the power lift worm gear and worm for wear.

Assembly

Install the bushings in the lift housing making

sure the oil holes line up with the lubricant fittings. Place the ratchet wheel on shaft and rivet in place. Be sure rivet heads are below surface of wheel. Place the shaft and wheel in housing, starting the worm gear at the same time. Remove the expansion plug from housing above worm gear. A punch may be entered through this hole to buck rivet. Turn shaft and make sure both ends of rivet is upset.

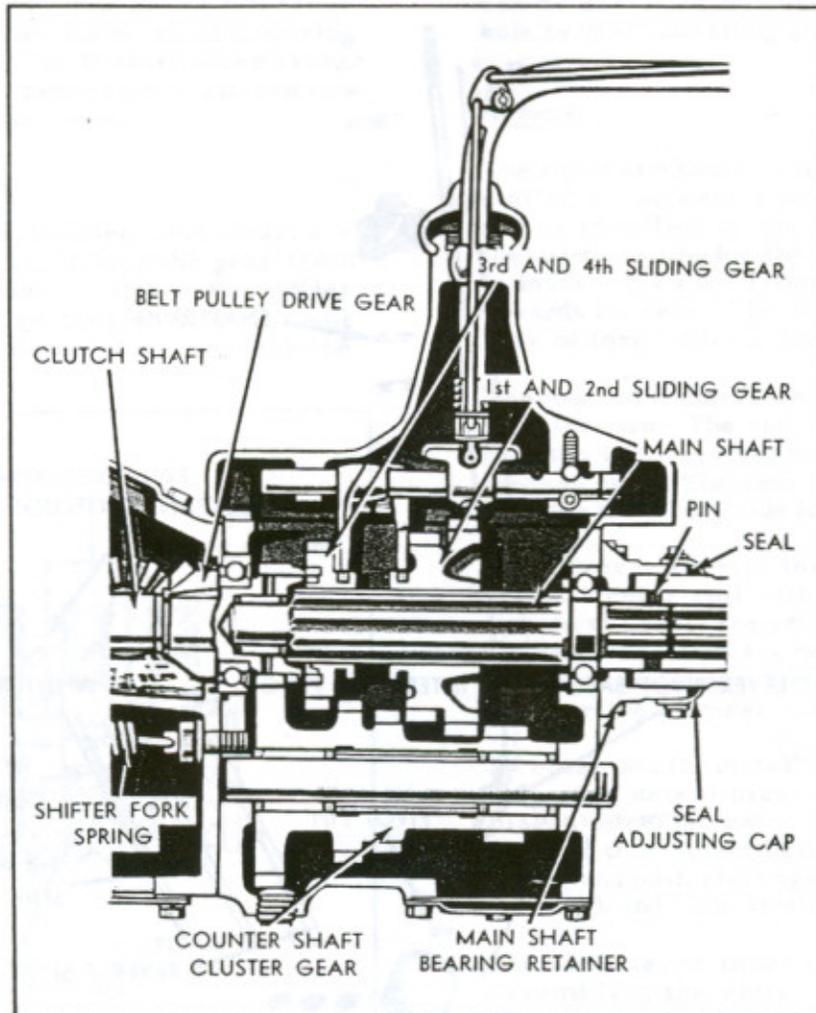
Rivet the pawl pin to the pawl, leaving it free to hinge. Enter the pawl assembly into ratchet and retain with cotter key. The pawl spring is installed with the loop end between the pawl and pawl pin. Place coil end of spring on pin in ratchet and wind spring in direction to force pawl towards outside of ratchet with pin lever in the list position. Enter tail of spring in notch of lister pin and enter retaining cotter pin.

Installation

Remove the cover from the torque tube of tractor and put lift in position using one gasket. Tighten the four capscrews and try backlash between worm and worm gear. If tight use additional gaskets. The backlash should be from .005" to .010"

When the backlash is correct, place as many shims between lift and frame of tractor as possible. Loosen lift. Add one extra shim. Place the bevel washers on the retaining bolts on underside of tractor frame. When shims cannot be placed between frame and lift, loosen torque tube from the differential and allow to shift on retaining studs until it aligns with side frame.

TRANSMISSION



Removal

Remove the tail lamp and seat. Block tractor squarely, under frame just back of transmission. Do not raise tires from the floor. Remove the four capscrews attaching side frames to axle housing. Roll rear end away from tractor. On tractors prior to 74330 remove the fender brace bolts.

Remove the plate from bottom of clutch housing and unhook clutch shifter fork return spring and remove nut from stud. Remove the four capscrews attaching transmission to clutch housing. Slide transmission straight back until clutch shaft is free of clutch housing.

Disassembly

Remove the gear shift cover assembly. Pull the

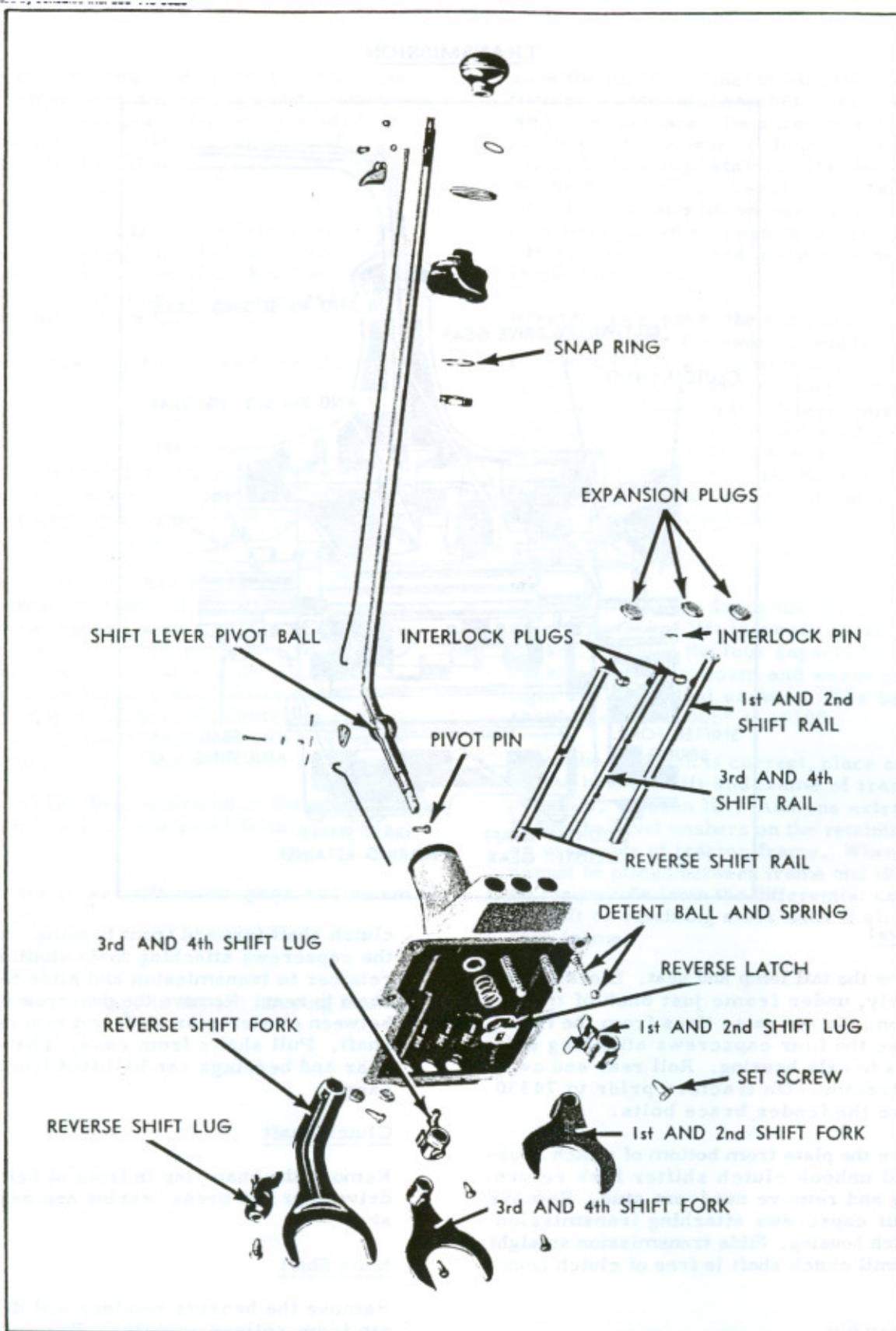
clutch shaft forward from housing. Remove the capscrews attaching main shaft bearing retainer to transmission and slide the main shaft to rear. Remove the capscrew and lock between cluster gear shaft and reverse gear shaft. Pull shafts from case. The cluster gear and bearings can be lifted from top of case.

Clutch Shaft

Remove the snap ring in front of belt pulley drive gear and press bearing and gear from shaft.

Main Shaft

Remove the bearing retainer and drive the pin from splined coupling. Press bearing and coupling from shaft.



Shifter Assembly

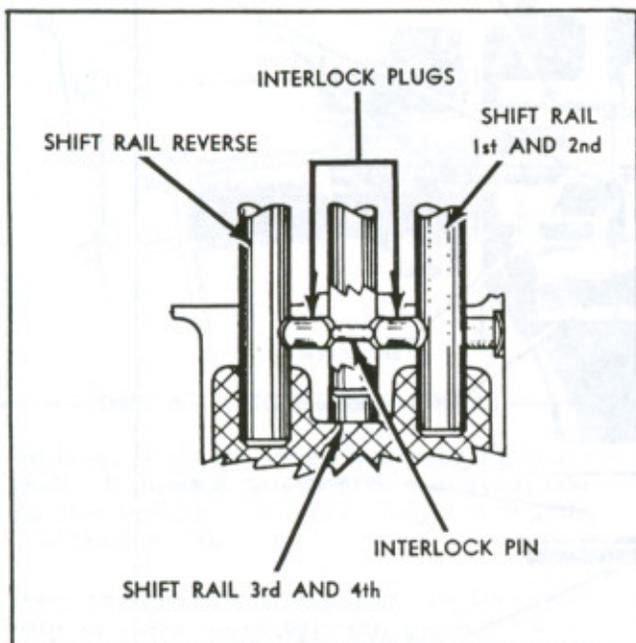
Remove all lock wires and set screws in shifter forks and shift lugs. Remove all

expansion plugs. Push shifter rails towards rear. Be sure to hold hand over detent balls and springs. The force of spring may cause injury to operator if allowed to jump free.

Press the reverse latch onto shift lever until it can be turned. When free to turn, it can be moved until the relieved section aligns with the latch rod. It can now be moved from shifter lever. Remove the boot and snap ring from top of cover. Pull shift lever from cover. The square headed guide pin can now be removed from the cover.

Inspection

Check all bearings, bushings and shafts for wear, and roughness. Check the gear teeth for wear and roughness. Check the shifter rails for wear and grooves or notches made by detent balls or detent plugs. Check the



length of interlock plugs and interlock pins. The plugs should be .566" long and the pin .546" long. If worn they should be replaced.

Check the shifter forks for wear and scoring. Some wear is permissible but if great enough between forks and shifter collar on gear that only partial gear mesh is obtained they should be replaced.

Two styles of reverse idler gear assemblies have been used. They are interchangeable as assemblies. However the bushings used are of different outside diameters and must be used with the correct gear. Check the lever ball end and shifter lugs for wear. They should be replaced if worn excessively, otherwise a sloppy shift lever will cause difficult shifting.

Check the slot in the shift lever pivot ball and the square headed guide pin and its fit in cover. An oversize pin is available and can be installed by drilling the cover pin hole to 9/32" and filing slot in lever to 11/32"

Assembly

The third and fourth speed shift rail is installed in the center position in cover. It can be identified by the drilled hole through the detent section for the detent pin. The fork is installed on the front end with the boss towards the rear. The shifter lug is installed back of fork with the long stop lug to rear.

The low and second fork is installed with the boss forward. The rail has three detent ball notches but does not have any hole clear through shaft. The shift lug has a closed side forming the closed side for shift lever.

The reverse fork is installed on the L.H. side of center rail with the curve towards outside of case. The rail has only two detent notches. The shift lug has a closed side and an extension above the pocket forming the stop for the reverse latch.

To enter shaft, install detent springs and balls and detent plugs. The detent pin is placed in center rail. Use a punch slightly smaller than detent ball. Depress ball and spring and push shaft against punch. Remove the punch and slide shaft into position.

The shift lever must be installed before assembling the shift rails etc. The reverse latch is installed on lever with the extended end down and towards the reverse shift lug. The latch rod is adjusted by turning the nut in thumb latch at the top until the latch is raised clear of the reverse lug, with thumb latch fully depressed.

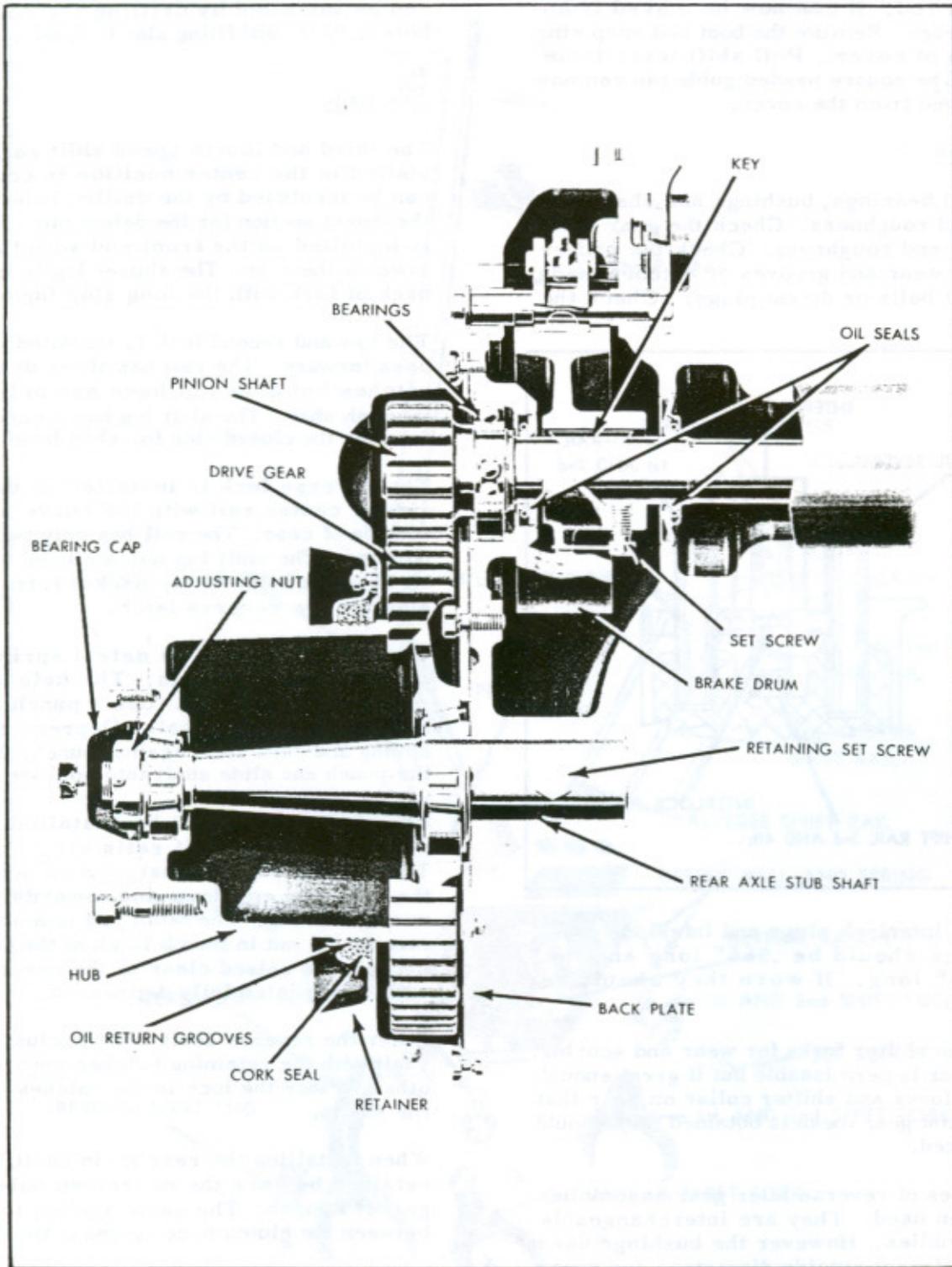
Enter the reverse shaft and the cluster gear shaft with the retaining notches toward each other. Place the lock in the notches between the shafts.

