TYPE OF EQUIPMENT

BRAKES

POWER BRAKES (BOOSTERS)

BRAKE SERVICING

CAR APPLICATION

POWER BRAKES (BOOSTERS)

CAR APPLICATION

BRAKES

HYDRAULIC BRAKE TROUBLE SHOOTING

Brake Pedal goes down to the floor:

1. Master cylinder empty. Refill and check for leaks in the brake system. If cylinder is completely dry it will be necessary to bleed the entire system, to remove air. After refilling and bleeding, apply the brakes and if pedal still goes down check for bad fluid leak. Examine bottom of each brake drum for fluid drip which would indicate a leaking wheel cylinder. Also look under car for leakage on floor from line leak, or from master cylinder (at boot), indicating worn master cylinder parts. If pedal action normal make further check for leakage by depressing pedal hard and holding it down for 2 or 3 minutes. After a minute or so it may start to go down slowly indicating a leak. NOTE—Pedal going down slowly can also be caused by a worn master cylinder cup allowing leakage past the piston. This would not cause an external leak as fluid would return to the master cylinder reservoir, through the intake port.
2. Excessive lining to drum clearance.
3. Air in the brake system.

Too Much Pedal Travel Before Brakes Are Applied (with Brakes Adjusted and Bled):—

1. Defective master cylinder check valve. Master cylinder check valve is designed to maintain 8 to 10 lbs. pressure on the brake system when brakes are released. If pressure is not maintained considerable pedal movement is used to develop line pressure before brakes operate.
2. Too much clearance between pedal rod and master cylinder.

One Wheel Locks When Brakes Are Applied:—

1. Grease, oil, or brake fluid on lining. NOTE—If lining is saturated with oil or fluid it should be replaced.
2. Improperly adjusted shoes.
3. Brake shoes installed incorrectly.
4. Brake shoe springs installed incorrectly.

Brakes Drag or do Not Release Properly:—

1. Improperly adjusted brake shoes.
2. Broken shoe return spring.
3. Wheel cylinder piston frozen.
4. Mineral oil in the brake system. This oil will cause rubber cups to swell up causing sluggish action. NOTE—When mineral oil is found in brake system, the wheel cylinders and master cylinder should be reconditioned, and the lines thoroughly flushed out with alcohol, or new fluid.
5. Master cylinder by-pass port plugged, or pedal to master cylinder rod not adjusted correctly, not allowing the master cylinder piston to return far enough to uncover the by-pass port. See Pedal Adjustment instructions for the particular car being repaired.

Brakes Go On By Themselves (locking all wheels) while driving:—

1. Condition shown in item 5 under "Brakes drag or do not release properly" apply to this trouble.

Car Pulls To One Side:—

1. Improper brake shoe adjustment.
2. Grease or oil on lining of one brake.
3. Plugged brake hose making one brake inoperative.

Brake Pedal Springy:—

1—Air in system. Bleed lines.
2. Brake shoe anchors incorrectly adjusted.
3. Thin brake drums, caused by machining too large oversize.

Brake Pedal 'Hard':—

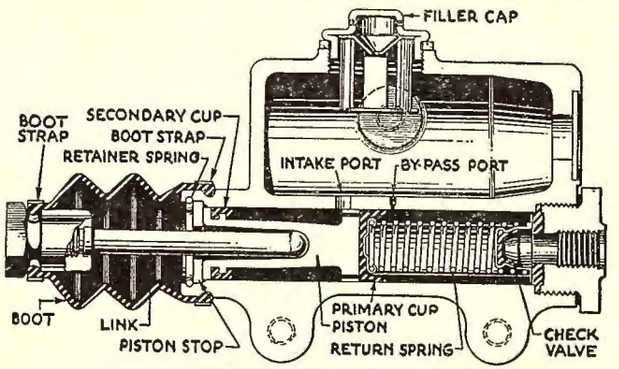
1—Improper adjustment.
2—Incorrect lining type.
3—Oily linings—replace or install new shoes.
4—Partial contact—high spots. Linings should be ground concentrically.

SERVICING NOTE:—See following article for directions for bleeding lines and servicing of master and wheel cylinders. See separate brake articles for brake shoe and brake pedal adjustment directions.

HYDRAULIC BRAKE SERVICING

BLEEDING BRAKE LINES:—Remove master cylinder supply tank filler cap, fill tank with genuine brake fluid, keep tank filled with fluid during entire bleeding operation (air will be drawn into brake lines if tank allowed to become dry). Remove screw in bleeder valve on wheel backing plate, install special fitting and hose connection. Submerge free end of hose in brake fluid in clean glass container. Unscrew bleeder valve ½-¾ turn, press brake pedal down by hand approximately half of travel, allow pedal to return slowly. Repeat operation until fluid flow from tube is completely free from any air bubbles, then close bleeder valve, remove hose connection and replace dustscrew. Bleed lines at each wheel in same manner.

CAUTION—Use extreme care not to allow supply tank to become dry during bleeding operation. If automatic refiller unit not used, supply tank should be filled after every 6-10 strokes of the brake pedal (automatic refiller will maintain level in supply tank without attention during bleeding operation).



BRAKE MASTER CYLINDER

Two Cylinder (Chrysler Front Wheel Brake Type). When bleeding these brakes, first attach bleeder line to **upper** cylinder bleeder connection, bleed this cylinder and the brake line as directed above. Then connect bleeder line to **lower** cylinder bleeder connection and bleed this cylinder and the line between the cylinders as directed above. Both cylinders must be bled in this manner to remove all air from the brake system.

Chrysler Disc Type. Bleed all four lower cylinders first, and then four upper cylinders. See Disc Type Brake for complete information.

Brakes with Power Units (Hydrovac, Midland, Vacdraulic, Vacu-Ease). See separate articles on these units for information about bleeding.

SERVICING:—Wheel Cylinders—To disassemble wheel cylinders, remove brake shoes, take out wheel cylinder mounting screws, withdraw cylinder through backing plate. Disconnect brake line, remove piston boots, withdraw pistons. Examine cylinder bore. If corroded or scored, cylinders can be lapped or honed and oversize pistons fitted. Piston clearance (metal piston) in cylinder should be .001-.003" and must never exceed .005". In assembling wheel cylinder, wash all parts in alcohol, dip rubber piston cups in Brake Fluid, and insert ahead of piston with lip in. Central return spring in stepped cylinders is tapered and should be installed with small end toward piston in smaller bore. Reconditioned cylinders should be tested for leakage in fixture under alcohol with 8 lbs. and 80 lbs. air pressure. Wheel must be bled when wheel cylinder reinstalled.

Piston Cup Expanders—Can be used with special return spring in wheel cylinders to correct leakage caused by piston cup contraction in extreme cold temperatures. Expander should have .005" clearance in cylinder and should fit into open end of piston cup with slight clearance. Install expanders with cupped face in and use special return spring which is ½ turn shorter than standard spring.

Chrysler Wheel Cylinder Pistons (with Rubber "Piston Ring"). On Chrysler Eight Cylinder Models (1940 on), all Chrysler, De Soto, Dodge, Plymouth (1946 on), separate piston cups are not used and the pistons are sealed by a rubber piston ring in a groove on the pistons. These piston rings are removed by rolling them off the end of the piston. Install piston rings with lip in toward inner end of cylinder. On two cylinder brakes (with single acting pistons), install piston spring with large end toward piston and smaller end in toward end of cylinder.

Master Cylinder:—To disassemble master cylinder, remove rubber boot and push rod or link, take out retainer spring and piston stop, withdraw piston. Examine cylinder. If corroded or scored, cylinder can be lapped or honed and oversize piston fitted. Clearance should be .001-.003". In reassembling, wash all parts in alcohol, dip in Brake Fluid, see that check valve is installed correctly and that thin washer is in place between piston and primary piston cup. Insert piston with lips on both primary and secondary cups in. Test for leaks in same manner as for wheel cylinders and bleed entire system when installed on car.

By-pass Port Note—By-pass or compensating port connecting supply tank and master cylinder must be uncovered with the master cylinder piston against its stop. When installing master cylinder piston assembly, hold piston against stop and make certain that this port is not covered by lip of primary cup.

CAUTION—When master cylinder installed on car, brake pedal must be adjusted for correct pedal clearance or free-travel to insure this by-pass port being uncovered with pedal released and master cylinder piston against its stop. Brakes will drag if this port is not open.

ANTI-CREEP

Studebaker 1950-51 Models with Automatic Transmission.

►**ANTI-CREEP RELEASE SWITCH NOTE:** On 1950 Commander models, this switch also controls the engine idle speed and is called the "Carburetor Idle Speed Adjustment Screw Switch" (see illustration). On other models, switch is mounted as follows:

Champion—Release switch is mounted on accelerator cross shaft bracket on dash. Switch contacts are closed by the cross shaft lever when accelerator pedal is released (closed throttle), and open when the accelerator pedal is depressed to open the carburetor throttle.

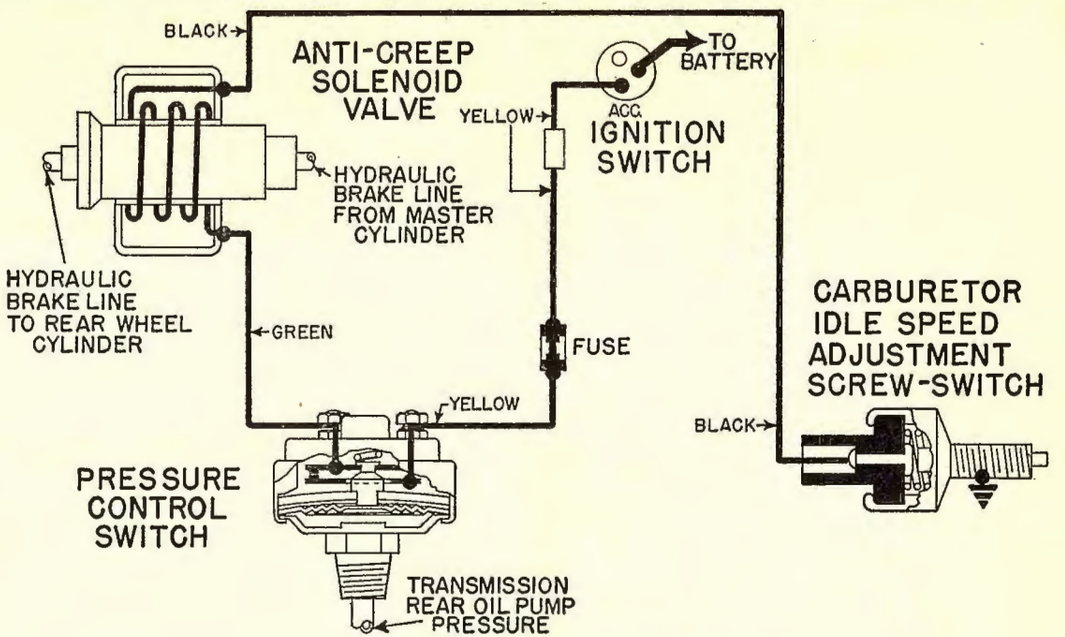
1950 Commander—Release Switch or "Carburetor Idle Speed Adjustment Screw Switch" mounted on carburetor throttle lever and replaces the customary throttle idle speed stopscrew. When accelerator pedal is released, switch contacts are closed and the switch also positions the throttle valve for correct engine idle speed. When the accelerator pedal is depressed to open the carburetor throttle, the switch contacts open.

1951 Commander—Release Switch is mounted on accelerator cross-shaft bracket on dash (similar to Champion).

DESCRIPTION: The Anti-Creep system performs the same function as the Hill-Holder used on earlier models. The system comprises a Solenoid Valve, Pressure Control Switch, and a Release Switch (see Carburetor Idle Speed Adjustment Screw Switch data above). When ignition is on, or when engine is idling and the car is not in motion and the brakes are applied, the rear wheel brakes will remain on, after releasing the brake pedal, until the accelerator is pressed down again. Whenever the car is in forward motion the Anti-Creep system is inoperative and brakes function normally.

OPERATION: The solenoid valve mounted on rear of master cylinder holds brake pressure on the rear brakes whenever the Anti-Creep circuit is closed. The pressure control switch which is operated by automatic transmission rear pump pressure, opens the Anti-Creep circuit when the car is moving forward, and closes the circuit when the car is stationary, or moving in reverse. The release switch opens or closes the circuit as the accelerator is depressed or released. With the ignition "on", the accelerator released (release switch closed), and the car stationary (pressure control switch closed), the Anti-creep circuit is completed through these switches and the solenoid valve is energized. When the brakes are applied under these conditions, the anti-creep solenoid valve will retain approximately 200 pounds per square inch pressure at the rear wheel brakes to prevent "creeping." When the accelerator pedal is depressed, the circuit is open at the idle adjusting screw switch allowing the solenoid to de-energize thereby releasing the brakes instantly. When the car is moving forward, normal brake operation is not affected since the rear pump pressure holds open the Anti-Creep pressure control switch, preventing solenoid from energizing.

CONTROL UNITS REMOVAL & INSTALLATION: If operation not satisfactory and checking indicates units defective, remove and replace as follows:



ANTI-CREEP CONTROL UNIT WIRING DIAGRAM

Release Switch: To remove switch, disconnect switch lead, loosen locknut and unscrew switch from accelerator cross shaft bracket on dash (Champion), carburetor throttle lever (Commander).

►***CAUTION—Switch must be adjusted when re-installed on car.***

Pressure Control Switch—To remove, disconnect switch leads, unscrew switch from transmission case.

Solenoid Valve: To remove, disconnect all leads, disconnect brake line at solenoid valve outlet. Take out screw mounting solenoid valve on adapter, lift unit out. Install solenoid valve in same manner.

►***CAUTION—Bleed brakes after installing solenoid valve and connecting brake line.***

ADJUSTMENT: Release switch (Carburetor Idle Speed Adjustment Screw Switch on Commander) is the only point requiring adjustment. Switch is adjusted differently on each model:

Champion Release Switch—Disconnect wire at Release Switch on accelerator cross shaft bracket on dash, hold contact plate on cross shaft lever firmly against end of switch, measure distance from face of contact plate to face of cross shaft bracket. If this measurement not ¼", adjust by loosening locknut and turning switch in or out of bracket, tighten locknut after adjustment completed.

NOTE—If this ¼" clearance cannot be secured by adjusting switch, disconnect accelerator cross shaft-to-transmission rod at transmission end and check pushrod and cross shaft for interference.

Do not bend contact plate or cross shaft bracket to secure correct switch setting.

1950 Commander Carburetor Idle Speed Adjustment Switch—Switch also controls engine idle speed and must be adjusted only with engine warm. With engine warmed up (choke valve wide open, fast idle inoperative), disconnect wire at switch on carburetor throttle lever, place selector lever in Neutral "N" position, turn switch in or out of carburetor lever until engine speed is 500-550 RPM.

1951 Commander Release Switch—After transmission linkage adjustment has been completed, loosen switch locknut and screw the switch into the bracket until switch plunger just contacts the plate. Connect switch wire, turn on ignition, screw switch in until an audible click is heard in the anti-creep solenoid. Tighten switch locknut.

CHECKING OPERATION: With rear wheels stationary, ignition switch on, and the accelerator fully released, depress the brake pedal firmly and release. Rear wheel brakes should now be set, preventing the rear wheels from turning. The rear wheel brakes should release when the ignition key is turned off or the accelerator is depressed.

►**Anti-Creep Fails to Operate**—Make certain that idle speed adjusted to 500-550 RPM. maximum with engine warm, and that throttle return spring returns throttle to its stop when accelerator released. Remove black wire from idle adjusting screw switch. Turn ignition key on. Using an ammeter, check the amperage draw from the black wire terminal to ground. Amperage draw should be between 1.2-2.2 amperes. If no reading is obtained, check the fuse or wiring for open circuit.

HYDROVAC POWER UNIT

Chevrolet Trucks:
1½ Ton (1946-50), 1 & 1½ Ton (1951) Optl.
2 Ton (1946-51), 1½ Ton Special (1951) Std.
Cab-Over-Engine Models (1946-51)

►CHANGES, CAUTIONS, CORRECTIONS

►**CONTROL VALVE PISTON CUP CHANGE (Control Valve Leakage Correction):** To correct or prevent leakage at control valve piston (see illustration), first type single-cup piston has been superseded by new type double-cup piston. These new parts furnished in Repair Kit, No. 3847643, which can be used to replace old type or repair new double-cup piston type units. When converting single-cup type piston unit to double-cup type piston unit, old Relay Valve Piston, Relay Valve Piston Cup, and Diaphragm & Plate Assembly must be discarded and replaced with new type parts. **Install these parts in sets.**
NOTE—This new type double-cup piston is used on late 1947 units which can be identified by metal tag marked "374550-G7" under one hook bolt nut.

►*CAUTION—Install this new type piston with lips on both piston cups toward valve piston hydraulic chamber.*

►**VACUUM POWER CYLINDER LUBRICATION:** All Hydrovac vacuum power cylinders (with or without lubricant plug) should be lubricated at regular intervals as directed below. NOTE—Late production units have lubrication plug on end of cylinder.
Units with Lubrication Plug—After unit has been installed on truck, remove lubricant plug and fill cylinder to level of plug hole with Bendix Vacuum Cylinder Oil. **At 10,000 mile intervals** (or every six months), remove plug and add one ounce of Bendix Vacuum Cylinder Oil through hole.
Units Without Lubrication Plug—Install proper amount of oil (see above) in cylinder when assembling unit (before installing piston).

►*CAUTION—Use care to prevent oil entering control tube or flowing through tube to control valve while assembling and installing unit on truck.*

►**VACUUM POWER CYLINDER PUSHROD CHANGE:** New type heat-treated push rod (see Identification Note) available for replacement of bent or broken rod which may cause complete failure of Hydrovac or dragging brakes and fluid leakage at hydraulic cylinder stationary cup. When replacing push rod, carefully inspect, and replace if damaged, push rod leather seal and rubber cup. Install new push rod plastic type washer (replaces former metal washer), and install new type cotton wicking under vacuum cylinder piston packing (replaces felt wicking).
Push Rod Identification Note—New type heat-treated piston rods marked by small letter "H" stamped on unthreaded part of push rod adapter or by small groove around circumference near end of this unthreaded part of this push rod fitting.

►*CAUTION—The Hydrovac push rod leather seal is impregnated with special lubricant and must not be soaked in oil prior to being installed. Dipping or soaking the seal in oil has resulted in failure of hydraulic piston cups, and other parts.*

DESCRIPTION: Hydrovac is a self-contained unit connected in the hydraulic line between the brake master cylinder and the wheel cylinders. It provides combined hydraulic and vacuum power braking (utilizing engine manifold vacuum), boosting the brake pedal pressure exerted by the operator, and providing more positive stopping than possible by use of foot pressure only. The unit is mounted on the truck frame side rail with hydraulic connections (from master cylinder and to wheel cylinders), vacuum line (to engine manifold), and air line (to air cleaner). The Hydrovac unit consists of the following sub-assemblies:

Vacuum Power Cylinder—Consists of a piston and pushrod assembly in a power cylinder and a return spring which holds the piston in the off position when brakes not being applied (vacuum on both sides of piston).

Control Valve Assembly—Consists of diaphragm and poppet type vacuum and atmospheric valves actuated by a hydraulic cylinder and piston (single-cup or double-cup type—See Special Service Notes above for changes), a diaphragm spring which holds the piston and diaphragm assembly in the "off" position when brakes not being applied, and a valve spring. Hydraulic cylinder is connected to main hydraulic brake channel in unit by a drilled passage so that brake line pressure is impressed upon the piston.

Hydraulic Cylinder—Consists of a piston and valve assembly in a cylinder through which all brake fluid flows between brake master cylinder and wheel cylinders. Vacuum power piston rod bears against this hydraulic cylinder piston so that piston is forced out in cylinder to "boost" hydraulic pressure to wheel cylinders when the vacuum power cylinder operates. A spring-loaded seal is provided around the piston stem in the vacuum power cylinder to prevent lubricant mixing with brake fluid.

OPERATION: With brakes off (no pressure in brake lines), vacuum cylinder piston is held in off position by return spring (vacuum on both sides of piston), and control valve piston is likewise held in off position by diaphragm spring (vacuum valve open, atmospheric valve closed). When brakes are applied by depressing brake pedal, brake fluid flows directly through hydrovac hydraulic cylinder (through valve in piston) to the wheel cylinders. At the same time, the pressure in the brake line is impressed upon the control valve piston. As soon as pressure in brake line reaches 40 lbs., this pressure begins to overcome control valve piston spring and causes the piston to move out in the cylinder. This piston movement operates the control valve, closing the vacuum valve and opening the atmospheric valve, so that atmospheric pressure is impressed on rear face of power cylinder piston. Initial movement of the power cylinder piston closes the by-pass valve in the hydraulic cylinder piston and additional movement of the power piston forces the hydraulic cylinder piston out in the cylinder, providing a ram or "boost" action which increases pressure in brake lines between the hydrovac unit and the wheel cylinders. This boost pressure being added to the normal pressure caused by depressing the brake pedal results in a more powerful application of the brakes. This boost action continues only so long as the operator continues to depress the brake pedal. As soon as the pedal movement stops (as in holding brakes "on"), atmospheric pressure in control valve assembly reacts against hydraulic piston pressure and tends to close the atmospheric valve and cut off atmospheric pressure in vacuum power cylinder. With the vacuum power cylinder thus cut off (both vacuum and atmospheric valves to rear end of cylinder closed), the piston remains stationary and assists in holding the brakes on. Whenever pedal pressure is increased for more braking power, the vacuum power cylinder boosting action is resumed. When the brake pedal is released to release the brakes, the control valve opens the vacuum valve so that pressure is equalized on both sides of power cylinder piston (vacuum on both sides). The return spring then returns the piston to its off position, and retracts the hydraulic cylinder piston (this piston yoked to power cylinder piston rod). When the hydraulic piston reaches its off position, the by-pass valve in the piston is opened which allows the fluid from the wheel cylinders to return to the brake master cylinder.

BLEEDING OF BRAKE SYSTEM (with Hydrovac Unit): *CAUTION—Different bleeding procedure required for 1951 Trucks with "Twinplex" brakes.*

1946-51 Trucks with regular Chevrolet Hydraulic Brakes: When bleeding the brake system, Hydrovac unit must **first** be bled at **two** points before bleeding the lines and wheel cylinders. Bleed the entire system exactly as detailed below. (CAUTION—Engine must not be running and there must not be any vacuum in the Hydrovac system while bleeding these brakes).

Hydrovac Point #1—Remove bleeder valve screw on side of control valve housing on Hydrovac endplate, attach bleeder hose and submerge end of hose in brake fluid in a clean drain jar. Fill brake master cylinder reservoir with fluid, open bleeder valve ½-¾ turn, depress brake pedal slowly by hand, **close bleeder valve before releasing pedal.** Repeat these operations until fluid flows from the hose in a solid stream without bubbles, then close bleeder valve, remove hose, install valve screw.

Hydrovac Point #2—Attach bleeder hose at bleeder valve on side of Hydrovac unit outlet fitting (point at which brake lines to wheels connected). Bleed system at this point in exactly same manner as detailed for Point #1 (above).

Wheel Cylinders—After bleeding Hydrovac unit, proceed to bleed lines and wheel cylinders at each wheel in the usual manner.

1951 Trucks with "Twinplex" Brakes: *CAUTION—A pressure type Bleeder Tank must be used and the following procedure used to bleed Hydrovac unit and entire brake system:*

1) Back off adjusting screw on upper shoe of both rear wheel brakes all the way.
2) Fill master cylinder reservoir to top of filler plug opening, connect pressure bleeder to main cylinder, maintain 20 lbs. air pressure on tank during entire bleeding operation.
3) Bleed the system at **each of the following points in order** until all air bubbles disappear (use bleeder tube with end submerged in fluid in bleeder jar).
4) Bleed Hydrovac hydraulic (slave) cylinder at bleeder valve on outlet fitting to which the wheel cylinder line is attached.
5) Bleed Hydrovac control valve at bleeder valve on control valve housing.
6) Bleed **rear** wheel cylinder in left rear wheel.
7) Bleed **front** wheel cylinder in left rear wheel.
8) Bleed wheel cylinder in left front wheel (one only).
9) Bleed **rear** wheel cylinder in right rear wheel.
10) Bleed **front** wheel cylinder in right rear wheel.
11) Bleed wheel cylinder in right front wheel (one only).
12) Repeat step 4 (bleed Hydrovac slave cylinder).
13) Repeat step 5 (bleed Hydrovac control valve).

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HYDROVAC POWER UNIT (Cont.)

14) Adjust upper brake shoe in each rear wheel (see Adjustment), make several hard brake applications to centralize shoes, then readjust all brake shoes.
15) Depress brake pedal with 75 lbs. pressure and check pedal clearance or distance from toeboard to underside of pedal pad in this position. Clearance should be not less than 3½". If pedal clearance less than 3½", repeat entire bleeding procedure.

TROUBLE SHOOTING: Unit Fails to Operate—

1. Out of fluid.
2. No vacuum at unit. Check for restricted vacuum line, or defective check valve (in vacuum line on firewall).
3. Hydrovac unit air cleaner, or cleaner line plugged.

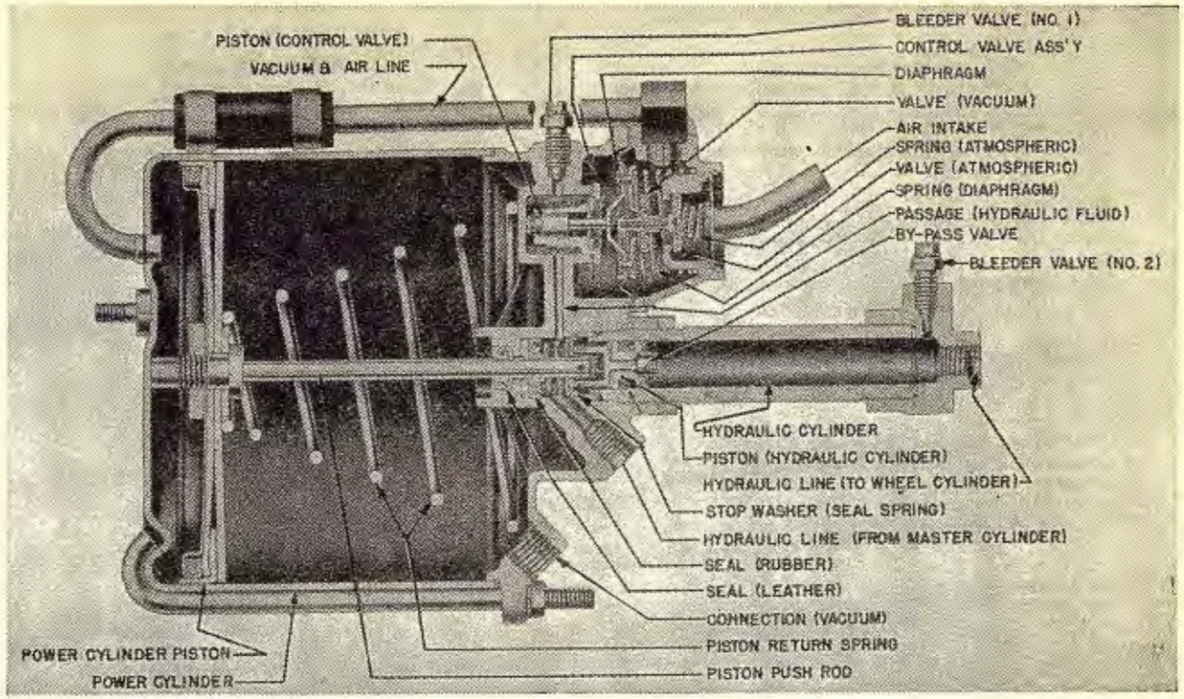
Brakes Drag or do not Release: This may not be noticeable until after two or three applications.
1. Insufficient vacuum cylinder shell length. Measure the distance from the center of the closed portion of the shell to the open end, being sure not to include the gasket, or space between the end plate and shell, on those units with vellumoid gasket, when measured in the complete assembly (later units use a rubber gasket fitted in a groove in the end of plate allowing shell to bottom against rim of end plate). Replace shell if this distance less than 5 29/64" (3 39/64" on early type single-piston Hydrovac unit).
2. Sticky control valve piston. Remove and clean piston and cylinder bore. If piston cup swollen, install new cup and check for wrong type brake fluid. Flush complete brake system with clean brake fluid.
3. Bent power cylinder push rod. Prevents power cylinder piston from returning to full release position. Replace with new type rod. See "Vacuum Power Cylinder Push Rod Change."

Brakes Apply When Engine is Started:—
1. Broken or improperly assembled atmospheric valve spring. This can be checked by removing the valve body cover (air cleaner hose elbow and plate assembly).
2. Sticky control valve piston (See 2, above para.).
3. Broken or improperly assembled valve poppet. Remove valve body cover and inspect, and for being in correct position. Replace with new valve body and poppet assembly if defective.

Brake Pedal Kick-Back:—
1. Defective hydraulic brake cylinder piston cup. This permits fluid to leak by, into the low pressure side of piston causing the above condition.
2. Leaky ball check valve (in hydraulic brake piston assembly). Replace assembly.

Loss of Fluid From Brake System: Hydrovac unit must be disassembled to check for this condition.
1. Defective push rod rubber seal.
2. Defective control valve piston cup. See "Control Valve Piston Cup Change." If piston cup swollen, install new cup and check for wrong type brake fluid. Flush complete brake system with clean brake fluid.
3. Dirt or other foreign matter under lip of brake hydraulic cylinder pushrod seal or valve piston cups. Correct by thoroughly cleaning parts and replacing piston cups and rubber seal.

Air In The Hydraulic System:—
1. Improperly assembled, defective, or missing control valve piston secondary cup. See "Control Valve Piston Cup Change."



HYDROVAC POWER BRAKE UNIT

DISASSEMBLY OF HYDROVAC: Remove both bleeder screws, hold hexagonal head of hydraulic cylinder in vise, loosen locknut on cylinder, then unscrew cylinder from power cylinder endplate. Loosen hose connection on power cylinder tube, slide hose along tube. Remove power cylinder hook bolts, remove endplate from power cylinder with attached piston assembly. Press endplate down on piston rod until hydraulic cylinder piston protrudes from endplate, remove snap ring retaining pushrod to piston connecting pin, remove pin. Remove hydraulic cylinder piston, power cylinder piston, and return spring from endplate. Unscrew end plug from hydraulic cylinder (hold end plug in vise, use 1⅜" end wrench on cylinder), use long nose pliers to remove snap ring retaining piston stop washer, then remove washer, coil spring, spring retainer, push rod hydraulic seal, and seat washer from endplate. Take out five screws attaching control valve assembly on endplate, remove diaphragm spring, diaphragm, and gasket. Take out snap ring retaining control valve cover, remove cover, valve spring, and gasket. Use 1⅛" socket to remove control valve hydraulic cylinder and piston from power cylinder cover. push piston out of cylinder. Remove C-washer, rubber cup, spacer washer, and second rubber cup from the hydraulic piston.

Cleaning & Inspection: Clean power cylinder, piston, and spring with cleaning solvent. Clean all hydraulic parts with alcohol. Dry all parts thoroughly. Inspect power cylinder for wear, scores, or dents; inspect piston pushrod for wear and scores (if piston packing worn, see Reassembly data for packing replacement). Check cylinder end plate for cracks and pushrod seal for wear or damage (if seal worn or damaged, see Reassembly data for seal replacement). Inspect control valve hydraulic cylinder and piston for scores and piston cups for wear or damage. Check diaphragm for cracks, pin holes, or abrasions. Inspect vacuum and atmospheric poppet valves for damage and valve seat for corrosion (valve seat can be cleaned with fine steel wool, Control Valve Cover and Poppet Assy. must be replaced if valves damaged). Inspect hydraulic cylinder for wear, scores, or corrosion (replace cylinder if pitted). Inspect piston for wear and scores, and check valve for free operation (valve can be disassembled for cleaning and inspection by removing snap ring and taking out retainer, spring, and ball). Inspect pushrod rubber seal and spring for wear or damage.
NOTE—Use NEW piston rubber cups when reassembling Hydrovac after overhaul.

REASSEMBLY: Assemble all parts in reverse order of disassembly (above) and note the following points:
Hydraulic Piston Lubrication—Coat piston cups with hydraulic fluid before installing piston assembly in cylinder.
Control Valve Diaphragm Installation—Use three pilot studs (may be made up by cutting heads off 8/32 x 1" machine screws) installed in power cylinder end plate to prevent damage to diaphragm when installing the diaphragm and gasket.
Brake Hydraulic Cylinder Piston Installation—Push piston into OUTER end of cylinder until end of piston protrudes from inner end. *CAUTION*—Rubber cup will be damaged if attempt made to install piston at inner end of cylinder.

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HYDROVAC POWER UNIT (Cont.)

Power Cylinder Piston Lubrication—Before installing piston, dip piston in Bendix Vacuum Cylinder Oil to saturate piston leather and cotton wicking, allow excess to drain off. After Hydrovac completely assembled and installed in truck, fill vacuum power cylinder to level of lubrication plug with Bendix Vacuum Cylinder Oil.

Power Cylinder Piston Packing Replacement—If packing requires replacement, proceed as follows:

Removal of Old Packing—Clamp piston rod hexagonal nut in vise, remove nut retaining piston plates on piston rod. Remove wicking retainer plate, expander ring, cotton wicking, outer plate, piston packing seal, and inner plate.

Installation of New Packing—Place large diameter piston plate in an assembly ring with chamfered inside diameter up (assembly ring may be made up by cutting 1" section from end of a power cylinder). Install parts on piston plate in the following order: 3-cornered seal, leather packing (lip on leather upward), small diameter piston plate (lip on plate toward packing), cotton wicking, wicking expander ring (grippers on ring pointing upward and ring securely hooked in notch near the loop), wicking retainer plate (opening must register squarely over loop in expander ring). Without disturbing these parts and with piston still in assembly ring, place flat washer and piston assembly on piston rod with lip on packing leather pointing toward near end of rod, install nut and tighten it securely, then remove assembly ring and stake nut with a center punch.

Pushrod Seal Replacement (in Cylinder End Plate). Drive old seal out with a punch (seal will be damaged and must not be reused). Start new seal in end plate with rawhide end inward, then press seal into end plate until it is seated (use punch with diameter equal to seal to press the seal in).

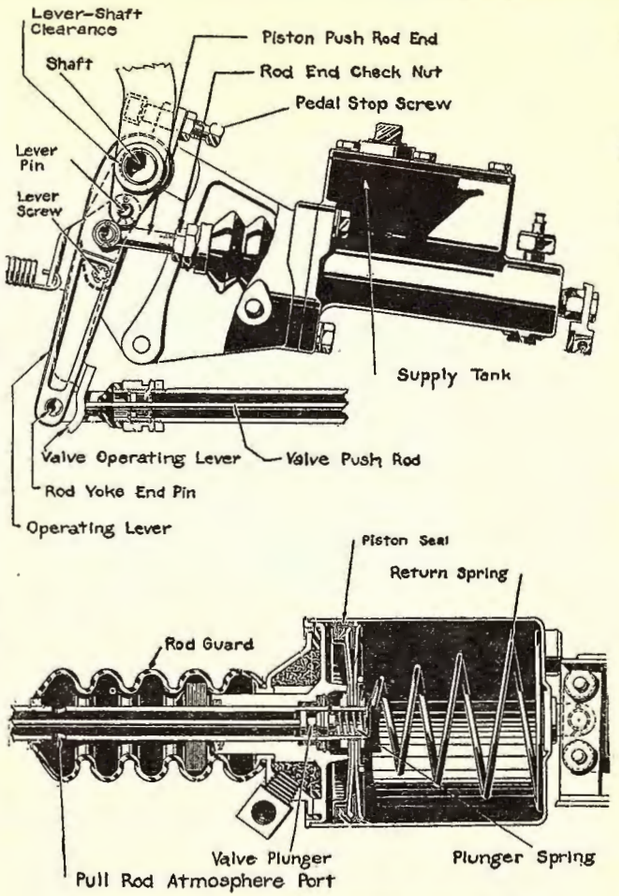
BENDIX VACUUM CYLINDER INTERNAL VALVE TYPE

Chrysler Custom Imperial (1939)
Chrysler Crown Imperial, C27 (1940)
Duesenberg, All Models (1937)
Packard 12, All Models (1937-39)

►**Packard Model Note.** Separate vacuum power unit used for both Brake operation and Clutch operation. *See Clutch Section for Clutch Power Cylinder.*

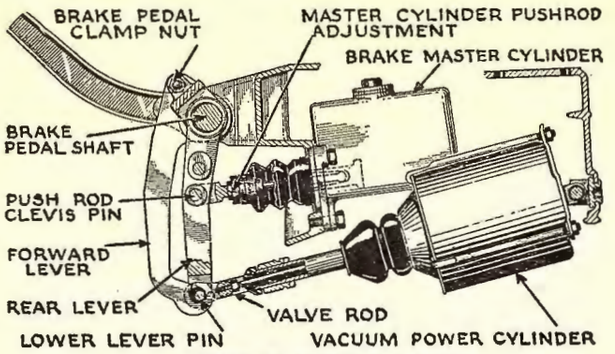
DESCRIPTION: Vacuum cylinder mounted on frame with hollow pull rod connected directly to brake pedal extension lever. Spring loaded piston type control valve located within hollow pull rod and operated by push-rod which extends out through pull rod to pedal lever. Vacuum line from manifold connected directly to rear end of cylinder so that vacuum always present in rear chamber behind piston. Front chamber controlled by control valve.

