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•Third Edition

This third edition of the hand book of brake service information has been compiled and revised by the Multibestos Brake Service Institute with a view to supplying the practical brake man with a handy reference book of the latest information on brakes, in a form which is understandable and at the same time fully reliable. This booklet will be supplemented from time to time with suitable bulletins explaining new developments in brake mechanisms, offering new suggestions for solving difficult jobs, and answering questions of immediate interest.

The national coverage of the Multibestos Brake Institute gives us a mass of field information which, coupled with the developments of our Research Laboratories and the results of the Laboratory Garage, enables us to act as a clearing house for information and ideas, which are free and gladly passed on to the registered members of the Multibestos Brake Service Institute.

Owing to the numerous advances in braking mechanisms we have adopted the "unit" system of presentation, wherein each type of brake is explained by itself without regard to minor modifications of springs, levers, cables, etc., that may be employed by different car manufacturers. All charts and data have a uniformity of presentation which enables easy and ready reference.

The brake adjustments and brake recommendations given, such as clearances, etc., are based on the actual successful experience of the Multibestos field men and the proved results of the Multibestos Research Laboratory Garage using Multibestos friction materials. If they differ slightly from the specifications supplied by others, it may be because of the use of different materials. Recommendations made in this hand book give best results with Multibestos products.

As a logical companion piece to the technical information in this hand book, there has been included a section of flat rates for the more popular cars serviced by Multibestos Sets. This flat rate guide is unique and simple, and one which insures the brake man an opportunity for a reasonable profit on both his labor and material, no matter where his business is located. All time figures have been taken from actual field experiences in relining passenger car brakes with Multibestos TAILORED Sets and represent an average figure for the average job. Where boosters or vacuum assisters are used a slightly greater labor time has been included.

In the past we have included in the flat rate guide the list price for Multibestos TAILORED Sets, but due to the frequent price changes in recent years, we are omitting them in this edition in order to keep the tables up to date and free from obsolete prices. List prices of all TAILORED Sets are given on the inside back cover so that you may easily insert the proper material price for any job. As list prices change, supplements will be supplied which will keep your hand book up to date for several years to come.

MULTIBESTOS BRAKE SERVICE INSTITUTE

Cambridge, Mass.

Montreal, Canada

BASIC FUNDAMENTALS OF BRAKE SERVICE

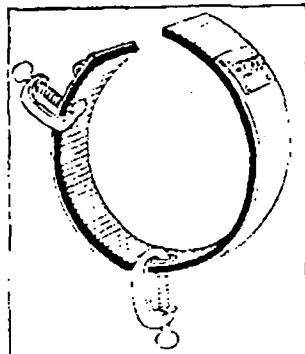
It'll pay even expert brake mechanics to review this information.

Because so much stress has been laid on the actual adjustment of brake mechanisms, the question of the proper method of relining shoes is often omitted in any instruction procedure. Many complaints from dissatisfied customers come from failure to follow basic fundamentals rather than from the brake lining used. This subject is of such vital importance that we are considering it first.

Relining of Brake Shoes and Bands

(1) External Brake Bands

Before relining external brake bands, it is necessary to see that the bands are free from rust and are shaped to the contour of the drum. Care must also be taken that none of the brackets are loose or that any rivets joining together pieces of the band and the brackets have become worn or are loose. In the case of soft woven lining, the ordinary procedure of relining external brake bands is to cut the lining about an inch and a half longer than the inside circumference of the band, rivet the two ends to the ends of the



With tightly woven lining such as Multidury

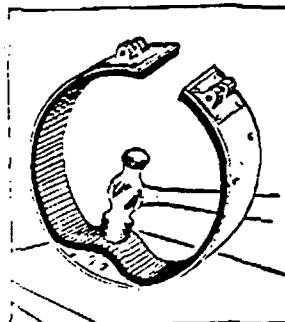
band, and buckle the lining into place. The buckle may be hammered down with a hammer, and this method usually assures a tight fit of such lining to the brake band. In the case of more rigid woven linings, it is necessary to hold these to the brake band by means of a suitable brake lining clamp, or, if this is not available, small C clamps should be used to assure a tight fit to the band. If a tight fit is not obtained, squeals and squeaks will result. Whenever brake bands indicate that the lining should be cut to allow flexibility of the band, this must be done. Care also must be

taken that the lining near the ends of the shoe is trimmed to the correct length and that it is chamfered slightly to avoid digging into the brake drum.

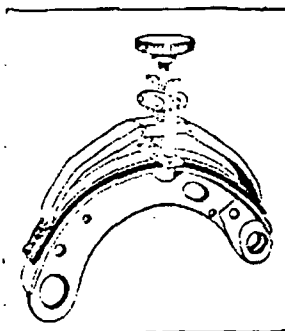
Soft woven brake linings should be counter-bored about one-half the depth of the lining. More dense woven linings should be counter-bored approximately two-thirds the depth of the lining.

(2) Internal Brake Shoes

Shoes for internal brakes should be thor-



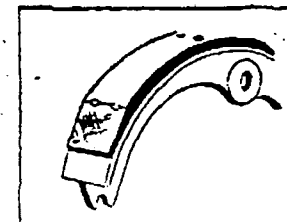
With soft woven lining such as Busduty



oughly cleaned before relining. They should be examined to see that they are not bent or cocked in any way, and that the web or fin is not broken away from the flat portion of the brake shoe. All internal brake lining should be applied to brake shoes with a brake lining clamp in order to insure a tight fit and to prevent squeaks, groans, and chatter. Lining should be counter-bored approximately two-thirds of its thickness, and brass semi-tubular rivets with heads large enough to fill the counterbore and shanks of the proper diameter to fit the holes in the brake shoe, and of sufficient length to allow an adequate clinch or roll, should be used.

In order to avoid any possibility of space between the lining and the shoe (called windows), it is recommended that a filler material be used between the lining and the shoe. Such a filler should be a soft plastic material which will not interfere with the assembly of the brake lining against the shoe, but which will fill any voids or hollows in the brake shoe and thus avoid vibration and squeaks which may result.

Linings should be cut to the correct length for the shoe being lined. Some Multibestos TAILORED Sets are supplied in standard lengths to fit a variety of different shoe lengths. Where longer pieces of brake lining are supplied for use in sets of shorter length, they must be cut to the correct length, which is approximately one-half an inch beyond the last rivet hole. Brake linings should be chamfered back three-quarters of an inch on both ends of the lining, at least to the center of the end rivet holes. For model B and V-8 Ford, and 1926-29 Nash front brakes, special long chamfer TAILORED Sets are supplied. Be sure both ends of lining are chamfered.



Chamfering

High spots and burrs around rivet holes should be removed by light grinding or with sandpaper or a file. Avoid the use of emery cloth.

Before removing shoes from a brake mechanism it is well to mark them so that correct material will be placed on each shoe. Multibestos TAILORED Sets using more than one kind of lining are clearly stamped on the friction surface indicating which to use on forward shoes. Reversal of materials causes erratic brake performance.

Care must also be taken to use the correct lining for the particular type of brake. In other words, the lining that is satisfactory for a two-shoe Bendix brake may be very unsatisfactory on another type and should not be used on it even though the width, thickness, and drum diameter correspond.

The thickness of Multibestos TAILORED Sets is carefully maintained so that grinding is unnecessary except for twisted or bent shoes or to remove the high spots and burrs around the rivet holes. With turned brake drums, Multibestos TAILORED Sets may be easily oversized with LX shim stock of the proper thickness.

Importance of Correct Clearance

As the clearance between the brake shoe and the drum governs effective brake travel, it is essential to follow carefully the clearance shown in this book under each type of brake. It is also given on the instruction tag that

Basic Fundamentals of Brake Service (Continued)

comes with each TAILORED Set. These clearances assure correct operation and full energizing of the brake without causing grab or uneven wear.

Centrallizing of Brakes

To secure the full effectiveness of a brake and to obtain maximum lining life or wear, the brake shoe mechanism must be concentric (the entire surface of lining touching the drum) when the brakes are fully applied. This does not necessarily mean that lining to drum clearances are uniform at all points when mechanism is fully released. It is the location of the anchor that determines these clearances. On internal brakes, such as hydraulic and double anchor Bendix, where the toe of the brake shoe travels about twice as fast as the anchor end, the clearance at the anchor end is approximately one-half the toe clearance, to give complete lining surface contact on brake application.

On internal brakes such as Bendix single anchor or Huck where heel and toe of brake shoe approach the drum at approximately the same rate the same clearance is used at each end of the brake shoe.

Incorrect toe or heel contact of fully applied brakes results in chatter, squeals, spongy pedal, locking, and uneven wear.

What is a Brake?

Any brake system consists of a machine for dissipating energy in the form of heat plus some type of actuating control system. The two are tied together, operating as a unit, and therefore must be considered together. Before attempting to adjust any brake it is essential to check the brake control system to see that it is functioning correctly. Hydraulic brakes naturally have no linkage system, but the lines should be checked for air in lines and leakage. A detailed explanation of mechanical leverage and equalizers is given on Pages 49-54 of this Hand Book. Hydraulic systems are discussed in detail on Pages 44-46.

Lubrication

All parts of the control system should be lubricated to insure free operation, the cross shaft bearings, roller cross shaft supports, clevis connection at the levers and the cable controls. Where rusty or frozen parts are found use penetrating oil to free. Conduit cable controls should be lubricated by unfastening the conduit at the support brackets on the frame and backing plate. Clean the exposed part of the cable nearest the cross shaft lever with penetrating oil and then slip the conduit toward cross shaft so the part of the cable ordinarily covered by the conduit is exposed. Apply ample graphite grease and work through conduit. (A mixture of heavy cylinder oil and powdered graphite can be used.) Remember that rusty bearings and parts absorb much of the force exerted on the brake pedal, resulting in a hard pedal. Lubrication, not adjustment, cures this evil. The best relining job may be a failure if the operating mechanism is defective. Replace frayed cables, worn or rusty clevis pins, swollen or clogged hydraulic lines, etc.

Brake Cables

In replacing brake cables be sure to use cables of CORRECT length to get proper operation of brake. Cables too long or too short are apt to give trouble in getting a good brake.

Return Springs

All brake shoe return springs should be checked, and those found weak or broken should be replaced. With a well lubricated control system additional return springs are unnecessary and only increase pedal pressure.

The Complete Control System

A completely freed control system should allow rods or cables to return to their released position whether on toe board, set screw stop, or lever return rest. All slack should be removed.

Brake Drums

Brake drums should be examined for scoring, wear, rust, and distortion. New linings in a scored drum result in further rapid scoring, fast wear of the lining, frequent adjustment, and, oftentimes, noisy brakes. Of the three general types of brake drum material, steel, centrifuse, and cast iron, the steel are subject to many variations, especially in hardness. This may be due to carbon content or to alloying of the steel. And the degree of hardness influences the effectiveness of the brake linings used. On certain cars the brake drums were changed during the year, so that different performance is experienced on different cars of the same model.

Drums that are only slightly roughed up or showing a tendency to score should be POLISHED before relinings. In many cases this is superior to machining the drums. Similarly all machined brake drums, although they may seem smooth, should be polished. We recommend the following procedure before removing drums from lathe:

First, wipe machined surface with kerosene-soaked rag and then dry with clean cloth. Second, polish drum in lathe with sandpaper and machine oil (do not use emery cloth). Wipe clean and dry. This procedure removes all minute rough and jagged surfaces and will result in better lining and drum life.

Drum Thickness

New brake drums should be installed when a micrometer measurement gives a thickness of less than minimum shown below:

MINIMUM THICKNESS TO TURN DRUMS			
Drum Diam.	Thickness		
	Steel	Centrifuse	Cast
9	110	140	...
10	115	145	...
11	115	145	...
12	130	170	225
13	140	170	230
14	140	175	235
15	170	200	270
16	190	220	285
17 (3" lining)	...	...	285
17 (4" lining)	...	...	330
17 1/4 (3 & 4" lining)	...	...	330

Basic Fundamentals of Brake Service (Continued)

It is inadvisable to turn scored or out-of-round drums more than .025", as it leaves too little metal in the drum. Insufficient countersinking and improper riveting, especially with copper or aluminum rivets is likely to cause drum scoring.

The strains set up in the final pressing operations in the manufacture of steel brake drums are often released under the annealing heat caused by brake friction, and result in out-of-round drums. Eccentric drums are also caused by setting brakes hard by hand while drums are still hot and expanded. On cooling and contracting the drums become oval. High pressures on short shoes may also cause out-of-round drums. Whatever the cause, high spots tend to cause erratic braking, resulting in localized tire wear, noisy brakes, hard pedal, and poor lining wear. When drums are turned, use Multibestos shim stock under lining to assure full drum to lining contact.

SUGGESTED STANDARD PROCEDURE FOR BRAKE JOBS

- | | |
|--|--|
| <ul style="list-style-type: none"> (a) Check, clean, and lubricate all working parts of brake mechanism. (b) Check linkage. (c) Check U-bolts and springs. (d) Check wheel bearings and axle for end-play. | <ul style="list-style-type: none"> 3. Inspect drums. <ul style="list-style-type: none"> a. Check for eccentricity. b. Scoring. 4. Check curvature of shoes. 5. Check for grease leaks. 6. Replace worn and defective parts. 7. Clean and inspect backing plates. 8. Reline shoes according to recommended procedure. 9. Re-assemble parts removed. |
|--|--|

Type of Brake Lining

- | | |
|--|---|
| <ul style="list-style-type: none"> (a) Internal Brakes—Multibestos TAILORED Sets. (b) External Brakes—Multibestos Busduty Woven Lining or Multiduty. (c) Truck and Bus Brakes—Multibestos FB, HT, ST Sets, or Multiduty Lining. See Heavy Duty Recommendation Book for details. | <ul style="list-style-type: none"> (b) External Brakes: <ul style="list-style-type: none"> 1. Remove wheels. 2. Recondition bands. 3. Inspect drums. <ul style="list-style-type: none"> a. Check for eccentricity. b. Scoring. 4. Check for grease leaks. 5. Replace worn and defective parts. 6. Shape bands. 7. Reline bands according to recommended procedure. 8. Re-assemble parts removed. |
|--|---|

General Procedure

- (a) Internal Brakes:
 - 1. Remove wheels.
 - 2. Recondition brake shoes.

FACTORS OTHER THAN BRAKE ADJUSTMENT AFFECTING THE BALANCING OF FOUR-WHEEL BRAKE SYSTEMS

Front Wheel Alignment. Faulty front wheel alignment will cause unbalanced brake operation even though the brakes appear equalized on a brake tester. The following three factors interfere with good brake adjustment.

1. Improper "toe-in" adds to the unmanageability of a car on brake application, causing skid.
2. Improper "camber" is caused by wear or looseness in front wheel bearings, king pins, bushings, etc., or from heavy axle loads.
3. Improper "caster" may result in "shimmy" or wandering and diving on brake application, due to roll of the front axle. One spring more flexible than the other may cause it. In extreme cases the stiffening of the front springs by addition of extra leaves may reduce the axle roll.

Bear in mind that changing "caster" or "camber" affects "toe-in" and should not be undertaken without authentic advice.

Road Shock Dampeners. Road shock dampeners as used on certain cars are found on the end of one of the front springs, and may cause variation in brake action. Pulling to one side due to the road shock dampeners may be overcome by giving less brake on the front and rear wheels on the same side as the road shock dampener is located. If a brake tester is employed, it is suggested that the front wheel on the side of the road shock dampener be 100 lbs. less than the opposite front wheel, and the rear on the same side 50 lbs. less than its opposite rear wheel.

Knee-Action Front End. Weak knee-action springs are liable to cause difficulty in front end braking, especially if the car is overloaded. In certain cases car manufacturers are recommending replacement with stronger springs in the knee-action units to overcome such difficulties.

U bolts and spring clips should be tightened to eliminate undue axle roll and general looseness of the front end which unbalances the system.

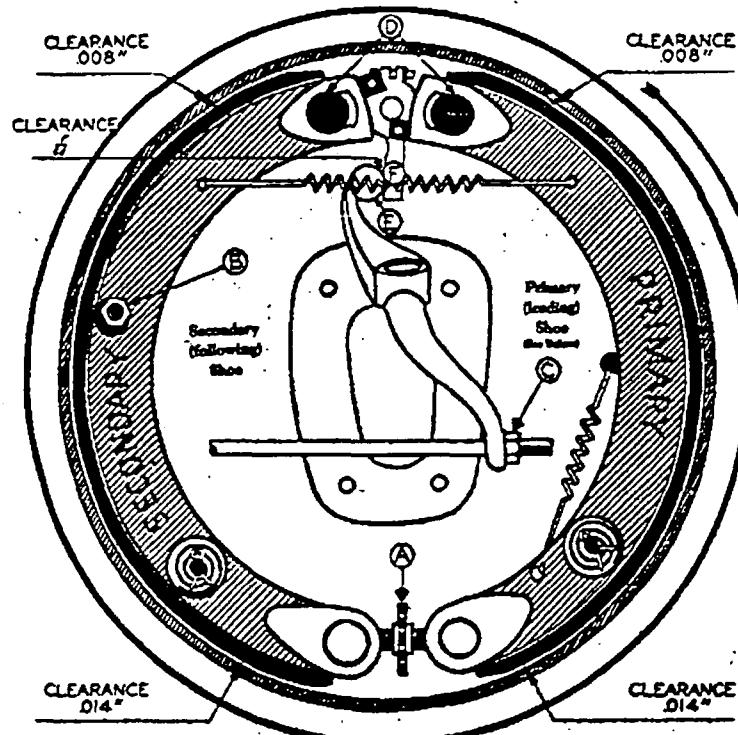
Tire Inflation, character of tread wear, road surface condition, all affect brake equalization. Always inflate tires to proper pressure when road-testing a car after relining.

Condition of the Brake Linings. Oil or grease in the brake lining is often caused by excessive lubricating of front wheel bearings or from the differential. New retainer felts are relatively inexpensive and should be used with rear wheel relines. If grease or oil gets into a lining, it destroys its effectiveness, causing unequal performance and rapid wear on the brakes. Cleaning such a lining with gasoline, cleaners, etc., are temporary expedients at best and a reline is suggested if possible.

With internal brakes, it is difficult for water to get on the linings. In washing cars, however, the high-pressure spray often forces water into the brake mechanism. The use of a pedal depressor will help to keep the water off the lining while washing. As the water film in a brake acts as a lubricant which is boiled away by braking application, the time of recovery for a water soaked brake is a function of the capacity of the lining to absorb water. Certain woven linings absorb and hold water very readily. Multibestos Rigid Moulded Lining and Multiduty Moulded Woven, such as used in TAILORED Sets, are practically impervious to water.

BENDIX TWO-SHOE BRAKE

(Double Anchor)



RIGHT FRONT BRAKE

THIS brake is a Duo "servo" type mechanism which uses the force of the momentum of the car for increasing the brake power. The primary shoe (see definition below) hinges from the floating end of the secondary shoe. On brake application the primary shoe contacts the revolving brake drum which carries it against the secondary shoe, thereby wrapping the assembly of brake shoes tight against the drum as pedal pressure is applied.

This self-energizing servo-action which multiplies the pedal pressure demands a dense, medium friction material of long wearing qualities on the secondary shoe and a higher friction, dense moulded lining on the primary shoe. This combination of lining allows the primary shoe to "kick in" the secondary shoe with the least possible pedal pressure, thus assuring an easy brake.

In order to give maximum performance, long wear, and freedom from scoring, Multibestos TAILORED Sets for two-shoe Bendix brakes have two types of lining, one for the primary shoe and the other for the secondary. Care should be taken to see that lining and shoes are correctly installed and assembled according to the instructions stamped on the lining. Insist on Multibestos *Genuine* TAILORED Sets.

HOW TO LOCATE PRIMARY SHOE

TO LOCATE THE PRIMARY SHOE START AT THE ACTUATING MECHANISM WITHIN THE BRAKE (IN THIS CASE, THE CAM) AND MOVE IN THE DIRECTION OF ROTATION OF THE WHEEL WHEN CAR IS MOVING FORWARD. THE FIRST SHOE ENCOUNTERED WILL BE THE PRIMARY SHOE.

