Bendix Three-Shoe Brakes

Characteristics of Construction

Bendix 3 shoe brakes are mechanically operated internal expanding type. The brake assembly for each wheel comprises three shoes (primary, secondary and auxiliary) so constructed and actuated as to give a servo or self-energizing action. One end of the **primary** shoe bears against the operating cam. The other end is connected to the **secondary shoe** by means of an **articulating pin.** This articulating pin engages (but is not rigidly fastened thereto) an **eccentric pin** attached to the **backing plate** in such a way as to form an adjustment to compensate for secondary shoe **lining wear.** The **secondary shoe** is hinged at one end to the primary shoe as shown in Fig. N 1, and is anchored to the backing plate at its other end. Acting independently of these two shoes, the **auxiliary shoe** on brakes over 11 in. diameter is anchored at one end to the backing plate while the other end bears against the operating cam. The primary and auxiliary shoes are both held against the operating cam by means of a tension spring known as the P & A spring.

When the brake is applied the operating cam pushes the primary and auxiliary shoes against the drum. The primary not being anchored is free to move and is **dragged** by the contact with drum in the direction of the drum or wheel rotation. This movement of the primary shoe forces both itself and the secondary shoe more tightly against the drum and thus increases the pressure by supplying a self-energizing action. Actually the pressure on the drum caused by this energizing action is much greater than could be exerted by hand or foot through the levers and cams.

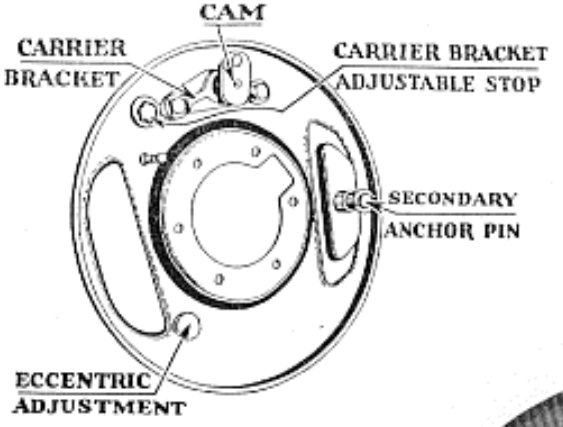

Fig. N2. Wheel side of the same backing plate as shown in Fig. N3. Note single anchor pin

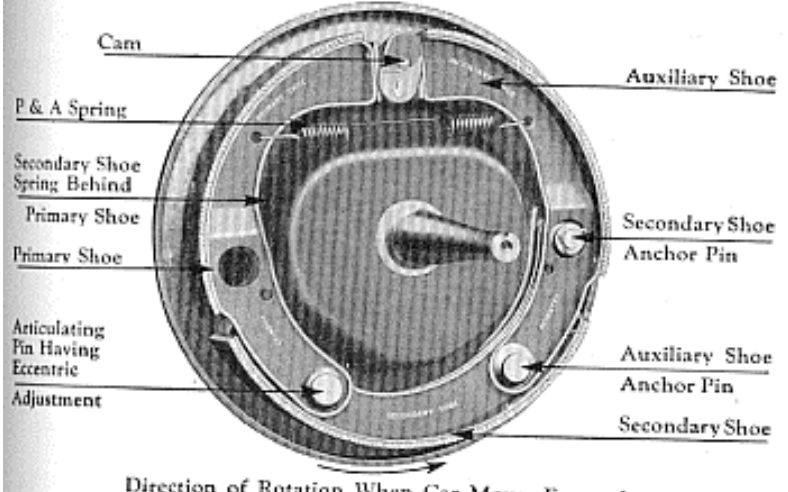

Fig. N1. A Left Front Bendix 3-Shoe Brake Installation. Note this model has two anchor pins