OPERATION: Control valve pushrod setting provides slight clearance at brake pedal lever with brakes 'off' so that valve is seated in forward position by spring. This cuts off air passage (air inlet is through air cleaner in cover and boot to hole in piston pull rod and through pull rod to atmospheric valve). Vacuum passage from rear chamber through push-rod stem and front chamber port in side of pull rod uncovered by valve is open so that both piston chambers are evacuated (pressure equal) and piston will be held in 'off' position (forward against boot end) by spring in cylinder. When brake pedal depressed, pull rod clevis pin contacts valve push-rod, moving valve to rear, cutting off vacuum and connecting front chamber port to atmosphere so that air pressure forces piston to rear applying brakes. When pedal travel is stopped, control valve cuts off air so that no further movement of piston takes place, and when pedal is released, further travel of control valve forward opens vacuum connection to front chamber, balancing pressure and piston is returned to 'off' position by spring.



CHRYSLER VACUUM POWER CYLINDER & BRAKE LINKAGE

ADJUSTMENT: On all cars, see that brake pedal position is correct (clearance at toeboard) and that cross-shaft is in released position against stops. Disconnect power cylinder piston rod by taking out clevis pin, adjust piston rod length so that clevis pin can just be inserted with piston pulled all the way out at the end of its stroke and power lever pressed forward so that clearance in hole is at opposite side of shaft. Then adjust valve rod length so that valve rod yoke just contacts yoke pin in valve lever with valve rod pulled all the way out. Special instructions on individual models given below.



PACKARD BRAKE LINKAGE

Chrysler Models: See illustration for details of vacuum cylinder mounting and linkage.

1. Adjust brake pedal stopscrew so that pedal just clears underside of floor board when released.
2. Remove clevis pin linking vacuum cylinder pullrod and operating lever. Loosen two studs holding valve operating lever to pedal so that pedal is free. Hold operating lever so that clearance between lever and brake pedal shaft is all on forward side of shaft (shaft is smaller than hole in lever), disconnect master cylinder pushrod and adjust push-rod length so that clevis pin can just be inserted with master cylinder piston against its stop (do not allow operating lever to shift from position while making this adjustment).
3. With operating lever still held so that clearance between lever and pedal shaft is on forward side of shaft, loosen vacuum cylinder frame bracket mounting bolt, shift bracket and vacuum cylinder on frame until clevis pin can just be inserted in pullrod and operating lever with vacuum cylinder piston pulled out against its stop. Make certain that clevis pin goes through ferrule on end of valve operating rod and that forked valve operating lever is hooked over ferrule (do not adjust valve operating rod).
4. With studs holding valve operating lever to pedal loosened so that pedal is free, allow valve operating rod to assume correct position (ferrule against clevis pin), tighten studs.
5. Make certain that entire power unit is in alignment and that links line up so that parts do not require springing to install clevis pins.

Packard Twelve:—Remove front floor boards, depress brake pedal at least 10 times (to exhaust vacuum supply tank), see that pedal is against toeboard with brakes released. Loosen clamp nut at top of brake pedal levers (above pedal shaft), press lower end of rear lever toward rear and front lever toward front until all clearance at pedal shaft (upper end of levers) and clevis pin (lower end of levers) is all on forward side, hold levers in this position and tighten clamp nut. Remove master cylinder push rod clevis pin in rear lever, move brake pedal down until all clearance at pedal shaft and clevis pin at lower end of levers is on rear side, adjust master cylinder pushrod length so that clevis pin can just be inserted with master cylinder piston against stop and pushrod just contacting piston.

SERVICING:—Power Unit—At 6000 mile intervals, remove plug on boot end of cylinder, inject 2 ounces of Bendix Vacuum Cylinder Oil, work piston around and up and down to spread oil in cylinder

BENDIX VACUUM CYLINDER PLAIN TYPE—EXTERNAL VALVE

Lincoln V12, All Models (1937-40)
Pierce Arrow 8 & 12, All Models (1937-38)

►**Lincoln Note.** This model has dash controlled regulating valve which supplements standard control valve so that operator may select amount of power

DESCRIPTION: Vacuum power cylinder is mounted on frame with piston rod linked to brake cross-shaft or pedal. Rod or boot end of piston chamber open to atmosphere (through air cleaner in cover) and opposite chamber behind piston connected to engine manifold through control valve.

OPERATION: Control valve connected in pedal linkage is two-way diaphragm type. With brakes off, Vacuum connection to manifold is cut off by seating of diaphragm. When brakes are applied, atmospheric valve moves forward and contacts diaphragm, cutting off air intake. Further movement unseats diaphragm opening manifold vacuum connection, and makes connection with power unit line so that air in chamber in exhausted. Air pressure on boot face of piston forces piston in, applying brakes. Vacuum, and consequently booster action of power unit, is directly proportional to pedal application. When atmospheric valve stop bottoms in housing (total travel approximately 3/32"), pedal pressure is transmitted directly through control valve housing to brake cross-shaft so that brakes are applied both by pedal and vacuum power unit.

ADJUSTMENT: Control Valve Setting. Pedal linkage should be adjusted so that there is no load on control valve (atmospheric valve should be bottomed in chamber) with pedal released and against its stop, and cross-shaft levers against stops. Any tension on control valve in this position will cause dragging brakes.

Power Unit:—With brakes 'off', and cross-shaft levers against stop, disconnect piston cable, pull piston all the way out (against boot end stop) adjust cable length to remove all slack, reconnect cable.

TROUBLE SHOOTING: Check as follows:

Engine Misses or stalls when brakes applied:

1—Loose hose connection between control valve and power unit. Check connections. Replace hose.

2—Dry Piston Seal in Power Unit cylinder. Check by disconnecting piston cable and hose connection at cylinder. Push piston all the way in. Hold finger over hose nipple on end of cylinder, pull on piston rod. If piston can be pulled out, piston seal is leaking. Lubricate as directed in Servicing below, repeat test. If operation still unsatisfactory piston seal should be replaced.

3—Cracked Diaphragm in Control Valve or dirt between valve and diaphragm seat. To check, disconnect all connections and remove valve from car. Apply suction to nipple from which manifold connection removed. If air can be drawn through valve, diaphragm does not seat or is cracked.

Engine misses or stalls when idling:—

1—Loose connections or leaky hose between control valve and manifold. Examine connections, replace hose.

SERVICING: Piston Seal Lubrication. Remove Power Unit from car, hold unit vertical with piston rod down, inject approximately 2 ounces Bendix Vacuum Oil through hose nipple in upper end of cylinder, work piston up and down and around to spread oil.

BENDIX VACUUM CYLINDER CHRYSLER 1941-42 TYPE

CHRYSLER CROWN IMP., C33 ('41) C37 ('42)

DESCRIPTION: Internal valve, reactionary (Vacuum Suspended) vacuum cylinder similar to the type used on previous Chrysler models. An intake air cleaner has been added and linkage has been redesigned due to new location of brake master cylinder and new type brake pedal mounting.

ADJUSTMENT: Note. Adjustment required only when master cylinder or vacuum power cylinder removed from car or disassembled (setting not disturbed by minor brake adjustment). CAUTION—Do not readjust vacuum cylinder linkage to compensate for normal brake wear—see Lockheed brake articles

Adjustment:—Make following adjustments in order:

1. Remove clevis pin connecting power cylinder pullrod to operating lever and pin connecting brake master cylinder pushrod to operating lever, loosen screws in valve lever and loosen vacuum cylinder mounting stud locknuts.
2. Adjust brake pedal toeboard clearance by loosening locknut and turning stopscrew on pedal shank to rear of pedal shaft.
3. Adjust master cylinder pushrod for correct free play by loosening locknut and turning pushrod. CAUTION—Make certain that all clearance of pedal shaft is to front of shaft when adjusting.
4. Hold brake pedal back against its stop and adjust vacuum cylinder so that all clearance of pedal shaft is to front of shaft and vacuum cylinder pullrod clevis pin will just slip in clevis, tighten vacuum cylinder mounting stud locknuts and install clevis pin, tighten valve lever screws.
5. Check to see that all clearance between vacuum cylinder valve rod bushing and pin is to front of pin.

SERVICING:—Lubrication—At 6000 mile intervals, lubricate power cylinder by removing plug on front of cylinder and inserting one ounce of shock absorber fluid, transformer oil, or ice machine oil. At the same time, disconnect vacuum line connection at rear end of cylinder and insert an additional ounce of oil at this point.

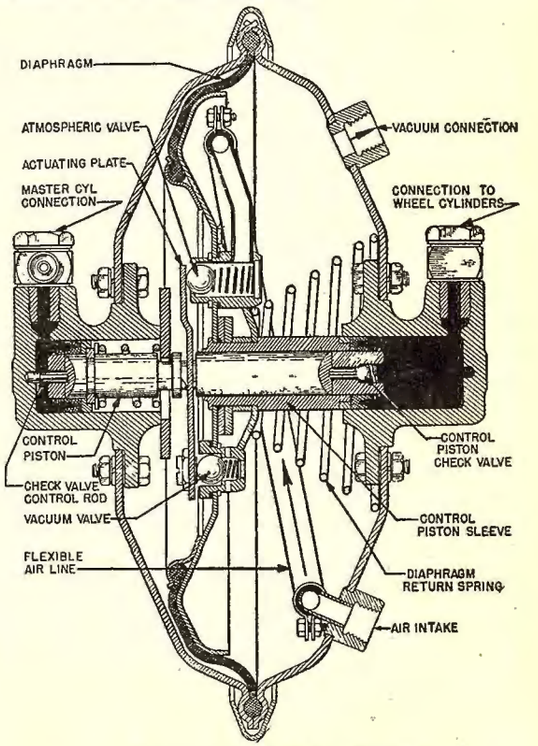
VACDRAULIC POWER UNIT

Chrysler Crown Imperial, C40 (1946-47-48)

DESCRIPTION: Vacdraulic is a self-contained diaphragm type power unit connected in the hydraulic brake line between the brake master cylinder and the wheel cylinders. The diaphragm type power piston is mounted directly on the control piston sleeve within the vacdraulic housing and includes the control valves (atmospheric air intake valve and vacuum valve), valve operating mechanism, and manifold vacuum connection (flexible line from vacuum connection on housing to vacuum valve). A control piston is located within the power piston control sleeve. This piston is hollow to permit brake fluid to flow freely through the unit when brakes are off (ball check valve in end of piston is held off its seat by a control rod in this position) and has a rubber "piston ring" type seal at each end.

OPERATION: Vacdraulic unit is "vacuum suspended" type with vacuum on both sides of diaphragm when brakes are released (vacuum valve open, atmospheric valve closed) and entire power piston assembly is held in the off position by a large return spring in the housing. When brake pedal is depressed to apply brakes, fluid flows freely through the unit to the wheel cylinders (control piston check valve open). As pressure in brake lines increases, the control piston tends to move within the control sleeve, closing the vacuum valve and opening the atmospheric valve. Atmospheric air pressure acting on one side of the diaphragm causes the power piston sleeve to move with the control piston to force fluid out through the lines to the wheel cylinders at a "boosted" pressure and with no loss of volume (check valve closes when piston starts to move). Whenever brake pedal movement stops (as when brakes held "on"), a balance is set up between the vacdraulic unit control piston and sleeve movement so that the atmospheric valve closes without the vacuum valve opening. This causes the power piston to remain stationary. When pedal released to release brakes, the vacuum valve opens and the return spring moves the power piston assembly to its "off" position. At this point the control piston check valve is positively opened by the rod to permit free fluid flow back to the master cylinder.

ADJUSTMENT: None required.



VACDRAULIC POWER BRAKE UNIT

CHRYSLER VACU-EASE BRAKE POWER UNIT

Chrysler Six, 8 Pass. Sedan Limousine (1949-50-51)
Chrysler Eight, C46 (1949), C49 (1950)
Chrysler New Yorker C52, Imp. C54 (1951)
DeSoto 8 Pass. Sedan & Limousine (1949-50-51)

►**PRODUCTION CHANGE NOTE:** Two types used
Internal Valve—1949 and early 1950.
External Valve—Late 1950 and 1951.

DESCRIPTION: Internal Valve Type—This unit is similar in construction to the Vacdraulic Power Unit. Primary and secondary cylinders can be removed without disturbing the diaphragm housing, Fluid return system has outside cross-over line.
External Valve Type—The valve housing and cylinder unit are mounted as an assembly on one end of the main diaphragm housing. The valve housing assembly controls the relative air pressures on both sides of diaphragm. Fluid return system built-in.
NOTE—The External Valve Type unit can be used to replace the Internal Valve Type by using an Adapter Kit, Chrysler Part No. 1321149.

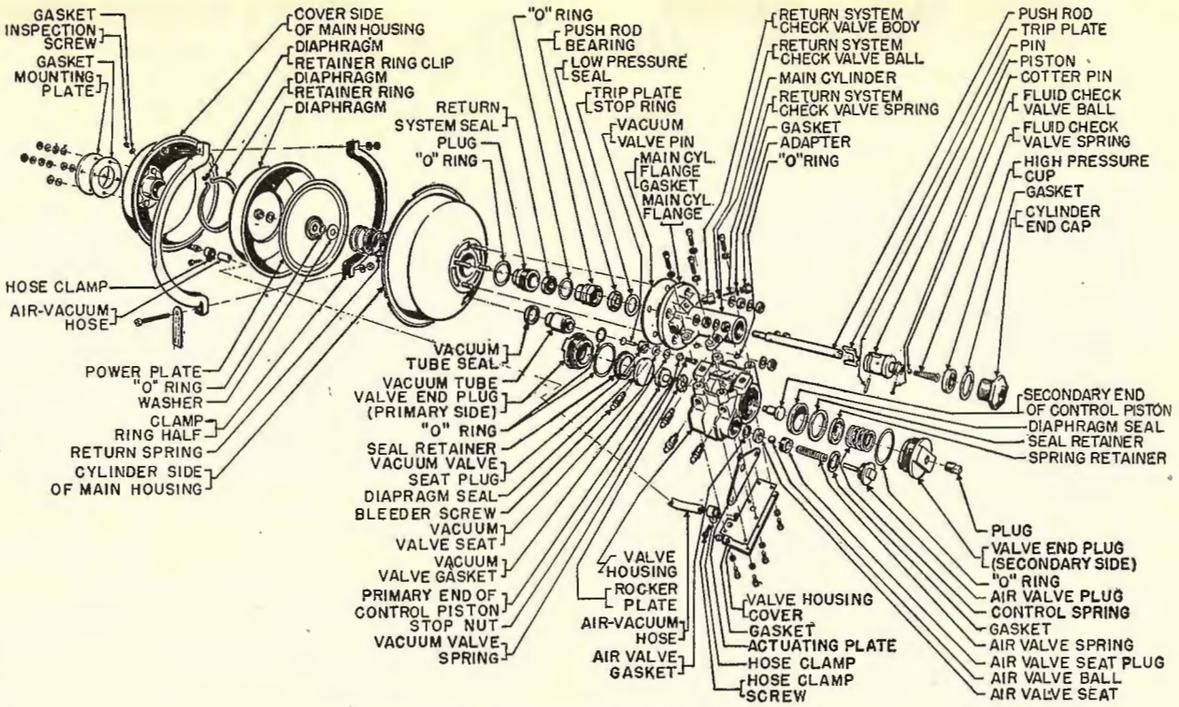
ADJUSTMENT: None required.

►*CAUTION:* Repair of the vacuum and air valves in the field is not recommended by the manufacturer, since these parts are specially calibrated.

INTERNAL VALVE TYPE UNIT OVERHAUL: All that is generally required is a minor overhaul as follows. ***Cleanliness is extremely important.***

Disassembly: After removing the unit from the car tape up the air and vacuum connections to keep out dirt. Remove the cross-over line and cylinder end caps. Mount the unit, primary end down, on a box or a short length of 4" pipe. Remove 4 nuts holding the secondary cylinder to housing. Remove cotter pin, fluid check valve ball, spring, and trip rod. Remove the cup retainer washer, secondary cup and spring. Remove the fluid seal with a hook, being careful not to scratch the control piston. Invert the unit and remove the primary cylinder. Remove the snap ring, cup retaining washer, primary retaining cup and piston ring. Using pliers and screwdriver remove the annealed ring from the end of the piston being careful not to damage the ring groove, and remove the seal with a hook. Examine parts for scores, chipping, or out-of-round. Always replace the cups and seals regardless of condition. Cylinders should be mirror smooth. Light scratches can be smoothed out with crocus cloth, but badly scored cylinders must be replaced.
Diaphragm Unit—To examine the diaphragm with the unit disassembled as above, mark both halves of the diaphragm housing, remove the clamp ring and unfasten the housing keys. Maintain pressure on the housing to keep the return spring under control. Housing should be dry inside. If wet with fluid, seals are leaking. Check diaphragm for cracks or leaks. When installing a new diaphragm, fit it snugly to the power piston flange, with the nub on the diaphragm fitting into the locating hole in piston. Connect hose to valve and inlet connections, holding power piston and diaphragm assembly so that locating tab on diaphragm is lined up with the locating slot in housing. This will prevent twisting the hose when assembling. Place housings together and install clamp ring, tapping ring all around with a rawhide mallet to seat ring, tighten all nuts.

Reassembly: Install the secondary end first. Lubricate the control piston and seal with silicone grease or castor oil. NOTE—The secondary seal has a ¾" inside diameter and the primary seal ½" inside diameter. Install the seal in the cylinder seat with the metal case down, lip up. Slide the piston ring, cup (with lip up), and retaining washer onto the end of the control piston. Drop the valve check ball into the end of the piston and install the ball spring (small end to ball). Install spring retaining cotter pin. Install new cylinder flange gasket, and apply a small amount of brake fluid on the cylinder wall and outer lip of the secondary cup. Install cylinder, aligning the elbow fitting with the inlet tube on housing. Install mounting nuts. Reach underneath and press the power piston up toward the secondary end to align the cylinder. Release the piston and tighten the cylinder nuts evenly to 150 inch pounds torque. Invert the unit and lubricate the piston and seal with silicone grease or castor oil. Install seal, with metal case down (lip up). Install annealed retaining ring in groove, using the minimum amount of pressure possible to close the ring. Install the primary piston ring, cup (with lip up), retaining washer, and snap ring. Lubricate cylinder wall and primary cup outer lip with brake fluid and assemble the primary clyinder as given for the secondary cylinder. Install trip rod in center of the control piston, insert copper gasket, trip rod stop plate, cap copper gasket, and cap. Mount the unit with the cap in the vise and tighten the other end cap to 80 ft. lbs. torque.



EXTERNAL VALVE TYPE VACU-EASE POWER UNIT

EXTERNAL VALVE TYPE UNIT OVERHAUL: After removing the unit from the car, proceed as follows. ***Cleanliness is extremely important.***

Disassembly: Clamp unit in vise (grip four mounting screws). Loosen cylinder end cap and clamp on hose. Remove four Allen head screws holding valve housing to cylinder, and remove housing. Invert the unit, mark both halves of housing, remove clamp ring and disassemble cover side of main housing from cylinder side. Remove hex nut from center of power plate and lift off plate and diaphragm assembly. Remove small "O" ring and washer from end of push rod and remove return spring. Remove the four cylinder-to-main housing nuts, and remove cylinder. Clamp cylinder in vise with push rod end up. Screw special protective "thimble" (included in repair kit) on threads of push rod end, unscrew return system seal retaining plug and remove it. Pull the push rod out of the cylinder. Remove cylinder end cap and examine cylinder walls. Remove light scratches with crocus cloth, and clean with alcohol. Replace badly scored cylinders. Remove cotter pin, fluid check valve ball and spring, and bronze bearing from push rod.

Reassembly: Remove secondary cup from piston being careful not to scratch the anodized aluminum surface, and replace with a new one. Drop check valve ball in piston, install ball spring (small end to ball) and install cotter pin. Lubricate piston and cylinder with brake fluid, insert push rod and piston assembly from cap end of cylinder. Install cylinder cap with new copper gasket, finger tight. Clamp cylinder, push rod end up in vise, and install stop plate washer. Remove primary cup from inside

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VACU-EASE POWER UNIT (Continued)

bronze bearing, and "O" ring from outside of bronze bearing, and replace with new cup and ring. Lubricate bronze bearing and slide into cylinder over push rod with primary cup down. Press down lightly with thumb. Lubricate inner lip of retaining seal, slide seal and plug assembly over end of push rod. Screw retaining plug into cylinder and tighten. Place cylinder in vise and tighten end cap to 110 ft. lbs. torque. Remove special thimble nut from threads on push rod. Replace "O" ring seal, and cylinder flange gasket between cylinder and main housing. Remove cylinder from vise and assemble to main housing with flat side of cylinder facing the short studs. Install lock washers and nuts and tighten to 150 ft. lbs. torque. Clamp assembly in the vise with push rod end up, and install flat washer first, and a new small "O" ring on end of push rod. Install spring in boss of power plate and press plate and diaphragm down over end of push rod against spring. Secure assembly to push rod with nut and lock washer tightened to 40 inch pounds torque. Assemble the two halves of the housing (lining up marks). See that cross-over tube rests in slot in cylinder side of main housing. Install clamp ring. Tighten clamp ring bolts, being careful to center cross-over line between ears of clamp ring. Pull vacuum tube out of valve housing and replace "O" ring and rubber grommet. Lubricate "O" ring only, and re-install vacuum tube, "O" ring first, into valve housing. Replace "O" rings used between valve housing and cylinder. Reconnect housing hose. Fasten the valve housing to cylinder.

TROUBLE SHOOTING: Brakes do not Release Properly—With engine shut off, pump the brake pedal several times to remove all vacuum from the power unit, and check brakes for release. If still not released crack the line from the master cylinder. If this releases the brakes, the trouble is not in the power unit. If the brakes are not released, crack the line between the power unit and the wheel cylinders. If this releases the brakes, the trouble is in the power unit. This trouble is caused by the fluid check valve not opening. Check the valve ball trip rod operation and ball spring, see that small end of spring bears on ball.

Unit does not Boost—With engine running press the pedal down and listen for a rush of air through the power unit air cleaner. If no rush of air is heard, check if vacuum is present at the unit by disconnecting the line. If no vacuum is reaching the unit, check for plugged line, or defective vacuum check valve (at the engine manifold). If a rush of air is heard at the unit air cleaner when the pedal is depressed and booster still is inoperative, it indicates (on the internal valve type unit) the secondary fluid check valve is not seating. Remove the secondary cylinder and examine the ball check valve. On the external valve type unit this condition would indicate the fluid check valve is not seating. If with engine running, a continuous rush of air is heard without operating the brake pedal it indicates the diaphragm is punctured, or the vacuum hose (internal valve type only) inside unit is leaking. On the external valve type unit it may also be caused by a leaky cross-over line between housing and front cover.

MIDLAND HY-POWER UNIT

Ford 1 Ton Truck, Series F-4 (1948-51) Optl.
Ford 1½ Ton Truck, Series F-5 (1948-51) Optl.
Ford 2 Ton Truck, Series F-6 (1948-51) Std.

DESCRIPTION: Hy-Power is a self-contained unit connected in the hydraulic line between the brake master cylinder and wheel cylinders to provide combined hydraulic and vacuum power braking (utilizing engine manifold vacuum), boosting the brake pedal pressure exerted by the operator, and providing more positive stopping with less effort. Unit is mounted on truck frame (slave cylinder must not be higher than master cylinder and bleeder screw should be upward) with hydraulic connections (from master cylinder, and to wheel cylinders), vacuum line (to engine manifold through vacuum check valve), and air line (to air cleaner). Hy-Power consists of the following sub-assemblies:

Vacuum Power Chamber: Consists of a pressure plate (piston) and diaphragm clamped between the two halves of the power chamber (outer bead on diaphragm seals joint between chamber sections). A return spring in the front half of the power chamber holds the piston in the off position when brakes not applied (vacuum on both sides of diaphragm).

Hydraulic Vacuum Control Valve—This assembly is mounted on, and is an integral part of the slave cylinder. A spring-loaded poppet type valve disc controls air and vacuum connection to rear half of power chamber. Valve disc is controlled by a hydraulic plunger and diaphragm assembly mounted directly below the valve with the plunger extending down into a chamber connected to the slave cylinder for actuation by brake line fluid pressure.

Hydraulic Slave Cylinder—Consists of a piston and check valve assembly in a cylinder through which all brake fluid flows between the master cylinder and wheel cylinders (fluid from master cylinder enters through ports in side of piston, and flows out through orifice in piston head to wheel cylinders when check valve is open). The vacuum power piston rod bears against this slave cylinder piston and forces piston out in cylinder to "boost" hydraulic pressure to wheel cylinders when power unit is operating (check valve in piston traps brake fluid).

OPERATION: With the brakes "off", vacuum power diaphragm and piston rod are held in off position by return spring (vacuum on both sides of diaphragm), and slave cylinder piston is likewise in the off position. Control valve disc is seated (cutting off air supply to vacuum power chamber) and control valve plunger and diaphragm assembly is held down away from valve disc by diaphragm return spring.

Initial Brake Application—When the brake pedal is depressed, brake fluid flows directly through Hy-power slave cylinder to wheel cylinders to apply brakes (see Slave Cylinder description above). At the same time, brake line pressure is impressed on control valve diaphragm plunger, moving the plunger up against the return spring. As soon as this line pressure reaches 40 lbs., the plunger unseats the valve disc and admits air to the rear end of the vacuum power chamber (vacuum is also cut off from front end of chamber by this plunger and valve action). The atmospheric pressure on rear face of diaphragm piston forces the piston rod out against the slave cylinder piston, closing the check valve within the piston, and forcing the piston out in the cylinder to provide a boost or ram action which increases the brake line pressure and causes a more powerful brake application than that resulting from pedal pressure alone. This boost action continues only so long as the operator continues to depress the brake pedal.

Vacuum Power Balance (When Brakes held "on")—When pedal movement is stopped and pedal held down to keep brakes on, the hydraulic pressure reacts against the control valve plunger which closes the atmospheric valve so that booster action stops. The diaphragm piston maintains its position to assist in holding brakes on until pedal movement is resumed (to further apply or release brakes).

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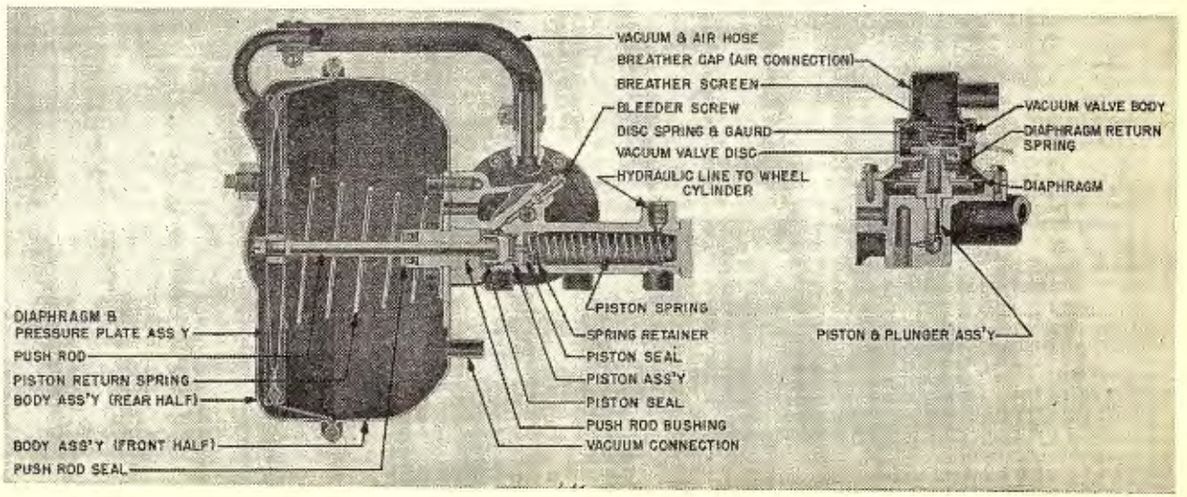


MIDLAND HY-POWER BRAKE UNIT

MIDLAND HY-POWER UNIT (Cont.)

Brake Release—When brake pedal is released, the hydraulic pressure at the control valve plunger drops which permits the diaphragm return spring to move the plunger and diaphragm downward, seating the valve, cutting off atmospheric pressure, and connecting both ends of the power chamber to the vacuum line. The return spring in the power chamber then returns the diaphragm piston and piston rod to the "off" position. Withdrawal of the piston rod allows the check valve in the slave piston to open which permits fluid in the brake lines to return to the master cylinder and reservoir.

VACUUM CHECK VALVE: Connected in line between manifold and Hy-power unit. Valve is spring-loaded, disc type and opens only when vacuum in manifold exceeds vacuum in booster assembly (prevents gasoline vapor being drawn into booster). Valve can be dismantled by removing cap on end of body.

BLEEDING BRAKE SYSTEM: When bleeding brake system equipped with Hy-power unit, first bleed line at the Hy-power unit (bleeder screw on top of slave cylinder at control valve assembly), then bleed system in usual manner at each wheel cylinder.

REMOVAL: Before disturbing unit, depress brake pedal several times to remove all vacuum from the system. Loosen the hose clamp and disconnect air intake tube at Hy-Power unit, disconnect brake line from master cylinder at Hy-Power unit connection. Disconnect vacuum tube hose connection at Hy-Power unit. Take out mounting bolts in bracket, remove Hy-Power unit from truck.

►***CAUTION—Do not disturb air intake breather assembly (in cab), or controls on firewall unless these units require repairs.***

OVERHAUL: If trouble shooting tests indicate that inspection and repairs are necessary, remove unit from truck (see Removal data above), disassemble and inspect the unit as follows:

Disassembly: Place scratch-marks on both sections of power chamber, and punch-mark flanges of control valve cover and slave cylinder, to insure reassembly in same relative positions. Remove large nut on end of slave cylinder, withdraw piston return spring and retainer. Disconnect and remove control valve-to-vacuum chamber tube. Remove clamp ring on power chamber, remove rear section of chamber, withdraw diaphragm and power piston assembly and return spring from front section of chamber. Remove five screws mounting front chamber section on slave cylinder, lift off seal retainer, front chamber section, and piston rod bushing. Remove three screws in control valve cover, remove cover, lift out valve spring and disc. Remove six bolts mounting control valve body on slave cylinder, lift off control valve body, diaphragm return spring, and valve plunger and diaphragm assembly. Remove piston rod seal from rear end of slave cylinder, use piston rod to push piston and rubber piston cup out of front end

Inspection: Wash all parts in cleaning fluid and dry carefully with clean rags. Dry all internal passages with compressed air. Inspect slave cylinder and replace if cylinder bore or control valve plunger bore worn or corroded. Install new rubber cups, seals, springs, and control valve diaphragm. Replace control valve body if valve seat is damaged. If leakage of slave cylinder has been noted (see Trouble Shooting), replace piston assembly, rubber piston cup, seal, control valve plunger, and piston seal.

Reassembly: Reverse disassembly procedure with particular attention to the following points: Use small amount of shellac on threads to prevent leakage when assembling control valve diaphragm, washers, and nut on plunger and piston assembly. Apply hydraulic brake fluid to all slave cylinder parts and bore before assembly. Install piston rod front seal in slave cylinder body before installing rod bushing and front chamber section.

TROUBLE SHOOTING: Check booster operation, and locate trouble by the following tests:

1. Depress brake pedal with engine not running, hold pedal in this position and start engine. Pedal should move downward with engine running. If not, connect vacuum gauge at trailer connection on rear face of power chamber (pipe plug), vacuum gauge should read 18-21" (engine running, brakes off).
2. Depress brake pedal with engine running. Vacuum gauge (above) reading should be zero. If not, control valve is not operating.
3. If test (2) indicates control valve O.K., depress brake pedal until vacuum gauge reads zero, hold pedal in this position for one minute. If pedal moves downward, brake fluid is leaking out of system. If pedal moves upward, slave cylinder piston check valve is leaking.
4. With engine running, depress brake pedal until vacuum gauge reads zero. Turn engine off and hold pedal in this position for one minute. Any upward movement of brake pedal indicates vacuum leakage. Check by starting engine with brakes released. Shut off engine and note vacuum gauge reading. Vacuum should drop not more than 1" per minute. This leakage may be in check valve, vacuum line connections, or in booster unit.

HILL-HOLDER & NOROL

Std. or Optl. Equipment On:

ALL CAR MODELS WITH HYDRAULIC BRAKES

DESCRIPTION:—These units consist of a gravity and clutch pedal controlled check valve in a housing which is ordinarily mounted directly on the end of the hydraulic brake Master Cylinder so that the check valve is in the brake line between the master cylinder and the wheel cylinders. The valve ball is free to roll endwise in the valve cage (when unit tilted by car being on an incline) while the valve cage itself is moved endwise by a cam lever linked to the clutch pedal.

OPERATION:—The valve cage with the rubber seal orifice is normally held away from the valve seat by the clutch pedal controlled camshaft (with the clutch engaged) so that the valve is open and brake operation is conventional. When the clutch is disengaged, the rotation of the camshaft permits the spring behind the valve cage to force the cage back so that the rubber seal seats against the valve seat. If the car is pointed uphill, the ball within the valve cage rolls down against the rubber seal, closing the orifice within the seal so that the brake fluid in the lines is prevented from returning to the master cylinder and brakes are held 'on' even though brake pedal is released. When the clutch is engaged, the valve cage is pulled away from the valve seat uncovering the return passage to the master cylinder and releasing the brakes. If the car is on a level road or pointing downhill, the ball will not close the rubber seal orifice.

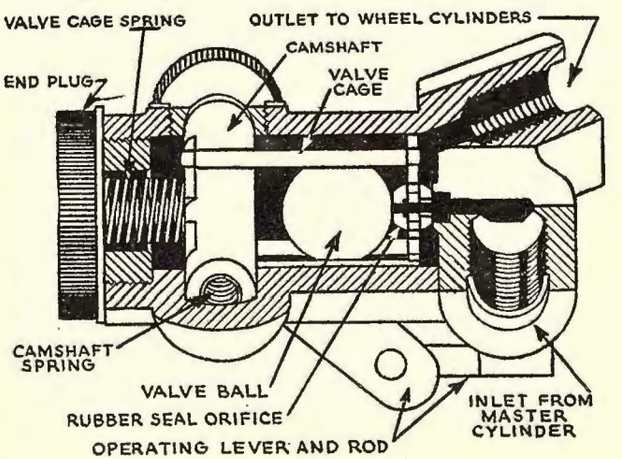
ADJUSTMENT:—Operating lever position must be checked (to insure correct timing of brake release when clutch is engaged) whenever clutch pedal is adjusted. See Clutch pedal adjustment instructions on car model page for special instructions. Adjust as follows:

Adjustment:—Check setting by applying brake on slight incline with clutch disengaged, then shift into low gear, engage clutch slowly and note point at which brakes release. If brakes release too soon and car has tendency to roll backward, loosen locknut and turn adjusting nut on end of control rod away from pedal to lengthen rod. If brakes release late and engine has tendency to stall, turn nut in to shorten rod. Tighten locknut and check setting.