Minor Adjustment

1. Release lock nut on eccentric (B). Turn eccentric (B) in direction of wheel when car is moving forward until a drag is obtained. Back off until wheel is free. Hold eccentric (B) and tighten eccentric lock nut.
2. Tighten star gear (A) until wheel drags. Release star gear until wheel moves freely.
3. Equalize by backing off on heaviest wheel.

Major Adjustment

1. Release or disconnect brake rods and cables at cross shaft.
2. Loosen anchor nuts at (D) until lock washer is free.
3. Turn star gear (A) until shoes are tightly wedged in drum. Do not turn wheels while shoes are being wedged into drum.
4. Tap anchors (D) on end with light hammer.
5. Tighten star gear (A) again until shoes are tight in drum.
6. Tighten anchor lock nuts with a 16-inch wrench.
7. Replace rods on cables.

- (a) Cable control type—adjust clevis yoke on end of cable to remove all slack in cable. Insert clevis and cotter pin.
- (b) Rod control type.

Rear brakes.

1. Adjust rods and allow 1/32" backlash in cam lever (F). Insert clevis pin and cotter pin.

Front brakes.

1. Set cam lever (F) to a vertical position in line with the center of the king pin.
2. Adjust rod allowing 1/64" clearance between ball (E) and cam lever (F). Insert clevis and cotter pin. This to eliminate locking of brakes on turns. Ball end of operating lever will then be approximately 1/4 to 1/2 in. back of center of king pin.
8. Back off on star gear (A) until wheel is just free (approximately fifteen notches). From this point follow procedure as outlined in minor adjustment. This adjustment should give the following clearances:
 - (a) .008" between the lining and drum at the toe end or anchor end of shoe.
 - (b) .014" clearance between the lining and drum at the heel or adjusting end of shoe.

Average time for complete four wheel reline between 4 1/2 and 5 1/4 hours.

Maintenance Suggestions

Ball and rocker arm type installations on two- and three-shoe Bendix brakes often cause difficulty in making correct adjustments and in locking of front wheel brakes when turning corners due to pitting of the flat face of the rocker arm with a comparable flattening of the ball. Filing or grinding the surface of the rocker arm flat is only a temporary expedient, as an unhardened surface is exposed which pits even more easily than the original installation. In many cases it is possible to change the rocker arm from the right front wheel to the left front wheel and vice versa—thus exposing a new case-hardened surface to the ball—and eliminating the necessity of buying new rocker arms.

Make sure that the small blocks in the cam block move freely and that the flat edges of these blocks rest against the shoe. If these blocks do not move freely it is possible that the shoe may rest against a corner of the block and will give difficulty in correctly adjusting the brake mechanism.

DO NOT SET CAM BLOCK TIGHT AGAINST SHOE BY TAKING UP EXCESSIVELY ON ROD OR CABLE CONTROL. IN REPLACING CAM BLOCK BE SURE THAT ROUND SIDE OF BLOCK IS IN THE SAME DIRECTION AS THE FORWARD ROTATION OF THE WHEEL. OTHERWISE BRAKES MAY LOCK WHEN CAR IS RUN IN REVERSE.

After adjustment be sure anchor lock nuts are tightened with a 16-inch wrench. Check all return springs and replace those found weak or broken. Additional return springs are unnecessary if rod or cable control systems have been properly freed by careful lubrication. These extra springs usually act only to increase pedal effort.

Remember that all four brakes act as a unit and should be balanced and all free from drag.

Soft, spongy linings should not be used on this brake—erratic performance and grabby brakes result from their use.

When difficulty is encountered by brakes locking in reverse, check the following:

1. See that cam is not in backwards.
2. That cables are not too tight.
3. That brake shoe return springs are replaced with new ones.
4. That eccentric has been turned in the correct direction as explained above.
5. That shoes are properly centralized and do not drag.

Follow major adjustment as given above, being careful not to turn the wheels while making this adjustment.

BENDIX TWO-SHOE BRAKE

(Single Anchor)

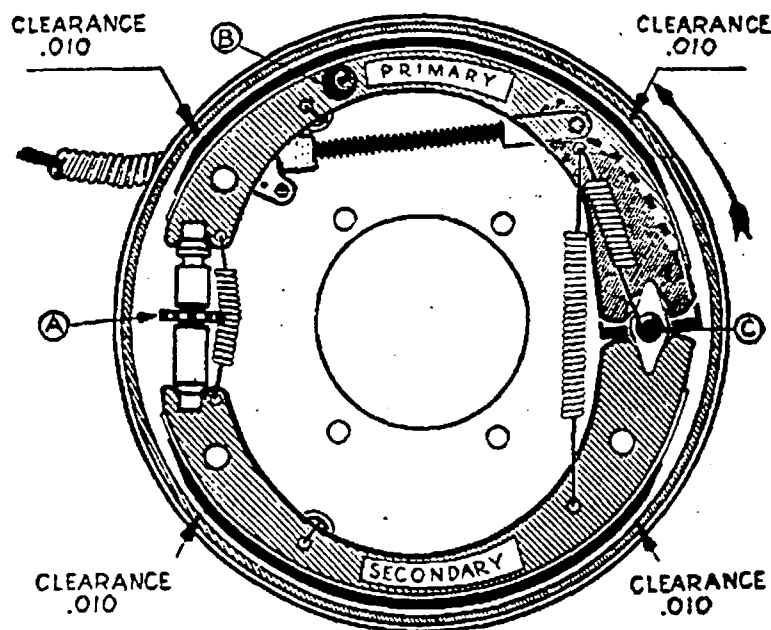


Fig. 1

LEFT REAR BRAKE

THIS brake is the Single Anchor Duo Servo type Bendix brake, and is found on 1931 to 1935 cars. The equal acting cam type, as shown in Fig. 2 differs from earlier types in that shoe application is by means of an equal action cam (D) which floats on the anchor pin (C). The cam lever (E) pivots on anchor and contacts lug (L) on the cam (D) to move brake shoes into action. This type of action is found on some 1933 and most 1934 and 1935 cars equipped with single anchor Bendix brakes. The principle of this brake mechanism is the same as the two-shoe double anchor brake shown on Pages 8 and 9 except that it is cable controlled in all cases.

There are two types of anchors—one with slotted holes in the backing plate for adjustment—and the other used commonly on trucks with an eccentric anchor pin. Some of the earlier models have a non-adjustable anchor which may necessitate filing an elongated slot for adjustment of the anchor. (See Figs. 5 and 6, Page 12.)

Because of the energizing action of this brake and due to the fact that the same principle is used in this brake as on the Bendix two-shoe double anchor, different types of lining are recommended for the primary and secondary shoe. These types of lining are carefully selected in Multibestos TAILORED Sets, and assure by their use good performance, lack of scoring, and long life.

HOW TO LOCATE PRIMARY SHOE

TO LOCATE THE PRIMARY SHOE START AT THE ACTUATING MECHANISM WITHIN THE BRAKE (IN THIS CASE, THE CAM) AND MOVE IN THE DIRECTION OF ROTATION OF THE WHEEL WHEN CAR IS MOVING FORWARD. THE FIRST SHOE ENCOUNTERED WILL BE THE PRIMARY SHOE.

Minor Adjustment

1. Same procedure as outlined for Bendix two-shoe double anchor type.

Major Adjustment

(a) Front wheels.

1. Disconnect cables at cross shaft levers.
2. Loosen anchor pin nut at (C).
3. Tighten star gear (A) until wheel can just be turned by hand. (See Fig. 4.) Then tap anchor lightly toward drum.
4. Snug up anchor pin nut at (C) —not tight.
5. Take up cable to remove slack.
6. Back off star gear (A) twelve notches.
7. Check and set clearance on secondary or top shoe .010" at anchor end and .010" at star gear (adjusting end) by means of eccentric (B).
8. Tighten anchor pin nut at (C) with a 16-inch wrench.

(b) Rear wheels.

1. Disconnect cables at cross shaft levers.
2. Loosen anchor pin nut at (C).
3. Tighten star gear (A) until wheel can just be turned by hand.
4. Snug up anchor pin nut at (C).
5. Adjust cable in usual manner to remove slack.
6. Back off star gear (A) twelve notches.
7. Insert .010" feeler gauge at star gear (adjusting) end of primary or top shoe. Tighten eccentric (B) to snug fit.
8. Check and set clearance on bottom or secondary shoe, .010" at anchor end and .010" at star gear (adjusting end) using anchor pin and star gear to make this adjustment.
9. Tighten anchor pin nut at (C) with 16-inch wrench.
10. Equalize with star gear (A).

Average time for a complete four wheel brake reline about 4½-5¼ hours.

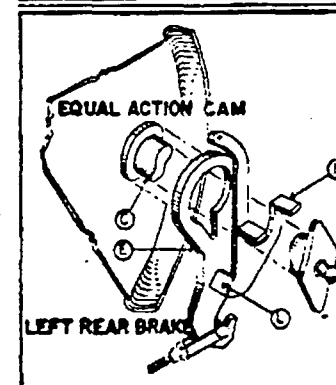


Fig. 2

There is no difference in adjustment between the early model two-shoe single anchor brake and the newer model of equal acting cam single anchor Bendix brake.

Care must be taken in determining the primary and secondary shoes of these various brake mechanisms. On the early models where the cable control comes through the backing plate at the top of the plate, the secondary shoe is the top shoe on the front wheel brakes and the bottom shoe on the rear wheel brakes. In the later models where the cable enters the rear backing plates through the bottom of the backing plates, the position of the primary and secondary shoes is not changed. If you are in doubt as to which is the primary and secondary shoe, read the definition on Page 10. Don't guess—make sure first.

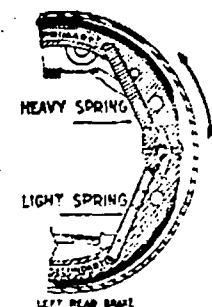


Fig. 3

Two arrangements for brake To Expand shoe-return-springs are used—one as Shoes in shown in Fig. 1 on Page 10; the other Drum Turn as shown in Fig. 3, where two short Toward shoe-return-springs are both attached Axle to pin C. This is the later type of spring arrangement, and two different sizes of springs are used. The one painted red is the heavier spring.

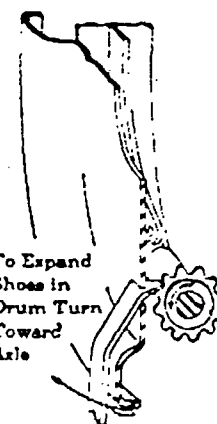


Fig. 4

Bendix Two-Shoe Brake (Single Anchor) (Continued)

and the Bendix Company has recommended that this spring always be attached to the top shoe on both front and rear brakes.

Multibestos Institute men have found that grabby brakes and loud clicks may often be eliminated by changing these springs so that the heavier spring is always attached to the secondary shoe. The Multibestos Company recommends the replacement of all retracting springs with new ones whenever the brakes are relined.

Eccentric Type Anchor

Some of the single anchor models are provided with Eccentric Type Anchor, which may be identified because a screw driver slot is provided in the anchor pin. When adjusting a brake with this type anchor, it is necessary to loosen anchor lock nut sufficiently to allow the anchor pin to be turned with a screw driver. A feeler gauge should always be used, and the eccentric anchor should be turned in the direction of rotation of the wheel when the car is going forward until the anchor end of the shoe controlled by the eccentric has a clearance of .010" between the lining and the drum. The eccentric controlling the clearance between the drum and brake shoe should then be adjusted so that the lining at the other end of the shoe shows a clearance of .010" between the lining and the drum. It will probably be necessary to readjust slightly eccentric and anchor at the same time to obtain these specified clearances.

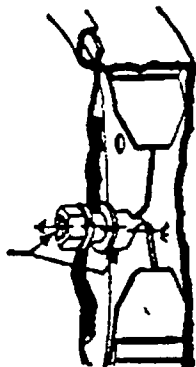


Fig. 5

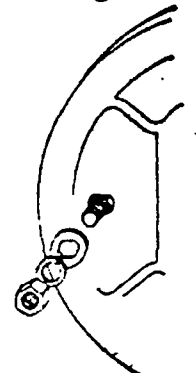


Fig. 6

After the anchor has been set in the above position and the lock nut has been tightened, the star gear should be expanded until both shoes are tightly wedged into the drum. The cables should then be connected to the cross shaft levers with no slack and the star gear backed off from 9 to 14 notches. Care should be taken to check with the feeler gauge to see that both the toe and heel end of the primary and secondary shoes have a clearance of .010".

In some cases a shoe stop as shown in Fig. 7 is used on this type of brake mechanism. When making adjustments on the brake the shoe stop lock nut should be loosened and the shoe stop moved away from the brake shoe. After adjustment is made, the shoe stop should be moved down until it just contacts the shoe when the brake is not applied. Lock nut should be tightened with stop in this position.



Fig. 7

Maintenance Suggestions

Read maintenance suggestions on Page 9.

The grooved ring on one end of the star gear assembly indicates that the left hand threaded screw is at that end of the assembly. In replacing this star gear linkage, the groove should be at the bottom of the assembly on the left front and right rear wheels. It should be at the top of the assembly on the right front and left rear wheels. In other words, if you look at the brake mechanism with the star gear assembly

downward, the left hand thread or grooved ring should be at the left hand side of the star gear.

If in replacing shoes the direction of rotation of the star wheel is reversed by putting link in upside down, final star wheel adjustments will vary—some shoes being expanded, others being drawn together. Where cable controls have pressure grease fittings installed beware of over lubrication. Too much lubricant will run down cable and get on the brake lining.

Weak springs holding shoes to backing plate may cause noise.

The kick shackle used on certain large heavy cars equipped with two-shoe Bendix brakes allows an axle roll when brake is applied, causing the front steering arm to turn to the left and the car to "duck" to the left. One car manufacturer has found that by reducing the braking effort on the left front brake this trouble is overcome. However, with less braking effort on this brake the lining wear would be unequal unless the breaking area on this wheel were correspondingly reduced. Accordingly, on the 1933, 1934, and 1935 models of Packard, a narrower lining is used on this wheel than on the other three wheels. Some of the 1934 cars equipped with Bendix two-shoe single anchor brakes are also displaying this tendency to duck to the left due to pulling of the left front wheel, and the car manufacturers are supplying a grooved lining to overcome this difficulty. It is our recommendation that, if the ducking to the left cannot be overcome by suitable adjustment of the brake mechanism or changing the leverage underneath the car, as has been recommended in some instances (see Page 53 for drillings on 1934 Terraplane), a groove approximately $\frac{1}{8}$ " wide x $\frac{3}{32}$ " thick be ground in the Multibestos TAILORED Set Lining on both primary and secondary shoes. A rat-tail file may be used for this purpose.

Another method of overcoming this difficulty is to use the same type lining on the primary shoe as is supplied for the secondary shoe in Multibestos TAILORED Sets.

See Page 15 on causes of super-effective brakes.

Erratic wet weather performance on the 1934 Pontiac may be due to the collection of trapped mud and water inside the brake mechanism. This condition may be overcome by drilling the splash shield which is integral with the backing plate. Drill three $\frac{1}{8}$ " holes in this shield on all four BACKING PLATES at points $2\frac{1}{4}$ ", $3\frac{1}{2}$ ", and $4\frac{1}{2}$ " back from center line of the plate.

Machining flange of brake drums to 13 11/16" O. D. gives approximately $\frac{1}{8}$ " clearance between brake drum flange and splash shield and allows water and mud to drain off.

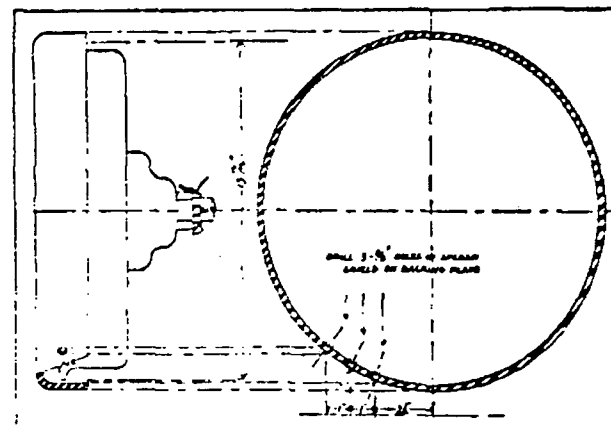
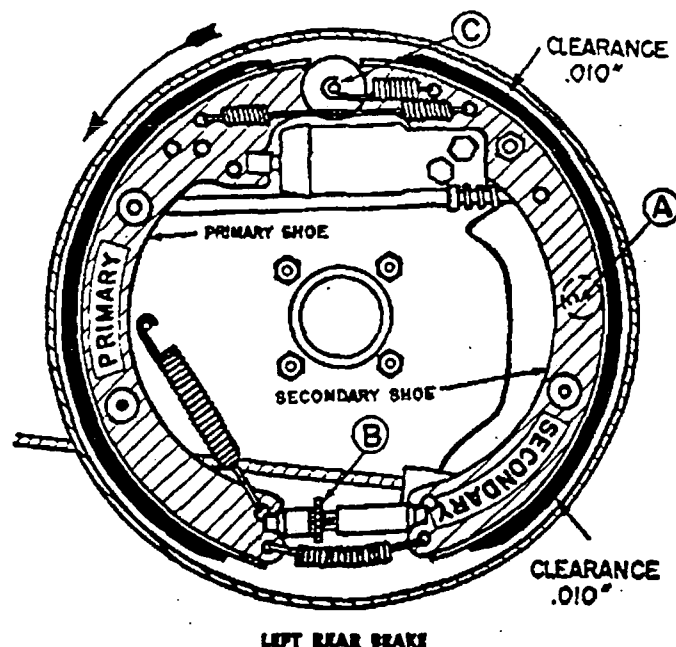


Fig. 8

BENDIX HYDRAULIC DUO SERVO BRAKE

(Single Piston)



THIS brake is used on the 1934 models of Oldsmobile and 1934-35 La Salle. It differs from the Bendix Hydraulic Duo Servo brake double piston type in that it has but a single piston in the hydraulic wheel cylinder. The wheel cylinder floats with respect to the backing plate, yet is anchored to the secondary shoe and actuates that shoe while the piston moves the primary shoe.

The Duo Servo action is still maintained, since the primary shoe is connected to the secondary shoe by a star gear assembly. The rear service brakes act as parking brakes and when used as such are mechanically controlled by separate cable control. Details of this control are shown in the above sketch.

The clearances of the secondary shoe should be .010" at all points. A .002" variance is allowable, but if the clearances at ends of secondary shoe differ more than this the anchor should be reset to assure good brake performance. No definite clearances are recommended on the primary shoe—if the secondary shoe clearance is correct and adjustment instructions are carefully followed, the clearances between the primary shoe lining and drum will take care of themselves.

See Page 16 for definition of Primary Shoe.

Minor Adjustment

1. Remove inspection covers from brake drums.
2. Loosen eccentric lock nut and insert .010" feeler gauge between lining of secondary shoe and brake drum.
3. Turn eccentric (A) in direction of forward wheel rotation until .010" feeler gauge is snug at adjusting points of secondary shoe. Tighten eccentric lock nut.
4. Expand brake shoes by turning star gear (turning star wheel down and toward brake drum expands the shoes—see Fig. 4, Page 11) until light drag is felt on the brake drum.
5. Turn star gear in opposite direction until drum is free from drag.
6. Check emergency brake cables for any excess play and adjust if necessary. (With parking brake lever released and against stop, pull brake cable until strut rod inside rear brake cam can be felt making contact with brake shoe. Holding cable in this position, adjust clevis on cable so that clevis pin can just enter brake cross shaft lever.) If parking brake cable is too short shoes will be expanded away

from anchor. Correct adjustment is impossible, and shoe will slap against anchor going backwards or forwards, with resulting clicking sound.