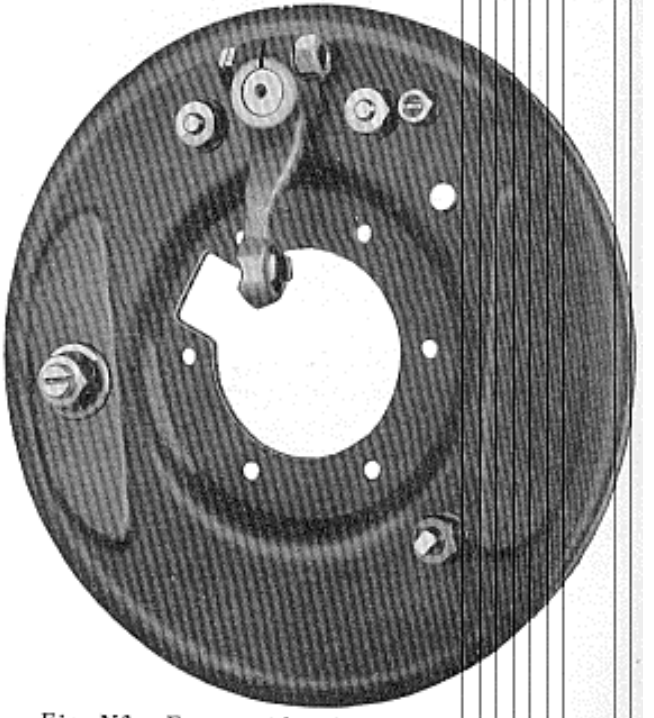

Fig. N3. Frame side of the backing plate for same model brake as shown in Fig. N2

On some Bendix installations the primary and auxiliary shoes are **exactly alike** and **interchangeable.** Exceptions to this rule are the **Super-Servo** and some **special** designs. On the Super-Servo the anchor pins are located **nearer** the center of the backing plate to give additional self-energization. The Super-Servo usually has a double compensating cam and no carrier bracket. See Fig. N6.

All parts of the Bendix wheel brake assemblies are mounted on a circular steel disk known as the backing plate shown in Fig. N2 and Fig. N3. Control of all adjustments is from the **frame** side of the backing plate.

Four Adjustments on 3 Shoe Models

There are four points of adjustment on the 3 shoe brake. One of these is the **eccentric** which functions as an adjustment for re-centering of the shoes to compensate for normal lining wear. It is mounted on the backing plate behind the articulating pin. Control of the eccentric adjustment which is illustrated in Fig. N4 is from the **frame side** of the backing plate.

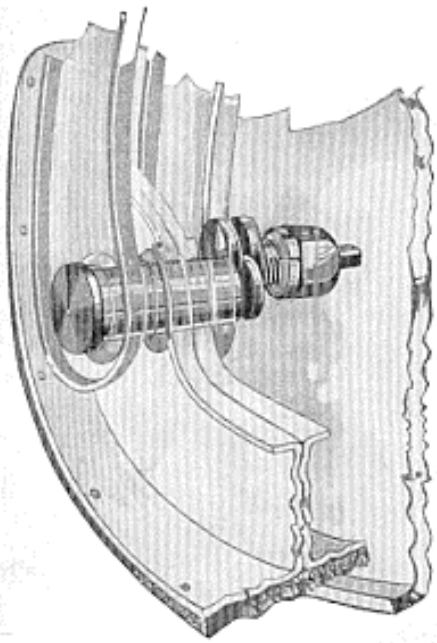

Fig. N4. Phantom view of the eccentric or clearance adjustment used on most models

The second adjustment is the **anchor,** which is the most important of all, since it controls the major or basic centering of the shoes and the effectiveness of the eccentric adjustment.

Most of the 3 shoe models are provided with two anchors although some of the smaller sizes have only one. The anchor pin adjustment which controls shoe centering on the Bendix brakes is fully described under "Major Adjustment."

On the **wheel** side of the backing plate is the **cam support,** which is also known as the **carrier bracket.** On most Bendix installations except the Super-Servo the **carrier bracket** is attached to the backing plate by two bolts which pass through slots in the plate as shown in Fig. N5. Because of these slotted holes it is possible for the carrier bracket to be moved endwise and this forms the **third** point of adjustment. The carrier bracket is bolted to the backing plate sufficiently tight to prevent a movement of the bracket on the backing plate by hand, but **not** so tight but that a tap of a hammer will not move it. The object of this construction is to allow the operating cam to **automatically** center itself between the primary and auxiliary shoes.

An exception to the usual design is the incorporation of a small **cam** that forms a **stop** to prevent the carrier bracket moving too far. See Fig. N2 and Fig. N14, Page 49.

On those installations where carrier brackets are **not incorporated, such as the Super-Servo, Fig. N6** the **cam** itself is slotted so that it can move or "float" slightly. When the self-aligning cam is used the cam ends of shoes are fitted with rollers, as in Fig. N-6.

The fourth point of adjustment controls the angle of the cam operating lever.