Mounting:—The unit must be mounted in a level position on car frame. To check, place spirit level on bosses on top of hill-holder body casting with car standing on level floor. Unit must be leveled lengthwise (place spirit level on two bosses on top of unit), and crosswise (place spirit level crosswise on one boss).

Hudson & Terraplane 1937 Model. When leveling the unit on these models, place .052" shim stock between spirit level and boss on forward end of the unit (no shims are used at the rear end), adjust unit until spirit level is horizontal. Level unit crosswise by placing spirit level on forward boss.
NOTE—Do not use this shim when leveling unit on 1938 Hudson and Terraplane models.

SERVICING: Before disassembly, mark shaft and lever and replace in same position. Remove ball chamber head plug and spring, withdraw camshaft being careful not to lose camshaft spring, withdraw ball cage assembly. In reassembling unit, see that ball cage is installed with two large ball rail rods underneath camshaft, and that camshaft spring is in place at inner end of camshaft.



HILL-HOLDER & NO-ROL CONTROL UNIT

BENDIX MECHANICAL SINGLE ANCHOR

Lincoln V12, All Models (1937-40)
Willys, Model 48 (1939)
Willys Comm'l, All Models (1939-40)

►**Willys Pass. Car Note (1939 & Later):** Cars beginning with 1939 equipped with Lockheed Hydraulic Brakes. See separate article for data.

DESCRIPTION & OPERATION: All Wheel Brakes. Two shoes per wheel, connected together by turn buckle type adjusting screw at one end and bearing against single anchor pin at other end. Cable actuated lever concentric with anchor pin forces anchor end of primary shoe against drum when brakes applied. Primary shoe applies secondary. Shoes returned to off position by independent spring hooked to lever and brake shoe. Shoes held in position by coiled springs and clips hooked to backing plate.

Brake Linkage:—Wheel brakes actuated by cables from a single cross-shaft on the car frame. Brake cables protected by flexible conduits between frame and wheel. Brake pedal linked to cross-shaft with Vacuum Power Cylinder Control Valve (when used) incorporated in pedal linkage.

Hand Brake:—Hand Brake lever linked to cross-shaft or equalizer plate applies all four service brakes.

ADJUSTMENT: Jack up all four wheels, disconnect cables at cross-shaft, remove adjusting screw hole covers on backing plates and inspection hole covers on drums (remove wheels if disc type). Check pedal position with cross-shaft levers against stops. Pedal should clear underside of toeboard by ½". Adjust by disconnecting pedal link and changing length. Then proceed as follows:

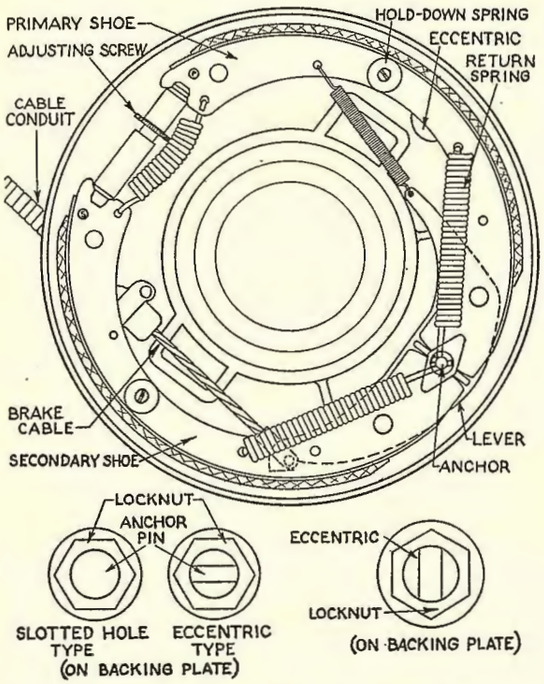
Minor Adjustment (For Wear):—1—At each wheel—loosen eccentric locknut, turn eccentric in direction of forward wheel rotation until .010" feeler is snug at both ends of this shoe. Hold eccentric from turning, tighten locknut. Clearance at both ends must be the same within .003" with smaller clearance preferably at anchor end. If variation greater than .003", anchor pin must be relocated (see Major Adjustment below). NOTE—If feeler gauge not used, turn eccentric up until slight drag felt when wheel turned by hand, then back eccentric off until wheel is just free.

2—At each wheel—insert tool or screwdriver in adjusting screw hole, turn notched adjusting screw toward backing plate rim (move outer end of tool up toward center of wheel) until shoes are expanded so that drum can just be turned, pull brake cables toward cross-shaft to remove all slack, adjust clevis position (loosen locknut, turn clevis, tighten locknut) until pins just enter clevises at cross-shaft lever freely, reconnect brake cables.

3—Back off adjusting screws same number of notches at each wheel until wheels are free. Apply brakes with hand lever or use pedal jack until wheel with least drag can just be turned, equalize brakes by backing off adjusting screws on tight wheels not more than two or three notches. Do not tighten loose wheels.

4—Check pedal reserve (distance from pedal to floorboard with brakes applied). This should be one half total travel (minimum). Recheck adjustment if less than this amount. Then check hand lever

Major Adjustment (New Shoes or Relined Brakes):—1—At each wheel loosen anchor pin nut one turn, tap anchor pin out toward drum (slotted hole type with plain end) or turn anchor pin in direction of forward wheel rotation (eccentric type with slotted end). Loosen locknut, turn eccentric in direction of forward wheel rotation until .010" feeler snug at both ends of this shoe, hold anchor pin, tighten locknut securely with 16" wrench, hold eccentric from turning, tighten eccentric locknut. Then proceed with (2) and (3) under Wear Adjustment



REAR BRAKE ASSY. (FRONT SAME EXCEPT HAND BRAKE LINKAGE OMITTED)

Hand Lever Adjustment:—With hand lever in released position, and cross-shaft levers against stops adjust length of hand lever cable or rod to eliminate all slack. Note following special data:

Willys Models. Hand brake lever linked to intermediate lever on left frame side member by cable with adjustable clevis at lower end. Lower end of intermediate lever is connected to lever on cross-shaft by slotted link (slot provides 'overrun' for foot brake operation). Left hand lever on cross-shaft (to which cables for left front and left rear wheels attached) serves as stop for entire brake system and must contact bracket when brakes are released.

RELINING BRAKES:—Manufacturer recommends use of replacement shoes furnished with new linings installed and ground concentrically. If shoes relined, use same type lining as fitted originally.

Lining Specifications—See Brake specifications on car model page for complete data.

SERVICING:—Brake Linkage—Whenever adjustment made, lubricate brake pedal hand lever, cross-shaft, overrunning linkage and all clevis pins. See that linkage operates freely and returns sharply to stops when pedal and hand lever released.

Cable Conduits:—Lubricate cable and conduit assemblies through fittings (when so equipped) or disconnect cable at both ends, clean thoroughly, pull cable out at wheel end to expose portion normally in conduit, clean and coat with Bendix Cable Lubricant, or graphite grease such as Gredag #213½, pull cable back and forth to spread lubricant in conduit. See that conduit is bottomed firmly in abutment brackets and that bracket bolts are tight.

Wheel Brakes:—With shoes removed, coat brake cam, anchor pin, cable ramps, eccentric, backing plate shoe edges and all other contact points with Bendix Lubriplate. Examine shoe return springs and see that heavier spring it attached to shoe which covers cable end of brake lever.

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

BENDIX HYDRAULIC DOUBLE ANCHOR

Hudson "112", Model 90 (1939)
Hudson Six, 40T Traveler, 40P Deluxe (1940)

►**Hudson Other Model Note**—Other models equipped with Bendix Hydraulic Single Anchor Brakes (With Eccentric Adjustment—Before 1941), Without Eccentric (1941 & Later Models). ***Refer to separate articles on Bendix Hydraulic Brakes for complete data on these other types.***

DESCRIPTION: Wheel Brakes. Two shoes linked together by strut and star adjusting wheel in same manner as on other Bendix Duo-Servo designs. Hydraulic cylinder is mounted on backing plate and has been moved up between shoes at anchor end so that pistons bear directly on ends of brake shoes. Anchor design is new and consists of a short anchor link (for each shoe) pivoted at lower end on anchor bolt (on backing plate) with short stud at opposite end engaging slot in brake shoe web (shoe held against stud when brakes released by short spring hooked between stud and shoe). Shoes are positioned on backing plate by eccentrics (one for each shoe, adjacent to anchor links) and are held against eccentrics by retracting spring hooked between shoes.

Master Cylinder:—Compensating type. Same design as used on other Bendix hydraulic brake systems.

Hand Brake:—Incorporated in rear wheel brakes. Consists of cable actuated lever pivoted on secondary brake shoe anchor link stud and linked to primary shoe by strut. Applies brake shoes mechanically for parking.

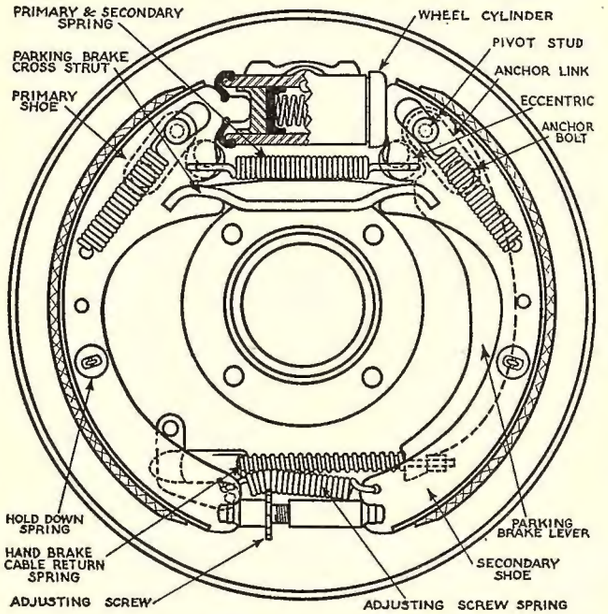
OPERATION: When brake pedal depressed, fluid in wheel cylinder forces piston and shoe out against drum, anchor link stud slides freely in slot in shoe until shoes contact drum. Primary shoe then applies secondary shoe which moves to bring anchor link stud against end of shoe slot and this link serves as anchor for both shoes. Links are mounted so that this braking thrust is in line with link axis so that shoes and anchors are free to swing within limit of eccentric adjustment (shoes follow drum and high spots due to irregular drums are eliminated). When brakes are applied with car in reverse motion, the application is exactly the same except that the opposite anchor link comes into use (only one anchor acts at a time).

ADJUSTMENT: Brake Pedal Clearance. Same as for other Hudson models. *See Bendix Single Anchor Brake (following).*

Minor Adjustment (For Wear):—Jack up all four wheels, remove wheels, remove adjusting hole covers on backing plates and inspection hole covers on drums, disconnect parking brake cables by removing clevis pin in lever toggle at forward end of cables.

CAUTION—If hand brake cables not disconnected, shoes may be held away from eccentrics (if cables adjusted too short) so that correct adjustment cannot be secured.

1. Loosen locknut on primary brake shoe (forward shoe) eccentric, turn eccentric in direction of forward wheel rotation until wheel can just be turned by hand, then turn eccentric slowly in opposite direction until wheel is just free of drag, hold eccentric in this position and tighten locknut. If feeler gauge used, insert .010" feeler between shoe and drum at anchor (upper) end of shoe, adjust eccentric until feeler gauge is snug, hold eccentric from turning and tighten locknut.
2. Adjust secondary shoe eccentric in same manner as primary shoe (above).
3. Remove adjusting hole cover on backing plate, use Tool HM-13985 (or screwdriver) and turn star wheel until brake shoes are expanded tightly against drum (move outer end of tool toward axle to expand shoes, in opposite direction to release shoes). Connect and adjust hand brake cables (see Parking Brake Adjustment below). Back off star wheel until drum is free of any drag (approximately 12 notches, both rear wheels must be adjusted exactly alike to maintain hand brake balance). Install wheels and road test car for equalization.



REAR BRAKE ASSY. (FRONT SAME EXCEPT HAND BRAKE LINKAGE OMITTED)

Complete Adjustment (For Wear or when New Shoes or Linings Installed):—Whenever new shoes or linings installed, or if adjustment does not give satisfactory operation, wheel brakes and cables should be cleaned and lubricated (see Servicing directions below). Jack up all four wheels, disconnect parking brake cable to each rear wheel at equalizer bar. Make following adjustments in order, repeating adjustment at each wheel as noted.

CAUTION—If hand brake cables not disconnected, shoes may be held away from eccentrics (if cables adjusted too short) so that correct brake adjustment cannot be secured.

1. At each wheel, remove inspection hole cover on brake drum, insert .010" feeler between drum and primary shoe (front shoe) near anchor end. Loosen eccentric locknut, turn eccentric in direction of forward wheel rotation until feeler is just snug, hold eccentric in this position, tighten locknut.
2. At each wheel, adjust secondary shoe (rear shoe) eccentric in same manner as primary shoe (above) using same .010" feeler.
3. At each wheel, remove adjusting hole cover on backing plate, use tool HM-13985 (or screwdriver), turn star wheel until brake shoes are expanded tightly against drums (move outer end of tool toward axle to expand shoes, in opposite direction to release shoes). Connect and adjust hand brake cables (see Parking Brake Adjustment below).
4. At each wheel, back off star adjusting wheel until wheel is just free of any drag with parking brake lever in released position. Check parking brake equalization by pulling on lever until wheels can just be turned by hand and noting if drag on rear wheels is equal. Check brakes for balance.

Parking Brake Adjustment:—With brake shoes expanded so that drums can just be turned, pull hand brake lever 'on' two notches so that clearance between hand brake cable lever and end of slot in guide plate is ⅛", pull cables tight, adjust clevis at forward end of each cable so that clevis pins just enter holes in toggle on lever, connect cables, back off adjusting screws until wheels are free and check equalization.

Mechanical Follow-up Adjustment:—Turn adjusting nut on pushrod until clearance between face of nut and end of pushrod tube is 1 7/16" (1939), 1 1/4" (1940), tighten locknut. See separate article for complete Follow up data.

SERVICING:—Brake Shoes. To remove shoes, install clamp (HMO-145) on wheel cylinder (this will make it unnecessary to bleed lines when shoes installed if brakes not applied with shoes off). Remove retracting spring and shoe anchor link springs, release hold-down springs and remove shoe retaining washers, pull anchor end of shoes free from wheel cylinder, lift shoe assembly out. Install shoes in same manner making certain that eccentrics are turned so that high side is away from anchor links. NOTE—Beginning with 90906, heavier (25 lbs.) spring used on secondary shoe. Lighter (20 lbs.) spring continued for primary shoes.

Backing Plate and Linkage. Remove anchor links by removing anchor bolt nuts on backing plate. Apply thin film of Bendix Lubri-plate to backing plate side of anchor links, shoe support ledges on backing plate, eccentrics, parking brake cable ramp, and all other moving or sliding parts. When installing anchor links, tighten anchor bolt nuts so that all sideplay removed but make certain that anchor links move freely.

Parking Brake Linkage. Disconnect brake cables at equalizer bar, clean exposed portion of cable, pull cable through conduit at wheel end until portion in conduit is exposed, clean and lubricate this part of cable with Bendix Cable Lubricant, push cable back into conduit. To connect cable (after shoes installed), move cable return spring away from cable end, place cable end in groove in end of brake operating lever, allow return spring to come back against lever to hold cable in place. Lubricate cable ramp with Bendix Lubri-plate. Adjust brakes and connect cables to equalizer bar.

Lining Specifications—See Brake specifications on car model page for complete data.

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

BENDIX HYDRAULIC–SINGLE ANCHOR (WITH ECCENTRIC ADJUSTMENT)

Cadillac V8, 39-75 (1939), 40-75 (1940)
Cadillac V16, Series 90 (1939)
Hudson 6 & 8, All exc. "112" (1939-40)
Nash 6 & 8, All Models (1939)
Nash 8, Ambassador 4080 (1940)
Oldsmobile 8, All Models (1939)
Packard 6, All Models (1939)
Packard "120" & Super 8, All (1939)
Packard Comm'l, 1801A, 3A, ('40), 1901A, 3A ('40)
Packard Comm'l, 2001A, 3A (1942)
Packard Super 8, '160' 1804, 5 ('40), 1904, 5 ('41)
Packard Super 8, '160' 2004, 5, 55 (1942)
Packard Super 8, '180' 1807, 8 ('40), 1907, 8 ('41)
Packard Super 8, '180' 2007, 8 (1942)
Packard Twelve, All Models (1939)
Pontiac 6 & 8, All Models (1942-48)

NOTE: Hudson Brake Follow-up. Mechanical follow-up used by which rear wheel brakes are applied by pedal, after hydraulic action, as a reserve. Check setting when brakes adjusted—see section at end. Hill Holder is optional equipment. See separate article for adjustment to insure synchronization of release with clutch engagement.

Packard Twelve. Bendix internal valve type Vacuum Power Cylinder linked to brake pedal lever. Check setting whenever brakes adjusted. See separate article.

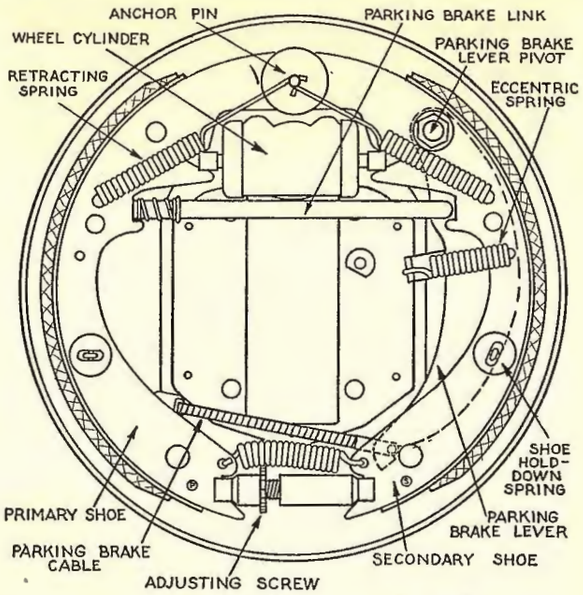
Pontiac Models. New type rubber adjusting hole covers (on 1939 and later cars) can be installed on previous cars to prevent dirt entering through adjusting hole. To install these Part No. 503630 covers, moisten cover with water or brake fluid, start one end in adjusting hole, strike cover with hammer to seat it in backing plate.

Pontiac (1942 & Later) Wheel Cylinder Stops. Located on backing plate and prevent the pistons being forced out of cylinder by brake application with drums or shoes removed. These stops make it unnecessary to use piston clamps to retain pistons when drums and shoes removed but wheel cylinder must be removed from backing plate before it can be dismantled or pistons taken out.

DESCRIPTION & OPERATION: All Wheel Brakes. Brake shoes used in this type are entirely similar to those used in mechanically operated brakes (see previous article). A rigid type hydraulic cylinder with double opposed pistons is mounted on the backing plate below the anchor bolt. The opposed pistons are connected to the brake shoes through short struts or studs and force the anchor ends of the brake shoes against the drum when the brake fluid, displaced from the master cylinder by depressing the pedal, flows through the lines to the wheel cylinders. The primary shoe applies the secondary shoe in the usual manner. Shoes are returned to the 'off' position by retracting springs hooked to shoes and anchor pin as on mechanical brakes and are adjusted in the same manner.

Hand Brake:—When incorporated in wheel brakes (rear wheels only), consists of cable actuated lever pivoted on one shoe and linked to other shoe by a strut so that the shoes are expanded against drums at anchor ends when brake is applied. Hand brake is adjusted as part of service brake adjustment.

ADJUSTMENT: Before adjusting, jack up all four wheels, disconnect parking brake (hand lever) cables at intermediate lever, remove adjusting screw hole cover on backing plate and feeler gauge hole cover on drum (remove wheels for access to this hole). Adjust as directed below. CAUTION—If hand brake cables not disconnected, shoes may be held 'on' by cables (if adjusted too tight) so that correct brake adjustment cannot be secured.



REAR BRAKE ASSY. (FRONT SAME EXCEPT HAND BRAKE LINKAGE OMITTED)

Bleeding Brake System. See separate article on Hydraulic Brake Servicing for complete bleeding directions (required when lines disconnected, to remove wrong type fluid which has been used in system, or to remove air from lines caused by allowing master cylinder supply tank to become dry).

BRAKE PEDAL ADJUSTMENT

Brake Pedal Clearance:—Brake pedal must have ⅜" free travel before master cylinder piston begins to move. To adjust, loosen locknut at outer end of master cylinder boot, change length of brake pedal rod, tighten locknut. By-pass port between master cylinder and supply tank must be uncovered when piston 'off' to provide compensating action.

Cadillac 1940. Rubber grommet on pedal under toeboard should be compressed to overall length of ¾" with brakes released.

Hudson 1939-40. Clearance between pedal shank and underside of toeboard should be ¼" with brakes released. To adjust, remove clevis pin and loosen locknut on link connecting pedal and master cylinder bellcrank, turn link until clevis pin can just be inserted with pedal shank ¼" from toeboard and bellcrank against its stop.

Oldsmobile 1939. Sponge rubber bumper on underside of toeboard must be compressed not more than 1/16" with pedal released and master cylinder piston against its stop. Adjusted in same manner as other cars (above).

Packard Models. Brake pedal free travel should be ¼"-½" with pedal in released position.

Packard Twelve. Vacuum power cylinder and master cylinder linkage must be adjusted together. See preceding article on Bendix Vacuum Cylinder for complete data.

Pontiac 1942 & Later—Adjust pedal height so top of pedal is even with top of clutch pedal and set both pedals so that distance from floor mat to underside of pedal pad is 4¾" (Torpedo Six and Eight), 5 3/16" (Streamliner Six & Eight).

MINOR (WORN LINING) ADJUSTMENT

Minor Adjustment (For Wear):—Adjust at each wheel as follows:

1. (All Models). Loosen eccentric locknut on backing plate and turn eccentric in direction of forward wheel rotation until .010" feeler is snug between lining and drum at each end of this secondary shoe, hold eccentric from turning, tighten locknut. Clearance at both ends of shoe must be alike within .002" (Cadillac), .003" (all others) with smaller clearance preferably at anchor end. If variation greater than this amount, anchor must be re-located (See Major Adjustment below). If feeler gauge not used, turn eccentric up until heavy brake drag secured, then back eccentric off until wheel is just free of drag. NOTE—When using feeler gauge to check clearance, gauge should be inserted at point approximately 1½" from end of shoe lining.

2. (All Models). Insert special tool, or screwdriver, in adjusting screw hole on backing plate, turn adjusting screw by moving outer end of tool up toward center of wheel to expand shoes until wheel can just be turned (if necessary to turn adjusting screw more than 50 notches or clicks, examine linings for wear and replace if necessary). Adjust and connect hand lever cables (see Hand Brake Adjustment below). Then back off adjusting screw until wheel is just free of any drag (approx. 20 notches) or until .010" feeler is snug between lining and drum at center of primary shoe. Check brake equalization by depressing brake pedal (holding pedal with pedal jack) until wheel with least drag can just be turned by hand, equalize by backing off adjusting screws on tight wheels not more than 2-3 notches. Do not tighten loose wheels.

Hudson Note. Check mechanical 'follow-up' setting after adjusting brakes. See separate article.

HAND BRAKE ADJUSTMENT

3. Hand Brake Adjustment (All Models). Adjust hand brake cables for each model as follows:

Cadillac. With rear brake shoes expanded so that rear wheels can just be turned by hand, make certain that hand lever in 'off' position, pull cables taut and adjust clevises so that clevis pins can just be inserted. Connect cables and back off adjustment at shoes 15-20 notches until wheels are just free. Equalize brakes—see Minor Adjustment (2).

Hudson & Terraplane Models. With brake shoes in rear wheels expanded so that wheels can just be turned, pull hand lever on 2 notches so that equalizer bar is ⅛" from stop, adjust clevises at forward ends of cables so that clevis pins just enter holes in equalizer bar with cables pulled tight, connect cables and make certain that rear face of equalizer plate is parallel with face of stop. Release hand brake, back off adjusting screw at each wheel until brakes just free of drag. Check equalization.

Nash. With rear brake shoes expanded tightly against drum, pull hand lever 'on' 2 notches, loosen two bolts on adjusting clamp (connecting lever and wheel cables), pull cables tight and tighten bolts. Return lever to 'off' position. Back off adjusting

CONTINUED ON NEXT PAGE

BENDIX HYDRAULIC (Cont.)

screw in each wheel to free brakes and check equalization as directed in (2) above. See that hand brake lever on each wheel backing plate has ⅛" free travel with hand lever in off position. Equalize hand brakes by loosening rear bolt in cable adjusting clamp and applying hand brakes (this will allow cable to shift on adjusting clamp). Check position of hand brake cable guide on rear spring. Guide should be exactly 19¾" (Nash 6, Nash-Lafayette), 18¼" (Nash 8).

Oldsmobile Models. With rear wheel brake shoes expanded until heavy drag secured on wheels, pull parking brake cable toward equalizer to remove all slack, adjust clevis at forward end of each cable so that clevis pin can just be inserted through both clevises and hole in equalizer bar link with link held parallel to drive shaft. Install clevis pin with head to top. Back off adjusting screw in each wheel approximately 20 notches until wheel is free of any drag. Check equalization. See Minor Adjustment (2).

Packard 1937-41. Adjust clevis at equalizer end hand brake lever cable to remove all slack with lever released and equalizer against stop. With rear wheel brake shoes expanded so that wheels can just be turned by hand, place hand lever in first notch, adjust clevis at forward end of each wheel cable so that clevis pin can just be inserted with all slack removed and equalizer bar held at right angles to frame. Back off adjusting screw in each wheel until wheels are just free of any brake drag, equalize brakes—see Minor Adjustment (2).

Packard (1942). With brake shoes expanded so that drums can just be turned by hand, pull hand lever on to first notch of ratchet sector, back off locknut on connector link at equalizer bar, pull forward on wheel cable with 20 lb. pull to eliminate all slack and lost motion, tighten adjusting nut on connector link against cable sleeve, tighten locknut. Release hand lever, back off adjusting screw in each rear wheel until drums rotate freely without drag. Check equalization. See Minor Adjustment (2).

Pontiac (1942-48): Check brake cable tension by moving clevis pin at cross lever wheel cable spreader, pin should move up and down with thumb and finger pressure (hand lever in released position, rear wheel brake shoes not expanded), and both rear wheels should lock with hand lever in third notch. To adjust, remove cross lever clevis pin and engage pin in another of the several holes in the cable spreader (approximate setting), remove hand lever clevis pin and turn clevis on cable (exact setting) using extreme care not to twist the cable. To equalize wheel cables after adjusting, loosen clampscrews on wheel cable spreader at cross lever (if necessary pry clamp ears apart with a screwdriver so that cable free in spreader), apply brakes hard by pulling back on hand lever, tighten spreader clampscrews before releasing hand lever.

MAJOR (NEW LINING) ADJUSTMENT

Major Adjustment (For New Shoes or Relined Brakes): —If shoes with new linings being installed, adjusting screw and eccentric adjustment must be backed off to allow drums to be installed. Disconnect parking brake cables, remove adjusting screw cover on backing plate and inspection hole cover on drums. Adjust brakes at each wheel as follows:

1. Anchor Pin & Eccentric Adjustment (All Models). Loosen eccentric locknut, turn eccentric in direction of forward wheel rotation until .010" feeler is just snug at adjusting screw end of this secondary shoe, hold eccentric from turning and tighten locknut. Check clearance at anchor pin end (opposite end) of this same shoe. If clearance not .010", adjust anchor pin as follows: Loosen anchor pin locknut one turn, turn anchor pin in direction of forward wheel rotation (eccentric type with slotted end) or tap anchor pin out toward drum (slotted hole type with plain end) until clearance at anchor pin end of shoe is exactly .010", hold anchor pin from moving and tighten locknut securely with 16" wrench. Recheck clearance at adjusting screw end of shoe. Make any necessary readjustments at eccentric and anchor pin until .010" clearance secured at both ends of this shoe. Then proceed with adjustments (2) and (3) as given under Minor (Wear) adjustment above.

RELINING BRAKES: Manufacturer recommends use of replacement shoes furnished with new linings installed and ground concentrically. If shoes relined, use same type lining as fitted originally (see Car Model article). Lining on primary and secondary shoes may be of different types (woven on primary, moulded on secondary, etc.), or of different lengths. Shoes may be identified by 'P' (primary), 'S' (secondary) stamped on rib.

SERVICING: Brake Cable Lubrication—*See preceding data on Bendix Mechanical Brakes.*

Brake Drum Grinding. On all Buick, Cadillac, Oldsmobile models, not more than .030" should be removed from drum. Removing of greater amount will weaken drum and may cause distortion. On Pontiac models, manufacturer recommends that drum be replaced if seriously scored.

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

BENDIX HYDRAULIC-SINGLE ANCHOR (WITHOUT ECCENTRIC)

Buick, All Series (1939-51)
Cadillac V8, 60S, 61 (1939), 60S, 62, 72 (1940)
Cadillac V8, All Series (1941-51)
Hudson 6 & 8, All Series (1941-51)
LaSalle V8, All Series (1939-40)
Nash Amb. 6, All Models (1940-51)
Nash Amb. 8, All Models (1941-42)
Nash-Lafayette, Model 4010 (1940)
Oldsmobile 6, All Models (1939-50)
Oldsmobile 8, All Models (1940-51)
Packard Clipper, Model 1951 (1941)
Packard "110" 6, All Models (1940-41)
Packard Clipper 6, All Models (1942 to 1947)
Packard "120" 8, All Models (1940-41)
Packard 8, All Models (1942-50)
Packard Super 8, "160" 1803 (1940), 1903 (1941)
Packard Super 8, "160" 2003, 2023 (1942)
Packard Super 8, All Models (1946-50)
Packard Cust. 8, "180" 1806 (1940), 1906 (1941)
Packard Cust. 8, "180" 2006 (1942)
Packard Cust. 8, All Models (1946-50)
Packard "200", "300", "400" Eights (1951)
Pontiac 6 & 8, All Models (1939-40-41)
Pontiac 6 & 8, All Models (1949-51)

►CHANGES, CAUTIONS, CORRECTIONS

►**Buick 1951 Series 70 "Segmented Lining"**—Shoe Lining consists of three segments bonded to the shoe (riveted lining on other series). *See car model page for lining specifications.*

►**Buick 1939 Adjusting Caution**—First cars have eccentric adjustment but it is turned and locked in position so that it is inoperative and short secondary shoe spring (hooked between center of secondary shoe and backing plate—normally used with eccentric adjustment) is not used.

►*CAUTION—On these models the eccentric should not be disturbed.*

►**Cadillac 1951 Series 60S, 61, 62 "Self-adjusting" Anchor**—Spring-loaded, slipper type anchor pin used which automatically centers the shoes within the brake drum (see illustration). This anchor automatically compensates for lining wear.

►*CAUTION—No anchor pin adjustment is required for this "self-adjusting" Anchor.*

►**Hudson Pedal Connection Change** (for less sensitive brakes but with harder pedal action, particularly at low speeds)—The brake pedal link may be changed to right hand hole in master cylinder operating lever. On all production cars, link is regularly assembled in left hand hole for soft pedal action.

►**Oldsmobile Eccentric Anchor Pin Adjusting Note.** Anchor pin on 1942 & later cars has square shank for wrench engagement (previous type slotted for screwdriver). End of shank is beveled on one edge and high point or edge which is not beveled indicates high point of eccentric anchor adjustment.

DESCRIPTION

DESCRIPTION: This brake similar to other Bendix single anchor designs except that secondary shoe eccentric not used (see Buick Note & Caution above) and short spring between secondary shoe and backing plate (used normally to hold shoe against eccentric) is omitted. This design requires special adjustment instructions as given below.

ADJUSTMENT: Before adjusting, jack up all four wheels, loosen or disconnect parking brake cables at intermediate lever or equalizer, remove adjusting screw hole cover on backing plate. Check brake pedal clearance (see Brake Pedal Adjustment below). Adjust each wheel brake as directed below.

BRAKE PEDAL ADJUSTMENT

Brake Pedal Adjustment: On all models, pedal must be adjusted to insure master cylinder piston being back against its stop (within master cylinder) for correct compensating action when brakes released. To adjust, loosen locknut on piston connector rod, turn clevis on rod to secure clearances specified below with master cylinder piston against the stop.

Buick. Clearance between pedal and underside of toeboard should be ⅞" (all 1939 models, 50,70,80,90 (1940), 1 1/16" (40, 60 '40), 1" (1941 & later cars).

Cadillac, LaSalle. Rubber grommet on pedal under toeboard should be compressed to ¾" with brakes released and master cylinder piston against its stop. This provides ⅛" clearance between end of pedal rod and master cylinder piston.

CONTINUED ON NEXT PAGE

BENDIX HYDRAULIC (Cont.)

Hudson—Pedal shank clearance at toeboard should be exactly ¼-⅜". Adjust by loosening pedal link clevis nut and turning clevis. See that master cylinder piston rod is against stop after setting pedal.

Nash—¼-½" pedal free travel in released position. Adjust by loosening locknut and turning pedal rod.

Oldsmobile. Sponge rubber pedal bumper on underside of toeboard should be compressed not more than 1/16" (1939-40), 3/16" (1941 & later cars) with brakes released and master cylinder piston against its stop.

Packard — Brake pedal should have ¼-½" free movement or play in the released position.

Pontiac—Pedal height should be adjusted so that brake pedal is even with clutch pedal. Distance from floor mat to pedal pad should be as follows:

Model 40-25	5 1/8"
Model 40-26, 40-28	4 3/4"
Model 40-29	5"
Model 41-25, 41-27	4 3/16"
Model 41-24, 41-29	5 3/16"
Model 42-25, 42-27 (1942)	4 3/4"
All other 1942 & 1946-48 Models	5 3/16"
1949-51 All Models	4 1/2"

Clutch Pedal Adjusting Note—On Synchro-mesh transmission cars, adjust clutch pedal to same height as brake pedal.

MINOR ADJUSTMENT

►*CAUTION—On 1939-49 Cadillac, 1939-40 LaSalle, 1939-48 Packard, manufacturer recommends minor adjustment be made in same way as major adjustment (below).*

Minor Wear Adjustment: Check and adjust brake pedal clearance (see Brake Pedal Adjustment), release hand brake lever and see that cables are free and are not holding rear brakes on. At each wheel, expand brake shoes by turning adjusting screw up until wheel can just be turned by hand, adjust hand brake (cars where hand brake adjusted with shoes "expanded"—see Hand Brake Adjustment), then back adjusting screw off the number of notches or "clicks" as shown in table below. Check wheel for freedom from drag (if drag noted, tap backing plate to assist centralizing of shoes, then recheck).

Adjusting Screw Setting

Buick	①15 Notches
Cadillac (1939-49)	See Caution above
Cadillac (All 1950), 75 & 86 (1951)	12 Notches
Cadillac 60S, 61, 62, (1951)	16 Notches
Hudson	14 Notches
LaSalle	See Caution above
Nash	14 Notches
Oldsmobile	16 Notches
Packard (1940-48)	See Caution above
Packard (1949-51)	16 Notches
Pontiac	14 Notches

①—17 Notches maximum.

MAJOR ADJUSTMENT

(ALL MODELS)

Major Adjustment (For New Shoes, Relined Brakes or when Minor Adjustment not satisfactory):—Jack up all four wheels, loosen or disconnect parking brake cables at equalizer or intermediate lever, remove adjusting screw hole cover on backing plate and inspection hole cover on drums (remove wheels for access). Check pedal clearance (see Brake Pedal Adjustment below). Adjust each wheel brake as follows. CAUTION—If hand brake cables not disconnected or loosened, shoes may be held on by cables (if adjusted too tight) so that correct brake adjustment cannot be secured.

