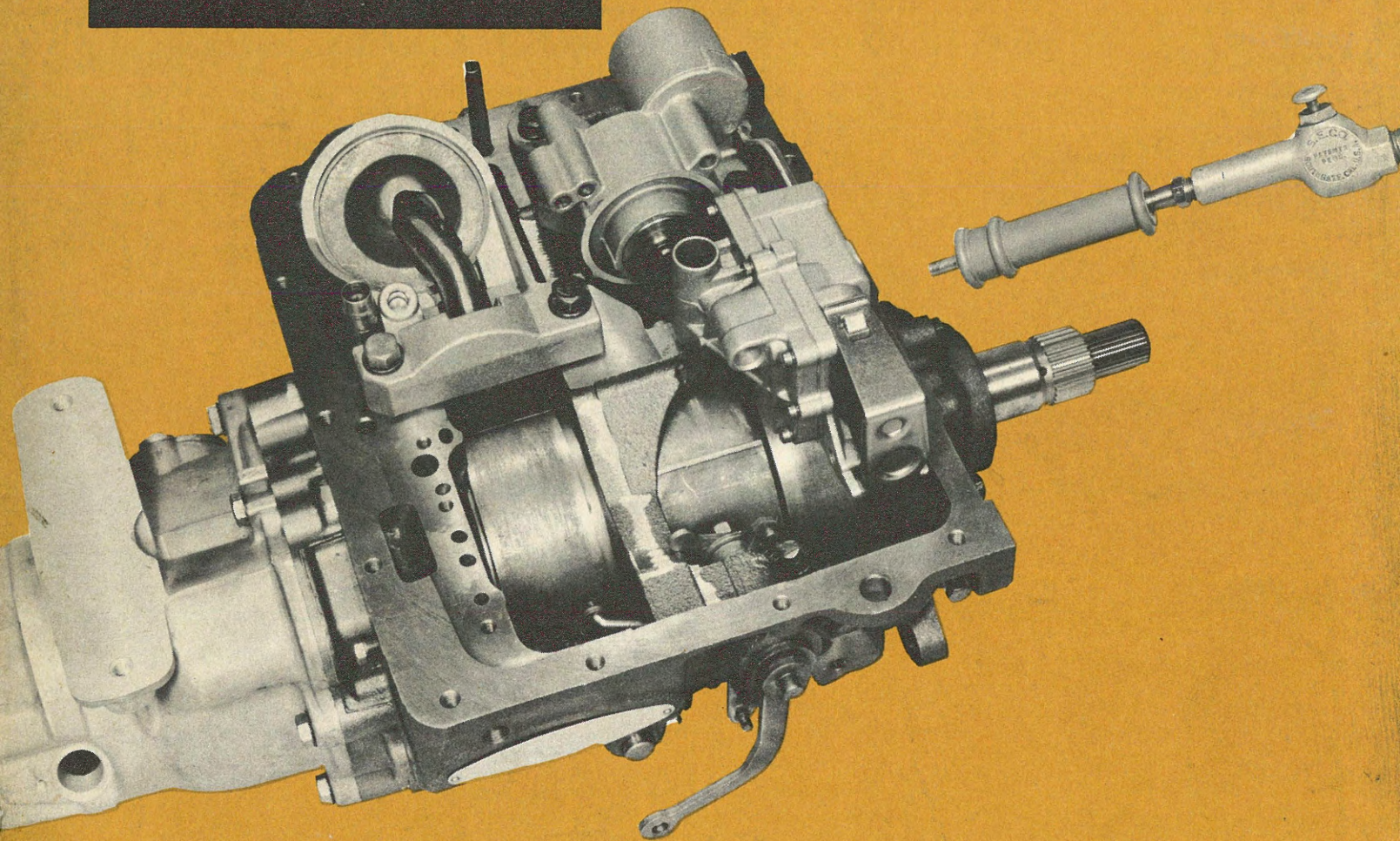


REGISTERED MECHANICS

Service Training



PRESSURE PROVES THE PROBLEM
on • **Two-Speed** • **Single-Range**
• **Dual-Range Transmissions**

M-E-L Headquarters • Technical Training Section • M-E-L Service Department

NUMBER

1

1959

WHEN THE TRANSMISSION IS OUT OF ORDER... **THE CAR IS, TOO**

Then it's YOUR job to make the right diagnosis to find what ails the transmission . . .

. . . so the car, and the driver, can get back in the hustle-bustle of everyday traffic.

There are several steps in diagnosing transmission failure

- **SHIFT TEST**
- **STALL TEST**
- **HYDRAULIC PRESSURE TEST**



AND . . .

THE AIR PRESSURE TEST

It may be necessary to use any one or all of the other tests to find which major units are not functioning properly. An **AIR PRESSURE** test will help you verify the results of these tests.

The purpose of this presentation is to show how the air pressure test, which involves substituting air pressure for oil pressure, helps to locate the cause of unsatisfactory operation.

THERE ARE THREE BASIC TRANSMISSIONS TO CONSIDER:

TWO-SPEED

SINGLE-RANGE

DUAL-RANGE

They are known by the following product names:

TWO-SPEED	Edsel Mile-O-Matic
SINGLE-RANGE	Mercury Merc-O-Matic
DUAL-RANGE	Edsel Dual Power Mercury Multi-Drive Lincoln and Continental Mark IV Twin-Range

You can quickly recognize these transmissions by . . .

... knowing the TRANSMISSION APPLICATION

	Transmission	Engine Cylinder	Cu. In. Displace- ment	Serial No. Prefix	Serial No.
EDSEL	Mile-O-Matic	6	223	PBP-A	B9PA-7000A
	Mile-O-Matic	8	292	PBR-A	B9PA-7000B
	Mile-O-Matic	8	332	PBS-A	B9PA-7000C
	Mile-O-Matic	8	361	PBS-B	B9PA-7000D
	Dual Power	8	361	PBL-U	PBL-7000U
MERCURY	Merc-O-Matic	8	312	PBM-G	B9PM-7000A
	Merc-O-Matic	8	383 (2V)	PBL-S	B9PM-7000D
	Multi-Drive	8	383 (2V)	PBL-T	B9PM-7000E
	Merc-O-Matic	8	383 (4V)	PBL-K	B9PM-7000B
	Multi-Drive	8	383 (4V)	PBL-L	B9PM-7000C
	Multi-Drive	8	430 (4V)	PBB-F	B9PM-7000F
LINCOLN	Twin Range	8	430 (4V)	PBB-E	PBB-7000E

Each transmission has a different system of band and clutch application.

TWO-SPEED TRANSMISSION BAND AND CLUTCH APPLICATION

	Front Band	Clutch	Rear Band	Parking Pawl
PARK	—	—	—	ON
REVERSE	—	—	ON	—
NEUTRAL	—	—	—	—
DRIVE LOW	ON	—	—	—
DRIVE HIGH	—	ON	—	—
MANUAL LOW	ON	—	—	—



THE SINGLE-RANGE TRANSMISSION BAND AND CLUTCH APPLICATION

	Front Clutch	Front Band	Rear Clutch	Rear Band	Parking Pawl
PARK	—	—	—	—	ON
REVERSE	—	—	ON	ON	
NEUTRAL	—	—	—	—	
INTERMEDIATE	ON	ON	—	—	
HIGH	ON	—	ON	—	
LOW	ON	—	—	ON	

SINGLE-RANGE

THE **DUAL-RANGE** TRANSMISSION BAND AND CLUTCH APPLICATION

	Front Clutch	Front Band	Rear Clutch	Rear Band	Parking Pawl	One Way Clutch
PARK	—	—	—	—	ON	—
REVERSE	—	—	ON	ON	—	—
NEUTRAL	—	—	—	—	—	—
DRIVE—2						
INTERMEDIATE	ON	ON	—	—	—	—
HIGH	ON	—	ON	—	—	—
DRIVE—1						
LOW	ON	—	—	—	—	Holding
INTERMEDIATE	ON	ON	—	—	—	—
HIGH	ON	—	ON	—	—	—
MANUAL LOW	ON	—	—	ON	—	—

DUAL-RANGE

SUPPOSE THE CAR BELONGING TO OUR HITCHHIKING FRIEND IS TO BE TAKEN TO THE DEALERSHIP...

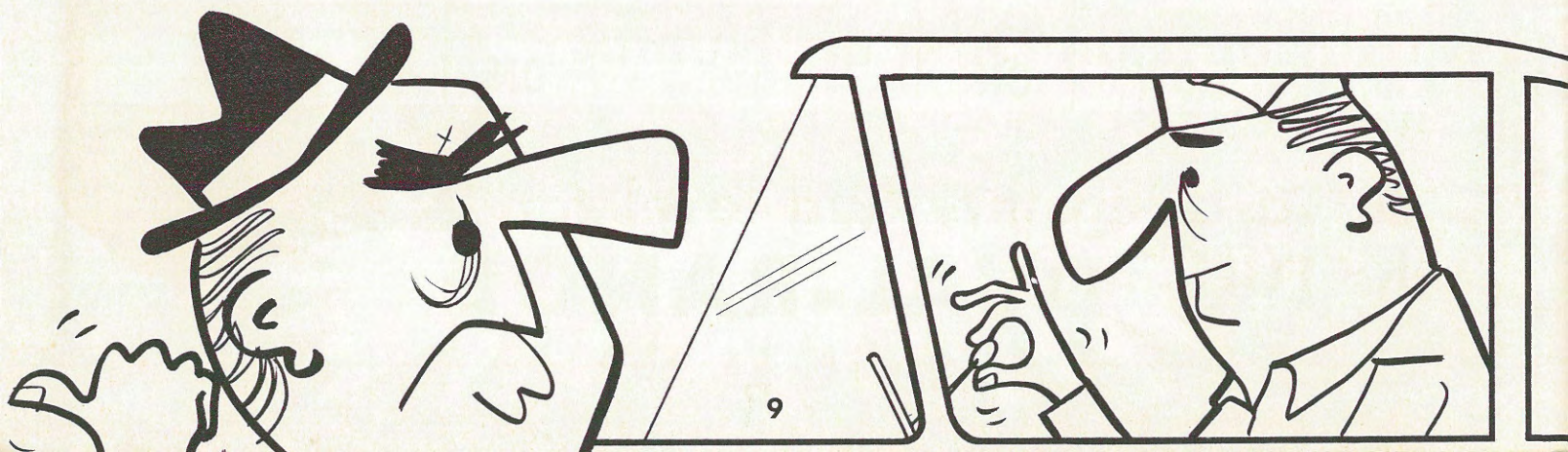
The first thing to do, if possible, is to make a **SHIFT TEST** to verify the customer's complaint. Then make a **STALL TEST** and...check the **HYDRAULIC OPERATING PRESSURE**.

Then to pinpoint the cause of the trouble... make an **AIR PRESSURE TEST**.

But first... there are some **Preliminary Checks and Adjustments** that must be carried out.