Major Adjustment

1. Remove parking brake cables at cross shaft.
2. Loosen anchor pin nut by backing off half turn on anchor pin lock nut.
3. Expand shoes by turning star gear until the two shoes are expanded sufficiently to cause enough drag so that the wheels can just be turned with both hands. Using a soft hammer, strike the anchor pin on the threaded end to make sure it is free and that it moves to correct position. Make this adjustment on all four wheels.
4. Tighten anchor pin (C) using 16-inch wrench.
5. Release shoes by turning star gear until wheels are free from drag.
6. Proceed with shoe adjustment as outlined under "Minor Adjustment."
7. Replace parking brake cables using adjustment as explained in "Minor Adjustment."

Average time required for a complete four wheel reline 4½ to 5¼ hours.

Maintenance Suggestions

If pedal is close to floor board or has springy action, then look for

- (a) Normal lining wear. (Minor adjustment.)
- (b) Leak in system. (Tighten connections or replace worn parts where leak is found.)
- (c) Air in system. (Bleed lines.)
- (d) No fluid in supply tank. (Refill and bleed lines.)
- (e) If brakes drag or do not release. (Check port hole in master cylinder and adjust pedal clearance, or look for mineral oil in lines.)

Do not attempt to wash any of rubber caps or parts with anything but clean alcohol.

Super-Effective Brakes

Some 1934 and 1935 cars with hydraulic Bendix brakes dive to the left and right on brake application, due to the super-effectiveness of the brakes. Following are some suggested remedies:

1. Check clearances on all shoes to insure equal balance of front wheels.
2. Check retracting springs for stiffness. If they show signs of weakness, replace them with stiffer springs.
3. Reduce clearance between drum and lining to reduce servo action.
4. Reduce effective area of primary shoe lining on front brakes by cutting off at second rivet holes or by a long tapering chamfer, or by grooving of primary shoe linings.
5. Use lower friction lining on primary shoes.
6. Watch for bent backing plates.
7. If oversize linings are used to reduce clearances and servo action, be sure lined shoes are ground to correct diameter to avoid toe and heel contact.
8. In cases of diving to one side check shock absorbers as possible source and equalize.
9. Check wheel alignment. Too great or unequal caster may cause diving.

Do not attempt to salvage used brake fluid.

Do not attempt to use mineral oil in lines. (Use nothing but genuine Hydraulic fluid.)

(a) If mineral oil has been used in lines, replace all rubber parts and flush lines with alcohol. (Refill with Hydraulic fluid.)

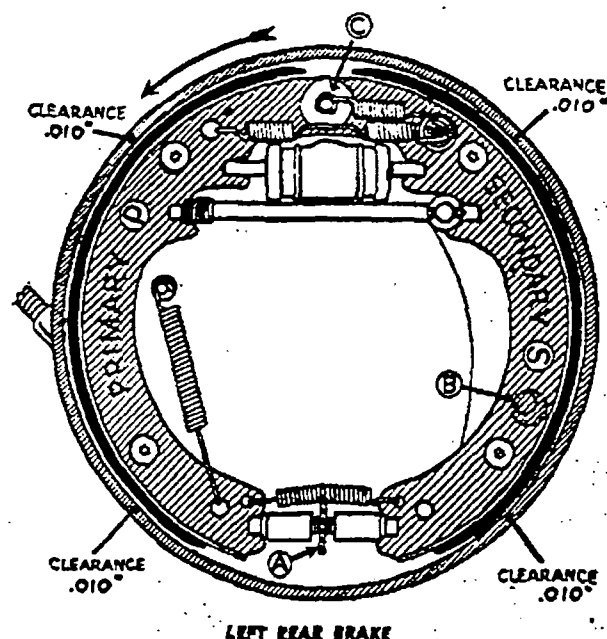
Drums should not be turned any thinner than .157".

Occasionally cap screws holding wheel cylinder to secondary shoes become loosened, allowing cylinder to drop. Be sure to check for correct alignment.

Lubricate dust cover plate at place where hydraulic hose fitting passes through backing plate to allow free movement of brake shoes.

BENDIX HYDRAULIC DUO SERVO BRAKE

(Double Piston)



LEFT REAR BRAKE

THIS double piston Bendix Hydraulic Duo Servo brake is used on all Auburn-12, 1932, Model-105, 1933, and all 1934 and 1935 Auburn cars, as well as on the 1935 Graham 6, La Salle, Nash, Oldsmobile, Packard 120, and Pontiac. It operates on the same principle as other two-shoe Bendix single anchor brakes, except that it is actuated by a Hydraulic pressure system. This brake mechanism uses the double piston wheel cylinder similar to standard Hydraulic brake installations, and the same care must be given to this system as to all Hydraulic systems as shown on Pages 44-46.

HOW TO LOCATE PRIMARY SHOE

TO LOCATE THE PRIMARY SHOE START AT THE ACTUATING MECHANISM WITHIN THE BRAKE AND MOVE IN THE DIRECTION OF ROTATION OF THE WHEEL WHEN CAR IS MOVING FORWARD. THE FIRST SHOE ENCOUNTERED WILL BE THE PRIMARY SHOE.

Bendix Hydraulic Brake (Double Piston) Adjustments

Minor Adjustment

1. Same procedure as outlined for Bendix Duo Servo brake, single piston type.

Major Adjustment (after relining)

1. Assemble brake shoes as shown in sketch—primary shoe marked P, secondary shoe S. Be sure springs are correctly assembled. Close star gear (A) so that shoes will not be expanded and drag. (See Fig. 4, Page 11.)
2. Disconnect each parking brake lever from cross shaft at clevis end.
3. Loosen eccentric lock nut and turn eccentric (B) in direction wheel revolves when car is moving forward until a .010" feeler gauge is just snug between lining and drum at a point about $1\frac{1}{4}$ " from star gear (adjusting) end of secondary shoe.
4. Loosen anchor pin lock nut and turn

anchor pin (C) with screw driver in direction wheel revolves when car is moving forward until there is .010" clearance between lining and drum at a point $1\frac{1}{4}$ " from end of lining at anchor pin end of secondary shoe.

5. Readjust eccentric (B) if necessary to .010" clearance as in (3).
6. Lock anchor pin nut and eccentric lock nut tight, holding anchor pin and eccentric rigid while so doing.
7. Expand brake shoes by turning star gear (A) until shoes are pressed tightly against drum.
8. Take all slack out of parking brake cables and reassemble at clevis end.
9. Release star gear 8 notches at all four wheels.
10. Test car on brake machine or on road—equalize by releasing star gear on locking wheels.

Average time to reline four wheel brakes between $5\frac{1}{2}$ and $6\frac{1}{4}$ hours.

Maintenance Suggestions

See Page 15 on super-effective brakes.

If with this type brake the car persists in pulling to the left when brake is applied, the following methods will cure this trouble. We recommend method No. 1 as most satisfactory and easiest:

1. Replace Primary and Secondary Shoe Return Spring on left front brake mechanism with a heavier one. Tighten up on kick shackle as much as possible without affecting steering.
- or 2. Tighten up on kick shackle as much as possible without affecting steering. Mount on the frame directly in back of kick shackle on left front spring a bracket with adjusting screw to prevent excessive movement of kick shackle. Severe brake application will not cause too great a movement of the shackle and pulling to left will be avoided.
- or 3. Cut a groove $\frac{1}{4}$ " wide and $\frac{3}{32}$ " deep the full length of the lining on both shoes of left front brake and replace Hydraulic wheel cylinder with a smaller size.
- or 4. Use of Lower Friction Lining on the Primary Shoe of the Left Front Brake.

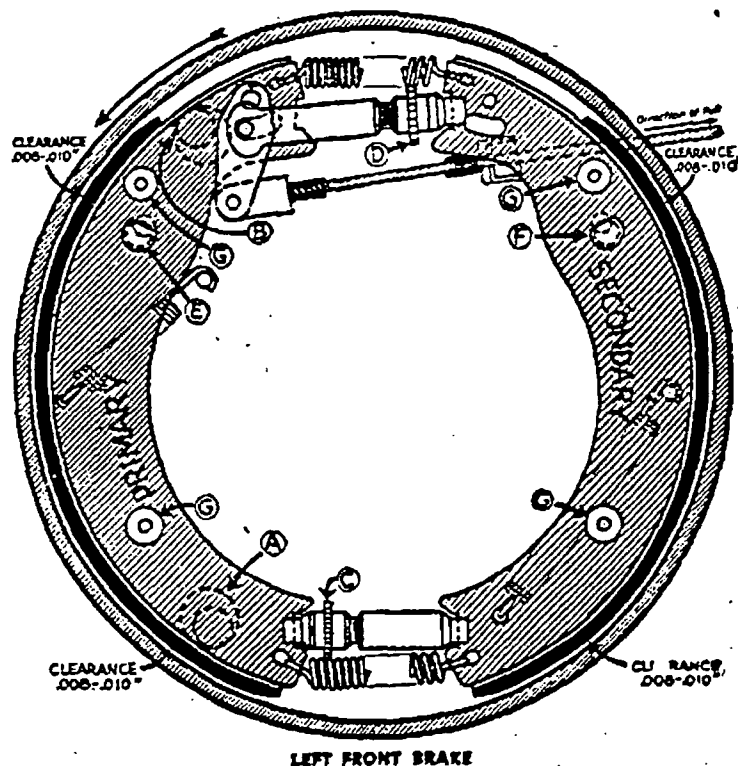
During 1935 there was a change in the specifications of the wheel cylinders of the 1935 Pontiac. Early in the year 1" bore cylinders were used on the front brakes and 15/16" on the rear brakes. Later this was changed to 15/16" bore cylinders front and rear.

Certain car owners do not like super-effective brakes, and use of smaller wheel cylinders in front is suggested as a remedy.

The 1935 Pontiac has a shorter piece of brake lining on the primary than is used on the secondary. Care should be taken to see that they are reassembled correctly.

Shortening of the lining on the primary shoes is suggested for overcoming grabby front brakes on certain lighter 1935 cars. Cut off lining $\frac{1}{4}$ " for second set of rivet holes and chamfer.

BENDIX DUO-POWER BRAKE



THIS brake is used on the 1933 and 1934 Studebaker cars equipped with BK Power Cylinder Units.

Although similar in appearance to a two-shoe Duo Servo Bendix brake, it differs in that the two anchors are **NON-ADJUSTABLE** and are located nearer the center of the length of each shoe. The primary shoe lining makes contact with the rotating drum, which forces the primary shoe into the secondary shoe through the articulating link (star gear assembly). The construction of the mechanism is such that this is a sliding action, so that the same clearance between lining and drum at toe and heel of shoe is correct.

Dense rigid moulded linings such as supplied in Multibestos **TAILORED** Sets assure good performance and long life. Two different types of lining are supplied for this brake mechanism, as the action is essentially the same as the Bendix Two-Shoe Single or Double Anchor.

HOW TO LOCATE PRIMARY SHOE

TO LOCATE THE PRIMARY SHOE START AT THE ACTUATING MECHANISM WITHIN THE BRAKE AND MOVE IN THE DIRECTION OF ROTATION OF THE WHEEL WHEN CAR IS MOVING FORWARD. THE FIRST SHOE ENCOUNTERED WILL BE THE PRIMARY SHOE.

Bendix Duo-Power Brake Adjustments

Adjustment (for normal wear)

1. With all wheels jacked up disconnect cables at cross shaft levers.
2. Adjust front shoes of front brakes and rear shoes of rear brakes by loosening eccentric locknuts and turning eccentrics (A) and (B) in direction of rotation of wheel until a clearance of .008"-.010" is obtained between the lining and the drum at point one inch from each end of the lining. Tighten locknut.
3. Adjust rear shoes of front brakes and front shoes of rear brakes by turning

star gears (C) and (D) until a clearance of from .008" to .010" is obtained between lining and drum at points one inch from each end of these shoes.

4. Make sure cross shaft is in fully released position against stop and reconnect cables. Be sure to adjust cable clevises so that cable slack is entirely removed when clevis pin is replaced. (See Note 1.)
5. Equalize by backing off the same number of notches on both star gears of heaviest wheel.

Average time for a complete four wheel brake reline—5½ to 6¼ hours.

NOTE 1: Although the instructions given in Paragraph 4 concerning the setting of the cables to the correct length usually give satisfactory results, the Multibestos Institute men have found that the following arrangements eliminate all difficulty of maladjustment as regards the setting of cables. After clearances have been obtained in accordance with Paragraph 3 of the Brake Adjustments, both star gears should be turned until the shoes are tightly wedged in the drum. This should be done by turning the two star gears simultaneously, or—first a notch on one star gear and then a notch on the other. The number of notches turned on each star gear should be recorded. When the shoes are fully expanded in the drum, all the slack may be taken out of the cables and they may be re-assembled to exactly the correct length. The star gears are then backed off the same number of notches as they were set out. This method of adjustment assures perfect results as regards the setting of the cables.

Maintenance Suggestions

Anchor Pins (E) and (F) are in fixed locations and should never have to be loosened—check occasionally to make sure anchor nuts are tight.

The primary shoe of front and rear brakes is the forward shoe. Primary and secondary shoes are interchangeable.

Always follow the directions for locating the primary shoe as shown on Page 18. The primary shoe is not necessarily the shoe which moves first when the foot pedal is depressed.

Avoid harsh brake applications during breaking-in period of new linings. Remember it's a **POWER** brake.

Backing plates occasionally become rusted and corroded and shoes bind against the plates at certain points. A suitable lubricant, such as white lead, will overcome the sticking and will assure good brake performance.

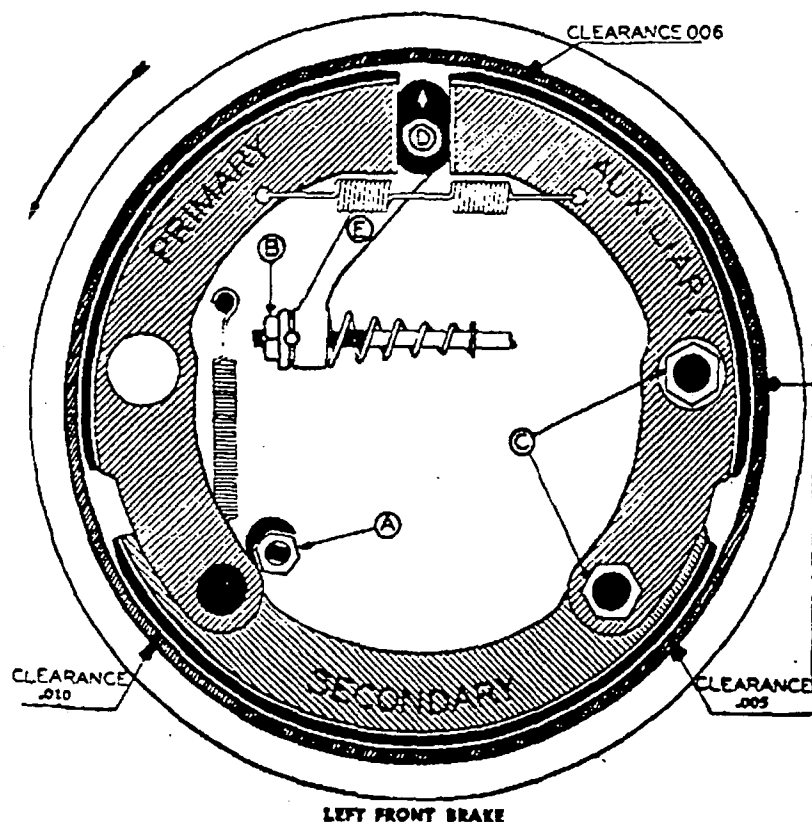
Some of the first cars equipped with Bendix Duo Power Brakes have no peep holes in the drums. It is necessary in such cases to drill holes in the drum to adjust these brakes satisfactorily. As an expedient for brakes without peep holes adjustment may be made as follows:

1. Set top eccentric until shoe drags. Back off until just free.
2. Repeat with bottom eccentric.
3. Force shoes solid in drum by turning upper and lower star gears.
4. Back off each star gear six notches.
5. If wheel still drags, back off one notch at a time on upper and lower star gears.

A common difficulty encountered with this brake mechanism, causing chatters and squeals, is loose backing plates. If the holes in the backing plate have not worn so much as to be unduly elongated, tightening of the backing plate bolts and nuts will usually overcome any difficulty due to these loose backing plates.

See Page 47 for BK Power Cylinder Unit used with this brake.

BENDIX THREE-SHOE BRAKE



THE three-shoe "Servo" brake is made in several types—slotted anchor type as shown, eccentric anchor pin type, and stationary anchor pin type—but all act in accordance with the Bendix "Servo" principle. When pedal pressure is applied, the primary shoe makes contact with the revolving drum and, as a result, forces the secondary shoe into full bearing with the surface of the drum. In the three-shoe brake mechanism, the auxiliary shoe does very little work in braking when the car is moving forward—in reverse it does almost all the work.

For best performance, the three-shoe Bendix brake requires a lining on the primary shoe which will give prompt and easy action in "kicking in" the secondary shoe into contact with the drum. The secondary shoe, upon which the greatest braking strain is exerted, must be a dense non-compressible moulded lining of the correct friction to give good performance and at the same time have long wearing qualities. To avoid "spongy" pedal and high speed fade, the lining on the auxiliary shoe should be dense and non-compressible.

Multibestos TAILORED Sets for three-shoe Bendix brakes provide the correct combination of linings to give the best possible results. Lining for primary shoes is specified by distinctive marking on the surface of the segments.

See Page 10 for rule for locating Primary Shoe.

Minor Adjustment

(To compensate for wear of lining and loss of brake pedal only.)

1. Loosen eccentric lock nut and turn eccentric (A) in the direction that the wheel travels when car is going forward until wheel locks. Back off on eccentric (A) until wheel is just free. Tighten lock nut.
2. Turn nut on end of rod (B) at cam lever (E) until brake drags, then back off until just free.
3. Equalize by backing off on heaviest wheel.

Major Adjustment

1. Remove cam lever (E) from serrated cam shaft (D).
2. Adjust eccentric (A), following same procedure as in minor adjustment.
3. Loosen anchor lock nuts (C) one-half of a turn.
4. Place a suitable wrench on cam shaft (D) so that brake may be applied in usual direction.
5. Spin wheel in direction of travel when car is going forward.
6. Apply brake with wrench. Repeat three times, the third time holding brake on with wrench, and tap anchor nuts (C) toward drum. Lock anchor nuts tight with a 16-inch wrench.
7. Re-adjust eccentric (A).

8. Turn cam lever shaft (D) in usual direction of travel until a slight drag is felt. Holding in this position, replace cam lever (E) at proper angle. On cam lever type adjustment on front brakes only, the center of the ball on the end of lever arm should, in the off position, be one-fourth to five-sixteenths of an inch back of the center of the king pin. To accomplish this it is often necessary to lengthen or shorten the brake rod. On the worm type adjustment cam lever, it is necessary to remove this lever to centralize cam or shoes properly. On this type of lever it is necessary to release the worm screw before making a major adjustment.

9. Cam carrier brackets should be adjusted to the backing plates so that they may be moved with a sharp rap of the hammer. This adjustment should give you the following clearances:

- (a) At the toe of the secondary shoe .010".
- (b) At the heel of the secondary shoe .005".
- (c) At the toe of the auxiliary shoe .006".

The arrow or long end of the cam should apply against the primary shoe.

Average time for a complete four wheel brake reline—5-5½ hours.

Maintenance Suggestions

It is well to check the cam carrier bracket to see that it is snug enough to be moved only by a slight tap of a hammer. A sloppy cam carrier bracket causes erratic performance, giving either a loss of brake or a grabby brake.

For loss of brake, check position of cam. ON PERROT CONTROL THE LONG OR ARROW END OF CAM WHEN BRAKE IS APPLIED SHOULD COME IN CONTACT WITH THE PRIMARY SHOE. ON THE SUPER-SERVO TYPE THE NOTCHED SIDE OF THE CAM ALWAYS FACES THE AXLE SPINDLE.