Anchor Pin & Adjusting Screw Adjustment—Turn drum so that inspection hole is at center of secondary shoe (rear shoe on each wheel), insert screwdriver and pry secondary shoe away from drum so that primary shoe (other shoe) is seated solidly against drum. Insert screwdriver or special adjusting tool in hole on backing plate and turn notched adjusting screw by moving handle of tool up toward center of wheel until feeler gauge is snug between lining and drum at adjusting screw end of secondary (rear) shoe. Check clearance at anchor pin (opposite) end of this shoe. If clearance not correct, adjust anchor pin by loosening **locknut and tapping anchor out toward drum (slotted hole type with plain end) or turn anchor pin in direction of forward wheel rotation** (eccentric with slotted end) until correct clearance secured, **hold anchor pin from shifting and tighten locknut securely with 16" wrench. Recheck clearance at adjusting srew end of shoe. Make any necessary re-adjustments at adjusting screw and** anchor pin for correct clearance at both ends.

It is very important that primary shoe be out in solid contact with drum while this adjustment being made. Adjust hand brake cables as directed in Hand Brake adjustment.

Brake Shoe Clearance

Buick	①.015"
Cadillac (1939-50)	①.015"
Cadillac (1951)	②.007-.010"
Hudson	①.015"
Nash	①.015"
Oldsmobile	①.015"
Packard	.010"
Pontiac	①.015"

①—At each end of secondary shoe after primary shoe has been moved out against drum.

②—Or .015" at each end of secondary shoe with primary shoe out against drum.

Buick—Turn adjusting screw up to expand shoes until wheel can just be turned with both hands (if wheel off, drum should just turn with long bar). Adjust anchor pin as follows: Loosen anchor pin nut just enough to allow anchor pin to slide in the slotted hole (CAUTION—loosening nut too much will allow springs to tilt the pin), rap backing plate with hammer adjacent to anchor pin to insure pin assuming central position between shoes, tighten anchor pin nut securely, then recheck drag (if this has changed, repeat anchor pin adjustment). Check and adjust hand brake (see Hand Brake Adjustment). Adjust shoe clearance by backing off adjusting screw in wheel 15 notches or "clicks." Wheel should be free of any drag (corret light drag by backing off screw 1-2 notches additional).

Cadillac 60S, 61, 62 (1951) with Self-adjusting Anchor Pin—Same as Minor Wear Adjustment above except that hand brake cables should be loosened at equalizer turnbuckle to insure slack in cables. ***Anchor pin on these models does not require adjustment.***

Cadillac (All '50, 75 & 86 '51), Hudson, Nash, Oldsmobile, Pontiac—Insert .015" feeler gauge through slot in drum at point 1½" from adjusting screw end of **secondary (rear) shoe,** turn adjusting screw up to expand shoes until feeler gauge tightly gripped (to move primary (front) shoe out against drum), then back adjusting screw off until only a slight drag is felt on the feeler gauge (will insure .015" clearance at this point). Check clearance at point 1½" from anchor pin end of this same secondary shoe. If .015" feeler does not have equal or slightly heavier drag at this point, adjust anchor pin (see notes below on slotted and eccentric type anchors) for correct .015" clearance at this point, tighten anchor pin nut to 75 ft. lbs. torque. Adjust hand brake, check and adjust brake pedal clearance (below).

Eccentric Anchor Pin—Pin has squared end and can be turned with a wrench after nut has been loosened. Turn pin in direction of forward wheel rotation to decrease shoe clearance. End of anchor pin is beveled and high point indicates high side of eccentric cam. Hold pin with wrench when tightening nut.

Slotted Anchor Pin—Anchor pin hole in backing plate is slotted. To adjust, loosen anchor pin nut and tap pin out toward drum to decrease shoe clearance.

Packard—Check position of anchor pin cam before making adjustments ("high" side of slotted anchor pin must be on rear side of slot—if pin incorrectly assembled, loosen locknut and turn pin 180°). Turn brake shoe adjusting screw up until wheel is just locked, then back screw off exactly 6 notches or "clicks." Adjust anchor pin by loosening locknut and turning pin forward or backward until wheel is free, then hold anchor pin from turning and tighten locknut securely. Again turn adjusting screw up until wheel is just locked, then back screw off exactly 16 notches or "clicks" for correct shoe clearance. NOTE—Clearance can be checked by inserting .010" feeler gauge through slot in drum if desired.

CAUTION—When checking clearance with feeler gauges, gauge should be inserted approximately 1½" from end of shoe lining.

HAND BRAKE ADJUSTMENT

Hand (Parking) Brake Adjustment: ***CAUTION—Brake shoes must be expanded on some cars when adjusting hand brake cables. Adjust each car as follows:***

Buick—With rear wheel brake shoes expanded so that wheels can just be turned by hand, place hand lever in fully released position, hold brake lever cable to prevent twisting and tighten nut at rear wheel cable sheave (under torque tube) to remove all slack from cables. Back off brake shoe adjusting screw 15 notches or "clicks" for correct shoe clearance and check wheels for drag.

NOTE—On 1940 Buick models, parking brake lever has two holes for brake cable attachment. Standard

CONTINUED ON NEXT PAGE

BENDIX HYDRAULIC (Cont.)

setting is with cable attached to upper bolt but cable can be shifted to lower hole for less lever movement (results in harder operating brake).

Cadillac, LaSalle (1939-40)—With rear brake shoes expanded so that rear wheels can just be turned by hand, make certain that hand lever in 'off' position, pull cables taut and adjust clevises so that clevis pins can just be inserted. Connect cables and back off adjustment at shoes 15-20 notches until wheels are just free. Check equalization.

Cadillac (1941). With brakes released (shoes not expanded in drums), loosen nut on rear end of hand lever cable rod at wheel cable sheave. Expand rear wheel brake shoes by turning adjusting screw at each wheel until drums can just be turned by hand. See that hand lever in fully released position, tighten nut at rear wheel cable sheave (locknut must be backed off to permit this adjustment) until cables are taut, tighten locknut. Back off adjusting screw in each wheel 15-20 notches so that wheels are free.

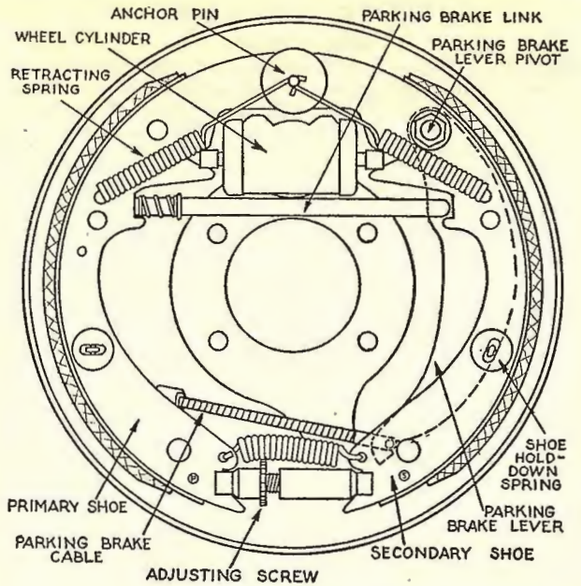
Cadillac (1942-48). CAUTION—Do not change position of brake shoe adjusting screw when making this adjustment. With service (foot) brake fully released, loosen nut on end of hand lever cable rod end at wheel cable equalizer in "X" member under car, see that hand lever in fully released position, tighten nut at equalizer until cables are taut, tighten locknut. See that rear wheels free of drag.

Cadillac (1949-51)—Do not expand rear brake shoes. Loosen locknut on rod at rear wheel cable equalizer at cross-member on frame, turn up nut on rear end of rod until cables are taut, tighten locknut. Check adjustment by using spring scale hooked to hand brake lever to apply brakes with 50-60 lbs. pull. In this position, measure distance hand lever has travelled from released position which should be 2¼". If not correct, readjust cables at equalizer.

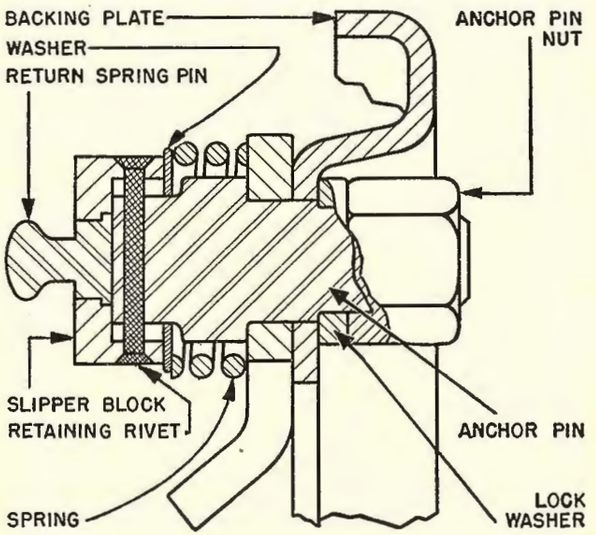
Hudson (1942-48). With rear shoes expanded tight against drum, pull hand lever 'on' two notches so that clearance between hand brake cable lever and end of slot in guide plate is ⅛", pull cables tight, adjust clevis at forward end of each cable so that clevis pins just enter holes in toggle on lever, connect cables, back off adjusting screw in each wheel until wheels are free, check equalization.

Hudson (1949-51)—With brake shoes expanded so that wheels can just be turned by hand, pull hand lever "on" two notches and check clearance between hand brake cable lever and end of slot in lever guide plate on frame cross-member. If this clearance not ⅛", loosen locknut and adjust hand brake cable clevis. Pull each rear brake cable tight and adjust clevis on forward end of cable so that clevis pin can just be inserted with all slack removed from cable. Connect cables, release hand lever, back off adjusting screw in each wheel 14 notches for correct shoe clearance, check brake equalization.

Nash (1941-48). With rear brake shoes expanded against drum, pull hand lever 'on' 2 notches, loosen two bolts on adjusting clamp (connecting lever and wheel cables), pull cables tight and tighten bolts. Return lever to 'off' position. Back off adjusting screw in each wheel to free brakes and check equalization. See that hand brake lever on each wheel backing plate has ⅛" free travel with hand lever



REAR BRAKE ASSY. (FRONT SAME EXCEPT HAND BRAKE LINKAGE OMITTED)



CADILLAC "SELF-ADJUSTING" ANCHOR

in off position. Equalize hand brakes by loosening rear bolt in cable adjusting clamp and applying hand brakes (this will allow cable to shift on adjusting clamp). Check position of hand brake cable guide on rear spring. Guide should be exactly 19¾" (1940), 17½" (1941-48) to rear of spring front eye bolt center line.

Nash Hand Brake Pulley Adjustment—When adjusting hand brake, first check position of hand lever cable pulley on front of dash (in engine compartment) and adjust cable position on pulley so that upper rear edge of pulley (segment type) is exactly 1⅝" from top of pulley bracket upper mounting screw with hand brake lever in fully released position. Then adjust hand brake in usual manner (adjustment located at wheel cable equalizer clamp under car).

NOTE—On 4860 cars, and 4760 after Serial No. R-451662, an aligning pin hole is provided in the pulley bracket. The pulley can be correctly located by using J-1390 Gear Shift Aligning Pin.

Nash (1949)—Pull hand lever "on" one notch. Remove all slack from cable at rear brake cable equalizer. Place hand lever in full "off" position and check rear wheel brakes for freedom from drag.

Nash (1950-51)—Do not expand rear brake shoes. Pull hand lever "on" 4" (measure from the face of bracket to handle). At rear wheel cable equalizer, loosen forward nut and tighten rear nut on hand lever cable fitting until rear brakes are fully applied, then tighten forward nut. Release hand lever and check brakes for freedom from drag.

Oldsmobile. With rear wheel brake shoes expanded so that drums can just be turned, pull wheel cables forward to eliminate all slack, adjust clevises on forward ends of cables so that clevis pins can just be inserted with equalizer link held parallel to propeller shaft, connect cables (insert clevis pins with head toward top), back off adjusting screw in each wheel approximately 16 notches until wheels are free, check equalization.

Packard (1940-48). With brake shoes expanded so that drums can just be turned by hand, pull hand lever on to first notch, pull each rear wheel cable forward with 20 lbs. pull to take up all slack and lost motion, adjust clevis on forward end of each cable so that clevis pin can just be inserted in equalizer link with link centered, connect cables. Back off adjusting screw in each rear wheel until drums turn freely without drag, check equalization.

Packard (1949-51). With brake shoes expanded so wheels can just be turned by hand, tighten adjusting nut at rear of cable equalizer on intermediate lever in frame x-member to remove all slack from cables. Back off adjusting screw 16 notches to provide correct shoe clearance, check brakes for freedom from drag.

Pontiac (1939-41). Check cable tension by moving clevis pin at cross lever wheel cable spreader, pin should move up and down with thumb and finger pressure (hand lever in released position, rear wheel brake shoes not expanded), and both rear wheels should lock with hand lever pulled on 5/8". To adjust, remove cross lever clevis pin and engage pin in another of the several holes in the cable spreader (approximate setting), remove hand lever clevis pin and turn clevis on cable (exact setting) using extreme care not to twist the cable. To equalize wheel cables after adjusting, loosen clampscrews on wheel cable spreader at cross lever (if necessary pry clamp ears apart with a screwdriver so that cable free in spreader), apply brakes hard by pulling back on hand lever, tighten spreader clampscrews before releasing hand lever.

Pontiac (1949-51). With foot brakes properly adjusted, 5/8" travel of the hand brake lever should just lock the rear brakes. If the clevis pin at the

CONTINUED ON NEXT PAGE

BENDIX HYDRAULIC (Cont.)

cross lever cable spreader can be moved up or down with thumb and finger when brake lever is in released position the cables are not too tight. Adjust by re-locating pin in equalizer for coarse adjustment, and for fine adjustment, with clevis on forward cable end at intermediate lever. To equalize brakes loosen clamps on cable spreader, spread clamp, and apply brake hard. Re-tighten clamps.

SERVICING: All service operations including Bleeding of Lines, Brake Shoe Removal & Installation (except eccentric and short secondary shoe spring data which should be disregarded), Master Cylinder & Wheel Cylinder Overhaul are same as on other Bendix brake installations. See preceding article on Bendix Duo-Servo, Single Anchor Type With Eccentric adjustment for data.

Pontiac Wheel Cylinders—Wheel cylinders of two different lengths are installed at factory and special backing plates (with narrow or wide piston stops to fit each type wheel cylinder) are used with each cylinder. Backing plate with narrow stop dimension only is furnished for service and stops must be filed out 1/16" on each side when service backing plate used with longer wheel cylinder.

Lining Specifications—See Brake specifications on car model page for complete data.

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

HUDSON MECHANICAL FOLLOW-UP

Hudson 6 & 8, All Models (1939-51)

DESCRIPTION & OPERATION: Consists of overrunning mechanical linkage between brake pedal and hand lever equalizer bar plate by which wheel brakes are set mechanically through hand lever or parking linkage after movement of pedal sufficient to operate brakes hydraulically has taken place. Acts as reserve if hydraulic application fails or when pedal travel excessive.

ADJUSTMENT: See that master cylinder operating lever is against stop (brake pedal stop) and that rear brake cable equalizer bar plate is against stop on bracket, loosen locknut on threaded follow-up rod below brake pedal, turn adjusting nut until clearance between face of nut and front end of pushrod tube is 1 7/16" (1939), 1¼" (1940 on), tighten locknut. This will provide correct lag between hydraulic application of brakes and the mechanical follow-up action.

1948 & Later Model Note—This ¼" measurement should be made from clevis pin in idler lever to rear end of slotted link on brake pedal follow-up pull rod.

STEWART-WARNER BRAKES

PIERCE ARROW 8 & 12, ALL MODELS (1936-37-38)

POWER UNIT NOTE: Bendix Vacuum Power unit used on all models. *See "Bendix Vacuum Cylinder—Plain Type—External Valve" for complete data.*

DESCRIPTION AND OPERATION:—Wheel Brakes—Two shoes per wheel anchored at adjusting screw end (heel) and operated by floating cam on brake shaft at opposite end (toe). Front brake shoes released proportionally to turning angle when turned from straight-ahead position. Shoes held in off position by short retracting spring hooked to shoe at center. Adjustments consist of centralizing screw (set angularly on backing plate so that tapered head contacts web of one shoe) and adjusting nut at anchor end which expands shoe.

Linkage:—Consists of single cable in conduit from brake lever forward to front brake cross-shaft and rearward to rear brake cross-shaft. Brake operating cams float on ends of cross-shafts. Cables require adjustment only when chassis units serviced.

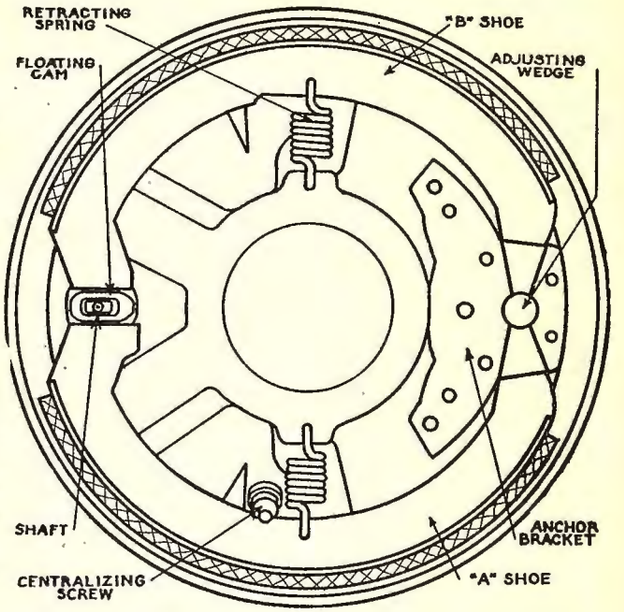
Hand Lever:—Applies all four service brakes. Provided with 'overrun' which provides automatic take-up in service. Overrun must be reset in lower position when brakes are adjusted.

ADJUSTMENT:—For Wear—Set hand lever in off position, see that pin is engaged in lower slot of brake rod overrun and that pin does not contact forward end of slot. Set front wheels in straight-ahead position (important). Jack up all 4 wheels, at each wheel, turn hexagonal adjusting screw clockwise until wheel can just be turned by hand, then back off adjusting nut 9 notches (front wheels), and 12 notches (rear wheels), tap nut snugly toward backing plate. One notch on nut moves shoe .001" (measured at center) and there are 6 notches per revolution of the nut. If wheel does not turn freely after adjusting, turn centralizing screw on backing plate in or clockwise until brake drags appreciably, then back screw off until wheel is free. Road test car and equalize wheels. Braking force is 54% front wheels, 46% rear wheels.

Hand Lever Adjustment:—After adjusting brakes (above), loosen locknut and adjust clevis at rear of hand lever brake rod until only slight clearance remains between lever pin and end of lower slot in overrun at forward end of brake rod.

Linkage Adjustment:—When cable adjustment required, see that cable conduit support springs are in place and fastened so that cable does not sag, place hand lever in 'off' position with pin engaging lower slot of rod overrun, set front wheels in straight-ahead position, loosen both cable adjustment locknuts and adjusting nuts at brake lever, turn up adjusting nut at each wheel until wheel can just be turned by hand, back off nut 2 notches, tap nut against backing plate. Tighten cable adjustment nuts until wheel can just be turned, tighten cable adjustment locknuts. Adjust wheel brakes as directed above.

RELINING BRAKES:—Manufacturer recommends installation of factory-lined shoes which are accurately ground. Shoes interchangeable in pairs.



STEWART-WARNER BRAKE ASSY.

SERVICING:—Removing and Installing Shoes—Use special spring tool to extend retracting spring permitting removal of shoe. If tool not used, pull 'A' shoe out radially until it hooks over two embossed shoe rests on backing plate, repeat with 'B' shoe, slide cam off shaft. Pull 'B' shoe away from backing plate to free it from rests, pull anchor end out of anchor bracket, holding cam end out so that it is free to overlap 'A' shoe, swing cam end against spindle, unhook spring, remove 'B' shoe.

Pull adjusting nut and wedge assembly out of anchor bracket, wipe all parts clean, lubricate bearing surfaces with graphite grease. See that tapered grooves in adjusting wedge assembly lines up with openings in anchor bracket when reassembling.

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

LOCKHEED HYDRAULIC SINGLE ANCHOR

Studebaker Champion, All Models (1939-46)
Willys-Overland, Model 39 (1939)

DESCRIPTION: These brakes similar in design to other Lockheed Hydraulic types except for Anchor **Anchor Pin**—Single anchor pin used with both brake shoes pivoting on this same pin. Anchor pin has double eccentric section so that both shoes are moved out toward drum when pin is turned.

ADJUSTMENT: Before making adjustments, jack up all four wheels, check pedal clearance or free travel (see Brake Pedal Adjustment below), release hand brake. Then adjust brakes at each wheel as follows:

Brake Pedal Adjustment:—Pedal must have ¼" min., ⅜" max. free travel to insure master cylinder piston being back against its stop (in cylinder) for correct compensating action when brakes released. To adadjust, loosen locknut and turn large adjusting nut on master cylinder end of connector rod.

Minor Adjustment (For Wear):—Install wrench on eccentric adjusting cam on backing plate with wrench handle up, turn cam by moving wrench handle out toward wheel until shoe contacts drum (brakes drag when wheel revolved), then turn cam in opposite direction until wheel is just free of any brake drag. Adjust all eccentric cams in this manner (one cam for each shoe). Cams are held in position by spring tension (no locknuts).

Major Adjustment (For new linings, etc.):—With wheels removed, rotate brake drums so that inspection hole in drum is at heel (anchor pin end) of shoe, loosen eccentric anchor pin locknut, turn anchor pin until clearance between lining and drum is exactly .005" (measured with feeler gauge 1½" from end of lining). Check to see that heel clearance of opposite shoe is likewise .005", tighten anchor pin locknut. Turn drum so that slot is 1½" from end of lining at toe end of shoe, adjust eccentric cam (as directed under Minor Adjustment above) so that clearance is exactly .010". Recheck clearance at anchor pin end and make any necessary re-adjustments to secure correct clearance at both ends of the shoe.

Parking Brake Adjustment:—Check whenever brakes adjusted. Adjust parking brake as follows:

Studebaker—With hand lever in second notch 'on' position, remove pin linking brake cable to parking brake lever on each rear wheel backing plate, pull on cable to eliminate slack and press forward on lever to take up play, install pin through holes in lever and cable end which line up with slight drag noticeable at wheel. Adjust both wheels in same manner, then release hand lever, check to see that both wheels free from any drag.

Willys—When adjusting the hand brake, first pull hand lever 'on' three notches. Adjust yoke on forward end of each wheel cable to eliminate all slack, re-connect cables, release hand brake lever, check rear wheels to see that they rotate freely without any drag. Equalize wheels by making slight re-adjustment at wheel cable yoke for tight wheel.

SERVICING: Except for shoe removal and installation, servicing is same as other Lockheed Brakes.

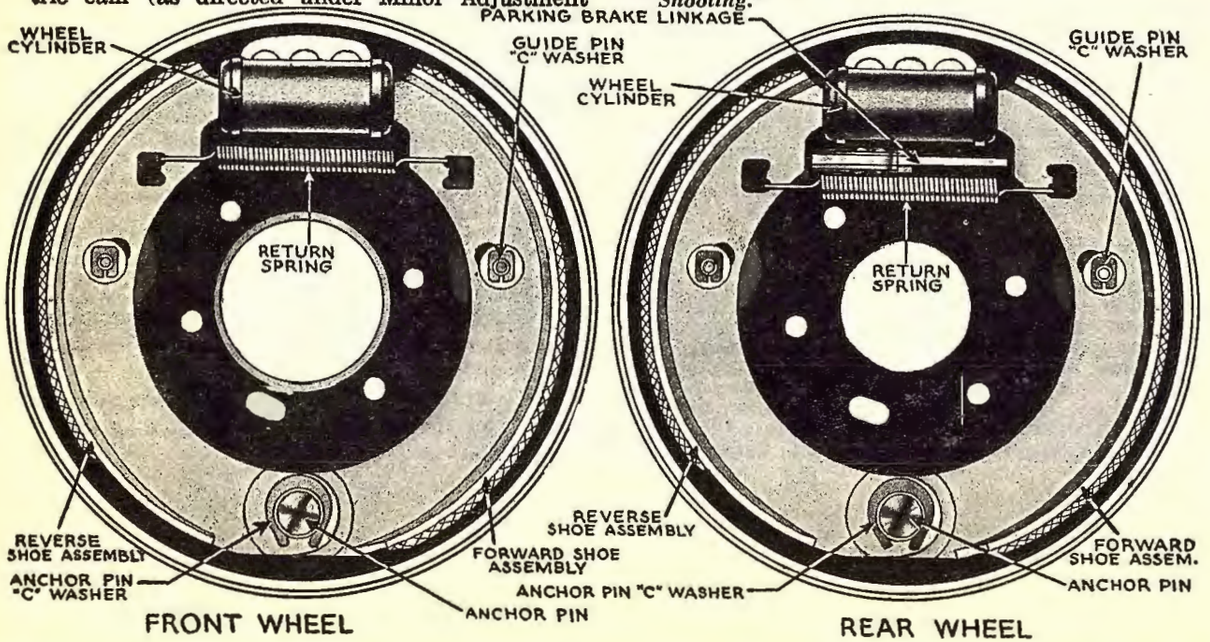
Brake Shoe Removal & Installation. To remove brake shoes for relining or servicing, remove anchor pin locknut on backing plate, free 'C' washer and remove plain washer on guide pin at center of each shoe, pull toe end of shoe free of wheel cylinder piston slot and boot. Remove 'C' washer on anchor pin, remove shoe. Reassemble shoes in same manner.

Wheel Cylinder Installation. Wheel cylinder on front wheels has greater diameter than rear wheel cylinder. Use extreme care not to interchange cylinders which would cause badly unbalanced brake

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*



LOCKHEED (DUESENBERG) HYDRAULIC

Model J & Supercharged SJ (1937)

DESCRIPTION AND OPERATION:—Wheel Brakes—Two shoes per wheel, mounted on anchor pins on lower support bracket at lower end and operated through reducing lever or toggle (linked by toggles to each shoe) by single piston in wheel cylinder. Adjustment provided on toggle lever at toe of shoe. Shoes returned to 'off' position by single retracting spring hooked between shoes.

Wheel Cylinder:—Cylinder mounted vertically (integral with steering knuckle pivot pin casting in front wheels) with single acting piston which is forced up when brake fluid, displaced from master cylinder by pedal operation, flows through lines. Toggle arm lever contacts piston directly.

Master Cylinder:—Compensating type mounted within supply tank and operated through crank on shaft linked to brake pedal. Similar to other Lockheed designs (see Lockheed article) except that secondary piston cup and bleeder holes in piston not used. Compensating action secured by free flow of fluid between master cylinder and supply tank through by-pass port with piston in 'off' position.

Hand Brake:—Independent type mounted at rear of transmission. See adjustment instructions below.

ADJUSTMENT:—Bleeding Lines—See Lockheed article

Pedal Clearance:—With pedal released and against toeboard, disconnect pedal linkage by taking out clevis pins and see that master cylinder piston is in fully returned position. Adjust by shifting position of master cylinder lever (attached to adjusting plate to which pedal links are connected).

Brake Shoe Clearance:—Jack up all four wheels. Remove plates on inside dust cover on front wheels marked 'Adjust Brakes Here', remove upper section of inside dust cover on rear wheels by taking off 2 nuts and removing 2 capscrews for each section.

1—At each wheel, loosen locknut on long toggle link, turn adjusting screw in opposite direction to expand shoes until brake drags slightly. With all wheels set for slight drag, depress foot pedal firmly. This will centralize shoes and wheels should be free. Repeat this operation until slight drag remains after pedal is released. Then back off adjusting nut exactly ½ turn at each wheel, tighten locknut.

Hand Brake Adjustment:—Loosen screw in equalizer sleeve at center of cross-shaft above brake at rear of transmission. Tighten adjusting nut until hand lever locks brakes when placed in fifth notch, tighten equalizer screw before releasing brake.

SERVICING:—Removing Brake Shoes—Remove brake drums (rear drums removed as unit with axles), remove inside dust covers, removing toggle pins at both ends of each shoe, disconnect retracting spring.

Wheel Cylinders:—Remove brake drums, use lever and lift toggle arm up and to rear shifting brake assembly slightly. Piston may then be withdrawn from cylinder (removal will be easier if bleed screw opened). Bleed lines when cylinders reassembled.

RELINING BRAKES:—If ring gauge or dummy shoe used to check clearance when shoes with new lining installed, shoe clearance should be .005-.008" at toes.

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

LOCKHEED HYDRAULIC DOUBLE ANCHOR

Chrysler 6, All Models (1939-42)—See Note
Chrysler 8, All Models (1939)—See Note
Crosley, Models CD & VC (1950-51)
DeSoto, All Models (1939-42)—See Note
Dodge, All Models (1939-42)—See Note
Jeep, Ford & Willys Army Model (1942-45)
Nash 6 & 8, All Models (1939)
Nash "600", All Models (1941-47)
Plymouth, All Models (1939-42)
Studebaker, Comm. & Pres. (1939-42)
Willys Pass. Cars, All Models (1940-42)
Willys Comm'l, All Models (1941-42)
Willys Jeep, CJ-2A & CJ-3A (1946-51)

►**1942 Chrysler 6, DeSoto, & Dodge 7-Passenger Car Note**—Brakes on these models are special type (Two-cylinder type on front wheels, Single cylinder type on rear wheels) of same design used on all cars beginning 1946. *See "Lockheed-Chrysler Safeguard Hydraulic" brake data for these models.*

►**Chrysler, DeSoto, Dodge & Plymouth Brake Anchor Pin Position Marks (1939-42 Cars).** Anchor pins on these models marked by arrow on inner end (visible with drums removed) so that point of minimum adjustment can be readily secured by turning pins so that arrows points toward each other (see special anchor pin adjustment instructions below).

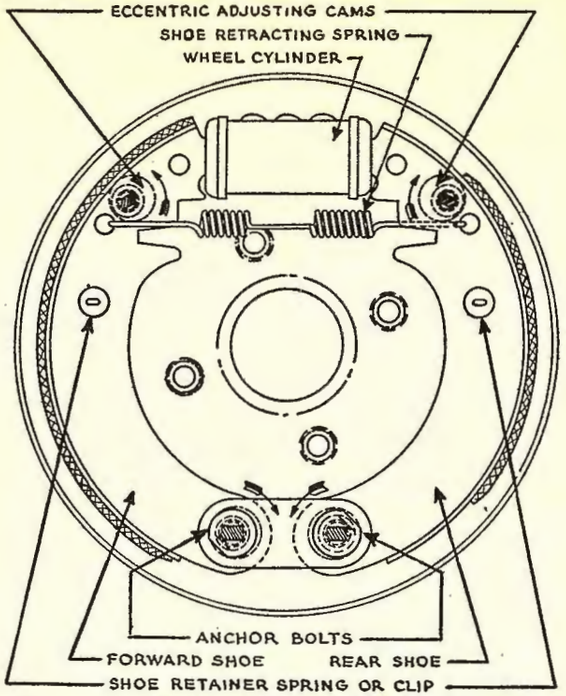
Jeep (Ford & Willys Car) Note—Eccentric adjusting cams have locknuts which must be loosened before adjustments can be made. Slots are provided in brake drums so that lining clearance can be measured directly by inserting feeler gauge through slot.

Studebaker Car Note—Anchor pins on front wheels brakes are special type which require Allen wrench for adjustment (end of pin has recess for wrench engagement). Use Allen wrench with dimension of ¼" across flats of hexagonal end section to adjust these pins.

Willys Model Note—Eccentric adjusting cams are fitted with locknuts which must be loosened before adjustments can be made (eccentrics held by spring tension on other models). Drums are provided with slots which are accessible after wheels removed so that lining clearances can be measured directly by inserting feeler gauge through slot.

DESCRIPTION & OPERATION: All Wheel Brakes. Two shoes per wheel, mounted on independent eccentric anchor pins at the lower or "heel" end and bear directly against the opposed pistons of stationary wheel cylinder at the upper or 'toe' end. Shoes are forced out against drum at toe end by fluid displaced from master cylinder and flowing through brake lines to wheel cylinder when brake pedal is depressed. No self-energizing action is employed and self-energizing effect of forward brake shoe ordinarily offset by using longer length lining on this shoe or by using 'stepped' wheel cylinders with smaller diameter forward shoe piston and larger diameter piston for rear shoe. Brakes are returned to 'off' position against eccentric stops by retracting spring connected between shoes at toe end.

Wheel Cylinder:—Rigid type mounted on backing plate with opposed pistons bearing directly on toe ends of brake shoes. Pistons sealed by rubber caps held against piston head by central spring.



FRONT & REAR BRAKE ASSY. (HAND BRAKE LINKAGE NOT SHOWN)

Master Cylinder:—Compensating type with integral supply tank. Supply tank is directly above master cylinder and is connected to it by two ports (1) bypass port uncovered when piston is in 'off' position so that fluid may flow freely in or out of master cylinder to compensate for any loss, and to prevent back-pressure due to expansion of fluid in system and (2) supply port by which additional fluid is drawn down and through holes in the piston and past the lip of the piston packing cup when brake pedal is released so that cylinder is always full of fluid and ready for repeated brake action even before fluid in system is returned to master cylinder by retracting wheel cylinder pistons caused by shoe springs. Master cylinder requires no attention other than keeping supply tank more than one half full of fluid at all times. Brake pedal clearance should be checked (see directions below) but will not change in service.

NOTE—Wheel cylinder must be 'bled' whenever brake line to that particular wheel is disconnected, and entire system (all four wheels) must be 'bled' whenever brake lines are disconnected at master cylinder to remove all air in system and correct springy brake action.

Bleeding Brake System—Refer to Hydraulic Brake Servicing data for complete information.

Hand Brake:—When incorporated in rear wheels consists of cable operated lever pivoted on one brake shoe and connected to other shoe through link or strut so that toes of both shoes are forced out against drum when hand lever is applied. Adjustment should be checked whenever brake adjustments are made.

ADJUSTMENT:—Before making adjustments, jack up all four wheels, check brake pedal clearance or free travel (See Brake Pedal Adjustment below), release hand brake and make certain that rear wheels are free, check pedal travel (Chrysler, DeSoto, Dodge, Plymouth—see Note below), then adjust at each wheel as directed below (Minor or Major adjustm't).

1940-42 Chrysler, DeSoto, Dodge, & Plymouth Note. Total pedal travel on these models should be 1⅞-2¼" (1940 Chrysler 6, DeSoto, Dodge, Plymouth), 1⅝-2" (1940 Chrysler 8), 1¾-2" (All 1941-42 Models —this includes free play of ⅛-¼" and ⅝-¾" additional travel before master cylinder primary cup closes off relief port and begins to apply brakes). If Minor Adjustment (below) does not give correct pedal travel, or if relief port is cut off with less than ¾" pedal travel, brake pedal adjustment (free play) should be checked.

BRAKE PEDAL ADJUSTMENT

Brake Pedal Adjustment:—Pedal clearance or free travel before master cylinder piston begins to move should be ¼-½" (see Notes below for special settings on some cars) to insure master cylinder piston being back against its stop for correct compensating action with brakes released. To adjust, remove clevis pin in pedal link, hold piston rod from turning with wrench on hexagonal end and loosen locknut on link, turn link in or out of piston rod.

Chrysler, DeSoto, Dodge, Plymouth—Pedal free travel should be ¼"-⅜" (1937-39), ⅛"-¼" (1940-42 Models).

Chrysler Eights (With Vacuum Power Cylinder)—Refer to Bendix Vacuum Power Cylinder article for master cylinder pushrod adjustment. CAUTION—Power cylinder valve adjustment will be disturbed unless adjustments made exactly as directed.

Jeep (Ford & Willys) Model. Pedal free travel should be ½" miinmum. Adjust by disconnecting pedal rod at brake pedal, loosening locknut on opposite end of rod, and turning rod in or out of piston link in master cylinder.

Studebaker Models—Pedal free travel should be ¼-⅜".

Willys Jeep Model (1946 On). Pedal free travel should be ½" minimum. Adjust by disconnecting pedal rod at brake pedal, loosening locknut on opposite end of rod, and turning rod in or out of piston link in master cylinder.

