Chevrolet Powerglide Troubles

Transmission Oil Foams and Spews Out of Filler Tube

1. Oil level too high.
2. Damaged suction pipe seal.
3. Ears on suction pipe retainer bent.
4. Bore for suction pipe in housing too deep.
5. Sand hole in suction bore in transmission housing or case.
6. Sand hole in suction cavity in valve body.
7. Water in transmission, indicated by overfilled condition and brown color of transmission oil. Water in transmission usually comes from a leaking oil cooler. In this case there may be excessive oil accumulation in top tank of radiator. Correct cause of leakage and completely drain and refill transmission.

Check Points For Oil Leaks and High Oil Consumption

1. Transmission housing side cover.
2. Low drive valve body and transmission case.
3. Servo cover and transmission case.
4. Transmission housing and transmission case.
5. Front of flywheel housing.
6. Transmission case extension and transmission case.
7. Oil cooler pipe connections.
8. Transmission case oil seal.
9. Ruptured diaphragm in vacuum modulator assembly (1950-54 & (1958-59).
10. "O" ring seal between converter cover and pump assembly.
11. Front pump "O" ring seal.
12. Front pump oil seal.
13. Oil drain in front pump plugged.
14. Oil leak between oil pump and converter cavity due to sand hole in transmission housing.

Transmission Overheats

1. Low coolant level.
2. Defective transmission thermostat.
3. Defective oil cooler.
4. Excessive slippage of clutch or low band.

Car Will Not Move In Any Range—Rear Wheels Free

1. If car will not move in any range after extended operation in reverse, it indicates air leakage into suction lines and excessive clearance at front oil pump. Front pump pressure will be very low during period when car will not move. Inspect for air leaks at rear oil pump gasket.
2. If car will not move for several minutes after standing overnight, park car for several hours with engine stopped and then check front oil pump pressure. A zero reading until such time as car will move indicates that front pump loses its prime due to excessive clearances. If condition has existed for some time it is advisable to inspect clutches and bands for excessive wear due to slippage.
3. Broken internal parts.

Car Will Not Move In Any Range - Rear Wheels Locked

1. Parking lock pawl engaged.
2. Parking brake applied.
3. Lock up due to broken part in transmission or rear axle.

Car Will Not Move In Drive Range Only (1950-52)

1. Defective clutch.

2. Dragging low band.

Car Will Not Move In Reverse Only

1. Low band needs adjusting.
2. Clutch relief valve stuck.
3. Clutch plates binding in hub or flange.
4. Clutch plates not properly installed.
5. Clutch piston stuck.
6. Reverse band strut broken.

Excessive Slip In All Ranges

1. Low oil level.
2. Manual control linkage improperly adjusted.
3. Oil suction pipe damaged or not seating properly, allowing air to be sucked into pumps.
4. Oil suction screen clogged.
5. Front oil pump worn or damaged.
6. Faulty pressure regulator valve or gasket.
7. On 1950-52 units, free wheeling stator rollers or secondary pump not properly assembled.

Excessive Slip In Drive Range Only (1950-52)

1. Manual control linkage improperly adjusted.
2. Worn or burned clutch plates.
3. Defective clutch piston seals.
4. Defective clutch drum oil seals.
5. Defective clutch release valve.

Excessive Slip In Manual Low & First Gear In Drive Range (1953-59)

1. Improper linkage adjustment.
2. Improper low band adjustment or broken band.
3. Modulator piston stuck (to 1954).
4. Accumulator valve stuck.
5. Broken low servo piston ring.
6. Worn clutch drum.
7. Defective servo-to-case gasket.
8. Defective valve body gaskets.

Excessive Slip In Reverse Only

1. Improper linkage adjustment.
2. Improper reverse band adjustment, or broken band.
3. No oil pressure due to stuck accumulator valve, stuck modulator lever or piston (to 1954).
4. Broken reverse servo piston ring.
5. Defective valve body gaskets.

Car Creeps In Neutral

1. Improper linkage adjustment.
2. Low band adjusted too tight.
3. Clutch inoperative due to:
   (a) Clutch plates not properly assembled.
   (b) Clutch plates sticking.
   (c) Clutch relief valve stuck closed.
   (d) Defective valve body gasket.
   (e) Control lever not attached to manual valve inside transmission.

Car Creeps Forward In Reverse or Backward In Low

1. Improper manual linkage adjustment.

Low-To-Direct Shift Abnormally Rough

1. Improper low band adjustment.
2. Worn clutch plates.
3. Clutch plates binding in drum or flange.
4. Modulator piston stuck (to 1954).
5. Inoperative accumulator dump valve.
6. Modulator vacuum line leaking (1950-54 & 1958-59).
7. Vacuum modulator valve stuck (1958-59).
8. Throttle linkage misadjusted (1955-57).

Engine Races On Low-To-Direct Shift

1. Clutch plates worn or burned.
2. Modulator spring weak (1950-54 & 1958-59).
3. Oil passage to clutch restricted.
4. Throttle linkage misadjusted (1955-57).

Rough Shift, Direct To Low

1. Improper low band adjustment.
2. Modulator piston stuck (to 1954).
3. Vacuum modulator valve stuck (1958-59).
4. Throttle linkage misadjusted (1955-57).

No Upshift In Drive Range (1953-59)

1. Defective governor.
2. Stuck shift valve.
3. Clutch plates worn or burned.

No Down Shift From Direct-To-Low With Accelerator Floored (1953-59)

1. Throttle linkage misadjusted.
2. Sticky shifter valve.

Rough Shift, Neutral to Reverse

1. Accumulator piston stuck closed.
2. Improper reverse band adjustment.
3. Modulator piston stuck (to 1954).
4. Engine idling speed too high.
5. Excessive end play in transmission. mainshaft.

Chatter In Manual Low (1950-52) Chatter In Manual Low & First Gear Drive Range (1953-59)

1. Improper low band adjustment.
2. Worn low band or drum.
3. Defective clutch plates.
4. Clutch piston stuck.
5. Clutch relief valve stuck.

Chatter In Reverse

1. Improper reverse band adjustment.
2. Worn reverse band or drum.
3. Worn or damaged reverse ring gear bushing.
4. Worn or damaged transmission case rear bushing.

Buzzing In All Ranges

1. Low oil level.
2. Front and/or rear pump not functioning properly.

Ringing Noise In Converter

1. Low oil level.
2. Oil suction pipe damaged or not seating properly.
3. Defective pressure regulator valve.
4. Front oil pump worn.

POWERGLIDE

A detailed description and service procedure on this transmission is given in the *Automatic Transmission Section* of this manual. Service adjustments and replacement procedure follows:

NEUTRAL SAFETY SWITCH

This switch prevents operation of the starter in all positions except Neutral.

1952-54

To adjust, loosen the two switch mounting screws. Place the selector lever in Neutral and, with clips over flats on end of shifter shaft, insert pin into switch mounting bracket and locating plate. Tighten screws to secure switch in this position and remove locating pin.

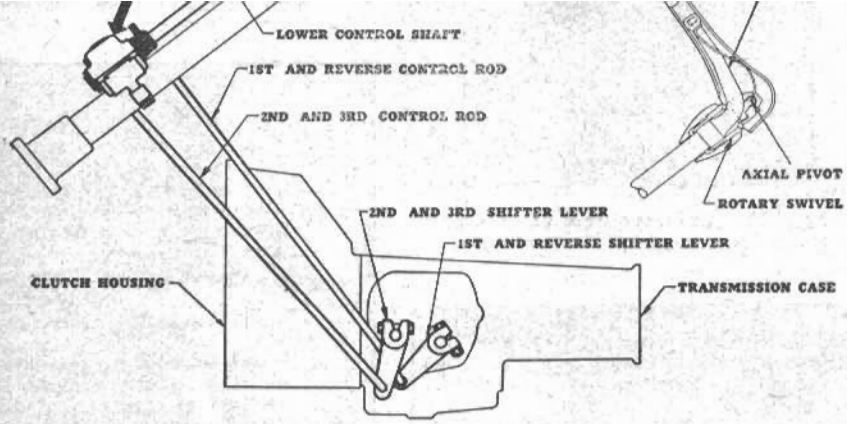

Fig. 11 1952-54 gearshift linkage

1955-56

Loosen one of the switch mounting screws and remove the other. Place selector lever in neutral. Center visible elongated slot in switch mounting with tapped hole in mast jacket. Then tighten screw that was loosened and tighten screw that was removed.

If the engine will not turn over after the switch is positioned as directed above, loosen the screws and rotate the switch until it does.

1957

Loosen both the switch mounting screws. Place selector lever in Neutral. Install cotter pins or similar aligning pins into two holes in switch on each side of pointer. Switch may be rotated to pointer between holes. Tighten the screws and remove cotter keys. *The slot in the switch must be set on the center line of the tang on the shifter tube.*

If, after the switch is positioned, the engine will not turn over, loosen the screws and rotate the switch in the direction necessary until it does. Be sure selector lever is in Neutral when performing this operation.

1958-59

Place selector lever in Neutral. Loosen screws securing switch retainer, then while holding ignition switch in "Start," adjust position of switch until engine starts cranking. Hold switch in this position and tighten screws.

LINKAGE, ADJUST

1952-53

1. Check clearance between control lever and upper support cover, which should be as shown in Fig. 13.
2. To correct this clearance, remove screws holding upper support to mast jacket and screw upper support up or down as required to gain the desired clearance. Replace upper support screws.
3. Place selector lever in reverse and check clearance between control lever and steering wheel rim which should be 1½ in,. Fig. 14. To adjust, loosen lower support clamp bolts and move up or down as necessary.
4. With selector lever in reverse, check clearance between reverse stop on control shaft lower support and lower lever, Fig. 15. This clearance should be $\frac{3}{64}$ in.
5. To adjust, loosen transmission control rod swivel and move selector lever as necessary to obtain $\frac{3}{64}$ in. clearance and retighten the swivel. When making this adjustment, be sure transmission manual valve lever is raised to top detent position and selector lever in reverse position.

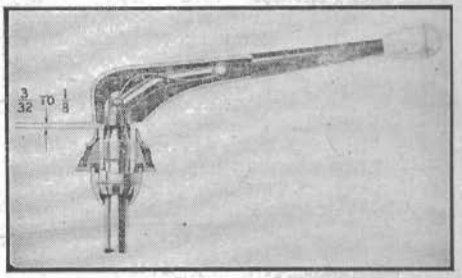

Fig. 13 Steering column upper support-to-control lever clearance. 1952-53 Powerglide

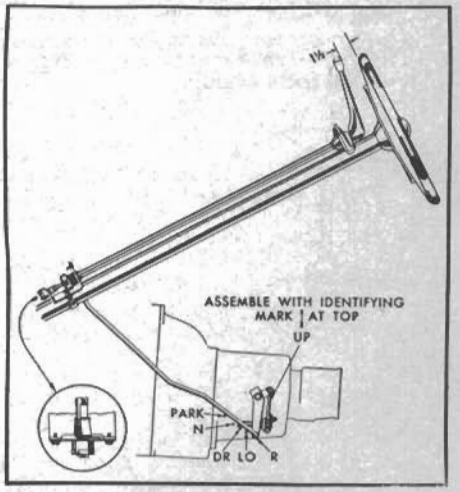

Fig. 14 Control lever to steering wheel clearance. 1952-53 Powerglide

1954

Throttle Linkage

1. Set transmission control lever in Drive range with the hand brake set and adjust engine idle speed to 425 rpm with engine and transmission at normal operating temperature. Stop engine when normal operating temperature is attained. *The automatic choke must be entirely off and throttle stop screw against low step on fast idle cam.*

2. Remove emergency brake rod from bell crank.
3. Disconnect rod "A" from throttle lever "D", Fig. 16.
4. Remove upper rear side cover bolt and rotate clamp "C" counterclockwise to the full detent position.
5. Measure the distance between the hole in the side cover and the hole in the throttle lever "D" with Positioning Gauge J-5588, Fig. 17. If the gauge pins will enter holes, adjustment of lever "D" is correct. If not, loosen clamp bolt and adjust accordingly. *When making adjustment, clamp "C" must be rotated counterclockwise to the full detent position.*
6. Connect rod "A" to lever "D".
7. Rotate engine bell crank clockwise to set transmission lever "D" at full detent and adjust rod "B" to length required for free entry of swivel pin into throttle lever when throttle lever is held at wide open (upward) position. Secure swivel pin to carburetor lever with clip.
8. Install a $\frac{5}{16}$ in. diameter gauge pin through bell crank "G" and bracket at "E".
9. With rod "B" against idle step in carburetor, adjust rod "F" for free entry of swivel pin into throttle valve control bell crank. Hold swivel from turning and lock check nut securely.
10. Remove $\frac{5}{16}$ in. gauge pin.

Selector Linkage

1. Place selector lever in reverse and check clearance between selector lever and steering wheel rim, which should be $1\frac{1}{16}$ in. To adjust, loosen lower support clamp bolts and move up or down as necessary. Tighten clamp bolts evenly.

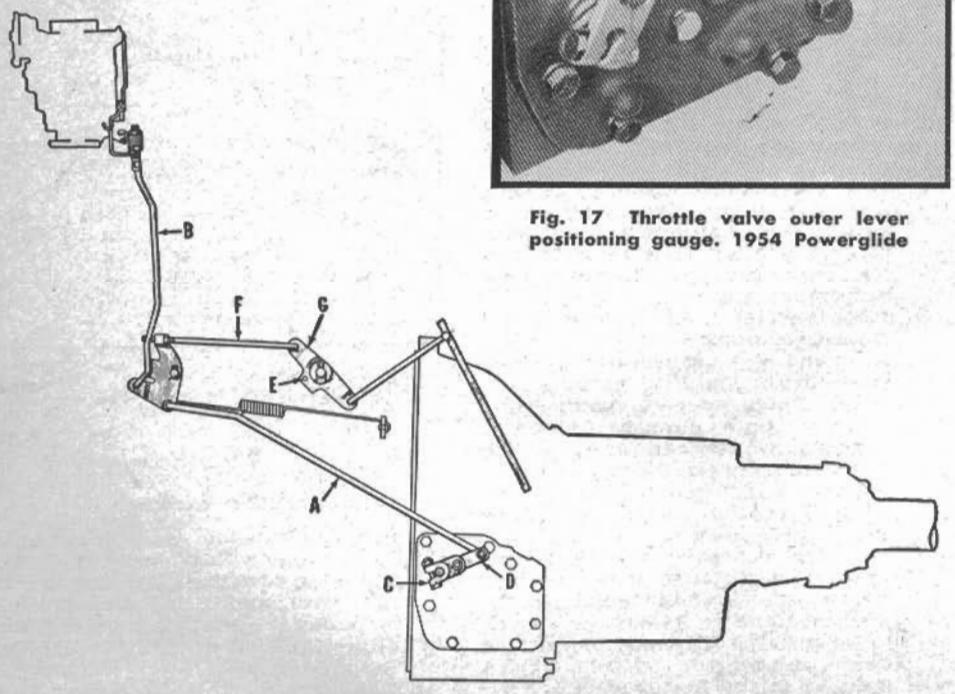

Fig. 16 Powerglide linkage. 1954

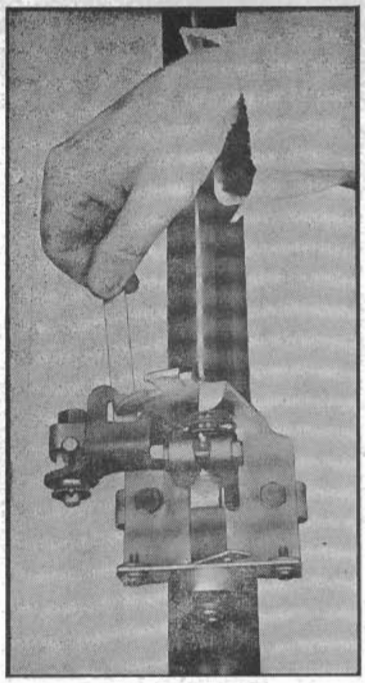

Fig. 15 Reverse stop to lower lever clearance. 1952-53 Powerglide

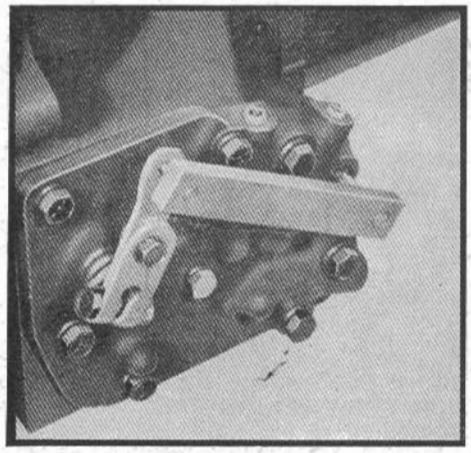

Fig. 17 Throttle valve outer lever positioning gauge. 1954 Powerglide

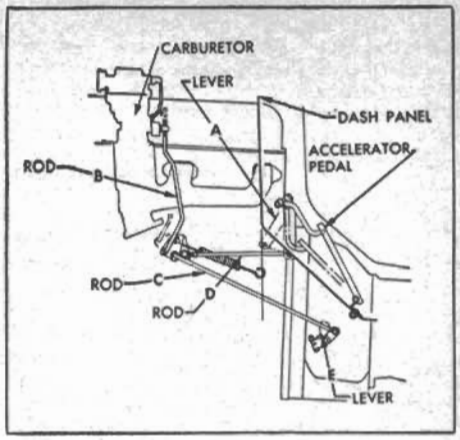

Fig. 19 Adjusting 6-cylinder throttle linkage. 1955 Powerglide

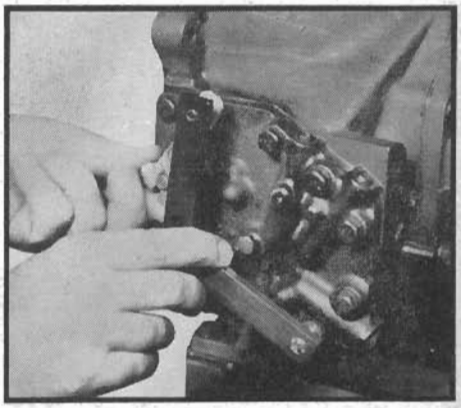

Fig. 20 Use of outer throttle valve lever gauge. 1955-56 Powerglide (6-cyl.)

2. With selector lever in reverse, check clearance between reverse stop on control shaft lower support and lower lever. This clearance should be .090 in.
3. To adjust, loosen transmission control rod swivel, making sure transmission manual lever is raised to top detent position and selector lever is in Reverse position. Move selector lever as necessary to obtain .090 in. clearance and retighten swivel.
4. On side of transmission, check proper installation of short connector rod (bell crank-to-parking lock lever)—arrow must point up.

1955-57

Positive Linkage Adjustment

1. Loosen shifter tube lever clamp nut enough to allow upper control rod to move freely in the swivel.
2. Push the control bell crank (left side of transmission case) toward the front of the car as far as it will go. This places the transmission in the Park position.
3. Place shift control lever (on steering column) in Park position.
4. Tighten shifter tube lever clamp nut securely.

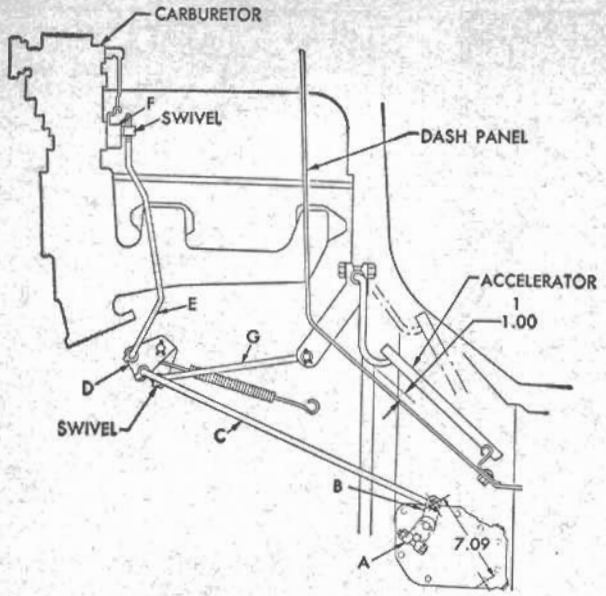

Fig. 21 Adjusting 6-cylinder throttle linkage. 1956-57 Powerglide

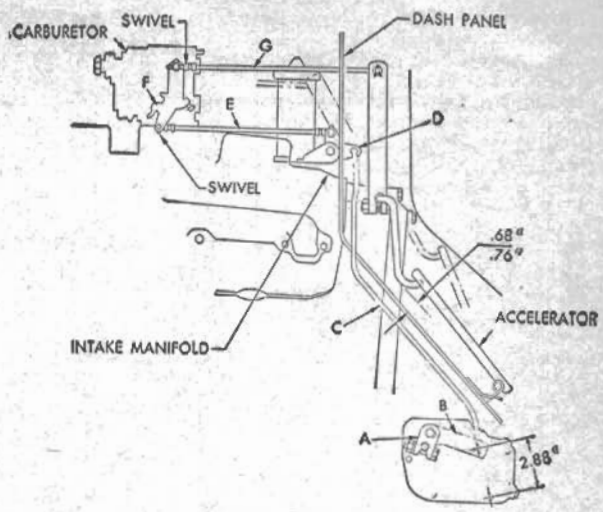

Fig. 24 Adjusting V8 (2-barrel carb.) throttle linkage. 1956 Powerglide

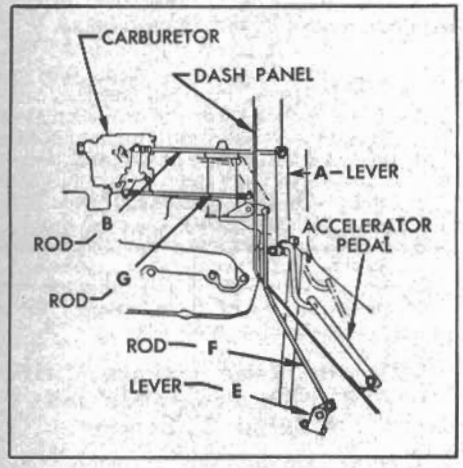

Fig. 22 Adjusting V8 throttle linkage. 1955 Powerglide

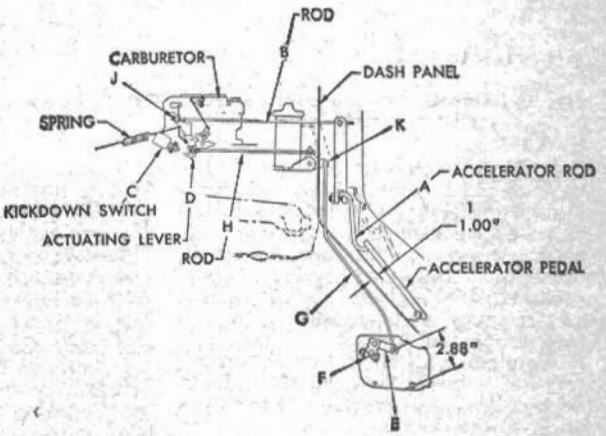

Fig. 25 Adjusting V8 (4-barrel carb.) throttle linkage. 1956 Powerglide

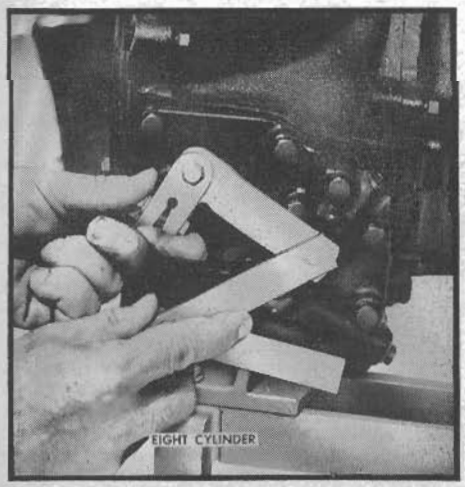

Fig. 23 Use of outer throttle valve lever gauge. 1955-57 Powerglide (V8)

Throttle Valve Linkage, 1955 Six

1. With selector lever in Drive Range and hand brake set, adjust engine idle to 425 rpm with engine at normal operating temperature and transmission warm.
2. After setting idle, shut off engine.
3. Disconnect rod "C", Fig. 19, from throttle lever "E".
4. Remove the extreme lower bolt from the rear low and drive body cover.
5. Rotate throttle valve control outer lever assembly counterclockwise to the open throttle position (to a definite stop). Hold in this position and, with the gauge shown in Fig. 20 set at 6⅜", measure distance between hole in side cover and hole in throttle lever. If the gauge pins will enter holes, adjustment of lever "E" is correct. If adjustment is not correct, loosen lever-to-clamp attaching bolt and adjust outer lever as necessary.
6. Connect rod "C" to lever "E".
7. Disconnect rod "B" from carburetor throttle valve lever and rod "D" from accelerator and throttle valve lever on cylinder block.
8. With engine idle set as in Step 1 and rod "C" forced forward against stop in transmission (open throttle), adjust rod "B" for free entry of swivel pin in carburetor throttle valve lever, with carburetor throttle valve in wide open position.
9. With carburetor throttle valve held in wide open position, and accelerator pedal fully depressed, adjust rod "D" for length required for free entry of swivel pin in bell crank.