When installing the rear main shaft bearing retainer be sure the oil return hole in the gasket is open. The same applies to gasket between the clutch housing and transmission.

If either of these passages are stopped up oil leakage may result.

Install the spacer ring on the main shaft pilot bearing to the rear of bearing.

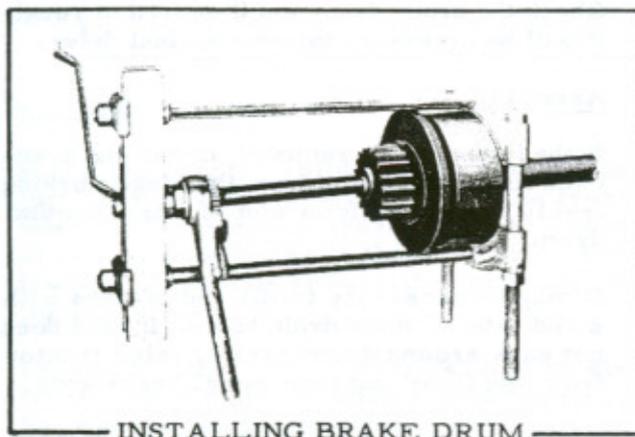
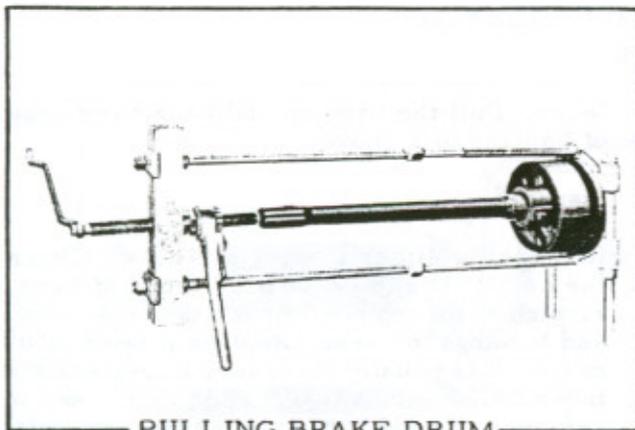
FINAL DRIVES



Removal

Raise the tractor from the floor. Remove the wheel, rim and tire. Remove the fender and brake cover. Remove the cork seal re-

tainer and the final drive cover. Remove the cap from end of hub and the bearing adjusting nut from shaft. Slide outer bearing and gear assembly from axle shaft. Remove the capscrews attaching the back plate to differential



housing. Pull the inner hub bearing from shaft. If the stub axle is to be removed, take out the retaining set screw and place housing in a heavy press.

Mark the bearing housing on the live axle with an index mark between its outer diameter and the differential housing. This will help when it is installed, as the final drive cover capscrew must enter this part. Place a pry bar between the housing and brake drum and force axle assembly out of housing.

Loosen the brake drum set screw jam nut and remove the brake drum and brake drum key. Remove the bearing retainer or housing and the bearing retaining snap ring. Press the bearing from the shaft.

On tractors prior to WC-86405, remove the nut from end of axle and press the bearing assembly and gear from the shaft.

Inspection

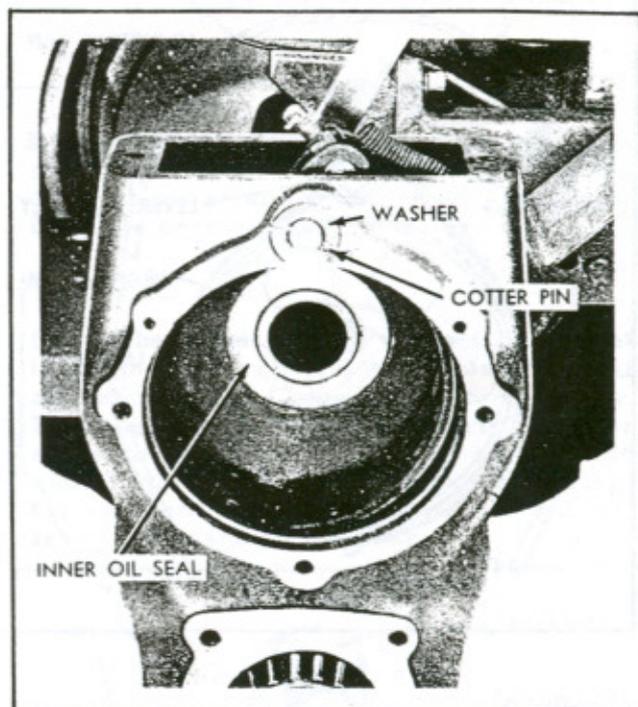
Check the gear for wear and chipping. Check the oil return groove in hub. The surface should be smooth and not worn more than .010". Wear at this point will not effect gear but will induce grease leakage. The sides of the oil groove should not have rough edges.

The R.H. hub has a L.H. spiral oil return. The left hand hub has a right hand spiral.

Check the bearing for wear and roughness. The ball bearing should be replaced if worn .006".

If the pinion and axle are "two piece" as used prior WC-86405, check the key and keyway. This gear must be tight.

Check the brake drum for wear and scoring. Always use new oil seals.



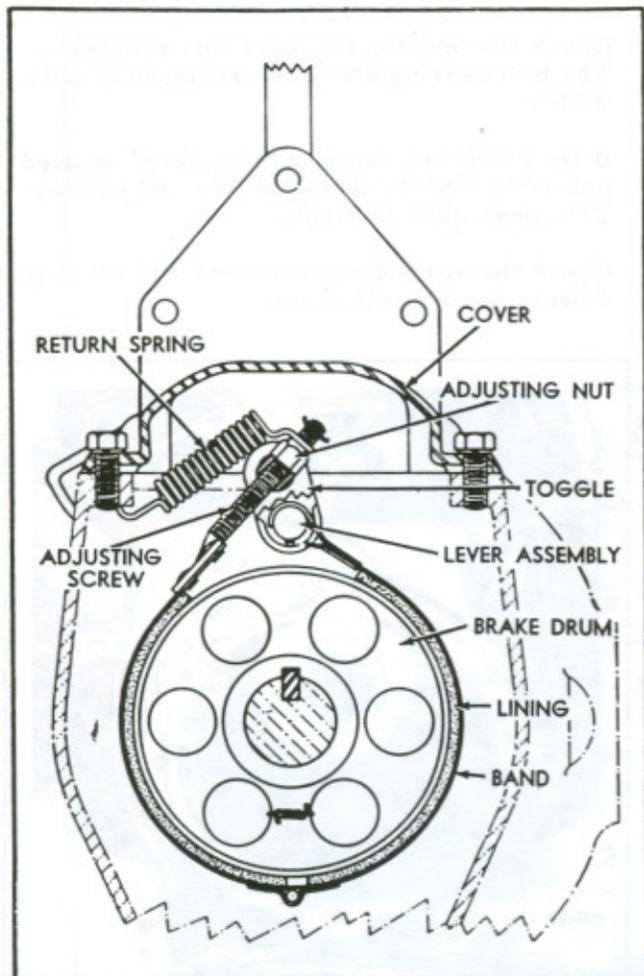
Assembly

Install seals with lips towards grease. When placing the axle assembly in housing line up the bearing cage so the gear cover capscrew can be entered.

When the back plate is installed place the vent capscrew in front of the pinion gear. Assemble the large cork oil seal in the housing cover. Lubricate the face of the seal and put cover in position allowing the seal to center itself on the hub. Hold in this position while the bolts are tightened.

Adjust the hub bearings to a slight drag. Loose bearings will cause chipping of gear teeth. Fill the bearing cap with grease and install. Lubricate with pressure gun after assembly to force grease into bearing.

BRAKES



Removal

Remove the brake cover and fender. Remove the cotter pin and washer from outer end of the brake lever. Remove the nut from bolt end of band. The lever must be turned so the woodruff key is in line with the V of loop end of band. Drive lever towards inside of tractor. Key must pass through band without catching. Key will force inside bushing out. Remove key and inside bushing from

lever. Pull the band up and back over edge of housing to remove.

Inspection

Replace the lining if worn or loose. Check the band. It should not be bent. If bent, straighten or replace. Check the lever shaft and bushings for wear. Replace if worn .010" more. It is usually necessary to replace the inner bushing as it is damaged by the key in removal. Check threads on adjusting bolt.

Check the brake drum and if scored or rough it will be necessary to remove final drive.

Assembly

If the final drive is removed, install the brake band first. Otherwise have the hinge working freely and start loop end of band around drum.

It may be necessary to lift end of band with a rod entered at the drain holes. If band does not pass around drum easily, raise tractor from the floor and turn wheel backwards.

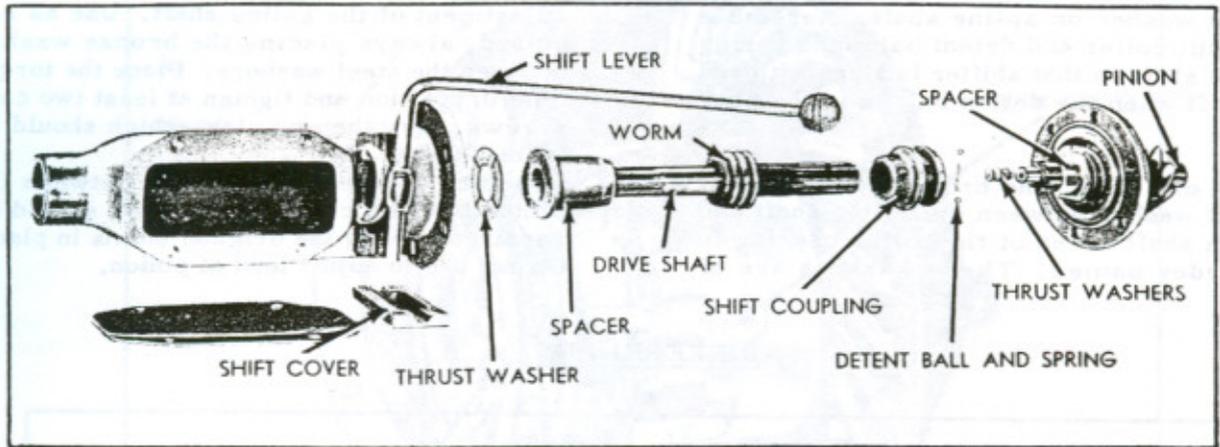
Place the inner bushing on the lever shaft. Install key in shaft. Start the shaft in loop end of band and toggle. Align keyway in toggle and drive lever shaft into position. Be sure the lever works freely in the bushings.

Adjust the brake until the latch will hold lever but not fall on through.

If tractor is equipped with cultivator the cultivator bracket must be held to one side while tightening so the brake latch will be free.

The extra extension brake lever for use with the cultivator must be installed in such manner as not to increase the original length of lever. If extended, enough leverage, may be obtained to break the band.

TORQUE TUBE, LIVE POWER LIFT AND PINION



Removal

Block the tractor solidly under the frame just back of transmission. Turn the front wheels to the straight ahead position. Place blocks of wood between the front tires and frame. This will reduce the tendency of tipping.

Loosen the seat and the four capscrews attaching the frame to differential housing. Remove the starter pedal rod. Roll the rear end assembly away from tractor.

Remove the four capscrews, and two nuts attaching the torque tube to the differential. Pull torque tube and worm shaft from pinion.

The pinion shaft and bearings assembly may now be removed from differential.

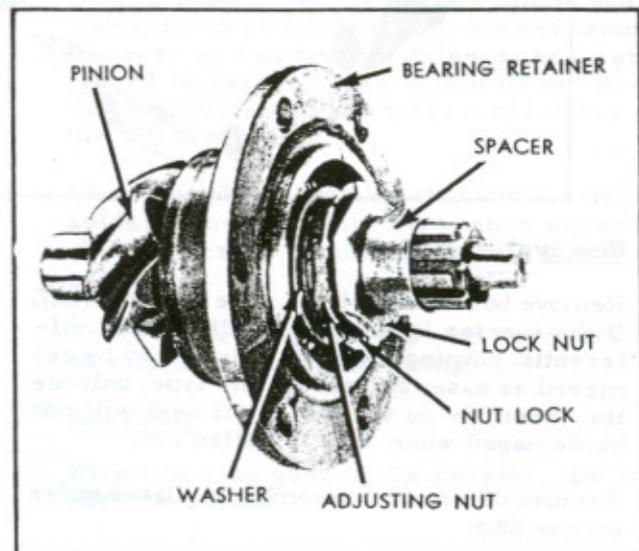
Remove the cover over the shift lever and lift the shifter out. The shaft, shifter, collar and worm can now be pulled from rear end of torque tube.

When removing the shift collar, catch the detent balls and spring. Press the worm from front end of shaft.

Remove the overshift collar from pinion shaft. Break the nut lock and remove the lock nut and retaining nut. Press the pinion from the bearing cage.

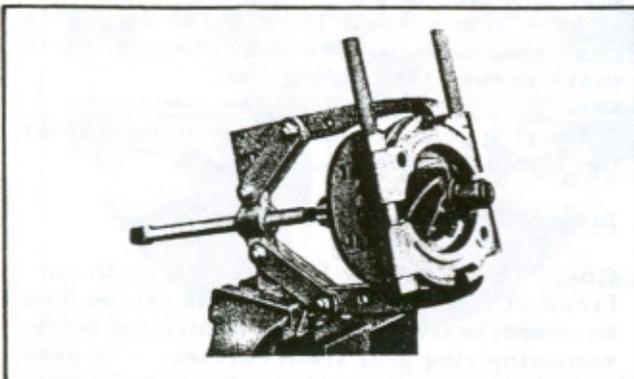
Inspection

Check the thrust washer contact surface at front end of torque tube. Replace tube if scored or rough. Check face of worm spacer. Replace if worn. Check the worm for wear and scoring. Check the shaft splines and shifter splines for wear. Check the bearings for wear and roughness. Check the shifter lever and bearings for wear.



Assembly

Install the pinion and bearings in the pinion bearing retainer. Adjust bearings to a free rolling fit without end play or binding. Install a new nut lock and tighten lock nut securely. Recheck bearing adjustment. Lock the two nuts together by bending two of the nut lock lips in opposite directions.



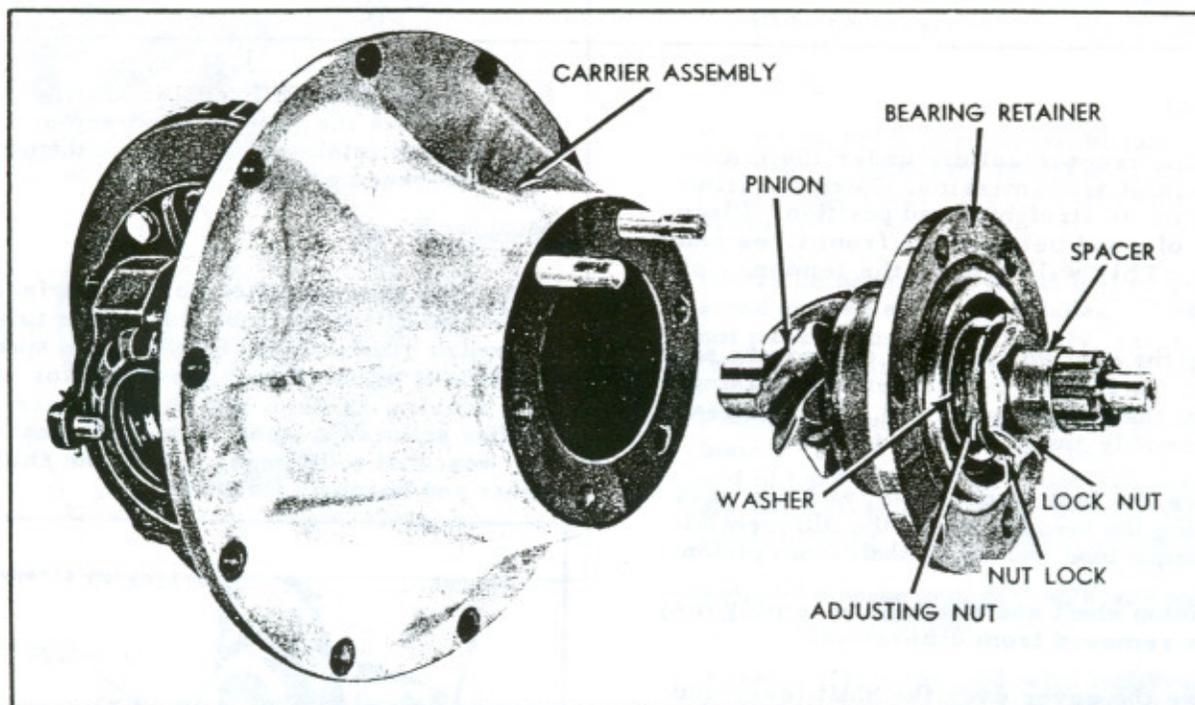
Place the overshift spacer on the pinion shaft. Assemble the worm and worm spacer and thrust washer on spline shaft. Assemble the shift collar and detent balls and spring on the shaft so that shifter is flush with end of shaft when the detent ball is in the rear notch.

