Bulletin—204
Dec. 1, 1929

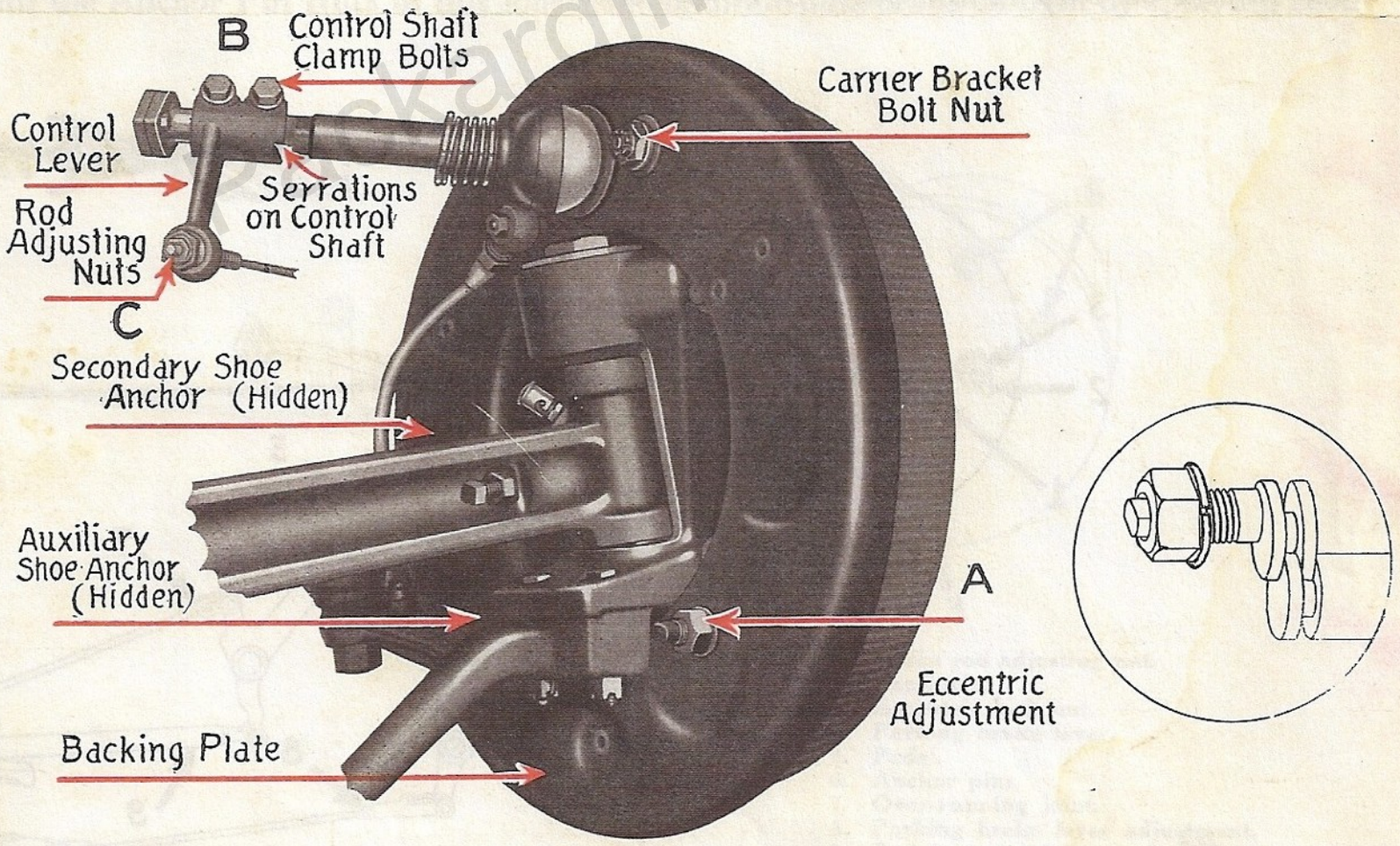
FOR SAFETY 4 BENDIX BRAKES

SERVICE BULLETIN

BENDIX BRAKES

Packard

Adjustment Instructions



View Showing
Left Front Brake

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Before Making These Adjustments Jack Up All Four Wheels —Have Brakes Released

Move hand brake lever forward as far as possible, make sure that there is no slack in overrunning joints, and that rear cross shaft is tight against cross shaft lever stop.

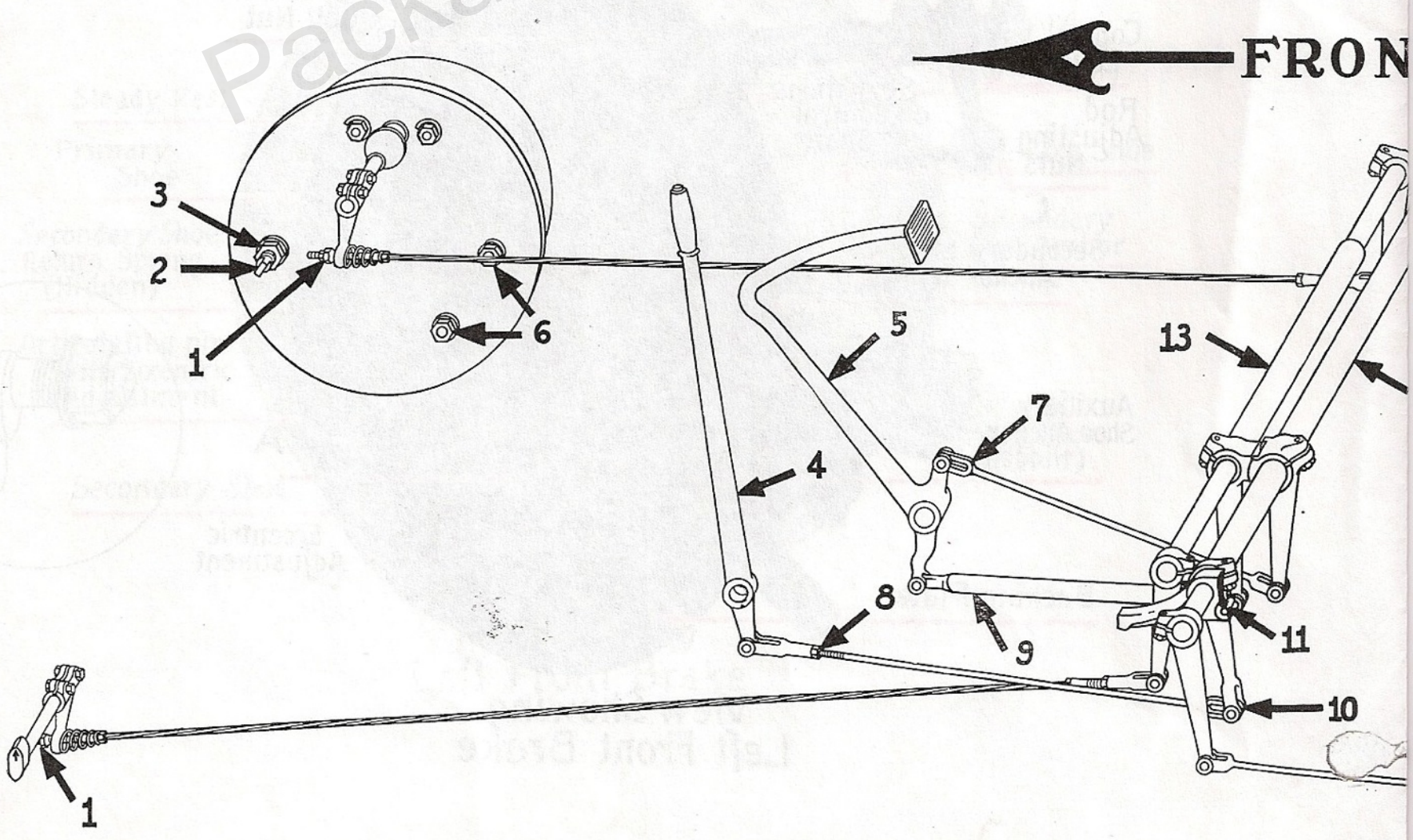
Check to insure freeness of frame brake cross shaft, rods, etc.
Spring clips should be checked and tightened if found loose.