Throttle Valve Linkage, 1956-57 Six

1. With selector lever in Drive and hand brake set, adjust engine idle to 425 rpm with engine and transmission at operating temperature.
2. After setting idle, shut off engine.
3. Disconnect rod C from lever B, Fig. 21.
4. Remove lower rear bolt from transmission side cover.
5. Rotate lever A counterclockwise to

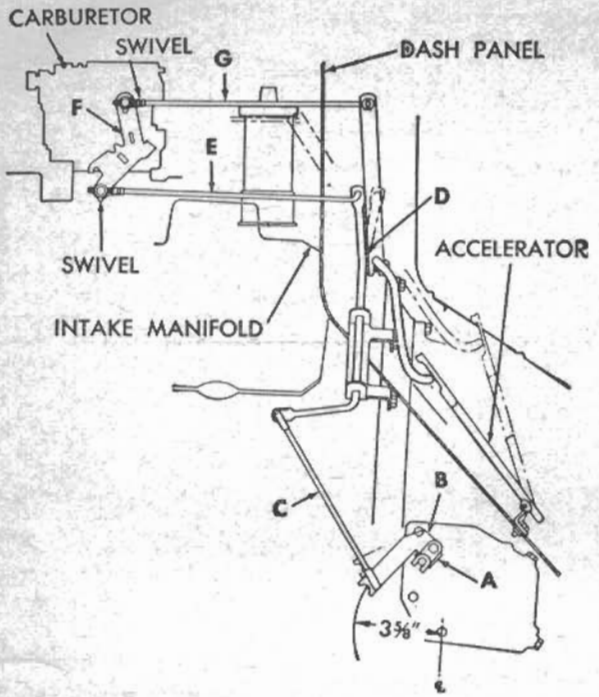

Fig. 26 Throttle linkage adjustment. 1957 V8 Powerglide

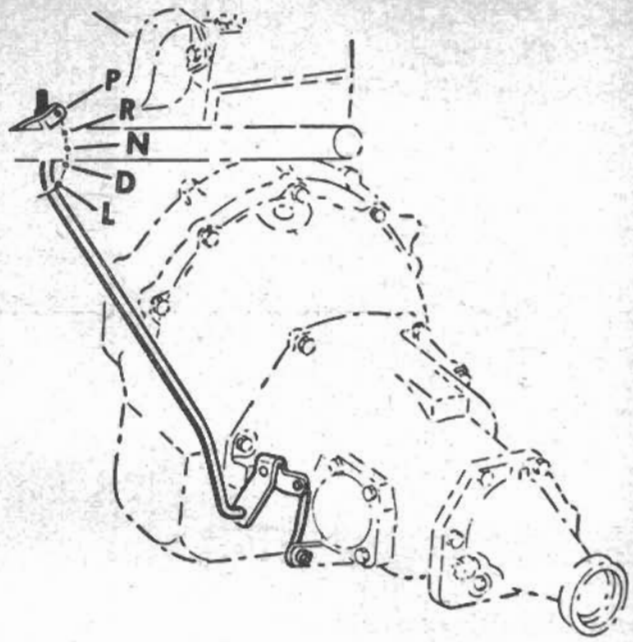

Fig. 27 Shift linkage adjustment. 1958-59 Powerglide

the full detent position. Hold in this position and, with gauge shown in Fig. 20 set at 7.09", measure distance between hole in side cover and hole in lever B. If gauge pins enter holes, adjustment of lever B is correct. If not, loosen clamp A and adjust lever as necessary.

6. Install rod C.
7. Disconnect rod E from carburetor throttle valve lever, and rod G from accelerator and throttle valve lever on cylinder block.
8. Move lever F to the wide open position and adjust rod E for free entry into lever D.
9. With accelerator pedal depressed placing lowest point on accelerator rod 1" above toe panel, and lever D rotated to the wide open position, adjust rod G for free entry of swivel pin in accelerator bell crank.
10. Check adjustment by releasing and depressing accelerator pedal. If lever F does not reach the wide open position it will be necessary to repeat Steps 8 and 9.

Throttle Valve Linkage, 1955 V8

1. With engine and transmission warm and set to idle at 425 rpm, shut off engine.
2. Disconnect rod "F" from throttle lever "E", Fig. 22.
3. Remove bolt from extreme lower rear low and drive body cover.
4. Rotate throttle valve control outer lever counterclockwise to the open throttle position (to a definite stop). Hold in this position and with the gauge shown in Fig. 23 set at 2⅞", measure the distance between the hole in the side cover and hole in throttle lever,, Fig. 23. If pins of gauge will enter holes, adjustment of lever "E" is correct. If adjustment is not correct, loosen lever-to-clamp attaching screw and adjust the clamp as necessary.
5. Connect rod "F" to lever "E".
6. Disconnect rods "B" and "G" from carburetor throttle valve lever.
7. With engine idle set as recommended and rod "F" forced forward against stop in transmission, adjust rod "G" for free entry of swivel pin in carburetor throttle valve lever with carburetor throttle valve in wide open position.
8. With throttle in wide open position and accelerator pedal fully depressed, adjust rod "B" for free entry of swivel pin in throttle valve lever.

Throttle Valve Linkage. 1956 V8 With Powerglide and 2-Barrel Carburetor

1. With engine and transmission at operating temperature, set idle at 425 rpm and shut off engine.
2. Disconnect rod C from lever B, Fig. 24.
3. Remove bolt from lower rear hole of transmission left hand side cover.
4. Rotate clamp A counterclockwise to full detent position. Hold in this position and, with gauge shown in Fig. 23 set at 2.88", measure distance between hole in side cover and hole in lever B. If pins of gauge enter holes freely the adjustment is correct. If not, loosen clamp A and adjust as necessary.
5. Connect rod C to lever B.
6. Disconnect rods G and E from lever F.
7. Rotate lever F to wide open position and adjust rod E to enter freely while holding it forward against transmission internal stop.
8. With accelerator pedal depressed, placing lowest point on accelerator rod ¾" above toe panel, and lever F rotated to wide open position, adjust rod G for free entry into lever F before attaching it.
9. Check adjustment by releasing and depressing accelerator pedal. If lever F does not reach the wide open position it will be necessary to repeat Steps 7 and 8.

Throttle Valve Linkage. 1956 V8 With Powerglide and 4-Barrel Carburetor

1. With engine and transmission at operating temperature, set idle at 425 rpm and shut off engine.
2. Disconnect rod G from lever E, Fig. 25.
3. Remove bolt from lower hole of transmission left hand side cover.
4. Rotate clamp F counterclockwise to the full detent position. Hold in this position and, with the gauge shown in Fig. 23 set to 2.88", measure the distance from the hole in the side cover to the hole in lever E. If pins of gauge enter holes freely, adjustment is correct. If not, loosen clamp F and adjust as necessary.
5. Install rod G.
6. Disconnect rod B from lever J and rod H from lever K.
7. Place lever J to wide open position and pull rod G upward until it is stopped by transmission internal stop. Adjust rod H for free entry into lever K.
8. With accelerator pedal depressed, placing lowest point on accelerator rod 1" above toe panel, and lever J rotated to wide open position, adjust rod B for free entry into lever J.

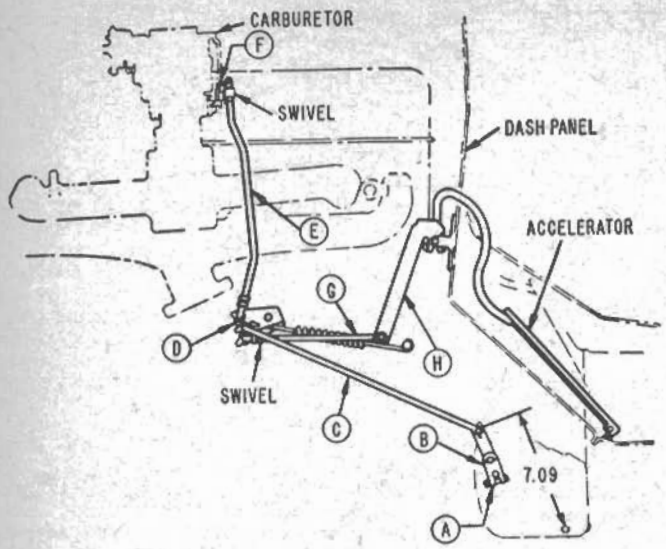

Fig. 28 Throttle linkage adjustment. 1958 Six-cylinder Powerglide

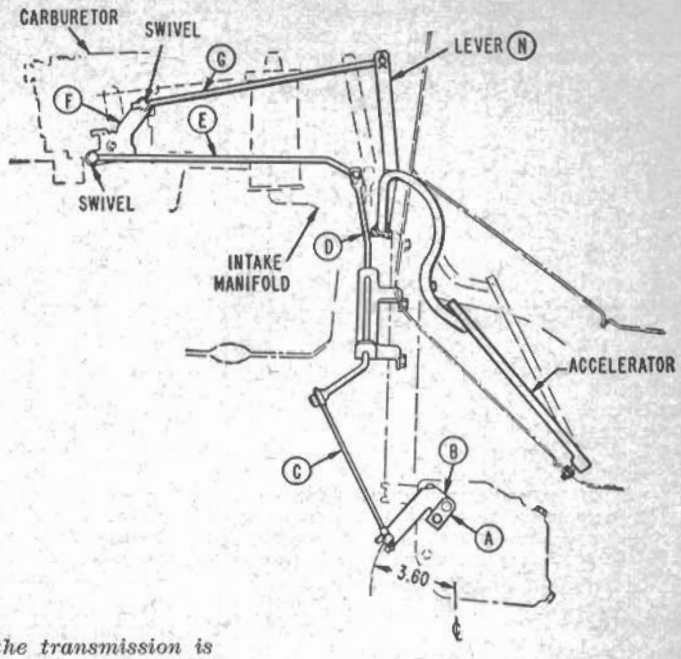

Fig. 29 Throttle linkage adjustment. 1958 V8 Powerglide

9. Check adjustment by releasing and depressing accelerator pedal. Lever J should reach wide open position. If not it will be necessary to repeat Step 8.

Throttle Linkage, Adjust 1957 V8 Powerglide

1. Referring to Fig. 26, remove rod C.
2. Loosely assemble lever B to clamp A.
3. With suitable gauge in place so as to obtain the 3⅝" dimension between the points indicated in Fig. 26, tighten lever B to clamp A.
4. Install rod C.
5. Install rod E in cross shaft D.
6. Place lever F in wide open position and pull rod E forward until it is stopped by transmission internal stop. Adjust swivel in rod E for easy entrance in lever F before fixing swivel in lever F.

1958-59

Shift Linkage

1. With engine stopped, lift up on range selector lever and move the lever to the position where transmission Drive detent is felt, Fig. 27. Slowly release lever to see if lever lock pin freely enters lock plate. Check Reverse range in similar manner. If the lock pin does not freely enter the lock plate in both Drive and Reverse ranges, adjust as follows:
2. Place range selector lever in Drive. Loosen clamp nut on shift control rod at attachment to the shift conrol lever on the lower end of the mast jacket.
3. Hold shift control lever (at lower end of mast jacket) against the Drive stop of the range selector lock plate while at the same time adjusting the length of the shift control rod to obtain Drive detent at the transmission. With the linkage held in this position, carefully retighten the clamp nut on the shift control rod. *Drive detent in the transmission is the second detent felt as the shift lever is pulled forward from its rearmost travel.*

Throttle Linkage, 6-Cyl.

1. Referring to Fig. 28, loosely assemble lever B to clamp A.
2. Insert Gauge J-5906 between transmission left hand side cover lower rear bolt and hole in lever B. Dimension between bolt and hole center lines should be 7.09 inches as shown in Fig. 28. With gauge in place, and holding clamp A counterclockwise in full detent position, tighten lever B to clamp A. Remove gauge.
3. Install rod C.
4. Install rod E in lever D. Place lever F in wide open position and pull rod E up until it is stopped by transmission internal stop. Adjust swivel in rod E for free entry in lever F before fixing swivel in lever F.
5. Check adjustment by placing linkage in idle position, then return to wide open. Position by rotating lever F upward on lever B to see if rod C deflects, meaning transmission is not on internal stop. If rod deflects, or lever F will not reach wide open position, repeat Step. 4.
6. With accelerator pedal depressed until lever H contacts stop and lever D rotated to wide open position, adjust swivel or rod G for free entry into lever D before fixing swivel to lever D.
7. Check adjustment by releasing, then depressing, accelerator pedal. Check lever F for wide open position; if it doesn't reach repeat Step 6.

Throttle Linkage, V8

1. Referring to Fig. 29, loosely assemble lever B to clamp A.
2. Insert Gauge J-5906 between transmission left hand side cover lower front bolt and hole in lever B. Distance between hole center lines is 3.60", Fig. 29. With gauge in place and holding clamp A counterclockwise in full detent position, tighten lever B to clamp A. Remove gauge.
3. Install rod C.
4. Install rod E in cross shaft D. Place lever F in wide open throttle position, adjust rod swivel on rod E for free entry in throttle bellcrank, *and then lengthen the adjustment by three turns.* Fasten swivel in bellcrank.
5. Check the adjustment by releasing linkage to its idle position, then rotate throttle bellcrank F to wide open position. While holding linkage thus, press downward on transmission outer TV lever B and check for deflection. If rod C deflects, repeat Step 4.
6. Place a ½" wood block beneath accelerator pedal rod, depress and hold accelerator to block and then adjust swivel on rod G for free entry into throttle bellcrank F with bellcrank held fully wide open.
7. Remove wood block and depress accelerator pedal by hand to check for detent feel and check that throttle bellcrank F reaches wide open position; if it doesn't reach, repeat Step 6.

POWERGLIDE, REPLACE

1958-59

1. Drain transmission oil and remove filler pipe.
2. Disconnect oil cooler lines, vacuum modulator hose and speedometer drive cable fitting at transmission. Tie lines out of the way.
3. Disconnect body ground strap.
4. Disconnect control rods at transmission.
5. Remove propeller shaft.
6. Attach suitable transmission lifting device.

7. Disconnect engine rear mount on transmission extension, then remove transmission support crossmember.
8. Remove flywheel cover and flywheel-to-converter attaching bolts.
9. Lower rear of transmission slightly so that three upper transmission attaching bolts can be reached; use universal socket and a 39-inch extension. *Care must be taken not to lower transmission too far as the distributor housing may be forced against the dash causing damage to the distributor.*
10. Support engine at oil pan rail with a suitable jack capable of supporting weight of engine when transmission is removed.
11. Remove remaining transmission attaching bolts.
12. Move transmission slightly to the rear and downward. *Do not tip front of transmission downward as the converter could fall out as transmission is removed.* Secure converter in place with a suitable holding tool to prevent it falling out.
13. Reverse removal procedure to install transmission.

Removal, 1952-57

1. Remove toe pan plate and, on models prior to 1955, remove transmission hole cover.
2. Remove spark plugs.
3. On V8s, disconnect ground strap from battery and wires from starter solenoid.
4. Disconnect oil cooler lines at transmission and speedometer cable from driven gear fitting. Unclip cooler lines and tie them to right frame side rail.
5. Disconnect transmission control rods from levers.
6. On 1955-57 models, split rear universal joint and remove propeller shaft and front universal joint.
7. On models prior to 1955, disconnect emergency brake rod from cross shaft and drop cross shaft, cables and spring. Unfasten and slide universal ball and collar back on propeller shaft housing. Split the front universal joint and lower front end of propeller shaft.
8. Drain transmission.
9. Remove filler tube and dip stick and tape filler tube opening.
10. On V8s, remove starting motor.
11. On V8s, disconnect exhaust pipe from cross-over pipe. On 6-cylinder models, disconnect exhaust pipe from exhaust manifold.
12. Disconnect muffler from its bracket. Then move exhaust pipe and muffler to the left and tie to left frame side member.
13. Remove flywheel inspection cover.
14. Using a suitable tool to turn engine over, remove three flywheel-to-converter attaching bolts through opening in flywheel housing that is adjacent to the starting motor on V8s. On 6-cylinder models, the opening is on left side of engine.
15. Remove all converter housing-to-flywheel housing bolts except the upper most three.
16. On models prior to 1955, remove transmission support.

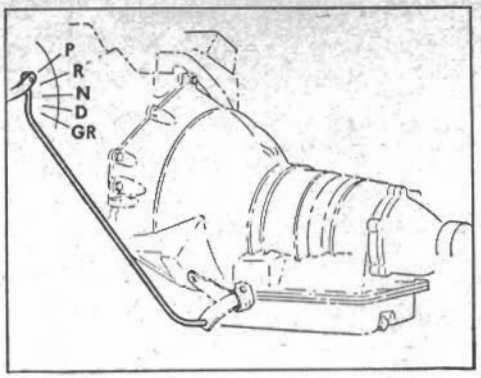

Fig. 30 Shift linkage adjustment. 1958 Turboglide Typical of 1959

17. Install engine support bar or cradle to support engine.
18. Position hydraulic jack under transmission; raise and fasten handling equipment to transmission.
19. Remove rear engine mountings.
20. Remove three remaining attaching bolts through toe pan opening.
21. Move transmission to rear slightly and install a suitable converter holding tool.
22. Lower transmission on jack and remove from under car.
23. Reverse the order of removal procedure to install the transmission.

TURBOGLIDE

For details on this transmission see the *Turboglide Chapter.*

TURBOGLIDE LINKAGE

1959 Adjustments

Shift Linkage—

1. Check transmission shift linkage for proper adjustment as follows: With engine stopped, move range selector lever to the position where Drive detent is felt. Slowly release lever to feel if lever lock pin freely enters lock plate. Check Reverse range in similar manner. If lock pin does not enter lock plate freely in both ranges, adjust as follows:
2. Position selector lever in "D". Disconnect shift control rod at its swivel attachment to the shift control lever on the lower end of the mast jacket by loosening clamp nut.
3. Place transmission shift control outer lever in Drive Position. (Drive detent in transmission is the first clockwise detent position from the fully counterclockwise detent or "GR" position, Fig. 30.)
4. Hold shift control lever (at lower end of mast jacket) against the Drive stop of the range selector lock plate while at the same time adjusting the length of the swivel on the shift control rod for free entry into the shift lever on the mast jacket. With the linkage held in this position, carefully retighten the swivel clamp nut.
5. Test transmission shifts in all ranges.

Throttle Detent Linkage—

1. Disconnect transmission throttle rod from carburetor throttle lever and accelerator rod from carburetor throttle lever.
2. Pull throttle valve rod toward front of car its full limit of travel, then adjust TV rod swivel for free entry into carburetor throttle lever with lever in wide open throttle position. Secure swivel to lever.
3. Check adjustment by placing carburetor throttle lever in wide open position, then pushing downward (counterclockwise) on transmission throttle valve lever and noting if transmission throttle valve rod attached to carburetor throttle lever deflects (transmission not on internal stop). If rod deflects or carburetor throttle lever will not reach wide open position, repeat adjustment.
4. Position carburetor throttle lever at wide open throttle and with an assistant depressing the accelerator pedal to hold the accelerator pedal lever in contact with the lever stop, adjust swivel on accelerator rod to permit free entry into carburetor throttle lever. Secure swivel to lever.
5. Check for detent feel by depressing accelerator pedal by hand. Detent should be felt before accelerator pedal rod strikes carpet or floor mat.

Neutral Safety Switch—

1. Place gearshift lever in neutral.
2. Loosen screws securing switch retainer. Then while holding ignition switch in "Start", adjust position of switch until engine turns over.
3. Hold switch in this position and tighten screws.
4. Check adjustment by cranking in both neutral and park.

1958 Adjustments

Shift Linkage—Follow instructions as outlined for 1959 models.

Throttle Linkage—

1. Disconnect transmission throttle valve (TV) rod at throttle bellcrank on carburetor.
2. Place wood block ½" thick beneath accelerator pedal rod and carpet or floor mat and have an assistant hold accelerator pedal fully down to block.
3. Pull transmission TV rod toward front of car its full limit of travel (through detent) and adjust rod swivel for free entry into hole in throttle bellcrank.
4. Connect TV rod swivel to throttle bellcrank with clip, remove block from beneath accelerator pedal rod and check for detent "feel" by depressing accelerator pedal by hand. Transmission detent should be felt before pedal rod strikes carpet or floor mat.
5. Road test and adjust to insure that stator high angle is obtained at full throttle.

Neutral Safety Switch—This adjustment is obtained in the same manner given for 1959.

POWERGLIDE

For Linkage Adjustment See Car Chapter

CONTENTS

1950-52 Powerglide

This transmission consists of a combination torque converter and auxiliary gearbox. The converter constitutes a complete transmission within itself, the gearbox being used solely for the purpose of providing a neutral position, a reverse gear, a parking brake, and a rarely used emergency low gear. During practically all actual driving, the gearbox is inactive.