FLUID LEVEL
EXTERNAL LEAKAGE
ENGINE IDLE
LINKAGE

These Concern: 



CHECK THE FLUID LEVEL

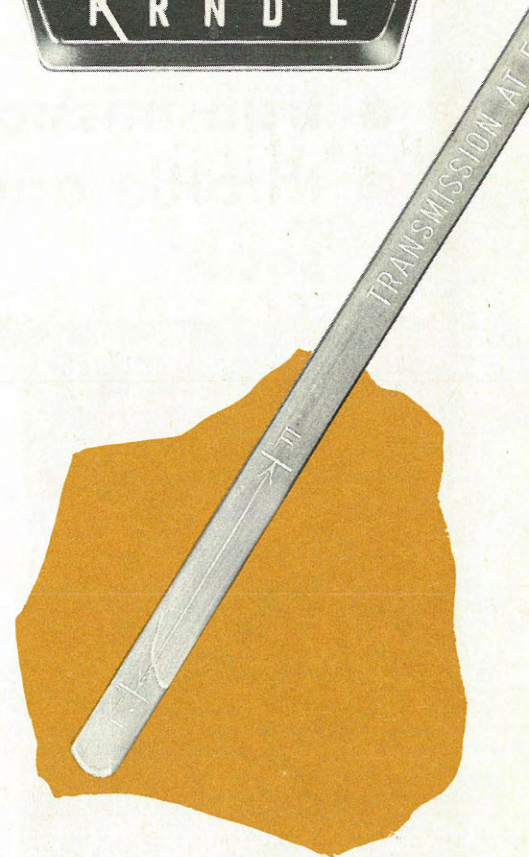
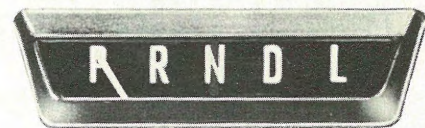
- Be sure the car is standing level.
- Place the transmission in park or neutral and apply the parking brake.



- Then start the engine. When engine is warm, shift the transmission through all the drive ranges . . .

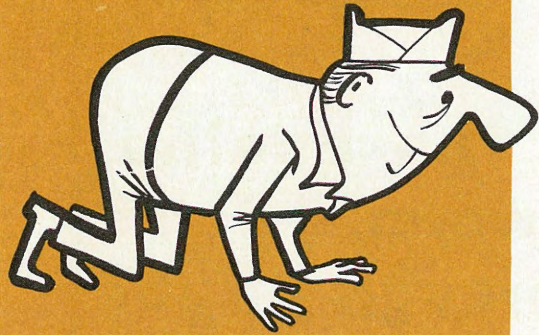
P ▶ R ▶ N ▶ D ▶ L

- Then place the transmission in park position . . .
- With the engine running . . . remove the indicator and read the fluid level.
- If the dipstick does not read FULL . . .
- Add Type "A" Automatic Transmission Oil (Part Number MK-19582).
- To bring the fluid level to the FULL mark.



CHECK FOR EXTERNAL OIL LEAKAGE

LOOK FOR OIL LEAKS AT THESE POINTS:



- extension housing oil seal
- speedometer cable connection
- extension housing gasket
- oil pan

- oil filler pan connection
- transmission oil cooler lines
- transmission oil cooler
- throttle and manual lever seals



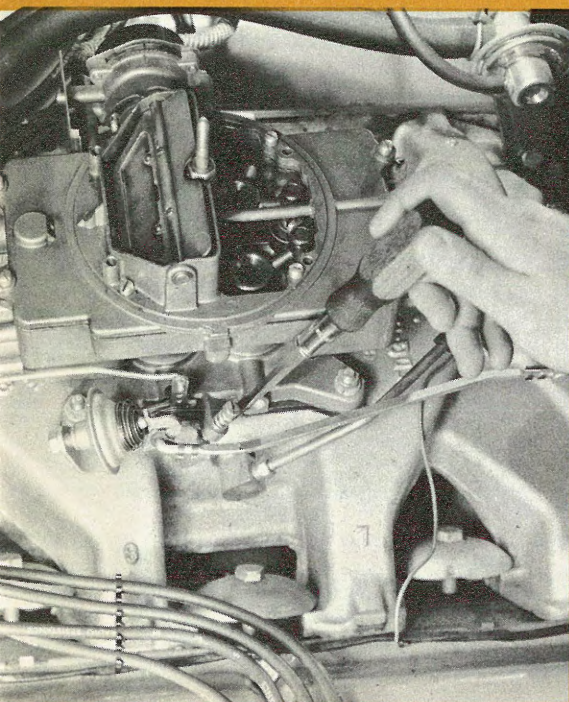
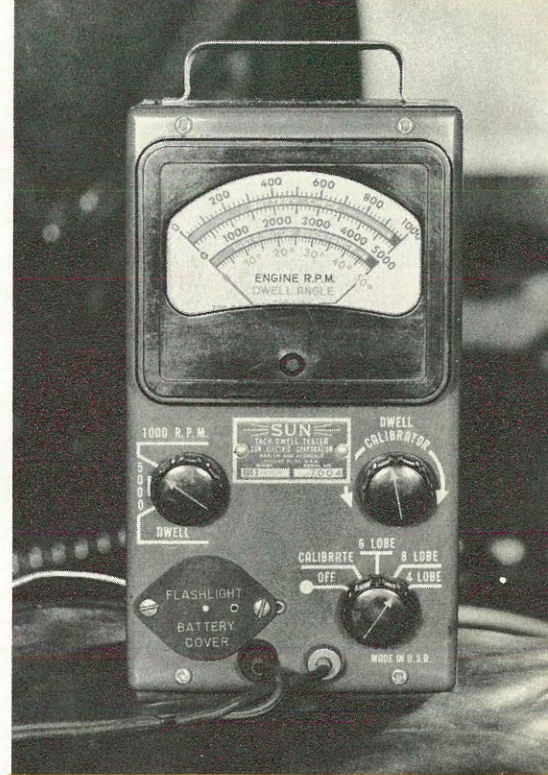
- convertor drain plugs
- front pump oil seal and gasket
- servo covers and seals
- low servo apply pressure plug

ADJUST THE ENGINE IDLE SPEED

This step must be taken before adjusting the linkage. First, install a tachometer. Set the parking brake firmly. Then start the engine.

Place the selector in the correct drive position . . .

Two-Speed — Drive
Dual-Range — Drive 2
Single-Range — Drive



Engine must be at normal operating temperature. Carburetor lever must be positioned against the hot idle screw. Then adjust the hot idle screw for an engine R.P.M. of 450.

Also, adjust the anti-stall dashpot to specified clearance.

Then . . . **ADJUST THE THROTTLE LINKAGE**

There's a step-by-step procedure to follow here:

1

. . . the engine idle speed

2

. . . the carburetor connecting link

3

. . . the accelerator connecting rod

4

. . . the throttle control rod

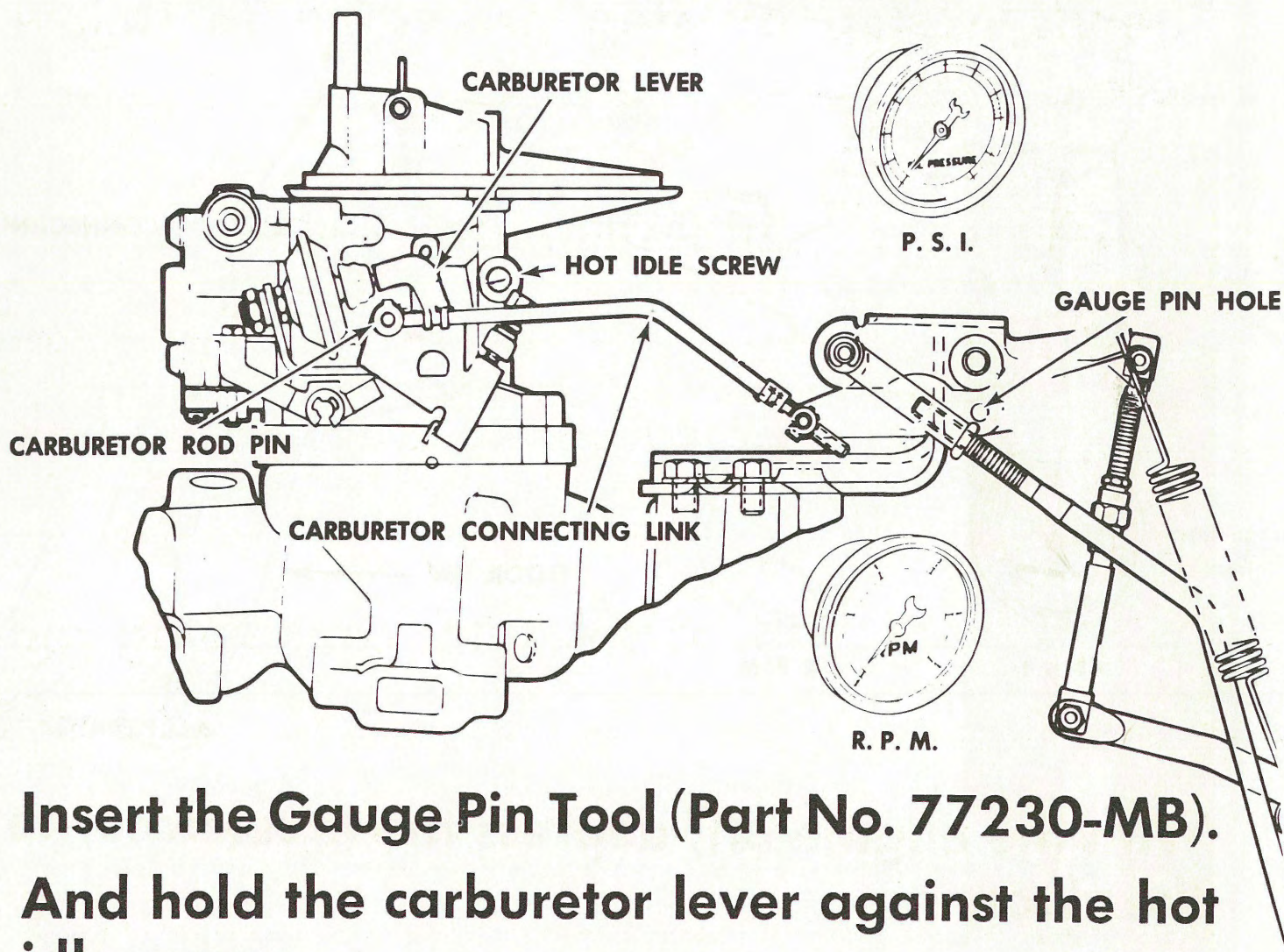
5

. . . the manual linkage

Of course, we've already adjusted the engine idle speed . . . so . . .

THE NEXT STEP IS TO ADJUST THE . . .