MINOR ADJUSTMENT

Minor Adjustment (For Wear):—Jack up all four wheels, release hand lever, see that rear wheels are free. At each wheel, turn up eccentric on each shoe (move wrench toward wheel rim when installed on eccentric nut upward) until shoe contacts drum, then back off eccentric slightly until wheel rotates freely in both directions with no drag. Eccentric held in position by spring tension. Check hand brake setting and adjust if necessary.

Jeep (Ford & Willys) Note—Eccentric is locked by a locknut on the backing plate which must be loos-

CONTINUED ON NEXT PAGE

LOCKHEED HYDRAULIC (Cont.)

ened before the eccentrics can be adjusted. After completing adjustment, hold eccentric from turning while tightening locknut.

Willys Note—On this model, eccentric is locked by a locknut on the backing plate. Locknut should be loosened before eccentrics are adjusted. Hold eccentric from turning while tightening locknut after adjustment completed. On all other models, eccentrics are held in position by spring tension and locknuts are not used.

MAJOR ADJUSTMENT

Major Adjustment (For New Linings):—Dummy drum with cut-away section, ring gauge or other type adjusting tool must be used. Release hand lever and check hand brake clearance or disconnect hand brake cables, install dummy drum or ring gauge, turn so that gauging point is at heel (anchor pin end of shoe), loosen anchor pin locknut on backing plate and turn anchor pin (see special directions below for Chrysler, DeSoto, Dodge, Plymouth, Jeep, Willys) until clearance between lining and gauge is correct (see table below) at point 1½" back from heel of shoe, tighten anchor pin locknut. Turn gauge to toe (opposite end of shoe), adjust eccentric cam as directed under Minor Adjustment above until clearance between lining and gauge is correct (see table below) at point 1½" back from end of lining. Adjust each shoe in each wheel in this manner, adjust hand brake cables (where parking lever applies rear wheel service brakes) as directed in Parking Brake section below.

Brake Shoe Clearances

Car Model	Heel (Anchor End)	Toe (Cyl. End)
Chrysler 6 & 8	.006"	.012"
Crosley	.005"	.008"
DeSoto	.006"	.012"
Dodge	.006"	.012"
Jeep	.005"	.008"
Nash (1939-40)	.005"	.010"
Nash (1941 on)	.004"	.008"
Plymouth	.006"	.012"
Studebaker	.005"	.010"
Willys (1940-41)	.005"	.010"
Willys (1942)	.005"	.008"
Willys CJ-2A, 3A	.005"	.008"

1939-42 Chrysler, DeSoto, Dodge, Plymouth. Inner ends of anchor pins are marked by an arrow and flattened so that adjusting wrench can be applied at this end of pins. Before making adjustment, loosen anchor pin bolt nuts on backing plates, turn each anchor pin so that arrows line up with arrow heads together. Then adjust anchor pins by turning right hand pin counter-clockwise, left hand pin clockwise (pins turned toward each other at top) to secure correct clearance. CAUTION—Shoes will not be centralized in drum (even though set for correct clearance) unless anchor pin arrows lined up first and adjusted exactly as noted above.

Chrysler Brake Gauge Note—When using MT-19-C Brake Gauge to set clearances on these brakes, after setting up gauge to specific "DRUM" Measurement for each wheel, proceed as follows: Place gauge in position on wheel spindle, turn gauge finger so that mark "HEEL" is uppermost, position gauge finger over heel (anchor pin) end of shoe, adjust anchor pins so that lining contacts gauging surface of finget. Rotate gauge to toe (cylinder) end of shoe, turn gauge finger so that mark "TOE" is uppermost, adjust eccentric cam until lining contacts gauging surface of finger. Recheck heel or anchor pin end of shoe and readjust as necessary. NOTE—Pointed edges of gauge finger are the gauging points and mark is on opposite side so that when mark is uppermost, gauging point is down toward lining. This gauge is designed for .006" heel clearance (mark "HEEL" uppermost) and .012" toe clearance (mark "TOE" uppermost).

Jeep (Ford & Willys) Model—Slot provided in brake drum so that feeler gauge can be inserted to check lining clearance. To use feeler gauge, turn drum so that slot is at gauging point (1½" from end of lining on shoe).

Willys Models. Slot provided in brake drum so that feeler can be inserted to check lining clearance. To use feeler gauge, turn drum so that slot is at gauging point (1½" from end of lining on shoe).

HAND BRAKE ADJUSTMENT

Parking Brake:—Adjust when service brakes are adjusted or new shoes installed. For all models except as noted below, pull hand lever up three notches. Shorten each brake cable by turning turnbuckle at forward end until slight drag felt on rear wheels. Release hand lever, check to see that wheels rotate freely without drag. Brakes can be equalized by pulling up lever until wheel with least drag can just be turned, slack off cable to tight wheel.

NOTE—On all models with independent parking brake on propeller shaft at rear of transmission, see individual car model page (or Special Shop Notes) for parking brake adjustment instructions.

All Chrysler, De Soto, Dodge and Plymouth Models—On these models, when hand lever applies rear wheel service brakes, adjust at each wheel as follows: Place hand lever in released position, loosen support cable bracket cover bolt nut, and adjusting clevis locknut, turn up adjusting nut on clevis (under locknut) until slight drag felt when wheel turned, back off adjusting nut until wheel is free, tighten locknut and support cable bracket cover bolt nut, equalize by setting hand brake so that wheel with least drag can just be turned, slack off adjustment on tight wheeel slightly. With correct adjustment wheels should be free with hand lever released and should have slight drag with lever in second notch.

Jeep (Ford & Willys) Model. Hand brake is independent type on drive shaft behind transmission. See car model page for adjustment directions.

Nash Models. Pull hand lever 'on' to second notch, loosen two bolts on adjusting clamp (connecting hand lever cable and wheel cables), pull cables tight and tighten clamp bolts. Release hand lever and check rear wheels to see that they rotate freely without brake drag. To equalize hand brakes, loosen rear bolt in cable adjusting clamp and apply brakes by pulling on hand lever (this will allow wheel cable to shift in adjusting clamp), tighten adjusting clamp bolt. Check position of hand brake cable guide on each rear spring. Guide should be exactly 19¾" (Nash 6, Nash-Lafayette), 18¼" (Nash 8).

Nash (1941-47). Set hand lever two notches 'on', loosen locknuts on wheel cable spreader (hand lever cable connection), remove all slack from cables by pulling forward on wheel cables and to rear on hand lever cable, tighten locknuts. Release hand lever and check to see that rear wheels are free of any drag.

Studebaker 1939-40. With hand lever released, take up slack in hand lever cable by turning turnbuckle brake lever end. Pull hand lever 'on' to second notch. Adjust turn-buckle at forward end of each wheel cable so that slight drag felt at each wheel. Release hand lever and make certain that wheels are free of any brake drag. Equalize brakes by slacking off cable to tight wheel slightly (equalizer link used on former six cylinder models has been discontinued).

Studebaker 1941-42. Set hand lever 2-4 notches 'on'. Loosen locknuts and turn turnbuckle on hand lever cable (below and to left of transmission) until slight drag noticed at both rear wheels when turned by hand. Tighten turnbuckle locknuts, release hand lever, check to see that rear wheels free from any drag. NOTE—On Late 1942 cars, adjustment consists of an adjustable rod located between two turnbuckles. This type is adjusted by turning rod.

Willys 1940—With hand lever released, adjust turnbuckle at rear end of hand lever and cross-shaft cable so that levers on shaft (to which wheel cables are attached) are 23½° to rear of vertical line. Then pull hand lever 'on' to third notch, adjust each wheel cable by turning turnbuckle or adjusting clevis at forward end of cable until slight drag felt at rear wheels when cables connected, release hand lever. Wheels should be free of any drag. Equalize by making slight adjustment on wheel cable for tight wheel.

Willys 1941-42. Set hand lever 2 notches "on." Loosen locknuts on hand lever cable connection at wheel cable spreader (equalizer), take up all slack in cables by turning up rear nut until slight drag noticed at rear wheels, tighten locknuts. Release hand lever and check to see that rear wheels free of any drag.

Willys Jeep Model (1946 On). Hand brake is independent type on drive shaft behind transmission. See Willys Jeep article in Car Model Section.

RELINING BRAKES:—See car model page for lining type and length and instructions where lining of unequal lengths used on forward and rear shoes in same wheel. Linings should be faced or ground concentrically after installation.

Shoe Removal:—Shoes held in place by coil spring retained by plain washer and 'C' type washer on each shoe. To remove shoes, pull out 'C' washer, disassemble plain washer and spring, take off return spring freeing shoes at toe end (use piston clamp on wheel cylinder and do not depress pedal with shoes disconnected). Remove 'C' washers on anchor pins, slide shoes off.

SERVICING: Master Cylinder & Wheel Cylinders. *See "Hydraulic Brake Servicing" for complete data.*

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

BENDIX (LOCKHEED) HYDRAULIC SELF-CENTERING

Frazer, All Models (1947-51)
Henry J, 4 Cyl. & 6 Cyl. Models (1951)
Kaiser, All Models (1947-51)
Nash "600", Series 4840 (1948)
Nash "600", Series 4940 (1949)
Nash Rambler, 5010 (1950), 5110 (1951)
Nash Statesman, 5040 (1950) 5140 (1951)
Willys Sta. Wgn., 4 & 6 Cyl. (1946-51)
Willys Jeepster, All Models (1948-51)
Willys Sedan Delivery, All Models (1947-51)
Willys Trucks, All Models (1947-51)

DESCRIPTION: These brakes are same design as other Lockheed Hydraulic Double Anchor types except for "self-centering" feature on each car as follows:

Brake Shoe "Self-centering" Device—Each brake shoe fitted with rounded rocker on lower (anchor) end which bears against a solid block on the backing plate. This bearing block is machined with the rocker bearing surface aligned radially to the drum center so that shoes move radially out against the drum when brakes are applied and are automatically "centered with each brake application." Both shoes are held against the bearing block by a plain spring hooked in holes in each brake shoe web.

ADJUSTMENT: Before making adjustments, jack up all four wheels, check brake pedal clearance or free travel (see below), fully release hand brake and make certain that rear wheels are free, then adjust each wheel as follows:

►*CAUTION—Brake shoes must be "centralized" by several hard brake applications before adjusting.*

Brake Pedal Adjustment: Adjust master cylinder pushrod by loosening locknut and turning rod for following pedal free travel with master cylinder piston and pushrod back against stop:

Brake Pedal Free Travel

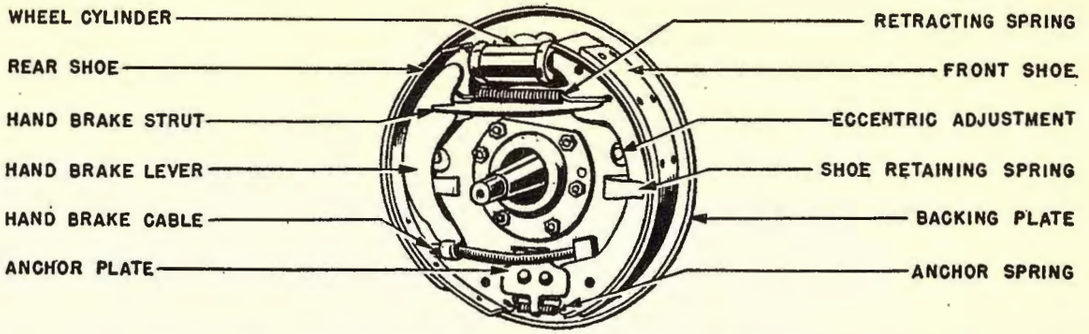
Frazer & Kaiser	½-¾"
Henry J	¼"
Nash (All)	¼-½"
Willys	½" min.

Brake Shoe Adjustment (For Wear or New Linings): Before making adjustments, centralize shoes by making a hard brake application (press firmly on brake pedal, then **release** pedal). At each wheel, adjust each brake shoe eccentric cam by turning cam out until shoe is tight in drum (with wrench installed on eccentric so that handle is upward, turn wrench away from wheel center-line), then back off eccentric until wheel just rotates freely without drag. Adjust each shoe eccentric in each wheel in this manner, then adjust parking brake (hand brake linkage) as directed below.

►**Frazer & Kaiser Adjustment Note**—Eccentric cams have locknuts which must be loosened first.

►**Shoe Clearance Note**—If brakes adjusted by means of feelers or brake gauges, adjust shoes for the following clearances:

NOTE—If brakes adjusted by means of dummy drum or gauge, adjust shoes for following clearances:



REAR BRAKE ASSY. (FRONT SAME EXCEPT HAND BRAKE LINKAGE OMITTED)

Brake Shoe Clearance

Clearance (each shoe):	Heel	Toe
Frazer, Henry J, Kaiser	.010"	.010"
Nash	.010"	.010"
Willys	.005"	.008"

Hand Brake Adjustment: ***CAUTION—Adjust each model as follows:***

Frazer & Kaiser (1947-48): After brake shoes adjusted, release hand lever, loosen locknut, turn clevis on rear end of lever cable at idler lever on frame cross-member to remove all slack from cables. When limit of adjustment reached, shift wheel equalizer-to-idler lever clevis pin to next set of holes in equalizer (three sets of holes), then make final adjustment at hand lever cable clevis as above. When properly adjusted, cables should have minimum slack without brake drag with hand lever in released position.

Frazer & Kaiser (1949-51): With hand lever in released position, back off locknut at front of cable end fitting and tighten adjusting nut at rear to remove all slack from cables. Tighten locknut.

Henry J—Place hand lever in fully released position. Tighten nut on rear end of **front** cable at intermediate lever on frame cross-member until perpendicular distance between front cable and rear cable rod is 4⅝-4¾". Then pull hand lever "on" three notches and tighten rear cable by taking up adjustment nut at cable equalizer on rear end of cable rod until slight drag secured at rear wheels. Release hand lever, check wheels for freedom from drag.

Nash "600" Model (1948): With hand brake lever released, check position of hand lever cable pulley on front of dash (in engine compartment) and adjust cable position on pulley so that upper rear edge of pulley (segment type) is exactly 1⅝" from top of pulley bracket upper mounting screw (see Note below). Pull hand lever two notches "on" and leave in this position while adjusting cables. Loosen locknut on cable connector at wheel cable equalizer under car, remove all slack from cables, tighten locknut. Place hand lever in fully released position and make certain that rear wheels free of any drag.

NOTE—On 4840 cars, and 4740 after Serial No. K-170055, aligning pin hole provided in pulley bracket and pulley can be correctly located by inserting a J-1390 Gear Shift Aligning Pin through this hole.

Nash "600" Model (1949): Pull hand brake lever "on" one notch. Loosen forward nut and tighten rear nut on front cable fitting at rear cable equalizer to remove all slack from cables. Tighten forward nut, release hand lever, check rear wheels for freedom from drag.

Nash Rambler—Pull hand lever "on" two notches, loosen front nut on adjusting rod at rear cable equalizer, tighten rear nut to remove all slack from cables, then tighten front nut to lock adjustment. Release hand lever and check rear wheels for freedom from drag.

Nash Statesman—Pull hand brake handle "on" exactly 4" (measure from face of bracket to handle). At rear wheel cable equalizer, loosen forward nut, tighten rear nut on front cable fitting until rear brakes are fully applied, then tighten front nut to lock adjustment. Release hand lever and check rear wheels for freedom from drag.

Willys—Pull hand lever "on" three notches, loosen front nut on connecting link between intermediate lever on frame cross-member and rear cable equalizer, tighten rear nut on link until slight drag noted at each rear wheel, then tighten front nut to lock adjustment. Release hand lever and check rear wheels for freedom from drag.

SERVICING (Master Cylinder & Wheel Cylinders): *See "Hydraulic Brake Servicing" for complete data.*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

LOCKHEED (WAGNER) HYDRAULIC SELF-ADJUSTING

Frazer & Kaiser Models (1949-50)—Some Cars
Studebaker, All Models (1947-51)

DESCRIPTION: Two-shoe, hydraulic type with new self-centering, self-adjusting brake shoes. Master cylinder is compensating type and similar to type used on previous Studebaker and other car models.

1947 Type Contact Plug & Spring—Spring is simple spiral type located in contact plug stem (see illustration).

1948 & Later Contact Plug & Spring—Spring is torsion type and actuates contact plug through adjusting lever pin (see illustration). This spring also retains self-adjusting mechanism on brake shoe and eliminates use of two hairpin cotters used for this purpose in 1947 assembly.

OPERATION: Self-centering Feature. Each brake shoe is fitted with a rounded rocker on the lower (anchor) end which bears against a solid block on the backing plate. This bearing block is machined with the rocker bearing surface aligned radially to the drum center so that the shoes move radially out against the drum when the brakes are applied and are automatically "centered" with each brake application. Both shoes are held against the bearing block by a plain spring hooked in holes in each brake shoe web.

Self-Adjusting Feature—Consists of an adjusting wedge and lever and contact plug assembly mounted on the shoe web of the forward brake shoe (rear shoe ordinarily does not require adjustment before relining of forward shoe is necessary and for this reason no automatic adjusting device is provided on this shoe). The contact plug (visible through the hole in the brake lining) is pinned on the adjusting lever which is pivoted on the shoe web. A spring-loaded adjusting wedge is mounted on the lever between the flat guide plate on the lever and the wedge guide on the shoe web. When the brake is released, the adjusting lever bears against the eccentric cam on the backing plate and holds the shoe in the released position. When the brake is applied, the entire mechanism moves out with the shoe until the contact plug strikes the brake drum. The contact plug and adjusting lever stop at this point and any additional movement of the brake shoe before the lining contacts the drum allows the spring to move the adjusting wedge inward to take up the clearance between the guide plate on the adjusting lever and the wedge guide on the shoe. This constitutes an "adjustment for wear" since the contact plug and adjusting lever have assumed a new relation with respect to the brake shoe and limit the movement of the shoe (when the brakes are released) to a position corresponding to the original drum clearance as set up by the initial adjustment of the eccentric cam when the shoes were installed. When the entire range of adjustment has been utilized, subsequent wear of the lining results in increased brake pedal travel which calls the operator's attention to need for relining of brakes.

ADJUSTMENT: ***CAUTION—Check operation of self-adjusting mechanism before making adjustments.***

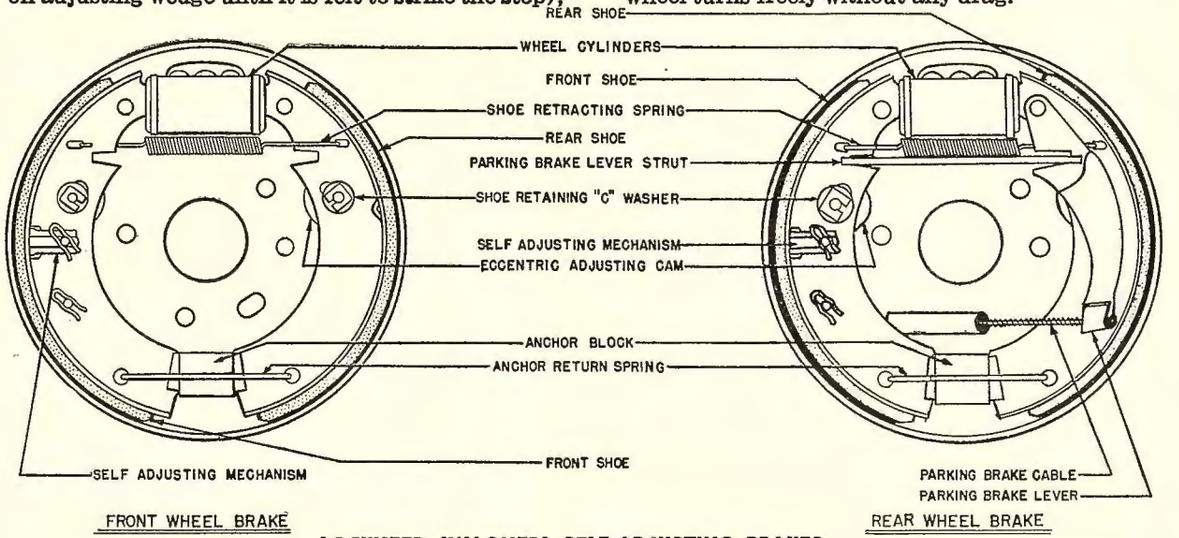
Self-Adjusting Feature—An initial adjustment is required when new linings are installed. No further adjustment is required during the life of the lining (self-adjusting feature and self-centering feature automatically compensate for lining wear each time brakes are applied). After new or relined shoes are installed, check self-adjusting feature and adjust eccentric cams (all wheels) and parking brake (rear wheels only) as follows:

Brake Pedal Clearance Adjustment: Pedal clearance or free travel must be correct to insure master cylinder pushrod being back against its stop for correct compensating action when brakes released. Adjust by loosening locknut on pedal connector rod and turning large adjusting nut.

Brake Pedal Clearance or Free Travel

Frazer & Kaiser	½-¾"
Studebaker	⅛-¼"

Self-Adjusting Mechanism Check: With shoes completely assembled on the backing plate, press contact plug in and completely retract wedge (pull out on adjusting wedge until it is felt to strike the stop), release contact plug, then release adjusting wedge. Press in on contact plug and note wedge action. Wedge should move in to take up the clearance. Repeat this test. Check contact plug spring tension by pressing and releasing contact plug while holding adjusting wedge in retracted position. Both tests should reveal positive spring action. NOTE—Self-adjusting mechanism should be overhauled if parts do not function correctly. CAUTION—Adjusting wedge must be in fully retracted position (pulled out against stop) after tests are made and before initial adjustment of brake shoes is attempted.



LOCKHEED (WAGNER) SELF-ADJUSTING BRAKES

Initial (Eccentric Cam) Adjustment: Adjustments must be made with drums in place and while drums are being rotated in a forward direction (when adjusting forward shoes with self-adjusting feature) or in a backward direction (when adjusting rear shoe). Make certain that hand (parking) brake is fully released, adjust each shoe in each wheel:

Adjusting Forward Shoes (with Self-adjusting Feature). Place adjusting wrench on hexagonal head of eccentric cam adjuster with wrench handle upward. Turn brake drum in a forward direction and at the same time move wrench handle outward until shoe has a decided drag on the drum (this will permit shoe to center itself), then back off eccentric cam adjuster until wheel turns freely without drag.

NOTE—Eccentric cam adjuster is friction type and will slip on the shaft if excessive pressure is applied. This slippage is designed to prevent damage to the self-adjusting mechanism. CAUTION—If adjuster slips so freely on the shaft after extended service that the brakes cannot be adjusted properly, turn the eccentric cam by inserting a screwdriver blade in the slot in the end of the shaft.

Adjusting Rear Shoes—Place adjusting wrench on hexagonal head of eccentric cam adjuster with wrench handle upward. Turn brake drum in a backward direction and at the same time move wrench handle outward until shoe has a decided drag on the drum (this will permit shoe to center itself), then back off eccentric cam adjuster until wheel turns freely without any drag.

Brake Shoe Adjustment: ***If required in service (noted by loss of pedal reserve), adjust each shoe as follows:***

Reverse Shoes—Turn eccentric out until brake shoe drags, then back eccentric off until wheel just turns freely. If adjustment of all reverse shoes does not provide adequate pedal reserve, then check and adjust forward shoes.

Forward Shoes—Check self-adjusting mechanism for correct operation first. Disconnect shoe return spring, pull shoe out so that self-adjusting lever clears eccentric, manually depress contact plug and fully retract adjusting wedge. Hold wedge in retracted position and see that contact plug moves up and down freely. Release wedge, depress contact plug and check to see that adjusting wedge advances upward. If self-adjusting mechanism operates correctly, reconnect shoe return spring, set contact plug by depressing plug until it is flush or one notch below surface of lining. Adjust shoe by turning eccentric outward until brake shoe drags, then back eccentric off until wheel just turns freely.

Parking Brake Adjustment: After adjusting brake shoes, adjust hand brake linkage as follows:

Frazer & Kaiser—With hand lever in released position, loosen locknut and tighten rear nut on for-

CONTINUED ON NEXT PAGE

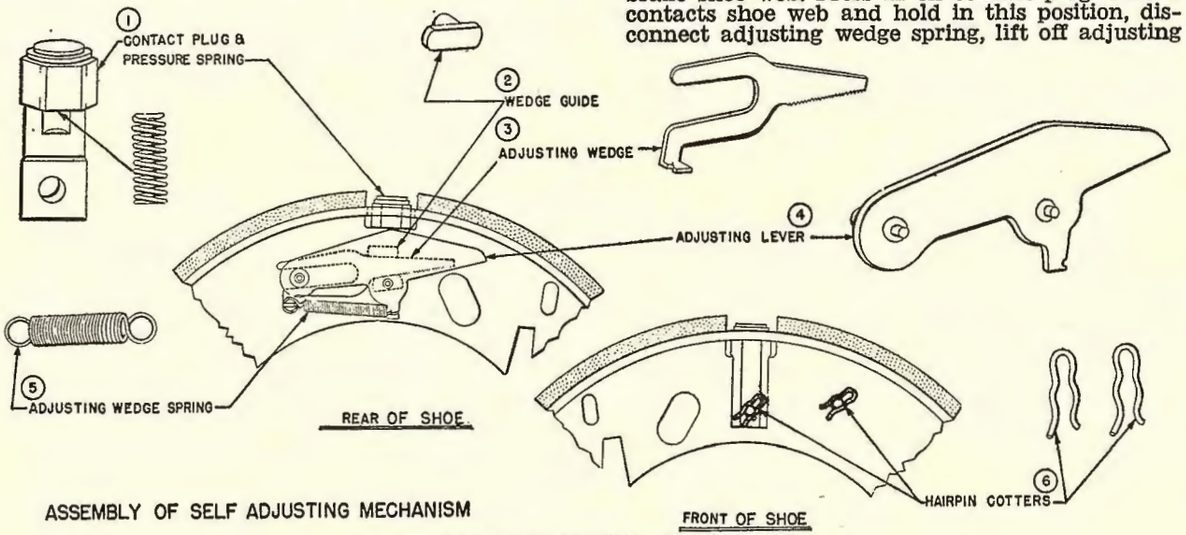
LOCKHEED SELF-ADJUSTING (Cont.)

ward cable fitting at wheel cable equalizer yoke to take up all slack in cables. Make certain that brakes do not drag.

Studebaker—Pull hand lever "on" four notches, back off front nut and tighten rear nut on cable clip under car until heavy drag noted at rear wheels, tighten front nut. Release hand lever and check wheels for freedom from drag.

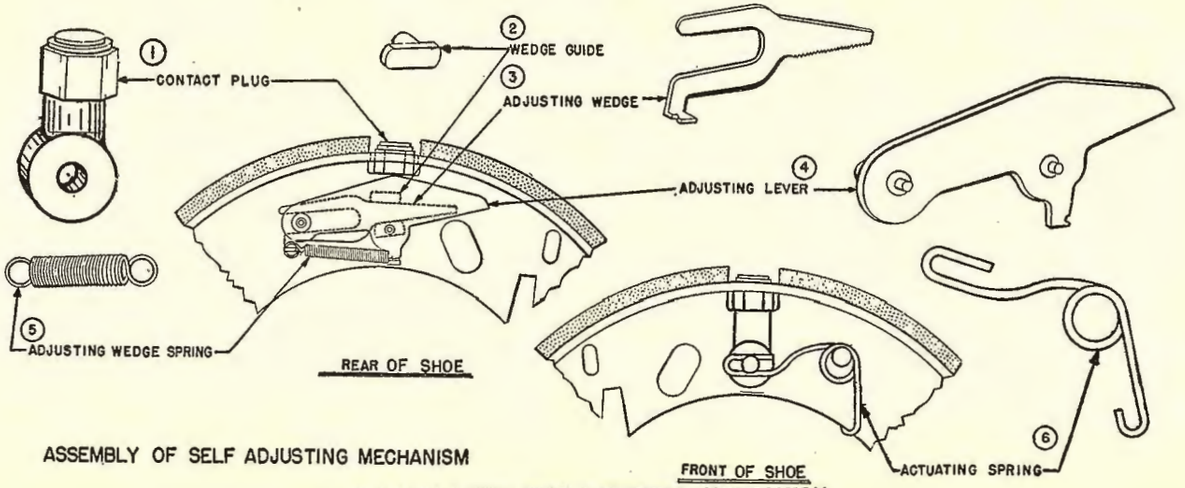
Hill-Holder & Anti-creep Adjustment: If these units installed, see separate data on each type for adjustment instructions.

RELINING BRAKES: Brake shoes should be removed for relining when increased brake pedal travel indicates limit of automatic adjustment reached and satisfactory shoe adjustment not possible.



ASSEMBLY OF SELF ADJUSTING MECHANISM

1947 TYPE SELF-ADJUSTING MECHANISM



ASSEMBLY OF SELF ADJUSTING MECHANISM

1948 & LATER TYPE SELF-ADJUSTING MECHANISM

►***CAUTION—Continued use of brakes after self-adjusting mechanism has reached limit of travel will result in increased lining clearance and pedal travel and in wear of the contact plug tip.***

Brake Shoe Removal: Install clamp across brake cylinder boots in each wheel to retain wheel cylinder pistons. Remove shoe retracting spring and anchor return spring. On rear wheel brakes only, pull parking brake lever toward center of wheel and unhook cable. Remove "C" washers from end of eccentric cam adjuster shaft on each brake shoe web. Pull heel of shoe away from anchor block, lift up on shoe until it clears eccentric cam adjuster shaft, pull toe of shoe out to clear cylinder boot.

Self-adjusting Mechanism Disassembly—Remove two hairpin cotters from adjusting lever pins on brake shoe web. Press in on contact plug until it contacts shoe web and hold in this position, disconnect adjusting wedge spring, lift off adjusting lever, remove adjusting wedge, wedge guide, contact plug, and contact plug spring. NOTE—Discard old contact plug and install new part when relined shoes are installed. All other self-adjusting device parts should be cleaned, inspected for wear, and reinstalled if not worn or damaged.

Relining Brake Shoes: Car manufacturer recommends that Lining Kits (with predrilled linings, new contact plugs, and plug adjusting gauge) be used when relining brake shoes. If predrilled linings not used, an accurately located ¾" hole for contact plug clearance must be drilled in lining for each forward brake shoe (high-speed edge hole saw recommended for this purpose) When riveting lining to shoe, make certain that there is a uniform clearance of 1/16" between the edge of the hole in the lining and the hole in the brake shoe.

►***CAUTION—If shoes ground after lining installed, do not install self-adjusting mechanism until after grinding completed.***

Self-Adjusting Mechanism Assembly: See illustration for proper location and order of installation of these parts. **Always use a new Contact Plug with new linings.** Press down on contact plug while installing adjusting wedge (pin on wedge must enter hole in contact plug) and make certain that lever is flat against shoe web. Push adjusting wedge in as far as possible while installing wedge-to-lever spring and use great care not to damage spring. After completing assembly, retract adjusting wedge (pull wedge out as far as possible), adjust contact plug:

►***CAUTION—Actuating spring must be installed as shown in order to provide proper tension on contact plug and to retain self-adjusting mechanism parts on shoe.***

Contact Plug Height Adjustment—Make certain that adjusting wedge fully retracted, clamp brake shoe assembly in vise with contact plug upward and vise jaws gripping adjusting lever so that contact plug cannot move inward, install gauge tool, FL-1047, on contact plug (gauge is .005" template designed to fit over end of contact plug), file end of contact plug down flush with face of gauge.

►***CAUTION—Contact plug must be depressed (flush or one notch below lining surface) when adjusting forward shoes (will cause over-adjustment of brake shoe on first application otherwise).***

Brake Shoe Installation & Adjustment: Do not lubricate any part of the brake. When installing shoes, turn eccentric cam adjuster to released or minimum adjustment position, make certain that adjusting wedge of self-adjusting mechanism is in fully retracted position, centralize shoes approximately (by hand) after shoe retracting springs are installed. Check self-adjusting mechanism and adjust each brake shoe (see Adjustment data).

SERVICING: Brake Shoes & Lining. *See Relining Brake data above.*

Master Cylinder & Wheel Cylinders: *See "Hydraulic Brake Servicing."*

Bleeding Brake Lines: *See "Hydraulic Brake Servicing."*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

CHRYSLER DISC BRAKE

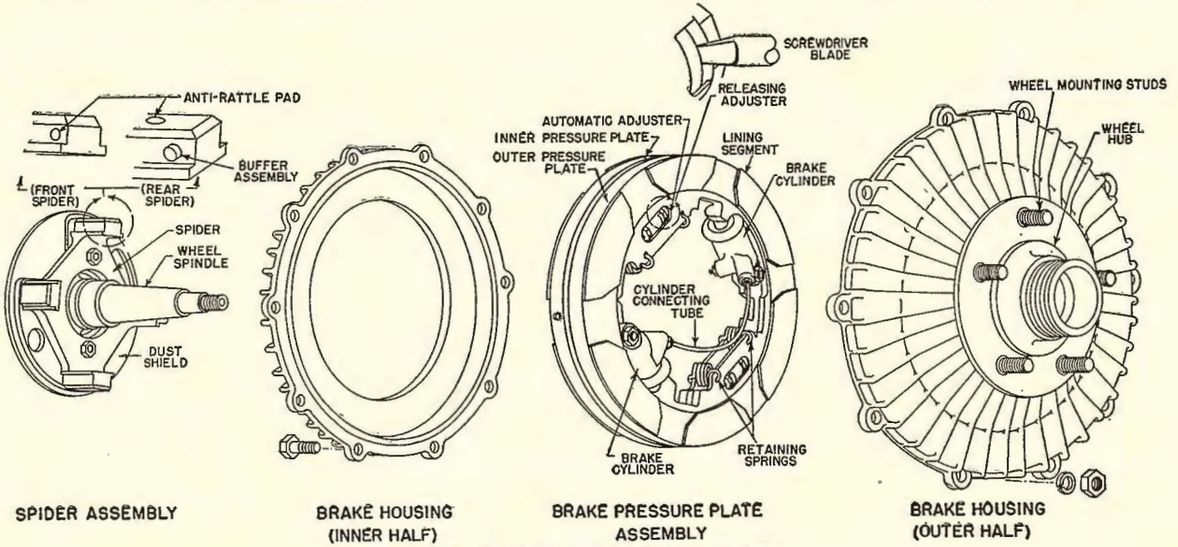
Chrysler Town & Country C49-3 (1950)
Chrysler Crown Imp. C47 (1949), C50 (1950)
Chrysler Imperial, C53 (1951)

DESCRIPTION: The Chrysler Disc Brake is hydraulically operated, self-energizing. The brake assembly which is enclosed in a rotating housing, utilizes two lined pressure plates in the form of annular rings which move apart, contacting the inner surfaces of the rotating housing. The housing is split and is held together by 10 bolts around the outside. The plate assembly, which carries two hydraulic cylinders, is mounted on a spider attached to the front wheel spindle body and the rear brake spider on the rear axle housing flange. Automatic brake adjusters are built into the assembly. Brake lining segments are used, bonded to the outer surface of each pressure plate. Two hydraulic wheel cylinders move push rods operating against bosses on the outer plate to provide plate movement. 1¼" cylinders are used on the front brakes and 1" cylinders on the rear brakes.

OPERATION: When the outer plate is rotated with respect to the inner plate by movement of the wheel cylinder push rods, steel balls between the pressure plates are forced up on ramps located on the inside surfaces of the plates. The movement of the balls up the ramps forces the pressure plates apart and contact is made between the lining and the inner surfaces of the brake housing.

Self-Energization: The self-energization action is obtained by utilizing the friction force that tends to rotate the pressure plates in the direction of brake housing rotation when contact is established between the linings and the brake housing. When the brakes are applied, the outer plate is rotated forward by the action of the brake cylinder push rods and the plates are separated. During forward motion of the car, the inner plate is held rigid. Therefore, when the linings contact the housing, only the outer plate is free to move. The resulting additional forward movement of the outer plate, with respect to the inner plate, forces the balls higher on the ramps and consequently provides greater pressure contact between the plates and the housing. Thus some of the energy due to forward motion of the car is used to increase the braking effect. When the car is in reverse, the outer plate becomes the fixed plate on the rear wheels, and self-energization is provided by the movement of the inner plate when it contacts the housing. The front wheel brakes are not self-energizing when in reverse, as the inner plate is still the fixed plate.