The torque converter consists essentially of a primary pump, a secondary pump, a turbine, primary and secondary stators (reactors) and an overrun coupling. The overrun coupling is included in the torque converter to facilitate engine braking and starting of the engine by pushing the car.

The planetary unit and clutch in the gearbox, provide reverse and an emer-

gency low driving range. The clutch locks the planetary gears to provide direct drive without gear action when the transmission is in Drive. In neutral and parking, the free-turning planetary gears and disengaged clutch provide a condition in which the engine is completely disconnected from the propeller shaft and rear wheels.

The hydraulic control system performs the following functions: (1) Keeps torque converter filled with oil; (2) provides lubrication for all working parts; (3) applies clutch in Direct Drive; (4) applies low band in low range; (5) applies reverse band in Reverse Range. To perform these functions, the system utilizes oil under controlled pressure and applies these pressures in proper order to the appropriate hydraulic mechanisms within the transmission.

1953-58 Powerglide

A three-element torque converter is used and the overrun coupling used in 1952 models is eliminated. The new torque converter provides improved cruising economy and retains the braking low speed, push starting characteristics of the previous five-element design. In short, this transmission, with the addition of the new automatic shift mechanism, provides Drive with a Low and Cruising range. The flexibility of operation in Drive is extended to supply faster, more positive pick-up from starts, higher acceleration at traffic speeds and increased power for heavy going in mud, sand or snow. The gearbox uses the same basic components as the previous design.

MAINTENANCE

Adding Oil

Check the oil level with the engine idling, parking brake set, transmission warm and control lever in Neutral. Add only automatic transmission fluid when the level reaches the "Add 1 qt" mark on the dipstick. Do not allow dirt to enter the filler tube.

Changing Oil

Note—The following oil change recommendations apply only to 1957 and prior models. Chevrolet discontinued this recommendation for 1958 models.

Drain and refill the Powerglide transmission every 25,000 miles. Before draining, warm the transmission up to operating temperature. Draining is accomplished as follows:

1. Remove transmission case drain plug.
2. After transmission is completely drained, install plug.
3. Remove dipstick and refill transmission with 5 quarts of fluid.
4. Start engine, allow it to idle for a few minutes and then check the level. If necessary, add oil to bring the level up to the full mark on the dipstick.

"In Car" Repairs

OIL PRESSURES, 1955-59

All pressures given in the tables below may vary approximately 5% (higher or lower) from the mean pressures shown. Location of the pressure take-off points are shown in Figs. 1, 2 and 3.

Front Pump Pressure

Idle 425 rpm	50-60
Above idle	85-95
Reverse—425 rpm	50-60
Reverse—Above idle (1955-57)	165-195
Reverse—at 1000 rpm—	
1958 V8	240-275
1958 6-cyl.	167-191

Transmission In Low Range

Pressure Takeoff Location	Light Throttle 10 MPH	Thru Detent 45 MPH
Low Apply	85-95	85-95
Clutch Apply	0	0
Governor	Fig. 4	Fig. 4
Throttle Valve	*	*

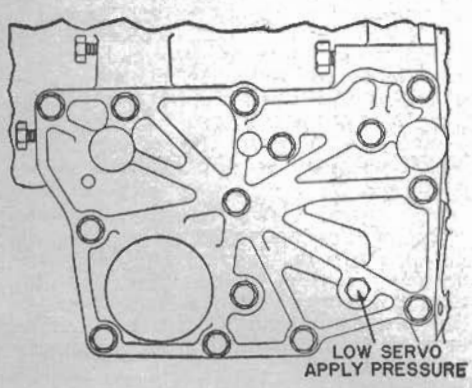

Fig. 1 Oil pressure check point

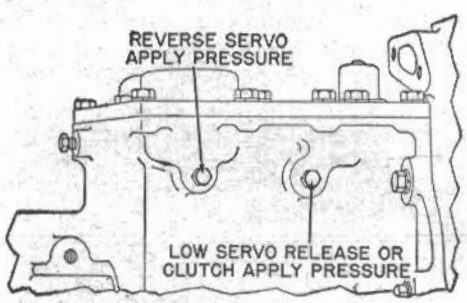

Fig. 2 Oil pressure check points

Transmission In High Range

Low Apply	85-95	85-95
Clutch Apply	85-95	85-95
Governor	Fig. 4	Fig. 4
Throttle Valve	*	*

* Throttle valve pressure will vary from 0 to 62 *psi dependent on throttle* position. At wide open throttle (thru detent) pressure should read 61 to 63 psi on acceleration.

OIL PRESSURES, 1950-54

Pressure tests will reveal the cause of slippage as well as several other causes of improper operation. Pressure gauge is connected to the following test points: Low servo apply; high clutch (release side of low servo); reverse servo; rear pump.

Drive Range

1. Adjust hot engine idle speed to 430-450 rpm.
2. Place selector lever in "D", and check idling pressure which should be 40-45 psi.
3. Increase speed to about 30 mph and note pressure; then load engine several times by partially applying the brakes while maintaining 30 mph. If vacuum modulator is operating properly, pressure will rise each time. If vacuum modulator is not operating correctly, check vacuum lines for leaks. If no vacuum leaks are found, the trouble is in the vacuum modulator.
4. Apply brakes and accelerate engine to normal stall speed (1560-1610 rpm). Pressure should be 75-100 psi.

Low Range

1. With selector in "L" and engine idling, pressure should be 125-150 psi.
2. Apply brakes and accelerate engine to 1560-1610 rpm. Pressure should be 160-200 psi.

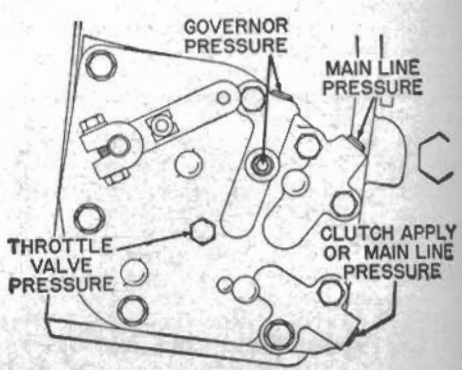

Fig. 3 Oil pressure check points

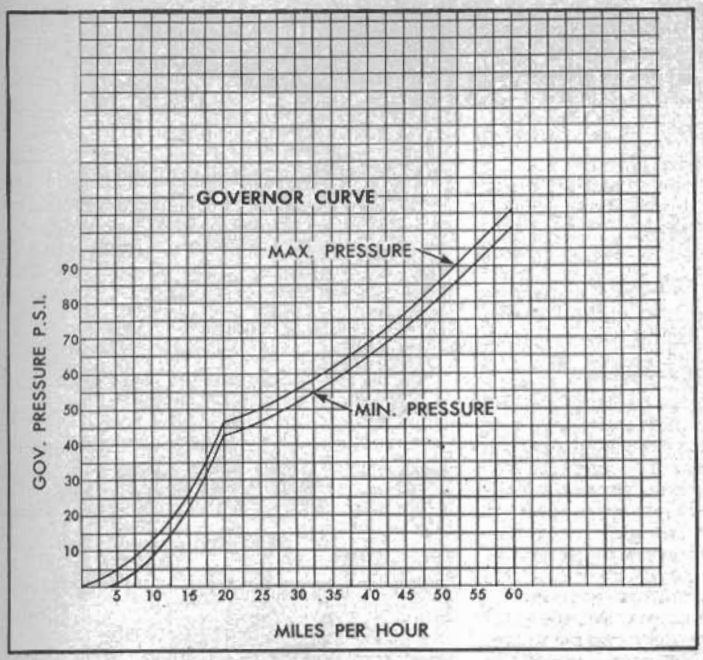

Fig. 4 Governor curve graph. 1955-59

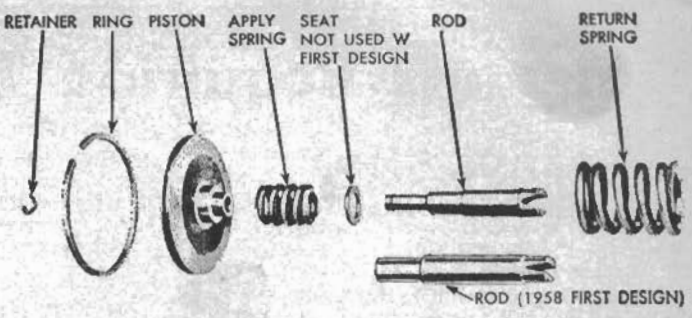

Fig. 5 Low servo piston. Apply spring design is used on all 1953-57 and late production 1958-59

Reverse Range

1. With selector lever in "R" and engine idling pressure should be 125-150 psi.
2. Apply brakes and accelerate engine to 1560-1610 rpm. Pressure should be 160-200 psi.

Rear Pump

1. With selector lever in "D" range and parking brake released, accelerate engine until speedometer reads 30 mph. Pressure should be 50-75 psi.
2. Move selector to "L" and check pressure which should be 140-180 psi.

BANDS ADJUST

Low Band, 1953-59

It is essential that the low servo piston design used in a specific transmission be identified as the low servo piston construction dictates the low band adjustment required. Fig. 5 shows the difference in design between the two types. With the servo cover removed, positive identification of the "apply spring" design can be made as the pin retaining the piston head will be visible. After determining the type piston used, the low band may then be adjusted as follows (see Fig. 6).

1. Torque low servo adjusting screw 5 to 7 lb. ft.
2. Back off adjusting screw *three* complete turns if piston has no apply spring, or *four* complete turns on piston with apply spring. *The amount of back-off must be exactly as specified*—not approximately.

Low Band, 1950-52

Tighten the low band adjusting screw down tight and back off *three* complete turns and tighten lock nut.

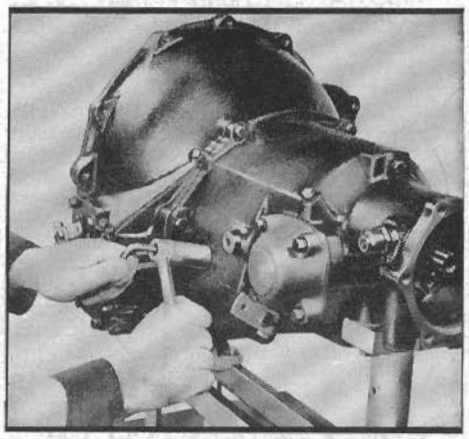

Fig. 6 Adjusting low servo

Reverse Band, 1955-59

As a means of obtaining a more precise adjustment of the reverse band, it is recommended that a predetermined measurement of required reverse band piston travel be used to calculate the necessary reverse band adjustment. The procedure is as follows:

Rotate reverse brake drum to center it in the reverse band. Then tighten the adjusting screw until all end play between the linkage and the band is removed without compressing the band, Fig. 7. This adjustment should provide a reverse piston travel of $\frac{5}{32}$" to $\frac{7}{32}$" from the retracted to the applied positions. To check the adjustment:

1. Measure distance from face of reverse piston outward to side of case with piston in its retracted (inboard) position with a scale rule. Record this dimension.
2. Pull reverse piston outward its full travel by grasping its hub with a pair of pliers. Again measure the distance from the face of the piston to the outboard side of the case. Record this dimension.
3. Subtract one dimension from the other; the difference will be the piston travel, which should be $\frac{5}{32}$" to $\frac{7}{32}$".
4. If the travel is too great, tighten adjusting screw and recheck. If travel is too little, back off adjusting screw and recheck.
5. When correct adjustment is obtained, tighten adjusting screw lock nut 20-25 lb. ft.

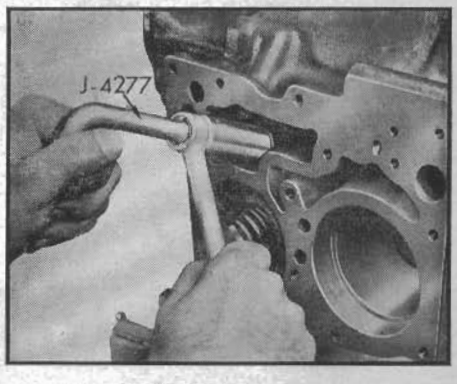

Fig. 7 Adjusting reverse servo

Reverse Band, 1950-54

Using one hand to turn down the adjusting screw, Fig. 7, check end play in linkage by grasping reverse servo return spring with the other hand. Continue turning down adjusting screw slowly until end play, as felt by push-pull on piston assembly, is taken up. Then back off adjusting screw ⅛ to ¼ turn and tighten lock nut securely.

This is a sensitive adjustment and must be done carefully. When end play movement of the piston is just taken up, and before backing off the adjusting screw, the band must be free on the drum so that the drum can easily be rotated by hand.

Repairs Requiring Transmission Removal

TRANSMISSION, DISASSEMBLE

1950-52

1. Place transmission in fixture.
2. Remove right side cover and oil sump suction screen.
3. Install turbine locking strap to turbine, attaching by means of bolt to one of flywheel attaching holes. This is necessary to hold unit stationary while loosening turbine cover retaining bolts.
4. After all retaining bolts have been removed, screw three 10-32x2" "T" screws into three tapped holes in turbine cover to loosen and remove cover and turbine assembly, Fig. 8.
5. Remove primary and secondary stators as a unit, and test rollers for slippage, rotating by hand. The overrunning clutch mechanism should allow rotation in one direction only.
6. Check secondary pump free wheeling clutch as in Step 5.
7. Remove converter retaining ring and washer.
8. Slide primary pump from stator support and remove. Examine pump hub for possible damage to bearing surface.
9. Remove modulator. When removing modulator cover, be careful that hydraulic plunger and body does not fall out and become damaged.
10. Remove servo cover and gasket. *Reverse servo spring and pressure regulator springs exert pressure against this cover. Care should be taken when cover is removed to maintain pressure against cover to eliminate possible cover breakage.*
11. Remove reverse servo spring and pressure regulator springs and valve, Fig. 9. *Handle this valve carefully and lay aside to prevent damage.*
12. Loosen low band adjusting screw lock nut and tighten low band adjusting screw to hold clutch in place.
13. Unfasten transmission from turbine housing and carefully separate these parts.
14. Remove manual valve from valve body, Fig. 10, and manual valve lever from turbine housing. Remove bronze thrust washer from valve body delivery sleeve. Then remove body and gasket.
15. Install front pump driver tool, Fig. 11, and remove pump from turbine housing.
16. Loosen low servo adjusting screw and remove transmission input shaft and clutch from transmission.
17. Back off adjusting screw and remove low servo band and strut assembly, low servo piston and release spring.
18. Remove retainer bolt, lockwasher and universal joint yoke washer and slide universal front yoke off end of shaft.
19. Using soft hammer, tap on end of output shaft to remove planet carrier from case and remove reverse brake drum.
20. Loosen reverse servo lock nut, back off adjusting screw and remove reverse servo band and piston.
21. Take off rear pump and gasket.
22. Using tool J-3383, Fig. 12, engage parking lock pawl spring and rotate spring to unhook end from case. Remove spring and parking lock pawl.
23. Remove transmission parking lock lever and steel washer. Then remove parking lock lever shaft and apply spring from case.
24. Remove lubrication check valve, parts of which are shown in Fig. 13.

1953-59

1. Remove converter assembly.
2. Remove right side cover and gasket, and oil pump suction screen.

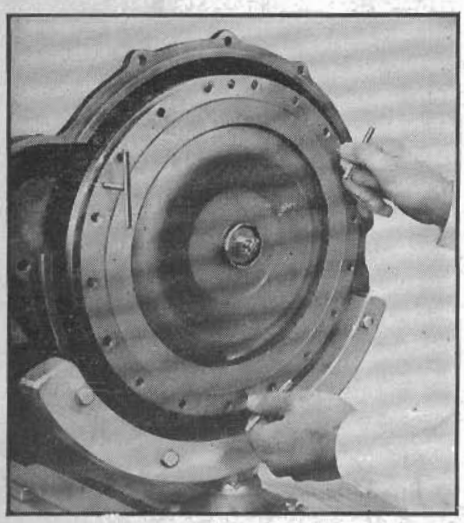

Fig. 8 Removing turbine and cover assembly. 1950-52

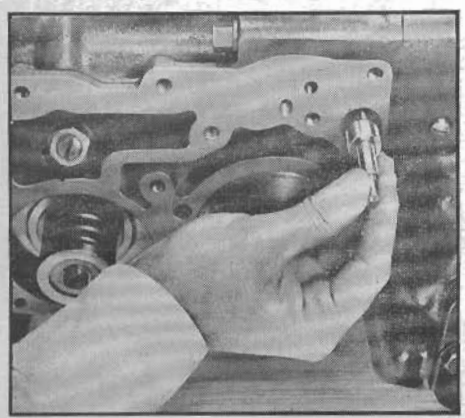

Fig. 9 Removing pressure regulator valve

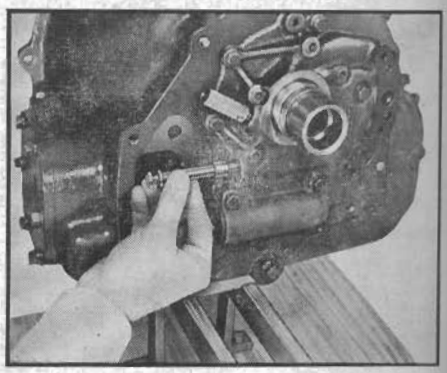

Fig. 10 Removing manual valve

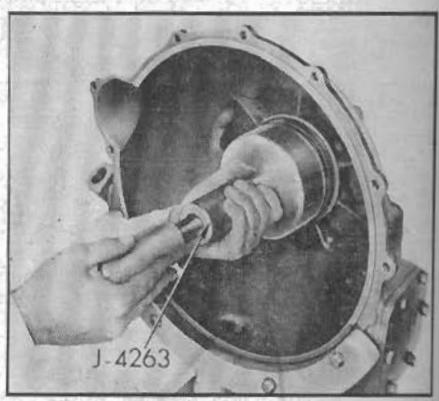

Fig. 11 Removing front oil pump

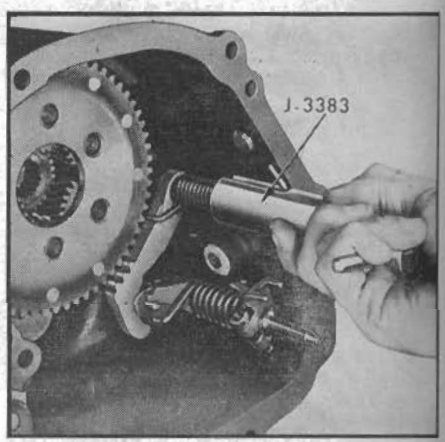

Fig. 12 Removing parking lock pawl spring

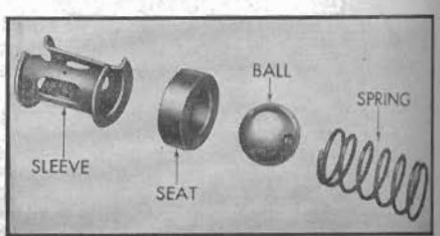

Fig. 13 Lubrication check valve parts

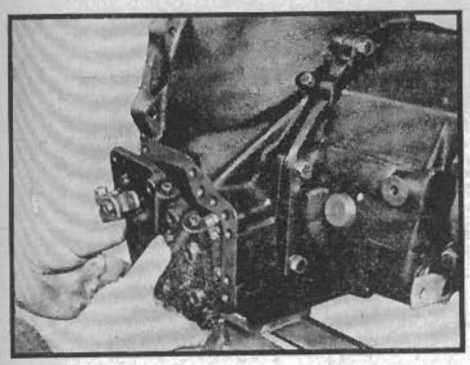

Fig. 14 Removing low and drive valve body. 1953-59

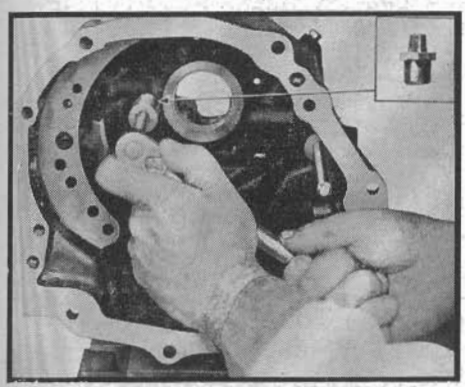

Fig. 15 Removing lubrication pressure relief valve. 1953-59

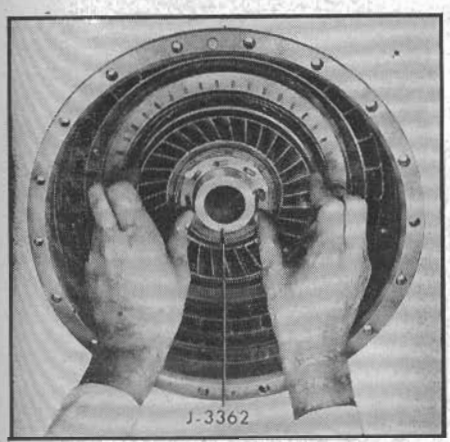

Fig. 16 Installing secondary pump to primary pump hub. 1950-52

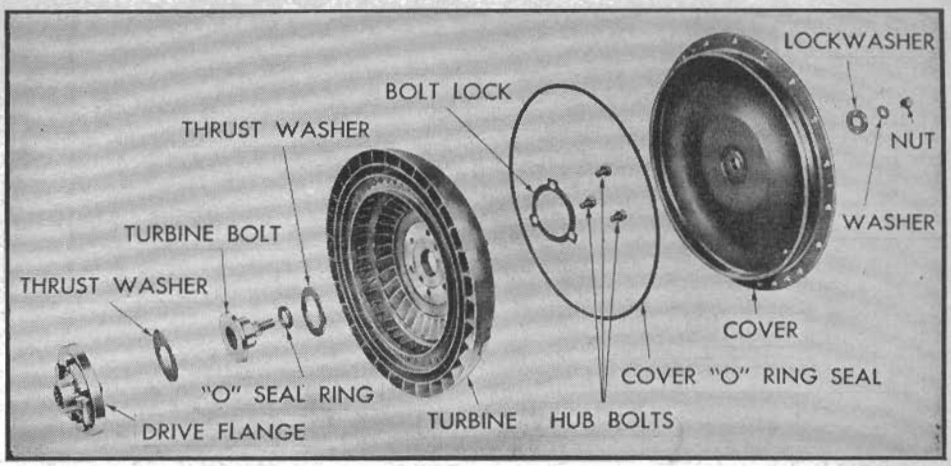

Fig. 18 Layout of turbine parts, 1950-52

3. Remove transmission Low and Drive valve body assembly, Fig. 14, and gasket. *The throttle valve control outer lever assembly should not be removed at this time as it retains the throttle valve inner lever assembly to cover.*
4. Remove modulator assembly and gasket. *When removing the modulator housing be careful modulator pistons do not fall out and become damaged.*
5. Remove servo cover and gasket. *Reverse servo spring, pressure regulator valve springs and low servo piston return spring exert pressure against this cover; therefore, care should be taken when this cover is removed to maintain a pressure against it to eliminate possibility of cover breakage.*
6. Remove reverse servo spring and pressure regulator valve springs and pressure regulator valve. *Handle valve carefully and lay it aside to prevent damage.*
7. Remove low band adjusting screw cover, loosen adjusting screw lock nut, and tighten adjusting screw to hold clutch assembly in place.
8. Working from inside converter housing, remove converter housing to transmission case self-locking bolt.
9. Remove bolts and carefully separate transmission from converter housing. Take off valve body to transmission case gasket.
10. Remove manual valve from valve body and manual lever from converter housing. Also remove the bronze thrust washer from the valve body oil delivery sleeve.
11. Remove valve body and gasket from converter housing.
12. Remove pump from converter housing.
13. Back off low servo adjusting screw and remove transmission input shaft, clutch assembly and low sun gear thrust washer from transmission.
14. Remove low servo band, strut, low servo piston and its return spring.
15. Remove speedometer driven gear.
16. Remove governor cover and gasket from transmission case.
17. Remove governor, allowing it to turn in a clockwise direction when removing it from the bore.
18. Engage parking lock pawl spring and unhook from case. Remove spring and parking lock pawl.
19. Remove parking lock lever and steel washer.
20. Remove parking lock lever shaft and oil seal from case.
21. Install removing and replacing tool J-938 to the planet carrier output shaft and to the rear face of the transmission case. This tool was originally designed for the 3-speed transmission but should be reworked so it will work on Powerglide.
22. Turn puller handle clockwise to force the planet output shaft out of rear bearing. Disconnect tool from output shaft and case and remove planet carrier through front of case.
23. Remove reverse brake drum.
24. Using tool J-4277, loosen reverse servo adjusting screw lock nut, back off adjusting screw and remove reverse brake band and reverse servo piston.
25. Remove rear pump and gasket from transmission.
26. Remove lubrication pressure relief valve, Fig. 15.

