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GENERAL DESCRIPTION

The hydraulic service brake system used on Henry J vehicles consists of a pedal operated master cylinder which is connected by hydraulic tubing to a cylinder in each of the four wheels (Fig. 202). Each wheel cylinder operates simultaneously, by fluid pressure, to force two floating brake shoes against the brake drum which revolves with the wheel.

When the brake pedal is depressed, pressure of the pedal is transmitted directly to the brake master cylinder piston assembly. Movement of the master cylinder piston forces the hydraulic fluid through the brake lines into the wheel cylinders. The fluid pressure forces the front and rear pistons in each wheel

cylinder outward, expanding the brake shoes against the drums. The greater the pedal pressure, the greater the force exerted against the brake drums.

When the brake pedal is released, the pedal, master cylinder piston, wheel cylinder pistons and brake shoes return to their released positions by means of their respective return springs.

A brake light switch is mounted in the hydraulic line "T" connector located on top of the left frame side rail near the steering gear. The switch can be tested as specified in Section 15, "Electrical."

A hand-operated parking brake is provided for use when the car is parked. This brake is independent of the hydraulic system and operates the rear wheel brake shoes through mechanical linkage (Fig. 203).

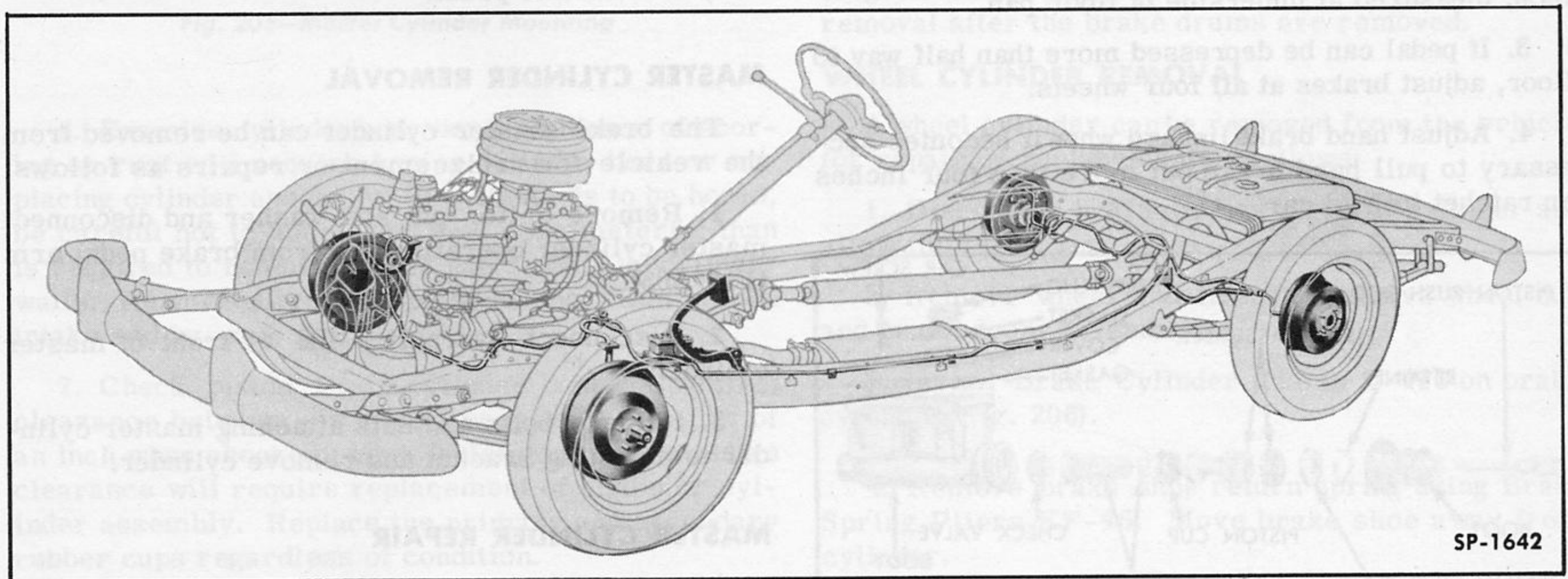


Fig. 202—Hydraulic Brake System

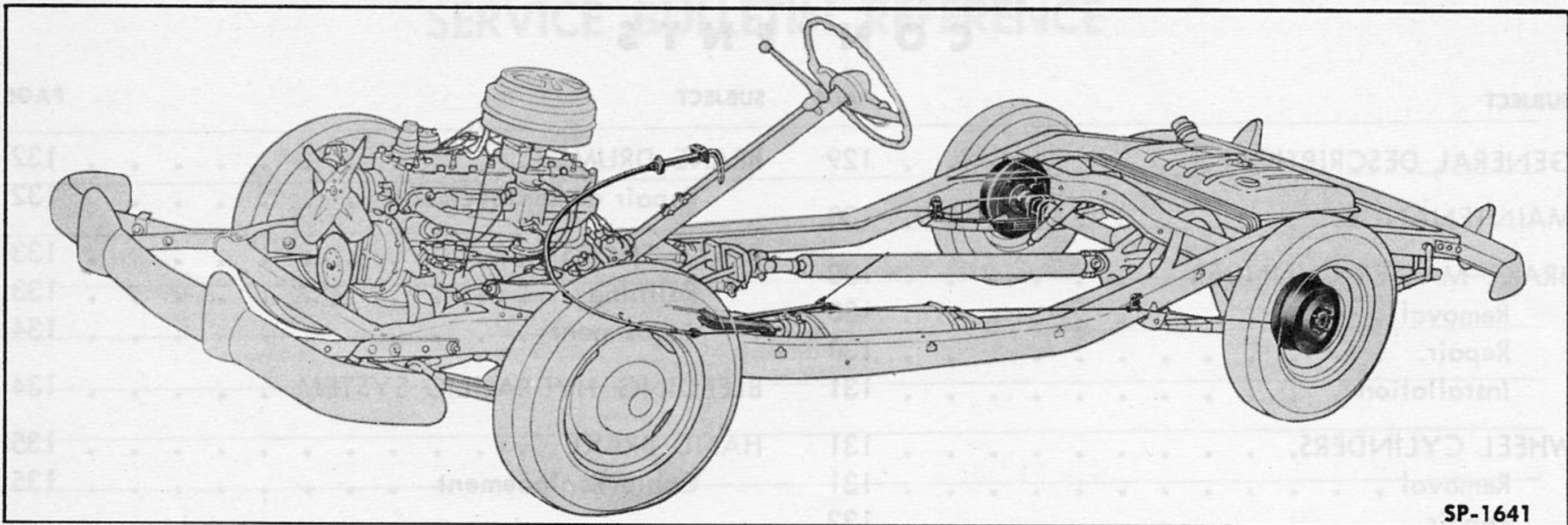


Fig. 203—Hand Brake Installation

The hand brake is connected by cable linkage from the pull type brake handle mounted below the instrument panel, to the rear wheel brakes. When the hand brake is applied the movement of the cable linkage to the rear wheels causes the brake shoes to expand, engaging the brake drums. The hand brake can be released by turning the handle clockwise to disengage the locking ratchet.