ADJUSTMENT FOR WEAR

A. Loosen eccentric lock nut and turn eccentric in same direction in which wheel revolves when car moves forward, until brake is tight against drum, then back it off gradually until wheel is just free. Hold eccentric and tighten lock nut. Repeat this operation on each of the other three wheels.

B. Angle of control lever with brake rod, with brakes released, should be from 60 to 70 degrees, otherwise reset as follows: Loosen clamp bolt and slide lever off serrations. Slack off rod adjusting nut to end of threads on rod. Apply brake with Stillson wrench on cam shaft and slip control lever on to serrations. If brake is too tight move lever back one serration. Tighten clamp bolt. Repeat this operation at each of the other three wheels. (Control levers should have approximately the same angle at each of the four wheels.)

C. Take up on rod adjusting nut until wheel just drags. Back off until wheel is just free. Repeat on each of the other three wheels.



EQUALIZING BRAKES

D. Push pedal down with pedal jack until the tightest of the two front wheels can just be turned by hand. Slack off tight wheel, a half turn at a time, on the brake rod adjusting nut until both front wheels are the same.

E. Balance the two rear wheels, the right rear wheel with the left rear wheel, the same as you have done with the front wheels.

(Do not try to balance front wheels with the rear wheels, or rear wheels with the front wheels.)

F. Remove block from pedal and with all four wheels still jacked up try all four wheels for drag. There should be no drag if previous operations were properly performed. If drag is on one of the front wheels slack off the same amount on each of the front wheels. If drag is on one of the rear wheels slack off the same amount on each of the rear wheels.

MAJOR ADJUSTMENT

(ADJUSTMENT OF ANCHOR PINS)

Anchor pins should be readjusted only:

(1) When fitting newly lined shoes.

(2) When anchor pin nuts are found loose.

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

First, jack up all four wheels. On each of the four wheels, turn the Eccentric Adjustment away from the Articulating Pin and leave loose. Slacken Anchor Pin Nuts just enough so that Anchor Pins may be easily moved by a slight tap of a hammer. Expand the brake shoes with the brake applying wrench as shown in the accompanying illustration. With the Anchor Pin Nuts in this loosened condition hold brake on tight by applying about

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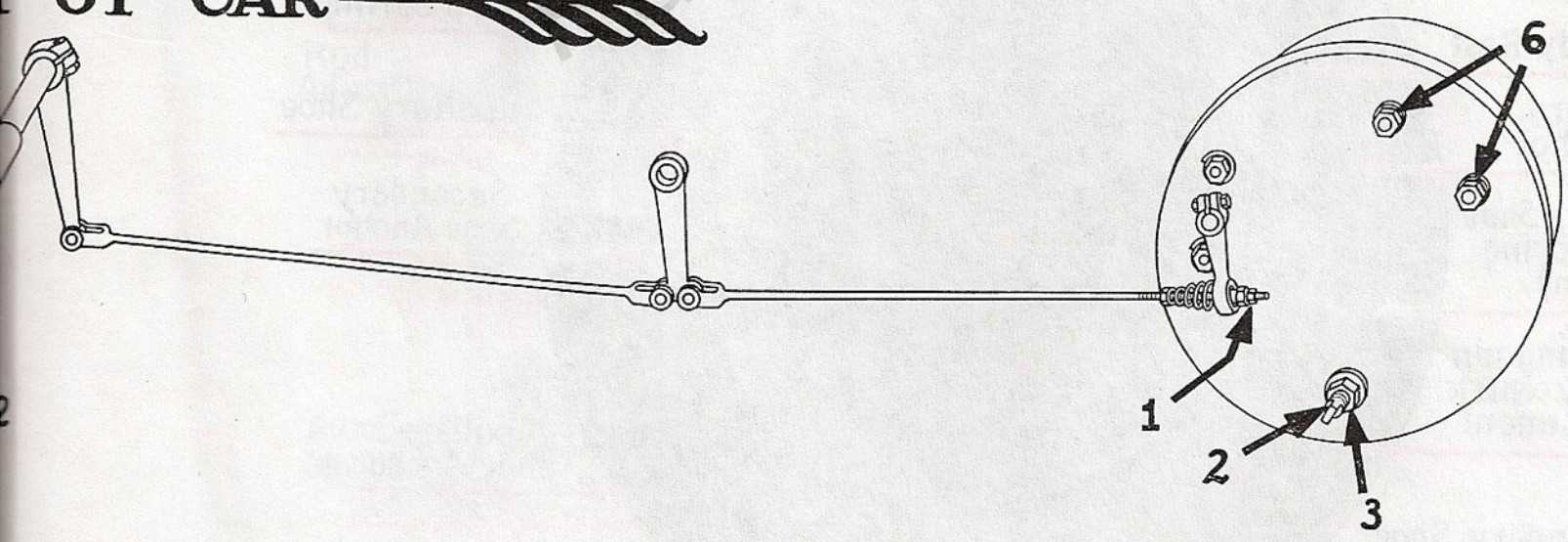
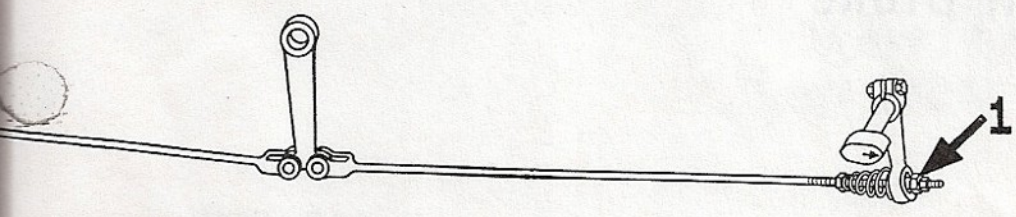


1. Brake rod adjusting nut.
2. Eccentric.
3. Eccentric lock nut.
4. Parking brake lever.
5. Pedal.
6. Anchor pins.
7. Over-running joint.
8. Parking brake lever adjustment.
9. Pedal connection to front cross shaft.
10. Over-running joint parking brake rod connection.
11. Hook-up return stop.
12. Rear cross shaft.
13. Front cross shaft.



