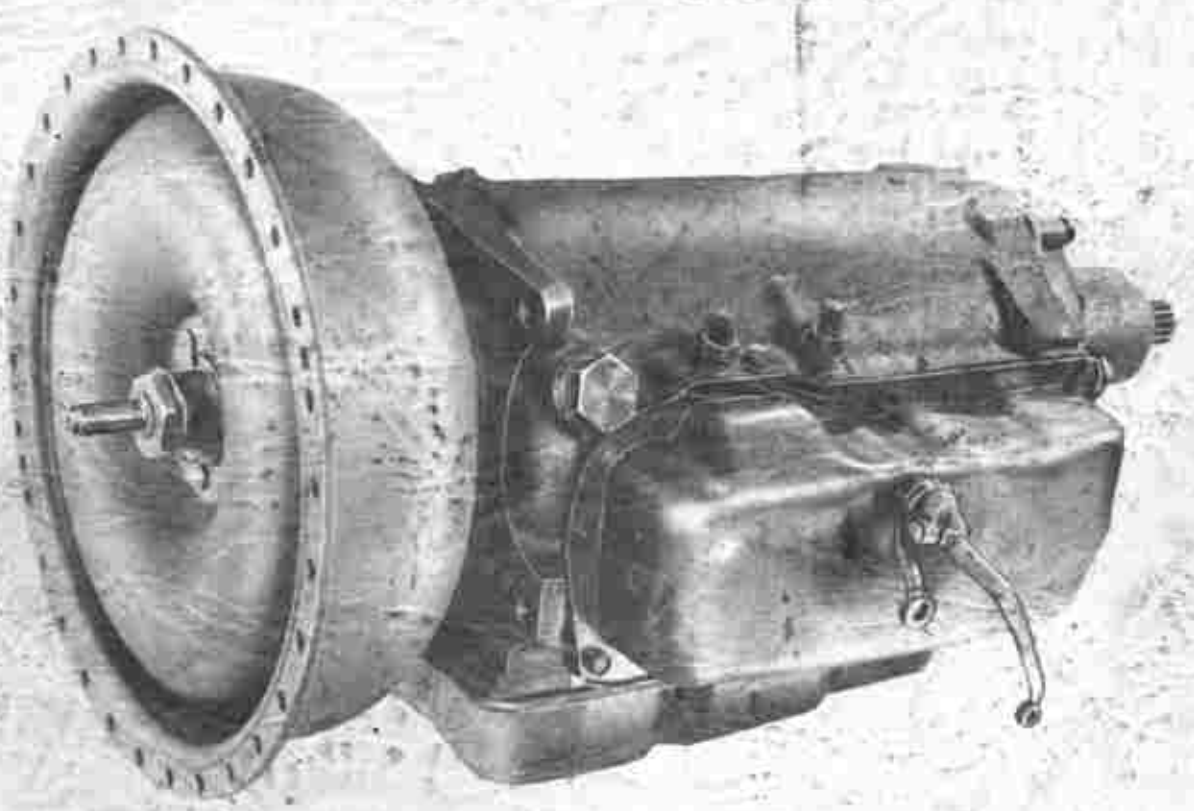
THE HYDRA-MATIC* TRANSMISSION 1946 • 1955



United Motors Service Division

ON-THE-CAR ADJUSTMENT SERVICE MANUAL

*The word Hydra-Matic is a registered trade-mark of the General Motors Corporation.

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PRICE: $1.00

When ordering copies of this manual, refer to it as Hydra-Matic manual, number J 6372.

Send orders to—

The Kent-Moore Organization, Inc.
5-105 General Motors Building
Detroit 2, Michigan

FOREWORD

This manual provides specific information on various services and adjustments, which can be performed on the Hydra-Matic transmission without removing it from the car. No attempt is made to cover *any* major repairs, replacements, or overhaul operations.

However, the procedures covered will enable you to handle about 75% of all the Hydra-Matic service you will run into. For the remaining 25% — which is major overhaul work — specialized training is obtainable in the United Motors Training classes at the General Motors Training Centers.

The procedures in this book are based entirely upon the use of Kent-Moore special tools — which have been developed, and kept up to date, in close cooperation with the automobile manufacturers. The procedures and charts take into consideration the principle variations between Hydra-Matics in different car models and makes. Hence, the instructions can be applied generally to *all* Hydra-Matic equipped cars. However, it will pay you to obtain manufacturer's shop manuals and acquaint yourself with all variations and fully detailed specifications.

TAKE IT FROM THE BEGINNING

In case you have never had any experience with the Hydra-Matic, it is suggested that you study this book from the beginning — to gain a full grasp of the subject, and to give yourself a broad view of what is involved.

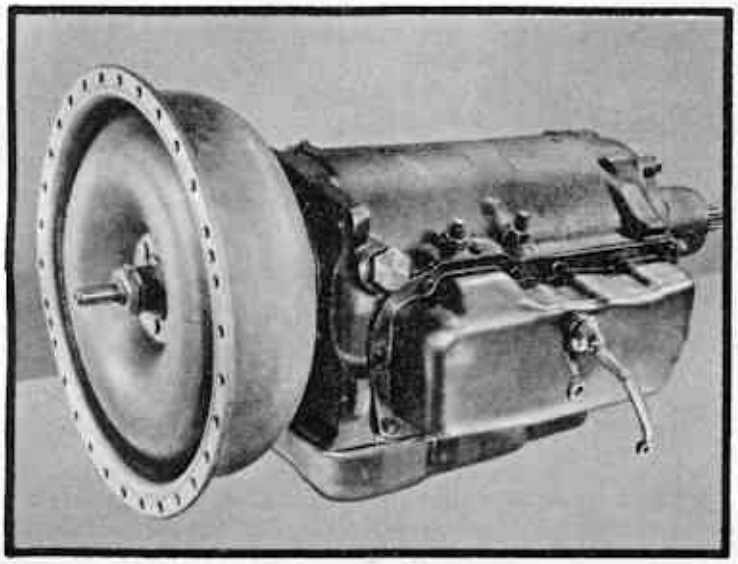
By understanding the fundamentals, by knowing how and why adjustments are made, by using the proper parts and tools, and by observing precautions, you will be certain of doing first class work.

Thus, comebacks will be eliminated, and customers satisfied. And the gains to you? Well . . . they're obvious, aren't they?

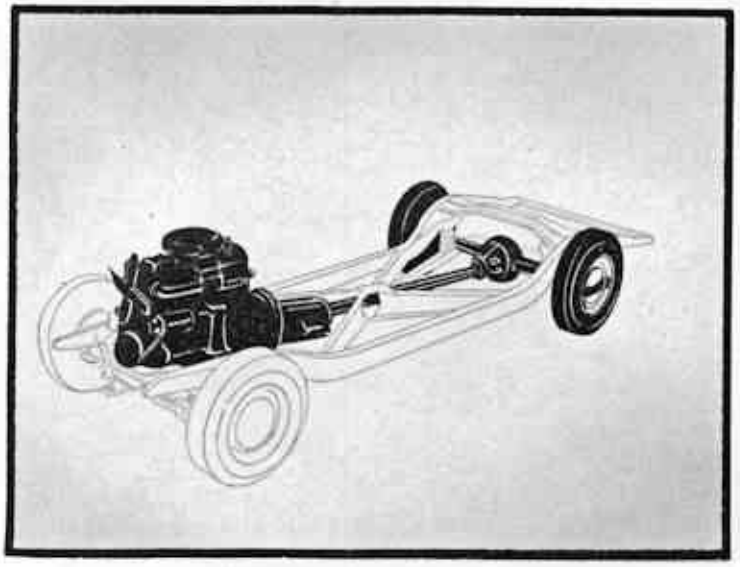
SECTION ONE

FUNDAMENTALS OF OPERATION

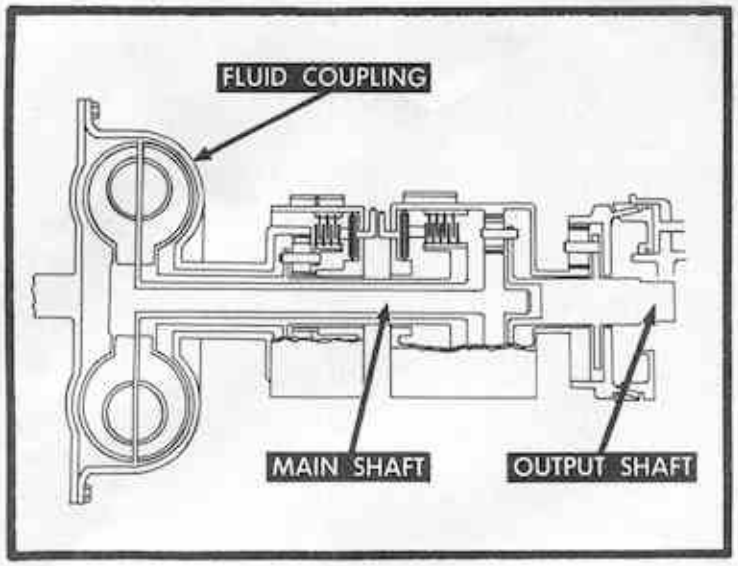
The fundamentals covered deal primarily with the mechanical operations of the Hydra-Matic. It is important to understand them, because, until they are understood, the various adjustments and the reasons for making them will remain a mystery. No attempt is made to cover the hydraulic system, since this is not subject to on-the-car adjustment. Now...



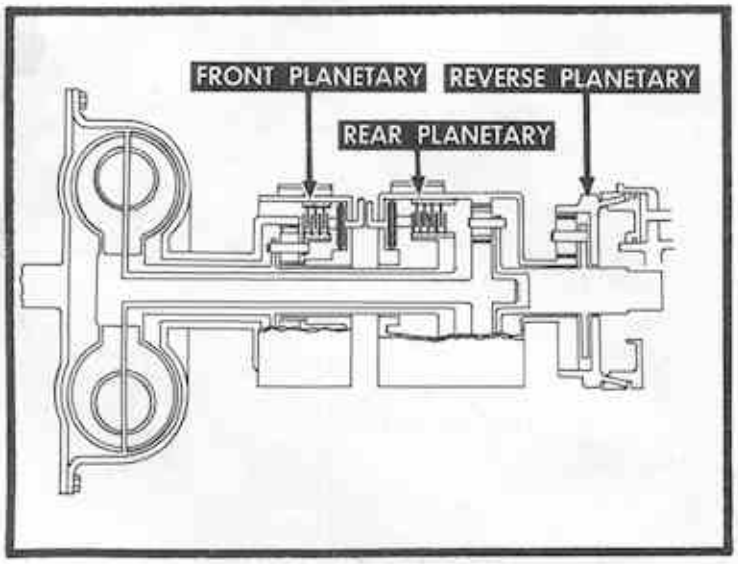
...let's take some of the mystery out of the Hydra-Matic, and see what makes it tick. In the first place...



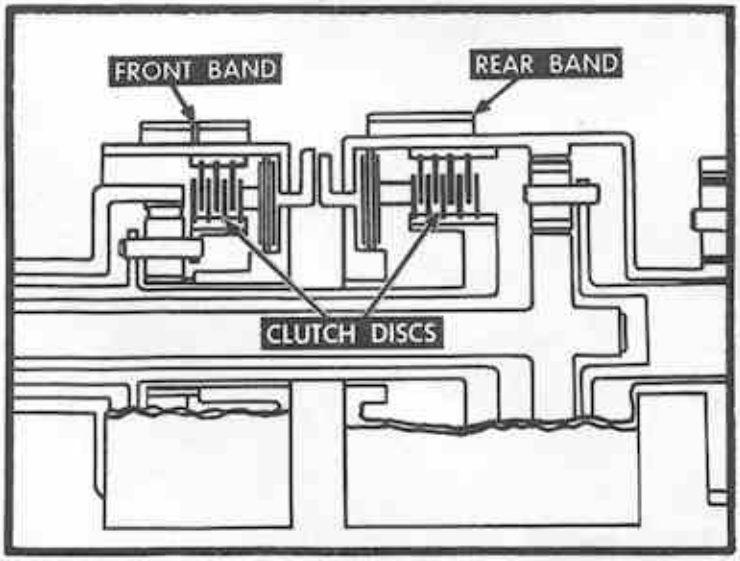
...its function is the same as that of any other transmission — to provide suitable gear ratios between the engine and rear wheels to meet all driving conditions.



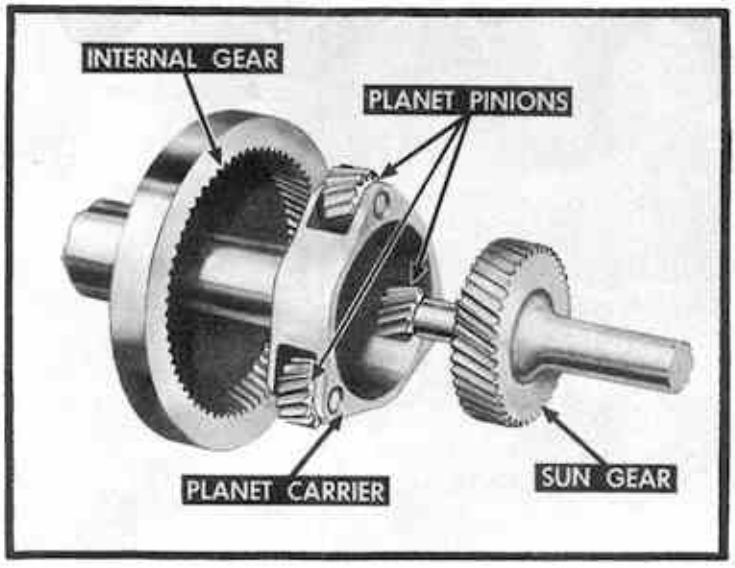
The drive components of the Hydra-Matic consist basically of a fluid coupling (which replaces the conventional clutch), the main shaft, output shaft, and...



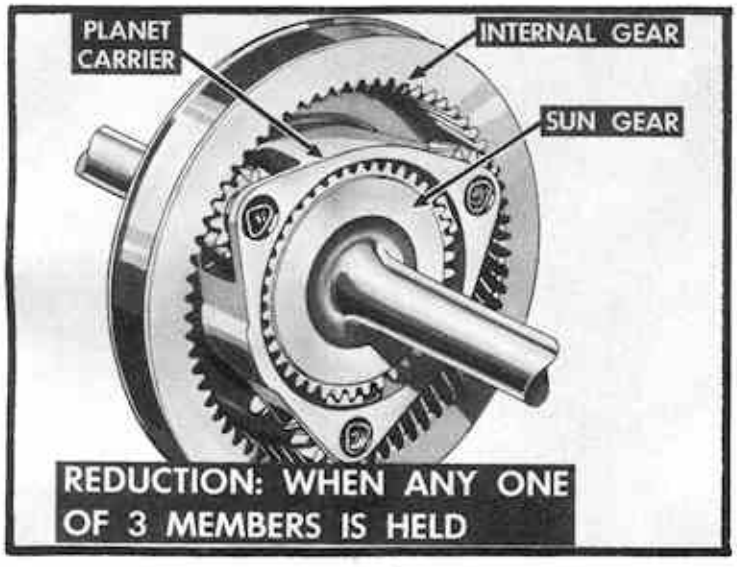
...three planetary units – the front planetary, the rear planetary, and the reverse planetary.



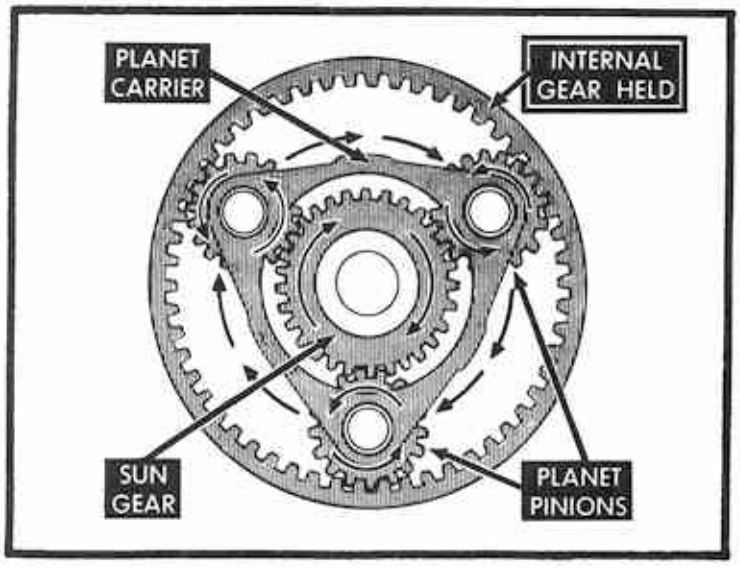
The front and rear planetary units function in combination to provide four speeds forward, and are controlled by hydraulically actuated bands and clutch discs.



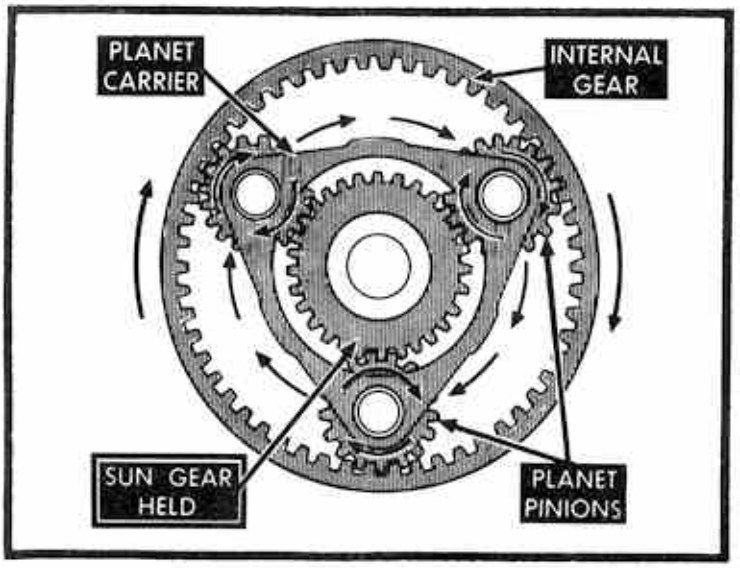
To best understand what is accomplished when adjustments are made, it is necessary to understand the function of a planetary gear assembly, which consists of an internal gear, a sun gear, and the planet pinions, which are mounted on a planet carrier.



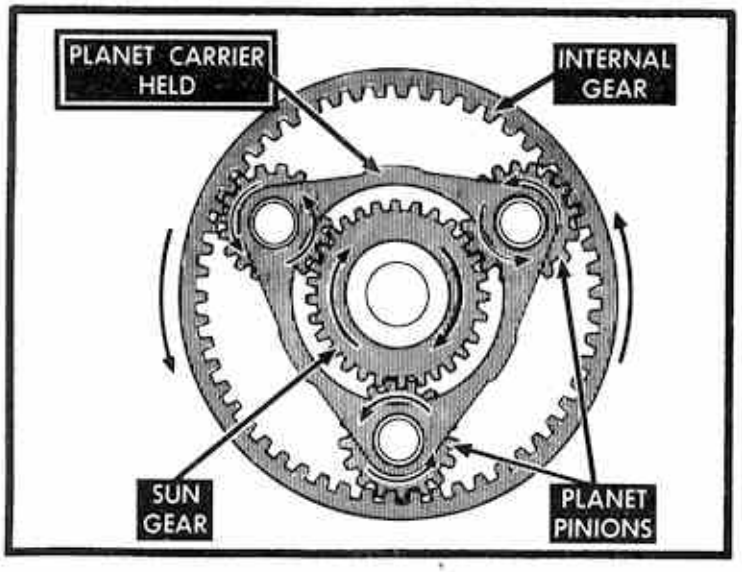
A planetary gear train will provide *reduction when any one of its three members is kept from rotating*, and power is applied to either the sun gear or the internal gear. For instance...



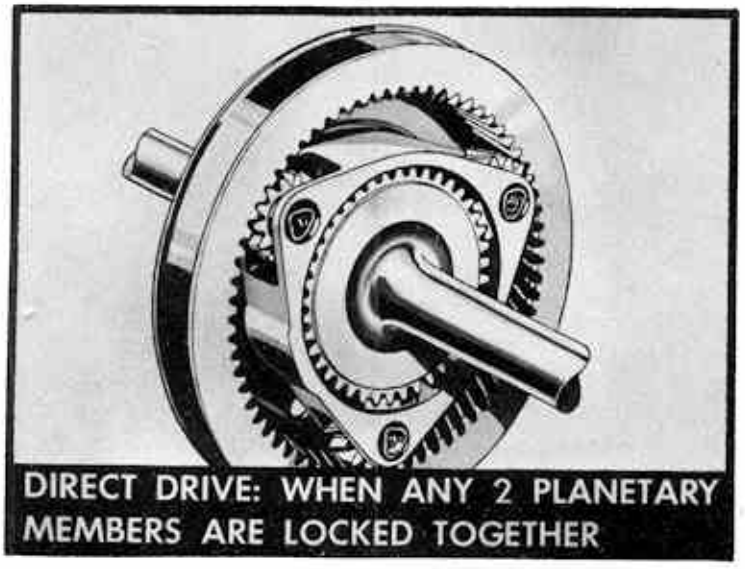
...power is increased, and speed reduced, if the *internal gear is held*, and power is applied to the sun gear. As the sun gear rotates, the pinions "walk around" inside the internal gear. The planet carrier turns with them in the same direction as the sun gear, but at a lower speed than that of the sun gear.



Reduction is likewise gained if the *sun gear is held*, and power is applied to the internal gear. In this case, as the internal gear rotates, the pinions walk around the sun gear, and turn the planet carrier at a speed less than that of the internal gear.

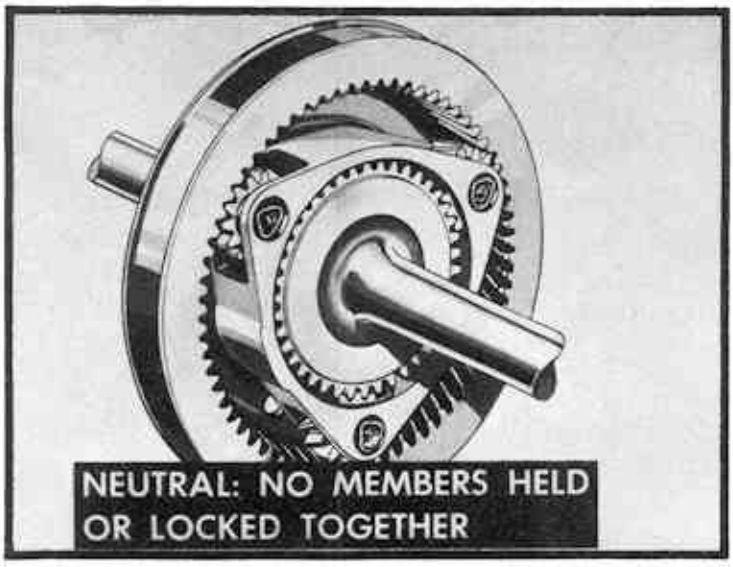


Both reduction and reverse are achieved, if the *planet carrier is held*. In this instance, the power is applied to the sun gear, and the pinions rotate on their pins. But, with the carrier stationary, the pinions act merely as idlers, and transmit power to the internal gear, causing the internal gear to turn in the opposite direction at a reduced speed.

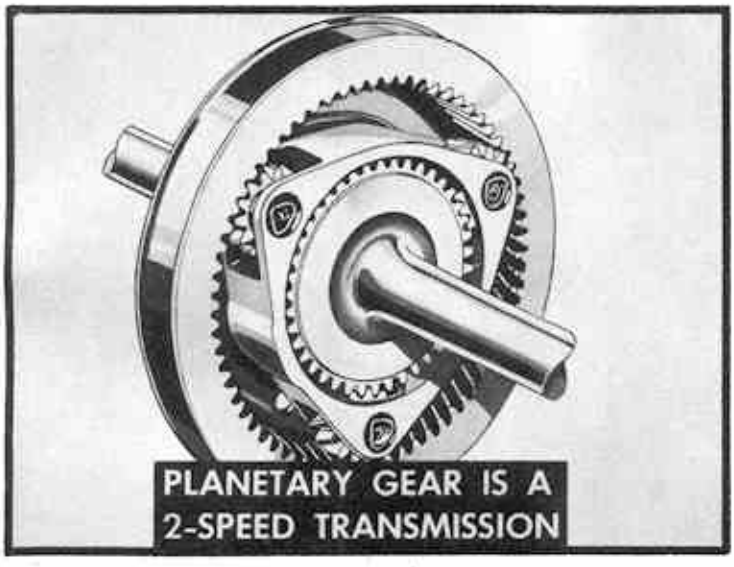


DIRECT DRIVE: WHEN ANY 2 PLANETARY MEMBERS ARE LOCKED TOGETHER

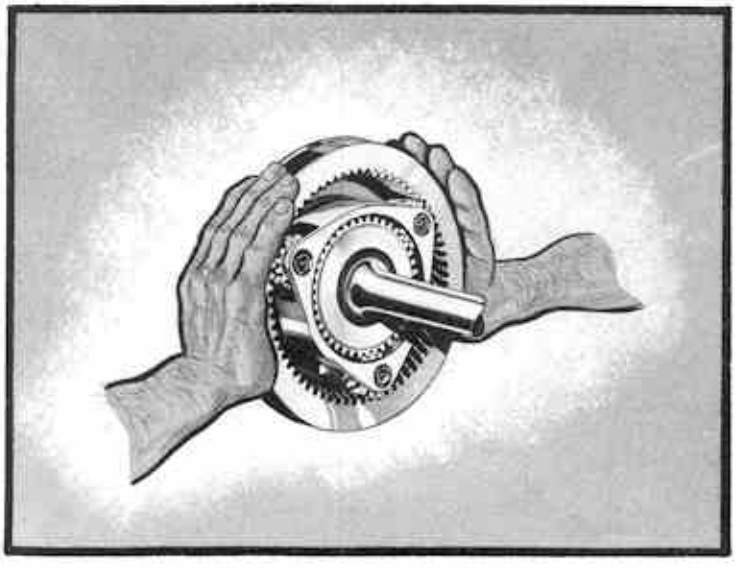
A planetary gear system will provide *direct drive when any two planetary members are locked together.*



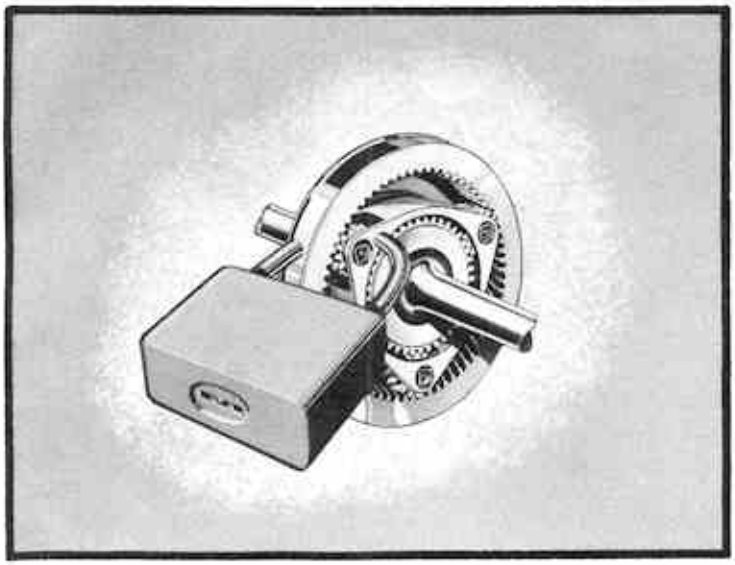
Neutral is obtained when none of the members of the planetary gear are held stationary to provide reduction, or locked together to provide direct drive, thus making it impossible for the unit to transmit power to the output shaft.



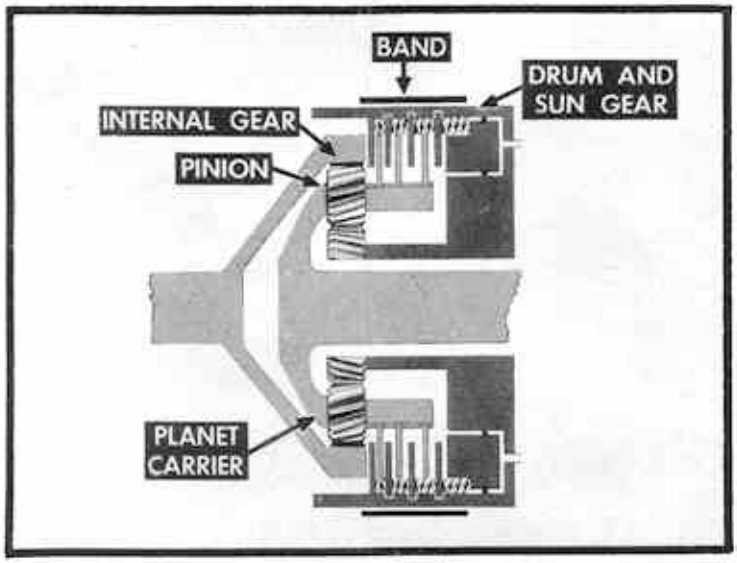
From the foregoing, we can see that a *single planetary gear assembly is actually a two speed transmission.* All that is needed to make it work...



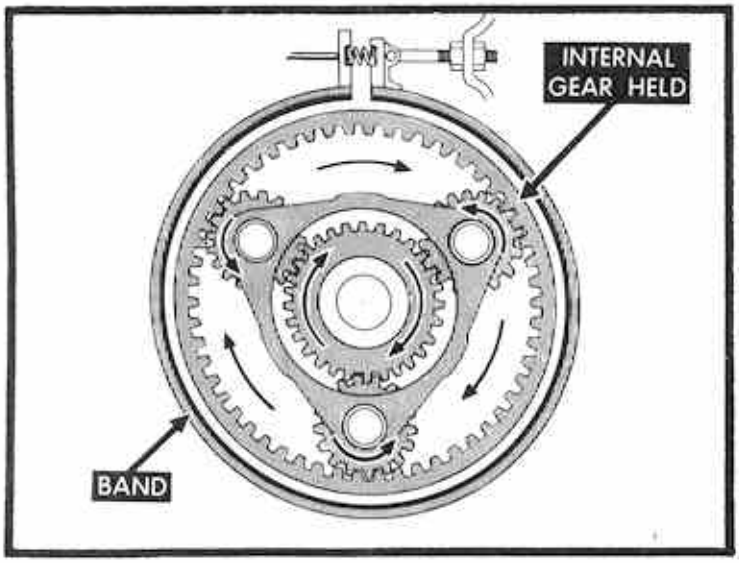
...is a way to prevent rotation of *any one* of the members in a planetary to provide reduction or low speed, and...



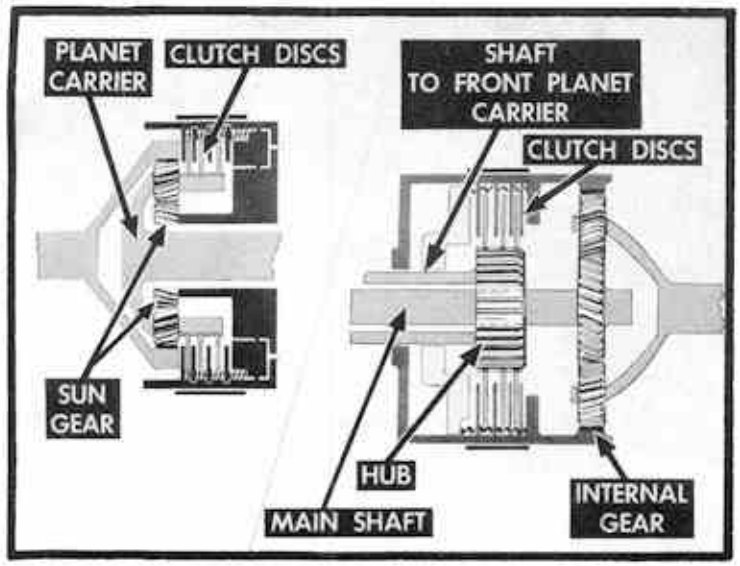
...a way to lock *any two* members of a planetary together for direct drive or "high" speed.



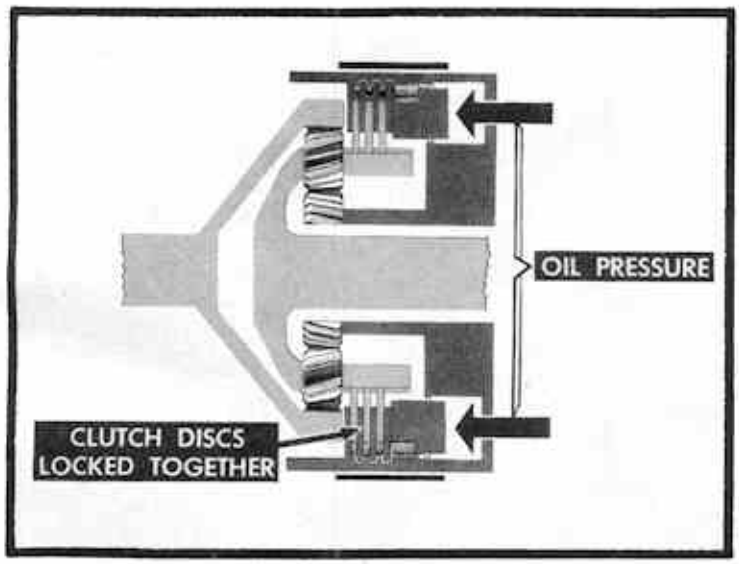
To provide reduction in the front planetary, a band is wrapped around a drum which is part of the sun gear. When the band is applied it stops the sun gear. In this case, the internal gear continues to turn and the pinions walk around the sun gear, rotating the planet carrier at a speed less than that of the internal gear.