CONVERTER REPAIRS 1950-52

Primary Pump

Disassembly—

1. Remove stator race thrust snap ring and thrust washer.
2. Rotate secondary pump in clockwise direction and withdraw from primary pump.
3. Remove overrun cam roller and spring retainer and remove cam rollers, spring retainers, springs and overrun cam thrust washer.

Inspection—

1. Wash and dry all parts.
2. Inspect cam rollers for scoring or galling.
3. Inspect cam roller springs for dis-

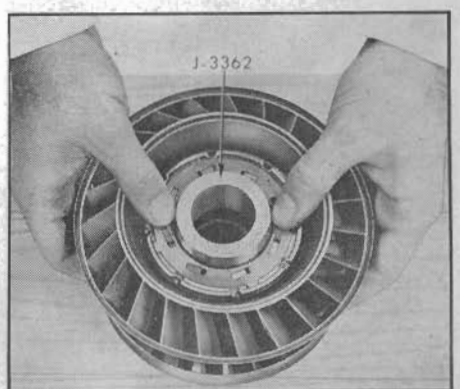

Fig. 17 Use of loading tool to assemble stators. 1950-52

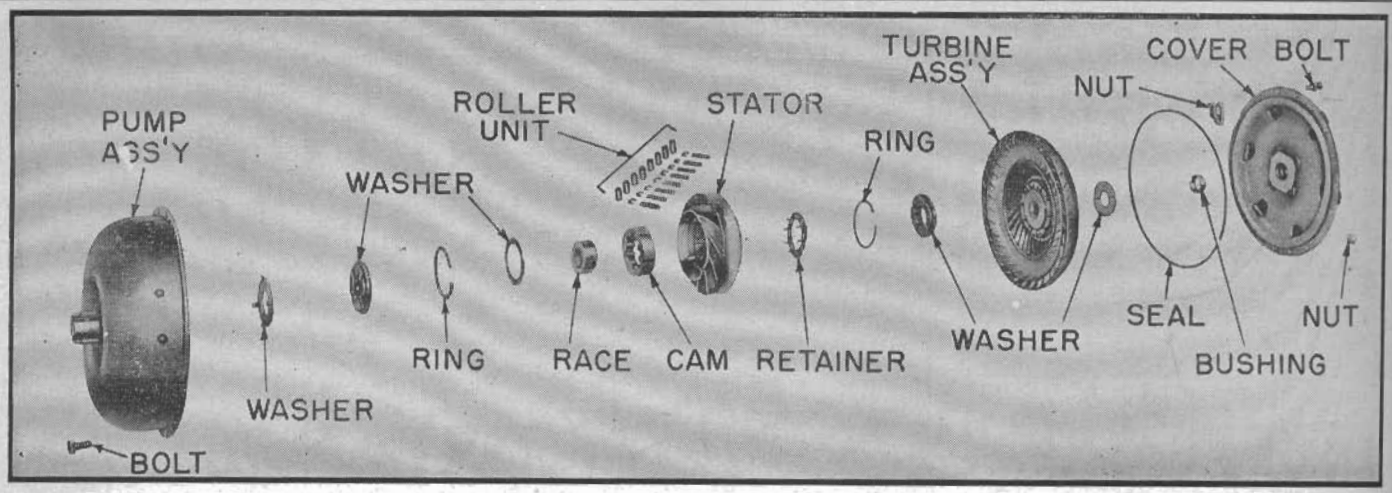

Fig. 19 Exploded view of torque converter. 1953-59

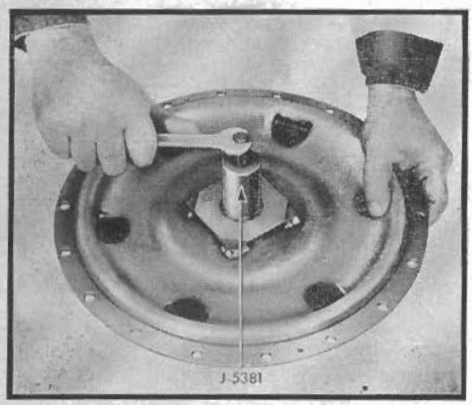

Fig. 20 Removing converter cover bushing. 1953-59

tortion, and spring retainers for excessive wear or damage.

4. Inspect inner and outer primary pump hubs for galling or scoring and inspect pump bushing for excessive wear.
5. Check primary and secondary pump vanes for looseness or damage.

Assembly—

1. Assemble overrun cam roller and spring retainer so that prongs on retainer are to the rear.
2. Assemble cam rollers, spring retainers and springs in cam pockets.
3. Install overrun cam thrust washer, holding retainer on opposite side so that it is not pushed out of position.
4. Using loading tool J-3362, install secondary pump to primary pump hub, Fig. 16, and rotate secondary pump, making sure that pump rotates freely in a clockwise direction and locks when rotated in a counterclockwise direction.
5. Remove loading tool and install stator race thrust washer and snap ring.

Stators

Disassembly—

1. Remove stator race thrust snap ring and thrust washer.
2. Rotate secondary stator clockwise and remove from stator race. Then carefully rotate stator race and remove from primary stator. **Caution**—Exercise care when separating parts so that cam rollers and springs may not become lost.
3. Remove cam roller and spring retainer from secondary and primary stator and remove cam rollers, springs and retainers. *Cam thrust washers, springs and spring retainers only are interchangeable.*

Inspection—Inspect these parts for same conditions as outlined for primary pump.

Assembly—

1. Install cam roller and spring retainer to secondary stator. *Secondary stator roller and spring retainer has long tabs to accommodate long rollers.*
2. Install cam rollers, springs and spring retainers. In assembly of spring retainers, curvature of retainers must follow curvature of hub.
3. Install overrun cam thrust washer.
4. Install cam roller and spring retainer to primary stator.
5. Install cam rollers, springs and spring retainers, being sure that curvature of retainers follow curvature of hub.
6. Install overrun cam thrust washer.
7. Carefully install stator loading tool J-3362, Fig. 17, on stator race and install primary stator over tool and onto stator race with thrust washer down.

Carefully rotate stator in free wheel direction (clockwise) to eliminate possibility of pushing cam rollers out of position.

8. Carefully rotate secondary stator over loading tool with thrust washer down and onto stator race, being careful not to dislodge cam rollers.
9. Install bronze thrust washer and snap ring.
10. Check operation of stators. They should free wheel in clockwise direction and lock to stator race in other direction.

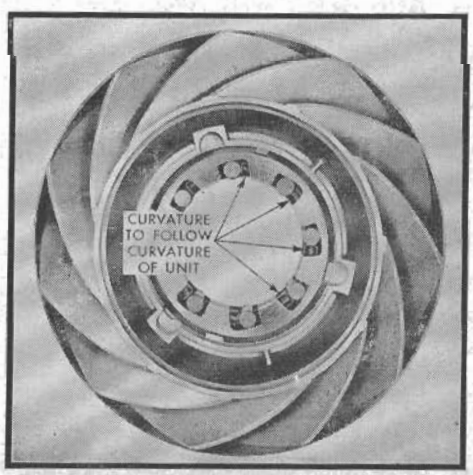

Fig. 21 Curvature of spring retainers. 1953-59

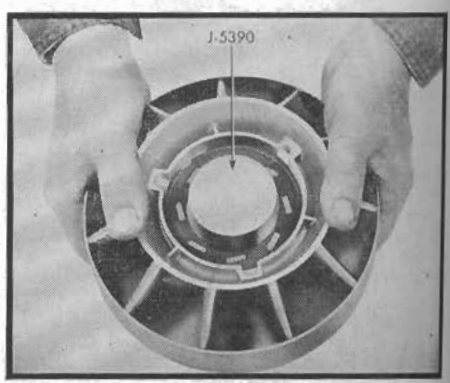

Fig. 22 Use of loading tool to assemble stator. 1953-59

Turbine

Disassembly—Fig. 18.

1. Remove "O" ring from cover.
2. Remove turbine bolt cotter key, nut, flat washer and slotted washer.
3. Lift turbine cover from turbine bolt.
4. Bend down ears of lock plate and remove three turbine hub-to-turbine capscrews.

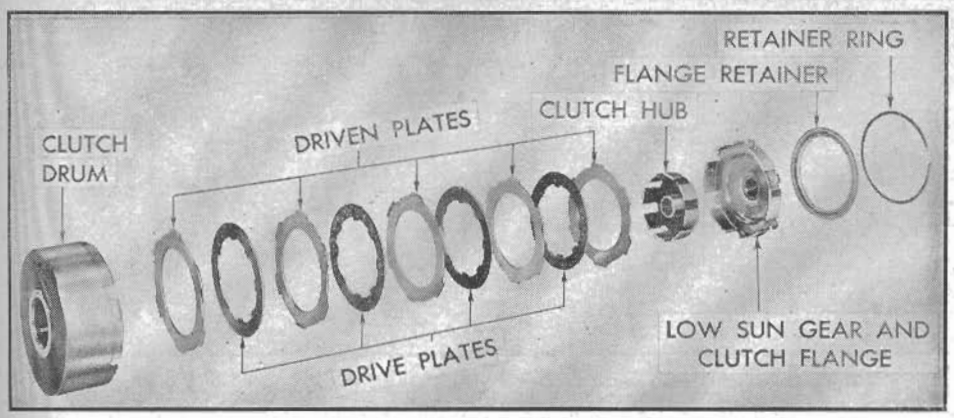

Fig. 23 Layout of clutch parts. 1950-52

5. Remove turbine hub and bolt from turbine.
6. Remove turbine bolt and two thrust washers from hub.
7. Remove "O" ring from turbine bolt.

Inspection—

1. Clean all parts in solvent and air dry.
2. Inspect turbine bolt, hub and thrust washers for excessive wear or scoring.
3. Inspect turbine blades for looseness or damage.

Assembly—Fig. 18.

1. Install new "O" ring on turbine bolt.
2. Install thick thrust washer to turbine, indexing lugs with locating holes in turbine.
3. Install turbine bolt.
4. Install thin thrust washer to turbine hub and install hub over bolt, indexing three dowels with locating holes in turbine.
5. Install lock plate and three turbine hub-to-turbine capscrews, tighten securely and lock.
6. Install turbine cover over turbine bolt.

Fig. 24 Removing clutch spring snap ring. 1950-52

7. Install slotted washer over turbine bolt, indexing pimples with locating hole in pilot. Then install flat washer and nut, tighten securely and lock with cotter key.
8. Install new "O" ring on turbine cover.

CONVERTER REPAIRS 1953-59

Disassemble, Fig. 19

1. Remove converter cover bolts and, with a small punch, drive two split dowel pins out of converter cover.
2. Remove cover, turbine, stator, stator thrust washers and converter pump thrust washer.
3. Remove thrust washer from turbine hub.
4. Remove "O" ring seal from converter cover.
5. Remove stator race from stator.
6. Remove snap ring and over-run cam retaining thrust washer. *Exercise care when separating the parts so that the cam rollers, springs and guides do not become lost.*
7. Remove snap ring and the over-run cam roller and spring retainer. *Exercise care that the cam does not become disengaged from the stator hub and become damaged.*

Inspection

1. Wash all parts in cleaning solvent. *Do not use rags to dry parts; use air.*
2. Inspect converter pump hub inner and outer surfaces for galling or scoring.
3. Inspect converter pump thrust washer for galling or scoring.
4. Check converter pump vanes for looseness or damage.
5. Inspect turbine hub and thrust washer for galling or scoring.
6. Check turbine vanes for looseness or damage.
7. Inspect converter cover bushing for galling, scoring or excessive wear.
8. Inspect stator race and cam rollers for galling or scoring.
9. Inspect cam springs for distortion and spring guides for excessive wear or damage.

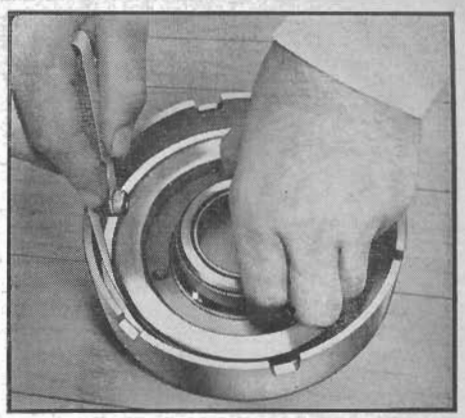

Fig. 25 Checking seating of clutch piston outer seal. 1950-52

10. Inspect over-run cam thrust washer and cam roller and spring retainer for excessive wear or damage.
11. Inspect stator thrust washers for galling, scoring or excessive wear.
12. Inspect stator vanes for looseness or damage.

Converter Cover Bushing, Replace—A precision type converter cover bushing, part number 3702078, should be used for field service replacement. This bushing will not require reaming after installation.

Should the converter cover bushing, during an overhaul inspection show evidence of being galled, scored or excessively worn, it may be replaced easily and accurately using the following procedure:

Insert the cover bushing remover, tool J-5381, in bore of bushing and turn puller screw clockwise, Fig. 20. Place the new bushing on pilot end of the bushing replacer, tool J-5382, and press bushing into position.

Assemble

1. Assemble over-run cam roller and spring retainer to stator so that the prongs of the retainer are pointed toward the rear of the stator. In-

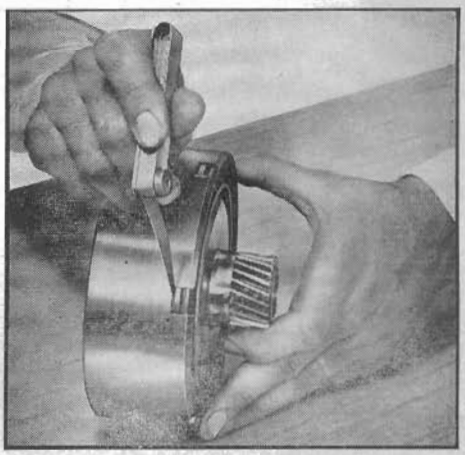

Fig. 26 Checking end play of clutch flange. 1950-59

stall retaining snap ring, making sure it is properly seated in groove. *The front of the stator can be identified by the vanes, which are thicker at the front than they are at the rear. The word "Front" are also cast in the stator.*

2. Assemble cam rollers, springs and guides in cam pockets. *Spring guides are curved and this curvature should fit curvature of unit, Fig. 21.*
3. Install over-run cam thrust washer and retaining snap ring. Be sure snap ring is properly seated in its groove.
4. Coat stator race and loading tool, J-5930, with a light film of oil. Then place stator race on pilot end of loading tool and carefully rotate stator over tapered end of loading tool and stator race, Fig. 22. *Carefully rotate stator in free wheel direction (clockwise) to eliminate* possibility of dislocating cam rollers.
5. Check operation of stator. It should free wheel in clockwise direction when viewed from the front.
6. Place converter pump on bench.
7. Install thrust washer to converter pump hub, being sure tabs are engaged in notches of the hub flange.
8. Assemble both thrust washers to stator and install to converter pump as an assembly. *Be sure that the cut-outs in the over-run cam roller and spring retainer are facing upward, toward the turbine.*
9. Install thrust washer on turbine hub and assemble turbine to converter pump.
10. Install new "O" ring seal on converter cover.
11. Align dowel pin holes in converter cover and dowel pins in pump and install converter cover.
12. Install pump-to-cover attaching bolts and lock nuts, tightening them to 12-15 lbs. ft. torque.

CLUTCH, 1950-52

Disassembly, Fig. 23

1. Remove clutch flange retainer ring and retainer.
2. Remove low sun gear and clutch flange from clutch drum.
3. Remove hub and plates from clutch drum.
4. Place clutch drum in press and install piston spring compression tool J-3364 to compress clutch release spring, Fig. 24. *When handling clutch drum, care should be taken to prevent damage to clutch pressure relief valve.*
5. Remove clutch spring snap ring, using snap ring pliers KMO-410. Release spring slowly and remove clutch spring seat and spring.
6. Forcibly rap clutch drum, face down, on a wood surface to remove clutch piston.
7. Remove piston outer ring seal from clutch piston.
8. Remove piston inner ring seal from hub of clutch drum.

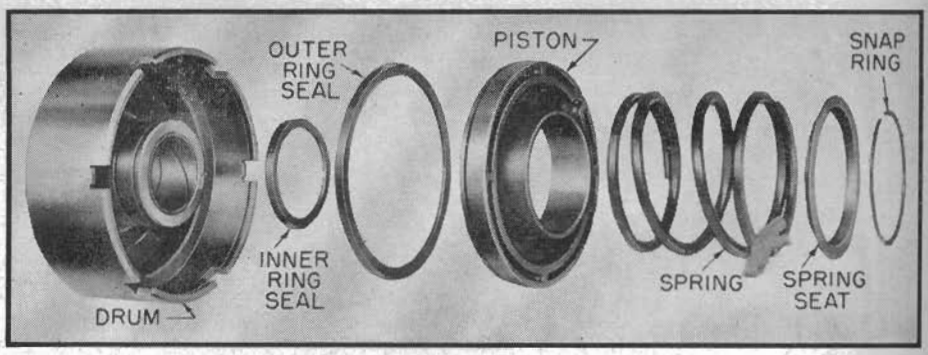

Fig. 27 Layout of clutch drum. 1953-59

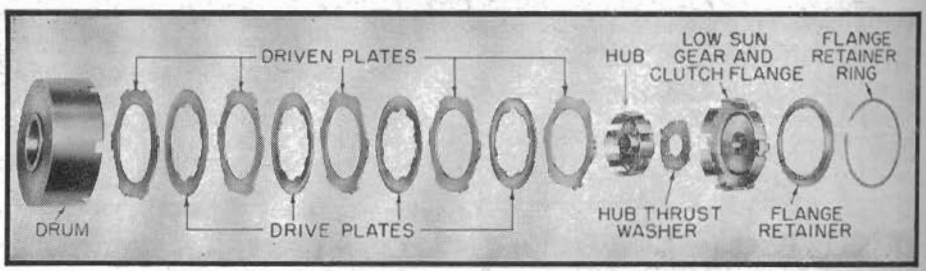

Fig. 28 Layout of clutch assembly. 1953-57

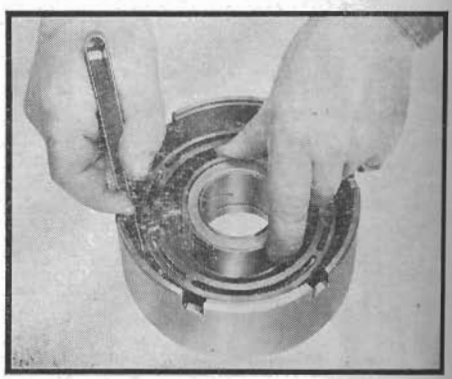

Fig. 30 Checking seating of clutch piston outer seal. 1953-59

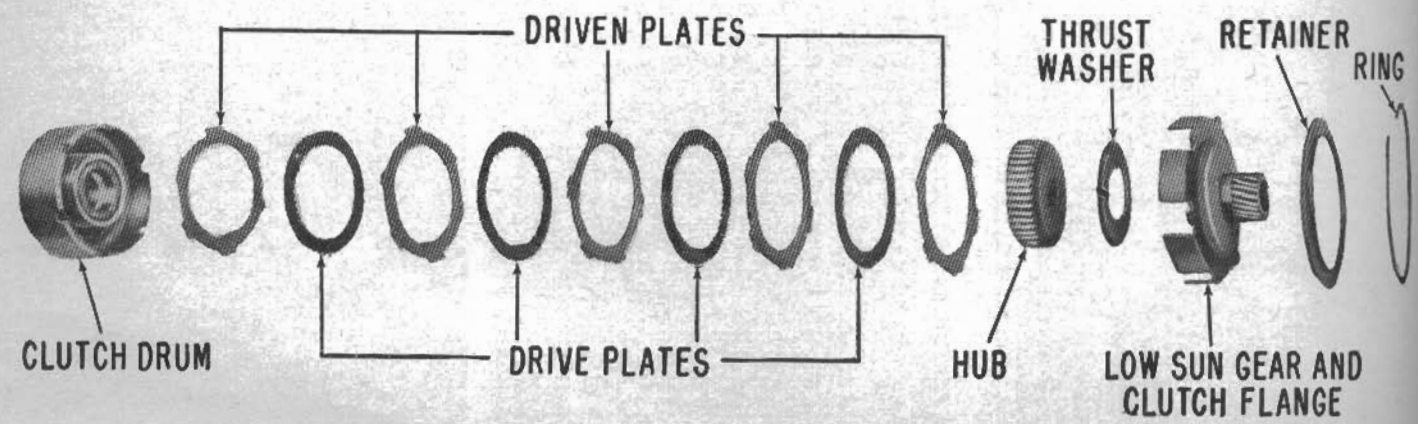

Fig. 29 Layout of clutch parts. 1958-59

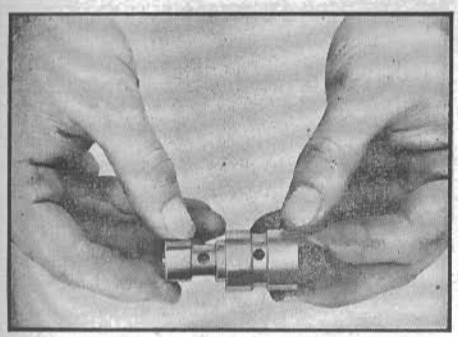

Fig. 31 Hydraulic plunger and body. 1950-52

Inspection

1. Wash all parts in cleaning solvent and air dry.
2. Inspect drum brake band surface for excessive scoring or burning. Also check drum bushing for scoring.
3. Check clutch drum piston relief valve for free operation and see that valve is not bent or damaged in any way.
4. Check fit of clutch flange in drum slots. There should be no perceptible radial play between these two parts. Also check low sun gear for nicks or burrs.
5. Check clutch plates for burning or metal pickup. Also check to see that composition plates are a free fit over clutch hub and that steel plates are a free fit in clutch flange.

