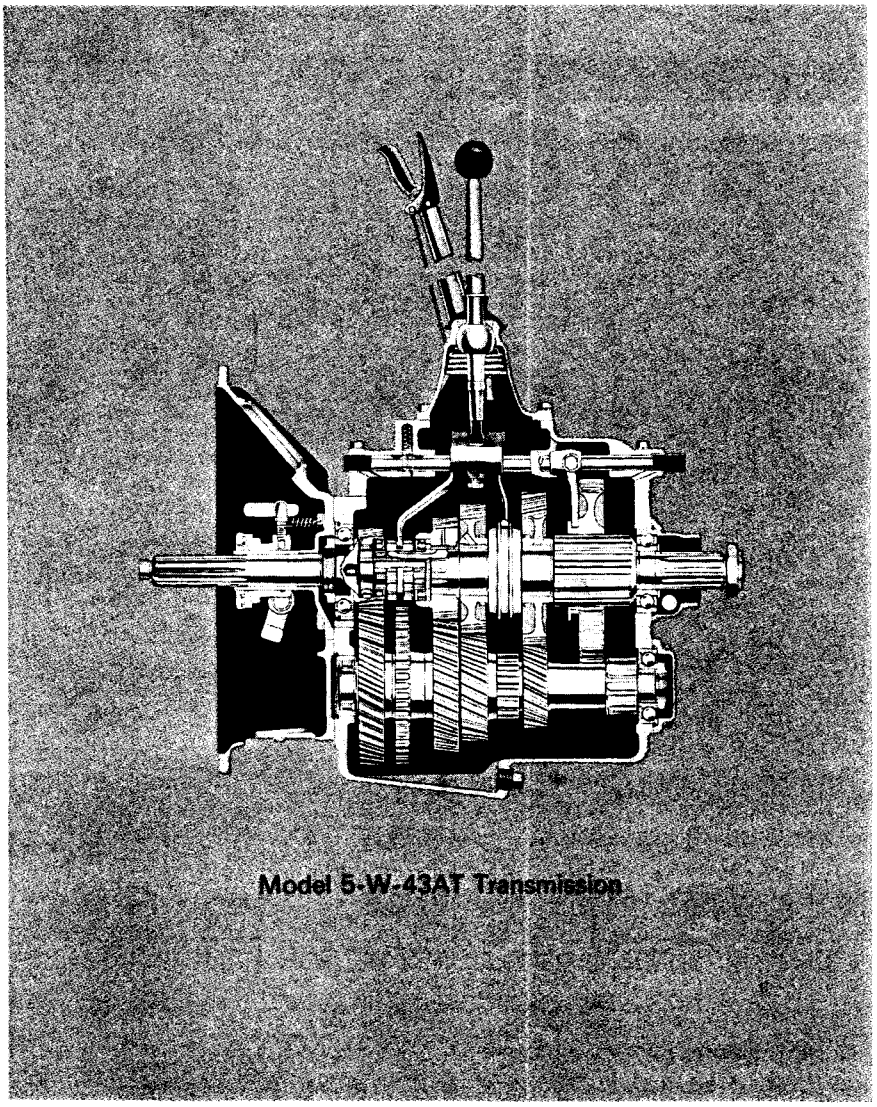
Service Manual

Fuller 5-W-43

Series Transmissions



Model 5-W-43AT Transmission

Models covered by this manual in the Fuller 5-W-43 series.

5-W-43AT
5-W-43CT
5-W-43DT
5-W-430AT
5-W-430BT

***See model designations inside.**

EATON Truck Components

Eaton Corporation
Transmission Division
Kalamazoo, Mich. 49001

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DESCRIPTION

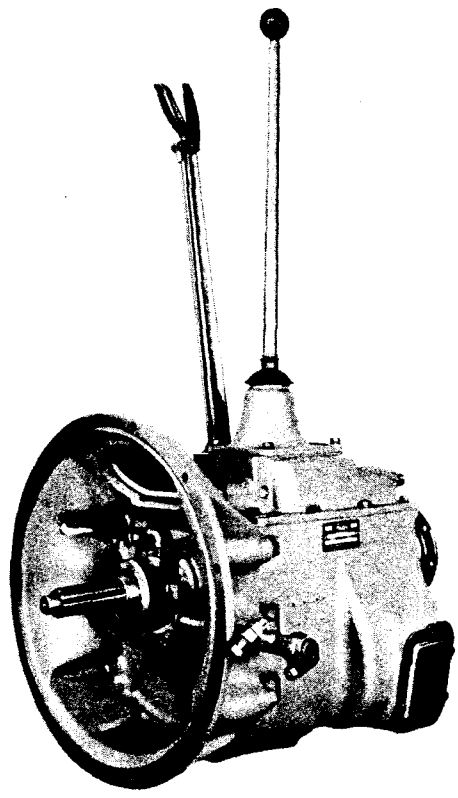
The 5-W-43 and 5-W-430 series transmissions have five forward speeds and one reverse, and are designed primarily for medium-duty on-highway equipment.

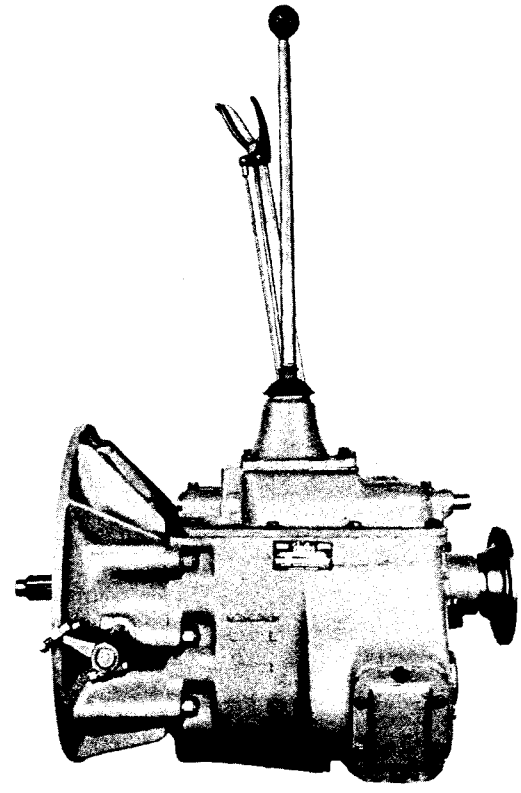
The construction for all models is the same; the difference in models is due to the size of the gears which determine the gear ratios. Gear ratios are designated by letters, A, B, C and D, which follow the model number. The zero in models 5-W-430A and 5-W-430B signifies that an overdrive ratio is used.

The letter "T" is used as a second letter designation to denote conical clutching teeth. Earlier models will not have the "T" designation.

Reverse, first and second ratios are spur-type gears; third, fourth and fifth are helical-type gears. Earlier models contain a helical-type second speed gear.

Except for the first and reverse ratios, all gears are constant mesh. Second and third gears are engaged by a sliding clutch collar on the mainshaft, and fourth and fifth gears are internally engaged by a sliding clutch gear, also mounted on the mainshaft. A sliding gear on the mainshaft meshes with the countershaft low speed gear or reverse speed gear for gear engagement for these two speeds.





A. Views of 5-W-43A model transmission with companion flange.

SPECIFICATIONS

GEAR RATIOS	5-W-43A	5-W-43C	5-W-43D	5-W-430A	5-W-430B
Fifth	1.00	1.00	1.00	.77	.82
Fourth	1.41	1.43	1.14	1.00	1.00
Third	2.47	2.30	1.77	1.77	1.90
Second	4.61	3.91	3.33	3.33	3.57
First	8.04	6.82	6.52	6.52	6.98
Reverse	8.00	6.79	6.49	6.49	6.95

POWER TAKE-OFF

Openings—Two SAE standard regular-duty:

Right Side—Standard length for 6/8 pitch gear.

Left Side—Standard length for 6/7 pitch gear.

Drive Gear

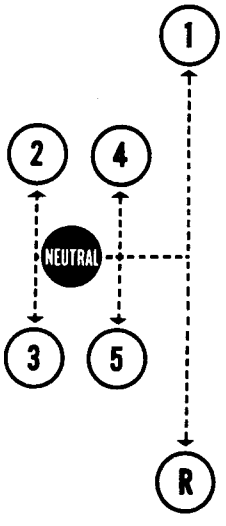
Right Side—A 43-tooth, 6/8 pitch gear on the countershaft.

Left Side—A 29-tooth, 6/7 pitch gear on the reverse gearing.

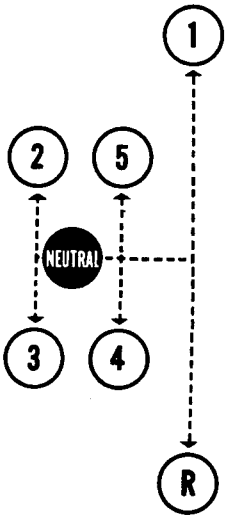
Drive Gear Speeds

Right Side—Turning at .524 engine speed on 5-W-43C model, .548 engine speed on 5-W-43D and 5-W-430A models, .512 engine speed on 5-W-430B model.

Left Side—Turning at .254 engine speed on 5-W-43C model, .265 engine speed on 5-W-43D and 5-W-430A models, and .248 engine speed on 5-W-430B model.



B. Shifting diagram for 5-W-43 series transmissions.



C. Shifting diagram for 5-W-430 series transmissions.

BRAKE MOUNTING

Four 5/8" mounting studs with nuts and lockwashers can be furnished in rear of case for the attachment of brake bracket.

CLUTCH RELEASE MECHANISM

Clutch release bearing carrier, release bearing, extended front bearing cover, release yoke, pedal shafts and pedal adjusting arm are furnished with transmissions for use with single and two-plate, push type clutches.

SPEEDOMETER DRIVE

Provision is made in the mainshaft rear bearing cover for the installation of speedometer gears and the attachment of cable.

OIL CAPACITY

Approximately 18 pints, depending upon the inclination of engine and transmission.

Weight .....355 pounds
Clutch Housing Size .....SAE No. 1, 2 or 3
Installation Dimensions .....22-5/16 inches

LUBRICATION

RECOMMENDED LUBRICANTS (In Order of Preference)

ON-HIGHWAY VEHICLES		
Type	**Grade**	**Temperature**
Heavy-Duty Engine Oil MIL-L-2104B	SAE 50 SAE 30	Above +10°F. Below +10°F.
Mineral Gear Oil, R and O type	SAE 90 SAE 80	Above +10°F. Below +10°F.
Mild E.P. Oil (except Sulfur-chlorine-lead type) MIL-L-2105B	SAE 90 SAE 80	Above +10°F. Below +10°F.
OFF-HIGHWAY & MINING EQUIPMENT		
Heavy-Duty Engine Oil MIL-L-2104B	SAE 50 SAE 30	Above +10°F. Below +10°F.
Special Recommendation — For extreme cold weather where temperature is consistently below 0°F.		
Heavy-Duty Engine Oil MIL-L-2104B	SAE 20W	Below 0°F.

Heavy-duty engine oil. Make sure to specify heavy-duty type meeting MIL-L-2104B specifications.

Mineral gear oil inhibited against rust, oxidation and foaming.

Extreme pressure oils under some conditions might form carbon deposits on gears, shafts, bearings, and synchronizer disc, and may also glaze friction surfaces of synchronizer discs—conditions which will result in transmission malfunction and premature failure.

It is suggested that if these conditions exist, and E.P. oil is being used, a change should be made to straight mineral gear oil or heavy-duty engine oil as recommended.

Transmissions in the 5-W-43 and 5-W-430 series are designed and built so that all internal parts operate in a bath of oil circulated by the motion of the gears and shafts. All gears, bearings, sleeves and bushings will be amply lubricated if proper lubrication procedures are followed.

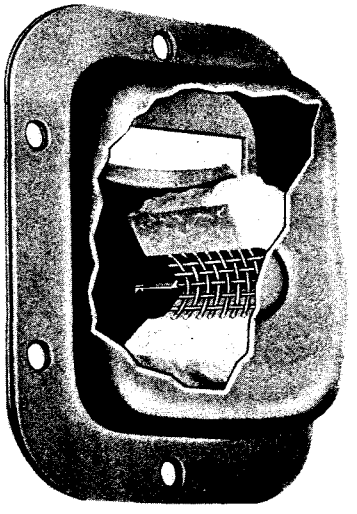
MAINTENANCE

It is obvious that gear oil costs less than replacement bearings, bushings and sleeves. Thus, to protect the transmission, it is important that the maintenance procedures below are closely followed:

1. Use the grade and type of oil recommended.
2. Change the gear oil at the recommended intervals.
3. Keep the oil at the proper level. Inspect regularly.

To keep the gear oil clean between oil changes use the Fuller Transmission Gear Oil Filter which can be attached to either or both power take-off openings. This assembly includes a re-

placeable filter element that removes the accumulation of metallic particles, road dirt and grit deposited in the lubricant. See Illustration D.



D. Fuller Transmission Gear Oil Filter.

DRAINING AND REFILLING

To drain the transmission remove the drain plug at bottom of case. Drain oil when transmission is warm. After the transmission has been drained, and before it is refilled, the case should be thoroughly flushed with a clean flushing oil or kerosene.

Before removing the filler plug on right side of case, all dirt should be removed from the area of the case adjacent to the filler opening. Fill the transmission to the level of the filler opening, metering approximately 18 pints of gear oil into the transmission. The exact amount will depend upon the inclination of the transmission. In every instance, fill to the level of the filler opening.

Do not overfill. Overfilling will cause oil to be forced out of the case through the mainshaft openings. Oil lost in this manner may impair the efficiency of clutch and parking brake.

INSPECTION

Gear oil is to be kept even with the level of the filler opening at all times. Check at the following intervals:

Highway Service ..... 1,000 miles
Off-highway Service ..... 40 hours

GEAR OIL CHANGE

Change the gear oil on all new equipment after the first 3000 to 5000 miles (on-highway), or first 40 hours (off-highway); thereafter, make oil changes as follows:

Highway Service ..... 25,000 miles

Off-highway Service
Logging and associated operations ..... 1,000 hours
Dirt moving, mining and associated operations... 250 to 500 hours, as indicated by operation and contamination of lubricant.

OIL FILTER

Replace oil filter element at each oil change; clean filter element housing.

SPECIAL RECOMMENDATION

The above oil inspection and change periods are based on the average use and operating conditions for the applications listed. It is recommended that the individual owner make a periodic lab analysis of the lubricant to determine contamination based on the individual's own operating conditions. After this has been determined, the individual owner can then set his own inspection and oil change periods based on his operation.

GENERAL INSTRUCTIONS FOR DISASSEMBLY

IMPORTANT: Read this section before starting the detailed disassembly procedures.

It is assumed in the detailed disassembly instructions that the transmission has been taken from the chassis, the lubricant has been drained, and the brake lever and parking brake removed. The gear shift lever housing assembly is included in the detailed instructions; however, this assembly also must be removed from transmission before transmission can be removed from vehicle.

Follow each procedure closely in each section, making use of both the text and pictures. Use certain precautions, as listed below, during disassembly.

1. **CLUTCH HOUSING**—Unless absolutely necessary the clutch housing should not be removed. If disassembly is necessary to replace either the housing or case, extreme care should be taken during reassembly to maintain the 90° angularity between the machined face on the engine side of the housing and the centerline of the mainshaft bores in the case. Concentricity between the pilot diameter of the clutch housing and mainshaft bearing bores should also be carefully maintained within SAE tolerances.
2. **SHIFTING BAR HOUSING**—As the shifting bar housing is disassembled, all parts should be laid on a clean bench in the same order as removed. This procedure will simplify reassembly as well as reduce the possibility of losing the small interlock parts.
3. **CLEANLINESS**—Provide a clean place to work. It is important that no dirt or foreign material enters the unit during repairs. The outside of the unit should be carefully cleaned before starting the disassembly. Dirt is abrasive and can damage highly polished parts such as bearings, sleeves and bushings.
4. **BEARINGS**—Carefully wash and relubricate all bearings as removed and protectively wrap until ready for use. Remove all bearings with pullers designed for this purpose—do not remove bearings with hammer and punch.
5. **SNAP RINGS**—Remove snap rings with pliers designed for this purpose. Rings removed in this manner may be reused.
6. **WHEN DRIVING**—Apply force to shafts, housings, etc., with restraint. Movement of some parts is restricted. Do not apply force after the part being driven stops solidly. Use soft hammers and bars for all disassembly work.

DETAILED DISASSEMBLY INSTRUCTIONS

A. To Remove the Gear Shift Lever Housing Assembly

1. Shift the transmission into the neutral position.
2. Turn out the four attaching capscrews and remove the gear shift lever housing from the transmission. Illustration No. 1.

B. To Disassemble the Gear Shift Lever Housing Assembly

1. Turn the ball grip from upper end of lever.
2. Pull the rubber boot upward and off lever.
3. Mount the assembly in a vise with the large opening in housing upwards.
4. With a heavy screwdriver, force the spring from under lugs cast in housing and remove the spring from housing. Illustration No. 2.
5. Withdraw the washer and gear shift lever from housing. Illustration No. 3.
6. Remove nut and lockwasher from pivot pin in right side of housing.
7. Remove the gear shift lever pivot pin by forcing it inward and through wall of housing.