Certain older models of three-shoe Bendix brakes have shoes with a decided ramp at ends of shoes. Rigid moulded lining cannot be used on these shoes without certain changes. The Bendix Company recommends bending the ramps out to the same curvature as the rest of the shoe by using an old drum as an anvil and hammering ramps until they are flat. This obviates the breaking of rigid moulded lining or the necessity of drilling new holes in the shoe.

On certain cars where difficulty is experienced in obtaining a stop when car is in reverse, we recommend using the lining marked "Caution—Use on Primary Shoe Only of 3-Shoe Bendix" for the Auxiliary Shoe of the rear brakes. This assures a good stop in reverse and also aids by giving more braking effect on the front brakes than on the rear brakes of these particular models. The ratio of brake effectiveness is then comparable with approved later day brake hook-ups.

'28 and '29 Packards have given considerable trouble in getting a satisfactory brake, not only with the original equipment lining, but with any replacement lining. Drilling of the equalizer as shown in Fig. 1 will tend toward giving better performance and effectiveness.

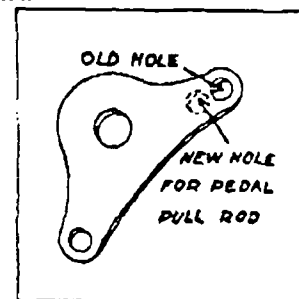


Fig. 1

EXTERNAL BAND BRAKE

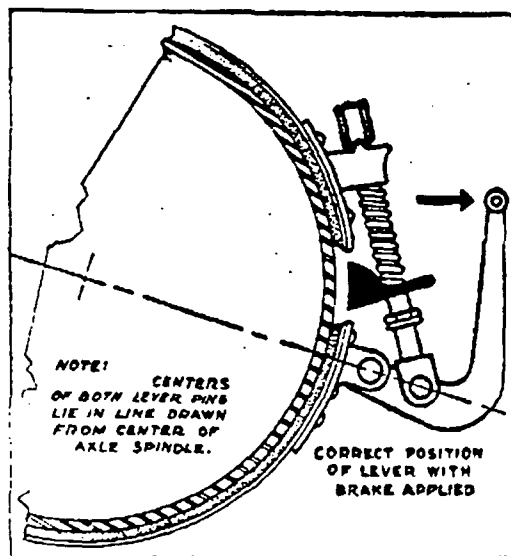
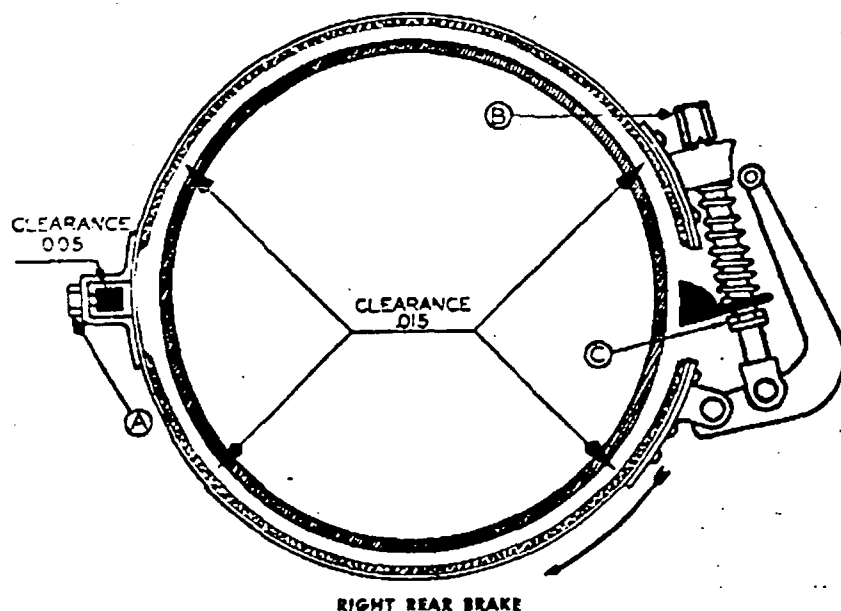


Fig. 1

THE external band type of brake has not been generally used on new car production since 1928. However, it is still quite common, and both mechanically and hydraulically operated systems are in daily use. The above diagram is typical of the mechanical type external brake and, although various shapes and designs of lever arms and anchors are used, the principle is the same. The adjustment for either mechanical or hydraulic type is practically the same, and the clearances shown above will give best results under most conditions. The external band brake requires a friction material of the type such as Multibestos Busduty or Multiduty moulded-woven brake lining.

External Band Brake Adjustments

1. Check linkage.
 - (a) Pedal rod.
 - (b) Cross shafts.
 - (c) Equalizers.
 - (d) Pull rods and cables.
 - (e) Lever arms back against stops.
2. Disconnect rods at the operating cams on each brake.
3. Adjust nut at point (C) until band drags slightly against drum at operating arm end of band.
4. Adjust clearance at (A), pushing band across the drum until the drag previously felt at operating arm end of band is relieved.
5. Turn nut (B) until slight drag is felt.
6. Check by applying slight pressure to brake pedal and adjust at points (B) and (C) until both ends of band approach brake drum at the same time.
7. Equalize brakes by making adjustments on the brake rod.

The above method of adjustment will, in all probability, give final clearances between the drum and the lining of approximately .015". However, due to certain variations, these clearances may not be equal, but by the above adjustment you are assured of an even acting brake at all times.

Average time required for a complete four wheel reline—4-5 hours.

Maintenance Suggestions

Where hard pedal is a chronic complaint on external band brake systems, it is possible in some cases to change over the leverage system to cure this. In the case of all four wheel external Buick brake jobs this can be easily done as follows:

1. Remove brake rod that connects brake pedal to equalizer from the lower hole at the pedal to the upper hole provided for just this purpose.
2. On levers, attached to the frame, which control the front brakes change the relative positions of the brake rods that run to the cross shaft and the cables that run to the front brakes so that the cables are connected to the upper hole and the rod to the cross shaft is in the lower hole of the lever.

This method gives more brake on the front wheels and consequently easy pedal. Another method of accomplishing the same effect is by drilling a new hole in the equalizer one inch nearer to the left frame of the cam than the present hole. The pull rod running from the brake pedal should be connected to the new hole. A greater pull will then be exerted on the cross shaft that controls the front brakes and accordingly an easier pedal will be required to obtain a suitable stop.

When brake is applied the operating lever should be in such a position that lever arm pin and yoke clevis pin will line up with the center of the axle. See Fig. 1. Bend operating lever with wrench to secure correct applied position and check to see that lever on each brake is in the same relative position. This assures an easy pedal.

To obtain a freer hinge action always cut out lining at anchor, chamfering the ends to reduce noise.

If clearance between band and drum is too small or uneven, frictional heat may expand the brake drums causing the brake to drag.

Out-of-round bands cause high spots which may result in dragging brakes or squealing brakes. Always reform relined bands, taking care not to twist them.

On external brakes the lining is more exposed to dirt and water and requires more frequent cleaning.

Excessive squeal, chatter, and groans may be eliminated by bending the toe ends of band slightly away from drums. Oiling the mechanism at points A, B, C, and the operating lever arm pins will tend to eliminate brake noise and increase brake efficiency.

Squeal is also caused by distorted backing plates or bands, too hard lining, scored or eccentric drums, dirt on lining, etc.

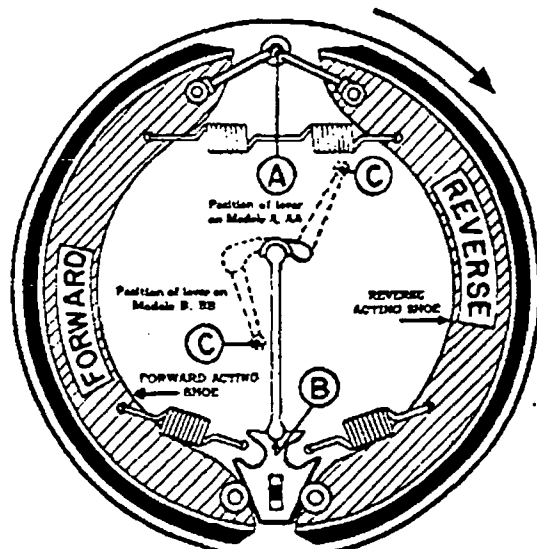
More than .005" clearance between anchor bracket and saddle allows the band to distort when brakes are applied. Closing up to correct clearance may be done by hammering or in a vise.

In certain cases where external band brakes have given good performance when dry and have resulted in no brake when wet, out-of-round drums with low spots on the drums have very often been found to be the cause of this trouble. Turning the drums, taking a slight cut only, will overcome this difficulty.

Poor wet weather performance is sometimes caused by the toe of the lining forming a small pocket in which the water gathers. We suggest cutting all ends of lining in a V shape so that the water and mud can escape.

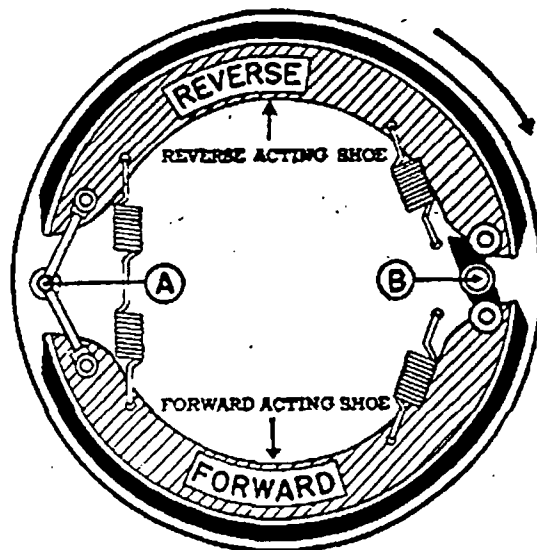
FORD BRAKES

FOR MODELS A, B, V-8, AA, BB



RIGHT FRONT
BRAKE

MULTIBESTOS TAILORED Sets for Ford brakes give uniformity of brake performance, lack of chatter, minimum glazing tendency, non-absorption of oil and grease, lack of grabbing in wet weather, and quick recovery from exposure to water. These sets are drilled and counterbored to factory specifications and are correctly chamfered to give best results.



RIGHT REAR
BRAKE

RIGHT REAR BRAKE

Ford Brake Adjustments

Minor Adjustment (Front or Rear)

1. Take up on square adjusting nut (A) until slight drag is felt. Back off until wheel is just free.
2. Equalize by backing off square adjusting nut (A) on heaviest wheel.

Major Adjustment

1. Disconnect brake rods at clevis end.

2. Take up on square adjusting nut (A) until slight drag is obtained. Back off until wheel is just free.
3. Check cross shaft and pedal rod to be sure they are against stops.
4. Adjust brake rods at the clevis end to remove lost motion and reconnect.
5. Equalize by backing off square adjusting nut (A) on heaviest wheel.

Average time for complete reline—3-4 hours.

Maintenance Suggestions

Very little difficulty is encountered in the rear brakes of a Ford. The front wheel brakes are the ones which require the greatest attention to assure proper performance on these cars.

The following procedure will assure proper operation of the front wheel brakes:

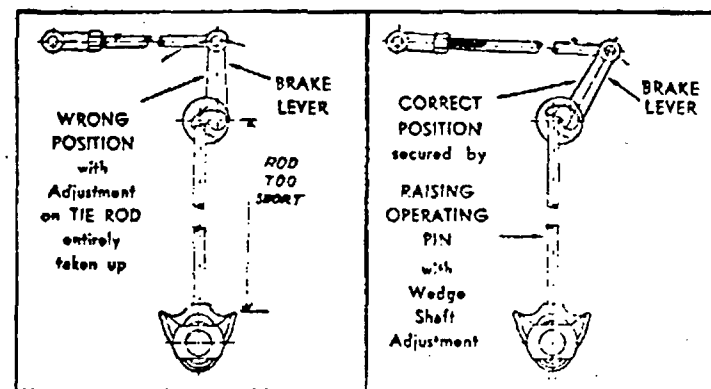


Fig. 1

1. If front levers (C) pull past their centers (Fig. 1) when brakes are applied, lengthen the push rod by placing a brake spreader shim (or the head of a 3/16" stove bolt) in the hole of the wedge applying cam (B), between the push rod and the wedge cam. (Adjustable brake wedges are available which allow raising or lowering of the wedge socket as necessary.)
2. Replace the socket cap and springs on the rear end of radius rod under the center of the motor.
3. Tighten radius rod at front axle.
4. Tighten support bolts at rear of engine.
5. Tighten any other parts that may be loose around the front axle.
It is well to check the wheel alignment and king pin bushing.
Loose spring shackles allow front end to dip and to cause loss of pull.

Ford Brakes for Models A, B, V-8, AA, BB (Continued)

Centralization of Brake Shoes

The most common cause of chatter and groans is the lack of centralization of the brake shoes due to the wear of the shoe support bracket which is attached to the backing plate behind the wedge-cam. This allows the shoes to drop and prevents centralization giving poor lining contact, unequal wear and usually chatter.

Correct centralization may be determined by means of a cut-out drum or a suitable brake lining gauge such as the KRW Gauge. It is built especially for Fords and is inexpensive, very satisfactory and can be used on Models A, B and V-8 cars.

In cases where worn or bent shoe support brackets cause chatter due to decentralizing of brake shoes in an up and down position, its effect may be overcome by one of the following methods:

1. Use of a Ford .020" oversize pin in the rollers on the brake shoe which raises shoe about .010". This oversize pin is identified by a depression in the center of the head.
2. Use of pin with eccentric head.
3. Use of pin with square head (Fig. 2) which allows raising of rear shoe (forward acting shoe) of front brakes either .015" or .020". The square head overrides any depression worn in shoe support brackets.
4. Use of a brake shoe roller pin support. This is a bronze clip which fastens over the shoe support bracket and raises both brake shoes to a centralized position.
5. The worn ears of the shoe support bracket may be bent upward. A small crescent wrench is a handy tool for this.

To allow the brakes on Ford V-8 models to centralize side-ways a special floating brake pin makes possible a floating wedge similar in action to that found on the 1935 models (Fig. 3). If such replacement bolts are not available, the present bolt may be ground off 1/16" on each side to accomplish same result. In assembling such bolts be sure that ground sides are parallel with the king pin. This allows the brake shoes to centralize and to overcome chatter and groan.

If chatter still persists, long chamfering of the brake lining on the toes of each shoe may allow better centering and eliminate the noise.

Anti chatter rings which clamp around the **BACKING PLATE** to give rigidity may be used to prevent vibration and noise.

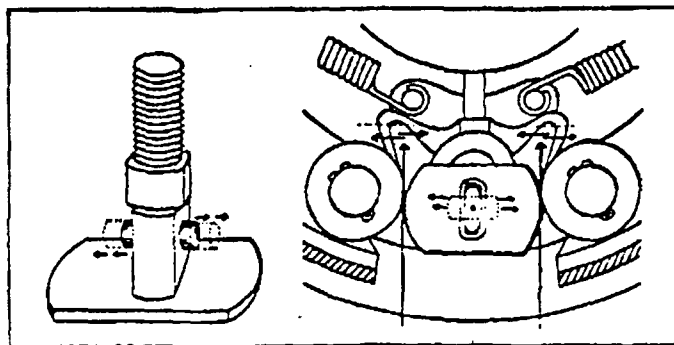


Fig. 3

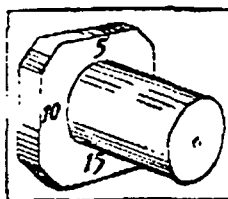


Fig. 2

Shoe found bent or cocked so that they do not fit the drum cannot be centralized. Check lined shoes in brake drum for full surface contact. Peening the web of the brake shoe or closing in the ends of the shoes in a vise or press may be necessary. If shoes are badly distorted replace with good shoes. Always make sure that you get full surface contact.

In cases where the chatter is very noticeable and it is impossible to hold the shoes firmly in position, Bendix Spring Grips such as those used on Bendix two-shoe brakes may be used by drilling holes in the backing plate directly opposite the holes in the brake shoe and inserting Bendix Spring Washers in these holes. Oftentimes brake shoes may be held rigidly in place by merely reversing the upper brake shoe return spring so that it hooks from the back of the shoes outward rather than from the front of the shoes inward.

Increasing length of slot in wedge cam by filing or filing down top of wedge cam guide bolt allows greater cam travel, tending to eliminate high speed fade.

Cotter pins in shoe roller pins must be in end away from backing plate.

Replace grease retainer felts if any oil leakage on rear brakes.

Looseness in the front end of 1933 V-8s, which may cause chatter, may be due to wear of rubber brushings in front spring shackles. Trimming off excess rubber with razor blade and filling space with steel washers will remove play at this point.

The short leverage of the cross shaft pedal lever on some 1933 cars may cause hard pedal. Pedal may be softened by replacing this cross shaft lever with a 1934 unit which has two leverage holes, the upper one being used if softer pedal is wanted. (See Fig. 4.)

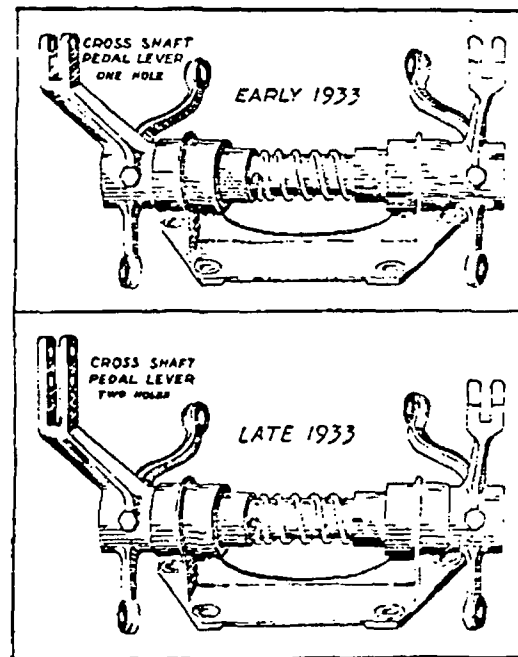
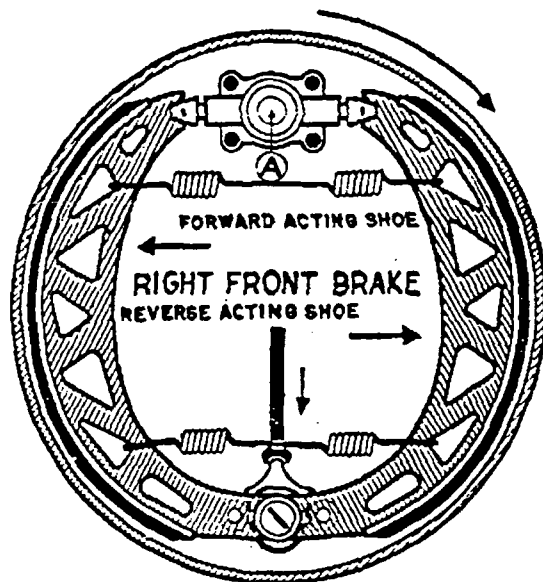


Fig. 4

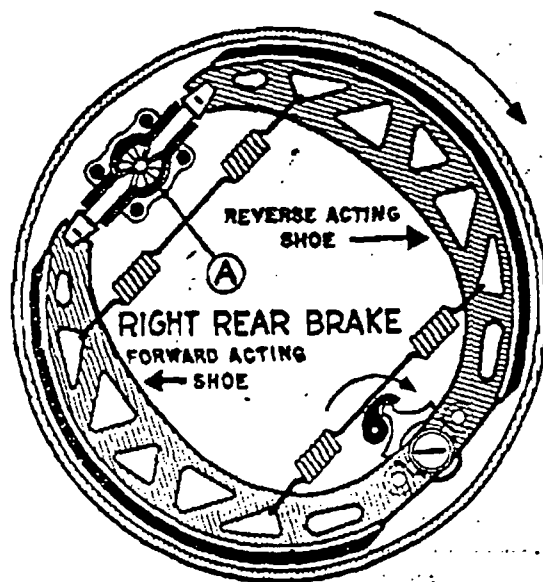
1935 FORD BRAKE



BOTH front and rear wheels are now operated by wedges. All wedges are of a floating type by which we mean that the slot in the center of the wedge is sufficiently wide to allow the cam wedge to shift and, in this way, to impart a self centering action. The wedge bolt no longer functions as an anchor so that both shoes are now more energized. (See Fig. 4.)

