

# SECTION-6R

## CLUTCH

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### GENERAL DESCRIPTION

The clutch used with Synchromesh transmission equipment from 1955 to 1962 is a single plate dry disc type. In 1956 a semi-centrifugal feature was added and carried over to the present date. As more powerful power plants were developed, torque capacity of clutches were increased accordingly. This is done by increasing the spring force in the clutch.

The centrifugal assist is accomplished by use of rollers between pressure plate and cover. The roller is not attached to either the pressure plate or cover but is guided by a channel on the pressure plate and retained in the channel by position of the cover when assembled to pressure plate. The rollers are free to

move away from center of the assembly as speed is increased and act as wedges between pressure plate and cover thereby increasing pressure plate force against driven disc.

Individual adjustment is provided for locating each lever in manufacturing assembly, but the adjusting nut is staked in place and should not be disturbed unless the clutch is disassembled for replacement of parts.

The clutch is operated by conventional linkage (figs. 1 and 2) assisted by an over-center spring. The linkage consists of a pendant type pedal, pedal push rod, cross shaft, clutch fork push rod, clutch fork, fork anti-rattle spring and over-center assist spring.

The over-center assist spring is located at the pedal side of the clutch cross shaft (figs. 1 and 2). In 1958 the spring attachment at the cross shaft was revised to

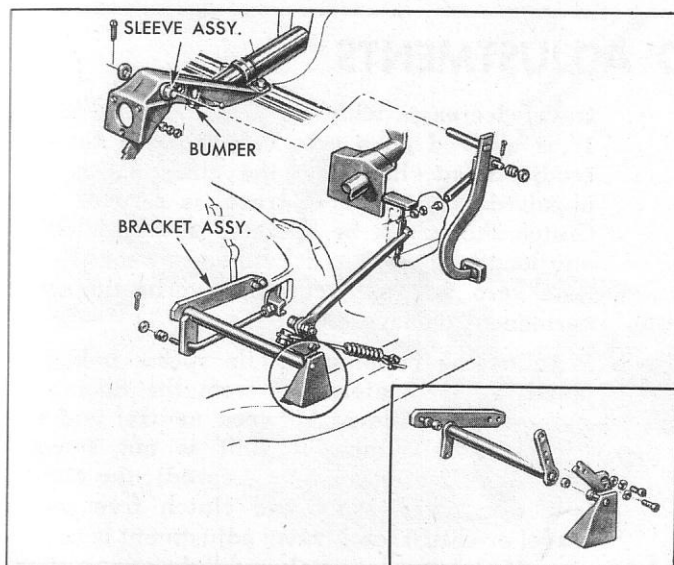


Fig. 1—Clutch Linkage (55-57)

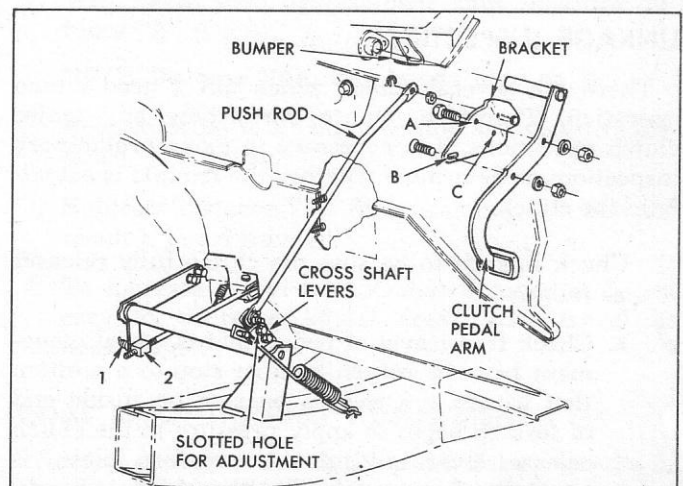


Fig. 2—Clutch Linkage (58-62)

provide for variable tension adjustment of the over-center spring (fig. 2).

In 1959 a dual position pedal bracket was introduced (fig. 5) which made a fast release possible by repositioning the bracket on the pedal and thus changing the length of effective lever arm that attaches to the push rod.

Two new clutch assemblies (both with a much higher pressure plate load) are used to provide adequate torque capacity for the new 327 cubic inch en-

gines in 1962. The first clutch (used with hydraulic lifter engines) has a pressure plate of gray cast iron and uses stronger springs. The second clutch (heavy-duty—used with mechanical lifter engines) has a pressure plate cast of extremely high tensile strength pearlitic malleable iron. It is identified by a groove ( $\frac{1}{8}$ " x  $\frac{3}{8}$ ") cast in each drive lug (insert, fig. 3).

The two clutches look alike, but the first must not be installed on a mechanical lifter engine while the second can be used interchangeably.