Clutch Relief Valve, Replace

1. With a sharp chisel, cut heads from relief valve spring retainer rivets.
2. With a small punch, drive rivets out of drum and remove valve spring and valve.
3. Install new relief valve, spring and two new rivets.
4. Carefully support drum and peen over ends of rivets securely.

Assembly

1. Install new piston outer seal ring on clutch piston, being careful not to stretch seal. Lip of seal should be installed so that it is toward oil pressure side of piston.
2. *Install new piston inner ring seal* on inner hub of clutch drum with lip of seal toward bottom of piston pocket.
3. Place small amount of transmission oil on inner diameter of clutch drum and on seals. Then carefully install piston into clutch drum, using a piece of feeler stock to insure seating of outer ring seal in clutch drum, Fig. 25.
4. Install clutch spring and spring seat. Place unit in press and, using tool J-3364, compress spring and install snap ring. *When compressing spring, be careful spring seat does not hang up in snap ring groove which will cause damage to groove.*
5. Place clutch hub in clutch flange with open side of hub up and install five steel and four composition plates alternately, starting with a steel plate. Steel plates are dished and must be installed with the dished side toward the low sun gear and clutch flange.
6. Assemble clutch drum over clutch flange, invert, and install clutch flange retainer and flange retainer ring.
7. Check end play with feeler gauge between clutch flange drive lug and drive slot in drum, Fig. 26. Maximum allowable end play is .013". *Retainer rings are available in three thicknesses (.055", .064" and .073") to control end play of sun gear and clutch flange in drum.*

CLUTCH, 1953-59

Disassembly, Figs. 27 to 29

1. Remove clutch flange retainer ring and retainer.
2. Remove low sun gear and clutch flange from clutch drum.
3. Remove clutch hub thrust washer, hub and clutch plates from clutch drum.
4. Place clutch drum in bench press and install piston ring compression tool, J-5133, to compress clutch release spring.
5. Remove clutch spring snap ring. Release pressure slowly and remove clutch spring seat and spring.
6. Forcibly rap the clutch drum, face down, on a wood surface to remove clutch piston.
7. Remove outer ring seal from piston.
8. Remove piston inner ring seal from hub of clutch drum.

Inspection

1. Wash all parts in cleaning solvent and *air dry.*
2. Inspect drum brake band surface for excessive scoring or burning. Also, check drum bushing for scoring.
3. Check steel ball in clutch piston that acts as a relief valve. Be sure that it is free to move in the hole and that the orifice leading to the rear of the piston is open.
4. Check fit of clutch flange in drum slots. There should be no appreciable radial play between these two parts. Also check low sun gear for nicks or burrs.
5. Check clutch plates for burning or metal pick up. Also check to see that composition plates are a free fit over clutch hub and that steel plates are a free fit in clutch flange. *The steel plates are waved and are not interchangeable with past models.*

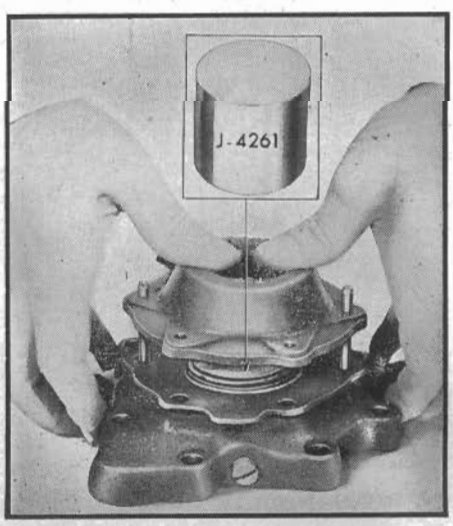

Fig. 32 Installing modulator cover. 1950-52

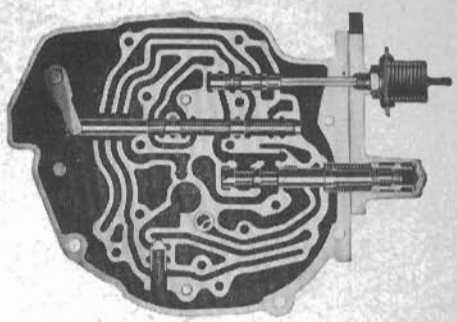

Fig. 33 Vacuum modulator installed. 1958-59

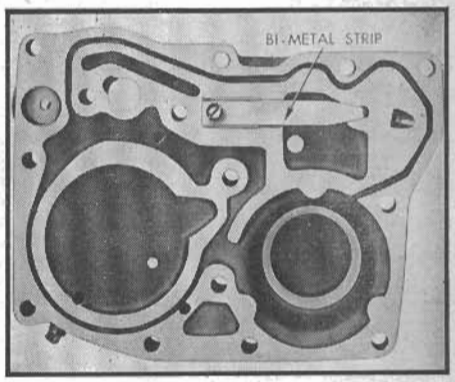

Fig. 34 Lubrication thermostatic valve. 1950-54

Clutch Relief Valve, Replace

Place the steel ball in the retaining hole and carefully stake around edge of the hole to make sure that it will not come out. *Be sure that the ball is free to move after staking.*

Assembly

1. Install new piston outer ring seal on clutch piston, being careful not to stretch seal. Lip of seal should be installed so that it is toward oil pressure side of piston.
2. Install new piston inner ring seal on inner hub of clutch drum with lip of seal toward bottom of piston pocket.
3. Place small amount of transmission oil on inner diameter of clutch drum and onto seals. Then carefully install piston into clutch drum, using a piece of feeler stock to insure seating of outer ring seal in clutch drum, Fig. 30.
4. Install clutch spring and spring seat. Place unit in press and using tool J-5133, compress spring and in-

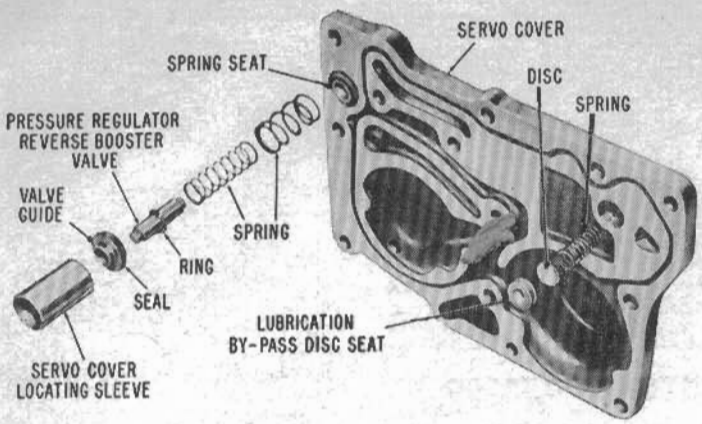

Fig. 35 Layout of servo cover. 1955-57

stall snap ring. *When compressing spring be careful spring seat does not hang up in snap ring groove which will cause damage to spring seat and groove.*

5. Place the four equally spaced tabs on clutch hub thrust washer into slots in clutch hub. Then place clutch hub with thrust washer on clutch flange with open side of clutch hub up and install five steel and four composition plates alternately. *When installing plates start with a steel plate. The steel plates are waved instead of dished; therefore, they may be installed with either side toward the low sun gear and clutch flange assembly.*
6. Assemble clutch drum over clutch flange. Invert it and install clutch flange retainer and retainer ring.
7. Check end play with feeler gauge between clutch flange drive lug and drive slot in drum. Maximum allowable end play is .013". *Retainer rings are available in three thicknesses, .055", .064" and .073" to control end play of sun gear and clutch flange in clutch drum.*

MODULATOR, 1950-52

Disassembly

1. Remove hydraulic plunger and body and carefully lay aside to prevent damage. *Hydraulic plunger and body consists of an internal plunger and external body, Fig. 31. Care must be taken not to drop plunger from body.*
2. Remove modulator outer cover attaching screws, holding cover down against diaphragm spring pressure.
3. Remove diaphragm and spring.
4. Wash all parts in cleaning solvent and blow out all oil passages.

Inspection

1. Check diaphragm spring for distortion or loss of tension.
2. Check diaphragm for wear or cracks that would cause leaks.
3. Inspect modulator outer cover for cracks.
4. Inspect hydraulic plunger and body for nicks and make sure body operates freely in modulator bore and plunger operates freely in body.

Assembly

1. Place assembly tool J-4261 in hydraulic plunger and body bore of modulator. Place diaphragm in position and place spring on diaphragm.
2. Install two 10-24 x 3" guide pins and install modulator cover, Fig. 32. Install attaching screws and tighten securely.
3. Install hydraulic plunger and body with plunger up so plunger will engage modulator lever when assembly is completed.

1953-54

Disassembly

1. Remove hydraulic pistons and carefully lay aside to prevent damage.
2. Remove outer cover screws, holding cover down against diaphragm spring pressure.
3. Remove diaphragm and spring.
4. Wash all parts in cleaning solvent and blow out all oil passages. Blow dry with air.

Inspection

1. Check diaphragm spring for distortion or loss of tension.
2. Check diaphragm for wear or cracks that would cause leaks.
3. Inspect outer cover for cracks.
4. Inspect hydraulic pistons for nicks and make sure they operate freely in modulator bore.

Assembly

1. Place assembly tool, J-5389, in hydraulic bore of modulator. Place diaphragm in position and place spring on diaphragm.
2. Install two 10-24x3" guide pins (part of Pilot Stud Set J-3387) and install modulator cover. Install screws and tighten securely.
3. Install hydraulic pistons with crown toward modulator lever and diaphragm.

1958-59

The vacuum modulator is installed in the servo cover, Fig. 33. See *Servo Cover* for modulator strut alignment procedure.

SERVO COVER, 1950-54

Disassembly

1. Remove bi-metal strip retaining screw, strip and retainer from cover, Fig. 34.
2. Remove lubrication by-pass ball plug and copper gasket. Remove spring and ball from cover.
3. Wash all parts in cleaning solvent and blow out all oil passages.

Inspection

1. Inspect cover for nicks or cracks which would result in oil leaks.
2. Inspect by-pass ball spring for distortion.
3. Inspect modulator control lever for free operation. It is important that this lever does not bind on guide pin.

Assembly

1. Install by-pass ball in servo cover.

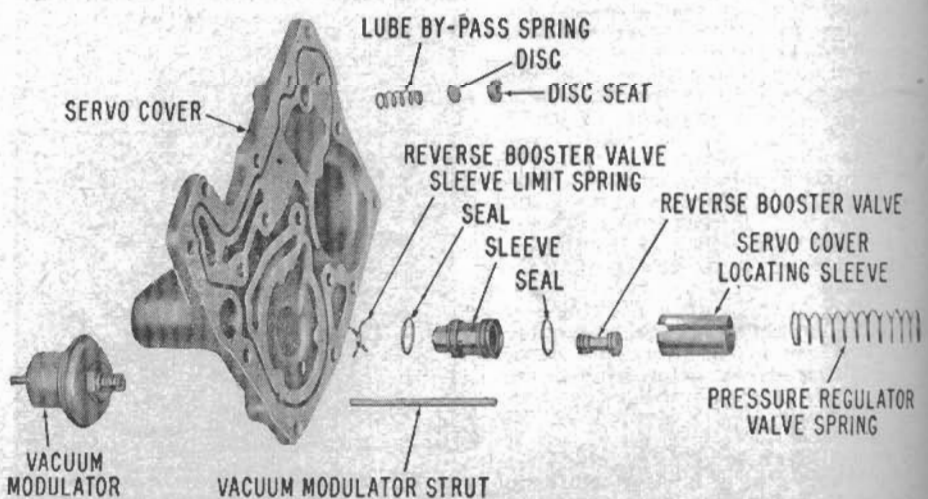

Fig. 36 Layout of servo cover. 1958-59

2. Install by-pass ball spring.
3. Using new plug gasket, install plug and tighten securely.
4. Install bi-metal strip retainer, strip and retaining screw and tighten securely.

1955-57

To disassemble, remove the booster valve parts by pulling on the protruding end of the booster valve. Wash all parts in cleaning solvent and blow out all passages.

Using a small punch, and working through opening in the by-pass disc seat, exert pressure on the disc to make sure the disc and spring are free to operate in their cavity, Fig. 35. Do not remove the disc seat unless there is evidence of damage.

When assembling, do not press the booster valve guide down too far as this would place heavy spring pressure on the guide and provide for the possibility of its release under pressure.

1958-59

To disassemble, Fig. 36, remove the pressure regulator reverse booster valve only. Wash all parts and clean out all passages. Do not remove the disc seat unless there is evidence of damage.

When assembling, do not push down on the booster valve sleeve as the sleeve has been properly located by the servo cover locating sleeve.

When installing the servo cover, before tightening the cover bolts, the vacuum modulator hole in the servo cover and modulator strut hole in the transmission case must be carefully aligned, Fig. 33. Failure to install the servo cover with these holes concentric to each other causes the vacuum modulator strut to bind, resulting in improper pressures, harsh shifts and possible clutch failure. Due to the degree of accuracy required, the following alignment procedure is recommended:

1. Cut the hex-head threaded fitting from the end of a discarded vacuum modulator and screw the fitting into the modulator hole in the servo cover.
2. Slide the shank of a $\frac{13}{64}$" drill through both the hole in the fitting and the strut hole in the transmission case. *The rod should slide freely through* the two holes if alignment is correct. If not correct, shift by tapping the edges of the servo cover with a soft hammer.
3. When alignment is correct, tighten all servo cover bolts to a torque of 15-18 lb. ft., then remove the threaded fitting and drill, and install the strut and vacuum modulator.

FRONT PUMP, 1950-52

Disassembly, Fig. 37

1. Remove stator support from pump body.
2. Remove pump gears from body. *Use care not to drop these gears or nick them as they are not heat treated.*
3. Remove front oil pump seal ring.

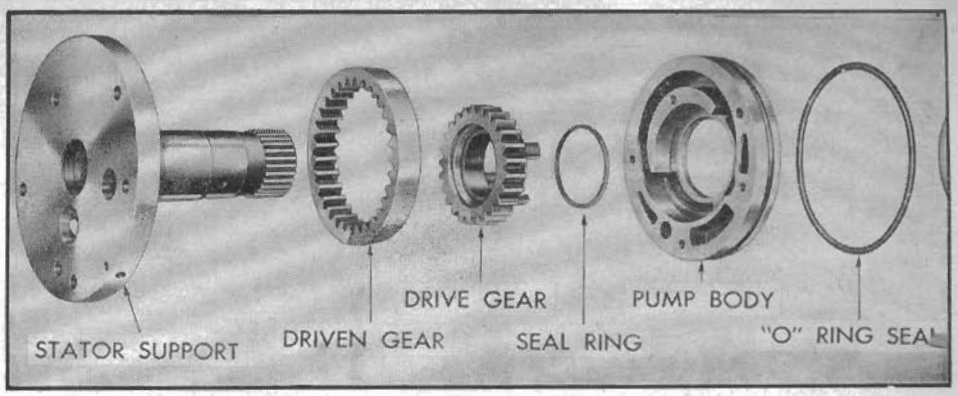

Fig. 37 Layout of front oil pump. 1950-52

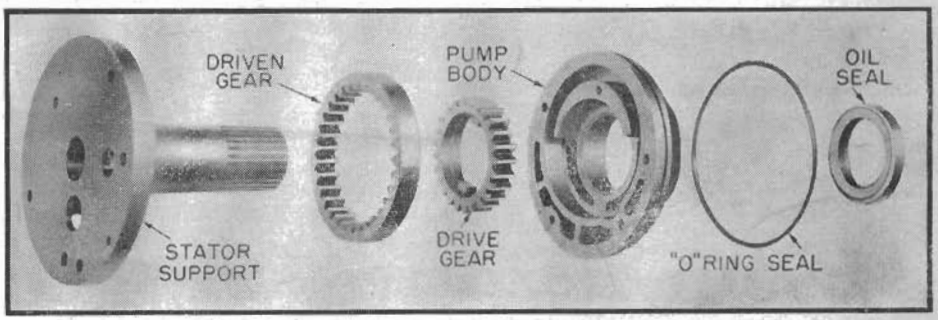

Fig. 38 Layout of front pump. 1953-59

4. Remove "O" ring from pump body.

Inspection

1. Wash all parts in cleaning solvent and blow out all oil passages.
2. Inspect pump gears for nicks or damage.
3. Inspect drive gear oil ring and oil ring groove, making sure ring is free of burrs and is free in ring groove. Also install ring in pump body bore and make sure hooked ring ends have clearance.
4. Inspect stator support pump face for nicks or scoring.
5. Inspect pump body for nicks or scoring.
6. Inspect pump body oil seal for excessive wear or damage or evidence of leakage.
7. *If oil seal is damaged or is leaking,* pry out and install new seal.
8. Wash parts clean and dry, install pump gears and check: (A) Clearance between outside diameter of gear and body should be .001-.002". (B) Backlash of gears should be .003-.005". (C) Clearance of gears to crescent: internal gear .002-.005", external gear .005-.006". (D) With scale and feeler gauge check gear and clearance, which should be .0005-.0015".

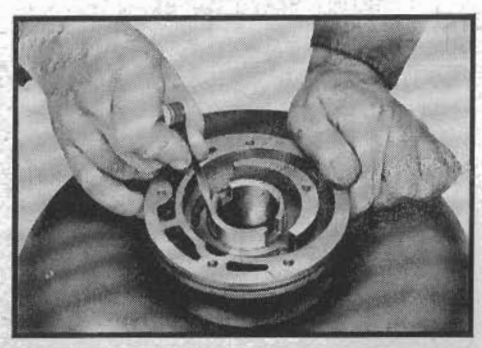

Fig. 39 Measuring clearance between pump body bushing and converter pump hub. 1953-59

Assembly

1. Install new "O" ring in pump body.
2. Remove gears from body, install oil pump seal ring, oil gears generously with transmission oil before assembly into body. *Drive lugs on drive gear protrude through oil seal.*
3. Assemble stator support through *drive gear aligning attaching holes.*

1953-59

Disassembly, Fig. 38

1. Remove stator support from pump body.
2. Remove pump gears from body. *Care must be taken when removing and handling gears not to drop or nick them as they are not heat treated.*
3. Remove "O" ring from pump body.

Inspection

1. Wash all parts and air dry.
2. Inspect pump gears for nicks or damage.
3. Inspect stator support pump face for nicks or scores.

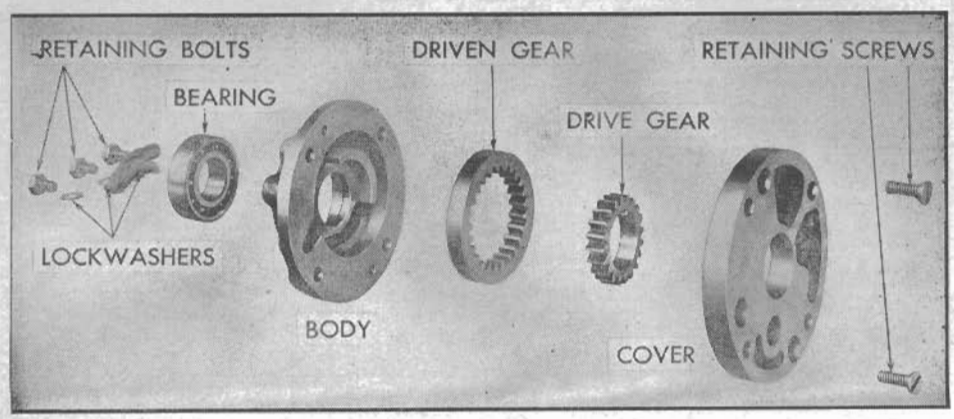

Fig. 40 Layout of rear oil pump. 1950-52

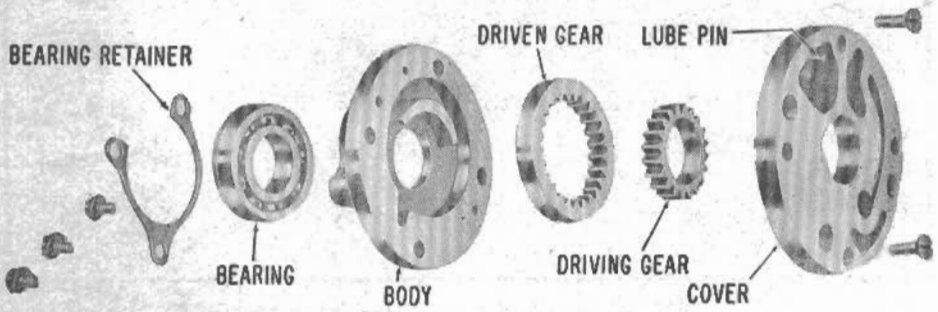

Fig. 41 Layout of rear pump. 1953-59

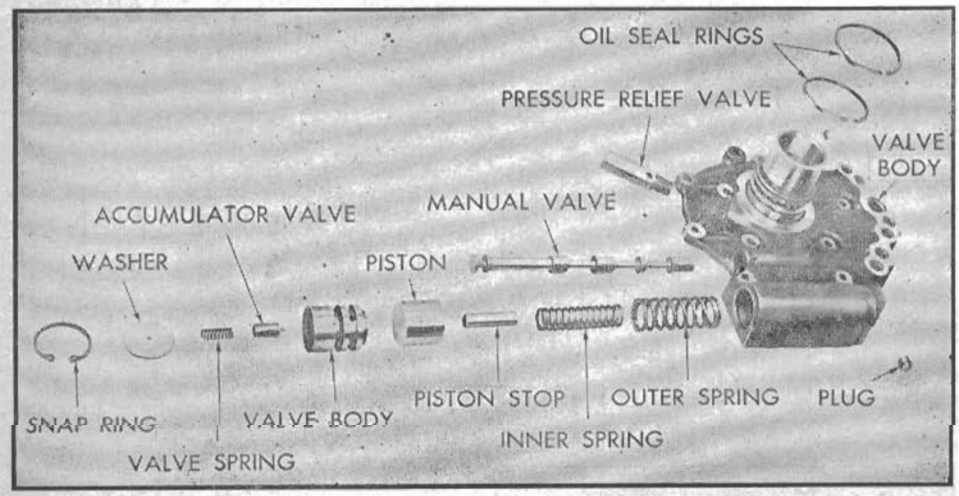

Fig. 42 Layout of accumulator valve body. 1950-52

4. Inspect pump body for nicks or scores.
5. Inspect pump body oil seal for excessive wear or evidence of leakage. If necessary, pry out oil seal and install a new one.
6. Inspect pump body bushing for galling or scoring. Check clearance between bushing and converter pump hub, Fig. 39. Maximum clearance .007".
7. With parts clean and dry install pump gears and check: (a) Clearance between outside diameter of gear and body should be .0025-.0055". (b) Clearance between internal gear and crescent should be .003-.009". (c) With scale and feeler gauge check gear end clearance which should be .0005-.0015".