The use of wedges all around provides equal speed of application of front and rear brakes.

In previous models, the brake shoes were pinned to the adjusting anchors. In the new brakes, the adjusting shafts are slotted so that the upper ends of the brake shoes are a sliding fit, permitting vertical shoe centralization.



Although the braking area is the same as on the 1934 cars, the lining is now $1\frac{1}{4}$ " wide instead of $1\frac{1}{2}$ " but it has been shortened. The shoes are not supported on the backing plate but they have support ends bearing against the anchor pins.

All drums are equipped with an increased number of cooling fins or ribs, increasing cooling effect about 40%.

Before starting adjustments, make sure that hand brake lever is in fully released position.

Minor Adjustment

1. Check cross shaft levers to see that they do not pull beyond centers.
2. Examine spring shackle studs, shock absorber links and front radius rod mountings for looseness.
3. Take up on square adjusting nut A until slight drag is felt, back off until wheel is just free.
4. Equalize wheels by backing off square adjusting nut A on heaviest wheel.

NOTE: Brakes must be cold when adjustment is made.

Major Adjustment

1. Disconnect brake rods from cam levers on front and rear brakes. Loosen clevis lock nuts at opposite ends of rods.
2. Take up on square adjusting nut A

until slight drag is obtained, back off until wheel is just free.

3. Check and adjust hand lever pull rod so as to obtain $\frac{1}{32}$ " clearance between clevis pin in cross shaft lever and back of slot in hand brake rod. (See Fig. 1.)
4. Reconnect brake pull rods to take out ALL back lash and lost motion. It is recommended that the length of the brake pull rods be $\frac{1}{32}$ " less than the actual distance between cross shaft levers and brake cam lever. (See Fig. 2.) This slightly preloads the system and prevents lost pedal motion. Check each wheel separately. If any wheel drags excessively, it indicates that the rod has been shortened too much.
5. Set hand brake lever in first notch. Turn each wheel at least one complete revolution. Drag should be equal. If not, equalize wheels by backing off square adjusting nut A on heaviest wheel until all turn with same amount of effort.

Average time for complete reline—4 hours.

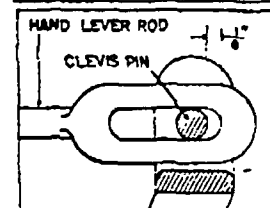


Fig. 1

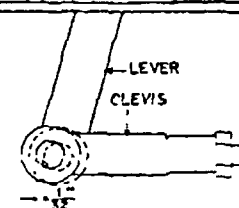


Fig. 2

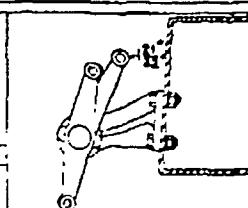


Fig. 3

On trucks, when adjusting pedal rod to secure clearances for the hand lever rod, adjust the pedal rod to secure a distance of $1\frac{21}{32}$ " between the cross shaft lever position and the frame of the car. (See Fig. 3.)

When making a major adjustment, it is well to check position of front brake cam wedges as follows: With pull rods disconnected, apply front brakes by means of a 16" wrench on the front cam levers. Note angle of cam lever in applied position and, if this lever pulls past their centers, either the lining is too thin or there is too much back lash in the shoe operating mechanism. If lining and drum diameter are O.K., replace worn or twisted parts or use cup washers inserted between upper end of push rod and internal lever.

Twisted front brake shafts are often the cause of abnormal back lash in the front brake shoe operating mechanism.

An optional method of removing of back lash in rods in order to give correct lining clearance at wedge end of shoes is to turn adjusting nut A until wheel drags and then back off until just free. With hand pressure only to front braking cam lever, apply brakes until lining is just contacting drum as indicated by wheel drag. Hold the cam lever in this position and adjust length of pull rod to allow entry of clevis pin. Insert clevis pin. Eliminate now any wheel drag by backing off on the square adjusting nut A. If pull rod length has been correctly adjusted, two clicks of the square adjusting nut should free the wheel. More than three clicks indicate too much preloading and rod should be lengthened until wheel turns freely.

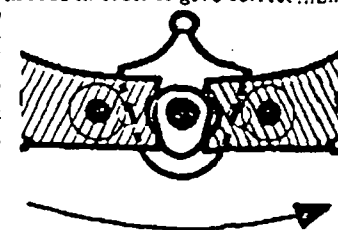
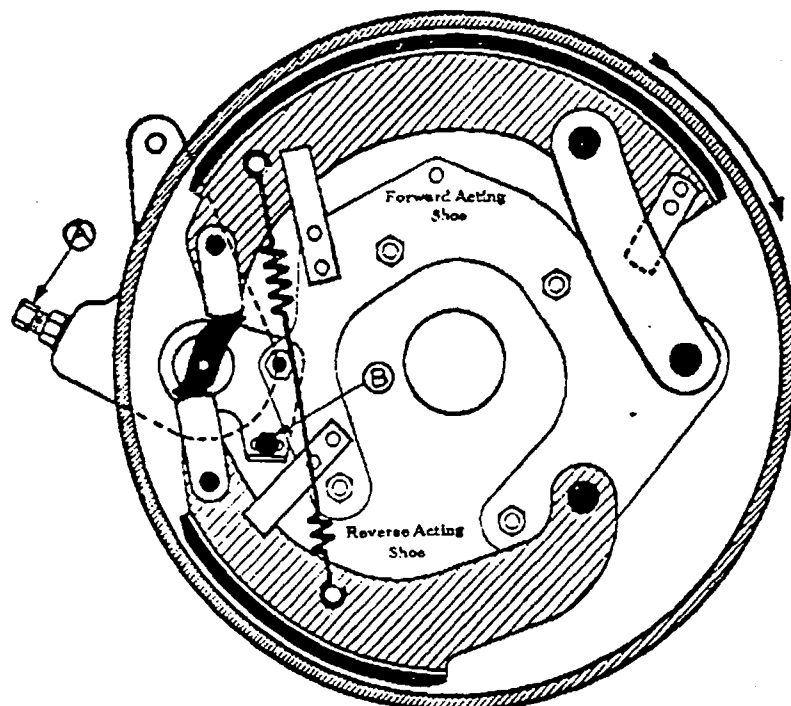


Fig. 4

HUCK BRAKE

(Long and Short Shoe Type)



RIGHT FRONT BRAKE

THE above diagram shows one of the several types of Huck brakes found on General Motors cars prior to 1934. In principle all Huck brakes are alike, although minor changes in design and length of shoes make them appear somewhat different. The Huck brake is a highly energized mechanism, and lining recommended for it depends greatly on the weight of the car on which the brake is used. Multibestos TAILORED Sets supply the correct lining for each size of Huck brake. In addition to the TAILORED Set for the 1930-32 Chevrolet a special moulded-woven TAILORED Set is available.

1933 CHEVROLET AND PONTIAC CARS

The axle shaft on the 1933 models of the above cars is pressed into a flange which is attached to the drum and is so arranged that a wheel puller cannot be used to remove the rear wheels and drums from these cars. There are no peep holes in the drums to examine the brake lining. Therefore proceed as follows:

1. Remove the differential cover at the rear end. A suitable container to hold the differential grease must be placed under this assembly.
2. Take out the necessary pins to allow removal of the two loose differential gears and the spacer block in between the ends of the two axles.
3. Push the wheel and axle assembly in from the outside of the car about $\frac{1}{8}$ ". This will expose two U-shaped shaft lock washers.
4. Remove the shaft lock washers. This will allow the axle assembly which includes the wheel and the brake drum to be pulled out, thus exposing the brake shoes and brake mechanism.

Huck Brake Adjustments

Minor Adjustment

1. None recommended on this brake.

Major Adjustment

1. Disconnect rods or cables at clevis end.
2. Loosen cam centralizing bolt (B).
3. Take up on adjusting nut or screw (A) until heavy drag is obtained.
4. Tighten cam centralizing bolt (B).

5. Check rods and cross shafts to see that all levers are against stops.
6. Adjust rods or cables to this setting and reconnect.
7. Back off approximately twelve flats of adjusting nut (A).

NOTE: On Chevrolets, back off adjusting screw until wheel is just free; then tighten adjusting screw lock nut.

8. Equalize at adjusting nut or screw (A).

Average time required to reline four wheel brakes—4-6 hours.

Maintenance Suggestions

Due to the weight distribution on 1933 Chevrolets and Pontiacs and to the fact that the cross-shaft is full floating, it is necessary to use high friction lining on the front wheels and low friction lining on the rear wheels to get good performance without skidding the rear wheels when the brake is applied. Multibestos TAILORED Set T-614D supplies the correct combination of linings to overcome this difficulty.

When centralizing brakes be sure that cam carrier bracket may be readily moved with a light tap of hammer. It is often found stuck by rust or paint, which prevents centralizing of shoes and prevents the "energizing" action. Use penetrating oil to loosen.

On Buick cars with lubricating fitting on cam assembly, over-lubrication runs through mechanism and gets on the lining.

An easy way of centralizing shoes is to loosen cam carrier bolt and kick foot pedal on and off hard several times. Then hold pedal on and lock cam carrier bracket. Clearance should be about .012" at all points. A clearance of less than this will inhibit the energizing action and cause hard pedal.

To take up excessive lost motion in control system, disconnect rods or cables, adjust brakes to drag, refit cables to brake, and then follow through on adjustments. Late model Cadillac and LaSalle cars equipped with booster brakes are adjusted according to standard procedure.

Huck brakes often develop squeals and squeaks that can be traced directly to faulty adjustment or general sloppiness and looseness of the brake mechanism. In a few cases these noises are attributable to the lining and can be cured only by replacement of the faulty material. In the majority of cases the various causes of these noises may be cured by the following suggestions:

Cause

Loose shoes due to loose spring guide clips or loose spring washers.

Worn anchor pins and anchor pin holes.

Side play at fittings between anchor pins and shoes.

General looseness, due to weak brake springs.

Shoes not centralized—too or heel contact.

Shoes bent or cocked giving edge contact when brake is first applied.

Backing plate warped or thrown out of line by strain of frequent emergency stops.

Lack of lubrication.

Knock when brakes are applied.

Remedy

Squeeze clips together and replace shoes without springing clips or, in case of spring washers, insert a spacer washer or replace with new springs.

Replace worn anchor pins.

Insert a spacer washer to remove all side play.

Replace with new brake springs.

Centralize shoes according to standard procedure.

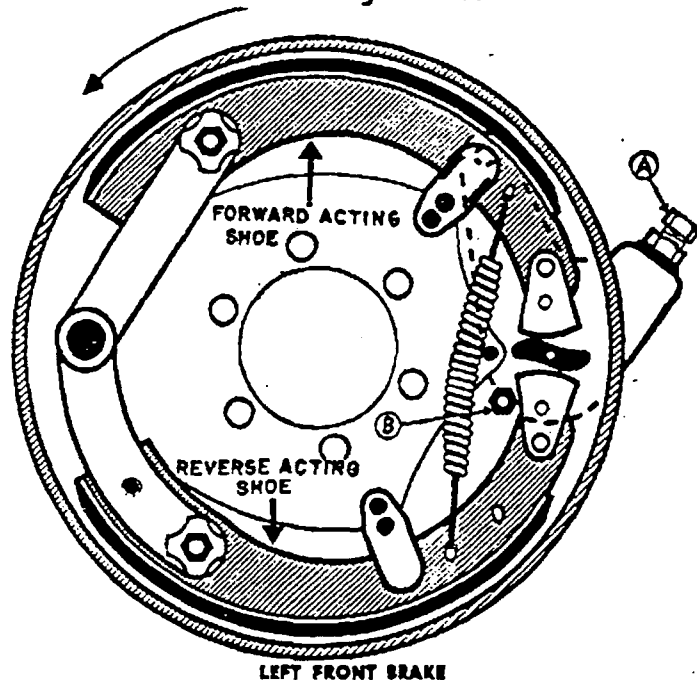
Straighten or replace shoes or, if not too severe, sand off lining at original contact points.

Replace backing plate or, if not too badly warped, loosen nuts on backing plate $\frac{1}{8}$ turn.

Apply heavy fibre grease sparingly to anchor pins, guide clips, and other bearing points.

Tighten backing plate bolts.

HUCK BRAKE (Two Long Shoes)



HUCK brakes with two long shoes are fundamentally the same as the earlier type with the long and short shoe. Except for the 1934 Chevrolet they have a floating shoe and an anchored shoe. In the 1934 Chevrolet brake both shoes floated.

On the 1934 Chevrolet, both the shoes have articulating (hinge) links that are interchangeable. On the 1935 models, the articulating (hinge) link of the reverse shoe is slightly curved and fits over a pin fastened in the anchor end of the reverse acting shoe. The reverse shoe now being held at two points is prevented from lifting away from the drum when the brake is applied with the car in forward motion. This gives more uniform wear.

As in all previous models of this type of brake, it is essential that shoes be held as rigid as possible to avoid squeaks, squeals and groans. The brake clip on the forward shoe has a steel spring, while the clip on the reverse shoe holds the shoe snugly only when squeezed together tightly. Spring washers hold the hinge links securely to the shoe. These must be tight to avoid looseness of the shoes but must not bind. Anchor pins, hinge pins and spring clips should be lubricated with fibre grease to assure easy brake action.

A short rigid cross shaft is used on the 1934 and 1935 Model Chevrolets. This takes the place of the floating full length cross shaft used on 1933 and earlier models and helps overcome the difficulty previously experienced in balancing braking performance between front and rear wheels.

The axle shaft on the 1934 and 1935 models, similar to that on the 1933 model, is pressed into a flange which is attached to the drum and is so arranged that a wheel-puller cannot be used to remove the rear wheels and drums from these cars. There are no peep holes in the drums to examine the brake lining. See Page 30 for procedure for removing rear wheels.

Brake Adjustment for 1934-35 Chevrolet Huck Brakes

Major Adjustment

1. Disconnect pedal pull back spring and pull rod, front and rear pull rods and hand brake pull rod.
2. Set hand brake lever to extreme forward position and assemble hand brake pull rod after it has been set to its proper length (15 $\frac{3}{4}$ " between rear of front hole and rear of slot at opposite end) (11 $\frac{1}{2}$ " for DB $\frac{1}{2}$ ton truck).
3. Hook up pull back spring and set brake pedal stop for $\frac{1}{4}$ " clearance between floor board and pedal.
4. With the brake pedal against its stop, adjust the pedal pull rod to its proper length, connect up front and rear brake rods and cables to take up all slack. Do not move cam levers away from their stops in hooking up the brake rods.
5. Centralize shoes in drum as follows:
 - (a) Loosen cam centralizing bolt (B).
 - (b) Tighten up on adjusting nut or screw (A) until heavy drag is obtained.
 - (c) Tighten centralizing bolt (B).
6. Adjust clearances by backing off adjusting nut (A) until wheels turn freely.
7. Equalize by loosening adjusting nut (A) on tightest wheel.

THE SAME GENERAL ADJUSTMENT PROCEDURE APPLIES TO BUICK AND CADILLAC HUCK BRAKES WITH LONG SHOES.

Average time to reline four wheel brakes between 4 and 6 hours.

Maintenance Suggestions

The maintenance suggestions shown on Pages 30-31 for the long and short shoe type of Huck brakes also apply to this brake mechanism.

Front brake cables on 1934-35 Chevrolets are identified by a letter "L" or "R" on the brake rod end. These cables are not interchangeable.

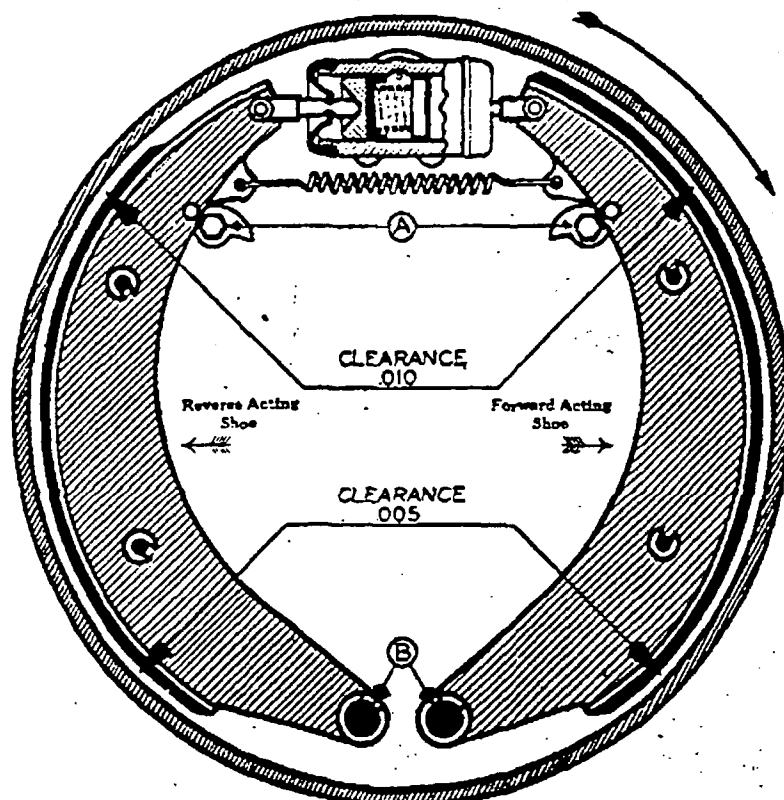
In assembling shoes, watch movement of articulating link and shoe. On spring clips that hold articulating link to brake shoe be sure they are well lubricated with fibre grease. Do not tighten nut so that correct brake action is retarded. We suggest in tightening that the nut be fully tightened and then backed off $\frac{1}{4}$ turn.

Squealing on the rear brakes of Chevrolet passenger cars and trucks is usually due to the fact that the lining is making toe contact only. Very often it is found that the nut at the end of the articulating link where it connects with the brake shoe is too tight. This does not allow easy pivot action of the brake shoe and defeats the purpose of the articulating links (hinge link). Loosening this nut and lubricating it usually overcomes squealing.

On some of the heavy cars equipped with Huck brakes, washers are used as fillers and additional washers may be used to take up side play of the shoe and yet not make the shoes bind.

The front end shimmy on 1934 Chevrolets can often be overcome by tightening the steering mechanism and truing up the drums. However, several cases have been found where the bushing in the backing plate which goes over the spindle is worn so much that it is necessary to replace it.

LOCKHEED HYDRAULIC BRAKE



RIGHT FRONT BRAKE

THIS type of brake is practically a non-energizing brake actuated by hydraulic force. The pressure applied at the pedal is transferred to the wheel cylinder by a column of non-compressible fluid which assures equalized pressure at all four wheels. However, as return springs are attached to the shoes it is essential that these springs be equal in tension to preserve the balance afforded by the system.

Certain intermediate type trucks and a few of the later passenger cars utilize a different size hydraulic cylinder on the front wheels than on the rear. This distributes the pressure in the desired ratio front and rear and thus controls the braking performance of the entire system. Some 1935 cars are equipped with "step-bore" wheel cylinders which have different size cylinder pistons operating forward and reverse acting shoes, thus giving greater pressure on one shoe than on the other. See Page 44 for description.

A moulded lining of the type supplied in Multibestos TAILORED Sets should be used to assure good performance, long life, and freedom from noise and scoring.

Lockheed Hydraulic Brake Adjustments

Minor Adjustment

1. Check pedal for play. (Should be $\frac{1}{4}$ ".)
2. Set out top cam (A) on forward shoe until wheel is locked. Back off until free.
3. Set out top cam (A) on rear shoe until wheel is locked and back off until free.
4. Follow same procedure on remaining wheels.
5. Check and fill supply tank. (Use genuine Lockheed fluid.)