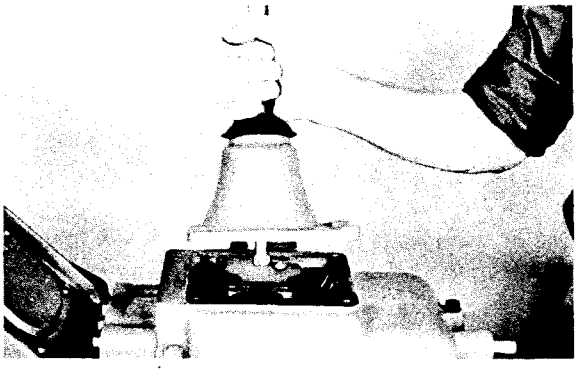
C. To Remove the Shifting Bar Housing Assembly

1. With the shifting bar housing assembly in a neutral position, turn out the attaching capscrews and lift the shifting bar housing from transmission. Illustration No. 4.

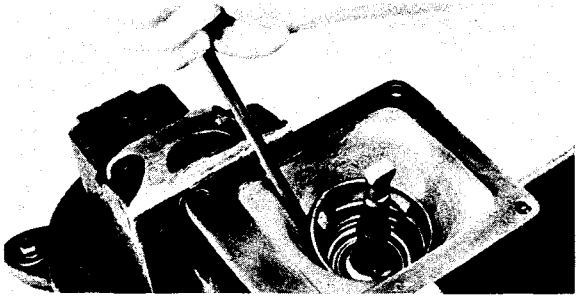
D. To Disassemble the Shifting Bar Housing Assembly

NOTE:

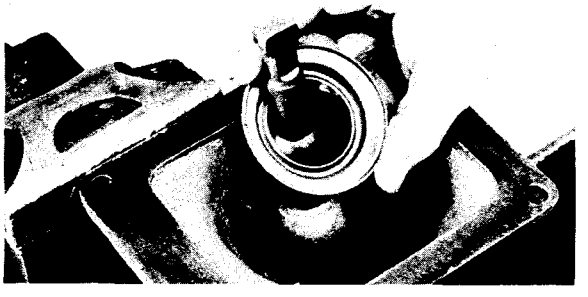
Lay shifting bars with corresponding yokes and blocks on a clean bench in the same order as removed. This will keep parts in their relative positions and facilitate reassembly. Illustration No. 5.



1. *Removing the gear shift lever housing assembly.*

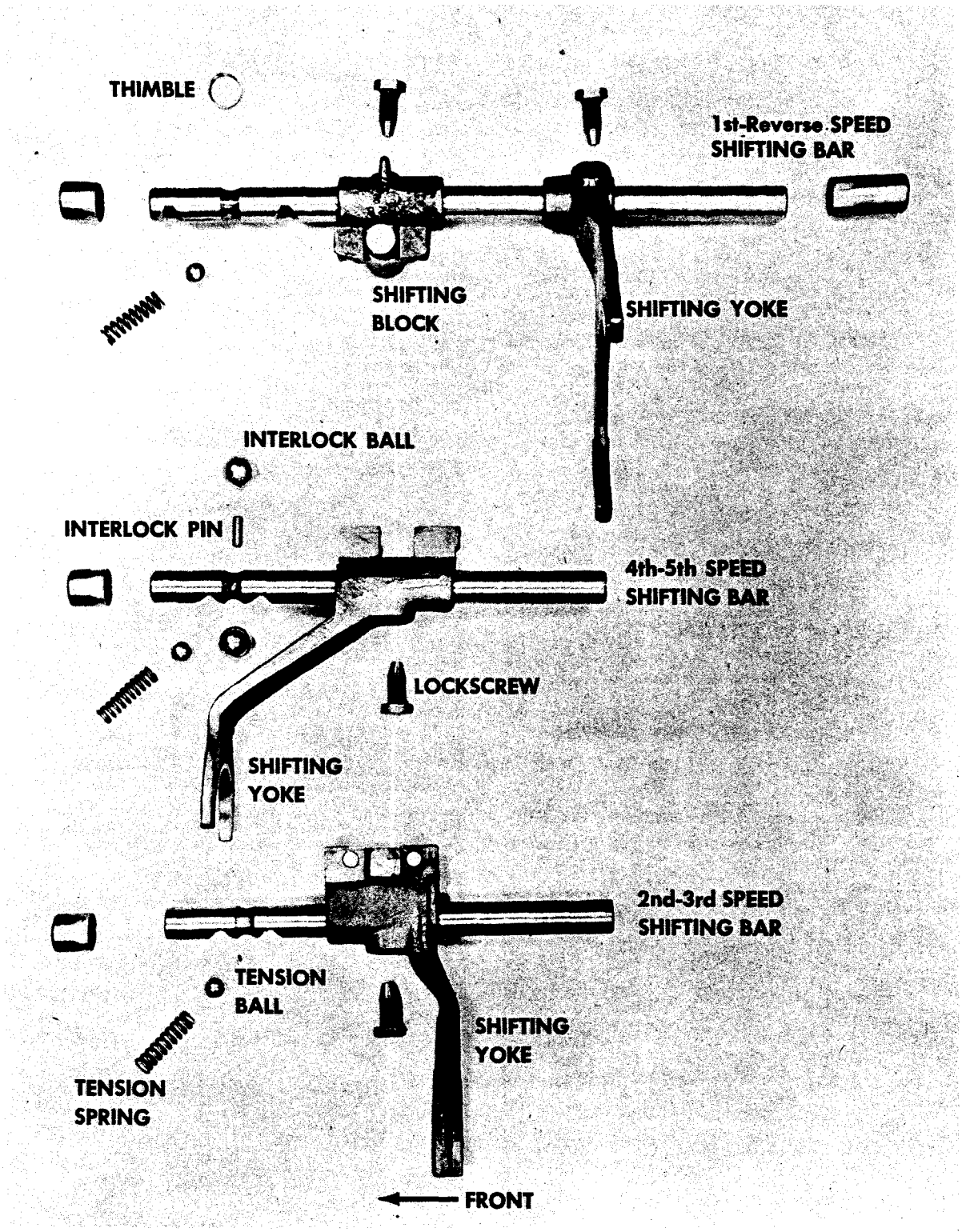


2. *Removing the gear shift lever tension spring. Pry the spring from under lugs cast into housing.*

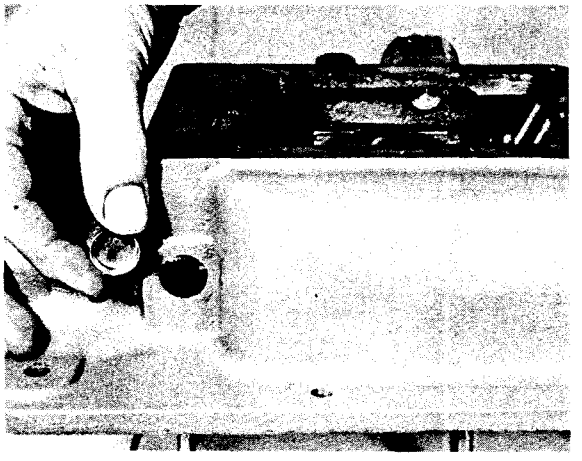


3. *Withdrawing washer and gear shift lever from housing.*

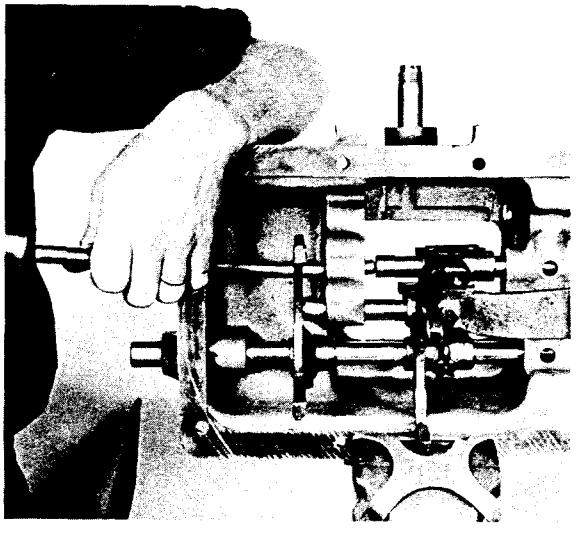
4. *Removing the shifting bar housing assembly. Jar to break gasket seal and lift.*



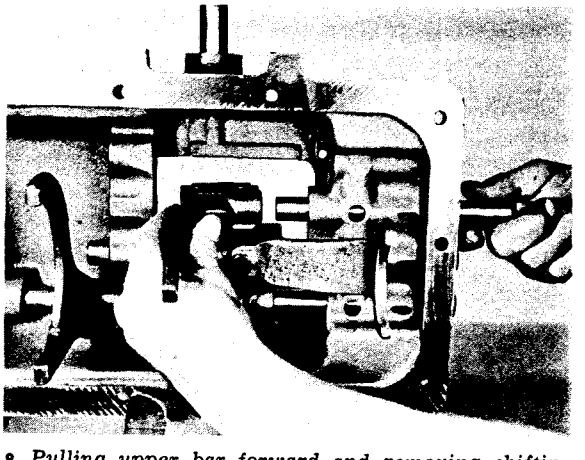
5. *Shifting bar housing parts in relative positions. Organization of parts in this manner during removal will simplify reassembly.*



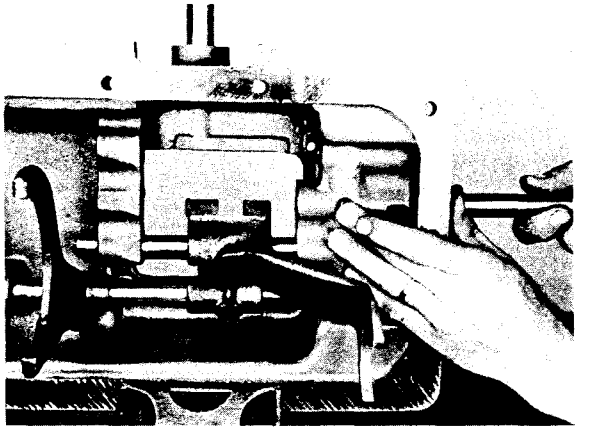
6. *Removing thimble from interlock ball bore on left side of housing.*



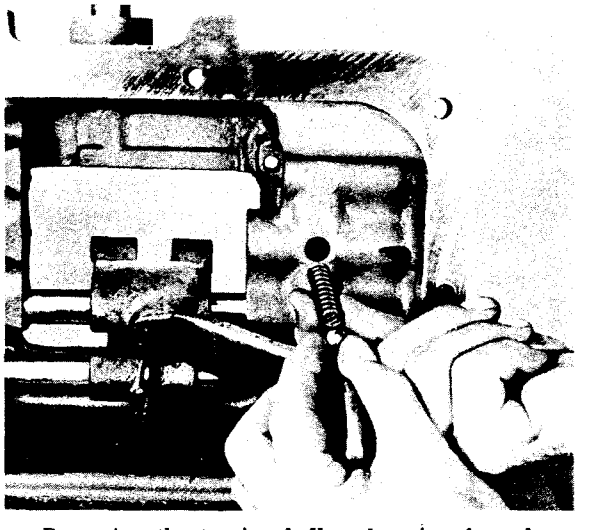
7. *Starting the upper bar out front bore of case, unseating front thimble.*



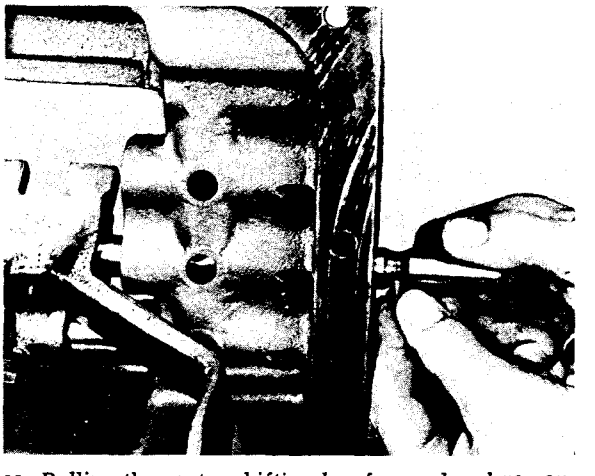
8. *Pulling upper bar forward and removing shifting yoke.*



9. *Catching tension ball as shifting bar is pulled past bore in case.*



10. *Removing the tension ball and spring from bore. There are three tension balls and three springs in housing, one ball and one spring under each bar.*



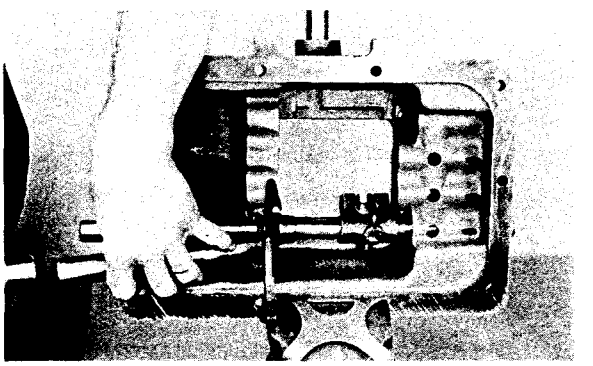
11. *Pulling the center shifting bar forward and removing the interlock pin from the bore in neutral notch.*

1. Remove the interlock ball thimble at front, left-side of housing. Illustration No. 6.
2. Mount the assembly in a vise with the brake lever shaft (right-side) upwards.
3. Cut lockwire from all yoke and block lockscrews.
4. Turn out the yoke lockscrew from the upper (2nd-3rd speed) shifting bar.

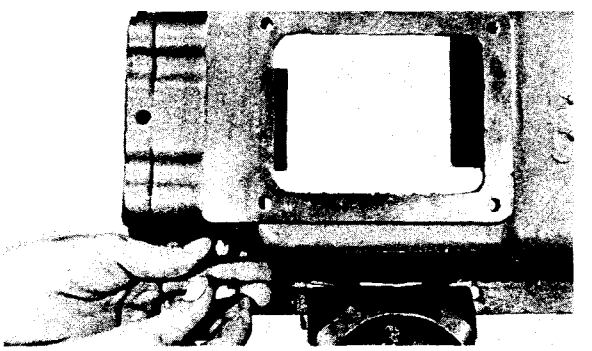
   CAUTION: A tension ball and spring is located under each of the shifting bars in the small bores toward front of housing. These will be forcibly ejected from housing as each bar is removed; thus, hold finger protected with padded cloth over bores when removing bars.
5. Use a curved soft bar against rear of shifting bar and *start* the upper bar forward and out the front bore of housing, unseating front thimble as bar is moved forward. Keep other bars in housing in a neutral position or interlock parts will lock bars. Illustration No. 7.
6. Pull the upper bar partially out the front bore, removing the yoke as bar is being withdrawn. Illustration No. 8.
7. As bar is withdrawn past tension spring bore, hold finger over bore to catch tension ball. Illustration No. 9.
8. Remove the tension ball and spring from bore. Illustration No. 10.
9. Remove the yoke lockscrew from center (4th-5th speed) shifting bar.
10. Use a curved soft bar against rear of shifting bar and *start* the center bar forward out front bore of case, unseating front thimble as bar is moved forward. Keep lower bar in neutral position.
11. Pull the center shifting bar partially out front bore, removing the small interlock pin from the bore in neutral notch of bar as the neutral notch clears housing. Illustration No. 11.
12. As center bar is withdrawn, remove yoke from bar and hold finger over tension spring bore to catch ball.
13. Remove the tension ball and spring from bore.
14. Remove the lockscrew from the shifting block on the bottom (1st-reverse speed) shifting bar. Do not remove lockscrew from yoke.
15. Using soft bar against yoke hub, *start* the bar forward out front bore of case, unseating front thimble as bar is moved forward. Illustration No. 12.
16. Remove the yoke lockscrew.
17. Pull the bottom bar out through front bore, removing the shifting yoke and block as bar is withdrawn. Hold finger over tension spring bore to catch tension ball.
18. Remove tension ball and spring from bore.

NOTE:

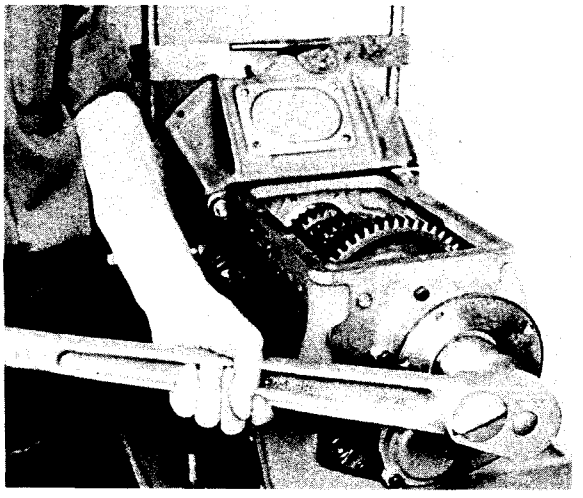
Two interlock balls will fall from the interlock bore in left-side of housing as the last bar is removed. If balls do not drop from housing, use a screwdriver to push balls down and out of housing. Illustration No. 13.