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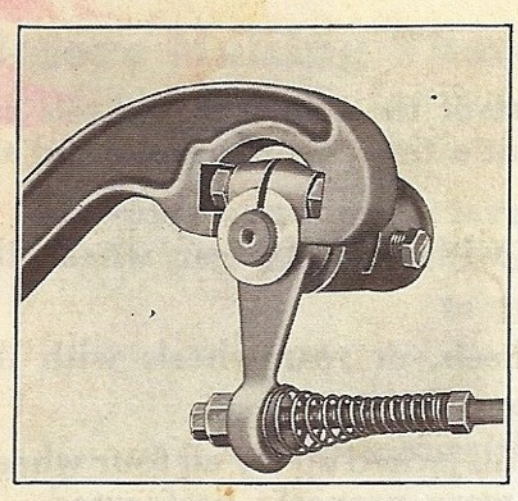
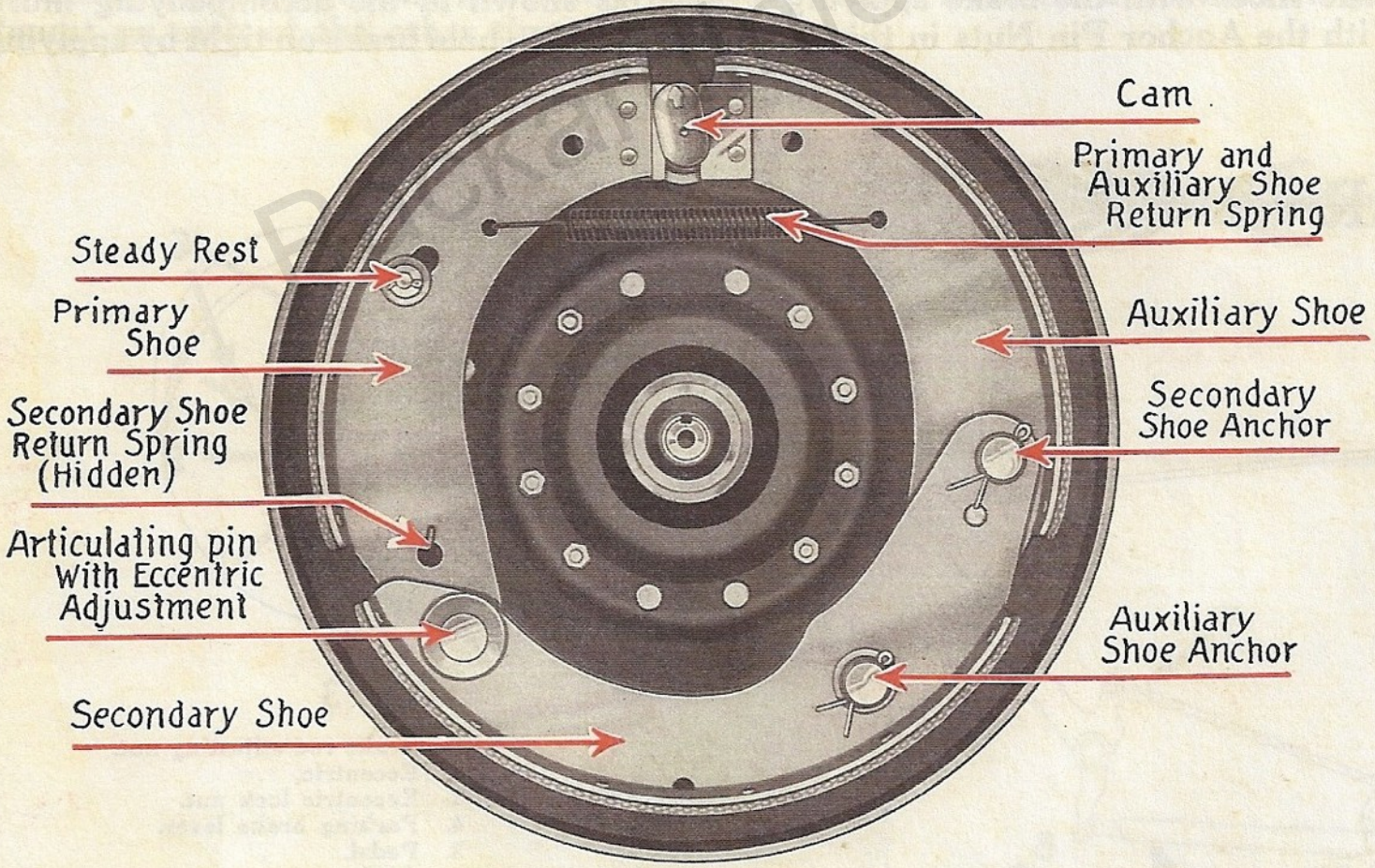


a fifty pound load at the end of the brake applying wrench. Tap Anchor Pins on end and outwardly and then turn wheel forward with brake applied. Still holding brake on, tighten both Anchor Pin Nuts as tight as possible with a sixteen inch wrench. Release the brake and proceed to adjust as first instructed under "Adjustment for Wear."

NOTE: A check of clearance adjustment may be made through the slots in the drum, inserting feeler gauges between the shoe lining and the brake drum as follows:

Remove covers on slots. With brakes released check toe and heel of auxiliary shoe and toe and heel of secondary shoe with feelers. A check with feelers showing about .006" clearance at anchor end of secondary and auxiliary shoes and about .010" at toe ends of these two shoes indicates that the adjustments have been properly made. If not to these limits repeat anchor adjustment or loosen the nut on the improperly set anchor one turn and tap until correct clearance is obtained, then tighten firmly and replace covers on slots.



Inside View
Left Front Brake

Bendix Three-Shoe Brakes

Characteristics of Construction

Bendix brakes are of the 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.

