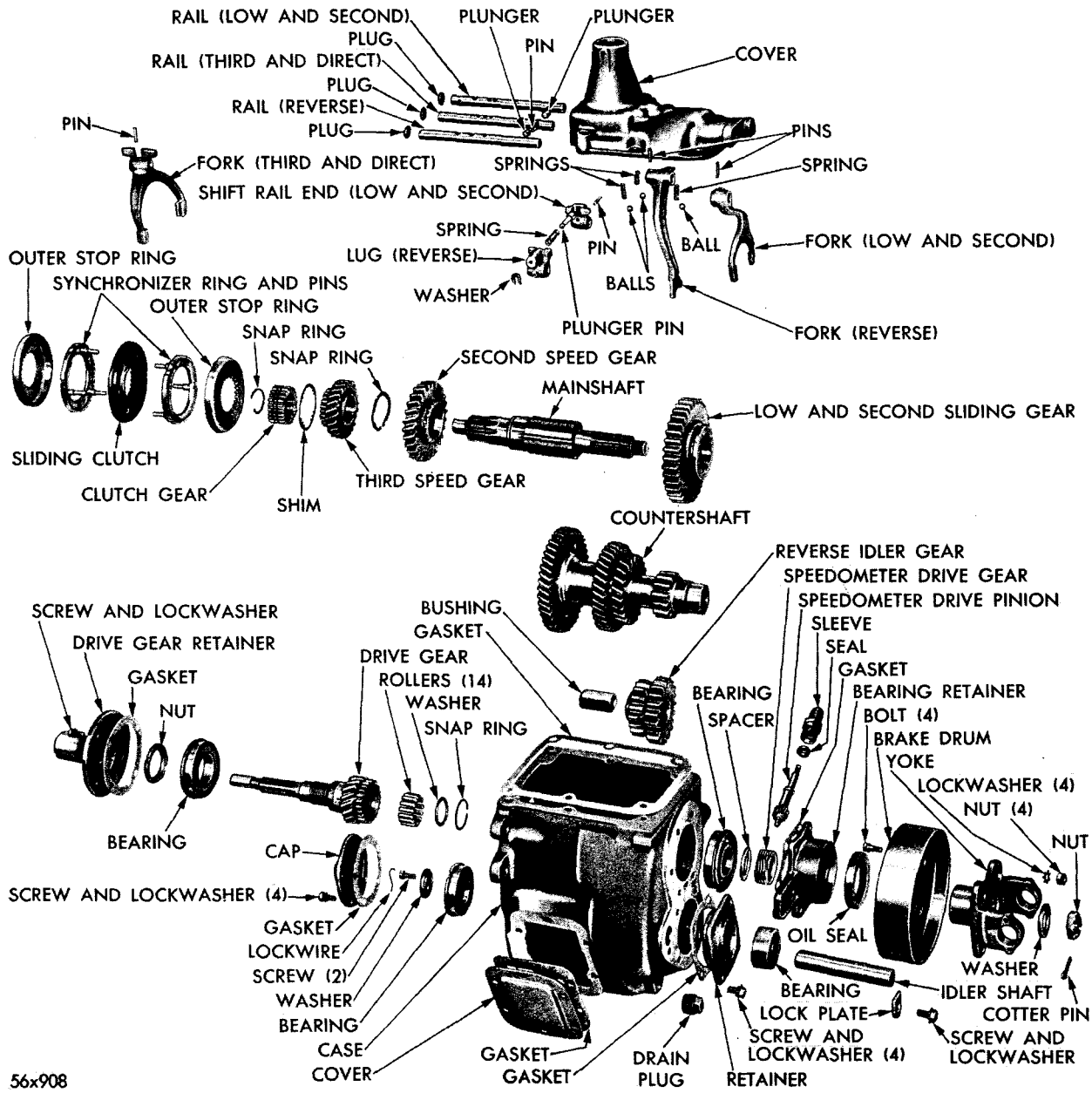

Fig. 1 — 4-Speed Transmission (Exploded View)

Section VI

TRANSMISSIONS

4-SPEED TRANSMISSION (Model 420)

1. REMOVAL AND INSTALLATION

a. Removal

Shift transmission gear shift lever into mesh with a drive gear. Disconnect universal joint and loosen yoke retaining nut (if so equipped). Disconnect brake and speedometer cables at transmission (if so equipped). Rotate gearshift lever retainer in a counter-clockwise direction and pull up on lever at same time. Do not lose spring or washer from lever. Remove transmission to clutch bell housing retaining screws and remove transmission.

b. Installation

Place a ½ teaspoon of short fibre grease in pinion shaft pilot bushing, taking care not to get any grease on the flywheel face. Lift transmission into place. Install screws and washers and tighten to 50-foot-pounds torque. Install gearshift lever. Shift into gear and tighten yoke nut to 95 to 105 foot-pounds torque. Install universal joint and speedometer and brake cables (if so equipped). Check clutch pedal adjustment. Install transmission drain plug and fill to proper level with lubricant specified in lubrication section of this manual. Check operation in all gears.

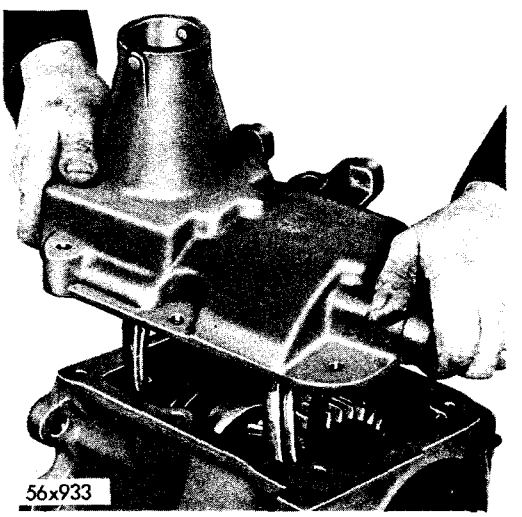

Fig. 2 — Removing Transmission Cover

2. REMOVING SUB-ASSEMBLIES FROM CASE (Fig's. 1 and 2)

Mount transmission in holding fixture drain, lubricant and remove emergency brake assembly. Shift gears into neutral. Remove cover screws and while lifting cover rotate cover slightly counter-clockwise to provide clearance to shifting forks and remove cover (Fig. 3). At this time check and record the amount of synchronizer end play for reference at assembly. Refer to Paragraph 5.

Remove yoke and brake drum as an assembly.

NOTE

The drum and yoke are balanced and unless replacement of parts is required it is recommended that drum and yoke be removed as a unit assembly.

Remove speedometer drive pinion (if so equipped) Figure 2, and rear mainshaft bearing support.

a. Main Drive Gear

Remove main drive gear bearing retainer. Re-

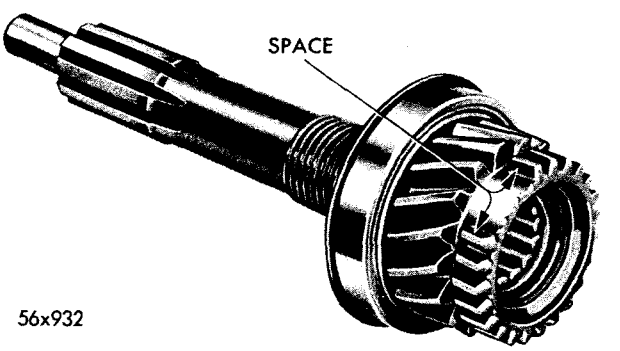

Fig. 3 — Main Drive Gear Showing Teeth Removed

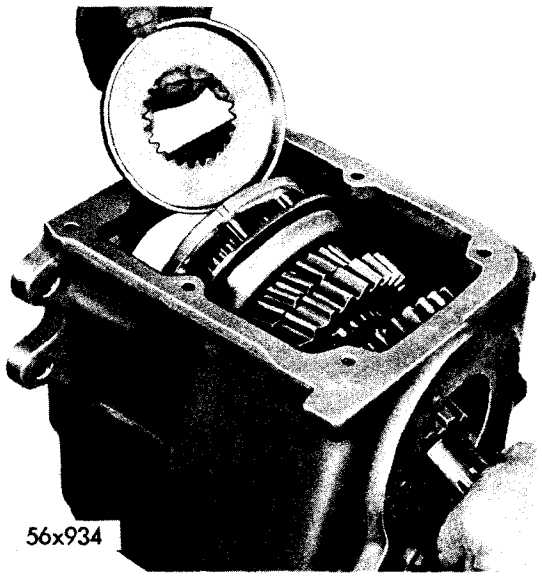

Fig. 4 — Removing Synchronizer

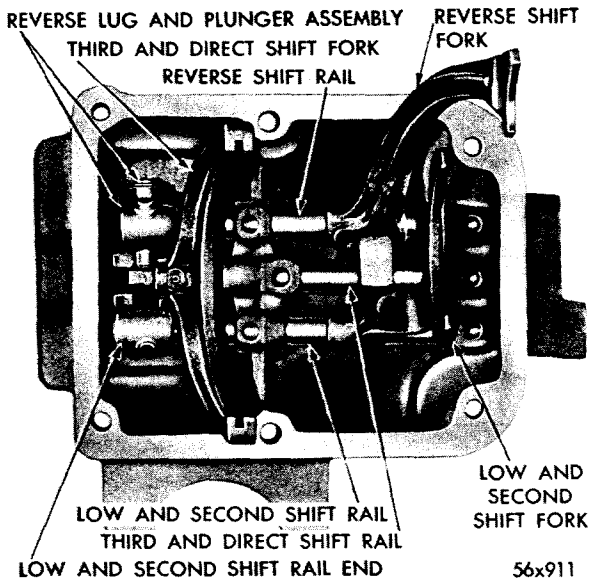

Fig. 6 — Cover and Shift Fork Assembly

move main drive gear by first moving synchronizer towards rear and while slowly rotating main drive gear (to observe clutch gear teeth on main drive gear) tap on main drive gear shaft with a soft hammer while at same time pulling out on shaft. A few of the clutch teeth on the main drive gear have been omitted to facilitate the removal of the main drive gear (Figure 4), past the mating driven gear of the cluster gears. This open space must be positioned at the bottom to allow withdrawal of the main drive gear from the transmission case.

b. Mainshaft

Place a brass drift in the front center of mainshaft and drive mainshaft to rear making certain that the synchronizer assembly remains free on shaft. When mainshaft rear bearing has cleared case remove rear bearing and speedometer gear (with spacer) with a suitable puller.

Move mainshaft assembly to rear and tilt front of mainshaft up. Remove sliding components of synchronizer separately, (Figure 5) and then, remove mainshaft assembly.

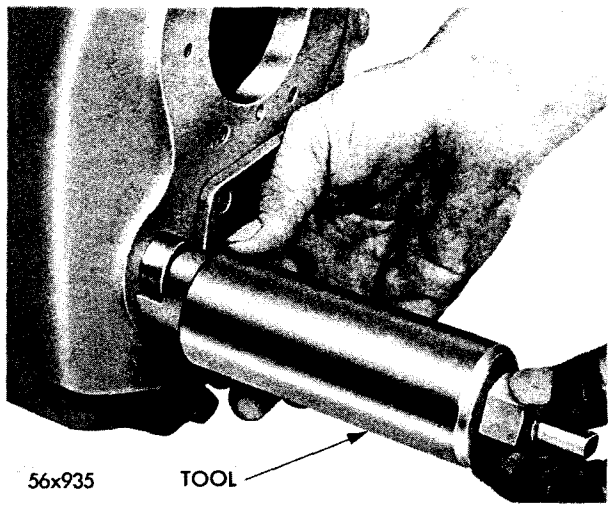

Fig. 5 — Removing Idler Shaft

c. Reverse Idler Gear

Remove reverse idler lock screw and lock plate. Install Tool C-603 (Figure 6), and remove idler shaft. Lift reverse gear from case.

d. Countershaft Cluster Gear

Remove bearing retainers at opposite ends of counter-shaft. The roller bearing assembly at rear end of shaft remains with the retainer. Drive the counter-shaft to the rear with a brass drift until shaft clears front bearing. Tilt cluster gear assembly and work out of case. Remove front bearing.

3. DISASSEMBLING SUB-ASSEMBLIES

a. Mainshaft

Remove clutch gear snap ring and remove clutch gear, synchronizer outer stop ring to third speed gear shim (or shims) and third speed gear. Remove special split lock ring with

two screw drivers and remove second speed gear. Remove low-second sliding gear. Drive old seal from rear bearing support housing.

b. Countershaft

The cluster gears are integral with the shaft. The rear bearing and retainer are serviced when required by replacement of the bearing and retainer assembly.

c. Reverse Idler

The bushing may be replaced if required by pressing the old one out and the new one in.

d. Cover and Shift Fork Assembly (Fig. 7)

Remove roll pin from fourth speed fork (center rail) with an "easy out."

NOTE

A square type or a closely wound spiral "easy out" mounted in a tap handle is preferable for this operation.

After removing pin drive the rail to the rear and remove fork. Continue driving rail to rear to remove rear expansion plug; being careful to catch poppet ball and spring as rail clears rail support in housing. Also, note interlock pin in rail.

Remove remaining rails, lugs and shift forks in same manner as center rail.

NOTE

It is very seldom that the interlocks require removal from cover. However, to replace interlocks remove the plug from the interlock passage in the cover.

Remove the reverse spring loaded plunger from the lug (if required) by removing horse shoe lock from plunger shaft.

e. Main Drive Pinion

Secure main drive pinion gear in a soft jaw equipped vise and remove bearing retaining lock nut from shaft.

NOTE

Retaining nut has left hand thread.

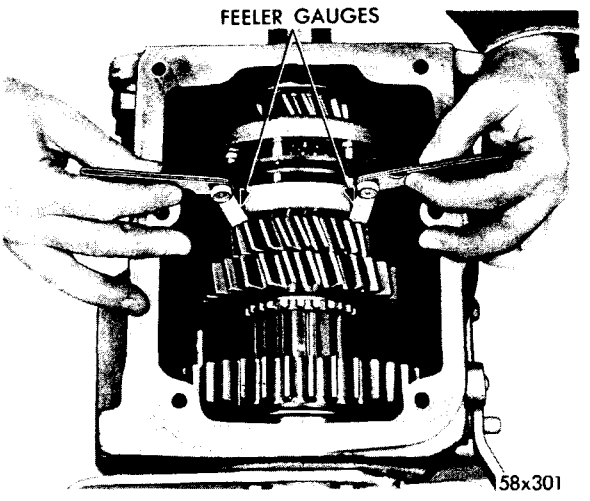

Fig 7. — Measuring Synchronizer End Play

Press bearing from shaft in a suitable press. Remove lock ring, washer and pilot rollers from gear.

f. Inspection Recommendations

Wash all parts in a suitable solvent and allow to dry thoroughly.

Bearings—Wash in a pressure bearing washer. *Do not spin bearing with compressed air.* Examine bearing for defects. Replace if necessary, and lubricate.

Gears and Gear Teeth—Check for chipped, broken or worn gear teeth. Spots, where case hardening has worn through, renders gears unfit for further service.

Splines and Shafts—Examine for evidence of twisting or excessive wear. Place sliding gears on respective shafts and check clearance along splines. If clearance exceeds—.005 inch, or if shaft is badly scored or twisted over .005 inch, install new parts.

Needle Bearings—If worn excessively will cause noisy operation and possible serious damage to transmission. New and used rollers must not be assembled together.

Washers and Snap Rings—Check for excessive wear. Check snap rings for broken ends and distortion and fit in grooves.

Castings—Inspect all mating surfaces for burrs and scratches. Examine for sand holes, cracks and stripped threads.

Seals—Replace if necessary.

4. ASSEMBLING SUB-ASSEMBLIES

In performing assembly operations, use new expansion plugs, gaskets and seals. Lubricate all parts with transmission lubricant before assembly.

a. Mainshaft

Place mainshaft in a soft jaw equipped vise with forward end up. Install second speed gear and lock in position with split lock ring. Install third speed gear with clutching teeth up. Install spacer shim (or shims) and clutch gear (oil slots down). Install clutch gear snap ring; selecting size to eliminate all clutch gear end play. Snap rings are available in four thicknesses marked A, B, C and D.

When installing the synchronizer assembly on the main shaft (Figure 5) the selection of shims on the third speed gear, to control end play clearance in the synchronizer, will be determined by the original number of shims and the amount of end play clearance recorded at this point when the unit was originally disassembled. The correct thickness of shims necessary to obtain proper end play clearance when unit is completely reassembled (.050 to .070), cannot be accurately measured until all the mainshaft components are in position and properly tightened.

b. Main Drive Pinion

Press bearing onto main drive gear pinion making sure bearing is properly seated against shoulder. Install retainer nut and tighten securely by turning left hand threaded nut counter-clockwise. Install large snap ring on bearing race.

Lubricate roller bearings to hold rollers in place and insert in pocket in main drive gear. Install washer and snap ring.

c. Transmission Cover

Start the reverse rail through hole at rear of cover. Push into cover only far enough to position fork on rail. Continue to push rail into cover until rail enters rail support containing cavity for poppet ball and spring. Install spring and ball in support and while pushing down on ball to compress spring push rail over ball. Install lug on rail and expansion plug in cover. Drive roll pins through lug, shift fork and rail. Install first and second speed rail assembly in same manner followed by third and fourth speed rail assembly; being certain that interlock pin is in position in third and fourth speed rail.

5. INSTALLING SUB-ASSEMBLIES INTO CASE

a. Countershaft

Lower countershaft assembly into case. With front journal protruding through case install front bearing, and bearing retainer. While holding gear assembly in alignment install rear bearing support gasket, support and bearing assembly. Install end cover and gasket over front bearing opening in case.

b. Reverse Idler Assembly

Position reverse gear in case. Align idler shaft so lock plate groove in shaft is in proper perspective to install lock plate. Tap shaft into case far enough to start reverse gear. While holding gear in position tap shaft through case and gear.

Install lock plate, washer and cap screw. Make sure gear turns freely on shaft.

c. Mainshaft and Main Drive Pinion

Lower rear end of mainshaft into case holding first speed gear on shaft and maneuver shaft through rear bearing opening. With shaft assembly moved to rear of case install synchronizer components one at a time (Fig. 5).

Install main drive pinion by tapping on outer bearing race while guiding main shaft pilot into roller bearing. Make sure bearing snap ring is flush against case. Install rear bearing on mainshaft by carefully driving bearing onto shaft and into case (snap ring flush against case) using a suitable sleeve against inner race of bearing. Install spacer and speedometer gear. Install rear support and gasket.

Place front main drive pinion bearing retainer over pinion shaft without gasket. Hold retainer tight against bearing and measure clearance between retainer and case with a feeler gauge. Select a gasket approximately .005 inch thicker than measured clearance and install gasket and retainer. End play should be .003 to .006 inch.

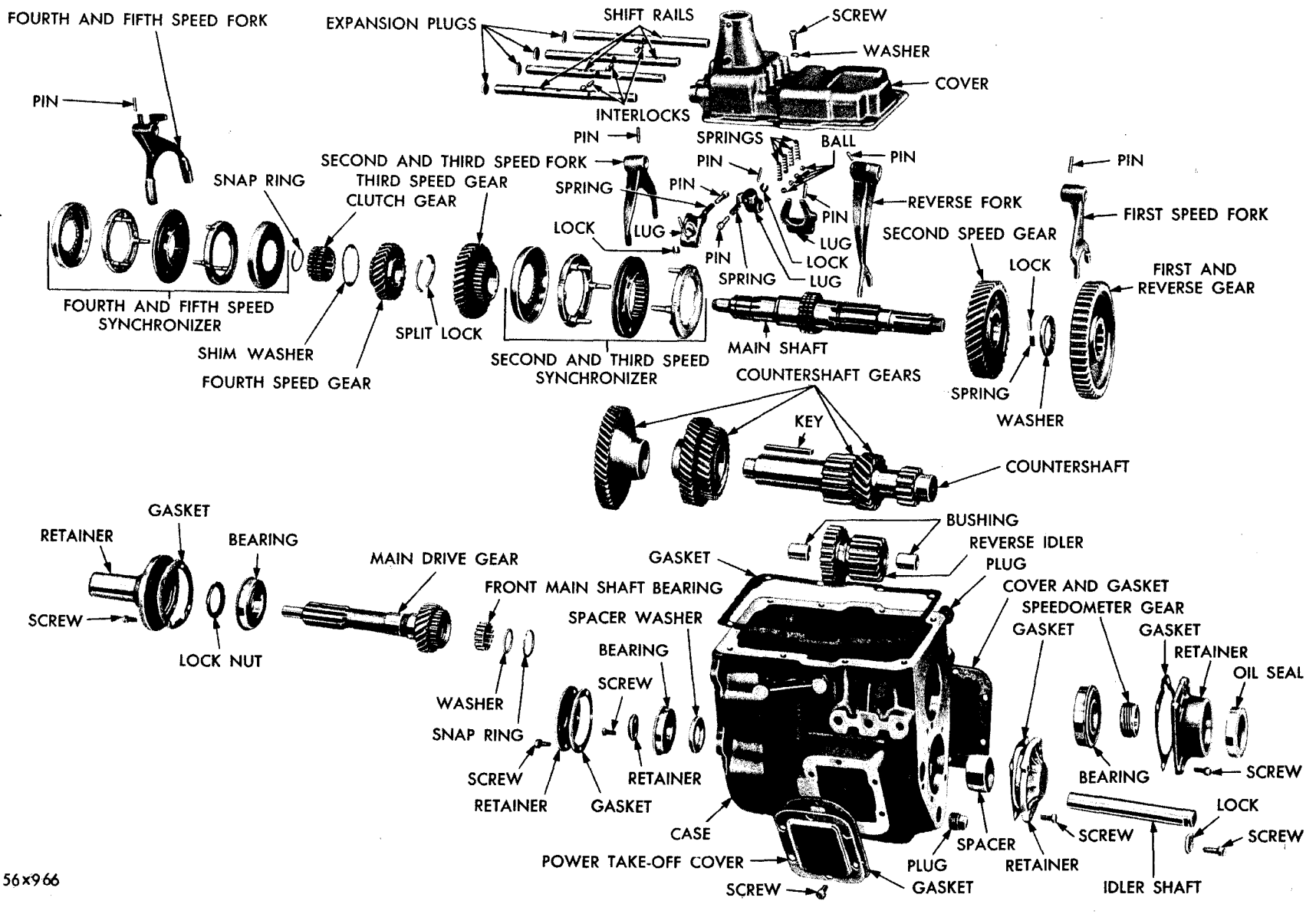

Fig. 8 — 5-Speed Transmission Model 540 (Exploded View)

Check the synchronizer end play clearance (.050 to .070) after all mainshaft components are in position and properly tightened. If two sets of feeler gauges are used to measure this clearance, as shown in Figure 8, care should be used to keep gauges as close as possible to both sides of the mainshaft for best results. In some cases, it may be necessary to change the thickness of the shims to keep the end play clearance within the specified (.050 to .070). Shims are available in four thicknesses A, B, C, and D.

Install speedometer drive pinion. Install yoke flange, drum and brake assembly. Final tightening of nut may be performed, however, place transmission into two gears at once to hold shaft for preliminary tightening.

Shift gears and/or synchronizer into all speed positions and check for free rotation. Be sure synchronizer pins are properly aligned.

d. Transmission Cover

Move gears into neutral position. Lower cover with new gasket in case, over transmission, Figure 3. Carefully engage forks into proper gears and lower cover into place. Install one screw on each side of case and try gears for free rotation by shifting gears through cover tower with a long screwdriver. Install remaining cover screws. Install transmission in engine performing final tightening of yoke flange retaining nut before connecting universal joint. Install gear shift lever and be sure gears shift into all speed ranges. Fill case with Automatic Transmission Fluid Type "A" as outlined in Lubrication section.

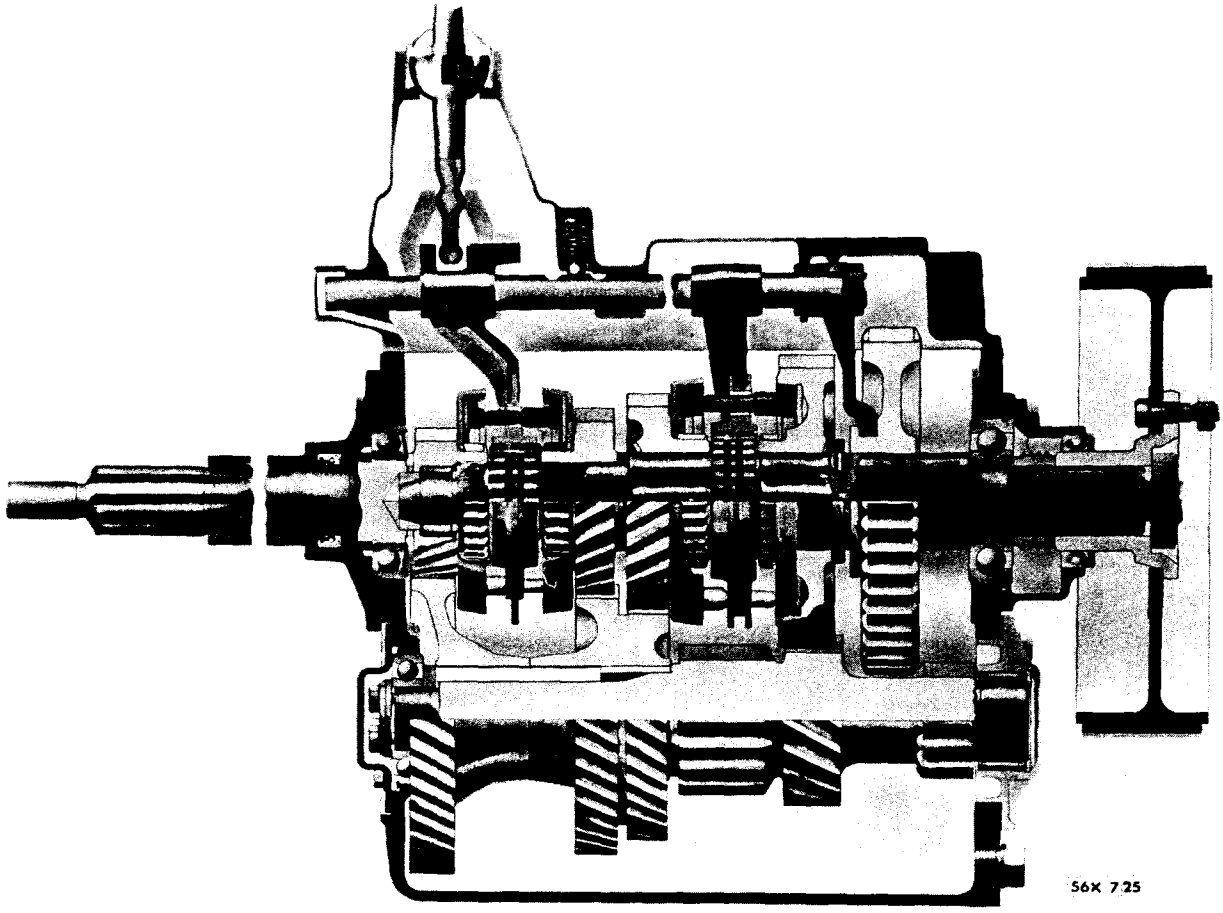

Fig. 9 — 5-Speed Transmission Model 540 (Sectional View)

5-SPEED HEAVY DUTY TRANSMISSION (Model 540)

6. REMOVAL OF TRANSMISSION FROM ENGINE

Remove gearshift lever. Disconnect speedometer cable (if so equipped), hand brake cable, and propeller shaft. Place transmission jack under the transmission and remove the cap screws which hold the transmission to the clutch housing. Pull the transmission and transmission jack straight back about 6 inches. Then, lower the jack slightly. Move the transmission with the jack to the left so that the transmission main drive pinion will clear the clutch housing. Remove the unit.

7. DISASSEMBLY (Figs. 9 and 10)

a. Transmission Cover Assembly

Place transmission in stand, Tool DD-1014. Drain lubricant. Use a screw driver (or install gearshift lever), inserted into gearshift lever opening and shift transmission into 2nd speed. Remove transmission cover screws. Note location of alignment screws (2) (Fig. 8). Alignment screws use split type lockwashers. Remove transmission cover by lifting upward while carefully rotating housing counter-clockwise, as shown in Figure 11.

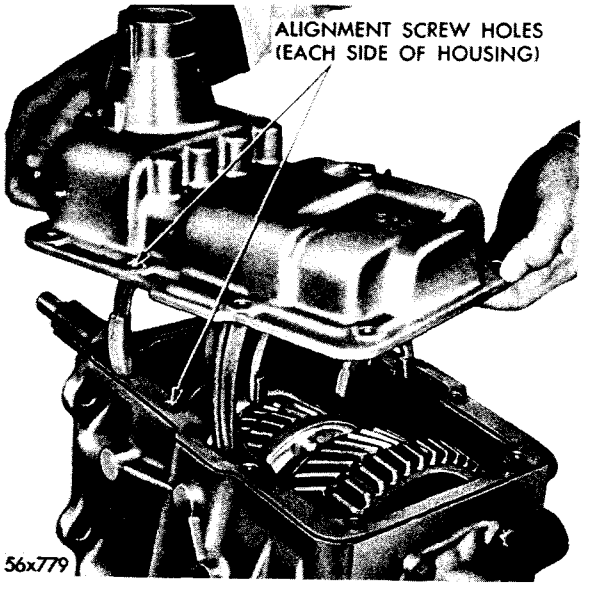

Fig. 10 — Removing or Installing Transmission Cover

NOTE

Movement of the transmission cover, during removal, will usually cause the 2nd-3rd speed synchronizer assembly to be rotated into a position which will allow sufficient clearance for the reverse shift fork to be withdrawn. If gear train is so damaged that synchronizer unit is not free to turn, the drive shaft can be slowly rotated by an assistant to place pins in required position, while transmission cover is being removed.

At this time check and record the amount of end play in both synchronizers for reference in reassembly. Refer to Paragraphs 9 and 10.

b. Drive Gear and Mainshaft Assembly

Shift transmission into any two gears to lock mainshaft while flange nut is being removed.