CARBURETOR CONNECTING LINK



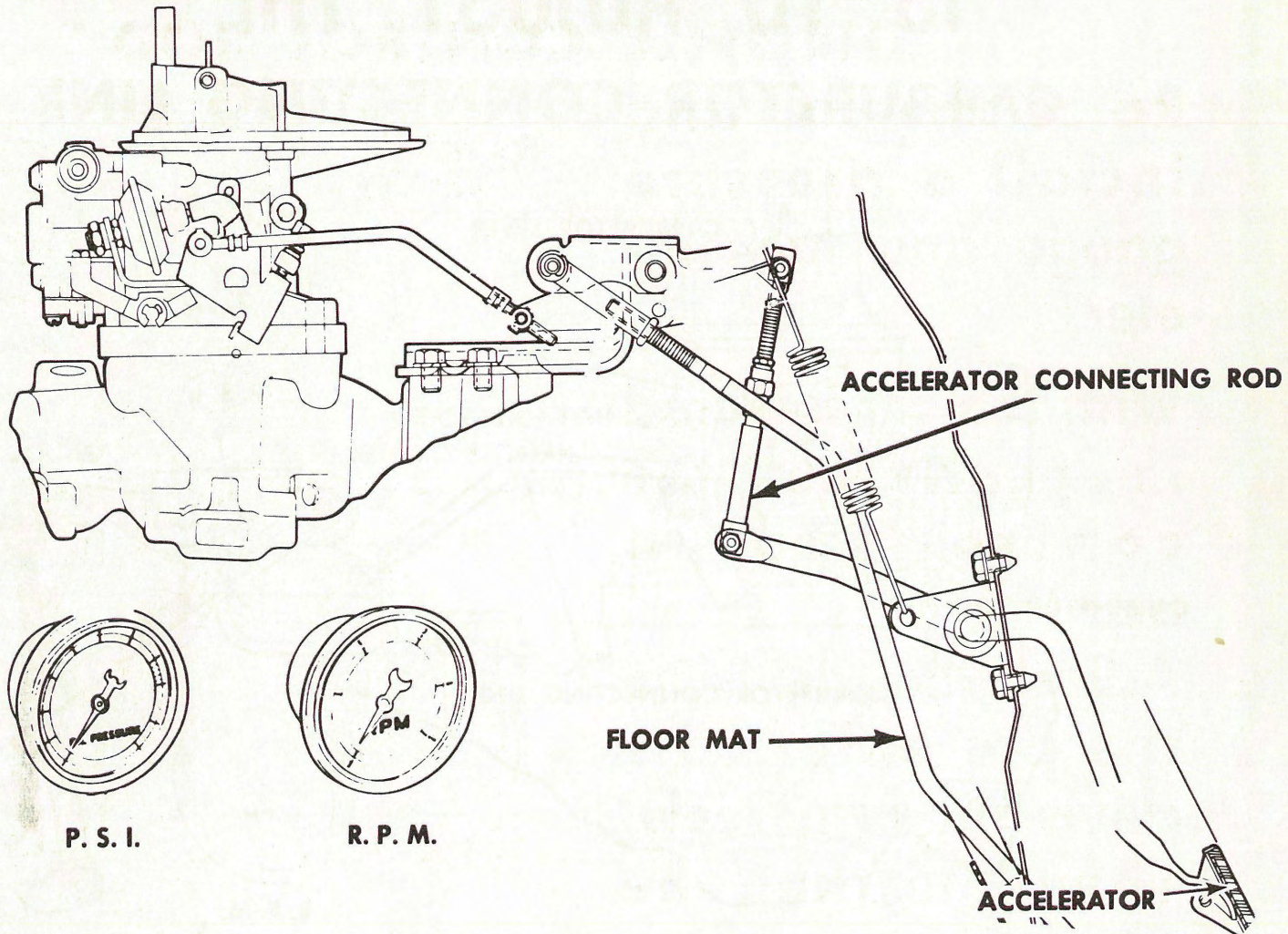
Insert the Gauge Pin Tool (Part No. 77230-MB).
And hold the carburetor lever against the hot
idle screw . . .

Then adjust the carburetor connecting link so
the pin enters the carburetor lever freely.

Lengthen the carburetor rod pin so that the
throttle lever is held against the hot idle screw.

NEXT STEP... ADJUST THE ...

ACCELERATOR CONNECTING ROD



With the engine off, depress the accelerator to the floor.

Then... check the alignment of the accelerator linkage. Check for binding, too.

Adjust the accelerator connecting rod so that the accelerator pedal height is within specifications.

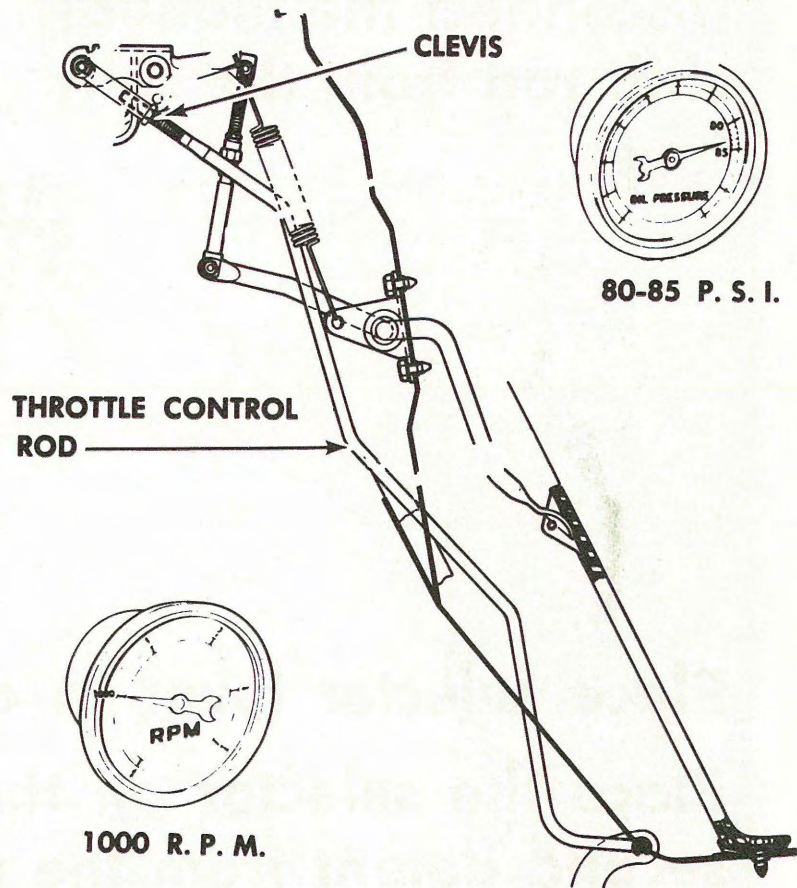
On single- and dual-range transmissions—

NEXT . . . ADJUST THE . . .

THROTTLE CONTROL ROD

Raise the car and install a pressure gauge and tachometer.

With the car lowered . . . gently pull the control rod up against its stop. Adjust the clevis so the pin enters the clevis and arm freely. Then lengthen the



clevis $3\frac{1}{2}$ turns. Next, set the brakes, place the selector in the correct drive position . . . accelerate the engine to 1,000 r.p.m.

Pressure gauge must read 80-85 p.s.i.

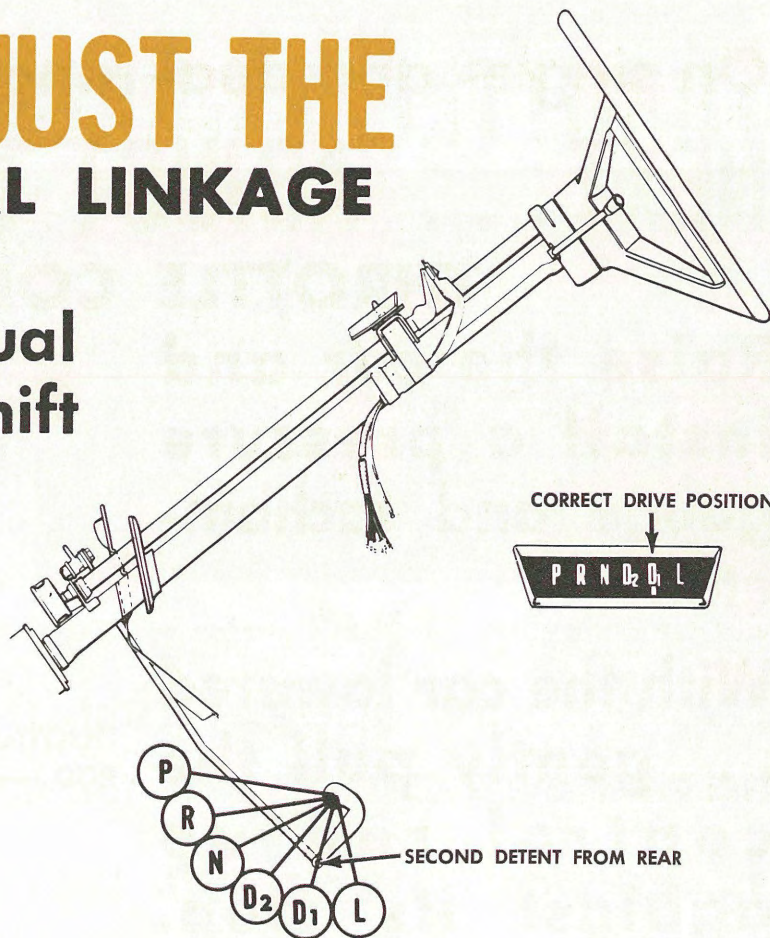
LENGTHEN clevis to increase pressure.

SHORTEN clevis to reduce pressure.

CAUTION: Make checks quickly. Return the selector to neutral after each check to avoid overheating the transmission.

NOW . . . ADJUST THE MANUAL LINKAGE

Disconnect the manual shift rod from the shift lever.



Place selector lever in correct drive position.

Place the selector on the transmission in the second detent from the rear.

Adjust the manual shift rod so . . . the clevis pin enters clevis and detent freely.

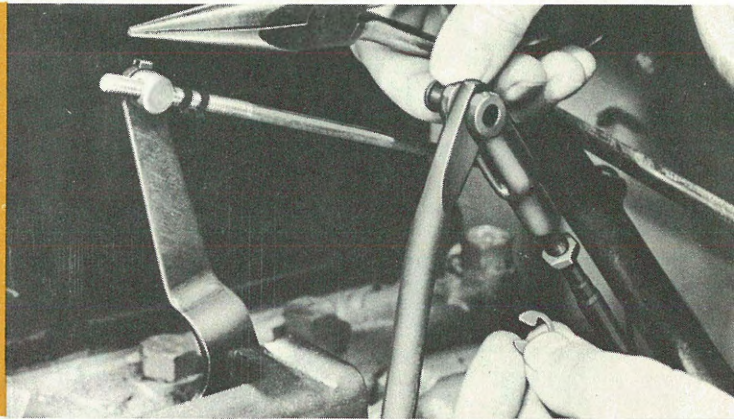
Then lengthen the clevis 1 full turn.

Reassemble and check the selector in each position. Also check operation of the neutral switch in park or neutral only.

NOTE: On Edsel models adjust the manual shift rod clamp in the same way.