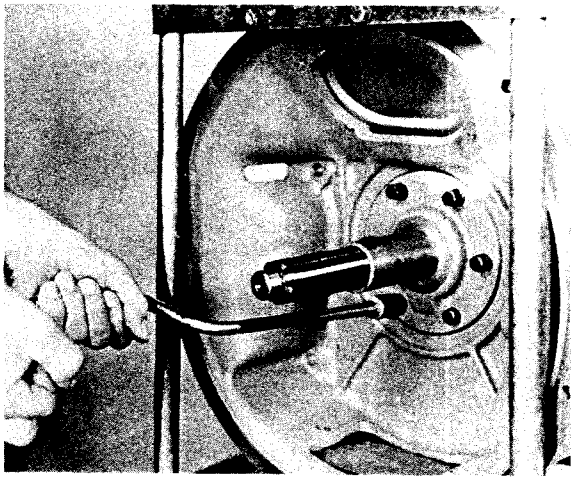
12. *Starting the lower shifting bar forward. Lockscrew is not removed from shifting yoke.*



13. *Two interlock balls will drop from bore in housing as last bar is removed.*

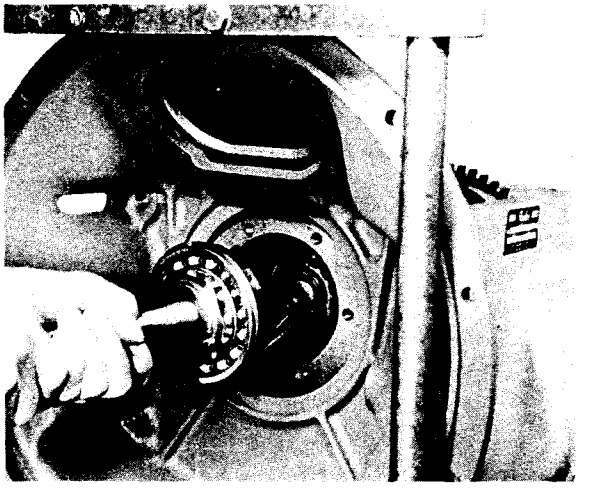


14. *Removing companion flange nut from rear of shaft.*

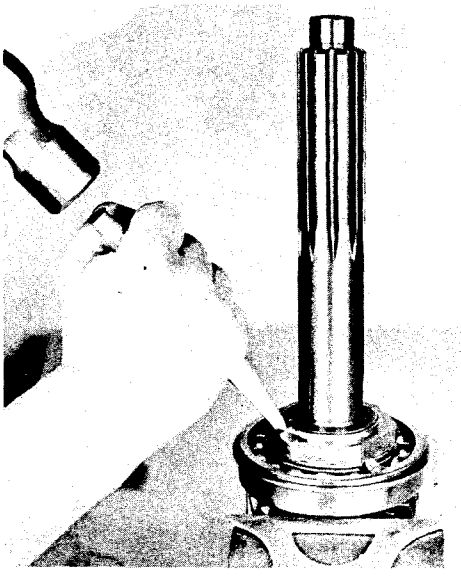


15. *Removing capscrews from front bearing cover.*

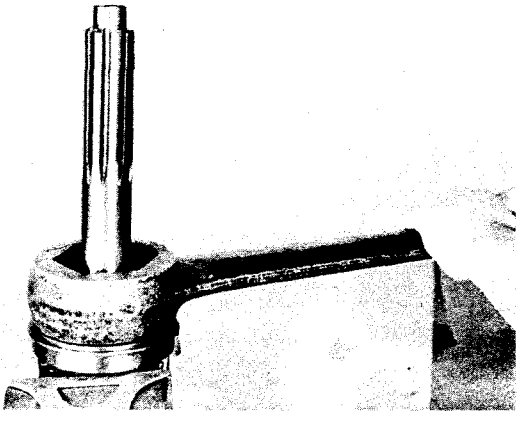
16. *Moving drive gear assembly forward from inside of case.*



17. *Removing drive gear assembly from front bore.*



18. *Relieving the drive gear bearing nut where peened into shaft.*



19. *Removing the drive gear nut, left-hand thread.*

19. Remove the rear thimble from shifting bar bore at rear of housing. Use shifting bar to force thimble outward from the inside.

E. To Remove the Universal Joint Companion Flange

1. Lock the mainshaft by engaging two speeds with the sliding gears.
2. Turn the companion flange nut from rear of mainshaft. Illustration No. 14.
3. Pull the companion flange to the rear and off splines of mainshaft.

NOTE:

The countershaft rear bearing nut can also be removed at this time while the mainshaft is still locked in position, thus making removal of nut easier and without the aid of blocking. To remove the countershaft bearing nut: remove rear bearing cover from countershaft, relieve nut where peened and turn nut from shaft; see paragraphs 1, 2 and 3 of section K.

F. To Remove the Drive Gear Assembly

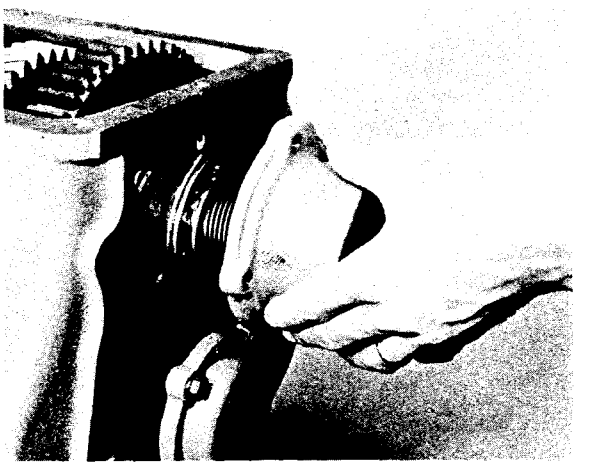
1. Remove the clutch release mechanism.
2. Turn out the attaching capscrews from the front bearing cover. Illustration No. 15.
3. Tap against drive gear from inside of case with soft bar and mall to move the assembly forward. Illustration No. 16.
4. Remove the cover from shaft as drive gear is moved forward.
5. Remove drive gear and clutch shaft from front bore of case. Illustration No. 17.

G. To Disassemble the Drive Gear Assembly

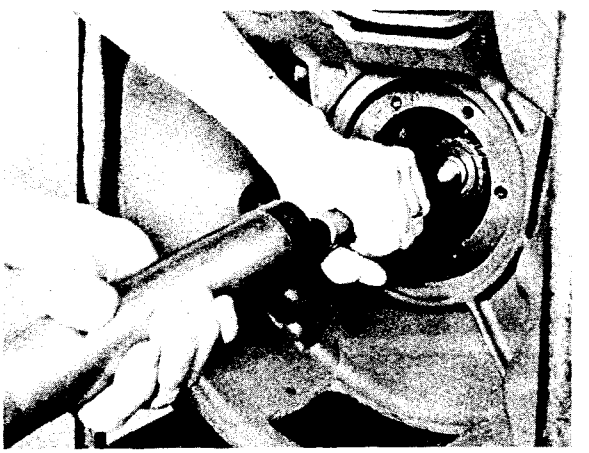
1. Mount the drive gear in a soft-jawed vise with the pilot end up.
2. Relieve the drive gear nut at points where it is peened into the two milled slots of shaft shoulder. Illustration No. 18.
3. Turn the drive gear nut from shaft, LEFT-HAND THREAD. Illustration No. 19.
4. Press the drive gear bearing from shaft.

H. To Remove the Mainshaft Assembly

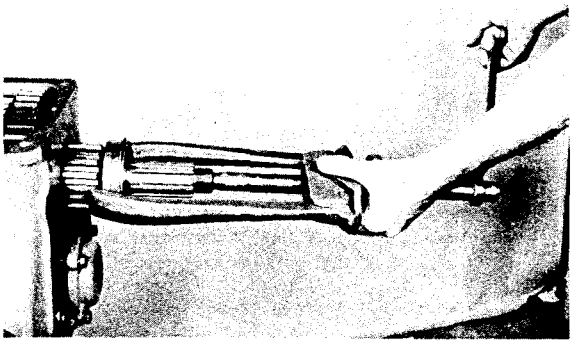
1. Turn out the attaching capscrews and remove the mainshaft rear bearing cover. Illustration No. 20.
2. Remove the speedometer gear or the replacement spacer from rear of mainshaft.
3. Remove the speedometer gear washer from rear of mainshaft.
4. Use soft bar and mall against front of mainshaft to move the assembly to the rear and to unseat rear bearing from the case bore. Illustration No. 21.



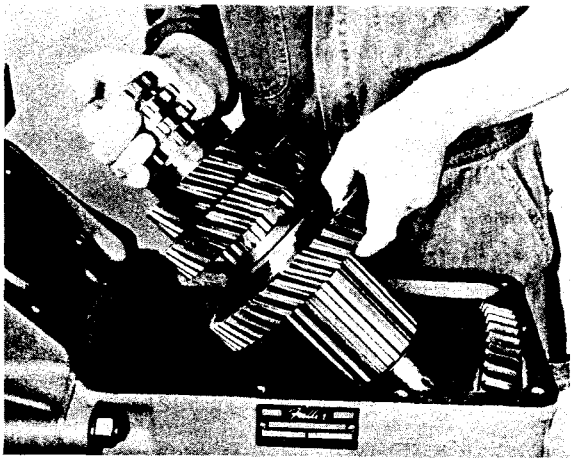
20. *Removing the mainshaft rear bearing cover.*



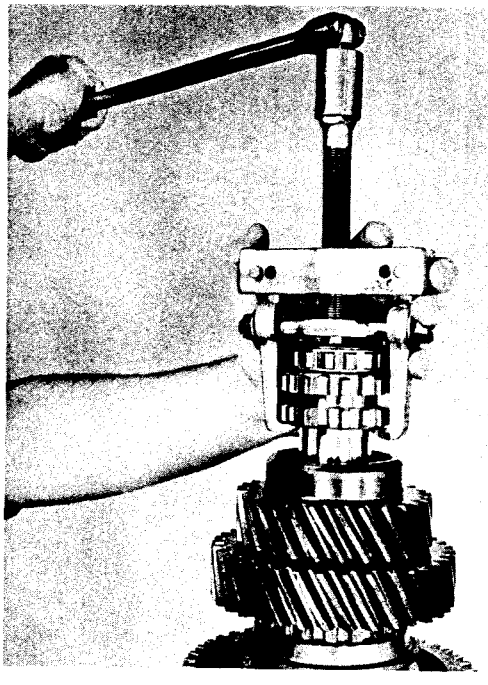
21. *Driving through soft bar to move mainshaft assembly to the rear, unseating rear bearing from case bore.*



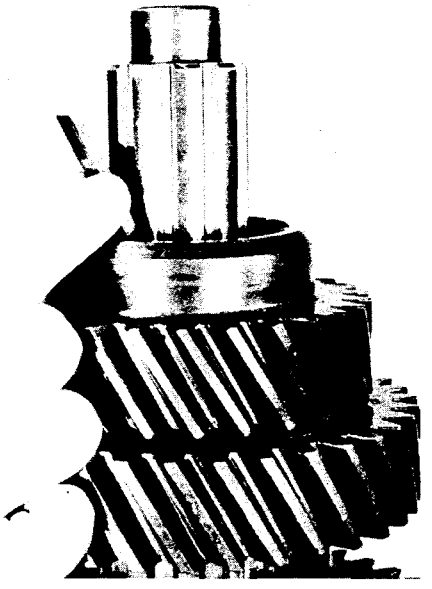
22. *Pulling rear bearing from mainshaft.*



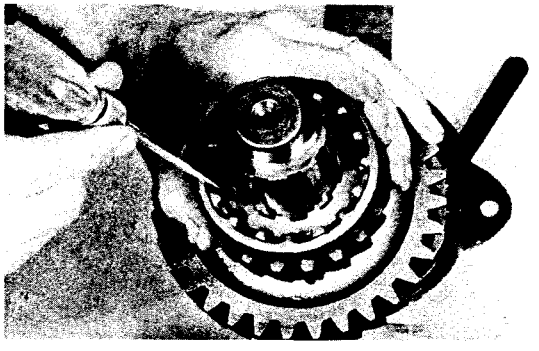
23. *Lifting mainshaft assembly from case.*



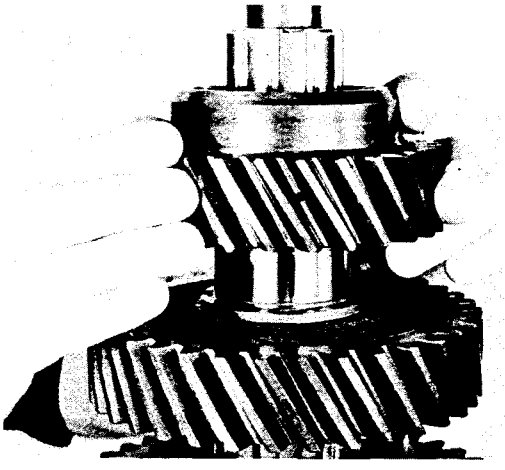
24. *Removing pilot bearing from mainshaft.*



25. *Removing washer retaining key from its keyway between splines of mainshaft.*



26. *Turning splined washer in its groove. Insert small punch or screw driver so that it engages internal teeth of gear and slot in washer; turn washer by turning gear.*



27. *Removing the fourth speed gear and splined washer from shaft.*

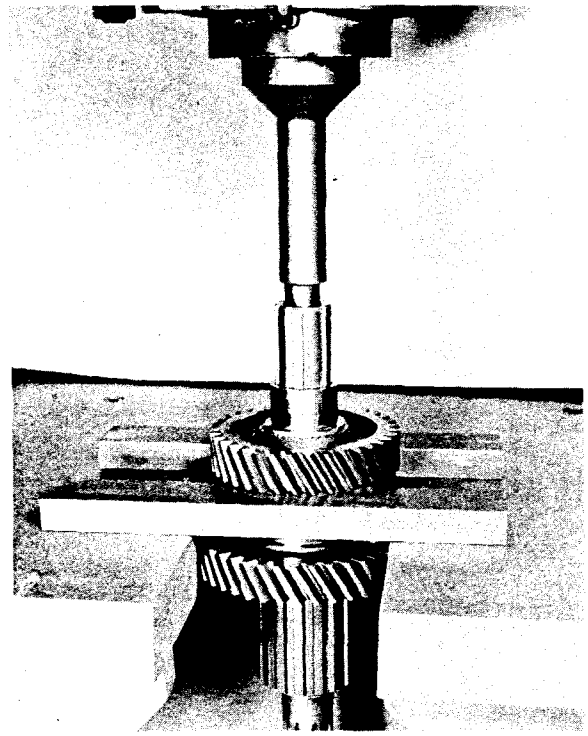
5. Remove mainshaft rear bearing from shaft. Illustration No. 22.
6. Lift the mainshaft assembly out through top of case, leaving the 1st-reverse sliding gear inside the case. Illustration No. 23.
7. Remove the sliding gear from case.

I. To Disassemble the Mainshaft Assembly

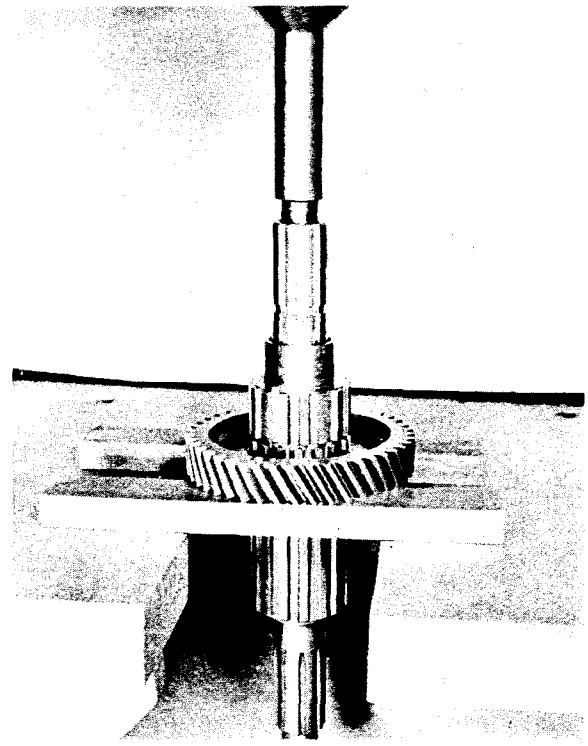
1. Mount the assembly in a soft-jawed vise with the pilot end up.
2. Remove the pilot bearing from mainshaft. Use pullers behind the sliding clutch gear to apply even pressure on bearing. Illustration No. 24.
3. Remove the sliding clutch gear from mainshaft.
4. Pry the washer retaining key from its keyway between splines of mainshaft. Illustration No. 25.
5. Turn the splined washer in its groove inside the hub of the fourth speed gear until the lugs on its inside diameter align with grooves in mainshaft. Illustration No. 26.
6. Move the fourth speed gear forward on shaft to remove the washer and gear from shaft. Illustration No. 27.
7. Place the assembly in a press, using the rear face of the third speed gear as a base.
8. Press the third speed gear and fourth speed gear sleeve from mainshaft. Illustration No. 28.
9. Remove the sliding clutch collar from the splined sleeve.
10. Place the assembly in a press, using the rear face of the second speed gear as a base.
11. Press the second speed gear, the splined sleeve, and the third speed gear sleeve from the mainshaft. Illustration No. 29.
12. Remove the three Woodruff keys from keyways in mainshaft.

J. To Remove and Disassemble the Reverse Gearing

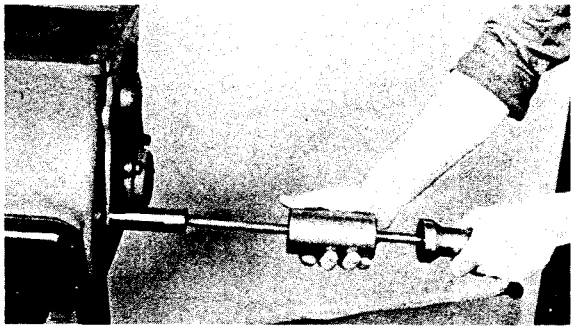
1. Turn out the capscrew from rear of case and remove the reverse shaft lock.