Assembly

1. Install new "O" ring seal in body.
2. Remove gears from body, oil generously with automatic transmission oil and install in body.
3. Assemble stator support through drive gear, aligning attaching holes.

REAR PUMP, 1950-52

Disassembly, Fig. 40

1. Remove two flat slotted head screws and remove pump body plate.
2. Remove pump gears, wash all parts in cleaning solvent and blow out all oil delivery holes.

Inspection

1. Inspect rear bearing for roughness by rotating by hand.
2. If bearing is rough, remove three retaining capscrews and drive out old bearing.
3. Press new bearing into place and install capscrews.
4. With parts clean and dry, install pump gears and check clearances in same manner as outlined in Step 8 for front oil pump.

Assembly

1. Remove gears from body and oil generously with automatic transmission oil.
2. Assemble gears to body.
3. Install pump body plate and secure with two flat slotted head screws.

1953-59

Fig. 41

Disassembly—Remove two slotted flat head screws and remove pump body plate. Remove pump gears, wash all parts, blow out all oil delivery holes and inspect all parts for damage. Install gears and check clearances, which should be the same as in the front pump.

Assembly—Remove gears from body and oil generously with automatic transmission oil. Assemble gears to body, install body plate and tighten screws to 3½-5 lbs. ft. torque.

1958-59 Service Note

A hollow bolt has been added to the 1958 transmission. This bolt is installed in the top rear pump-to-case hole. This bolt is used for venting purposes to facilitate the addition of oil. The dipstick markings of "add" and "full" are one quart apart, and some transmissions without the hollow bolt were taking only one pint to change the oil level from "add" to "full". Subsequent running, of course, brought the level down to midway between the marks on the dipstick.

VALVE BODY, 1950-52

Disassembly, Fig. 42

1. Remove accumulator special snap ring.
2. Remove accumulator valve spring washer, valve spring and valve.
3. Remove accumulator valve body and piston from its bore.
4. Remove accumulator inner and outer springs and piston stop from piston bore.
5. Remove two clutch drum oil seal rings.
6. Remove pressure relief valve.

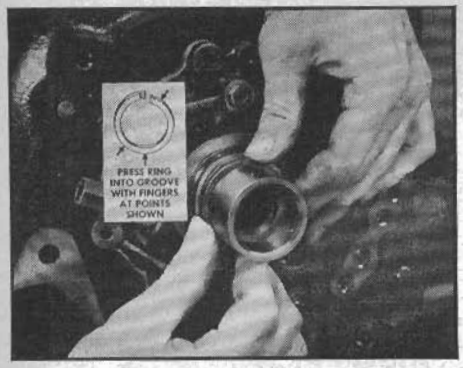

Fig. 43 Installing oil seal rings. 1950-52

Inspection

1. Wash all parts in cleaning solvent, air dry and blow out all oil passages.
2. Inspect valve body for scoring and make sure fibre valve operates freely.
3. Check body in bore to see that it operates freely.
4. Check piston for scoring and see that it operates freely in valve body bore.
5. Check valve for scoring and see that it operates freely in accumulator body bore.
6. Check rings for distortion.
7. Check oil seal rings for nicks or burrs and make sure they are free in ring grooves. Also install rings in clutch drum bore and make sure hooked ring ends have clearance.

Assembly

1. Install piston inner and outer springs and piston stop in valve body bore.
2. Install accumulator piston, making sure that it seats over inner and outer springs.
3. Install valve body into its bore.
4. Install accumulator valve into accumulator valve body bore and install accumulator valve spring.
5. Install accumulator valve spring washer, compress spring and install special snap ring, making sure it seats in groove.
6. Install pressure relief valve assembly.
7. Install two clutch drum oil seal rings, Fig. 43.

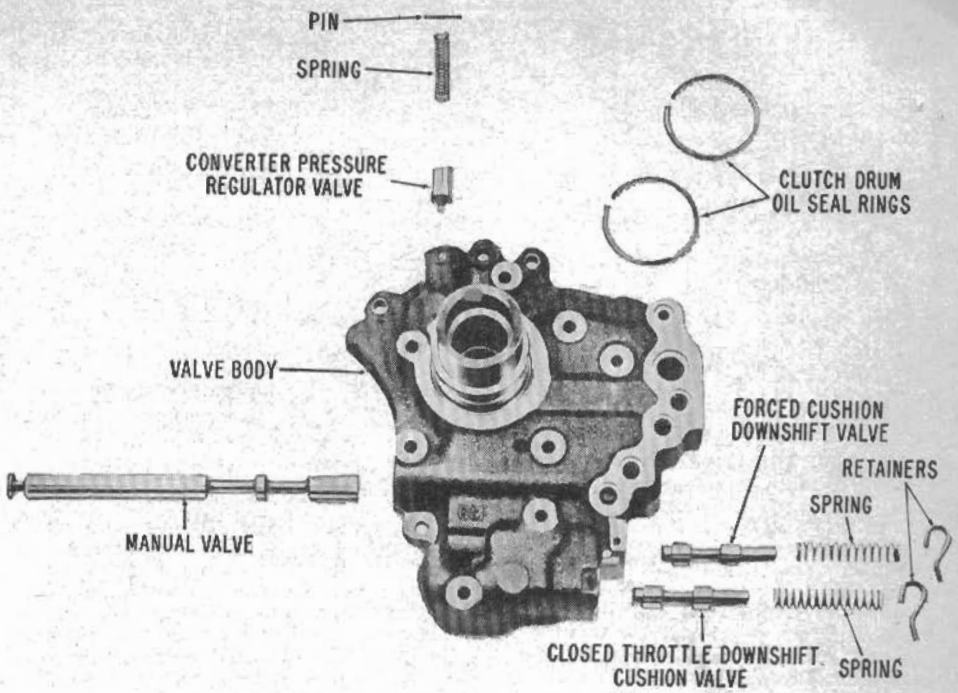

Fig. 45 Layout of main valve body. 1955-57

VALVE BODY, 1953-54

Disassembly, Fig. 44

1. Using pliers J-4245, remove accumulator special snap ring.
2. Remove accumulator valve spring washer, spring and valve.
3. Remove valve body and piston.
4. Remove inner and outer springs and piston stop from bore.
5. Remove clutch low servo valve from body.
6. Place valve body face down on two wood blocks of equal thickness and, with a small pin punch, drive the pressure regulator governor valve retaining pin from valve body.
7. Remove pressure regulator governor valve spring and valve.
8. Using a small pin punch, drive the converter pressure regulator valve retaining pin from valve body and remove spring and valve.
9. Remove two clutch drum oil seal rings.

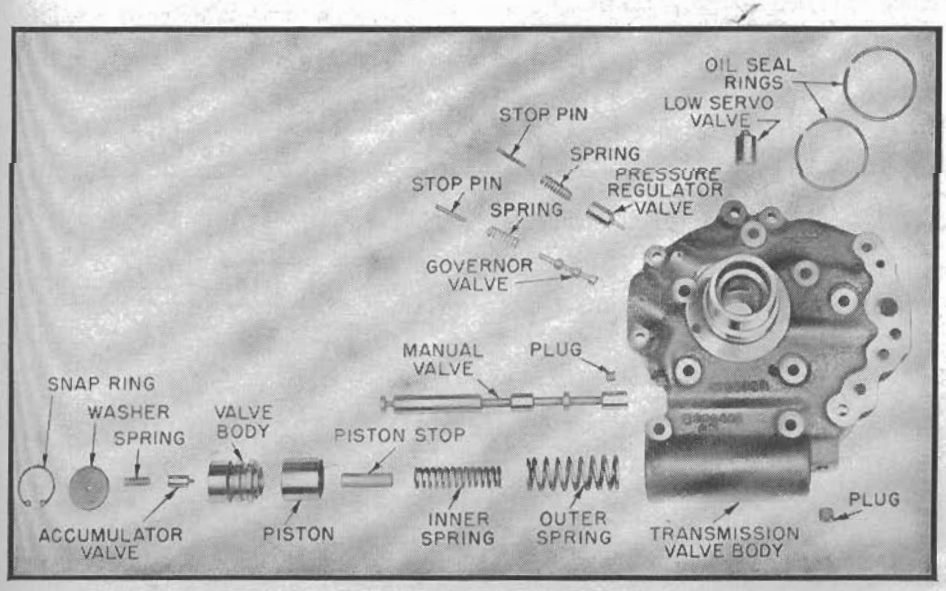

Fig. 44 Layout of valve body. 1953-54

Inspection

1. Wash all parts, air dry and blow out all oil passages.
2. Inspect accumulator valve body for scoring and make sure small fibre valve operates freely.
3. Check accumulator body in valve body bore to see that it operates freely.
4. Check accumulator piston for scoring and see that it operates freely in valve body bore.
5. Check accumulator valve for scoring and see that it operates freely in accumulator body bore.
6. Check springs for distortion.
7. Inspect clutch low servo valve and make sure bakelite valve operates freely.
8. Inspect converter pressure regulator valve spring for distortion.
9. Inspect converter regulator valve for galling or scoring.
10. Check converter pressure regulator

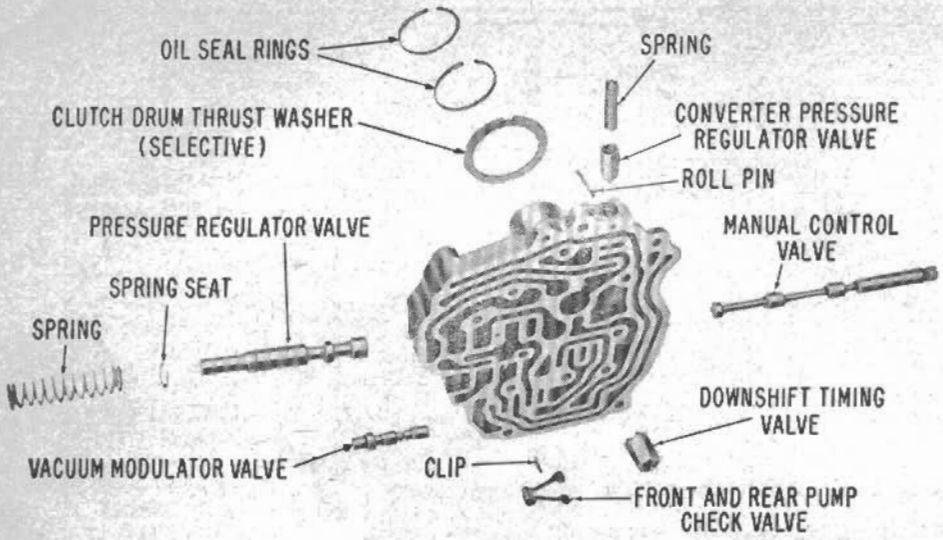

Fig. 46 Layout of main valve body. 1958-59

valve and make sure that it operates freely in valve bore.

11. Inspect pressure regulator governor valve spring for distortion.
12. Inspect pressure regulator governor valve for galling or scoring.
13. Check pressure regulator governor valve and make sure it operates freely in valve bore.
14. Check oil seal rings for nicks or burrs and make sure they are free in the ring grooves. Also install rings in clutch drum bore and make sure hooked ring ends have clearance.

Assembly

1. Install accumulator piston inner and outer springs, and piston stop in accumulator piston. Then install piston in valve body.
2. Install accumulator valve and spring in valve body.
3. Install accumulator valve body in valve body bore.
4. Install accumulator valve spring washer, compress and install special snap ring, making sure it is properly seated in groove.
5. Install clutch low servo valve.
6. Place valve body face down on wood blocks.
7. Assemble spring to converter pressure regulator valve and install assembly. Install retaining pin. *Do not confuse the converter pressure regulator valve spring with the pressure regulator governor valve spring. The converter spring is longer and heavier.*
8. Assemble spring to pressure regulator governor valve and install assembly in valve bore. Install retaining pin.
9. Install two clutch drum oil seal rings.

1955-57

Disassembly, Fig. 45

1. Use needle nose pliers to remove the forced downshift cushion valve retainer from valve body.
2. Remove forced downshift cushion valve spring and valve from bore.
3. Using needle nose pliers, remove the closed throttle downshift cushion valve retainer from valve body and remove spring and valve from bore.
4. Place valve body face down on two wood blocks of equal thickness and with a small punch drive out the converter pressure regulator valve retaining pin and remove spring and valve from bore.
5. Remove two clutch drum oil seal rings from oil delivery sleeve.
6. Remove front and rear pump check valve.

Inspection

Wash all parts and air dry. Check all springs for distortion or damage. Check all valves for nicks, burrs, scoring or galling. Also for free operation in bores.

Check oil seal rings for nicks or burrs and make sure that they are free in the ring grooves. Also install rings in clutch drum bore and make sure hooked ring ends have clearance.

Assemble

Reassemble the parts in the reverse order of their removal. Do not confuse the forced downshift cushion valve spring with the closed throttle downshift cushion valve spring. The forced downshift spring is the longer of the two and is of heavier gauge wire.

The interlocking type cast iron rings in this transmission are easily removed from, or installed in, their grooves by applying pressure to the ring with the index finger and thumb at the proper points.

1958-59

Disassemble, Fig. 46

1. Remove hairpin from vacuum modulator valve and remove valve.
2. Place valve body face down on two blocks of wood and with a punch drive out the converter pressure regulator valve retaining pin; remove spring and valve.
3. Remove two clutch drum oil seal rings from oil delivery sleeve.
4. Remove front and rear pump check valve.
5. Remove pressure regulator valve and spring.
6. Remove manual control valve.

Inspection

Wash all parts and air dry. Check all springs for distortion or damage. Check all valves for nicks, burrs, scoring or galling. Also see that they are free in their respective bores. Check oil seal rings for damage and make sure they are free in the ring grooves.

Install rings in clutch drum bore and make sure hooked ring ends have clearance.

Service Note

The downshift timing valve must not be removed unless replacement is necessary as indicated by poor coast downshift. However, all linkage adjustments should be checked before it can be determined that the downshift timing valve is faulty.

If necessary to replace the downshift timing valve, pry the old valve out with a small pin punch, using care not to damage its bore. To install, use an arbor press and a $\frac{7}{16}$" socket and press the new valve in the bore until the tip on

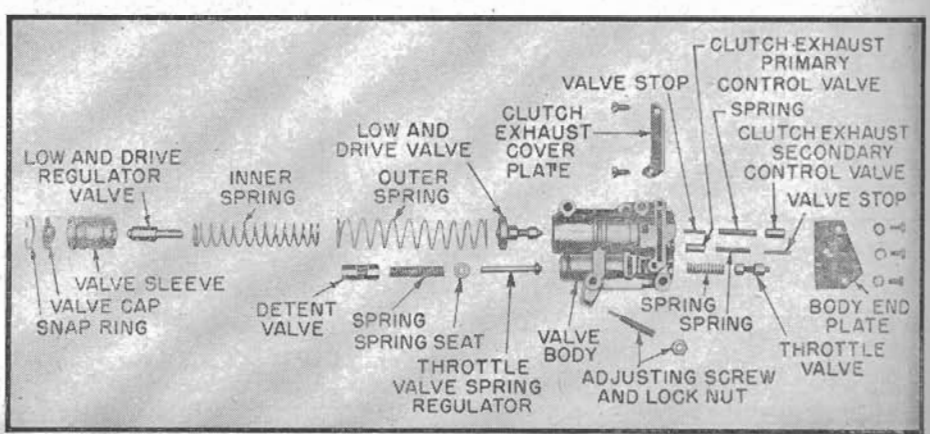

Fig. 47 Layout of low and drive valve body. 1953-59

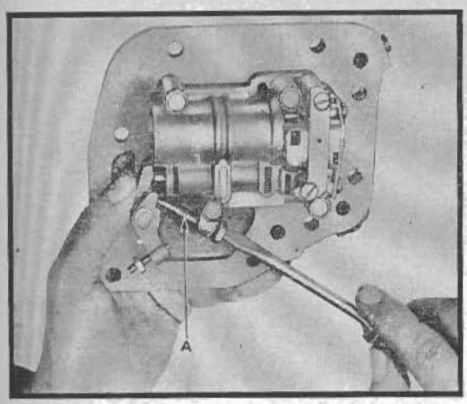

Fig. 48 Setting (1) of throttle valve inner lever adjustment. 1953-59

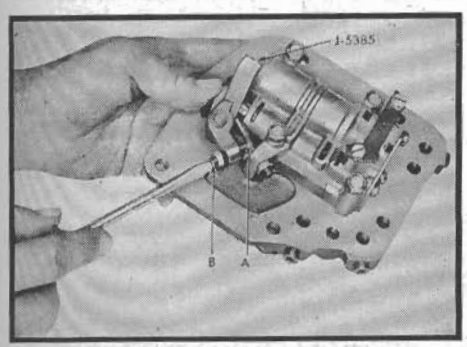

Fig. 49 Setting (2) of throttle valve inner lever adjustment. 1953-59

the check ball end of the valve is flush to .015" below the surface of the valve body.

Assemble

Replace the parts in the reverse order of their removal. Be sure to install the vacuum modulator valve clip, and the service check valve.

LOW & DRIVE VALVE BODY, 1953-59

Fig. 47—Should this assembly fail to function properly and it is necessary to disassemble it to locate the trouble, *do not disturb or tamper with the throttle valve adjustment, which has two settings.* The adjustment is pre-set at the factory to 62 psi and should not be disturbed unless new parts that would affect the adjustment are needed. It may be that foreign matter is responsible for the trouble and that a thorough cleaning would restore it to normal operation.

Disassembly, Fig. 47

1. Remove valve body attaching bolts.
2. Hold valve body in one hand and, with a soft faced hammer, tap on inner side of side cover until it is free of locating pins. *Exert pressure on detent valve when separating valve body from cover to prevent loss or damage to parts from falling. A clip can easily be made to retain the detent valve in its bore during disassembly and assembly.*
3. Remove detent valve, spring, spring seat and throttle valve spring regulator.
4. Remove throttle valve and spring.
5. Remove low and drive regulator valve cap retainer. Then remove cap, sleeve and valve as a unit, inner and outer springs and valve.
6. Remove clutch exhaust cover plate.
7. Remove low and drive body end plate. *Exert pressure on end plate while removing attaching screws to prevent loss of parts.*
8. Remove clutch exhaust secondary control valve, spring and stop.
9. Remove clutch exhaust primary control valve, spring and stop.
10. Remove throttle valve control outer lever, shield, and inner lever and seal.

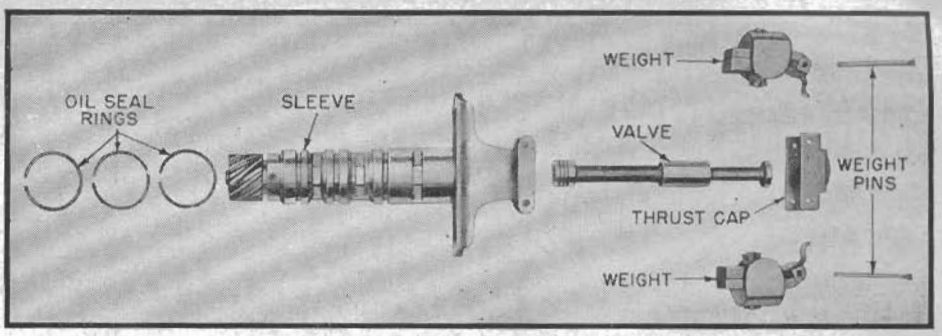

Fig. 50 Layout of governor assembly. 1953-59

Inspection

1. Wash all parts, air dry and blow out all oil passages.
2. Inspect detent valve, spring seat, throttle valve spring regulator and throttle valve for nicks, burrs, scoring or galling.
3. Check detent and throttle valves for free operation in their respective bores.
4. Check throttle valve spring regulator for free operation in opening of detent valve.
5. Inspect detent valve spring and throttle valve spring for distortion.
6. Inspect low and drive regulator valve sleeve and valve for nicks, burrs, scoring or galling.
7. Check low and drive regulator valve for free operation in valve sleeve.
8. Check low and drive regulator valve sleeve and valve for free operation in their respective bores.
9. Inspect low and drive valve inner and outer springs for distortion.
10. Inspect clutch exhaust primary and secondary control valves for nicks, burrs, scoring or galling.
11. Check clutch exhaust primary and secondary control valves for free operation in their respective bores.
12. Inspect clutch primary and secondary control valve springs for distortion.
13. Inspect throttle valve inner lever shaft for scoring or galling and the lever for being tight on the shaft.
14. Check throttle valve inner lever shaft for free operation in its bore in the side cover.
15. Inspect detent valve stop in side cover for distortion or damage. Replace with new stop if necessary.
16. Inspect locating pins in valve body and side cover for distortion or damage. Replace with new pins if necessary.
17. Inspect mating surfaces of valve body and side cover. Be sure they are free from nicks or burrs.