Place one steel, one bronze and one steel thrust washer between the spline shaft and pinion shaft ahead of the roller bearing in the order named. These washers are of

different thickness and may be used in various combinations to secure the proper adjustment of the spline shaft. Use as required, always placing the bronze washer between the steel washers. Place the torque tube in position and tighten at least two capscrews. Try the end play, which should be from .005" to .010".

Tractors equipped with shims between the pinion bearing cage and carrier, should be repaired leaving the original shims in place. Do not use to adjust lead of pinion.

DIFFERENTIAL



Removal

Remove both final drives. (See final drives). If the tractor is equipped with a steel differential housing, the final drives may be removed as assemblies. On this type, balance the assembly so the inside oil seal will not be damaged when axle is pulled out.

Remove differential assembly as listed under torque tube.

Remove the ring of bolts around the carrier assembly and remove the assembly from housing.

Remove the four capscrews from the ring gear retaining caps. These caps should be marked, in order that they may be installed in their original position. Pull ring gear

and carrier assembly from differential carrier.

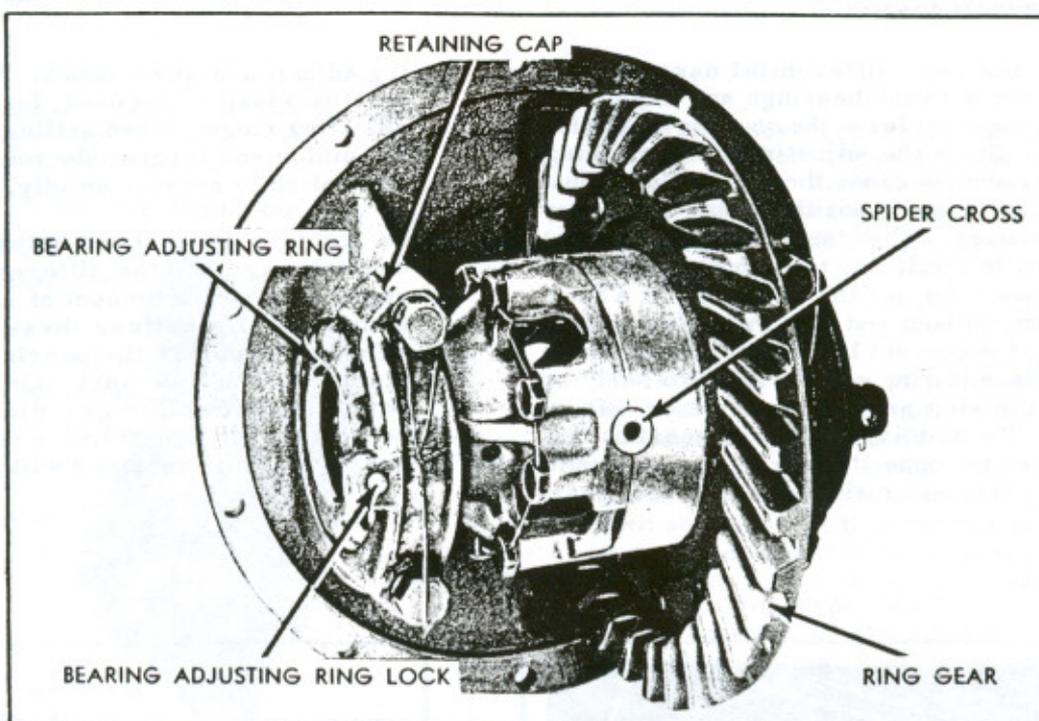
The rear pinion bearing can now be removed.

Separate the two halves of the ring gear carrier to remove the spider gears or pinions and the side gears. The two halves of this case should be marked with a single chisle mark across the parting line.

If the ring gear is removed from the carrier the rivets must be cut.

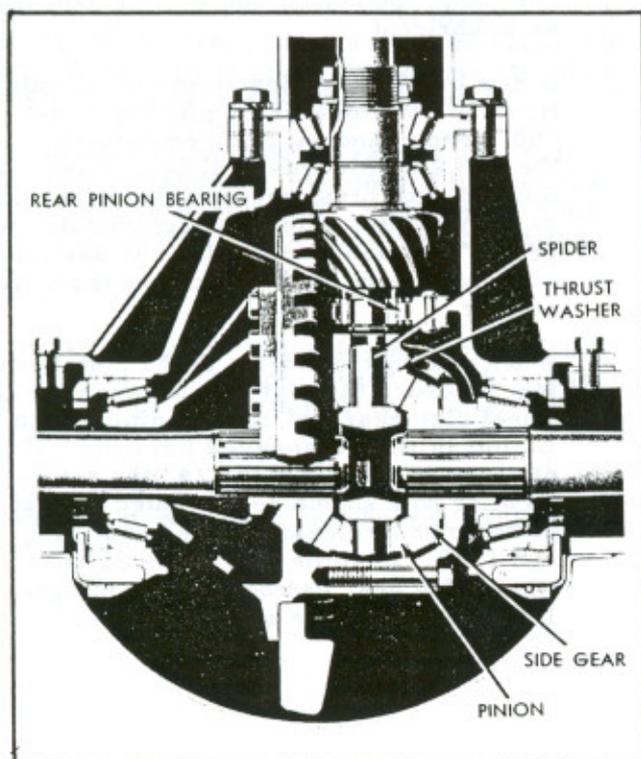
Inspection

Check the ring gear for wear on teeth surfaces. Check for run out. This can be done best with bearings adjusted tightly and before removing ring gear from carrier. The gear



should run true within .002". This can be checked by mounting a dial indicator against gear. This test need only be made if pinion is damaged or if trying to locate source of noise.

Check pinions and side gears for wear and rough teeth. Check the thrust washers and thrust faces on gears and case. They should not be worn or scored.



Two sizes of pinion thrust washers have been used. They are 1/16" thick and 1/32" thick. When the 1/16" washers are encountered they may be replaced by using two 1/32" washers.

The backlash between pinion gears and side gears should be .004" to .007". If this clearance is too tight, check for burrs, etc. on gears. Also check the 212258 pinion gear. The correct pinion has a groove cut around the rear end of teeth. A few gears were placed in repair stock which do not have these grooves and are incorrect for use in the WC tractor.

Check the pinion gear bearing surface on the spider cross. If this clearance exceeds .005" the cross or pinions or both should be replaced.

Check the bearings and cups for wear, cracks or chipping. Replace if damaged.

Assembly

Rivet the ring gear to the carrier. Do not heat the rivets.

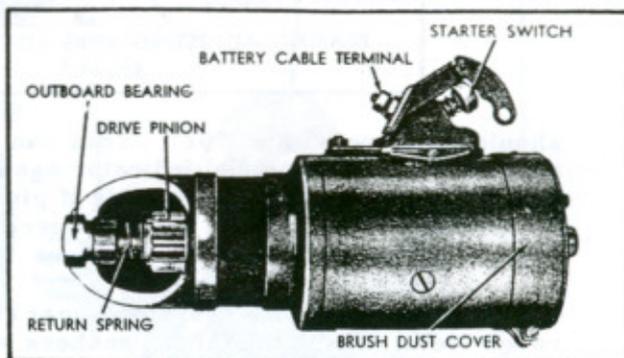
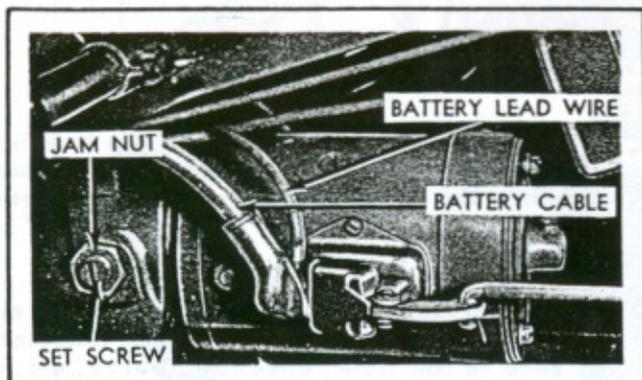
Assemble the side gears and pinions with the thrust washers, in the carrier. Match the reference marks, and assemble the two halves of carrier. Tighten the bolts evenly and tightly. Lock with wire in such manner that they cannot loosen. Try the backlash of gears. The assembly may be tight but must be free to turn in the pinion assembly by use of a 12" lever.

Set the ring gear differential assembly in the carrier with the bearings and cups. Install the caps but leave the capscrews slightly loose. Start the adjusting rings making sure they are not cross threaded. Caps must be installed in same position from which they were removed. When the bearing adjustment is nearly in position, tighten and lock the capscrews. Adjust the bearings to a free rolling fit, without end play or binding. After securing the correct bearing adjustment, set the backlash of ring gear to .004" to .007" by moving the ring gear to the right or left as desired. To do this, loosen one bearing ring and tighten the opposite bearing ring the same amount. This will maintain the correct bear-

ing adjustment at all times. After the correct backlash is secured, lock the bearing adjusting rings. When setting the ring gear the pinion and torque tube must be in place and bolted to carrier solidly.

On tractors using shims between the pinion bearing cage and the differential carrier, replace the same amount of shims as were removed. Do not use these shims as an adjustment unless the bearing cage is replaced with a new part. On tractors not equipped with shims originally it is not necessary to use shims even though the bearing cage is replaced with the new part.

STARTER



Removal

Disconnect the battery ground strap from the battery. Remove the battery cable and battery lead wire from the starter switch. Remove the starter switch rod. Loosen the jam nut and remove the starter retaining set screw. Move starter back and forth slightly and pull out of clutch housing.

Inspection

Check the brushes for length. If short, they should be replaced. Check the outboard bearing in bendix casting for wear. A worn bearing can be determined by examining the pole pieces. If bearing is worn excessively the armature will rub the pole pieces and these marks may be observed. Replace bearing if in doubt.

Replace bendix spring if bent or broken.

Assembly

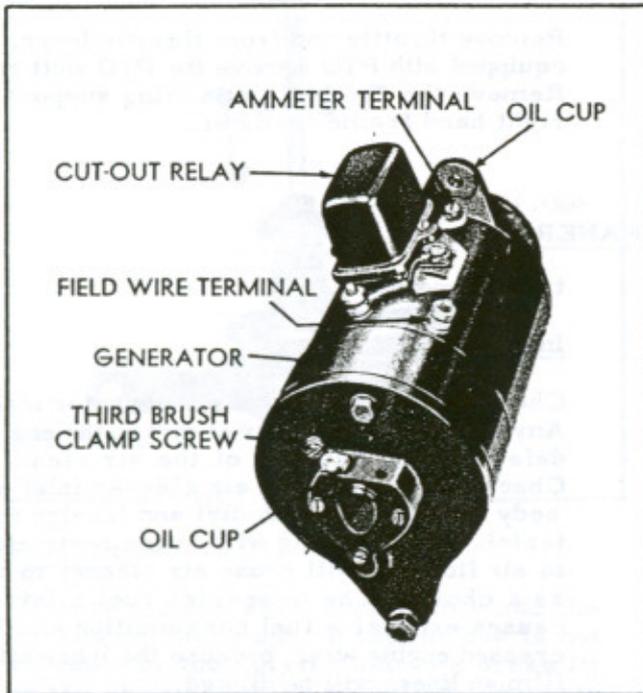
Wash out the threads of bendix drive with

kerosene. Do not oil but leave the kerosene as a lubricant.

If new brushes are installed they should be fitted to commutator by placing a piece of "00" grade sand paper on commutator with the grit side towards brushes. Turn commutator until brush acquires the same radius as commutator. Clean the commutator with grade "00" sandpaper. Do not use emory cloth or paper, as it will cause shorting of starter.

When placing the starter in the clutch housing, measure the distance between the fly-wheel ring gear and starter pinion with the pinion in the disengaged position. If this distance is greater than 1/4" the set screw locating hole should be relocated so that the pinion measurement will be between 3/16" and 1/4". In some cases the 211426 fly-wheel ring gear can be used. This gear is 1/8" wider than the standard gear.

GENERATOR



Removal

Remove the capscrew from the generator

brace and move generator towards engine until the fan belt can be removed from generator sheave. Remove the wires from the cutout relay and field terminal. Remove the bolts attaching generator bracket to tractor frame.

Inspection

Check the operation of generator before removal. Clean the commutator with grade "00" sand paper. Do not use emory cloth or paper. If, after cleaning, the cutout points fail to close at high idle engine speed, force them shut and note if generator shows charge on ammeter. If it does, replace the cutout assembly. If it does not show charge, have the generator repaired by an authorized service station. If the cutout points fail to open when engine is stopped, replace the cutout relay.

The charging rate of generator should be set at 3 amperes in low charge position, 3 amperes with lights on and 10 amperes at high charge position, all at high idle engine speed. Moving the third brush in direction of armature travel increases charging rate.

FUEL TANK AND SUPPORT

Removal

Remove the tractor hood. Shut off fuel cock on the fuel filter, disconnect fuel line to carburetor. Remove the two screws attaching the rear end of tank to tank support.

Empty fuel from tank and remove fuel filter. To remove support, disconnect light wires and remove headlights. Remove the four capscrews attaching support to clutch housing.

Inspection

Check filter shut off handle packing. Replace if signs of leaking are evident. Replace filter if broken or extremely dirty. Clean tank if filled with sediment.

Check tank cap gasket, replace if worn. The tank cap must have a vent hole and this hole must be open.

If the tank leaks it should be replaced. Soldering gasoline tanks is extremely dangerous and should only be attempted by one thoroughly familiar with this type of work.

Assembly

Place the packing strips under tank and between tank and hood. Allow tank to align itself by leaving the rear screws partly loose until hood strap is fastened. Do not tighten hood enough to crush tank.

Install the filter element in the fuel filter with the reinforcing webb on top.

The fuel shut off cock is built so that when fully open it makes a tight seal and will not leak. When only partially open the seal must prevent leakage. Place the filter above the cork seal.

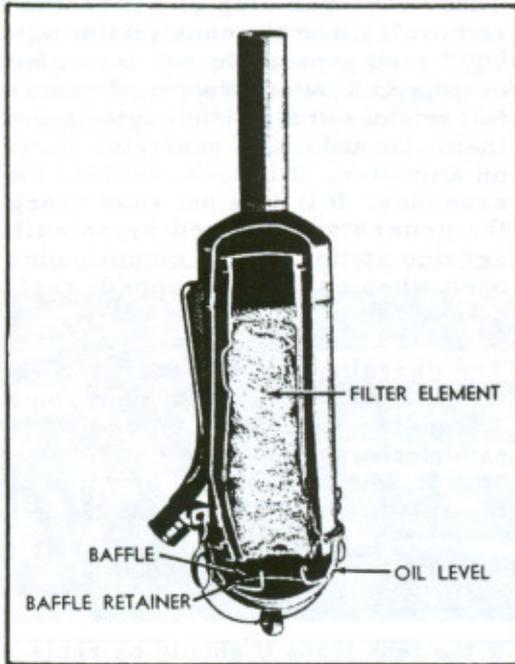
STEERING SHAFT SUPPORT AND STEERING WHEEL

Removal

Drive the pin from steering wheel hub. Support hub, while driving pin. Do not strike rim of wheel. Pull the wheel from the shaft.

Remove throttle rod from throttle lever. If equipped with PTO remove the PTO shift rod. Remove the two bolts attaching support to right hand frame member.