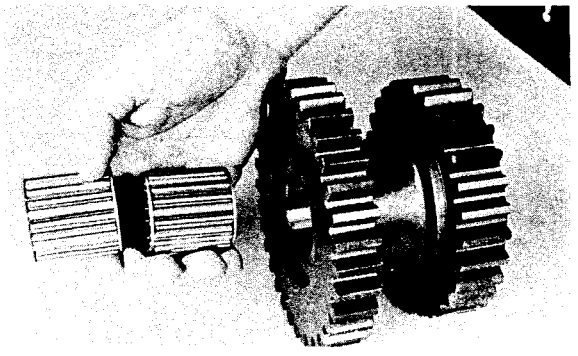
28. *Pressing the third speed gear and fourth speed gear sleeve from shaft.*



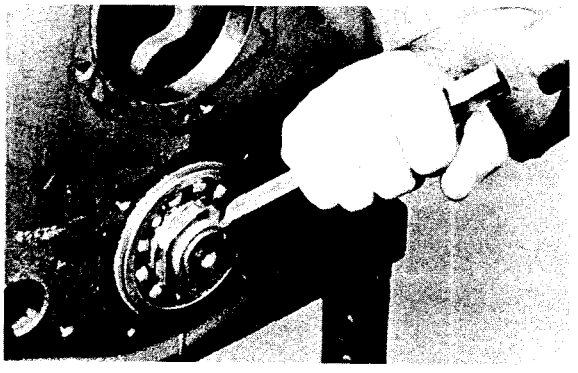
29. *Pressing the second speed gear, the splined sleeve, and the third speed gear sleeve from shaft.*



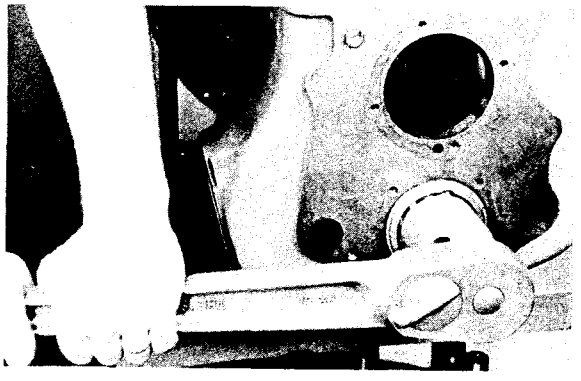
30. *Removing the reverse gear shaft with impact puller.*



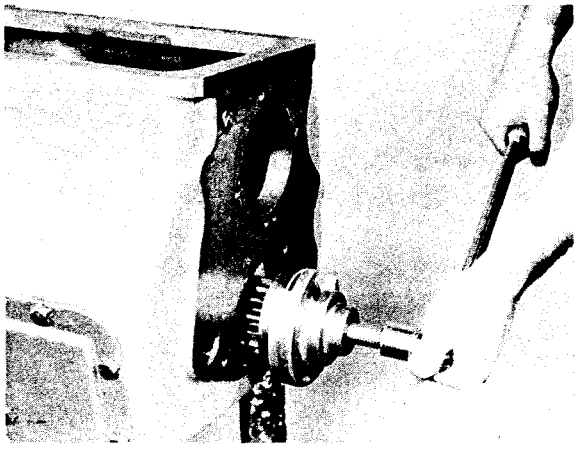
31. *Removing bearings from bore of reverse gearing.*



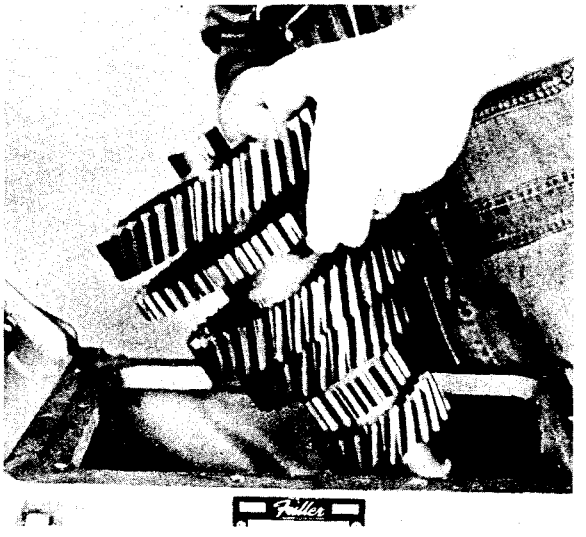
32. *Relieving the countershaft bearing nut where peened into shaft.*



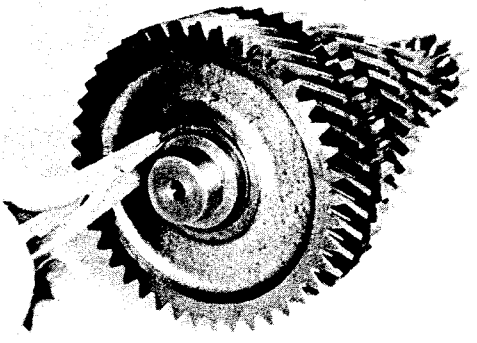
33. *Turning countershaft bearing nut from shaft.*



34. *Pulling rear bearing from countershaft.*



35. *Lifting countershaft assembly from case.*



36. *Removing snap ring from front of countershaft.*

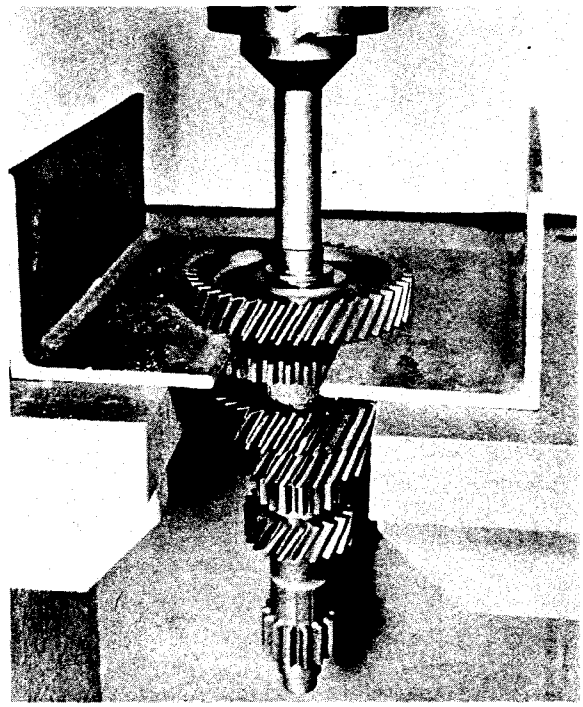
2. Insert shaft puller and remove the reverse shaft from case. Illustration No. 30.
3. Remove the reverse gearing and the two thrust washers from case.
4. Remove the two needle bearings from the reverse gearing bore. Illustration No. 31.

K. To Remove the Countershaft Assembly

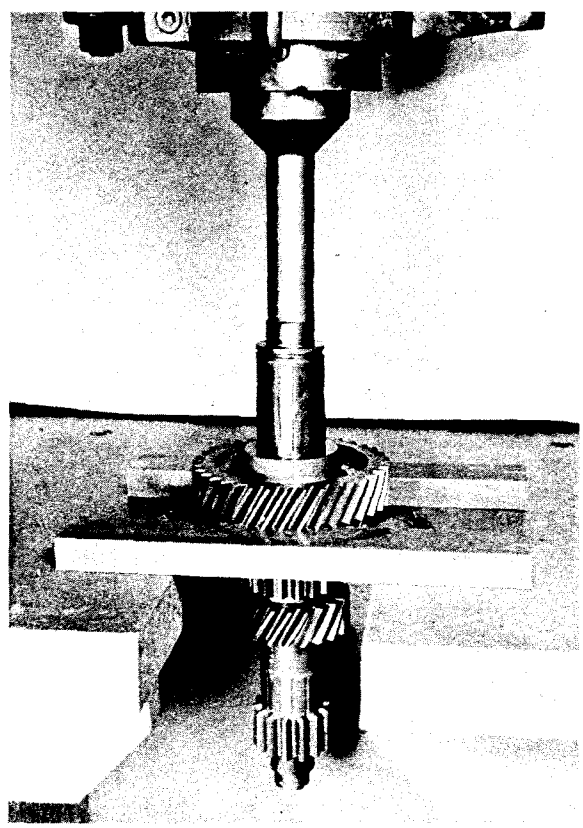
1. If countershaft bearing nut has not been previously removed, turn out the attaching capscrews and remove the countershaft rear bearing cover.
2. Relieve the countershaft bearing nut where it is peened into the milled slot of shaft. Illustration No. 32.
3. Place wood blocking between countershaft gears and case. Turn nut from shaft, right-hand thread. Illustration No. 33.
4. Move the countershaft assembly to the rear to unseat the rear bearing from case bore and the shaft from front bearing.
5. Pull the rear bearing from countershaft. Illustration No. 34.
6. Tilt the countershaft assembly and lift through top of case. Illustration No. 35.
7. Remove the washer from front of countershaft or from case.
8. Remove the front bearing from case bore.

L. To Disassemble the Countershaft Assembly

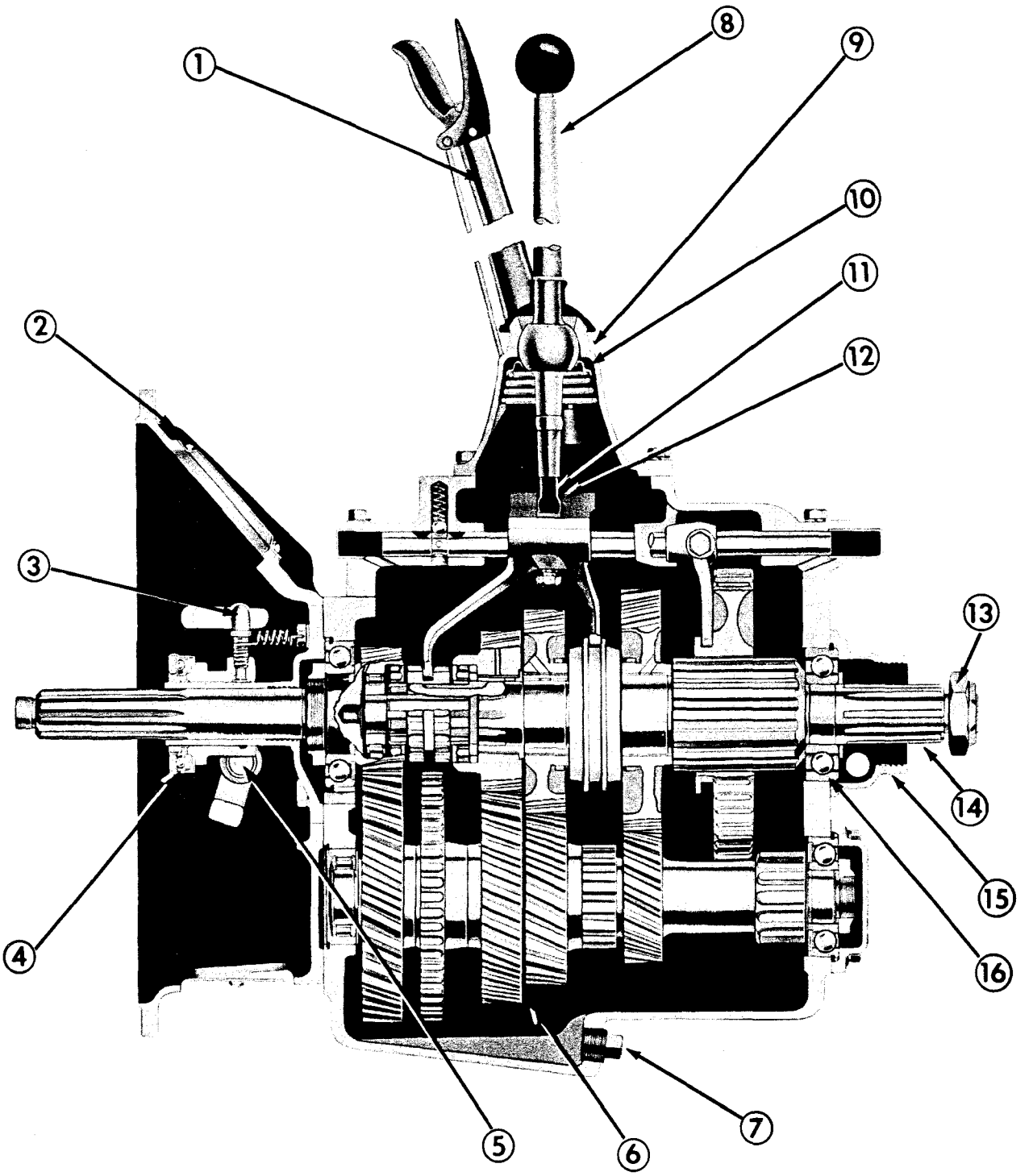
1. Remove the snap ring from groove at front of countershaft. Illustration No. 36.
2. Press the drive gear from countershaft. Press gears from countershaft ONE AT A TIME. Illustration No. 37.
3. Press the power take-off gear from countershaft.
4. Press the fourth speed gear from countershaft. Illustration No. 38.
5. Press the third speed gear from countershaft.
6. Remove the Woodruff keys from countershaft.



37. *Pressing drive gear from countershaft.*



38. *Pressing fourth speed gear from countershaft.*



Model 5-W-43A

PREVENTIVE MAINTENANCE CHECK CHART

CHECKS WITHOUT PARTIAL DISASSEMBLY OF CHASSIS OR CAB

1. Hand brake lever assembly

a. Rivets or screws in hand grip for looseness and wear.
b. Spring in hand grip for fracture and set.
c. Mounting shaft for lubrication and wear.
d. Axial clearance of lever assembly on mounting shaft. Increase or decrease by tightening or loosening nut.
e. Wear on latch rod at joint with latch.
f. Wear on latch from contact with segment and at latch rod hole.
g. Wear on segment from drag of latch.

2. Capscrews in bolt circle of clutch housing.

Check for looseness.

3. Clutch release bearing carrier oil pipe or flexible tube

Check for wear from drag in slot of housing.

4. Clutch release bearing

Remove hand hole cover and check radial and axial clearance in release bearing. Also check relative position of thrust surface of release bearing with thrust sleeve on push type clutches. (See maintenance manual—single plate type clutches.)

5. Clutch pedal shaft

Pry upward to check wear at bearing surface in clutch housing.

6. Gear lubricant

Change at specified service intervals; use only gear oils as recommended. See Lubrication section, page 5.

7. Filler and drain plugs

Remove filler plug and check level of lubricant. Tighten filler and drain plug securely.

8. Gear shift lever

Check for looseness and free play in housing. If lever is loose and sloppy in housing, proceed with Check No. 9.

CHECKS WITH FLOOR BOARDS REMOVED

9. Shift lever tension spring and washer

Remove gear shift lever housing and check tension spring and washer for set and wear respectively.

10. Gear shift lever housing

Remove tension spring and washer and check gear shift lever pivot pin for wear.

11. Gear shift lever

Check bottom end of gear shift lever for wear from contact with shifting yokes and blocks, and check slot in pivot ball for wear from pivot pin.

12. Shifting yokes and blocks

With gear shift lever housing removed, check lever slots, yokes and blocks, as well as latchout plungers for wear from contact with shift lever.

CHECKS WITH DRIVE LINE DROPPED

13. Universal joint companion flange retaining nut

Check for tightness. Tighten to recommended torque.

CHECKS WITH DRIVE LINE DROPPED AND WITH UNIVERSAL JOINT COMPANION FLANGE REMOVED

14. Splines on output shaft

Check for wear from movement and chucking action of universal joint companion flange.

15. Mainshaft rear bearing cover

Check oil return threads or oil seal for wear.

16. Output shaft

Pry upward against output shaft to check radial clearance in mainshaft rear bearing.

INSPECTION

Before reassembling the transmission, the individual parts should be carefully checked to eliminate those damaged from previous service. This inspection procedure should be carefully followed to insure the maximum of wear life from the rebuilt unit.

The cost of a new part is generally a small fraction of the total cost of down time and labor, should the use of a questionable part make additional repairs necessary before the next regularly scheduled overhaul.

Recommended inspection procedures are set forth in the check list which follows:

A. Bearings

1. Wash all bearings in clean solvent. Check balls, rolls and races for pits and spalled areas. Replace bearings which are pitted or spalled.
2. Lubricate bearings which are not spalled or pitted and check for axial and radial clearances. Replace bearings with excessive clearances.
3. Check fits of bearings in the case bores. If outer races turn freely in the bores, the case should be replaced.

B. Gears

1. Check operating gear teeth for pitting on the tooth faces. Gears with pitted teeth should be replaced.
2. Check all engaging gear teeth both internal and external. Gears with teeth worn, tapered or reduced in length from clashing in shifting should be replaced.
3 Check radial clearances of bushed gears. Where excessive radial clearance is found, replace the bushing.

C. Splines

1. Check splines on all shafts and drive gears for wear. If sliding gears, companion flange or clutch hub have worn into the sides of the splines, the shafts or gears in this condition should be replaced.

D. Thrust Washers

1. Check surfaces of all thrust washers. Washers scored or reduced in thickness should be replaced.

E. Reverse Gear and Shaft

1. Check bore of gear and diameter of shaft for wear from action of roller bearings. Replace these parts if worn.

F. Gray Iron Parts

1. Check all gray iron parts for cracks and breaks. Replace or repair parts found to be damaged. Heavy castings may be welded or brazed providing the cracks do not extend into bearing bores or bolting surfaces.