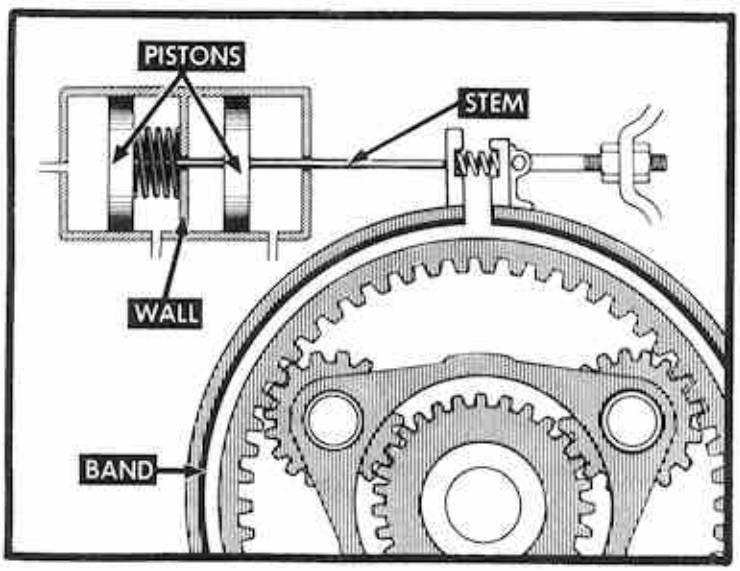
To provide reduction in the rear planetary, a band is wrapped around a drum, which is part of the internal gear. When the band is applied, it stops the internal gear. In this case, the sun gear continues to turn and drives the planet carrier and its pinions at a reduced speed.



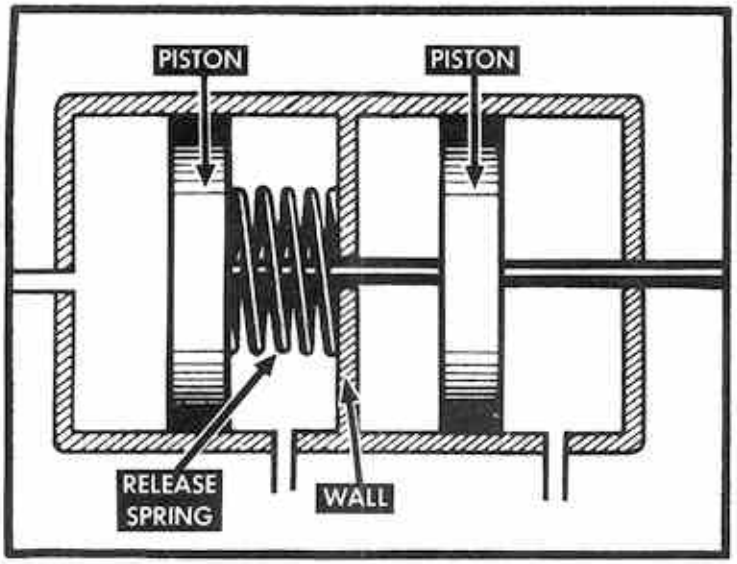
To provide direct drive, multiple disc clutches are used. In the front planetary unit, the clutch discs are alternately attached to the sun gear and the planet carrier. In the rear unit, the discs are alternately attached to the internal gear and a hub, which is splined to a shaft that extends from the front planet carrier. With no pressure applied to a clutch, the two members the discs are attached to are free to rotate independently of each other. However...



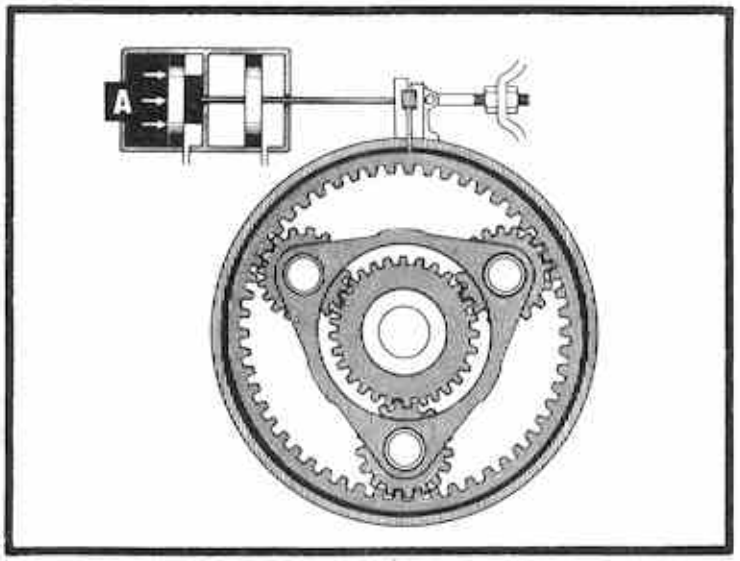
...when pressure is applied, two units of a planetary are locked together, and the assembly is in direct drive. Now, let's see how the bands and clutches are applied.



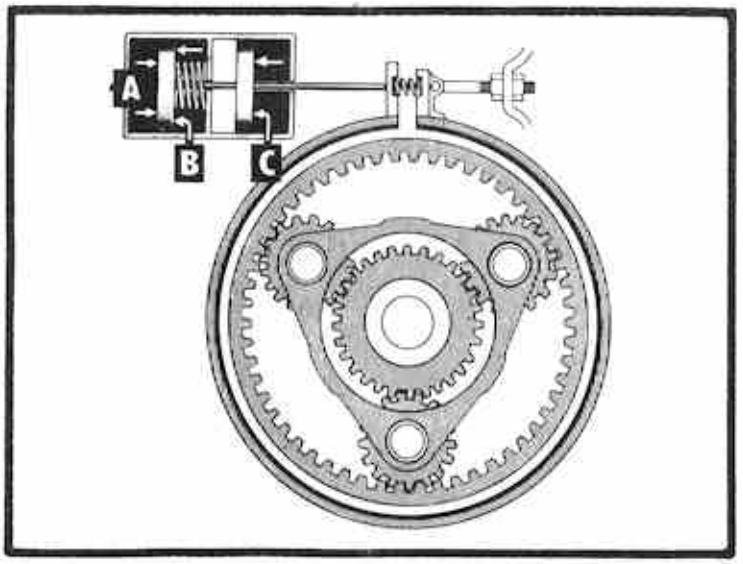
The bands are applied and released hydraulically through a servo. The front servo consists of a stem with two pistons installed in a cylinder, or servo body, which has a wall between the two pistons.



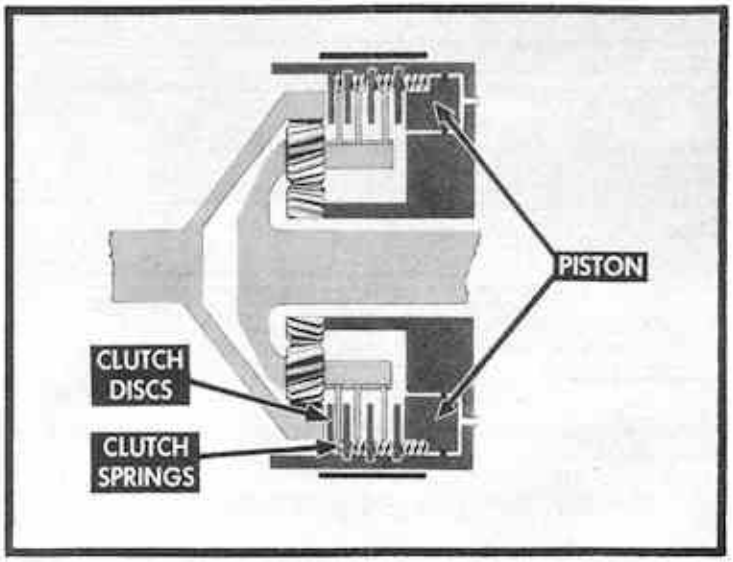
A release spring, installed between the servo body wall and one of the pistons, holds the servo in released position when no oil pressure is applied.



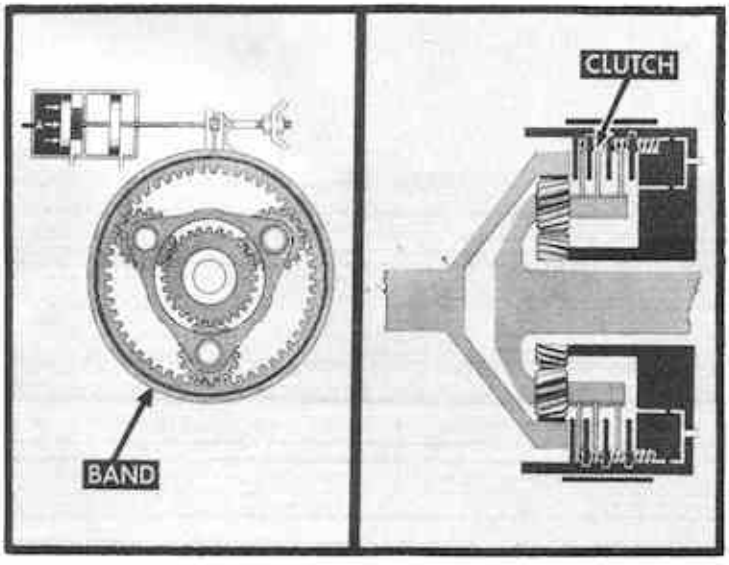
When a hydraulic force greater than the spring pressure is applied at point "A", the piston stem is forced out against the band. This applies the band, and causes the planetary unit to go into reduction or low speed.



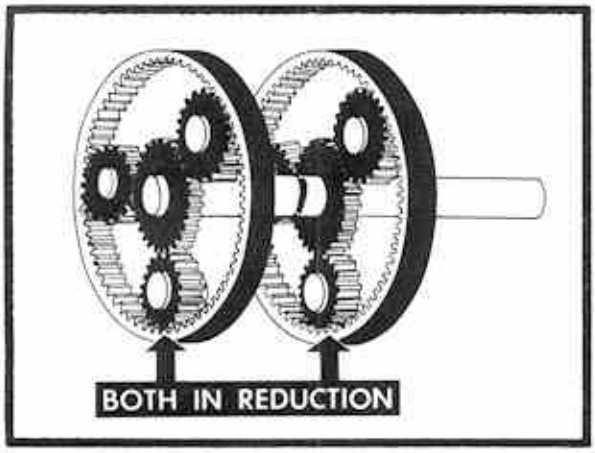
Applying pressure on points "B" and "C" will overcome the pressure on point "A". The pressure, thus applied at two points, and assisted by the spring, moves the piston and stem assembly in the opposite direction, and releases the band. The rear servo, though somewhat different in design, serves the same purpose and operates on the same general principles. Now...



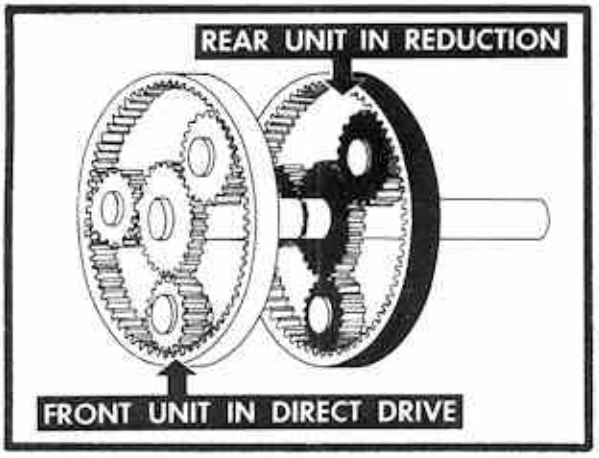
...let's consider clutch application. The clutch is actuated by a piston located in the clutch drum. With no pressure applied to the clutch piston, the clutch is held in released position by its springs. When hydraulic pressure is applied, the piston is forced against the clutch discs, which slide together and lock, causing the planetary unit to go into direct drive or high speed.



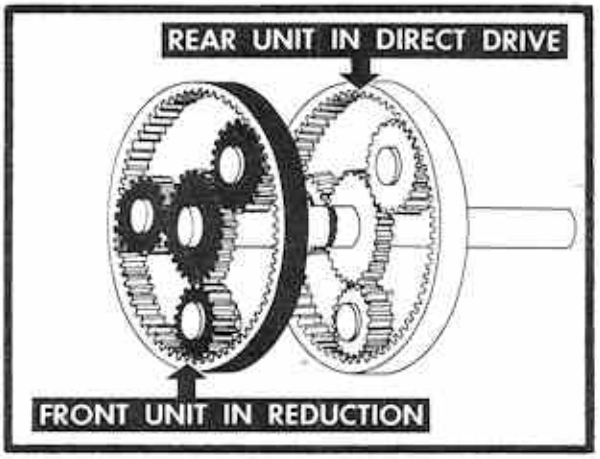
The coordination between band and clutch application plays a major role in smooth upshifts and downshifts. Just how important this is can best be seen by examining how the actions of the front and rear planetaries, and their bands and clutches, must be coordinated to provide the various speeds.



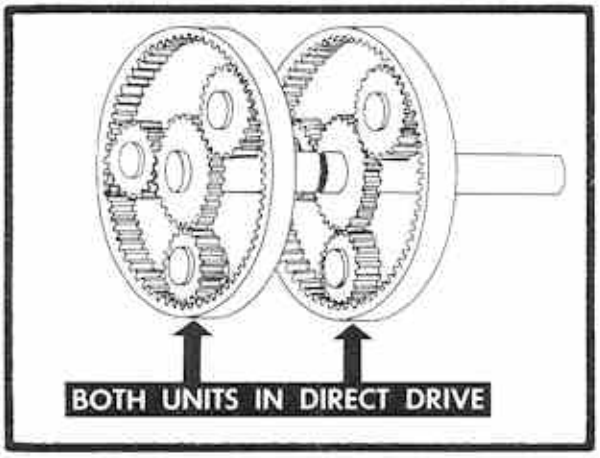
In first speed, both the front and rear planetary units are in reduction.



In second speed, the front unit is in direct drive, and the rear unit is in reduction.



In third speed, the front unit is in reduction, and the rear unit is in direct drive.



In fourth speed, both units are in direct drive. From this, it is obvious that...

HYDRA-MATIC BAND AND CLUTCH APPLICATION

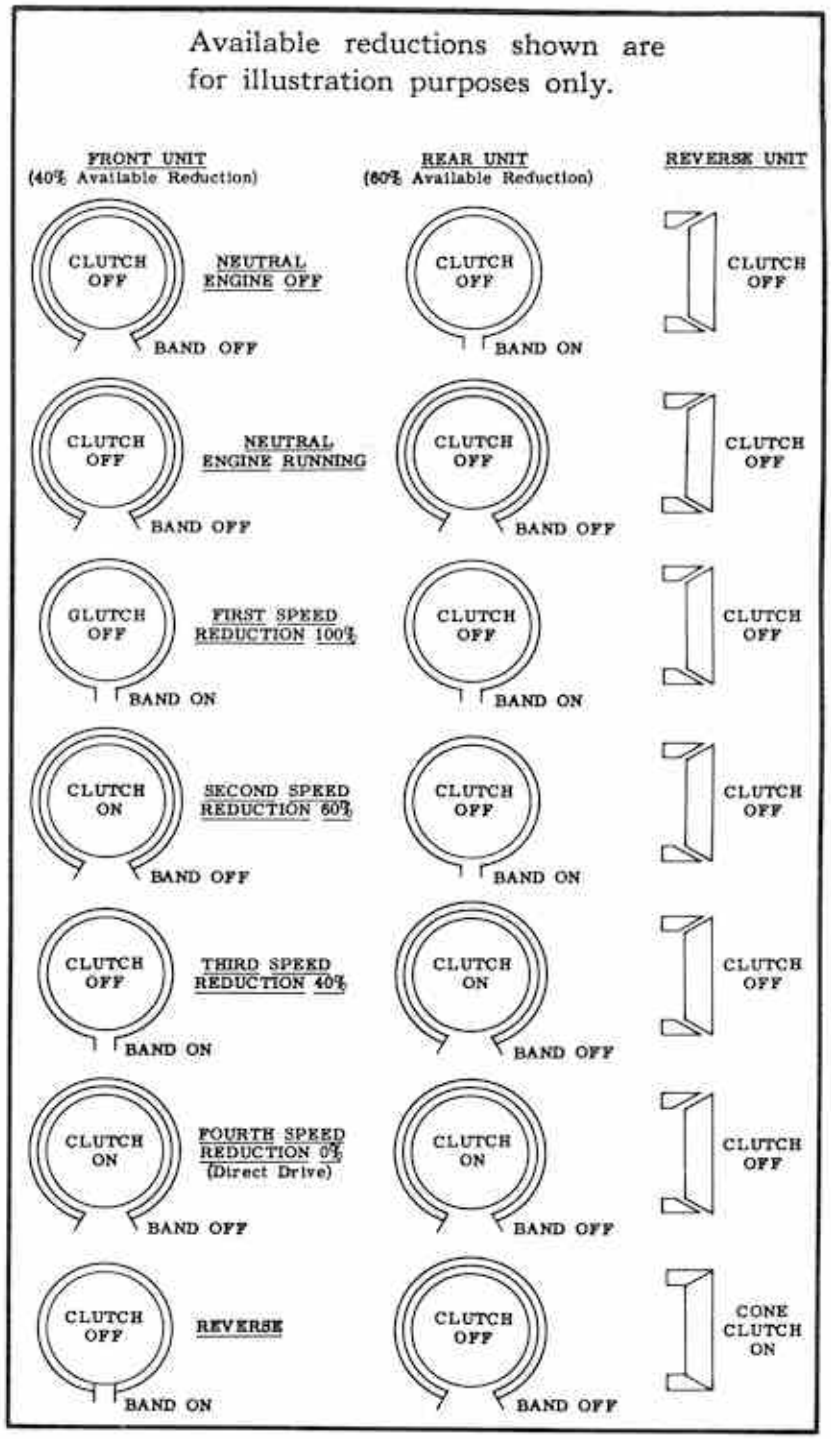
... precisely timed and coordinated action between the bands and clutches in the two planetaries must take place. For example, in neutral, with the engine off, both clutches are off, the front band is off, and the rear band is on.

In neutral, with the engine running, both clutches and both bands are off.

In first speed, both clutches are off, and both bands are on.

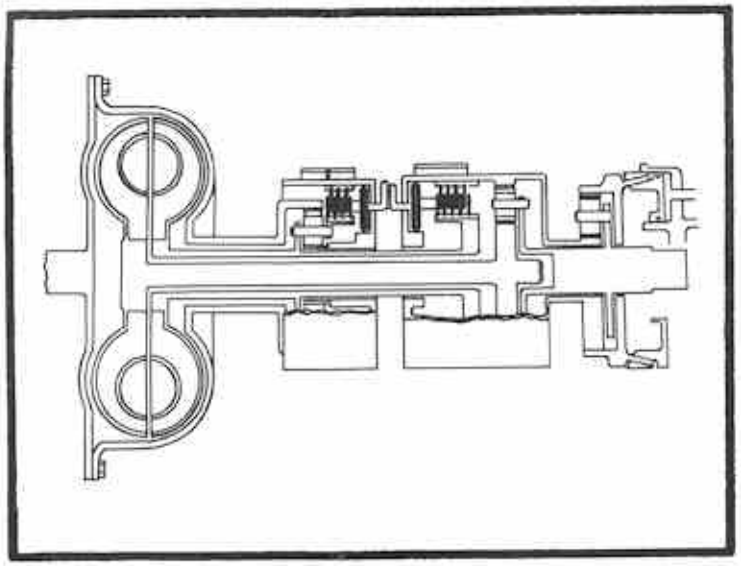
In second speed, the front clutch is on and the front band is off, while the rear clutch is off, and the rear band is on.

In third speed, the front clutch is off, and the front band is on, but the rear clutch is on, and the rear band is off.



In fourth speed, both clutches are on, and both bands are off.

... In reverse, the front clutch is off, and the front band is on, while both the rear clutch and band are off. From this it can be seen that, with different bands and clutches being applied and released with each shift, the need for exact band timing is vital. This is so important that virtually every Hydra-Matic adjustment is dictated by the need for proper band operation. If the bands do not operate properly, rough shifting, slippage, and even serious damage to the transmission can result.



We have only briefly covered the fundamentals of the Hydra-Matic . . . with emphasis on those components which are subject to adjustment.

More detailed information is available in various publications and shop manuals. It is suggested that you study these for a broader understanding.

SECTION TWO

CHECKING AND DIAGNOSIS

THE KEY

Diagnosis is the key to any Hydra-Matic work. Naturally, with experience, it becomes simpler. But, with or without experience, you can never afford to ignore certain steps, which precede diagnosis, or ignore using the diagnosis guide. The diagnosis guide in this book, like any other, cannot provide every answer. But it does provide answers to those problems which occur most frequently. For problems of a more complex or hidden nature, advanced training, or the advice of a specialist, is necessary.

FIRST THINGS FIRST

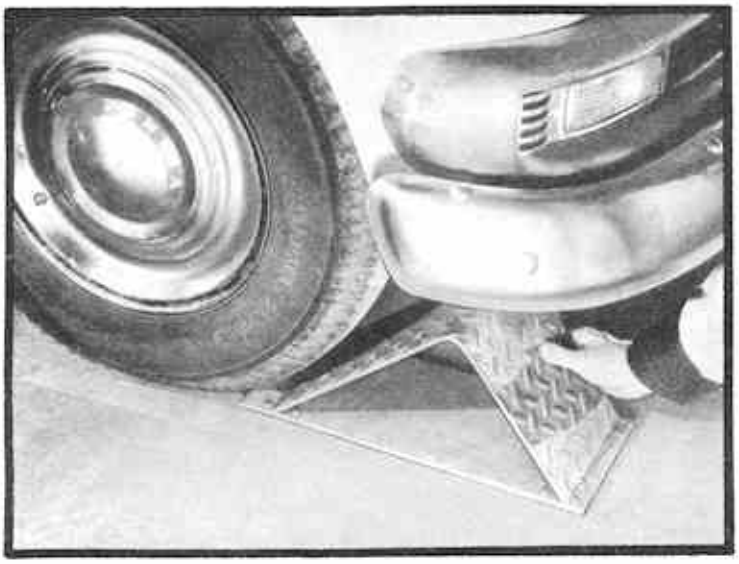
Before attempting any diagnosis or other work, make the five-step check outlined on the next few pages. This will not only help you in making accurate diagnosis, but will eliminate unnecessary work.

I. *Check The Engine* Check the engine to make sure it is not the cause of improper Hydra-Matic operation. Often, what may seem to be Hydra-Matic trouble is actually an engine malfunction. For that reason it is vital to . . .

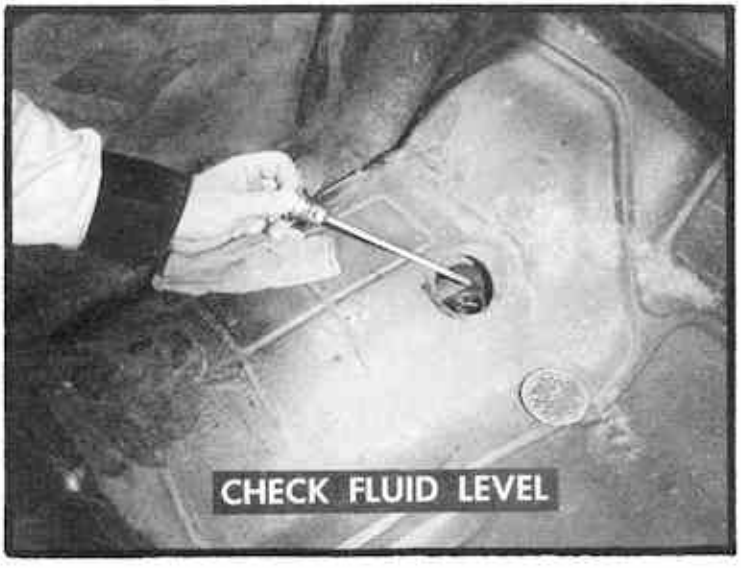
1. Make sure that engine does not stall.
2. That it idles smoothly.
3. That engine idle is set to specifications.
4. That it does not miss, backfire, or hesitate at any RPM range.
5. That it has no mechanical knock, clatter, or unusual noise.

II. *Check The Hydra-Matic Fluid Level*

The fluid level must be exactly at the full mark. Always use the following method to check fluid level, for it is the only way you can insure an accurate reading.



1. Before checking the fluid level, block the wheels and set the hand brake firmly.
2. Set the selector lever in neutral.
3. Run the engine at fast idle for two minutes.
4. Then cut engine speed to slow idle.



5. Remove the dipstick and clean it, then put it back into the filler hole, pull it out and check the reading.

NOTE

On some cars the dipstick is under the hood. On others it is under the front floor pan, and can be reached through the floor-pan access hole to the right of the Hydra-Matic.

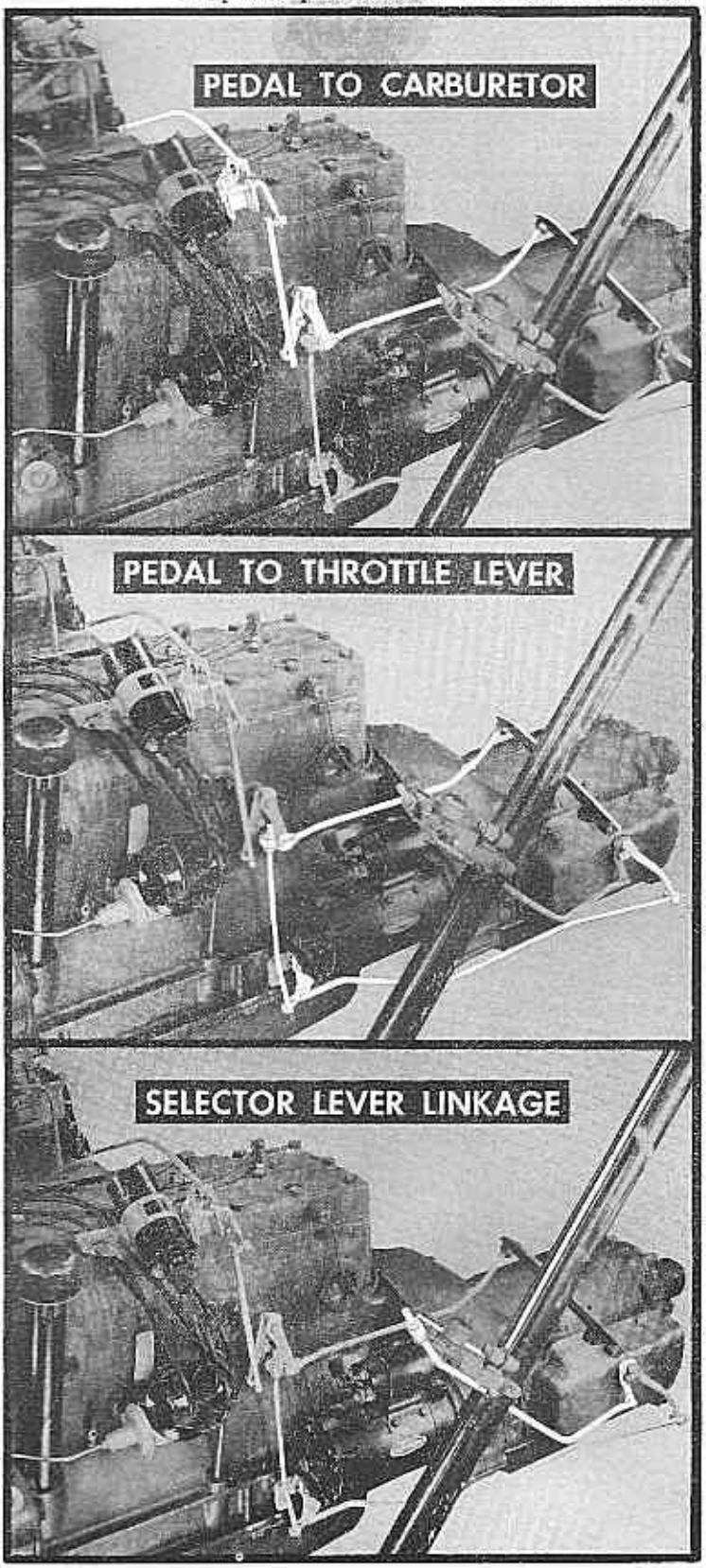
6. If the level is low, fill the transmission to the "F" mark. If the level is over the "F" mark, drain some fluid, and recheck level.

CAUTION

Do not overfill the transmission. This will cause foaming which in turn, causes improper operation and inaccurate oil pressure readings.

III. *Check All Linkage*

Since Hydra-Matic malfunction is often directly caused by the control linkages, it is important that they be checked before making any adjustments or repairs. *With the engine off*, operate and check all pivot points and "movement action" of . . .



1. The linkage running from the accelerator pedal to the carburetor.

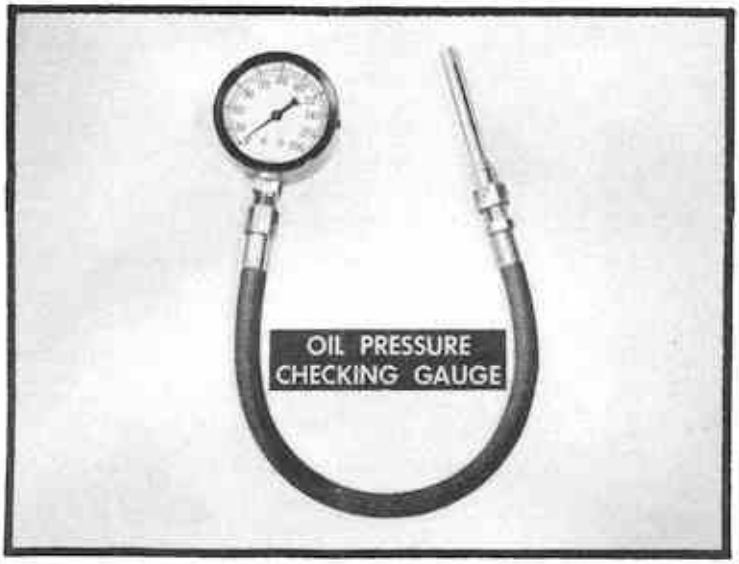
2. The linkage running from the accelerator pedal to the transmission throttle lever.

3. The linkage running from the selector lever to the manual control lever on the transmission.

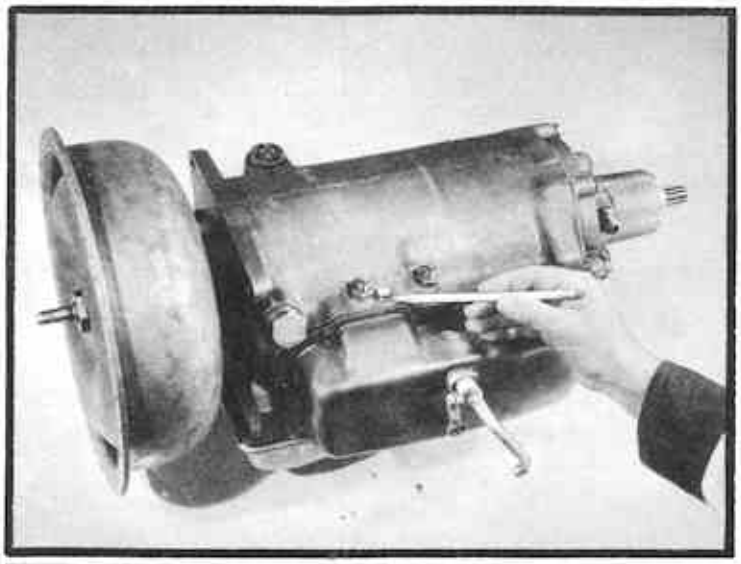
If any of the linkage sticks, binds, or if there are signs of excessive wear, the condition must be corrected or the faulty part replaced.

IV. *Check Oil Pressures*

Checking the oil pressure is one of the most important steps in pinpointing trouble, and it should be made during an actual road test.



This check requires the use of this oil pressure checking gage – No. J 5907



To make the oil pressure check –

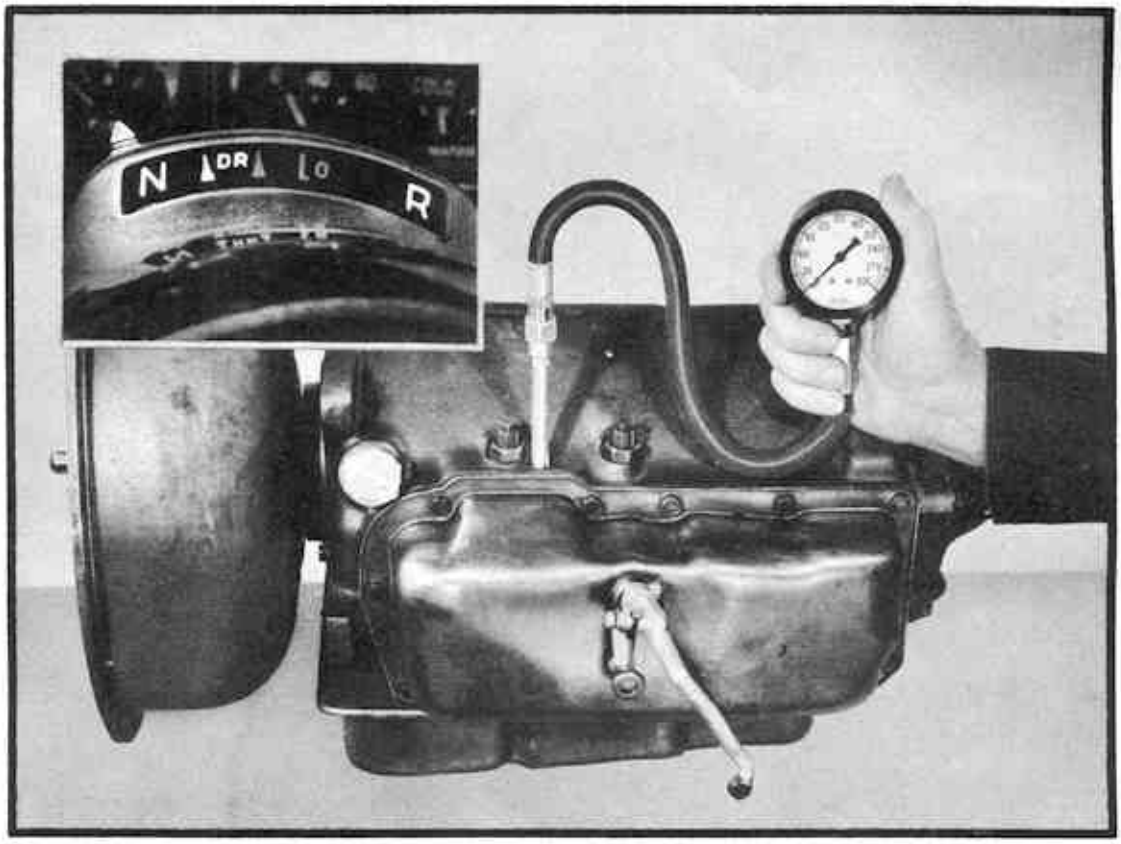
1. First clean off the area around the pipe plug located at the left side of the transmission.