THROTTLE LINKAGE ADJUSTMENT

ON A SIX-CYLINDER CAR WITH A TWO-SPEED TRANSMISSION



There are **FIVE** steps to follow... after the engine idle speed and dashpot adjustments have been made.

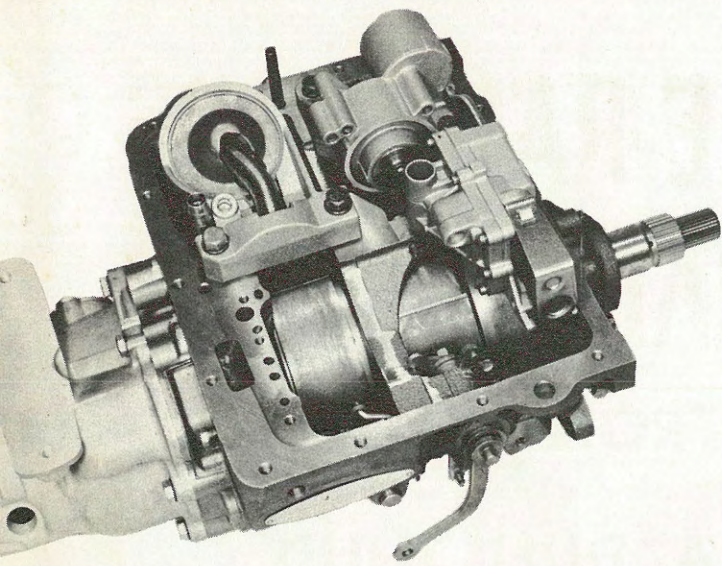
- 1.** Remove the clevis from the throttle control rod.
- 2.** Adjust the accelerator connecting rod so that the accelerator pedal height is within specifications.
- 3.** Then... turn the throttle control rod clevis until the pin fits the hole in the throttle lever.
- 4.** Lengthen the throttle rod $3\frac{1}{2}$ turns. (Not less than 3 nor more than 4.)
- 5.** And... connect the throttle rod to the throttle lever.

NOTE: It is not necessary to use the pressure adjustment method on a two-speed transmission.

REMEMBER OUR HITCHHIKING FRIEND? HE'S STILL THUMBING



- Let's get down to brass tacks . . . or worn bands . . . and see what's ailing his car.
- After making the preliminary checks and adjustments . . .
- we're ready to give his transmission the **AIR PRESSURE TEST.**



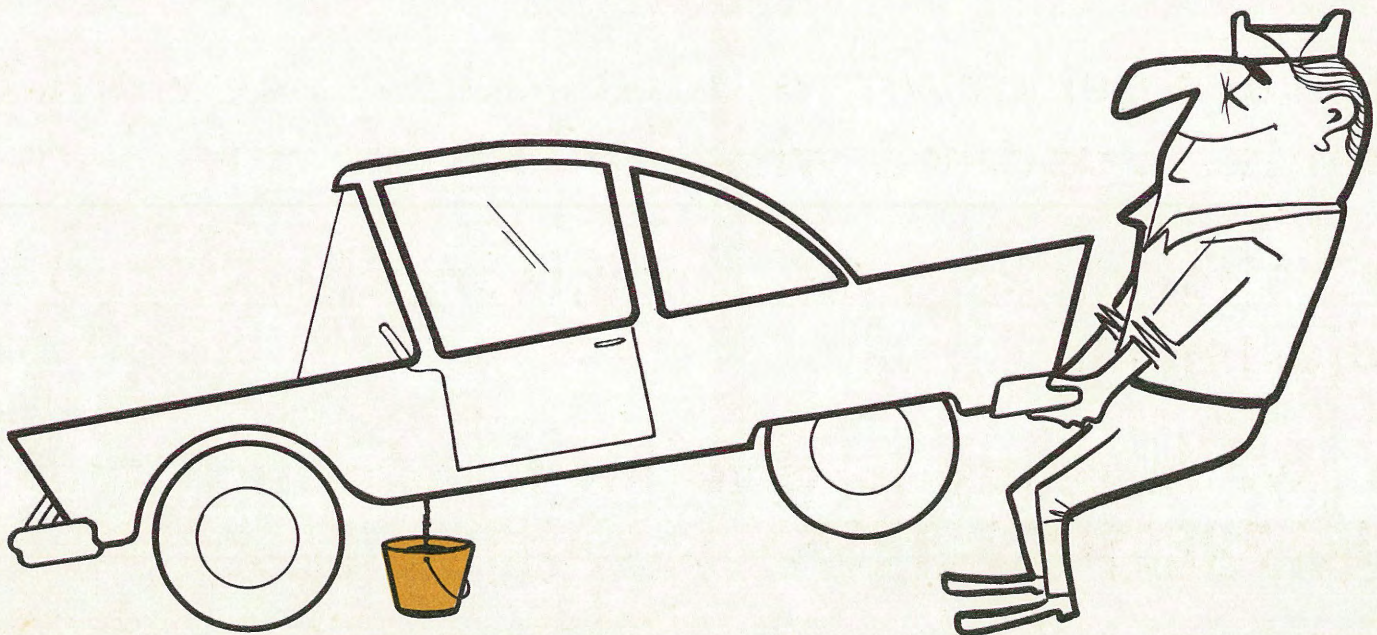
TO MAKE THE AIR PRESSURE TEST...

**DRAIN THE TRANSMISSION OIL
REMOVE THE OIL PAN AND . . . THE
CONTROL VALVE ASSEMBLY**

THEN

**USE A RUBBER TIPPED AIR HOSE TO APPLY
PRESSURE TO THE OIL PASSAGES THAT LEAD
TO THE**

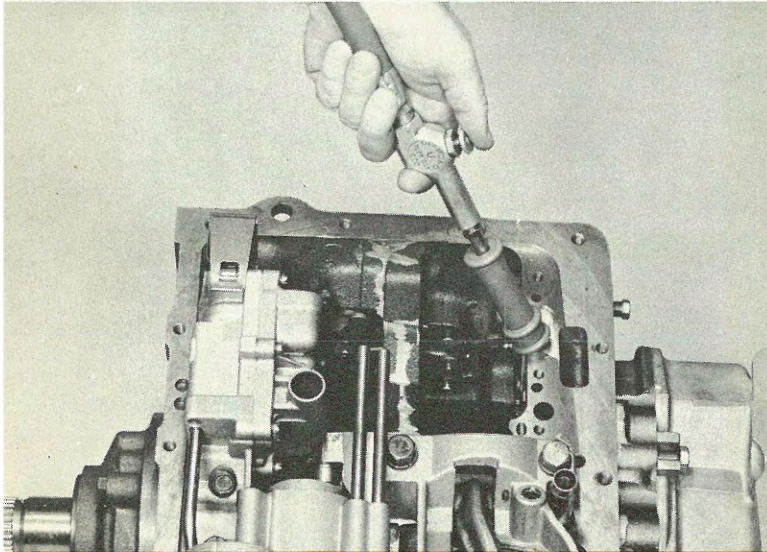
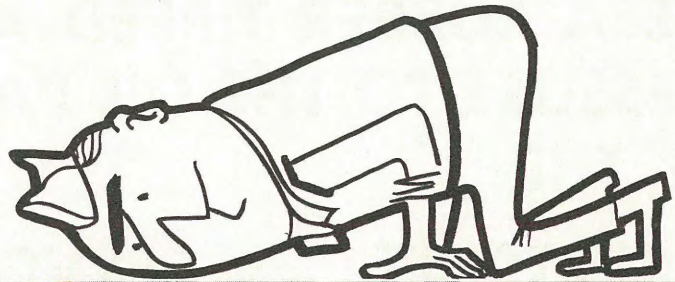
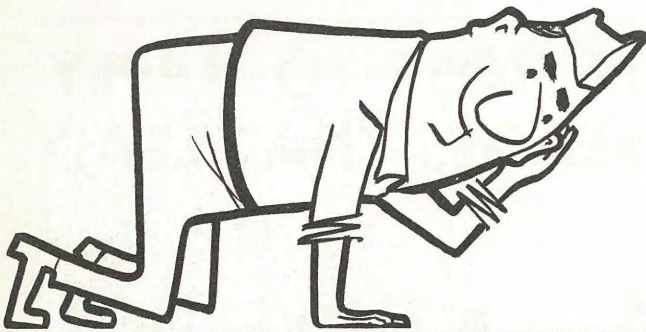
- **CLUTCHES**
- **SERVOS**
- **GOVERNOR**



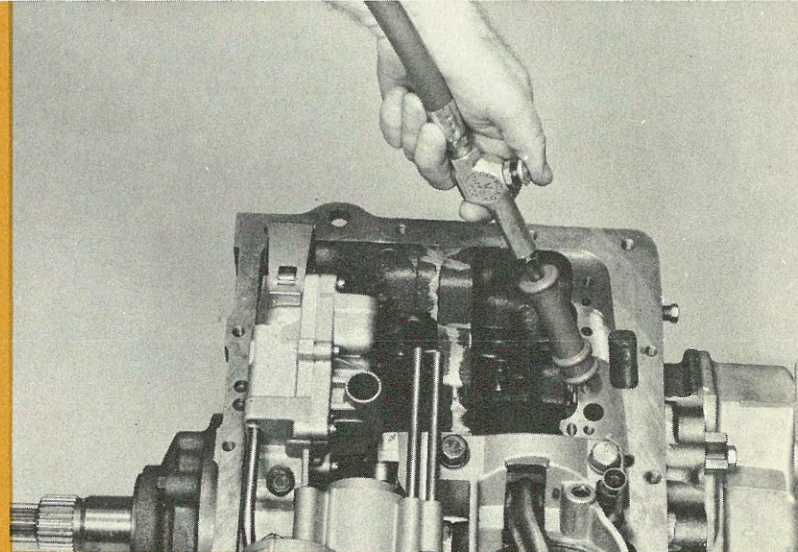
IF IT'S A SINGLE-RANGE OR DUAL-RANGE TRANSMISSION

- CHECK THE FRONT CLUTCH
- LISTEN FOR A DULL THUD
- CHECK THE REAR CLUTCH
- LISTEN FOR A THUD

Then . . .

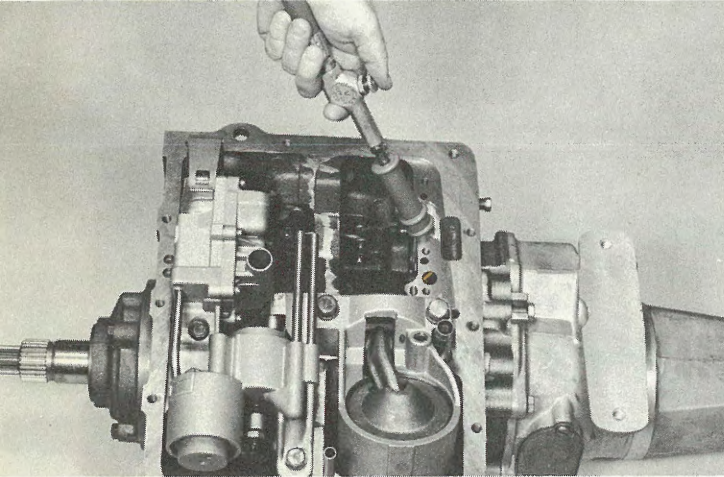


Front clutch input.