G. Clutch Release Parts

1. Check clutch release parts. Replace yokes worn at cam surfaces and bearing carrier worn at contact pads.
2. Check pedal shafts. Replace those worn at bearing surfaces.

H. Shifting Bar Housing Assembly

1. Check yokes and blocks for wear at pads and lever slot. Replace those which are worn.
2. Check yokes for alignment. Straighten those which are sprung.
3. Check lockscrews in yokes and blocks. Tighten and rewire those found loose.
4. If housing has been dismantled, check neutral notches of shifting bars for wear from interlock balls. Bars indented at points adjacent to the neutral notch should be replaced.

I. Gear Shift Lever Housing Assembly

1. Check spring tension on shift lever. Replace tension spring and washer if lever moves too freely.

J. Bearing Covers

1. Check covers for wear from thrust of adjacent bearing. Replace covers worn and grooved from thrust of bearing outer race.
2. Check bores of covers for wear. Replace those worn oversize.

K. Oil Return Threads

1. Check oil return threads in bearing covers. If sealing action of threads has been destroyed by contact with input shaft or companion flange, replace the cover.

L. Bushings, Mainshaft Gears

Check bushed gears on sleeves to determine radial clearance. Replace bushings in mainshaft gears if there is excessive radial clearance. The following instructions apply to the installation of replacement bushings:

1. Clean bore of gear thoroughly and remove all burrs.
2. Remove sharp edge from end of bore having locking notches. Use hone or emery cloth.
3. Lubricate bushing and bore of gear.
4. Make sure that lugs on bushing line up with locking notches in gear hub. If bushing is type in which oil holes are drilled, make sure oil holes are lined up with oil holes in gear.
5. Press bushing carefully into gear hub.
6. Bushing should be 1/32" inside gear hub. Lugs must not project beyond face of gear hub when locked in place.
7. Remove all burrs and sharp edges from bushing.
8. If replacement bushing is without oil holes, drill holes working through corresponding holes in gear. Make sure all oil holes are open and remove all burrs resulting from drilling operation.
9. Check gears on lubricated sleeves and shaft seats to determine that they move freely. If additional radial clearance is required, polish ID of bushing.

TORQUE RATINGS

Recommended torque ratings, location and thread sizes of capscrews and nuts used on 5-W-43 and 5-W-430 series transmissions are listed below. Capscrew lengths are given for reference purposes as a guide for installation at proper locations.

Correct torque application is extremely important to assure long transmission life and dependable performance. Over-tightening or under-tightening can result in a loose installation and, in many instances, eventually cause damage to transmission gears, shafts or bearings.

CAPSCREWS

Location	Thread Size and Length	Torque Rating Foot-Pounds
PTO covers	3/8-16 x 5/8	15-20
Reverse shaft lock	3/8-16 x 1	15-20
Shifting bar housing	3/8-16 x 1 3/8-16 x 1-1/4 3/8-16 x 2-1/4 3/8-16 x 3 3/8-16 x 4-1/4	35-45
Drive gear bearing cover	3/8-16 x 1-1/4	
Gear shift lever housing	3/8-16 x 1-1/4	
Mainshaft rear bearing cover	3/8-16 x 1-1/4 3/8-16 x 2-1/4	
Countershaft rear bearing cover	3/8-16 x 1-1/4	

NUTS

Countershaft bearing	1-1/4-18	225-275
Drive gear bearing	2-1/8-16	250-300
Companion flange	1-1/4-18	350-400

LOCATION OF GASKETS

1. Between gear shift lever housing and shifting bar housing.
2. Between shifting bar housing and case.
3. Between drive gear bearing cover and case.
4. Between mainshaft rear bearing cover and case.
5. Between countershaft rear bearing cover and case.
6. Between right-side power take-off cover and case.
7. Between left-side power take-off cover and case.

GENERAL
INSTRUCTIONS FOR REASSEMBLY

IMPORTANT: Read this section before starting the detailed reassembly procedures.

Make sure that interiors of case and other housings are clean. It is important that dirt be kept out of transmission during reassembly. Dirt is abrasive and can damage polished surfaces of sleeves, bushings, bearings and washers. Use certain precautions, as listed below, during reassembly.

1. **GASKETS**—Use new gaskets throughout the transmission as it is being rebuilt. Make sure all gaskets are installed, see heading "Location of Gaskets." Omission of gaskets can result in oil leakage or misalignment of bearing covers.

2. **CAPSCREWS**—To prevent oil leakage, use shellac on all capscrews. See torque rating chart for recommended torque applications.

3. **BUSHED GEARS, SHAFTS, WASHERS**—Coat all bushings, gear seats, thrust washers and splines of shafts with Lubriplate during installation to provide initial lubrication, thus preventing scoring and galling.

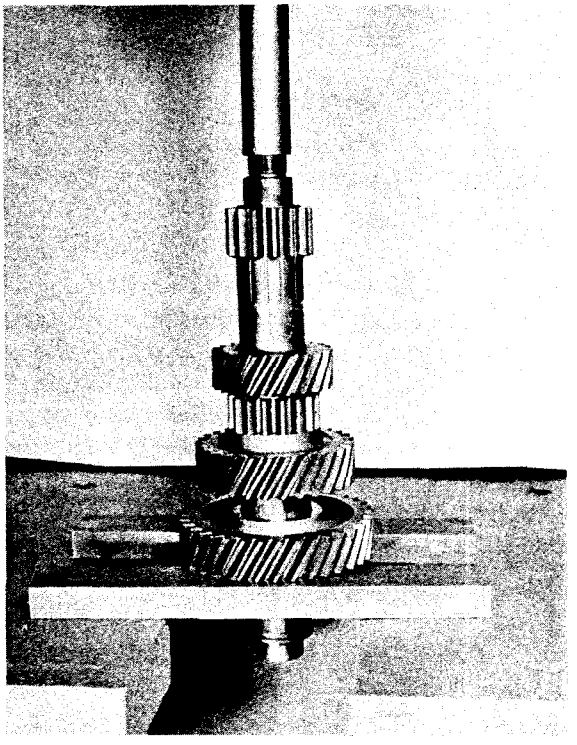
4. **AXIAL CLEARANCES, BUSHED GEARS**—Maintain original axial clearance of .006" minimum and .012" maximum.

5. **BEARINGS**—Use of flanged-end bearing drivers is recommended for installation of bearings. These drivers apply equal force to both inner and outer races of bearing, preventing damage to balls and helping to maintain correct bearing alignment with shaft and bore. If tubular or sleeve type driver is used, apply force only to inner race and drive through tubing of correct diameter. Never apply force to outer race only.

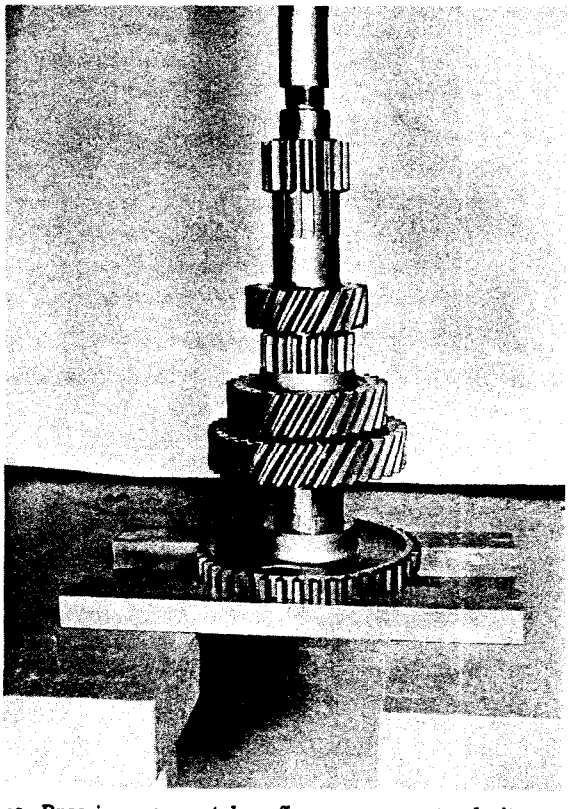
6. **UNIVERSAL JOINT COMPANION FLANGE**—Make sure the companion flange is pulled tightly into place with the mainshaft nut. At the same time make sure that all parts between auxiliary mainshaft rear bearing and inside end of companion flange are in place. Omission of parts between companion flange and rear bearing or failure to pull the flange tightly into place will permit the shaft to move axially with resultant damage to pilot bearing, mainshaft and drive gear.

   When installing companion flange, use 350-400 foot-pounds of torque. Make sure the speedometer gear washer and the speedometer gear have been installed between flange and bearing. If speedometer gear is not used, a replacement spacer of the same width must be used.

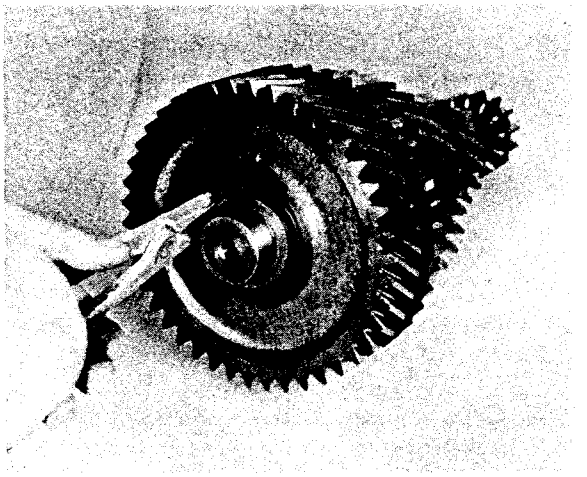
7. **OIL FILLING**—Remember to fill the transmission with the correct amount of straight mineral gear oil of the grade recommended for the prevailing season.



39. *Pressing fourth speed gear on countershaft.*

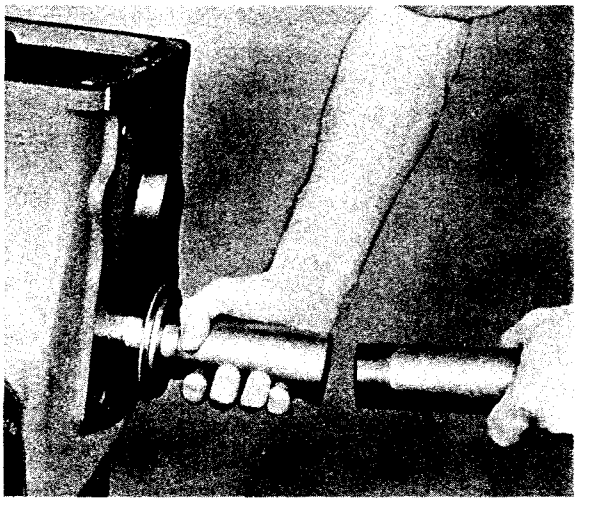


40. *Pressing power take-off gear on countershaft.*



41. *Installing snap ring in groove at front of countershaft.*

42. *Installing washer on front of countershaft.*



43. *Installing rear bearing on countershaft and into case bore.*

DETAILED REASSEMBLY INSTRUCTIONS

A. To Reassemble the Countershaft

1. Install the four Woodruff keys in keyways in countershaft. Press gears on countershaft ONE AT A TIME.
2. Line up keyway in gear with keys in shaft and press the third speed gear on countershaft, long hub of gear to the rear. Seat tightly against integral gear of countershaft.
3. Line up keyway in gear with keys in shaft and press the fourth speed gear on countershaft, long hub towards the front. Seat tightly against third speed gear. Illustration No. 39.
4. Line up keyway in gear with keys in shaft and press the power take-off gear on countershaft, long hub towards the rear. Seat tightly against fourth speed gear. Illustration No. 40.
5. Line up keyway in gear with key in shaft and press the drive gear on countershaft, long hub to the rear. Seat tightly against power take-off gear.
6. Install the snap ring in groove at front of countershaft. Illustration No. 41.

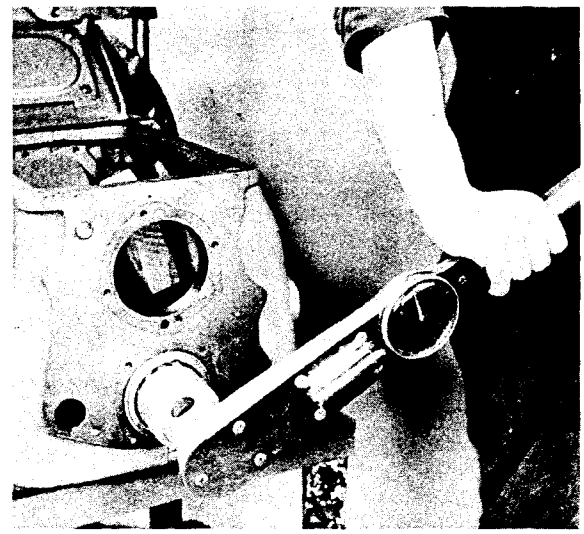
B. To Install the Countershaft Assembly

1. Install the bearing in front countershaft bore in case.
2. Set the countershaft assembly vertically in case, drive gear upwards, and install washer on front of shaft. Illustration No. 42.
3. Set the countershaft into horizontal position in case, then move forward to insert the front of shaft into front bearing. Make sure washer has remained in position on shaft.
4. Install the rear bearing on countershaft and into bore of case, shield to the inside. Seat bearing tightly against shoulder of shaft. Illustration No. 43.
5. Place blocking between gears and case, and install the countershaft bearing nut on rear of shaft, using 225-275 foot-pounds of torque. Illustration No. 44.

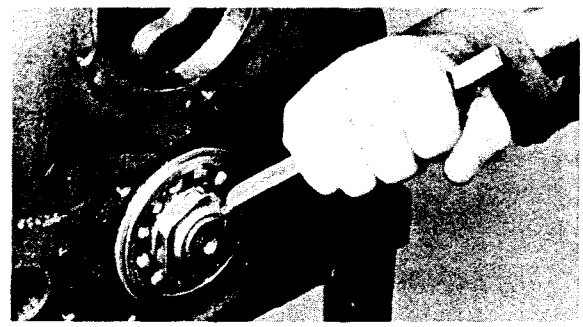
NOTE:

The countershaft bearing nut can be tightened after the mainshaft and drive gear assemblies have been installed in case so that countershaft can be locked by engaging two speeds with the mainshaft sliding gears.

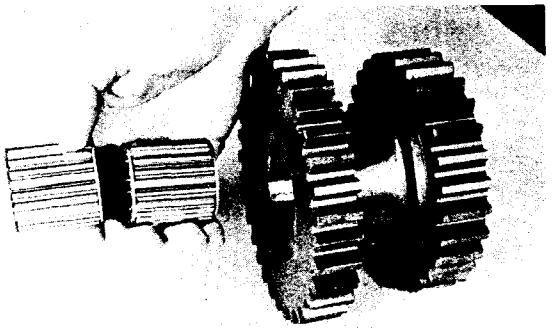
6. Peen the nut into the milled slot in countershaft. Illustration No. 45.



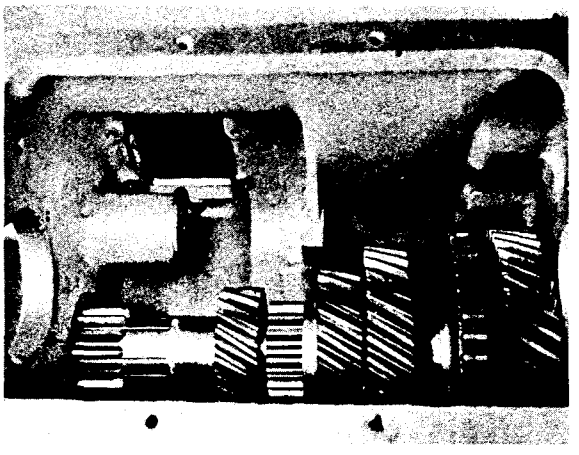
44. *Installing countershaft bearing nut, using 225-275 ft. lbs. of torque.*



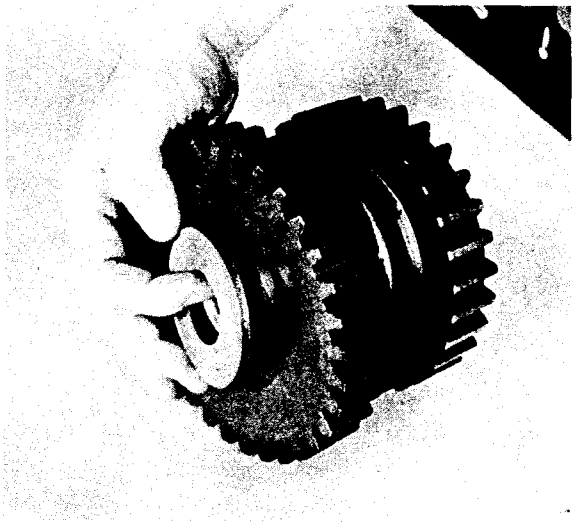
45. *Peening countershaft bearing nut into milled slot.*



46. *Placing the two needle bearings into bore of reverse gearing.*

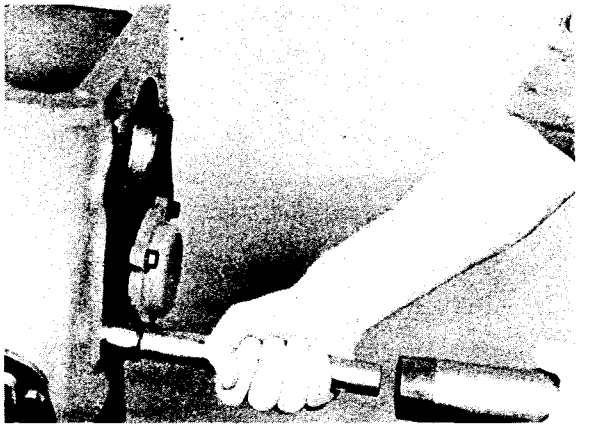


47. *Reverse gear shaft inserted into case so that rear thrust washer is held in position.*