NOTE

If flange nut was not loosened while transmission was on engine, use wrench, Tool DD-406.

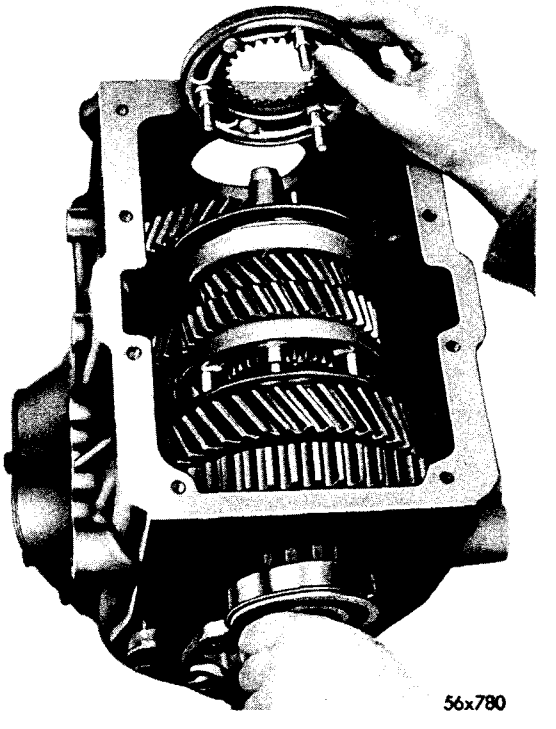

Fig. 11 — Removing 4th - 5th Speed Synchronizer Stop Rings

Remove brake drum and flange assembly by lightly tapping with a soft hammer. Remove the brake band assembly anchor and support bolts and lockwashers. Remove brake band assembly as a complete unit. Remove drive gear bearing retainer. Withdraw drive gear assembly from case by pulling on gear stem while tapping stem with a soft hammer.

Remove mainshaft rear bearing retainer and speedometer drive gear.

Using a brass hammer, carefully tap front end of mainshaft rearward to drive rear bearing from its bore. Pull bearing from mainshaft, using a suitable puller. Remove 4th and 5th speed synchronizer unit (less clutch gear) from mainshaft, as shown in Figure 12. Remove mainshaft assembly from case by lifting front end upward and drawing entire assembly forward until first speed gear can pass through notched areas in transmission case. (Fig. 13).

c. Reverse Idler Gear Assembly

Remove reverse idler gear shaft lock strap cap screw and strap. Pull shaft, using puller, Tool C-603.

Fig. 12 — Removing Mainshaft Assembly

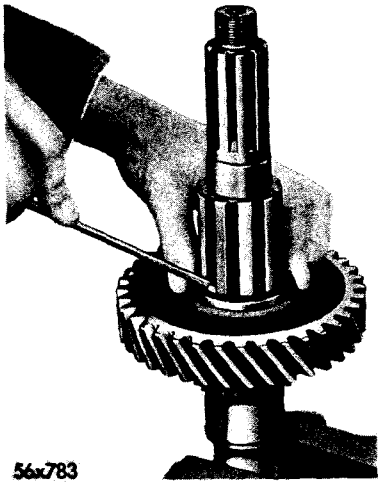

Fig. 13 — Removing 2nd Speed Gear Thrust Washer

d. Countershaft

Remove countershaft front bearing retainer and gasket (or gaskets). Remove lockwire, two cap screws and washer. If necessary to prevent countershaft from turning, insert hammer handle between gear set and transmission case, to form a locking wedge. After first removing rear bearing retainer cap screws, drive against front end of countershaft with a brass drift to remove rear bearing retainer. Using a countershaft as a driving tool, place face of countershaft drive gear against front bearing inner race and gently tap rear of countershaft to

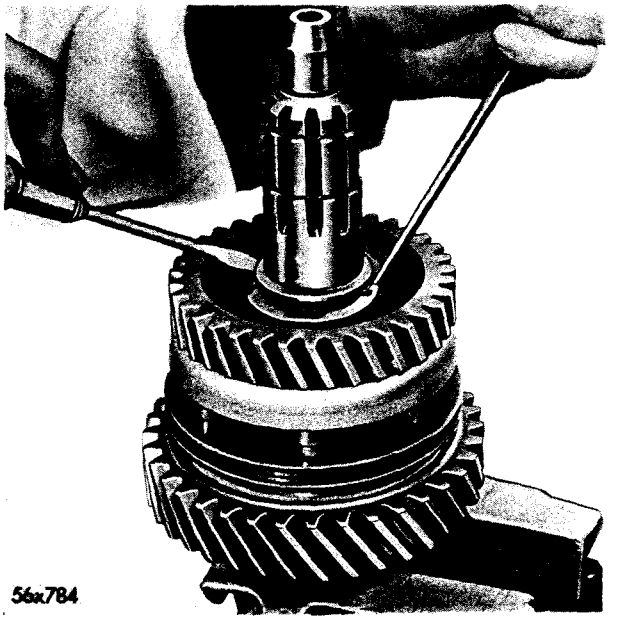

Fig. 14 — Removing 3rd Speed Gear Lock Ring

drive front bearing out of its bore. Tip countershaft upward, and remove from transmission case. Remove spacer washer from front end of countershaft.

8. DISASSEMBLY AND INSPECTION OF SUB-ASSEMBLIES (Refer to Fig. 9)

a. Mainshaft

Remove first speed gear. Remove the 2nd speed gear by depressing the plunger lock, as shown in Figure 14, and rotating the splined thrust washer.

NOTE

Plunger lock is spring loaded—do not lose plunger or spring.

Remove 2nd-3rd speed synchronizer unit. Clamp mainshaft in vise, equipped with soft jaws, and remove 4th and 5th speed synchronizer clutch gear snap ring (use pliers, Tool C-484) and clutch gear. Remove the 4th speed gear and shim (or shims). Remove the 3rd speed gear split lock ring as shown in Figure 15. Remove 3rd speed gear. The 2nd-3rd speed synchronizer clutch gear is integral with the mainshaft.

b. Drive Gear

Remove snap ring and washer holding pilot roller bearings in place and remove bearings.

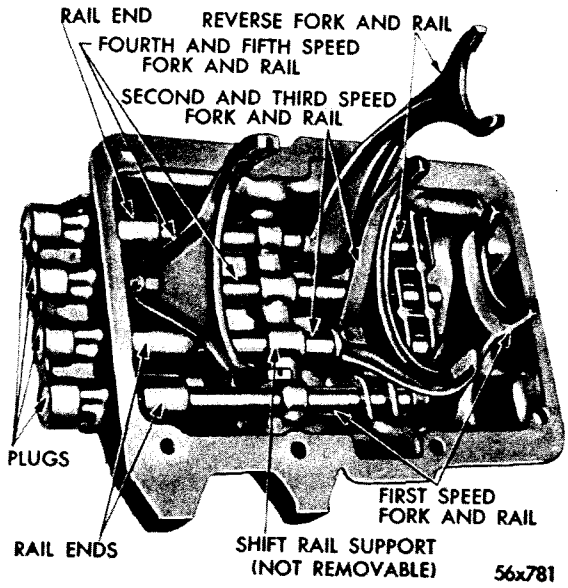

Fig. 15 — Transmission Cover (Interior View)

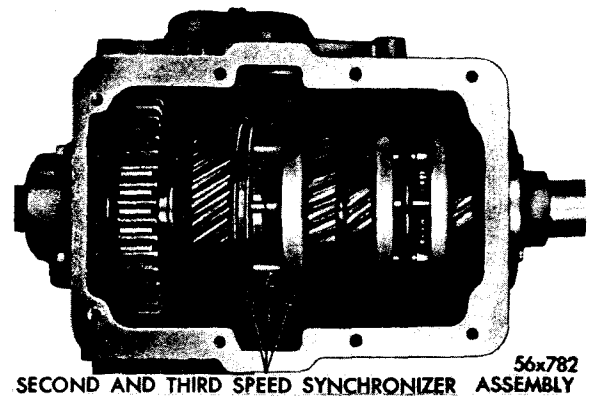

Fig. 16 — Positioning 2nd and 3rd Speed Synchronizer Pins

Remove drive gear ball bearing retainer nut and remove ball bearing.

CAUTION

Ball bearing retainer nut has left hand threads.

Remove snap ring from drive gear ball bearing.

c. Countershaft

During disassembly operations it is usually not necessary to disassemble the countershaft assembly; however, if inspection, damage or malfunctioning warrants disassembly, proceed as follows:

Place assembly in a suitable arbor press with blocks supporting the 3rd speed gear and carefully press shaft out. Remove the one key.

d. Transmission Cover (Refer to Fig. 16)

Place shifter forks and rails in neutral. Remove split pins from shifter fork and rail ends.

NOTE

Split pins may be removed by using a square type or a closely wound spiral "easy out" mounted in a tap handle.

Drive the 4th-5th speed or 2nd-3rd speed shift rails forward and out front of transmission cover, then remove the center rail.

NOTE

Place a cloth over shift rail while driving out, to prevent loss of poppet balls and springs.

Remove the six interlock balls from shift rail support.

NOTE

It may be necessary to shake or tap the transmission cover to remove interlock balls.

Drive out reverse and first speed rails, using care not to lose poppet balls and springs.

9. ASSEMBLY OF SUB-ASSEMBLIES

Wash all parts in a suitable solvent and allow to dry thoroughly.

Bearings—Wash in a pressure bearing washer. Do not spin bearing with compressed air. Examine bearing for defects. Replace if necessary, and lubricate. Gears and Gear Teeth—Check for chipped, broken or worn gear teeth. Spots, where case hardening has worn through, render gears unfit for further service.

Splines and Shafts—Examine for evidence of twisting or excessive wear. Place sliding gears on respective shafts and check clearance along splines. If clearance exceeds—.005 inch or if shaft is badly scored or twisted over .005 inch, install new parts.

Needle Bearings—If worn excessively, will cause noisy operation and possible serious damage to transmission. New and used rollers must not be assembled together.

Washers and Snap Rings—Check for excessive wear. Check snap rings for broken ends and distortion and fit in grooves.

Castings—Inspect all mating surfaces for burrs and scratches. Examine for sand holes, cracks and stripped threads.

Seals—Replace.

In performing assembly operations, use new plugs, gaskets and seals where indicated. Lubricate all parts, before assembly, with transmission lubricant.

a. Mainshaft

Place mainshaft (forward end up) in vise equipped with soft jaws. Place 3rd speed gear on shaft, with clutching teeth facing down. Install split lock ring. Make certain ring is properly locked. Install shim (or shims) on 4th speed gear. Place gear on shaft with clutching teeth facing up. Place 4th and 5th speed synchronizer clutch gear (with oil slots down) on mainshaft. Select a snap ring (available in four sizes, marked, A, B, C, D) to eliminate all end play of the clutch gear. Install snap ring with pliers, Tool C-484.

Remove mainshaft from vise and install 2nd-3rd speed synchronizer unit. Synchronizer sleeve is marked "FRONT" for proper installation. Place 2nd speed gear on shaft. Lock in place after installing plunger spring and plunger and splined thrust washer. Push in plunger (Fig. 14) and lock washer by rotating until splines are aligned. Install 1st speed gear on shaft with fork groove facing front end of shaft.

b. Rear Synchronizer Float

Checking the end play float (.070-.090) at the rear synchronizer (2nd & 3rd speeds) is mandatory and should be performed during the assembly of the mainshaft subassembly. This can be done by using two equal sized feeler gauges diametrically opposite each other between the 3rd speed outer stop ring and the 3rd speed gear itself.

NOTE

Extreme care should be used to make sure that all synchronizer parts are properly assembled and square, and the gauges are inserted close to the mainshaft and up on the shoulder of 3rd speed gear, otherwise on erroneous reading will result.

In the event, the end play float is less than .070 or is more than .090, select different new component parts for the assembly of the synchronizer.

c. Countershaft

If countershaft assembly was disassembled for any reason, reassemble as follows:

Place key in position and press gears on countershaft until properly seated. Install spacer washer on countershaft drive gear.

d. Drive Pinion

Grease pilot rollers, to hold in place, and insert into pocket of drive gear. Install washer and snap ring. Carefully press large bearing onto stem. Make sure bearing is properly seated. Install bearing retainer nut and tighten securely. (Nut has a left hand thread). Install snap ring

on large bearing, making sure it is properly seated.

e. Transmission Cover (Refer to Fig. 16)

Drive reverse rail into housing only far enough to install reverse lug, poppet ball and spring. Continue to drive rail through support until reverse fork can be installed, then finish driving in rail. Install welch plug. Install 1st speed rail in similar manner.

Place a small quantity of grease on the six interlock balls. Shift reverse and 1st speed rails into neutral and install interlock balls in shift rail support. Install 4th-5th speed shift rail and fork and 2nd-3rd speed shift rail, fork and rail end in same manner described for reverse rail.

10. INSTALLATION OF SUB-ASSEMBLIES

a. Countershaft

Place countershaft in transmission. Make sure spacer washer is still installed. With countershaft front bearing journal protruding through front bearing bore, install front bearing on journal and seat against spacer washer. Be sure to keep centerline of countershaft aligned with rear bearing bore to prevent damage to countershaft front bearing. Install countershaft rear bearing (needle) and retainer. Tighten retainer screws securely. Install front bearing washer, cap screws and lockwire.

b. Reverse Idler

Place reverse idler gear in position in case. Drive shaft through case and gear, using a brass hammer. Make sure lock strap slot in shaft will line up so that lock strap screw can be installed. Install lock strap on shaft and tighten cap screw securely.

c. Mainshaft

Carefully guide 1st speed gear through relieved areas in case as rear end of mainshaft is lowered into case (Fig. 13). With rear end of mainshaft extending through rear bearing bore, install 4th-5th speed synchronizer units as shown in Figure 12. Carefully press rear bearing onto shaft and into its bore in case. Bearing snap ring must lay flush against face of transmission case.

d. Drive Pinion

Install drive pinion by carefully driving on bearing outer race while guiding pilot of mainshaft into bearing pocket. Make sure bearing is fully seated (snap ring laying flush against case). Install bearing retainer (without gasket) pressing tightly by hand against bearing. Measure clearance between drive pinion retainer and case, using a feeler gauge—Select a gasket about .005 inch thicker than measured clearance (to eliminate end play in bearing) and reinstall retainer.

NOTE

If necessary to replace retainer oil seal, tap seal lightly until seal makes contact with its seat. Do not drive beyond this point.

e. Front Synchronizer

When checking the end play float of (.050-.070) at the front synchronizer (4th and 5th speeds), which should be preformed just before the transmission cover assembly is installed, follow approximately the same procedure as for the rear synchronizer, except that the feeler gauges are placed between the main drive gear and the outer stop ring. Correct readings can only be obtained after all main shaft components are properly assembled and tightened to specifications.

If the end play float does not check within the limits (.050 to .070), shims should be removed or added between the 4th speed gear and the outer stop ring of the synchronizer assembly.

f. Transmission Cover

Place transmission in 2nd gear. Rotate 2nd-3rd speed synchronizer unit until pins are aligned (Fig. 17). Move reverse idler gear assembly forward, then, position housing above case, as shown in Figure 11.

Carefully lower into position on case while guiding reverse fork through relieved area in case and past synchronizer pins.

NOTE

At this point it may be necessary to move the 1st speed gear slightly forward (using screw

driver) to enable fork to properly engage fork groove on gear.

Install aligning screws and lockwashers and tighten thumb tight. Install remaining screws and then tighten all screws securely after cover is properly seated. Reinstall brake drum and flange assembly. Final tightening of flange nut can be done with transmission installed in engine using wrench, Tool DD-406. Install brake band assembly.

11. INSTALLATION OF TRANSMISSION

Place transmission on transmission jack. Raise jack to position transmission to proper height for installation. Align splines on main drive gear shaft with clutch hub splines. Slide assembly forward and bolt transmission to bell housing.

Install hand brake cable and speedometer cable (if so equipped). Connect propeller shaft companion yoke. Fill Transmission with Automatic Transmission Fluid Type "A" as outlined in the Lubrication section. Run engine and test transmission.

SERVICE DIAGNOSIS

12. HARD SHIFTING

Possible Causes:

a. Improper selector rod adjustment.

b. Synchronizer shifting plate damaged or broken.

c. Synchronizer springs improperly installed.

d. Broken or worn synchronizer stop rings.

e. Absence of gearshift rail interlock.

f. Improper clutch adjustment.

Remedies:

a. Place the transmission gears in neutral position. Loosen the lock nut on the front end of the selector rod and tighten adjusting nut until all end play is removed from the rod. Back off the adjusting nut ½ turn for clearance and tighten lock nut.

b, c, d and *e.* Causes noted above can only be corrected by disassembling transmission, inspecting parts referred to and replacing parts if necessary.

f. Refer to Clutch Section for correction of this condition.

13. TRANSMISSION SLIPS OUT OF GEAR

Possible Causes:

a. Second or direct speed gear synchronizer clutching teeth worn.

b. Gearshift fork lock screw loose.

c. Clutch housing bore or face out of alignment.

Remedies:

a. Disassemble and replace synchronizer. Replace parts as required.

b. Remove shift cover and tighten gearshift fork lock screw securely.

c. Refer to Clutch Section for correction of this condition.

14. TRANSMISSION NOISES

Possible Causes:

Backlash Noise

a. Excessive end play in the cluster gear.

b. Loose synchronizer hub spline fit on mainshaft.

c. Loose spline fit on low speed sliding gear.

d. Loose spline fit of rear mainshaft flange.

Continuous Noise

e. Damaged, broken or excessively worn gear teeth.

f. Drive pinion bearing worn.

Remedies:

If on examination it is found that any of the above conditions exist, the remedies will be self evident. Perform corrective operation as required.

Section VII

CLUTCH, FLUID COUPLING AND TORQUE CONVERTER

DATA AND SPECIFICATIONS

CLUTCH

MODELS	*IND. 52, 53, 54, 56, 56A*		
Make	Borg & Beck	Borg & Beck	Borg & Beck
Model Number	1433	1237	12774
Size			
Outside Diameter	11 in.	13 in.	13.875 in.
Inside Diameter	6.5 in.	7 in.	8.38 in.
Thickness	.140 in.	.140 in.	.187 in.
Clutch Pedal Free Play	1⅛ x 1¼ in.	1½ x 1¾ in.	1⅛ x 1¼ in.
No. of Pressure Springs	9	12	15
Total Pressure (lbs.)	1965	2496	2325
Facing Material	Woven Asbestos		
Release Bearing Type	Permanently Lubricated Ball		
Pilot Bearing Type	Oilite Bushing	Oilite Bushing	Ball
Disc Hub Spline Size (in.)	1 x 1.12	1.50 x 1.68	1.50 x 1.68

FLUID COUPLING

RUNNER BUSHING—FRONT AND REAR	
Type	Oilite
DIAMETER OF COUPLING	13 Inches

TORQUE CONVERTER

Rotation	Right Hand
Input Torque—Maximum	300 Foot Pounds
Torque Multiplication—Maximum	2.6
Efficiency in Coupling Range—Maximum	96.5
Converter Oil—Maximum Operating Temperature	250 Degrees F.
Cooling	Water and Direct Air
Governor—Type	Output Shaft
Converter Oil	Automatic Transmission Fluid Type "A"
Converter Oil—Capacity	12 Quarts
Converter Oil Filter	Full Flow replaceable element
Converter Elements	Three—Impeller, Stator and Turbine
Converter Size—Diameter	12½ inches
Converter Housing	SAE No. 3
Total Weight	Short Housing—164 Pounds Housing with Extension—204 Pounds

TORQUE SPECIFICATIONS

	Foot-Pounds Torque
Oil Pan Drain Plug	50
Torque Converter to Crankshaft Nuts	55
Oil Seal Retainer to Converter Housing Screws	18
Turbine Shaft to Clutch Driving Plate Screws	50
Adapter Plate to Engine Cylinder Block Screws	30
Torque Converter Housing to Adapter Plate Screws	30
Converter to Oil Pump Housing Bolts	18

Section VII

CLUTCH, FLUID COUPLING AND TORQUE CONVERTER

(OPTIONAL EQUIPMENT)

CLUTCH

1. DESCRIPTION

The type of clutch used is determined by the type of adaptation. On units equipped with fluid coupling or torque converter the turbine shaft is attached to the driving plate of the clutch. When the clutch is engaged, the clutch disc, which is splined to the transmission drive pinion, is clamped between the clutch driving plate and the clutch pressure plate to transmit power to the transmission. The unit is controlled by the clutch release fork and linkage to the clutch pedal or lever.

In units not equipped with fluid coupling, torque converter, or power-take-off with heavy duty clutch, the clutch cover is attached to the engine flywheel. When the clutch is engaged, the clutch disc is clamped between the pressure plate and the flywheel; drive is transmitted from the cover through the pressure plate to the disc and then to the transmission.

The clutch, as shown in Figure 1, is a single plate, dry disc type, with no adjustment for wear provided in the clutch itself. The adjusting nut on the four individual release levers should never be disturbed, unless the clutch is to be dismantled for replacement of parts.

When engaged, the driving disc which operates on the splined shaft of the transmission or power-take-off, is clamped between the pressure plate and flywheel by springs mounted in bosses on the cover. Four tempered steel straps transmit drive from the pressure plate to cover. One end of each strap is riveted to the cover, while the other is bolted to a corresponding boss on the pressure plate.

As the release bearing moves toward the flywheel, the release lever pivots on the floating pin (which remains stationary in the release lever) and rolls across a short flat portion of the enlarged hole in the eyebolt. This causes the outer end of lever to engage the pressure plate lug, by means of the strut which provides a knife edge contact between the outer end of lever and lug. This action forces the pressure plate away from the driving disc, disengaging the clutch and disconnecting the engine from the load.

The outer ends of the eyebolts protrude through holes stamped in the cover, and are fitted with adjusting nuts which correctly position the levers.

SERVICE PROCEDURES

2. CLUTCH REMOVAL

The clutch can be removed only after the transmission or power-take-off (if so equipped) has been removed. Proceed as follows:

(1) Remove transmission or power-take-off (if so equipped).

(2) Remove clutch housing pan.

(3) Remove clutch release bearing.

(4) Disconnect clutch release fork bracket at clutch housing.

(5) Remove the clutch release fork flange bolts

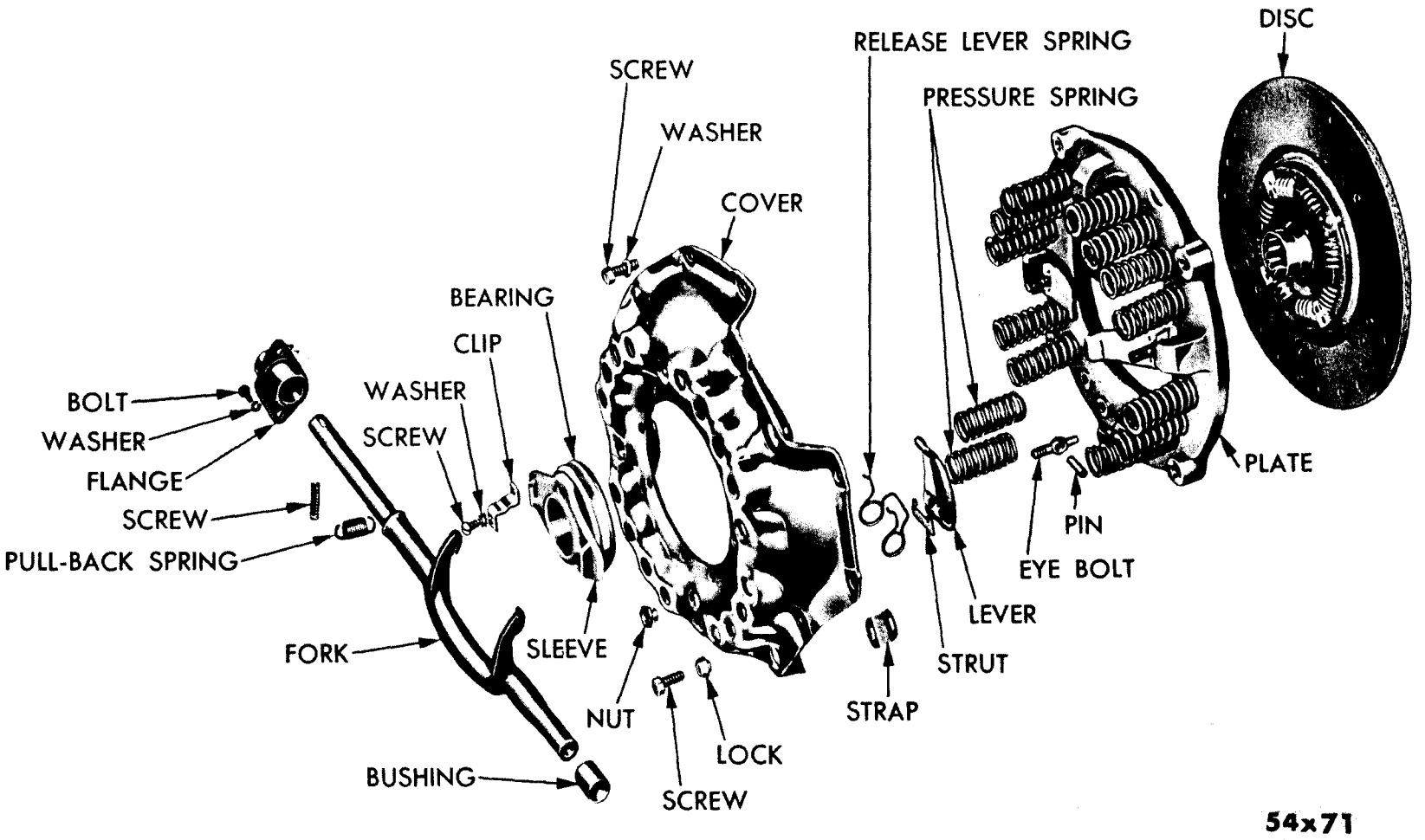

Fig. 1 — Clutch (Exploded View)

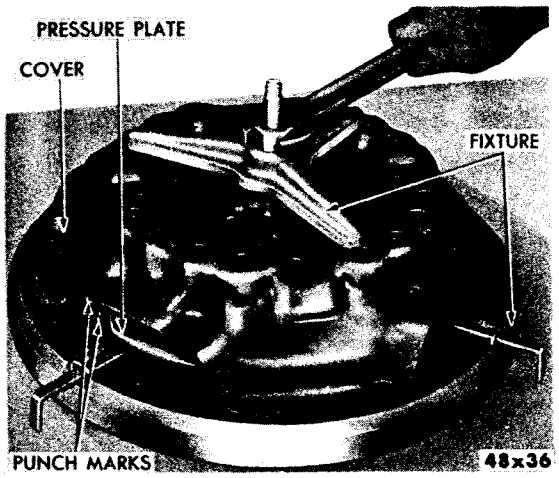

Fig. 2 — Disassembling or Assembling Clutch Pressure Plate

and pull the release fork out of the clutch housing far enough to provide clearance for the clutch assembly to pass the cross shaft clutch release fork.

(6) Prick punch the clutch cover and make a similar mark on the flywheel to identify the proper position for assembly. The crankshaft, flywheel, and clutch assembly (when used) are balanced individually as a unit. To maintain this balance the clutch and the flywheel must be marked before removal.

(7) Loosen all the pressure plate mounting bolts evenly before removing. This will relieve the pressure plate spring pressure and prevent cover distortion.

(8) Remove bolts and lift out clutch pressure plate and cover assembly and the clutch disc.

3. SERVICING CLUTCH

a. Disassembly of Clutch Cover Assembly

To disassemble the clutch cover assembly, refer to Figure 1, and proceed as follows:

(1) Mark the cover and pressure plate with a prick punch, as shown in Figure 2, so that they can be assembled in their original position to maintain balance.

(2) Mount clutch assembly in clutch fixture, Tool C-585-B.

(3) Install the three-legged spider over center screw so that it rests directly against top of clutch cover.

(4) Install the plain thrust washer and the hexagon compression nut. Compress the nut (see Figure 2).

(5) With clutch springs under compression, remove clutch release lever eyebolt nuts and the bolts which attach the four driving straps to the pressure plate. Slowly relieve the spring pressure by unscrewing the compression nut.

(6) The cover can then be lifted off and all parts made available for inspection.

b. Removal of Clutch Release Levers

To remove the release levers, proceed as follows:

Grasp lever and eyebolt between the thumb and fingers, as shown in Figure 3, so that the flat side of lever and upper end of eyebolt are as close together as possible. Keep the eyebolt pin seated in the socket in the lever.

The strut can then be lifted over the ridge on the end of the lever, making it possible to lift lever and eyebolt off the pressure plate.

4. INSPECTION AND TESTS

Clean all parts thoroughly with a suitable solvent. Inspect carefully for excessive wear or distortion as follows:

Fig. 3 — Removing or Installing Clutch Release Levers

a. Pressure Plate

If pressure plate shows signs of scoring, excessive wear, heat checking or if warped more than .020 inch, the plate should be replaced.

b. Testing Pressure Springs

It is advisable to replace pressure springs when the clutch is dismantled after considerable service or if there has been a great amount of slippage (creating excessive heat) which may have caused the springs to lose their initial tension. To test pressure springs, place spring on seat of spring tester, Tool C-647, as shown in Figure 4. Affix torque wrench and check tension. Clutch pressure springs should test 135 pounds (plus or minus 5 pounds), when compressed to $1^{1}\frac{1}{16}$ inches. Discard any spring that does not meet minimum requirement.

c. Cover Plate

Check cover plate for distortion, broken or bent cover straps and for loose or broken rivets.

d. Release Levers

Replace release levers that are badly worn on tips (this is an indication of a sticking release bearing), worn or damaged threads on eyebolts or adjusting nuts, or where binding appears to be present which retards free back and forth movement. Check struts for wear on contact edges.