AIR CLEANER



tank support.

Inspection

Check the air cleaner body and cup for leaks. Any leak will allow entry of dirt to the engine, defeating the purpose of the air cleaner. Check the passages in air cleaner inlet and body for plugging with dirt and foreign material. Any plugging will cause restriction to air flow and will cause air cleaner to act as a choke. The over-rich fuel mixture causes excessive fuel consumption and increased engine wear, because the lubricating film on liners will be diluted.

Check the filter element for accumulation of dirt and foreign material. Clean by backwashing or by removal of element so it can be washed separately.

Installation

Install air cleaner using new hose and shellacking joints. Do not use any hose except the special hose supplied by A.C. Ordinary radiator hose will collapse.

Fill the oil cup with the correct quantity and viscosity of oil.

Removal

Loosen the hose clamps on carburetor inlet. Remove precleaner and hood. Remove the four screws attaching air cleaner to fuel

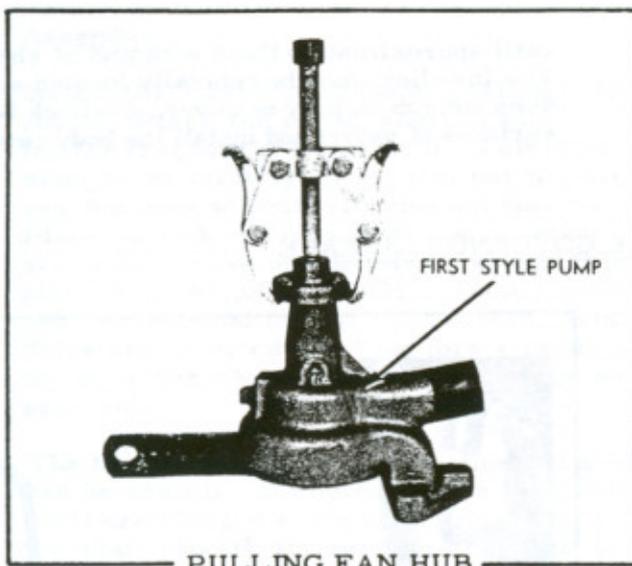
WATER PUMP AND FAN

Removal

Remove the hood and drain radiator and cylinder block. Loosen the lower hose and remove the fan blade. Leave the fan blade in radiator until pump is removed. Remove

the capscrew attaching the pump to the engine block and lift pump up and towards left side of tractor.

Two styles of water pump assemblies have been used on the "W" Engine.



First Style

Remove the fan sheave assembly and the fan hub retaining nut. If the fan hub is not retained by the nut, the hub is a press fit on the shaft and must be pulled. Remove the pump cover, thrust spring and button. Turn impellor until the pump vanes line up with the notches in body and slide shaft assembly from body. Drive the taper groove pin out of impellor and press impellor from the shaft. Drive the bushings from the body. A special punch is best adapted to this job and will shear the flange from one bushing, driving it on through body until second bushing is driven out.

Inspection

Check the bushings and shaft for wear. If worn more than a combined clearance of .008" they should be replaced. The rear bushing should be replaced if scored or scratched on the water seal surface. The water seal consists of a die cast washer that fits the curved surface of the rear bushing and a neoprene seal. Replace the seal if sealing surface is scored. This seal is located on the shaft by a pin in the impellor. Make sure the pin does not hold seal to one side as this would induce water leakage. Replace the impellor if it has any broken vanes. Check the end thrust button. And thrust spring and cover for wear. Replace if worn or damaged.

Check the fan sheave for wear at belt contact surface. If worn excessively the sheave should be replaced.

Assembly

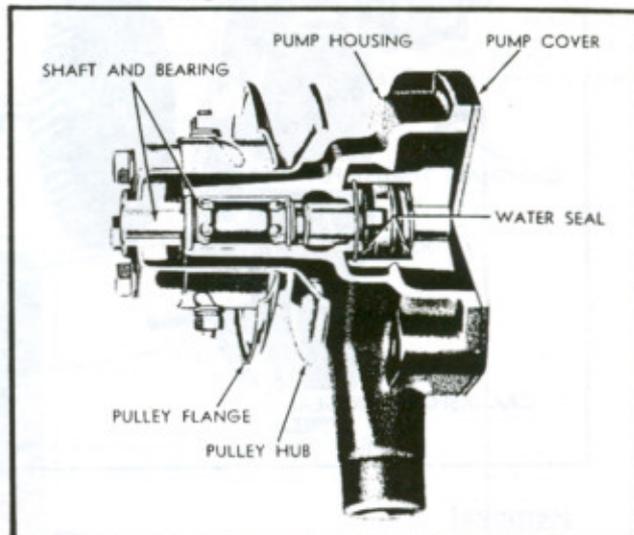
Press the bushings into pump body using tool with a curved surface for rear bushing. If such tool is not available use the old water

seal die casting.

Put the impellor and shaft assembly in position and press fan hub on until the play is .001" to .003". On pumps using a nut to retain fan hub the adjustment is made by shims placed between nut and hub. The water seal should be lubricated with water pump grease before assembly.

Lubricate the end thrust spring button with water pump grease. Shellack both surfaces of the gasket and install with the spring tail in the notch in cover plate.

Soluble oil should be used in the cooling system of the engine.



Second Style

Disassembly

Pull the fan hub from the pump shaft. Remove the bearing retainer snap ring from front of body. Remove the cover plate and press the shaft assembly from impellor and body. Turn impellor until it will align with notches in body and remove. Remove the snap ring from the impellor and remove the seal assembly.

Inspection

The shaft assembly consists of a shaft and bearing and are not serviced separately. If worn .005" it should be replaced.

Check the seal surface of body. If worn uneven or scored the body should be replaced or resurfaced. Always use a new seal assembly.

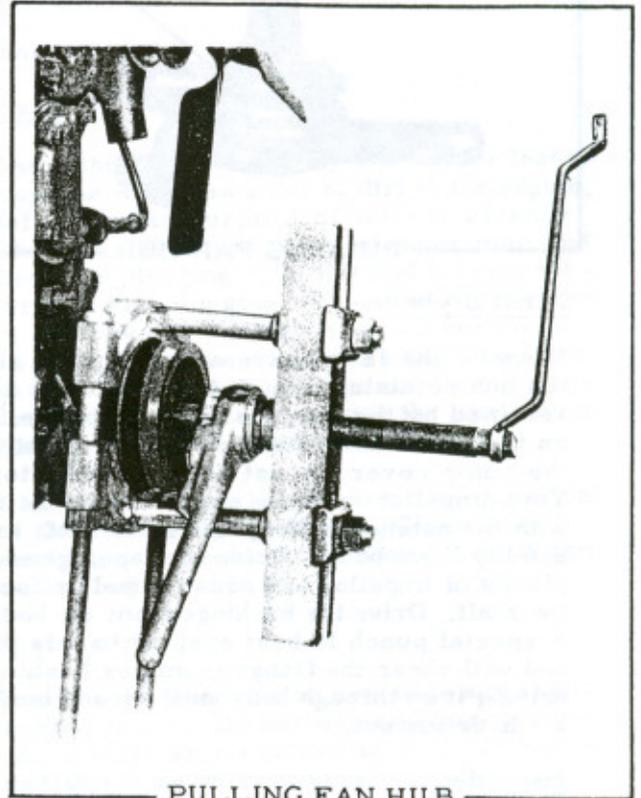
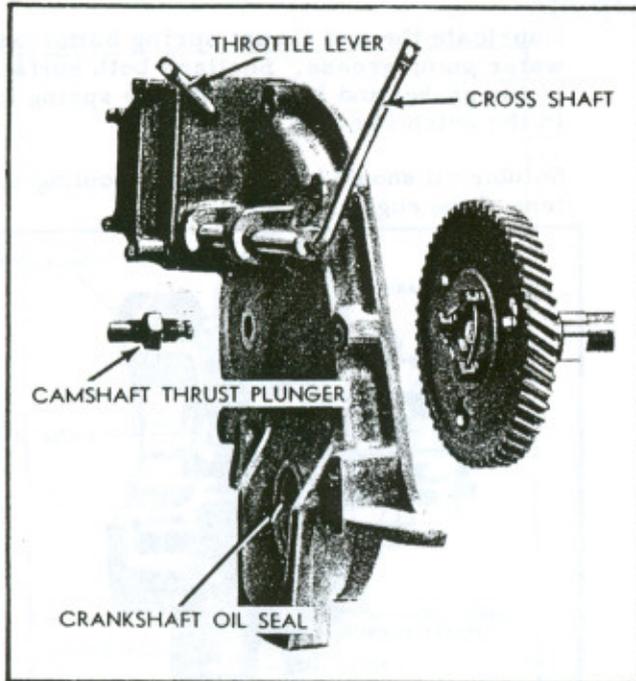
Assembly

Install shaft assembly in pump body and insert

snap ring. Press fan hub on shaft until flush with the end of shaft. Assemble the neoprene seal, seal retainer spring and carbon seal washer in the impellor and insert the retaining snap ring. Press the hub onto shaft

until approximately flush with end of shaft. The impellor must be centrally located so it does not rub on body or cover. Shellack both surfaces of gasket and install the body cover.

TIMING GEAR COVER & GOVERNOR LINKAGE



PULLING FAN HUB

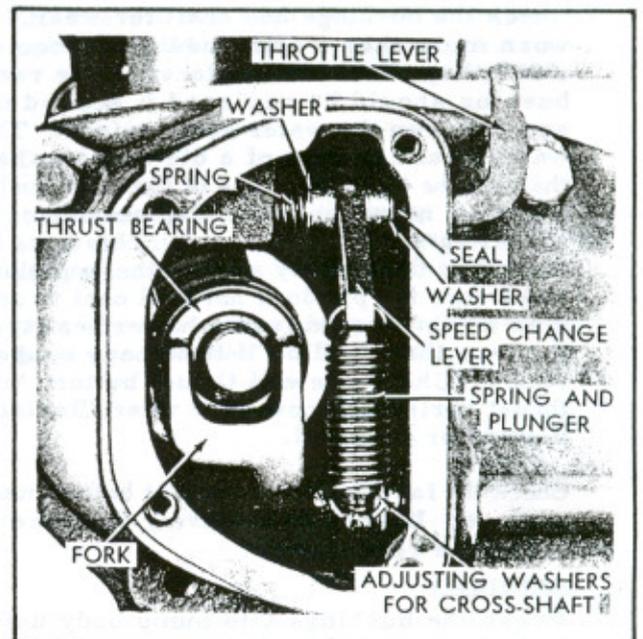
Removal

Remove the hood and radiator. Drive the pin from the starting crank extension and loosen extension bracket. Pull the crankshaft fan pulley. Disconnect throttle rod and governor link rod.

Remove the front motor support and the capscrews attaching cover to cylinder block.

Inspection

Always use a new front crankshaft oil seal. Check the camshaft thrust plunger assembly. Replace if contact surface is scored or worn. Check the throttle lever for wear. Replace if worn. The cover can be drilled and the cross shaft tube bushing installed if cover is worn where throttle lever shaft passes through the cover. A jig should be used to properly locate drill. Replace the cross shaft tube bushings if worn. Check the spring eye holes in governor levers and contact surfaces of levers. Replace if holes are elongated or contact surface worn flat.



Assembly

Install the cross tube and bushings in cover. Place the cross shaft in tube and try for freedom of movement. This shaft must be absolutely free. (Do not install new bushings without removing old bushings) Place the fork on cross shaft and use enough shims to remove end play from shaft. End play should be .003" to .005". Do not bend shaft while installing taper pin in fork. Next drive tube in or cut until the fork straddles the governor shaft with equal clearance on each side.

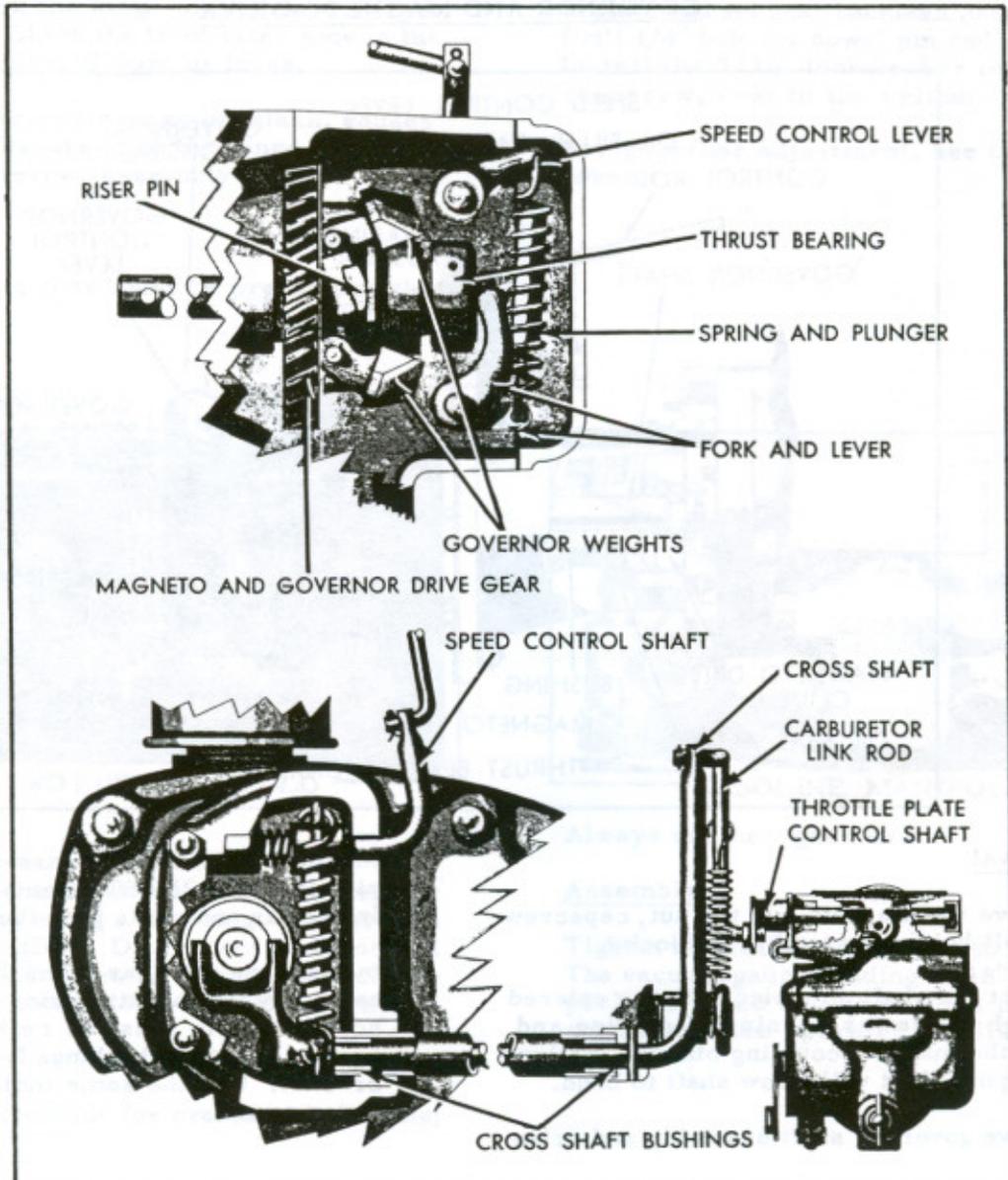
The throttle lever shaft with the leather seal can be used in all engines if the fork and shaft are changed at the same time. Install the shaft placing the leather seal next to cover, next the two metal washers, lever and spring.

Hook the governor spring, being careful not to open spring eyes and increase the length of spring.

Use spring U-3192 with U-3086 governor assemblies and spring 222822 with governor assembly 217050. The 222822 spring can be identified by a stripe of green paint.

In all events make sure the spring is extended to 3-1/16" when throttle is fully open. On some of the older engines it may be necessary to file out cover above arm so it can be raised higher. On engines above W-84264 the cover was cast with a depression above the lever.

To adjust governor linkage, place the hand lever in the full speed position. Hold the carburetor throttle valve wide open. The link rod should just reach between cross



shaft arm and carburetor valve arm, or at most be 1/16" too long.