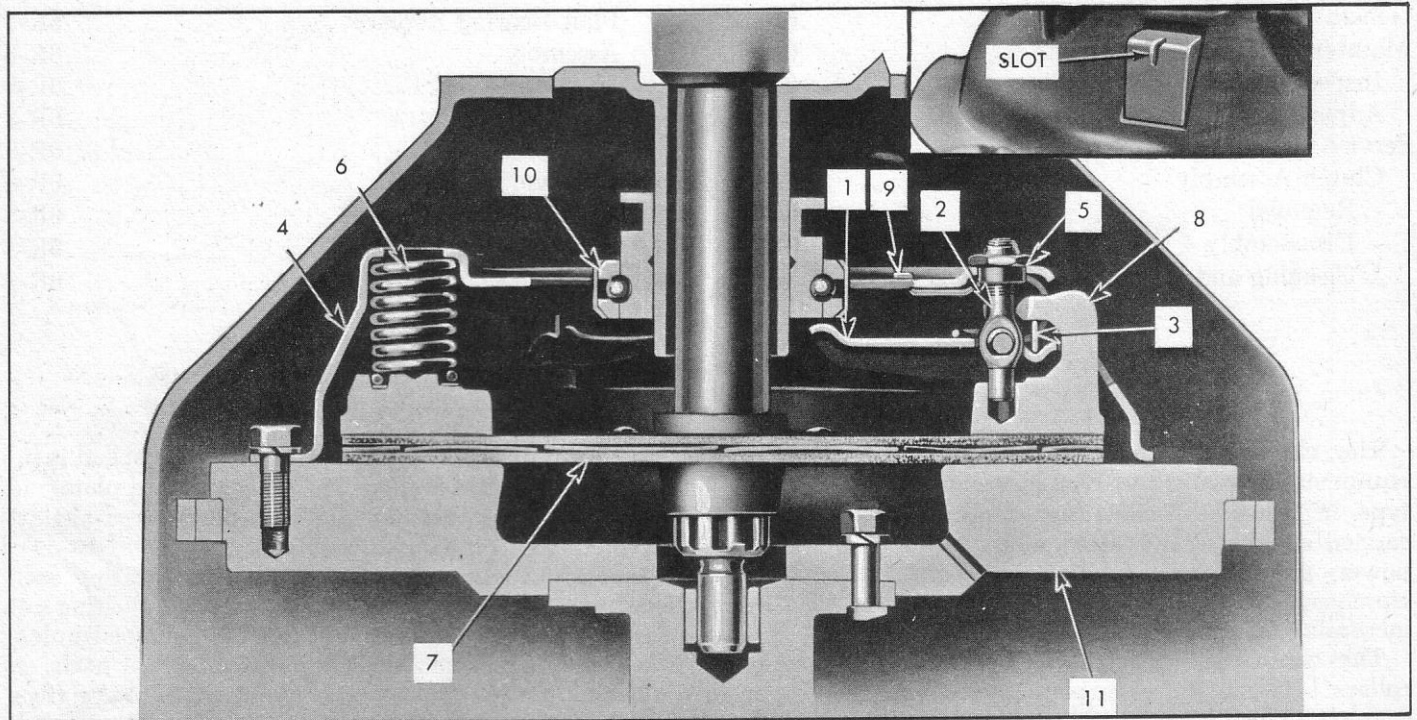


Fig. 3—Clutch Assembly Cross-Section

1. Release Lever  
2. Eyebolt  
3. Strut

4. Cover  
5. Adjusting Nut  
6. Coil Spring

7. Driven Plate  
8. Pressure Plate  
9. Anti-rattle Spring

10. Throwout Bearing  
11. Flywheel

## MAINTENANCE AND ADJUSTMENTS

### LINKAGE INSPECTION

There are several things which affect good clutch operation. Therefore, before performing any major clutch operations, it is necessary to make preliminary inspections to determine whether the trouble is actually in the clutch.

1. Check linkage to be sure the clutch fully releases as follows:
  - a. Check free travel of pedal, that is, pedal movement from its return bumper stop to a position that causes the release bearing on inside end of fork to begin to apply pressure to the clutch release levers lifting the pressure plate, is necessary to ascertain that the clutch is working at its maximum efficiency. Since this free

travel decreases with wear, as much as  $\frac{3}{4}$ " to 1" is allowed on a new vehicle or at time of readjustment, however, the efficiency is not impaired until the free travel is zero or less. Clutch should not be operated at zero lash for any length of time as it will soon wear to less than zero and slip, causing overheating and permanent damage.

- b. With engine running at idle speed, hold the clutch approximately  $\frac{1}{2}$ " from the floor mat and move shift lever between neutral and reverse several times. If shift is not smooth (especially into reverse on 4-speed), the clutch is not fully releasing and clutch free pedal travel or clutch total travel adjustment is necessary. If clutch releases ok and linkage operation is smooth, omit the following steps.



2. If clutch pedal release check is not satisfactory and free pedal travel is ok, check "Clutch Pedal Total Travel" as outlined in this section.
3. Check clutch pedal bushings for sticking or excessive wear and clutch lever and shaft assy. for lubrication at ball studs.
4. Loose or damaged engine mounts may allow the engine to shift and cause a bind on the clutch linkage at the cross shaft.
5. Check for bent, cracked or damaged outboard cross shaft bracket.
6. Check for proper over-center spring adjustment. Disconnect fork push rod and adjust arm on clutch cross-shaft assy. so that load required to push pedal away from bumper is 6-9 lb.

### CLUTCH PEDAL FREE TRAVEL ADJUSTMENT

This adjustment sets the amount of pedal travel from the return bumper position to point of release bearing contact with clutch release levers in the clutch assembly. This travel, when resetting, should be as close to 1" as possible for maximum wear allowance.

Do not confuse lash feel and over-center feel. The over-center assist spring opposes the initial (approximately  $\frac{1}{2}$ " ) pedal movement, but the pedal can be depressed over this part by hand and then a very noticeable increase in pressure is felt when throwout bearing contacts throwout fingers.

If necessary, adjust as follows:

1. On 1955, 1956 and 1957 Corvettes (fig. 4).
  - a. Loosen jam nut (1), then turn adjusting nut (2) until all lash is removed at clutch fork.
  - b. Shorten the rod two turns of the adjusting nut and tighten jam nut (1).

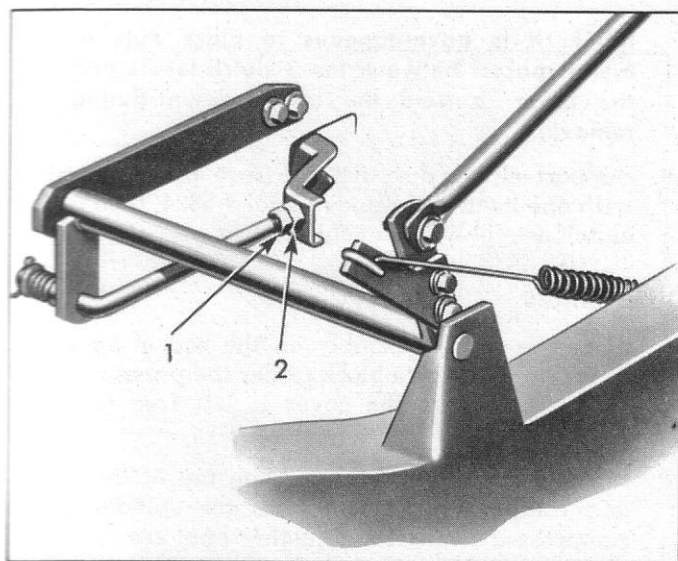


Fig. 4—Free Pedal Adjustment (55-57)

- c. Check free pedal travel at pedal.
2. On 1958 through 1962 Corvettes (fig. 5).

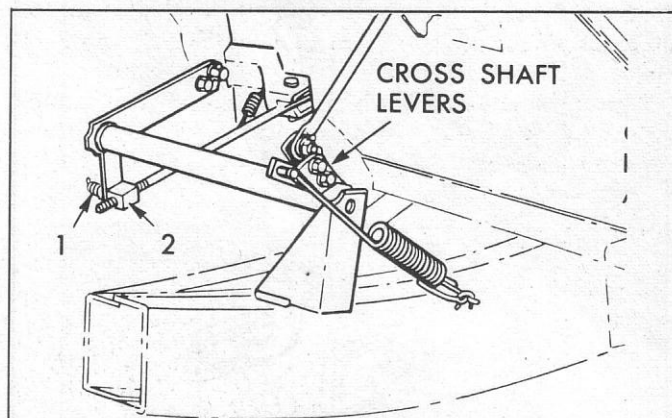


Fig. 5—Free Pedal Adjustment (58-62)

- a. Disconnect lower push rod swivel from cross shaft lever.
- b. Hold push rod in direction of clutch release (so that throwout bearing is against clutch release fingers), then adjust swivel to freely enter hole in cross shaft lever. This removes all pedal lash.
- c. Shorten the push rod (to get proper lash) by turning swivel 2 turns onto the rod, then connect swivel to cross shaft lever.
- d. Check free pedal travel at pedal.