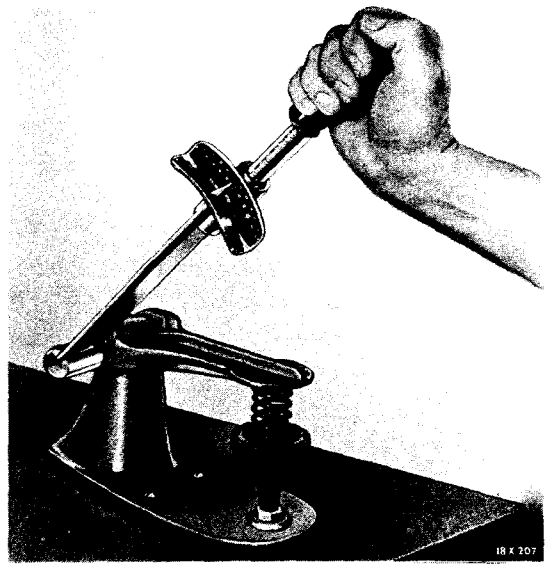

Fig. 4 — Testing Clutch Pressure Springs (Tool C-647)

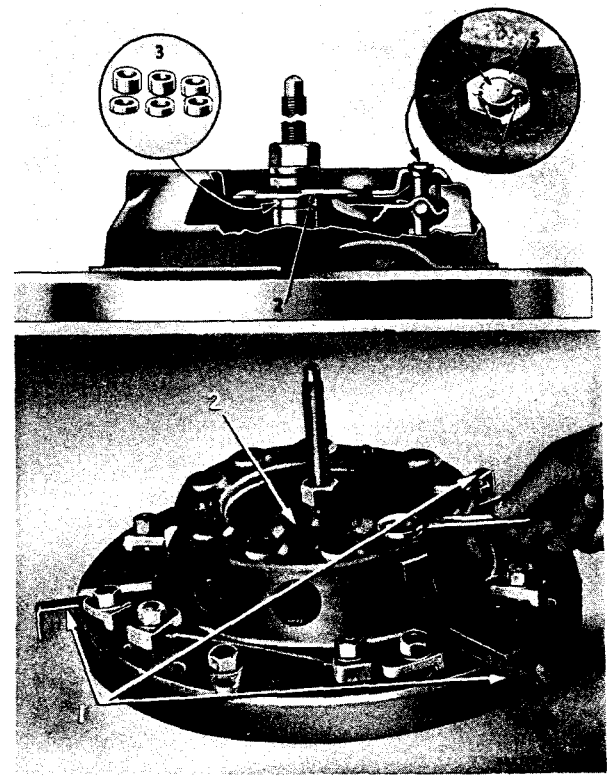

Fig. 5 — Adjusting Clutch Release Levers

1 — Feeler Blades (Part of Tool C-585)
2 — Compression Plate (Part of Tool C-585)
3 — Spacers (Part of Tool C-585)
4 — Clutch Release Lever Eye Bolt
5 — Clutch Release Lever Eye Bolt Nut
6 — Stake Here to Lock

5. ASSEMBLY OF CLUTCH

To assemble the release levers on pressure plate, proceed as follows:

Assemble lever pin and eyebolt to the release lever. Holding the threaded end of eyebolt between the thumb and index finger, allow end of lever to rest on second finger. Keep end of lever and eyebolts as close together as possible. With the other hand, grasp strut between thumb and first finger and insert in slot of pressure plate lug. Drop strut slightly until it touches the vertical milled surface of lug. Insert the lower end of eyebolt into hole in pressure plate, which will bring the short end of lever under the hood of lug and near the strut. Slide the strut upward in slot and lift over ridge and into groove on short end of lever.

Assemble the remaining release levers in the same manner. Continue to assemble, observing the following precautions:

(1) Place pressure springs in position so that they rest on the small bosses of the pressure plate, and engage the embossed seats on the cover.

(2) Match up the prick punch marks made when disassembling, so that cover and pressure plate will be assembled in the same position.

(3) The assembly can be slowly compressed as outlined for disassembly. Make certain that the eyebolts are guided through the holes in the cover.

(4) Screw the adjusting nuts on the protruding eyebolts, until nuts are flush with top of eyebolts. Slowly release pressure by unscrewing compression nut on the tool. Depress each lever several times to settle parts into working position.

(5) Install bolts through the driving straps and tighten securely.

6. ADJUSTING RELEASE LEVERS

Mount the clutch assembly on the fixture, Tool C-585-B, with two of the release levers over the feeler gauges in base of fixture, as shown in figure 5.

(1) Install the bolts that hold cover to fixture.

(2) Place proper spacers on center screw of fixture.

(3) Install compression plate on center screw. Make sure that it rests directly against the clutch release fingers (levers).

(4) Install the self-aligning washer, flat-washer and compression unit.

(5) Tighten compression nut until clutch is fully compressed.

(6) Adjust clutch release levers until the feeler gauges have the same slight *drag* or *feel* while being pushed in or pulled out. Tighten nuts to decrease *drag* and loosen to increase *drag*.

(7) Recheck release lever adjustment to make sure each one is adjusted properly.

Two of the levers should be located over two of the feeler gauges, and adjustments made as outlined above. The clutch should then be rotated 180 degrees on the base of fixture so that the other two levers can be adjusted.

When removing the clutch assembly from fixture, loosen the housing clamps first, then loosen and remove the compression nut.

Clamp pressure plate to hold it to surface plate. Adjust levers until $2\frac{1}{16}$ inch height is obtained.

7. SERVICING CLUTCH SHAFT PILOT BUSHING

The use of remover, Tool C-41 will facilitate the removal of worn or scored pilot bushings on engines not equipped with a fluid coupling. On engines equipped with a fluid coupling, refer to "Servicing Fluid Coupling Bushings," Paragraph 21, of this Section.

To remove pilot bushing, screw the tapered pilot of remover Tool C-41 into the bushing, allowing pilot to cut its own threads until a solid grip is obtained. Insert puller screw and turn, forcing bushing out of crankshaft.

To replace pilot bushing, slide new bushing over the pilot of Tool DD-386 and drive into place with a soft hammer. This action causes bushing to tighten up on pilot. Install cup and puller nut and tighten, removing tool from bushing. This action burnishes the bushing to the exact size and leaves a smooth and lasting finish.

Lubricate the bushing with a half teaspoon of short fiber grease (medium). Insert grease in bushing (not clutch shaft) as shown in Figure 6.

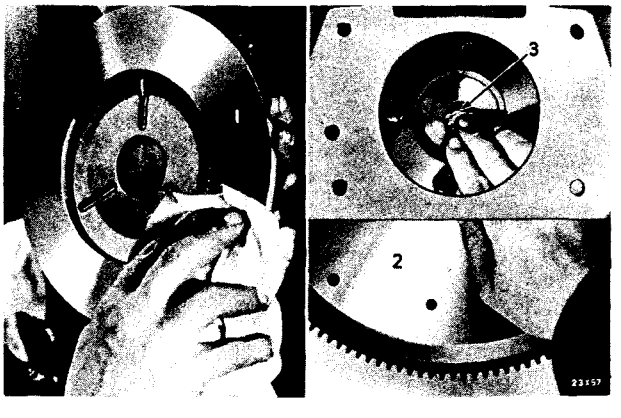

Fig. 6 — Cleaning Clutch Friction Surfaces and Lubricating the Pilot Bushing

1 — Clutch Pressure Plate
2 — Engine Flywheel
3 — Transmission Main Drive Pinion Pilot Bushing

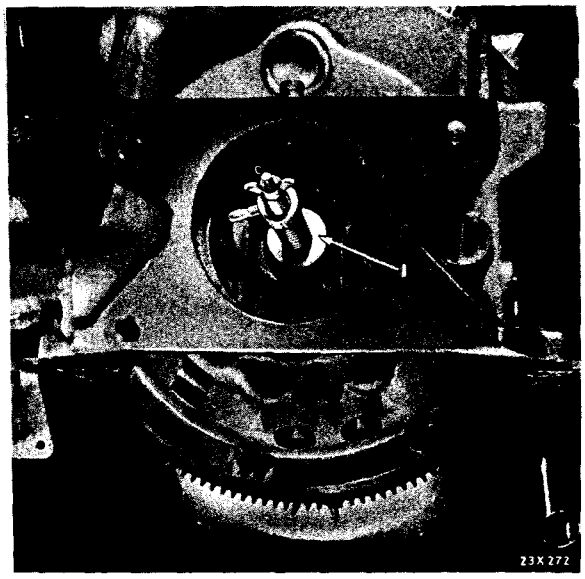

Fig. 7 — Installation of Clutch Disc (Arbor Tool C-360)

8. INSTALLATION OF CLUTCH

Install clutch in reverse order of disassembly and observe the following precautions:

(1) Coat main drive pinion bushing in the end of the crankshaft with a short fiber medium grease, as shown in Figure 6.

(2) Clean surfaces of the flywheel and pressure plate thoroughly, making certain that no oil or grease remains on these parts.

(3) Hold clutch cover plate and disc in place, and insert the aligner, Tool C-360, through hub of the driving disc and into the pilot bushing in crankshaft, as shown in Figure 7.

(4) Bolt clutch assembly loosely to flywheel with the marks on cover and flywheel in alignment.

(5) Tighten clutch mounting bolts a few turns each in progression until all are tightened securely. Remove aligning tool.

9. TYPICAL METHOD OF CHECKING ALIGNMENT OF CLUTCH HOUSING (If so equipped)

Replacement of clutch housing or reinstalling the original clutch housing (if removed for any reason), must be correctly aligned when installed. Out-of-round of the bore must not exceed .005 inch total indicator reading. To correctly align clutch housing, proceed as follows:

(1) Inspect the housing face, where it contacts the rear of the engine block, for particles of dirt and burrs. Remove burrs with a file and clean both surfaces.

(2) Start the dowel pins in the block from the front end so they protrude beyond the machined face of the engine block and install the clutch housing. Install clutch housing to block cap screws, making them just snug enough so the housing can be shifted if necessary by tapping with a mallet.

(3) Install fixture Tool C-870 to the flywheel attaching bolts (Figure 8) and install the

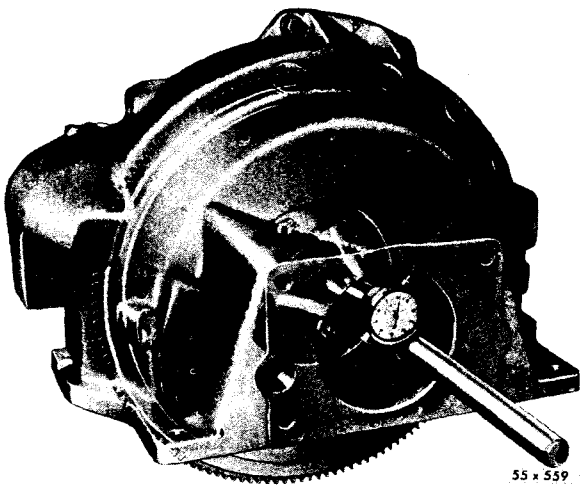

Fig. 8 — Checking Clutch Housing Bore, Using Attaching Fixture Tool C-870

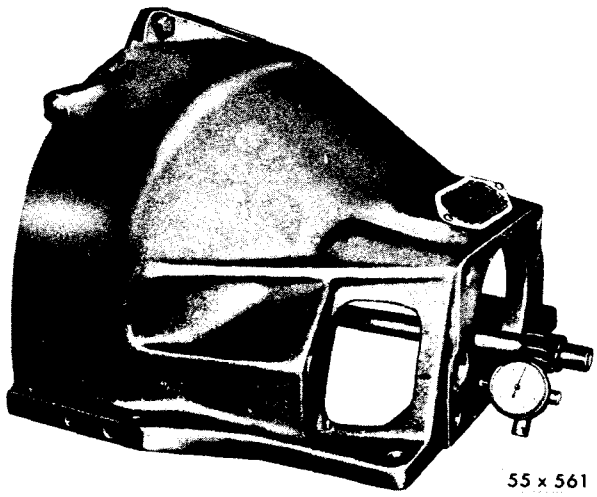

Fig. 9 — Checking Rear Face of Housing

indicator (Tool C-435 or Tool C-430), as shown in Figure 8. Rotate the crankshaft and check the inside diameter of the housing bore. It should not vary more than .005 inch to one complete revolution of the crankshaft. If alignment is necessary, remove the dowel pins and tap the housing until it comes within the specified tolerance. After obtaining correct alignment, tighten the housing cap screws to 35 foot-pounds torque.

(4) Change the position of the dial indicator and check the rear face of the housing as shown in Figure 9. This tolerance must be within .002 inch.

NOTE

Failure to align clutch housing may result in hard shifting of transmission and the possibility of gear disengagement.

If alignment of the housing is necessary as described in step (3), the dowel pin holes must be reamed. Ream with reamer, Tool C-860 and install .512 inch oversize dowel pins.

10. ADJUSTING CLUTCH PEDAL FREE MOVEMENT

(1) Loosen pedal adjusting screw lock nuts.

(2) Turn clutch pedal adjusting screws until pedal has 1 to 1⅛ inch free movement.

SERVICE DIAGNOSIS

11. CHATTERING CLUTCH

Possible Causes:

a. Improper lever adjustment.

b. Oil or grease on facings.

c. Worn splines on transmission shaft.

d. Binding pressure plate.

e. Binding release levers.

f. Binding disc hub.

g. Glazed facings.

h. Unequal contact of pressure plate.

i. Bent clutch disc.

j. Uneven spring pressures.

k. Improper alignment of transmission.

l. Loose facings.

m. Scored pressure plate.

Remedies:

a. Readjust clutch, as outlined in Adjustments, Paragraph 6, of this section.

b. Check for oil leaks at rear main bearing and at transmission pinion shaft bearing. To correct this condition, refer to Engine and Transmission Sections in this manual. Replace disc assembly and clean clutch parts thoroughly.

c. Replace worn transmission drive pinion (clutch shaft). Install new disc assembly and adjust clutch.

d. Check pressure plate for binding where lug protrudes through cover; coat contact surfaces with a thin coat of MOPAR Lubriplate Replace worn parts as required.

e. Free up binding release levers. Check for worn or damaged threads on eyebolts, adjusting nuts or where binding appears to be present, which retards free movement. Check struts for wear on contact edges and, if necessary, replace.

f. Replace disc assembly and adjust clutch.

g. Replace disc assembly after checking pressure plate, flywheel or driving plate for possible scoring. If parts are badly scored or worn, complete replacement is required.

h. Check clearances of release levers, disc for thickness and pressure plate for parallel position against flywheel or driving plate.

i. Replace disc assembly after checking to determine cause of distortion. Examine pressure plate for excessive wear or scoring. Replace if necessary.

j. Check spring for tension, as described in Testing Pressure Springs, Paragraph 4 (b), of this section.

k. Check clutch housing alignment. Misalignment between transmission and clutch housing may be caused by chips, dirt, buckled gaskets or burrs. Check to determine cause and correct.

l. Replace disc assembly. Examine pressure plate and flywheel or driving plate for possible scoring and excessive wear. Replace as required.

m. If pressure plate shows sign of scoring, excessive wear, heat checking, or if warped more than .005 inch, plate must be replaced.

12. GRABBING CLUTCH

Possible Causes:

a. Improper lever adjustment.

b. Oil or grease on facings.

c. Worn pressure plate, flywheel or drive plate.

d. Clutch disc hub sticking on pinion (clutch) shaft.

e. Worn or binding release levers.

f. Worn or glazed facings.

g. Broken or weak pressure springs.

h. Incorrect disc facings.

i. Improper alignment of transmission.

j. Worn or deteriorated rubber engine mountings.

k. Engine loose in supports.

Remedies:

a. Adjust clutch as outlined in Adjustments, Paragraph 6, of this section.

b. Replace disc assembly. Check for oil leak at rear main bearing. To replace the oil seal, refer to Engine Section.

c. A flywheel or pressure plate, that shows signs of excessive wear, heat or scoring, must be replaced.

d. Free up disc hubs. Check pinion shaft for excessive wear or burrs. Check disc assembly for distortion and replace if necessary.

e. Release levers that are badly worn on the tips should be replaced. This is an indication of a sticking release bearing. Worn or damaged threads on eyebolts or adjusting nuts, or where binding appears to be present (which retards free movement) should be corrected. Check struts for wear on contact edges and replace as required.

f. Replace disc assembly. Check pressure plate for excessive wear or scoring. Replace parts as required.

g. Replace broken or weak springs. To test springs for tension, refer to Testing Pressure Springs, Paragraph 4 (b) of this section.

h. Replace disc assembly. Use Factory Engineered and Inspected clutch disc assembly. Adjust clutch.

i. Check clutch housing alignment. Misalignment between transmission and clutch housing may be caused by chips, dirt, buckled gasket or burrs. Check to determine cause and correct.

j. Replace worn engine mountings. Refer to Engine Section.

k. Check engine mountings for loose bolts. Tighten as required to correct this condition.

13. SLIPPING CLUTCH

Possible Causes:

a. Weak or broken pressure springs.

b. Worn facings.

c. Improper clutch adjustments.

d. Oil or grease on facings.

e. Warped disc assembly.

f. Warped or scored pressure plate.

g. Binding release levers.

Remedies:

a. Replace weak or broken springs. To test springs for tension, refer to Testing Pressure Springs, Paragraph 4 (b) of this section.

NOTE

It is advisable to replace pressure springs when clutch is dismantled after considerable service, or if there has been a great amount of slippage

(creating excessive heat), which may have caused the springs to lose initial tension.

b. Replace disc assembly. Check pressure plate, flywheel, or clutch driving plate for possible scoring, heat checking or excessive wear. Test pressure springs for lost tension. Replace parts as needed.

c. Examine disc assembly for excessive wear or a glazed surface, pressure plate for possible scoring or distortion. Test springs for tension. Replace parts as required. Adjust clutch.

d. Replace disc assembly. Check for oil leak at rear main bearing. To replace the oil seal, refer to Engine Section.

e. Replace warped or distorted disc assembly after examining pressure plate for possible damage. Test pressure springs for tension as described in Paragraph 4 (b) of this section.

f. A pressure plate that is badly scored, heat checked or warped more than .005 inch, must be replaced. Test springs for tension and install new disc assembly.

g. Free up release levers where binding appears to be present which retards free movement. Examine struts for excessive wear on contact surfaces. Lubricate all moving parts with Lubriplate. Check disc and pressure plate for scoring or heat checking, and test pressure springs for tension. Replace parts as required.

14. DRAGGING CLUTCH

Possible Causes:

a. Oil or grease on facings.

b. Incorrect lever adjustment.

c. Incorrect pedal adjustment.

d. Dust or dirt in clutch.

e. Worn or broken facings.

f. Bent clutch disc.

g. Disc hub binding on pinion shaft.

h. Binding pilot bushing.

i. Sticking release bearing sleeve.

j. Warped pressure plate.

k. Improper alignment of transmission.

l. Clutch facings too thick.

Remedies:

a. Replace disc assembly. Check for oil leak at rear main bearing. To replace the oil seal, refer to Engine Section.

b. Readjust levers after checking for possible damage. Refer to Paragraph 6, of this section.

c. Readjust pedal as described in Adjustments, Paragraph 10, of this section.

d. Disassemble clutch and clean thoroughly. Examine all parts for excessive wear or scoring. Replace worn or scored parts as required. At reassembly, coat all moving parts with a thin coat of MOPAR Lubriplate.

e. Replace disc assembly. Inspect pressure plate for excessive wear or scoring. Test pressure springs for tension, as described in Paragraph 4 (b) of this section.

f. Replace bent disc assembly after checking to determine cause of distortion. Replace worn or scored parts.

g. Free up disc assembly. Check pinion shaft (clutch shaft) for burrs or gummed splines. Replace parts as required to correct this condition.

h. Replace pinion shaft (clutch shaft) pilot bushing, as outlined in Servicing Clutch Shaft Pilot Bushing, Paragraph 7 of this section.

i. Free up sticking sleeve and examine mating surfaces for scoring or rough spots. Replace parts as required to correct this condition.

j. A pressure plate that is warped more than .005 inch must be replaced. Install new disc assembly. Adjust clutch.

k. Check clutch housing alignment. Misalignment between transmission and clutch may be caused by chips, dirt, buckled gasket, or burrs. Determine cause of condition and correct.

l. Clutch facings of more than .125 inch in thickness should be replaced. When replacing the disc assembly, always use Factory Engineered and Inspected Parts.

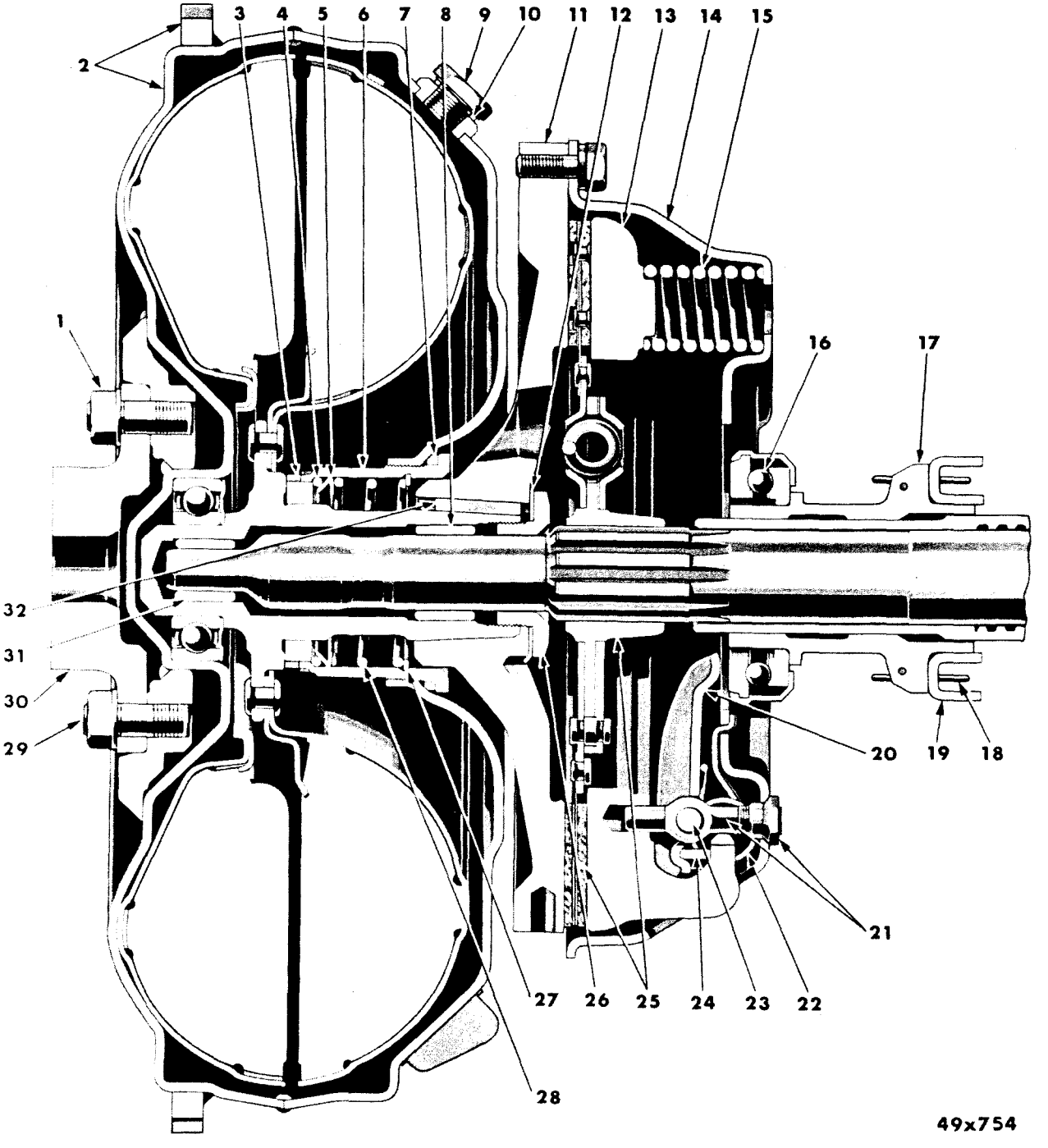

Fig. 10 — Clutch and Fluid Coupling Sectional View

1 — Fluid Coupling Flange Stud Nut
2 — Fluid Coupling Assembly
3 — Fluid Coupling Floating Seal Ring
4 — Fluid Coupling Seal Ring Gasket
5 — Fluid Coupling Seal Ring Gasket Retainer
6 — Fluid Coupling Seal Assembly
7 — Fluid Coupling Seal Retainer Gasket
8 — Fluid Coupling Runner Bushing-Rear
9 — Fluid Coupling Filler Plug
10 — Fluid Coupling Filler Plug Gasket
11 — Fluid Coupling Clutch Driving Plate
12 — Fluid Coupling Driving Plate Lock Washer
13 — Clutch Pressure Plate
14 — Clutch Cover
15 — Clutch Pressure Spring
16 — Clutch Release Bearing
17 — Clutch Release Bearing Sleeve
18 — Clutch Release Bearing Sleeve Pull-Back Spring
19 — Clutch Release Fork
20 — Clutch Release Lever
21 — Clutch Release Lever Eyebolt and Nut
22 — Clutch Release Lever Spring
23 — Clutch Release Lever Pin
24 — Clutch Release Lever Strut
25 — Clutch Disc Assembly
26 — Fluid Coupling Driving Plate Nut
27 — Fluid Coupling Seal Spring Retainer Snap Ring
28 — Fluid Coupling Seal Spring
29 — Fluid Coupling Driving Flange Stud
30 — Crankshaft
31 — Fluid Coupling Runner Bushing-Front
32 — Fluid Coupling Driving Plate Key

15. SQUEAKING CLUTCH

Possible Causes:

a. Lack of lubrication in release sleeve.

b. Worn release sleeve.

c. Dry pilot bushing.

d. Pilot bushing turning in crankshaft.

e. Worn drive pinion bearing.

f. Improper alignment of transmission.

Remedies:

a. Lubricate release sleeve with Lubriplate.

b. Check sleeve land for interference at Oilite part of release bearing. Replace sleeve if necessary.

c. Replace pilot bushing as outlined in Servicing Clutch Shaft Pilot Bushing, Paragraph 7 of this section.

d. Replace pilot bushing as indicated above.

e. Replace worn drive pinion bearing after checking bearing retainer for cracks and excessive wear. Examine pilot bushing and if necessary, replace (see *c.* above).

f. Check clutch housing alignment. Misalignment between transmission and clutch housing may be caused by chips, dirt, buckled gasket or burrs. Check to determine cause and correct.

16. VIBRATING CLUTCH

Possible Causes:

a. Improper balance of assembly.

b. Improper fitting of pressure plate.

c. Pressure spring off center.

d. Improper clutch alignment.

e. Loose engine mountings.

f. Worn transmission main shaft rear bearing.

Remedies:

a. Replace disc assembly and pressure plate to correct this condition.

b. Check clutch cover for distortion which would interfere with correct operation of pressure plate. Check clutch cover assembly mounting bolts for looseness and tighten if necessary.

c. Check springs for alignment on bosses and test for tension. See Paragraph 4 (b) of this section.

d. Replace disc assembly and align with aligning Tool C-360. Readjust clutch.

e. Tighten engine mounting bolts as required.

f. Replace worn transmission main shaft rear bearing, as described in Transmission Section.

FLUID COUPLING

17. DESCRIPTION

Some engines are equipped with a fluid coupling as shown in Figure 10 which eliminates all mechanical connections between the engine and clutch. It consists of a driving and a driven member.

The driving member is a steel stamping in which a number of steel fins are welded. This member is mounted on the end of the crankshaft and a cover plate is welded to the member forming a housing which contains a special fluid coupling oil. The cover plate and driving member are welded together forming an oil tight seal.

The driven member contains a number of welded steel fins. The stamping is riveted to a hub attached to the clutch driving plate. The hub of the driven member rotates in a bearing submerged in fluid in the assembly and therefore requires no other lubrication. The energy, set up by the revolving motion of the driving member through the medium of the fluid in the assembly, acts as a force on the fins of the driven member.

Fluid is maintained within the assembly by a housing type seal. The fluid coupling is filled to about 80 per cent of its total volume with a very light, lightly refined mineral oil which maintains uniform viscosity over a wide range of temperature.

SERVICE PROCEDURES

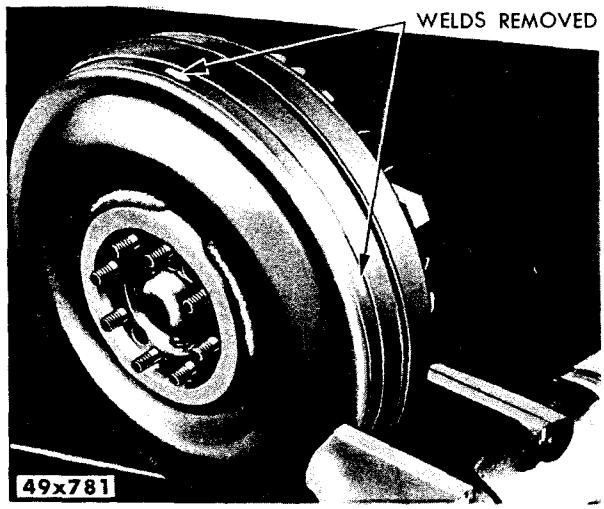

Fig. 14 — Driving Off Ring Gear from Fluid Coupling

18. FLUID COUPLING MAINTENANCE

After a new engine has been operated 25 hours the level of the fluid in the assembly should be checked. Allow the unit to cool to normal room temperature before inspecting the fluid level. Rotate the fluid coupling unit until the filler plug is opposite the filler hole in the clutch housing—located 56 degrees from the upper vertical centerline. In this position, the fluid should be level with the bottom of the filler plug opening in the fluid coupling unit.

Loss of fluid from the fluid coupling unit will be evidenced by excessive engine speeds, similar to a slipping clutch. The cause of fluid loss should be determined by inspection after removing the clutch housing pan. If leakage is at the filler plug, tighten the plug or replace the gasket and tighten the plug securely. If leakage is apparent at any point other than the filler plug, the unit must be removed for the necessary repairs. The recommended operating capacity of the fluid coupling is approximately 13 pints.