2. Remove the pipe plug, using a 7/16-inch, 6-point socket.

3. Install the oil pressure checking gage.

CAUTION

Tighten the gage adapter securely to prevent leaks. The oil reaches about 200 degrees F. at normal operating temperatures.



4. Then, during the road test, check oil pressures in neutral, reverse and drive 4 at the throttle openings and RPM's given in Chart C, page 70. This chart also lists all required oil pressures.

NOTE

1. If oil pressures are BELOW minimum or OVER maximum shown on Chart C STOP and advise that more extensive work than external adjustment is required to insure proper operation of the Hydra-Matic and give normal "life" to the unit.

2. Oil pressures may vary in Drive Ranges 3 and 4, or right and left, but should not exceed 10 PSI variation.

3. A quick check of the Rear Pump (the Hydra-Matic unit has 2 pumps) may be made by driving the automobile at 20-25 MPH. Move the selector lever to "N" position. Turn the ignition key off. Then place the selector lever in Drive position. Turn the ignition key *on*. If the engine starts, it means that the rear pump is operating properly, since the rear pump in this test is doing all the work of producing enough oil pressure in the system to operate the shift valves and direct oil pressure to the bands and clutches.

V. *Check For Excessive Oil Leakage*

Any visible Hydra-Matic oil leakage should be corrected to prevent malfunction and serious damage to the internal units. It might be necessary to wipe off the areas being checked to pin-point the location of a leak. (See the oil leak chart on page 22.) The four points which most commonly show signs of leakage are at—

1. THE OIL PAN DRAIN PLUG

To correct this...

A. Remove the drain plug, and drain the bottom pan.

B. Remove the plug gasket, if damaged or worn.

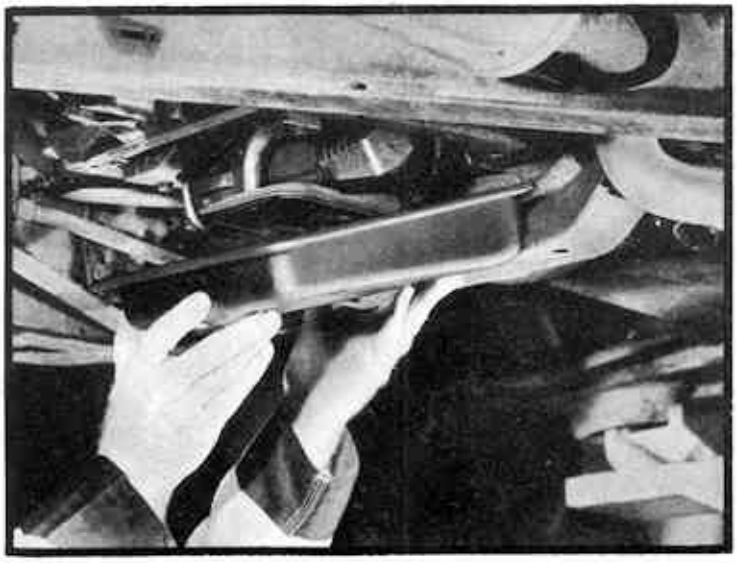
C. Inspect the pan and plug for nicks and burrs. Correct as necessary.

D. If you have to replace the drain plug gasket, soak the new drain plug gasket in water until it is pliable.

E. Install the gasket on the plug.

F. Install the drain plug, and tighten it firmly.

G. Fill the transmission and recheck fluid level as described on pages 16 and 50.



2. THE BOTTOM OIL PAN

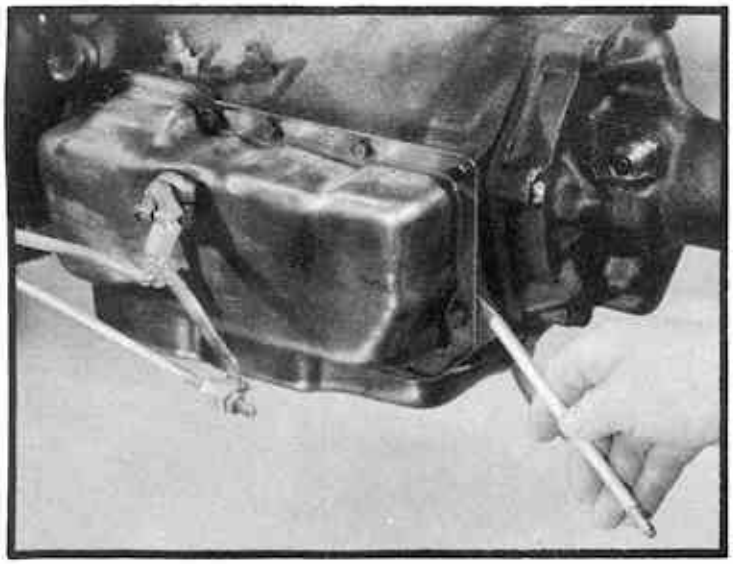
To correct this...

A. Drain the pan, and remove it.

B. Scrape the mating surfaces of the pan and case clean.

C. Install the pan, using a new gasket and light grease to hold it in place. Torque the bolts 10 to 13 foot pounds.

D. Add fluid, and check its level as described on pages 16 and 50.



3. THE SIDE PAN

To correct this...

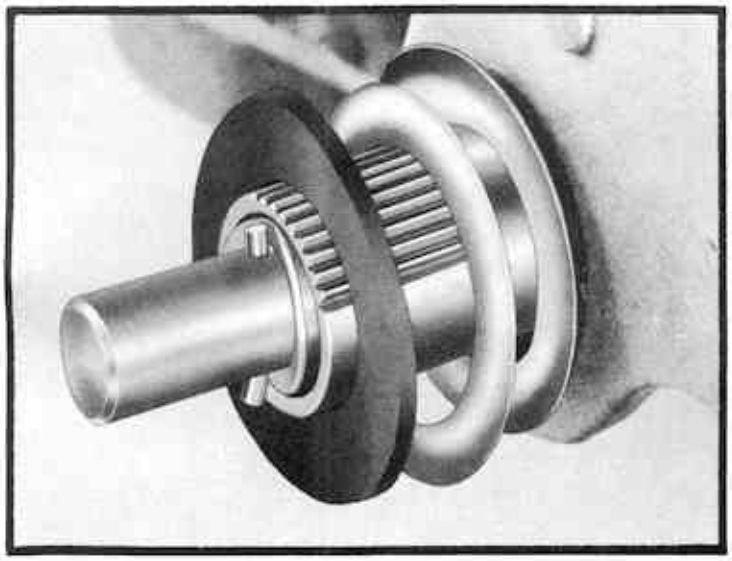
A. Disconnect the linkage from the manual and throttle control levers.

B. Remove both levers.

C. Drain the bottom oil pan.

D. Remove the side pan.

E. Scrape the mating surfaces of the side pan and case clean.

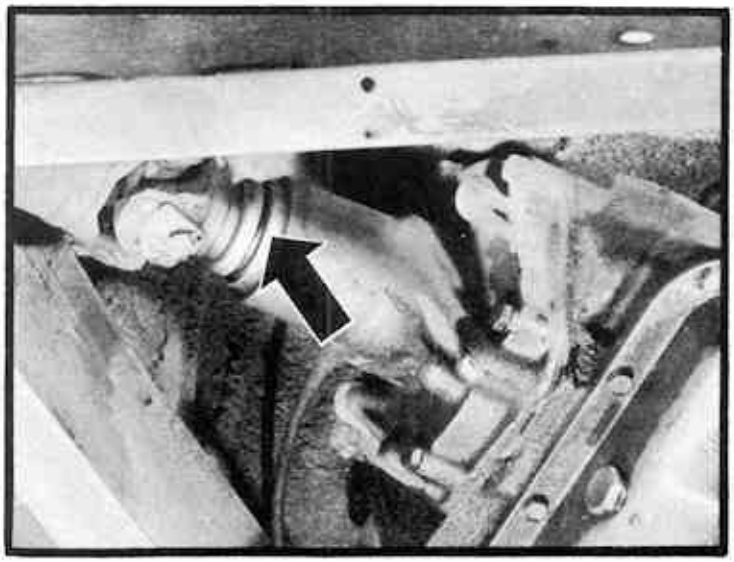


F. Make sure the neoprene seal and its two metal washers are in place on the control shaft.

G. Install the side pan, using a new gasket. Torque the bolts 10 to 12 foot pounds.

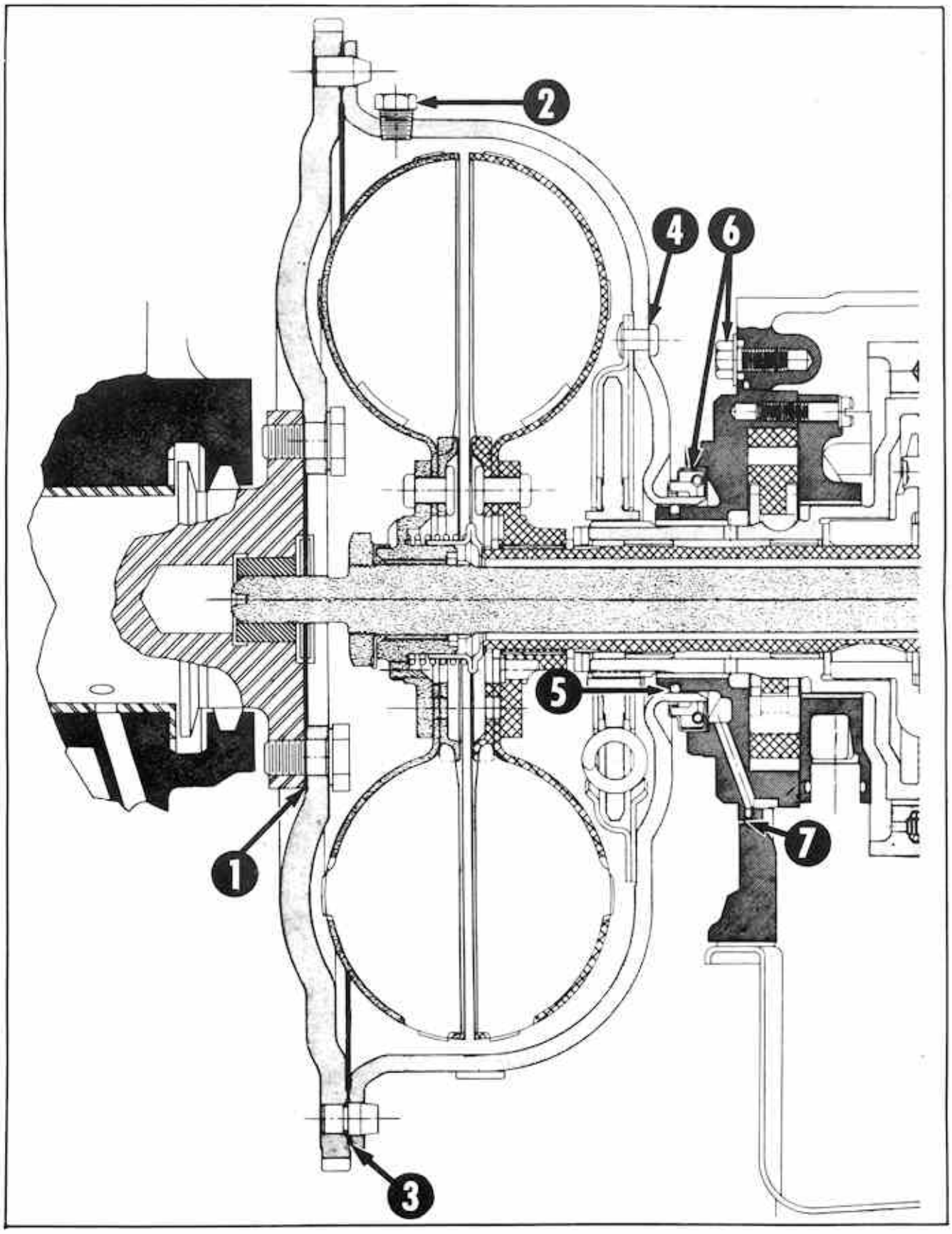
H. Install the manual and throttle control levers.

I. Connect the linkage to the levers.



4. THE REAR BEARING OIL SEAL

To correct this install a new seal as described on page 45 .


2
4
6
5
1
7
3

OIL LEAKS

(Illustration on facing page)

POSSIBLE POINTS OF OIL LEAKS	POSSIBLE CAUSE
1. Front Face of flywheel.	a. Crankshaft to flywheel flange gasket, or bolts. b. Rear main bearing.
2. Oil around drain plug and inside of bell housing in line with plug.	a. Loose torus cover drain plug.
3. Oil on transmission side of flywheel starter gear teeth and inside of bell housing in line with torus cover gasket.	a. Torus cover to flywheel bolts not torqued to specifications. b. Damaged torus cover to flywheel gasket.
4. Oil on torus cover streaked radially outward.	a. Pin hole in torus cover (rare). b. Loose torus cover dampener rivet (rare).
5. Oil on torus cover and inside of bell housing in line with front oil seal.	a. Broken oil seal rings in front pump or excessive ring groove wear in torus neck I. D. b. Too much run out at torus cover neck (.005″ maximum). c. Damaged front oil seal.
6. Oil on torus cover and/or front face of the transmission case and inside of bell housing.	a. Porus or cracked front pump cover. b. Loose fit or poor seal of front oil seal in pump cover. c. Front pump cover attaching screws not torqued to specifications.
7. Oil on front face of transmission case.	a. Front pump cover not sealing in case. Caused by insufficient chamfer at pump bore in case, or missing "O" Ring. b. Cracked or porus transmission case front face.

After making the five-step check of the engine, fluid level, linkage, oil pressure, and excessive oil leakage, and correcting any conditions uncovered by the checks, use the diagnosis guide on the following pages to discover the source of trouble and possible corrections. The operations shown in the guide should be checked in the order listed. This can prevent major repair work where a simple minor repair could correct the malfunction.

HYDRA-MATIC DIAGNOSIS GUIDE

CONDITION	HIGH	LOW	ROUGH	SLIPS	MISSES
UPSHIFTS	B1-B3-G1-G3-I1 I2-I3-I5	B2-B3-G1-G2-G3 I2-I3-I5-K4	B1-B2-B3-C1-E1 C2-G1-G2-K9-L3 L9-Q1-Q4-R1-R4	B2-B3-C1-E1-C2 G1-G2-K1-L1-S1 Q1-R1-K10-K11 K2-L2-L3-L9-S2 S3	G1-H1-I1-I2-N1 S1
1ST SPEED				B2-B3-C1-C2-E1 G1-G2-K1-K11 L1-L9-S2	I1-I4-I5-G1-K4 K11-Q3-S2
1-2 SHIFT	SAME AS UPSHIFTS	SAME AS UPSHIFTS	SAME AS UPSHIFTS	L2-K2-S1-Q1-S2 S3-Q2-Q4-K1-G1 G2-L9	I1-I4-I5-G1-G2 G4-G5-K2-K3-L2 Q2-S1-S2
2ND SPEED				SAME AS SLIPS 1-2 UPSHIFT	SAME AS MISSES 1-2 UPSHIFT
2-3 SHIFT	SAME AS UPSHIFTS	SAME AS UPSHIFTS	SAME AS UPSHIFTS	B2-C1-E1-C2-G1 G2-K1-K6-K10 L3-S1-R1-R2 S2-S3-L9	G1-K4-K11-S2 Q3
3RD SPEED				SAME AS SLIPS IN 1ST SPEED	SAME AS MISSES 2-3 UPSHIFT
3-4 SHIFT	SAME AS UPSHIFTS	SAME AS UPSHIFTS	SAME AS UPSHIFTS	G2-K2-S1-Q1-S2 S3	SAME AS MISSES 1-2 UPSHIFT
4TH SPEED				SAME AS SLIPS 1-2 UPSHIFT	SAME AS MISSES 1-2 UPSHIFT
FORCED 4-3			C1-E1-G1-K7	K3-K4-K5-K10	B2-B3-G1-Q3
FORCED 3-2				G1-G2-G4-L2-L9 K2-K9-Q1-Q2-Q4	B2-B3-G1
CLOSED THROTTLE 3-2 or 3-1			A-B1-C1-L3-L4 L5-L9-G1-G2		

MALFUNCTIONS	POSSIBLE CAUSES
No reverse – Slips	D-E2-F1-G5-I4-J1-N2-S2-K4
Locks up in reverse (light throttle or coast)	D-E2-L3-J1
Jumps out of reverse	D
Selector won't go into "R"	(Eng. Run) I1-I5-M1-I4-D (Eng. Off) H2-D
Clashes when shifting to "R" 51-55	A-E1-H3
Will shift into "R" above 12 MPH 51-55	H4
Will not lock in "R" Eng. Off 51-55	H4
No Drive after shifting from "R"	N3
No Drive when Engine is first started	O1-P2
No Drive	D-E1-F2-G5-S2-J1-P1-C3
Slips in Dr. normal start in Lo.	I1-I5-G1-M1
Slips intermittently in all Ranges	E1-F2-J1-K3-P1-G1-G2
Slips in Dr. 3 on Coast	K8
Trans. shifts or hunts vehicle not moving	S2-I4
Rough Shifting Neutral to Dr.	A-B1-C1-E1-G1
Slow Band Apply – Shifting Neutral to Dr.	C1-K9-L6-L7-L8
Unable to Drive Engine by Push or Tow	M2

LEGEND

A. Engine Idle	H. Parking Brake Bracket	N. Reverse Unit
B. Throttle Linkage	I. Governor	O. Torus Members
C. Servo Bands	J. Line Exhaust Valve	P. Front Pump
D. Shift Linkage	K. Front Servo	Q. Front Unit
E. Oil Pressure	L. Rear Servo	R. Rear Unit
F. Pressure Regulator	M. Rear Pump	S. Transmission Case & Misc.
G. Control Valve Assembly		

*A —Engine Idle.
*B1 —Throttle linkage too short.
*B2 —Throttle linkage too long.
*B3 —Outer throttle lever bent.
*B4 —Throttle linkage binding.
*C1 —Bands should be adjusted externally to factory specifications. Occasionally a transmission may be encountered that will not take a good external adjustment. If a transmission with normal pressure shifts roughly after a linkage and external band adjustment, the bands should be adjusted internally.
*C2 —Adjust bands by the internal method.
C3 —A broken front band will cause loss of drive in all positions except where second speed start is normal. A broken rear band will cause loss of drive in all positions except reverse.
*D —Adjust manual linkage.
*E1 —Check line pressure in all ranges. See manual for test procedure and specifications. Watch pressure thru complete shift pattern.
*E2 —Check line pressure in reverse. Excessive pressure loss may be caused by missing or mispositioned pressure regulator reverse oil pipe, or reverse clutch pipe.
F1 —Pressure loss in reverse may be caused by the reverse booster plug missing or sticking in the pressure regulator assembly.
F2 —Pressure regulator sticking will cause loss of or extremely high pressures — remove regulator valve and run engine at idle speed not over 30 seconds to flush circuit.
G1 —Valves sticking in control valve assembly.
G2 —Internal leak in control valve assembly — possible loose screws or mating surfaces require lapping.
G3 —Incorrect model valve body assembled to transmission.
G4 —Passages not machined in control valve assembly.
G5 —Improperly assembled control valve assembly.
H1 —Oil passage leak in parking brake bracket (possibly missing plug) check with air pressure.
H2 —Reverse blocker piston sticking in parking brake bracket.
H3 —Parking pawl actuating crank bent on parking brake bracket.
H4 —Parking blocker piston sticking.
I1 —Valves sticking in governor or improper valve travel.
I2 —Governor oil delivery pipe leaking at connections.
I3 —Incorrect model governor assembled to transmission.
I4 —Internal leak in governor.
I5 —Broken governor ring.
J —Line exhaust valve sticking or leaking. The line exhaust valve is located in the case under the front servo on 1952 models and in the front servo valve body on 1953-1955 models.
K1 —Compensator leak in front servo, between case and servo, or at rear servo compensator pipe connection. Check for leak with air pressure.
K2 —Leak in front servo release passage. Check with air pressure.
K3 —4-3 downshift valve retainer spring out of place (models through 1952).
K4 —Leak between front servo valve body and front servo (1953-1955 models).
K5 —Front servo by pass apply passage not drilled through servo body (1953-1955 models).
K6 —4-3 downshift valve stuck in closed position.
K7 —4-3 downshift valve stuck in open position.
K8 —Over-run control valve sticking.
K9 —Front Servo Apply Piston sticking.
K10—Misalignment of front servo sleeve to servo body.
K11—Leak in front Servo apply passage.
L1 —Compensator passage leak in rear servo. Check with air pressure.
L2 —Leak in 1-2 Oil passage to exhaust valve in rear servo (1953-1955 models).
L3 —Leak in rear servo release passage. Check release passage with air pres-

*Procedures for these repairs are the only ones covered in the instructions of this book. Corrections for other conditions require that mechanics making them have advanced training.

sure with servo mounted on case. Make certain servo applies and releases freely without tendency to stick or chatter.

L4 —Broken or misalined rear servo check valve.

L5 —Rear servo exhaust valve sticking open (possibly caused by misaligned gasket).

L6 —Rear servo sticking when applying.

L7 —Rear servo check valve misaligned or orifice hole undersize.

L8 —On 1953-1955 models rear servo exhaust valve sticking closed would retard servo application.

L9 —Oil passages not drilled or interconnected in servo body and or accumulator body. Check with air pressure. Refer to manual for identification of passages.

M1 —Governor drive flange off position or rear pump mispositioning governor in parking brake bracket.

M2 —Rear pump inoperative.

N1 —Steel locating ball missing from bronze rear pump drive gear allowing gear to slip on reverse carrier. Condition may only be apparent when transmission is hot, allowing bronze gear to expand.

N2 —Leaking reverse piston seals will allow slipping and pressure loss in reverse.

N3 —Reverse cone sticking will result in no forward drive after reverse application. Free up and burnish in cone by driving car as described in manual.

O1 —Torus check valve sticking or damaged. Refer to manual for checking excessive drain back after engine is shut off.

P1 —Slide sticking (Vane Type Pump) will cause intermittent low and high pressures or complete loss of pressure (1952-1955).

P2 —Front pump relief valve (on 1X type pump — 1946 through 1951 models) sticking open will allow rapid torus cover drain back when engine is shut off.

Q1 —Incorrect number of clutch plates, release springs or wrong annular piston in front unit.

Q2 —Front unit annular piston seals or expanders damaged.

Q3 —Gear set failure locking front unit in direct drive.

Q4 —Annular piston sticking in front unit.

R1 —Incorrect number of clutch plates, release springs or wrong annular piston in rear unit.

R2 —Rear unit annular piston seals or expanders damaged.

R3 —Annular piston sticking in rear unit.

S1 —Loose bearing cap bolts in case allowing leak between oil delivery sleeve and cap. Check for leak at this point by applying air pressure to front and rear clutch apply passages in case after removing valve body. If a leak exists with cap bolts at recommended torque, dress down cap to provide snugger fit to oil delivery sleeve.

S2 —Oil passages not drilled or interconnected in case. Remove valve body and air check all case passages. Refer to manual for identification of case passages.

S3 —Broken ring — oil delivery sleeve.

NOISE

OCCURS UNDER FOLLOWING CONDITIONS	POSSIBLE CAUSE
Neutral and all gears whenever engine is running	Front Oil Pump
Neutral, 1st and 2nd Gears Only	Rear Unit Planetary Gears
Neutral, 1st, 3rd, and Reverse Gear Only	Front Unit Planetary Gears
Reverse Gear, Acceleration Only	Reverse Unit Planetary Gears
Reverse Gear, Deceleration Only	Rear Unit Planetary Gears
Metallic Scraping at Front of Transmission	Excessive End Play Torus members
Constant and Loud Flutter in Pressure Regulator Valve	Front Servo Oil Hole Plug Missing Front Pump Suction Pipe Loose or Seal Damaged

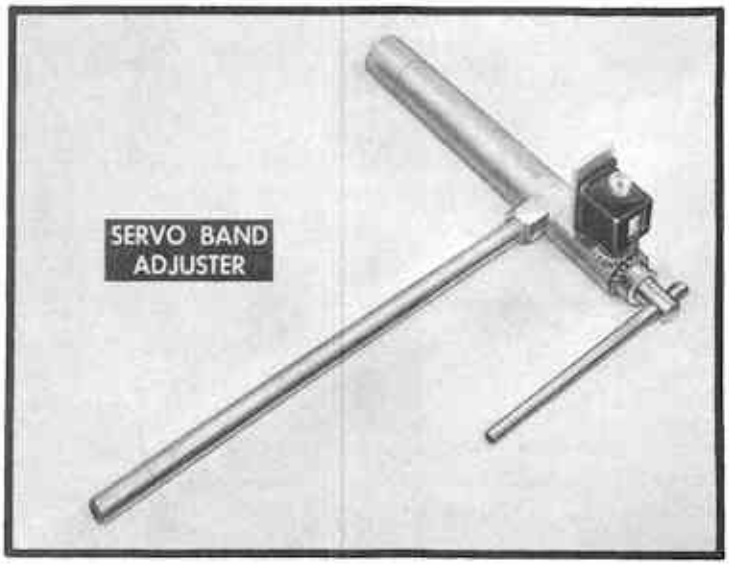
SECTION THREE

ON-THE-CAR SERVICE AND ADJUSTMENT INSTRUCTIONS

AN ESSENTIAL POINT

The following instructions, as well as all that have preceded, are a sound starting point in Hydra-Matic work. Your own powers of observation are the best supplement to the instructions covered here. For instance, in any book, it would be impossible to cover every possible variation that exists in linkages, installation, and access arrangements for every model and make of car in which the Hydra-Matic is used. Wherever such variations have an important bearing on the work, they are pointed out. In cases, where they are basically unimportant, they are not pointed out, since, we are sure, your own common sense will tell you what to do. So, draw from your own experience a knowledge of the variations, and also make every effort to obtain manufacturers' shop manuals. Only in this way will you gain full knowledge of the Hydra-Matic — and become familiar with *all* the variations.

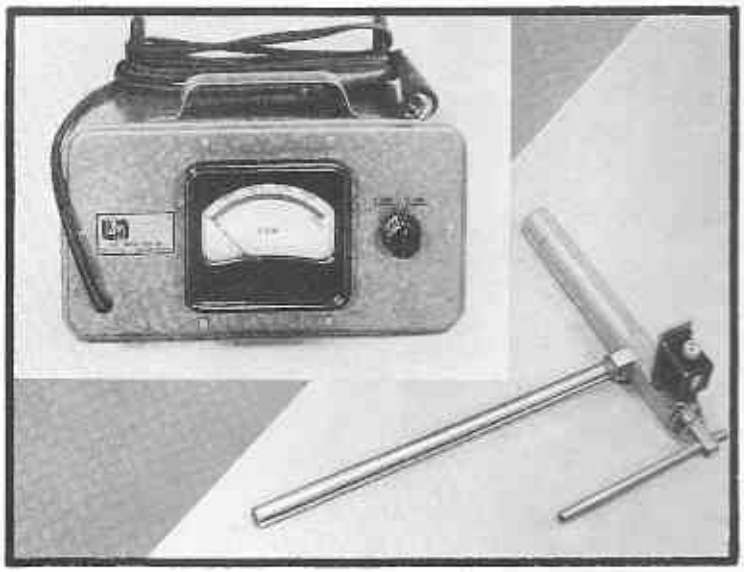
I. EXTERNAL FRONT BAND ADJUSTMENT



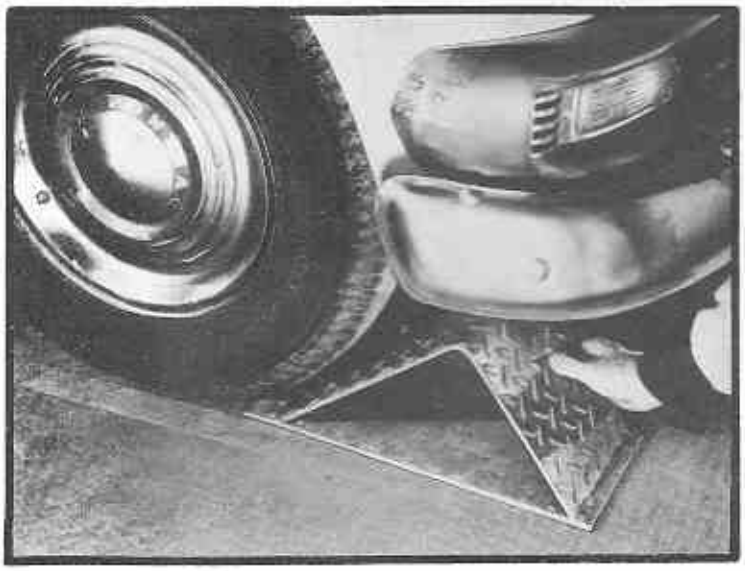
External front band adjustment requires the use of this tool — the servo band adjuster — No. J 2681-C.

NOTE

Check the tool application Chart on Page 72 for correct year and model usage of J 2681-C. 1954 and 1955 Oldsmobile and 1955 Pontiac have no external adjustment nut for front band. J 1693-B must be used on these two models. The adjustment nut for the front band of these models is located on the front servo body and is exposed when the bottom pan is dropped.

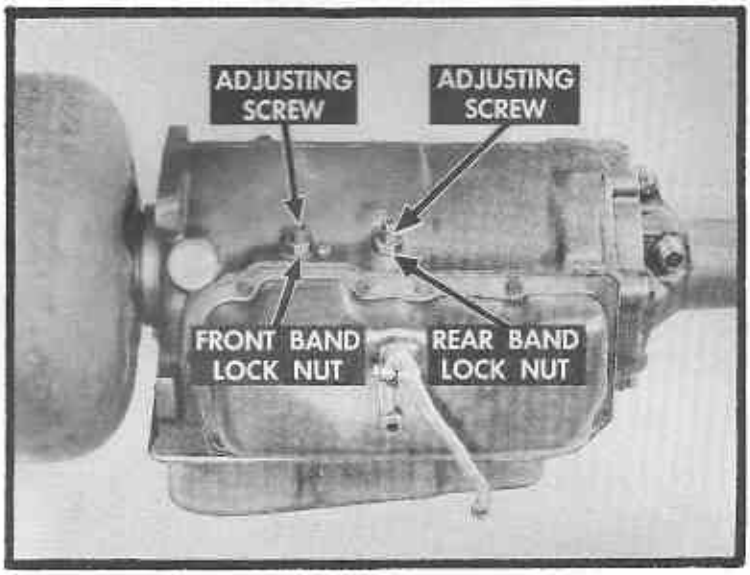


A tachometer is also required to provide accurate engine-speed readings, which are absolutely necessary in making external band adjustments.



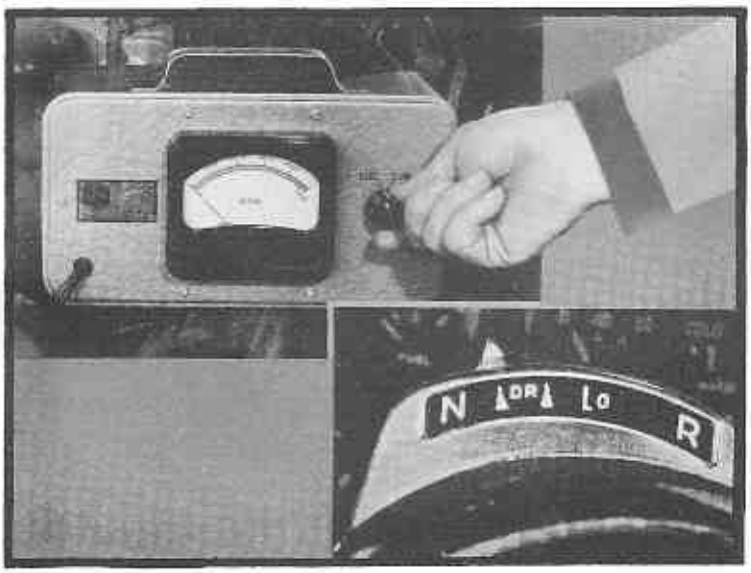
1. Block the wheels and set the brakes.

2. On cars so equipped, remove the plate, which covers the access hole in the front floor pan. This plate is located to the left of the Hydra-Matic. On cars, which do not have access holes, front band adjustment must be made by the internal method, described on page 36.



NOTE

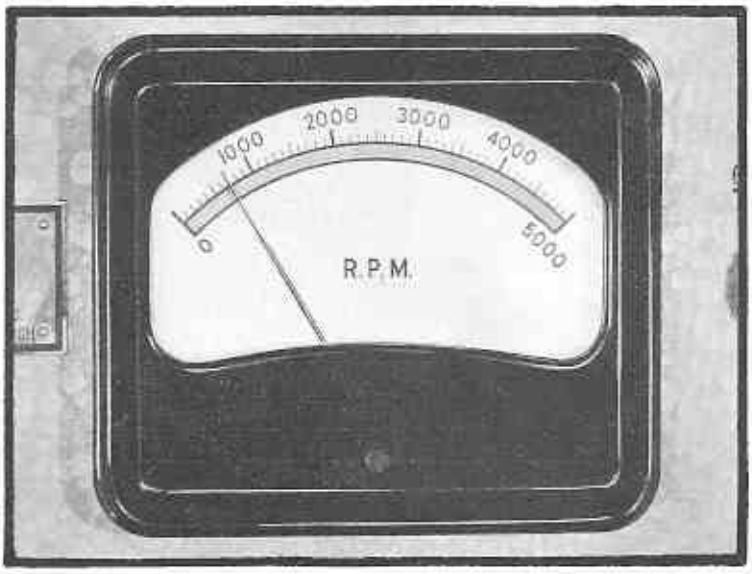
In actual practice, external front band adjustment is made through the access hole, but for purposes of clarity we will show the details with the transmission completely exposed. Both the front and rear bands can be adjusted through their respective adjusting screws, which are secured by lock nuts. The front band adjusting screw is the one nearest the engine.