### CLUTCH PEDAL TOTAL TRAVEL ADJUSTMENT

Clutch pedal total travel is the chord of the arc traveled by the pedal pad from its bumper stop position to its floor stop position during clutch release as shown in Figure 6. This dimension should be approximately 6 $\frac{1}{2}$  inches (4 $\frac{1}{2}$  on fast release position—late model vehicles) measured as follows:

1. With pedal held against floor stop, measure distance "A" (fig. 6).
- NOTE:** Distance "A" may be as little as  $\frac{1}{8}$ ".
2. Release pedal to its bumper stop and measure distance "B" (fig. 6).
  3. Subtract distance "A" from distance "B" and the result is pedal travel.
  4. To increase travel trim rubber bumper as necessary—to decrease adjust free pedal travel as necessary.

### PEDAL REPOSITIONING ADJUSTMENT

Normal setting of the clutch pedal linkage results in a total pedal travel of approximately 6 $\frac{1}{2}$ ". A second setting (available since 1959) is provided in the link-

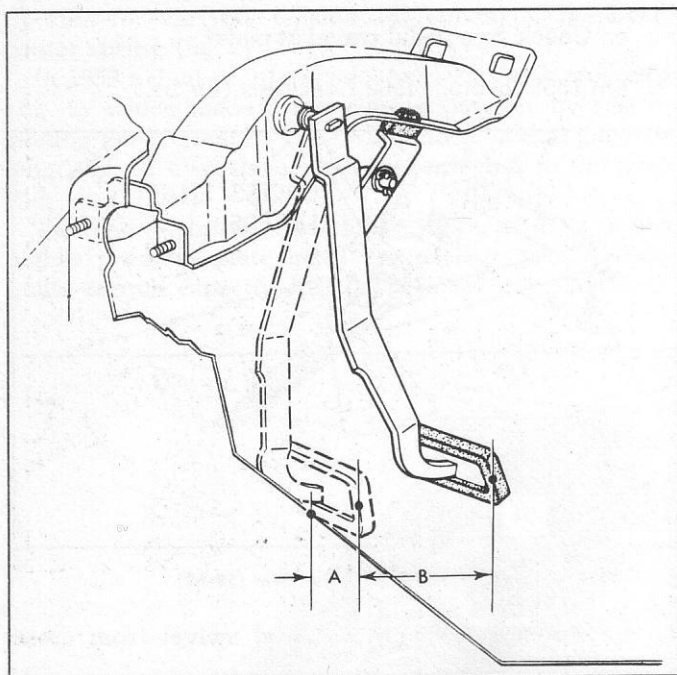


Fig. 6—Pedal Total Travel Adjustment

age to reduce the pedal travel to approximately  $4\frac{1}{2}$ ", which provides the precision feel of the fast release and permits more rapid gear shifting. The adjustment is accomplished by relocating the pedal push rod pin bracket as follows:

1. Wedge a block between the cross shaft upper lever and the toe pan to hold the pedal just off bumper stop.
2. Disconnect clutch pedal push rod at both ends.

3. Loosen push rod bracket to pedal lower attaching bolt (in slotted hole "B", Figure 7).
4. Remove the upper bolt from hole "C", and rotate the bracket until hole "A" is aligned with upper hole in pedal arm, then install bolt, lockwasher and nut.
5. Tighten both upper and lower bolts.
6. Install clutch pedal push rod so the bend (as shown in Figure 7) is in opposite direction from its previous installed position.
7. Remove block from cross shaft lever and check for free pedal play, proper clutch release, and new total pedal travel distance if necessary.
8. Readjust lash to  $\frac{1}{2}$  to  $\frac{3}{4}$ " (for low pedal position).

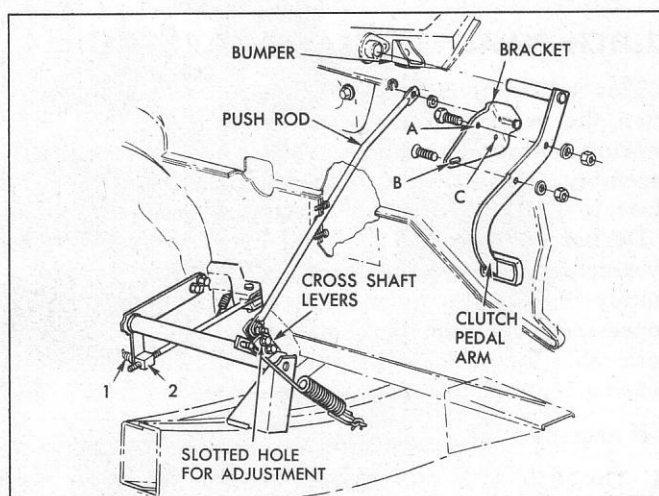


Fig. 7—Pedal Repositioning Adjustment

## MAJOR SERVICE OPERATIONS

### CLUTCH ASSEMBLY

#### Removal from Vehicle

1. Remove transmission as outlined in transmission section.
2. Remove flywheel underpan.
3. Remove throwout bearing from clutch fork.
4. Install Tool J-5824 to support the clutch assembly during removal.

**NOTE:** Look for "X" mark on flywheel and on clutch cover. If "X" mark is not evident, prick punch marks on flywheel and clutch cover for indexing purposes during installation.

5. Loosen the clutch-to-flywheel attaching bolts evenly 1 turn at a time until spring pressure is released, then remove the bolts.

**NOTE:** It is advantageous to place nuts or metal spacers between the 3 clutch levers and the cover to hold the levers down during removal.

6. Support clutch disc and pressure plate assembly with one hand and remove Tool J-5824, then lower clutch assembly from vehicle.

#### Disassembly

1. Place the cover assembly on the bed of an arbor or drill press with a block under the pressure plate so arranged that the cover is left free to move down.
2. Place a block or bar across the top of the cover and compress the cover with the spindle. Hold compressed while the adjusting nuts are removed as shown in Figure 8, then slowly release pressure to prevent springs flying out.