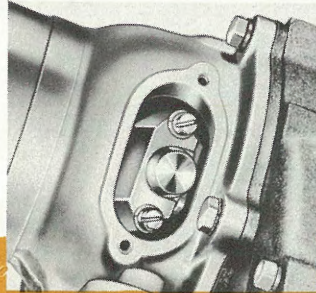
Rear clutch input.

CHECK THE GOVERNOR



Listen for a click.

Notice the valve snap forward.

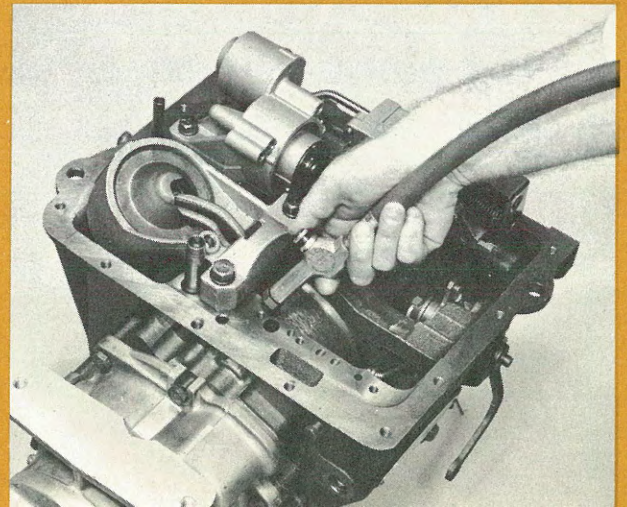
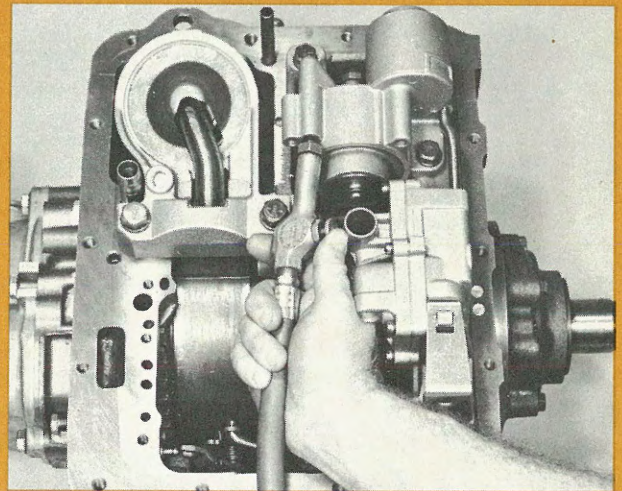


AND CHECK . . .

**THE FRONT BAND AND
SERVO**

**THE REAR BAND AND
SERVO**

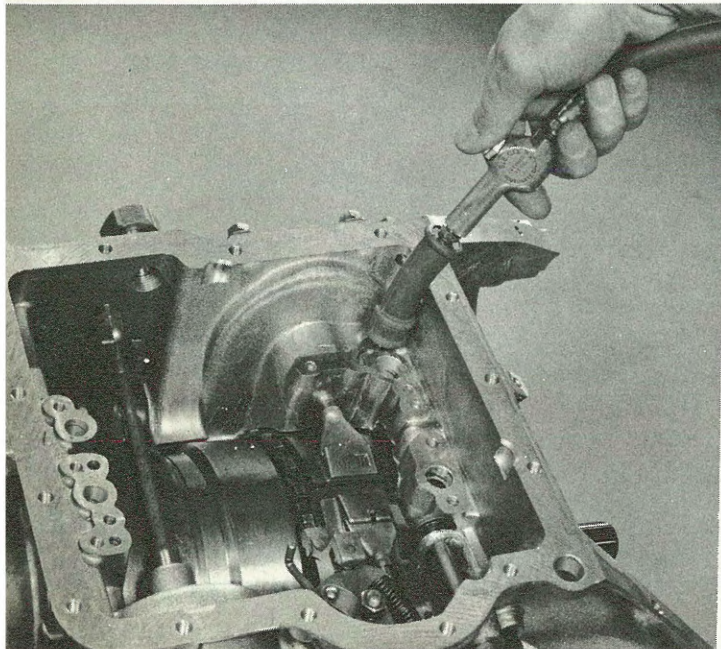
Of course, this applies only to single-range or dual-range transmissions . . .



IF IT'S A TWO-SPEED TRANSMISSION

USE AN ADAPTOR AND ...

CHECK THE FRONT SERVO



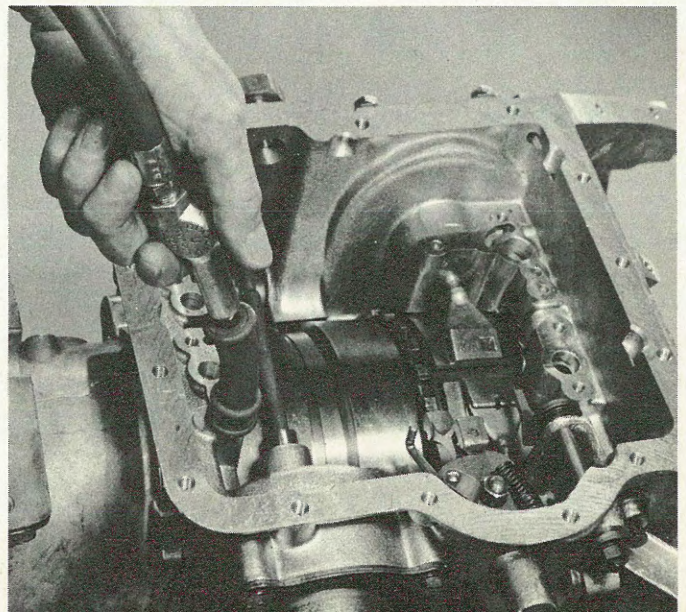
First, the apply passage. The low band should tighten... then relax when pressure is released.

Second, the release passage.

Listen for excessive leakage.

CHECK THE REAR SERVO

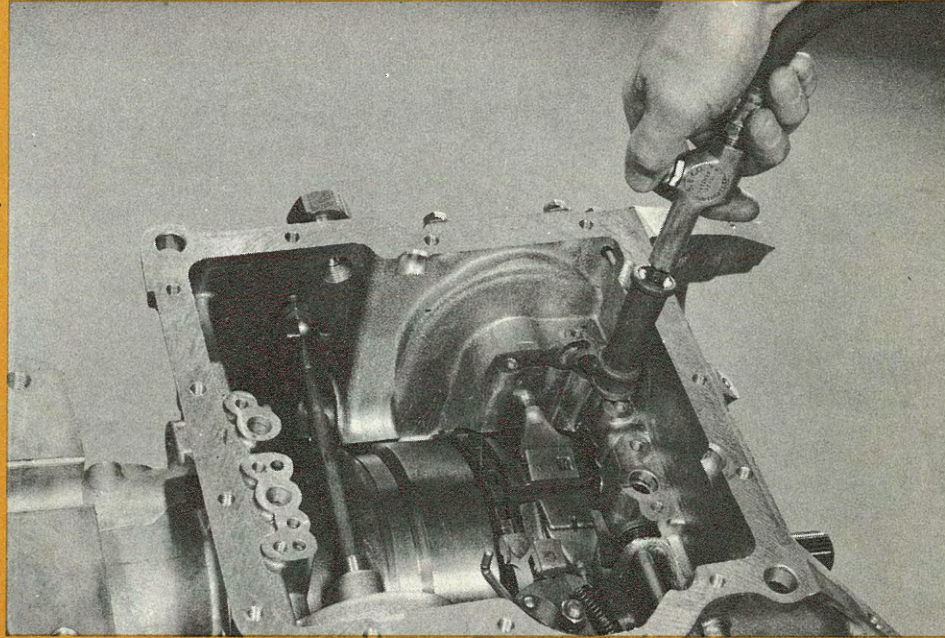
The reverse band should tighten... then relax when pressure is released.



NEXT...

CHECK THE CLUTCH

Listen for a dull thud.



If no noise . . .

feel the drum to see if you can detect the piston moving.

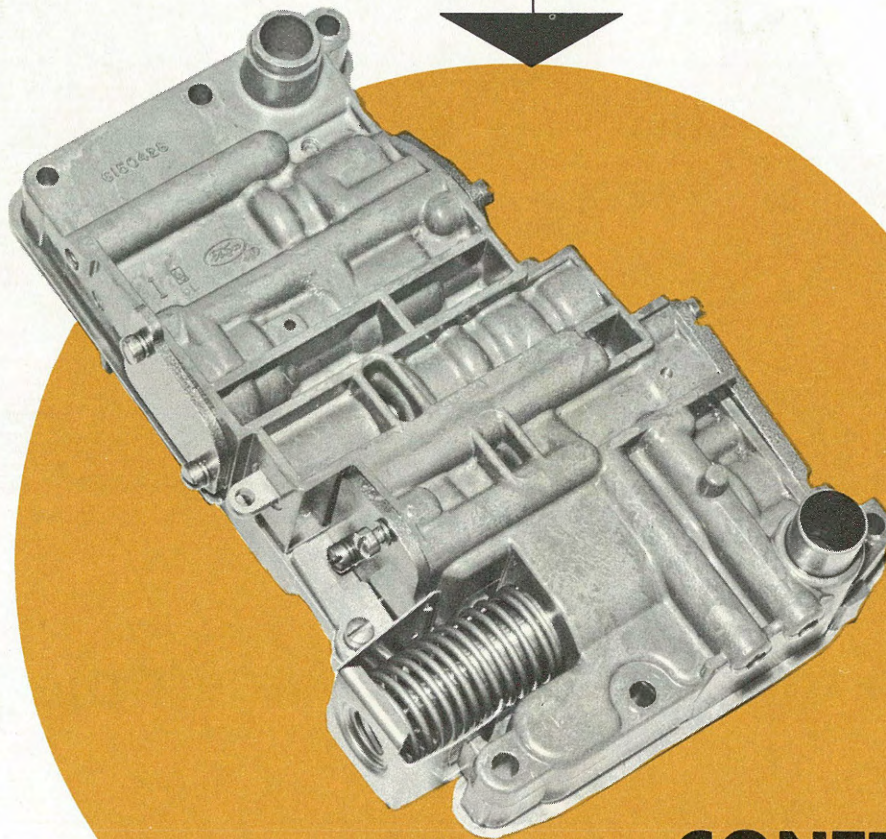
If necessary . . .

REMOVE THE CLUTCH FROM THE TRANSMISSION CASE AND CHECK.