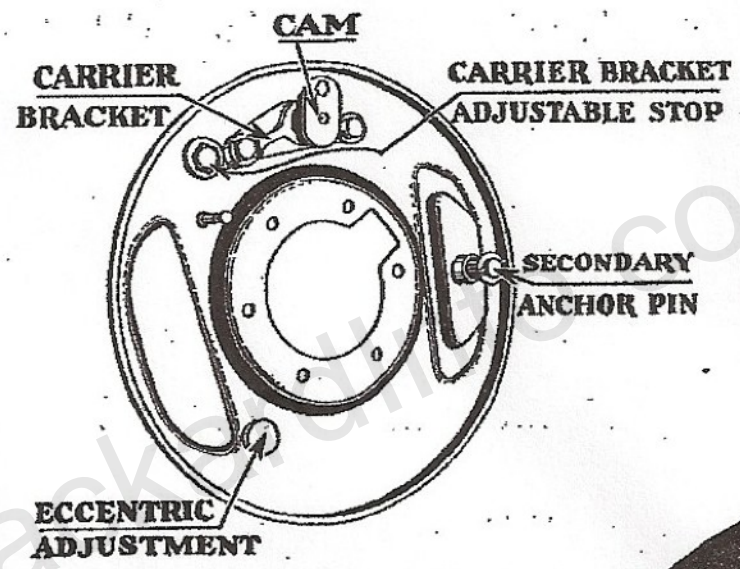


Fig. N2. Wheel side of the same backing plate as shown in Fig. N3. Note single anchor pin

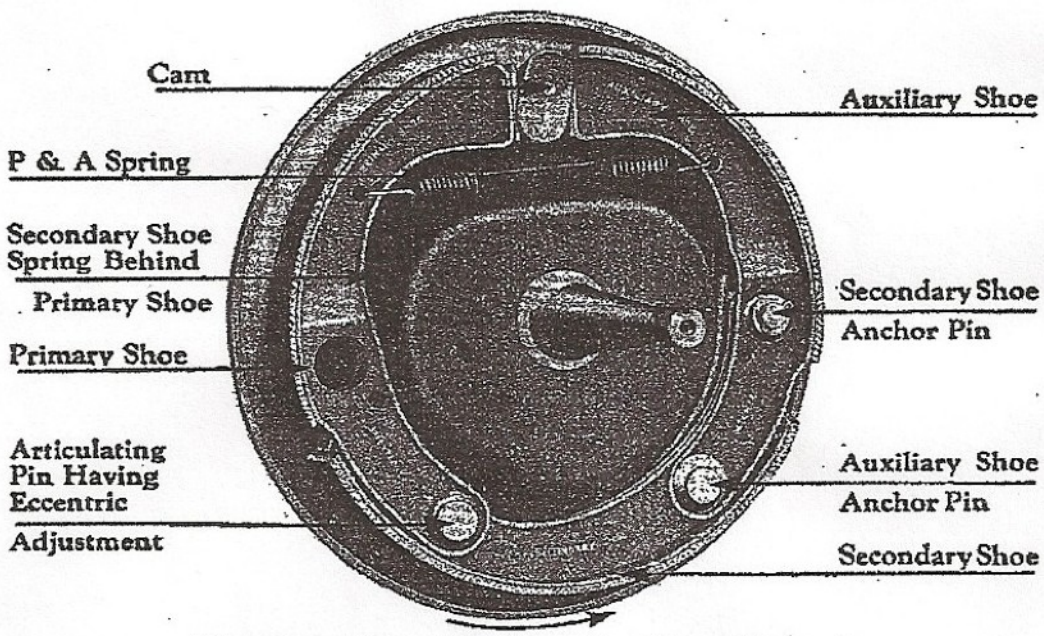


Fig. N1. A Left Front Bendix 3-Shoe Brake Installation. Note this model has two anchor pins

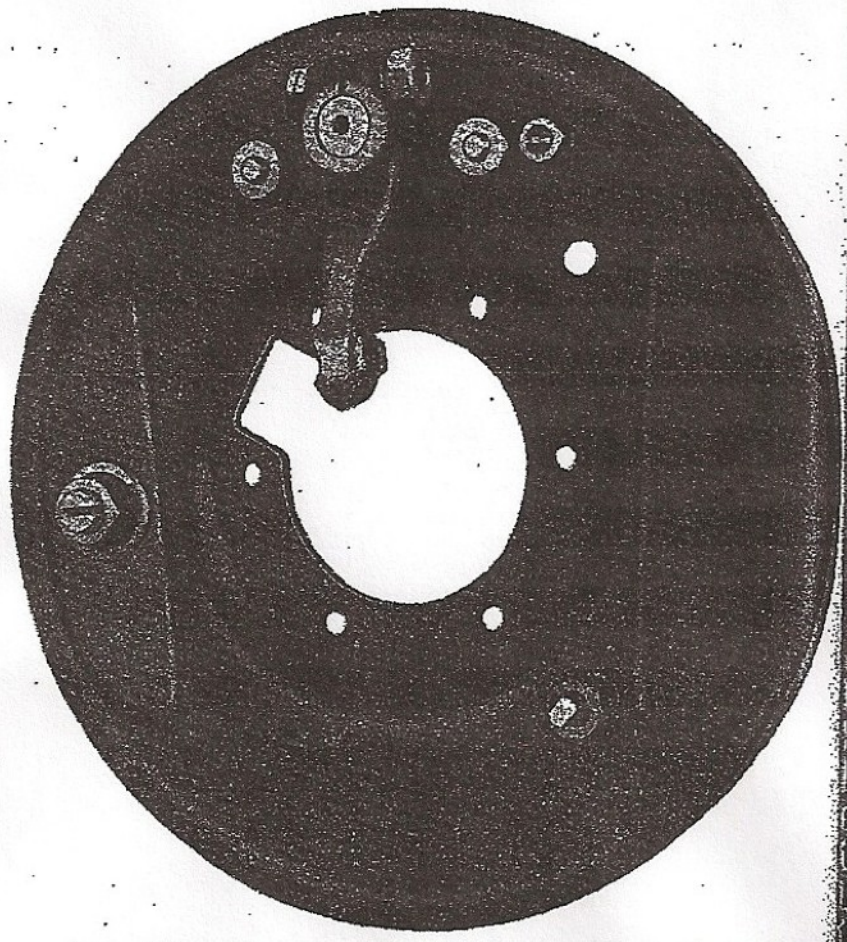


Fig. N3. Frame side of the backing plate for same model brake as shown in Fig. N2

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 Bendix Brakes

There are four points of adjustment on a Bendix brake. One of these is the **eccentric adjustment** (at the articulating pin) which is provided to compensate for the natural wear of the brake lining. Its function is to control the clearance between primary and secondary linings and the drum. Control of the eccentric adjustment which is illustrated in Fig. N4 is from the **frame side** of the backing plate.