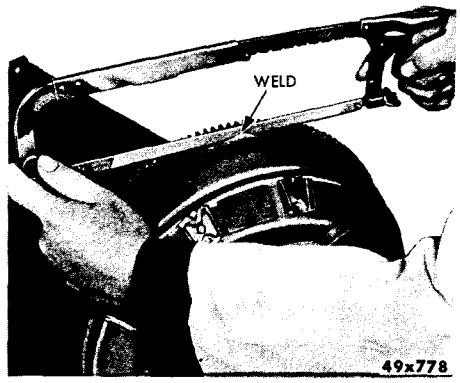

Fig. 11 — Remaining Weld Removed

Fig. 12 — Cutting Weld Spots Ring Gear to Housing

19. REPLACING STARTER RING GEAR ON FLUID COUPLING

a. Removal of Ring Gear

(1) Remove the fluid coupling unit from the engine and clamp it in a swivel vise so the weight rests on the bench. Refer to Figure 11.

(2) Use a hack saw to cut the six weld spots parallel to the back face of the ring gear to within $\frac{1}{16}$ or $\frac{3}{32}$ inch of the housing, as shown in Figure 12. Care must be taken so as not to cut too deep.

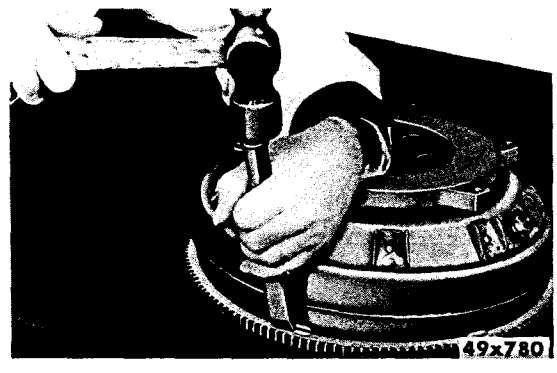

Fig. 13 — Scribing Housing for Ring Gear Location

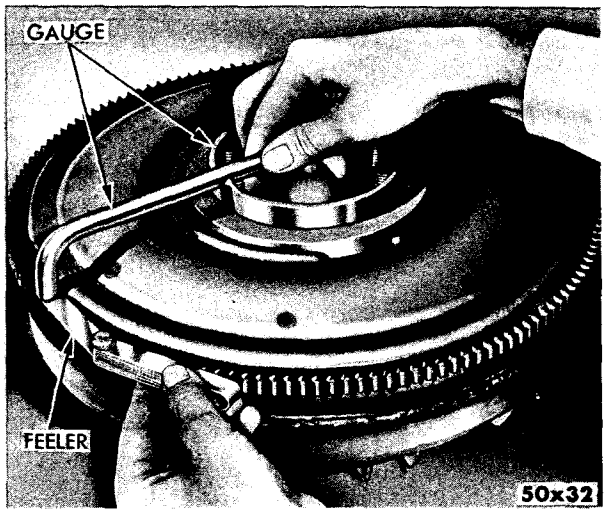

Fig. 15 — Positioning Ring Gear on Fluid Coupling (Tool C-896)

(3) Scribe a line around the housing, as shown in Figure 13. This is for reassembling purposes and gives the approximate position for the new ring gear.

(4) With the front face down, and using a heavy drift and hammer, drive the ring gear off as shown in Figure 14.

(5) Position the fluid coupling assembly in a vise and remove all the remaining welded metal with 12 inch bastard file. Care should be exercised when filling so as not to file more than just the remaining weld, as shown in Figure 11.

b. Installing Ring Gear

The new ring gear being approximately .018 inch less than the diameter of the coupling, must be heated to a uniform temperature of not more than 212 degrees F. for installation.

With ring gear heated as described below, place it on the coupling (chamfered teeth up) and with a rawhide mallet or fiber block, drive the ring gear down until the scribed mark on the coupling is just visible.

NOTE

The ring gear may be submerged in boiling water for approximately five minutes and then installed, chamfered teeth up. If a welding torch is used to heat the ring gear, use a medium-size welding tip and direct the flame on the outer face of the ring adjacent to the inside diameter. DO NOT APPLY FLAME TO TEETH. Place a few drops of water on the ring gear as a temperature check and rotate the coupling while applying the flame. In most instances, the ring gear will fit down in place before the drops of water boil. DO NOT OVERHEAT.

Place the aligning gauges, Tool C-896 in the crankshaft counterbore, as shown in Figure 15.

There should be a uniform clearance between the checking face of the gauge and the ring gear and should not exceed .020 inch.

This clearance can be altered by tapping the ring gear up or down with a rawhide mallet. The .020 inch feeler gauge shown in Figure 15 is actually the "NO GO" limit.

Reweld ring gear to housing using original spaces provided. Apply an equal amount of weld to each space to preserve the balance of the unit.

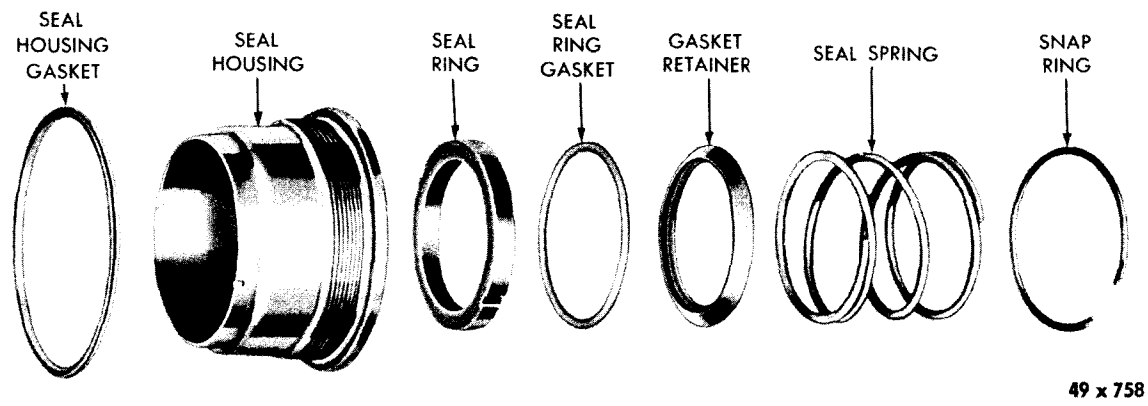

Fig. 16 — Housing Type Seal (Exploded View)

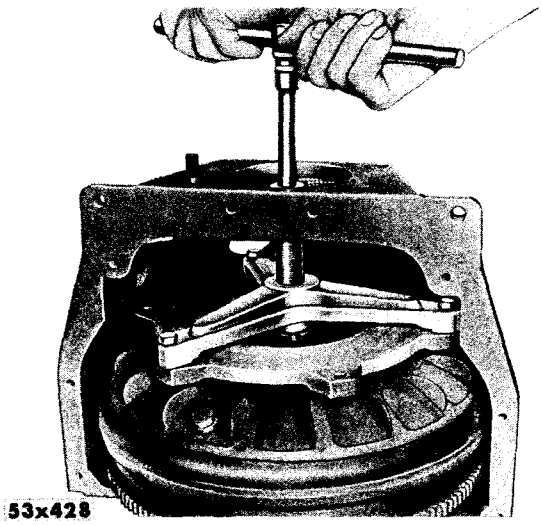

Fig. 17 — Removing Drive Plate Retainer Nut

The following suggestions are offered as an aid in making the above weld:

(1) Welding current—200 amperes.

(2) Straight polarity D.C. or A.C.

(3) A good electrode to use is 5/32 inch diameter Fleet weld number 47 or 5/32 inch diameter General Electric number W28 or equivalent.

CAUTION

To prevent burning through the housing, the arc should be directed at an angle of approximately 45 degrees from the face of the gear. USE ONLY ARC WELDING EQUIPMENT, NEVER GAS WELD.

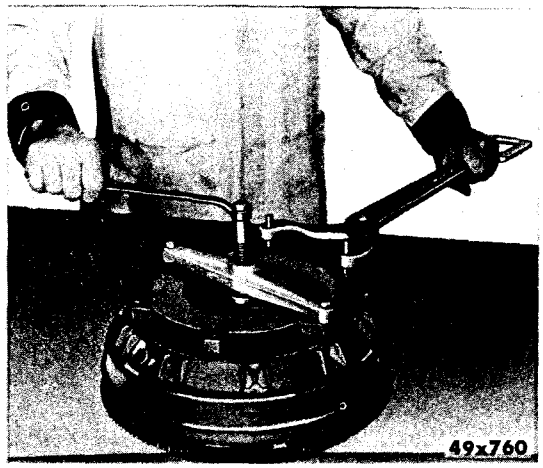

Fig. 18 — Removing Clutch Driving Plate

Fig. 19 — Method of Retaining Snap Ring and Spring

20. SERVICING FLUID COUPLING SEAL ASSEMBLY

The loss of fluid from the fluid coupling unit will be evidenced by excessive engine speeds, similar to a slipping clutch. The cause of fluid loss should be determined by an inspection after removing the clutch housing pan. If leakage is at the seal at the front end of the hub (at the clutch driving plate) new parts must be installed.

NOTE

Throughout this servicing operation, cleanliness is of utmost importance.

a. Disassembly (Coupling Removed)

Refer to Figure 16 and proceed as follows:

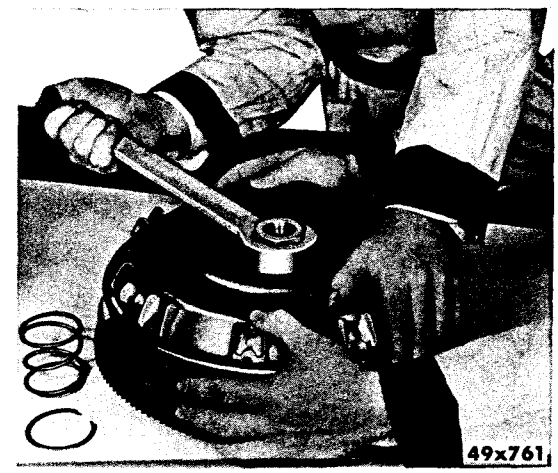

Fig. 20 — Removing or Installing Seal Housing

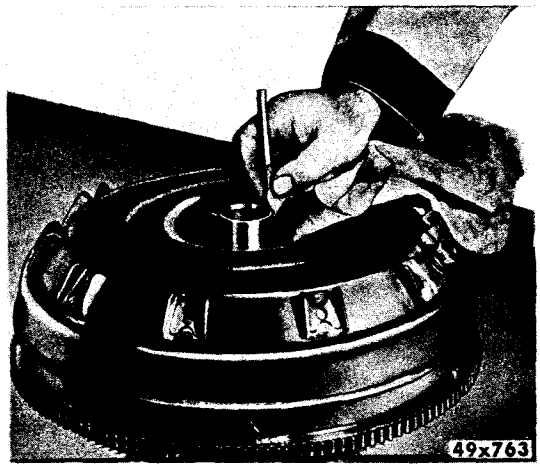

Fig. 21 — Cleaning Runner Hub Sealing Surface

(1) Remove filler plug and drain unit.

(2) Bend back tab on the lockwasher and with special socket wrench, Tool C-607, remove drive plate retainer nut (Fig. 17).

(3) Hold drive plate securely (Fig. 18) and remove drive plate with puller, Tool C-665. Remove key.

(4) Thoroughly clean back plate of fluid coupling adjacent to seal housing. Cover seal housing opening with a shop towel to retain snap ring and spring as shown in Figure 19. With a screwdriver, pry one end of the snap ring, up and out. Remove snap ring and spring.

(5) Use special spanner wrench, Tool C-545,

Fig. 22 — Cleaning Contact Surfaces of Seal Ring

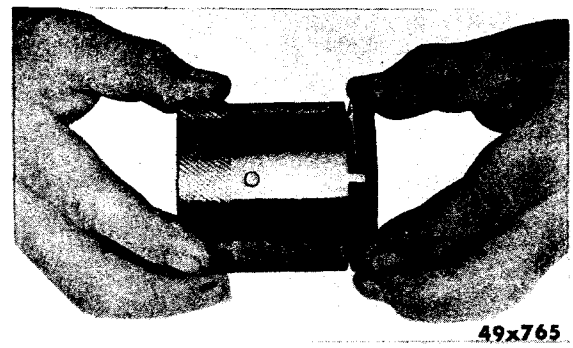

Fig. 23 — Squaring Seal Ring on Location

to unscrew seal housing. To assist in holding wrench in place, screw retainer nut on hub (Fig. 20). The seal ring gasket and seal ring gasket retainer will then come out with the seal housing. With two pieces of wire bent over to form hooks, lift out seal ring.

CAUTION

Do not attempt to remove the seal housing without first removing the snap ring and spring. This practice will destroy the seal gasket.

b. Pre-Assembly Instruction

Before installing the seal ring, make certain the sealing surfaces are perfectly clean and free from scratches or marks of any kind. Do not attempt to recondition these sealing surfaces. If the surface of the seal ring is damaged, install a new seal. If the surface of the

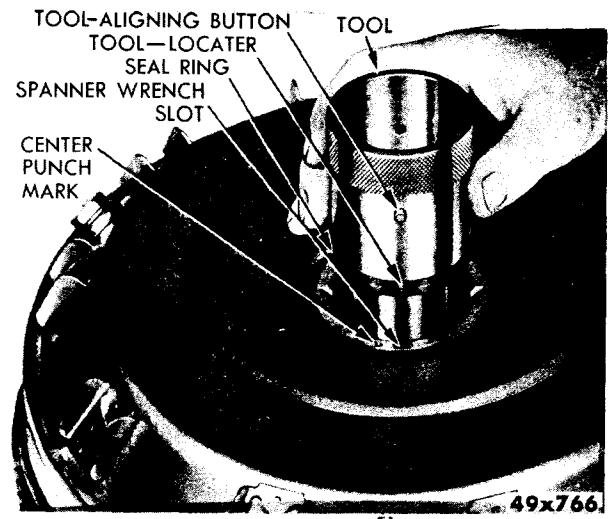

Fig. 24 — Locating Seal Ring in Seal Housing

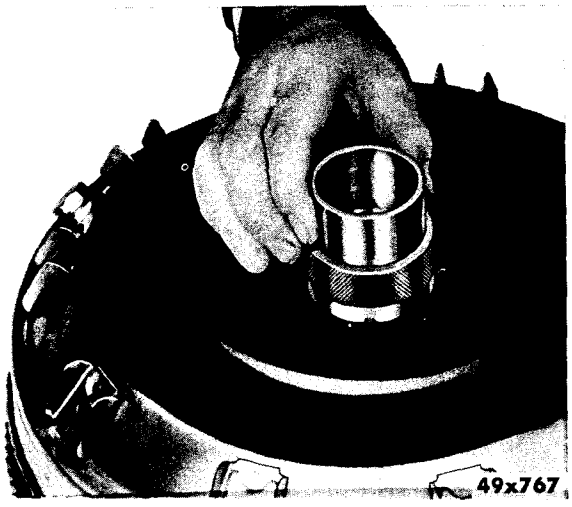

Fig. 25 — Pushing Seal Ring Off Locators Using Pilot (Tool SP-788 Part of Tool C-885)

runner hub is damaged, a new fluid coupling assembly is required.

Using the eraser end of a lead pencil as shown in Figure 21, press a clean cloth against the seal surface while rotating the runner hub. Repeat this operation until no oil or dirt appears on the cloth. Follow this same procedure with a piece of new chamois to remove remaining lint particles.

CAUTION

Never use a metallic object such as a screwdriver to apply cloth or chamois against runner hub seal surface as the sealing surface may be damaged.

c. Assembly

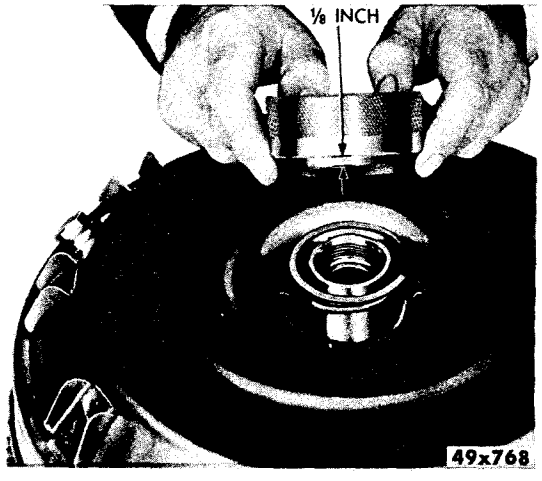

Fig. 26 — Positioning Inner Sleeve of Tool C-884

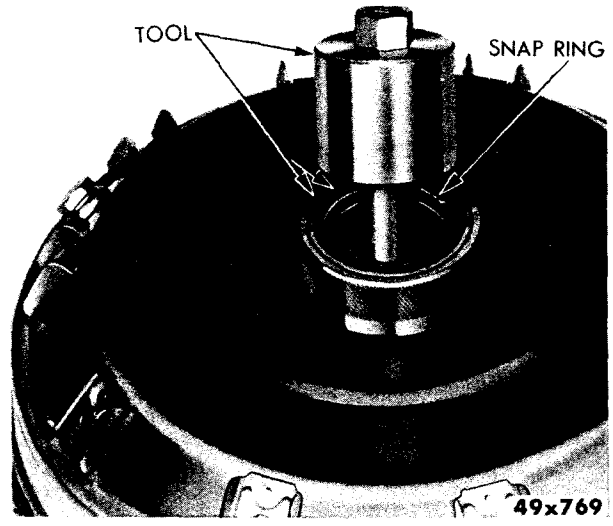

Fig. 27 — Tool and Snap Ring Positioned for Installing (Tool C-884)

(1) Inspect seal housing for burrs in the spanner wrench slots, the chamfer, top edge of bore and around the snap ring groove. Carefully remove all burrs. Wash all parts (except gaskets and seal ring) including tools needed for assembly purposes in a cleaning solvent and dry with an air hose.

(2) Screw seal housing in place, finger tight, so that the seal housing gasket contacts both the flange of the seal housing and machined face and the back plate of the fluid coupling. Again, every precaution must be maintained to assure absolute cleanliness of the sealing surface on the runner hub and seal ring while assembling.

(3) Wipe both sides of seal by rotating each face against a clean, new chamois, as

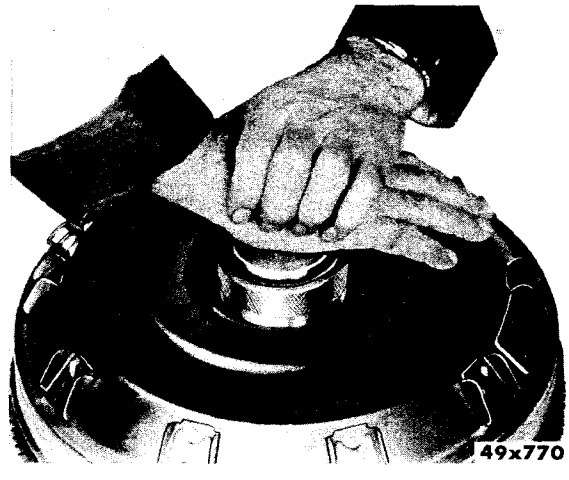

Fig. 28 — Installing Snap Ring

shown in Figure 22. Special Tool C-885 has been designed to install the seal ring and consists of two parts: SP-788 and SP-791. Use special aligner, Tool SP-791 to place the seal ring squarely on the locators, as shown in Figure 23. Align both locators at the same time. Enough tension should be maintained on the locators at all times to just hold the seal ring in place. Place aligner, Tool SP-791 with seal ring installed into seal housing, as shown in Figure 24. Lower the tool into the seal housing, aligning the button of the tool with the spanner wrench slot nearest center punch mark (Fig. 25). Slide pilot sleeve, Tool SP-788 gently down inside Tool SP-791 to push the seal ring off the locators and onto the two small indentions at the bottom of the seal housing (Fig. 25).

CAUTION

Do not drop pilot tool in aligning sleeve as chipping of the seal ring may result.

(4) Remove seal ring installing tools and install seal ring gasket making certain that it is in full contact with seal ring.

(5) Install seal ring gasket retainer with the angular face down. Install spring.

(6) A special Tool C-884 has been designed to compress the spring and at the same time, install the snap ring. The tool consists of three parts: SP-738, SP-740 and SP-739. Push the angular end of the inner sleeve out until approximately 1/8 inch shows, as shown in Figure 26. Place angular end of inner sleeve in the chamfer of seal housing and push outside collar down so it seats on the face of seal housing (Fig. 27). Place snap ring on top of spring and install push portion of Tool C-884, as shown in Figure 27. The snap ring is installed by pressing quickly and heavily on the top of the tool, as shown in Figure 28.

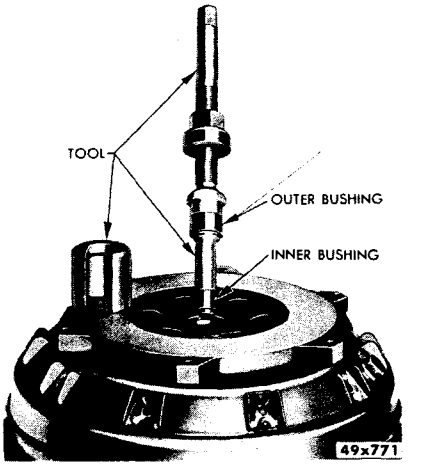

Fig. 30 — Bushings Positioned on Tool for Installation Tool (C-708)

(7) Tighten seal housing with spanner wrench

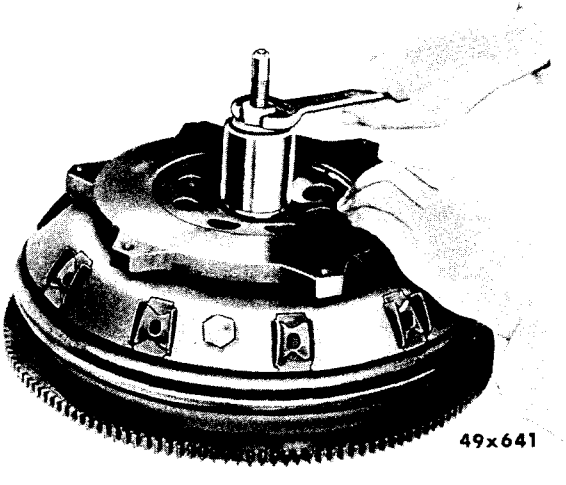

Fig. 29 — Removing Bushing

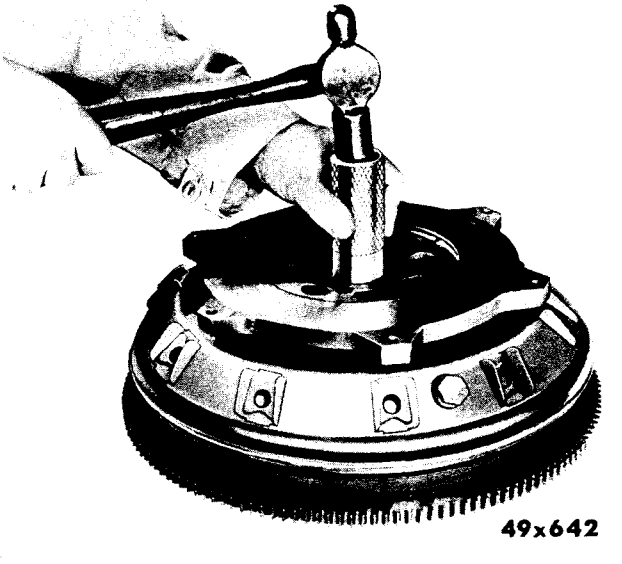

Fig. 31 — Installing Bushings

Tool C-545 to 270 foot-pounds torque. Install drive plate, and insert key.

(8) Install drive plate retainer nut and washer. With the aid of wrench Tool C-784, as shown in Figure 17, tighten nut securely with special wrench, Tool C-607. Lock retainer nut by bending edge of washer up and center punch washer at small drive plate hole.

21. SERVICING FLUID COUPLING BUSHINGS

To remove and replace the fluid coupling hub bushings, proceed as follows:

(1) Place fluid coupling unit on bench and remove clutch driving plate nut. Do not remove plate.

(2) Using puller Tool C-625, remove outer hub bushing with puller sleeve and large expansion jaw. Remove inner bushing using small expansion jaw without the sleeve (Fig. 29). Clean all parts thoroughly. Place new inner and outer Oilite bushings on installing and burnishing Tool C-708, as shown in Figure 30 and insert in hub. Drive both bushings into hub until they are seated (Fig. 31). The bushings are burnished during the removal of tool, as shown in Figure 32.

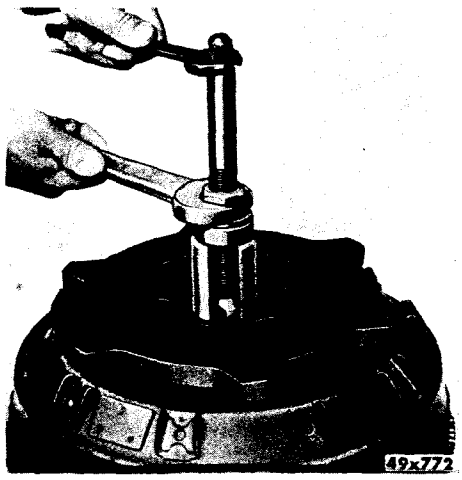

Fig. 32 — Line Burnishing Bushings (Tool C-790)

NOTE

When replacing bushings in the fluid coupling unit, use only Oilite bushings. Replacement, if ever necessary, should be made only with another "Oilite" bearing of the same size as the bearing being replaced. "Oilite" bearings should not be reamed, filed or otherwise cut to size, although they may be burnished to a final running fit. Cutting an "Oilite" bearing tends to seal the pores of the metal, which prevents the seepage of the oil necessary for lubrication. Refer to Paragraph 21, Lubrication Section for information concerning this type of bearing.

SERVICE DIAGNOSIS

22. FLUID COUPLING NOISE

Possible Causes:

a. Noise in fluid coupling bearing.

b. Noise in fluid coupling inner or outer bushings.

Remedies:

a. Replace fluid coupling assembly. Servicing the inner bearing is permanently assembled in the unit when manufactured.

b. Replace worn bushings as described in Servicing Fluid Coupling Bushings, Paragraph 21, of this section.

23. FLUID COUPLING SLIPPAGE

Possible Causes:

a. Fluid low in coupling.

b. Fluid coupling leak.

Remedies:

a. Check fluid coupling assembly for leak. Repace parts as required to correct this condition. Fill coupling to proper level, using only MOPAR Fluid Drive Fluid.

b. Check for leak at filler plug or seal, at the front end of hub and at the clutch driving plate. Refer to Housing Type Seal, Paragraph 20 of this section.

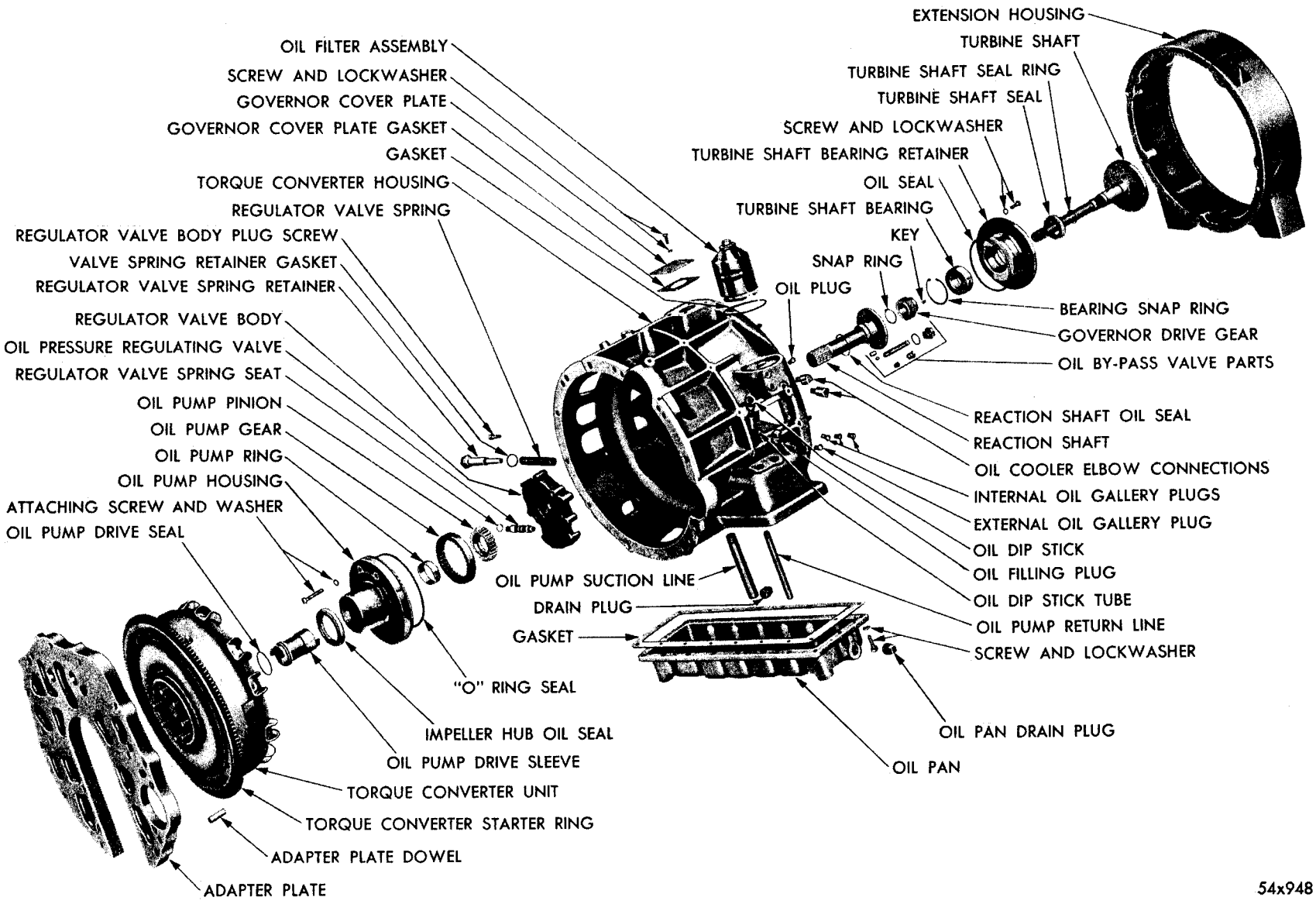

Fig. 33 — Torque Converter Housing Assembly (Exploded View)

TORQUE CONVERTER

24. PRINCIPLES OF OPERATION

A Torque Converter as shown in Figures 33 and 34, is a hydraulic Coupling which automatically "Multiplies" engine torque when a rising operating load starts to slow down the output shaft speed, relative to the engine speed.