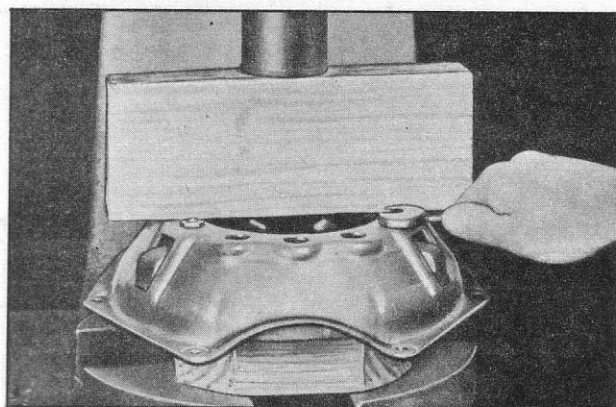


Fig. 8—Compressing Clutch

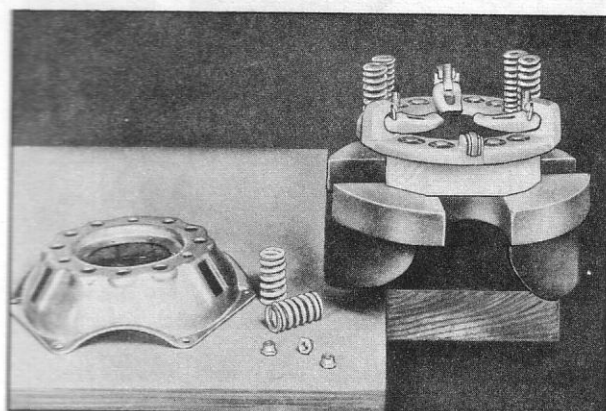


Fig. 9—Dismantling Clutch

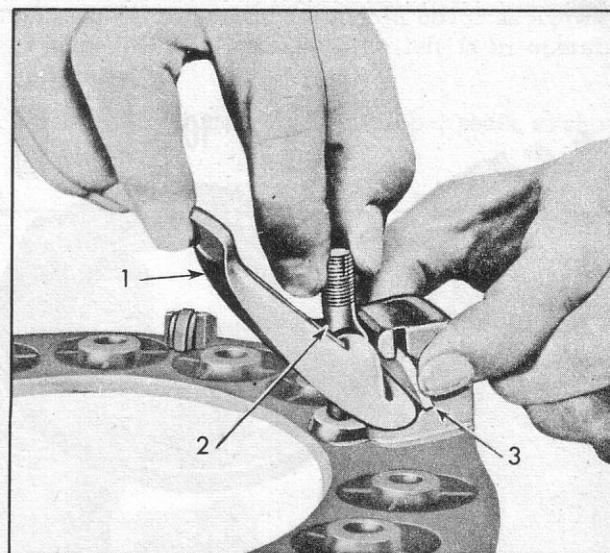


Fig. 11—Removing Levers (Step 2)

1. Release Lever      2. Eyebolt      3. Strut

**NOTE:** It is important to replace all parts which show wear.

### Inspection and Repair

1. Wash all parts, except driven disk and throwout bearing, in cleaning solvent.

**NOTE:** The throwout bearing is permanently packed with lubricant and should not be soaked in cleaning solvent as this may dissolve the lubricant.

2. Inspect pressure plate and flywheel for scores on the contact surfaces. Use a straight-edge and check for flatness of contact surfaces.
3. Check drive lugs for looseness at the clutch cover and evidence of looseness at pressure plate bolt holes.
4. Check throwout bearing for roughness and free fit on the sleeve of the transmission clutch gear bearing retainer.
5. Inspect clutch disc for worn, loose or oil soaked facings, broken springs, loose rivets or riding.
6. Examine splines in hub and make sure they slide freely on splines of transmission clutch shaft. If splines are worn, the clutch disc or clutch gear should be replaced as necessary.
7. Inspect clutch fork ball socket and fingers for wear and ball retaining spring for damage.
8. Inspect ball stud for wear.

### Pilot Bearing

The clutch pilot bearing is an oil impregnated type bearing pressed into the crankshaft. This bearing requires attention only when the clutch is removed from the vehicle, at which time it should be cleaned

3. Lift off cover and all parts will be available for inspection. Note carefully the location of all parts including arrangement of the springs.
4. To remove levers grasp lever and eyebolt between thumb and fingers as shown in Figure 10, so that inner end of lever and upper end of eyebolt are close together, keeping eyebolt pin seated in its socket in lever.

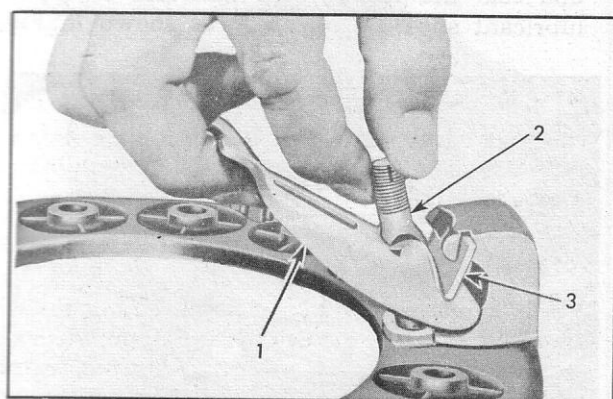


Fig. 10—Removing Levers (Step 1)