MAINTENANCE

Maintenance of the brake system should consist of the following items to insure efficient braking action:

1. Periodically check hydraulic fluid level in brake master cylinder and fill as required. Refer to Section 17, "Lubrication" for instructions.
2. Maintain proper brake pedal free travel of 1/4 inch, measured at underside of floor pan.
3. If pedal can be depressed more than half way to floor, adjust brakes at all four wheels.
4. Adjust hand brake linkage when it becomes necessary to pull hand brake out more than four inches on ratchet to hold car.

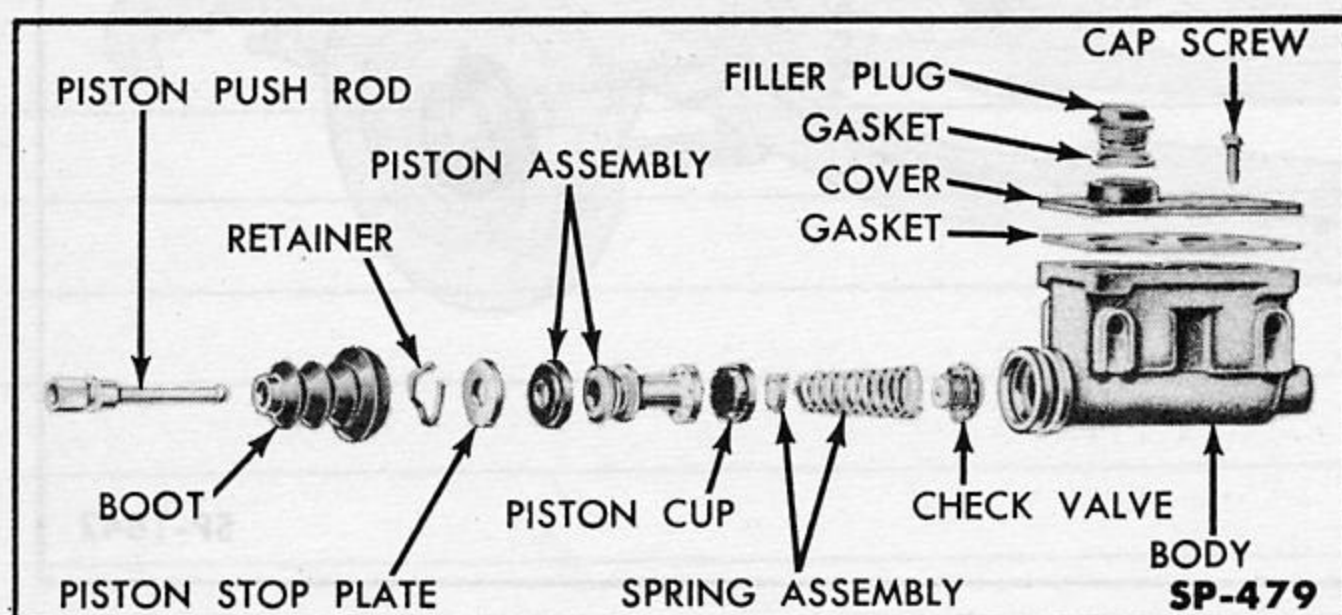


Fig. 204—Master Cylinder—Exploded View

5. Brake pedal should be lubricated as shown in Section 17, "Lubrication."

BRAKE MASTER CYLINDER

The brake master cylinder consists of a cast body which serves as both a fluid reservoir and as a cylinder in which the piston can move. It contains the piston assembly with primary and secondary rubber cups, a push rod, check valve and return spring assembly (Fig. 204).

The master cylinder is mounted on a bracket which is attached to the frame side rail in the area directly below the brake pedal. The master cylinder piston push rod is connected, through an adjustable operating rod, to the brake pedal.

MASTER CYLINDER REMOVAL

The brake master cylinder can be removed from the vehicle for replacement or repairs as follows:

1. Remove cotter pin and washer and disconnect master cylinder operating rod from brake pedal arm (Fig. 205).
2. Disconnect hydraulic line at front of master cylinder.
3. Remove bolts and nuts attaching master cylinder to mounting bracket and remove cylinder.

MASTER CYLINDER REPAIR

After the master brake cylinder has been removed from the vehicle and drained of brake fluid, it can be disassembled, inspected and reassembled as follows:

1. Remove piston push rod and boot from cylinder body. If boot shows signs of deterioration, discard it and use a new boot when reassembling cylinder.
2. Remove cover plate and gasket.
3. Pry out piston stop plate retainer and remove stop plate, piston assembly, piston cup and spring assembly.
4. Remove check valve from spring assembly.
5. Wash all parts in denatured alcohol and dry. Make sure intake and by-pass parts in cylinder body are open. **CAUTION: DO NOT USE GASOLINE OR KEROSENE FOR CLEANING MASTER CYLINDER PARTS.**