On the older models with Lever control the adjustment for angle is by means of a worm mounting of the operating lever called the **worm screw adjustment,** as shown in Fig. N9, Page 48. However, on some of the later Lever type Bendix installations the camshaft operating lever angle is controlled by means of a **threaded button or tapped screw,** as shown in Fig. N10, Page 48. On Perro control installations adjustment of the camshaft levers, front and rear, is by means of serrations or notches on the camshaft. The serration method of adjusting the operating cam levers is sometimes used on the Lever type controls, but at the **rear** wheels only

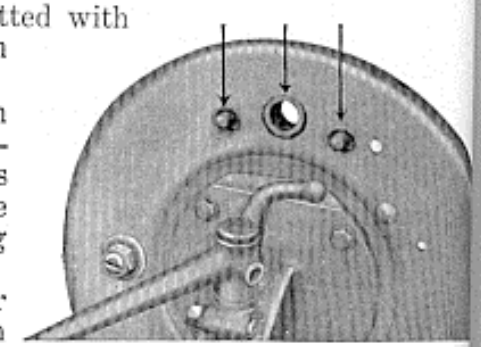

Fig. N5. End arrows show slotted holes which permit centering of the operating cam

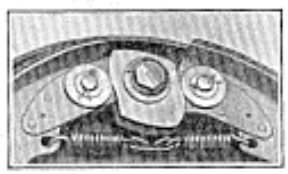

Fig. N6. On self aligning cam models such as this there is no carrier bracket

Three Shoe Lever Control

Adjustment Procedure

In the Bendix lever control, the brake cam is actuated by a control lever attached to the axle of the vehicle. One end of this control lever is ball shaped and bears against a small lever attached to the camshaft, as shown in Fig. N7. The other end of the control is operated by the brake pull rod.

This provides a very simple means of actuating the front brakes without interfering with the movement of the wheels in steering. When the wheels are turned, the flat end of the small lever

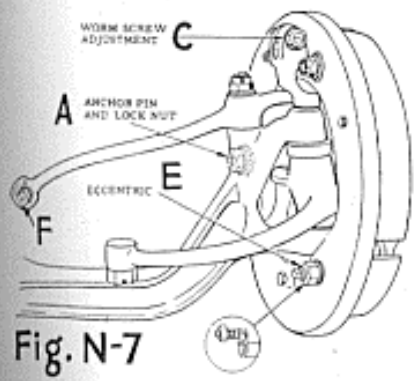

Fig. N-7

Fig. N7. Lever control front brake with worm screw type adjustment

slides over the ball and the relationship between the two remains approximately the same.

As adjusted at the factory, the **center** of the ball is about ¼ to 5/16 in. **behind** the **center of the steering king pin,** when the brakes are **released.** As the brake lining wears, the center of the ball moves slightly forward. Any serious variation from these dimensions will cause the brake to be applied when the car turns a corner. With the ball ends in the correct position the outer brake is released when the car is turning a corner.

Minor adjustment is made as outlined in paragraphs 1 to 7 inclusive.

Front Wheels

1. With all wheels jacked up turn the nuts (F, Fig. N-7-A) on ends of **front** pull rods until **center line of ball on operating lever** is ¼ in. to 5/16 in. **back of** the center line of the steering king pin, with brakes in released position. See Figs. N7 and N8.
2. Next loosen **lock nut** on the **cam** lever **worm-screw** ("C," Fig. N-7) **or** the **button** adjustment ("B," Fig. N-7A) and turn **slotted screw** until brake shoes are **free.**
3. Loosen eccentric adjustment **locknut** (E, Figs. N-7 & N-7-A) and then turn eccentric adjustment screw in **same** direction as wheel revolves when car moves **forward,** until shoes are **tight**

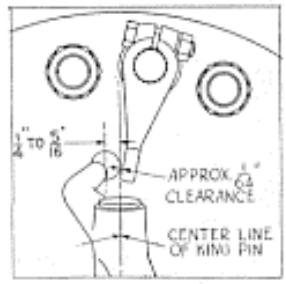

Fig. N8. Center line of ball should be 1/4-5/16 in. back of center line of king pin with brakes RELEASED

against drum. Now **back off** gradually on eccentric until wheel just turns **freely.** Hold eccentric adjusting screw and tighten locknut.

4. Now turn the cam lever wormscrew "C," Fig. N7) **or** button adjustment ("B," Fig. N7A) until wheel **binds,** then **back** off until wheel just turns **freely.** Tighten locknut. Do operations described in paragraphs 2, 3 and 4 to the other front wheel.

Note: Nearly all of the later three-shoe lever-control brakes carried the button type of adjustment instead of the wormscrew. See Fig. N10, Page 48.