1. Release Lever      2. Eyebolt      3. Strut

5. Lift strut over ridge on end of lever, (fig. 11).
6. Lift lever and eyebolt off pressure plate.

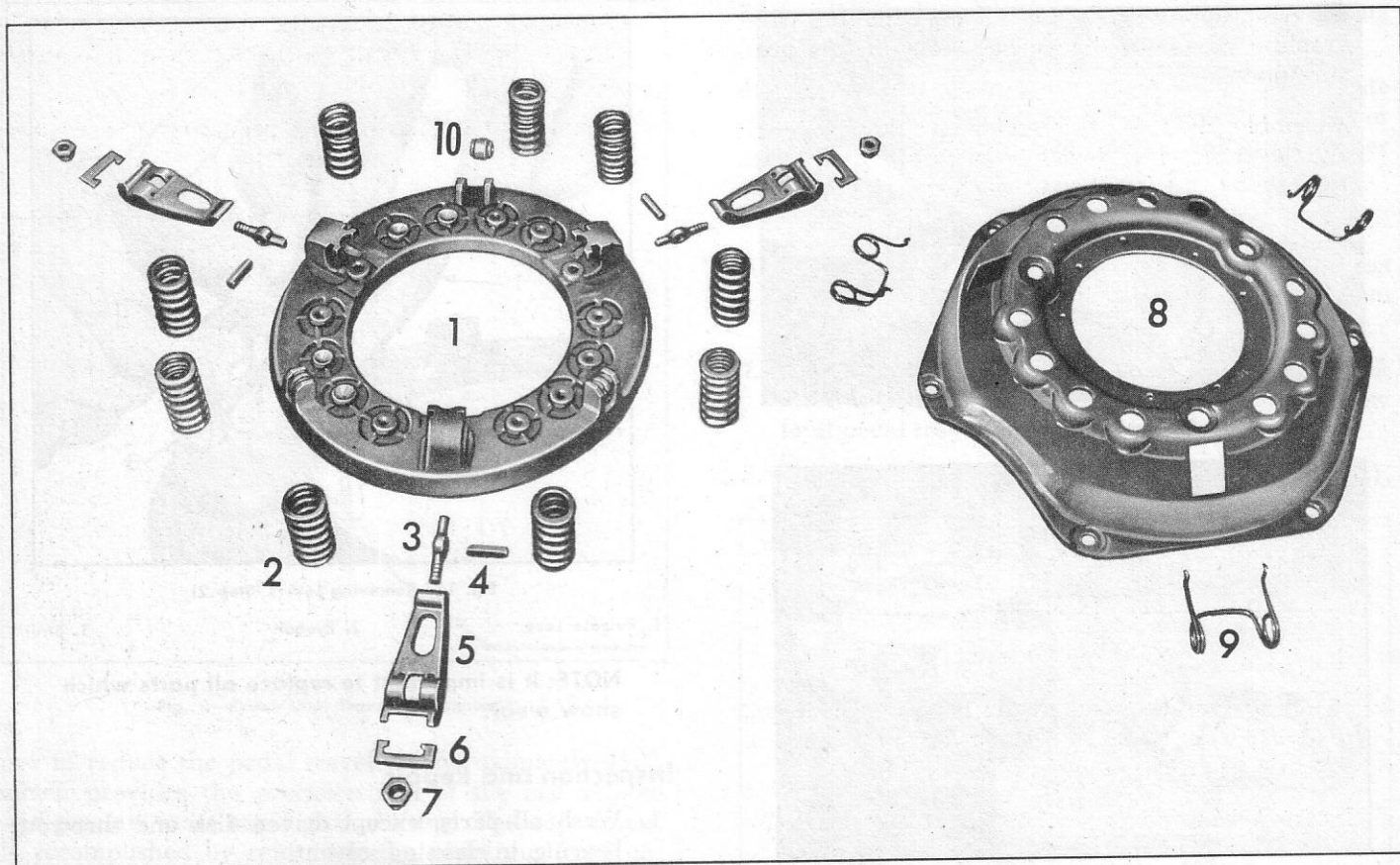


Fig. 12—Coil Spring Clutch—Exploded

1. Pressure Plate  
2. Coil Spring

3. Eyebolt  
4. Pin

5. Release Lever  
6. Strut

7. Adjusting Nut  
8. Cover

9. Anti-Rattle Spring  
10. Centrifugal Roller

and inspected for excessive wear or damage and should be replaced if necessary. To remove, install Tool J-1448 and remove bearing from crankshaft (fig. 13). In re-

placing this bearing, use Tool J-1522. Place bearing on pilot of tool with radius in bore of bearing next to shoulder on tool and drive into crankshaft.

### Assembly

1. Lay the pressure plate on the block in the press and coat the lugs with a thin film of approved lubricant such as lubriplate as shown in Figure

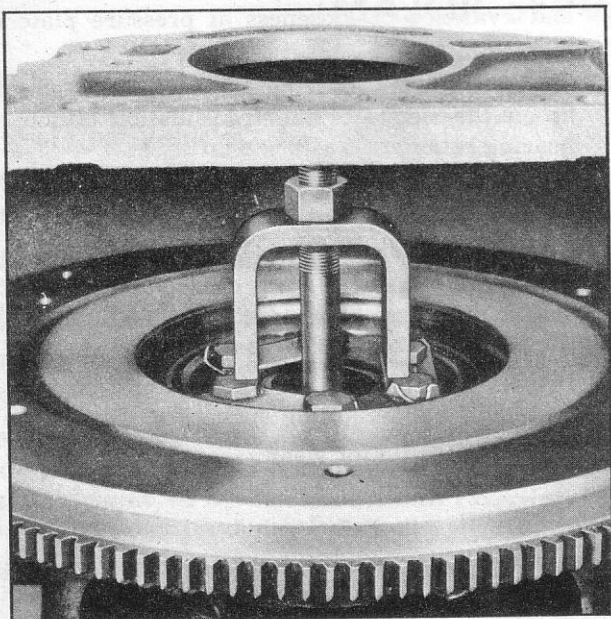


Fig. 13—Clutch Pilot Bearing Removal

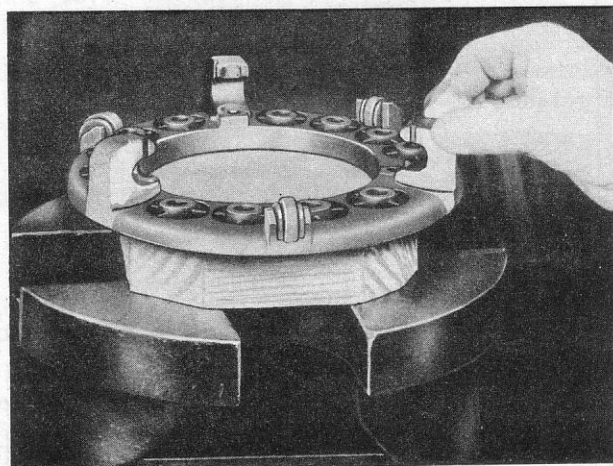


Fig. 14—Greasing Drive Lug



14. Also, apply a light film of high melting point graphite grease in the eyebolt holes in the pressure plate.
2. Assemble lever, eyebolt and pin, holding eyebolt and lever as close together as possible and with the other hand grasp strut as shown in Figure 15.

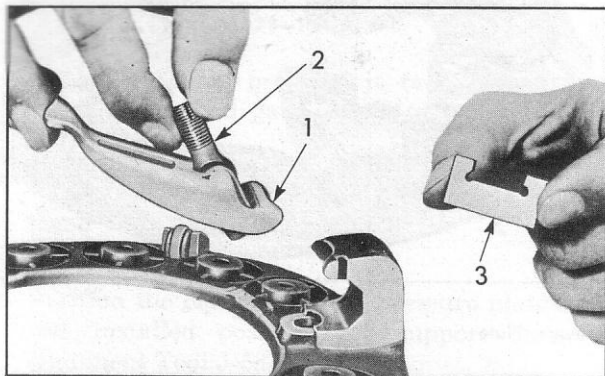


Fig. 15—Installing Levers

3. Insert strut in the slots in the pressure plate lug, drop slightly and tilt the lower edge until it touches vertical milled surface of lug.
4. Insert lower end of eyebolt in hole in pressure plate. The short end of the lever will then be under the hook of the pressure plate and near the strut (fig. 11).
5. Slide the strut upward in the slots of the lug, lifting it over the ridge on the short end of the lever and drop it into the groove in the lever (fig. 10).
6. Assemble the pressure springs, on the small bosses of the pressure plate in accordance with the order of removal.

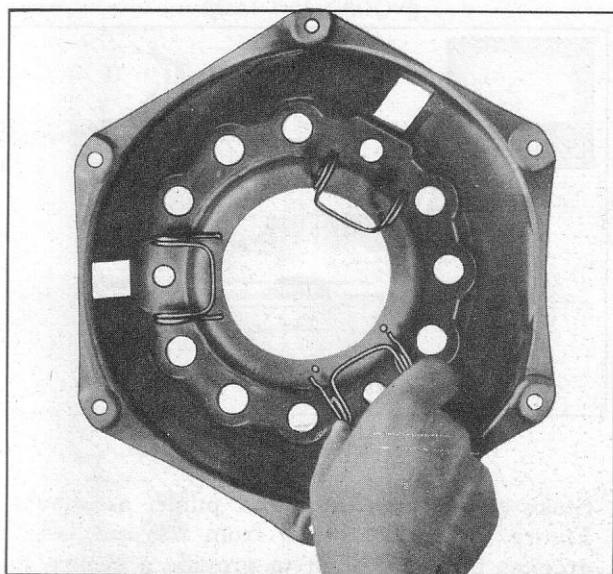


Fig. 16—Installing Anti-Rattle Spring

7. Assemble anti-rattle springs in cover as shown in Figure 16. The spring to the left is in operating position.
8. Install centrifugal rollers in proper seats, as shown in Figure 17.