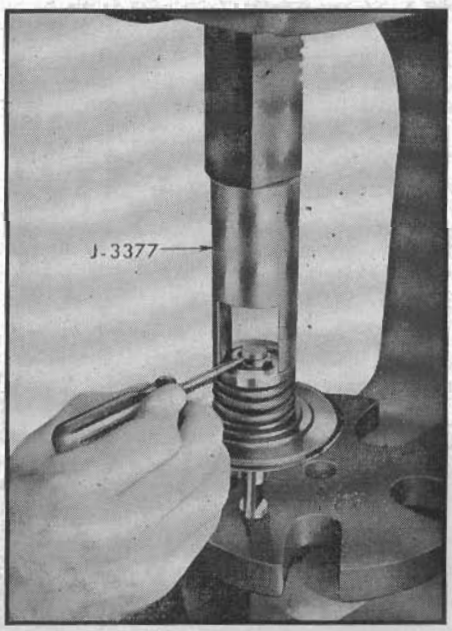

Fig. 51 Removing reverse servo piston keeper. 1950-52

Assembly

1. Install low and drive valve in valve body bore. *The valve must be guided into its bore to prevent damage to the bore. This can be accomplished with a piece of brake tubing. Insert it into the valve shank bore, in the rear of the valve body, engaging the tit on the end of the shank in the opening of the tubing. Then slowly move the valve into its proper position.*
2. Install low and drive regulator inner and outer springs in valve body bore.
3. Assemble low and drive regulator valve and cap to the valve sleeve. Then install as an assembly in the valve body. Be sure inner spring is properly seated on sleeve.
4. Compress low and drive regulator

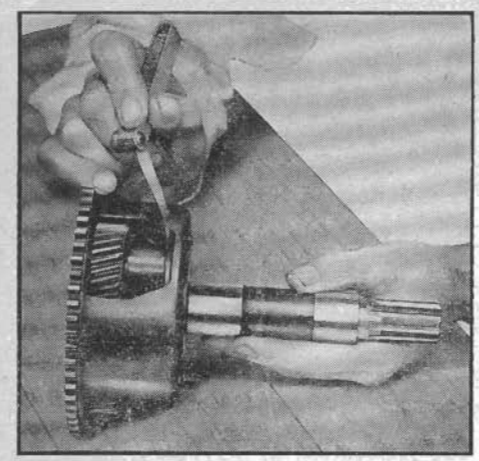

Fig. 55A Checking planet gear end clearance. 1950-58

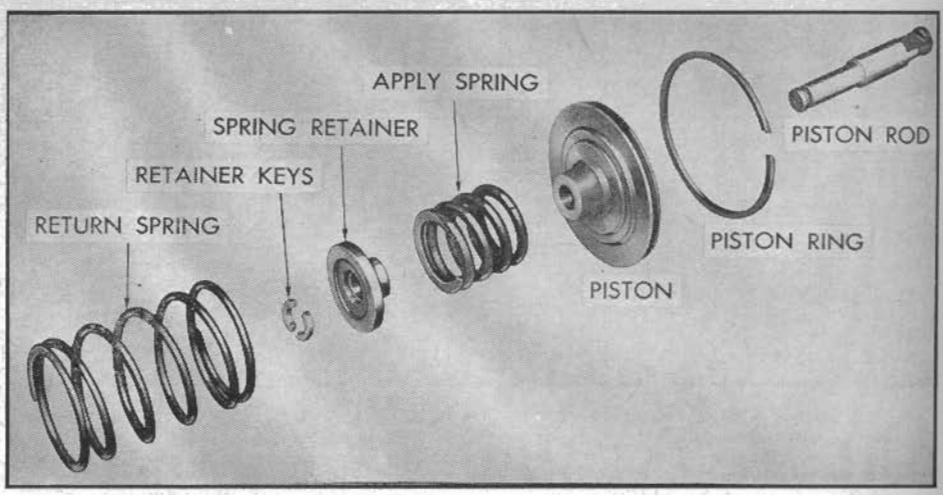

Fig. 52 Layout of reverse servo piston. 1950-52

valve assembly into valve body and install retainer with snap ring pliers. Be sure retainer is properly seated in its groove in valve body.

5. Install clutch exhaust primary control valve. Then install the spring and stop in clutch exhaust primary control valve. *Do not confuse the primary control valve stop and spring with the secondary control valve stop and spring. The primary stop is longer and the primary spring is shorter.*
6. Assemble clutch exhaust secondary control valve spring and stop to piston. Then install this assembly in the valve body.
7. Install throttle valve spring and valve in valve body.
8. Place low and drive body end plate in position and install attaching screws and lockwashers, tightening screws to 1½-2½ lbs. ft. torque. *Exert pressure on end plate while installing to hold parts in position.*
9. Install clutch exhaust cover plate and tighten attaching screws to 2½-3½ lbs. ft. torque.
10. Install throttle valve spring regulator, being sure it is seated on the throttle valve spring.
11. Install detent valve spring seat in the valve body, threading the pin of the throttle valve spring regulator through the opening in the detent valve spring seat.
12. Install detent valve spring and valve, threading the pin of the throttle valve spring regulator through the opening in the detent valve.
13. Place the side cover in a vise face up. Align the locating pin hole in valve body and locating pin in side cover. Exert pressure on the valve body to keep the locating pin in the hole and at the same time compress the detent valve into the valve body. Rotate the valve counter-clockwise until the locating pin in the valve body enters the locating hole in the side cover. *Be sure that the face of the detent valve is resting against the detent valve stop pin in side cover.*
14. Install low and drive body attaching bolts and lockwashers, tightening bolts to 3½-5 lbs. ft. torque.
15. Install throttle valve inner lever to side cover. Install new seal over shaft and into counterbore in cover. Then install shield.
16. Install throttle valve control outer lever on inner lever shaft.
17. From the underside, install outer lever attaching bolt, washer and nut and tighten securely.

THROTTLE VALVE INNER LEVER, ADJUST, 1953-59

If new throttle valve parts have been installed, the throttle valve should be readjusted. It has two settings and the procedure is as follows:

1. Rotate the throttle valve inner lever until it just contacts the face of the detent valve. Hold the lever in this position and turn adjusting screw "A", Fig. 48, until it just contacts the flat surface of the step in the lever. Back off one complete turn and lock in this position by tightening the lock nut securely.
2. Place throttle valve inner lever positioning gauge, J-5385, Fig. 49, between the face of the detent valve and throttle valve inner lever. Hold in this position and turn adjusting screw "B" until it contacts threaded body of adjusting screw "A". Tighten lock nut securely.

GOVERNOR, 1953-59

All the components of the governor assembly, Fig. 50, with the exception of the oil seal rings on the governor sleeve, are of a select fit and each assembly is calibrated. Therefore, the only parts

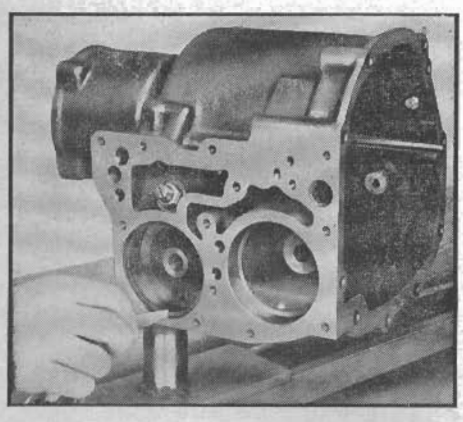

Fig. 53 Checking servo piston ring gap. 1950-59

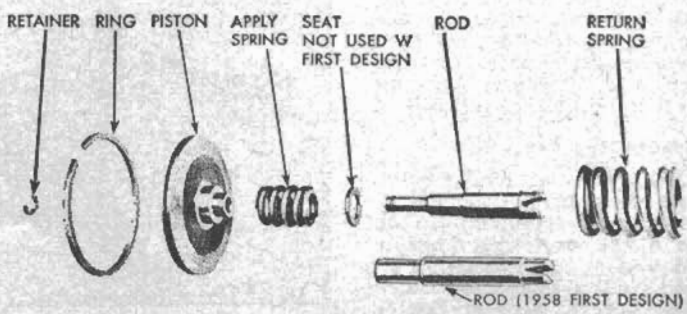

Fig. 54 Low servo piston. Apply spring design is used on all 1953-57 and late production 1958-59

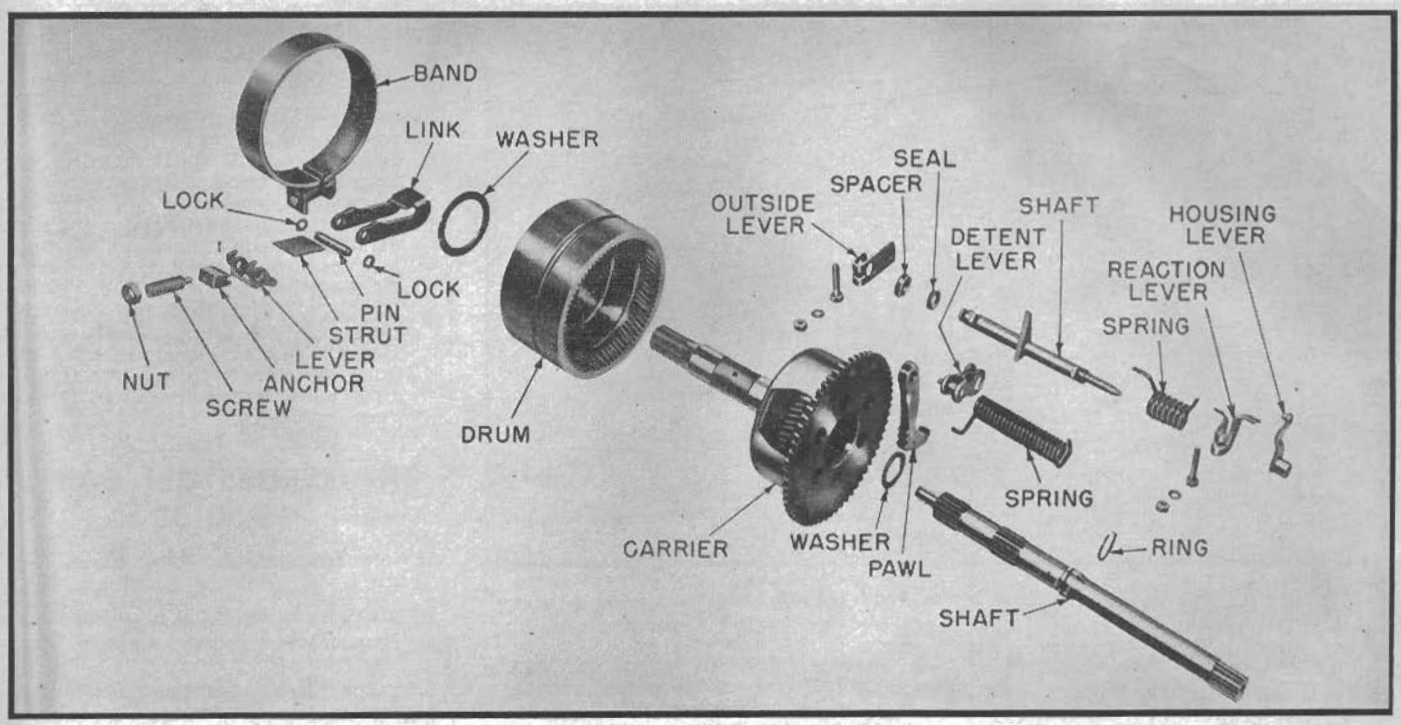

Fig. 55 Exploded view of planet unit and related parts. 1950-59

serviced for replacement are the governor assembly and oil seal rings.

Disassembly

1. Cut off one end of each of the governor weight pins and remove pins, thrust cap, weights, and valve from sleeve. *The diameter of the pins should be measured with a micrometer upon their removal as the same gauge piano wire should be used when reassembling, otherwise the calibration of the assembly will be upset.*
2. Remove oil seal rings from sleeve.

Inspection

1. Wash all parts, air dry and blow out all passages.
2. Inspect sleeve for nicks, burrs, scoring or galling.
3. Check sleeve for free operation in transmission case bore.
4. Inspect valve for nicks, burrs, scoring or galling.
5. Check valve for free operation in bore of sleeve.
6. Inspect driven gear for nicks, burrs or damage.
7. Check driven gear for looseness on sleeve.
8. Inspect weight springs for distortion or damage. Do not disassemble weights.

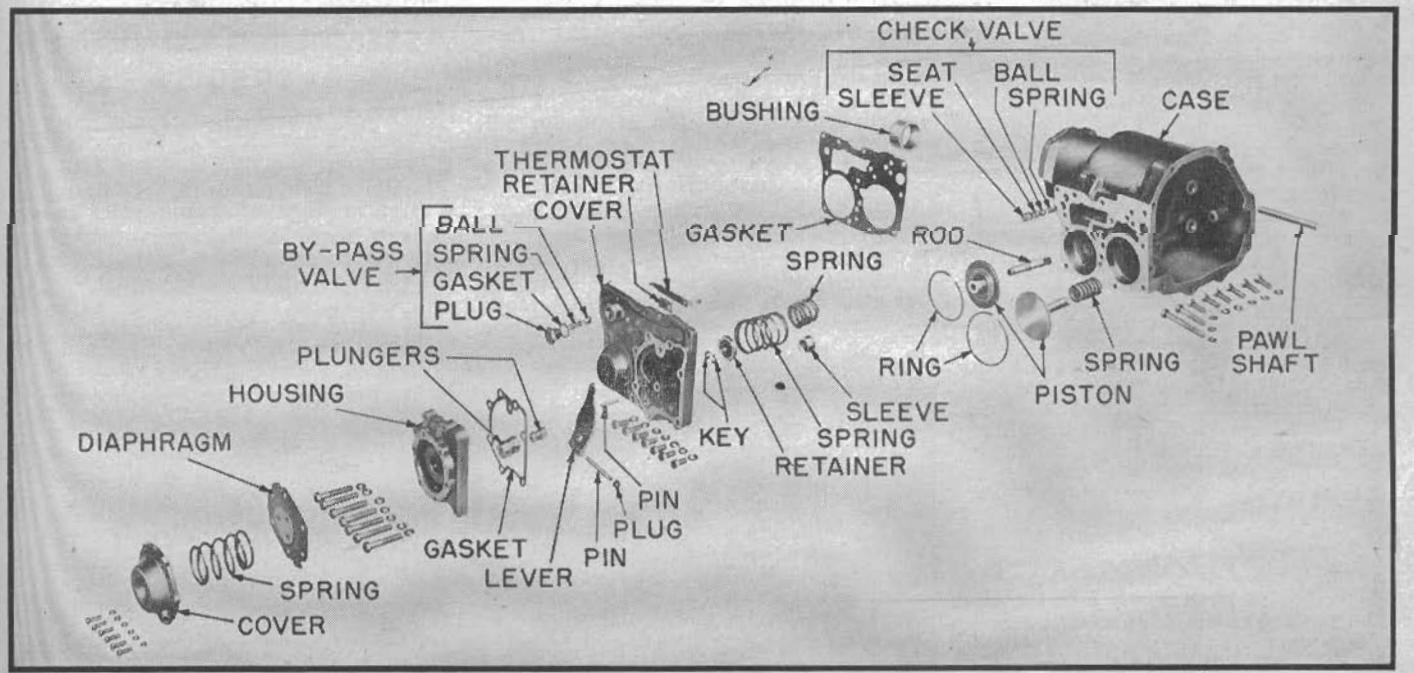

Fig. 56 Transmission case section. 1953-59

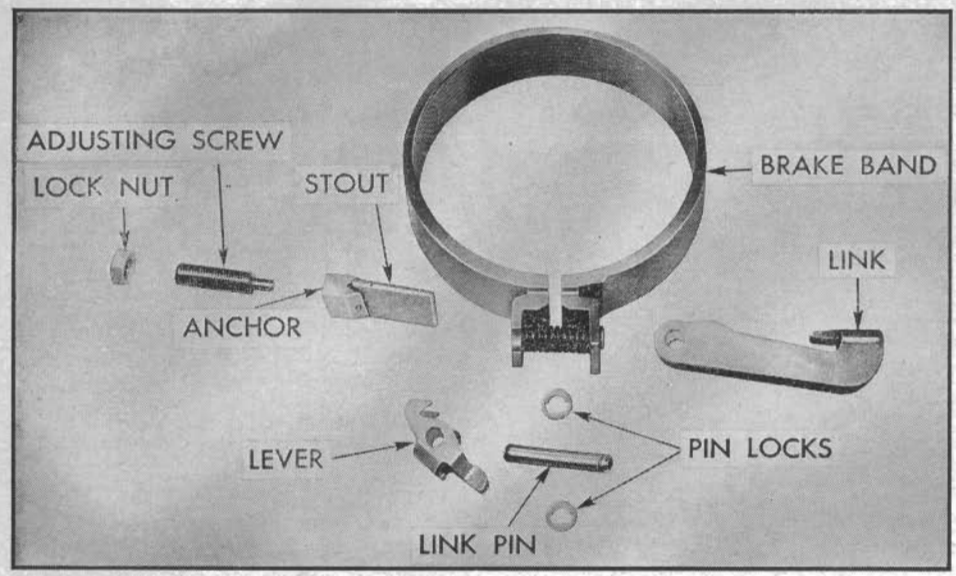

Fig. 57 Reverse brake band. 1950-59

9. Check weights for free operation in their retainers.
10. Inspect sleeve oil rings for damage. Then insert rings in governor bore in transmission case and check to see that the hooked ends have clearance.

Assembly

1. Install oil seal rings on sleeve, being sure ends of rings are hooked together and that rings are free in grooves.
2. Install valve in sleeve bore.
3. Align pin holes in thrust cap, weights and sleeve and install new pins. Crimp both ends of both pins to hold them in position.
4. Check weights for free operation on pins.

REVERSE & LOW SERVO PISTONS, 1950-52

1. Place reverse servo piston in press and, with tool J-3377, Fig. 51, compress piston spring and remove spring retainer key and retainer. Remove piston from piston shaft. Fig. 52 shows a layout of reverse servo piston parts.
2. Install piston on shaft and install servo piston apply spring.
3. Install spring retainer over spring and shaft and compress spring with tool J-3377. Install retainer key.
4. Remove piston ring from reverse and low servo pistons and install in piston bore. Check ring gap which should be .005-.010", Fig. 53.
5. Install rings to reverse and low servo pistons.

1953-59

Service on the reverse servo piston remains the same as previous models. However, a change has been made in the low servo piston and the service procedure is as follows (see Fig. 54):

1. Place piston in press with the notched end of the piston rod on a wood block. With tool J-3377, compress piston spring and remove rod retainer.
2. Remove piston, spring and washer from piston rod.
3. Remove piston ring and install in low piston bore. Check ring gap which should be .005-.010", Fig. 53.
4. Assemble in the reverse order of disassembly, being sure rod retainer is properly seated in piston rod groove.

PLANET UNIT & INPUT SHAFT, 1950-59

A special snap ring is used on 1953 and later input shafts to serve as a stop to insure that the shaft will not float forward. Upon inspection, if this snap ring shows signs of damage or excessive wear, install a new one. The balance of the service procedure is the same for all models (see Fig. 55).

Inspection

1. Wash in cleaning solvent, blow out all oil passages and air dry.
2. Inspect reverse brake drum outside diameter for scoring or burning. Also check internal gear for tooth damage and drum hub bushing for scoring or damage.
3. Inspect planet pinions for nicks or other tooth damage.
4. Check end clearance of planet gears, which should be .006-.030", Fig. 55A.
5. Check reverse sun gear for tooth damage, and sun gear rear thrust washer for damage.
6. Inspect output shaft bearing surface for nicks or scoring and inspect input pilot bushing.
7. Inspect input shaft splines for nicks or damage and check fit in clutch hub and reverse sun gear. Inspect fit of spline in turbine hub.
8. Check oil seal ring for clearance; ring must be free in shaft groove. Remove ring and insert in valve body bore and check to see that hooked ring ends have clearance. Replace ring on shaft.

TRANSMISSION CASE, 1950-59

Inspection, Fig. 56

1. Wash case thoroughly in solvent, air dry and blow out all oil passages.
2. Inspect case for cracks which may contribute to leakage.
3. Inspect case rear bushing for damage or excessive wear.

BRAKE BANDS, 1950-59

Brake bands have bonded lining which, due to the transmission characteristics and band usage should require very little attention. However, whenever the transmission is disassembled, the bands should be cleaned in solvent, air dried and inspected, Figs. 57, 58, 59.

1. Check linings for evidence of scoring or burning.
2. Check bands and linings for cracks.
3. Check all band linkage for excessive wear.

ASSEMBLING CONVERTER, 1950-52

1. After thoroughly cleaning suction screen, install in oil sump, making sure sealing ring is in position.
2. Place two ¼-20x3½" guide pins in valve body attaching holes in converter housing.
3. Install new valve body gasket to turbine housing.
4. Install valve body over guide pins and install attaching bolts, tightening them to 10 lbs. ft. torque with

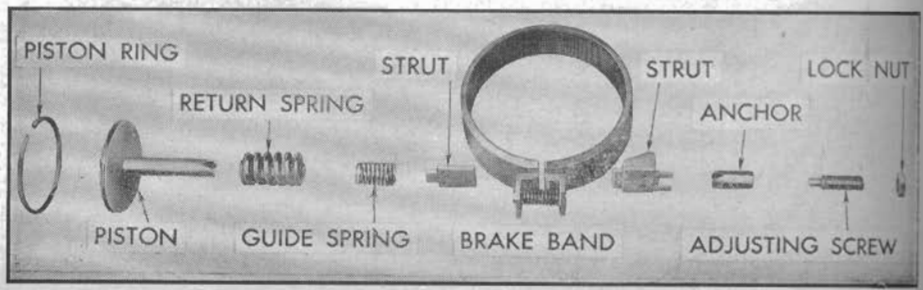

Fig. 58 Low brake band. 1950-52

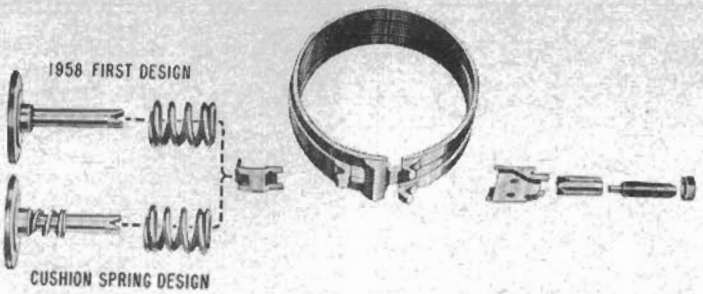

Fig. 59 Low brake band and related parts. 1953-57 and late production 1958-59 uses the cushion spring design

the exception of the bolt over the pressure regulator valve. This bolt should be torque tightened to 8 lbs. ft. Tighten bolts in a criss-cross manner and after bolts are installed, check to make sure manual valve and pressure regulator valve operate freely.

5. Align holes in stator support with holes in front oil pump body and install two ¼-20x3½" guide pins in front pump, Fig. 60. Install pump to turbine housing, using pump driver J-4263.

When installing pump, line up suction and delivery holes on left side of pump.

6. Install five self-locking bolts through valve body and into pump. Torque tighten two bolts over regulator valve to 8 lbs. ft. and remaining bolts to 10 lbs. ft. *After tightening two bolts over pressure regulator valve bore, check valve to make sure it operates freely.*
7. Check to be sure front pump operates freely.

1953-59

1. After cleaning suction screen, install it in the oil sump, making sure sealing ring is in position.
2. Install two guide pins (¼-20x3½") in valve body attaching holes in converter housing.
3. Install new valve body gasket to converter housing.
4. Install valve body over guide pins, install attaching bolts and tighten them to 7½-10 lbs. ft. torque. *Lower left bolt over accumulator bore is self-locking. Therefore, be sure this bolt is installed in this position. Tighten all bolts in a criss-cross manner. Check to make sure manual and pressure regulator valves operate freely.*
5. Align holes in stator support with holes in front oil pump body and install two of the afore-mentioned guide pins in the front pump. Install pump to converter housing, using pump driver J-4263-5. *When installing pump, line up suction and delivery holes on left side of pump.*
6. Install five self-locking bolts through valve body and into pump. Tighten bolts to 7½-10 lbs. ft. torque. *After tightening across pressure regulator valve bore, check valve to make sure it operates freely.*
7. Check and make sure front pump operates freely.
8. Install two pilot studs (⅝-18x3") in converter housing as guides for low and drive valve body and install new gasket.
9. Install low and drive valve body over guide pins. Install attaching bolts and tighten to 12½-15 lbs. ft. torque.