Automatic Wheel Brake Adjusters: This self-adjusting mechanism automatically compensates for lining wear. Thus, the desired clearance is maintained at all times between the pressure plates and the brake housing, and full pedal effectiveness is provided. Two identical automatic adjusters are mounted opposite each other on the inside surface of each inner pressure plate. The adjusters are identical in operation for either front or rear brakes. Two lugs are provided on the inside surface of each outer pressure plate, and are placed so as to straddle the automatic adjusters. Refer to Illustr. Each self-adjusting unit is composed of a bracket (which is riveted to the inner pressure plate) with two guide flanges, a rod, a lubricating washer, 11 steel adjuster balls, an adjuster washer, a bushing and a sleeve. When the brakes are applied, the outer plate is rotated with respect to the inner plate and lug "B" contacts the adjuster rod. Refer to Figure 4. If the brake linings are new, the linings contact the brake housing before the adjuster rod is pushed forward. However, if the linings have worn, lug "B" pushes the adjuster rod through the bracket guide flanges until the linings contact the brake housing, and the relative rotation of the outer plate stops. When the brakes are released, the brake return springs cause the outer plate to tend to return to its former position with respect to the inner plate. However, when lug "A" comes into contact with the adjuster rod, the locking action provided by the automatic adjuster prevents the adjuster rod from being pushed back, and the outer plate cannot return completely to its former position. Because the difference between the length of the rod and the distance between the finished surfaces of the lugs has been calculated to provide the desired clearance between the linings and the housing when the brakes are released, proper clearance is maintained regardless of the wear on the linings.



CHRYSLER DISC BRAKE MAIN UNITS

ADJUSTMENT: Self-adjusters are used and no service adjustments are necessary.

Brake Pedal: ⅛-¼" free travel. Adjust by loosening locknut on master cylinder end of pedal rod and turning large adjusting nut.

Parking (Hand) Brake: Independent type. See Car Model pages for adjustment data.

REPAIR DATA: ***CAUTION—None of the parts on four wheel disc brake assemblies are interchangeable. When more than one assembly is being serviced at one time, care should therefore be taken to keep the parts of each assembly separated from the others.***

Wheel Brake Cylinders: Front brake cylinders are 1¼" diameter and rear cylinders are 1" diameter. Two cylinders are used on each brake.

Bleeding Brakes: While bleeding brakes it is important to keep the master cylinder full of fluid. A long rubber hose **must** be used on bleeding screw while bleeding screw is open. Bleed only one cylinder at a time. Best results are obtained by bleeding **all four lower cylinders first** and then bleeding all four upper cylinders.

►***CAUTION: After brakes are thoroughly bled, the brake pedal may still be low. Driving the car and applying the brakes a few times will set up the automatic adjustment and provide a good pedal operation.***

BRAKE LINING: To replace the lining it is necessary to remove the plate assembly. See disassembly procedure following. Segment type brake lining is used, bonded to the pressure plates.

►***CAUTION: When new linings have been installed, erratic operation may prevail for a few miles of operation. Car should be driven and brakes operated until normal brake applications result in smooth straight stops. This may take up to twenty-five or thirty miles of driving.***

Disassembly of the Front Disc Brake: Remove dampener spring and clips. Remove the ten bolts around brake housing. The inner and outer housings are matched sets. A cut-out is cast in each housing so that both halves can be mated to their original position. Remove dust cap and wheel bearing nut. Separate inner and outer housings by tapping lightly, at one of the attaching bolt hole flanges, with a fibre-nose hammer. When housings separate, remove outer wheel bearing. Pull off the hub and outer brake housing. Disconnect front brake hose from the tube at frame connection. The hose should be held down to drain fluid. Remove the brake tube dust grommet (2 metal screws) from the dust shield and slide the grommet off the brake tube. (On late C-47 and on all C-49 Town and Country and C-50 models, the dust grommet will not have to be removed from dust shield.) Cover open end of brake tube with absorbent cloth to prevent brake fluid leakage on brake parts. Remove brake pressure plate assembly. Place the assembly on a clean surface or cloth on the bench. Keep plates and lining clean.

Assembly of the Front Disc Brake: Install inner half of brake housing. Prior to installing pressure plate assembly, release both self-adjusters. Release auto-

CONTINUED ON NEXT PAGE

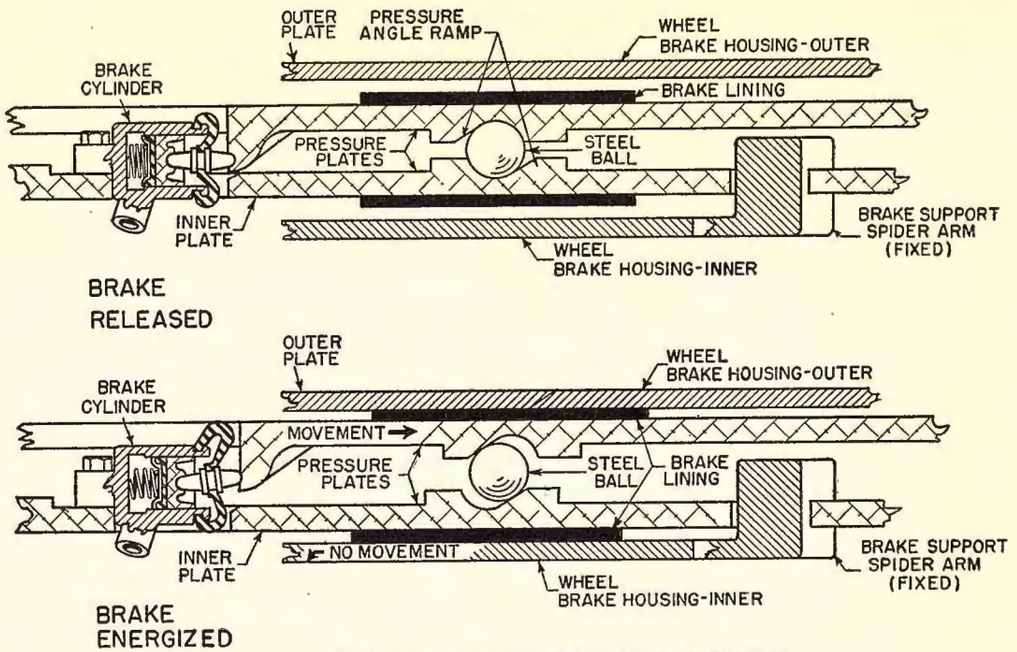
CHRYSLER DISC BRAKE (Continued)

matic adjusters by inserting a thin shank screwdriver between the release sleeve in the automatic adjuster and the adjuster guide of each adjuster, and then twisting both screwdrivers. See Illustr.. The pressure plates will then snap back into fully released position. Install brake pressure plate assembly. Install brake tube dust grommet. Connect brake tube to frame connection. Install assembly of hub and outer brake housing. Inner and outer brake housing are matched and balanced as an assembly so that it is necessary to line up the mating cutout or marks on each housing. Install outer wheel bearing, washer, and nut. Adjust bearing, install cotter pin and replace dust cap. Install the ten housing bolts, lock washers and nuts. Install dampener spring and clips.

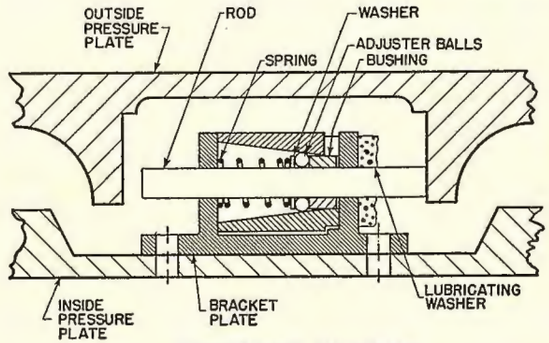
Disassembly of the Rear Disc Brake: Disassembly procedure for the rear brake is similar to the front brake procedure, except as follows: After removing the 10 housing bolts, remove the outer housing with a hub puller. Remove axle key to prevent scoring the oil seals. When the pressure plates are removed two buffer assemblies mounted in the brake spider will fall out.

Assembly of the Rear Disc Brake: Rear brake assembly procedure is similar to the front brake procedure except as follows: Before installing the spider, check the inside face of the seal assembly. It must be flush with the inside face of the spider. Wrap a piece of wax paper over axle shaft to cover key slot. This will prevent cutting the seal lip. Then install spider and seal assembly in correct position—aligning buffer loading pin holes in spider to correspond with holes in dust shield. Install inner half of brake housing. Prior to installing pressure plate assembly, release both self-adjusters. (See Assembly of the Front Disc Brake.) Insert the two buffer assemblies in spider anchors. **NOTE: Be sure lock groove in buffer is facing dust shield.** Using a pair of water pump pliers, hold buffer in compressed position, in spider leg, and while fully compressed insert lock pin (round stock 3/16" dia. by 1½" long with blunt ends) through hole in dust shield, so the buffer will remain in compressed position when pliers are released. Install brake pressure plate assembly. After brake pressure plate assembly is in position, remove buffer lock pins. Install brake tube dust grommet (C-47 only) and connect brake hose to the tube at axle housing connection. Place hub and outer brake housing assembly in position on axle shaft, and line up key way. Insert key and drive into position with fibre-tipped hammer.

Disassembly of Inner and Outer Pressure Plates: Release automatic adjusters. By inserting a thin shank screwdriver between the release sleeve in the automatic adjuster and the adjuster guide of each adjuster, and then twisting both screwdrivers, the pressure plates will snap back into fully released position. (See Illustr.) Remove the four pressure plate retaining springs. These coil springs perform the same function as the return spring in the shoe-type brake in that they pull the pressure plates together when hydraulic pressure is released and prevent the plates from maintaining friction contact with the brake housing. A "V" slot cut into one side of a screwdriver will greatly assist in spring removal. The discs can now be separated.



PRESSURE PLATE ASSEMBLY RELEASED & ENERGIZED



AUTOMATIC ADJUSTER

Assembly of Inner and Outer Pressure Plates: With the wheel cylinders and automatic adjusters properly installed on the inner pressure plate, place the six steel pressure expanding balls (7/8" dia.) in the six ramps. Place outer plate into position in inner plate. It will be necessary to cock the wheel cylinder push rods slightly when positioning the outer plate. Automatic adjuster rods must also be centered so that operating lugs on the outer plate will straddle the rods. Install the four pressure plate retaining springs.

Disassembly of Automatic Adjuster: (See Illustr.) The rod in the automatic adjuster will only move in one direction and can be pulled out by hand. The adjuster sleeve can then be removed by sliding the sleeve out from between the bracket guides. It is not necessary to remove the bracket from inner pressure plate.

►***CAUTION: Hold a finger over each end of the sleeve during removal so that steel balls, washers, etc. inside will not be lost.***

Assembly of Automatic Adjuster: To assemble the automatic adjuster, it will be necessary to make a dummy shaft out of round stock ¼" in diameter by ¾" long chamfered on one end to use in place of the adjuster rod which is installed later. Place adjuster sleeve (slotted end down) upright on finger and insert dummy shaft (chamfered end up) in sleeve. Place bushing over dummy shaft. NOTE: Dummy shaft and bushing can be held in proper positions by placing the large end of a common paper clip around the shaft at the slotted end of the adjuster sleeve. Install the eleven adjuster balls around dummy shaft. Tap lightly to position balls. Install adjuster washer on top of balls. Place the adjuster spring over the shaft above washer. Holding thumb over spring, carefully remove paper clip, holding dummy shaft. Continue to hold pressure on spring —compress sufficiently to slide sleeve into position on the bracket. NOTE: The sleeve is grooved and the bracket is stepped, so that installation can be made the right way only. Align sleeve assembly so that dummy shaft is in line with the holes in the bracket guides. Insert the adjuster rod into the stepped end of bracket and force dummy shaft out. Push the adjuster rod through the adjuster until adjuster is in the center of the rod. Install lubricating washer on adjuster rod at stepped end of adjuster bracket.

Buffer Assemblies: The buffers which are used on the rear brakes only, control the clocking motion of the outer pressure plate.

►***CAUTION: Buffer assemblies are calibrated units. If defective replace the complete buffer assembly. When intalling buffers in the spider arm be sure the lock groove in buffer faces the dust shield (backing plate).***

CHRYSLER-LOCKHEED "SAFEGUARD" HYDRAULIC

Chrysler 6, Model C34 7 Pass. Cars (1942)
Chrysler 6, All Models (1946-51)
Chrysler 8, Models C26, C27 (1940)
Chrysler 8, Models C30, C33 (1941)
Chrysler 8, Models C36, C37 (1942)
Chrysler 8, Models C39, C40, C46 (1946-50); C49 ('50)
Chrysler 8, Models C52, C54, C55 (1951)
De Soto, Model S10 7 Pass. Cars (1942)
DeSoto, All Models (1946-51)
Dodge, Model D22 7 Pass. Cars (1942)
Dodge, All Models (1946-51)
Plymouth, All Models (1946-51)

►CHANGES, CAUTIONS, CORRECTIONS

►**BRAKE SQUEAK & SQUEAL CORRECTIONS:** On all models, if this condition cannot be corrected by proper adjustment of the brakes, check the following points and note also the specific recommendations for each car model. It is recommended that both front wheels be checked first as it has been found that only front wheels squeak in most cases. **Brake Shoe Alignment**—Check brake shoes for distortion and twisting and for straightness of the shoe web (use a surface plate). Correct or replace shoes.

Brake Shoe Clearance at Cam Pin—Incorrect clearance between brake shoe and eccentric cam pin will cause misalignment of shoe with consequent wear on edge of lining and squeaking and vibration as brakes are applied. Too little clearance (long cam pin) will result in wear on inner edge of lining, too much clearance (short cam pin) will result in wear on outer edge of lining. Check the cam pin height (Brake Shoe Adjusting Gauge can be adapted to this purpose). Top of pin should be same height as flat surface at rear of wheel cylinder (front brakes), face of flat spacer under anchor bolt (rear brakes). If pin is too high, file off head of pin or "dimple" shoe web (see Notes below) for clearance. If pin too low, "dimple" shoe web in opposite direction (see Notes below) or bend spring guide outward to relieve pressure on shoe (CAUTION—spring tension must not be less than 15 lbs. measured with spring scale).

"Dimpling" of Brake Shoe for Pin Clearance—Support shoe web on end of pipe or wrench socket (at point directly over cam pin), strike web with ball end of ball peen hammer. Dimple side next to cam pin for increased clearance, opposite side for decreased clearance.

Dodge Insulating Washer Installation for Cam Pin Clearance—Install special insulating washer over head of cam pin to support shoe web so that shoe does not contact pin (file pin if contact is apparent). When making height gauge readings, use face of washer as indicating point rather than top of pin. Readings should be from zero to minus .020" (support plate can be bent to secure this height). **Grooving Brake Lining (Chrysler & Dodge)**—If above procedures do not correct squeaks (make certain that brake drum dampener springs are in place also), lining can be grooved to secure more perfect contact between lining and drum as follows: Clamp brake shoe in vise, scribe diagonal line on face of lining beginning at point 7/8" in from side at one end and 7/8" from opposite side at opposite end. Cut groove approximately .050" wide (use two fine hacksaw blades clamped together in holder) completely through lining to face of brake shoe.

►***CAUTION—Do not attempt to groove riveted lining or any of the edge-bonded, wire-backed, cycle-bonded linings.***

Slotting Brake Shoes (Dodge)—If grooving does not correct squeaks, toe end of shoes can be slotted to depth of 1 3/8". Use hacksaw blade to cut web loose from shoe table (lining surface) cutting as close to the table as possible.

►***CAUTION—Do not slot front brake shoes which have four 5/8" holes through the shoe table.***

►**BRAKE BLEEDING CAUTION:** On front wheel brakes, each wheel cylinder must be bled separately (two points). *See Brake Bleeding data on next page.*

►**BRAKE ANCHOR PIN NOTE:** Pins marked by arrow on inner end (visible with drums removed) so that point of minimum adjustment can be readily secured by turning pins until arrows point toward each other (rear wheel brakes), or arrow on each pin points toward adjacent wheel cylinder (front wheel brakes). See adjusting instructions under "Major Adjustment" below.

►**POWER BRAKE CAUTION:** Vacuum power cylinders used as standard or optional equipment on models as listed below. See separate data on each type for adjustment and overhaul data.

Power Brake Applications

1940-42	Bendix Vacuum Power Cylinder
1946-48	Vacdraulic Power Unit
1949-51	Vacu-ease Power Unit

DESCRIPTION: This Chrysler "Safe-Guard" brake system consists of two-cylinder type hydraulic brake (front wheels), single double-acting cylinder type hydraulic brake (rear wheels). Design is similar on all models listed above and consists of the following special front and rear wheel brakes:

Two-Cylinder (Front Wheel) Type—Consists of two independent single-acting brake cylinders mounted on the backing plate, each cylinder actuating one brake shoe. Each cylinder is mounted on the anchor pin of the other shoe (top cylinder mounted on rear shoe anchor pin and actuates forward shoe, bottom cylinder mounted on forward shoe anchor pin and actuates rear shoe). All shoes are of the "primary" or self-energizing type.

Single Cylinder (Rear Wheel) Type—Same as other "Lockheed Double Anchor Hydraulic" brake cylinders. Consists of single double-acting cylinder mounted at top of backing plate and actuating both brake shoes. Shoes are pivoted on anchors at bottom of backing plate.

ADJUSTMENT: Before making adjustments, jack up all wheels, check brake pedal free travel (should be 1/8-1/4" (to take up pushrod play) plus additional 5/8-3/4" (to close off master cylinder relief port) before brakes begin to be applied. Total pedal travel to apply brakes should be 1 3/4-2". If Minor Adjustment does not give correct pedal travel, or if relief port is cut off with less than 3/4" pedal travel, check brake pedal free play adjustment.

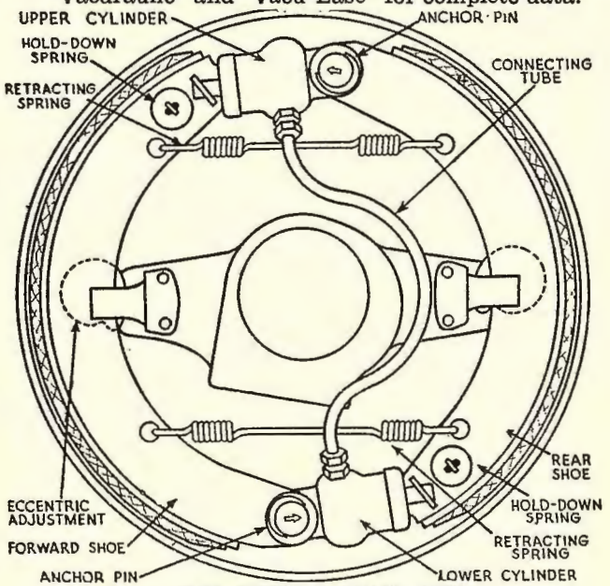
BRAKE PEDAL ADJUSTMENT

Brake Pedal Adjustment:—Brake pedal must have 1/8-1/4" free travel to insure the master cylinder piston being back against its stop and compensating port uncovered when brakes released in order to provide for correct compensating action (brakes will drag if this port blocked). To adjust, loosen locknut on master cylinder end of pedal rod, turn large adjusting nut.

MINOR ADJUSTMENT

Chrysler Crown Imperial Power Brake. 1940-42 models are equipped with Bendix Vacuum Power Brake booster. See article on these units for master cylinder pushrod adjustment. Master cylinder adjustment is part of the booster adjustment and must be set in accordance with booster adjustment data.

Chrysler Vacdraulic & Vacu-Ease Power Units. Are on 1946-50 models, and are non-adjustable. See "Vacdraulic" and "Vacu-Ease" for complete data.



TWO-CYLINDER BRAKE ASSY.

Minor Adjustment (For Wear):—Turn eccentric cam adjuster on backing plate out until shoe is solid against drum and wheel is locked then back eccentric off until wheel is free. Adjust each eccentric in this manner (one eccentric for each shoe, two on each wheel backing plate). Eccentric is held in position by spring tension and no locknuts are used. Adjustments should be made with brakes at

CONTINUED ON NEXT PAGE

CHRYSLER-LOCKHEED "SAFEGUARD" (Continued)

room temperature (brakes will drag when cold if adjusted when drums are hot or immediately after car has been driven).

NOTE—Turning eccentrics out at top (toward rim of backing plate) will move brake shoes out toward drum and decrease clearance.

MAJOR ADJUSTMENT

Major Adjustment (For New Linings):—Special adjusting gauge (MT-19-C) or cutaway drum must be used to check shoe clearance. Before making adjustments, set both anchor pins in minimum position by loosening locknuts on backing plate and turning anchor pin until arrow on inner end points toward adjacent wheel cylinder (on front wheel brakes), toward each other (rear wheel brakes). Install adjusting gauge on the wheel spindle and adjust each wheel as follows:

FRONT WHEELS

Front Wheels—With the adjusting gauge over the heel (anchor pin end) of the forward brake shoe, turn this lower anchor pin in clockwise direction (left hand side of car), counter-clockwise direction (right hand side of car) to move shoes out toward drum until clearance is correct (see table and gauge note), tighten anchor pin locknut. Move gauge to toe (wheel cylinder end) of shoe, adjust eccentric cam adjuster on backing plate (turn eccentric out toward rim of backing plate at top) until clearance is correct (see table and gauge note). Recheck clearance at heel end (readjust as necessary). Repeat adjustments for rear shoe (keeping in mind that anchor pin end and wheel cylinder end of shoe reversed from those on forward shoe), then adjust wheel on opposite side of car in same manner (anchor pin must be turned in opposite direction as directed above).

Front Wheel
Brake Shoe Clearances

Car Model	Heel (Anchor End)	Toe (Cyl. End)
Chrysler 6 ('42) 7 Pass.	.006"	.007"
Chrysler 6 ('46 On)	.006"	.006"
Chrysler 8 ('40-42)	.006"	.007"
Chrysler 8 ('46 On)	.006"	.006"
DeSoto ('42) 7 Pass.	.006"	.007"
De Soto ('46 On)	.006"	.006"
Dodge ('42) 7 Pass.	.006"	.007"
Dodge ('46 On)	.006"	.006"
Plymouth ('46 On)	.006"	.006"

Brake Gauge Note—When using MT-19 Brake Gauge, set the gauge finger so that mark "HEEL" is uppermost when checking both heel and toe ends of brake shoes on 1946 & later cars (and Heel of shoes only on 1942 and previous models). To check clearance at Toe end of shoes on 1942 and previous models, set the gauge finger so that mark "DRUM" is uppermost and use a .007" feeler gauge between the gauge finger and the lining. NOTE—Pointed edges of gauge finger are the gauging points (mark is on opposite side so that mark is uppermost when gauging point is down toward lining).

CAUTION—Do not use "TOE" position of gauge finger when checking these brakes (Toe position will give .012" clearance and is designed for use on previous car models only).

REAR WHEELS

Rear Wheels—With the adjusting gauge over the heel (anchor pin) end of the forward shoe, turn the anchor pin inward at the top (toward the other anchor pin) to move shoes out toward drum until clearance is correct (see table and gauge note below), tighten anchor pin locknut. Move gauge to toe (wheel cylinder) end of shoe, adjust eccentric cam adjuster on backing plate by turning eccentric outward at top (toward wheel rim) to move shoes out toward drum until clearance is correct (see table and gauge note below). Recheck clearance at heel end and readjust as necessary. Repeat these adjustments for the rear shoe and then adjust the other wheel in the same manner.

Rear Wheel
Brake Shoe Clearances

Car Model	Heel (Anchor End)	Toe (Cyl. End)
Chrysler 6, 7 Pass. ('42)	①	.007"
Chrysler 8 ('40-42)	①	.007"
Chrysler 6 & 8 ('46 On)	.006"	.006"
DeSoto 7 Pass. ('42)	①	.007"
De Soto ('46 On)	.006"	.006"
Dodge 7 Pass. ('42)	①	.007"
Dodge ('46 On)	.006"	.006"
Plymouth ('46 On)	.006"	.006"

①—.006" for Forward Shoe, .007" for Rear Shoe.

Brake Gauge Note—When using MT-19 Brake Gauge, set the gauge finger so that mark "HEEL" is uppermost when checking both heel and toe ends of all shoes on 1946 & later cars and heel of Front shoes only on 1942 and previous models. To check clearance at toe end of all shoes, and heel end of Rear shoes, on 1942 and previous models, set gauge finger so that mark "DRUM" is uppermost and use a .007" feeler gauge between the gauge finger and the lining. CAUTION—Do not use the "TOE" position of gauge finger when checking these brakes (Toe position will give .012" clearance and is designed for use on previous car models only).

CAUTION—Anchor pins must always be turned to minimum adjustment position (with arrow on inner end pointed toward adjacent wheel cylinders (two cylinder brakes on front wheels), toward each other (single cyl. brakes on rear wheels) before adjustments are made. If this is not done, shoes will not be centralized in drum even though clearances are correct. Anchor pin inner ends are flattened so that wrench can be applied at this point and arrows checked while pins are being turned.

Hand Brake: Independent type on propeller shaft. *See adjustment instructions in Chrysler Special Data in Car Model Section.*

BLEEDING BRAKE LINES: Bleeding of the brake lines must be done exactly as outlined below in order to fully bleed both cylinders of the front wheel brake system (all air cannot be removed from system by bleeding one cylinder only).

Front Wheel Cylinders & Lines—Fill master cylinder supply tank with fresh fluid, attach bleeder hose to bleeder screw in center of upper wheel cylinder, submerge end of hose in fluid in clean glass container. Loosen bleeder screw ½-¾ turn, bleed line by pumping brake pedal slowly through one-half of pedal travel until fluid flow from hose is continuous and no air bubbles are evident. Then close upper bleeder screw. Connect hose to lower cylinder bleeder screw in center of lower wheel cylinder, open bleeder screw ½-¾ turn and bleed line between two brake cylinders in same manner. This is important.

Rear Wheel Cylinder & Lines—Bleed these wheels in usual manner (see separate article on Brake Servicing). One bleeder connection only is located on each rear wheel backing plate.

SERVICING (Master Cylinder & Wheel Cylinders):

Front Wheel Cylinders: Both cylinders (two on each wheel) are single acting type with one piston. Pistons have rubber 'piston ring' in groove on piston (no separate piston cups used). To remove piston ring from piston, roll ring off end of piston. Install this rubber ring with lip on ring in toward inner end of cylinder and install piston spring with small end in (large end toward piston).
NOTE—No piston spring used on 1940 models.

Rear Wheel Cylinders: One double-acting cylinder used on each wheel. Cylinder is conventional type with double opposed pistons and piston spring. Pistons have rubber "piston ring" in groove in piston (same as Front Wheel Cylinders described above) and separate piston cups are not used.
NOTE—No piston spring used on 1940 models.

Master Cylinder: Compensating type of same design used on previous Chrysler and other car models.

See "Hydraulic Brake Servicing" for complete data.

Lining Specifications: See Brake Specifications on car model page (Car Model Section) for data.

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting."*

CHEVROLET (OWN) HYDRAULIC

Passenger Cars, All Models (1937-50)
Comm'l & Trucks, All Models (1937-50)
All ¾, 1, 1½, 2 Ton Trucks (1951)①
①—Front Wheels only on 1951 1½ & 2 Ton (new "Twinplex" Brakes on rear wheels).

►**1951 Pass. Car & Half-Ton**—Have Chevrolet-Bendix Duo-Servo, Single Anchor, Hydraulic brakes.

►CHANGES, CAUTIONS, CORRECTIONS

►**TRUCK BRAKE BOOSTER NOTE:** Hydrovac Power Unit Std. or Optl. on 1½ and 2 Ton Trucks. *See "Hydrovac Power Unit" for complete data.*

►*CAUTION*—On trucks with Hydrovac, special brake system bleeding procedure is required. See special bleeding instructions under "Servicing" below.

►**1½ & 2 TON BRAKE CABLE CHANGE (1939-48 for Increased Clearance between Tires and Cable):** Approximately 1" additional clearance between tires and brake cables can be secured by installation of following parts:

Hand Brake Cable Axle Bracket—Brackets approximately 1" longer than original type furnished under Part No. 3686657 (R. H.), 3686658 (L. H.) for all 1937-47 Trucks.

Hand Brake Cable & Clamp Assembly—New design assembly which holds cable inward after it leaves cable frame bracket furnished for all models as follows: 1939-46 Utility Models—3651403 (R. H.), 3651404 (L. H.). 1947-48 Half-Ton Comm'l—3686522. 1947-48 ¾ Ton Comm'l—3676305. 1947-48 One-Ton Comm'l—3684247. 1947-48 1½ & 2 Ton (137" & 161" WB)—3686686. 1947-48 2 Ton C-O-E (110" WB)—3686727. 1947-48 1½ & 2 Ton School Bus & 2 Ton C-O-E (134" & 158" WB)—3686685.

►**BRAKE SHOE INSTALLATION CHANGE (To Correct Erratic Brake Action When Wet Complaints):** Brake lining on front wheels must be Inlite 599849 or Marshall Eclipse 3682131 (see identification data below). Manhattan 475518 lining (also furnished in Pkg. No. 603872) **must not be used on front wheels.**

NOTE—All service packages with Manhattan lining now stamped "Use on Rear Brakes only."

Lining Identification—Inlite lining has blue identification on side, Marshall Eclipse has orange identification mark. Manhattan lining not marked but packages will be marked as above.

►***CAUTION—Manhattan lining must be used on rear wheels only. Inlite & Marshall Eclipse lining can be used on either front or rear brakes.***

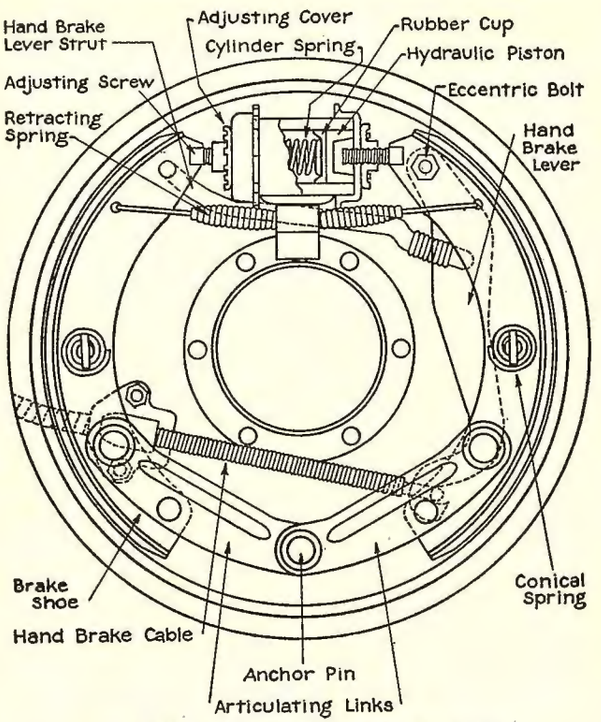
DESCRIPTION

DESCRIPTION & OPERATION: Wheel Brakes. Two shoes per wheel similar to previous design in that shoes are mounted on articulating links at anchor pin end with upper end bearing directly on wheel cylinder piston adjusting screws. Rigid type hydraulic wheel cylinder mounted on backing plate between shoes. Shoes are forced out in contact with drum by piston movement when fluid displaced from master cylinder by pedal application flows through lines to wheel cylinder. Articulating links result in uniform shoe contact with drum and only one adjustment (at piston) provided. Shoes returned to off position when pedal released by single retracting spring linked between shoes.

Adjustment Note (1940 On). Slots provided in front wheel backing plates (closed by snap covers) on all models so that brakes can be adjusted without removing wheels (required on 1939 & earlier cars).

Stop Light Switch Note (1942 On). Mechanical type Stop Light Switch is used on all Passenger Cars and Trucks (hydraulic type switch on first 1942 Trucks). This switch requires special Brake Pedal Clearance setting on Passenger Cars only (Truck setting same as previous models). See Brake Pedal Clearance section below for data.

Hand Brake:—Hand lever applies rear wheel service shoes through cable actuated lever pivoted on one shoe and linked to other shoe by strut (passenger cars) or lever and link (1½ ton truck).



REAR BRAKE ASSY. (FRONT SAME EXCEPT HAND BRAKE LINKAGE OMITTED)

Hand Brake (1939 Passenger Cars). Hand Brake lever is mounted under cowl and is linked to bell-crank lever on left frame side-rail by non-adjustable rod. Bell-crank is linked to idler lever on second frame cross-member by non-adjustable rod with anti-rattle clip on rod at engine tie bar. This idler lever is linked to rear wheel hand brake cables by rods with adjusting clevises at cable connections. Free end of lever is guided by slotted guide plate.

Hand Brake (Passenger Cars 1940 On):—Cars have idler lever mounted on bracket welded to second cross-member (at rear of transmission) and linked to each rear wheel by cable with adjustment on each cable at idler lever end (see Adjustment data below).

Parking Brake (1947-50 ½ & ¾ Ton Trucks)—Rear wheel brakes are applied by a foot-operated pedal and released by a button under the instrument panel. See Parking Brake adjustment data below.

Master Cylinder:—Compensating type similar in design to type used on other brake systems. *See "Hydraulic Brake Servicing" for complete data.*

Master Cylinder Piston Primary Cup (1939 Model). New type rubber primary cup used which has brass support ring vulcanized in base to prevent cup imbedding in bleeder holes in piston. This new type primary cup can be used on previous car and truck models. NOTE—Old design truck primary cups cannot be used on 1939 truck models.

BLEEDING BRAKE SYSTEM: Required when lines disconnected, to remove wrong type fluid if used in system, or to remove air from lines caused by allowing master cylinder supply tank to become dry or by disconnecting lines.

All Pass. Cars (and Trucks without Hydrovac): *See "Hydraulic Brake Servicing" for complete data.*

►**Trucks with Hydrovac Brake System**—When bleeding entire brake system, Hydrovac unit must first be bled at two points before bleeding the lines and wheel cylinders. Bleed the entire system exactly as detailed below (CAUTION—Engine must not be running and there must not be any vacuum in the Hydrovac system while bleeding these brakes).

Hydrovac Point #1—Remove bleeder valve screw on side of control valve housing on Hydrovac end-plate, attach bleeder hose and submerge end of hose in brake fluid in a clean drain jar. Fill brake master cylinder reservoir with fluid, open bleeder valve ½-¾ turn, depress brake pedal slowly by hand, close bleeder valve before releasing pedal. Repeat these operations until fluid flows from the hose in a solid stream without bubbles, then close bleeder valve, remove hose, install valve screw.

Hydrovac Point #2—Attach bleeder hose at bleeder valve on side of Hydrovac unit outlet fitting (point at which brake lines to wheels connected). Bleed system at this point in exactly same manner as detailed for Point #1 (above).

Wheel Cylinders—After bleeding Hydrovac unit, proceed to bleed lines and wheel cylinders at each wheel in the usual manner.

BRAKE PEDAL ADJUSTMENT

Pedal Clearance Note: Clearance between pedal and underside of toeboard must be correct to insure master cylinder piston being back against its stop for correct compensating action when brakes released (clearance between edge of master cylinder piston primary cup and center of compensating port must be .035" minimum).

Adjustment—Adjust each model as follows:

Pass. Cars (with hydraulically operated Stop Light Switch)—Clearance between pedal and underside of toeboard must be ¼". To adjust, loosen locknut on eccentric bolt (linking pedal and master cylinder pushrod) and turn bolt. Tighten locknut after adjusting.

Passenger Cars (With mechanically operated Stop Light Switch). Clearance between upper face of pedal and first toe-board re-inforcing rib below pedal rod must be 7/16". Adjust in same manner as previous models by loosening locknut on eccentric pedal bolt and turning bolt. Tighten locknut to 20-25 ft. lbs. after adjusting.

►*CAUTION*—If correct 7/16" clearance cannot be secured by turning eccentric bolt, adjust by installing shims under front or rear master cylinder mounting bolts.

CONTINUED ON NEXT PAGE

CHEVROLET (OWN) HYDRAULIC (Continued)

Trucks (1937-47). Loosen clevis locknut on rear end of master cylinder pushrod, turn pushrod until correct clearance of ¼" is secured between pedal and underside of toeboard with pedal released, tighten locknut after adjusting.