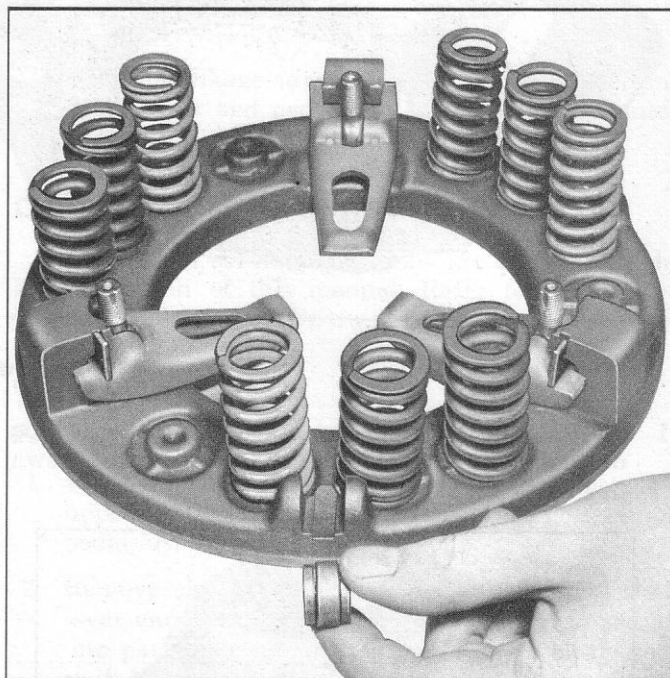


Fig. 17—Installing Rollers

9. Lower the cover on top of the assembled parts, (fig. 18) being sure that the anti-rattle springs are in correct position and also that the punch marks made before dismantling are matched to insure retaining the original balance.
10. Place a bar across the cover, as shown in Figure 8 and slowly compress, guiding the holes in the cover over the pressure plate lugs and all springs into their spring seats in the cover.
11. Assemble adjusting nuts on the eyebolts and screw them down until their tops are flush with the tops of the eyebolts. Slowly release pressure of spindle and remove cover assembly from press.

### Adjusting Levers

While no wear adjustment is needed because of the coil spring design, it is imperative that the clutch release levers are each set to exactly the same height at the time of manufacture or rebuild to insure uniform clutch application. To obtain exactly the same adjustment at each release lever, use gauge plate J-1048 and release lever height gauge J-6456 as follows:

**NOTE:** To adjust levers it is necessary to use Tool J-1048 on the flywheel in the car or on a spare flywheel at the bench.

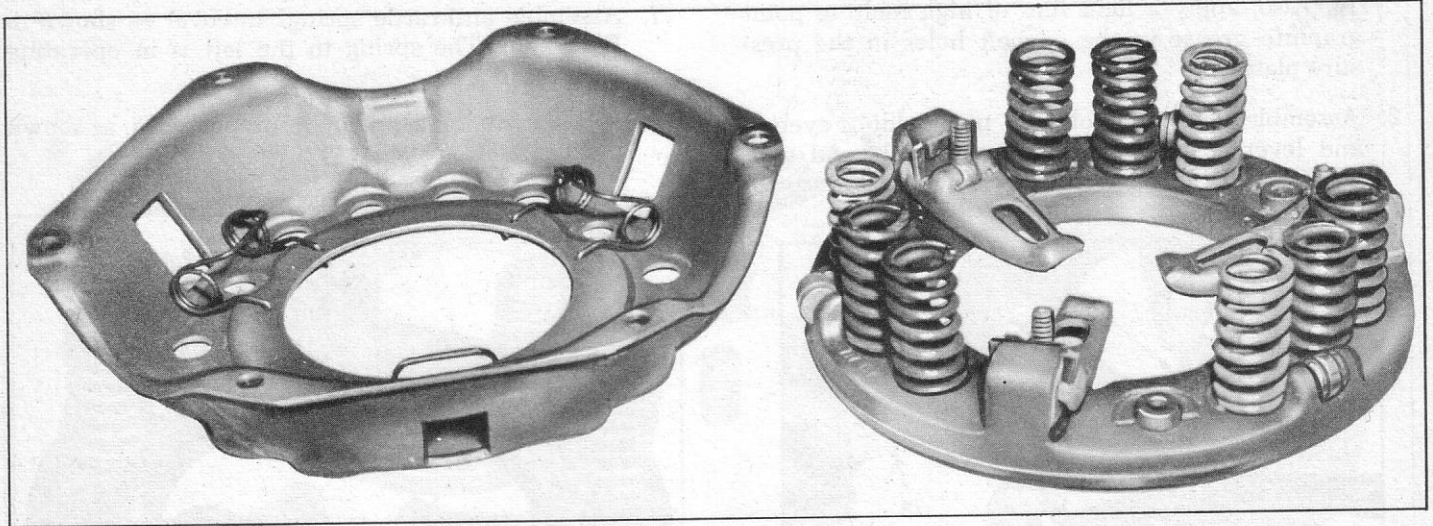


Fig. 18—Assembling Cover to Pressure Plate

1. Place gauge plate on the flywheel in the position normally occupied by the driven plate as shown in Figure 19.

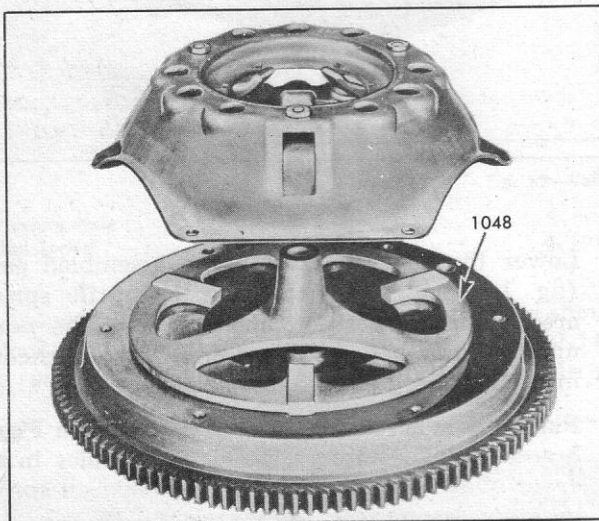


Fig. 19—Gauge Plate Position

2. Bolt cover on flywheel with the gauge plate centered and with the three flat machined lands placed directly under the levers.
3. Depress each lever several times with a hammer handle as shown in Figure 20 to settle all of the parts into working position.
4. Make a sheet metal lever height gauge like that shown in Figure 21 or use Tool J-6456. The step (or notch), should be  $\frac{1}{8}$ " by approximately  $\frac{5}{16}$ " long.
5. Lay the height gauge across the hub of the gauge plate and the bearing surface of one lever and turn the adjusting nut until the lever is flush with the height gauge. Then adjust the other levers in the same manner.