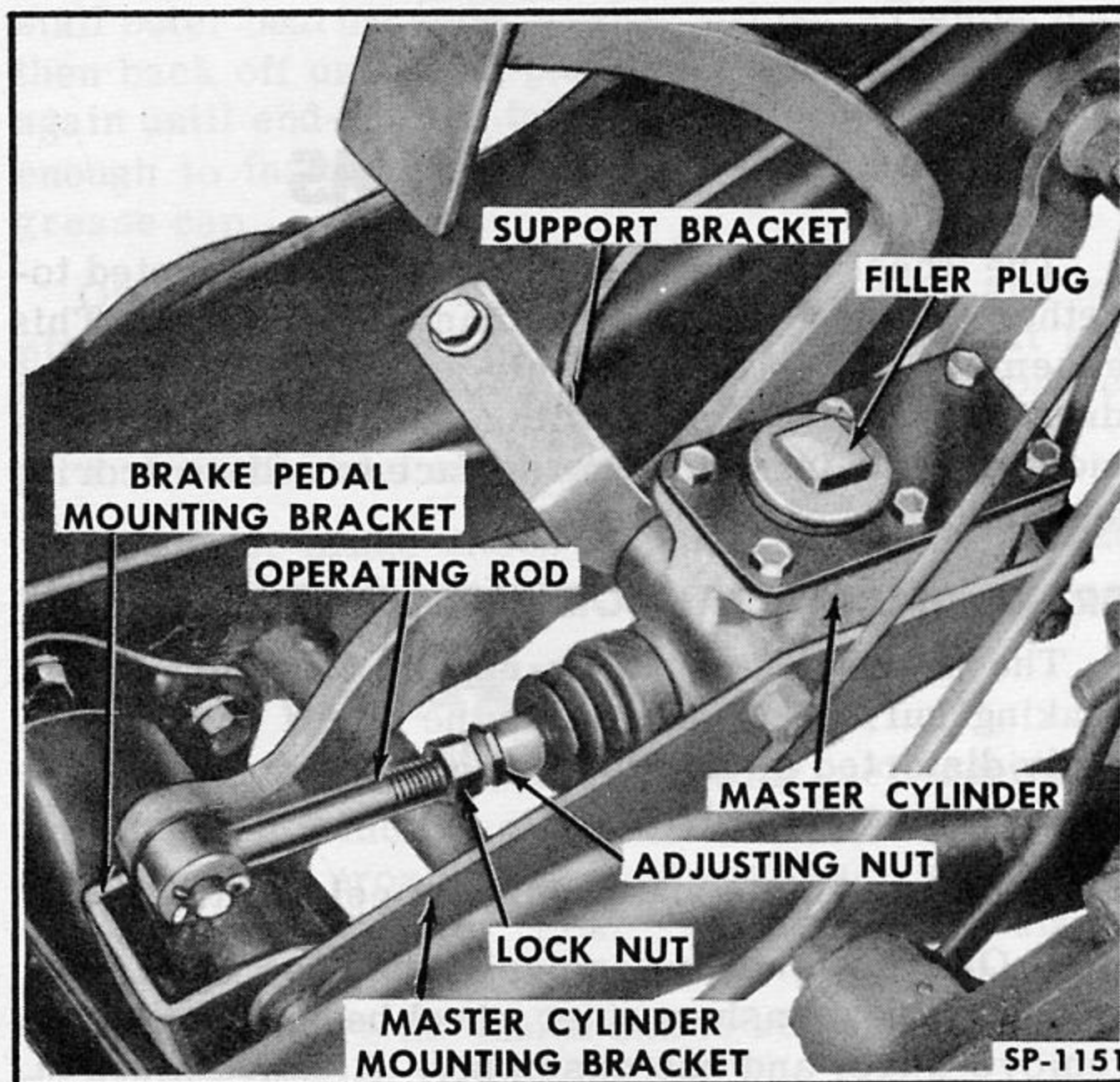


Fig. 205—Master Cylinder Mounting

6. Examine cylinder body bore. Evidence of scoring or rust will require honing cylinder bore or replacing cylinder assembly. If cylinder is to be honed, be careful not to hone away any more material than is required to remove scores and smooth up cylinder walls. Remove burrs, caused by honing, from around intake and by-pass ports.

7. Check piston fit in cylinder bore. Specified clearance between piston and bore is .001 - .005 of an inch when checked with a feeler gauge. Excessive clearance will require replacement of piston or cylinder assembly. Replace the primary and secondary rubber cups regardless of condition.

8. Inspect check valve. If it is worn or damaged, check valve must be replaced.

9. Dip parts in hydraulic brake fluid and assemble in the reverse order of their removal.

MASTER CYLINDER INSTALLATION

After the master cylinder has been repaired, or if a new cylinder is used, install it to the vehicle as follows:

1. Install master cylinder to mounting bracket on frame with bolts and nuts.
2. Connect hydraulic line at front of master cylinder.
3. Install master cylinder operating rod to push rod and connect opposite end to brake pedal. Adjust operating rod until brake pedal free travel is 1/4 inch, measured from underside of floor pan. Tighten lock nut.
4. Fill master cylinder and bleed hydraulic system according to instructions in this section.

WHEEL CYLINDERS

The wheel brake cylinders are mounted at the top of the brake shoe support plate between the brake shoes, at each wheel. The cylinders are mounted on the brake support plate and are enclosed by the brake drum. When the brake pedal is depressed and the fluid pressure builds up, additional fluid enters the center portion of the wheel cylinder and forces the pistons to move outward, thus pushing the brake shoes against the brake drum.

Each wheel cylinder consists of a cast body, return spring, front and rear pistons, front and rear rubber cups, two boots and a bleeder valve assembly (Fig. 207). The wheel cylinders are accessible for removal after the brake drums are removed.

WHEEL CYLINDER REMOVAL

A wheel cylinder can be removed from the vehicle for repair or replacement as follows:

1. Disconnect hydraulic line at wheel cylinder and allow fluid to drain.
2. Remove wheel and tire and remove wheel hub and brake drum assembly.
3. Install Brake Cylinder Clamp C-416 on brake cylinder (Fig. 206).
4. Remove brake shoe return spring using Brake Spring Pliers KF-46. Move brake shoe away from cylinder.
5. Remove bolts and washers attaching wheel cylinder to support plate and lift off cylinder.