Take the engine speed at high idle. It should be 1577 to 1622. If the speed is too high, let the throttle rod out of hand lever at the quadrant, reducing the spring tension on the governor. Speed can be taken at belt pulley, which is 1420 to 1470 R.P.M.

The cross shaft arm must be bent to secure the proper link rod adjustment. Use care not to twist the cross shaft and cause binding in the linkage.

On engines equipped with 217050 governor assembly and U-3192 governor spring the link rod should be 1/8" to 1/4" too long. It will be best to discard the spring replacing

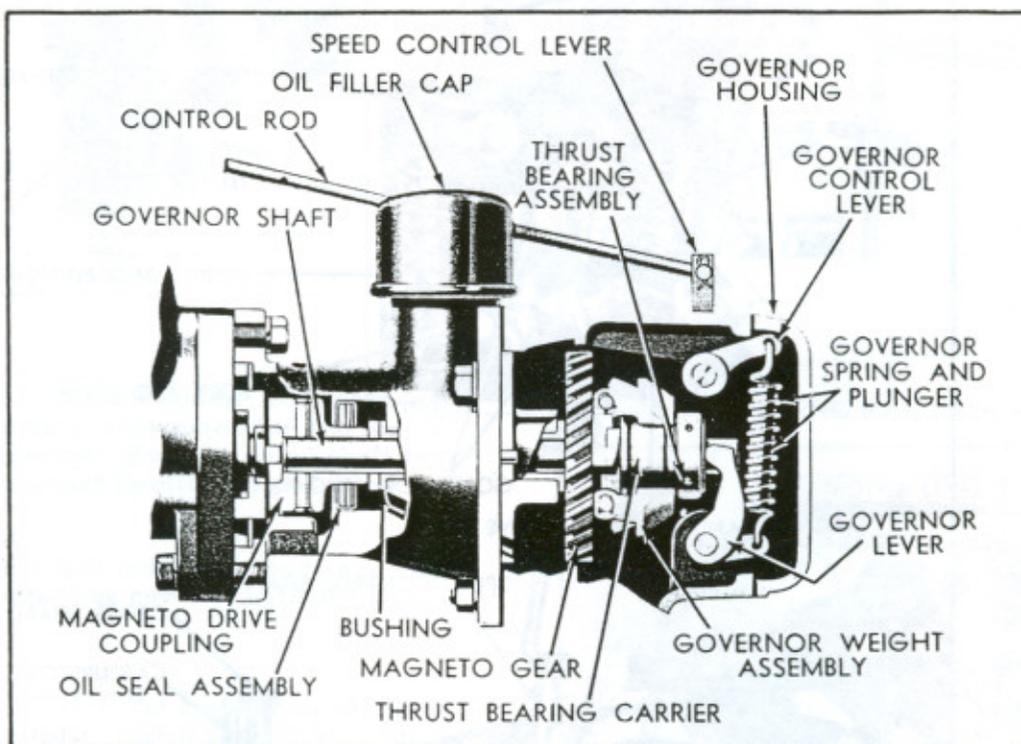
it with a 222822 spring and readjusting as above.

When installing the cover assembly to the cylinder block, back out the camshaft adjusting screw. Center the oil seal on the crankshaft. It is best to use a special jig for this purpose. If the seal is not centered oil seepage will be induced.

Adjust the camshaft end play by turning screw in until tight then backing out 3/4 turn and locking nut.

Use the 2-1/4" capscrew at lower left side and 3-1/4" capscrew at upper right and the 1-3/4 capscrews in remaining holes. All as viewed from operators seat.

GOVERNOR AND MAGNETO DRIVE



Removal

Remove the magneto and the nut, capscrew and bolt holding assembly to block.

Support the shaft on a piece of pipe entered through the lower opening of casting and drive the magneto coupling pin out. Failure to support shaft will allow shaft to bend.

Remove governor shaft assembly and drive

the pin from the U-3086 assembly or the two pins from the 217050 assembly. Remove pin from gear and press gear from shaft.

In pressing the gear from the 217050 shaft assembly the thrust bearing surface will be scored. This must be refinished if used again. Press the bushings from the magneto bracket. Use the same tool as used on the water pump.

The first style of 217050 governor assembly used a gear with a larger bore. If this style is to be repaired and a shaft, gear, or thrust bearing carrier is needed all parts must be replaced.

Inspection

Always use a new oil seal. Check shaft and bushings for wear, if combined clearance exceeds .008" they should be replaced. Replace the magneto coupling if impulse coupling jaws are worn. Check the hole in shaft. If the new pins do not fit shaft tightly the shaft should be replaced. The thrust bearing carrier section of shaft should be examined for scratches, scoring and wear. If damaged, replace shaft and carrier. The thrust bearing should be replaced if worn or rough. Check the riser pins on weights (217050 assembly). Replace if worn. Replace carrier if worn on section contacted by riser pins. Check the hinge pin holes in weight assembly. Check the fit of riser pins in the weight. Replace if worn or loose.

Timing gear with excess backlash, causes excessive breakage of the hinge pin in the U-3087 governor assembly.

Assembly

If the timing gear must be pressed on the

217050 assembly, it must be heated to a blue color, to prevent scoring of the thrust bearing carrier surface.

When installing the U-3086 weight assembly, do not rivet the hinge pin. Use a center punch ground to a 30° angle and swell end section only enough to retain the washer. Excessive riveting will cause pin to break.

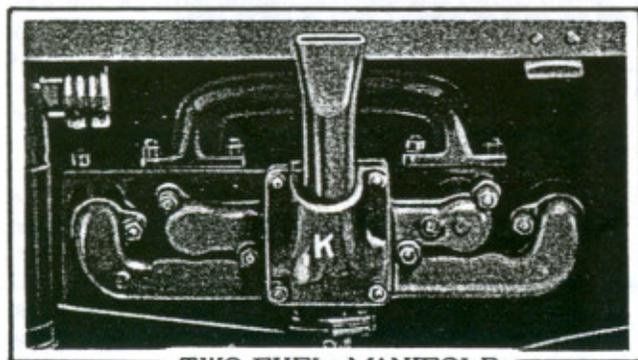
Support the shaft when riveting the magneto coupling pin.

When installing the assembly in the tractor the magneto gear must be timed with the camshaft gear. The best method, is to attach the magneto to assembly and proceed as under magneto timing, holding the magneto in position while entering gear.

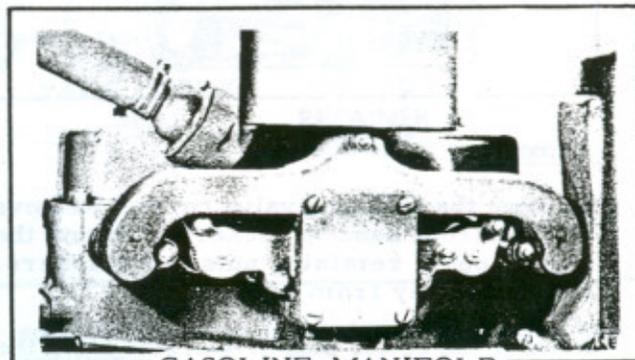
If a new cylinder block is used, the pin hole for dowel pin is not drilled. Bolt assembly in place and set gear backlash .003" to .005". Drill 1/4" hole for dowel pin and insert pin. Install the 7/16" lockwasher on the 3/8" capscrew, next to the cylinder block.

For governor adjustment, see timing gear cover.

MANIFOLD



TWO FUEL MANIFOLD



GASOLINE MANIFOLD

Removal

Disconnect the air cleaner hose, carburetor link rod, choke rod and spring. Remove the hood and muffler. Disconnect fuel line and remove the carburetor. Remove the nuts attaching the manifold to the cylinder head.

Inspect

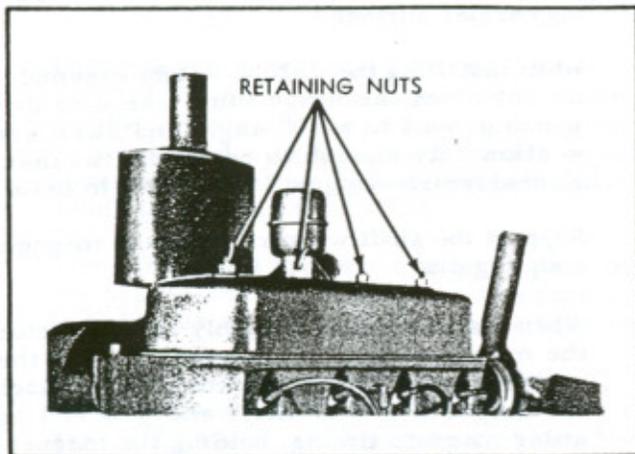
Inspect the manifold for cracks and plugging;

Always use new gaskets.

Assembly

Tighten the manifold stud nuts to 20 Ft. Lbs. The vacuum gauge reading is 18" for a properly adjusted engine in good mechanical condition when operated at idling speed.

VALVE COVER



Removal

Remove the hood and the four nuts retaining

the cover to the cylinder head.

Inspection

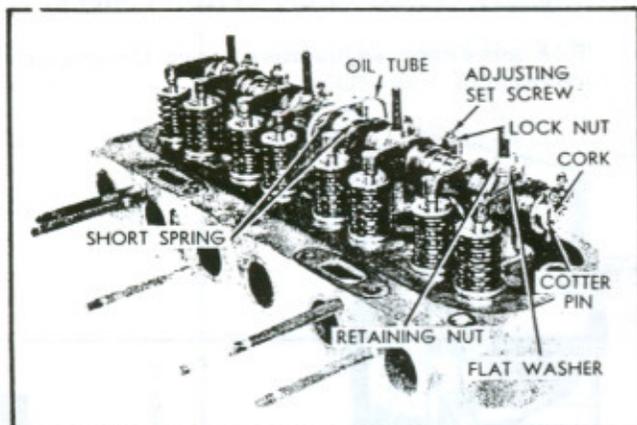
Always use a new cover gasket. If the cover has been crushed down from over tightening retaining nuts, it should be replaced. Use new gaskets between retaining nut washers and cover.

Assembly

Assemble gasket to cover with shellac and allow to dry. Place cover in position and tighten nuts evenly. Do not crush cover.

The breather cap is a part of the cover assembly and should be thoroughly clean. Coat breather filter element with oil.

ROCKER ARM ASSEMBLY



Removal

Remove the hood and valve cover. Remove oil line from head to rocker arms and the four support retaining nuts and washers. Lift assembly from head.

Remove the cotter pins or hairpins from the end of shaft and remove the rocker arms, springs and supports from the shaft.

Inspection

Check the shaft and rocker arm bushings. The combined clearance should not exceed .008". The rocker arm face contacting valve, should be refaced if worn flat. Reface to correct curvature on the valve lathe. The

two halves of the supports should be oil tight at the joint and flat at top surface contacted by the flat washer. All supports must be of the same length from center of shaft to cylinder head.

The intake rocker arm has an oil shed ground in its upper surface between the shaft and the valve stem. This shed governs the amount of oil allowed to reach the intake valve. Excess oil to intake valves causes abnormal oil consumption. Check the assembly while in operation and correct any leaks or spray which might strike intake valves. In the event of continued oil consumption it may be necessary to decrease the width of oil shed slightly.

In some extreme conditions the oil to the exhaust rocker arm caused a splash from the exhaust valve spring to the intake valve. Excessive wear of rocker arm bushings will cause uneven distribution of oil to the valves. On engines with cast steel rocker arms the exhaust arm should be drilled in channel of web into bushing to lead extra oil to the valve. On engines of this type the shaft must be installed with the holes for oil towards the cylinder head.

Assembly

Assemble the short spring towards the center oil tube connection. Place the exhaust arm,

support, intake arm, long spring, intake arm support, exhaust arm, washer and retainer on the shaft in order. Assemble opposite end the same. Install supports so split side of support is towards the push rods. Use the short cork in shafts with cotter pins and the long cork in shaft with the hair pins. Place the long cork with about one half its length in shaft and leave the outer end about long enough to touch the cover. This will prevent cork from coming out.

When tightening assembly to head, shift shaft, supports, etc. until the two end rocker arms are free.

Adjust the valve clearance to .010" with the

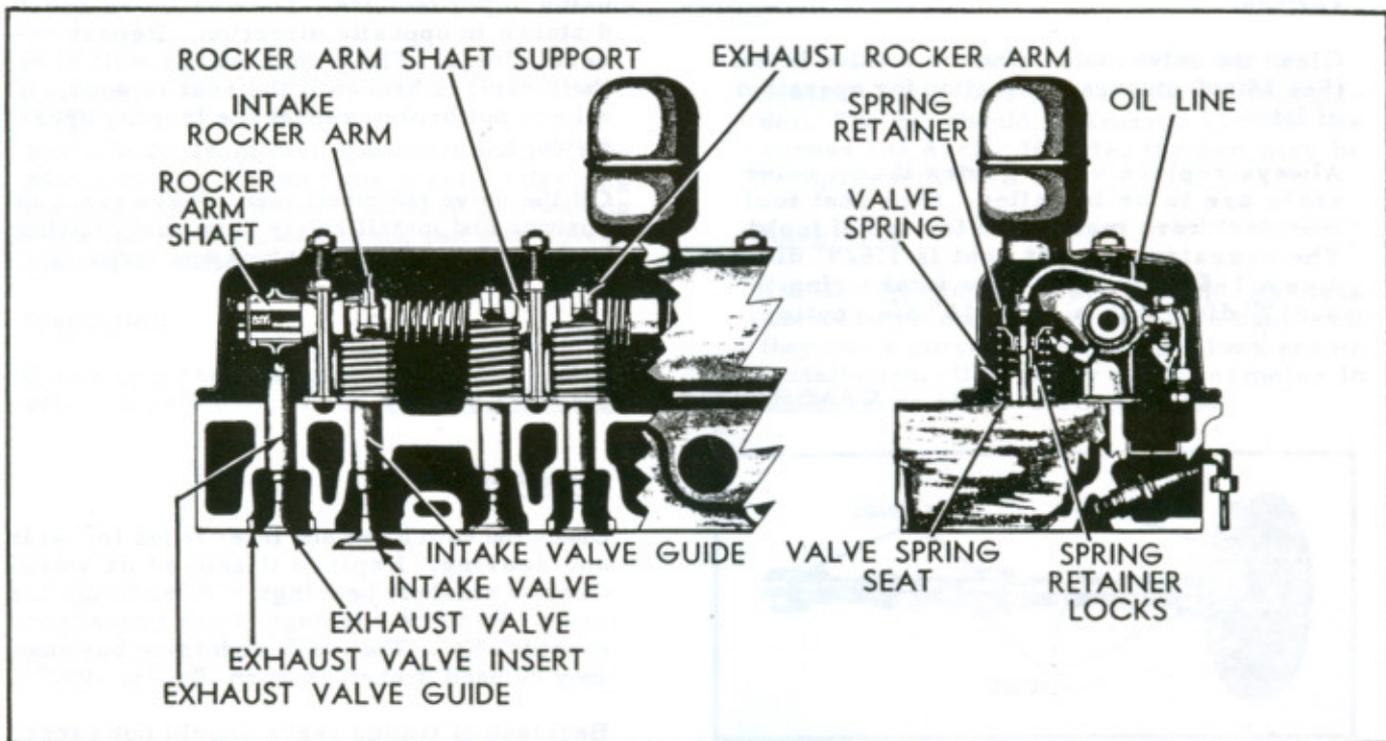
engine heated to normal temperature. Adjust the valves with cylinder on its compression stroke.

Valve leakage is caused by worn guides, rocker arm contact surface worn flat, valves sticking or excessive valve lash clearance.

Excessive valve lash clearance retards valve timing and lowers engine efficiency.

When installing the valve cover, do not tighten retaining nuts enough to crush the cover. Stop tightening just before cover strikes the cylinder head.

CYLINDER HEAD



Removal

Remove the hood, valve cover, and rocker arms. Drain the radiator and cylinder block. Remove the manifold. Remove the upper radiator hose connection and water manifold. Remove the nuts and washer attaching the cylinder head to the block.

Compress the valve springs and remove the two keepers, retainer and spring. Remove the safety snap wire from valve stem and remove the valve. Best practice is to use a board with eight holes. Drop valves in holes

so the valve may be replaced in its original position.

Inspection

Check the valve guides and stems. Use plug gauges to check guides. A combined clearance of .008" or more indicates valves or guides or both should be replaced. If the margin of valve is 1/64" or less the valve should be replaced. The margin is the portion of head between the seat and top of the valve.