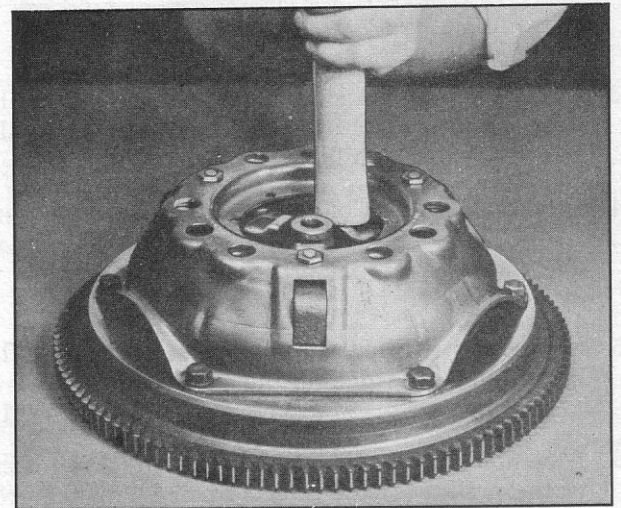


Fig. 20—Depressing Lever

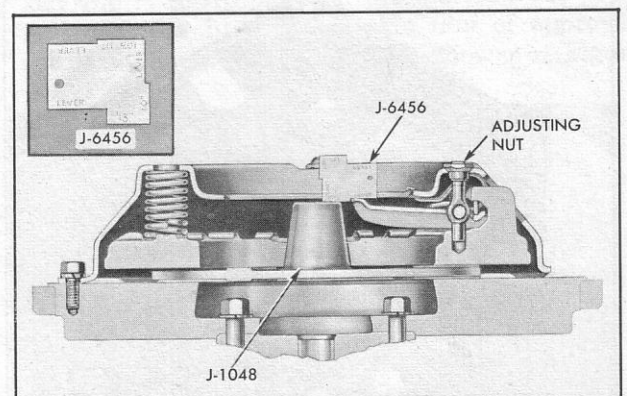


Fig. 21—Setting Lever with Height Gauge

6. Stake the nuts with a dull punch as shown in Figure 22 driving metal from the nut into the grooves in the eyebolt to provide a secure lock.
7. Loosen the holding screws a turn or two at a time



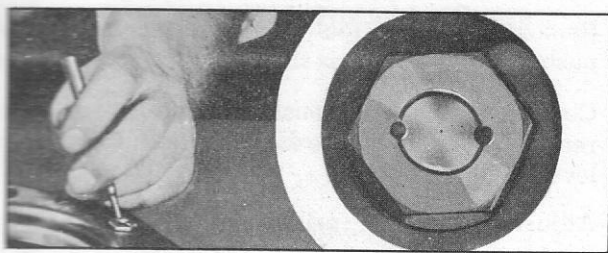


Fig. 22—Staking Nut

until the spring pressure is relieved which will allow clutch and gauge plate to be removed.

### Installation to Vehicle

1. Hand crank the engine until the "X" mark on flywheel is at bottom.
2. Position the clutch disc and pressure plate in relative installed position and support them with alignment Tool J-5824.

**NOTE:** Clutch driven disc is installed with damper springs and slinger toward pressure plate.

3. Turn clutch assembly until "X" mark on cover lines up with "X" mark on flywheel, then align cover bolt holes to nearest flywheel holes.
4. Install bolts in every other hole first and tighten down evenly and gradually until tight (to avoid possible clutch distortion), then install the remaining bolts.
5. Remove pilot tool.
6. Unhook clutch fork and lubricate ball socket with a high melting point grease such as graphite and reinstall on ball stud.

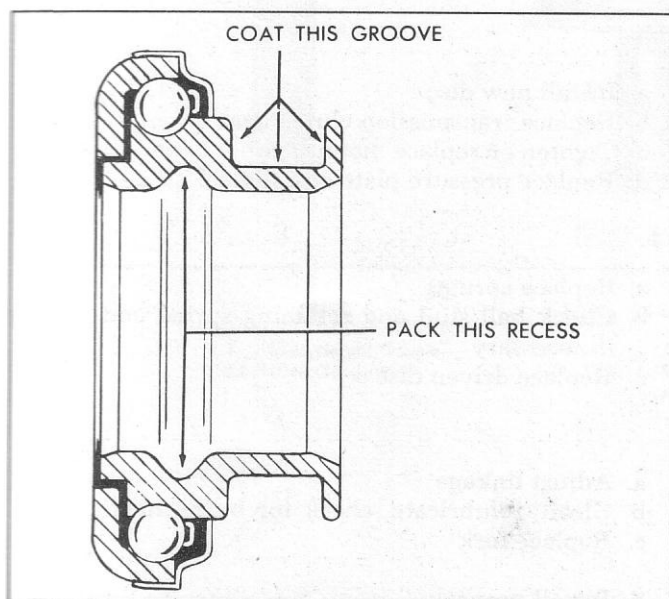


Fig. 23—Throwout Bearing Lubrication

7. Lubricate the recess on the inside of throwout bearing collar and the throwout fork groove with a light coat of graphite grease (fig. 23).
8. Install throwout bearing to the throwout fork.
9. Install transmission as outlined in transmission section.
10. Install flywheel underpan.
11. Perform linkage adjustment for over-center spring adjustment and pedal free play and check clutch release position.

### CLUTCH PEDAL

Clutch pedal service operations are outlined in the Brake Section of this manual. Refer to Clutch and Brake Pedal Service Operations, Section 5.

### Clutch Cross Shaft

#### Removal

1. Place a blocking device (wood or other) between upper cross shaft lever and toe-pan to hold clutch pedal just off bumper stop.
2. Remove clutch pedal push rod bolt at cross shaft lever and pin at pedal end, then slide push rod up into passenger compartment enough to clear cross shaft lever.
3. Raise vehicle on hoist or stand jacks.
4. Disconnect clutch fork push rod from cross shaft lever.
5. Hold lower cross shaft lever using a 12" crescent wrench or slide a deep socket with 12" extension over the lever.
6. Move the lever rearward enough to remove blocking device, then move the lever forward to rotate cross shaft and release tension on over-center assist spring, then unhook spring.
7. Remove cross shaft bracket-to-engine bolts and remove the cross shaft and bracket together.

#### Repair

1. Inspect cross shaft brackets and ball pivots for wear, damage or bent conditions. Damage to the ball requires replacement of brackets and ball.
2. Inspect cross shaft ends for cracks, wear, or other damage. Damaged cross shafts should be replaced.
3. Inspect felt spacers at each ball pivot. Replace torn, worn, or excessively compressed felts.

#### Installation

1. Install felt spacers over each ball pivot.
2. Install cross shaft over frame bracket ball, install

- engine bracket and ball onto opposite end, then slide engine bracket into place on engine and install bracket bolts.
3. Rotate cross shaft lower lever forward to install assist spring end plate over its mounting pin (on 1955-1957 models hook spring into mounting eye).
  4. Using wrench or socket as before, pull lower lever rearward far enough to install blocking device between toe-pan and upper cross shaft lever.
  5. Remove leverage tool and connect clutch fork push rod to lower cross shaft lever.
  6. Connect clutch pedal push rod at both ends, then remove blocking device from between toe-pan and lever.
  7. Adjust over-center spring.
  8. Check free pedal play and clutch release feel and adjust as needed.