NOTE: This adjustment should give you solid pedal. If this is not obtained, check for leaks—repair and bleed system.

5. Set eccentric anchor pin (B) on same shoe until ring gauge becomes free.
6. Check with feeler gauge—heel .005" —toe .010".
7. Lock anchor nut at (B) tight.
8. Set rear shoe in same manner using same clearances.
9. Lock anchor nut at (B) tight.
10. Follow same procedure for setting shoes on remaining three wheels.
11. Check supply tank and add fluid if necessary.

NOTE 1: This adjustment should give you solid pedal. If not, check for leaks—repair and bleed system.

NOTE 2: In reassembling brake shoes, care should be taken to see that long shoe is the forward shoe in each wheel.

NOTE 3: When repairs are made the system must be bled. In bleeding lines it is absolutely necessary to fill the supply tank after the bleeding of each wheel.

Major Adjustment

1. Loosen anchor lock nuts at (B).
2. Set cams (A) in released position.
3. Mount ring gauge or dummy drum on spindle or axle.
4. Set out top cam (A) on forward shoe until slight drag is obtained.

Average time to reline four wheel brakes between 4 1/2-5 1/2 hours.

Maintenance Suggestions

In case it is necessary to replace a shoe return spring be sure that opposite brake has a spring of the same tension. Keep the return springs in pairs of equal tension. It prevents unequal brakes which may cause car to duck or dive to the left or right.

Squeal—often caused by sloppy or worn shoes or bushings or improper anchor adjustment. Squeals are often caused in this brake mechanism by windows or open spaces between the brake shoe and the lining. The use of a filler material as explained on Page 3 will usually overcome such noises.

Lateral vibration of shoes causes squeal and noise. This may be overcome by the use of shims or spring washers on shoe guides. Present washers may be bent to make a spring washer.

A spongy pedal usually indicates air in the fluid system.

It is advisable to wire up wheel cylinders before removing shoes to prevent pistons being accidentally blown out. Saves rebleeding the system.

Setting eccentric anchors should always be done by turning them toward each other so as to bring shoes down and out into the drum. The wrong procedure here sometimes results in excessive forward shoe lining wear.

On cars where eccentric anchors cannot be turned from outside it is suggested that they be removed and the end of the screw portion slotted for a screw driver.

Lockheed Hydraulic Brake Adjustments (Continued)

As anchor bolts are case hardened, it is necessary to grind off hardened surface of threaded end so that it may be slotted.

Whenever possible replace shoes, anchors, etc., from same place as originally removed. This avoids considerable unnecessary labor in making adjustments.

If new fluid in Hydraulic system is necessary, use only new, clean Hydraulic fluid.

Bleeding of Hydraulic brake systems is recommended by following the procedure as outlined below. (See Pages 44-46 for more information on Hydraulic systems.)

Use two men, one man at the brake mechanism and one man in the car. Keep the supply tank filled at all times (master cylinders with the supply tank cast in the same unit require filling after four strokes). An automatic refilling tool for the brake master cylinder as illustrated in Fig. 1 will prevent it from running dry during the bleeding operations. The man in the car should pump up pressure with the pedal, holding that pressure with his foot. The man at the brake unlocks the bleeding system $\frac{1}{4}$ turn. The man in the car pushes on the pedal, and before it strikes the floor he should instruct the man at the brake to lock the system. This operation should be repeated four or five times on each wheel in the following order:

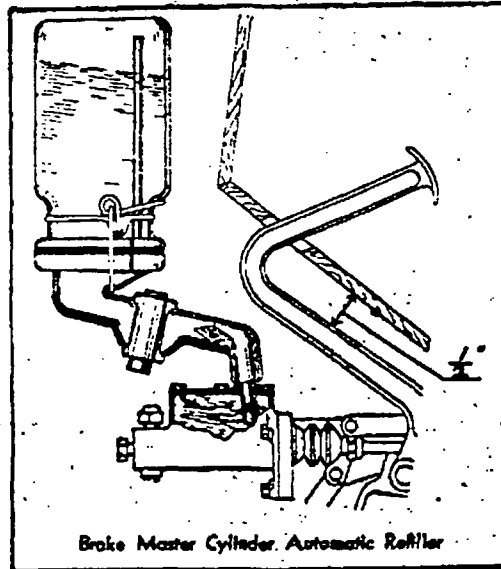


Fig. 1

This method of bleeding assures removal of all air in the front line and avoids the possibility of spongy pedal and poor performance.

There are two arrangements of the step-bore cylinders found on 1935 cars. In one class the larger cylinder operates the reverse acting shoe, giving more uniform wear of the brake linings. This arrangement is

found on cars in the Chrysler group. In the other class the larger bore cylinder operates the forward acting shoe, giving a very effective brake. This arrangement is found on 1935 Studebakers.

Cars in the last named class have experienced excessive forward acting shoe lining wear. It has been found that the wheel cylinders can be interchanged right front with left front, right rear with left rear, giving a system where the larger bore cylinder acts as the reverse acting shoe. As only three studs are used to hold the brake cylinder to the backing plate, it is necessary in making this change to drill one new hole in the backing plate.

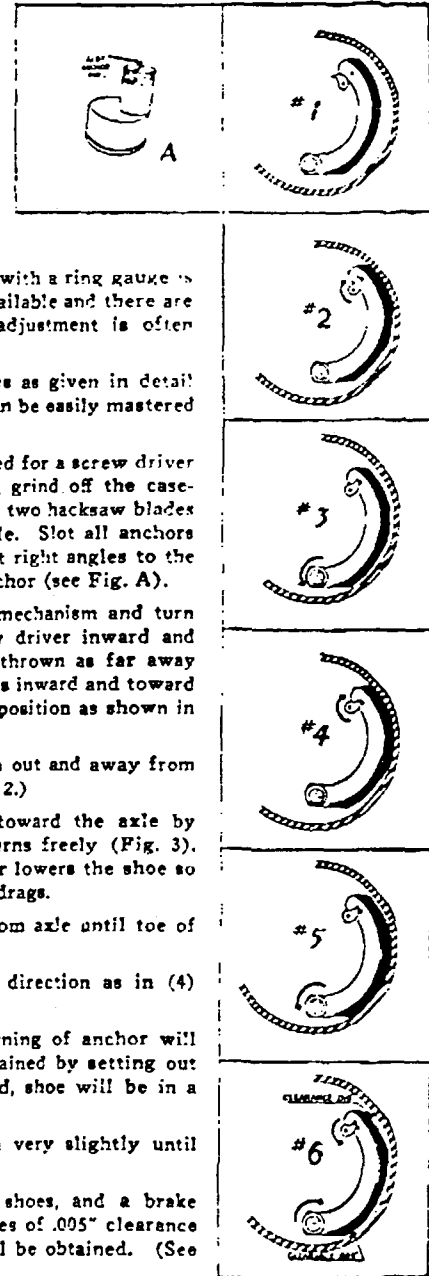
Oftentimes a ring gauge or dummy drum is not available for adjusting Hydraulic brake systems. The following is a method of adjusting Hydraulic brakes without the use of either of these useful appliances.

Adjusting Hydraulic Brakes Without a Ring Gauge

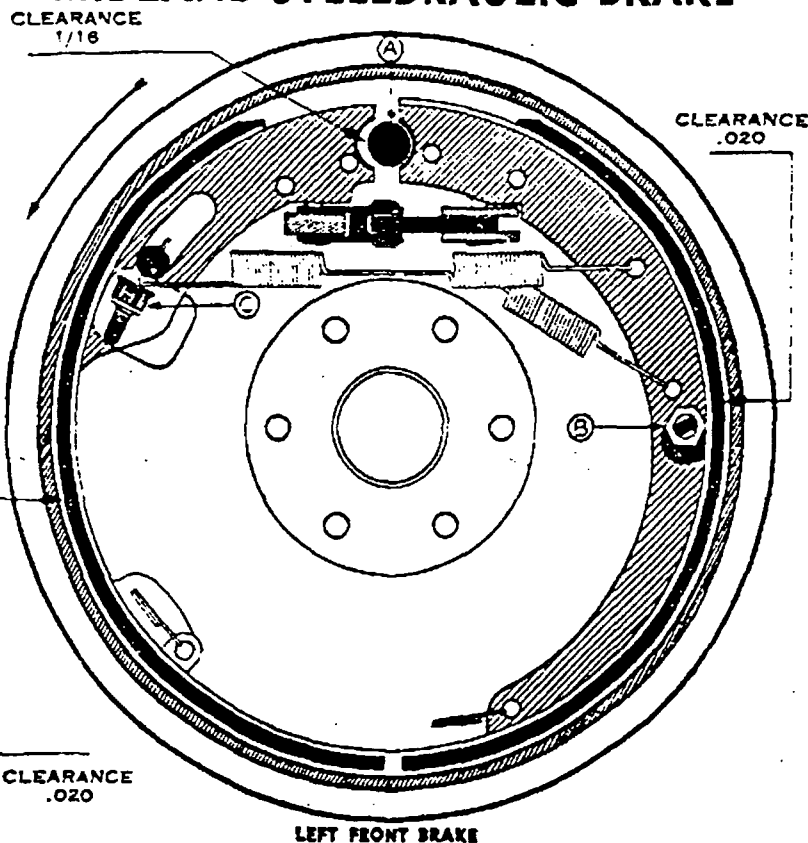
The adjustment of Hydraulic brakes with a ring gauge is very simple, but when no ring gauge is available and there are no peep holes in the drum, a correct adjustment is often quite difficult to make.

The method of "feeling in" the shoes as given in detail below has proved very satisfactory and can be easily mastered after a few trials.

1. If eccentric anchor bolts are not slotted for a screw driver remove them from the backing plate, grind off the case-hardened surface and slot the end with two hacksaw blades placed side by side in the same handle. Slot all anchors in a like location so that the slot is at right angles to the high and low sides of the eccentric anchor (see Fig. A).
2. Replace anchors and shoes in brake mechanism and turn eccentric anchors by means of screw driver inward and toward the axle so that the shoe is thrown as far away from drum as possible. Also turn cams inward and toward the axle. All shoes will then be in a position as shown in Fig. 1.
3. Adjust one shoe at a time. Turn cam out and away from axle until brake just drags. (See Fig. 2.)
4. Turn eccentric anchor inward and toward the axle by means of screw driver until drum turns freely (Fig. 3). Note that the movement of the anchor lowers the shoe so that lining at toe of shoe no longer drags.
5. Again turn cam outward and away from axle until toe of shoe just drags on drum (Fig. 4).
6. Then turn eccentric anchor in same direction as in (4) until drum turns freely.
7. Repeat (5) and (6) until further turning of anchor will not free the drum from the drag obtained by setting out cam. When this condition is reached, shoe will be in a position as indicated in Fig. 5.
8. Then back off both anchor and cam very slightly until drum turns freely.
9. Repeat the above procedure on all shoes, and a brake adjustment very close to the tolerances of .005" clearance at heel and .010" clearance at toe will be obtained. (See Fig. 6.)



MIDLAND STEELDRAULIC BRAKE



THIS brake is a highly energized brake. Pressure on the brake pedal is transmitted through rods and cables into a direct pull on the toggle inside the brake drum. This toggle forces the flexible end of the brake band into contact with the rotating drum, which tends to carry it around, thereby forcing the rigid portion of the band against the drum with great force. Soft woven linings give a grabby action on this brake, while rigid moulded and non-compressible woven lining of the type supplied in Multibestos TAILORED Sets assures good performance, soft pedal, and long life.

The above diagram shows the latest model, T section, Steeldraulic brake equipped with long toggle. Earlier models embody the same principle but are slightly different in construction and method of adjustment. U-section shoes and short toggles were standard equipment on cars made prior to August, 1930, and in certain model cars difficulty is experienced in obtaining soft pedal. This difficulty is overcome by the correct type of lining—TAILORED Sets supply this without any guess-work.

The moulded lining as supplied in Multibestos TAILORED Sets is used on the flexible end of the band. The compressed woven lining is used on the rigid end of the band. This combination assures good performance, long life, correct effectiveness under all weather conditions without grabbing.

Midland Steeldraulic Brake Adjustments

Minor Adjustment

1. Depress pedal three inches from floor, then adjust nuts (C) at flexible end of band to give proper equalization.
2. Always check clearances at anchor.

Major Adjustment

1. Adjust cable or rod to obtain $1/16''$ clearance between the anchor (A) and the flexible side of the shoe. (See maintenance suggestions.)
2. Adjust eccentric (B) for $.020''$ clearance between lining and drum at that point. Turn adjusting nut (C) to obtain $.020''$ clearance between lining and drum on the flexible side of shoe.

NOTE: Clearances of $.040''$ between the lining and the drum were previously recommended for Steeldraulic brakes. Multibestos Institute men have found that such large clearances

between drum and lining are necessary when greater effectiveness is desired. However, with Multibestos TAILORED Sets it is recommended that the clearance between the drum and lining on the rigid end of shoe at eccentric (B) be set at approximately $.020''$. In setting the brake mechanism by depressing the pedal half way as shown in Adjustment Recommendation 3 below, the clearance between the drum and the lining on the flexible side of the shoe may exceed $.020''$ in certain cases. As long as the clearance between the drum and the lining at point B is approximately $.020''$, the clearance between the drum and lining at other points will automatically take care of itself.

3. Depress pedal half way. Take up on adjustment (C) on flexible side of shoe until the proper equalization is obtained.
4. Release pedal and check for drag.

Average time to reline four wheel brakes between $5\frac{1}{4}$ and 6 hours.

No time allowance has been included if it is found necessary to replace cables or free them up. This matter should be considered very carefully before quoting on brake jobs for Steeldraulic brakes.

Maintenance Suggestions

In adjusting length of rod hold cable end with end wrench as shown in Fig. 1 below, so that turning of the rod will not twist cable. This is important for correct operation of cables.

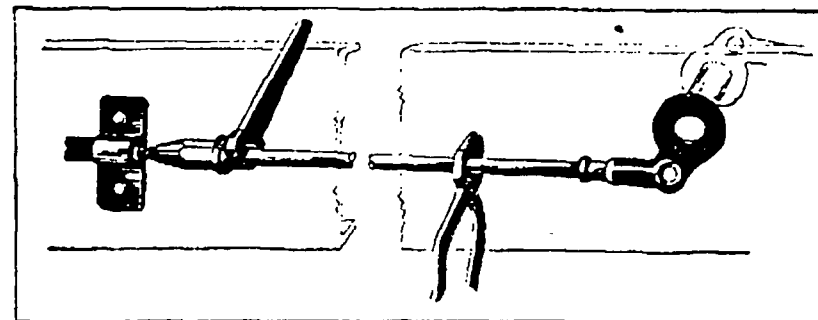


Fig. 1

Mark shoes before disassembling and reinstall on same brake as that from which they were removed. Do not exchange shoes, as they are fitted to backing plate for centralizing. Take care that shoes are not distorted in relining.

Midland Steeldraulic Brake (Continued)

A slight film of fibre grease on backing plate where shoe is held to plate insures free action.

Do not try to obtain a high pedal, a high pedal usually results in a hard pedal.

Putting lining on in two pieces insures tighter fit, especially where brake clamps are not available, and assures flexibility of the band.

Cables must be free in conduit. Be sure cable is not frayed inside conduit, as it prevents complete brake action, although you may have apparent freedom. Don't take chances. If in doubt replace cable.

When reassembling brake, be sure the toggles are placed over the clevis pins before return spring is hooked.

The commonest cause of hard pedal is improper adjustment. Be sure you can get the 1/16" clearance between the anchor pin and the flexible shoe. If you cannot, it means that the cables have stretched and must be renewed.

Half of a 1/8" cotter pin makes a good 1/16" feeler gauge for setting clearance at anchor.

Shoes should be centered vertically so that a clearance of .020" is obtained at the bottom. This is done by filing out anchor pin openings in shoes or by hammering down lips over anchor pin.

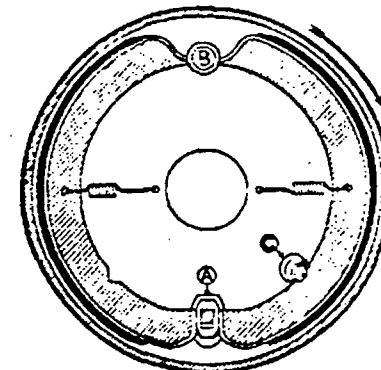
Shoe return spring on flexible end should hook over clevis pin inside of shoe next to backing plate. This eliminates squeal, as it prevents twisting of flexible side of shoe.

To increase the pedal travel on 1929 Pontiacs, release the jam-nut on the pedal stop screw and loosen the stop screw. Adjustment of this stop screw will increase pedal travel from 4" to 6". Care must be taken, however, to set the pedal so that there will be shoe clearance between the pedal and the floorboard to avoid rattles. After making this adjustment, the stop light switch spring should be stretched so as not to retard the return of the pedal to normal release position. It has also been found on 1929 Pontiacs that the push-pull rods between the pedal and the cross-shaft must be adjusted so that when the pedal is fully depressed there is no twisting action on the cross-shaft, nor any strain on the rods. These push and pull rods must be adjusted by "cut and try" methods until the clevis pins at the ends of both rods line up with the holes at the cross-shaft lever both in released and depressed position of the pedal.

On the 1935 Hupmobile Steeldraulic brakes pliers are not required to make adjustments. The knurled pin C is operated by an adjusting screw located so as to be easily reached from the outside of the backing plate.

Some of the 1935 Hupmobile models have vacuum power boosters operating the Steeldraulic brakes. Models D and O have Hydraulic brakes.

STEWART WARNER POWER BRAKE



RIGHT FRONT
BRAKE

THE Stewart-Warner power braking system used on all 1933-35 Pierce-Arrow cars comprises a mechanical power unit at the rear of the transmission and Stewart-Warner mechanical wheel brakes.

The treadle-type brake pedal is connected to the power unit, and depressing the pedal brings a pressure plate into contact with the rotating friction disc which is mounted on two threaded members or actuators on the transmission shaft. Pressure applied to the disc momentarily retards its speed in relation to the speed of the shaft and causes one of the actuators to screw out against a yoke shaft and operate the distributor lever to which the front and rear brake cables are attached. The outer actuator screws out to apply the brakes when the car is going forward; and the inner actuator, when the car is moving backward. A dense Rigid Moulded lining of medium friction is required for this brake to give suitable performance. Specific Multibestos TAILORED Sets are made for this brake mechanism.

Adjustment

Power Unit Adjustment

(The power unit adjustment consists of a single turnbuckle on the rod connecting the brake pedal to the power unit.)

1. Jack up rear wheels and run engine with transmission in high gear.
2. Release lock nuts and tighten turnbuckle until distributor shaft moves forward a slight amount. Then back off turnbuckle just enough to permit distributor lever to return to the "off" position.
3. Back off turnbuckle additional half-turn and tighten lock nuts.

Cable Adjustment

1. With wheels jacked up, and cable adjustments backed off to provide slack in cable, tighten wheel brake adjusting nuts (B) until wheels lock when turned by hand.
2. Back off each wheel brake adjusting nut (B) two notches.

3. Tighten cables until wheels again lock when turned by hand.
4. Tighten lock cable lock nuts.

Wheel Brake Adjustment

1. With wheels jacked up, tighten adjusting nuts (B) so that wheels lock when turned by hand.
2. Back off front wheel adjusting nuts (B) 10 notches each and rear wheel adjusting nuts (B) 12 notches each.
3. If it is necessary to centralize brake shoes, screw centralizer screw (C) in until brake drags slightly, then back off centralizer screw until wheel is free (approximately 6 notches).

To Check Wheel Brake Adjustment drive car at approximately 25 m.p.h. on clean asphalt street and apply brakes gradually, increasing pressure sufficiently to cause wheels to lock. Should there be any variation shown by the markings on the road surface, back off the adjusting nut on the wheels showing the heavy braking until braking is uniform on all four wheels.