The mechanical difference between a straight Fluid Coupling and a Torque Converter, is that the Torque Converter is fitted with a Stator between the Impeller and the Turbine.

The Stator is stopped while the converter is "Multiplying," and is allowed to "Freewheel" and rotate with the Impeller and the Turbine, when the last two units are running at approximately the same speed, so when this is the case, there is no torque "Multiplication" and the converter is automatically in the coupling range.

25. CHRYSLER INDUSTRIAL TORQUE CONVERTER BASIC UNITS

The Chrysler Industrial Torque Converter consists of the following:

The Torque Converter Unit or "Donut," the Oil Cooling and Lubrication System, and the Governor, which is optional equipment.

26. TORQUE CONVERTER UNIT

The Torque Converter Unit consists of three basic elements and are the Impeller, Turbine and the Stator.

The Impeller and Turbine are hydrogen brazed assemblies of stamped steel parts, while the Stator is a machined aluminum casting. (Fig. 35).

The Torque Converter Unit or assembly is completely enclosed in a welded unit, and cannot be serviced except as an assembly.

While many vane angle combinations are possible in this assembly, the vanes of the enclosed Impeller are curved forward and the Turbine vanes are curved backward, so that the turbine may absorb the maximum of force from the circulating oil, while the Stator blades are just curved in an arc. The arc causes the oil leaving the Turbine to change its direction of flow and allows the oil to re-enter the Impeller vanes in the direction of Impeller rotation. Consequently, the Impeller is driven by the compounded action of the engine torque and the flow of oil re-entering the Impeller blades.

The result is a "Multiplication" in the torque transmitted by the Impeller to the Turbine shaft-load.

When the Torque Converter Assembly is installed on an Industrial Engine, it "Multiplies" the torque output to a value of 2.6 times the torque of the engine. The "Multiplication" decreases to a 1:1 ratio as the speed of the Turbine increases to the speed of the Impeller. When this occurs, the Stator begins to rotate freely on the overrunning clutch.

The Stator Overrunning Clutch consists of several spring-loaded rollers, as shown in Figure 35, which is mounted within an internal cam, and around the periphery of a hub, which is held stationary by a hollow reaction shaft, bolted to the main housing to the rear of the

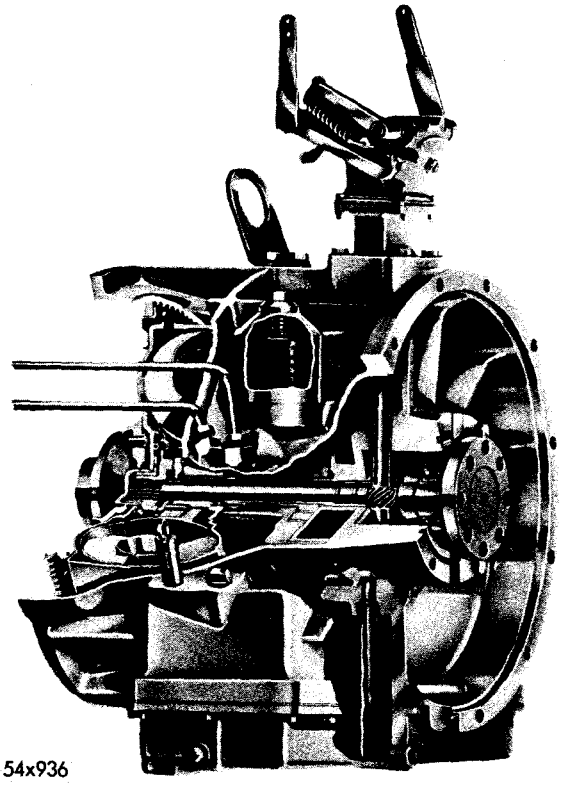

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Fig. 34 — Torque Converter (Sectional View)

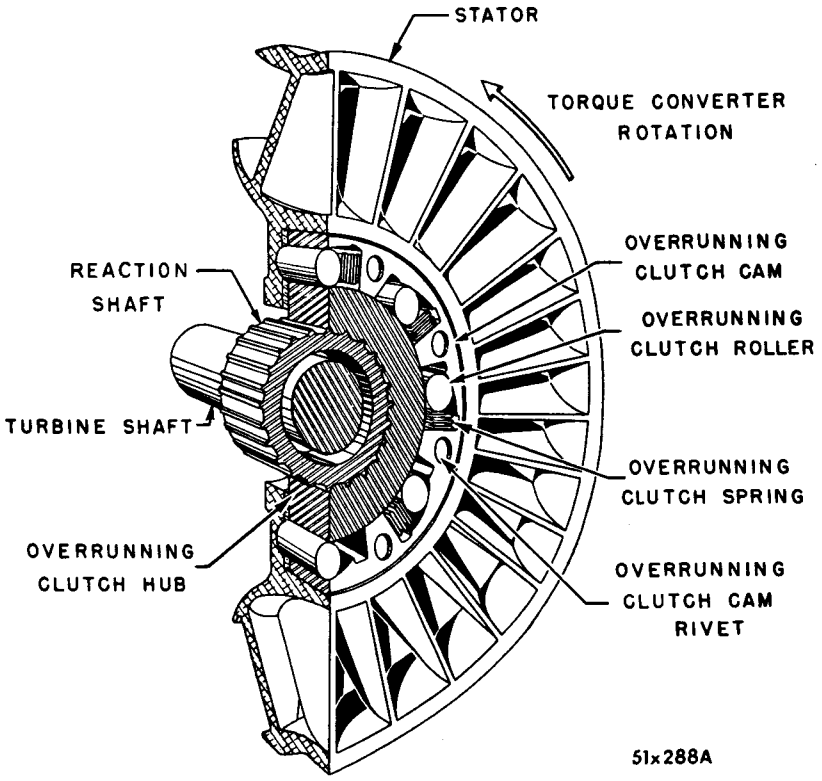

Fig. 35 — Torque Converter Overrunning Clutch

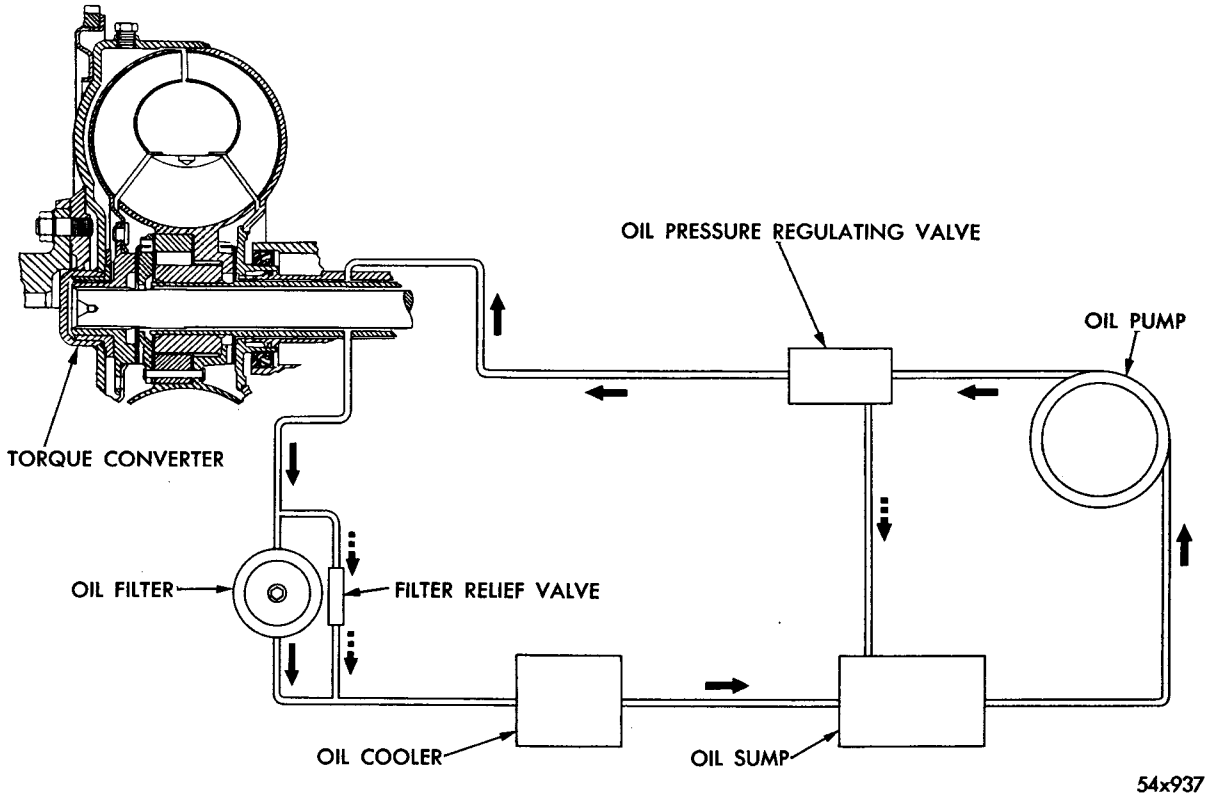

Fig. 36 — Torque Converter Oiling System

oil pump. The Stator overrunning Clutch prevents the Stator from moving in a direction opposite to the Turbine and Impeller rotation, but allows the Stator to rotate freely with the Turbine and Impeller.

27. THE OILING SYSTEM

NOTE

All component parts of the oiling system are located in the Torque Converter Housing, except the Oil Filter and the Oil Cooler, as shown in Figure 36.

The Torque Converter Oiling System, as shown in Figure 36, consists of the following:

An oil Reservoir or Oil Pan built into the underside of the Torque Converter Housing, an internal gear type Oil Pump, the main and auxiliary pressure Regulator Valves, an Oil Filter with a bypass relief valve and an oil-water Cooler.

The Oiling System fulfills the following three functions; to provide Lubrication for the entire system, to pressurize the Torque Converter and to cool the oil.

28. CIRCULATING SYSTEM

The Oil Pump Housing, as shown in Figure 37, and the regulator Valve Body, are located directly behind the Oil Pump Housing, and are installed into a recess of the center boss of the Torque Converter Housing.

The Oil Pump delivers the oil to the Main

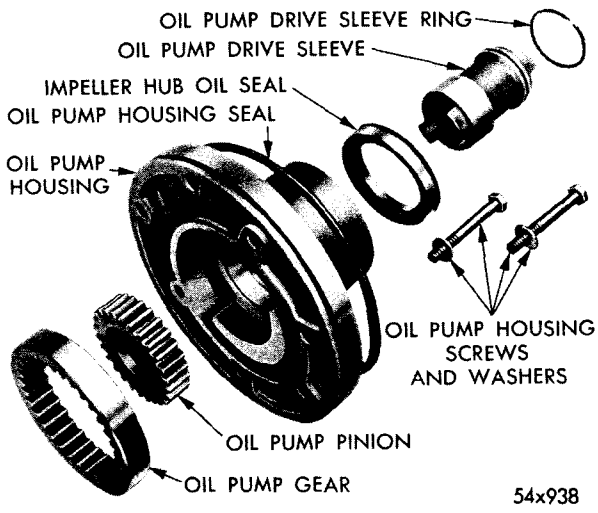

Fig. 37 — Oil Pump Housing Assembly (Exploded View)

Regulator Valve. The Main Regulator Valve is used as a *Maximum Pressure Regulator,* controlling the supply of oil at 60 pounds-per-square-inch to the Torque Converter "donut" or unit.

NOTE

The Main Regulator Valve is the same Valve, as used in the Chrysler PowerFlite Transmission. The other regulating features designed into the Valve are not utilized in the Chrysler Torque Converter.

After the oil leaves the Regulator Valve Body, it enters a tubulure space, between the oil Pump Drive Quill and the Reaction Shaft, and is pumped along this tubular space into the torque converter.

The oil is circulated within the Torque Converter "Donut" or unit by the hydraulic flow of oil between the Impeller and the Turbine. Oil *leaving* the Torque Converter unit, passes along the space between the Turbine shaft and the Reaction shaft, from where it flows through an oil hole in the Reaction shaft and back into the Regulator Valve Body. Oil leaving the Regulator Valve Body, enters the Auxiliary or Downstream Regulator Valve.

The purpose of this valve is twofold; to act as a secondary pressure relief valve and to maintain the oil pressure in the Torque Converter unit at 30 pounds-per-square-inch. The Downstream Regulator Valve does not open to permit oil circulation, until the oil pressure has reached 30 pounds-per-square-inch. This is to ensure a complete filling of the Torque Converter and avoidance of a "cavitation" in the oil. If this "cavitation" were to occur, it would result in a complete loss to the Transmission and cause considerable overheating of the Torque Converter unit. (See Paragraph 29, "Lubrication and Drain System" that follows.) The Downstream Regulator Valve will remain in the operating position, so long as the oil pressure is between 30 and 80 pounds-per-square-inch. If the pressure should rise above 80 pounds-per-square-inch, the Downstream Regulator Valve will move over further, and allow the oil to flow directly back to the oil pan. It does this, by flowing out of a port in the Regulator Valve Body, down the outside of

the valve body and through a 5/8 inch oil hole, which connects the oil Pump recess with the oil pan.

After passing through the Downstream Regulator Valve, the oil leaving the Regulator Valve Body re-enters the Main Torque Converter Housing by an oil hole at 2 o'clock on the back face of the Oil Pump recess, from where the oil travels radially through the Torque Converter Housing, to the oil Filter. There is a relief Valve fitted across the Oil Filter to safeguard the oil system, should the Oil Filter become clogged. The tubes, to and from the oil-water Cooler, at the front of the engine, are connected to adapters on the pad, which support the Oil Filter, with a rearmost tube, being the outlet to the cooler.

29. LUBRICATION AND DRAIN SYSTEM

Lubricating oil to the Oil Pump bushing, drains back through the Oil Pump Housing, spilling into the Oil Pump Recess, and flows through a 5/8 inch drain hole into the oil pan.

Lubrication to the Turbine Shaft Bearing, is by leakage past the piston ring seal on the Turbine Shaft, into the rear Chamber. If a Governor is installed, (as optional equipment), the oil from the Governor, drains into this Chamber as well. Oil to the Governor, is supplied from a connection by the oil Filter.

The rear Chamber is drained through a 3/8 inch oil hole in the bulkhead between the rear Chamber, and the oil Pump recess, then into a passage in the Regulator Valve Body, which is open to the 5/8 inch drain hole, between the Oil Pump recess and the oil pan. The position of the 3/8 inch drain hole, maintains the correct level of oil in the rear chamber to lubricate the Turbine Shaft bearing.

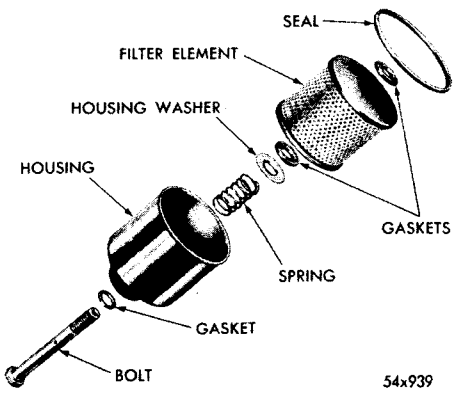

Fig. 38 — Oil Filter (Exploded View)

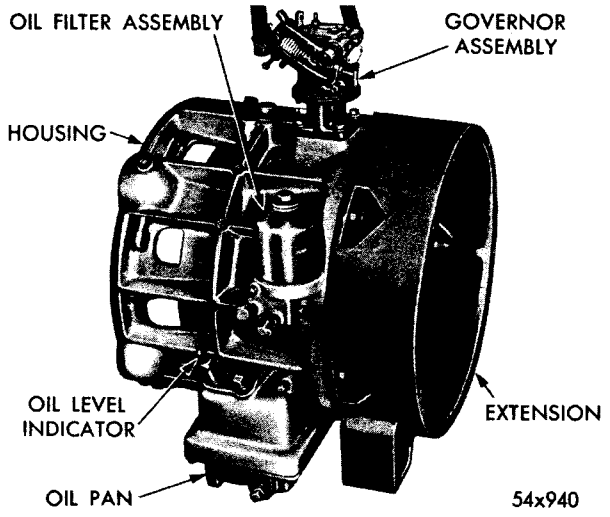

Fig. 39 — Torque Converter Housing (with Extension)

30. OIL FILTER

The Oil Filter, as shown in Figure 38, is of the replaceable cartridge type. The cartridge, with gasket, should be replaced every 250 hours of operation.

31. OIL CHANGE

The frequency of an oil change depends upon the type and severity of the operation. The lack of body, or the presence of dirt or grit, is an indication that fresh oil is needed. Under normal operating conditions, oil should be changed every 500 hours of operation. The oil Filter on the Torque Converter Housing, should be changed at this time also to coincide with the oil change. High speed, heavy load and extremely dusty conditions necessitate more frequent changes.

Remove the plugs at the bottom of the Torque Converter Housing oil pan, as shown in Figure 39, and drain the fluid. When changing the oil, the engine and the Torque Converter should be hot, as the oil will drain down into the oil pan more readily, and carry off foreign material and sediment more completely. Tighten the drain plugs to 50 foot-pound torque after the oil has drained.

32. FILLING THE CONVERTER WITH OIL

Remove the plug next to the dip stick on the

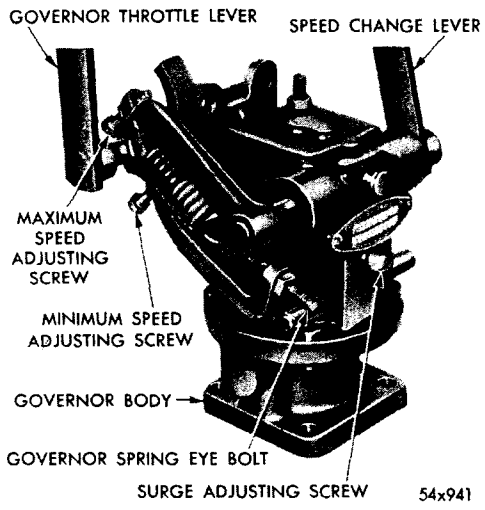

Fig. 40 — Torque Converter Governor (Optional Equipment)

oil pan of the Torque Converter Housing, and fill the oil pan with Transmission Fluid Type "A" to the level of the filler plug. Start the engine and run at idle speed. After a few minutes of running, add sufficient oil to bring the level up to the "full" mark on the dip stick. Tighten the plug to 50 foot-pounds torque. The oil level should always be checked with the Torque Converter running, since part of the oil in the system drains back when the engine is stopped.

33. GOVERNOR (Optional Equipment)

The governor as shown in Figures 40 and 41 for the Chrysler Torque Converter, has a built-in speed control feature. The governor is geared to the output shaft of the Torque Converter Housing and connected to the carburetor throttle. This feature gives instant engine response—Torque Converter response—to any given change in load condition.

34. OPERATING PROCEDURES

The Governor weights revolving with the mainshaft through centrifugal force, cause the rocker shaft and the operating lever to rotate. The operating lever is connected to the carburetor throttle. A calibrated spring attached to the operating lever, opposes the effort exerted by the Governor weights. The engine speed is governed by the balance of the two forces.

35. ADJUSTING THE GOVERNOR

Make certain that no engine deficiencies exist before attempting to adjust the governor. When installing the carburetor to the governor rod, the lower ball joint is installed in the upper hole of the throttle lever. Screw in the low speed stop screw to hold the throttle lever in its open position, toward the rear of the engine. Hold the carburetor throttle lever against its wide open stop and adjust the length of the rod, so that the upper ball joint will just fit into the tapped hole in the die cast throttle lever. Check the rod installation, and eliminate friction or excessive free play by adjusting the ball joint.

In order to adjust the governor to eliminate surge, select an engine speed at the low point of the range at which the Governor is to operate, and move the speed change lever to obtain this speed. If a no-load surge is encountered at this point turn the surge adjusting screw in ¼ turns at a time, until the surge is removed. *UNDER NO CIRCUMSTANCES SHOULD THIS SCREW BE TURNED IN FAR ENOUGH TO INCREASE THE NO-LOAD SPEED OF THE ENGINE MORE THAN 25 RPM.*

When adjusting the governed speed of the engine, move the speed change lever in a clockwise direction until an engine speed mid-point in the desired range is obtained. Check the regulation by loading and un-loading the engine. If there is too great a variation in engine rpm's between the no-load and full-load speeds, in-

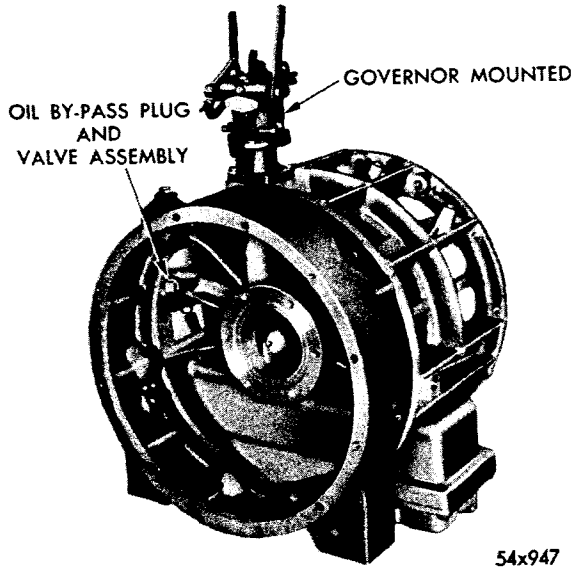

Fig. 41 — Governor Attached to Converter Housing

crease the tension on the governor spring by adjusting the screw eye, and move the speed change lever in a counter-clockwise direction, until the previously selected speed is obtained. Check results again and repeat the process until the desired regulation is obtained. Should the governor surge objectionably when the engine is under load, it will be necessary to decrease the tension on the governor spring with the screw eye, and bring the engine back to the selected speed with the speed change lever. Repeat until the load surge is removed.

To test the speed load, move the speed change lever in a clockwise direction, until the top load is reached. Set the maximum speed adjusting screw o sttop the lever travel at this point. Move the speed change lever back until the lowest speed in the range is reached, and set the minimum speed adjusting screw to check the lever travel at this point. Lock all adjustments securely with the check nuts.

SERVICE DIAGNOSIS

36. REMOVAL AND DISASSEMBLY

Drain the oil from the oil pan, on the bottom of the Torque Converter Housing, by removing the two oil pan drain plugs, as shown in Figure 42.

After the oil is drained, remove the rear and external oil gallery plugs, the oil pump filler plug, and the oil level assembly.

Disconnect the oil-water cooler tubes, from the adapters on the side of the Converter Housing, and remove the two brass elbows, as shown in Figure 43.

Install a lifting bracket on the top of the Torque Converter Housing and tighten securely. Attach a hoist, or chainfall to the lifting bracket and take up the slack. Remove the bolts attaching the Torque Converter Housing to the adapter plate, and with the chainfall, lift the housing from the engine.

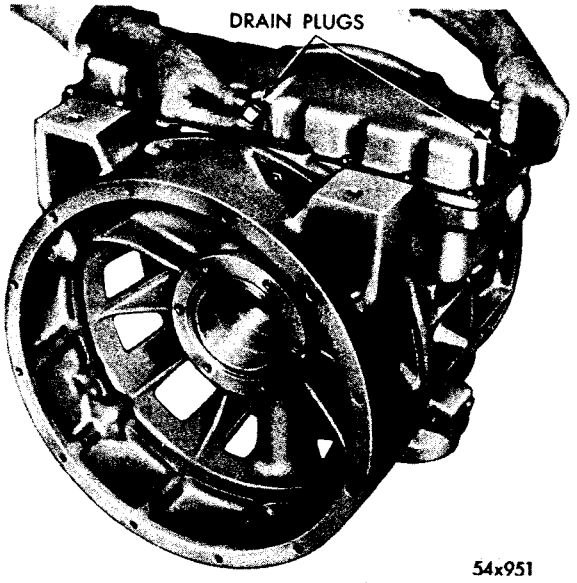

Fig. 42 — Removing or Installing Oil Pan Drain Plugs

CAUTION

The Torque Converter Housing is doweled to the adapter plate, and care should be exercised when removing the Housing from the adapter. DO NOT HAMMER OR PRY BETWEEN THE HOUSING OR THE ADAPTER, AS THIS WILL DISTORT THE METAL AND RESULT IN MISALIGNMENT. Extreme caution should be exercised also, by moving the Housing straight back from the adapter to avoid damage to the Torque Converter.

Place the Converter Housing on a clean bench with the oil pan side down. Remove the governor, (if so equipped), shaft and the nee-

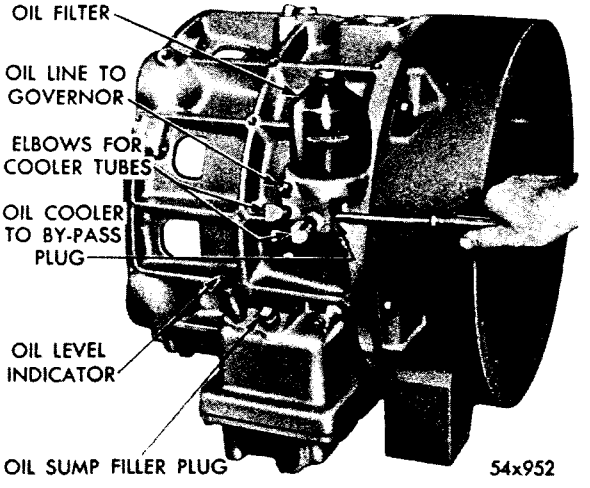

Fig. 43 — Removing or Installing Oil Cooler By-Pass Plug

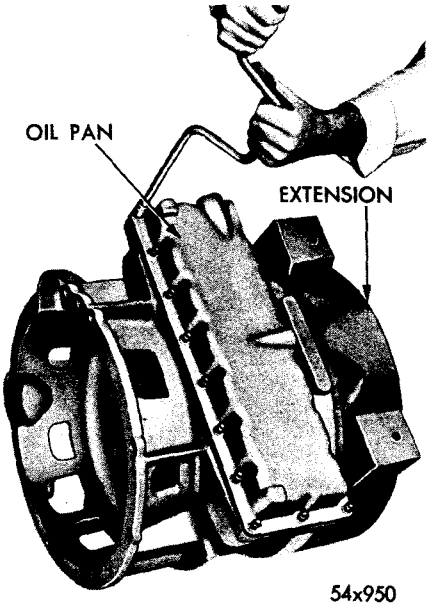

Fig. 44 — Removing or Installing Oil Pan

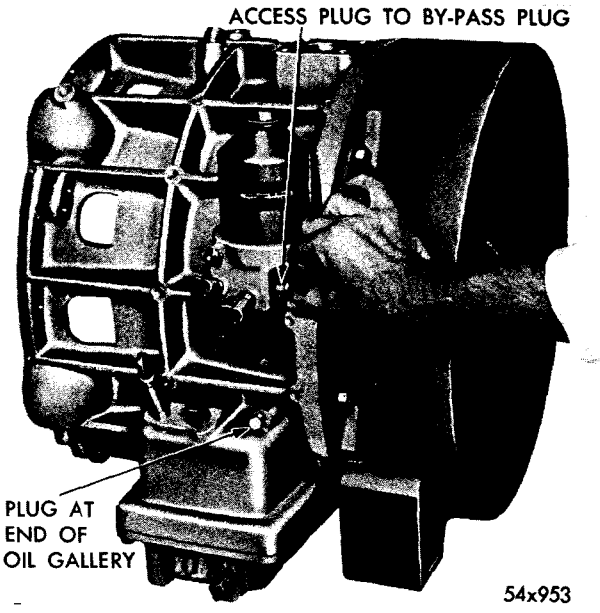

Fig. 46 — Removing or Installing Access Plug to Oil Cooler By-Pass Plug

dle bearing from the Converter Housing, as shown in Figure 39.

Using a drift, push out the rivet and remove the upper drive shaft sleeve, and the shaft bearing from the Governor shaft.

Remove the oil pan, and discard the gasket, as shown in Figure 44. Remove the oil suction and the oil return pipes from the inside of the Converter Housing, after the oil pan is removed, as shown in Figure 45.

Remove the access to cooler by-pass plug, as shown in Figure 46. Remove the oil cooler by-pass plug, as shown in Figure 43.

Remove the screws and lockwashers from the Turbine Shaft retainer in the rear of the Torque Converter, and remove the Turbine Shaft.

Disassemble the Turbine shaft by removing the oil ring, lock ring, the Governor drive gear, lock ring, (Woodruff) key, and using an arbor, press out the shaft from the bearing retainer. Remove the bearing from the retainer and the oil seal. (Fig. 47).

Remove the regulator valve spring retainer, the spring gasket, and the regulator valve spring, from the right side of the Converter Housing. (Fig. 48).