**IF THESE PARTS OPERATE CORRECTLY WITH
AIR PRESSURE**

THEN

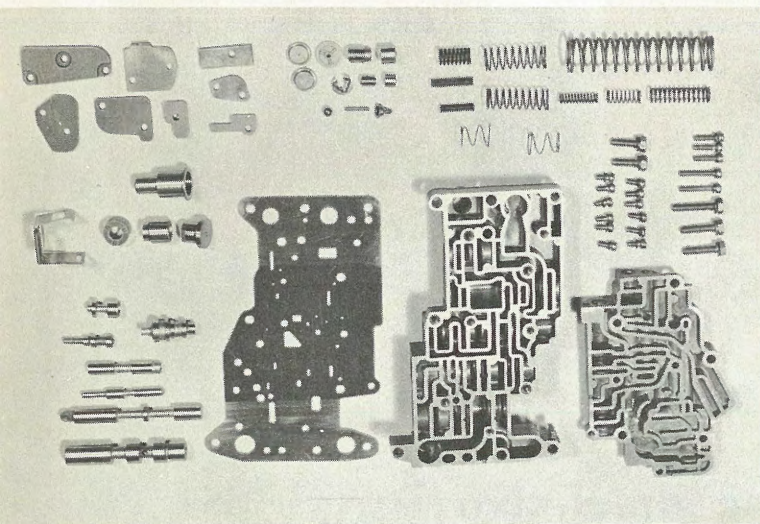
THE NEXT STEP IS TO CHECK THE...



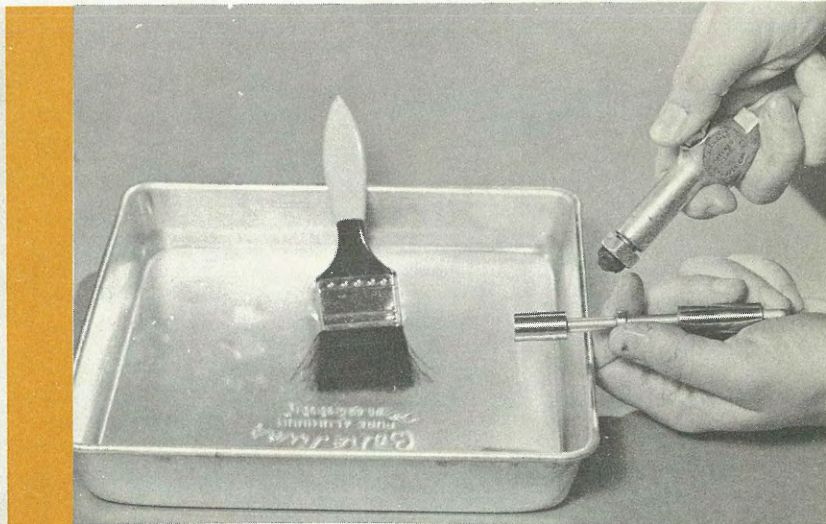
CONTROL VALVE

TROUBLE IN THE CONTROL VALVE

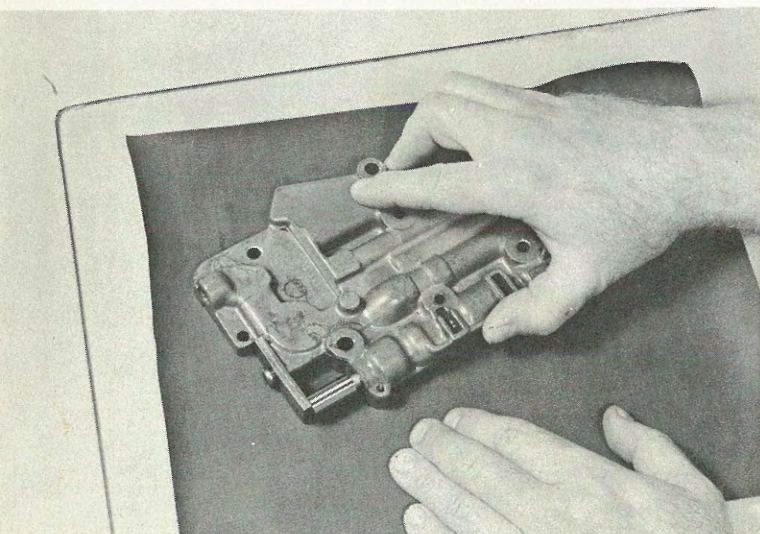
means these steps should be followed . . .



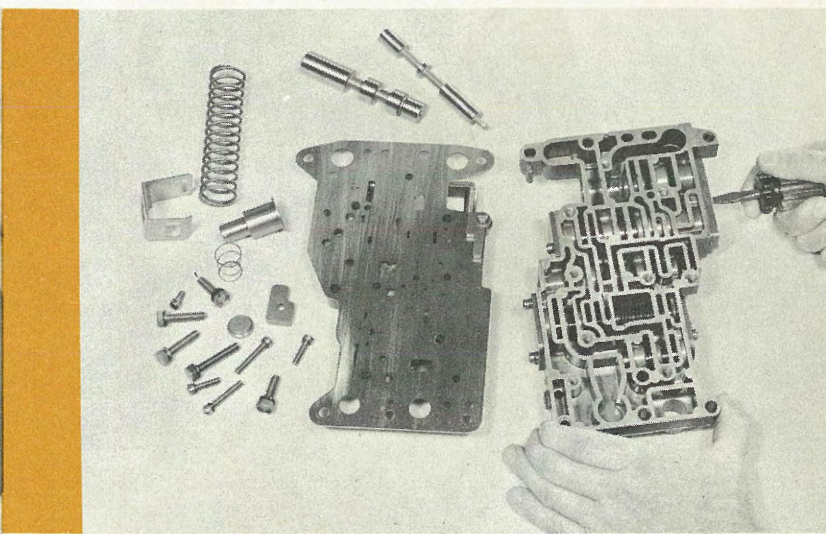
disassemble the valve body



clean and dry all parts



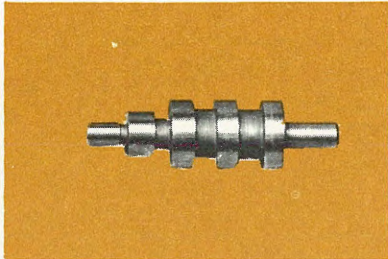
check mating surfaces for flatness



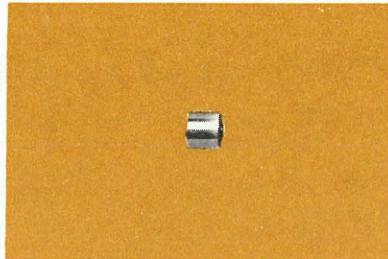
inspect all parts

NOTE: Always lay parts on a clean dry surface.

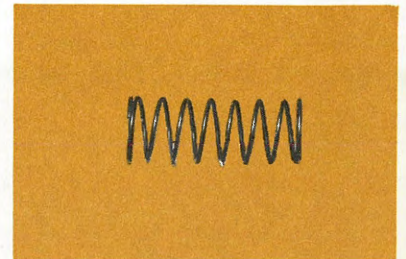
INSPECT EACH . . .



VALVE



PLUG

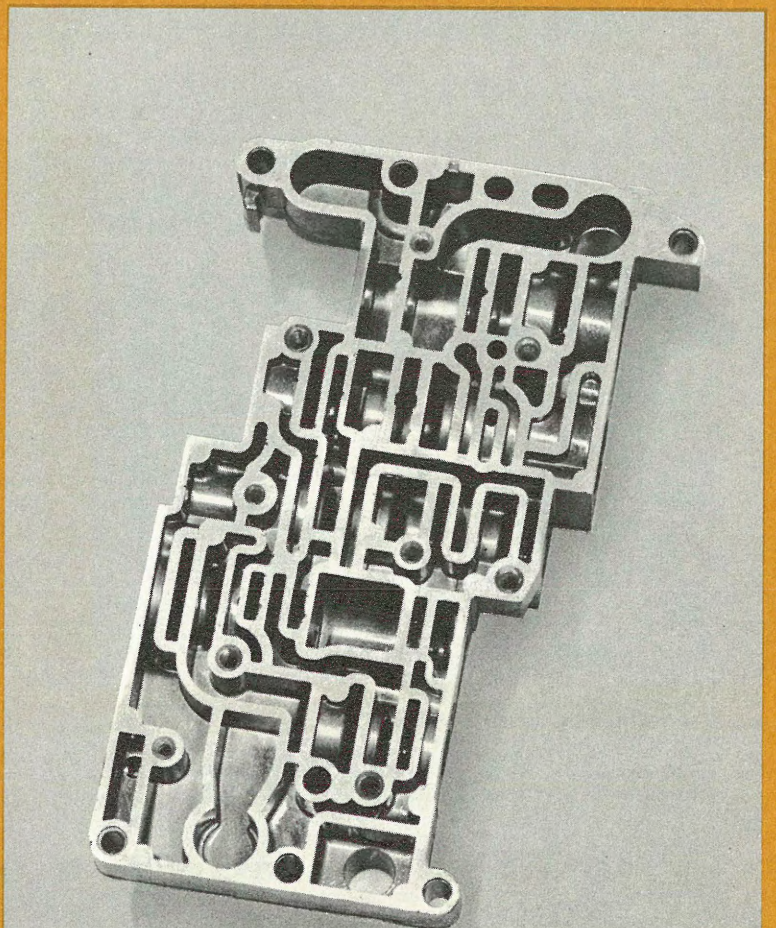


SPRING

AND BORE

for scores, burrs, scratches or distortion.

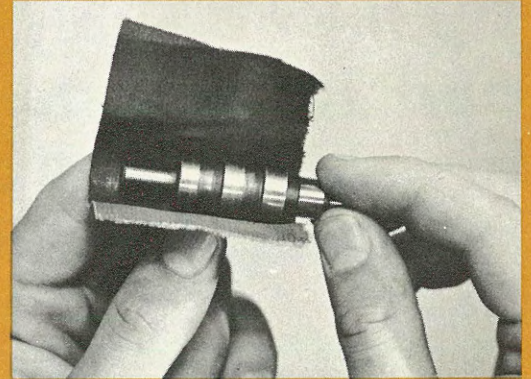
**ALSO CHECK . . .
for obstruction in
passages.**



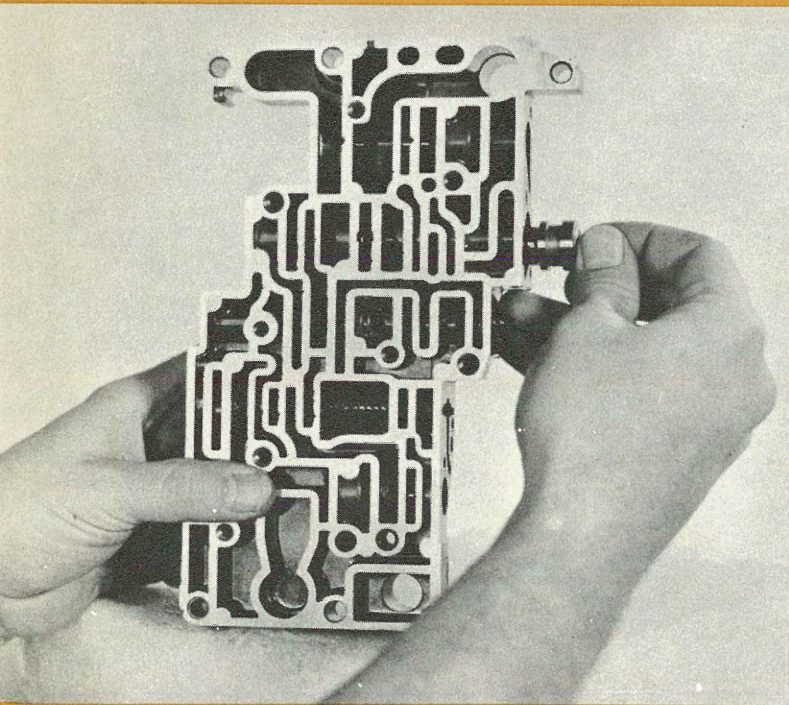
PROPER MAINTENANCE OF MACHINED SURFACES

involves . . .