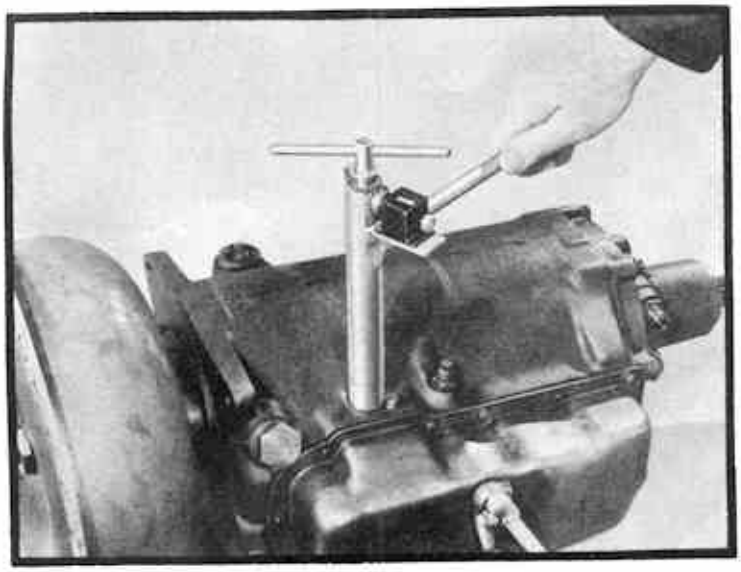
3. After removing the access plate, warm up the engine in neutral range.
4. Connect the tach, and set it for proper operation on either an 8-cylinder or 6-cylinder engine.
5. Then set the selector lever in drive range.

CAUTION

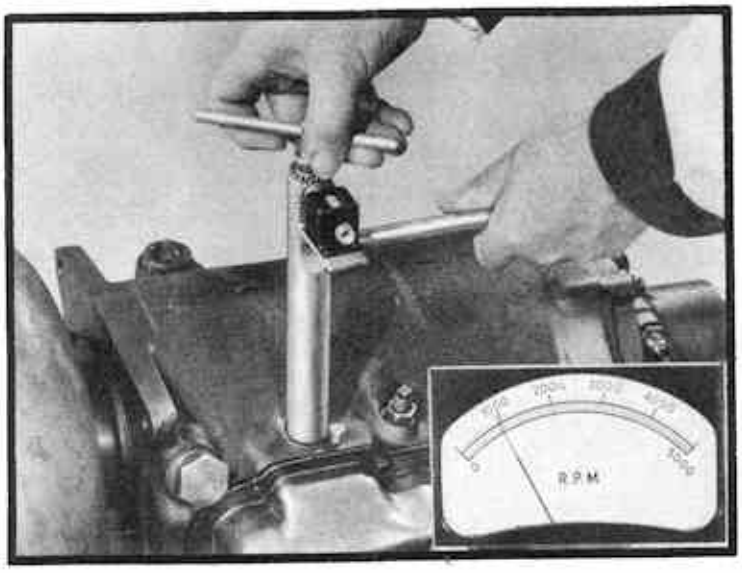
All cars, Hydra-Matic equipped, are to be in "D" range when adjusting the bands with J 2681-C *EXCEPT* 1950-51 Oldsmobile. For 1950-51 Oldsmobile, position the selector lever in LO range.



6. Now, adjust the carburetor idle speed screw until an engine speed of 700 RPM is indicated on the tach.



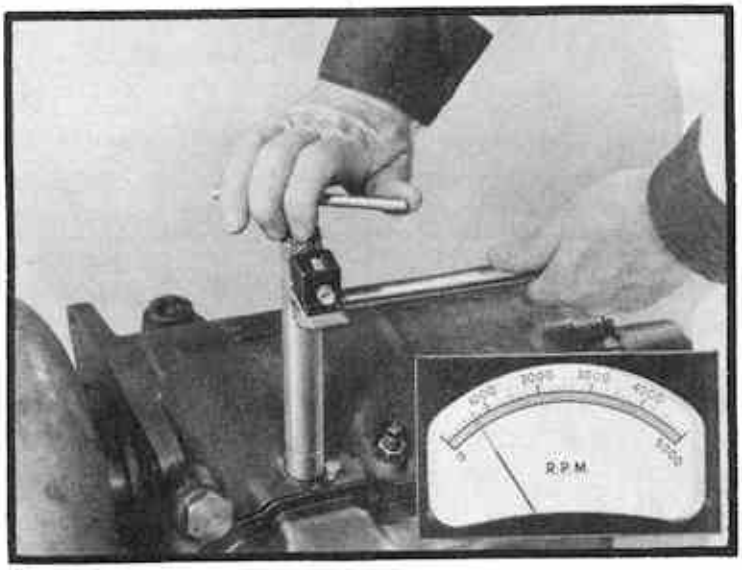
7. Then using the band adjusting tool, loosen the front band adjusting screw lock nut by turning it counterclockwise with the long handle of the tool.



8. Next, turn the adjusting screw counterclockwise with the short handle, until the engine speed hits 900 to 1,000 RPM. The drum of the front planetary unit is now spinning freely.

CAUTION

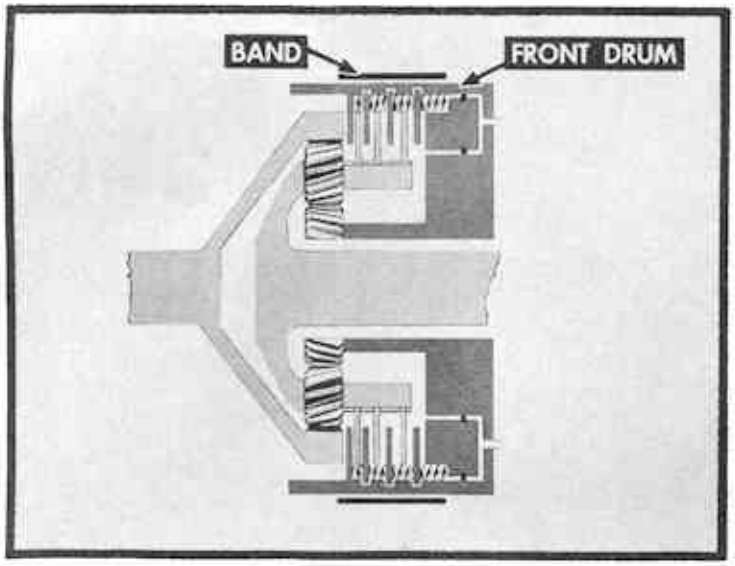
If engine speed *does not* increase, internal inspection and adjustment of the bands is necessary. (See pages 36 and 42.)



9. Now, slowly turn the adjusting screw clockwise until engine speed drops to 700 RPM.

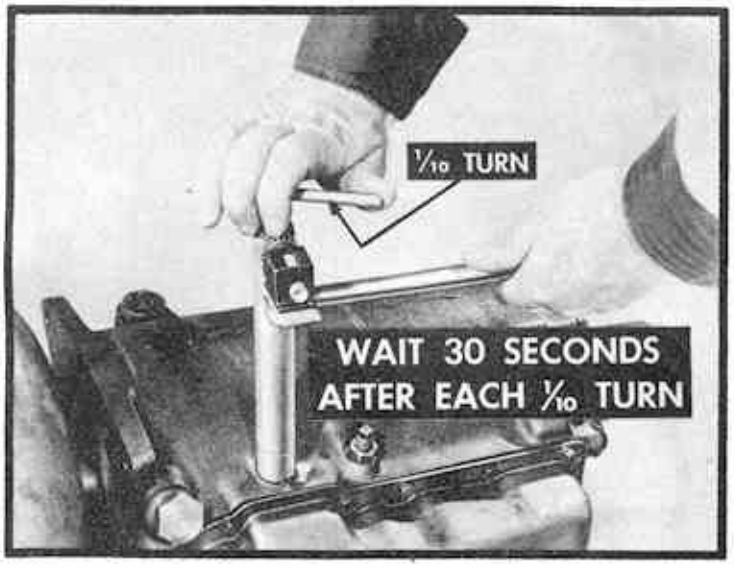
10. Again, slowly turn the screw counterclockwise until engine speed increases.

11. Then turn the screw clockwise until engine speed drops to 700 RPM.

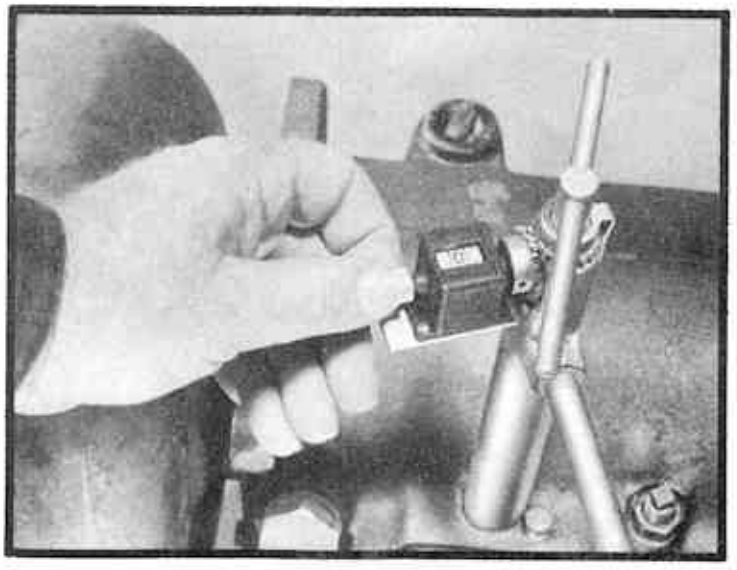


NOTES

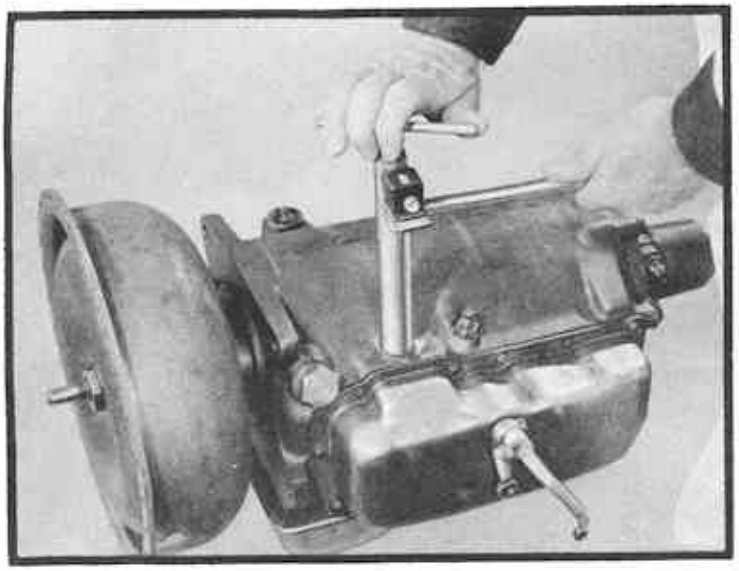
The adjusting screw is turned back and forth to locate the exact point at which the band grabs the front drum and keeps it from turning. The various engine speeds indicate when the band is taking hold or releasing.



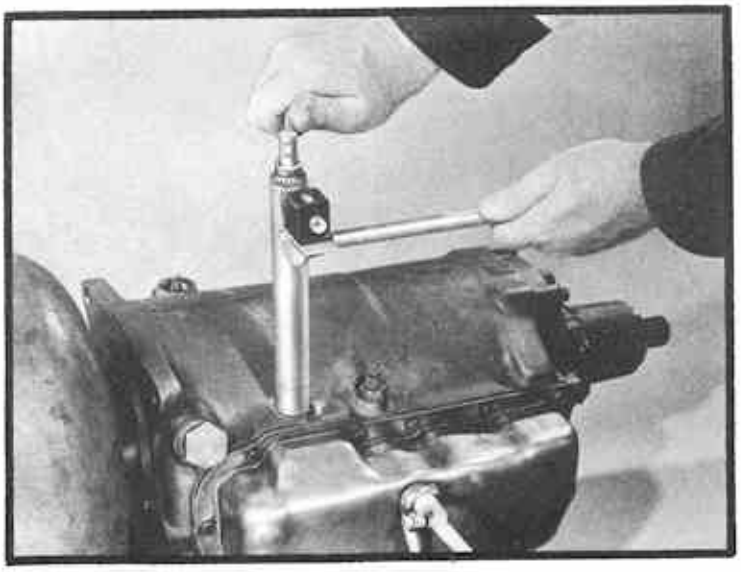
12. Wait 30 seconds with the engine running at 700 RPM.
13. If engine speed increases *at all*, turn the screw clockwise 1/10 turn as indicated by the tool counter.
14. If necessary, continue to make 1/10 turns until the engine speed stays at 700 RPM for at least 30 seconds. This indicates that the front drum is being held stationary.



15. Without removing the tool, or moving the handles, set the counter on the band adjuster to zero.

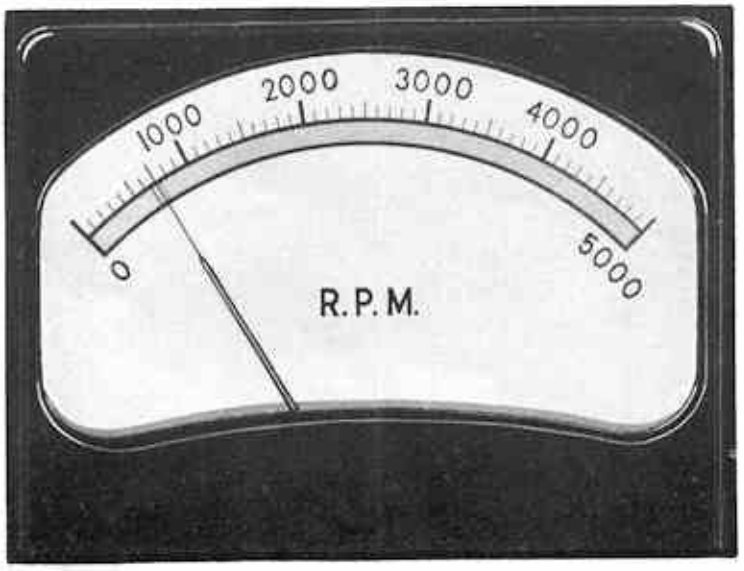


16. Then hold the lock nut with the long handle of the tool, and turn the adjusting screw clockwise with the short handle until the counter reads exactly 6.5 or 7.7 — depending on the car. Refer to Chart "A" on page 69.



17. After this final setting, tighten the lock nut with the long handle. While doing this hold the adjusting screw in its final setting with the short handle.

18. Torque the lock nut 40 to 50 foot pounds.



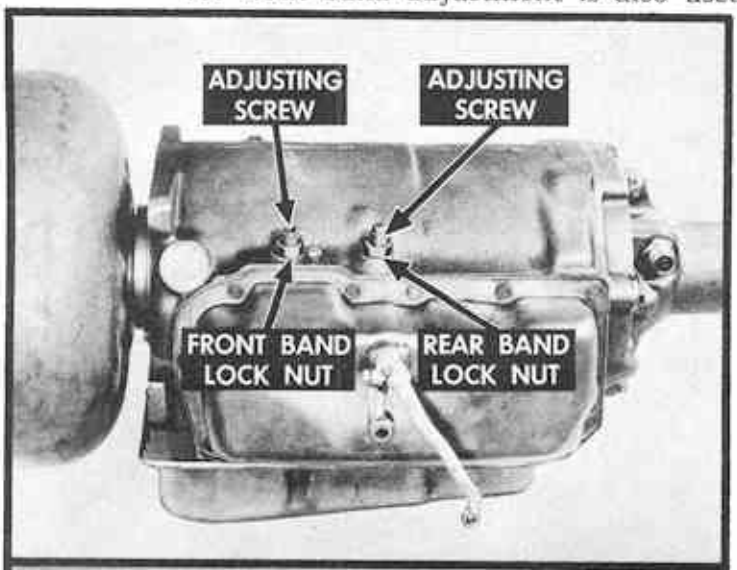
19. As the last step, recheck the tach reading, which should be 700 RPM.

NOTE

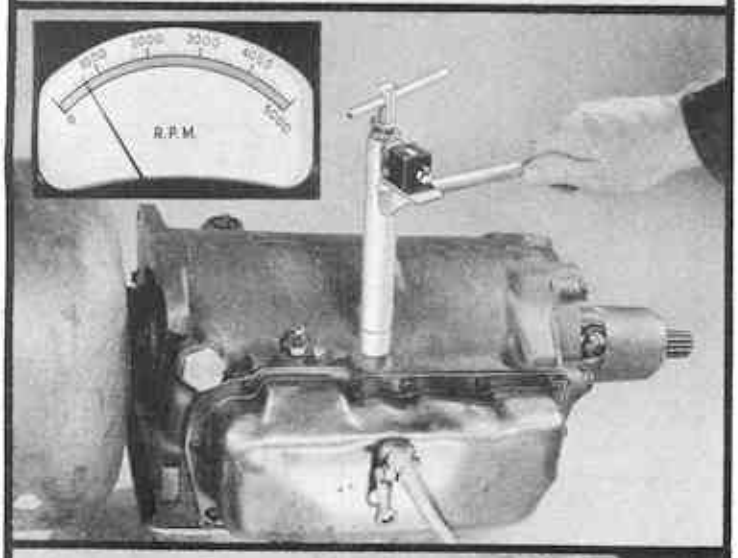
After the front band is adjusted, the rear band should be adjusted.

II. EXTERNAL REAR BAND ADJUSTMENT

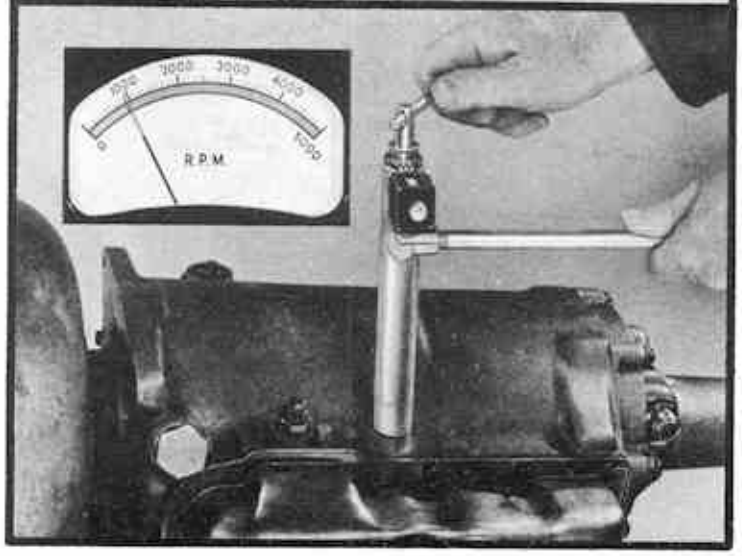
With the access plate removed, the tach hooked up, and the engine still running, make the rear band adjustment. Procedures for this are much the same as for front band adjustment. The tool used for front band adjustment is also used for rear band adjustment.



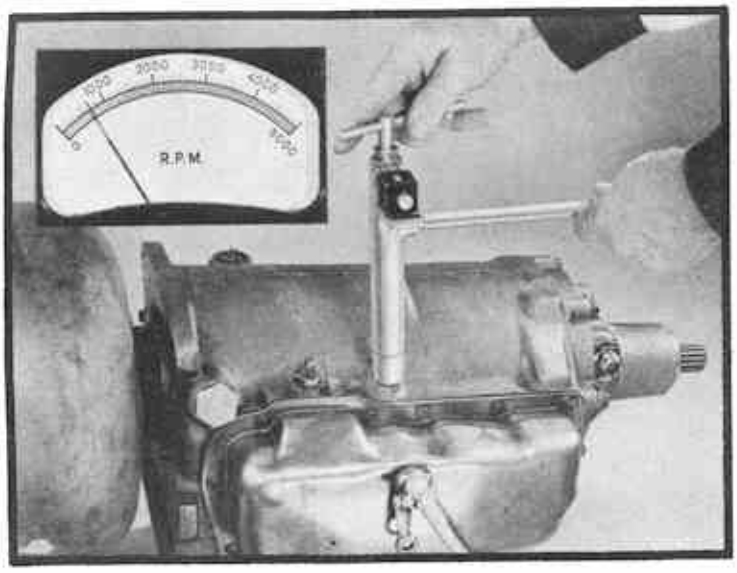
The rear band adjusting screw and its lock nut are immediately behind the front band adjusting screw.



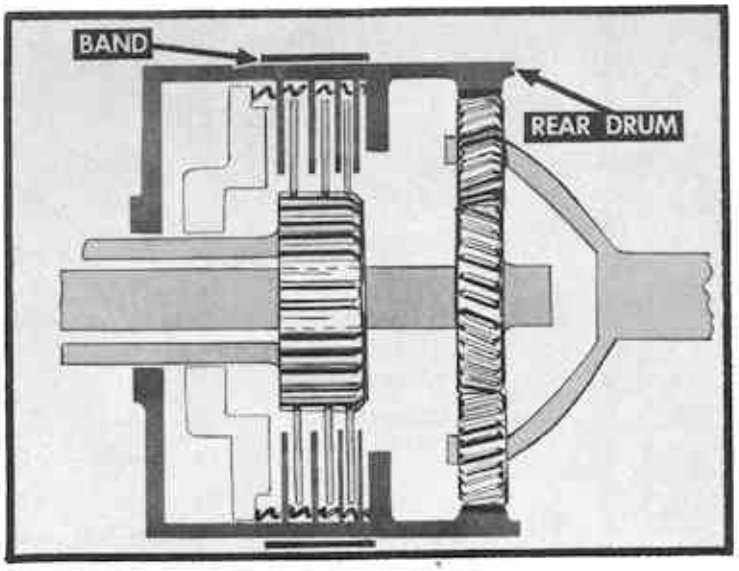
1. With the engine still running (in drive range) at 700 RPM, loosen the rear band adjusting screw lock nut by turning it counterclockwise.



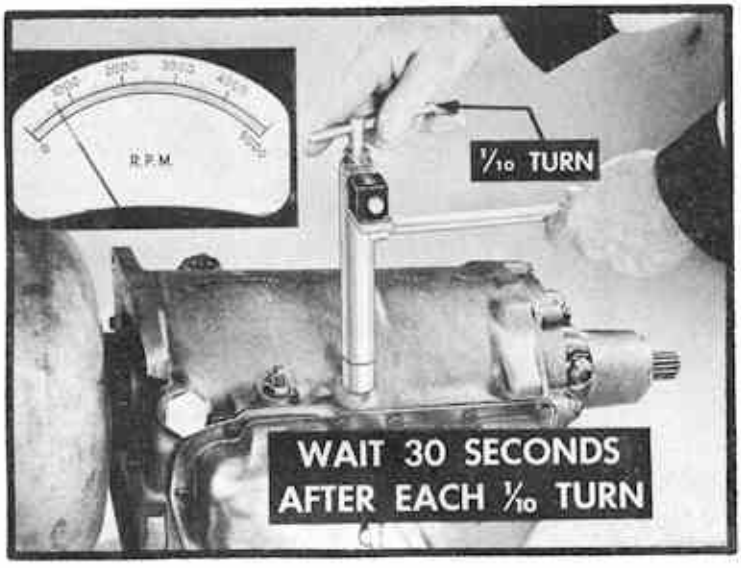
2. Then turn the adjusting screw counterclockwise until the engine speed hits 900 to 1,000 RPM. The drum of the rear planetary unit is now spinning freely.



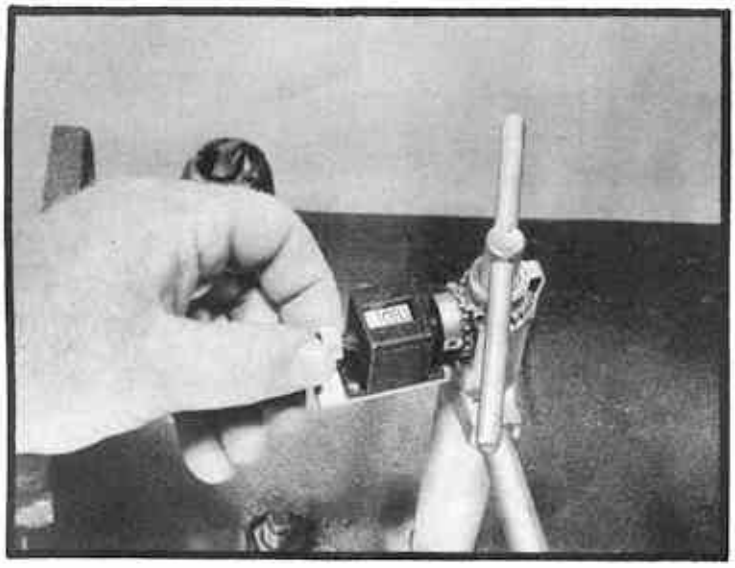
3. Now, slowly turn the adjusting screw clockwise until engine speed drops to 700 RPM.
4. Then, slowly turn the screw counter-clockwise until engine speed increases.
5. Next, turn the screw clockwise until engine speed drops to 700 RPM.



The rear band adjusting screw is turned back and forth to locate the exact point at which the band grabs the rear drum and keeps it from turning.

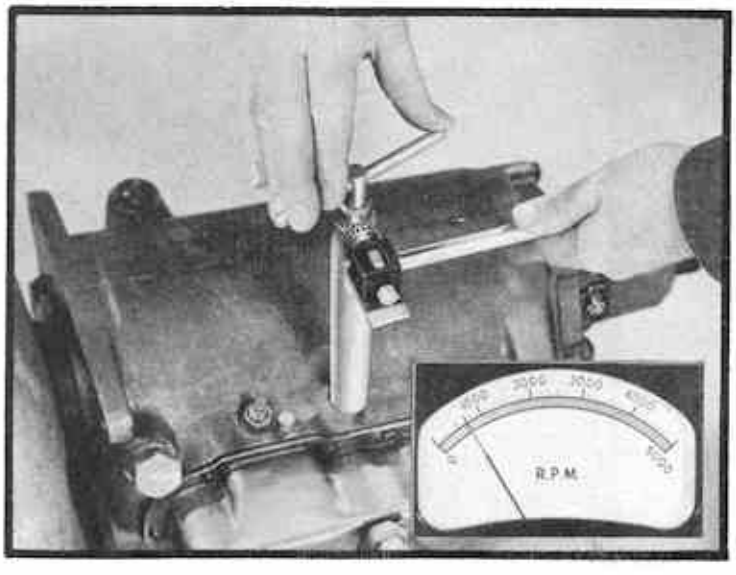


6. Wait 30 seconds with the engine running at 700 RPM.
7. If engine speed increases *at all*, turn the screw clockwise 1/10 turn.
8. If necessary, continue making 1/10 turns until engine speed stays at 700 RPM for at least 30 seconds. This indicates that the rear drum is being held stationary.



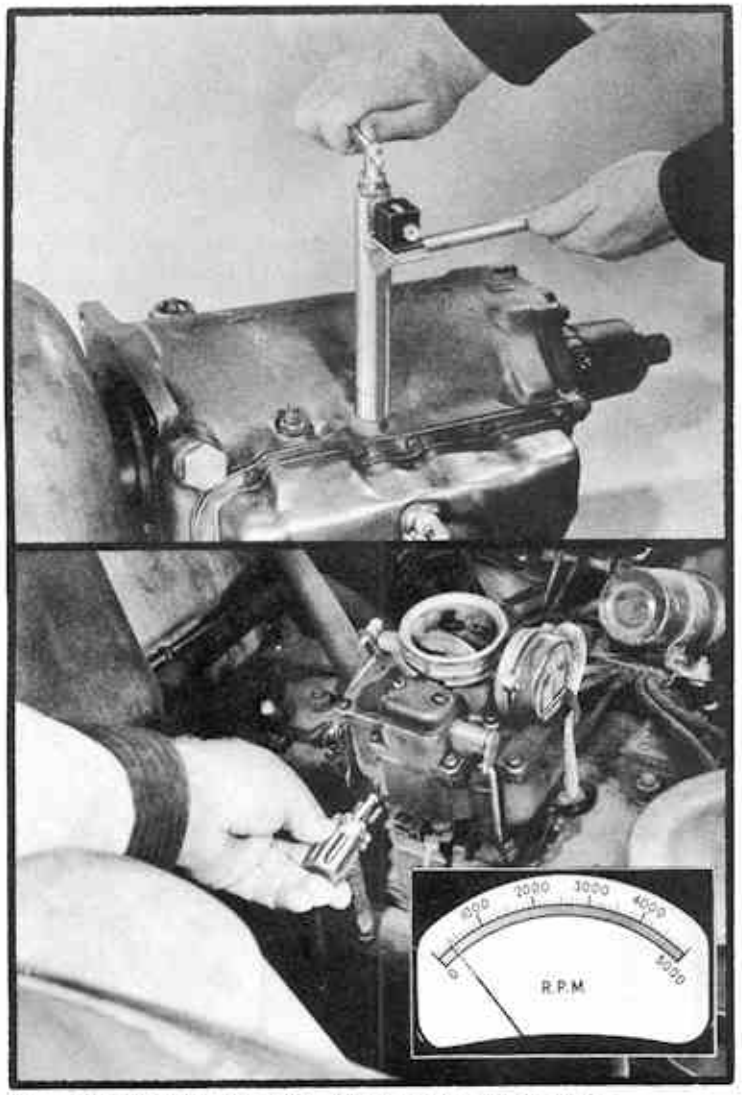
9. Without removing the tool, or moving the handles, set the counter on the band adjuster to zero.

10. In making the final rear band adjustment, set the selector lever in neutral. This makes it much easier to turn the adjustment screw for the final setting.



11. Then turn the adjustment screw clockwise exactly 2 turns.

12. Now, place the selector lever in drive, and check the engine speed, which should be 700 RPM. This is the final setting.



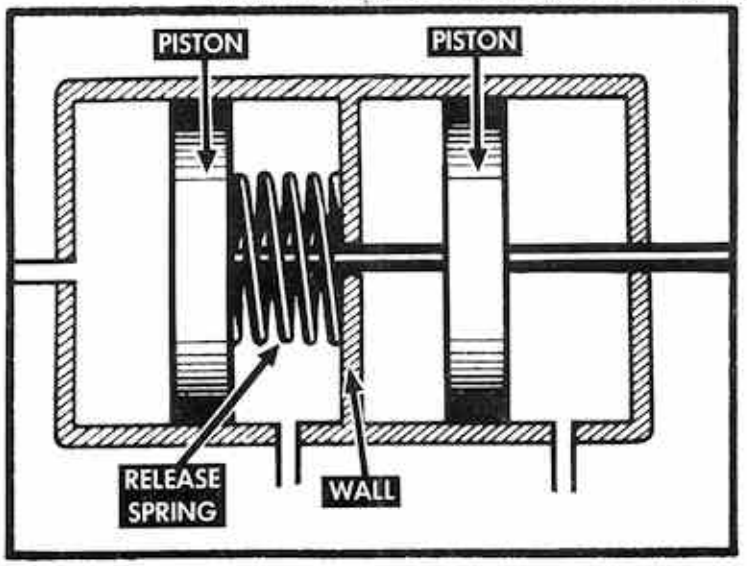
13. Now, tighten the lock nut, making sure to hold the adjusting screw in its final setting.

14. Torque the lock nut to 40 to 50 foot pounds.

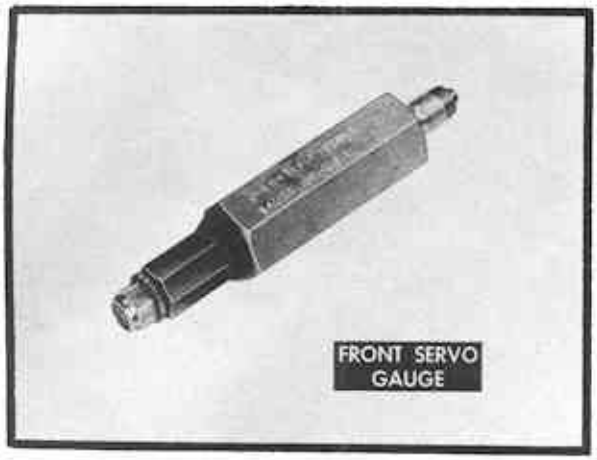
15. Then reset the engine to specified idle with the selector lever in neutral, and button the job up.

III. INTERNAL FRONT BAND ADJUSTMENT

The internal method of adjusting the front band is done on some cars, which provide no means of external adjustment, or when it is better, and more efficient, to make front and rear band adjustments with the transmission oil pan removed.



In making the front band adjustment inside the Hydra-Matic, it's necessary to actuate the front servo piston. For that reason . . .



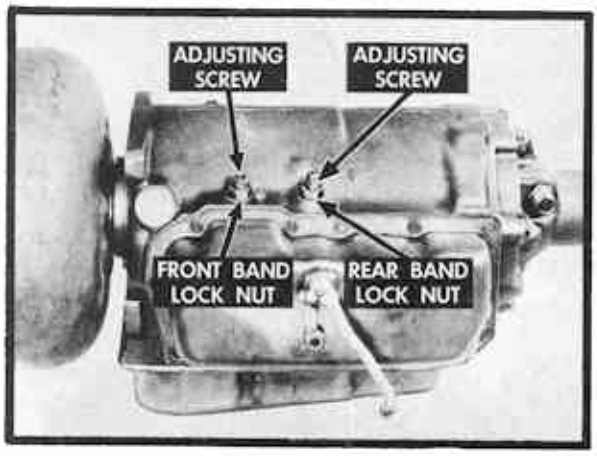
...this tool – the front servo gauge (No. J 1693-B) is required. The first step in the internal method of front band adjustment is to...

1. Drain the bottom oil pan.

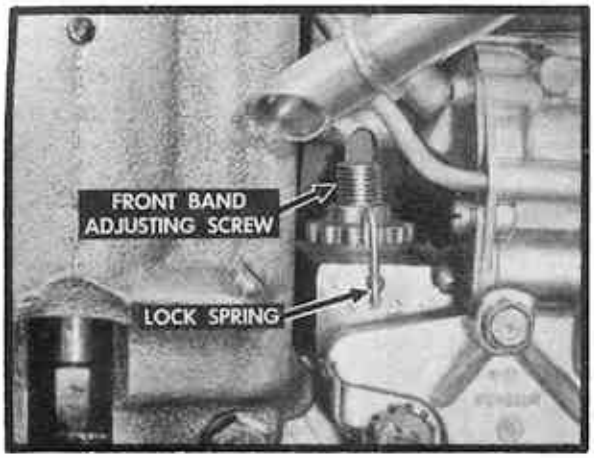
NOTE

This drains only the pan – not the entire transmission.

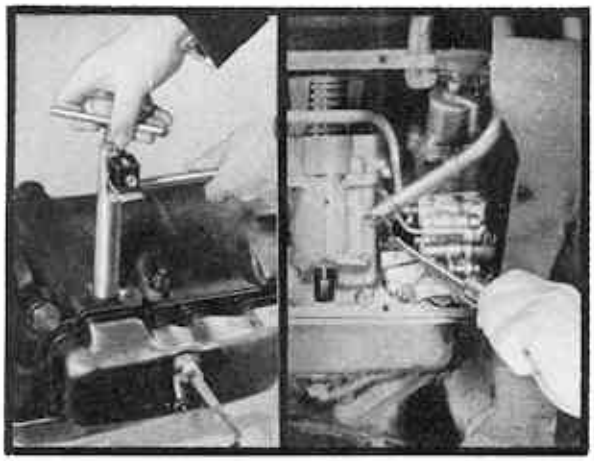
2. Then remove the oil pan.