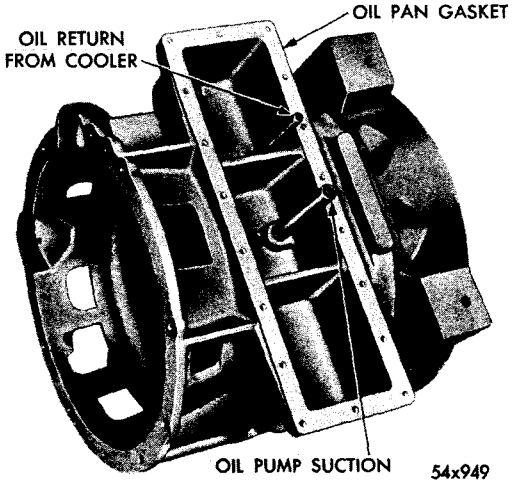

Fig. 45 — Removing or Installing Oil Section Return Pipes

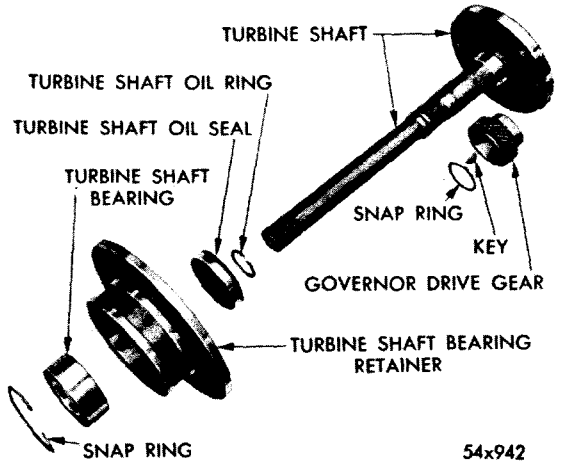

Fig. 47 — Turbine Shaft Assembly (Exploded View)

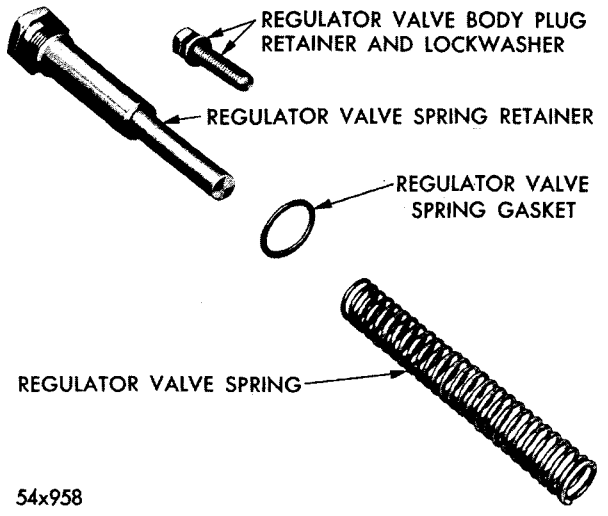

Fig. 48 — Regulator Assembly (Exploded View)

Remove the regulator valve body retainer bolt, from the right side of the Converter Housing. Remove the oil pump drive seal and the oil pump drive sleeve from the oil pump housing.

Remove the screws which bolt the oil pump assembly in the Converter Housing. Number the screws while removing, as they must be assembled in their original location. (Fig. 49).

Remove the pinion and gear from the inside of the oil pump housing. Remove the reaction shaft oil seal, and remove the screws from the reaction shaft. Remove the regulator valve body from the Converter Housing. Remove the regulator valve from the body. (Fig. 48).

Remove the oil Filter assembly. Discard the element and the rubber seal. (Fig. 38). Remove the valve, valve cup and the pressure relief (ball type) valve. Discard the gasket. Rotate the Torque Converter until the drain plug is accessible. Remove the oil plug and drain the fluid.

Inspect both plug gaskets and install new ones if necessary. Tighten the plugs in the Torque Converter to 50 foot-pounds torque. Remove the eight Torque Converter stud nuts and lockwashers from the crankshaft flange using wrench, Tool C-811, and remove the Torque Converter. The Torque Converter and the Housing, are now disassembled and ready for cleaning and inspection.

37. CLEANING AND INSPECTION

Make a thorough inspection of all parts for wear and damage. To insure proper sealing, new seals and gaskets should always be used when re-assembling. Thoroughly examine the oil passages in the Torque Converter Housing, along the Turbine Shaft and the Reaction shaft for wear or scoring.

The regulator valve body is made of aluminum and requires care in handling to avoid damage. Place the body and valve in a pan containing a clean solvent, wash thoroughly, and dry with compressed air.

Inspect the valve for free movement in the valve body. Check all fluid passages for obstructions and inspect all mating surfaces for burrs and distortion. Clean the oil pan with a solvent. Inspect the mating surfaces of the adapter plate and the Torque Converter Housing. Remove any burrs or rough spots with emery cloth.

Clean the housing mating surface, with a mild solution of cleaning fluid before reassembly. When cleaning the Torque Converter, cover the hub in front of the Converter so that nothing gets inside, and using a mild solvent, clean the outside thoroughly.

38. CHECKING THE CONVERTER HUB RUNOUT

Since the Torque Converter was removed from the crankshaft flange, it will be necessary to

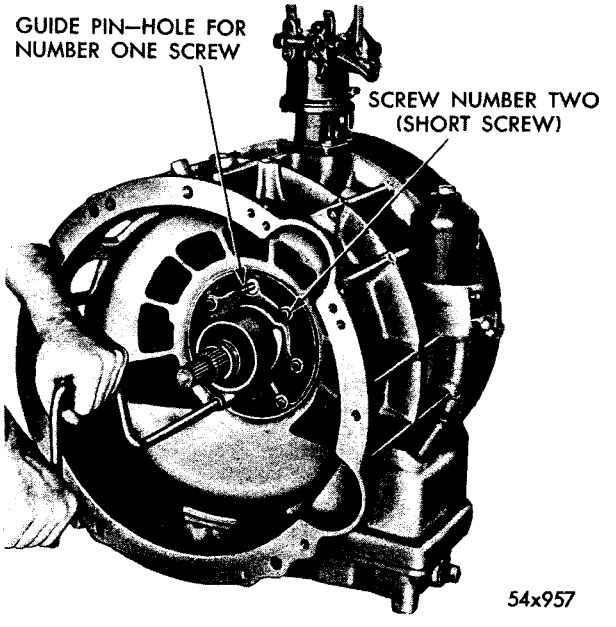

Fig. 49 — Installing Oil Pump Housing

take a **RUNOUT,** to determine if the Converter is aligned correctly.

Install the Converter on the crankshaft flange and attach the lockwashers and stud nuts. Using Tool C-811, tighten the nuts to 55 foot-pounds torque.

Attach the clamp, swivel and attaching rod of Tool C-430 to the adapter plate, as shown in Figure 50.

Place the dial indicator, part of Tool C-430 onto the attaching rod. Adjust the plunger of the indicator against the Converter hub. Set the dial indicator to read zero (0).

Rotate the crankshaft to determine the runout. The maximum allowable is .003 inch. If the runout is greater than .003 inch, the Torque Converter should be removed from the crankshaft flange.

Check the Converter mounting face and the crankshaft flange for dirt or burrs. Clean the surface again of both, and reinstall the Converter. Tighten all the nuts evenly, and take another runout. The Converter should now be within the above limits.

39. CHECKING THE TORQUE CONVERTER HOUSING RUNOUT

Before reassembling the Torque Converter Housing with the internal parts, it will be necessary to align the Housing as follows:

Remove the Torque Converter from the crankshaft flange. Inspect the Housing face

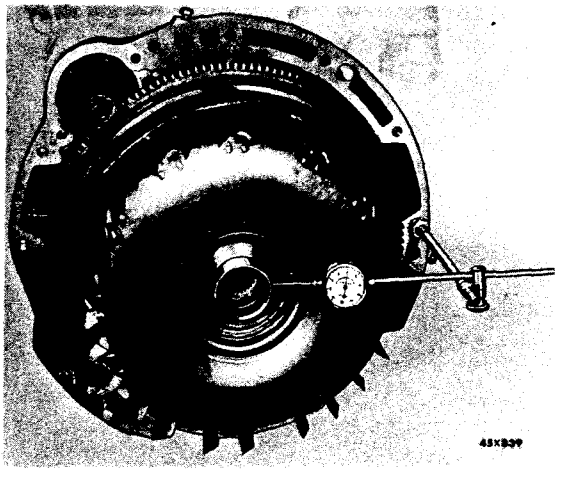

Fig. 50 — Checking Converter Hub Runout

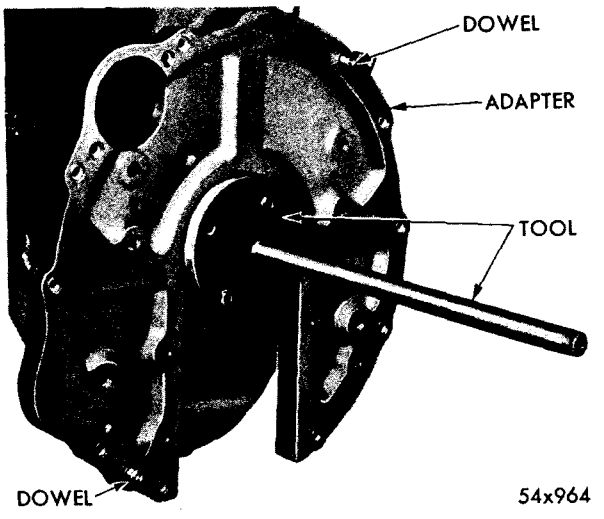

Fig. 51 — Tool C-870 Installed to Crankshaft Flange

where it contacts the rear of the adapter plate for particles of dirt or burrs. Remove all burrs with a file and clean both surfaces.

Using any standard flywheel bolts, install fixture Tool C-870 to the crankshaft flange and tighten securely, as shown in Figure 51.

Install two dowel pins in the adapter plate from the front end so that they will protrude beyond the machined face of the adapter plate.

Using a chainfall or lift, install the Torque Converter Housing to the adapter plate with the cap screws and tighten securely.

Install the dial indicator Tool C-435 or Tool C-430 onto the shaft of the fixture Tool C-870, as shown in Figure 52.

Adjust the plunger of the indicator against the inside diameter of the Housing bore. Set the dial indicator to zero (0).

Rotate the crankshaft and check the inside diameter of the Housing bore, as shown in Figure 52. It should not vary more than .003 to .005 inch **RUNOUT** to one complete revolution of the crankshaft.

If alignment is necessary, install the correct amount of shims between the Converter Housing and the adapter plate until it comes within the specified tolerance.

After obtaining the correct alignment, stamp on the Housing and on the side of the adapter plate, at each screw position, the required number of shims (in thousandths) needed to align the Housing.

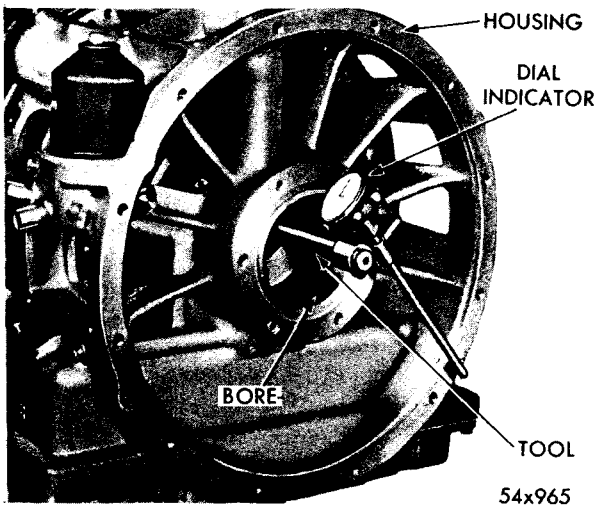

Fig. 52 — Checking Runout Converter Housing Bore (Tool C-870 and C-430)

Check the **RUNOUT** of the Torque Converter Housing rear face as outlined in the next paragraph.

40. CHECKING THE REAR FACE RUNOUT OF THE TORQUE CONVERTER HOUSING

After checking the bore of the Torque Converter Housing, it will be necessary to take the runout of the Converter Housing rear face.

Proceed as outlined in the Converter Housing Runout, and change the position of the dial indicator Tool C-430. Check the rear face of the Converter Housing, as shown in Figure 53. The maximum allowable is .002 inch.

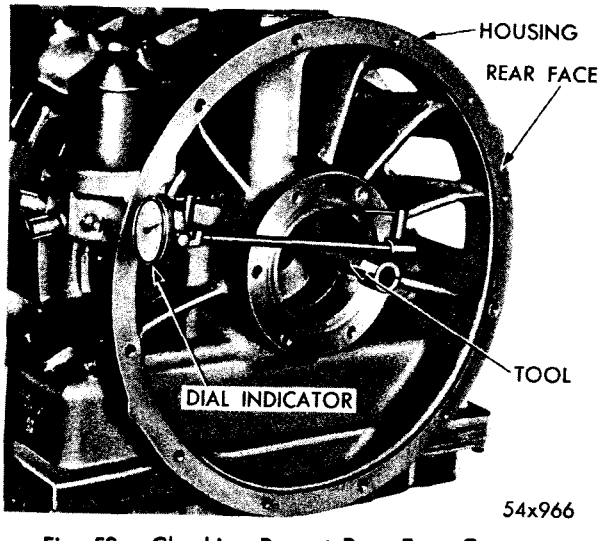

Fig. 53 — Checking Runout Rear Face Converter Housing (Tool C-870 and C-430)

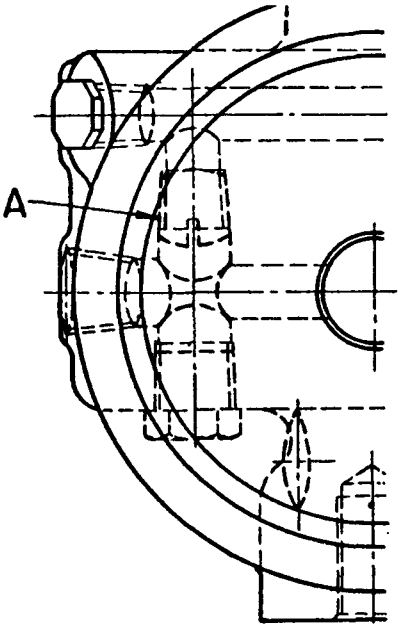

Fig. 54 — Inner By-Pass Hole (Schematic)

If the runout is greater than the above limits, check the Converter Housing rear face for dirt and/or burrs. Remove all burrs with a file and take another runout after the face of the Housing has been cleaned. The rear face of the Housing should come within the above limits.

41. TORQUE CONVERTER HOUSING ASSEMBLY

Install the oil suction, and the oil return pipes, as shown in Figure 45. Tighten securely.

Install the oil pan so that the center plug hole faces the rear of the Converter Housing, as shown in Figure 44. Using a new gasket, start the bolts all around and tighten them from the middle of the oil pan to each end, 17 foot-pounds torque.

Install the oil pan drain plugs, as shown in Figure 42. Install the rear gallery plugs, the external gallery plug, and the oil pump filler plug and oil level assembly. Tighten all plugs securely.

Install the pressure relief (ball) valve. Using a brass rod, tap the pressure relief valve lightly several times to insure the proper seating.

Install the valve spring, using two gaskets and the valve cap. Tighten securely.

Install the oil filter assembly. (See Fig. 38).

Using a new element and rubber seal, install in the recess of the filter seat, and tighten the nut assembly.

Install the oil cooler by-pass plug, as shown in Figure 54, and tighten securely.

Install the access plug to cooler by-pass plug, as shown in Figure 46, and tighten securely.

Install the two brass elbows, for the oil cooler tubes, as shown in Figure 43, and tighten securely.

On the Torque Converter without the Governor, install the Governor gasket and cover plate over the Governor shaft recess and tighten the nuts.

On the Torque Converter with a Governor, fit the upper bearing on the upper drive shaft. Install the drive shaft sleeve to the upper end of the drive shaft and rivet it to the drive shaft. Install the bronze thrust washer on the drive shaft, as shown in Figure 55.

Install the lower needle bearing into the main Converter Housing, and install the Governor drive shaft assembly, as shown in Figure 56, seating the upper bearing in the bearing recess.

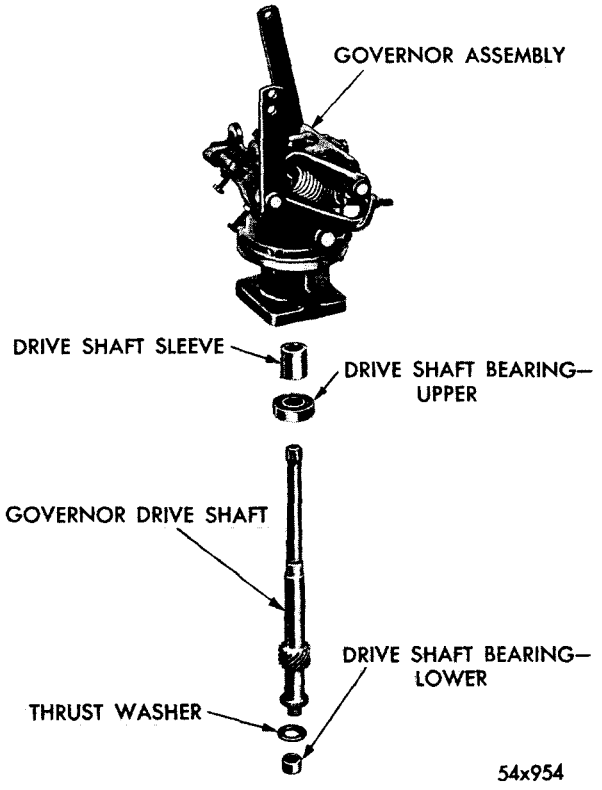

Fig. 55 — Governor with Drive Shaft

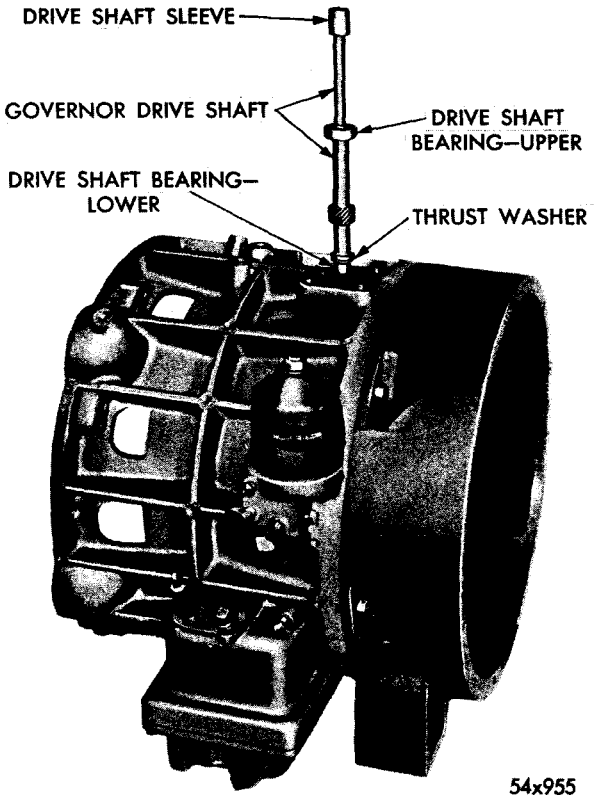

Fig. 56 — Installing or Removing Governor Drive Shaft

Rotate the Governor shaft, and see that it operates freely.

Install the reaction shaft thru the rear of the Converter Housing. Line-up the shaft guide hole with the guide pin in the Housing. Install the reaction shaft screws and tighten. Make certain that the oil hole in the reaction shaft flange is in line with the oil hole in the Housing, and that a clear passageway exists. Install the

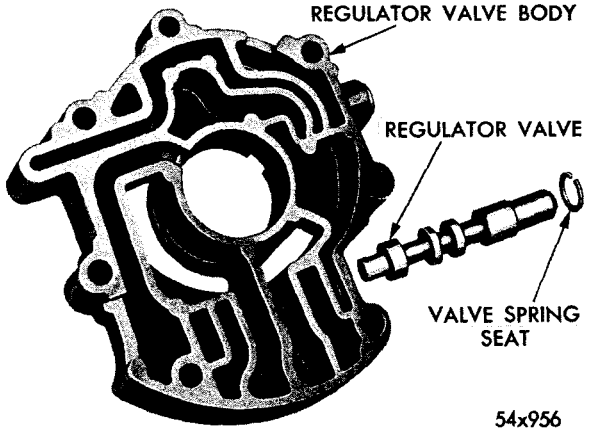

Fig. 57 — Regulator Valve Body (Exploded View)

reaction shaft oil seal on the rear of the reaction shaft. Install the dowel pin in the rear face of the reaction shaft.

CAUTION

DO NOT FORCE THE REACTION SHAFT IN THE HOUSING. Use care, when installing the shaft, as any force or jamming can cause extensive damage to the Housing.

Install a guide pin in the front of the Converter Housing to coincide with the oil pump housing screw Number One, as shown in Figure 49.

Install the regulator unit, so that its open end (with all the channeling) is facing into the Converter Housing, (Fig. 57), and that the screw hole Number One of the regulator unit is aligned with the screw hole Number One of the oil pump housing, as shown in Figure 49.

Install the regulator valve body retainer into the right side of the Converter Housing and tighten. (See Fig. 48).

Assemble the regulator valve spring gasket, the regulator valve spring and the spring retainer. Install the assembly into the right side of the Converter Housing and tighten.

Install the Oil Pump Assembly, over the reaction shaft into the Converter Housing, using

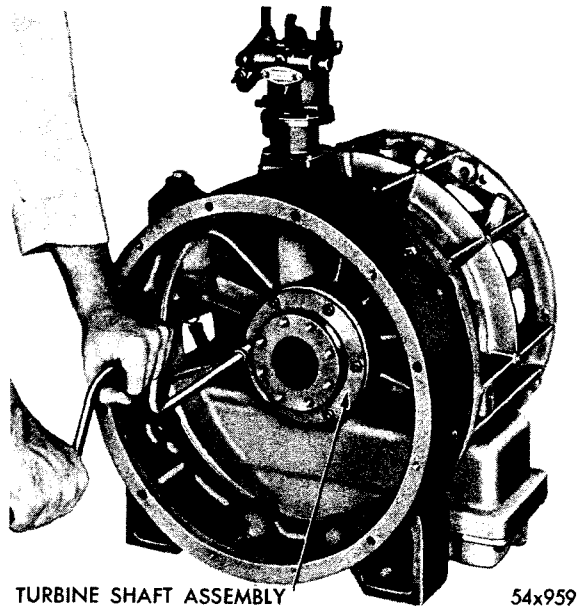

Fig. 58 — Removing or Installing Turbine Shaft Assembly to Converter Housing

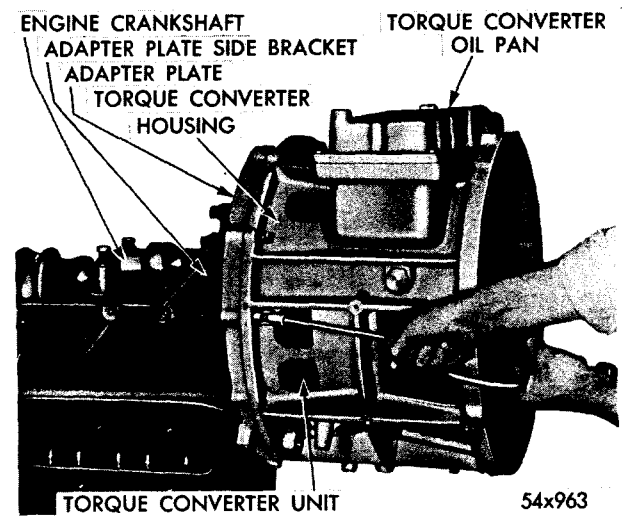

Fig. 59 — Installing or Removing Converter Housing on Adapter Plate

the guide pin in the hole Number One to insure proper assembly.

Using a suitable Tool over the Oil Pump Assembly, press the Assembly, until it is firmly seated in the Converter Housing.

Install and lock the reaction shaft ring seal on the Oil Pump drive sleeve.

Install the Oil Pump drive sleeve over the reaction shaft and engage with the Oil Pump pinion gear. Rotate the assembly for freedom of operation.

Install screws three and seven with washers and tighten to 15 foot-pounds torque, as shown in Figure 49. While tightening the screws, continue to turn the Oil Pump drive sleeve so that it operates freely.

Install screw Number two. This is the short screw and is the only screw that will fit into this hole. Tighten to 18 foot-pounds torque. *DO NOT PLACE A LONGER SCREW INTO THIS HOLE.*

Remove the guide pin. Install screw Number One and tighten to 18 foot-pounds torque. After all the bolts are tightened, see that the Oil Pump drive sleeve operates freely.

Install the bearing retainer flange to the Converter Housing oil seal, in the recess, at the rear of the Converter Housing.

Refer to Figure 47, when re-assembling the Turbine Shaft as follows:

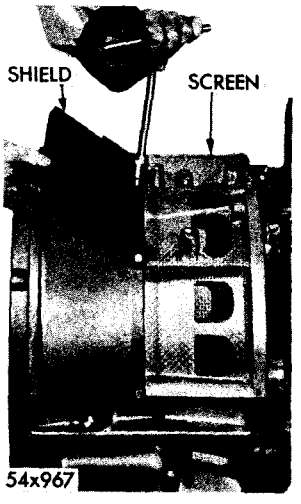

Fig. 60 — Attaching Shield to Converter Housing

Using Tool C-3125, press fit the Turbine Shaft oil seal into the rear of the bearing retainer.

Using the above tool, press fit the Turbine Shaft bearing into the front of the Turbine Shaft retainer, and install the Turbine Shaft bearing snap ring into the front retainer recess, over the Turbine Shaft bearing.

Install the Governor drive gear (if so equipped) over the Turbine Shaft, with the gear end toward the front of the shaft. Align the Governor drive gear keyway with the key (Woodruff key) in the Turbine Shaft at the same time.

Install the snap ring on the Turbine Shaft over the Governor drive gear. Press fit the Turbine Shaft into the Turbine Shaft bearing, until the Turbine Shaft is properly seated against the bearing race. Install and lock the Turbine Shaft oil ring on the Turbine Shaft. The Turbine Shaft assembly is now ready for installation.

Install the Turbine Shaft assembly into the rear of the Converter Housing. Rotate the Turbine Shaft on units equipped with a Governor, to insure mating of the Governor gears. Install the screws and lockwashers and tighten the assembly to the Converter Housing, as shown in Figure 58.

42. INSTALLATION OF TORQUE CONVERTER HOUSING (On Engine) (Fig. 59)

Install a lifting bracket on top of the Torque Converter Housing and tighten securely.

CAUTION

Exercise extreme care when installing the Torque Converter Housing to prevent damage to the Turbine Shaft and the reaction shaft splines, the Impeller hub oil seal and the oil seal ring. Use gentle pressure and DO NOT FORCE THE CONVERTER HOUSING into position.

Using a suitable overhead hoist, carefully line-up the Converter Housing with the guide pins in the adapter plate attached to the engine. The correct value of shims must be in the proper location according to the runout as explained earlier, and remove the hoist and the bracket when all the screws are tightened securely. (Refer to Fig. 59.)

Install the screen and dust shield after the bracket is removed, as shown in Figure 60.

INDIVIDUAL ASSEMBLIES OF THE CHRYSLER INDUSTRIAL TORQUE CONVERTER

43. INSTALLATION AND SERVICING

When installing or servicing the Chrysler Industrial Torque Converter Assembly, there are four separate assmblies in the complete assembly, which are as follows:

The Torque Converter Unit or "Donut" and Adapter Plate

The Oil Pump and Regulator Assembly

The Turbine Shaft Assembly

The Torque Converter Housing Assembly.

44. TORQUE CONVERTER "DONUT" AND ADAPTER PLATE ASSEMBLY

Install the Torque Converter adapter plate on the rear of the engine cylinder block, and tighten to 30 foot-pounds torque.

Install the adapter plate side brackets on the rear of the adapter plate and the cylinder block. Tighten to 30 foot-pounds torque. Inspect the mating surface on the Torque Converter "Donut" and the crankshaft flange for burrs and/or dirt.

Install the Torque Converter "Donut" on the crankshaft. Using the eight stud nuts and lockwashers, draw down the nuts evenly, using Tool C-811. Tighten to 55 foot-pounds torque.

NOTE

The Torque Converter "Donut" drive flange recess has two bolts that are unevenly spaced with respect to the rest of the recess bolts. These bolts match-up with the two holes in the crankshaft flange. Tighten the flange nuts securely.

45. TORQUE CONVERTER RUNOUT

NOTE

When the Torque Converter unit or "Donut" is removed from the crankshaft drive flange, for any reason, the Converter runout should be checked when re-installed. The runout should not exceed .003 inch total indicator reading. Refer to Paragraph 39 for the Runout procedure.

46. OIL PUMP AND REGULATOR DISASSEMBLY AND ASSEMBLY

The oil pump and regulator assembly, as shown in Figures 48 and 49, fits into the front end of the Torque Converter Housing, and consists of the following parts:

The Regulator Assembly

The Oil Pump Assembly

47. REMOVAL

Remove the regulator valve body retainer bolt, the regulator valve spring retainer, the spring gasket and the regulator valve spring, from the right side of the Torque Converter Housing. (See Fig. 48.)

Remove the oil pump drive seal and the oil pump drive sleeve from the oil pump housing.

Remove the screws which hold the oil pump assembly in the Converter Housing. Number the screws while removing, as they must be assembled in their original location. (See Fig. 49.)

Remove the regulator valve body from the rear of the oil pump housing. (See Fig. 57.)

48. CLEANING AND INSPECTION

Clean the oil pump body, pinion and gear, the regulator valve body, and the regulator valve in a solvent solution.

After cleaning the parts, inspect for burrs and any other damage or wear.

Inspect the regulator valve spring seat for a tight fit on the regulator valve, before installation.

49. INSTALLATION

Using Tool C-3125, install a new oil seal in the Torque Converter Impeller Hub, as shown in Figure 61.

Install a new oil O-ring seal on the outer diameter of the Oil Pump Housing, as shown in Figure 62.

Assemble the Oil Pump pinion and gear in the Oil Pump Housing.