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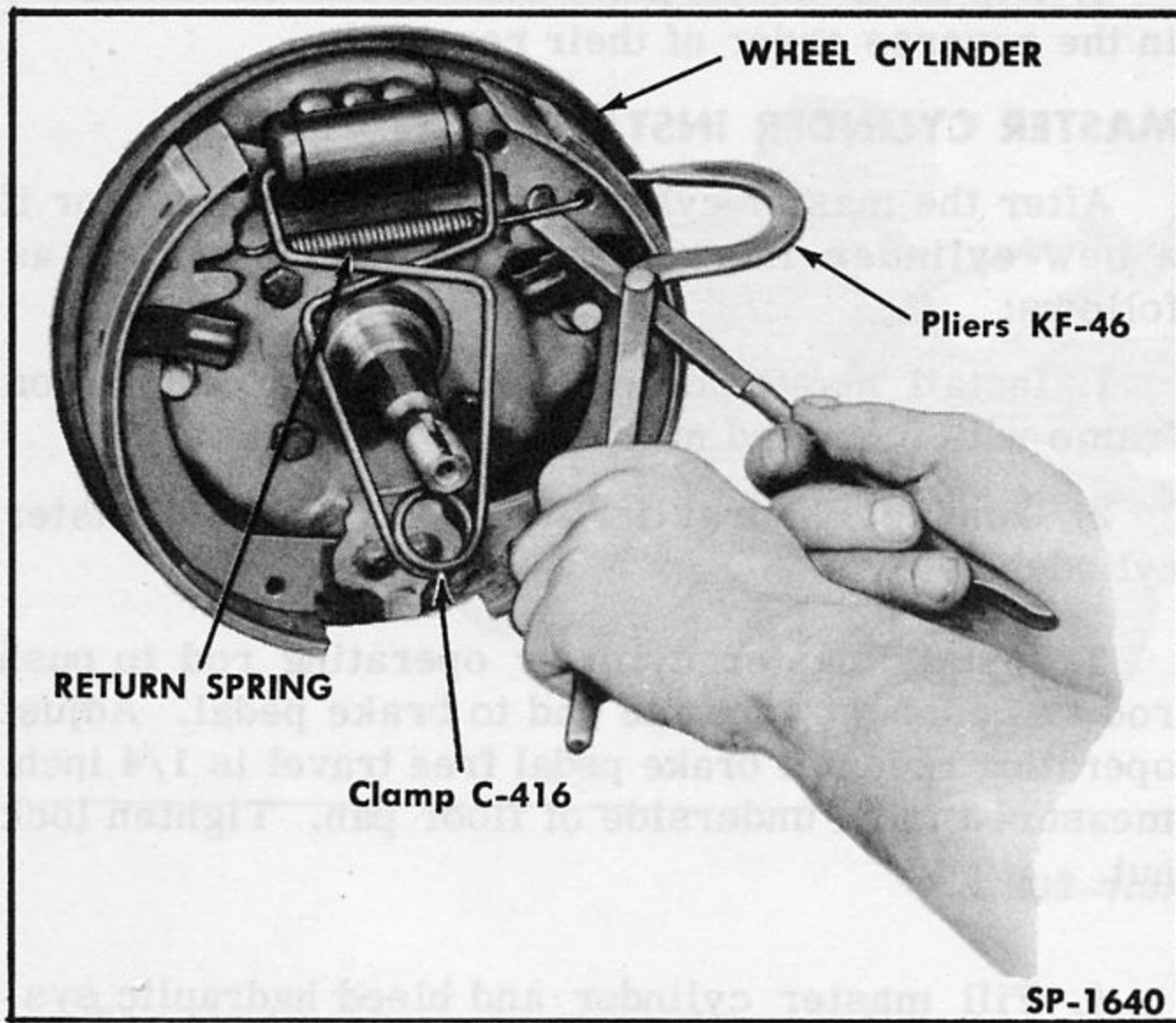


Fig. 206—Removing Brake Shoe Return Spring

WHEEL CYLINDER REPAIR

After the wheel cylinder has been removed, it can be disassembled, inspected and reassembled as follows:

1. Remove Clamp C-416 and end boots from cylinder body. Then remove pistons, cups and return spring from body (Fig. 207).

2. Wash all parts in denatured alcohol and dry. **DO NOT USE GASOLINE OR KEROSENE TO CLEAN WHEEL CYLINDER PARTS.**

3. Examine cylinder body bore. Evidence of scoring or rust will require honing cylinder bore or replacing cylinder assembly. If cylinder is to be honed, be careful not to hone away any more material than is required to remove scores and smooth up cylinder walls.

Check piston fit in cylinder bore. Specified clearance between piston and bore is .001 - .005 of an inch when checked with a feeler gauge. Excessive clearance will require replacement of piston or cylinder assembly. Replace rubber cups regardless of condition.

4. Dip all parts in hydraulic brake fluid and assemble all parts to cylinder body with lips of rubber cups facing inward, toward spring. Place Clamp C-416 on cylinder to compress return spring in preparation for installation.

WHEEL CYLINDER INSTALLATION

Install the wheel brake cylinder to the vehicle as follows:

1. Install cylinder to brake support plate with bolts and washers.

2. Fit prongs of brake shoe web into cylinder pistons and install brake shoe return spring, using Pliers KF-46.

3. Remove Clamp C-416 from cylinder and back off adjusting cams to permit easier installation of hub. Install the wheel hub and brake drum assembly and the wheel and tire.

4. Fill master cylinder and bleed hydraulic system.

5. Adjust brake shoes as detailed under "Brake Shoe Adjustment" in this section.

BRAKE DRUMS

The wheel hub and the brake drum are riveted together solidly to form a permanent assembly. This assembly is replaceable only as a unit. The brake drums are made of steel with a cast alloy-iron lining molded to the inner braking surface to reduce scoring and distortion of the drums.

BRAKE DRUM REPAIR OR REPLACEMENT

The brake drum can be repaired by turning the braking surface down on a lathe or, if the drum is badly distorted or damaged, it can be replaced. Use the following procedure:

1. Raise vehicle and remove wheel and tire.
2. On front wheels, remove grease cap, cotter pin, spindle nut and washer, outer wheel bearing cone, then remove wheel and hub assembly. Remove oil seal, inner bearing cone and bearing cups from front wheel hub for replacement if necessary.

On rear wheels, remove cotter pin, nut and washer from rear axle shaft and remove wheel hub and brake drum assembly, using Rear Wheel Hub Puller C-319 (Fig. 208). Remove wheel hub to axle shaft key.