3. Next, loosen the front band adjusting screw lock nut on those transmissions which have the external adjusting screw.



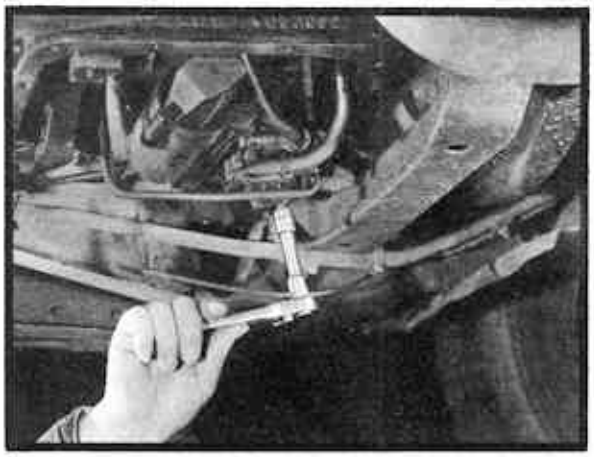
4. In transmissions, which have the adjusting screw located inside the transmission case, remove the lock spring.



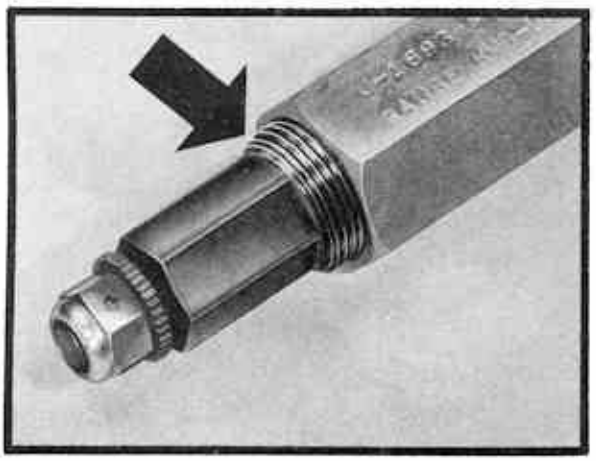
5. Then back off the front band adjusting screw about five turns.

NOTE

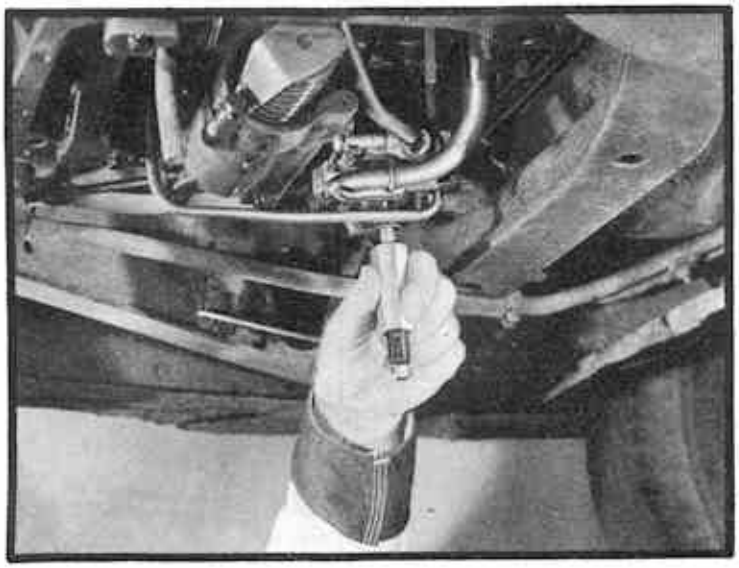
1. Where the screw is external it is reached through the access hole in the front floor, and the servo band adjusting tool can be used.
2. Where the front band adjusting screw is located internally, it is necessary to use a screwdriver.



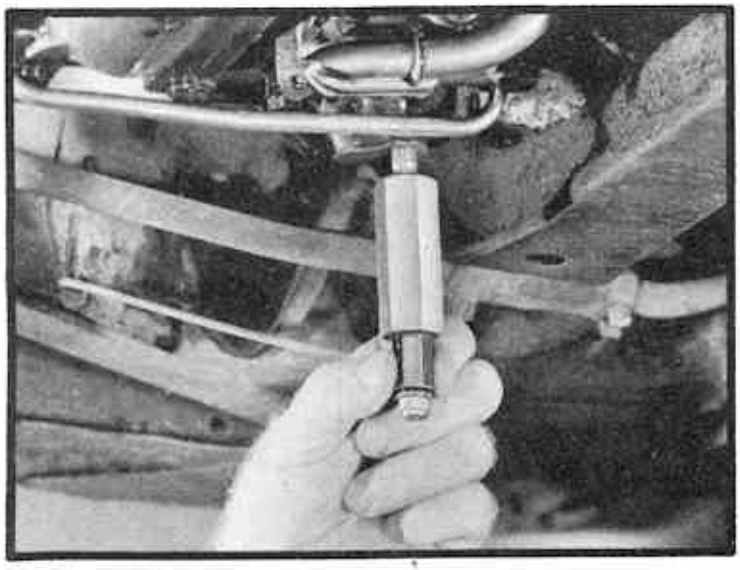
6. Then remove the pipe plug from the front servo, using a 7/16, 6-point socket.



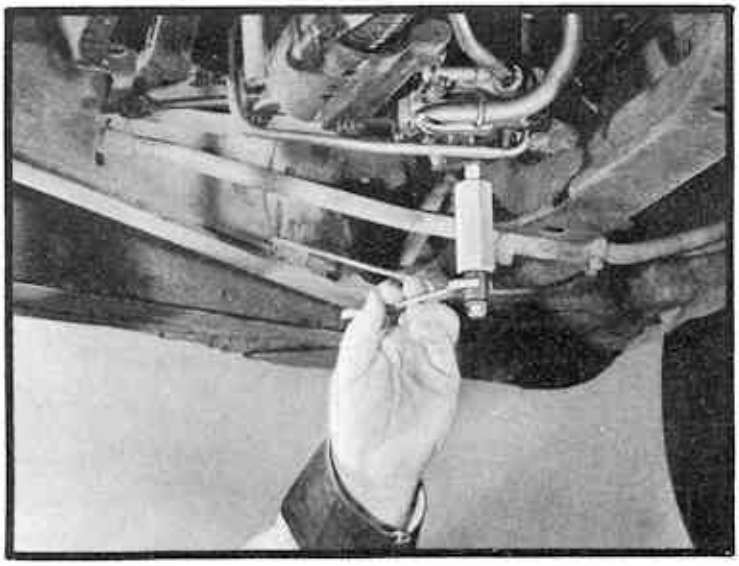
7. Next, loosen the hex adjusting screw of the front servo gauge until about ⅛ inch of its threads show and the stem has been drawn into the gauge body.



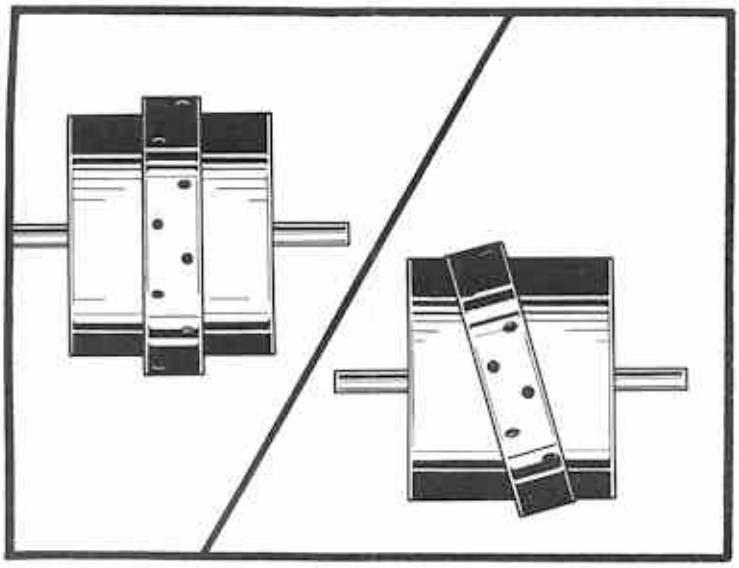
8. Then screw the gauge into the front servo body, and snuggly hand-tighten it.



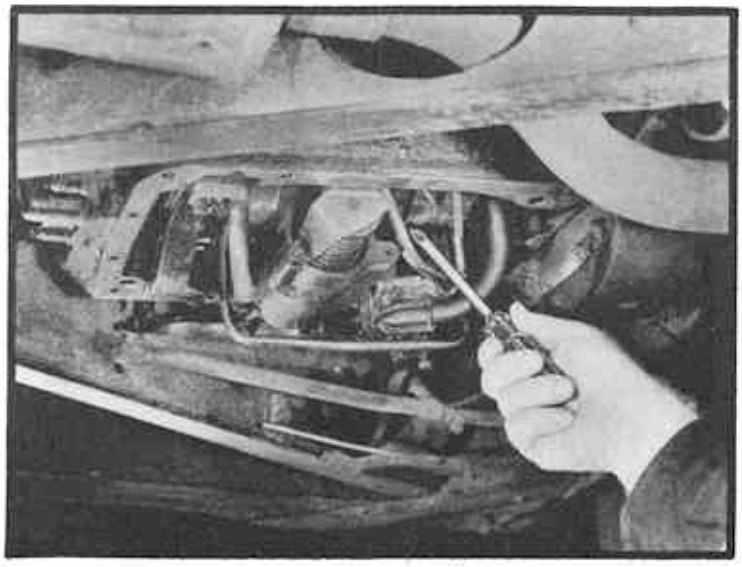
9. Now, tighten the hex adjusting screw in the gauge until you can feel the stem of the gauge just touch the front servo piston.



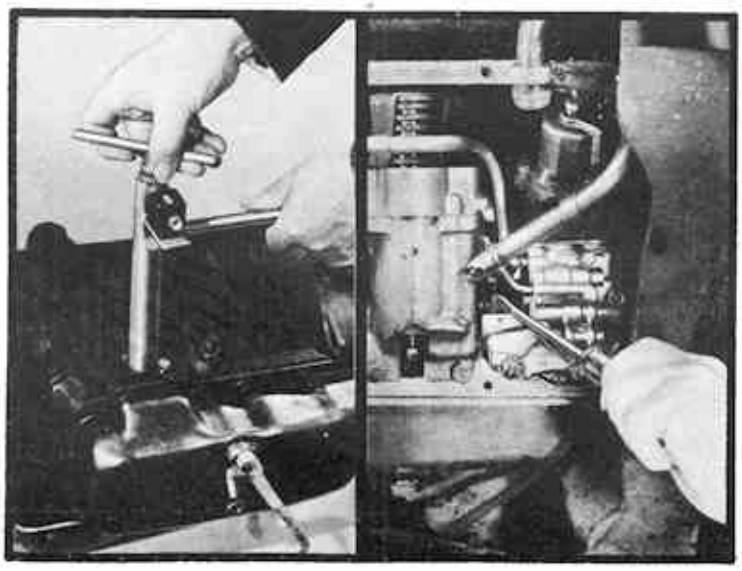
10. Then, with a wrench, tighten the gauge down *exactly* 5 full turns. While doing this...



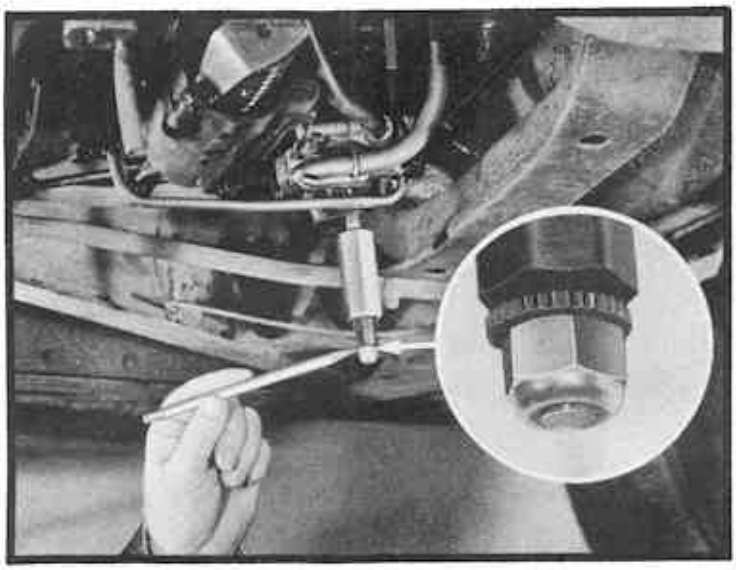
11. . . . make sure the band is in its normal operating position to insure that the band lining is in full, flat contact with the drum. This can be done by . . .



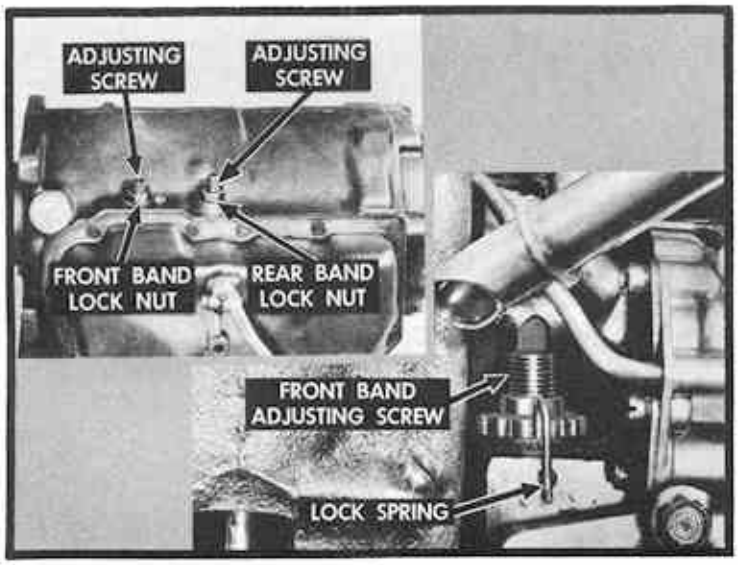
. . . turning the drum by hand or by pressing on the band anchor lug. Either way will assure accurate adjustment.



12. Now, slowly tighten whichever front band adjusting screw the transmission is equipped with, until . . .



... the knurled washer on the front servo gauge just breaks free, and yet is not so loose that it will spin.

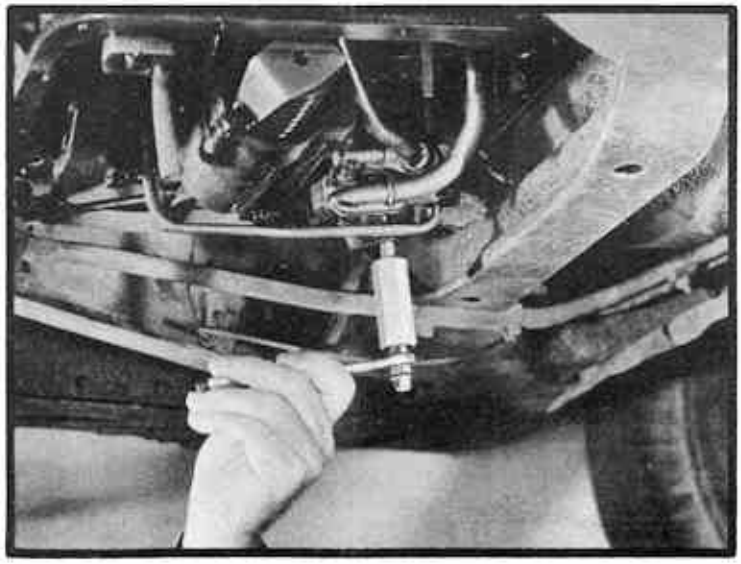


13. Tighten the front band adjusting screw lock nut, or install the lock spring, depending on which type transmission is being serviced.

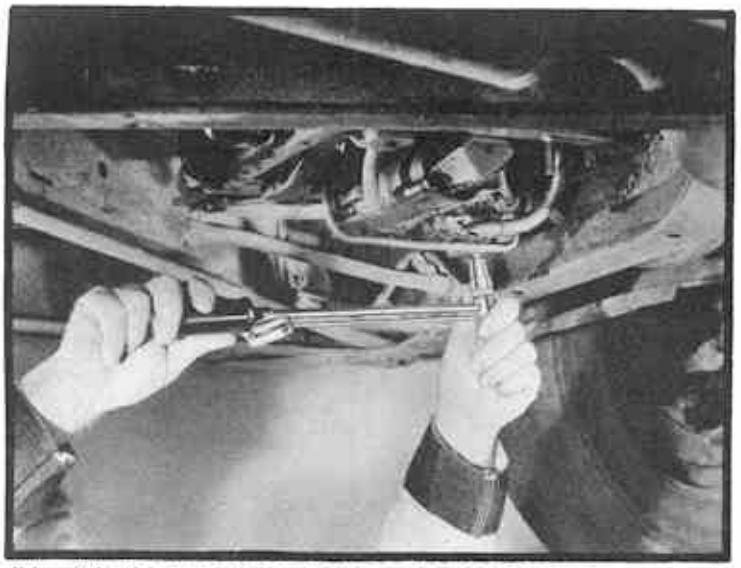
14. Torque the lock nut 40 to 50 foot pounds.

NOTE

Recheck knurled washer after torquing lock nut to be sure setting has not changed.



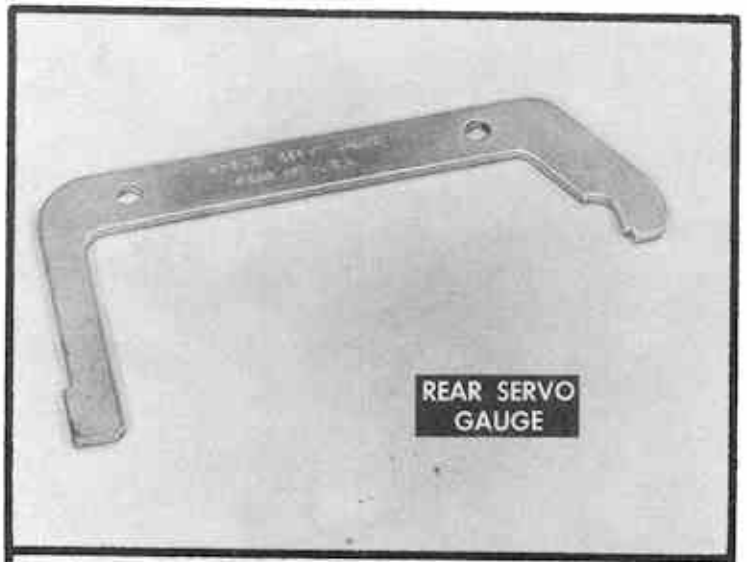
15. Then back off the hex adjusting screw on the gauge a full 6 turns, and remove the gauge from the servo body.



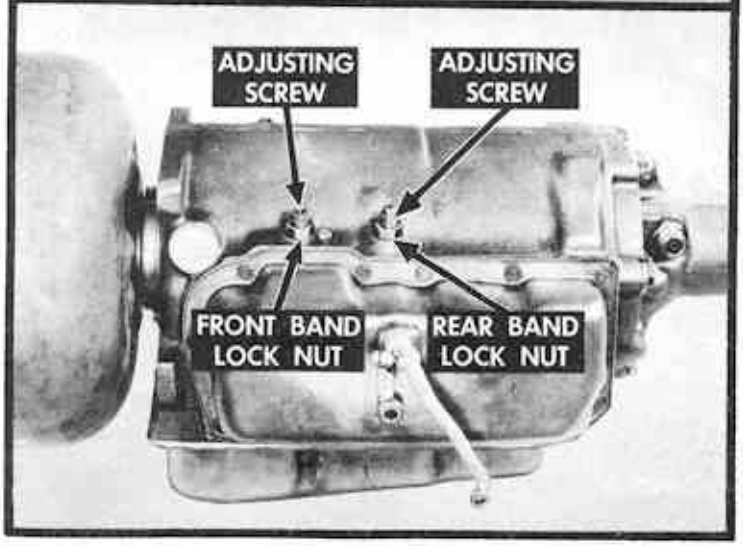
16. Last, install the pipe plug in the servo body, and torque it 6 to 7 foot pounds. With the front band adjustment complete, you can now make the internal rear band adjustment.

IV. INTERNAL REAR BAND ADJUSTMENT

This is always done along with internal front band adjustment, since the oil pan is already removed.



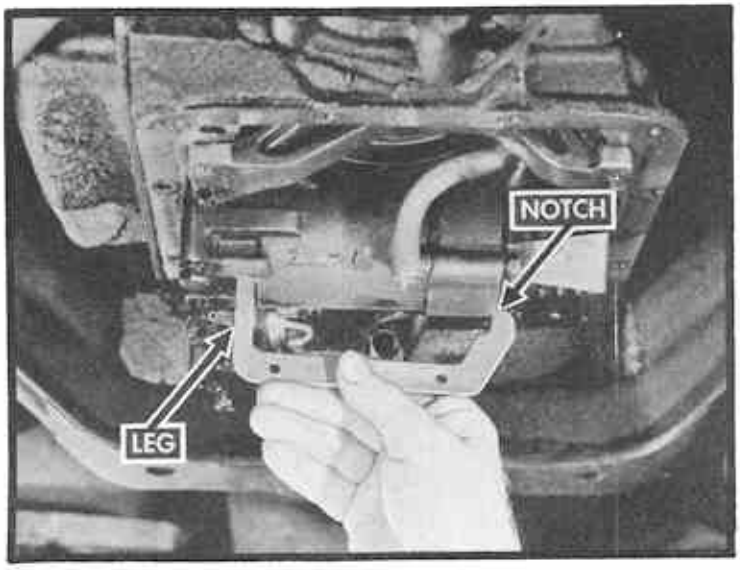
Rear band adjustment requires the use of this rear servo gauge (No. J 5071).



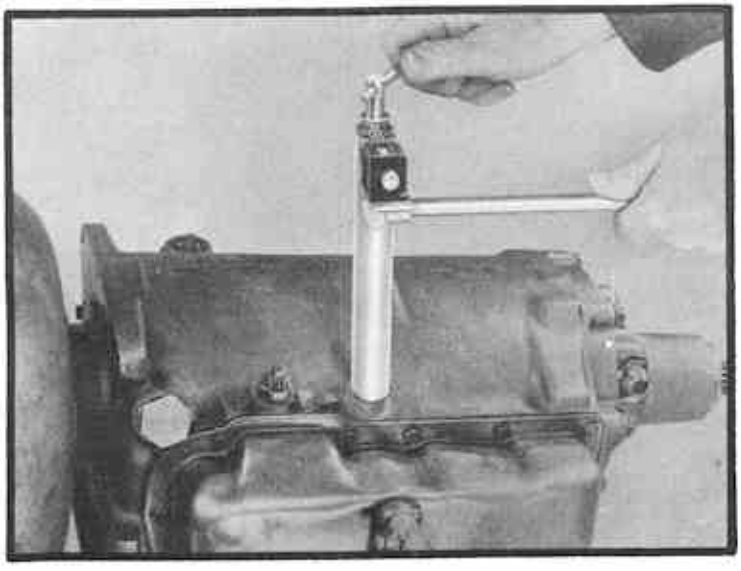
1. As the first step in rear band adjustment, loosen the rear band adjusting screw lock nut.

NOTE

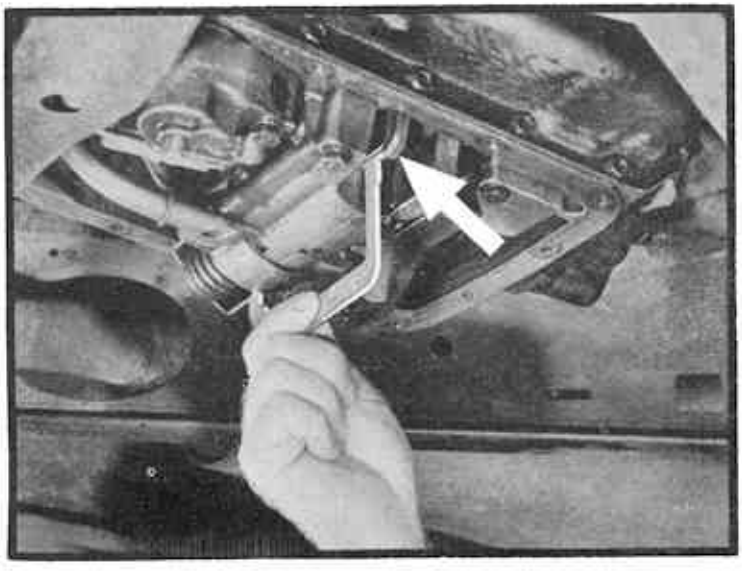
This lock nut and screw are *always* located externally. On some models, they can be reached through the access hole, and on other models from under the car.



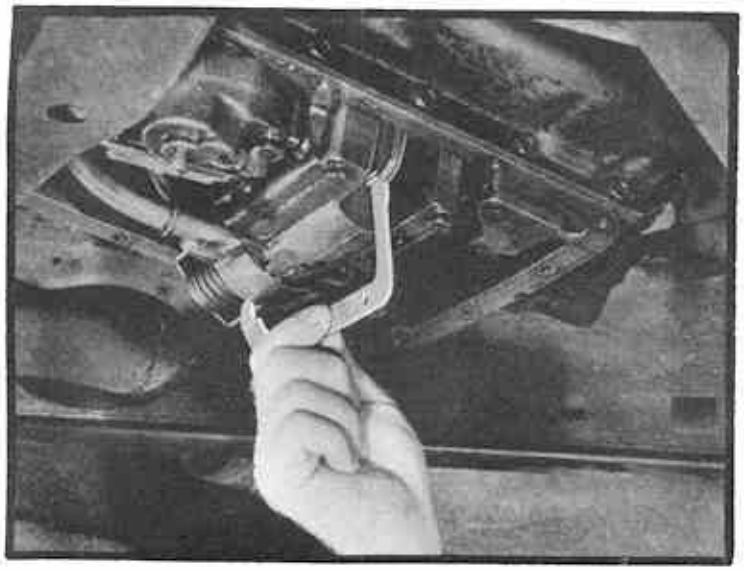
2. Next, position the rear servo gauge, centering it so that the leg of the gauge rests on the servo stem, and the notch in the tool fits over the finished surface of the rear servo body.



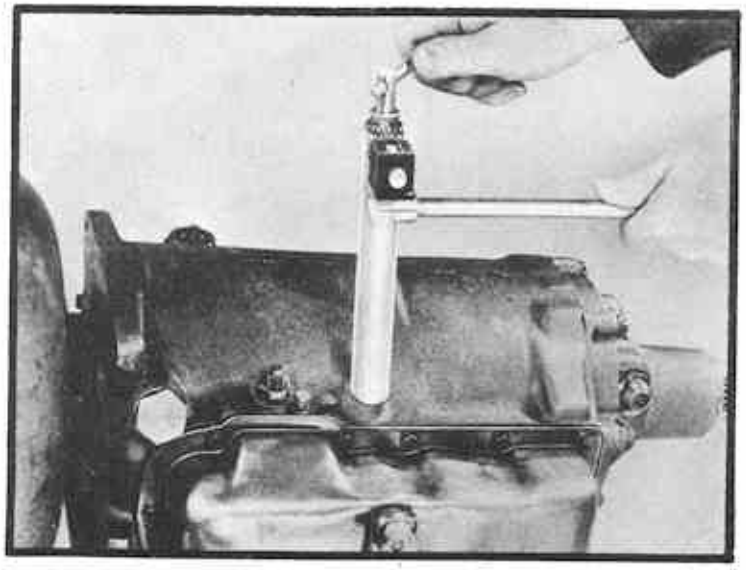
3. Then, back off the rear band adjusting screw using this tool, for cars with access holes, or wrenches where the screw can be reached only from under the car.



4. Back off the screw until the rear servo actuating lever is well away from the face of the gauge leg and will move freely.



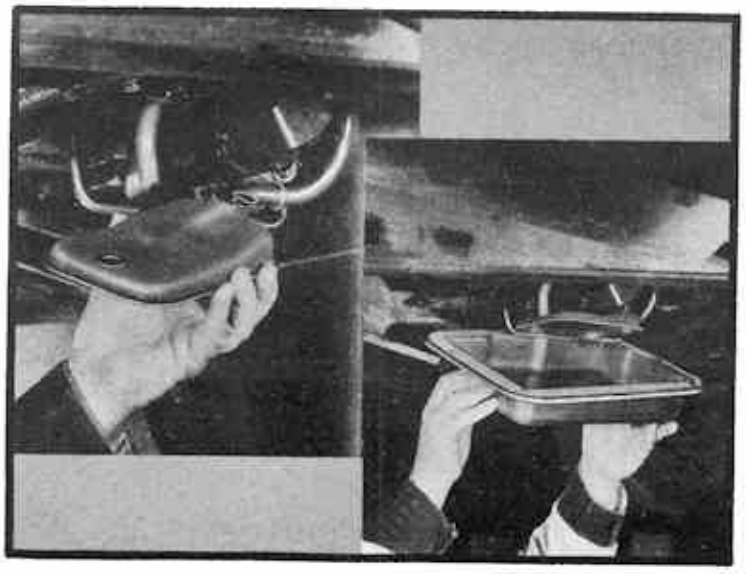
5. Now, tighten the adjusting screw until the face of the actuating lever barely touches the face of the gauge leg, making certain that the gauge is centered.



6. Then, tighten the lock nut, while keeping the adjusting screw from turning.
7. Torque the lock nut 40 to 50 foot pounds.

NOTE

After torquing lock nut recheck using the rear servo gauge (J-5071) to be sure setting has not changed.

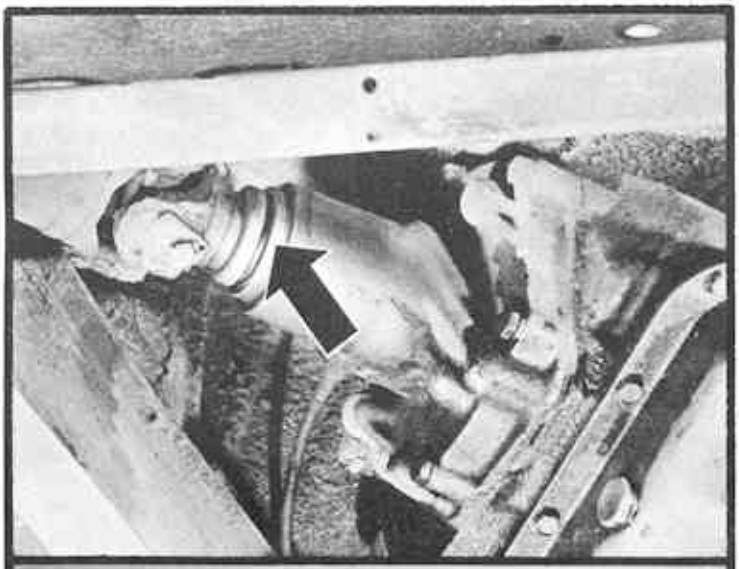


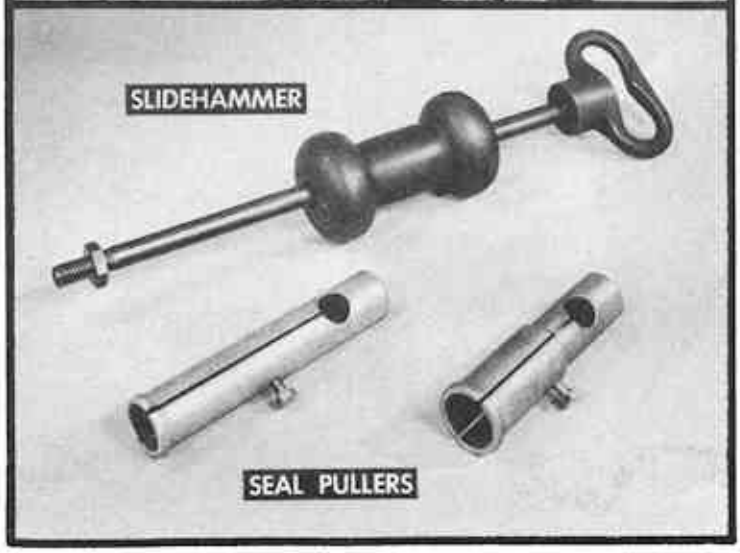
8. Next, inspect the oil screen, and clean it, or replace it, if necessary.
9. Clean the bottom oil pan, and reinstall it with a *new* gasket.

10. Torque the bottom oil pan bolts 10 to 13 foot pounds.

11. Last, refill the Hydra-Matic according to the procedures covered on page 50.

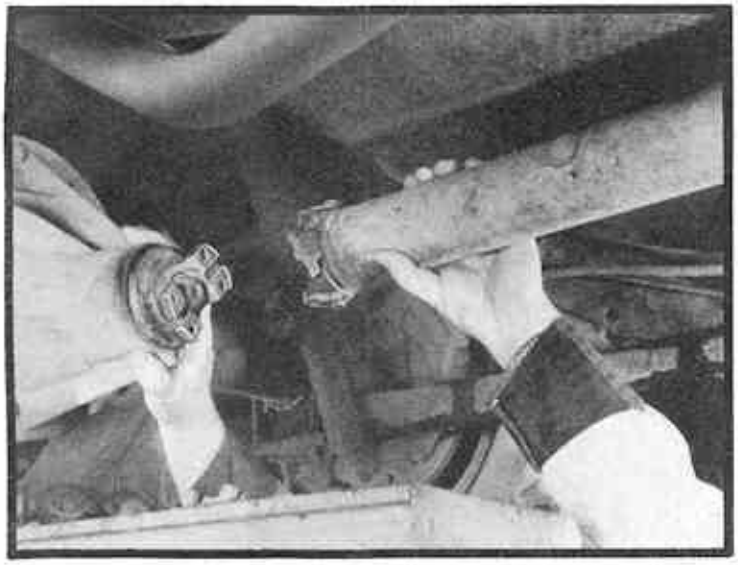
V. REPLACEMENT OF REAR BEARING OIL SEAL



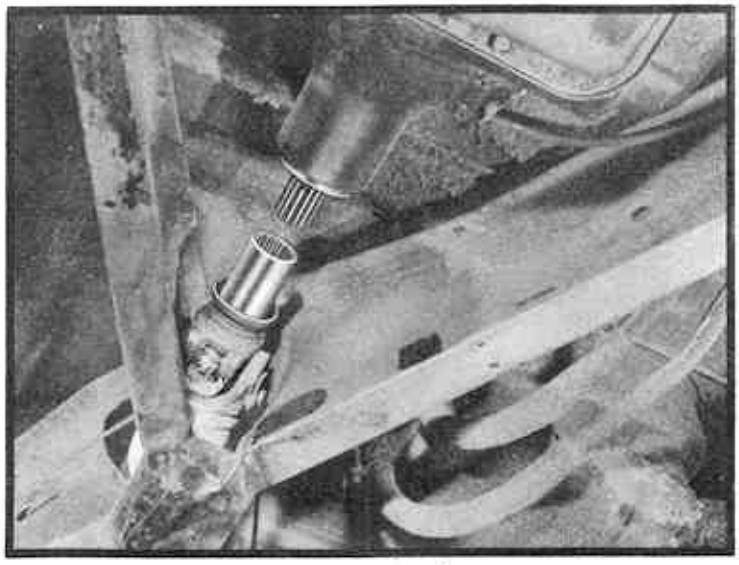


This is a fairly common part replacement, which can be made without removing the transmission. Where the seal is recessed, it is necessary...