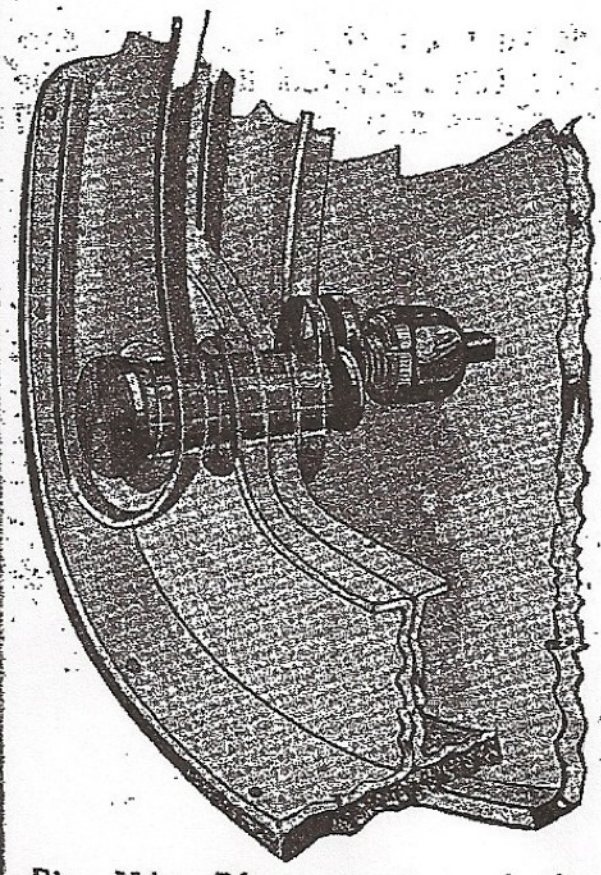


Fig. N4. Phantom view of the eccentric or clearance adjustment used on most models

The second adjustment is the **anchor adjustment,** which is the most important of all, since it controls the centering of the shoes with respect to the drum. Like most internal brakes having two or more shoes per assembly **no other adjustments can be accurately made until the shoe assemblies have been accurately centered.** 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.

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 on its shaft under similar conditions. Like the carrier bracket, it is held by friction. In order to simplify the adjustment of these floating cams, a special cap screw is used.

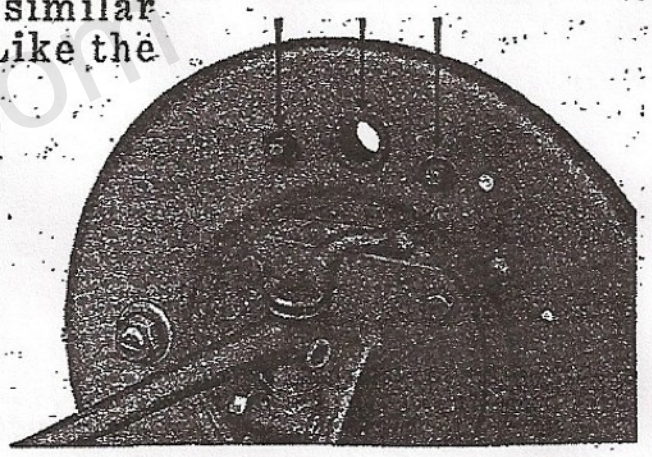


Fig. N5. End arrows show slotted holes which permit centering of the operating cam

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. However, on some of the recent Lever type Bendix installations the camshaft operating lever angle is controlled by means of an **adjustable set or tappet screw,** as shown in Fig. N10. On Perrot control installations adjustment of the camshaft levers, front and rear, is by means of serrations or notches on the camshaft. The serrations method of adjusting the operating cam levers is also used on the Lever type controls, but at the **rear** wheels only.

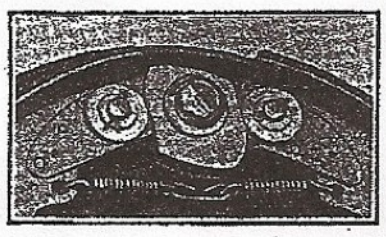


Fig. N6. On compensating cam models such as this there is no carrier bracket

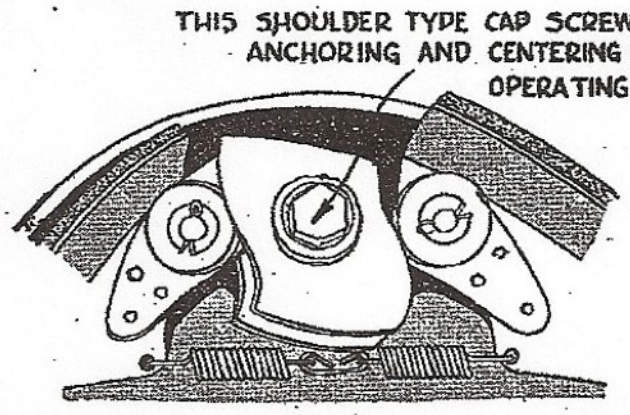


Fig. N15. Adjustable cam assembly as used on some Bendix installations

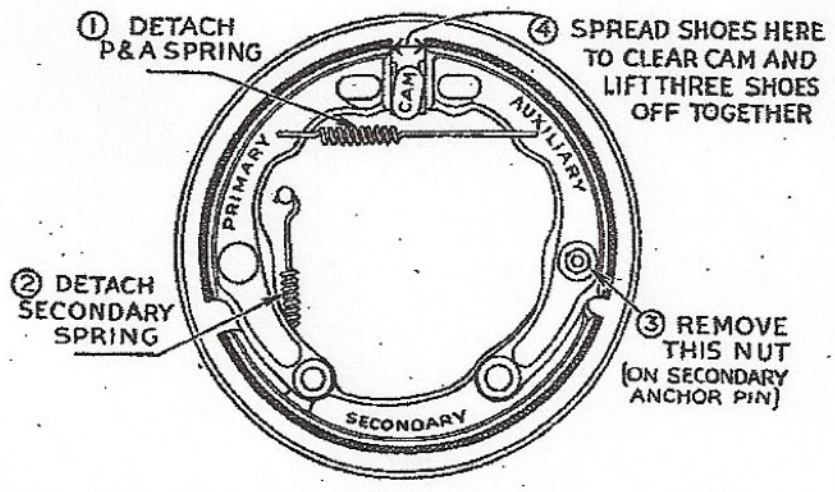


Fig. N16. Shoe assemblies are removed from axle by following above operations in numerical order

Cars With Adjustable Operating Cams

Some Bendix installations make use of an **adjustable operating 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 in and out 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 lbs. tension at **installed** length. Removal and reinstallation of these springs can be easily and quickly done by using Bendix spring tongs #10088 and #10089.