NASH FRONT WHEEL BRAKES (Prior to 1930)

LEFT FRONT BRAKE

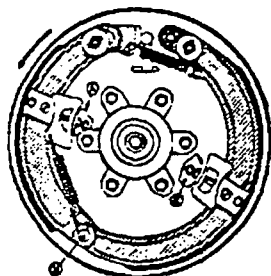


Fig. 1
Standard Light Six and
Special Six 1926, '27, '28

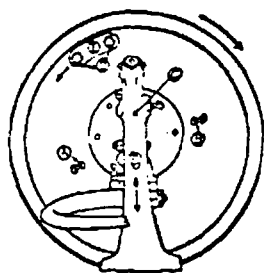


Fig. 2
Rear View—all models
1926, '27, '28

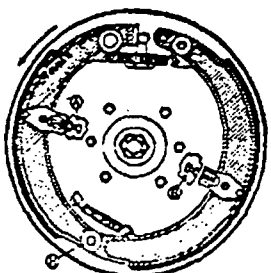


Fig. 3
Advanced Six
1926, '27, '28

Three different front brake mechanisms as shown on this page are used on the various models. The principle used in all three is the same and they differ only in minor details of construction.

The front wheel internal brakes on Nash cars prior to 1930 require a rigid moulded, medium friction lining as supplied in Multibestos **TAILORED** Sets.

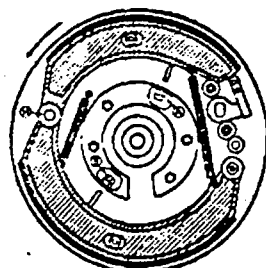


Fig. 4
1929 Nash Series 400

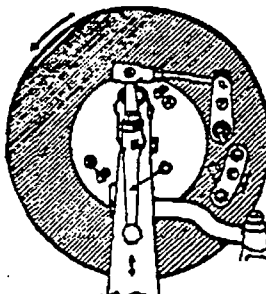


Fig. 5
Rear View
1929 Nash Series 400

1926-1929 Nash Front Brake Adjustments

1. Jack up all four wheels, free up and lubricate all connections, adjust wheel bearings and test for eccentric drums before making any brake adjustments.
2. Disconnect both front brake pull rods and loosen brake clearance adjusting screws (A) and (B) until there is no lining drag.
3. Screw in adjusting screw (A) until wheel drags and back off until wheel turns freely.
4. Screw in adjusting screw (B) until wheel drags and back off until wheel turns freely.
5. Apply brake with monkey wrench on operating lever (C). With brake applied this lever should stand directly in line with center line of front axle of car. If not, loosen anchor screws (D) and with light hammer tap clamp plate (E) toward rear of car about 1/16".
6. Tighten anchor screws (D) and apply brake with monkey wrench on operating lever and see if lever is in line with axle. If not, change position of clamp plate (E) by loosening anchor screws (D), and tapping with hammer until the lever does line up with the front axle. On 1929 400 series models shoe lever (F) should stand vertical when brake is applied. If not, adjust the length of link (G) until with brake applied shoe lever stands vertical and operating lever is in line with center line of front axle.
7. Recheck lining clearance at shoes by means of adjusting screws (A) and (B) and reconnect brake rods.
8. Equalize by adjusting screws (A) and (B) on heavier wheel. Be sure and tighten locknuts on screws (A) and (B) after final adjustment.

External rear brakes are adjusted in accordance with standard External Brake Procedure shown on Page 23.

Maintenance Suggestions

Linings for 1926-1929 Nash Front Brakes should have a long chamfer to avoid grabby and erratic brakes. According to the Nash Company the long chamfer should be on the toe of the primary or short shoe (the end of the shoe away from hinge pin [H]) and on the toe of the secondary or long shoe (the end of the shoe nearest hinge pin [H]). Multibestos Institute men have found that squeaks and grabby brakes can often be cured by also chamfering the lining back about 2 inches at the heel of the primary or short shoe.

If Nash front wheel brakes are grabby the first thing to check is to see that operating lever (C) is in line with front axle when brake is fully applied.

Grabbing of brakes after adjustment may often be corrected by centralizing the brake shoes in the brake drum. A jig for this purpose is supplied by the Nash Company. In the absence of a Nash jig centering may be accomplished by removing the front wheel, loosening slightly cap screws on the backing plate, replacing the wheel, and applying the brake hard two or three times. Then remove wheel and tighten cap screws securely without changing the position of the backing plate. This centralizes the shoes within the brake drum and usually overcomes grabbing tendencies.

HYDRAULIC BRAKE SYSTEMS

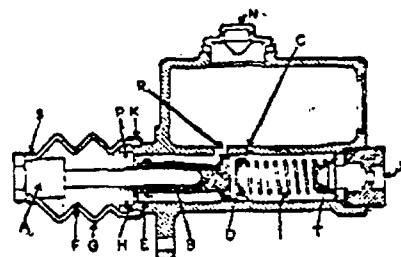


Fig. 1
Master Cylinder

- A—Rod
- B—Piston
- C—Compensating Port Hole
- D—Primary Cup
- E—Secondary Cup
- F—Vent
- G—Boot
- H—Washer
- I—Spring
- J—Outlet to Brake System
- K—Boot Clips
- N—(Fig. 1) Vent Cap
- O—(Fig. 2) Inlet Valve
- P—(Fig. 1) Spring Stop
- Q—(Fig. 2) Spring Washer
- R—Turret Port
- S—Boot Clips
- T—Double Check Valve

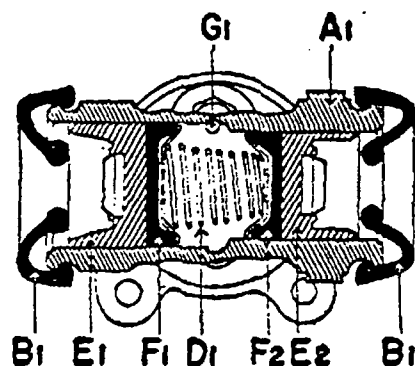


Fig. 4
Step-Bore Wheel Cylinder

- A1—Outer Casting
- B1—Rubber Boot
- C1—Connecting Link
- D1—Piston Cup Return Spring
- E1—Piston
- F1—Smaller Piston
- G1—Piston Cup
- H1—Smaller Piston Cup
- I1—Bleeder Valve

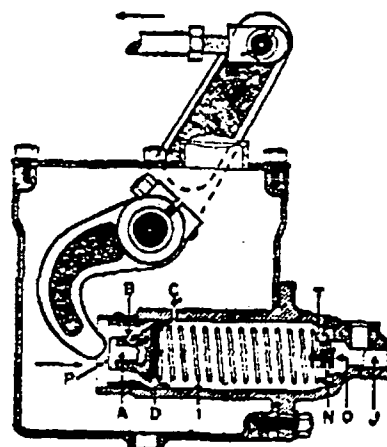


Fig. 2
Box Type Master Cylinder

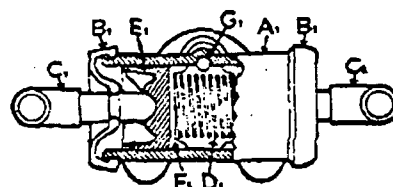


Fig. 3—Wheel Cylinder

The hydraulic wheel cylinder used on the Steeldraulic brake is shown in Fig. 5. Note the use of a rigidly held rubber diaphragm.

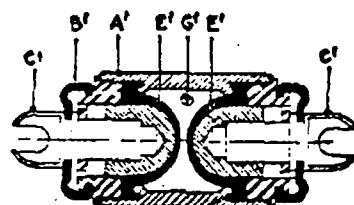


Fig. 5—Wheel Cylinder

THE master cylinder shown in Fig. 1 is the integral tank master cylinder (compensating type) in common use on late model cars. The Barrel Type cylinder (not shown) is on the same principle, except that a dash type gravity supply tank is used. The Box Type master cylinder (Fig. 2) is the same as the barrel type except that the master cylinder itself is submerged in a reservoir of hydraulic fluid instead of having a dash supply tank.

The plain master cylinder (non-compensating) is a simple cylinder used in conjunction with a dash supply tank equipped with a plunger pump to replace fluid lost by seepage or when bleeding the system. Compensating type cylinders:

1. Constantly maintain the correct volume of fluid under varying heat conditions.
2. Constantly maintain the correct volume of fluid under extreme cold conditions.
3. Automatically replace fluid lost through gravity seepage or slight leaks.
4. Eliminate pump in supply tank necessary during bleeding operation.

Wheel cylinders, although differing slightly in appearance, all operate under the same principle as the cylinder picture in Fig. 3.

The workings of a hydraulic system are as follows:

1. Depression of foot pedal causes piston (B) and cup (D) to move forward in the cylinder barrel. A very small movement forward of cup (D) closes compensating port hole (C) and the pressure stroke commences.
2. Fluid is forced through copper tubing and flexible hose to the wheel cylinders, which, under hydraulic pressure, causes the wheel pistons (E) and connecting links (C) to move outwardly against brake shoes, thus expanding the shoes and lining against the drum. The column of fluid being incompressible and automatically maintained at the correct volume, is, by the principle of hydraulics, transmitted to all surfaces with equal and undiminished force. This assures equalization of pressure at all four wheel cylinders.
3. Removal of pressure from brake pedal permits return of pedal and push rod (A) to their off position and return of piston (B) and cup (D). Removal of hydraulic pressure at the wheel cylinders allows return of the brake shoes to relaxed position because of tension of return brake springs.
4. The construction of the above type of compensating cylinder equipped with a secondary cup (E) allows fluid on both sides of the primary cup thus avoiding air pocketing. The return to off position of piston (B) and cup (D) is much faster than the return of fluid from the braking system through outlet (J). As a consequence a momentary vacuum is created in cylinder barrel and additional fluid is drawn into system through drilled holes in piston (B) and past lip of cup (D) as well as through compensating port hole (C). As the fluid finally returns to master cylinder excess is by-passed through compensating port hole (C) back into the reservoir.
5. Expansion of fluid due to heat, contraction due to cold or loss by seepage or bleeding system is compensated by flow in either direction as the occasion demands, through compensating port hole (C).
6. A double check valve (T) is used in all master cylinders of the compensating type. It is held at the closed end of the master cylinder barrel by the piston cup return spring (I). This valve performs two functions:
 - (a) It acts as a seal to prevent fluid or air being drawn into the system during the bleeding operation and prevents entire loss of fluid in case a break in the tubing occurs.
 - (b) It maintains a slight pressure (approx. 7 lbs.) in the brake system—not sufficient to cause the shoes to drag but enough to assure immediate action at the wheel cylinders when foot pedal is depressed. A slightly higher pressure (10-12 lbs.) is maintained in some of the newer hydraulic systems.

Wheel Cylinders on Some 1935 Models

1935 Chrysler, Dodge, Plymouth, and Studebaker cars are employing a new "Step-bore" wheel cylinder construction (see Fig. 4) in which pistons of different diameters are used on forward and reverse shoes within the same brake assembly.

Hydraulic Brake Systems (Continued)

This gives right and left hand cylinders which are not interchangeable as such. Accordingly, in case of removal of these cylinders care must be exercised in their replacement.

On 1935 Studebaker models the large bore is always assembled toward the front of the car. (See maintenance note under Hydraulic Brakes.)

On the Chrysler cars the large bore is always assembled toward the rear of the car. The cylinders are marked (R) to indicate the reverse acting shoe connection.

As the front wheel brake cylinders are different from the rear wheel brake cylinders in their cylinder bore sizes, they should never be interchanged front and rear, as it would cause badly unbalanced brakes.

Maintenance Suggestions

1. Master cylinder supply tank should be kept full of fluid.
2. Air vent at top of vent cap (N) should be kept open and free from dirt.
3. Compensating port hole (C) must be kept open. Locked brakes, spongy pedal, and no brakes at all may all be caused by blocking of the compensating port hole.
4. ONE HALF-INCH FREE MOVEMENT OF ROD (A) IS NECESSARY WHEN PEDAL IS RELEASED. Should rod be adjusted tightly against piston (B) then compensating port hole (C) will be blocked by cup (D) and compensating action of master cylinder will be destroyed.
5. Examine cups (D) and (F) occasionally and, if swelled, replace.
6. Leakage of fluid past piston (E) may be partially remedied by the replacement of cups (F) but, if cylinder walls are scratched, re honing is necessary.
7. Bleeding the system.
(Whenever system has been disconnected or when air is found in the system it is necessary to bleed the lines.)
 - (a) Fill supply tank with fluid. (An automatic refiller bottle like Fig. 1, Page 36, will prevent master cylinder from running dry during bleeding.)
 - (b) Remove cap from bleeder valve (G) and screw in bleeder drain—brass fitting with rubber tube attached—the end of which is immersed in clean container partially filled with brake fluid.
 - (c) Allow tube to hang in clean container—unscrew bleeder connection $\frac{1}{4}$ turn and depress foot pedal slowly by hand to half the limit of its travel, allowing spring to return pedal to off position. End of rubber hose should be kept below surface of liquid in container. When all air bubbles cease to appear (approximately 6 to 10 half strokes of pedal will be necessary to bleed each wheel cylinder) close bleeder connection.
 - (d) Repeat on each wheel cylinder—making sure that supply tank is filled after bleeding each wheel. Fluid withdrawn in the bleeding should not be used again.
 - (e) When bleeding operation is completed, the fluid reservoir must be refilled to within $\frac{1}{8}$ " of the top.
8. Conditioning Hydraulic system for extreme cold weather conditions. (This procedure should be followed in all sections of the country where zero temperatures are experienced during winter months.)
 - (a) Use light metal cup expander inside rubber cups (F) to hold skirts of cup more closely to the cylinder walls. (Extreme cold weather causes slight shrinkage of rubber cups. The expander is of no value to increase the piston seal until the skirt of the rubber cup contracts due to cold.)
 - (b) Use stiffer coil spring (D) between the two wheel cylinder pistons. These heavier springs are usually dull in finish in contrast to the standard spring, which is quite shiny.
 - (c) Drain and refill system with special cold weather hydraulic fluid.
9. Use genuine hydraulic brake fluid. Engine or any mineral oil will render the brakes inoperative and will necessitate replacement of all rubber parts in the system.

VACUUM POWER BRAKES

THERE are two types of Vacuum Brake Systems now in use:

1. Air Suspended Type:
This system utilizes the vacuum created in the intake manifold to operate (within a cylinder) a piston which is connected to a lever on the brake cross shaft. The air suspended system is always used in conjunction with an external valve, either pull or pusher type, depending upon room for installation.
2. Vacuum Suspended Type:
 - (a) Plain cylinder with external valve.
This system also utilizes the vacuum created in the intake manifold but differs from the air suspended type insofar as the entire system is constantly under vacuum. Admission of air to one side of the booster cylinder by means of the external valve applies the pressure to the braking system.
 - (b) Internal Valve Type Cylinder:
This system is under vacuum at all times when the engine is running and is similar to (a) except that the valve controlling intake of air to the cylinder is built within the cylinder itself.

Irrespective of the type of vacuum system, the following principles apply:

Pressure on the foot pedal operates a valve that allows air to enter the booster cylinder in the case of the vacuum suspended type, or air to be drawn from the cylinder in the case of the air suspended type.

The thrust, caused by the difference in pressure at the piston surfaces, is transferred by means of a piston rod either to a single cross shaft actuating both front and rear brakes or to separate cross shafts mounted at front and rear of car operating the front and rear brakes respectively. (When a hydraulic system is used the piston rod is attached directly to the master cylinder.)

The booster valve (or cylinder with internal valve) is so mounted on the frame that when pedal is only partially depressed the brake will be only partially applied. This is the so-called "holding" position. The mechanism of the system is such that the port hole in the valve is closed after the brake rods have travelled a prescribed distance as controlled by the foot pedal. This arrangement allows partial brake application for stopping slowly or holding back loads on steep grades.

Certain booster systems (air suspended type) have a dash control valve to prevent overbraking in wet, icy, and snowy weather. This valve regulates the amount of vacuum taken from the manifold.

A relay valve is used in tractor trailer installations to overcome the "time lag" which would be encountered if no relay valve were used. The connection between control valve and relay valve is a $\frac{1}{4}$ " pipe. Immediately upon operation of the control valve, air is admitted through this line to the relay valve which operates the separate booster system on the trailer. In synchronism with the control valve on the tractor the relay valve allows perfect control of the braking system no matter how long the trailer train may be.

Maintenance Suggestions

As a general statement, there should be no occasion to adjust any power unit or brake assister unless it has been tampered with or damaged in an accident or removed and disassembled. All adjustments to power units are external. For complete details on the different brakes we refer you to Mr. Paul Dumas's book entitled "Brakes."

In case of trouble or replacement of the internal parts it is recommended that the power unit should be taken to an official service station for repairs (BK, Bestler, or car distributor).

Vacuum Power Brakes (Continued)

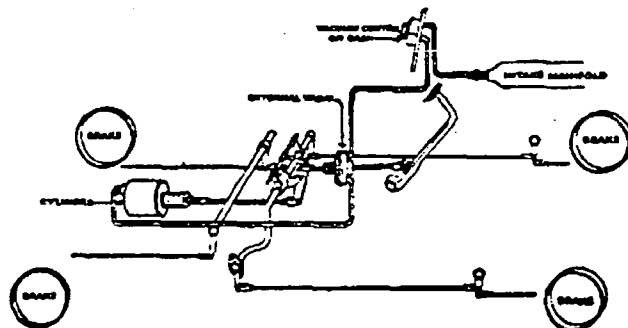


Fig. 1

Fig. 1 shows the three units of a standard B-K booster system and the relationship each unit bears to the other. This system is the one used on the majority of truck installations and on heavy passenger cars up to 1933. Similar installations without the valve control on the dash are equally as common as the three unit system shown.

The power unit should be lubricated twice a year through ports in end of cylinder with two ounces of Bendix vacuum cylinder oil. Dust covers should be removed and the curled hair in the air cleaner washed and thoroughly cleaned in high test gasoline.

It is important that the rubber piston rod guard be in good condition and properly fitted in its recesses at each end.

The vacuum suspended, internal valve type of booster system commonly found on passenger cars is shown in Fig. 2. The arrangement shown is that used on 1933 Studebaker with Power Brakes. The important point to observe is the method of connecting the power unit to the brake linkage so as to provide "feel" at the brake pedal. This gives a slight play or sloppiness to the system not found in conventional linkage.

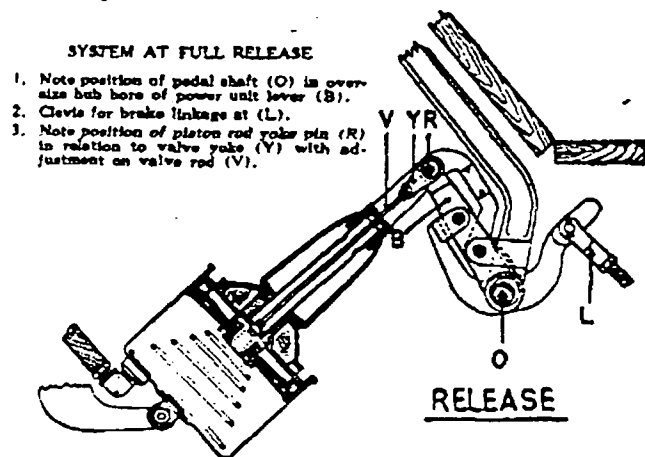
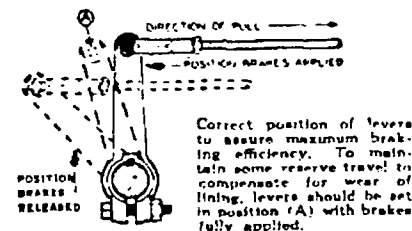


Fig. 2

MECHANICAL LEVERAGE SYSTEMS AND EQUALIZERS

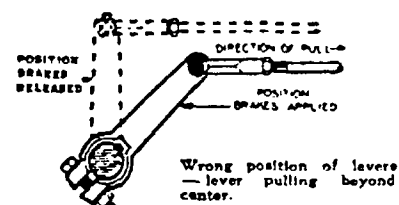
THERE are such a vast variety and combination of mechanical leverage hookups on cars that without going into detail for each car, only generalities will be discussed.