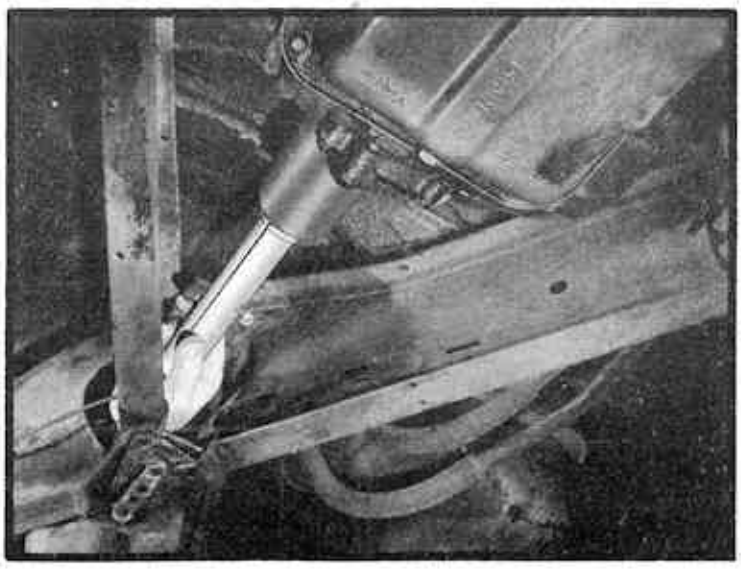
...to use one of these seal pullers (No. J 2623 and No. J 4830) and the slide hammer (No. 2619-B). The two pullers shown can be used to remove any recessed rear bearing oil seal. Refer to the tool chart on page 72 to determine which puller should be used.



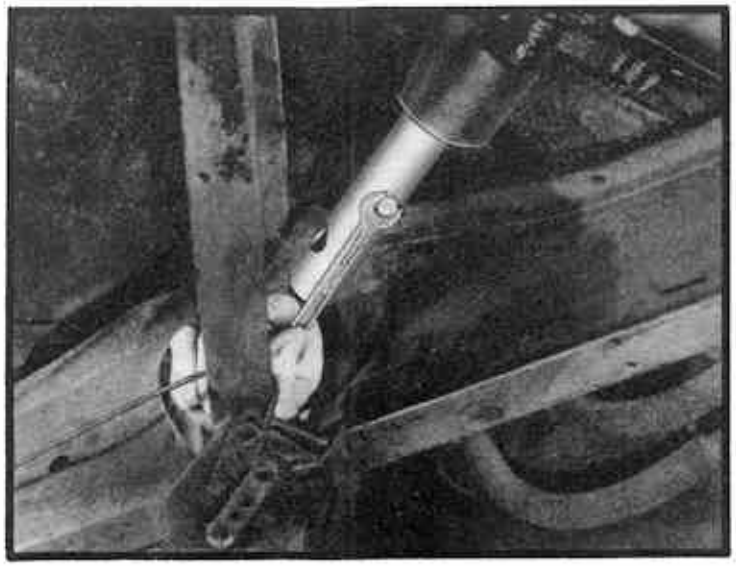
1. As the first step in removing the seal, disconnect the drive shaft.



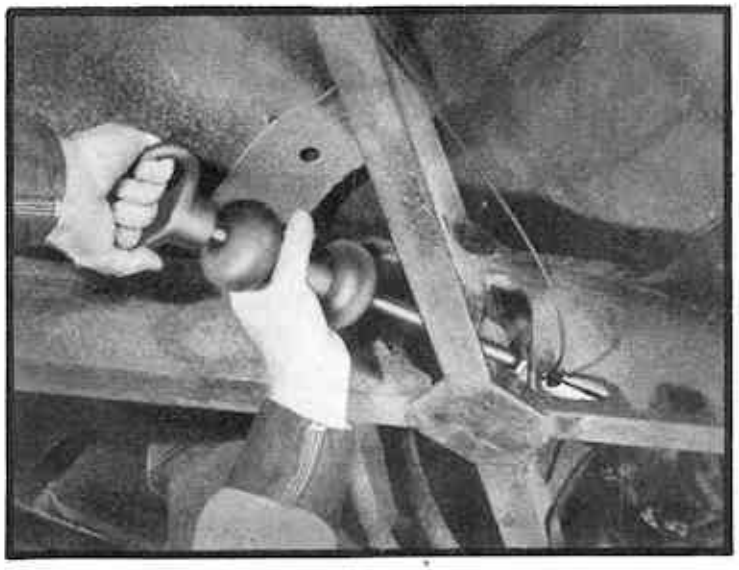
2. Then slide the drive shaft from the output shaft.



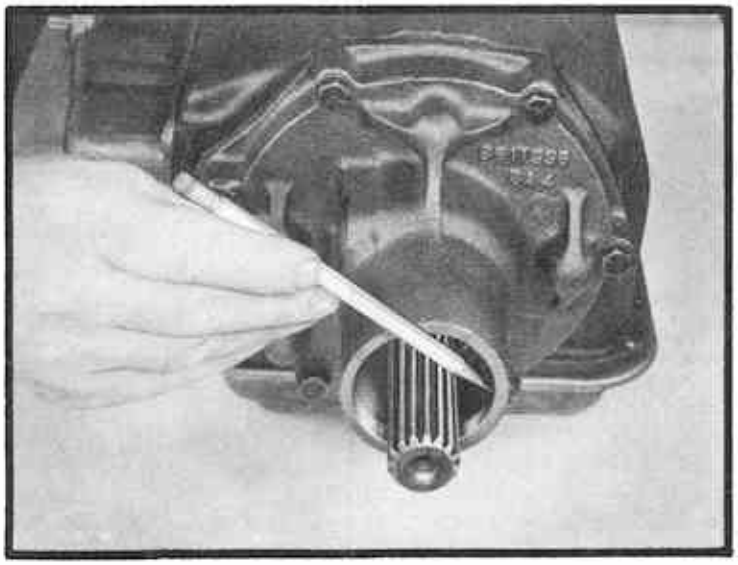
3. Now, place the proper remover over the shaft, and push it into the seal.



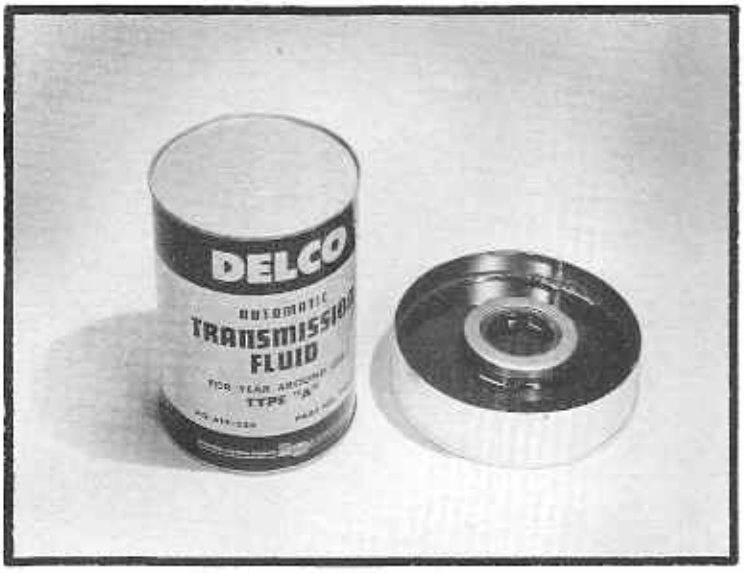
4. Then, expand the end of the tool in contact with the seal by tightening this screw.



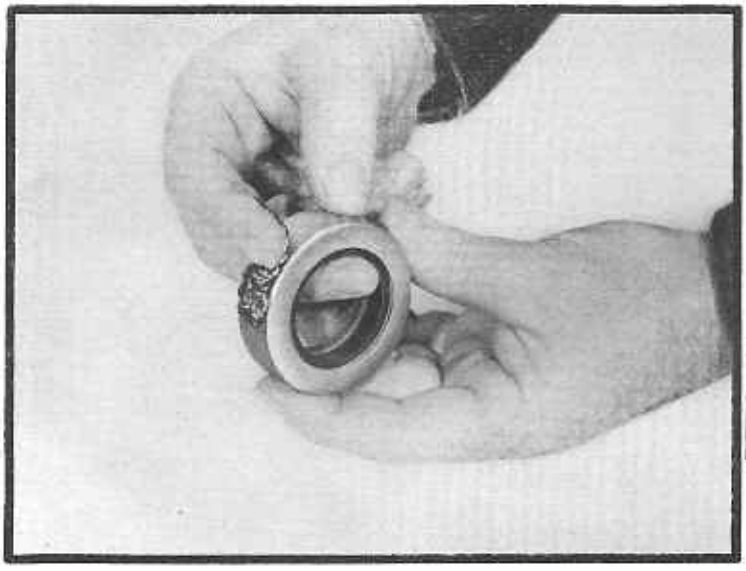
5. Now, screw the slide hammer into the seal remover.
6. Carefully tap the rear seal out of place.



7. Then, inspect the rear bearing retainer and output shaft for nicks and burrs, and remove any that are found.



8. Before installing the new seal, soak the felt portion of the seal in Hydra-Matic fluid.

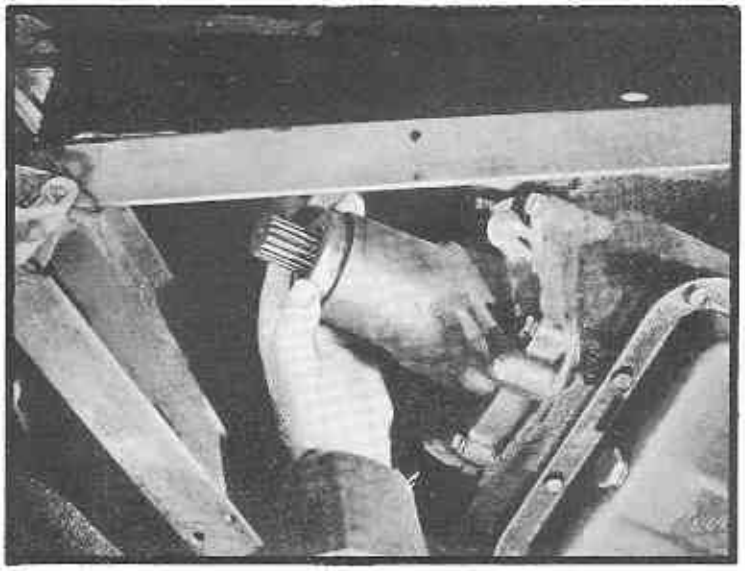


9. Apply non-hardening sealer to the *outer edge* of the seal.

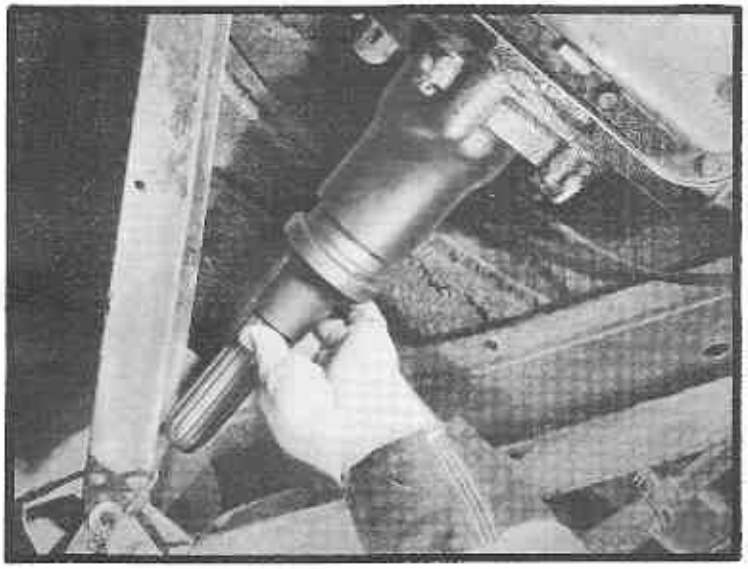
CAUTION

Do not use too much sealer, or get any on any other part of the seal.

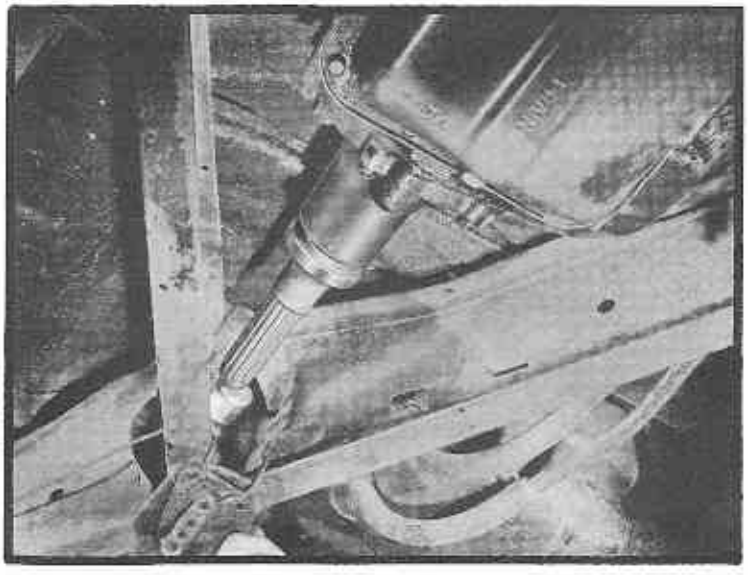
To install a seal properly, it's necessary to use one of these seal installers (Nos. J 1354, J 1942-A, J 5154-A). To select the proper installer, refer to the tool application chart, on page 72 .



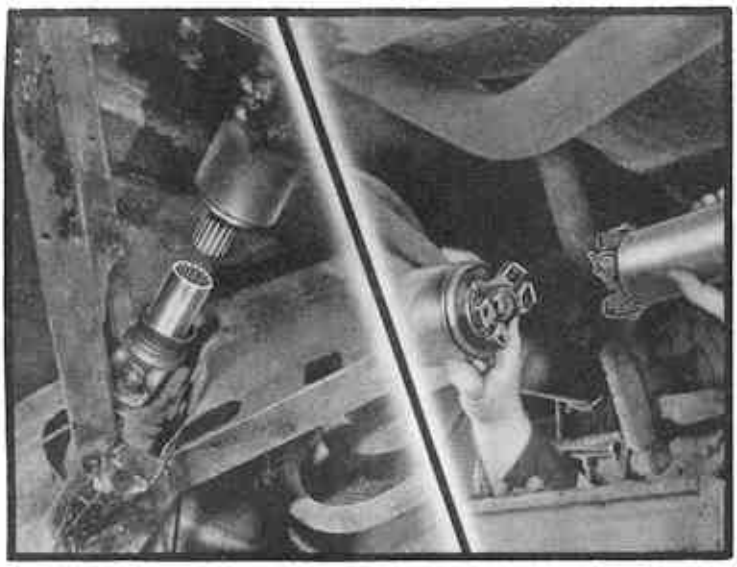
10. To install the new seal, first place it in position in the housing.



11. Place the seal installer over the shaft, and against the seal.

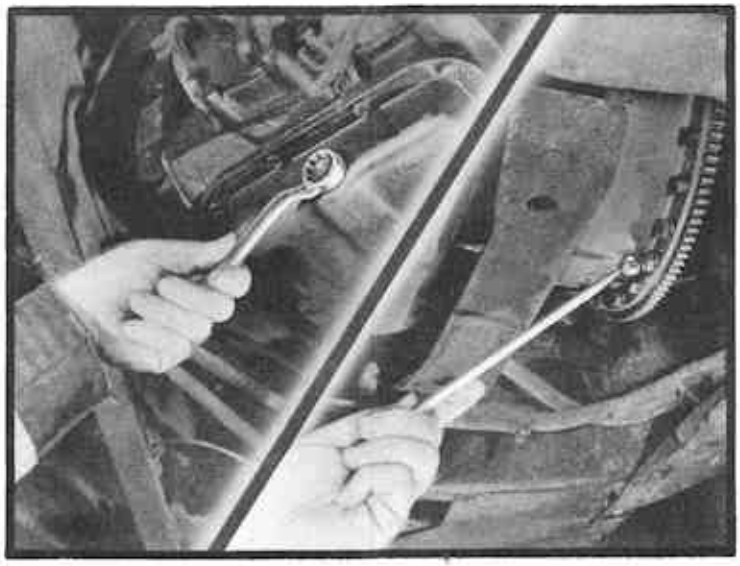


12. Then, tap the installer until the seal is seated. No further checking or gaging is necessary.



13. Last, slide the drive shaft over the output shaft, and connect the drive shaft.

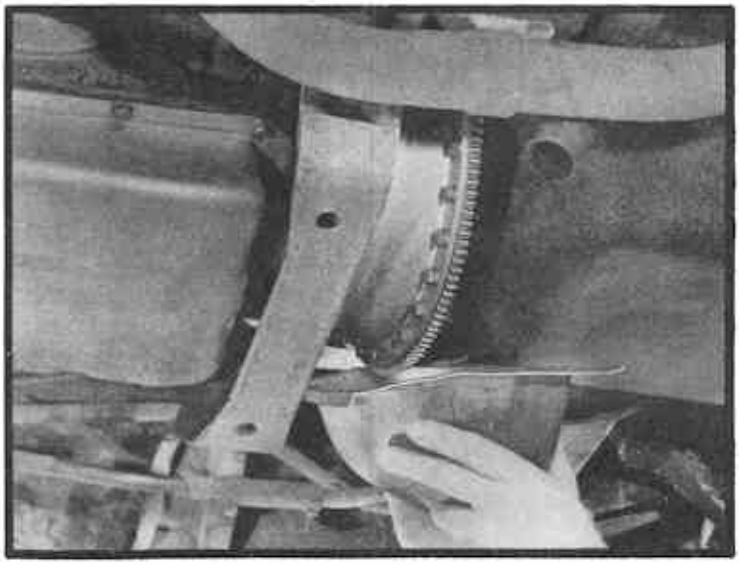
VI. DRAINING AND FILLING THE TRANSMISSION



One of the simplest on-the-car services is draining and filling the transmission. But it is important that certain precautions and steps be followed.

CAUTION

The fluid should be at operating temperature when it is being drained. If the car has just come off the road from a hard run, be careful when removing drain plugs, as the fluid may be so hot that it will spurt out and burn the hands or arms.



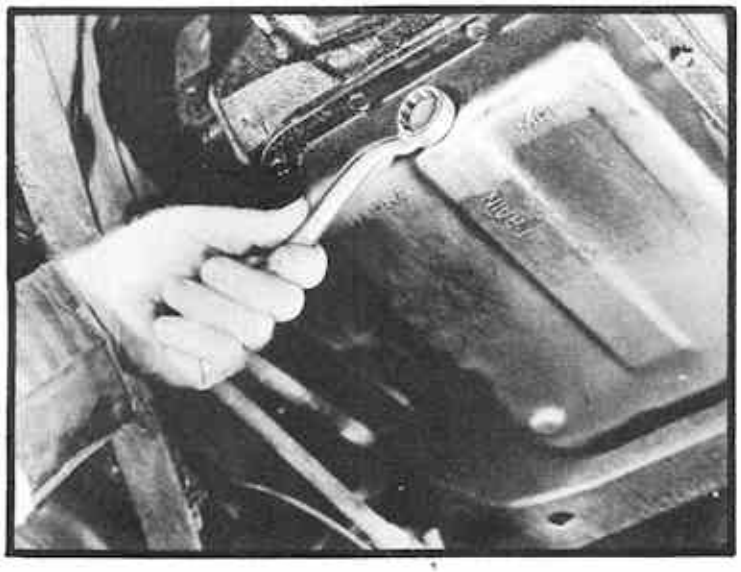
1. First, remove the flywheel housing bottom cover on the access plate.

2. Then, turn the engine over to bring the torus cover drain plug down to the bottom.

NOTE

On some car models, this drain plug is located in the flywheel.

3. Remove this plug, with a 6-point socket.



4. Then, remove the bottom oil pan drain plug. *Only* by removing these 2 plugs can you drain the transmission completely.

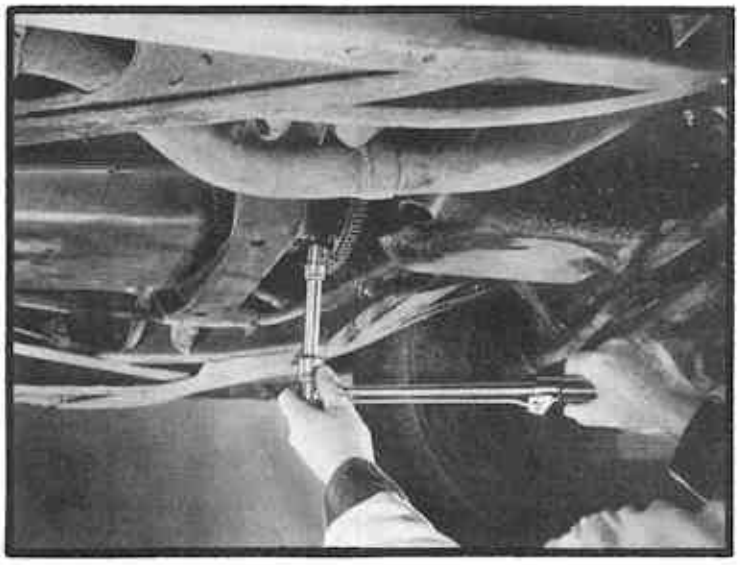
NOTE

On late model Oldsmobiles, disconnect the fill tube from the bottom oil pan to drain it, since there is no drain plug.

5. After draining, replace both plugs.

NOTE

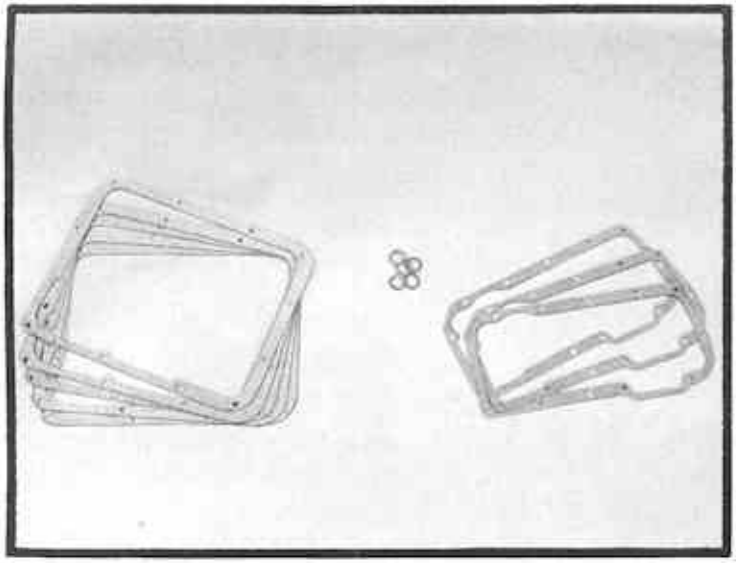
On late model Oldsmobiles, which have no plug in the bottom pan, connect the filler tube.



6. Torque the oil pan plug 35 to 45 foot pounds.

7. Torque the torus cover plug 6 to 7 foot pounds.

8. Then install the flywheel cover on the housing.

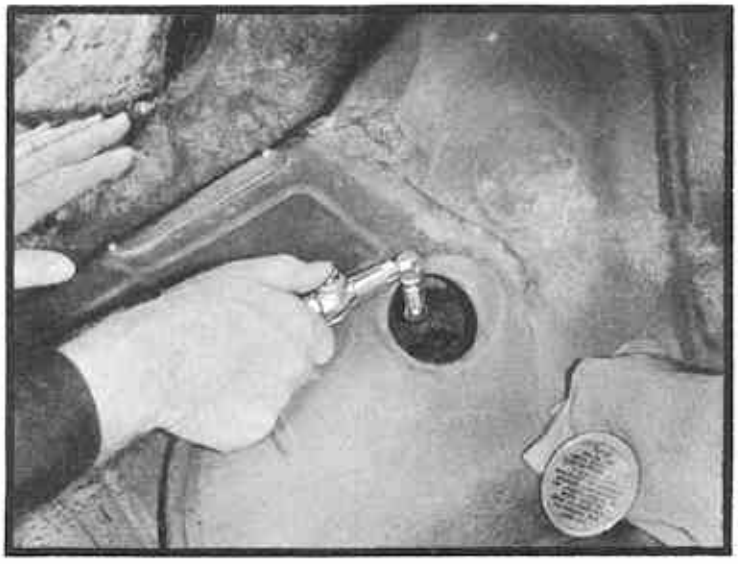


NOTE

New gaskets must be used *whenever* covers, or pans, which have gaskets, are removed and installed.

CAUTION

Never flush the Hydra-Matic transmission. If the fluid has become contaminated so that flushing seems necessary, drain and refill with the fluid specified for regular operation. Drive the car or operate the engine until the fluid has been warmed to operating temperature, then drain and refill again.



9. Now, carefully clean the area around the fill hole which, on some cars, is under the hood. On others it is under the front floor pan, and is reached through the access hole, to the right of the Hydra-Matic.

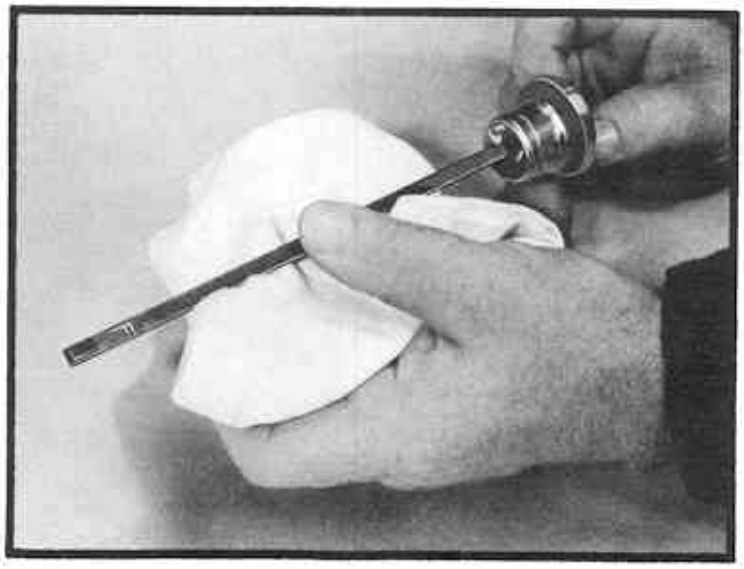
10. Then, pour approximately, eight quarts of specified fluid into the transmission, using the filler funnel, which is equipped with a very fine mesh screen.

NOTE

It is important to use only G. M. Hydra-Matic Fluid or Automatic Transmission Fluid (Type A) identified by Armour Institute Qualification Number "AQ-ATF ..." such as Delco Fluid — available at your nearest U. M. S. dealer. This is an all-season fluid for year-round operation. No special additives to these fluids are required or recommended.

In cases of emergency, when the specified fluid is not available, any good quality 20W engine oil will operate for a temporary period. When such oil is used, however, it should be removed as soon as possible and the transmission refilled with the recommended fluid.

11. Now, with the engine in neutral, run it at fast idle for 1½ to 2 minutes.



12. Then, at slow idle add enough fluid to bring the level just below the "L" mark on the indicator.

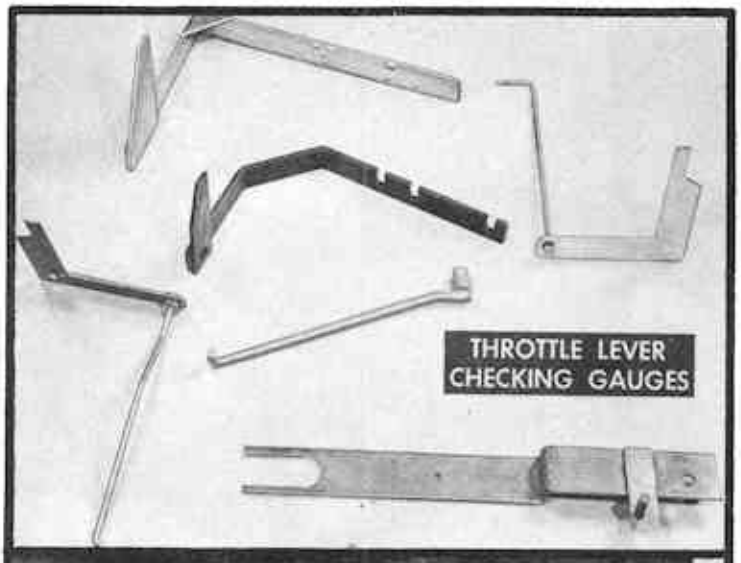
13. Now, run the engine at fast idle for 3 minutes to bring the fluid to operating temperature.

14. Then, at slow idle, add fluid to bring the level to the "F" mark.

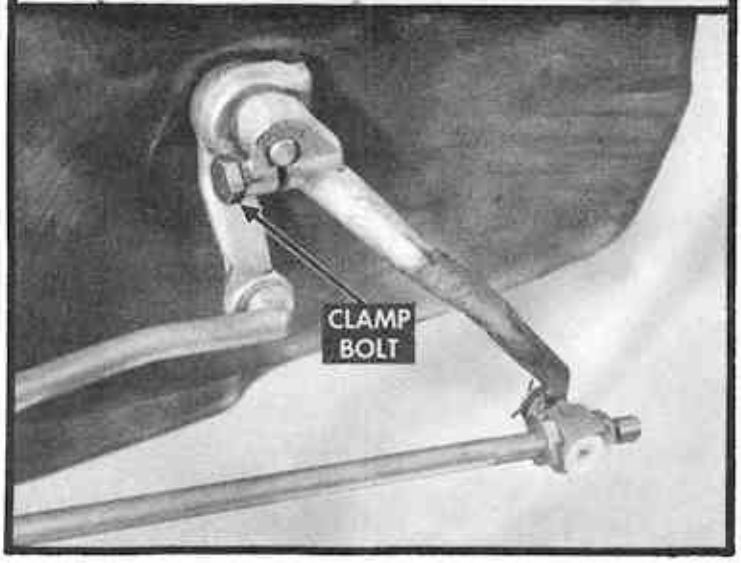
15. With the engine idling, and the fluid warm, check to make sure the transmission is not overfilled. And that's the final step in filling the transmission.

VII. THROTTLE LEVER ALIGNMENT

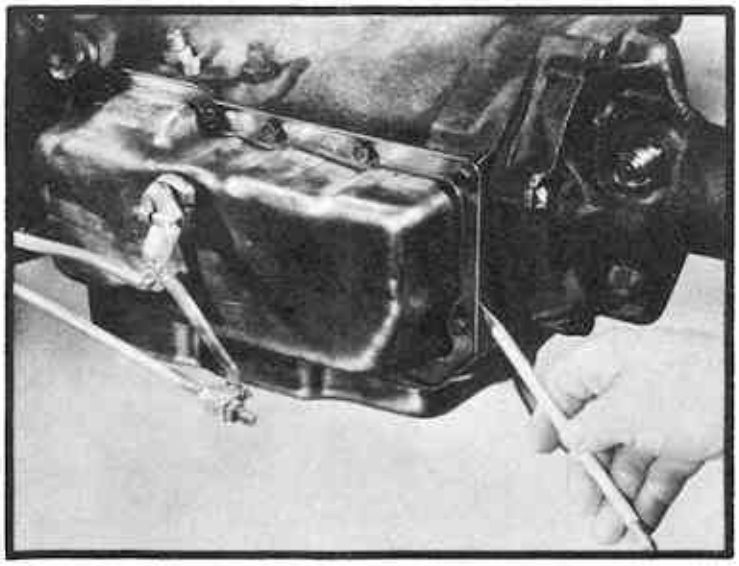
If throttle lever alignment is not correct, slippage, bunched shifts, or rough shifting can result.



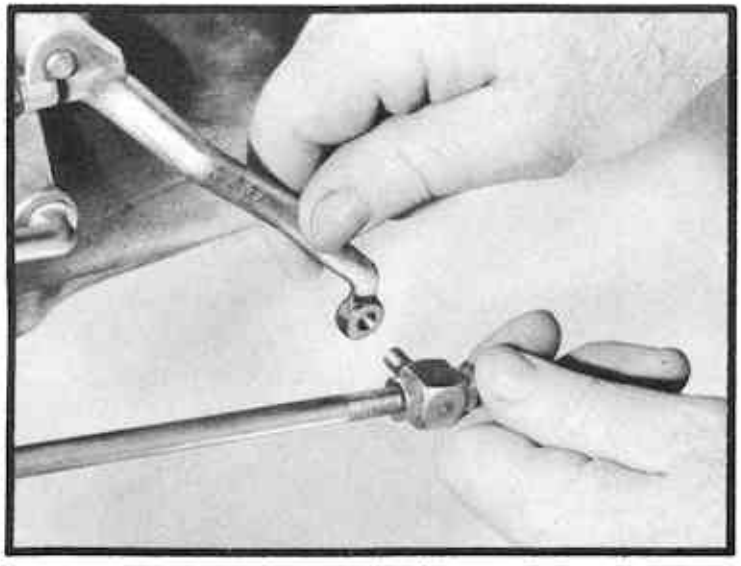
To check throttle lever alignment, it is necessary to use one of these throttle lever checking gauges. To determine which to use refer to the tool chart on page 72.