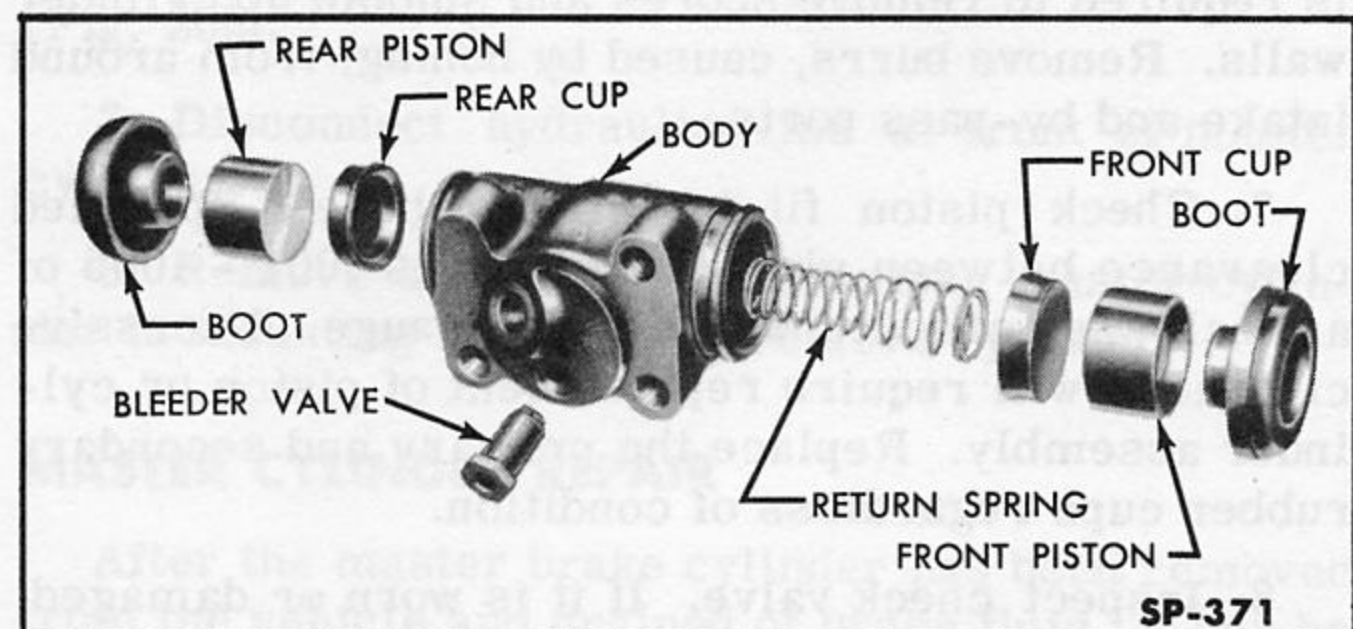


Fig. 207—Typical Wheel Cylinder—Exploded View

3. Inspect braking surface of drum. If it is scored, out-of-round or bell-mouthed, it can be turned down on a lathe or replaced. If it is turned down on a lathe, the inside diameter must never be turned more than .060 of an inch in excess of the original 8.995 - 9.005 inch diameter. An oversize brake shoe set should be installed if drums are turned down more than .030 inch oversize.

4. Clean all dirt from drum and brake components. Turn brake shoe adjusting cams to allow brake shoes to fully retract.

5. On front wheels, install bearing cups, inner bearing cone and new oil seal to wheel hub, then install hub and drum assembly to steering knuckle, install outer bearing cone, washer and nut. Tighten nut, then back off until end-play is evident. Tighten nut again until end-play is taken up and back off nut only enough to install cotter pin. Install cotter pin and grease cap.

On rear wheels, install key on axle shaft and install hub and drum assembly with washer, nut and cotter pin. Tighten nut to 70 - 100 foot-pounds torque.

6. Install wheel and tire.

7. Adjust brake shoes as outlined under "Brake Shoe Adjustment" in this section.

BRAKE SHOES

The brake shoes are the floating self-centering type, having a moulded lining riveted to each shoe. Adjustment is provided by a cam for each shoe. The shoes are allowed to "float" by means of a clamp arrangement on the support plate. Springs provide tension to secure the shoes and to return them to the retracted position.

Normal brake usage will eventually cause wear of the brake lining, requiring adjustment at the cams. When maximum cam adjustment has been reached, the brake shoe lining must be replaced. If hydraulic brakes are properly adjusted the brake shoe linings will wear evenly on all wheels, consequently relining of brakes will be required on all four wheels at one time under normal conditions. However, brake shoe and lining assembly replacement, or brake shoe lining replacement, may be made in sets for both front wheels or both rear wheels. Except in cases of low mileage, where only slight wear is evident, lining or shoe replacement on one wheel only is not recommended. When relining the brakes or replacing components, use only K-F approved lining and parts.

BRAKE SHOE RELINING

Brake shoes can be relined according to the following procedure:

1. Raise vehicle and remove wheel and tire and hub and drum assembly.

2. Install Brake Cylinder Clamp C-416 on brake cylinder pistons as shown in Fig. 206.

3. Remove brake shoe return spring using Brake Spring Pliers KF-46.

4. Remove brake shoes.

5. Replace brake shoe lining if lining is oil soaked, or worn within 1/32 of an inch of the rivet heads. Lining that has not been making full and uniform contact with the drum must also be replaced. The brake shoe and lining should be replaced as an assembly if the shoe itself is damaged or warped. Brake shoe and lining assembly replacement, or brake shoe relining should be made only in sets for both front or both rear wheels.