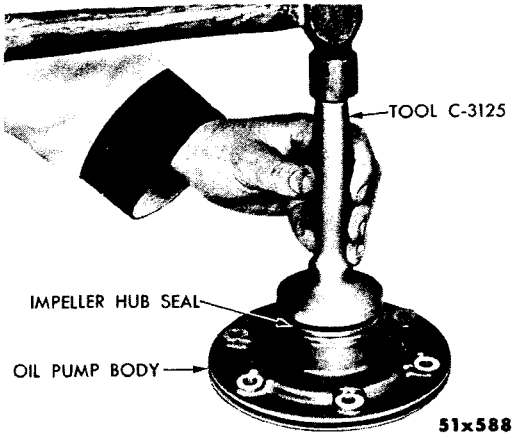

Fig. 61 — Installing Impeller Hub Seal

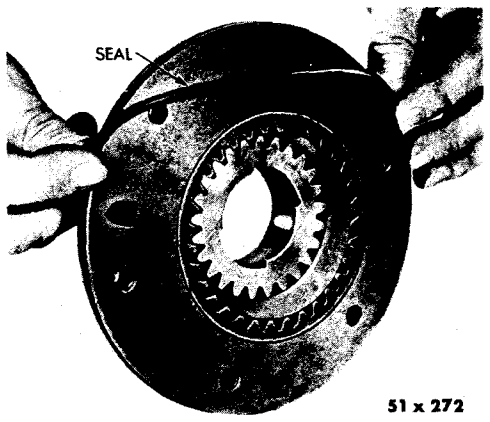

Fig. 62 — Installing Oil Pump Body Seal Ring

Install the Oil Pump pinion and gear, with the flange end up, as shown in Figure 62.

Using Tool C-3335 as a surface plate, check the clearance between the Oil Pump Body face and the face of the gears, as shown in Figure 63. The maximum allowable clearance is .003 inch.

NOTE

In the event that either the pinion or the gear is to be replaced, due to wear or damage, a matched set (pinion and gear) must be installed as a unit. This is necessary in order to maintain the oil pressure and the oil flow in the Torque Converter at the designed values.

Install the regulator valve into the regulator valve body, rotating the valve while installing. This is done to insure a free snug fit. Should the regulator valve snag in the valve passage, remove the valve. Inspect the regulator valve body for burrs, dirt or wear. If there is no damage to the regulator valve body, or the valve, reinstall the valve in the regulator valve body.

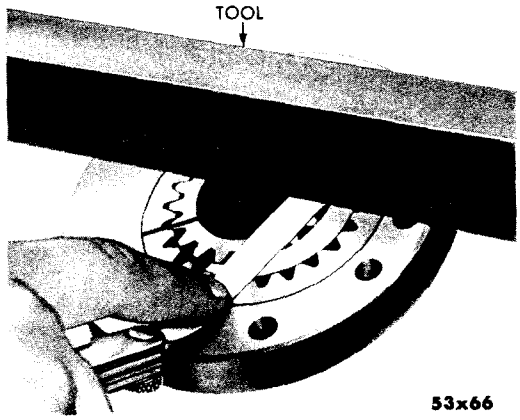

Fig. 63 — Checking Clearance between Oil Pump Body and Gears (Tool C-3335)

DO NOT USE FORCE WHEN REASSEMBLING THE REGULATOR VALVE INTO THE VALVE BODY. Damage to the oil passageway in the diecast valve regulator body, will render the unit useless and cause great damage to the Torque Converter, if installed incorrectly.

Install a guide pin or stud in the hole in the front of the Converter Housing, to coincide with the Oil Pump Housing screw Number One, as shown in Figure 49.

Install the regulator assembly, so that its open end (with all the channeling) is facing into the Converter Housing, and that the unit is aligned with the screw hole Number One of the Oil Pump Housing.

Install the Oil Pump Assembly, over the reaction shaft into the Converter Housing, using the guide pin in Hole Number One to insure proper assembly. Using a suitable tool press the assembly until it is firmly seated in the Housing.

Install and lock the reaction shaft ring seal on the Oil Pump drive sleeve.

Install the Oil Pump drive sleeve over the reaction shaft and engage with the Oil Pump pinion and gear. Rotate the assembly for freedom of operation.

Install screw Number two, the short screw only will fit into this hole. Tighten to 18 foot-pounds torque.

Install the balance of the screws except screw Number one. Tighten them to 18 foot-pounds torque. Remove the guide pin. Install the screw Number one and tighten to 18 foot-pounds torque. Rotate the assembly for freedom of operation.

Install the regulator valve body retainer into the right side of the Converter Housing and tighten.

Assemble the regulator valve spring gasket,

the regulator valve spring over the spring retainer. Install the assembly into the right side of the Converter Housing and tighten.

50. TURBINE SHAFT ASSEMBLY INSTALLATION (Fig. 47)

Using Tool C-3125, press fit the Turbine Shaft oil seal into the rear of the bearing retainer.

Press fit the Turbine Shaft bearing into the front of the retainer, and install the snap ring into the front retainer recess, over the Turbine Shaft bearing.

Install the Governor drive gear over the Turbine Shaft with the gear end toward the front, (if so equipped). Align the gear keyway, with the key (Woodruff key) in the Turbine Shaft at the same time. Install the snap on the Turbine Shaft over the Governor drive gear.

Press fit the Turbine shaft through the Turbine Shaft bearing, until the shaft is properly seated against the bearing race.

Install and lock the Turbine Shaft oil ring on the Turbine Shaft. The Turbine Shaft Assembly is now ready for installation into the Converter Housing.

51. REMOVING THE STARTER RING GEAR

Remove the Torque Converter Housing from the engine. Remove the "Donut" from the crankshaft.

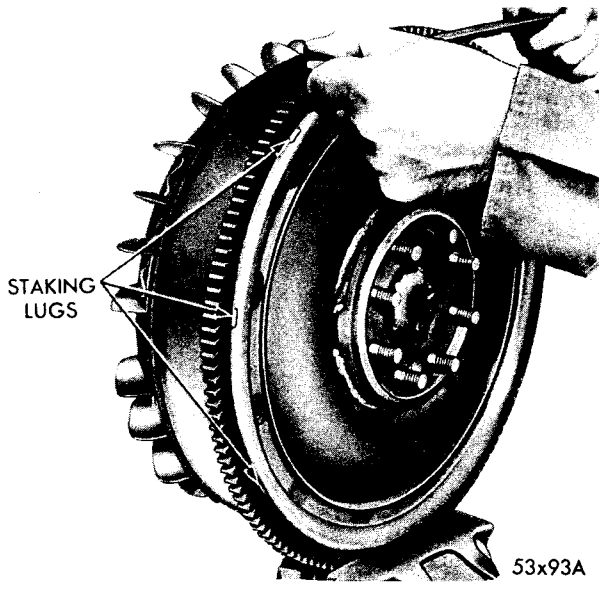

Fig. 64 — Removal of Staking Lugs from Converter

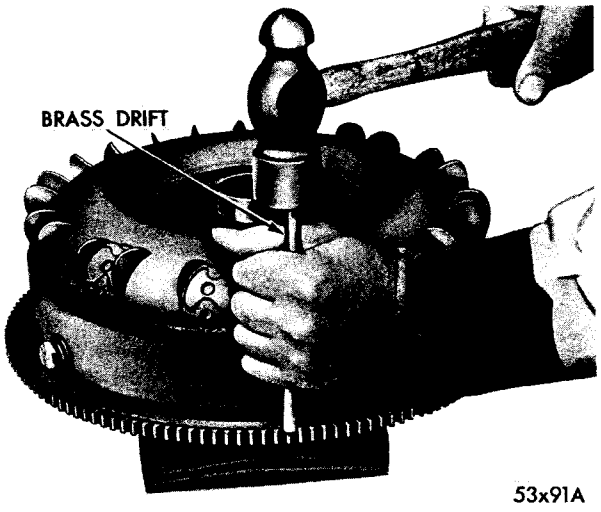

Fig. 65 — Removal of Starter Ring Gear

Support the Torque Converter "Donut" in a vise, being careful not to tighten the vise too tightly, as to avoid distortion.

Remove the staking lugs, with a file, as shown in Figure 64.

After filing off the lugs, remove the "donut" from the vise and place it on blocks of wood for support while removing the ring gear.

Using a blunt drift, as shown in Figure 65, tap around the gear until the ring gear comes off the "donut."

Remove the burrs or raised spots on the surface of the "donut" with a file. Do not remove more metal than is required, as the "donut" is a welded unit, and cannot be serviced except as an assembly.

52. INSTALLATION

Heat the starter ring gear for installation to the "donut" as follows: Using a medium size tip, direct a slow flame around the inner rim of the ring gear. *DO NOT DIRECT THE FLAME ONTO THE TEETH OF THE RING GEAR.* Place a few drops of water on the face of the gear at short intervals during the heating process. When the gear is hot enough to cause the water to boil, installation of the gear can be made on the "donut."

Place the ring gear over the flange of the "donut" so that the rear face of the gear contacts the flange of the "donut" evenly, around the entire diameter.

Three methods are recommended for welding the ring gear to the "donut" which are as follows:

a. Using a welding current of 200 amps.

b. Using a D.C. Welder that is set to a straight polarity or an A.C. Welder.

c. Using a 5/32 inch diameter, Fleet Weld Number 47, or, a 5/32 inch diameter General Electric Number W28 or their equivalent.

Reweld the ring gear to the "donut," using extreme care to place as nearly as possible, the same amount of metal in exactly the same location as the original assembly. This is necessary, in order to maintain the proper balance of the assembly. Place the welds alternately on opposite sides of the "donut" to minimize distortion.

CAUTION

To prevent burning through the "donut," the arc should be directed at the intersection of the ring gear and the "donut" from an angle of approximately 45 degrees, from the face of the gear. DO NOT GAS WELD. SUCH A PROCEDURE WOULD RUIN THE ASSEMBLY.

Before installing the "donut" on the crankshaft, inspect all the ring gear teeth, remove all nicks where metal was raised, welding splatter, etc., as they will cause noisy starter operation.

SERVICE DIAGNOSIS

53. OIL LEAKING AT FRONT-END OF TORQUE CONVERTER HOUSING (Engine Side)

Possible Causes:

a. Worn or damaged impeller hub seal.

b. Worn oil pump drive sleeve ring seal.

c. Loose oil pump housing screws or washers.

d. Worn oil pump housing bushing.

e. Worn oil pump housing seal.

f. Excessive converter hub runout.

Remedies:

a. Inspect impeller hub seal for wear or damage, and replace as necessary.

b. Inspect the oil pump drive sleeve ring seal for wear or damage, and replace as necessary. If the seal is removed from the sleeve, replace with a new one.

c. Check the oil pump housing screws for looseness. If necessary, tighten to 18 foot-pounds torque.

d. Inspect the oil pump housing bushing, for wear or damage. If damaged or worn excessively, replace the oil pump bushing. Check the oil pump gear and pinion for clearance. Replace if necessary.

e. Check the oil pump housing seal for damage. If the oil pump housing is removed from the Converter Housing, replace the O-ring seal.

f. Check the Converter Hub with a dial indicator for the runout. Refer to Paragraph 39 for the service procedure.

54. OIL LEAKAGE AT REAR-END OF TORQUE CONVERTER HOUSING

Possible Causes:

a. Worn or damaged Turbine Shaft oil seal.

b. Worn or damaged retainer to housing oil seal. (O-ring).

c. Worn or damaged Turbine Shaft oil ring.

d. Loose retainer screws.

e. Loose rear gallery plugs.

f. Loose oil pan drain plugs.

g. Loose reaction shaft screws.

Remedies:

a. Inspect the Turbine Shaft oil seal for wear or damage, and replace as necessary.

NOTE

If the Torque Converter has been in operation for a period of time, a new oil seal must be installed.

b. Inspect the retainer to housing oil seal for wear or damage. Replace as required.

a. Inspect the Turbine Shaft oil seal for wear or damage, and replace as necessary. If the seal was removed from the shaft, replace with a new one.

d. Check the retainer flange screws for looseness, and tighten if necessary.

e. Check the rear gallery plugs for looseness, and tighten if necessary.

f. Check the oil pan drain plugs for looseness.

g. Check the reaction shaft screws for looseness, tighten if necessary.

55. RESERVOIR OVERFILLED

Remedies

a. Inspect the oil pressure control valve for proper operation.

b. If the oil pressure control valve is not operating properly, replace the valve. If necessary, the valve body should also be replaced.

c. If the valve spring is weak, it should be replaced.

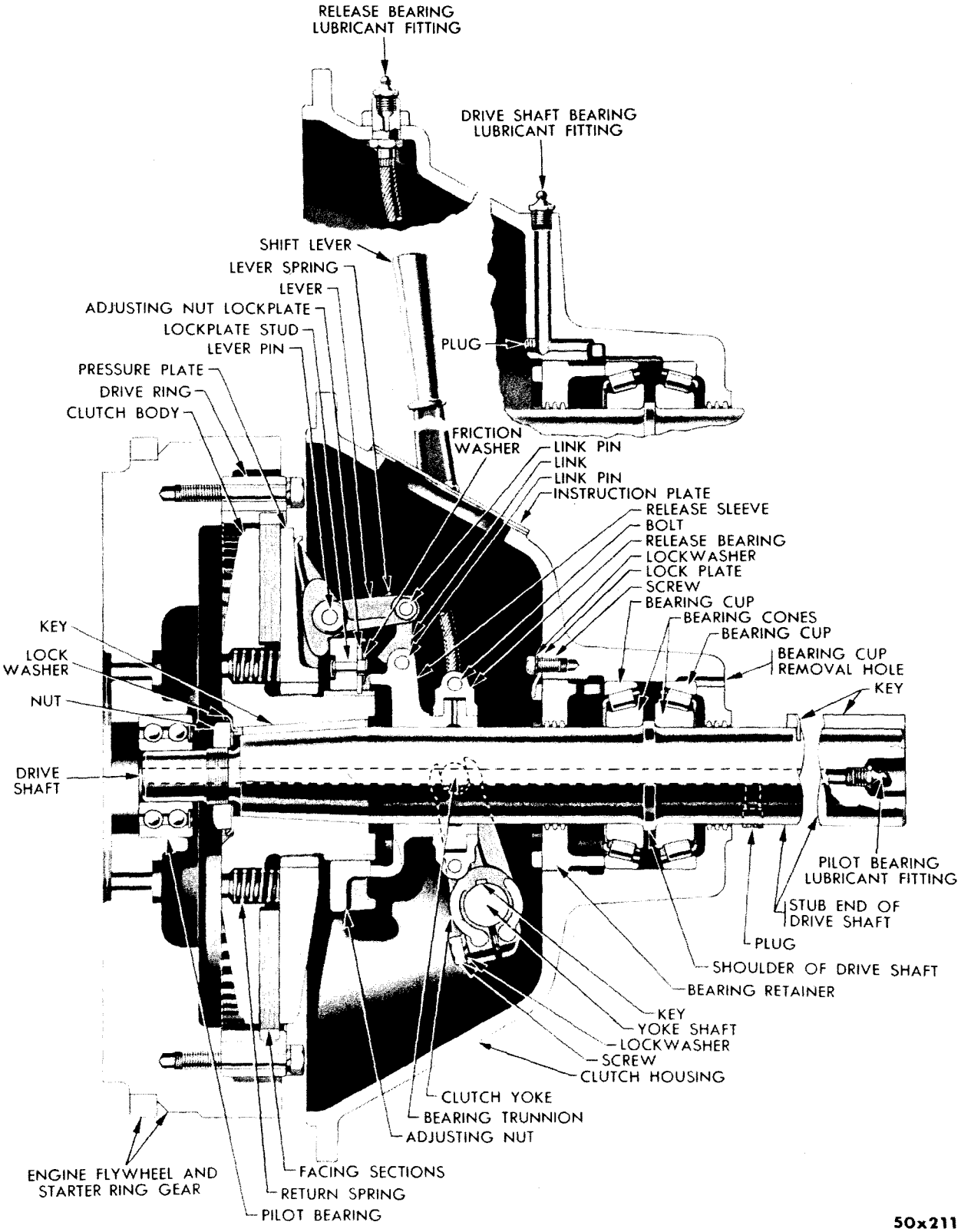

Fig. 1 — Typical Power Take-Off With Heavy Duty Clutch (Sectional View)

Section VIII

POWER TAKE-OFF
DATA AND SPECIFICATIONS
(All Models)

MAKE	Rockford
MODEL	PTA-31126
TYPE	Over Center-Gear Tooth Drive
CLUTCH FACINGS	
Type	Moulded Asbestos
Inside Diameter (Friction Surface)	6¼″
Outside Diameter (Friction Surface)	11½″
Total Friction Area—(Square Inches)	146.4
RETURN SPRINGS	
Pressure when compressed to 13/16 inch	15 to 20 lbs.
Number of Springs	3
CLUTCH ADJUSTMENT	Threaded Nut, Self Locking
SHIFTING LEVER RATIO (Handle to Rel. Sleeve)	4 to 1
SHIFTING LEVER PRESSURE	100 lbs.
POWER TAKE-OFF HOUSING BEARINGS	Tapered Roller
WEIGHT—COMPLETE POWER TAKE-OFF ASSEMBLY	142 lbs.
WEIGHT—CLUTCH ASSEMBLY ONLY	54 lbs.
MAXIMUM RECOMMENDED OPERATING SPEED—R.P.M.	3100
MAXIMUM RECOMMENDED CLUTCH ENGAGING SPEED—R.P.M.	1000
*MAXIMUM H.P. per 100 R.P.M.	13.5
*CLUTCH RATED CAPACITY—FOOT-POUNDS TORQUE	700

*No safety factor—Rating must be divided by recommended safety factor for application.

Section VIII
POWER TAKE-OFF
(OPTIONAL EQUIPMENT)

1. DESCRIPTION

Some industrial Engines are equipped with a Power Take-Off, as shown in Figures 1 and 2.

The Power Take-Off as a unit, is a heavy duty gear tooth type drive. It consists of a clutch which is mounted to the flywheel of the engine and a shaft that is supported by a double ball bearing at the front and by two tapered roller bearings at the rear which transmits power from the engine when the clutch is engaged.

A special housing, bolted to the flywheel housing of the engine, supports the clutch operating mechanism and the shaft's tapered roller bearings.

The clutch is a three section, dry disc type, with a threaded adjusting nut to compensate for wear.

Driving pressure is applied well toward the outside diameter of the facing, to insure maximum torque capacity, and the driving load is carried by teeth on the outside diameter of the facing member.

The frequency with which the facings will have to be replaced, as well as the frequency of adjustments, will depend to a great extent, on the type of service for which the Power Take-Off is used.

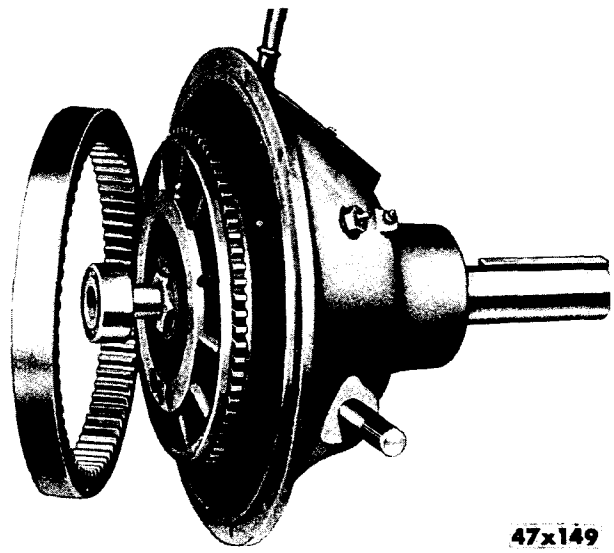

Fig. 2 — Typical Power Take-Off

If it becomes necessary to replace the clutch facing, due to slippage or excessive wear, it will be necessary to remove the complete Power Take-Off assembly from the engine.

SERVICE PROCEDURES

2. REMOVAL OF POWER TAKE-OFF

To remove the Power Take-Off from the engine, refer to Figure 1, and proceed as follows:

(1) Remove Power Take-Off pulley, sprocket or other driving means, from stub end of shaft.

(2) Support the weight of the Power Take-Off assembly with a jack, hoist, blocks or other mechanical means to hold assembly while removing attaching bolts.

(3) Remove the attaching bolts holding Power Take-Off unit to the engine flywheel housing, backing out each bolt a few turns at a time until all are completely removed.

(4) If the clutch housing of the Power Take-Off fits tightly into the bore of the flywheel housing, force out of position with the aid of two $\frac{3}{8}$-16x2 inch bolts inserted into the two tapped holes in the housing flange. Turn bolts evenly until clutch housing is free.

CAUTION

The weight of the Power Take-Off assembly must not be permitted to hang on the pilot bearing end of the drive shaft. Move the complete assembly straight back until the end of drive shaft clears the pilot bearings.

3. DISASSEMBLY OF POWER TAKE-OFF

To disassemble the Power Take-Off for replacement of facing, overhaul or repair, refer to Figure 1 and proceed as follows:

(1) Remove bolts holding drive ring to flywheel and lift off drive ring.

(2) Unclamp lockwasher on end of drive shaft, removing nut and lockwasher.

(3) With the clutch in the engaged position, place the Power Take-Off assembly on the shop floor, with the stub end of drive shaft blocked in a horizontal position to that of the floor. Disconnect lube fitting tube to release bearing.

(4) Insert two pry-bars at the back of pressure plate on opposite sides of clutch, and across the clutch housing.

(5) As pressure is exerted on the pry-bars, strike the end of drive shaft sharply (pilot end) with a soft hammer to loosen the clutch body from shaft. Remove the entire clutch assembly and key.

CAUTION

Do not hit end of shaft with undue force, or damage to the tapered roller bearings may result.

(6) Loosen the bolt that holds the shifting lever to the yoke shaft. Tap lever slightly, and remove.

(7) Loosen the two bolts holding the clutch yoke to the yoke shaft. Slide yoke to the right or left, at the same time sliding the yoke shaft in the opposite direction, until the woodruff keys are free of yoke.

(8) Remove woodruff keys, permitting the removal of the yoke shaft through the housing, leaving the yoke disassembled.

(9) Remove bolt and lockwasher attaching lockplate to housing. Remove lockplate.

(10) Turn out and remove the drive shaft bearing retainer.

(11) Pull drive shaft with roller bearings assembled, through the housing. If binding occurs, strike shaft lightly on stub end to loosen, or if tight, rotate shaft while striking.

(12) With a 1/8 inch diameter rod or drift, drive out the bearing cup remaining in the housing. (Three holes are provided for this purpose.)

(13) If necessary to remove bearings from drive shaft, they may be removed with bearing puller Tool DD-914 with special plates or a suitable press. Remove one bearing from pilot end of shaft and the other from the stub end.

4. DISASSEMBLY OF CLUTCH

The clutch is disassembled as follows:

(1) Release clutch by using a pry-bar inserted between sleeve and adjusting nut directly under inner end of link.

(2) Remove garter spring from links.

(3) Remove retaining rings and pins that hold links to sleeve.

(4) Mark both halves of the bronze release bearing so they can be reassembled in the same relative position.

(5) Loosen and remove the two bolts and nuts. Separate bearing and remove from sleeve.

(6) Remove the retaining rings from pins holding the levers to the pressure plate.

(7) Holding lever drive out pin thus releasing lever from body. Release other levers in like manner. Lift off levers and sleeve.

(8) Remove sleeve, lockwasher and lock from pressure plate.

(9) Back off adjusting nut from pressure plate.

(10) Lift pressure plate, facing sections and return springs off clutch body.

5. CLUTCH INSPECTION

Clean all parts thoroughly with a suitable sol-

vent. Inspect carefully for damage, excessive wear or distortion.

a. Pressure Plate

If the pressure plate shows signs of scoring, excessive wear, heat checking, or if warped more than .020 inch, the pressure plate should be replaced. Check for wear or damage on the drive slots and threads.

b. Return Springs

It is advisable to replace return springs when the clutch is dismantled after considerable service, or if there has been a great amount of slippage creating excessive heat, which may have caused the springs to lose initial tension. Springs should test (Fig. 3) from 15 to 20 pounds when compressed to $1\frac{1}{16}$ inches. Discard springs that do not meet minimum requirements.

c. Clutch Body

The clutch body should be examined closely for wear or damage on drive lugs. The contact surface in the tapered hole and keyway should be without burrs or upsets. The friction surface of the clutch body should also be checked for signs of scoring, excessive wear, heat checking or warpage.

d. Levers and Links

Check the levers for wear on the radius surface which contacts the face of the adjusting nut. Check the links for wear in the pin holes (also levers) and the contact surfaces of lever and link pins. Replace if worn or grooved.

e. Adjusting Nut

Check the adjusting nut for wear on face which is contacted by the levers and for damaged or stripped threads in nut.

f. Release Bearing

Check the release bearing for wear on trunnions and inside bearing surfaces which contact the sleeve.

g. Release Sleeve

Check the wear in pin holes, inside diameter

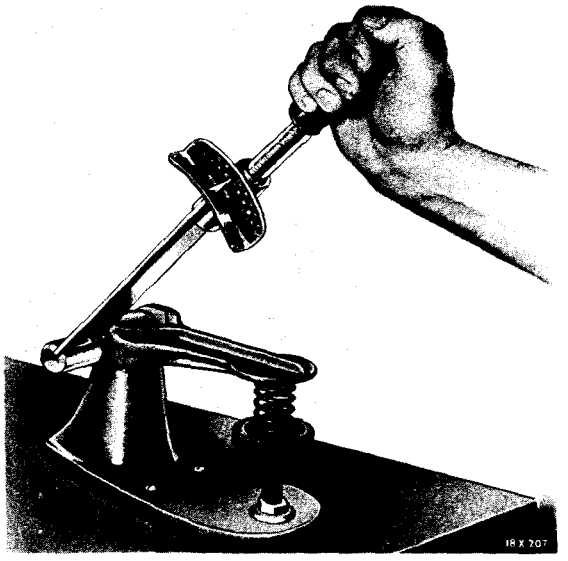

Fig. 3 — Testing Clutch Return Springs

and shoulder surfaces which are contacted by the release bearing.

h. Yoke and Housing

Check for wear in yoke ends where contacted by the release bearing trunnions. Check for excessive wear in the clutch housing at the yoke shaft holes.

i. Bearings

Replace all bearings which show signs of wear, roughness or brinelling.

j. Drive Shaft

Check the drive shaft for wear on pilot bearing end, damaged threads, taper surface and keyway. Check surface contacted by release sleeve and for possible damage to the shaft—if the tapered bearings have been removed.

The replacement of worn or damaged parts at this time will result in satisfactory operating efficiency and will eliminate unnecessary disassembly and rebuilding.

6. ASSEMBLY OF CLUTCH

After cleaning and inspecting all parts thoroughly, the clutch can be assembled in the following manner:

(1) Place clutch body on bench with hub end up.

(2) Place pressure plate return spring in holes provided in clutch body.

(3) Lay pressure plate face down on bench with a suitable protection between plate and bench to prevent damage to plate surface.

(4) Assemble adjusting nut into pressure plate by turning clockwise till ring bottoms.

(5) Assemble adjusting nut lock onto pressure plate with screw and lock washer.

(6) Install assembled pressure plate and adjusting nut over hub of clutch body.

(7) Install levers with pins through pin holes in clutch body. Install retaining rings and crimp securely in place into groove on pins. Be sure retaining rings are securely locked on pins.

(8) Lubricate clutch release sleeve collar, place the two halves together over the shoulder on release sleeve with marks aligned and fasten together with two bolts and nuts. Rotate collar on sleeve for free turning. If collar binds, tap lightly with soft hammer to free up.

(9) Assemble release sleeve assembly to clutch with links and pins. Install retaining rings and crimp securely in place into grooves on pins. *Be sure retaining rings are securely locked on pins.*

(10) Insert the three clutch facing segments between pressure plate and clutch body.

(11) Install garter spring over levers.

(12) Place the drive ring over facing sections, making sure that the ring is centered in relation to the pressure plate, by measuring carefully from the outside diameter of the pressure plate.

NOTE

This is important, as it will be impossible to assemble the unit in the flywheel unless the teeth on the facing sections are centrally located in relation to the Power Take-Off shaft.

(13) Lock the facing sections in position by engaging the clutch. Because of pressure required to engage clutch it may be necessary to use arbor press, jack or similar equipment.

(14) Remove the drive ring and bolt it to the flywheel.

(15) Press the two cone and roller assemblies of the tapered bearings on the drive shaft, one from the pilot end and the other from the stub end. Seat the bearings firmly against shoulder on the shaft.

(16) Install one cup of the roller bearings in the hub of clutch housing, with the large end of cup inserted first. Seat firmly. Lubricate the bearing thoroughly with a good quality medium weight bearing grease filling the space between the bearings and the three grooves inside the clutch housing hub.

(17) With the clutch housing resting on the hub end, install shaft with the bearings assembled, by passing the stub end through the bore in hub. Place the cup of the inner bearing (with the small end down) firmly against the rollers.

(18) Install the bearing retainer and turn into the threaded hole of the housing, until seated against bearing cup. Rotate the shaft and tighten the retainer firmly against bearing to seat cones in position.

NOTE

To provide the proper adjustment for the roller bearings, turn the retainer back three notches from the seated position and lock in place with lockplate.

(19) Using a soft hammer or block of wood to prevent damage, tap the stub end of shaft lightly, so as to free the bearings, thereby allowing proper operating clearance.

(20) Assemble the yoke shaft into the side hole of clutch housing and through yoke, just starting into opposite hole in housing. The yoke must be assembled to the shaft with the heads of the bolts toward the open end of housing.

(21) Slide yoke on shaft, leaving the keyways in shaft visible and install the keys.

(22) Slide yoke back over the keys until centered in housing and the shaft extends an

equal distance outside of clutch housing. Tighten bolts securely.

(23) Place the housing and shaft assembly (with the pilot end up) on blocks, allowing drive shaft to protrude. This will place the weight of the assembly on the housing, thus preventing damage to the shaft and bearings.

*(24) Start the clutch assembly over the pilot end of shaft, guiding keyway in clutch body over keyway in shaft, and at the same time, engaging the trunnions on release bearing into the yoke ends. Place key in keyway slot.

*Release sleeve will not clear key if key is in shaft when clutch is assembled to shaft.

(25) Place the lockwasher over end of shaft. Make certain the tang engages the keyway of clutch body. Install nut and tighten securely. Bend washer against the flat of nut to lock in position. Connect lube tube to release bearing.

(26) Install shifting lever on yoke shaft and secure with clamp bolt.

7. CLUTCH ADJUSTMENT (At Assembly)

The clutch should be adjusted as follows:

a. Apply sufficient pressure on release sleeve until sleeve is contacting the clutch body.

b. Turn adjusting nut counter-clockwise until pressure plate just contacts the facing sections.

c. Release the clutch.

d. Turn the adjusting nut counter-clockwise 12 notches.