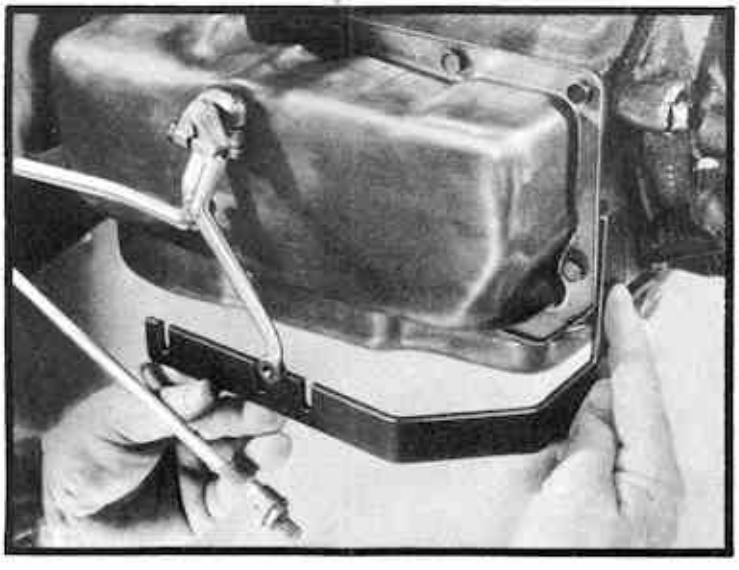
1. As the first step, make sure the clamp bolt is tight.



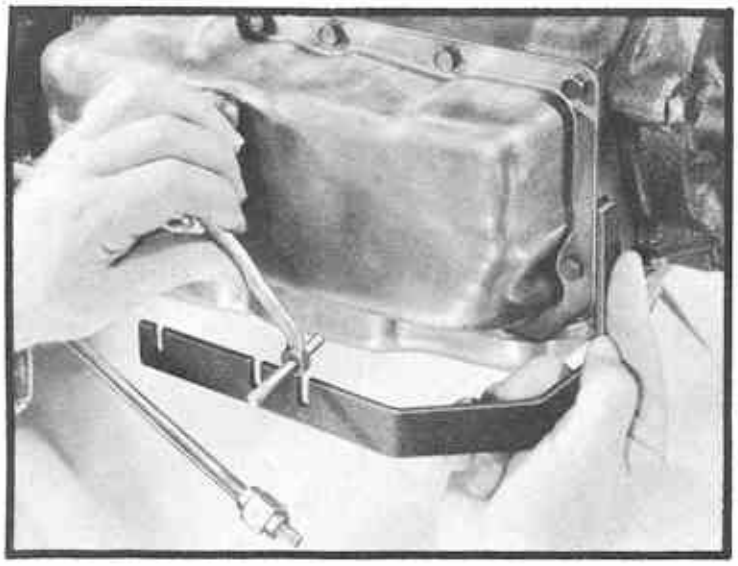
2. Then, clean the rear face of the machined surface of the transmission.



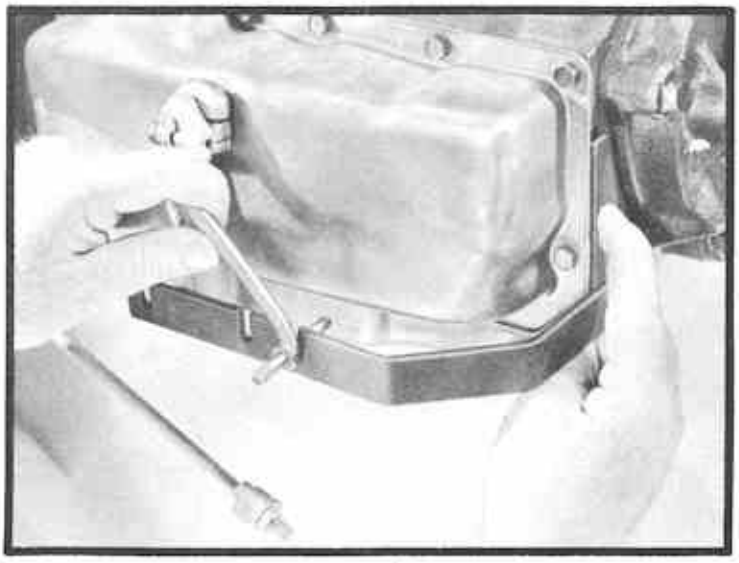
3. Next, disconnect the throttle lever rod from the throttle lever.



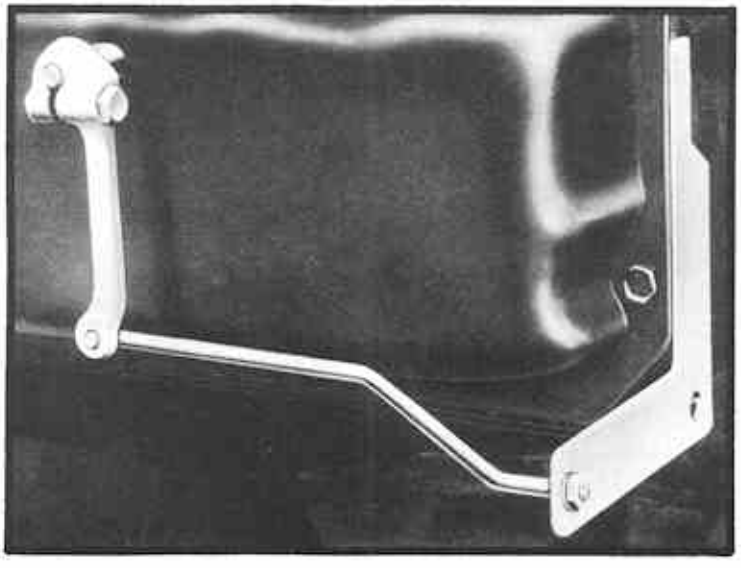
4. Then, place the gauge against the machined surface, with the edge of the gauge against the side cover.



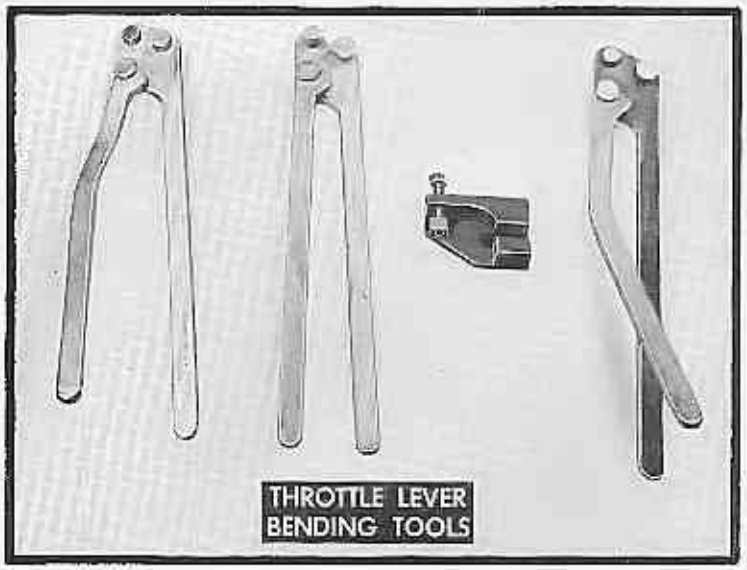
5. Then, install a gage pin (shown on page 58) in the throttle lever, and move the lever as far as possible toward the rear of the transmission, without trying to force it past its stop point.



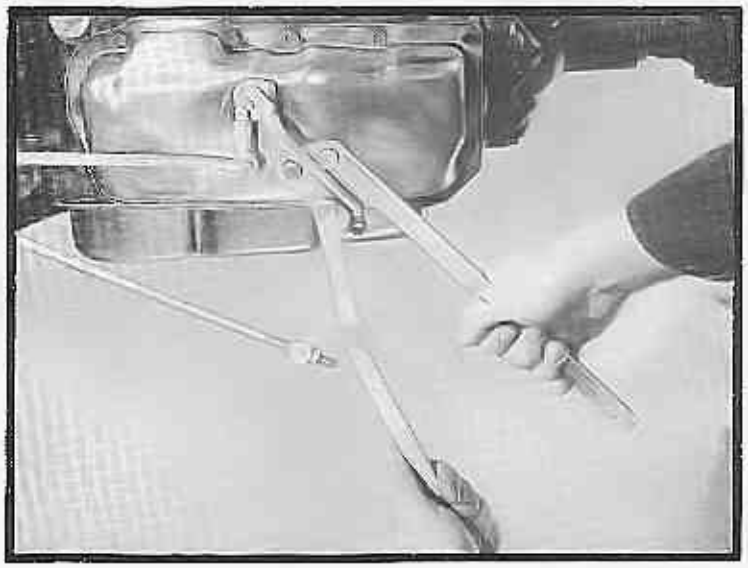
6. Where the notched type gauge is used, hold the throttle lever in its rearward position, and slide the gauge up toward the lever. The gage pin should engage the correct gauge notch.



7. If the rod-type gauge is used, the end of the rod should engage the hole in the throttle lever. If the throttle lever, in either case, does not gage properly . . .


THROTTLE LEVER BENDING TOOLS

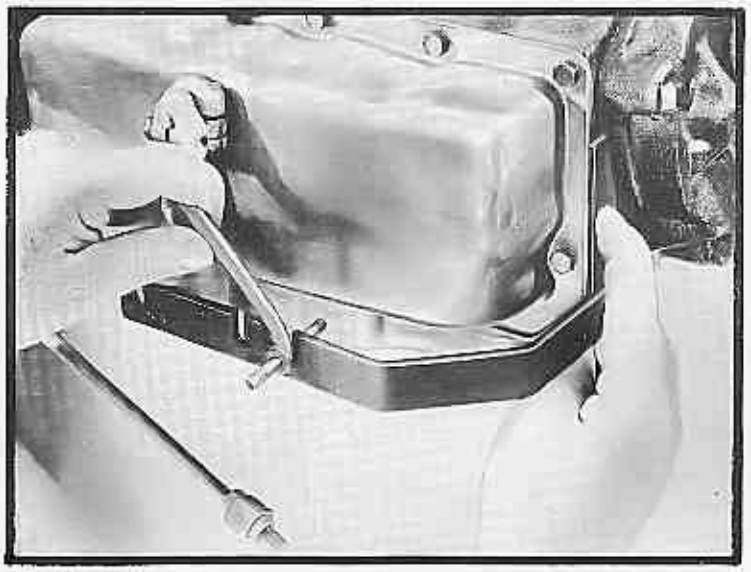
8. ...use one of these throttle lever bending tools to bend the lever... referring to the chart on page 72 to determine which one to use.



9. Bend the throttle lever forward or rearward, depending on which way it is out.

CAUTION

The only safe way to perform this operation is with a bending tool. If you don't use a bending tool, there is a risk of causing serious internal damage to the Hydra-Matic control valve assembly.



10. As the last step, recheck throttle alignment with the gauge.

VIII. THROTTLE LINKAGE ADJUSTMENT

The correct adjustment of the Throttle Lever Linkage – after the Throttle Lever is aligned properly – plays a *major* and *vital* role in correct Hydra-Matic operation through all shift ranges. To eliminate any confusion, check with the car manufacturers' Shop Manuals for year and model. Follow step by step their recommendations as to the correct adjustment procedure of the Throttle Linkages involved.

A Throttle Lever Rod, which is short, will give more TV (Throttle Valve) pressure meaning a more solid shift pattern at higher vehicle speeds. But a Throttle Lever Rod that is lengthened will give less TV pressure meaning earlier and softer shifts.

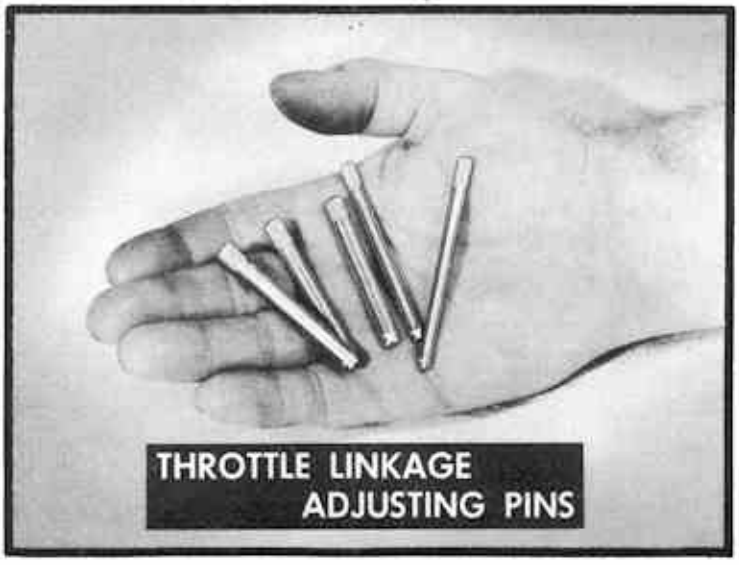
Insufficient TV pressure may result in a slip during a shift and when final engagement occurs, a severe engagement may result.

If excess wear exists at pivot points or at clevises, the very best advice is to replace those worn parts rather than attempt to re-adjust all linkages to fit the excess wear.

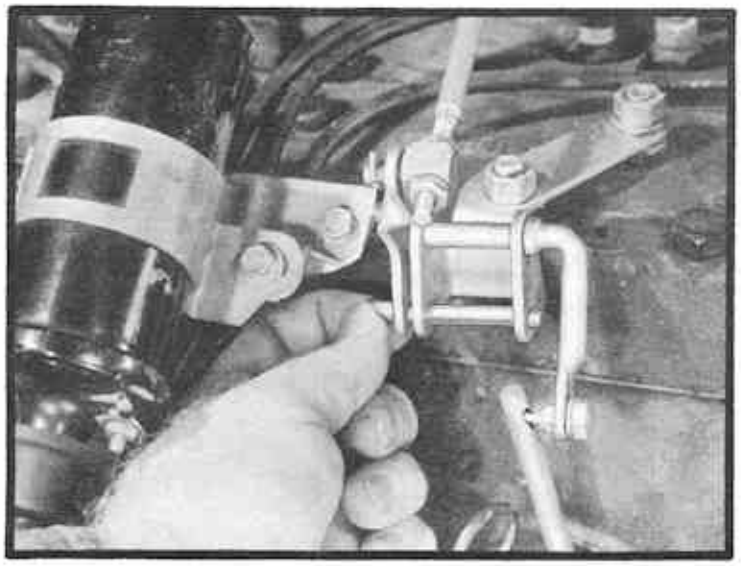
Basically, when you make Throttle Linkage and Throttle Lever adjustments you are setting the Throttle Valve in the Hydra-Matic Valve Body to move in correct relationship with the Throttle Butterfly Valve in the Carburetor.

As an example, if the Carburetor Throttle Valve moves 86°, the Throttle Lever in the Hydra-Matic Valve Body should move 22°.

This is a hypothetical case and is used for illustration purposes only.

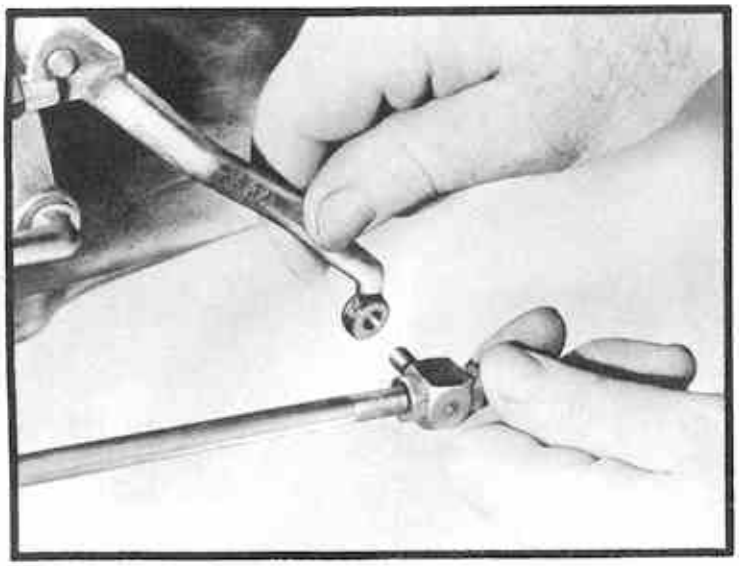


Adjustment of the throttle linkage requires these throttle linkage adjusting pins. These pins...

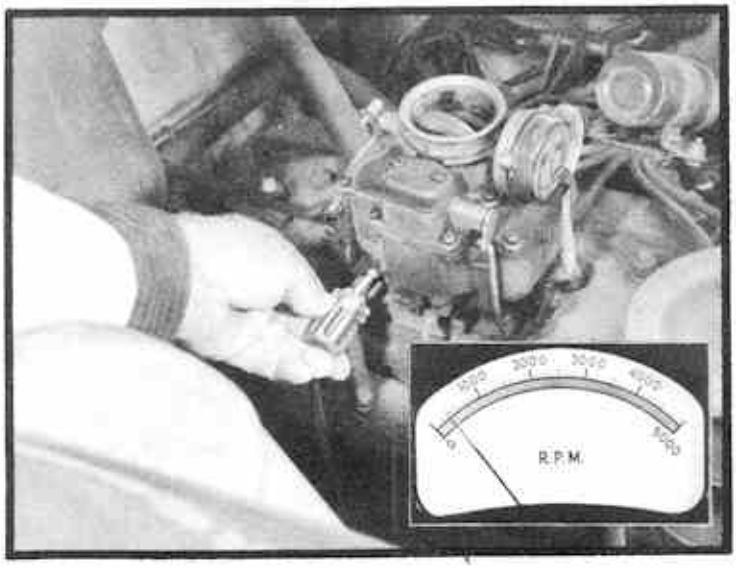


...are used to hold ballcranks and pivot points of the throttle and carburetor linkage in place when linkage adjustments are made. There are so many variations and hook-ups that it is necessary to...

...follow the specific procedures issued for every car model. However, to show what basic steps are involved, we will demonstrate *one example* of how the entire throttle linkage is adjusted.



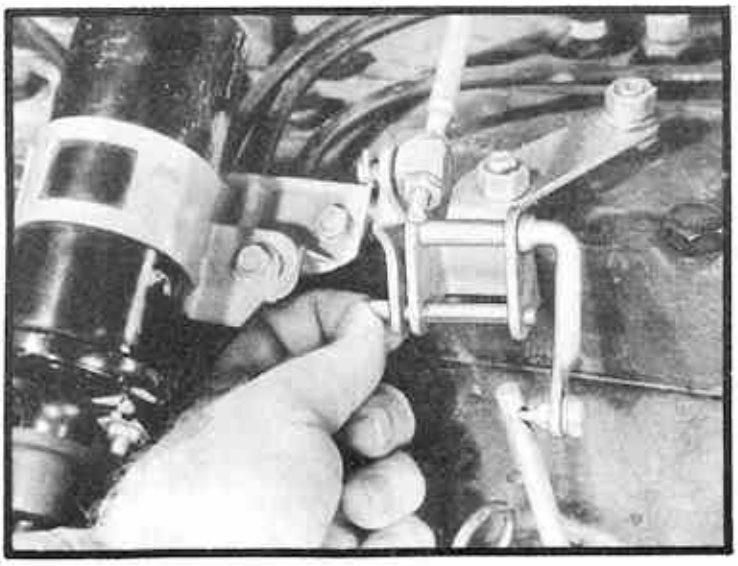
1. First, disconnect the throttle rear rod from the throttle lever.



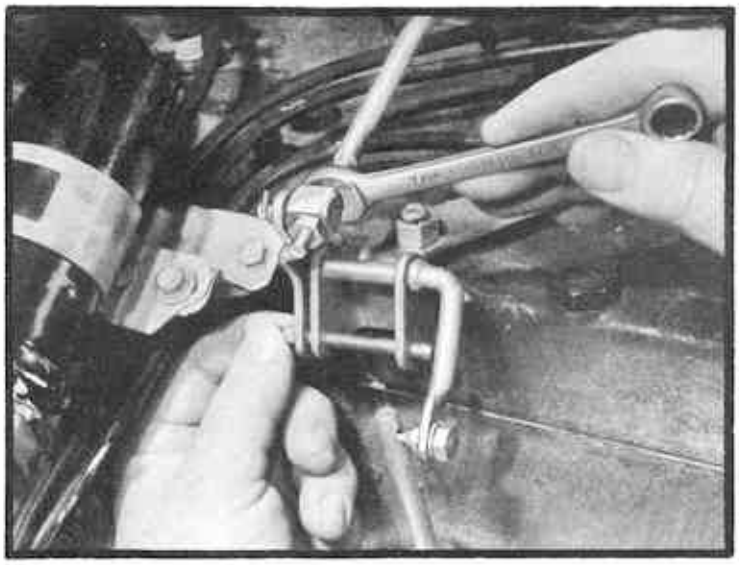
2. Now connect a tach.
3. Start the engine.
4. Adjust the idle speed to specifications with the engine at operating temperature.

NOTE

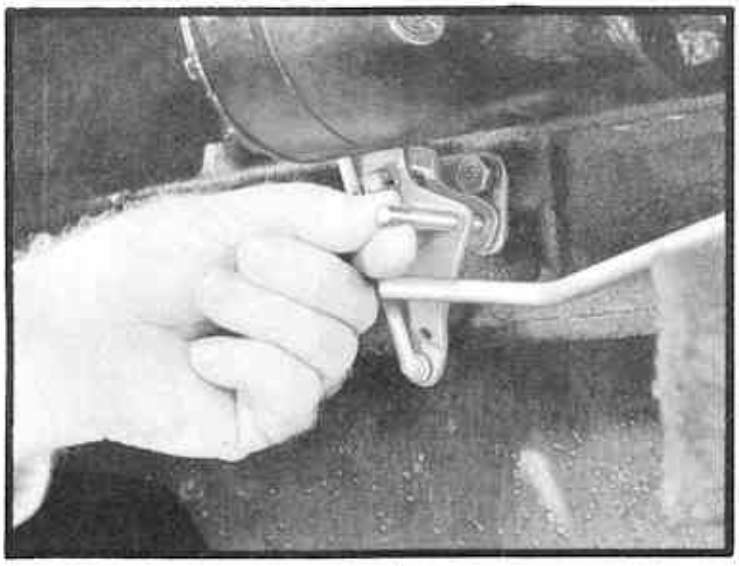
Make certain the carburetor is in the slow idle position.



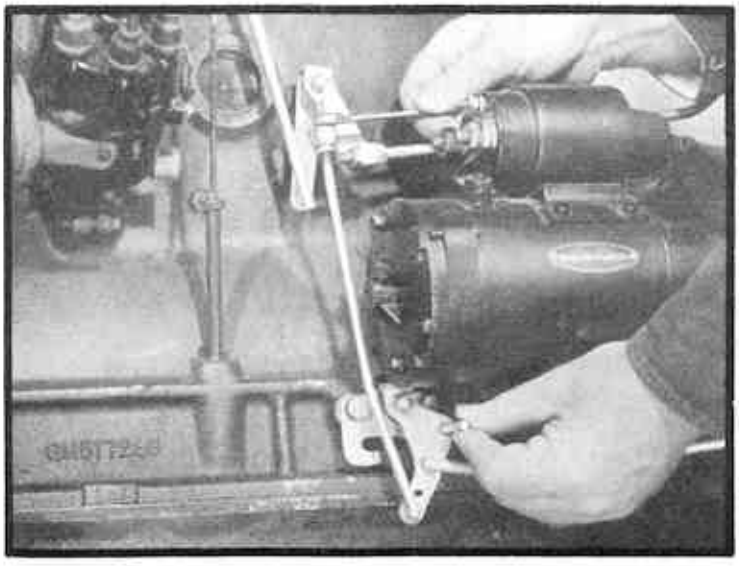
5. Then, shut off the engine.
6. Install a linkage adjustment pin through the holes in the lever and bracket. This locks the moveable arm to the stationary bracket.



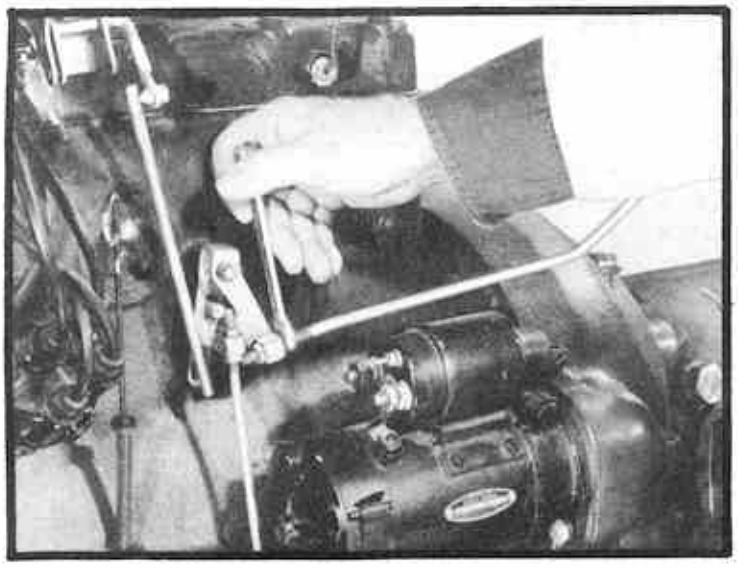
7. Next, with the carburetor throttle valve closed, loosen the lock nuts, and adjust the length of the carburetor throttle rod so that the linkage adjustment pin moves in and out freely.
8. Leave the pin installed and tighten the lock nuts securely.



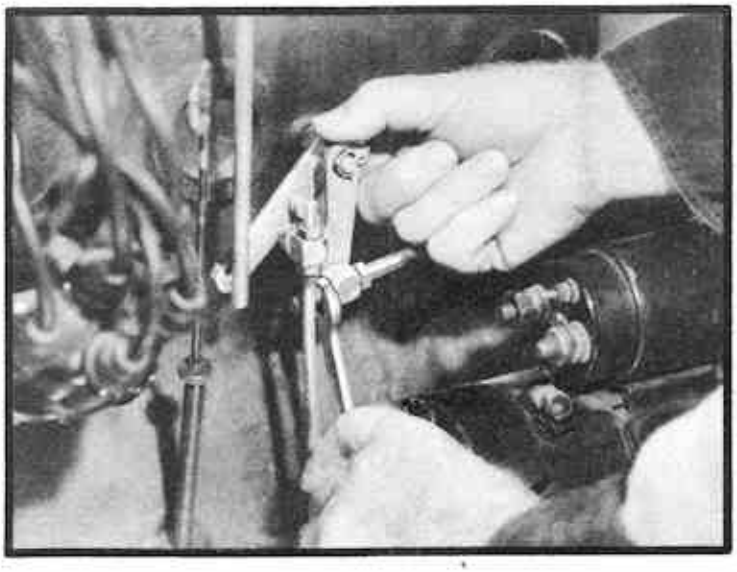
9. Then, try installing a linkage adjustment gage pin through the holes in the transmission throttle rod idler lever and bracket, as shown.



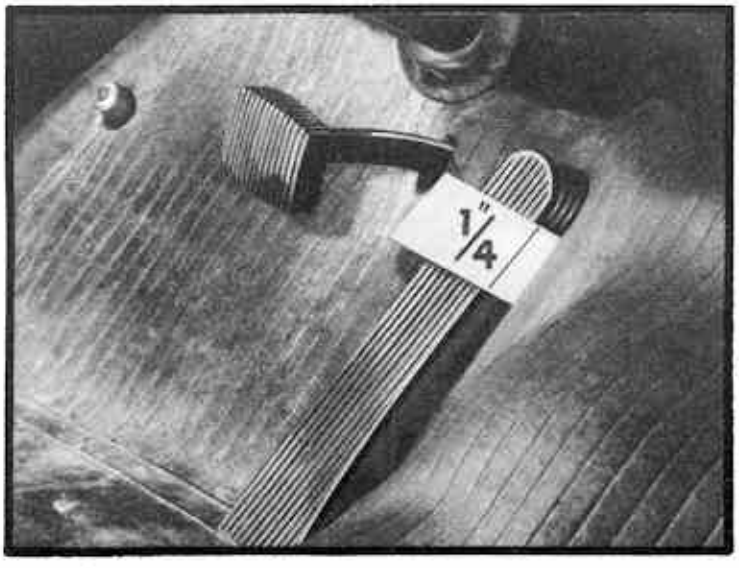
10. If the pin does not enter the holes freely, adjust the length of the transmission throttle front rod. When the pin does enter the holes in the idler lever and bracket freely, the length of the throttle rod is correct.
11. Now, remove both pins.



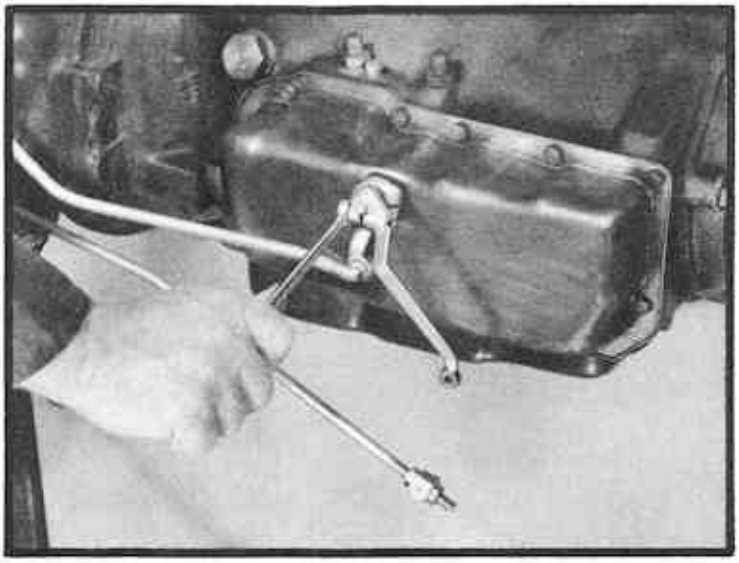
12. Loosen the lock nuts on the accelerator pedal rod.



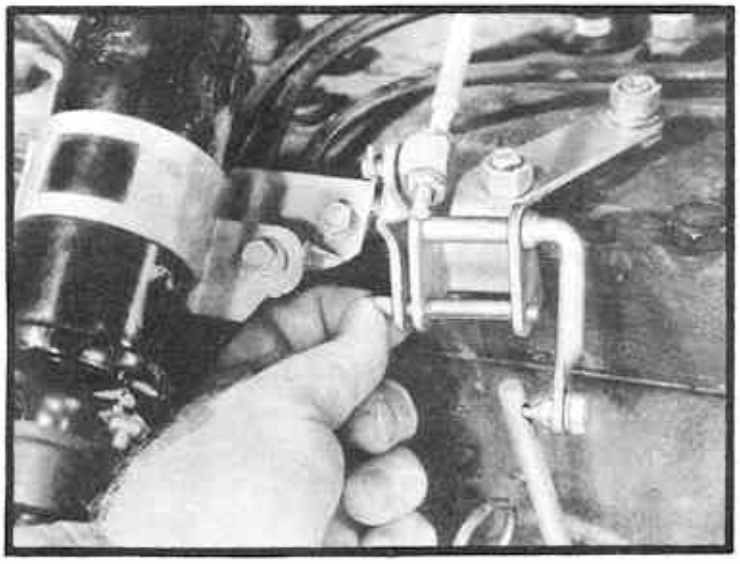
13. With the throttle wide open adjust the length of the accelerator pedal rod at the throttle control idler lever so that...



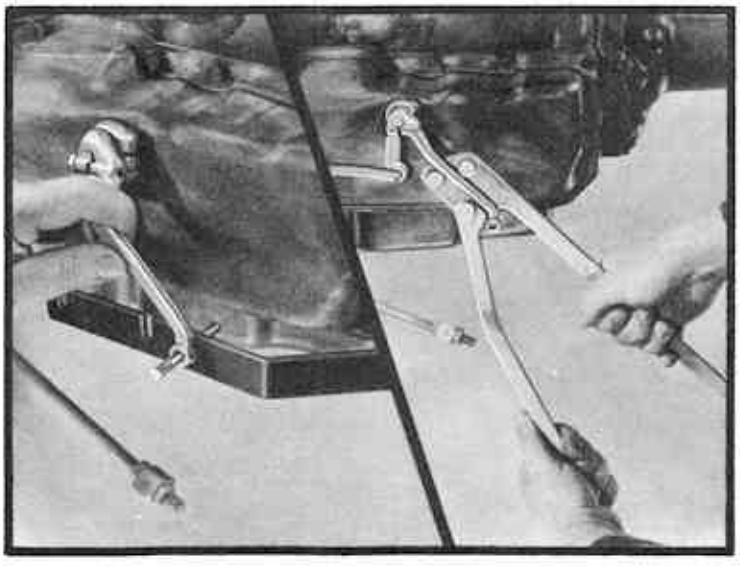
...the accelerator pedal clears the floor mat by about ¼ of an inch at the closest point. This clearance is necessary for forced downshifts.



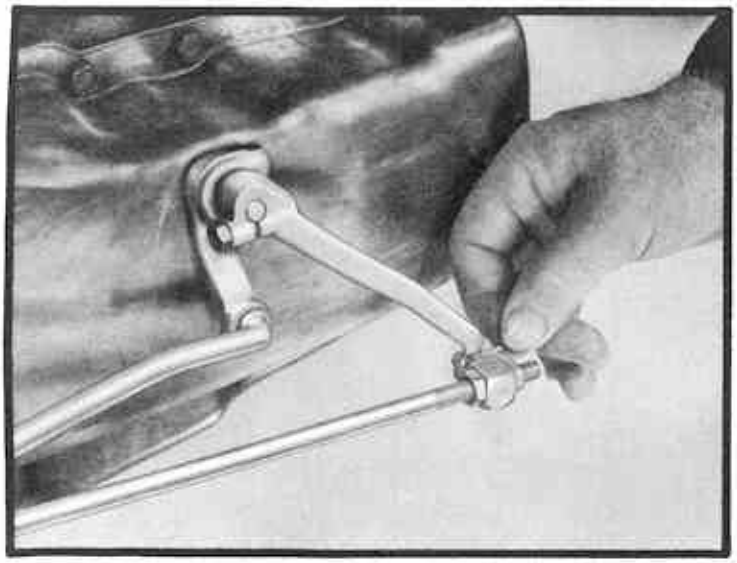
14. Now, make sure the clamp bolt in the throttle lever is tight.