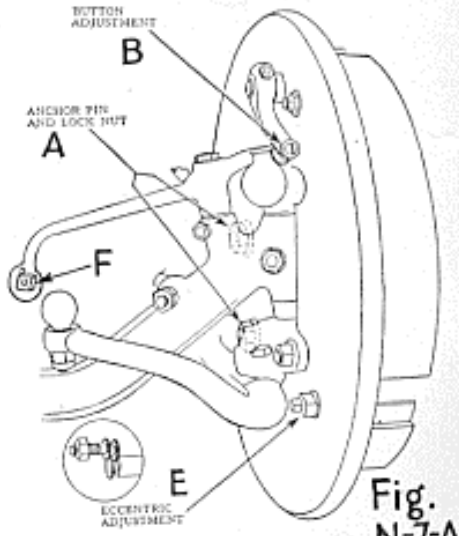

Fig. N7A. Lever control brake with button type adjustment

Fig. N-7-A

Front Brake

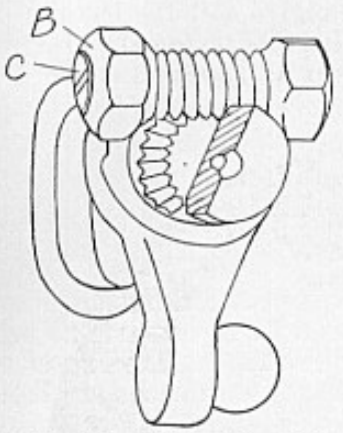

Fig. N9. Section through wormscrew cam lever adjustment used on early lever type control

Rear Wheels

5. If rear brakes are Bendix, **back off** on **rear** pull rod nut until wheel turns freely. Now loosen eccentric adjustment lock nut and turn eccentric adjustment screw (E Fig. N12) in same direction as wheel revolves when car moves forward until wheel drags, then **back off** until wheel is just free. Tighten eccentric adjustment lock nut. **Tighten** rear pull rod ball nut until wheel drags then **back off** until wheel is just free. Repeat this procedure on the other rear brake.

Cam lever at rear brakes should stand at 65 degrees brakes released, as shown in Fig. N12, or just less than perpendicular, brakes **applied.** To change angle of levers, **back off** on pull rod nut and lever clamping bolt then move lever forward or backward on its serrations, as shown in Fig. N21, Page 51.

Equalizing

6. Equalize as follows: Apply brakes by use of **pedal depressor** until the **tightest** wheel can just be turned by hand. Slack off on pull rod nut of tight **rear** wheel and button or worm-screw adjustment at tight **front** wheel until all four brakes are the same.

7. Remove depressor tool from pedal and see that all wheels are free. Make final equalization on testing machine or road, backing off at "tight" wheel as in paragraph 6.

Some cars have been built with wormscrew adjustments on the rear brakes. In these cases the adjustment procedure is the same as for the fronts as outlined in paragraphs 2, 3 and 4.

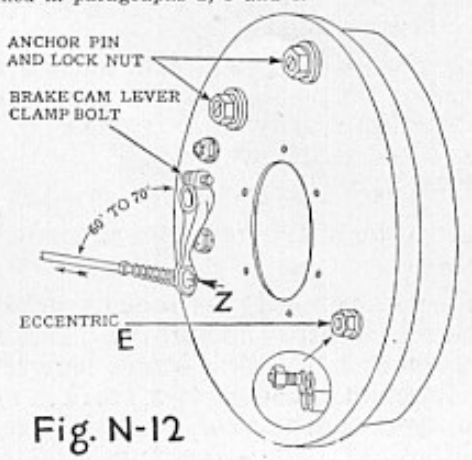

Fig. N-12

Rear Brake

Anchor Adjustment

Anchor pins should be adjusted—

(a) When fitting new lined shoes.

(b) When anchor pin nuts are found loose.

(c) When other adjustments fail to give satisfactory results.

8. To adjust anchors: Turn eccentric adjustment (See Fig. N7, Page 47) **away from** articulating pin and leave loose. Slacken off on **anchor pin nuts** (Fig. N12), then tap both anchors out toward edge of drum. Hold brake on tight by 100-pound load on the end of a 10-in. length monkey wrench applied to control lever. Tap anchor pins on **end** and try to turn wheel **forward** with brake **applied.** Still holding brake on tighten both **nuts** as tight as possible with a 16-in. wrench. Release brake and readjust clearances as outlined in paragraphs 1 to 7 inclusive.