The valve seats must not allow valve to be lower than flush with the head. If seats are low or cannot be refinished to proper width they should be replaced. Oversize exhaust valve seat rings are available.

Standard rings are available for the intake valve seat.

Examine the core hole plugs for evidence of rust and leaks. They can be removed to clean head if necessary.

Check the valve springs for length. They should be 2-5/16" free length. Replace if more than 1/16" short.

Assembly

If the core hole plugs are removed, replace with new plugs, using a sealer on the contact surface.

Clean the valves and reface in a valve lathe. (See Manufacturers Instruction for operation of lathe.)

Always replace valve guides if new valve seats are to be installed. (See seat tool manufacturers instruction for use of tools). The oversize exhaust seat is 1.629" dia. Use a 1-5/8" cutter. The intake ring is 1.817" dia. Use a 1-13/16" dia. cutter.

Drive the insert in with a pilot driver or use dry ice to shrink the ring so it can be positioned without driving.

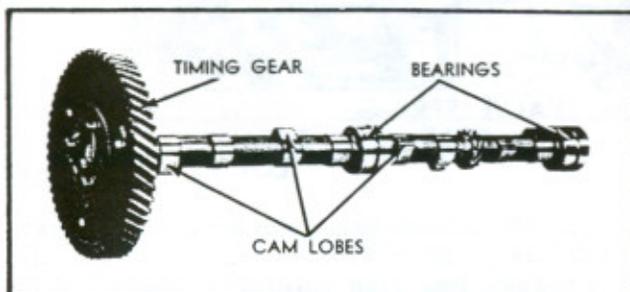
Guides must be pressed in the head until the scribe line on guide is flush with the top of head. The exhaust guide is the shorter. Use a press or a special driver to install guides to prevent swelling and collapsing guide bore.

Reface the valve seats using a high speed grinder and 45° stone. Use a 60° and 30° stone to narrow seat surface. The seat width should be 1/16".

Lap the valve to its seat, using fine compound. The seat should be polished all the way around. Check by making pencil marks across face of valve about 1/4" apart. Place valve on seat and rotate valve about 1/2" using high pressure. Turn valve an equal distance in opposite direction. Repeat several times. The pencil marks will have their centers broken if the seat is good. If all are not broken repeat the lapping operation.

Oil the valve stem and seat. Place valve in position and install safety snap wire, spring seat, spring, spring retainer and locks.

CAMSHAFT AND VALVE LIFTER



Removal

Remove the valve cover and rocker arm assembly and push rods. Remove the oil sump and timing gear cover. Pull the camshaft forward, holding the lifters away from lobes on shaft.

The shaft can be removed with engine in frame, if the front support cover plate and cam gear are removed. Bushings cannot be replaced without removing the flywheel.

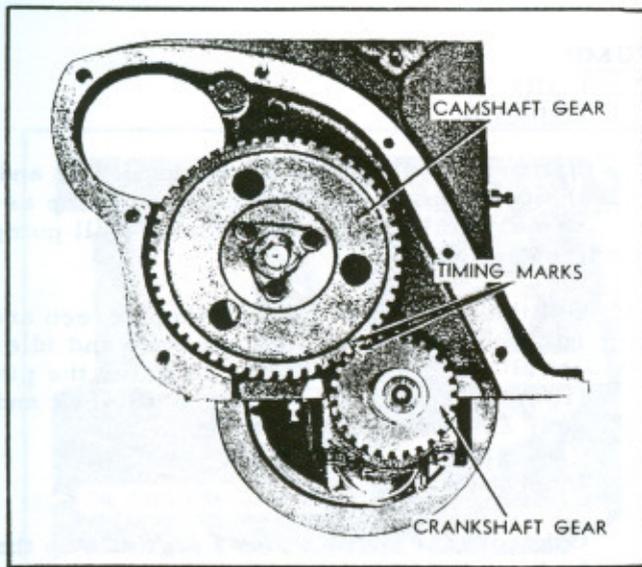
Inspection

Check the cam lobes and lifter faces for wear and scoring. Replace if scored or worn. Check camshaft bearings and bushings for wear. Replace bushings if total clearance exceeds .006". The .0025" undersize bushings may be used if shaft is worn .001" to .002".

Backlash of timing gears should not exceed .007" when using the U-3086 governor assembly and .010" when using the 217050 governor assembly.

Assembly

Install the camshaft bushings, lining up the oil hole with drilled passage in the block. Install rear bushing first, driving in from the front. Drive in until flush with expansion plug bore. Place center bushing in center of web. Drive front bushing in until flush with front of block. Use special driver for installing bushings.



Be sure the oil drain hole between rear bushing and expansion plug in block is open. Install expansion plug, using a good sealer on outside edge. The shaft must fit bushings with .002" to .004" clearance. If too tight, bushing may seize and turn, closing oil hole. If too loose will cause loss of oil pressure. Install the pipe plug in rear end of camshaft and thrust plug in front end. This front plug is special as it carries the end thrust of shaft and has a small hole to supply oil to the thrust surface.

Time the camshaft to the crankshaft by aligning the straight marks on each gear together.

For setting end thrust (see gear cover).

OIL SUMP

Removal

Remove the front motor support and the fly-wheel cover. Remove the screws attaching the sump to the block. Use care in breaking sump loose from block as the pan may spread making it difficult to hold the arch gaskets.

Inspection

Clean pan and examine the covers at ends of arch gasket. These corners must be

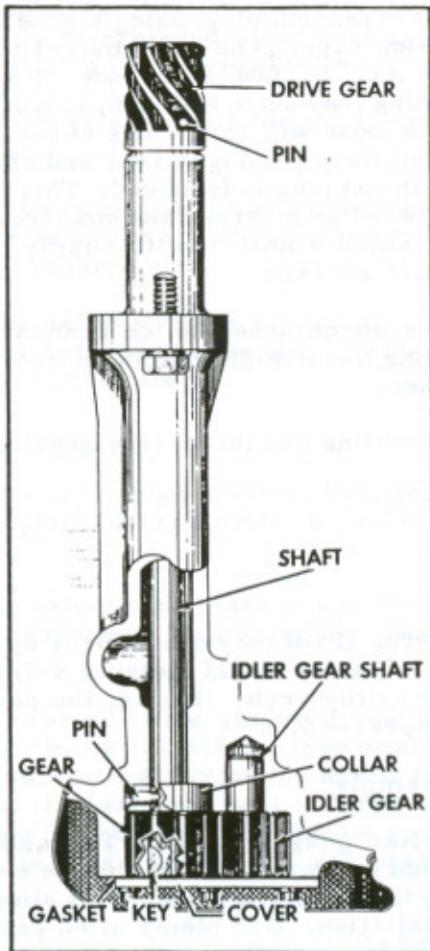
square. If not they can be built up with solder. The pan should measure 4-7/8" inches across the arch. If wide, the pan may be compressed.

Assembly

Shellac gasket to pan. The end gaskets should be stored a short time in a can, until they take a curved shape. This allows easier installation. Use plenty of #2 permatex in the corners of the arch gaskets.



OIL PUMP



Removal

Remove the oil sump, the pump oil line and the two capscrews attaching the pump assembly to the cylinder block. Pull pump from engine.

Cut the wire from the oil pump screen and remove screen and pump cover and idler gear. Support the shaft and drive the pin from the spiral drive gear. Pull shaft and gear assembly from the body.

Inspection

Oil from the pump follows a groove up the body and shaft to lubricate the cam drive gear. Wear on shaft or body may cause low pump pressure. Replace if clearance exceeds .008". Replace gears if backlash clearance exceeds .015".

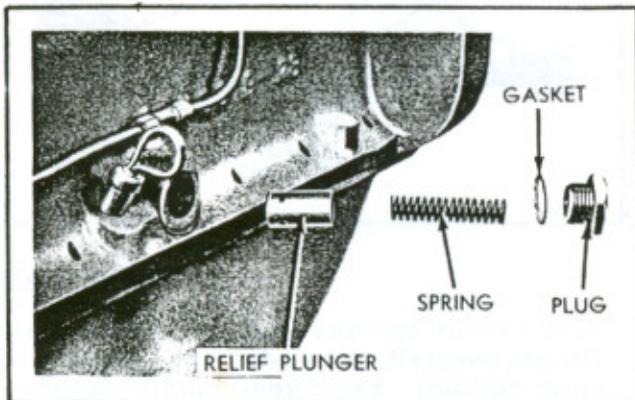
End play of the pump gears should be about .002". If greater, the body may be lapped on a face plate with compound.

Assembly

When riveting the pin in drive gear, support the pin so the shaft will not be bent.

Install the short cover screw in the hole directly over the pump inlet opening.

OIL PRESSURE RELIEF VALVE

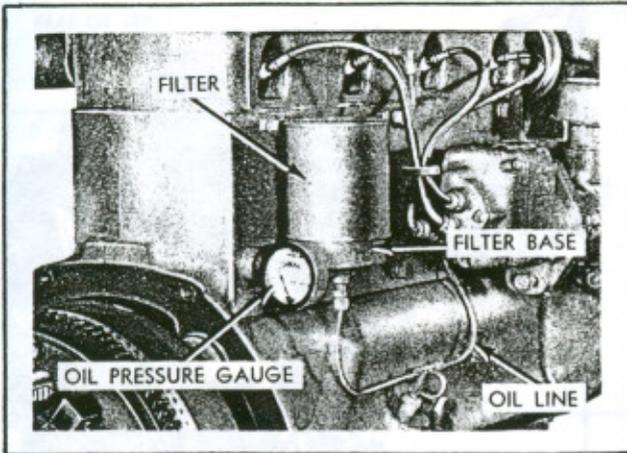


Remove the large plug from the right hand side of the block. Remove the spring and relief plunger.

The plunger does not need a good seat in block as the plunger floats in operation.

Oil pressure may be adjusted by adding washers between spring and plug to increase pressure and adding gaskets between plug and block to decrease pressure. Do not adjust for low pressure until other sources of low pressure have been investigated.

OIL FILTER ASSEMBLY



Removal

Disconnect the oil lines and remove the oil gauge. Remove the filter element and the two nuts attaching filter to push rod cover plate.

Inspection

Pressure gauges sometimes fail to register pressure because dirt enters the small metering hole in the end of the gauge. This hole may be cleaned with solvent and compressed air.

The filter base must be open so oil from filter to engine is not obstructed. Obstruction at this point or frozen condensation will cause filter cans to blow up.

Filters with unevenly distributed filtering material will cause low pressure. Filters with too much filtering material will cause high pressure. Do not confuse low pressure caused by filter with a new filter that is not thoroughly saturated with oil. Dry filters will show momentary low pressure, until saturated with oil.

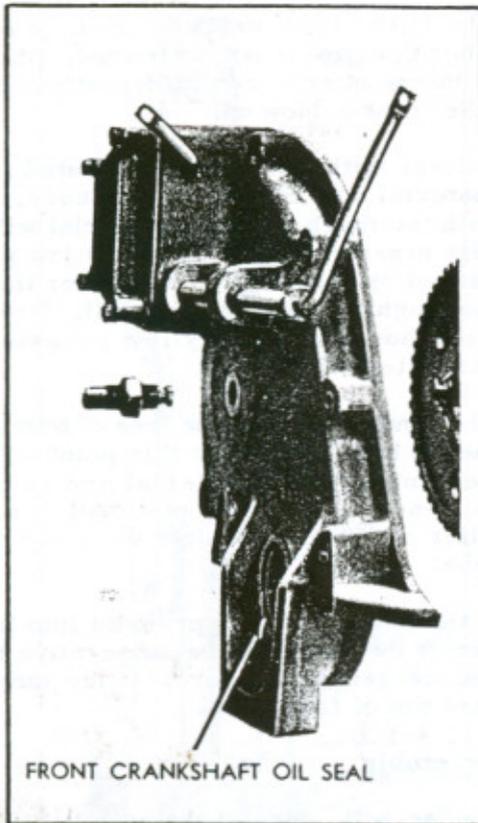
The center tube must be free of burrs around the oil hole. Burrs at this point will cause wadding of filter material and ruin filter. For easy installation, place oil in center of filter and press straight down over center tube.

If the center tube is pressed into base too deeply the filter will be inoperative and will reduce gauge pressure. If too long it will dent top of filter can.

Assembly

Shellac both sides of the base to cover plate gasket.

Tighten filter can and after operating about one hour, retighten.



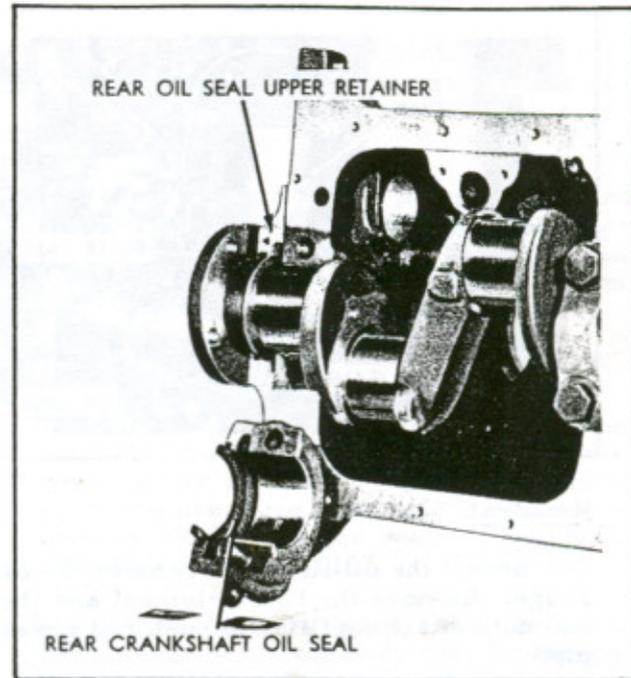
Removal

The front seal is in the timing gear cover and can be replaced if crank shaft fan pulley is removed.

To replace the rear seal, remove engine, oil sump, clutch and flywheel. Remove the rear main bearing cap and the upper seal retainer.

Inspection

Check the oil threads or grooves. They must be clean, free from nicks and burrs and not worn undersize more than two or three thousandths of an inch. Always replace seal corks.

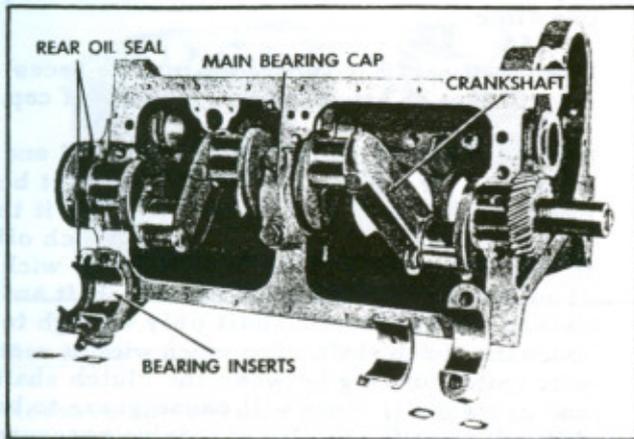


Assembly

Clean grooves in retainers and dry thoroughly. Shellac groove and allow shellac to dry partially before entering corks. Install cork and if possible allow to dry thoroughly. Do not cut ends of cork. Let them extend from retainer. Retainers that have an extra strip of paper behind the cork must continue to use this backing. To determine if the backing is necessary, press cork into place. It should be 1/32" wider or higher than groove. Use the key shape gaskets between the rear main bearing cap and block. Lubricate the face of cork so it will not seize shaft.

The front cork should be shellacked in cover and lubricated on its face. The timing gear cover must be located so the seal is perfectly centered on the crankshaft.

Seal leakage will be caused by loose main bearings.



Removal

Remove engine from tractor. Remove the clutch, flywheel, oil sump and timing gear cover. Remove the connecting rod and main bearing caps. Usually other work will be done on engine at the same time and the cylinder head will be removed, allowing rod and piston assembly to be removed from the engine.

Inspection

Inspect the front and rear oil seal oil return threads. They should not be nicked or worn more than .002" to .003".

Use an accurate micrometer and measure the bearing journals. Measure each journal at the ends and center recording the three readings taken. Revolve micrometer on shaft 90° and take three more readings.

The shaft should not be out of round or tapered more than .005" or more than .005" between the high and low readings as taken above.