Acknowledgment is hereby made to the Bendix Brake Co. for many of the illustrations and considerable of the text matter of this chapter.—EDITOR.

Bendix Three Shoe

Perrot Control Type, Used on the Following Cars:

Hudson	Locomobile (some)	Stearns-Knight to 1930
Hupmobile Six (early)	Cunningham 8 to 1930	Studebaker Commander (some)
Lincoln prior to 1931	Marmon 8 (1927)	Studebaker President 8 (some)
	Packard (after 1925)	

The **Bendix-Perrot Control** is a method of operating the front wheel brakes by means of an articulated shaft. This type of control is positive in action because the brake cam is always mechanically connected to the brake rod.

One end of the control shaft is supported in a ball joint known as the **10,249 ball assembly** (Fig. N17), attached to the frame of the car or other convenient point. The other end is attached by means of a universal joint to the brake cam. The rod is thus free to move with the rise and fall of the vehicle wheels without causing any tightening or slackening of the brake control rod.

As far as adjustment is concerned, the only difference between the Bendix Lever and Bendix-Perrot controls is that the Bendix-Perrot type has **no worm adjustment**, and the front brake cam position is altered by varying the relative positions of the control lever and shaft.

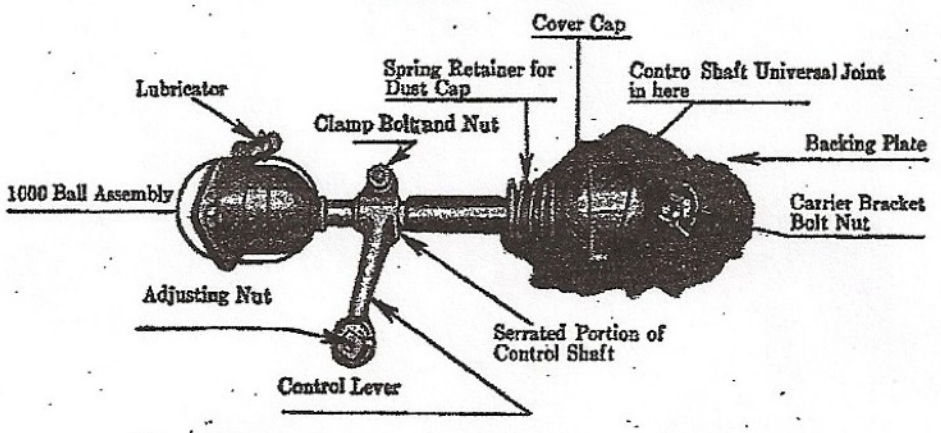


Fig. N17. Parts of Bendix-Perrot Control

Minor Adjustment for Wear—Bendix-Perrot Control

Jack up all four wheels before making these adjustments:

1. Loosen eccentric adjustment **lock nut** (B, Fig. N18) and turn eccentric in direction wheel revolves when car moves **forward**, until secondary shoe is **tight** against drum. Then **back off** gradually until wheel is just free-

Hold eccentric and **tighten lock nut.**

2. Now check **angle** of **cam shaft operating levers** to which the pull rods are attached at the brake end. All levers should **stand at** just more than **right angles fully applied** or at approximately **65 degrees to their pull rods** when brakes are **released,** as shown in Fig. N19. If levers do **not** stand at position of **maximum leverage** they should be **reset** as follows:

(a) Loosen **operating lever clamp bolt** (Fig. N20) and slide lever **off serrations.**

(b) **Back off** on **ball adjusting nut** at end of pull rod. Now apply brake with an 8-inch pipe wrench (as shown in Fig. N20) and slip control lever back on serrations.

(d) Remove wrench. If brake is **too tight** move lever **back** one serration. **Tighten** clamp bolt.

(e) Do the same to **all four brakes,** using the method shown in Fig. N21 on the **rear** brakes.

3. **Take up** on **square ball nut** (A Fig. N18) until wheel just **drags. Back off** until just **free. Repeat on other three wheels.**

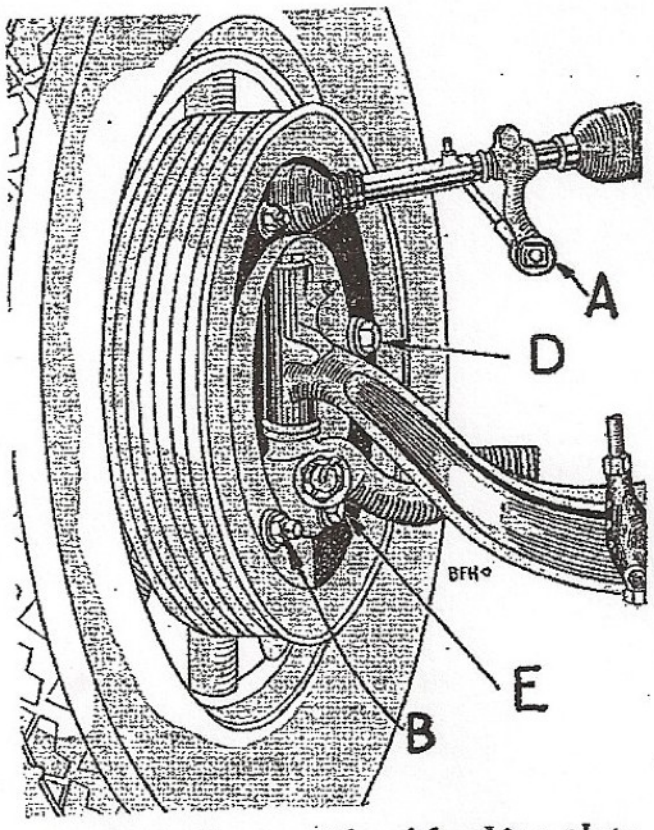


Fig. N18. Frame side of backing plate showing various adjustment controls

Equalizing

4. Equalize as follows: Push pedal down with block or pedal depressor until the tightest wheel can just be turned by hand. Slack off tight wheels a turn at a time on pull rod ball nuts until all four are the same, remembering that where a flexing single cross-shaft is involved a change in the rear brake may affect the front brake on the same side, and vice versa.

5. Remove depressor from pedal and try all four wheels for **drag.** There should be no drag if previous operations were done properly.