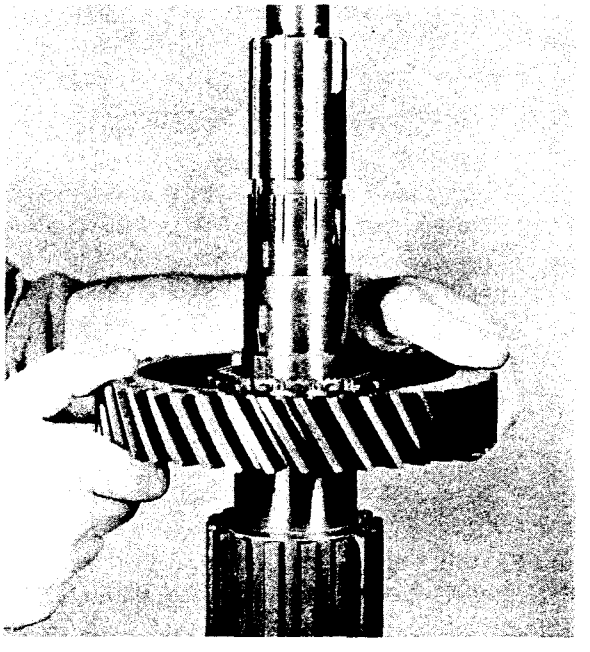


48. *Placing front thrust washer in recess of reverse gearing.*

49. *Placing reverse gearing into position in case.*



50. *Installing reverse gear shaft in case.*



51. *Installing the second speed gear on mainshaft.*

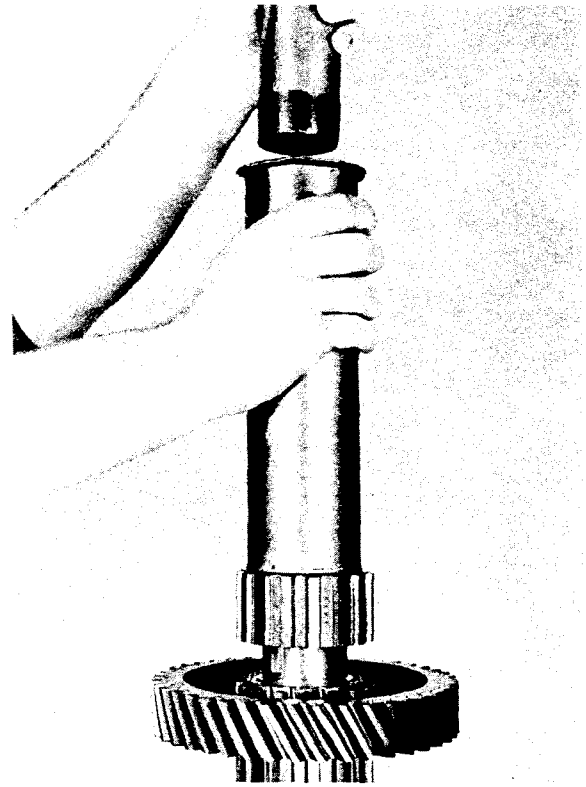
7. Install the rear bearing cover on case, tighten capscrews securely.

C. To Reassemble and Install the Reverse Gearing

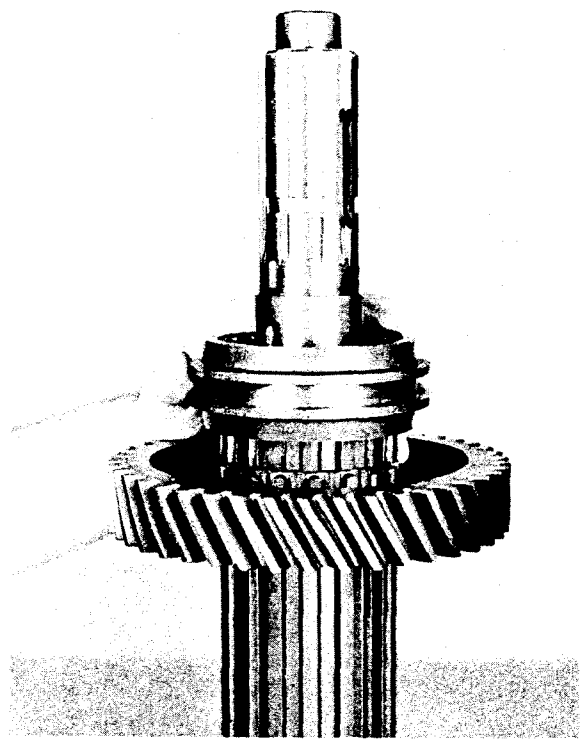
1. Place the two needle bearings inside the bore of the reverse gearing. Illustration No. 46.
2. Insert the reverse gearing shaft through bore in case so that it protrudes inside the case just enough to hold the rear thrust washer in position and place the rear thrust washer on shaft. Illustration No. 47.
3. Place the front thrust washer in the recess at front of reverse gearing. Illustration No. 48.
4. Place the reverse gearing with the front thrust washer into position in case, large gear towards the front. Illustration No. 49.
5. Install the shaft through the washers and reverse gearing, making sure milled flat on end of shaft aligns with lockscrew hole in case. Install shaft until milled flat is flush with case. Illustration No. 50.
6. Install the reverse shaft lock, tighten capscrew securely.

D. To Reassemble the Mainshaft Assembly

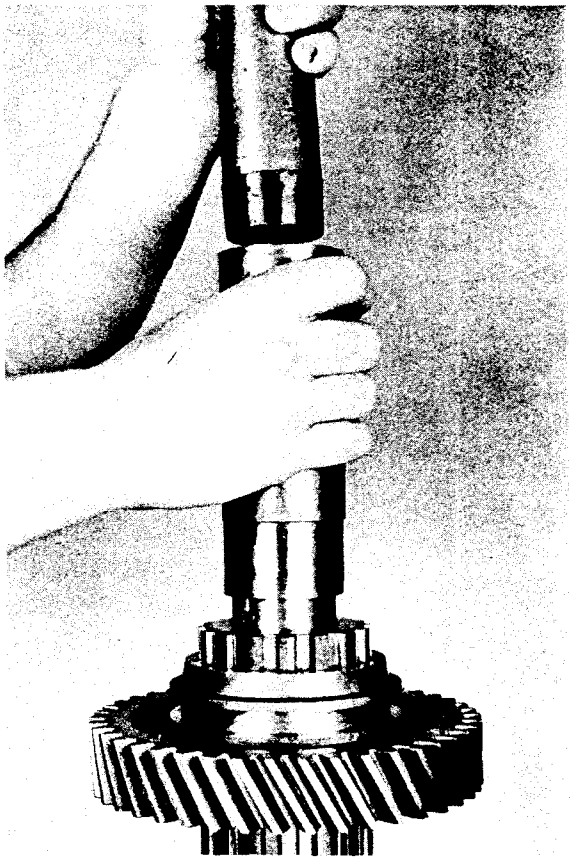
1. Mount the mainshaft in a soft-jawed vise with the pilot end up.
2. Install the Woodruff keys in the three keyways in mainshaft.
3. Install the second speed gear on mainshaft, clutching teeth towards the pilot end. Illustration No. 51.
4. Install the splined sleeve on mainshaft, lining up keyway in sleeve with key in shaft. Fit tightly against shaft shoulder with the chamfered ID towards the second speed gear. Illustration No. 52.
5. Install the splined clutch collar on the splined sleeve. Illustration No. 53.
6. Line up keyway in the third speed gear sleeve with key in shaft, and install the



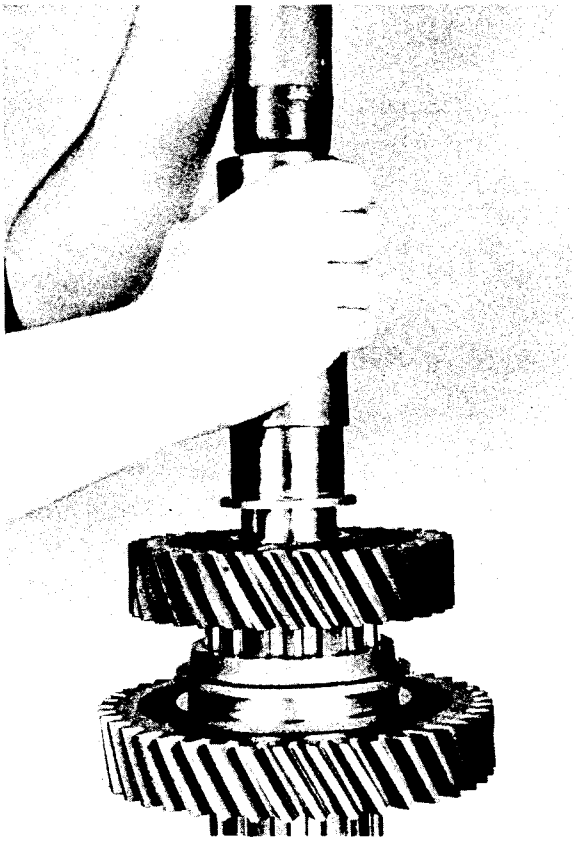
52. *Installing splined sleeve on mainshaft.*



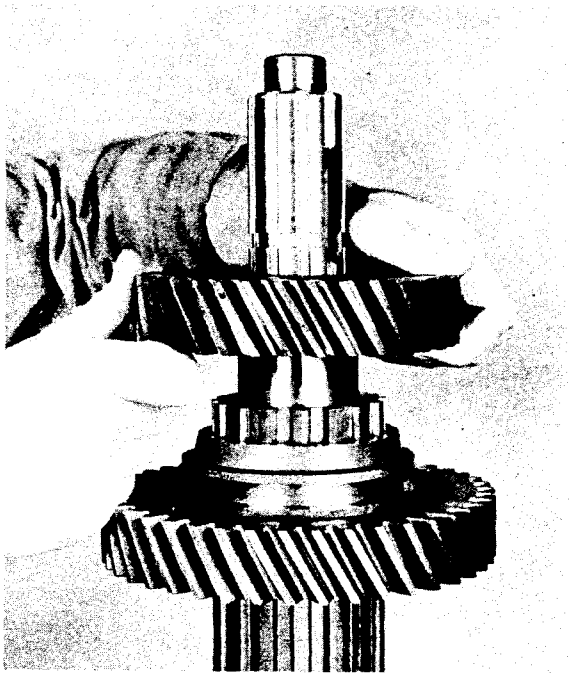
53. *Installing splined clutch collar on mainshaft.*



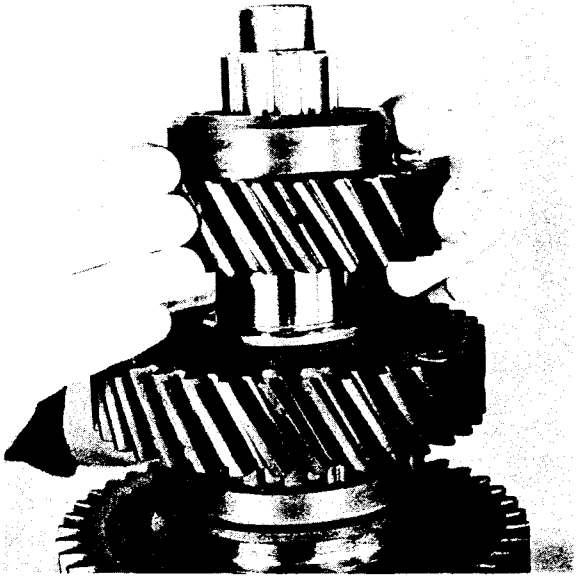
54. *Installing the third speed gear sleeve on mainshaft.*



56. *Installing the fourth speed gear sleeve on mainshaft.*



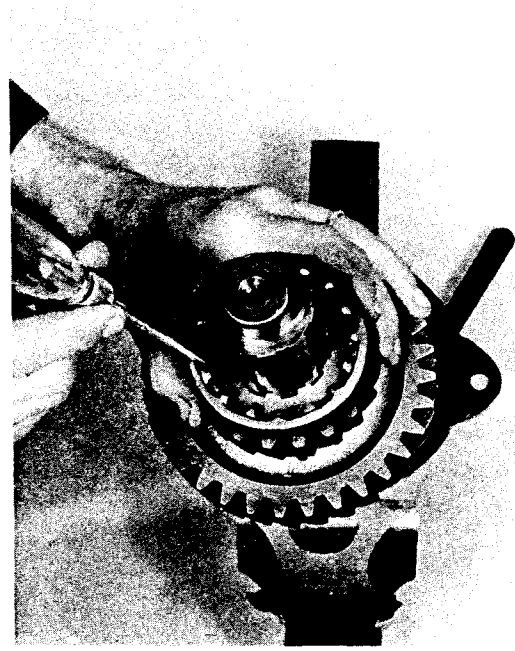
55. *Installing the third speed gear on sleeve.*



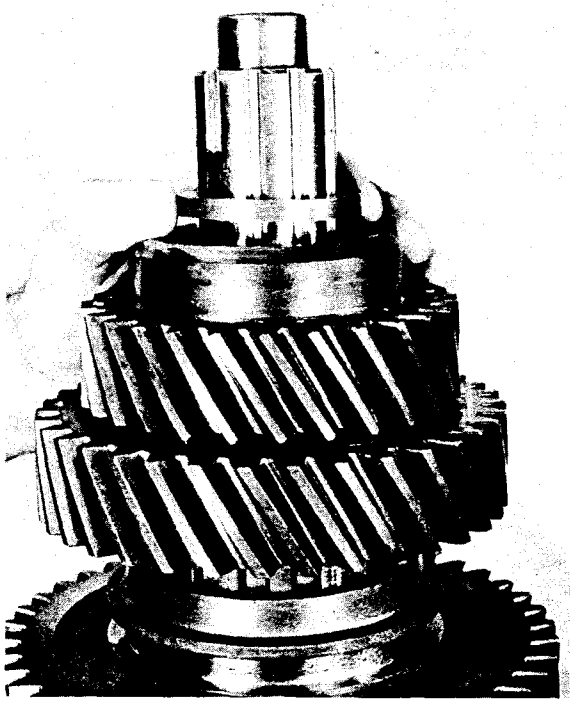
57. *Installing the fourth speed gear on sleeve.*

sleeve on shaft, fitting tightly against splined sleeve. Illustration No. 54.

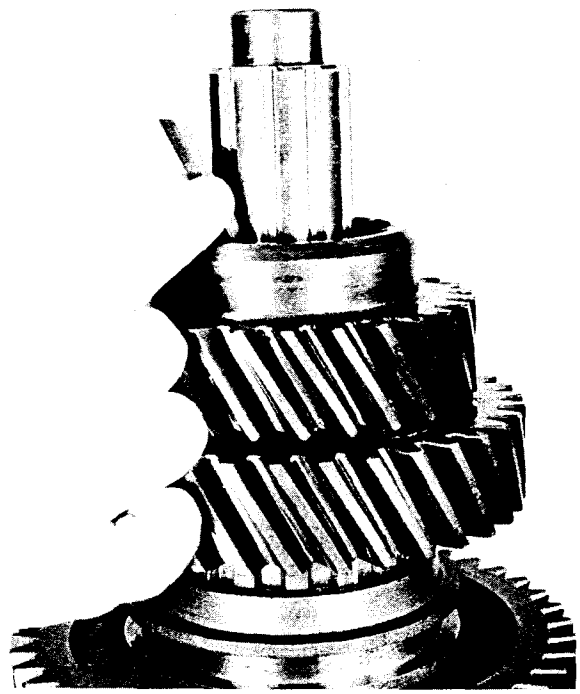
7. Install the third speed gear on sleeve, clutching teeth towards the rear of shaft. Illustration No. 55.
8. Line up keyway in the fourth speed gear sleeve with key in shaft, and install the sleeve on shaft, seating tightly against shoulder of shaft. Illustration No. 56.
9. Install the fourth speed gear on sleeve, clutching teeth forward. Illustration No. 57.
10. Install the splined washer in pocket of fourth speed gear and in its groove on mainshaft. Chamfer on ID towards gear. Illustration No. 58.
11. Turn the splined washer in its groove until lugs on its inside diameter align with raised splines of mainshaft. Illustration No. 59.
12. Install the washer retaining key in keyway between raised splines of mainshaft. Illustration No. 60.