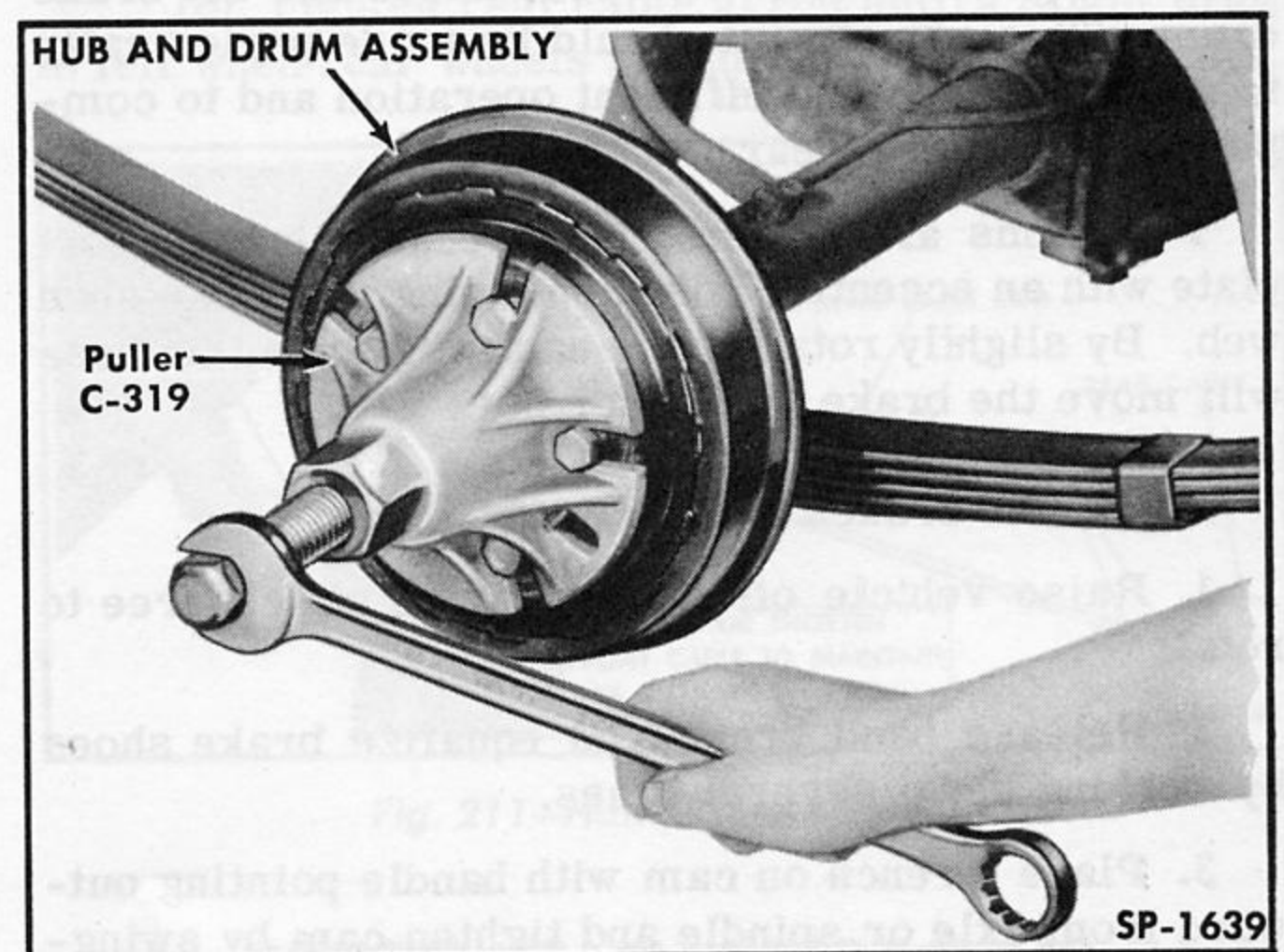


Fig. 208—Removing Hub and Drum Assembly

If the brake drum inside diameter has been refaced from .030 to .060 inch oversize (standard size is 8.995 - 9.005 inches diameter), it will be necessary either to install a .030 inch oversize brake shoe and lining set or reline the old brake shoes with a .030 inch oversize lining set to compensate for the increased diameter of the drum.

Both brake shoe sets and lining sets consist of replacement parts for both front wheels or both rear wheels. Front and rear shoes for each wheel are marked "Forward" and "Reverse" respectively and must be installed in their correct position on the support plate. Notice that the forward shoe is fitted with a longer lining surface than the rear shoe. Proceed with the lining replacement on each shoe as follows:

(a) Remove lining rivets using a de-liner punch in a conventional lining riveting machine.

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(b) Position new lining on shoe, locating center holes of lining on shoe. Install two center rivets using a conventional lining riveting machine.

(c) Install remaining rivets working from center out toward ends. Rivets must be tight, holding lining securely to shoe.

6. Install brake shoes to brake support plate and attach return spring, using Pliers KF-46. Remove Clamp C-416 from cylinder.

7. Install hub and drum assembly and install wheel and tire. Adjust brake shoes as described under "Brake Shoe Adjustment" in this section.

BRAKE SHOE ADJUSTMENT

An adjustment is provided at each wheel to control the space between the brake shoes and the brake drum. This adjustment should be made periodically to assure proper and efficient operation and to compensate for lining wear.

Two cams are mounted in the brake shoe support plate with an eccentric boss contacting the brake shoe web. By slightly rotating the cam, the eccentric boss will move the brake shoe in or out.

Adjust the brakes as follows:

1. Raise vehicle off floor, leaving wheels free to rotate.
2. Release hand brake and equalize brake shoes by working pedal several times.
3. Place wrench on cam with handle pointing outward from axle or spindle and tighten cam by swinging wrench downward (Fig. 209).

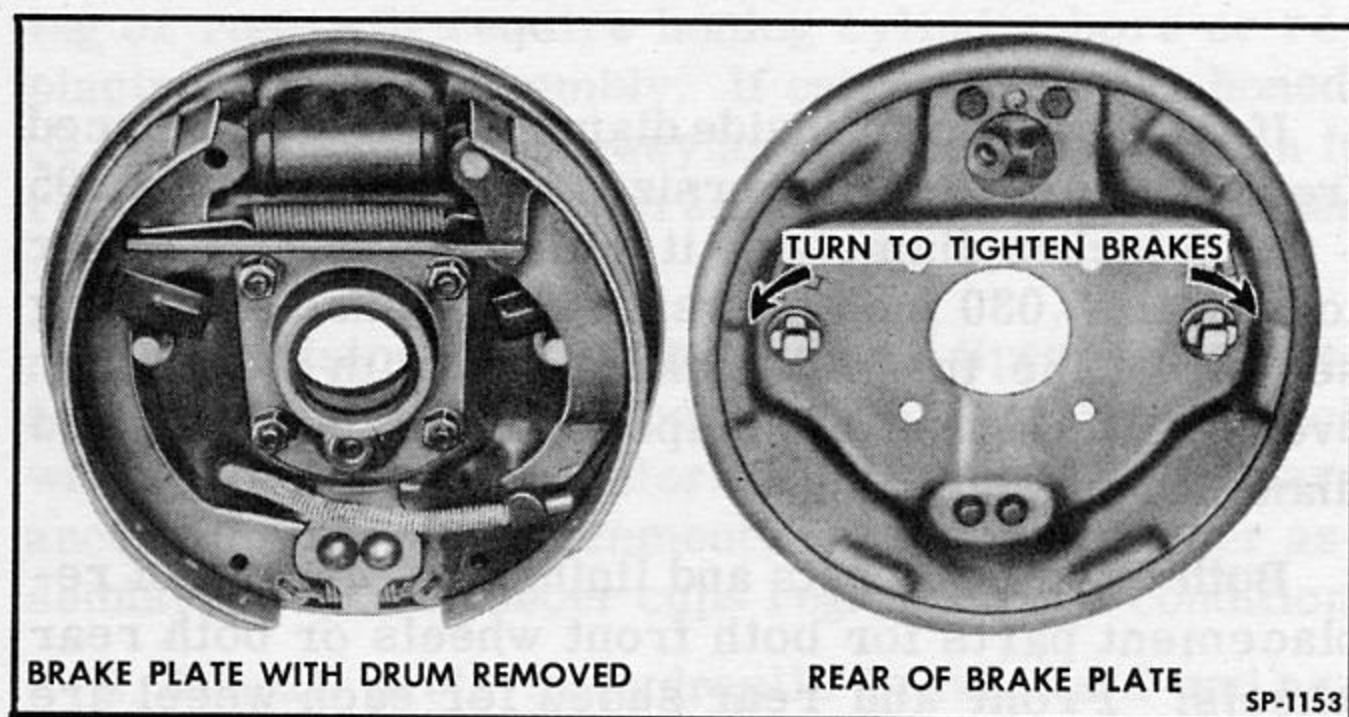


Fig. 209—Brake Support Plate and Adjustment Cams

Tighten both cams until wheel binds and cannot be turned by hand.