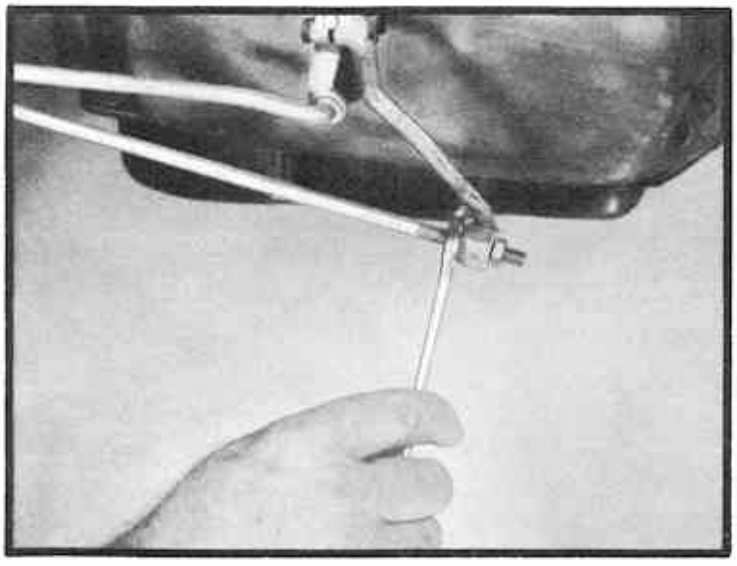
15. Then, install a linkage adjusting pin, as shown, to lock the throttle linkage in idle position.



16. Now, check the position of the throttle lever using a throttle lever checking gauge, and, if necessary, bend the throttle lever as described on pages 54 to 57.

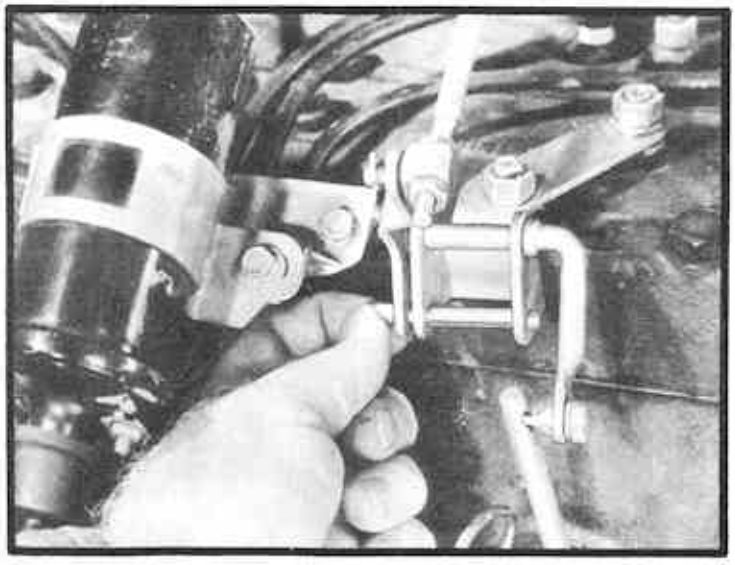


17. Next, connect the throttle rear rod to the throttle lever, and . . .

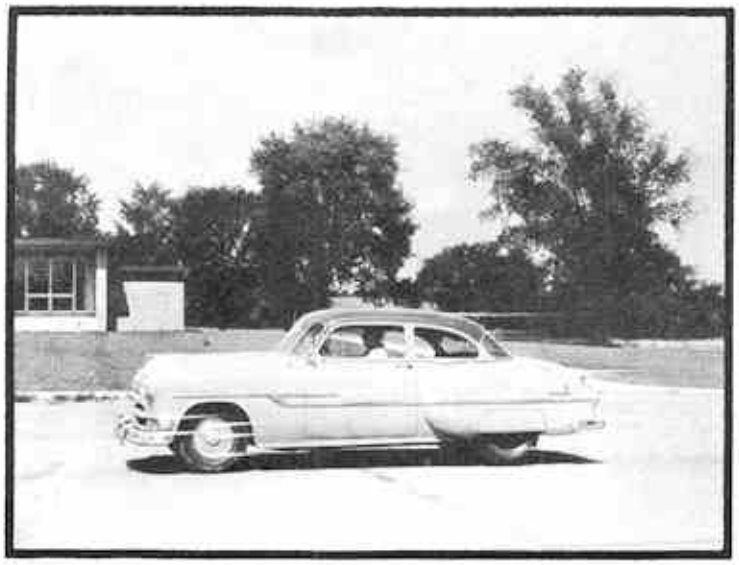


18. . . . adjust its length so that it exerts only a light force against the throttle lever, when the lever is at its rearward limit.

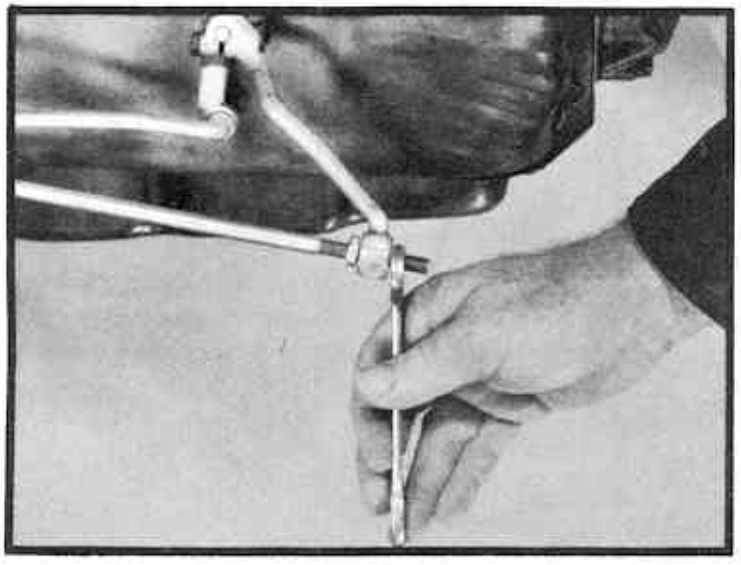
19. Then shorten the rod length by backing off the trunnion front lock nut one full turn, and tighten the rear lock nut securely. This adjustment insures correct throttle control valve operation.



20. Now, remove the linkage adjusting pin.



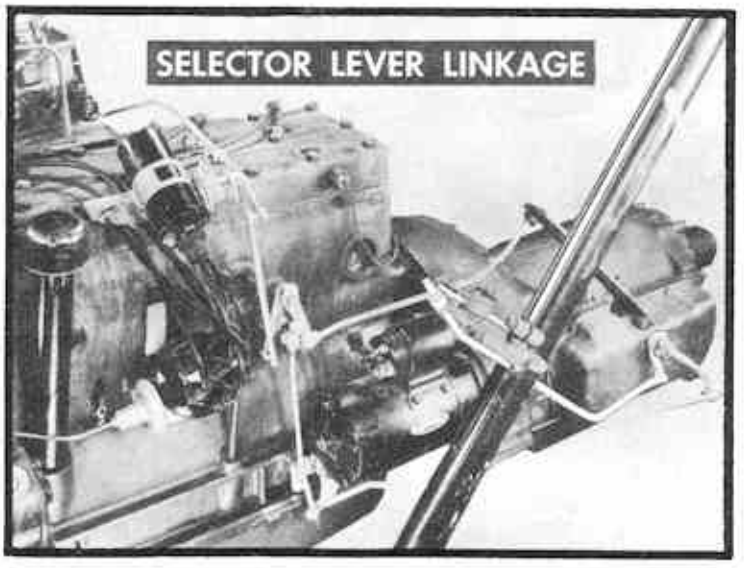
21. Then, road test the car to check the shift pattern.



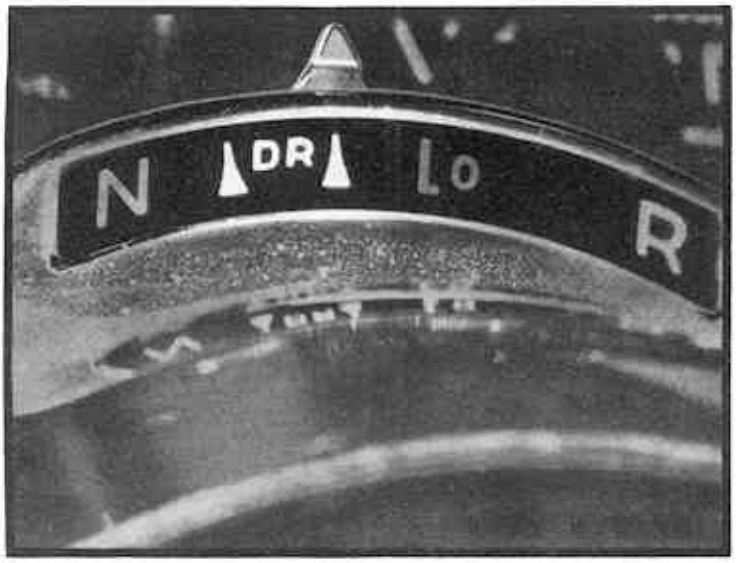
NOTE

If the shifts are too low, or bunched together, shorten the transmission throttle rear rod *slightly* to provide proper shift pattern. Do not shorten the rod too much since this will raise the shift points too high.

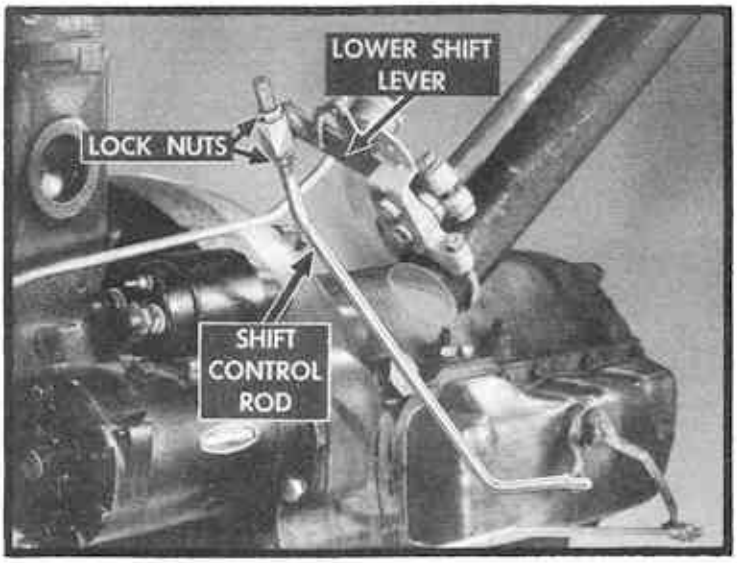
IX. SELECTOR LEVER LINKAGE ADJUSTMENT



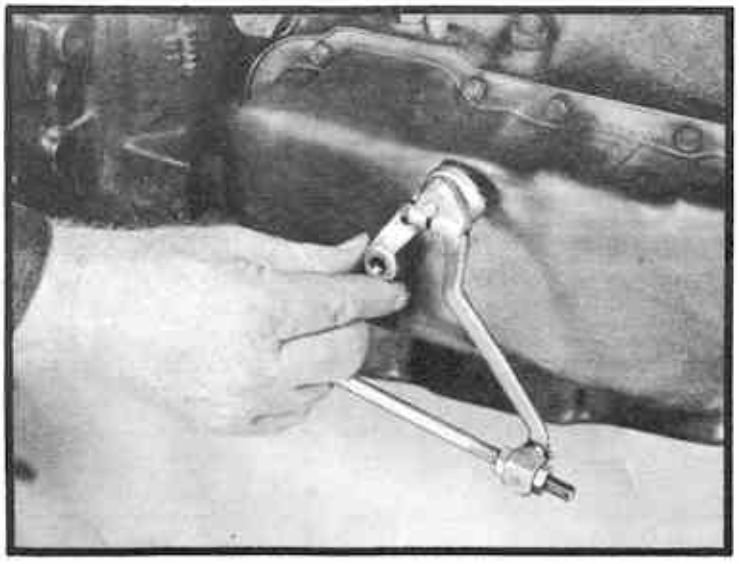
The selector lever linkage runs from the selector lever to the manual control lever. To adjust it . . .



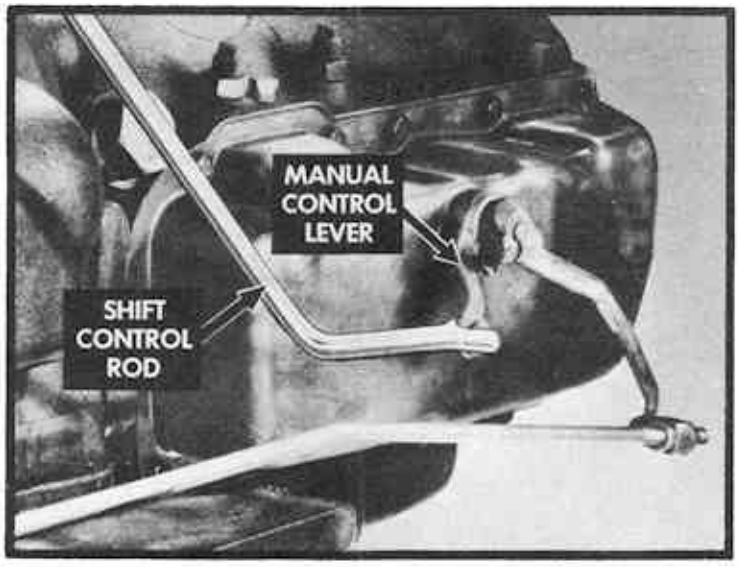
1. . . . first place the selector lever in "drive right" position against the stop, which prevents accidental shift into low range.



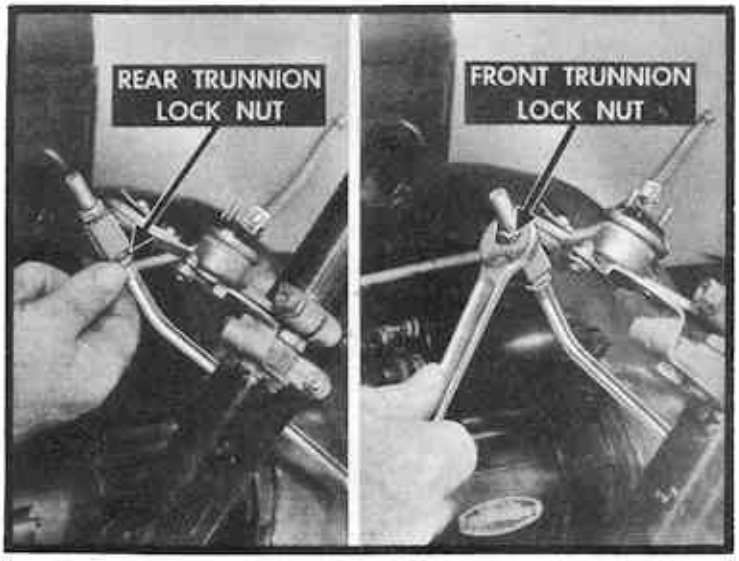
2. Back off both the front and rear trunnion lock nuts on the shift control rod.
3. Disconnect the shift control rod from the manual control lever.



4. Now, make sure the manual control lever also is in "drive right" position by moving the lever and setting it in the second detent from the front.



5. Then, connect the shift control rod into the manual control lever.



6. Next, finger-tighten the rear trunnion lock nut to remove clearance in the linkage.
7. Now, tighten the same lock nut one complete turn to lengthen the rod.
8. And last, tighten the front lock nut.

X. STARTING ENGINE BY PUSHING

If it becomes necessary to start engine by pushing the car a short distance due to a low battery, move control lever to the "N" position. When a speed of approximately 25 MPH is attained, turn ignition switch on and move the control lever to DR 4 position.

XI. TOWING THE CAR

Disconnect the propeller shaft or raise the rear wheels off the ground to prevent possible damage to the transmission.

SECTION FOUR

REFERENCE CHARTS

CHART "A" — USE OF SERVO BAND ADJUSTER — J 2681-C

(See step 16, Page 32)

FRONT SERVO (FRONT BAND)

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Oldsmobile	6.5	6.5	6.5	6.5	6.5	6.5	7.7	7.7		
Pontiac			6.5	6.5	6.5	6.5	7.7	7.7	7.7	
Cadillac	6.5	6.5	6.5	6.5	6.5	6.5	7.7	7.7	7.7	7.7
Lincoln				6.5	6.5	6.5	7.7	7.7	7.7	
Nash				6.5	6.5	6.5	7.7	7.7	7.7	7.7
Hudson					6.5	6.5	7.7	7.7	7.7	7.7
Kaiser					6.5	6.5	7.7	7.7	7.7	7.7
Willys								7.7	7.7	7.7
Chevrolet Truck (1/2 - 3/4 - 1 ton only)									7.7	7.7
GMC Truck (Up to and including 1 ton Models only)							7.7	7.7	7.7	7.7

REAR SERVO (REAR BAND)

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Oldsmobile Pontiac Cadillac Lincoln Nash Hudson Kaiser Chevrolet Truck (1/2 - 3/4 - 1 ton only) GMC Truck (Up to and including 1 ton Models only)	(See step 11, Page 35) USE TWO (2) TURNS FOR ALL YEARS AND MODELS WHEN ADJUSTING REAR SERVO WITH J 2681-A AND TACHOMETER EXCEPT 54-55 OLDS AND 55 PONTIAC. ON THESE USE THE INTERNAL METHOD OF ADJUSTMENT ONLY. (See Pages 36 and 42.)									

CHART "B" — USE OF FRONT SERVO GAUGE — J 1693-B

(See step 11, Page 40)

Car	Years	No. of Turns
Oldsmobile	46 - 55	5
Pontiac	48 - 55	5
Cadillac	46 - 55	5
Lincoln	49 - 54	5
Nash	49 - 55	5
Hudson	50 - 55	5
Kaiser	50 - 55	5
Willys	53 - 55	5
Chevrolet Truck (1/2 - 3/4 - 1 ton only)	54 - 55	5
GMC Truck (Up to and including 1 ton Models only)	52 - 55	5

OIL PRESSURE TEST INFORMATION

The following Oil Pressure Guide should be used whenever an oil pressure check is made. Before making the oil pressure test, check the metal plate on the right side of the Hydra-Matic case. This has a letter or letters and a number – followed by a serial number, and indicates which figures in the guide apply to the test.

1. Under the automobile heading, Oldsmobile, for example, Neutral, Drive, or Reverse designates the positioning of the Selector Lever located under the steering wheel.
2. The RPM figures denote the engine RPM with a tachometer hooked up.
3. Drive 4-Full throttle means: Drive range position of the selector lever with the engine RPM at the specified figure and the throttle valve of the carburetor "Full Open" (accelerator pedal depressed but – NOT – through the warning detent). This means driving the automobile from a lower RPM figure than specified and when the RPM called for in the guide is reached, an oil pressure reading should be taken.
4. 50 Min. or 45 Min., for example, means 50 lbs. pressure minimum or 45 lbs. pressure minimum etc.
5. Where NO oil pressure figures are listed in the guide, this means you DO NOT need an oil pressure reading for the particular condition called for.

CHART "C"

MAIN LINE OIL PRESSURE TEST GUIDE

NOTE: On transmissions with over 25,000 miles, idle pressure may be as low as 30 P. S. I. without indicating a defective transmission.

KAISER	R.P.M.	1952-3-4-5	1951	1950
Neutral	Idle	50 Min.	45 Min.	40 Min.
Reverse	1200	135-175	150-210	
Drive-4 (Full Throttle)	1200	85-93	80 Min.	80-88

WILLYS	R.P.M.	1955-4	1953-2
Neutral	Idle	50 Min.	50 Min.
Reverse	1200	135-175	125-165
Drive-4 (Full Throttle)	1200	85-95	78-86

OLDSMOBILE	R.P.M.	1955-4	1953	1952	1951	1949-8-7-6
Neutral	Idle	50 Min.	50 Min.	50 Min.	45 Min.	40 Min.
Reverse	1200	145-185	145-185	135-175		
Drive-4 (Full Throttle)	1200	101-109	90-98	85-93	80 Max.	90 Max.

Main line oil pressure test guide —(Continued)

CADILLAC	R.P.M.	1955	1954	1953-2-C	1952-A	1951-C&A	1950-49-48-47-46
Neutral	Idle	50 Min.	50 Min.	50 Min.	50 Min.	45 Min.	40 Min.
Reverse	1200	76-210	145-185	145-184	155-195	150-220	
Drive-4 (Full Throttle)	1200	114-122	110-118	90-98	97-105	80-100	80 Min.

PONTIAC	R.P.M.	1955	1954-3-2	1951	1950-9-8
Neutral	Idle	50 Min.	50 Min.	45 Min.	40 Min.
Reverse	1200	145-185	145-185	140-210	
Drive-4 (Full Throttle)	1200	101-109	90-98	80-88	80-90

NASH	R.P.M.	1951-N & E	1955-Y	1954-E & NA	1954-Y	1954-N	1953-E-EA & Y
Neutral	Idle	50 Min.	50 Min.	50 Min.	50 Min.	50 Min.	50 Min.
Reverse	1200	145-185	135-175	145-185	135-175	145-185	135-175
Drive-4 (Full Throttle)	1200	90-98	84-92	90-98	84-92	100-108	85-93

NASH	R.P.M.	1953-N & NB	1952-N	1952-E	1951 N & E	1950 E & N
Neutral	Idle	50 Min.	50 Min.	50 Min.	45 Min.	40 Min.
Reverse	1200	145-185	145-185	125-165	140-210	
Drive-4 (Full Throttle)	1200	90-98	90-98		80-88	80 Min.

HUDSON	R.P.M.	1955-H	1955-Z	1954-3-H	1953-54-J-Z	1952-H & J
Neutral	Idle	50 Min.	50 Min.	50 Min.	50 Min.	50 Min.
Reverse	1200	150-175	135-175	155-175	135-175	135-175
Drive-4 (Full Throttle)	1200	94-102	84-92	90-103	85-93	85-93

HUDSON	R.P.M.	1952-Z	1951-H & J	1950-H
Neutral	Idle	45 Min.	45 Min.	40 Min.
Reverse	1200	145-210	140-210	
Drive-4 (Full Throttle)	1200	80-88	80-88	80 Min.

LINCOLN	R.P.M.	1954-L	1953-L & LA	1952-L	1951-L	1950-L & F
Neutral	Idle	50 Min.	50 Min.	50 Min.	45 Min.	40 Min.
Reverse	1200	145-185	145-185	150-210	150-210	
Drive-4 (Full Throttle)	1200	100-108	100-108	90-98	80 Min.	80 Min.

GMC TRUCK	R.P.M.	1955-177C & CA	1955-220-Y 210-U UA-UC	1954-220-Y 210-U	1953-210U 1953-177C
Neutral	Idle	50 Min.	65 Min.	65 Min.	50 Min.
Reverse	1200	145-185	180-220	180-220	145-185
Drive-4 (Full Throttle)	1200	85-93	92-97	92-97	85-93

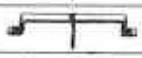
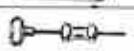
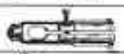
GMC TRUCK	R.P.M.	1952-210-U
Neutral	Idle	50 Min.
Reverse	1200	135-175
Drive-4 (Full Throttle)	1200	85-93

CHEVROLET TRUCK	R.P.M.	1955-4 180-CH	1955-200-CH 200-CHC	1954-180-CH	1954-200-CHC 200-CH
Neutral	Idle	50 Min.	65 Min.	50 Min.	65 Min.
Reverse	1200	145-185	180-200	145-185	180-200
Drive-4 (Full Throttle)	1200	85-93	92-97	85-93	92-97

KENT-MOORE *RATE-MAKER* HYDRA-MATIC TOOLS

for complete External and Internal Service

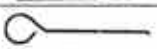
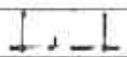
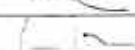
Tools listed are available through your local Kent-Moore jobber

ILLUSTRATION	TOOL NO.	DESCRIPTION	HYDRA-MATIC APPLICATION								
			CAD.	CHEV. TRUCK	HUD.	NASH	OLDS	PONT.	GMC TRUCK	LINC.	KAISER -W.
	J 1354	—Rear Bearing Retainer Oil Seal Installer*			50-55	49-55	46-51	48-55			50-55
	J 1459-B	—Rear Unit Holding Tool	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 1465-B	—Dial Indicator Extension Rod	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 1537	—Oil Delivery Sleeve Ring Compressor	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 1693-B	—Front Servo Gauge*	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 1942-A	—Extension Housing Rear Oil Seal Installer*	46-55							49-54	
	J 2029	—Throttle Lever Bending Tool*					46-55				
	J 2170	—Front Pump Cover Oil Seal Installer	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2173	—Front Drum Spacer	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2174	—Rear Clutch Hub Retainer Bracket	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2182-A	—Transmission Bearing Retainer Remover	46-55		50	49-50	46-50	48-50		49-54	50
	J 2183	—Governor Flange and Pump Riveting Set	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2184-A	—Front Pump Holder & Socket Set	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2187	—Front Planet Carrier Assembly Holder	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2191	—Speedometer Drive Gear Spacer			50	49-50	46-50	48-50			
	J 2195	—Throttle Lever Checking Gauge*			50-55		46-53				
	J 2541-B	—Transmission Holding Stand	46-55	54-55	50-55	49-55	46-53	48-54	52-55	49-54	50-55
	J 2544-A	—Linkage Adjusting Pins (3)*			50-55		48-49	48-55		49-54	50-54
	J 2545-C	—Throttle Lever Checking Gauge*		54	*, 55	49-55		48-54	1954		50-54
	J 2549	—Torus Cover Hub Checking Gauge					46-55				
	J 2586	—Torus Cover Hub Checking Gauge			55	49-55		48-55			50-55
	J 2587-B	—Transmission Mainshaft Endplay Guide	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2619-B	—Slide Hammer Assembly*	46-55		55	49-55				49-54	
	J 2623	—Extension Housing Oil Seal Remover Collet*	46-55							49-54	
	J 2650	—Reverse Gear Backlash Gauge	46-50		50	49-50	46-50	48-50		49-50	50
	J 2681-C	—Servo Band Adjuster*	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 2808	—Floor Jack Adapter	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 3065-C	—Throttle Lever Checking Gauge*	46-55								
	J 3310	—Throttle Lever Bending Tool*	46-55		55	55				49-54	

**Rambler only

*Special tools recommended for on-the-car service

KENT-MOORE *RATE-MAKER* HYDRA-MATIC TOOLS —(Continued)

ILLUSTRATION	TOOL NO. DESCRIPTION	HYDRA-MATIC APPLICATION								
		CAD.	CHEV. TRUCK	HUD.	NASH	OLDS	PONT.	GMC TRUCK	LINC.	KAISER -W.
	J 4158 —Throttle Linkage Adjusting Pins (2)*				49-55					
	J 4264-A —Oil Filler Funnel and Tube*	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 4353 —Annular Piston Seals Leak Detector	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 4353-1 —Blow Gun Assembly (only)	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 4415 —Rear Servo Spring Compressor	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 4448 —Crow Foot Adapter for Torque Wrench	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 4638 —Torus Member Indicator Support			50-54						
	J 4639 —Flywheel Housing Indicator Support			50-54						
	J 4659 —Extension Rod (Use with KMO 30)			50-54						
	J 4660 —Transmission Lifting Eye Bolt	46-53		50-53	49-53	46-53	48-53	52-53	49-53	50-53
	J 4670-C —Clutch Spring Compressor	51-55	54-55	51-55	51-55	51-55	51-55	52-55	51-54	51-55
	J 4731 —Governor Sleeve Aligning Tool	51-55	54-55	51-55	51-55	51-55	51-55	52-55	51-54	51-55
	J 4752 —Reverse Piston to Drum Seal Installer	51-55	54-55	51-55	51-55	51-55	51-55	52-55	51-54	51-55
	J 4830 —Extension Housing Oil Seal Remover Collet*			55	49-55					
	J 5071 —Rear Servo Gauge*	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 5138 —Rear Bearing Retainer Ball Bearing Installer					52-55		54-55		
	J 5139 —Rear Bearing Retainer Ball Bearing Remover					52-55		54-55		
	J 5154-A —Rear Bearing Retainer Oil Seal Installer		54			52-54		54		
	J 5157 —Regulator End Casting Assembly Clamp*	51-55	54-55	51-55	51-55	51-55	51-55	52-55	51-54	51-55
	J 5172 —Rear Bearing Retainer Internal Snap Ring Pliers					52-55	51-52	54-55		
	J 5177 —Line Exhaust Valve Sleeve Remover	51-52		51-52	51-52	51-52			51-52	51-52
	J 5260 —Throttle Lever Bending Tool		54	50-55	49-55		48-54	52-54		50-55
	J 5492 —Torus Cover Hub Checking Gauge*		54-55					52-55		
	J 5586 —Snap Ring Pliers	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	J 5605 —Throttle Lever Checking Gauge					54-55				
	J 5609 —Carburetor Control Lever Positioning Gauge*		54							
	J 5629 —Carburetor Control Lever Positioning Gauge*		54							
	J 5907 —Universal Pressure Checking Gauge (with adapters)*†	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	KMO 30 —Dial Indicator Set	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	KMO 629—0-50 ft. lbs. Torque Wrench	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55
	KMO 630—Snap Ring Pliers	46-55	54-55	50-55	49-55	46-55	48-55	52-55	49-54	50-55

*Special Tools recommended for on-the-car service

†Also applicable to Dynaflow, Powerglide & Ford-O-Matic

HYDRA-MATIC IDENTIFICATION GUIDE

YEAR	HYDRA-MATIC MODEL	VEHICLE APPLICATION
1940	40-O	Oldsmobile
1941	41-C	Cadillac
	41-O	Oldsmobile
1942	42-C	Cadillac
	42-O	Oldsmobile
1946	46-C	Cadillac
	46-O	Oldsmobile
1947	47-C	Cadillac
	47-O	Oldsmobile
1948	48-C	Cadillac
	48-O	Oldsmobile & Pontiac
1949	49-A	Cadillac-Commercial
	49-C	Cadillac
	49-G	GMC-Coach
	49-L	Lincoln
	49-N	Nash Ambassador
	49-O	Oldsmobile
	49-P	Pontiac
1950	50-A	Cadillac-Commercial
	50-B	Oldsmobile 6 (2nd speed start)
	50-C	Cadillac
	50-D	Pontiac 8
	50-E	Nash Statesman
	50-F	Lincoln-Commercial
	50-G	GMC-Coach
	50-H	Hudson Commodore
	50-K	Kaiser-Frazer
	50-L	Lincoln
1950	50-N	Nash Ambassador
	50-O	Oldsmobile 8
	50-P	Pontiac 6
	50-S	Oldsmobile 6
	48-X	Extra Duty Commercial (also built in 46, 47, 48)
1951	51-A	Cadillac-Commercial
	51-C	Cadillac
	51-D	Pontiac 8
	51-E	Nash Statesman
	51-G	GMC-Coach
	51-H	Hudson Commodore
	51-J	Hudson Pacemaker
	51-K	Kaiser-Frazer
	51-L	Lincoln
	51-N	Nash Ambassador
	51-O	Oldsmobile 8
	51-P	Pontiac 6
1952	52-A	Cadillac-Commercial
	52-C	Cadillac
	52-E	Nash Statesman
	52-H	Hudson Commodore
	52-J	Hudson Pacemaker
	52-K	Kaiser
	52-L	Lincoln (52)
	52-LA	Lincoln (53)
	52-N	Nash Ambassador
	52-O	Oldsmobile 88
	52-O.H.D.	Oldsmobile 88 (H.D.)
	52-P	Pontiac
	52-R	Oldsmobile 98
	52-R.H.D.	Oldsmobile 98 (H.D.)
	52-U	GMC-Truck
	52-X	Rolls Royce

HYDRAMATIC IDENTIFICATION GUIDE — (Continued)

YEAR	HYDRA-MATIC MODEL	VEHICLE APPLICATION
1953	53-A	Cadillac-Commercial
	53-C	Cadillac
	53-E	Nash Statesman (Small Torus)
	53-EA	Nash Statesman (Large Torus)
	53-G	GMC-Coach
	53-H	Hudson Commodore
	53-J	Hudson Pacemaker
	53-K	Kaiser
	53-L	Lincoln
	53-N	Nash Ambassador (Large Torus)
	53-NB	Nash Ambassador (Intermediate Torus)
	53-O	Oldsmobile 88
	53-O.H.D.	Oldsmobile 88 (H.D.)
	53-P	Pontiac
	53-R	Oldsmobile 98
	53-RA	Oldsmobile 98 (After fire)
	53-R.H.D.	Oldsmobile 98 (H.D.)
	53-U	GMC-Truck
	53-X	Rolls Royce
	53-Y	Nash Rambler
	53-Z	Hudson Jet
	177-C	GMC-Truck
1954	54-C	Cadillac
	54-E	Nash Statesman
	54-H	Hudson Hornet
	54-J	Hudson Wasp & Super Wasp
	54-K	Kaiser
	54-L	Lincoln
	54-N	Nash Ambassador (Intermediate Torus)
	54-NA	Nash Ambassador (Large Torus)
	54-P	Pontiac
	54-R	Oldsmobile
	54-W	Willys
	54-Y	Nash Rambler
	54-Z	Hudson Jet
	177-C	GMC ½ Ton
	54-180-CH	Chevrolet ½ Ton
	54-200-CH	Chevrolet ¾ and 1 Ton
	54-200-CHC	Chevrolet ¾ and 1 Ton
	54-210-U	GMC Panel Delivery
	54-220-Y	GMC-1½ Ton
1955	55-Z	Hudson
	55-E	Nash
	55-Y	Nash
	55-177-C	GMC-Truck
	55-177-CA	GMC ½ Ton
	55-180-CH	Chevrolet ½ Ton
	55-W	Willys
	55-N	Nash
	55-200-CHC	Chevrolet ¾ and 1 Ton
	55-200-CH	Chevrolet ¾ and 1 Ton
	55-H	Hudson
	55-210-U	GMC Panel Delivery ¾ and 1 Ton
	55-210-UA	GMC Panel Delivery R.R. Exp.
	55-210-UC	GMC Panel Delivery ¾ and 1 Ton
	55-220-Y	GMC 1½ Ton
	55-P	Pontiac
	55-R	Oldsmobile
	55-A	Cadillac
	55-B	Cadillac
	55-C	Cadillac-60-62
	55-CE	Cadillac Eldorado


GM
GENERAL MOTORS
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UNITED
MOTORS
SYSTEM