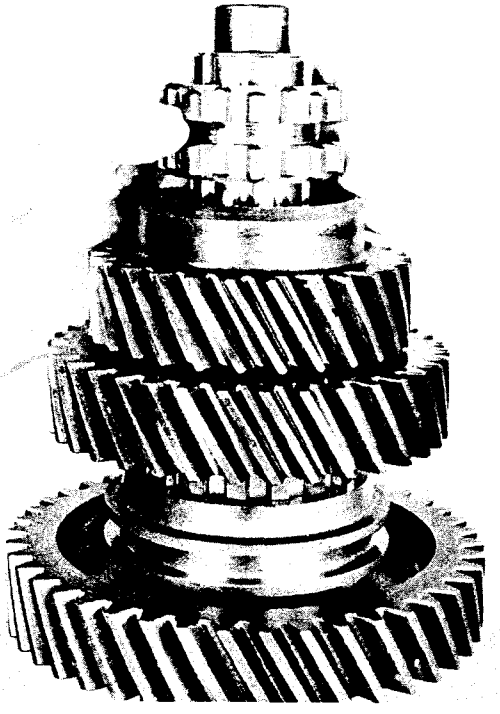
59. *Turning splined washer in its groove. Insert small punch or screw driver to engage internal gear teeth with slot in washer; turn washer by turning gear.*



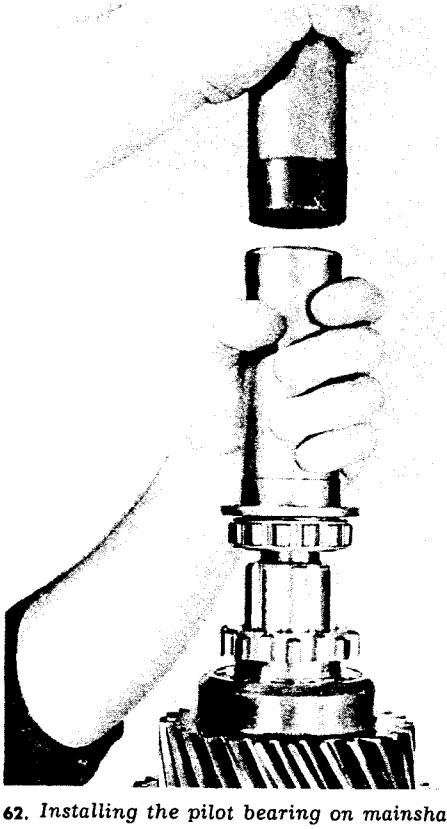
58. *Installing the splined washer on mainshaft.*



60. *Installing the washer retaining key in keyway, inserting thick end of key between splines of washer.*

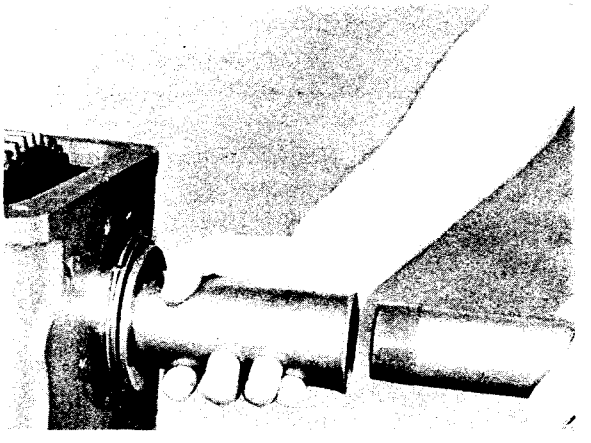


61. *Installing the 4th-5th speed sliding clutch gear on mainshaft.*

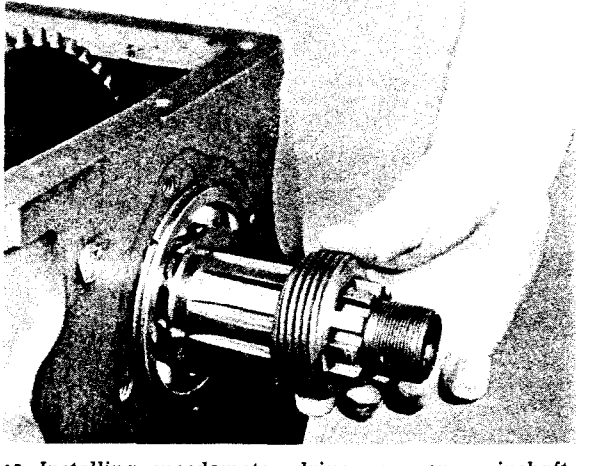


62. *Installing the pilot bearing on mainshaft.*

63. *Lowering mainshaft assembly into position in case.*



64. *Installing rear bearing on mainshaft and into case bore.*



65. *Installing speedometer drive gear on mainshaft. Note speedometer gear washer already installed.*

13. Install the 4th-5th speed sliding clutch gear on mainshaft with side marked "front" to the front. Illustration No. 61.
14. Install the pilot bearing on mainshaft, chamfered inner diameter to the rear. Illustration No. 62.

E. To Install the Mainshaft Assembly

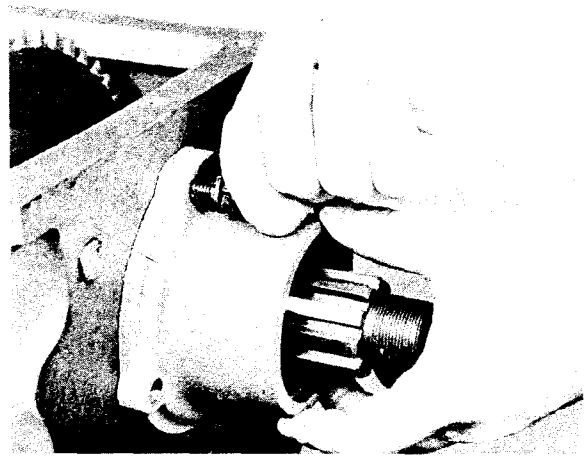
1. Install the 1st-reverse sliding gear on mainshaft, yoke slot towards the front. Place gear to the rear on splines as far as possible.
2. Tilt the mainshaft assembly and place in position in case. Illustration No. 63.
3. Install the mainshaft rear bearing on shaft and into case bore, seating tightly against shoulder of shaft. Illustration No. 64.
4. Install the speedometer gear washer on mainshaft and against bearing.
5. Install the speedometer drive gear or the replacement spacer on rear of mainshaft and against washer. Illustration No. 65.
6. Install the mainshaft rear bearing cover. Tighten capscrews securely in a staggered or opposite sequence. Illustration No. 66.

F. To Reassemble the Drive Gear Assembly

1. Press the drive gear bearing on shaft, seating tightly against shoulder of shaft, snap ring away from gear.
2. Mount the drive gear in a soft-jawed vise with the pilot end up.
3. Apply ample amount of Grade AV Loctite to threads of shaft and bearing nut. Illustration No. 67.
4. Install the bearing nut on shaft, left-hand thread, and secure with 250-300 foot-pounds of torque. Wipe off excess Loctite. Illustration No. 68.

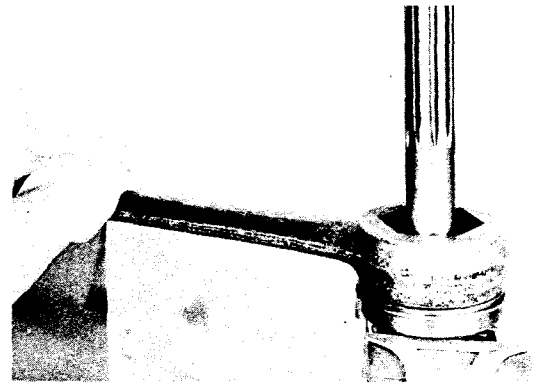
NOTE:

If torque wrench is not available, torque can be closely approximated by multiplying the pounds of pull times the length of wrench handle. For example: if there is 150 pounds of pull on a wrench with a two-foot handle, multiply 150 × 2 which will equal 300 ft. lbs. of torque. Ordinary pull scales can be used to measure pounds of pull.

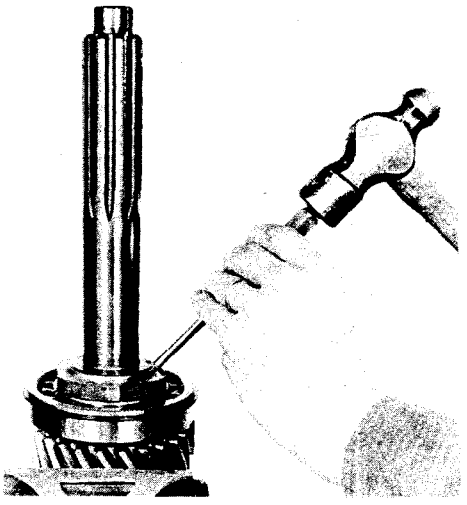


66. *Installing the mainshaft rear bearing cover.*

67. *Applying Loctite to threads of drive gear bearing nut.*

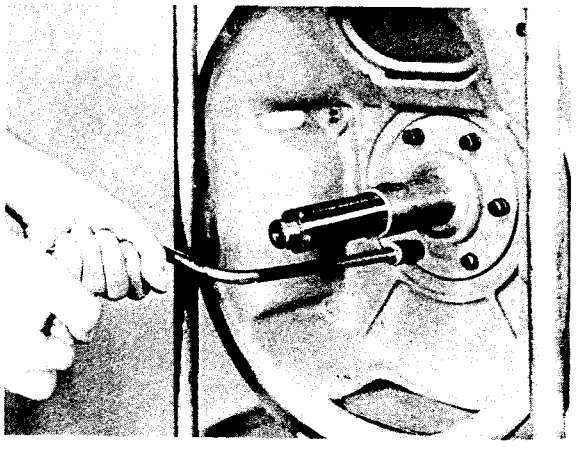


68. *Installing bearing nut on shaft, left-hand thread.*

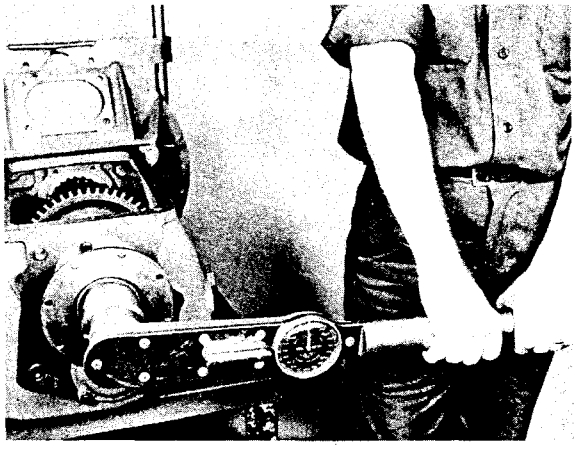


69. *Peening bearing nut into the two milled slots in shaft.*

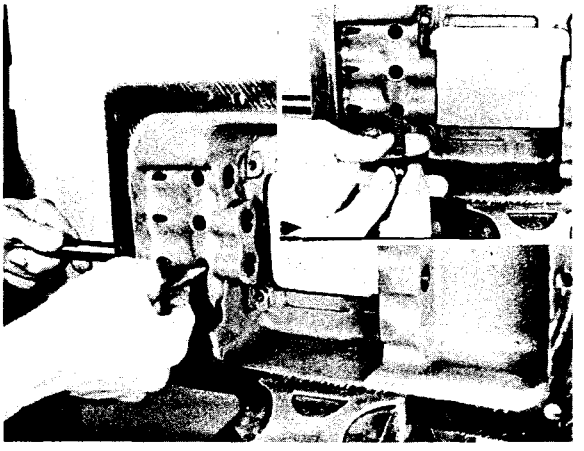
70. *Installing drive gear assembly into front case bore. Make sure pilot bearing on mainshaft seats properly in pocket of drive gear.*



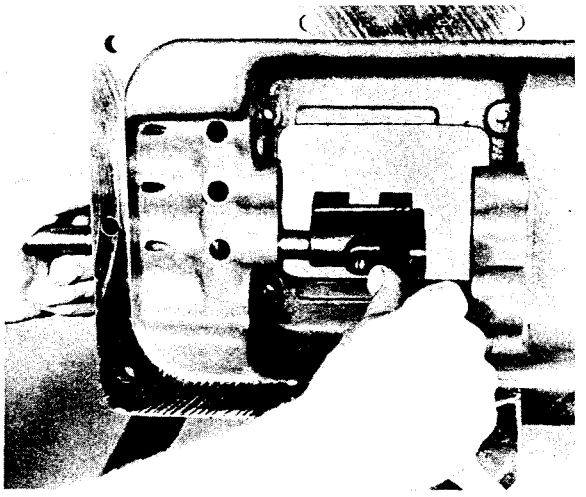
71. *Installing the drive gear bearing cover.*



72. *Installing the companion flange nut on rear of mainshaft, using 350-400 ft. lbs. of torque.*



73. *Depressing tension spring and ball in bore as shifting bar is pushed into housing. Insert shows the installation of spring and ball. There is a tension spring and ball for each bar.*



74. *Installing the 2nd-3rd speed yoke as bar is being pushed into housing.*

5. Lock the bearing nut by peening it into the two milled slots in shaft. Illustration No. 69.
6. To hasten the hardening of Loctite, place the drive gear assembly under heat lamps for 10 to 15 minutes. This procedure will set-up the Loctite solution rapidly and drive gear assembly will be ready for immediate use. Otherwise, at room temperature, Loctite takes from 4 to 6 hours to set-up properly.

G. To Install the Drive Gear Assembly

1. Install the clutch shaft and drive gear, with assembled nut and bearing, into the case bore. Turn the mainshaft during installation of the drive gear to make sure the pilot bearing seats correctly in pocket of drive gear. Illustration No. 70.
2. Install the drive gear bearing cover on case, oil channel to the bottom. Tighten capscrews securely. Illustration No. 71.
3. Install the clutch release mechanism.

H. To Install the Universal Joint Companion Flange

1. Lock the mainshaft by engaging two speeds with the sliding clutch gears.
2. Make sure the speedometer washer and the speedometer gear are installed on mainshaft.
3. Install the companion flange on splines of mainshaft.

NOTE:

Bearing cover must be perfectly aligned. Use the companion flange as a gauge to see if cover binds or rubs against companion flange when shaft is turned. If bind or rub does occur, loosen capscrews in cover, reposition cover and retighten capscrews.

4. Install the companion flange nut on rear of mainshaft, using 350-400 foot-pounds of torque. Illustration No. 72.

NOTE:

If torque wrench is not available, see Section F, paragraph 4 of Reassembly.

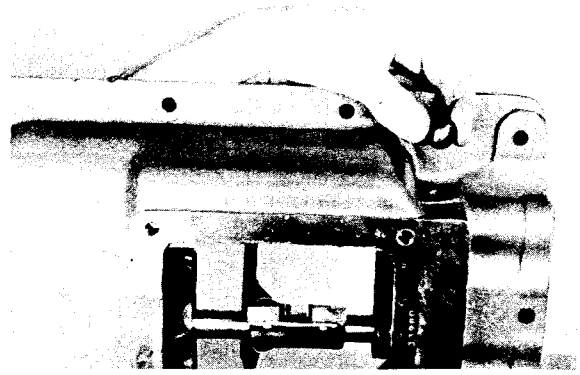
I. To Reassemble the Shifting Bar Housing

1. Mount the housing in a vise with the brake lever boss (right-side) down.
2. Start the 2nd-3rd speed shifting bar through the front, bottom bore in housing. This bar is the short bar which does not have an interlock pin bore in the neutral notch.

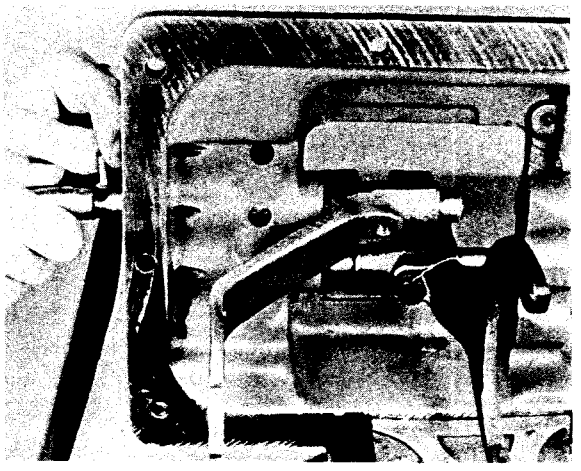
NOTE:

Refer to Illustration No. 5, page 9, as a guide for reassembling shifting bars and yokes.

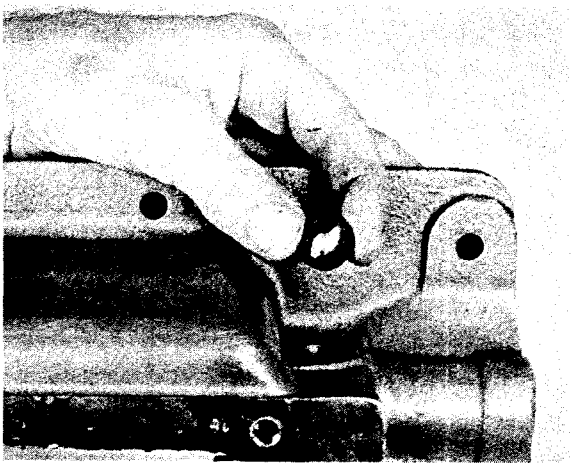
3. As the shifting bar reaches the tension spring bore, insert spring and ball in bore. Push ball and spring inward and move bar into housing past ball. Illustration No. 73.
4. Continue to move shifting bar into housing, installing the 2nd-3rd speed shifting yoke on bar with fork of yoke to the rear. Illustration No. 74.
5. Install lockscrew in yoke, tighten and wire securely.
6. Install the 3/4 inch interlock ball in opening in right side of housing. This ball rides between the 2nd-3rd speed shifting bar and the 4th-5th speed shifting bar. Illustration No. 75.