POLISHING valves and plugs with a crocus cloth.



But do not round the sharp edges.



CHECKING valves for free movement in the bores.

Rotate to ease the entry.

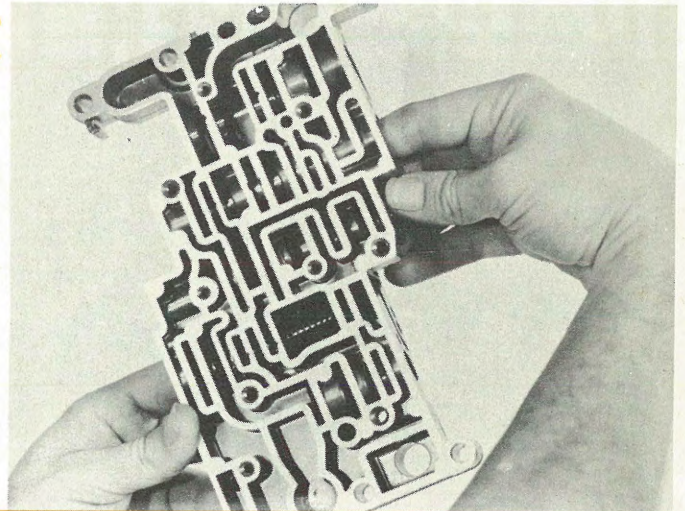
Valves and plugs should fall into the bores by their own weight when dry.

Avoid shearing of soft body casings. Also . . . check mating surfaces for flatness.

TO ASSEMBLE THE CONTROL VALVE

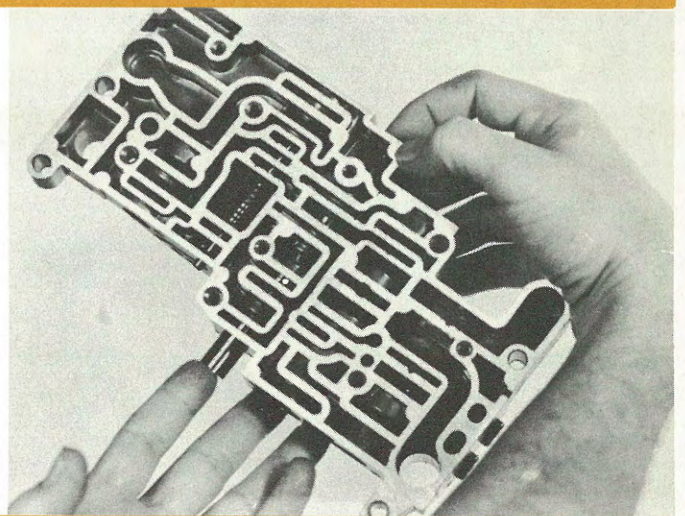
FOLLOW THESE STEPS :

Tip the assembly back and forth. Listen for the valve and plug to slide freely in their bores...

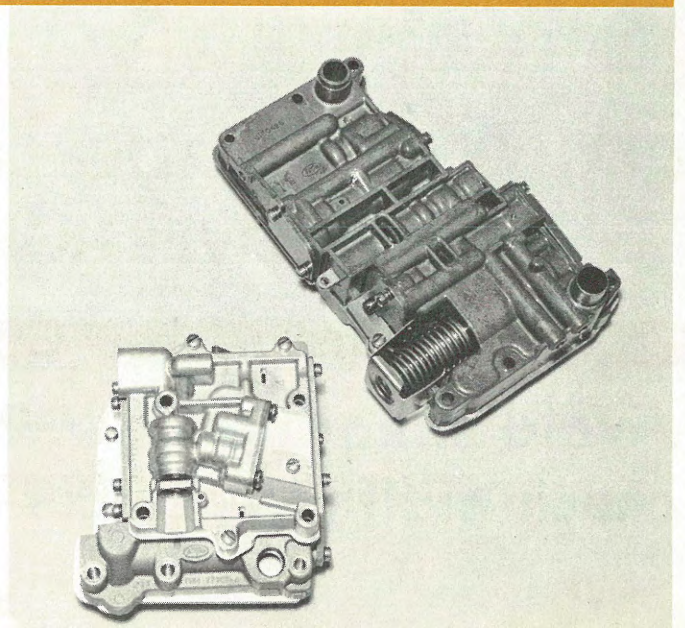


then

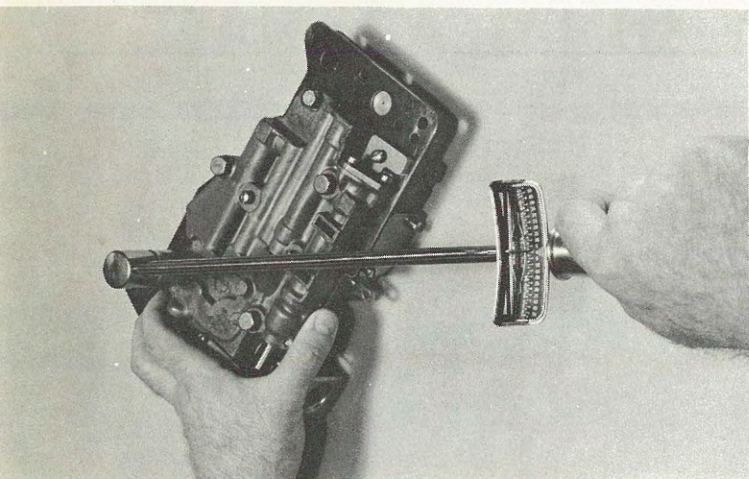
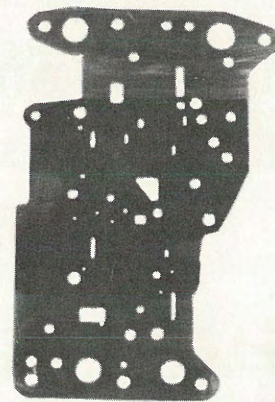
... test each plug and valve in its bore for free movement.



Assemble all the valve body sections .

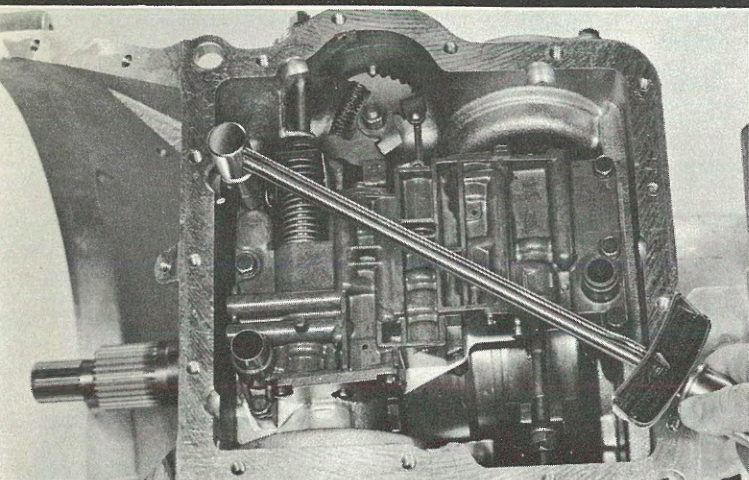


INSTALL THE SEPARATOR PLATE TO THE UPPER BODY



- **COVER ATTACHING BOLTS**

torque to . . .
4-6 pounds-feet



- **MOUNTING BOLTS**

torque to . . .
6-10 pounds-feet

DO NOT OVERTIGHTEN . . .

OVERTIGHTENING

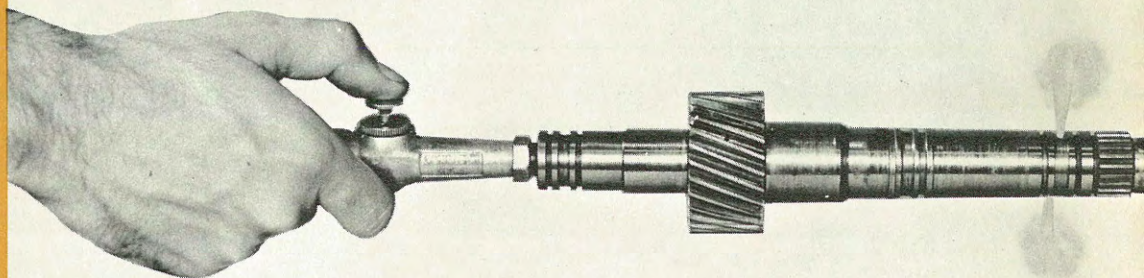
may distort the Control Valve Body
and
. . . cause the valves and plugs to stick.

When assembling a job, check the units for leaks or obstructions by using

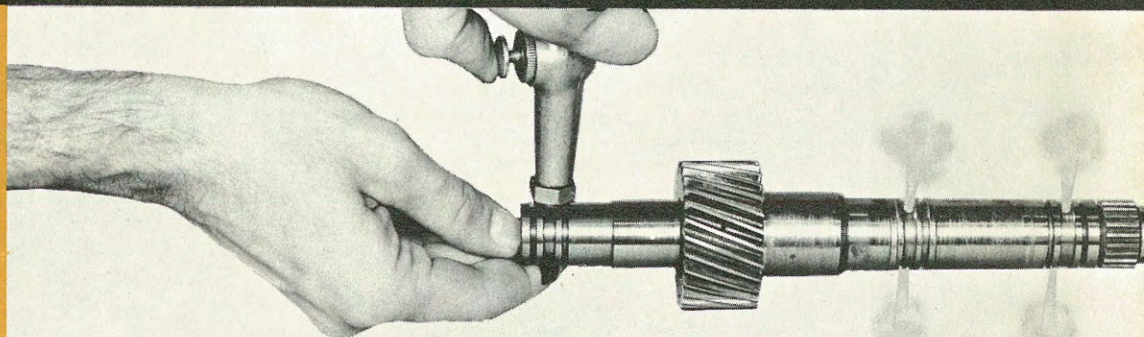
AIR PRESSURE

Air should only come out holes as indicated. On single-range and dual-range transmissions, check the **PRIMARY SUN GEAR SHAFT**.