NOTE—On 1942 Truck Models, same clearance of ¼" is correct for all models (whether hydraulic or mechanical type Stop Light Switch used).

Trucks (1947-51). Clearance between top of pedal arm and underside of depression in toe pan at pedal must be 13/16" with pedal released and master cylinder piston against its stop. To adjust, loosen locknut at pushrod clevis, turn pushrod (knurled section provided on rod for this purpose), tighten locknut after adjusting.

BRAKE SHOE ADJUSTMENT

►*CAUTION*—Before adjusting, jack up all wheels, disconnect hand brake cables at idler lever on cross-member (Pass. Cars, Half-Ton, & Forward Control trucks), or at cross-shaft idler levers (other trucks). Remove adjusting cover on backing plate at each end of wheel cylinder (not necessary for rear wheels on 1½ & 2 Ton or 1 Ton after 1947). Adjust each wheel as directed below. If brake drums have been removed previously, apply brakes firmly to align articulating pins before adjusting.

CAUTION—Hand brake cables or rods must be disconnected to eliminate possibility of shoes being held on which would result in incorrect adjustment.

Pass. Cars & Half-Ton (Front & Rear Wheels): Insert point of screwdriver in slot on backing plate at each end of wheel cylinder so as to engage notched adjusting covers on cylinder, turn adjusting covers until shoe has slight drag on drum, then back cover off exactly **4 notches** (Pass. Cars & 1939-47 Half-Ton), **5 notches** (Half-Ton beginning 1948) for correct shoe clearance. Adjust all wheels in this manner, then adjust parking brake and check brake pedal clearance.

Trucks (except Half-Ton): ***CAUTION—Front and rear wheels adjusted differently as follows:***

Front Wheels (All Trucks)—Insert point of screwdriver in slot on backing plate at each end of wheel cylinder so as to engage notched adjusting covers on cylinder (adjusting cover at each of cylinder controls one shoe), turn adjusting covers until shoe has slight drag on drum, then back cover off exactly **5 notches** for correct shoe clearance. Adjust both wheels in this manner.

Rear Wheels (All ¾ Ton & 1941-47 1 Ton)—Adjust in same manner as front wheels (above), backing cover off 5 notches for correct shoe clearance.

Rear Wheels (1948-51 1 Ton, 1939-50 1½ & 2 Ton). Use an open-end wrench to turn the hexagonal headed pinion shaft on brake backing plate (shaft turns adjusting covers through gear engagement). Turn pinion shaft clockwise (looking out toward backing plate) until shoe drags slightly, then back pinion shaft off 2/3 turn (four sides of hexagonal head) for correct running clearance. Adjust parking brake (see below) and check brake pedal clearance.

HAND BRAKE ADJUSTMENT

Parking Brake Adjustment Caution: Different types of linkages used. Adjust each model as follows:

Passenger Cars (All Models): Place the hand lever in fully released position. Loosen both checknuts on each wheel cable at idler lever on frame cross-member (forward end of cables), pull cables forward out of conduit until definite stop is felt, hold cable in this position and tighten both checknuts on each cable so that cable is locked to idler lever toggle. Make certain that rear wheels are free.

Trucks (1939-47): Place hand lever in fully released position. Pull wheel cable end fitting (at front of rear frame cross-member) forward until a definite stop is felt, hold cable in this position, turn nut on forward rod down until it contacts (turn by hand only, do not use wrench), lock cable by turning rear nut up securely. Check equalization and make any necessary re-adjustment by loosening wheel cable slightly (do not change wheel cylinder adjusting cover setting).

Cab-Over-Engine Note—On Cab-over-Engine models before 1941, Front Cowling Assembly and Left Front Fender must be removed for access to hand lever mounting and pull rod clevis pin.

Half-Ton (1947-50) & ¾-Ton (1947-51) Pedal Type. This foot-operated type adjusted in same manner as other trucks (following). Also check release rod handle (under instrument panel) for ½" minimum clearance at support bracket. Adjustment provided at lower end of rod. CAUTION—This clearance necessary for correct locking action of pedal lock bar.

1-Ton (1947-51) & 1½, 2-Ton (1947-50): After the brakes properly adjusted, place hand brake lever in fully released position. Disconnect brake cables at cross-shaft levers on frame by removing clevis pins, pull cable out of conduit by hand until a positive stop is felt, adjust clevis on end of cable by loosening locknut and turning clevis until clevis pin can just be inserted in lever. Tighten locknut and connect cables. Check for drag and equalization. Correct by readjusting cables.

►***CAUTION—Do not attempt to equalize parking brakes by changing wheel cylinder brake shoe adjustment.***

Toggle Lever Adjustment—This adjustment must be made whenever new rear brake shoes installed. After adjusting service (hydraulic) brakes, remove brake drum, loosen eccentric bolt locknut (lever pivot on shoe web below right end of hydraulic cylinder), hold toggle lever against shoe, turn eccentric bolt until only slight clearance between lever and bottom of slot in hand brake extension link, tighten locknut, recheck clearance. Adjust hand brake as directed above. This toggle lever is not used on 1½ and 2 Ton Trucks.

1½ & 2 Ton (1951)—Rear wheel brakes are new "Twinplex" type (see separate data on Twinplex Brakes) and parking brake is independent type on propeller shaft at rear of transmission.

RELINING BRAKES: Manufacturer recommends installation of replacement shoes furnished with linings. Hard (semi-moulded or moulded) lining used which will have glazed appearance when burnished. See Car Model page for specifications for each model. Wheel cylinder piston clamp should be installed on piston when shoes removed.

Brake Shoe Removal: With wheels and drums removed (see Brake Drum Notes below), remove shoe return spring & hold-down springs. On rear brakes remove toggle lever eccentric bolt and nut from rear brake shoe. Remove articulating link friction spring pin lock, pin and spring. Take out pin lock and pin on each shoe and remove articulating links.

NOTE—In assembling toggle lever on new shoes, see that high side of eccentric bolt is toward shoe in minimum adjustment position (high side indicated by flat ground in bolt head). Toggle lever adjusted as directed above under Hand Brake.

►**Brake Drum Removal Note**—Remove drums for access to brake shoes as follows:

Passenger Cars—Rear brake drums are held on axle shaft flange by wheel mounting nuts and two screws (Zipon nuts beginning 1940). To remove drums, remove wheel and then take out screws or remove the zipon nuts on two of the wheel studs. When installing drums, see that extra hole in drum and gaskets is lined up with notch in axle shaft flange to provide oil drainage hole (or tongue on web section of drum extending into drain hole in axle shaft flange on 1942 and later models).

½, ¾, 1 Ton Truck Models—Rear brake drums are held on rear axle hub flange by two slotted screws and can be removed by taking out these screws without disturbing hub or wheel bearing adjustment.

1½ & 2 Ton Truck Models. Wheels, brake drums, and wheel hubs must be removed for access to brake shoes. This will make it necessary to adjust wheel bearings when wheels re-installed (see car model page for wheel bearing instructions).

NOTE—Brake shoes on these truck models have individual anchors.

Brake Shoe Installation: When installing shoes, see that they contact all pads on anchor plate (3 pads for each shoe) by checking clearance at each pad with .002" feeler gauge. If shoes do not touch all pads, bend anchor plate.

SERVICING: Brake Linkage (Pass. Cars). Brake cables are interchangeable (left and right).

1½ & 2 Ton Truck—Rear brake cables on these models are not interchangeable (left and right) and may be identified by string tracer woven under cable wire shield of left hand cable. *See 1½ & 2 Ton Brake Cable Change data above.*

Master Cylinder:—Piston clearance in cylinder must be .001-.005". When reassembled clearance between lip on primary piston cup and center of compensating by-pass port should be .035". *See "Hydraulic Brake Servicing" for complete data.*

Wheel Cylinders:—To disassemble wheel cylinders, with brake line disconnected and return spring on shoes removed, take out two mounting screws on backing plate. Remove cylinder, lift off adjusting cover and screw assemblies, withdraw pistons, piston cups and return spring. Examine bore. Piston clearance in cylinder should be .002-.004". Line must be bled when reinstalled.

NOTE—Wheel cylinders for front and rear wheels are of different bore and must be replaced in same wheel. No part of assembly interchangeable (see Car Model page for specifications).

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting" for complete data.*

CHEVROLET BENDIX HYDRAULIC

Chevrolet, All Pass. Car Models (1951)
Chevrolet Half-Ton Truck, Model JP (1951)

DESCRIPTION: Duo-servo, single anchor, hydraulic type (Bendix type **without** eccentric adjustment). Hand (parking) lever applies the rear wheel service brakes through a cable linkage connected to a lever-and-strut mechanism in the rear wheel brakes.

►**ADJUSTMENT NOTE**—Adjustments are made differently for wear (Minor Adjustment) and for new lining or shoe assemblies (Major Adjustment). Major adjustment should also be made whenever a minor adjustment is not satisfactory.

BRAKE PEDAL CLEARANCE: 7/16" (Cars), 13/16" (Trucks) clearance between pedal shank and bottom of toeboard depression at pedal with brakes released and master cylinder pushrod against its stop. Adjust as follows:

Pass. Cars—Loosen check nut on eccentric pedal bolt, turn bolt, tighten check nut to 20-25 ft. lbs.

►*CAUTION*—If correct 7/16" clearance cannot be secured by turning eccentric bolt, adjust by installing shims under front or rear master cylinder bolts.

Trucks—Loosen locknut at pushrod clevis, turn pushrod (knurled section provided on rod for adjustment), tighten locknut.

MINOR ADJUSTMENT (For Wear): Jack up all four wheels clear of the floor, remove adjusting hole cover on backing plates (spring snap cover—pry out). Relieve parking brake cable tension to insure brake shoes being up against anchor (On Pass. Cars, loosen front check nut on forward end of each wheel cable; on Half-Ton, disconnect cables by removing clevis pins). At each wheel, insert special adjusting tool J-4707 or screwdriver through adjusting hole to engage notched adjusting screw, expand brake shoes by turning up adjusting screw (move tool handle toward center of wheel) until light brake drag secured, then back off adjusting screw 14 notches or "clicks" for running clearance. Adjust parking brake, check brake pedal clearance.

MAJOR ADJUSTMENT (For New or Relined Shoes): Support car on stands and remove all four wheels (for access to clearance checking slot in drums). Check and adjust brake pedal clearance or free travel. Relieve parking brake cable tension to insure brake shoes being up aaginst anchor (On Pass. Cars, loosen front check nut on forward end of each wheel cable; on Half-Ton, disconnect cables by removing clevis pins). At each wheel, loosen anchor pin nut just enough to allow pin to shift in slotted hole (CAUTION—if nut loosened too much, brake springs will tilt pin). Use adjusting tool J-4707 or screwdriver inserted through adjusting hole on backing plate to expand shoes (move tool handle toward center of wheel) until heavy drag secured on drum. Tap anchor pin and backing plate lightly to insure pin shifting to center the brake shoes. If this changes brake drag, tighten adjusting screw several notches and repeat tapping on anchor pin. When drag remains constant, tighten anchor pin nut securely. Back off adjusting screw **10 notches** or "clicks," check clearance at each end of secondary (rear) shoe with .010" feeler gauge inserted through slot in drum. If clearance not equal at both ends of shoe, tap anchor pin up or down to equalize clearance, then tighten anchor pin nut to 60-80 ft. lbs. Install wheels. At each wheel, tighten brake adjusting screw until light brake drag secured, then back adjusting screw off 14 notches or "clicks" for correct running clearance. Adjust parking brake cables.

HAND (PARKING) BRAKE ADJUSTMENT: ***CAUTION—Pass. Cars and Trucks adjusted differently:***

Pass. Cars—Pull hand brake handle "on" 7 clicks of the pawls (CAUTION—this is not 7 notches). Loosen both check nuts at forward end of each wheel cable, tighten front nuts against clevis plates to tighten each cable until moderate drag secured at each rear wheel, tighten rear nuts securely to lock adjustment. Set hand brake handle 2 clicks from fully released position. There should be no brake drag.

Half-Ton Truck—Set parking brake foot pedal in fully released position. Adjust pedal pull rod clevis so that clearance between brake cross-shaft and frame cross-member at center is ⅛". Depress foot pedal 1½". Pull each wheel cable forward out of the conduit as far as possible, loosen locknut and adjust clevis on forward end of cable until hole in clevis lines up with hole in cross-shaft outer lever, connect cables. Depress foot pedal until heavy drag noted, check both wheels for equal drag, readjust wheel cable clevis as necessary. Release foot pedal, check clearance between release rod handle and rod support bracket. This clearance should be ½", correct by adjusting handle.

BLEEDING BRAKE SYSTEM: ***See "Hydraulic Brake Servicing" for complete data.***

TROUBLE SHOOTING: ***See "Hydraulic Brake Trouble Shooting" for complete data.***

BRAKE SHOE REPLACEMENT: Bonded linings used. Factory bonded shoes are recommended.

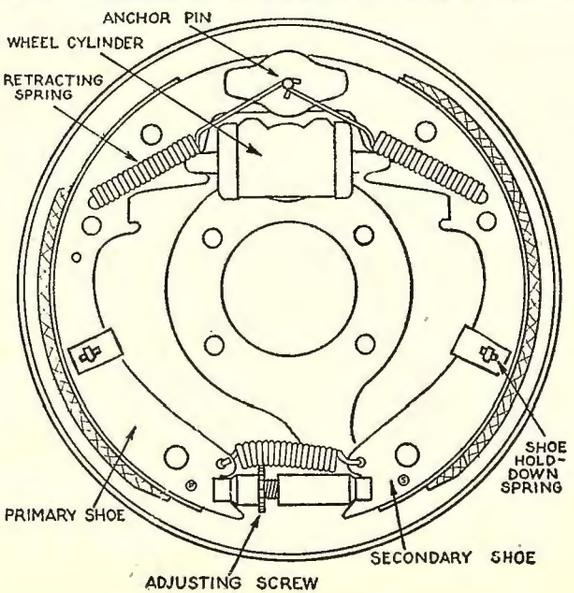
Removal: Loosen or disconnect parking brake cables. Remove brake drums. Unhook brake shoe retracting springs from anchor pin (KM0526 tool), remove brake shoe hold-down pins and springs (J-4712 tool). Spread shoes to free them from wheel cylinder connecting links, lift shoe assembly off (CAUTION—stops on backing plate will prevent wheel cylinder pistons coming out but brake pedal must not be depressed with brake drum off). Remove adjusting screw and spring to separate shoes. Remove parking brake strut, remove parking brake lever from secondary (rear) shoe of rear wheel brakes.

Installation: On rear wheels only, lubricate parking brake cables, lubricate fulcrum end of parking brake lever and bolt with Lubriplate or brake lube, mount lever on secondary (rear) shoe and make certain that lever moves freely. Lubricate adjusting screw threads and socket end, assemble adjusting screw and spring on shoes (CAUTION—adjusting screw and socket must be adjacent to primary or front shoe on **left side**, adjacent to secondary or rear shoe on **right side** for correct alignment with adjusting hole in backing plate). Install shoe assembly on backing plate, engage shoes with wheel cylinder connecting links, and connect hold-down pins and springs (CAUTION—Primary shoe which has **shorter lining** must be toward front of car). On rear brakes, connect cable to parking brake lever and install strut between lever and primary shoe as shoes are installed. Install brake shoe retracting springs (CAUTION—use new springs if old springs nicked, distorted, or weak). Pull shoes away from backing plate and lubricate contact surfaces with thin coat of Lubriplate or brake lube. After drums installed, make Major Adjustment (see above).

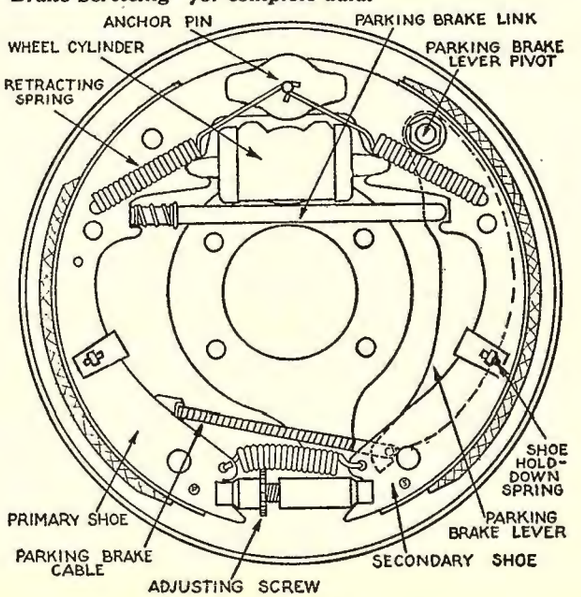
OVERHAUL: Brake Drums—Rebore brake drums if more than .010" out-of-round. Manufacturer recommends reboring to .060" oversize and use of .030" oversize lining (max. available oversize). Drum run-out must not exceed .005".

Cable Lubrication—Lubricate cables when making major adjustment or if cables sticky. Use hand gun only and remove rear brake drums to make sure lubricant not being forced into brake assembly.

Master Cylinder & Wheel Cylinder—***See "Hydraulic Brake Servicing" for complete data.***



FRONT BRAKE ASSY.



REAR BRAKE ASSY.

CHEVROLET TWINPLEX

Chevrolet 1½ & 2 Ton Truck (1951)—Rear Only.

►**FRONT WHEEL BRAKE NOTE**—Front wheel brakes are same Chevrolet-Hydraulic type used previously.

DESCRIPTION: "Twinplex" hydraulic brakes are two-cylinder, four-anchor type (each shoe anchored at each end and linked to wheel cylinder at each end). All shoes are radially self-centering and self-energizing for both forward and reverse wheel motion. Wheel cylinders are double-acting type and are mounted vertically (one at front and one at rear of brake assembly) and are connected together by a hydraulic line. Brake shoes are mounted above and below wheel cylinders with each end linked to the wheel cylinder pistons. Each shoe has one primary or sliding pivot anchor and one secondary or adjustable anchor, and **two different pull back springs** (see illustration).

ADJUSTMENT: Each shoe has one adjustment (adjusting screw at adjustable anchor end) and adjustment is the same both for wear and for new or relined shoe clearance.

Brake Pedal Adjustment: Pedal clearance or distance between top of pedal arm and underside of toeboard should be 13/16" with pedal released and master cylinder piston against its stop. To adjust, loosen locknut at pedal clevis and turn master cylinder pushrod (knurled section provided on rod).

Brake Shoe Adjustment: Jack up both rear wheels, remove adjusting hole covers from backing plates (two holes at each wheel—one for each shoe). Use tool J-4707 or screwdriver inserted through rear (lower shoe) adjusting hole and turn adjusting screw up (move outer end of tool toward center of wheel) until light brake drag is felt on wheel, then back adjusting screw off 3 notches or "clicks" for correct running clearance. Adjust upper shoe similarly by inserting tool through front adjusting hole.

Hand (Parking) Brake Adjustment: Independent type on propeller shaft at rear of the transmission. To adjust, fully release brake lever. Loosen locknut on outer shoe adjusting screw then tighten to secure a clearance of .010" to .015" measured at point directly above screw. Tighten locknut. Loosen locknut on link between hand brake lever and shoe actuating lever. Tighten adjusting nut on link to secure a clearance of .010" to .015" between inner shoe and drum. Tighten locknut.

BLEEDING BRAKE SYSTEM: *CAUTION—Pressure Bleeder Tank should be used as follows:*

1) Back off adjusting screw on upper shoe of both rear wheel brakes all the way.
2) Fill master cylinder reservoir to top of filler plug opening, connect pressure bleeder to main cylinder, maintain 20 lbs. air pressure on tank during entire bleeding operation.
3) Bleed the system at **each of the following points in order** until all air bubbles disappear (use bleeder tube with end submerged in fluid in bleeder jar). NOTE—Omits steps **4, 5, 12 and 13 if Hydrovac Power Unit not used.**
4) Bleed Hydrovac hydraulic (slave) cylinder at bleeder valve on outlet fitting to which the wheel cylinder line is attached.
5) Bleed Hydrovac control valve at bleeder valve on control valve housing.
6) Bleed **rear** wheel cylinder in left rear wheel.
7) Bleed **front** wheel cylinder in left rear wheel.
8) Bleed cylinder in left front wheel (one only).
9) Bleed **rear** wheel cylinder in right rear wheel.
10) Bleed **front** wheel cylinder in right rear wheel.
11) Bleed cylinder in right front wheel (one only).
12) Repeat step 4 (bleed Hydrovac slave cylinder).
13) Repeat step 5 (bleed Hydrovac control valve).
14) Adjust upper brake shoe in each rear wheel (see Adjustment), make several hard brake applications to centralize shoes, readjust all brakes.
15) Depress brake pedal with 75 lbs. pressure and check pedal clearance or distance from toeboard to underside of pedal pad in this position. Clearance should be not less than 3½". If pedal clearance less than 3½", repeat entire bleeding procedure.

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting" for complete data.*

BRAKE SHOE REPLACEMENT: Brake linings are riveted type and can be installed in the field after shoes have been removed.

Removal: Support rear end of truck on stands, remove rear wheels, back off adjusting screw for each shoe (two per wheel), remove brake drums by taking out 3 retaining screws on face of drum. Disconnect and remove all shoe pull back springs, remove hold-down nut on washer on web of each shoe. Disengage shoes from cylinder links, lift shoes out.

►***CAUTION—Stops on backing plate will prevent wheel cylinder pistons from coming out but brake pedal must not be depressed when drums are off.***

Installation: Lubricate shoe primary (sliding pivot) anchors and all shoe bearing surfaces on brake flange plate with light film of Lubriplate or Brake Lube. Install shoes, engaging ends of shoes with anchors and slotted ends of wheel cylinder links, and making certain that hold-down bolt enters hole in shoe web. Lubricate hold-down bolts and washers lightly with Lubriplate or Brake Lube, install washer and nut on each hold-down bolt and tighten nuts loosely. Install shoe pull back springs (CAUTION—see illustration and Note below for correct spring installation). Tighten each hold-down bolt nut until clearance between edge of shoe and contact face on flange plate is .010" (measure with feeler gauge). Install drums and adjust brakes.

►**Brake Shoe Pull Back Spring Note**—Different spring used at each end of shoes. Install springs thus:

Spring at Primary (Sliding Pivot) Anchor End of Shoe—10¾ coil, 90 lb. type, painted BLACK for identification, with LARGE hook at shoe end of spring. Install spring with this **large hook engaging small hole** in shoe web.

CAUTION—This spring must not be engaged in larger manufacturing hole in web adjacent to spring hole.

Spring at Secondary (Adjustable) Anchor End of Shoe—11¼ coil, 70 lb. type, painted GREEN for identification, with SMALL hook at shoe end of spring. Install this spring with this smaller hook engaging the large hole in the shoe web adjacent to the shoe adjusting wheel.

►***CAUTION—Interchanging springs or incorrect installation will result in uneven brake shoe wear and unsatisfactory brake operation.***

OVERHAUL: Brake Drums—Rebore brake drums if more than .010" out-of-round. Manufacturer recommends reboring to .060" oversize and use of .030" oversize lining (max. available oversize). Drum run-out must not exceed .005".

Master Cylinder: *See "Hydraulic Brake Servicing."*

Wheel Cylinders: To remove wheel cylinders, first remove brake shoes, then take out capscrews holding

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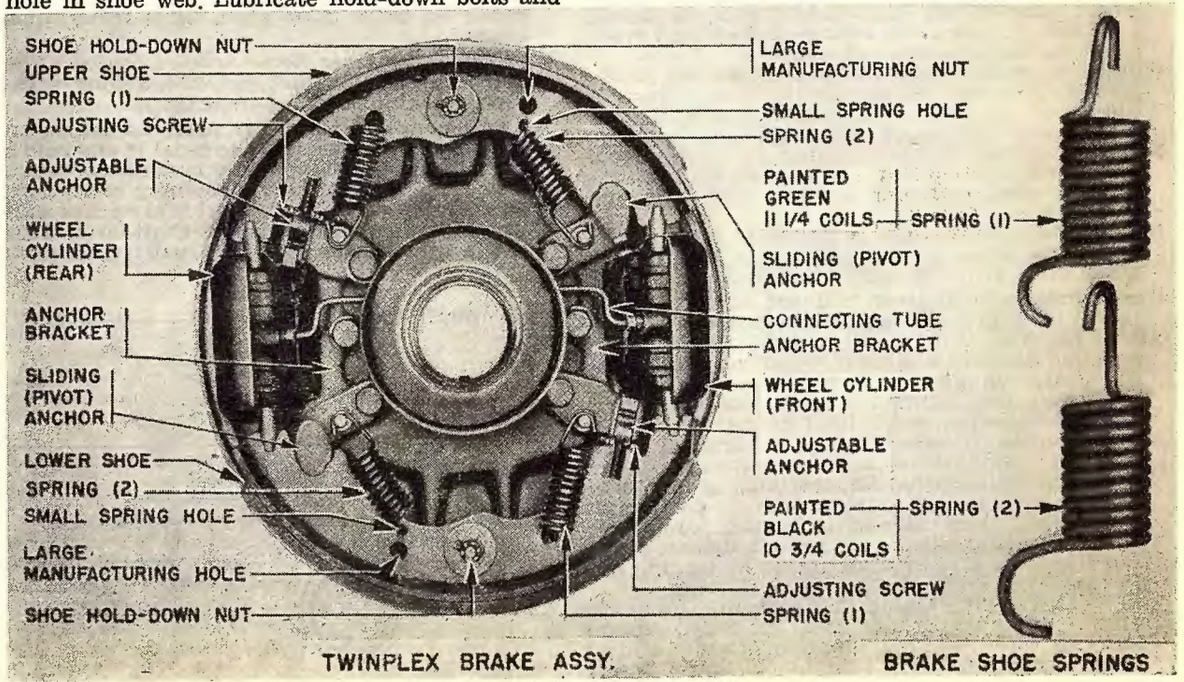


CHEVROLET TWINPLEX BRAKE ASSY.

CHEVROLET TWINPLEX (Cont.)

wheel cylinder on backing plate and remove **both cylinders and connecting line as a unit.**

Disassembly—Disconnect line linking the two cylinders, remove rubber boots and shoe connecting links, withdraw pistons and rubber cups and springs from cylinder. ***CAUTION—Do not remove rubber cups (piston rings) from grooves in pistons unless these cups being replaced.***

Inspection & Repair—Inspect cylinders for scores, scratches, and corrosion. Light scratches or lightly corroded areas may be cleaned up with crocus cloth, replace cylinder if these cannot be polished out. (CAUTION—Honing cylinders not recommended). Replace piston cups and cylinder boots if swollen or damaged. Piston clearance in cylinder .002-.004".

Reassembly—Dip all parts in brake fluid. Install piston and cup assemblies with cupped side toward spring or inward. (CAUTION—use care not to damage edges of cups). If new cups being installed, use tool J-4705 and install cups with open end toward flat end of piston.

HAWLEY MECHANICAL FLOATING LINING TYPE

CROSLEY, A (1939-40), CB41 (1941), CB42 (1942)

DESCRIPTION: "Neutral Shoe" type with floating lining (single piece of lining extending completely around shoes and centered by rib on backing plate and conical retainer on wheel side).

Brake Lining: Lining "floats" between shoes and drum (1/16" gap at end) and provides friction drag on both shoes and the drum when the brakes are applied. Brake shoes are ground and polished to provide smooth and even contact with the lining. ***CAUTION—Crosley lining must be used with this brake for correct and satisfactory operation.***

Wheel Brakes: Two shoes per wheel, anchored at adjusting screw end and operated by cam at opposite end. Shoes are held against adjusting screw and cam by small coil spring hooked between shoes.

Linkage:—Wheel brakes operated by cables from main cross-shaft on frame. Cables enclosed in conduits at wheel ends and provided with adjusting clevises at cross-shaft.

Hand Brake:—Hand lever is linked to main cross-shaft on frame. Cables enclosed in conduits at wheel ends with adjusting clevises at cross-shaft.

Hand Brake:—Hand lever is linked to main cross-shaft and applies all four wheel service brakes.

ADJUSTMENT: Jack up all wheels, remove clevis pins and disconnect all four wheel cables at cross-shaft. At each wheel, loosen locknut and tighten brake adjusting screw on backing plate (turn screw counter-clockwise) until slight drag noticed when wheel turned by hand, then back adjusting screw off until wheel just free, tighten locknut.

Linkage Adjustment—Depress brake pedal 1" and hold in this position. Adjust clevis on cross-shaft end of each wheel cable so that brakes barely drag when cable connected to cross-shaft. Release pedal. Road test car and equalize brakes by turning adjusting screw on tight wheel back slightly.

SERVICING: Brake Lining Replacement. To remove and renew brake linings, jack up wheel, remove hub cap, wheel, and hub assembly. Remove conical brake lining retainer. Take out old lining. Insert new lining and re-install wheel.

HAWLEY MECHANICAL TWO-SHOE TYPE

Crosley, Model CC (1947-48)

TYPE: Two-shoe, four-wheel, mechanically operated (cable) type.

DESCRIPTION & OPERATION: Wheel Brakes—Two shoes per wheel, anchored at adjusting screw end and operated by cam at opposite end. Shoes are held against adjusting screw and cam by coiled springs hooked between the shoes (lighter spring at adjusting screw end, heavier spring at cam end of shoes).

Linkage: Wheel brakes operated by cables linked between cam operating levers on backing plates and levers on main cross-shaft on frame. Cables are enclosed in conduits at wheel ends and have adjusting clevises at cross-shaft ends.

Hand Brake: Parking brake handle on floor board in front of driver's seat linked directly to lever on main cross-shaft and applies all four service brakes. No adjustment is required.

ADJUSTMENT: Jack up all four wheels securely. Remove cotter pins and clevis pins from all four wheel cables at brake cross-shaft. Adjust as follows:

Brake Shoe Adjustment: Jack up all wheels, disconnect wheel cables by removing cotter pins and clevis pins from levers at each end of cross-shaft. Install cross-shaft spacer (see Spacer Note below) on each side of cross-shaft bearing at each end of shaft. Check brake pedal linkage adjustment and make certain that both upper and lower rods act on cross-shaft simultaneously. At each wheel, loosen adjusting screw locknut on backing plate, tighten adjusting screw (turn screw counter-clockwise) until brakes begin to drag, then back off screw (approximately ¼ turn) until wheel turns freely, tighten locknut.

Cross-shaft Spacer Note—Spacers consist of piece of bar stock, 3/16" thick, ½" wide, 3" long, with 30° bend at center (included angle 150°).

Brake Linkage Adjustment: After adjusting brake shoes (above), depress brake pedal 1" and hold it in this position by pulling hand brake lever "on". Adjust each wheel cable by loosening clevis locknut and turning clevis until wheel brake drags slightly when cable connected to cross-shaft lever. With all cables adjusted and connected, pull hand lever "on" for considerable brake drag, check all wheels for equal drag. Equalize by readjusting cables. Push brake pedal down hard, hold in this position by pulling hand lever "on". Check each wheel to see that all wheels are locked and that reserve cable travel (distance from clevis to brake cable clamp on backing plate) is ½" minimum. **Remove spacers from cross-shaft bearings.**

Hand Brake: No adjustment required.

SERVICING: Brake Lining Replacement—Manufacturer recommends that factory replacement shoes (with lining installed) be used. Lining is molded type and is ground concentrically after installation on shoes. CAUTION—Keep paired brake shoes together.

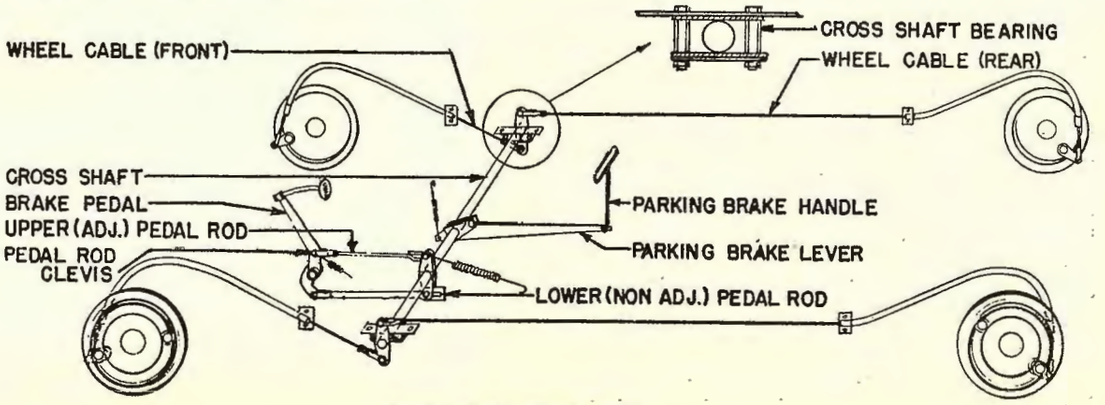
Brake Shoe Installation—Install heavier retracting spring on cam end of brake shoes with spring hooks inward toward backing plate, install lighter spring on adjusting screw end of brake shoes with spring hooks outward or away from backing plate.

CAUTION—Replacement brake shoes are ground in pairs and paired shoes should be kept together and installed on same wheel.

Cross-shaft Installation: Bearings must be assembled on cross-shaft when shaft installed on car. Insert bolts with head on inside of frame, install flat fabric bearing on bolts next to frame, place spacer on each bolt, install second flat fabric bearing, bearing plate, lockwashers and bolt nuts. Before tightening nuts, install cross-shaft spacer at each cross-shaft bearing (see Cross-shaft Spacer Note under Brake Shoe Adjustment above), to center the shaft, then tighten bolt nuts. Adjust the brakes.

►***CAUTION—See that cross-shaft remains centered in the slotted bearings while connecting cables and adjusting brakes.***

Brake Pedal Linkage Adjustment: With the brake pedal against the floor board stop, rotate the cross-shaft until lower bracket pin is against the front end of the slot in the lower (non-adjustable) brake pedal rod. Hold cross-shaft in this position, adjust clevis on forward end of upper brake pedal rod until upper bracket pin on cross-shaft is against the rear end of slot in upper pedal rod. This setting does not change in service and no adjustment is required when brakes are adjusted.



HAWLEY BRAKE SYSTEM

GOODYEAR-HAWLEY HYDRA-DISC HYDRAULIC

Crosley, Model CD & Hotshot (1949-50)

►**WHEEL HUB REMOVAL CAUTION**—Wheel brake unit must be disassembled before wheel hub and brake disc can be removed. See Wheel Brake disassembly data below.

DESCRIPTION: Goodyear-Hawley hydraulic disc have new type wheel brakes as follows:

Wheel Brakes: Consists of an inboard housing containing the single acting hydraulic cylinder with circular lining mounted directly on the end of the hydraulic cylinder piston, and an outboard housing on which a second circular lining is mounted directly. These housings are bolted together by tie bolts and mounted on the dust cover so that they straddle the brake disc which is integral with the wheel hub. In operation, the piston moves out to bring the lining in contact with the disc and the reaction in the opposite direction causes the entire assembly to move inward so that the outer lining is likewise brought into contact with the drum and the disc is gripped between the two linings. When brakes are released, return springs return the piston and entire assembly to their original positions.

Hand Brake: Consists of a cam lever in each rear wheel brake which applies the brakes mechanically (operation is similar to hydraulic actuation). These levers are linked to the hand lever at the driver's seat by a rod and cable linkage.

Master Cylinder: Conventional type. Similar to design used with other hydraulic brake systems.

ADJUSTMENT: Wheel Brakes. Jack up all four wheels, loosen locknut on compensating screw on inner housing (CAUTION—locknut has left-hand threads). Turn compensating screw clockwise until wheel is locked, then back off compensating screw ¼ turn. Tighten locknut (CAUTION—see that compensating screw does not turn while tightening locknut). Adjust all four wheels in this manner.

Hand (Parking) Brake Adjustment: Should not require adjustment (automatically taken up when wheel brakes adjusted). If hand lever travel excessive, tighten clevis at rear end of hand lever rod or tighten clevis at left wheel end of wheel cable.

►*CAUTION*—Do not move parking brake cam lever (in rear wheel brakes) away from released position when adjusting hand brake cable.