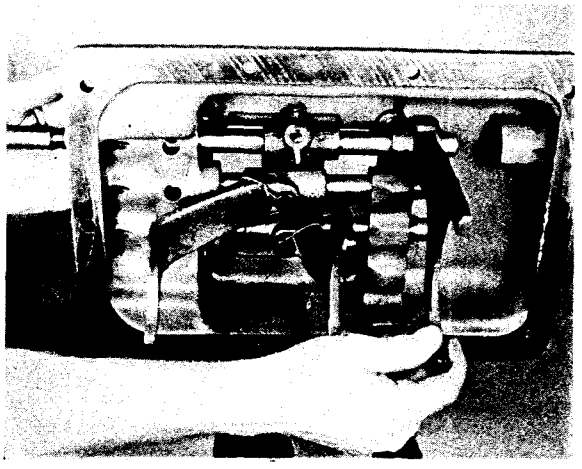
75. *Installing interlock ball in bore in side of housing.*



76. *Installing interlock pin in neutral notch of 4th-5th speed shifting bar. Tension spring, ball and yoke have already been installed.*

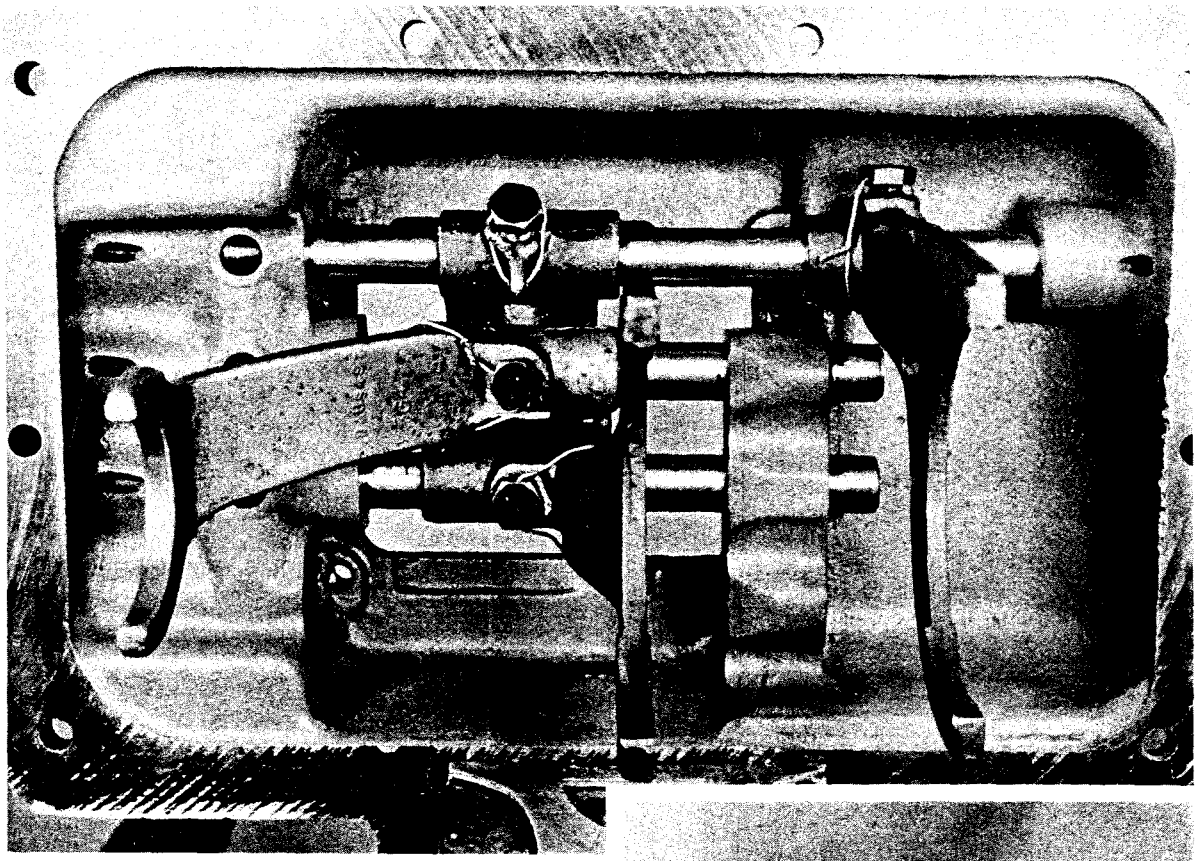


77. *Installing interlock ball in bore in side of housing.*

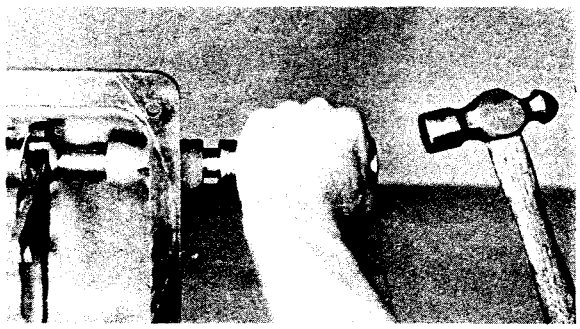


78. *Installing the yoke and shifting block on the 1st-reverse shifting bar as it is being pushed into housing. Tension ball and spring have been installed.*

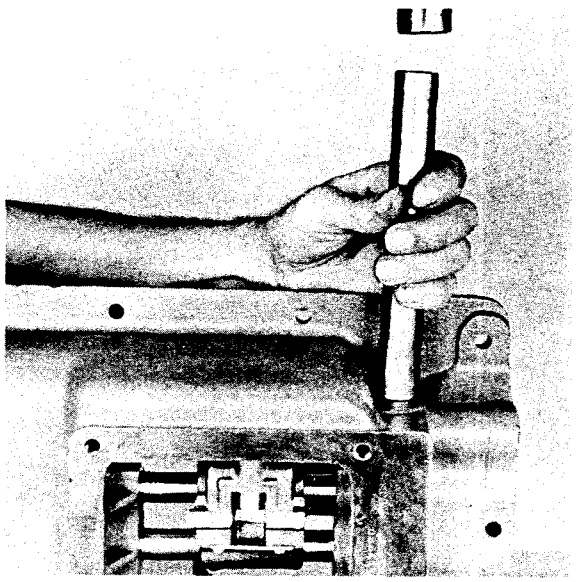
7. Start the 4th-5th speed shifting bar through the front, center bore of housing. This is the short bar which has an interlock pin bore in the neutral notch.
8. As the shifting bar reaches the tension spring bore, insert spring and ball in bore. Press ball and spring inward and move bar into housing past ball.
9. Continue to move bar into the housing, installing the 4th-5th speed shifting yoke on bar with the yoke fork towards the front, and installing the interlock pin in bore of neutral notch as notch enters housing. Illustration No. 76.
10. Install the lockscrew in yoke, tighten and wire securely.
11. Install the 3/4 inch interlock ball in opening in right side of housing. This ball rides between the 4th-5th speed shifting bar and the 1st-reverse speed shifting bar. Illustration No. 77.
12. Start the 1st-reverse speed shifting bar through the front, top bore in housing. This is longest of the three shifting bars.
13. As the shifting bar reaches the tension spring bore, insert spring and ball in bore. Press ball and spring inward and move the bar into housing past ball.
14. Continue to move the shifting bar into housing, installing the shifting block and the 1st-reverse speed shifting yoke on bar. Shifting yoke is installed with the long hub towards the front of housing. Illustration No. 78.
15. Install the yoke and block lockscrews, tighten and wire securely.
16. Recheck placement of yokes for correct position. Illustration No. 79.
17. Install the thimble in interlock ball opening in right-side of housing. Illustration No. 80.
18. Install thimble in rear shifting bar bore. This is the longest of the four thimbles. Illustration No. 81.
19. Install thimbles in the three front shifting bar bores. Illustration No. 82.



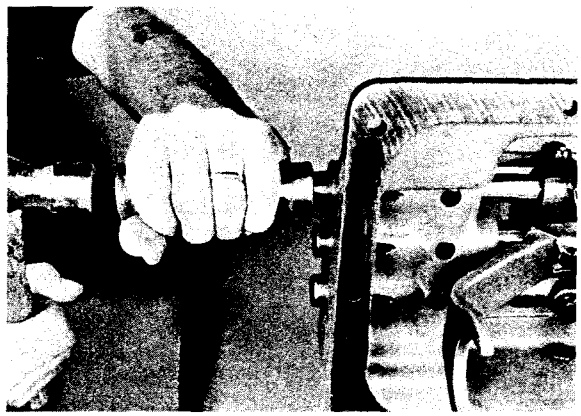
79. *Shifting bars, yokes and block correctly assembled with lockscrews tightened and wired.*



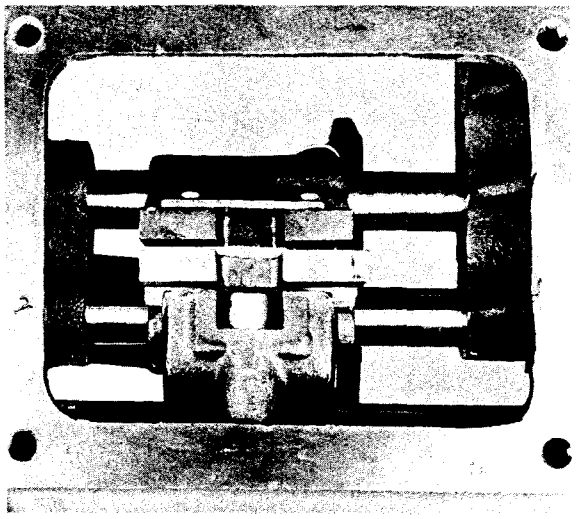
81. *Installing thimble in rear shifting bar bore.*



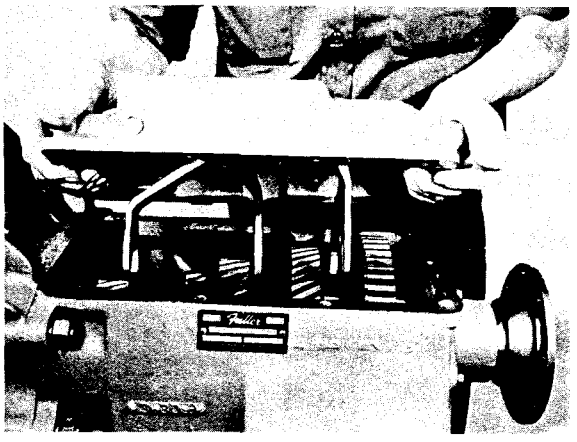
80. *Installing thimble in interlock ball opening.*



82. *Installing thimbles in front shifting bar bores.*

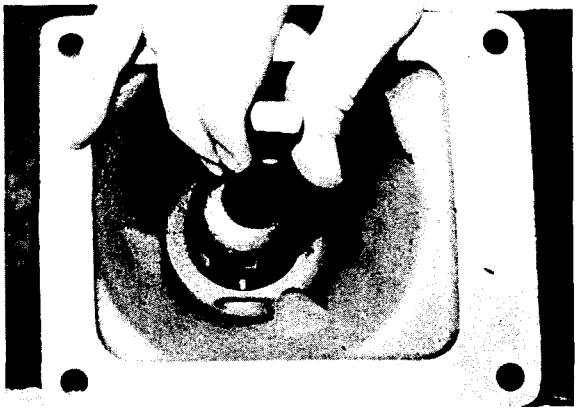


83. *Shifting bar housing with yokes and shifting block in the neutral position.*

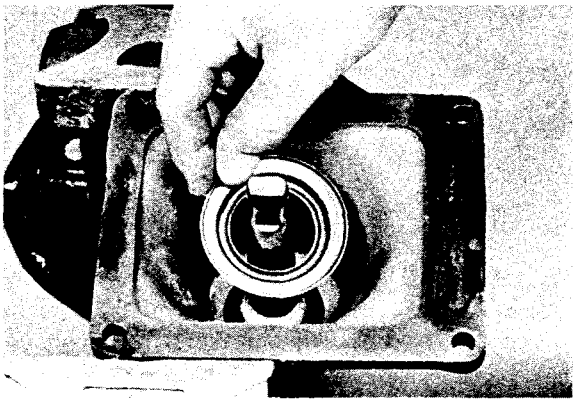


84. *Installing shifting bar housing assembly, fitting yokes into yoke slots of corresponding gears.*

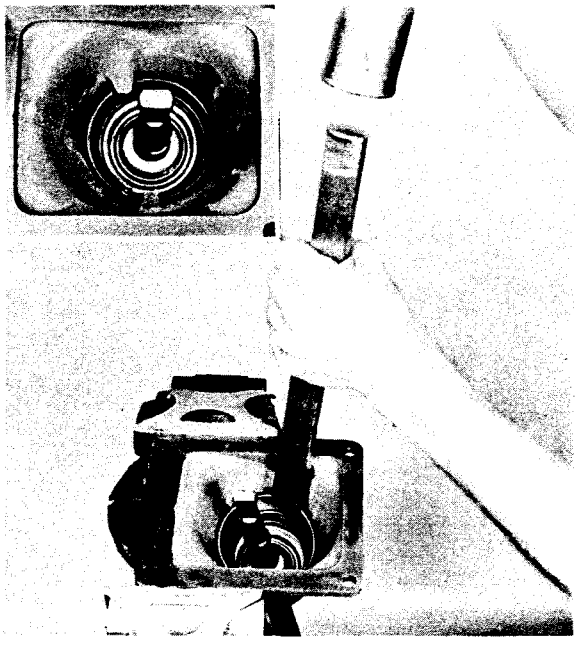
85. *Installing lockwasher and nut on gear shift lever pivot pin.*



86. *Installing gear shift lever in housing, inserting pivot pin in slot in pivot ball of lever.*



87. *Placing the tension spring washer in housing.*



88. *Seating the tension spring under lugs cast in housing. Insert shows spring correctly seated.*

J. To Install the Shifting Bar Housing

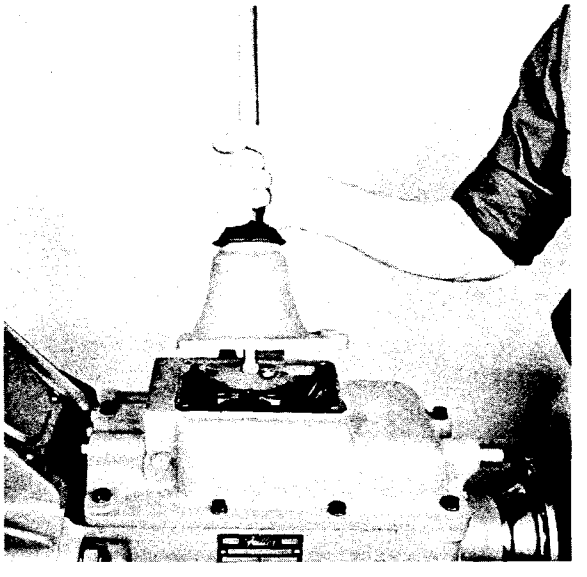
1. Make sure the transmission and the shifting bar housing assembly are in the neutral position. Illustration No. 83.
2. Install the shifting bar housing on the transmission case, inserting yokes of shifting bar housing into the yoke slots of corresponding gears. Illustration No. 84.
3. Install the attaching capscrews and tighten securely.

K. To Reassemble the Gear Shift Lever Housing Assembly

1. Install the gear shift lever pivot pin in housing.
2. Install the lockwasher and nut on outer end of pivot pin, tighten nut securely. Illustration No. 85.
3. Mount the housing in a vise with the large bottom opening upwards.
4. Install the gear shift lever in housing, fitting keyway in pivot ball over end of pivot pin. Illustration No. 86.
5. Install the tension spring washer in housing. Illustration No. 87.
6. Install the tension spring in housing. Depress spring until upper coil is secured under lugs cast inside the housing. Illustration No. 88.
7. Remove the assembly from vise and install the rubber dust cover on lever and against top of housing.
8. Install the ball grip at upper end of lever.

L. To Install the Gear Shift Lever Housing Assembly

1. Make sure the shifting bar housing assembly is in the neutral position.
2. Install the gear shift lever housing on shifting bar housing, entering lower end of lever in notches in shifting yokes and blocks. Illustration No. 89.
3. Install capscrews and tighten securely.



89. *Installing the gear shift lever housing assembly on shifting bar housing. Make sure shift lever fits into notches of yokes and block.*

TOOL REFERENCE

Some illustrations in this manual show the use of specialized tools. These tools are recommended for transmission repair as they make repair easier, faster and prevent costly damage to such critical parts as bearings and sleeves.

Some of these tools can be obtained from a regular tool supplier, while others can be made either from prints of the tools obtained from the Transmission Division or from dimensions as required by the individual user.

Listed below are illustrations which show these specialized tools, the tool name and how it can be obtained. Prints are available for tools which have a Fuller tool number: send requests to the Service Department, Eaton Corporation, Transmission Division, Kalamazoo, Michigan.

Also available upon request is a tool booklet which gives in detail the use and description of suggested specialized tools for rebuilding Fuller transmissions.

Illustration	Tool	How Obtained
22	Jaw pullers, large	Tool supplier
24	Jaw pullers, medium	Tool supplier
30	Impact puller	Make from 18″ steel rod, threaded 1/2″-13 one end, attach end block and sliding block
34	Ring puller	Make from Fuller tool print No. T-10682
36-41	Snap ring pliers	Tool supplier
43-62	Flanged-end bearing driver	Make from Fuller tool print No. T-7551
44-72	Torque wrench	Tool supplier
52	Tubular driver	Make from 1/4″ tubular steel stock, 8″ long, with ID slightly larger than ID of splined collar
54	Tubular driver	Make from 1/4″ tubular steel stock, 5″ long, with ID slightly larger than ID of sleeve
56	Tubular driver	Make from 1/4″ tubular steel stock, 5″ long, with ID slightly larger than ID of sleeve
64	Flanged-end bearing driver	Make from Fuller tool print No. T-10064
68	Tension spring driver	Make from Fuller tool print No. T-11938

NOTES

EATON Truck Components

Eaton Corporation
Transmission Division
Kalamazoo, Mich. 49001