Major Adjustments

Anchor pins should be adjusted:

(a) **When fitting newly lined shoes.**

(b) **When anchor pin nuts are found loose.**

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

6. To adjust anchors: **Jack up all four wheels.** Turn eccentric adjustment (B, Fig. N18) **away from articulating pin** and leave **loose.** Slacken anchor pin nuts free of lock washer. **Tap** both anchors out **toward edge of drum** as in Fig. N11. **Hold brake on tight by** 100-pound load on the end of a 10-in. pipe **wrench.** See Fig. N20. Tap anchor on end and

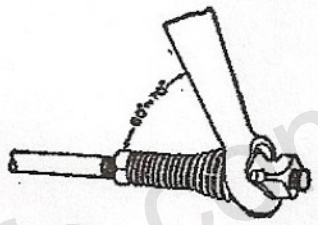


Fig. N19. Correct angle of Bendix levers with brakes released

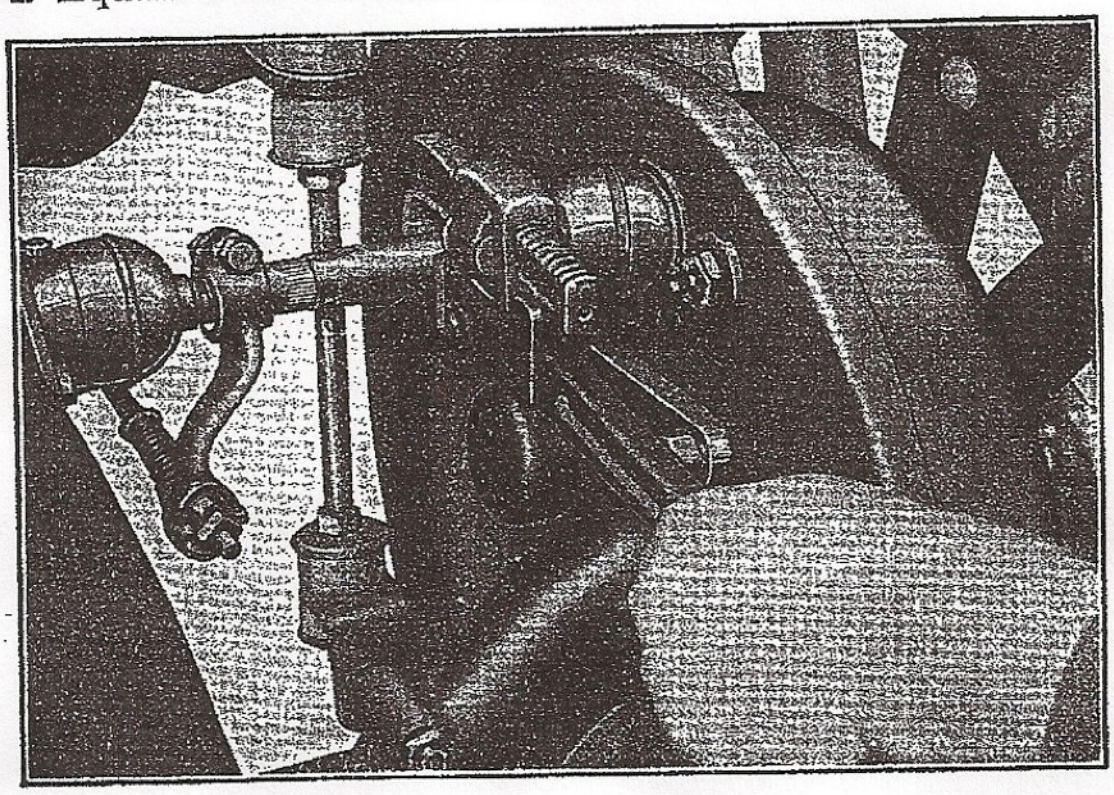


Fig. N20. Applying front brake with pipe wrench for resetting cam operating lever. Note lever is off serrations

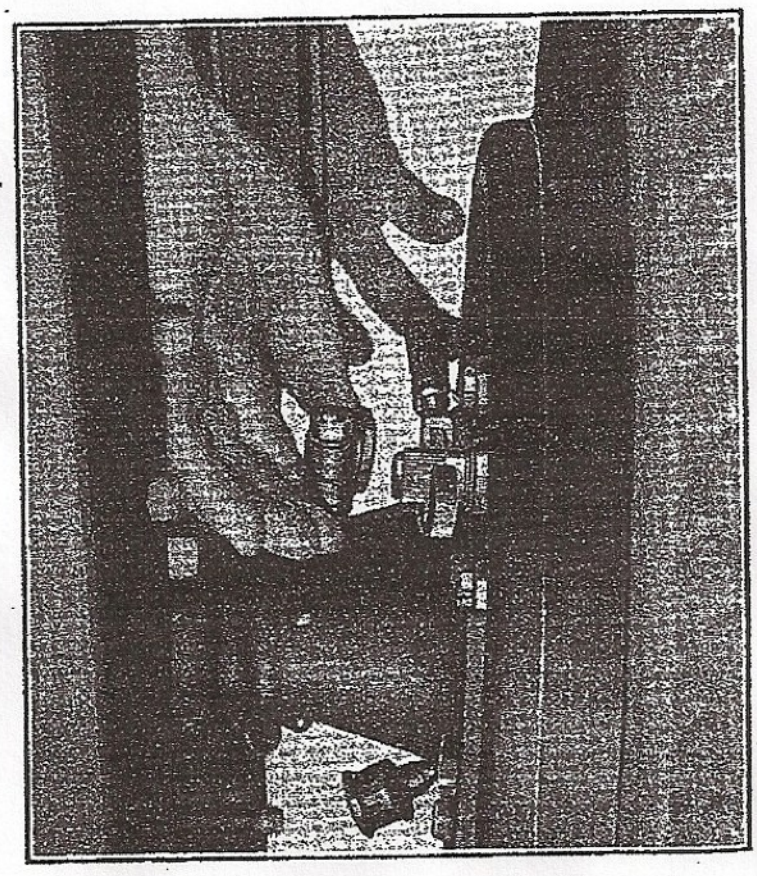


Fig. N21. Applying rear brake with pipe wrench to set cam lever to proper position

still holding brake on, tighten both nuts as tight as possible with a 16-24-in. wrench. Release brake and adjust as in "Minor Adjustment," paragraphs 1, 2, 3 and 4.

Anchor Setting—Important

6x Drums with inspection ports permit a far more satisfactory major adjustment, as follows:
(a) Slack off eccentric adjustment "B," Fig. N 18, and slightly loosen both anchors "D" and "E." Apply brake by hand and tap anchor nuts.
(b) Using a feeler, adjust upper anchor "D" to give .005 in. clearance at the **heel** (anchored) end of the **secondary** shoe and **lower** anchor "E" to get .005 in. clearance at heel of **auxiliary shoe.**
(c) Using a feeler, adjust eccentric "B" to get .010 in. clearance at **toe** end (end that is hinged to primary shoe) of **secondary** shoe. See Fig. N21a.
(d) Now insert .010 in. feeler blade in drum hole and, while turning drum slowly, check clearance over remaining length of primary and auxiliary shoe lining. The clearance, except near **heel** of auxiliary shoe should be approximately uniform full length. If not, balance clearance 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 24 in. wrench. Do the same to all four wheels. See additional data on carrier brackets, pages 34 and 35.