Brake Pedal Adjustment: Pedal should have ¼" free travel in released position with master cylinder pushrod against its stop. Adjust by loosening locknut and turning pushrod.

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting" for complete data.*

BLEEDING BRAKE SYSTEM: Loosen brake hose at wheel unit ½ turn (CAUTION—do not attempt to disconnect hose without removing brake unit). Tighten hose after bleeding operation completed.

See "Hydraulic Brake Servicing" for complete bleeding instructions.

►*CAUTION*—Use only Lockheed #21 Brake Fluid.

REMOVAL & INSTALLATION OF WHEEL UNIT: *Necessary for servicing of unit and for wheel hub removal.*

Removal: Loosen brake hose at wheel cylinder (CAUTION—do not attempt to remove hose). Take out tie bolt lockplate screw (Phillips head screw on outer housing), remove lockplate, unscrew both tie bolts, lift off outer housing. Remove four Phillips head screws in torque plate, slide inner housing assembly out. Hold brake hose and unscrew brake unit from hose.

Installation: Screw inner housing unit on brake hose snugly. Position unit on mounting bracket and install four torque plate screws. Install outer housing, screw both tie bolts in finger-tight (see Compensating Screw Setting below) and back screws off to nearest flat which will allow lockplate to be installed, install tie bolt lockplate and lockplate screw. Bleed brakes, then tighten brake hose, and adjust brakes.

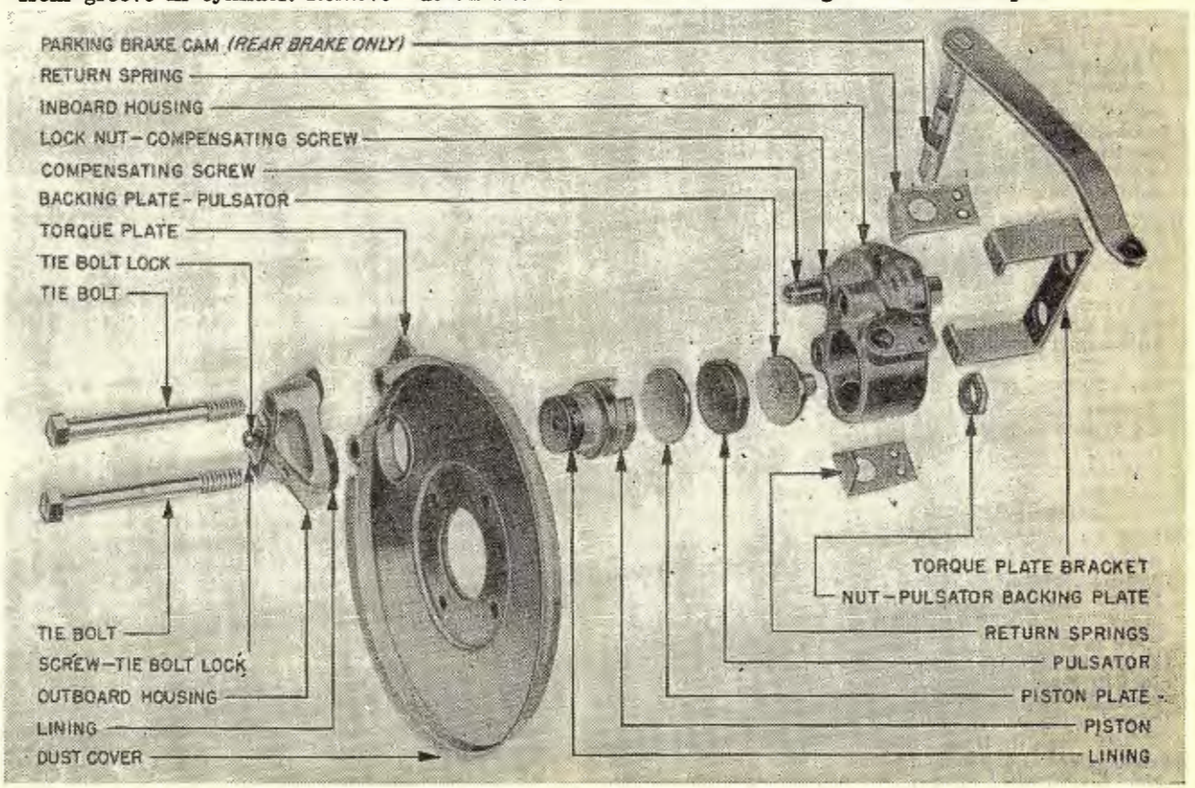
►**Compensating Screw Setting**—Compensating screw must contact outer housing with approximately 1/16" clearance between lining and disc. Adjust by turning compensating screw before tie bolts are started in threads.

DISASSEMBLY & REASSEMBLY OF WHEEL UNIT: *For replacement of Pulsator or other service operations.*

Front Wheel Unit: With wheel unit removed from car, remove return springs by taking out attaching screws, remove piston. Insert a screw in the threaded hole on the side of the cylinder, remove lockring from groove in cylinder. Remove nut on back of inner housing, push piston plate, pulsator, and pulsator backing plate out of cylinder. Remove pulsator from backing plate and wash all parts in alcohol. When reassembling, place new pulsator on backing plate and install these parts in cylinder (CAUTION—Keep oil and grease off pulsator and make certain it does not catch in lockring groove and peel back over backing plate), tighten backing plate nut on housing loosely. Install piston plate and lockring, position lockring gap approximately 1" from threaded hole in cylinder.Install piston and return springs, then tighten backing plate nut securely.

Rear Wheel Unit: With wheel unit removed from car, remove return springs by taking out attaching screws, remove piston. Lift out parking brake cam and lever assembly. Remove nut on back of inner housing, push piston plate, pulsator, and backing plate out of cylinder. Remove pulsator from backing plate and wash all parts in alcohol. When reassembling, place new pulsator on backing plate, install in cylinder (CAUTION—Keep oil and grease off pulsator), tighten backing plate nut on housing loosely. Install piston plate, insert parking brake cam and lever (see illustration for correct position), install piston making certain that groove engages parking brake cam. Install return springs, then tighten backing plate nut securely.

RELINING BRAKES: Lining is riveted to piston and on outer housing. When installing new lining, make certain that lining is seated on lockpin.



GOODYEAR-HAWLEY HYDRA-DISC BRAKE (REAR BRAKE SHOWN—FRONT BRAKE SAME EXCEPT PARKING BRAKE CAM OMITTED)

FORD-LOCKHEED HYDRAULIC FORD & MERCURY

Ford 6 & V8 Pass. Car Models (1939-48)—See Note
Ford Comm'l & Truck, All Models (1939-48)
①**Ford F-2 ¾ Ton Truck (1948-51)—See Note**
①**Ford F-3 ¾ Ton Spec. Trk. (1948-51)—See Note**
②**Ford F-3 Parcel Del. (1949-51)—See Note**
Ford F-4 1 Ton Truck (1948-51)—See Note
Ford F-5 1½ Ton & F-6 2 Ton (1948-51)—See Note
Mercury, All Models (1939-48)—See Note

①—Late 1951 models have Ford-Bendix "Uni-Servo" front brakes and Ford-Bendix Hydraulic Rear Brakes.

②—Late 1951 model has Ford-Bendix Hydraulic brakes on rear wheels (Ford-Lockheed continued on front wheels).

►**BRAKE TYPE NOTE: Ford & Mercury 1946 & Later Passenger Cars.** The brakes on these models are "self-centering" type and do not have adjustable anchor pins. These brakes are adjusted in the same manner as on other models except that Anchor Pin Adjustment (Major Adjustment) is not necessary and these instructions should be disregarded.

Series F-2 (Front & Rear), F-3 (Front)—Lockheed "self-centering" hydraulic type without anchor pin adjustment (eccentric adjustment only).

Series F-3 Parcel Delivery (Front & Rear)—Brakes are double-anchor hydraulic type with eccentric and anchor pin adjustments. Late 1951 model has Ford-Bendix hydraulic brakes on rear wheels only.

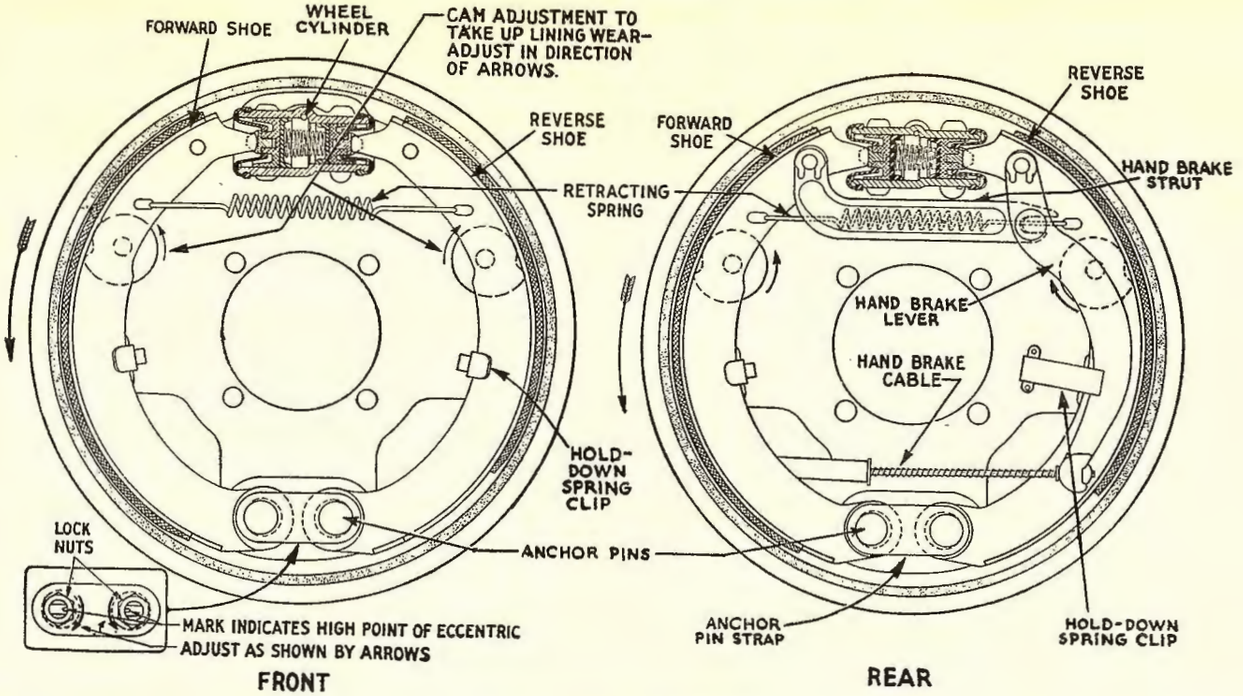
Series F-3 (Rear only), F-5 & F-6 (Front & Rear): Lockheed double-anchor hydraulic type with eccentric and anchor pin adjustments.

Lincoln-Zephyr Models—Brakes on these models are Bendix Hydraulic, Single Anchor type, without eccentric adjustment. *See "Ford-Bendix Hydraulic" Brakes (following) for data.*

DESCRIPTION & OPERATION: Lockheed two shoe, double anchor type. Two shoes per wheel, each mounted on individual eccentric anchor pin at lower or 'heel' end and bearing directly against opposed pistons of stationary wheel cylinder at upper or 'toe' end. Shoes are held against eccentric adjusting cams (wear adjustment) in 'off' position by a single retracting spring hooked between the two shoes at the toe end.

Anchor Pins (All Ford & Mercury Self-centering type Brakes). On these models, anchor pins are fixed on backing plate and have special elongated washers which engage elongated holes in brake shoe web. With this mounting, shoes tend to "center" themselves in drum when brakes are applied.

Wheel Cylinders:—Rigid type mounted on backing plate with opposed pistons which bear directly against toes of brake shoes. Pistons are sealed by rubber cups held against piston heads by central spring and dirt is excluded from cylinder by rubber boot fitting over end of cylinder and brake shoe. **Passenger Car & 1 Ton Truck**—Cylinders are stepped or two-stage bore type with larger end of cylinder toward front and actuating forward shoe. Front wheel cylinders larger than rear wheel. **Truck Models.** Cylinders not stepped (both ends same size). Larger cylinders used on rear wheels. NOTE—Wheel cylinder not interchangeable from right to left sides of car or from front to rear wheels.



FORD-LOCKHEED BRAKE ASSY.

Master Cylinder:—Compensating type with integral supply tank. Similar in design to type used on other Lockheed Hydraulic Brake applications.

Parking (Hand) Brake:—On Pass. Cars, ¾ Ton&1 Ton models, hand lever applies rear service brakes through cables connected to a strut and lever linkage on the brake shoes. On other truck models, hand lever applies an independent internal-expanding brake band in the rear wheel brake drums (1939), independent brake band on brake drum on propeller shaft at rear of transmission (1940 and later models).

BLEEDING BRAKE SYSTEM: *See "Hydraulic Brake Servicing" for complete data.*

BRAKE PEDAL ADJUSTMENT

Brake Pedal Adjustment:—Brake pedal must have ¼" free movement (measured at pedal pad), to insure master cylinder piston being against its stop for correct compensating action when brakes released. To adjust, loosen locknut on pedal rod, turn rear section of rod (integral with large adjusting nut—not necessary to disconnect clevis pins), tighten locknut.

MINOR ADJUSTMENT

►*ADJUSTMENT CAUTION:* First jack up all four wheels, remove one front wheel and inspect lining (to determine if new linings required), re-install wheel. Check front wheel bearing adjustment, spring shackles, shock absorber links, and radius rod mountings, tighten steering connections. Place hand lever in released position. Adjust each wheel as follows:

Minor Adjustment (For Wear):—Install wrench on eccentric adjusting cam on backing plate with wrench handle upward, turn cam by moving wrench handle out toward wheel rim until shoe is tight in drum, then turn cam back until wheel just turns freely without drag (do not turn cam back more than enough to free wheel, desired setting is with least possible amount of clearance). After adjusting forward shoe, repeat adjustment on rear shoe, then adjust all other wheels in same manner. Check pedal reserve, if reserve less than half total travel, repeat adjustment (if pedal is 'spongy', bleed lines). Check brake pedal clearance and adjust hand brake

►*CAUTION—Clearance between shoes and drum should be least amount possible without drag (no specific clearance specified).*

MAJOR ADJUSTMENT

Major Adjustment (For relined brakes, etc.):—NOTE *This adjustment not required on 1946-48 Pass. Cars and Light Trucks with "self-centering" type brakes.*

Before installing brake drums, loosen eccentric anchor pin locknuts and turn each anchor pin so that marks on flatted ends of pins are together (marks indicate 'high' side of eccentric and in this minimum position will allow drums to be installed over new linings), turn eccentric adjusting cam for each shoe to minimum position. With drums installed, turn eccentric anchor pin toward adjacent anchor pin (wrench handle upward) until brake

CONTINUED ON NEXT PAGE

FORD-LOCKHEED HYDRAULIC (Cont.)

shoe is tight against drum, then back anchor pin off slightly until wheel turns freely without any drag. Hold anchor pin from turning and tighten locknut securely. Then adjust eccentric adjusting cam (see Minor Adjustment above) for correct toe clearance of the brake shoe. Adjust both shoes in each wheel in this manner, then adjust hand brake.

Brake Shoe Clearance

	Heel	Toe
Trks. with adj. Anchor Pins	.007"	.010"
Pass. Cars (adj. Anchor Pins)	See Adjustment	

HAND BRAKE ADJUSTMENT

Passenger Cars (& 1939 1 Ton)—Place hand lever in fully released position. Depress the brake pedal until rear brake shoes applied firmly against drums, leave pedal in this position while adjustment being made. Pull forward on cables to remove all slack, adjust clevis on end of hand brake cable so that, with foot brake applied as above, end of hand lever has ½" travel before slack in cables is taken up. Release foot brake pedal. With hand lever in released position, check that rear wheels are free of any brake drag.

All Trucks 1939: Hand lever linked to cross-shaft by non-adjustable rod, cross-shaft linked to hand brake lever on each rear wheel backing plate by adjustable rods. To adjust, remove clevis pin in forward end of each rod at cross-shaft, loosen locknut, turn clevis on rod.

¾ and 1 Ton Trucks (1940-51): Place the hand brake lever in fully released position. Use pedal jack to depress brake pedal until rear brake shoes are applied firmly. Adjust each wheel cable at equalizer lever on frame cross-member by taking out clevis pin, loosening locknut, and turning clevis on cable end fitting until all slack is removed from cables and mounting bolt is centered in slot in equalizer plate. Adjust hand lever cable by taking out clevis pin, loosening locknut, and turning clevis on cable end fitting until hand lever has approximately ½" movement (with brake shoes applied as above). Release pedal, make certain rear wheels free of drag.

¾ & 1 Ton (Late 1951) and F-3 Parcel Delivery 1949-51): Hand brake is independent contracting band type operating on drum on propeller shaft at rear of transmission. *See 1½ & 2 Ton adjustment instructions (following).*

1½ & 2 Ton Truck Models (1940-51): Release hand brake lever. See that flat of cam rests on brake band ear (if not, remove clevis pin from rod above cam and adjust clevis as necessary so that flat of cam rests on ear of band, install clevis pin. Remove lockwire and turn anchor screw (on bracket on left side) in until clearance between lining and drum is .010" at this point, replace lockwire. Loosen locknut and turn bracket adjusting screw nut (on right side, adjusting screw head on bracket is slotted) until clearance between lining on lower half of band and drum is .010", tighten locknut. Then tighten nut on lower end of band adjusting rod (below ear on lower end of band) until clearance between lining on upper half of band and drum is likewise .010". Recheck rod linking cam and brake lever. Make certain that adjusting nuts are secured with lockwire.

OVERHAUL: *NOTE.* Factory recommends installation of factory reconditioned brake shoes (with new lining installed) whenever lining worn so that replacement required. Before removing brake shoes, install clamp on wheel cylinders (to retain wheel cylinder pistons) and be careful not to depress brake pedal with shoes off. This will eliminate necessity of bleeding lines when shoes installed.

Brake Shoe Removal: Remove each type as follows:

Self-centering Type Shoes—Remove brake shoe return spring, take out anchor pin cotter pins, remove anchor pin plate. Remove brake shoes, anchor pin washers, and anchor pin bushings. On rear brakes, unhook parking brake cable, remove parking brake link and lever.

Adjustable Anchor Type Shoes—Remove brake shoe return spring, remove nuts and lockwashers on anchor pins. Remove anchor pins and anchor pin plate. Remove brake shoes and anchor pin bushings. On rear brakes, disconnect parking brake cable and remove parking brake link and lever.

Relining Brake Shoes: Lining should be replaced when worn to point where rivet head less than 1/32" below surface of lining. Inspect shoes for distortion or looseness between rim and web. Clean shoe rim and remove all burrs or high spots before installing new lining. After riveting, new lining must be snug against shoe with not more than .005" separation midway between rivets.

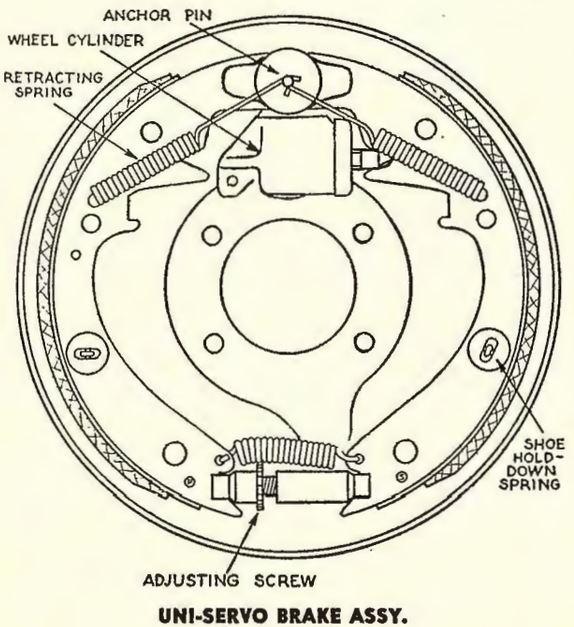
►*BRAKE LINING NOTE*—Lining furnished in brake lining kits is ground in production and does not require grinding after installation.

Brake Shoe Installation:—Assemble retracting spring to shoes (and hand brake lever and link parts for rear wheels). Turn eccentric adjusting cams to minimum position. Hold shoes so that anchor pin ends overlap and upper ends spread sufficiently to enter wheel cylinder pistons, engage shoes in piston slots, spread lower ends of shoes until they are engaged under flat lip of hold-down springs. Install anchor pins making certain that eccentric is in place in hole in brake shoe and that anchor pin engages eccentric. Turn anchor pins so that notch in flatted end of each pin is lined up with notch in opposite pin, install anchor pin locknuts, connect hand brake cable to lever. Adjust shoes as directed in Major Adjustment above.

Master Cylinder & Wheel Cylinder Disassembly and Overhaul:—All service operations same as on other Lockheed brake installations. *See "Hydraulic Brake Servicing" for complete data.*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting" for complete data.*

FORD-BENDIX "UNI-SERVO" HYDRAULIC



UNI-SERVO BRAKE ASSY.

Ford 3/4 Ton, F-2 & F-3 (Late 1951)—Front Only.

►**FORD F-3 TRUCK NOTE**—These brakes used only on FRONT WHEELS OF LATE 1951 trucks. Rear wheel brakes are Ford-Bendix Self-energizing type.

DESCRIPTION: Bendix "Uni-servo," single anchor, hydraulic type with single-acting wheel cylinder mounted on the backing plate and actuating the primary shoe through a strut (no direct connection to secondary shoe). Brake shoes are conventional Bendix type (joined by adjusting screw at lower end, single anchor between shoes at upper end with retracting springs hooked to each shoe and anchor pin). Wheel cylinder has single piston and cup with a return spring seated in the end of the cylinder.

ADJUSTMENT: Minor (wear) and Major (new or relined shoes) Adjustments are exactly the same as for the Ford-Bendix Self-energizing brakes used on the rear wheels of these trucks. *See "Ford-Bendix" data following.*

BLEEDING BRAKE SYSTEM: *See "Hydraulic Brake Servicing" for complete data.*

BRAKE SHOE & BRAKE DRUM REPLACEMENT: *See "Ford-Bendix Hydraulic" brake data (following).*

TROUBLE SHOOTING: *See "Hydraulic Brake Trouble Shooting" for complete data.*

FORD-BENDIX HYDRAULIC (FORD, LINCOLN, MERCURY)

Ford Pass. Cars, 6 Cyl. & V8 (1949-51)
Ford Half-Ton Truck, Series F-1 (1948-51)
Ford ¾ Ton, F-2 & F-3 (Late 1951) Rear Wheels
Lincoln Zephyr & Cont'l., All (1939-48)
Lincoln & Cosmopolitan, All Models (1949-51)
Mercury, All Models (1949-51)

►CHANGES, CAUTIONS, CORRECTIONS

►**FORD F-2 & F-3 TRUCK NOTE**—These brakes used only on REAR WHEELS of LATE 1951 trucks. Lockheed Double Anchor brakes used in early 1951.

►**FORD HAND BRAKE LINKAGE CHANGE (To lessen effort required to set hand brake on First cars):** On first cars, pull required to set brake can be decreased by drilling new hole in equalizer lever and shifting wheel cable connector to this new hole.

Passenger Cars—Drill new 5/16" hole 13/32" from existing hole toward pivot end of lever.

Station Wagon & Convertible—Drill new 5/16" hole at point 9/16" from center of existing hole toward pivot end of lever (new hole center will be 1¼" from center of pivoting notch in lever).

►***NOTE—This change made in production on later cars.***

►***CAUTION***—If above procedure does not correct complaints of hand brake being hard to apply, remove hand lever assembly, check for burrs on hand brake shaft, clean up shaft with round file, apply light film of lubricant when reassembling.

►**FORD HAND BRAKE CABLE INTERFERENCE CORRECTION (on First Cars):** If cable or conduit rubs on frame or tires, correct these points:

Cable rubbing on intermediate cross-member—Bend rear edge of lower flange on cross-member slightly at point just above cable for clearance.

Cable Conduit rubbing on tires or striking carrier plate—Remove cable conduit clip on frame, revolve conduit toward center of car (twist conduit at carrier plate if necessary), re-install clip.

Cable Equalizer twisting—If equalizer twists on adjustment bolt, install additional nut on adjustment bolt in front of equalizer, tighten this nut after hand brake adjustment completed so that equalizer clamped firmly between nuts.

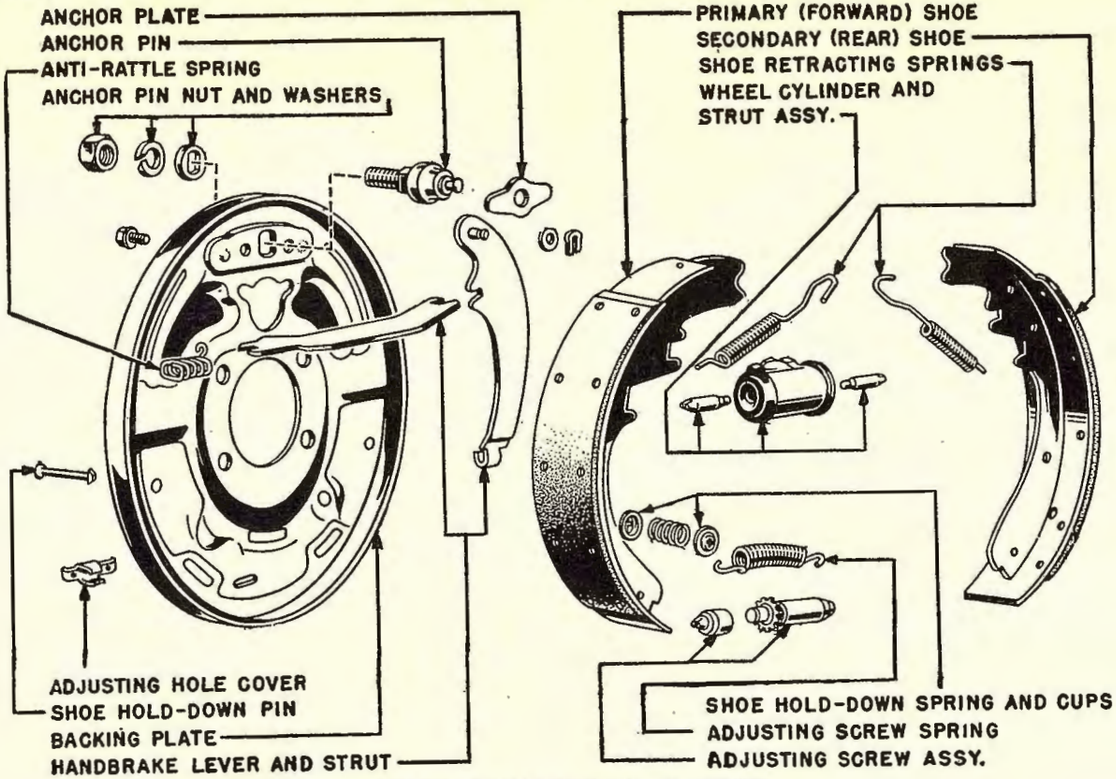
►***NOTE—This clamp nut installed on later cars in production.***

►**LINCOLN & MERCURY HAND BRAKE LINKAGE CHANGE (for improved operation on First Cars):**

Re-route Brake Cable. Disconnect cable at lever, remove all clips down to spring clip at center of frame "X" member (do not disturb this clip), re-route cable and install new clips as follows: Install No. E.D. 11A-17278 clip at transmission case bottom rear shifter cover bolt, E.D. 353364-SB at brake master cylinder front bolt (route cable over top of steering column tube, install clip E.D. 353364-SA at upper rear corner of front fender apron (on Lincoln 121" WB, use clip 11A-14598 installed on fender apron 1½" to rear of wiring harness clip), route cable through hole in dash (use 91A-14602-A1 rubber grommet) attach cable and adjust hand brake.

►***CAUTION—Avoid all sharp bends and kinks when installing the brake cable. Tape brake cable and hood latch control cables together to prevent rattles.***

Re-locate Cable Connection on Hand Lever (Mercury only)—Drill new 5/16" hole in hand brake lever at point 1.38" from center of pivot hole in lever and shift cable connection to this new hole to improve leverage.



FORD-BENDIX REAR BRAKE ASSEMBLY
(FRONT BRAKE SAME EXCEPT HANDBRAKE PARTS NOT USED)

Lubricate Hand Brake Control—Lubricate following points with Lubriplate or equivalent (use sparingly): 1. Lever Pivot at ratchet bar, 2. Ratchet Bar, 3. Dash Hinge Bracket, 4. hand lever and body bracket Bolt & Contact Surface.

Align Hand Brake Control—To insure alignment, first attach hand brake lever at body bracket, second attach ratchet bar housing assembly to instrument panel with hand lever in fully released position.

DESCRIPTION

DESCRIPTION: Brakes used on these models are Bendix Hydraulic, Single Anchor (Without Eccentric adjustment of same design as used on other car models.

ADJUSTMENTS

►**ADJUSTMENT NOTE:** Adjustments are made differently for wear (Minor Adjustment) and for new lining or shoe assemblies (Major Adjustment). Major adjustment should also be made whenever a minor adjustment does not give satisfactory brake performance. Perform all following operations before adjusting brakes:

Preliminary Brake Adjustment Operations: Check master cylinder fluid level and fill to within ½" of top of filler neck, Check brake pedal free travel and adjust (see Brake Pedal Adjustment below) if not within limits of ¼-½". Check pedal reserve (distance from pedal pad to floor with brakes applied—brakes require adjustment if this distance less than ½ total pedal travel). Jack up all four wheels. Place hand lever in fully released position and make certain that cable slack is sufficient so that rear wheel brake shoes fully released.

►***CAUTION—Correct brake adjustment cannot be secured if hand brake cables so tight that brake shoes are held away from anchor pin.***

BRAKE PEDAL ADJUSTMENT

Brake Pedal Adjustment: Pedal must have more than ¼", but less than ½", free travel measured at pedal pad before master cylinder piston begins to move.

Ford (Pass. Cars)—Loosen locknut and turn eccentric bolt linking brake pedal to master cylinder pushrod. Locknut must be securely tightened.

Ford (Trucks)—Loosen locknut on master cylinder pushrod, remove clevis pin at brake pedal, turn pushrod in or out as necessary, tighten locknut.

Lincoln & Mercury—Loosen locknut on master cylinder end of pedal rod, turn connecting link.

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FORD-BENDIX HYDRAULIC (Cont.)

MINOR ADJUSTMENT

Minor (Wear) Adjustment: ***CAUTION—Recommended procedure for Ford is not same as Lincoln & Mercury.*** See all "Adjustment Note" preliminary operations above. At each wheel, make certain that anchor pin nut is tight (check with 16" wrench), remove adjusting hole cover on backing plate, adjust each model as follows. After adjustment completed, check and adjust parking (hand brake) cables.

Ford—Turn up adjusting screw for each wheel (accessible through slot in backing plate) until brake drum can just be turned by hand, then back off adjusting screw 14 notches or "clicks" until shoes are just free and wheel revolves without drag.

Lincoln & Mercury—Use feeler gauge to set shoe clearance at .010". See Major Adjustment for data.

MAJOR ADJUSTMENT

MAJOR ADJUSTMENT (For New or Relined Shoes):

►***CAUTION—Recommended procedure and setting for Ford is not same as for Lincoln & Mercury.***

Ford: Wedge the primary shoe out against drum by inserting .010" feeler through slot in drum at center of secondary shoe and expanding shoes by turning adjusting screw. Then adjust adjusting screw and anchor pin (slotted type) for .010" clearance at each end of secondary shoe (measure 1½" from each end of shoe).

Lincoln & Mercury: The shoe clearance should be .010" at all points. Check by inserting .010" feeler through slot in brake drum and measuring clearance at several points. Adjust by turning adjusting screw accessible through slot in backing plate and by shifting anchor pin if necessary (pin hole is slotted and pin can be tapped out after locknut loosened as follows:

Adjusting Screw—Insert screwdriver or adjusting tool through the adjusting slot on backing plate to engage notched adjusting screw, turn screw by moving tool handle inward toward axle (to move shoes out toward drum), or outward away from axle (to move shoes in away from drum), until .010" feeler is snug between secondary shoe and drum at point 1½" from adjusting screw end of shoe. Then check clearance at anchor pin end of shoes.

Anchor Pin—If clearance not .010" at point 1½" from anchor pin end of shoe, loosen the anchor pin locknut, tap anchor pin out toward drum (to decrease clearance), or inward away from drum (to increase clearance). Tighten anchor pin locknut securely with 16" wrench. Recheck clearance at both ends of secondary shoe and repeat adjustments if required. Adjust all four wheels in this manner. Then adjust parking (hand) brake cables (above).

HAND BRAKE ADJUSTMENT

►***CAUTION—Do not over-tighten cables which will hold brakes away from anchor pin and cause brake drag.***

Hand (Parking) Brake Adjustment: ***CAUTION—See Production Change Notes above.***

Ford (Passenger Cars), Lincoln, Mercury—Place hand lever in fully released position, check position of parking brake equalizer lever on frame cross-member. If lever pin not aligned horizontally with respect to cross-member, adjust front cable by turning equalizer lever nut (on end of cable). Remove slack from rear wheel cables by loosening forward nut on equalizer rod (to which cables attached) and tightening rear nut.

►***CAUTION—make certain that rear brake shoes are not pulled away from anchors and that brakes do not drag***

Ford (F-1 Truck)—After adjusting brake shoes, place hand lever in fully released position. Depress brake pedal to point where rear brakes firmly applied and hold pedal in this position. Adjust each rear wheel brake cable to remove all slack (loosen locknut and turn clevis at equalizer lever end of cable). Release brake pedal and make certain that brakes do not drag. Apply hand brake and check position of equalizer bolt. If bolt not centered in slot, readjust rear wheel cables. With hand lever released, adjust hand lever-to-equalizer cable so that ½" movement of hand lever is necessary to take up all slack in cables.

Ford Truck (F-2 & F-3)—These models have independent brake on propeller shaft behind transsion. ***See preceding "Ford-Lockheed Hydraulic" brake data for adjustment procedure.***

OVERHAUL

BLEEDING BRAKE SYSTEM: ***See complete "Hydraulic Brake Servicing" for bleeding instructions.***

TROUBLE SHOOTING: ***See "Hydraulic Brake Trouble Shooting" for complete data.***

BRAKE DRUM REPLACEMENT: Brake drums are "demountable" type (removable without disturbing wheel hub) on all models except Ford Pass. Car & Station Wagon **front wheels.** To remove brake drums after wheel has been removed, take off three speed nut (Ford Pass. Car Rear Wheels), or remove three capscrews (Ford Truck, Lincoln, Mercury), retaining drum on wheel hub or axle shaft flange.

Drum Regrinding Note—When refinishing drums, diameter must not be increased more than .030".

BRAKE SHOE REPLACEMENT: With wheels and brake drums removed, brake shoes are removed and replaced as follows:

Removal: Disconnect brake shoe return springs at anchor pin, remove hold-down cup, spring, and pin on each shoe. Disconnect hand brake cable at lever on rear wheel brake rear shoe. Pull shoes out at top to free wheel cylinder piston links, lift shoe assembly out, lift out hand brake strut and anti-rattle spring on rear wheel brakes. Disassemble shoes by removing adjusting screw spring (free spring by moving anchor pin end of shoes together) and lifting off adjusting screw assembly.

Relining Brake Shoes: Lining should be replaced when worn to point where rivet head less than 1/32" below surface of lining. Inspect shoes for distortion or looseness between rim and web. Clean shoe rim and remove all burrs or high spots before installing new lining. After riveting, new lining must be snug against shoe with not more than .005" separation midway between rivets.

►***BRAKE LINING NOTE***—Lining furnished in brake lining kits is ground in production and does not require grinding after installation.

Installation: Lubricate all points of contact between brake shoes and other brake parts with Lubriplate. Assemble both brake shoes with adjusting screw and spring (see illustration). On rear wheel brakes, assemble parking brake lever on rear (secondary) shoe and install link. Install shoe assembly on backing plate, install hold-down cups and springs, install return spring. Install drums and adjust brakes.

OVERHAUL: Master Cylinder & Wheel Cylinders. ***See "Hydraulic Brake Servicing" for complete data.***