The shaft should be replaced if out of round .0025" or more. This measurement would not include any taper wear as above. If the shaft is worn .0025" undersize and still round and fit for use the .0025" undersize bearings should be installed.

The shaft must be free from scratch and score marks.

The ridge that encircles shaft at oil hole will not cause any difficulty, however, when fitting new bearings to such shaft be sure a good fit is obtained.

End thrust of shaft should not be more than .011".

Assembly

Install the bearing inserts in the block and bearing caps with the lip on insert in the recess of block and cap.

The front main bearing carries the end thrust of shaft and must be installed with the notch in insert over the pin in the block. This pin keeps the insert from turning in the block.

Each cap and the cylinder block is numbered. The block number is on the pan gasket surface or web just inside of gasket surface. Place all caps with numbers on the same side as number on block.

The inserts and caps use four shims on each side on new shaft and new inserts. The bearing insert should stand out above the block and cap .0055" on each side. This gives .0015" standout with all shims in place assuring a tight fit between back of insert and block and cap. This assures good heat conductance from bearing to block.

The block and cap and backs of inserts should be thoroughly clean. A piece of dirt or carbon behind insert will cause a raised place on babbitt side of insert and excess heat, also poor conductance at high spot which will cause a small spot of bearing to burn out.

Be sure shims are not placed between the two halves of bearing insert.

As the bearing cap is tightened the ends of the insert must crush .0015". When more than two shims are removed from each side, the parting surface of insert must be filed away .002" for each shim removed. This is because the insert will not crush more than .0055". Failure to follow this procedure will stretch the main bearing caps. When removing metal from inserts, remove some from each of the four ends. Do not file the original bearing caps.

When fitting a replacement cap to a cylinder block, fit the cap with a new insert and shaft so that four shims are used on each side. This may be done by filing cap.

The main bearing insert oil holes must line up with the drilled passages in the block.

these passages must be clean.

Be sure the crankshaft gear is pressed on shaft until tight against shoulder.

Tighten the main bearing capscrews to 85 foot lbs.

The bearings should have .002" to .003" oil clearance when properly fitted. This will allow shaft to turn freely. This clearance can be measured by placing a one inch length of .010" soft lead wire between shaft and insert and tightening bearing. Remove and measure wire with micrometers. A piece of .002" shims stock can also be used, tightening bearing until a definite drag is felt.

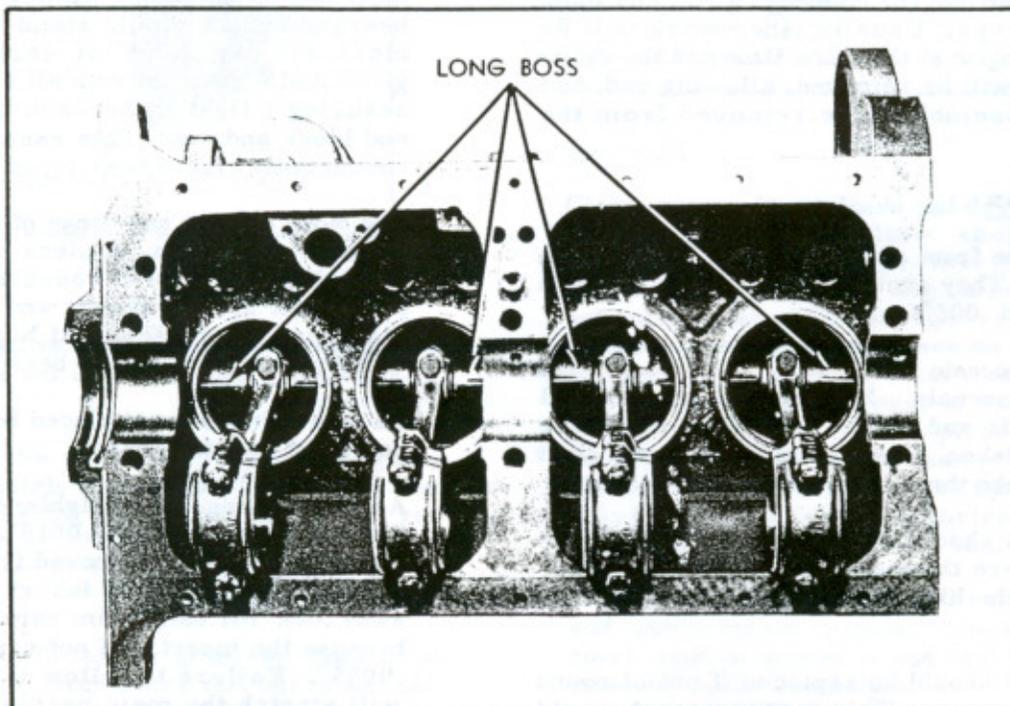
Never remove all shims at one time when

trying bearing fit. This may stretch bearing cap. Remove one shim from each side at one time.

When the final fit is secured it may be necessary to have an extra shim on one side of cap.

Dip the clutch pilot bearing wick in oil and insert in crankshaft. The wick must be pushed in. Pulling wick will cause it to stretch and allow passage of too much oil to the clutch shaft pilot bearing. The wick should be flush with front side of shaft and extend from rear of shaft only enough to touch the clutch shaft. Too much wick at rear will cause binding between the clutch shaft and crankshaft. This will cause gears to be difficult to shift and also excessive pressure on the thrust flange of the front main bearing.

CONNECTING RODS



Removal

Remove the oil sump and cylinder head. Mark the rod and rod cap of each rod 1-2-3-4. Clean the carbon from top of cylinder liner. Remove rod cap and push rod and piston assembly from cylinder liner.

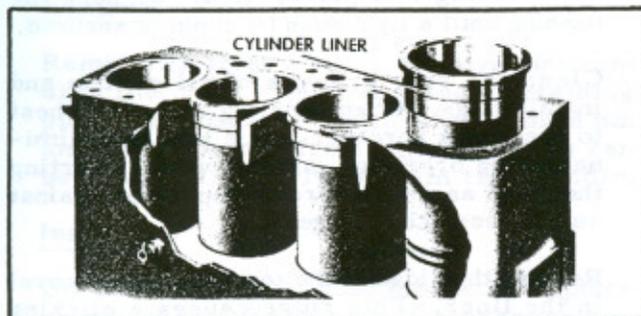
To remove the piston from the connecting rod, insert a punch in a vise and place piston pin over the punch. Loosen the piston pin clamp screw. This will prevent twisting the rod. Never clamp rod in vise.

Inspection

Check the rod for straightness in a connecting rod aligner. Check the bearing and journal the same as for main bearings.

Assembly

Adjust bearings in same manner as outlined under crankshaft and main bearings. Tighten the nuts to 70 ft. lbs. Install the piston on connecting rods so long boss of piston will be towards nearest main bearing when installed in engine.



Removal

Remove the cylinder head, oil sump and connecting rods.

Use a suitable puller and pull the cylinder liner from the block.

Inspection

Inspect the sleeve before removal. The greatest wear on sleeve occurs at the top of the ring travel. Replace sleeve if scored or wear exceeds $.011''$.

The pistons are cam ground and measure $.0025''$ more on skirt at right angles to the piston pin. Pistons do not wear much and probably will not need replacing unless scored or cranked.

The piston ring should have $.001''$ to $.0015''$ side clearance in ring groove. If a new ring in the old piston has $.003''$ side clearance or more it may cause oil consumption.

The piston pin bushing should be replaced if clearance exceeds $.002''$. No damage will be caused if clearance exceeds this figure but engine will be noisy.

Piston rings must have $.007''$ end gap. If a new ring in the old liner has $.032''$ end gap it will not provide full length of service and new liners should be used.

Assembly

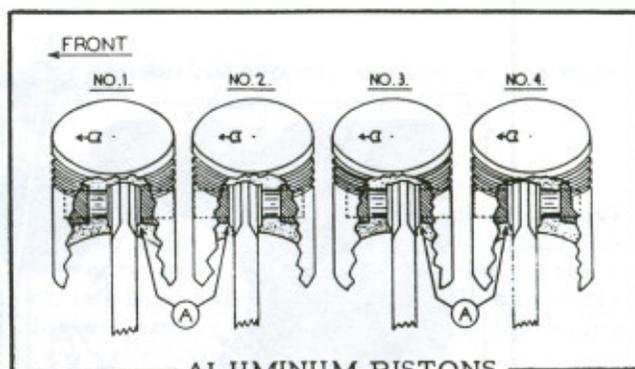
Clean the cylinder block thoroughly. Use emory cloth at bottom web on seal contact surface. Remove all traces of old sealer etc. Clean liner flange groove at top of block. Clean cylinder liner. Install seal rings using a thin white lead mixture. Keep all twists from seal rings.

Lower the sleeve into block gently until seal touches bottom web. Place each thumb on

opposite sides of liner. Push as hard as possible and at the same time rotate sleeve. It should go into place. If it does not, use a piece of hard wood that will span top of liner and drive into place. Be sure no foreign material drops under liner flange that will keep the liner from going down.

The liner should have $.002''$ to $.004''$ standout above the top surface of the cylinder block. If the standout is greater than $.004''$, check for foreign material under liner flange. If clean dress top of sleeve with a file. Excessive standout will cause water seepage at gasket edge.

Install the pistons on the connecting rods so the long boss of piston will be towards the nearest main bearing.



The aluminum piston used in the W engine has pin bosses of equal length and cannot be used as a guide in installation.

The piston top is stamped with an arrow and this arrow must point towards the front of engine.

To eliminate the possibility of the piston pin extending enough to score liner, assemble #1 connecting rod to the piston with the clamp screw of rod towards the camshaft and arrow pointing towards front of engine, and "T" slot towards the left or opposite camshaft. Place rod against boss "A" and insert piston pin until it is flush with skirt of piston on side opposite arrow. Tighten clamp screw. Move the rod about $1/8''$ away from boss "A".

Assemble #2 the same, except piston pin is placed flush with side of piston towards arrow or front of engine. Assemble #3 the same as #1 and #4 the same as #2. (See sketch.)

Check all rings in the cylinder liners. Push ring in with piston so ring will be square with walls. End gap must be at least .007". If less, file until proper gap is secured.

Roll each ring in the groove in piston in which it is to be installed. It must not bind or stick in groove. Stagger the ring gap on piston so no two gaps are in line.

Lubricate rings and piston, use a good ring compressor and install in liner.

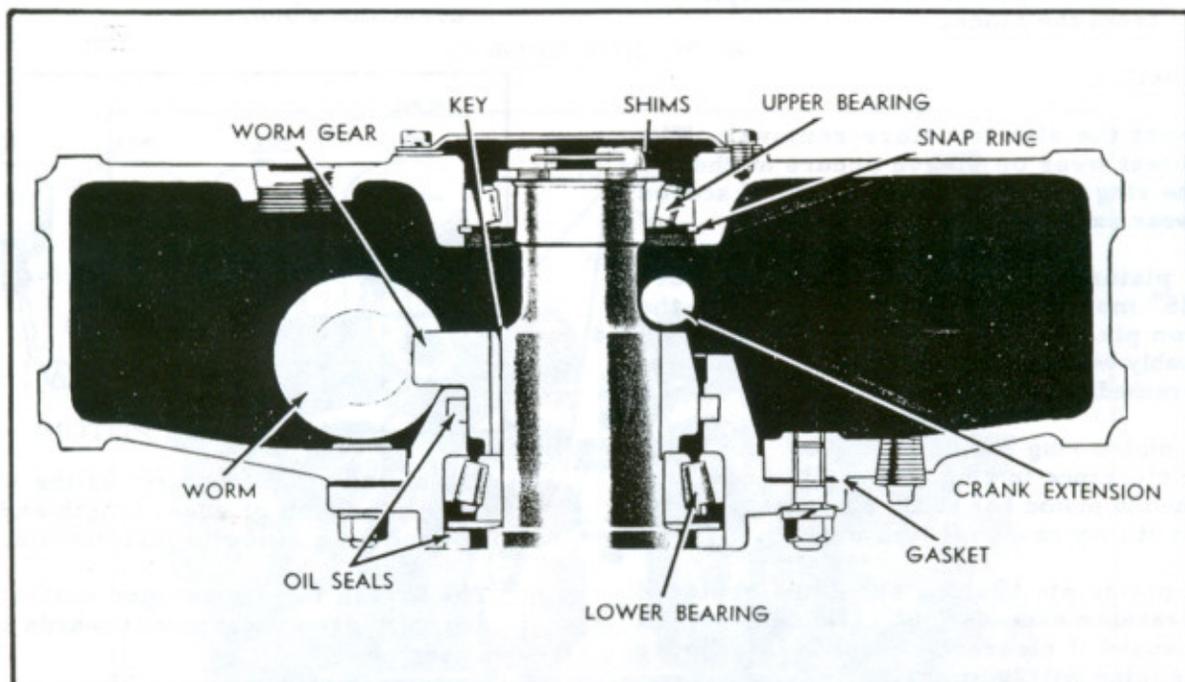
When installing new bushings in old pistons, place the new bushing against old bushing. Place a piece of old copper or wood on op-

posite side of piston. Place in vise and press new bushing into place. Ream or hone the bushing until a light push fit of pin is secured.

Clean the ring grooves of all carbon and install rings. When handling rings it is best to use a ring spreader. This tool will eliminate ring breakage, and prevent distorting the rings as well as protect operator against cut and scratched fingers.

Remove the ridge at the top of the ring travel in the liner. This ridge causes a clicking sound, damage to rings and bearings if not removed.

WIDE FRONT AXLE



Removal

Remove the radius rod assembly and drag links. Raise front of tractor and remove front axle.

Remove the top cover and the upper bearing retainer. Remove the capscrews attaching axle support to the front support. The assembly can now be forced out of upper bearing and will be removed from tractor.

Remove the jam nut and set screw from the gear and pull from shaft. The shaft can now be removed from bottom of axle support.

Remove bearing and oil seal.

Inspection

Check gears and bearings for wear, pitting and chipping. Always use new oil seal and gaskets.

Assembly

Reverse the above procedure. Adjust bearings by use of shim between end of shaft and upper bearing retainer plate. Adjust bearings to a free rolling fit without end play or binding.

Removal

Remove the front wheels. Remove pin from drag link yoke. Remove spindle retaining pin from the center of axle. Drive spindle pin and expansion plug from axle. Bushings can be pressed or driven from the spindle.

Inspection

Check spindle and bushing for wear. Replace spindle or bushing or both if clearance exceeds .012". Replace spindle arm, drag link clevis and pin if worn.

If the ball end of clevis pin is worn flat it should be replaced.

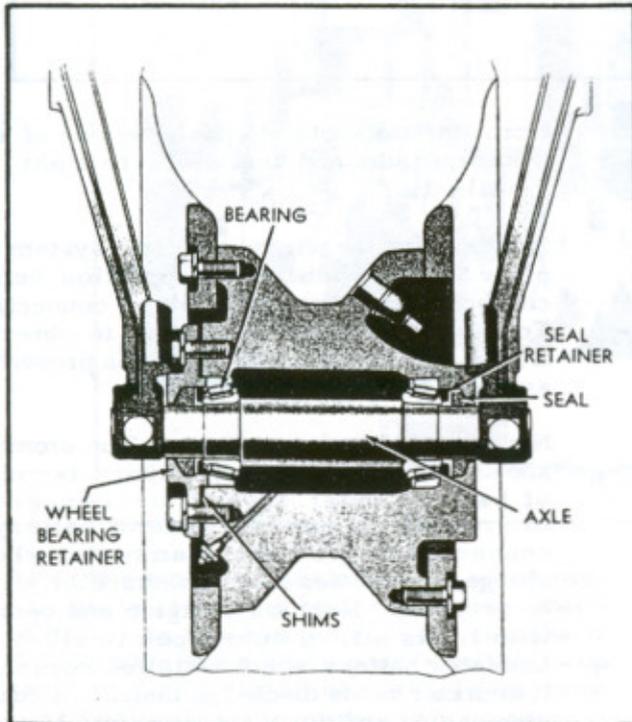
The expansion plug at bottom must be tight enough to hold grease pressure. It is best to use new plugs.

Adjust ball ends snugly but not excessively tight.

The tie rod must be adjusted to give the front wheels the correct amount of toe in.