## TROUBLES AND REMEDIES

### Symptom and Probable Cause

### Probable Remedy

#### Fails To Release

- a. Improper linkage adjustment
- b. Improper pedal travel
- c. Loose linkage
- d. Faulty pilot bearing
- e. Faulty driven disc
- f. Fork off ball stud.
- g. Clutch disc hub binding on clutch gear spline
- h. Clutch housing misalignment
- i. Pressure plate fingers not adjusted evenly—Check pressure plate lift—.055"-.070".

- a. Adjust linkage
- b. Trim bumper stop
- c. Replace bushings
- d. Replace bearing
- e. Replace disc
- f. Install properly and lubricate fingers at throwout bearing
- g. Repair or replace clutch gear
- h. See "Clutch Housing Alignment" Section 6
- i. Remove clutch and adjust lever height to variation of less than .007".

#### Slipping

- a. Improper adjustment (no lash)
- b. Oil soaked
- c. Worn facing or facing torn from disc
- d. Warped pressure plate or flywheel
- e. Weak springs

- a. Adjust linkage
- b. Install new disc and correct oil leak at its source (rear main, transmission, or leakage into housing from other engine gasket areas)
- c. Replace disc
- d. Replace same
- e. Replace assembly springs on pressure plate

#### Grabbing

- a. Oil on facing or burned or glazed facings
- b. Worn splines on clutch gear
- c. Loose engine mountings
- d. Warped pressure plate or flywheel

- a. Install new disc
- b. Replace transmission clutch gear
- c. Tighten or replace mountings
- d. Replace pressure plate or flywheel

#### Rattling—Transmission Click

- a. Weak retracting springs
- b. Throwout fork loose on ball stud or in bearing groove
- c. Oil in driven plate damper

- a. Replace springs
- b. Check ball stud and retaining spring and replace if necessary
- c. Replace driven disc

#### Throwout Bearing Noise with Clutch Fully Engaged

- a. Improper adjustment
- b. Throwout bearing binding on transmission
- c. Insufficient tension between clutch fork spring and ball stud
- d. Fork improperly installed
- e. Weak linkage return spring

- a. Adjust linkage
- b. Clean, relubricate, check for burrs, nicks, etc.
- c. Replace fork
- d. Install properly
- e. Replace spring



**Symptom and Probable Cause****Probable Remedy****Noisy**

- a. Worn throwout bearing
- b. Fork off ball stud (Heavy clicking)

- a. Replace bearing
- b. Install properly and lubricate fork fingers at bearing

**Pedal Stays on Floor When Disengaged**

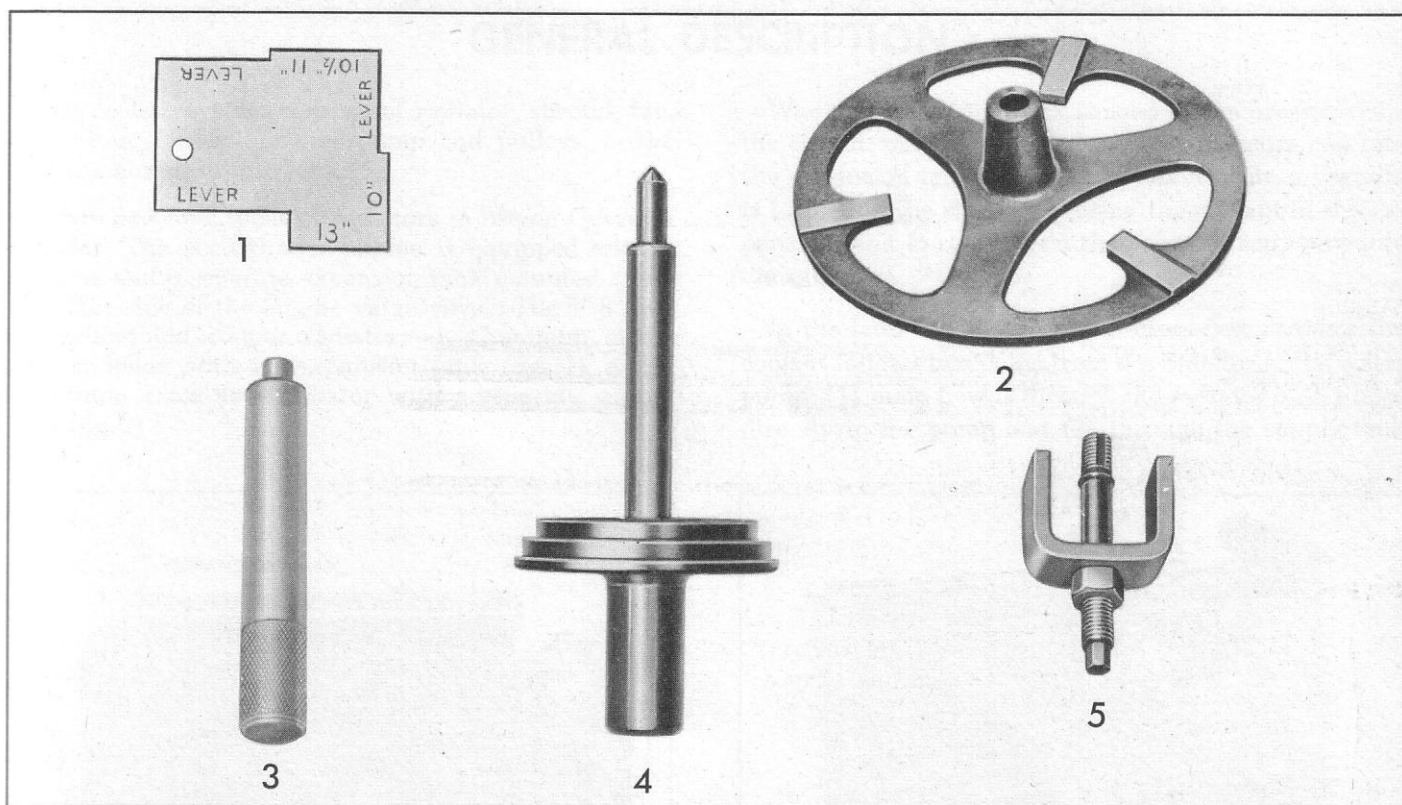
- a. Bind in linkage
- b. Over-center spring adjustment
- c. Springs weak in pressure plate

- a. Lubricate and free up linkage
- b. Adjust
- c. Replace

**High Pedal Effort**

- a. Bind in linkage
- b. Over-center spring adjustment

- a. Lubricate and free up linkage
- b. Adjust

**SPECIAL TOOLS****Fig. 24—Clutch Special Tools**

- 1. J-6456 Height Gauge
- 2. J-1048 Gauge Plate

- 3. J-1522 Pilot Bearing Driver
- 4. J-5824 Clutch Pilot Tool

- 5. J-1448 Pilot Bearing Puller