4. Loosen cams until wheel is just free.
5. Repeat adjustment on all four wheels.

BLEEDING HYDRAULIC SYSTEM

The hydraulic system must be bled whenever a fluid line has been disconnected or air gets into the system. If a hydraulic line is disconnected at the master cylinder, the system must be bled at all four wheel cylinders. Whenever a hydraulic line is disconnected from an individual wheel cylinder, only that wheel cylinder must be bled.

The presence of air in the hydraulic system will cause "spongy" brake pedal operation. Air trapped in the system is compressed and does not permit all of the pressure applied to the brake pedal to be transmitted through the brake lines.

Manual bleeding of the hydraulic system, as described below, is a simple method, forcing additional hydraulic fluid through the brake lines by actuating the brake pedal in order to expel air from the system.

A pressure type Airless Bleeder Tank C-837 can also be used. This tank pumps fluid through the lines under pressure to remove air, sediment and sludge from the system and leaves it full of clean fluid.

Each wheel cylinder is equipped with a bleeder valve which is readily accessible at the top of the brake shoe support plate. Proceed as follows:

1. Pull back front floor mat, remove foot pedal seals and retainer plates and clean off dirt from top of master cylinder.
2. Remove master cylinder reservoir filler plug and install Automatic Brake Master Cylinder Refiller C-362, with nozzle in filler opening.
3. Attach one end of Brake Bleeder Hose C-650 to wheel cylinder bleeder valve (Fig. 210). Place opposite end in a glass container partially filled with hydraulic fluid so end of hose is submerged.
4. Turn bleeder valve on wheel cylinder to the open position (1/2 to 3/4 turn).
5. Open valve on Refiller C-362 so brake fluid may flow into master cylinder reservoir.
6. Pump brake pedal by hand, forcing fluid through lines and out Brake Bleeder Hose C-650. When bubbles cease to appear and fluid stream is solid, close bleeder valve and remove hose.
7. Repeat the above operations on the other wheels.
8. When all wheels are bled, remove automatic refiller, making sure master cylinder reservoir is full of fluid to 1/4 inch of the filler hole. Install filler plug and replace foot pedal seals and retainers.

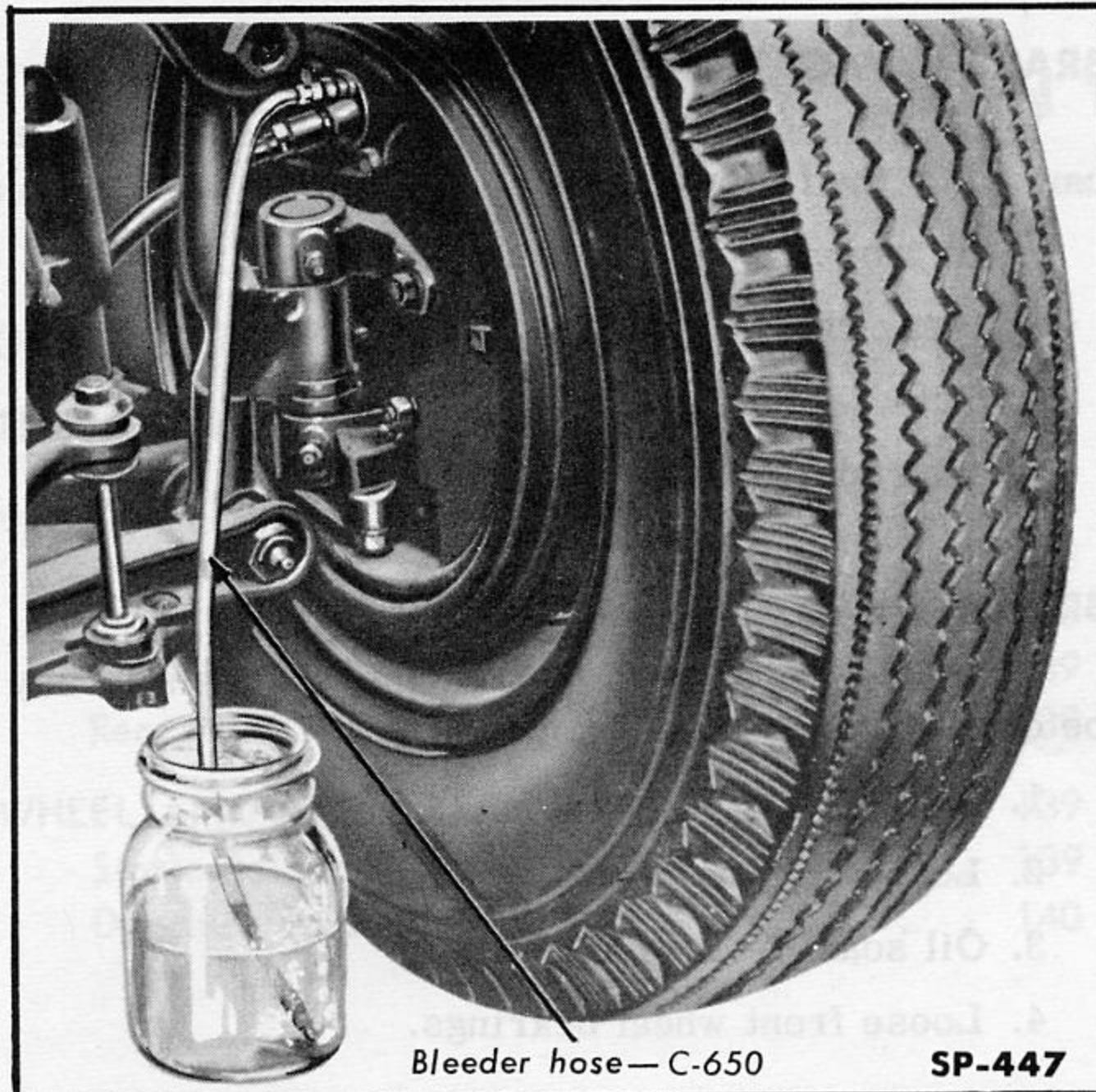


Fig. 210—Bleeding Hydraulic System at Wheel Cylinder

HAND BRAKE

The hand brake or parking brake system is controlled by a pull type handle mounted at the instrument panel. The handle has a ratchet to hold the brake automatically in any position until the handle is turned clockwise to release the ratchet. A front cable assembly connects the handle to a lever mounted on the number two crossmember. The lever, in turn, operated a rear cable assembly which extends to each rear wheel to actuate the rear brake shoe by mechanical linkage.