Fig. 60 Guide pins in front pump. 1950-59

ASSEMBLING GEAR BOX, 1950-52

1. Install two ⅝-18x3" guide pins in rear pump attaching holes. Install new gasket and pump, aligning suction and delivery holes. Install bolts and tighten 12½-15 lbs. ft. torque.
2. Install reverse servo piston, using ring compressor J-3365, Fig. 61. Notch on shaft should be positioned toward front of transmission case.
3. Install reverse brake band and strut *with thin end of band away from* piston. Thread adjusting screw in until it indexes with hole in anchor.
4. Install bronze thrust washer on hub of reverse drum and install drum into case and brake band.
5. Rotate rear pump drive gear lug to top of pump, then install planet carrier in drum, aligning slot on carrier shaft with lug of pump drive gear. Check amount end of shaft protrudes out of bearing, Fig. 62. This should be a minimum of ⅞" and indicates proper seating of pump drive gear lug in carrier shaft slot.
6. While holding planet carrier in, install universal joint front yoke, universal joint washer, lockwasher and bolt and tighten securely. This pulls planet carrier into its seat.
7. Tighten reverse servo adjusting screw, using tool J-4277, as tight as

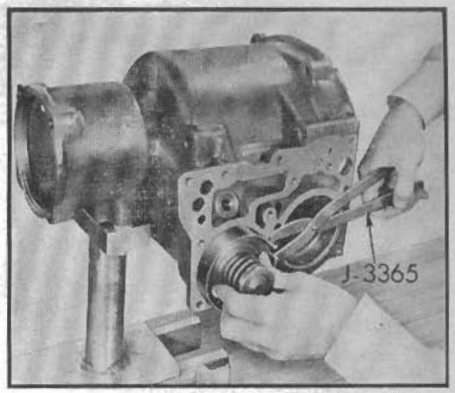

Fig. 61 Installing reverse servo piston. 1950-59

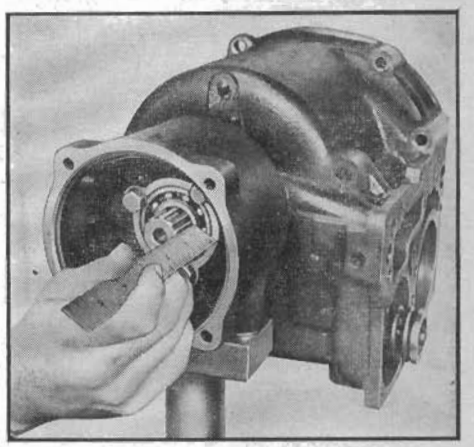

Fig. 62 Checking seating of output shaft. 1950-54

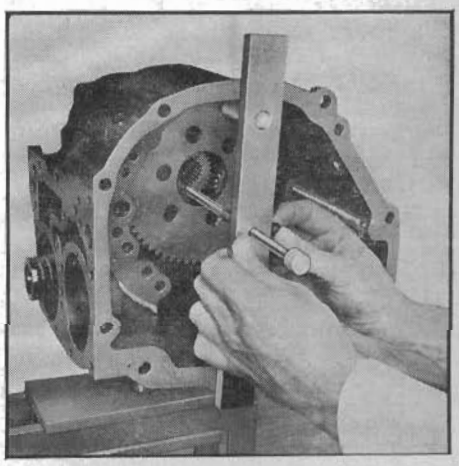

Fig. 63 Measuring sun gear depth. 1950-59

it will go, then back off 2¾ turns and lock the lock nut.

8. To determine thickness of low sun gear-to-reverse sun gear thrust washer, proceed as follows: (A) Install bronze thrust washer and clutch on oil delivery sleeve. (B) To measure distance from case flange to reverse sun gear, loosen set screw of tool J-4260, Fig. 63, and place bar of tool against case flange with stem of

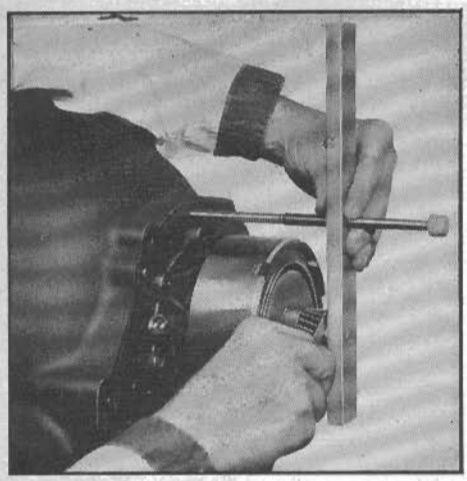

Fig. 64 Checking for proper low to reverse sun gear clearance. 1950-59

tool against face of reverse sun gear. While holding tool in this position, tighten thumb screw. (C) There are three hardened and ground steel washers furnished with this tool which are .070", .095" and .120". These washers are the same thickness as bronze thrust washers available for service. (D) Select the .095" steel washer furnished with the tool and place it over the tool pilot. Insert pilot into bore of low sun gear and, while holding tool securely, check clearance between end of low sun gear and steel washer with feeler gauge, Fig. 64; clearance should be .007-.035". (E) If clearance is not within above limits, remove tool and recheck, using either the .070" or .120" steel washer furnished with the tool until the proper clearance is obtained. (F) When proper clearance is obtained, the thickness of the steel washer used is the thickness of the bronze washer required for transmission assembly.

9. After above checks are completed, remove clutch and thrust washer from oil delivery sleeve.
10. Install parking lock lever and apply spring in case. Install small lip seal over end of parking lock lever shaft and into counterbore of case with lip of seal toward inside of case.
11. Install flat washer and parking lock lever on end of lever shaft, pushing lever onto shaft to obtain .000" to .010" clearance between lever and washer. Then tighten clamp screw.
12. Install parking lock pawl over pawl support rod and install parking pawl spring.
13. Wind up pawl spring, using tool J-3383, so that spring catches on inside of case.
14. Install input shaft to clutch unit. Install thrust washer previously selected on reverse sun gear splines of input shaft, aligning missing spline opening with oil hole in reverse sun gear splines of input shaft, Fig. 65.
15. Install unit assembly into case, indexing input shaft pilot with pilot in output shaft and low sun gear with short pinions in planet carrier, Fig. 66.
16. Install low servo piston release spring on servo piston shaft and install piston and spring in case, using ring compressor J-3365.
17. Install low brake band over clutch drum with thin end of band toward piston.
18. Place strut guide spring over piston and anchor strut in piston slot with other end of anchor strut engaging brake band.
19. Place brake band strut assembly in brake band groove, then engage slotted end of anchor over strut and locate over adjusting screw.
20. Install speedometer driven gear.

1953-59

1. Install two guide pins ($\frac{5}{16}$-18x3") in rear pump attaching holes. Install new gasket and pump, aligning suction and delivery holes. Install bolts and tighten to 12½-15 lbs. ft. torque.
2. Check lubrication pressure relief valve, making sure that its openings are free of obstructions and that the valve disc and spring operate freely.
3. Install and tighten lubrication pressure relief valve to rear of transmission case.
4. Install reverse servo piston, using ring compressor J-3365. Notch on shaft should be toward front of transmission case, Fig. 61.
5. Install reverse brake band and strut assembly with thin end of band away from piston, and thread adjusting screw in until it indexes with hole in anchor.
6. Install bronze thrust washer on hub of reverse drum and install drum into case and brake band.
7. Rotate rear pump drive gear lug to top of pump. Then install planet carrier assembly in drum, aligning slot on carrier shaft with lug of pump drive gear. On 1953-54, end of shaft should protrude out of bearing ⅞", Fig. 62, and indicates proper seating of pump gear drive lug in carrier shaft slot.
8. Install shaft of tool J-938 into threaded end of planet carrier output shaft and bolt yoke of tool to rear face of transmission case. Turn tool handle counter-clockwise until the output shaft is seated in the rear bearing. Disconnect tool from output shaft and case.
9. On Chevrolet units, install universal joint front yoke, washer, lockwasher and bolt and tighten to 25-30 lbs. ft. torque.
10. Adjust the reverse servo band as outlined at the beginning of this chapter.

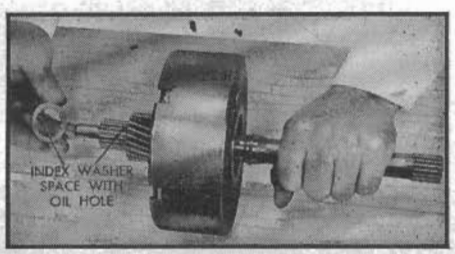

Fig. 65 Alignment of thrust washer oil slot with shaft oil hole. 1950-59

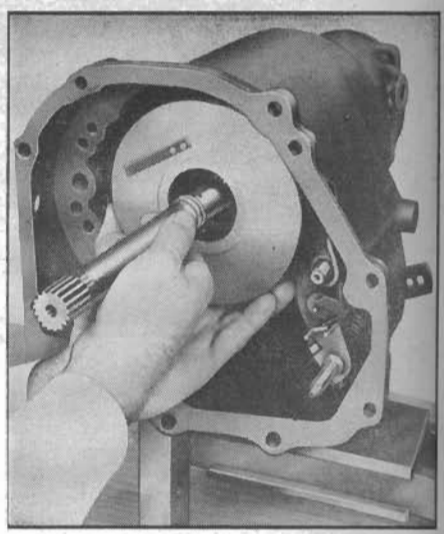

Fig. 66 Installing clutch and shaft into case. 1950-59

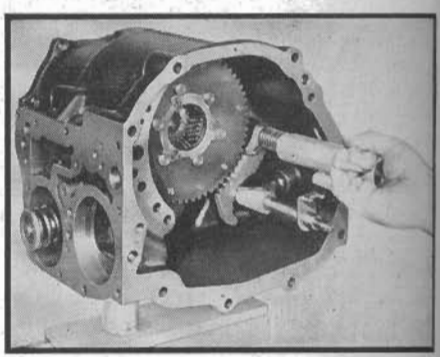

Fig. 67 Installing parking pawl spring. 1953-59

11. In determining the thickness of the low sun gear thrust washer, follow the procedure in Step 8 for 1950-52 models.
12. Install parking lock lever shaft in case. Install small lip seal over end of parking lock lever shaft and into counterbore of case with lip seal toward inside of case.
13. Install flat washer and parking lock lever on end of parking lock lever shaft, pushing lever onto shaft to establish zero to .010" clearance between lever and washer. Then tighten clamp screw to 8-12 lbs. ft. torque.
14. Install parking lock pawl over pawl support rod and install parking lock pawl spring.
15. Wind up pawl spring, using tool J-3383, so that spring catches on inside of case, Fig. 67.
16. Install input shaft to clutch unit. Install thrust washer previously selected (Step 8 in 1950-52 procedure) on sun gear splines on input shaft. *Be sure flat side of thrust washer is installed toward reverse sun gear.*
17. Install unit assembly into case, indexing input shaft pilot with pilot in output shaft and low sun gear with short pinions in planet carrier.
18. Install low servo piston release

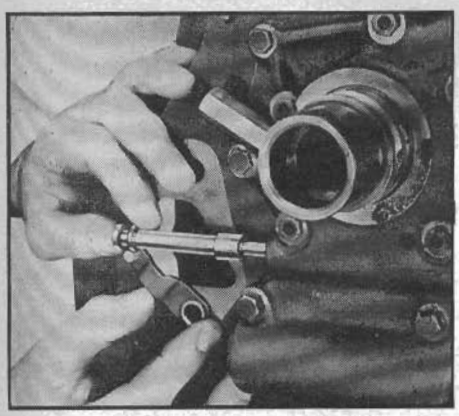

Fig. 68 Indexing manual valve with lever. 1950-52

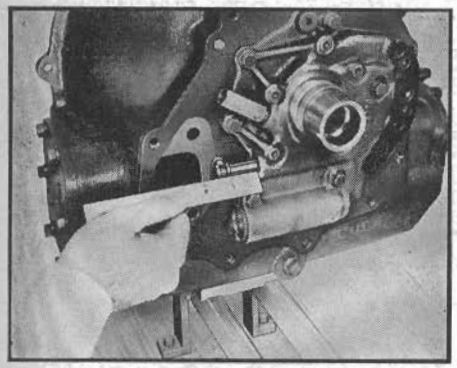

Fig. 69 Setting manual valve in reverse position. 1950-59

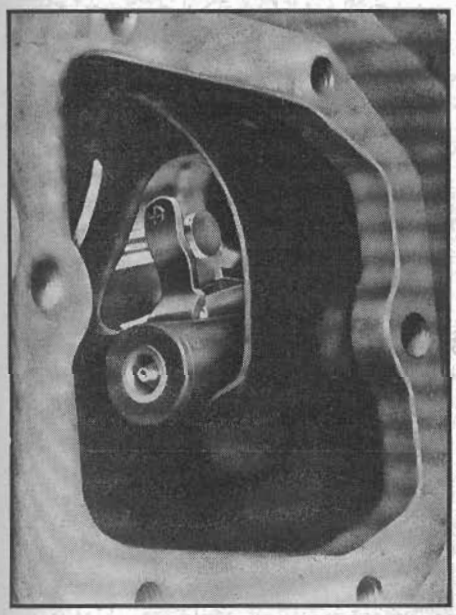

Fig. 70 Indexing manual valve inner lever and reaction lever. 1950-52

spring on servo piston rod and install piston and spring into case, using piston ring compressor J-3365.
19. Install low brake band over brake drum.
20. Place apply strut guide spring over piston shaft and apply strut in piston shaft slot with other end of apply strut engaging brake band.
21. Place brake band anchor strut assembly in brake band groove. Then engage slotted end of anchor over strut, locating other end of anchor over adjusting screw.
22. Install governor in case, allowing it to rotate in a counter-clockwise direction as the governor driven gear meshes with the drive gear of the output shaft.
23. Install two guide pins ($\frac{5}{16}$-18x3") as guides for governor cover and install new gasket.
24. Install governor cover and tighten attaching bolts to 6½-8½ lbs. ft. torque.
25. Install speedometer driven gear and tighten to 45-50 lbs. ft. torque.

ASSEMBLING TRANSMISSION TO TURBINE HOUSING, 1950-52

1. Install manual valve in valve body and manual valve inner lever in turbine housing. Index lever pin with pickup slot in valve, Fig. 68.
2. Set manual valve so end of valve protrudes 1½" from face of valve body, Fig. 69. This places value in reverse position.
3. Install new servo body to case gasket.
4. Raise transmission manual valve lever to top detent position, which is reverse. This aligns reaction lever so that it will index with manual valve inner lever.
5. Place clutch drum thrust washer over oil delivery sleeve.
6. Install two $\frac{3}{8}$-16x3¾" guide pins in turbine housing, then push case and turbine housing together, checking to see that reaction lever indexes properly with manual valve inner lever. Then install case-to-housing bolts and tighten securely. *Remove left hand sump cover to observe mating of manual valve inner lever and reaction lever, Fig. 70.*
7. Install lubrication check valve parts into case in the following order: Spring, ball, ball seat and lubrication sleeve. *Install ball seat with radius toward ball.*
8. Install two $\frac{5}{16}$-18x3" guide pins as guides for servo cover and install new servo cover gasket.
9. Install pressure regulator valve and inner and outer valve springs. Install reverse servo return spring.
10. Install servo cover, applying pressure to cover to compress springs and secure with cover bolts. Tighten securely. *Be sure pressure regulator springs and reverse servo spring seat properly in seat pockets of servo cover.*
11. Install new modulator cover gasket and cover, and tighten bolts securely.
12. Adjust low servo band as outlined at the beginning of this chapter.
13. Assemble primary pump, aligning front pump drive gear tangs with drive slots in pump hub, Fig. 71. Face of pump must be flush with face of bell housing.
14. Install converter retaining washer and snap ring.
15. Install stator to stator support, with small (primary) stator to rear.
16. Install two $\frac{5}{16}$-24x1½" guide pins in primary pump bolts holes, align dowel pin hole of turbine cover and dowel pin in primary pump and install turbine cover. Remove guide pins and secure with 12 capscrews, Fig. 72. *Install one bolt on each side of dowel pin, skip one hole and then install two bolts alternately around assembly.*
17. Install right hand sump cover and new gasket. Secure with capscrews and tighten securely.
18. On Chevrolet units, install universal joint and "O" ring, ball and collar and add or remove shims to allow a snug fit. If ball cannot be moved by hand, add a shim until a smooth firm adjustment is obtained. If ball moves freely by hand, remove shims until proper adjustment is obtained. After number of shims for proper adjustment have been determined, remove universal joint ball and collar and ball seat. Note number of shims used for later assembly and replace universal ball and collar on end of propeller shaft.

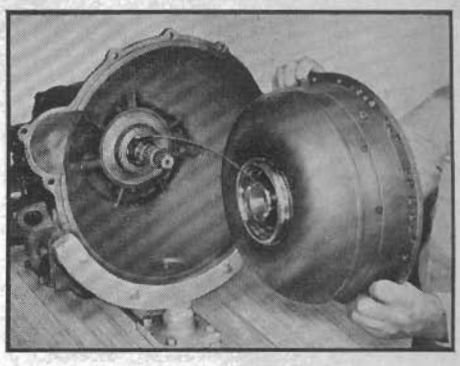

Fig. 71 Aligning primary pump with front pump drive lugs. 1950-52

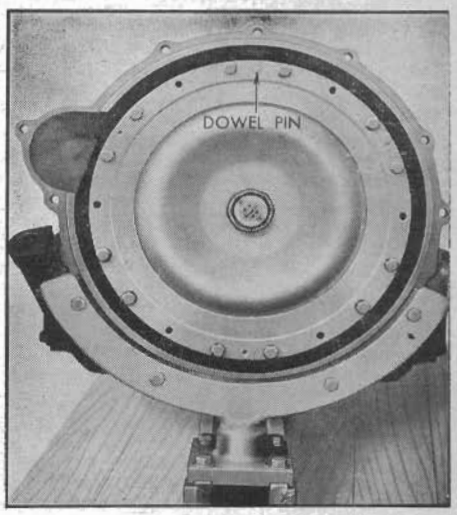

Fig. 72 Positioning of turbine capscrews. 1950-52

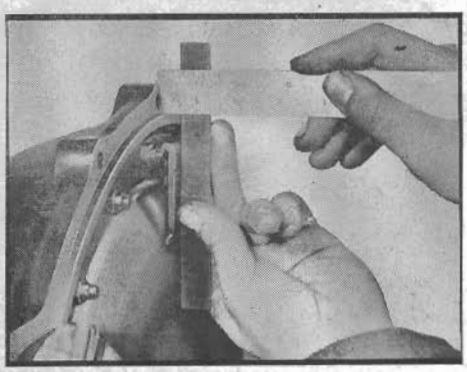

Fig. 72 Checking engagement of converter pump hub with front pump drive gear. 1953-59

ASSEMBLING TRANSMISSION TO CONVERTER HOUSING, 1953-59

1. Install manual valve in valve body and manual valve inner lever in converter housing. Index lever pin with pick up slot in valve.
2. Set manual valve so it protrudes 1½" from face of valve body. This places valve in reverse position.
3. Install new valve body gasket.
4. Raise transmission manual valve lever to top detent position, which is reverse. This aligns reaction lever so that it will index with manual valve inner lever.
5. Place clutch drum thrust washer over oil delivery sleeve.
6. Install two guide pins (⅜-16x3¾") in converter housing. Then push case and converter housing together, checking to see that reaction lever indexes properly with manual valve inner lever. Then install attaching bolts and tighten to 25-30 lbs. ft.
7. From front of converter housing, install special self-locking bolt and tighten to 25-30 lbs. ft. torque.
8. Install two guide pins (5/16-18x3") as guides for servo cover and install new gasket.
9. Install pressure regulator valve and inner and outer valve springs. Install reverse servo return spring.
10. Install servo cover, applying pressure to cover to compress springs and secure with bolts, tightening them to 12½-15 lbs. ft. torque. *Be sure springs seat properly in pockets of servo cover.*
11. Install new modulator cover gasket and cover and tighten attaching bolts to 12½-15 lbs. ft. torque.
12. Adjust low band as outlined at the beginning of this chapter.
13. Install converter in its housing, aligning front pump drive gear lugs with drive slots in converter pump hub. *After converter is installed, check to insure engagement of converter pump hub drive slots in lugs of front pump drive gear. This dimension should be measured as shown in Fig. 73. It should be* 9/16" *or less.*
14. Install converter holding tool J-5384, Fig. 74, to converter housing.
15. After transmission is assembled, remove the extreme lower rear bolt from the low and drive valve body.
16. Rotate the throttle valve control outer lever, Fig. 75. If the large throttle position (to a definite stop).

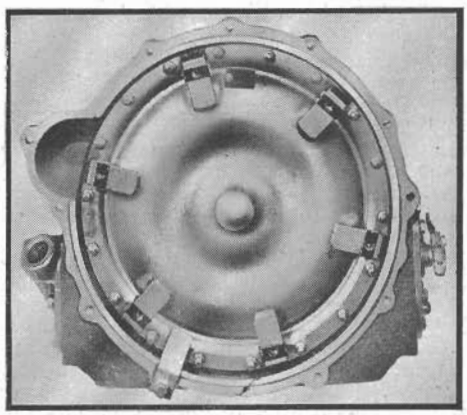

Fig. 74 Converter assembly holding tool. 1953-59

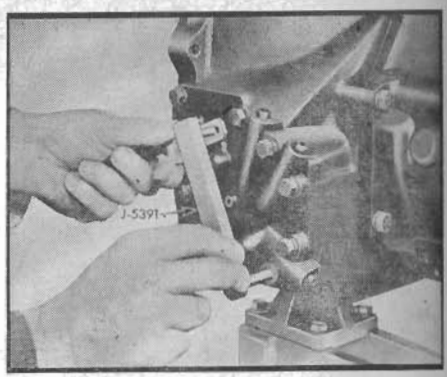

Fig. 75 Adjusting throttle valve linkage and outer lever. 1953-59

Hold in this position and, using positioning gauge J-5391, measure the distance between the open hole in the drive valve cover and the hole in the outer lever, Fig. 75. If the large pin of this gauge will go into the open cover hole and the small pin in the hole of the lever the adjustment is correct. If not, loosen the lever-to-clamp attaching bolt and adjust accordingly. *If an adjustment is necessary, be sure that it is made with the lever in the closed throttle position.*

17. Reinstall the valve body bolt previously removed and tighten it to 12½-15 lbs. ft. torque.
18. On 1953-54 units, install "O" ring seal on universal joint ball seat. Install universal joint ball seat and, using four new universal ball shims, install ball and collar and tighten bolts to 8-12 lbs. ft. torque. If ball cannot be moved by hand, add a shim until a smooth firm adjustment is made. If ball moves freely by hand, remove shims to obtain proper adjustment. *Ball joint collar cork oil seal should not be installed when making this adjustment.* After adjustment, remove ball, collar and seat. Note number of shims used for later assembly and replace universal ball, collar oil seal and collar on end of propeller shaft.