The toe in should be from straight ahead to a maximum of 1/8" narrow at the front. Measure the toe in at hub height at back and front of tires. Have tractor on level ground and wheels in straight ahead position when measuring toe in.

SINGLE FRONT WHEEL



For removal of support and fork - see wide axle.

Removal

Raise front of tractor and block. Remove the two bolts retaining the axle in fork. Remove the capscrews holding bearing retainer on left hand side of hub. Pull axle and bearing assembly from wheel. Press bearing from the axle.

If the tire is to be removed, be sure all pressure is relieved before removing retaining ring.

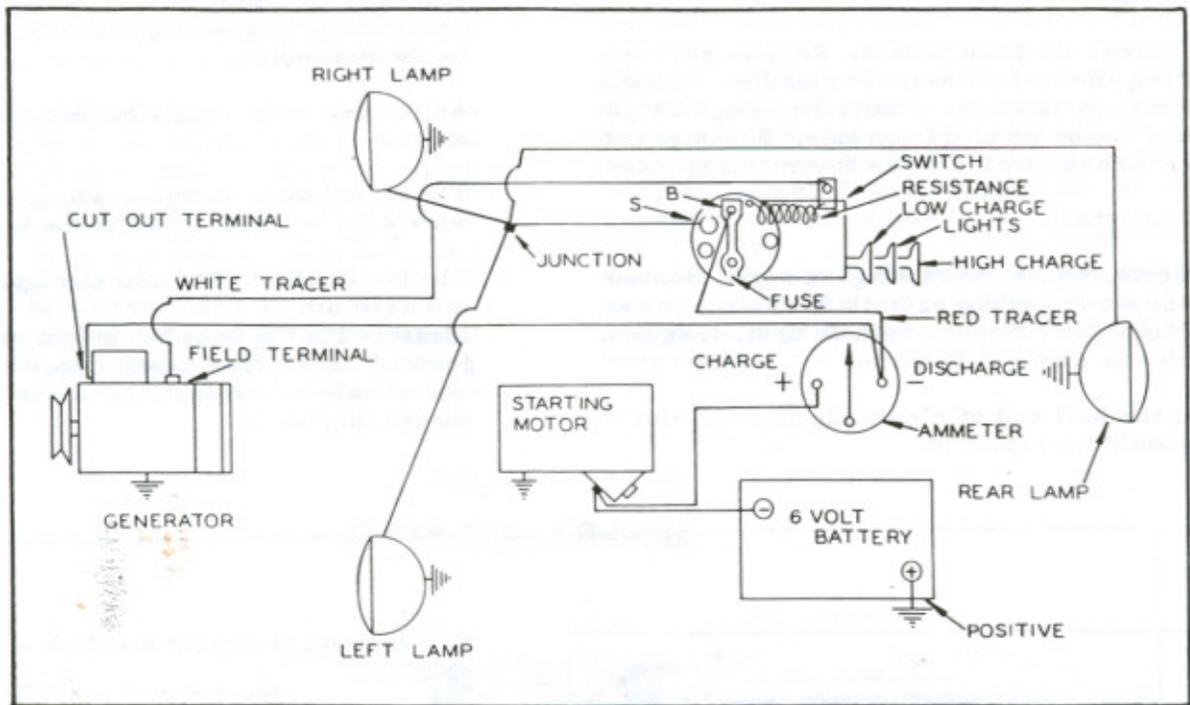
Inspection

Check bearings, etc. for wear and chipping. Always use new oil seals.

Assembly

Adjust bearings by use of shim between retainer and hub. Adjust to a free rolling fit without end play or binding.

WIRING DIAGRAM



By referring to diagram at top of page the wires may be placed in position correctly on both the "WC" and "WF" tractors. This diagram does not show the various retainers and insulating grommets which must be used to prevent wires from chaffing and causing short circuits.

There are two wires which have color traces woven into the insulating material in order to facilitate correct wiring. The short wire with red tracer connects the discharge side of ammeter to light switch. This wire connects to terminal "B" which is in the bar holding fuse. The long wire with white tracer connects the field of generator to resistance unit in light switch. This resistance unit controls the low charge rate by only supplying a partial ground to charging circuit. When switch is placed in the high charge position, the resistance unit is not in the circuit and the field is connected directly to ground.

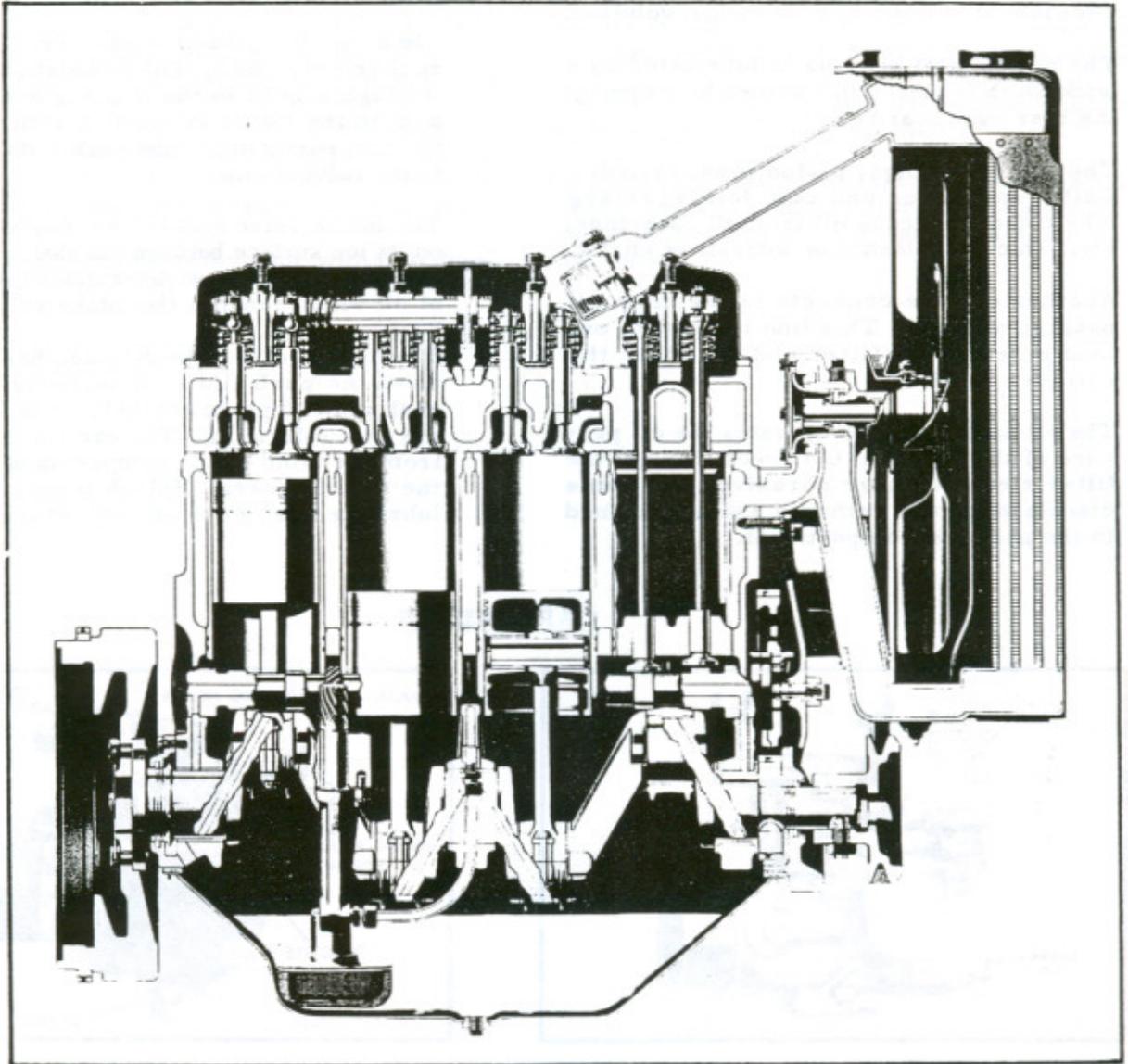
All other wires used are solid black. However they are of different size and length. The wire from generator cut out to discharge side of ammeter being the largest, the wire

from starting motor to positive side of ammeter medium, and the wires to light the smallest.

In connecting the wires, complete system and place light switch in "off" position before connecting battery ground strap connection. Touch ground strap and if spark is observed it indicates that a short circuit is present or system improperly wired.

Next test by turning on lights. The ammeter should show discharge. (Positive terminal of battery must always be connected to ground). If positive side of battery is connected to ground and ammeter shows charge, it indicates leads on ammeter should be reversed. Next start engine and operate with lights off. If cutout points vibrate it indicates battery is not installed correctly. If ammeter reads discharge instead of charge stop engine and touch cutout points together and repeat test.

The light wires are attached to light switch at terminal marked "S". When completed place spacer over battery and install battery box cover.



The oil supply is carried in the oil sump. The oil is picked up by the oil pump which is driven by a worm gear on the camshaft. Oil from the pump gears passes up the pump shaft in a restricted channel, furnishing lubrication for the pump drive gears.

The oil from the pump is piped to the block where it enters a drilled passage leading to the center main bearing and center camshaft bearing. From the side of this passage the oil pressure relief valve is located. The relief valve opens at a predetermined pressure according to the spring tension of valve. When this valve opens any excess oil returns directly to the sump preventing the oil pressure from becoming too high.

The oil enters the camshaft through a hole in the camshaft bushing. A groove is cut around each camshaft journal so that constant pressure will be maintained on the system. The camshaft is hollow and is used to distribute oil to the front and rear main bearings. The camshaft end thrust plug has a small hole which allows the escape of a small quantity of oil which lubricates the thrust plunger and timing gears.

The crankshaft is drilled from the main bearings to the connecting rod bearings. The center bearing feeds #2 and #3 connecting rods. The front bearing lubricates #1 connecting rod. The rear bearing lubricates #4 connecting rod. The main bearing shells or

inserts are grooved about 3/4" on either side of the oil hole, thus the connecting rods only receive oil about 1/6 of each revolution.

The clutch pilot bearing is lubricated by a wick which is placed in a drilled hole through the rear main bearing.

The pistons, rings, piston pins, cylinder walls, cam lobes and cam followers are lubricated by excess oil from the bearings, etc., which is splashed on interior of engine.

Another oil line connects to the main oil passage of block. This line is divided, one lead entering oil filter and the other the cylinder head.

The oil entering filter operates the oil pressure of the system. Oil flows through the filter element where abrasives and some discoloration are removed and is returned to the push rod compartment.

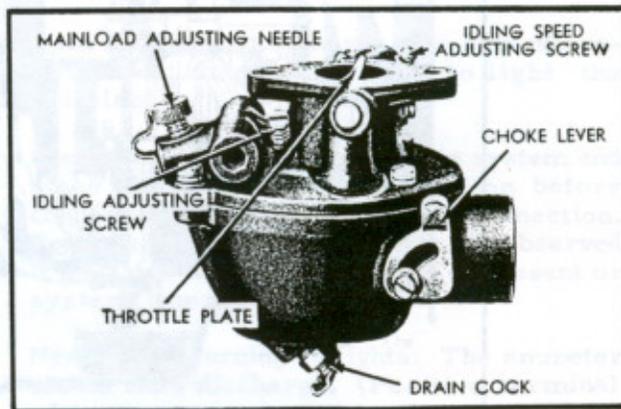
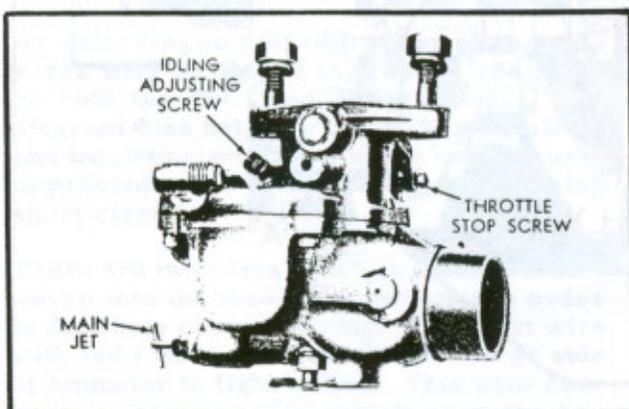
About 1/6 of the total oil handled by the pump passes through the filter.

The oil to the cylinder head enters the hollow rocker arm shaft. Oil from shaft passes through a hole in the bushing and rocker arm to the top of the rocker arm where it divides, part going to the push rods and part to the valve stems.

The intake valve rocker arm has a shed cut on its top surface between the shaft and valve. The width of this shed determines the amount of oil which reaches the intake valve stem.

The excess oil on the cylinder head drains down the push rods. It partially fills the push rod compartment, helping to lubricate the cam followers. The excess oil drains from the front of the compartment onto the the timing gears. Splash from the gears lubricates the governor and magneto shaft.

CARBURETOR



Removal

Disconnect the choke rod, choke return spring, surge spring, link rod, fuel line and remove the two nuts attaching carburetor to the manifold.

Inspection

Check the float for leakage and worn hinge or hinge pin.

Observe if float has touched side of bowl.

Check the throttle shaft and choke shaft for wear. Excess wear on shafts will allow entry of air and cause poor idling of engine

and entrance of dirt which causes excessive piston ring and cylinder liner wear.

Check the venturi and jet sizes. (See Parts Books).

Assembly

Use new packing on throttle and choke shaft. The throttle plate must be installed with the long side up.

Set the float valve level by using thicker or thinner washer under float valve. File washer to correct thickness. Do not bend float arm.

Float lever on Zenith 124-1/2 TOP should measure 1-35/64" from bottom of float to edge of body. Zenith 61 and 161 should measure 1-5/32". Marvel-Schebler should measure 9/32" from top edge of bowl to nearest edge of float. If using a glass tube to measure fuel level, the 124-1/2 TOP should measure 35/64" from top of fuel to top of bowl. The 61 and 161 should measure 7/16" from top of fuel to top of bowl. The Marvel-Schebler should measure 7/16" from top edge of fuel to top edge of bowl.

The Marvel-Schebler carburetor with four bowl vent holes causes erratic operation and ex-

cessive fuel consumption when operated on rough ground. This is caused by fuel splashing through the two front vent holes and draining into air horn. From the air horn the fuel is drawn back through the venturi to engine.

The vent holes are drilled from float chamber to throat of carburetor (behind venturi).

Close off the two holes farthest from the float hinge. Use 1/8" lead shot or solid wire solder. Do not leave any lead chips in carburetor to plug jets.

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IT PAYS TO PAY A LITTLE MORE FOR QUALITY LUBRICANTS.

It has long been recognized that the life of a tractor is largely determined by the kind of lubrication it receives. Therefore always use oil and grease of high quality, manufactured by a dependable oil company who has established a reputation for quality products and whose success depends upon maintaining such quality.

In addition to using high quality oils it is also necessary to use oils of proper viscosity. Oil that is too heavy cannot reach all points to be lubricated; therefore it will cause undue wear and engine sluggishness. Oil that is too light will not form a protective film between moving parts. For best results and to assure lubrication between snug fitting parts, refer to lubricants recommended in Maintenance Chart.

Some parts need more frequent lubrication than other parts. Lubrication intervals outlined in Maintenance Chart should be followed closely.

FUELS

FOR ECONOMY AND PERFORMANCE USE FUELS SPECIFIED FOR YOUR ENGINE.

Engines for model "WF" tractors are furnished in two compression ratios. Each is designed to efficiently burn a particular class of fuel. For best results use the class of fuel for which the engine was designed.

Standard compression engines are equipped to burn low octane fuels (distillate or tractor fuel) or low octane gasoline. These fuels should have the following specifications: Gravity - 38 or higher; End Point - 525^o or less; Octane Rating - 30 or more. Gasoline - 60 octane or higher. Engines equipped for low octane are designated by the letter "K" following the engine serial number located on left side of engine block, near carburetor. (Example W91286K).

Motors having letter "K" following the engine serial number are furnished with two manifold covers. Cover marked with letter "K" must be used when burning low octane fuel. Cover marked "G" is to be used when burning gasoline.

High compression engines are equipped to burn gasoline only. For average loads, use 60 octane gasoline or higher. For continued heavy loads, use 70 octane gasoline or higher. These engines are designated by the letter "G" following the engine serial number. (Example W91286G).

FUEL CONTAINERS

In addition to using quality fuels and lubricants, always use clean containers for storing and handling.