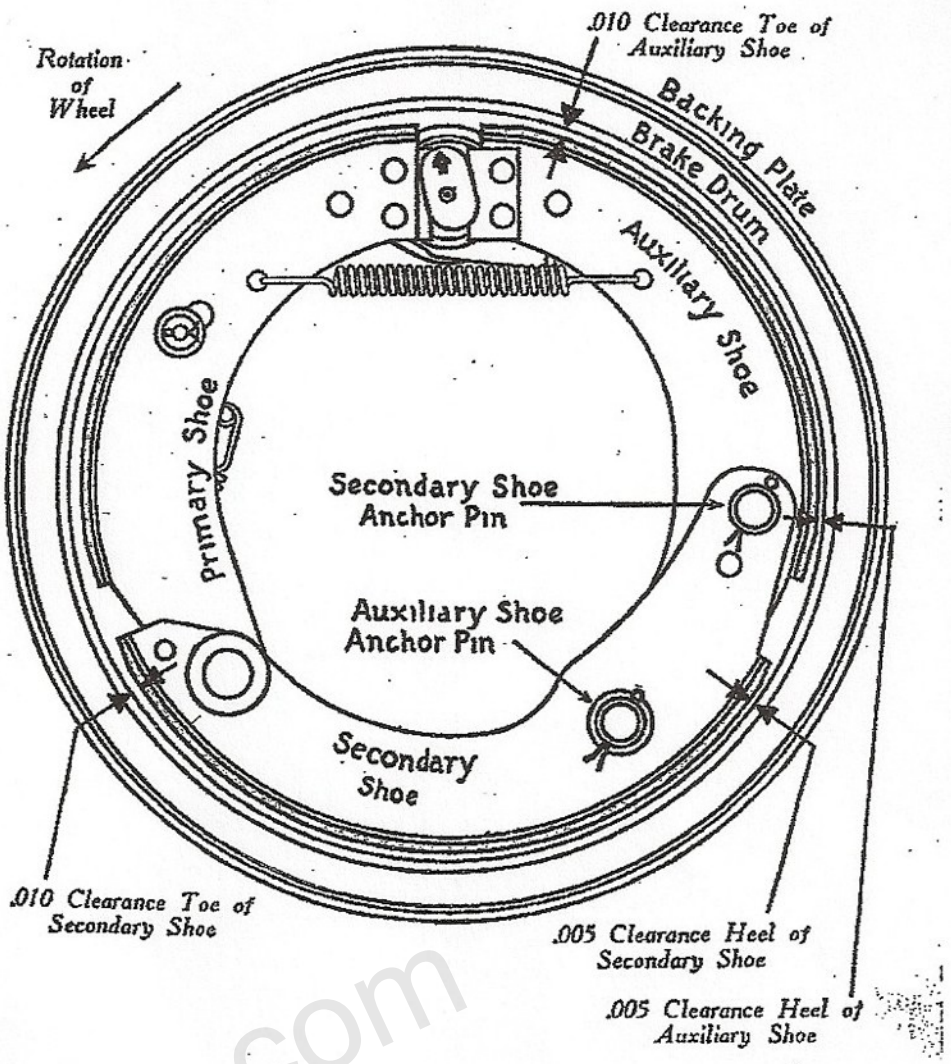


Fig. N21a—Proper heel and toe clearances for best results on most three shoe models

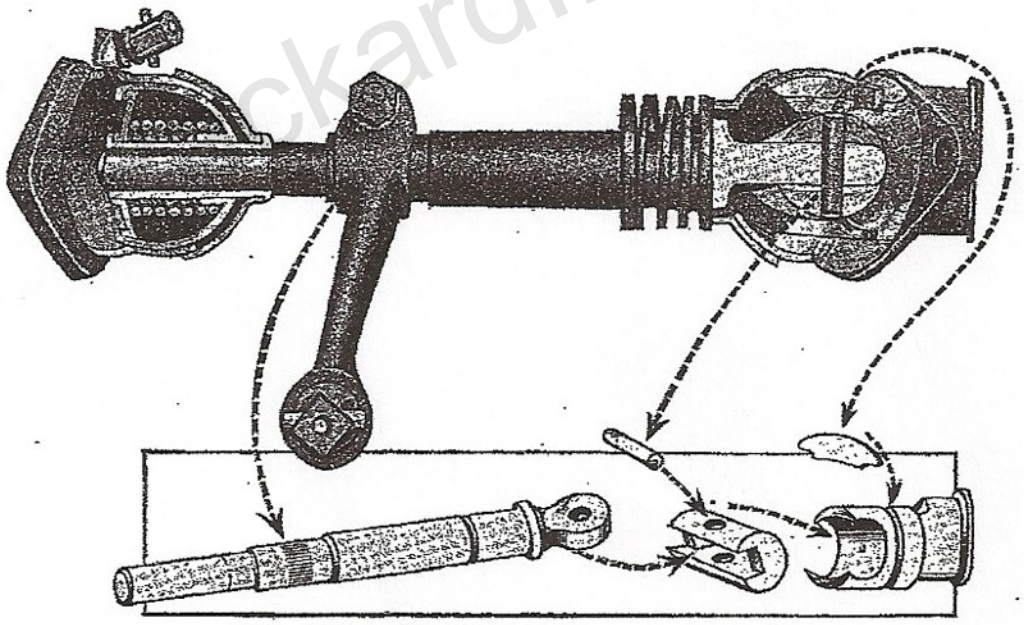


Fig. N22—Section of Perrot Control

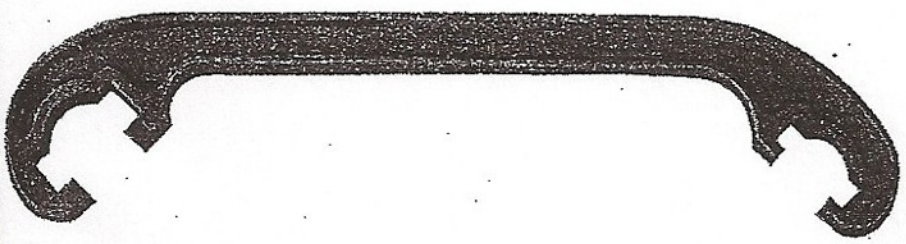


Fig. N23—Bendix special wrench #10090, used to apply brakes while setting anchors. This wrench engages the control lever and eliminates cutting the shaft, which occurs when the pipe wrench is used

Fig. N24—16-in. double-end box wrench for Bendix anchor nut. Proper tightening of anchors requires 16-in. leverage