8. INSTALLING POWER TAKE-OFF

(1) When installing the Power Take-Off assembly to the engine flywheel housing, position the end of shaft in pilot bearing, and mesh the teeth of the facing sections with the teeth in the drive ring.

(2) Install bolts through clutch housing and into flywheel housing. Tighten securely.

9. CLUTCH ADJUSTMENT (Installed)

These instructions cover clutch adjustment in the field to compensate for wear. Frequency of adjustment will depend upon the amount and nature of the load, which determines the amount of facing wear.

To assure the longest life and the best clutch performance, the clutch should be adjusted BEFORE slippage occurs.

NOTE

Since a slipping clutch causes rapid wear of facings and distortion of pressure plates, it is imperative that proper adjustment be maintained before slippage occurs.

When handling heavy or shock loads, it is very important to keep the clutch adjusted to the point where the pressure required to engage, is close to that shown on the Data and Specifications page. When handling light loads, the operator can use his own judgment as to when adjustment is necessary to avoid slippage.

CAUTION

Should slippage of the clutch be experienced, immediate adjustment will be necessary to prevent damage to the equipment.

To adjust the clutch on an engine in service, the following instructions should be adhered to:

(1) Place the clutch in released position and remove the instruction plate to expose the adjusting nut.

(2) Insert the end of a long screwdriver, or rod into a notch in the adjusting nut. Turn the nut counter clockwise by prying against the edge of hand-hole in housing.

(3) Apply sufficient pressure on shifting handle to keep clutch from turning, but not enough to make it difficult to turn adjusting nut.

(4) Turn adjusting nut counter clockwise until pressure required on shifting handle, to engage the clutch, is approximately that as shown on the Data and Specifications page for the size of the clutch being adjusted.

(5) The adjustment lock on the pressure plate will automatically lock the adjusting nut in the position in which it is left after adjustment.

Should it become necessary, after considerable service, to adjust the tapered roller bearings, follow the instructions as described in Paragraph 7 steps 18 and 19.

Section IX
LUBRICATION

The selection of the proper lubricant and its correct application at regular intervals will do much to increase the operating life of the Industrial Engines.

The following lubrication information is intended to aid Service Personnel in selecting the proper lubricants and using these lubricants correctly. It must be pointed out that the following information is applicable to normal operating conditions only, in view of the fact that engines are operated in all types of service, in extreme cold and heat.

When operating under abnormal conditions, such as in extreme heat, heavy loads and dusty roads it will require lubricating attention, more frequently, than is herein recommended. The type of lubricant may also have to be changed to obtain the best service operation when the engine is continually under abnormal conditions.

No particular brand of lubricant is recommended as any reputable oil dealer can furnish the right lubricant when advised of the correct specification desired.

As it has been pointed out, the varying conditions of engine operation may require the use of special lubricants applied at specific intervals.

It is therefore recommended that a well planned lubrication and maintenance schedule be developed which will tend to promote peak engine operation.

1. ENGINE OIL RECOMMENDATIONS

Break-In-Period (First 25 Hours)

An anti-scuff additive is added to the engine oil in the regular break-in period at the factory to aid in extending the life of the Industrial engine. After the initial break-in period the oil is drained. All engines when delivered from the factory are delivered dry; therefore add a good grade of engine oil when received from the factory.

If it is necessary to add oil during the engine break-in period, (Fig. 1), use a good quality engine oil according to the following chart:

If the anticipated minimum atmospheric temperature will be:

No lower than +32°F.....Use SAE 20W

As low as −10°F.....Use SAE 10W

Below −10°F. Use SAE 5W-20 (See Note)

NOTE

SAE 10W plus 10% colorless refined kerosene may be used if SAE 5W-20 oil is not available.

After the first 25 hours of stationary operation, the crankcase should be well drained and refilled with the oil of the correct type and viscosity number.

2. ENGINE OIL CHANGE PERIODS

Following the break-in period, oil changes should be made, UNDER NORMAL CONDI-

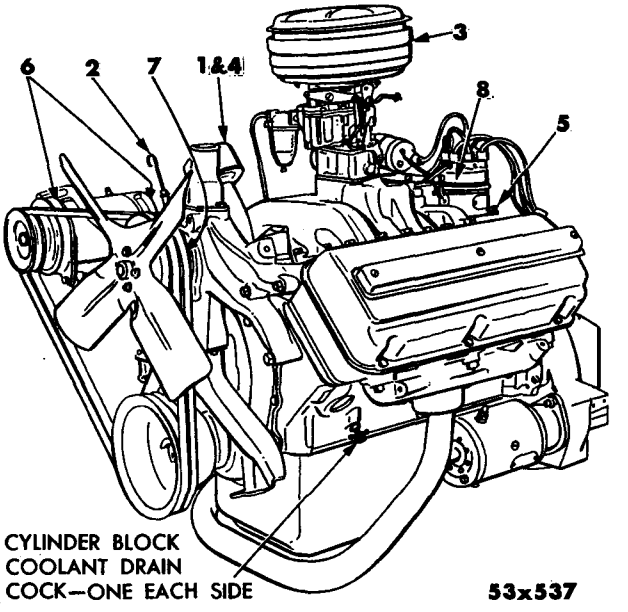

Fig. 1 — Engine Lubrication Points (Typical) (8 cyl.)

1 — Oil filler pipe
2 — Oil level indicator
3 — Carburetor air cleaner
4 — Oil filler pipe cap air cleaner
5 — Distributor
6 — Generator
7 — Water pump
8 — Rotor Wick

TIONS every 50 hours of stationary operation, using the type of oil best suited for the particular conditions under which the vehicle will be operating.

If the anticipated minimum atmospheric temperature will be:

Not lower than +32°F.....Use SAE 30

As low as +10°F.....Use SAE 20W

As low as —10°F.....Use SAE 10W

Below —10°F. Use SAE 5W-20 (See Note)

NOTE

SAE 10W plus 10% colorless refined kerosene may be used if SAE 5W-20 oil is not available.

The oil pan should be drained while the engine is at normal operating temperature. Oil will drain more completely when hot and more of the foreign material will be removed with it.

3. SELECTION OF LUBRICANT

The type of service for which an engine oil is intended is usually designated by the letters MS, MM, or ML on the container. These are service classifications established by the API (American Petroleum Institute.) This system does not replace the SAE (Society of Automotive Engineers) grade number of the oil which indicates the viscosity or consistency of the oil recommended.

For best performance and engine protection, the factory recommends that the owner select:

a. An oil which conforms to the requirements of API classifications "For service MS."

b. An oil of proper SAE number in accordance with the recommendations for the anticipated temperature shown in the following table:

Anticipated Temperature Range	Recommended Viscosity Number	Recommended Multi-Viscosity Oils
Above +32°F	SAE 30	SAE 20W-40
As low as +10°F	SAE 20W	SAE 20W-40
		SAE 10W-30
As low as —10°F	SAE 10W	SAE 10W-30
		SAE 10W-20
		SAE 5W-20
Below —10°F	SAE 5W	SAE 5W-20

NOTE

The factory does not recommend the use of any lubricant which does not have both an SAE designation and an MS service classification on the container.

4. ABNORMAL WINTER CONDITIONS

If the engine is operated at low speeds, moisture will condense in the crankcase and form a sludge. Under conditions of this kind the engine does not become sufficiently warm to expel the condensation through the crankcase ventilating system, therefore, the oil should be changed approximately every 30 hrs., under extreme conditions.

As an alternative to this frequent change period of operation, higher speeds will do much toward expelling the condensation through the crankcase ventilating system. If these operations are made frequently or a high engine temperature is maintained by using a 180° thermostat, winter-fronts, etc. or other equipment, the change period may be extended to the normally recommended oil change.

NOTE

When using 180° thermostats, it is necessary to use a permanent type of anti-freeze to prevent boiling away.

Dusty Conditions

Engine operation through dust laden air increases enormously the problem of keeping abrasive materials out of the engine. Under these conditions special attention should be given to the carburetor air cleaner, the filler pipe cap air cleaner, the crankcase ventilator outlet pipe air cleaner making sure that they are clean in serviceable condition at all times. This will tend to reduce the amount of abrasive material that may enter the engine.

As a further precaution in preventing excessive wear and possible failure of parts under these dusty conditions, the engine oil and the oil filter cartridge should be changed more frequently. The frequency will depend upon the severity of the dust conditions; therefore, no definite recommendations can be made.

5. CARBURETOR AIR CLEANER

The carburetor air cleaner (Fig. 2) should be

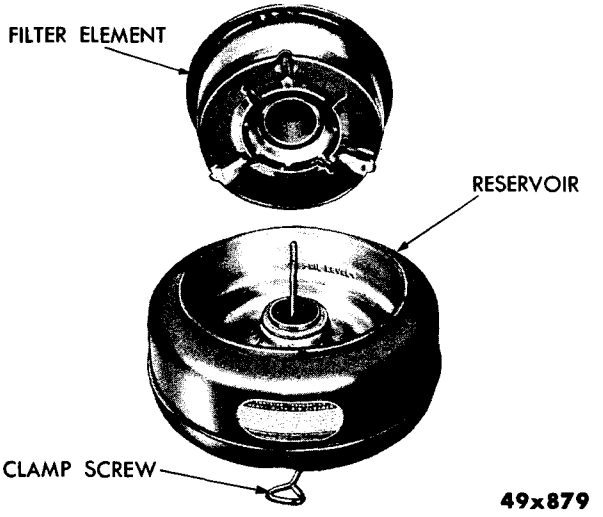

Fig. 2 — Typical Carburetor Air Cleaner

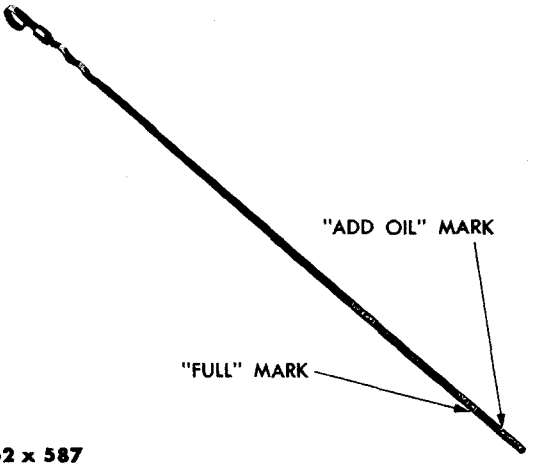

Fig. 3 — Engine Oil Indicator (8 cyl.)

inspected after each 50 hours of operation or oftener, depending on operating conditions. Dirt level above the lower off-set in the reservoir calls for cleaning of the unit.

6. CLEANING THE CARBURETOR AIR FILTER

Remove the cover filter element and clean in kerosene. Allow to drain. Unscrew the clamp screw and remove the reservoir and the gasket between the reservoir and the carburetor. Clean the reservoir thoroughly and install the reservoir with the gasket on the carburetor. Make certain the gasket is in good condition. Use a new gasket, if necessary and be sure the reservoir fits securely on the carburetor. Tighten the clamp screw. Refill the reservoir to the indicated level with one pint of SAE 50 engine oil for temperatures above 32 degrees F., or SAE 20-W for temperatures consistently below 32 degrees F. Do not overfill reservoir, as excess oil in the air cleaner may be sucked into the engine through the carburetor. Install the filter element and cover.

7. ENGINE OIL LEVEL INDICATOR

The "FULL" mark on the indicator (Fig. 3), shows the proper level of oil in the crankcase after the engine has been standing for a few hours. As soon as the engine starts running, the oil level will drop somewhat, due to the filling of oil passages and the oil filter. A quart of oil should be added when the level is at, or just above, the "ADD OIL" mark on the indicator. The oil level should never be allowed to remain below the "ADD OIL" mark.

8. FULL-FLOW OIL FILTER

Full-Flow means that all of the oil, delivered under full pressure to the working parts of the engine, goes through the filter before entering the oil passages.

Not only does this type of filter assure a constant flow of clean oil to the engine, but it is constructed and installed in such a manner that it is impossible for the supply of oil to be cut off even though the oil filter becomes clogged.

The oil filter element is the replaceable type and should be replaced every 50 hours, or earlier, if the oil appears to be excessively dirty. In dusty areas or under severe operating conditions, it is advisable to change the filter cartridge more frequently.

After replacing the filter cartridge, the engine should be operated for a period of five minutes and a check made for leaks. The oil level should then be corrected to compensate for the oil absorbed by the new filter cartridge.

LUBRICATION OF ENGINE ACCESSORIES

To prolong the life of the various engine accessory units, they must be lubricated at specified intervals with the proper type of lubricant.

Clean the fittings or oil cups before applying the lubricant and record the number of hours of engine operation between lubrications.

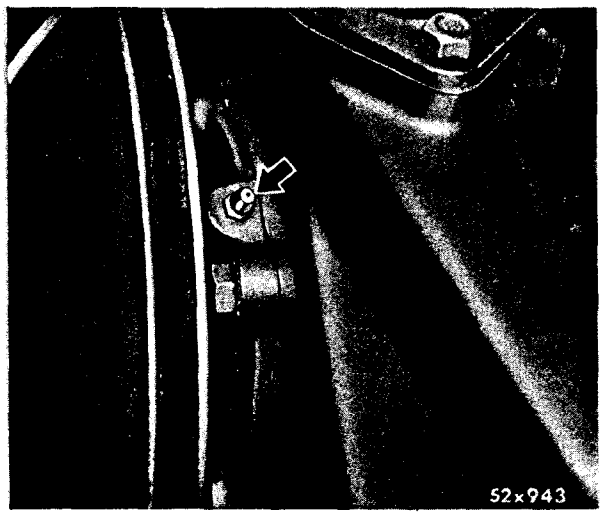

Fig. 4 — Typical Water Pump Lubricant Fitting

9. WATER PUMP (Fig. 4)

The water pump has one fitting. Lubricate with water pump grease after each 25 hours of operation.

10. GENERATOR (Fig. 5)

The generator has two oil cups, one at either end. Lubricate with five to ten drops of SAE 10 engine oil after each 50 hours of operation.

11. STARTER

The starter is lubricated at time of assembly and needs no further lubrication.

12. DISTRIBUTOR (Fig. 6)

The distributor has an oil cup at the side. Lubricate with five or ten drops of SAE 10 engine oil after each 50 hours of operation. After 250 hours of operation, remove the distributor cap and rotor, apply two or three drops of SAE 10 engine oil to the cam wick.

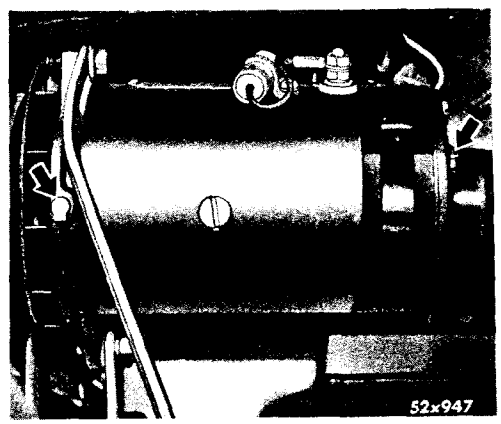

Fig. 5 — Generator Lubrication

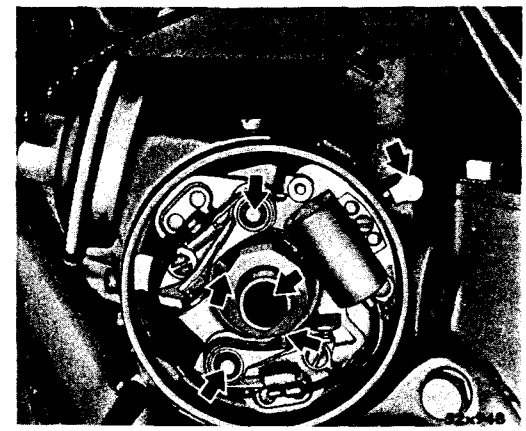

Fig. 6 — Distributor Lubrication

CAUTION

Keep oil away from the contact points.

13. CRANKCASE VENTILATING AIR CLEANERS

After each 50 hours of operation, or with each oil change, remove the air cleaners from the oil filler pipe (Fig. 7) and from the ventilator outlet pipe located near the distributor. Wash in kerosene, dry and re-oil with SAE 50 engine oil.

14. GOVERNOR (Pierce)

Check the oil level in the governor housing daily removing the inspection hole plug at the rear of the housing. The level should be even with

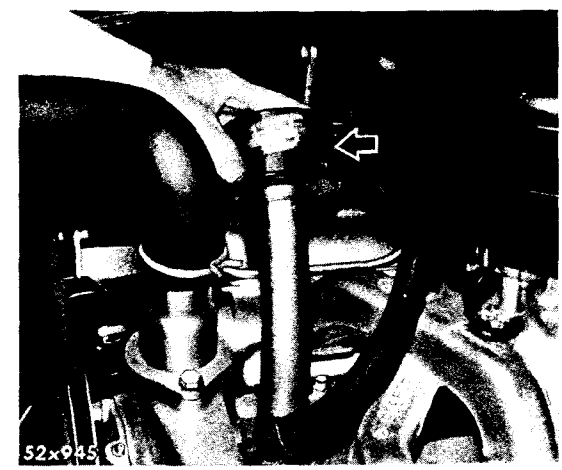

Fig. 7 — Crankcase Oil Filler Pipe Air Cleaner

lower edge of the inspection hole. To replenish the oil, remove the inspection hole plug near the bottom of the housing and fill with engine oil until oil reaches the correct level. Use oil of the same viscosity as that in the engine crankcase. Place a few drops of engine oil in oil cup near front pulley.

15. LUBRICATION OF FLUID COUPLING

The oil in the fluid coupling is retained by means of seals and normally, the unit requires no servicing. If there is evidence of loss of oil through the seals, the unit should be removed and inspected and necessary repairs made. Loss of fluid will be evidenced by excessive engine speeds, similar to a slipping clutch.

16. LUBRICATION OF TORQUE CONVERTER

Run engine at idle speed to operating temperature. Remove the dip stick on left side of the torque converter and inspect the level of the oil after 25 hours of operation and each 250 hours thereafter. If necessary, replenish with Automatic transmission fluid type "A" to bring oil level to the bottom of the filler plug opening.

After 500 hours of operation, drain and refill the assembly.

To drain the reservoir, remove the drain plug from the bottom of the reservoir.

To drain the torque converter unit, remove the flywheel housing cover plate (at bottom), remove the drain plug from the torque converter housing and allow the oil to drain. Rotate the unit one-half revolution and remove the opposite drain plug. Allow the remainder of the oil to drain. Install the two drain plugs, with new gaskets. To refill, remove the filler plug from the left side of the reservoir and fill the reservoir to the lower edge of the filler plug opening, with Automatic transmission fluid type "A." Start the engine and run between 500 rpm and 700 rpm with the transmission in neutral to permit the fluid to fill the unit. With the engine running, continue adding fluid to the reservoir until the fluid level remains constant at the lower edge of the filler opening. Install the filler plug, with the gasket and install the cover plate on the engine flywheel housing.

To eliminate air bubbles from the fluid, lock the output shaft and again run the engine between 500 rpm and 700 rpm for not more than two minutes and inspect the fluid level. Refill if necessary and install the filler plug.

17. INSPECTION AND LUBRICATION OF 4, 5-SPEED REGULAR OR 5-SPEED HEAVY DUTY TRANSMISSION

Remove the filler plug and inspect the level of the lubricant after each 50 hours of operation. Level should be at bottom of the filler plug opening. Replenish, if necessary, with fluid gear lubricant of the proper grade. For temperature above 10 degrees F., use SAE 90 and for temperatures below 10 degrees F., use SAE 80. If SAE 80 is not available, use a blend of four parts SAE 90 to one part SAE 10-W engine oil. Do not use a lubricant heavier than SAE 90. Drain and refill the transmission prior to anticipated temperature change or after each 500 hours of operation. The capacity of the regular 4-speed transmission is 5½ pints, the 5-speed regular transmission is 9½ pints and the 5-speed heavy duty transmission is 15 pints. If the engine is equipped with a power take-off add 1½ pints.

18. LUBRICATION OF POWER TAKE-OFF (With Heavy Duty Clutch) (Fig. 9)

Two lubrication fittings are provided for this assembly, one on the side of the housing and one at the end of the shaft. On some units, the fitting for the clutch release bearing is inside the housing. It is made accessible by removing a small plate at the left side of the housing. For some types of installation, the drive shaft must

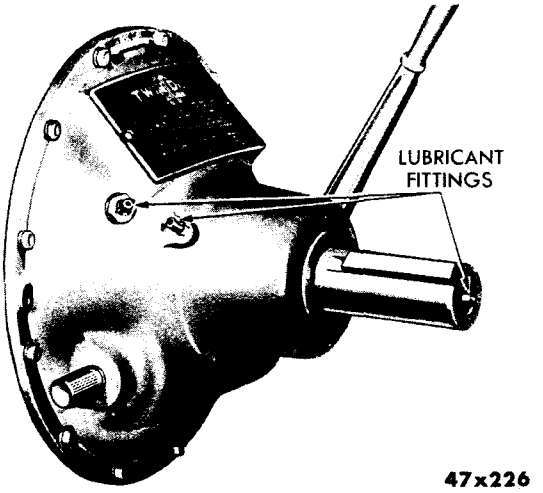

Fig. 9 — Lubrication of Power Take-Off

be lubricated from the side, rather than the end. In such case, remove the small plug from the shaft and install a fitting in its place. Remove the fitting from the end of the shaft and replace with the plug. Lubricate the clutch release daily with general purpose grease, and lubricate the drive shaft after each 50 hours of operation.

19. POINTS REQUIRING NO LUBRICATION

Clutch release bearing, starter bearings, carburetor linkage, automatic choke linkage, rubber bushings and fluid coupling require no lubrication.

20. SERVICE RECOMMENDATIONS

Engines operated under adverse conditions may need lubrication attention more frequently and should be serviced as required. In dusty territories, the air cleaners should be cleaned often. Under extreme conditions, once a day may be necessary.

21. RUBBER PARTS

The rubber bushings are designed to grip the contacting metal parts firmly and operate as a flexible medium between these parts. The use of any lubricant will destroy the necessary friction and cause noise and premature failure of the rubber parts.

22. OILITE BEARINGS

"Oilite" bearings are, to a great extent, self-lubricating and are for this reason ideal for use in locations where lubrication is difficult to maintain. They contain copper, tin, solid lubricants and lubricating oil of different proportions and characteristics, depending upon the requirements of the bearings.

"Oilite" bronze appears to be the same as ordinary bronze, but when subjected to heat or pressure, oil comes to the surface in a quantity sufficient to supply a constant thin coating, which is often sufficient for the lifetime lubrication requirements of the bearing.

Replacement, if ever necessary, should be made only with another "Oilite" bearing of the same size as the bearing being replaced. "Oilite" bearings should not be reamed, filed or otherwise cut to size, although they may be burnished to a final running fit. Cutting an "Oilite" bearing tends to seal the pores of the metal, which prevents the seepage of the oil necessary for lubrication.

If machining is necessary, follow these instructions:

Machine like cast bronze and apply no coolant. After machining, soak in a good grade of SAE 30 engine oil. For finishing surfaces where lubrication is necessary, use a diamond point shaped tool ($\frac{1}{64}$ inch radius) and dead sharp of diamond or tungsten carbide. Take very light cuts (.002 to .004 inch) on the diameter, with a fine feed and high speed.

CAPACITIES
(U. S. MEASURE)

ENGINE CRANKCASE ..... (When filter element is replaced add one additional quart)	5 Quarts
TORQUE CONVERTER	12 Quarts
TRANSMISSIONS	
4-Speed (Regular)	5½ Pints
5-Speed (Regular)	9½ Pints
5-Speed (Heavy Duty)	15 Pints

If units are equipped with Power Take-Off add 1½ pints.

LUBRICATION & MAINTENANCE CHART

Proper lubrication and proper maintenance are essential for efficient and economical engine operation. The engine and its accessories should be lubricated at the designated time intervals with the best material and with the utmost care. Proper adjustment must be maintained on the engine assembly and the electrical, fuel and cooling systems must be kept in efficient operating condition. The following information is presented as an aid in maintaining such service.

Name of Unit	*Capacity*	*How Lubricated*	*Type of Lubricant*	*Maintenance Instructions*
		DAILY		
Oil Level Indicator	— — —	— — — — — —	— — — — — — — —	Check oil level daily.
Carburetor Air Cleaner	— — —	— — — — — —	— — — — — — — —	Check oil daily if engine is operated under extremely dusty conditions. If the sump is found to contain a semi-solid mixture of oil and dirt up to the shelf, the air cleaner should be serviced as outlined in Paragraph 5.
Governor Mechanical	— — —	Unscrew oil level plug and put oil in oil cup until it starts to run out of oil level plug hole. Install oil level plug.	Engine oil	Use oil with same viscosity as oil in crankcase.
Governor Linkage	Few drops	Oil can	Engine oil	— — — — — — — — — — — —
		EVERY 25 HOURS		
Water Pump	— — —	Fitting	Water Pump Grease only	— — — — — — — — — — — —
Torque Converter	12 qts.	Remove the filler plug at side of reservoir below the clutch housing and inspect level of oil in Torque Converter Drive unit.	Automatic Transmission Fluid Type "A"	Initial inspection after first 25 hours of operation. Thereafter, each 250 hours.
		EVERY 50 HOURS		
Engine (Oil Pan)	5 qts. 6 qts. when filter element is replaced	Remove plug in bottom of oil pan to drain oil. Install plug. Add oil through filler pipe to bring to proper level.	Refer to Paragraph 3	Replace oil if engine is idle 30 days or longer.
Carburetor Air Cleaner	1 pint	Remove cover and filter element, rinse element clean in kerosene and drain. Empty dirty oil from reservoir, clean out the sump and refill to indicated level with fresh oil.	Engine Oil SAE 50 above +32° F. SAE 20-W below +32°F.	Clean more often if engine is operated under extremely dusty conditions. If SAE 50 oil is not available, SAE 40 oil may be used.
Oil Filler Pipe Air Cleaner	— — —	Remove filler pipe cap, wash filter element in kerosene, dry thoroughly and dip in fresh oil.	Engine Oil SAE 50	Clean more often if engine is operated under extremely dusty conditions. If SAE 50 oil is not available, SAE 40 oil may be used.
Crankcase Ventilator Outlet Pipe Air Cleaner	— — —	Remove filter element and wash element in kerosene. Re-oil with fresh oil.	Engine Oil SAE 50	Clean more often if engine is operated under extremely dusty conditions. If SAE 50 oil is not available, SAE 40 oil may be used.

LUBRICATION & MAINTENANCE CHART (Cont.)

Name of Unit	*Capacity*	*How Lubricated*	*Type of Lubricant*	*Maintenance Instructions*
		EVERY 50 HOURS (Continued)		
Generator	5 or 10 drops	Oil cup at front bearing and covered oil hole at rear bearing.	Engine Oil SAE 10-W	After oil is applied, be sure the oil cup and hole covers are closed.
Distributor Bushing	— — —	Fill oil cup on side of distributor.	Engine Oil	— — — — — — — — — — — —
Power Take-Off	— — —	Rear fitting on side of housing and fitting on end of shaft.	General Purpose Grease	— — — — — — — — — — — —
Clutch Linkage	— — —	Oil can	Engine Oil	
Transmission	— — —	— — — — — —	— — — — — — — — — —	Replace oil every 500 hours or 6 months as outlined in the last item of this table.
		EVERY 100 HOURS		
Oil Filter (Full-Flow Type)	— — —	Remove cover, gasket and element. Wipe clean inside of filter casing and install new MOPAR filter element and gasket. Install cover. Then, idle engine for about five minutes and correct oil level in engine oil pan to compensate for oil absorbed by the filter.		Service filter more often if engine is operated under extremely dusty conditions.
		EVERY 200 HOURS		
Oil Filter (Shunt Type)	— — —	Replace the filter element after each 200 hours of operation, or as often as necessary to keep the oil clean.		More often under extreme conditions.
		EVERY 250 HOURS		
Torque Converter	12 qts.	Remove the filler plug at side of reservoir below the clutch housing and inspect level of oil in Torque Converter Drive unit.	Automatic Transmission Fluid Type "A"	Check condition of filler plug gaskets.
Distributor Wick	2 or 3 drops	Remove distributor cap and rotor and oil wick in center of cam.	Engine Oil SAE 10-W	Allow no oil on points.
		EVERY 300 HOURS		
Fluid Coupling	13 pints	Allow unit to cool to atmospheric temperature to allow maximum contraction. Rotate fluid coupling until filler plug is opposite the filler hole in the clutch housing. Add fluid if necessary to bring level to bottom of filler hole in the fluid coupling unit. This applies to Chrysler Manufactured housing. Should other type housing be used, the fluid coupling filler plug should be at a 56 degree angle from top dead center.	MOPAR Fluid Drive Fluid	NOTE: Inspect the level of the fluid in a new engine after the first 25 hours of operation and if necessary refill to the proper level.
		EVERY 500 HOURS		
Torque Converter	12 qts.	Remove flywheel housing cover plate (at bottom). Remove drain plug from Torque Converter housing and allow the oil to drain. Rotate unit ½ revolution and remove opposite drain plug. Allow remainder of oil to drain. Install two drain plugs with new gaskets. To refill, remove the filler plug from left side of reservoir and fill reservoir to lower edge of filler plug opening.	Automatic Transmission Fluid Type "A"	Use new filler plug gaskets.

LUBRICATION & MAINTENANCE CHART (Cont.)

Name of Unit	*Capacity*	*How Lubricated*	*Type of Lubricant*	*Maintenance Instructions*
EVERY 500 HOURS OR 6 MONTHS				
Transmission: 4-Speed Regular 5-Speed Regular 5-Speed Heavy Duty	 5½ pints 9½ pints 15 pints	Remove drain plug in bottom of case to drain lubricant. Install plug. Fill transmission to bottom of filler plug hole at side of case.	Multi-Purpose Gear Lubricant SAE 90 above —10°F. SAE 80 below —10°F.	If SAE 80 lubricant is not available, SAE 90 lubricant blended with 20% of SAE 10-W engine oil may be used.