HAND BRAKE CABLE REPLACEMENT

The procedure below outlines the necessary steps for replacing front and rear cables, including adjustments.

1. Replace front cable assembly as follows:

(a) Pull out hairpin clip at end of control handle and unhook cable.

(b) Disconnect cable from clips on frame and clutch housing.

(c) Remove nut from end of cable and release cable from lever at number 2 crossmember (Fig. 211).

(d) Install new cable by reversing this procedure and adjust as described in step 3 below.

2. Replace rear cable assembly as follows:

(a) Remove rear wheels and tires and rear wheel hub and brake drum assemblies.

(b) Disconnect end of cable from parking brake lever (mounted on brake support plate).

(c) Remove cable guides from frame side rails.

(d) Remove nut from end of rear cable rod and remove cable.

(e) Install new cable by reversing this procedure and adjust as described in next step.

3. Adjust hand brake linkage as follows:

(a) Place control handle in fully released position.

(b) Adjust nut on front cable until it is approximately 4-3/4 inch away from rear cable rod.

(c) Pull hand brake handle out 3 clicks on ratchet.

(d) Tighten rear cable at rod until a slight drag is felt when rear wheels are turned. Tighten lock nut.

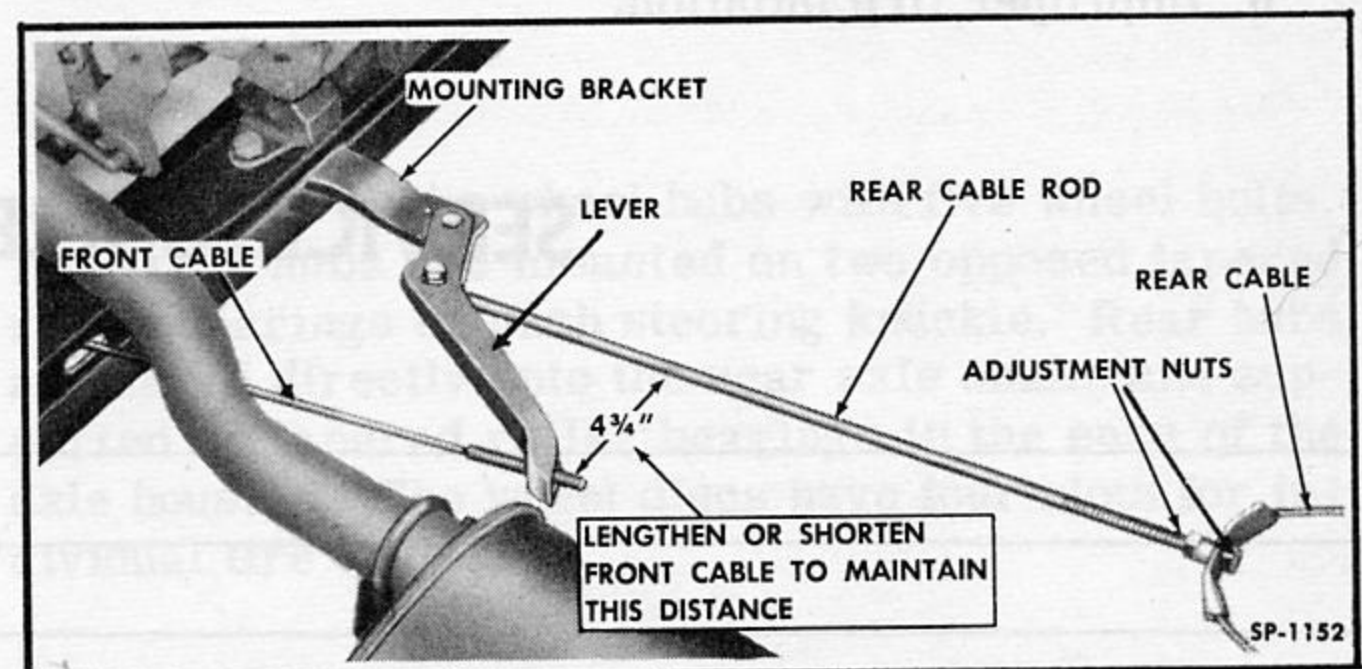


Fig. 211—Hand Brake Linkage

SERVICE DIAGNOSIS

The brake system requires periodic servicing and adjustment to maintain safe and efficient operation. A diagnosis of the brake system is recommended during the servicing and adjustment operation to assure proper operation. Check for the following conditions:

PEDAL GOES TO FLOORBOARD

This condition usually requires pumping the pedal to obtain brake action and is caused by one of the following:

1. Normal lining wear.
2. Hydraulic fluid leak in system.
3. Air in system.
4. Fluid supply exhausted.

SPRINGY OR SPONGY PEDAL

A normal brake pedal travels only to a point where the desired hydraulic pressure is developed. If the

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pedal continued to travel under foot pressure, it may be traced to the following causes:

1. Improper shoe adjustment.
2. Air in system.
3. Hydraulic fluid leak in system.

UNEVEN BRAKING

If uneven braking is evident by the car pulling to one side or one brake locking, it may be caused by the following:

1. Grease or foreign matter on brake linings.
2. Shoe improperly set.
3. Loose support plate.
4. Improper lining.
5. Loose adjusting cam.
6. Improper tire inflation.

BRAKES DRAG

If the brakes drag on one or all wheels, it may be caused by the following:

1. Improper shoe adjustment.
2. Weak return springs.
3. Out-of-round drums.
4. Improper hydraulic fluid.

BRAKES GRAB

If the brakes grab on one or more wheels it may be caused by the following conditions:

1. Improper adjustment.
2. Loose support plates.
3. Oil soaked linings.
4. Loose front wheel bearings.

SERVICE BULLETIN REFERENCE