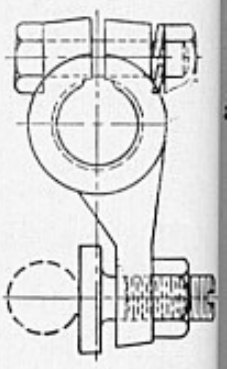

Fig. N10. Button type cam lever adjustment used on some lever control installations instead of the wormscrew

— OR —

8x. Drums with inspection ports permit a more satisfactory anchor adjustment as follows:

(a) **Slack off** eccentric adjustment and slightly **loosen** both anchors. Apply brake by hand and tap anchor nuts lightly.

(b) Using a feeler, adjust upper anchor to give .005 in. clearance at the **heel** (anchored) end of the **secondary** shoe and **lower** anchor to get .005 in. clearance at heel of **auxiliary** shoe. **See Fig. N21a, Page 52.**

(c) Using a feeler, adjust eccentric to get .010 in. clearance at **toe** end (end that is hinged to primary shoe) of **secondary** shoe.

(d) Now insert .010 in. feeler blade in drum hole and, while turning drum, check clearance over remaining length of primary and auxiliary shoe lining. The clearance should be approximately uniform full length. If not, balance by tapping carrier bracket slightly one way or the other. Recheck all clearances, making sure that **toe** of secondary shoe has **twice** as much clearance as heel, then lock all anchors with 10 24 in. wrench.

For data on models having only one anchor see next page.

Models With Single Anchor Pin

On the cam and plate type eleven-inch diameter brake there is only one adjustable anchor pin. This is the secondary anchor pin—the auxiliary pin stopping short of the backing plate and not being attached thereto. In this case the auxiliary pin forms an articulating joint between the secondary and auxiliary shoes. Shoe anchor pin construction of the eleven-inch brake is shown in Figs. N7, Page 47, and N13.

To adjust the secondary anchor pin on this type assembly proceed as follows:

(a) **Loosen** anchor nut A (Fig. N7, Page 47) about one turn. **Do the same to other 3 wheels.**

(b) Turn eccentric adjustment (Fig. N7, Page 47) **away from** articulating pin (by turning it in opposite direction to that in which wheel revolves when car moves forward) until wheel spins freely. **Do the same to other 3 wheels.**

(c) Spin the wheel rapidly or drive the car in a forward direction and apply the brake with **considerable** force. While the brake is still **applied,** tap **each** anchor pin on its **end** and **outwardly,** not less than three times, with a lead hammer to assist its movement.

(d) Tighten the 4 anchor nuts **firmly** with a **16-inch** wrench and readjust eccentric at each brake.

If Bendix brakes do not give satisfactory performance after making these adjustments, check carrier brackets and operating cams, as outlined below.

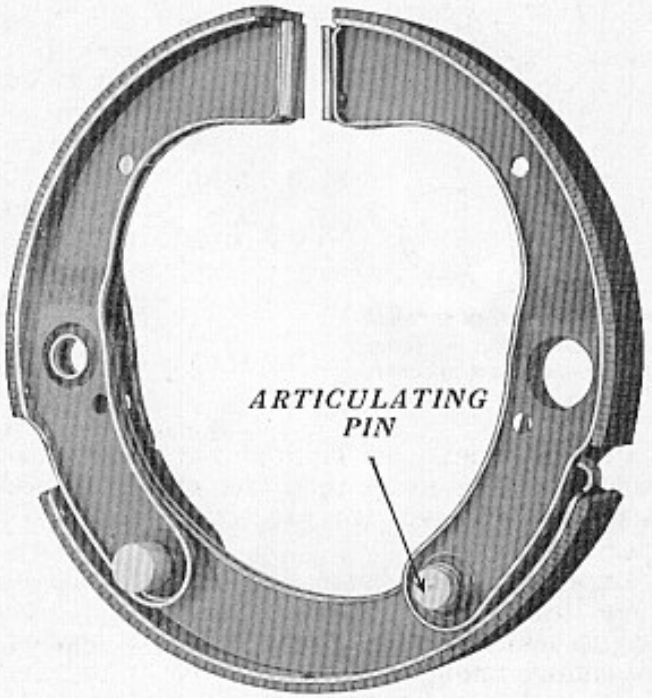

Fig. N13. Eleven-inch type Bendix shoe assembly which has only one adjustable anchor pin. Note stub auxiliary shoe pin

Adjustment of Cam Carrier Brackets

Adjustment of the brake operating cams and their carrier brackets should be made whenever the shoe assemblies are removed and also on all major adjustments.