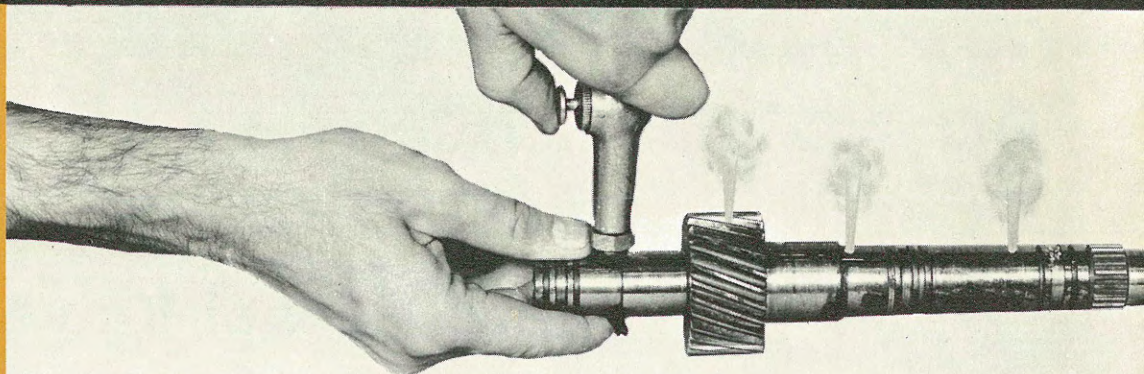
**FRONT
CLUTCH**



**REAR
CLUTCH**



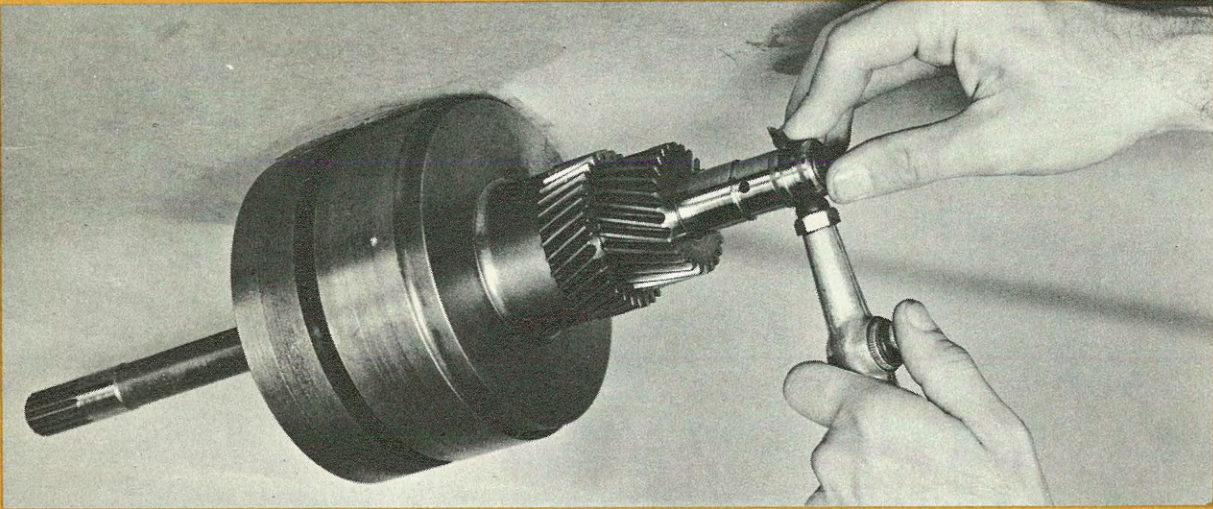
**LUBRI-
CATION**



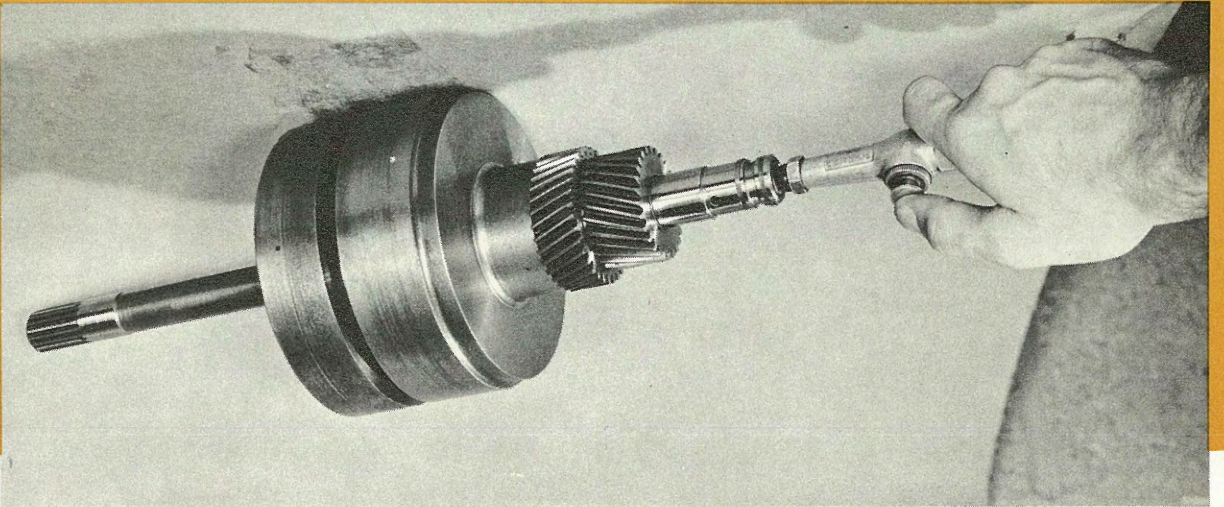
ALSO . . . CHECK NEW SHAFTS, TOO!

... Air should come out the proper holes.

The Rear Clutch Housing



The Front Clutch Housing

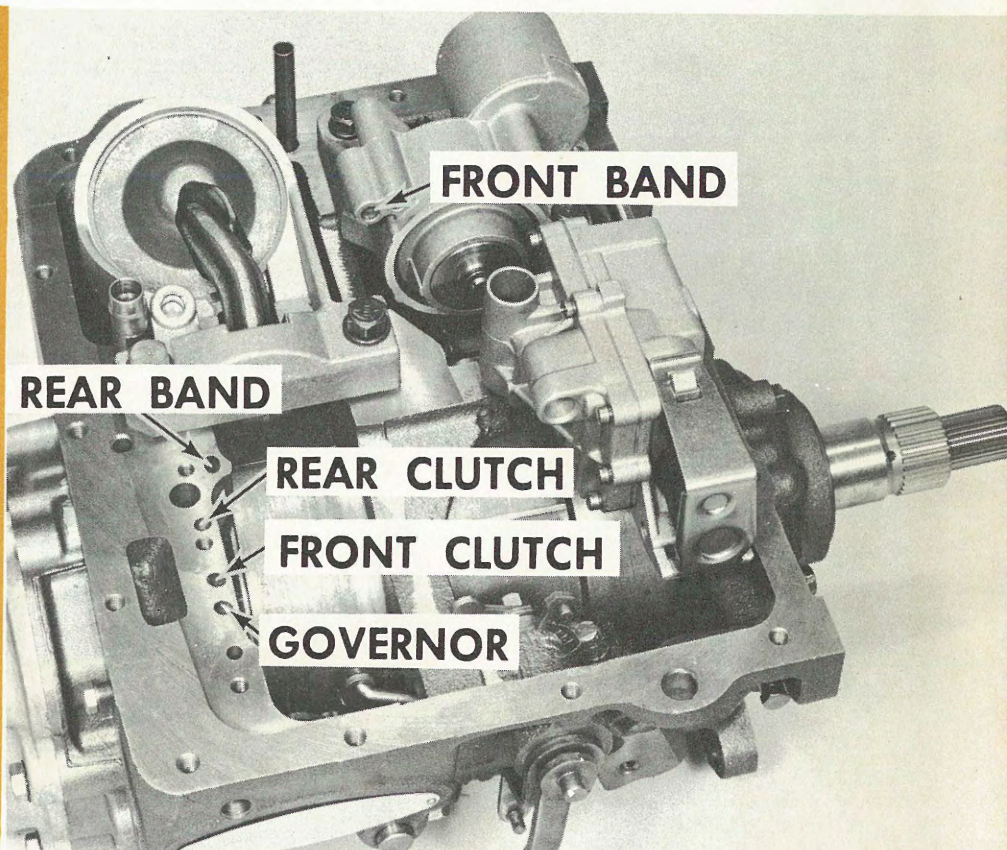


And TEST . . .

THEN CHECK—

- The Front Servo
- The Rear Servo

... and make a final check on ...



... before installing the control valve.

- THE AIR PRESSURE CHECKS MADE PREVIOUSLY ON TWO-SPEED TRANSMISSIONS SHOULD BE RECHECKED AT THIS POINT.

WELL, THAT'S IT...

The preliminary checks and adjustments and a careful **AIR PRESSURE TEST** should lead to the transmission ailment so it can be corrected and our hitchhiking friend can finally get a ride.



SUMMARY



Transmission troubles can be located by
SHIFT TEST . . . STALL TEST . . . HYDRAULIC PRESSURE TEST and **AN AIR PRESSURE TEST**

There are three basic transmissions to consider:

- **TWO-SPEED**
- **SINGLE-RANGE**
- **DUAL-RANGE**

Know the band and clutch application for each.

Make these preliminary checks and adjustments:

- **FLUID LEVEL**
- **ENGINE IDLE**
- **EXTERNAL LEAKAGE**
- **LINKAGE**

Then make an Air Pressure Test of the transmission circuits.

- **FRONT CLUTCH**
- **GOVERNOR**
- **REAR CLUTCH**
- **FRONT AND REAR SERVOS**

If the trouble is in the Control Valve:

- **CLEAN AND INSPECT**
- **CHECK AND REPAIR MACHINED SURFACES**
- **MAKE PROPER ASSEMBLY**

Use Air Pressure when assembling a job. Test...

- **PRIMARY SUN GEAR**
- **GOVERNOR**
- **CLUTCHES**
- **SERVOS**

QUESTIONS



- | | T | F |
|--|-----|-----|
| 1. There are four basic transmissions to consider. | () | () |
| 2. The engine must be running when the fluid level is checked. | () | () |
| 3. It is necessary to use a tachometer when making preliminary checks and adjustments before an air pressure test. | () | () |
| 4. The throttle control rod clevis must be shortened to increase pressure, and lengthened to reduce pressure. | () | () |
| 5. The control valve assembly must not be removed when making an air pressure test. | () | () |
| 6. An air pressure test is made by applying air pressure to the oil passages in the transmission case. | () | () |
| 7. In checking single- or dual-range transmission, the governor should make a clicking sound. | () | () |
| 8. The front band should tighten when pressure is released from the front servo. | () | () |
| 9. Valves should not drop by their own weight into the control valve assembly bores. | () | () |
| 10. The primary sun gear shaft can be air pressure checked only on a single- or dual-range transmission. | () | () |

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