As already explained the carrier bracket bolts pass through slotted holes so that the bracket can move endwise a little. This end movement allows the cam to center itself between the primary and auxiliary shoes. If the plain washer is bent or the carrier bracket is held too tightly against the backing plate thereby preventing the end movement above referred to, the automatic centering of cam and bracket will not take place and poor brake action will result. Too loose a carrier bracket on the other hand will cause grabby brakes.

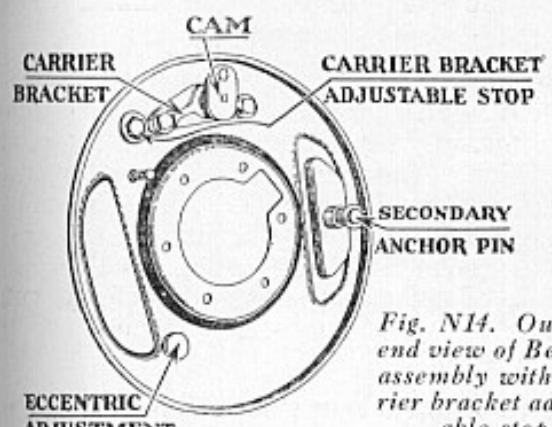

Fig. N14. Outside end view of Bendix assembly with carrier bracket adjustable stop

The carrier bracket may be considered in correct adjustment when it is bolted to the backing plate **tightly** enough to resist movement by **hand** but **loose** enough to be readily moved when tapped with a **hammer.** Examine and make sure that the plain washer is **not bent.** Make sure that the **lock washer is not broken.**

On some models a special cam shaped **stop** is fitted to control the position of the carrier bracket. This construction is shown in Fig. N14. To adjust this type proceed as follows:

(a) Turn each stop **away** from bracket.

(b) Drive car short distance and apply brakes **violently.**

(c) Turn stops until they **touch** bracket, then **back off** slightly and tighten. This should give about 1/32 in. clearance between stop and bracket. The carrier bracket nuts on this type construction should have same tightness as those **without** the stop.

Self Aligning Cams

Some Bendix installations make use of a self-aligning shoe cam as shown at Fig. N15 instead of the usual carrier bracket. On these installations the cam itself is slotted so that it can move

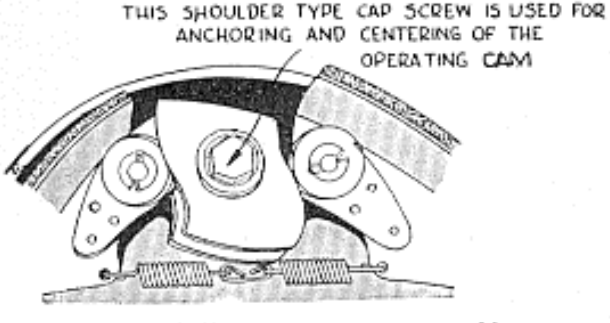

Fig. N15. Self-centering cam assembly as used on some Bendix installations

back and forth on the operating shaft. The cam retaining cap screw has a shoulder which functions as a stop. If it has not been altered or substitution made, the cam should be tight to the hand but loose enough to be moved by a hammer tap when cap screw is turned all the way in.

Removal of Shoe Assemblies

To remove Bendix shoe assemblies proceed as shown in Fig. N16.

Shoe **return springs** should have 35 to 50 lb tension at **installed** length. Removal and reinstallation of these springs can be easily and quickly done by using Bendix spring tongs #10089 and #10089.

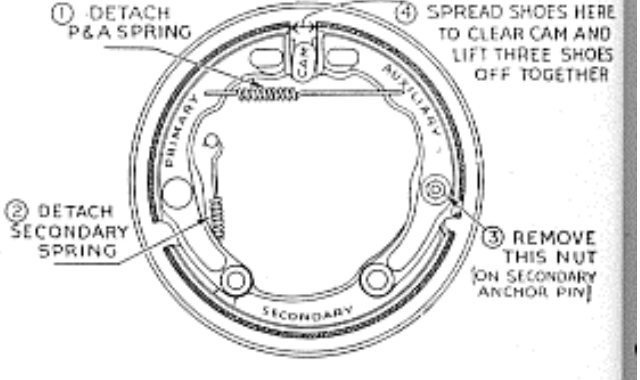

Fig. N16. Shoe assemblies are removed from axle by following above operations in numerical order