To assure maximum braking efficiency all brake levers should be so adjusted that the greatest mechanical advantage is obtained (see Fig. 1) which means that all levers with brake pull applied will be on dead center. Fig. 1 also shows that a reserve travel to compensate for wear of lining should be made in any setup. Figs. 2 and 3 show the wrong position of levers to give greatest efficiency. In the case of Fig. 2 the lever is pulled beyond the center, thus decreasing efficiency at the time when it is needed most, that is, at the greatest pedal pressure, or when making an emergency stop. Fig. 3 shows the leverage too far forward. A lever set in this position would require unusually severe pressure even to start the brake mechanism moving.



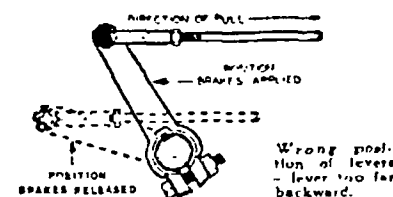
CORRECT

Fig. 1



WRONG

Fig. 2

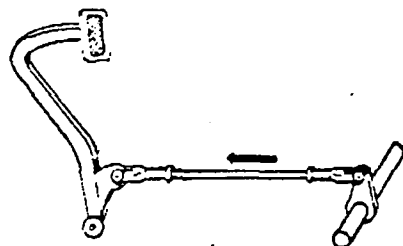


WRONG

Fig. 3

A twisted, bent or weak cross shaft will not deliver full pedal power to the brake which results in hard pedal and unequal brakes. Worn clevis pins should be replaced as they cause lost motion. Cotter pins should be in good condition and none missing.

The following diagrams illustrate some of the most common types of leverage hookups. Oftentimes a combination of two or even three of the types is found on a single car. The same general principles, however, apply to combinations of types as would apply if only a single type were used.

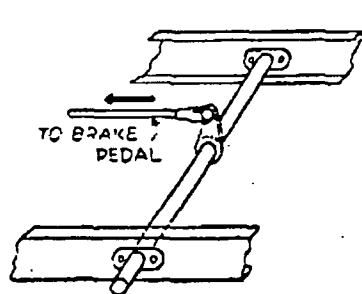
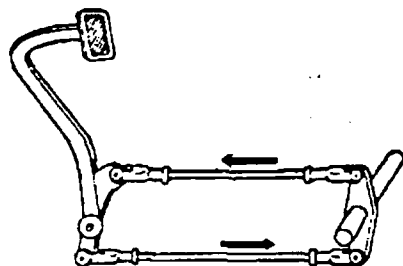


Single Pedal Rod

This is the simplest connection between pedal and cross shaft and is used on the majority of mechanical leverage systems. With the brake in applied position the lever on the cross shaft should not pull beyond center.

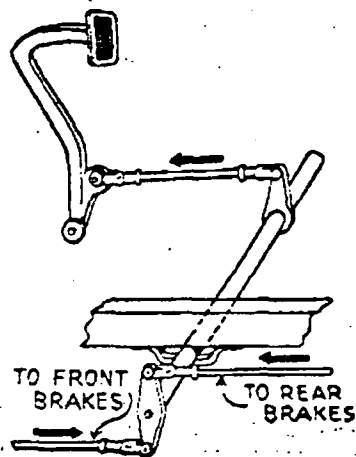
Double Pedal Rod

The double pedal rod is of the push and pull type. This is a common arrangement on cars equipped with Steel-draulic brakes. It avoids twisting or distorting of the cross shaft. When correctly balanced it gives good performance. When brake is fully applied the lever on the cross shaft should not be pulled beyond center.



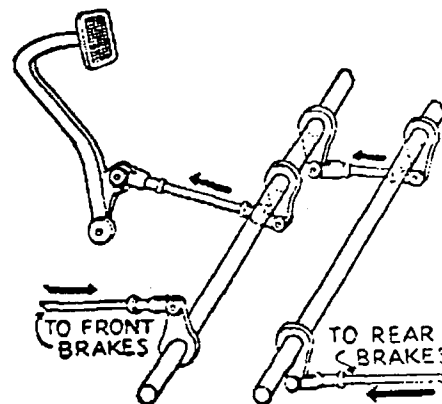
Anchored Single Brake Cross Shaft

One of the most simple and rigid cross shafts used on mechanical systems is the single cross shaft rotating in bearings anchored to the frame of the car.



Floating Single Brake Cross Shaft

The floating cross shaft is an inexpensive method of equalizing the pull between front and rear brakes. The sketch shown is the type used on the early Model A Ford. Similar type installations varying in design are used on many of the lower priced cars.

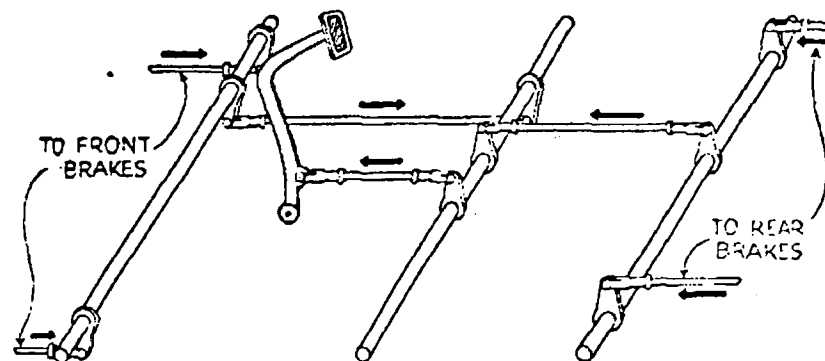


Double Cross Shaft

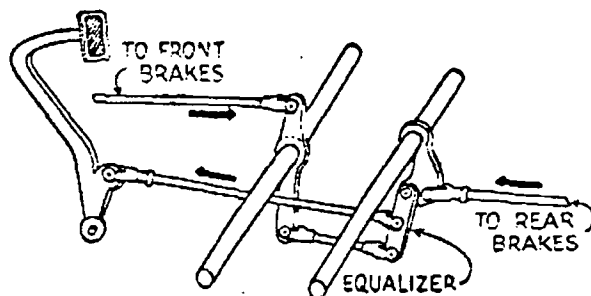
A simple double cross shaft shown in this sketch is used usually on cars where a single cross shaft can not be used because of the construction of the car. It has the advantage by varying the lengths of the levers on the two cross shafts of changing the mechanical advantage of the leverage system so as to give greater braking either at the front or rear as desired.

Multiple Cross Shafts

This sketch shows multiple cross shafts all of which extend the full width of the frame. In the majority of instances where multiple cross shafts are used the cross



shafts at either the rear or the front are usually very short. This system is used to overcome difficulties encountered due to the construction of the car. The sketch shown is of the simple type and no equalizing action is shown.



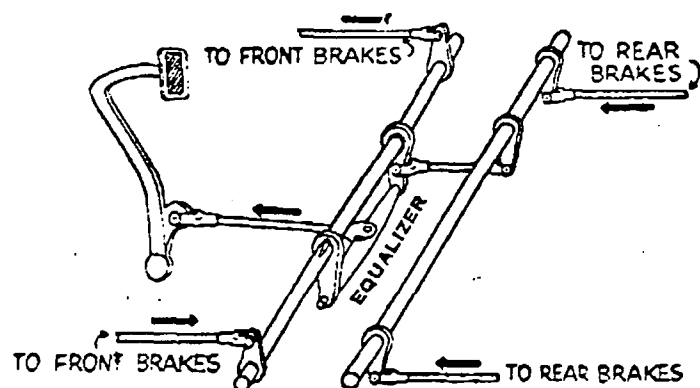
Vertical Equalizers

This sketch shows the most simple of vertical equalizers. By connecting the pedal rod to an equalizer it is possible to distribute the braking effort between the front and rear brakes to any desired degree; at the same time being sure that if any mechanical difficulties

are encountered in any of the brake mechanisms, the equalizer will have a tendency to overcome such inequalities. Equalizers are not always of such simple design. Curved equalizers bending over cross shafts are common in a great many instances. In all cases, however, the principle is the same.

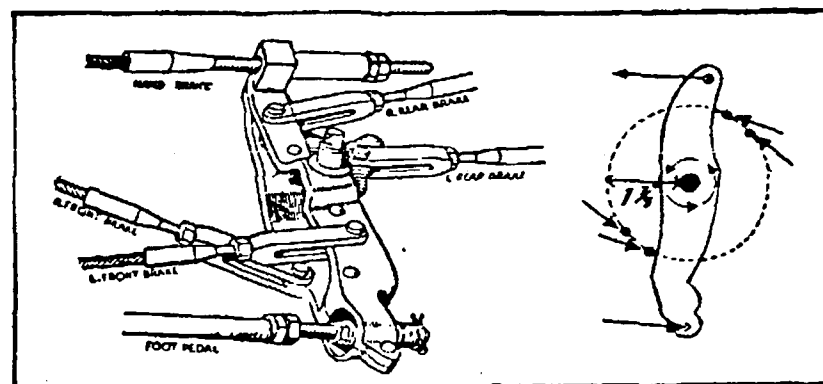
Horizontal Equalizers

The effect obtained by a horizontal equalizer is the same as by a vertical equalizer. In the case shown the brake pedal is connected to the equalizer which moves a lever connecting to the front cross shaft and, at the same time, pulls on a lever



which rotates freely on the front cross shaft but which is connected by means of a short connecting rod to another lever which is securely fastened to the rear cross shaft. Thus an equalization of pressure is obtained between the front and rear brakes on such a system.

Rotary Equalizer (Hudson-Terraplane Style)



The drop forged rotary equalizer is pivoted under center of the frame X member. Each of the brake cables is connected to the equalizer at points $1\frac{1}{4}$ " from the pivot pin and at such angles as to insure equal movement being transmitted to each brake. The connection's being close to pivot prevents distortion under heavy loads.

Equalizing by Changing Leverages

Drilling of cross shaft levers is often employed to equalize brakes. For example, the 1934 KU Terraplane Major Six had a tendency to pull to the left. This was overcome by changing the leverage as shown in Fig. 2. Note that the least leverage is supplied to the left front brake. (Read Page 13.)

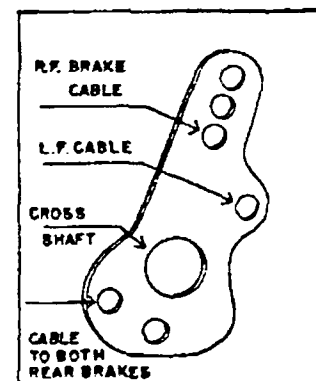
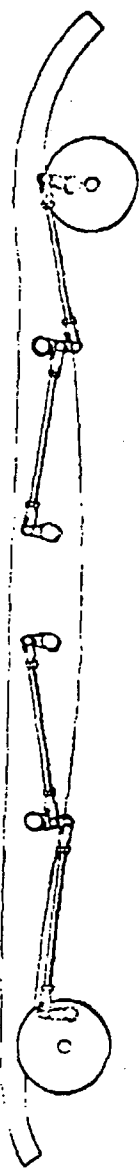
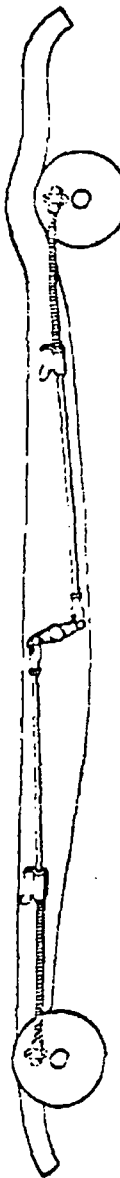


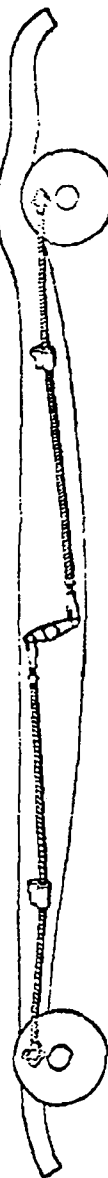
Fig. 2

**Rod and Lever Control**

This sketch shows a double cross shaft rod and lever control hook-up. With such a system it is necessary to have a lever, ball and rocker arm on the front brakes so as to allow the car to turn corners without the brakes locking. This leverage system is fast passing out of the picture.

**Rod and Cable Control**

This sketch shows a single cross shaft actuating two brake rods which in turn pull cables which actuate the front and rear brakes. The use of cables obviates the use of lever, ball and rocker arm on the front brakes. This type of installation is the common type as used on Steeldraulic systems and the majority of Bendix systems.

**Full Cable Control**

A hook-up for full cable control is practically the same as for rod and cable except that cables are used exclusively in this system. With long cables carried in conduits it is necessary to lubricate fully in order to insure freedom of movement. In the majority of cases the cable is not covered except for about three feet near the brake mechanisms.

MULTIBESTOS FLAT RATE GUIDE

A BRAKE SERVICE STATION IN ORDER TO BE SUCCESSFUL MUST CHARGE FAIR HOURLY RATES WHICH WILL PROVIDE AMPLE MARGIN TO COVER FULL OVERHEAD AND PROFIT AND YET BE IN LINE WITH COMPETITIVE PRICES IN ITS LOCALITY.

With this point of view in mind Multibestos again offers its Flat Rate Guide, which allows you to make your own price, which will guarantee you a fair price for your labor and yet allow you to meet competition.

In the following table we have listed the cars alphabetically, with their brake lining recommendations. Note that we have left both the prices of the TAILORED Sets and the labor charges vacant for you to fill in. The current list prices for TAILORED Sets are shown on the inside back cover of this book. And on Page 56 you will find a Labor Conversion Table to help you figure the labor costs for each reline more rapidly.

In quoting prices for relines BE SURE you know the exact condition of the job on which you are quoting. When new parts or overhauling of a brake system are necessary an added charge must be made. When you find this necessary, always call it to the attention of the car owner and secure his permission to do the work.

On the following page is a typical example of how the table is made out in use. The table at the bottom of this page gives the percentage of the complete reline cost that should be charged when only the front or rear brakes are relined.

To figure charges for relining front or rear brakes only (with accompanying adjustment of unrelined brakes) multiply complete reline costs by the percentage shown in the following table:

Type of Brakes	PERCENTAGE OF COMPLETE RELINE	
	For Front Brake Reline	For Rear Brake Reline
Hydraulic	60%	70%
Steeldraulic	60%	65%
Three-Shoe Bendix	60%	65%
Two-Shoe Bendix	60%	65%
Huck	60%	65%

MULTIBESTOS HANDBOOK FOR BRAKE SERVICE

LABOR CHARGE CONVERSION TABLE

Hrs.	Rate Per Hr. 													
	8.75	8.90	9.00	9.10	9.20	9.30	9.40	9.50	9.65	9.70	9.80	9.90	10.00	10.10
1 1/4	1.31	1.36	1.75	1.93	2.10	2.28	2.45	2.63	2.80	2.98	3.15	3.32	3.50	3.68
2	1.50	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.80	4.00	4.20
2 1/4	1.69	2.03	2.25	2.48	2.70	2.93	3.15	3.38	3.60	3.83	4.05	4.28	4.50	4.73
2 1/2	1.88	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
2 3/4	2.06	2.45	2.75	3.05	3.30	3.58	3.85	4.13	4.40	4.68	4.95	5.23	5.50	5.78
3	2.25	2.70	3.00	3.30	3.60	3.90	4.20	4.50	4.80	5.10	5.40	5.70	6.00	6.30
3 1/4	2.44	2.93	3.25	3.58	3.90	4.23	4.55	4.88	5.20	5.53	5.85	6.18	6.50	6.83
3 1/2	2.63	3.15	3.50	3.85	4.20	4.55	4.90	5.25	5.60	5.95	6.30	6.65	7.00	7.35
3 3/4	2.81	3.38	3.75	4.15	4.50	4.88	5.25	5.63	6.00	6.38	6.75	7.13	7.50	7.88
4	3.00	3.60	4.00	4.40	4.80	5.20	5.60	6.00	6.40	6.80	7.20	7.60	8.00	8.40
4 1/4	3.19	3.83	4.25	4.68	5.10	5.53	5.95	6.38	6.80	7.23	7.65	8.08	8.50	8.93
4 1/2	3.38	4.05	4.50	4.95	5.40	5.85	6.30	6.75	7.20	7.65	8.10	8.55	9.00	9.45
4 3/4	3.56	4.28	4.75	5.23	5.70	6.18	6.63	7.13	7.60	8.08	8.55	9.03	9.50	9.98
5	3.75	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50
5 1/4	3.94	4.73	5.25	5.78	6.30	6.83	7.35	7.88	8.40	8.93	9.45	9.98	10.50	11.03
5 1/2	4.13	4.95	5.50	6.05	6.60	7.15	7.70	8.25	8.80	9.35	9.90	10.45	11.00	11.55
5 3/4	4.31	5.18	5.75	6.33	6.90	7.48	8.05	8.63	9.20	9.78	10.35	10.93	11.50	12.10
6	4.50	5.40	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20	10.80	11.40	12.00	12.60
6 1/4	4.69	5.65	6.50	7.15	7.80	8.45	9.10	9.75	10.40	11.05	11.70	12.35	13.00	13.65
6 1/2	4.88	5.85	6.75	7.45	8.10	8.75	9.40	10.05	10.70	11.35	12.00	12.65	13.30	13.95
6 3/4	5.06	6.05	6.95	7.65	8.35	9.05	9.75	10.45	11.15	11.85	12.55	13.25	13.95	14.65
7	5.25	6.25	7.15	7.85	8.55	9.25	9.95	10.65	11.35	12.05	12.75	13.45	14.15	14.85
7 1/4	5.44	6.45	7.35	8.05	8.75	9.45	10.15	10.85	11.55	12.25	12.95	13.65	14.35	15.05
7 1/2	5.63	6.65	7.55	8.25	8.95	9.65	10.35	11.05	11.75	12.45	13.15	13.85	14.55	15.25
7 3/4	5.81	6.85	7.75	8.45	9.15	9.85	10.55	11.25	11.95	12.65	13.35	14.05	14.75	15.45
8	6.00	7.20	8.00	8.80	9.60	10.40	11.20	12.00	12.80	13.60	14.40	15.20	16.00	16.80

How to Use the Multibestos Flat Rate Guide

Example

Car—Nash.

Refer to Flat Rate guide—page 64.

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		R.I.M.A. No.	Type Drive	Labor Hours	Labor Cost	List Price	Com- plete Rollins
	Front and Rear Brakes	Front or Rear Axles						
NASH								
1935, Lafayette, Nash 3520.....	T-288		259	B2	4 1/2	7.13	57.00	12.85
1934, Big Six 1220; La- fayette 110.....								
1935, Nash 3580.....	ET-228		280	B2	4 1/2	7.13	8.10	15.25
1934, 1280, Advance 8.....								
			273	B2	8			

If the rate per hour in your locality is \$1.50 an hour then 4¼ hours at \$1.50 . . . \$7.13
Add \$5.70 (list price tailored set T-259) to \$7.50 (labor cost) making a total of . . . \$12.83

**REMEMBER YOUR RATE PER HOUR MUST INCLUDE YOUR FULL
OVERHEAD AND PROFIT.**

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		B.I.M.A. No.	Type Brake	Lube Hours	Labor Cost	List Price	Com- plete Rolling
	Front and Rear Brakes	Front or Rear Brake						
AUBURN								
1935, 6-53	T-233		254	B2	5			
1935, 8-51	ET-281		281	B2	5 1/2			
1934, 5-52	T-233		254	B2	5			
1934, 8-50	ET-281		281	B2	5 1/2			
1933, 8-105	T-226		279	B2	5			
1934-33, 12-165	T-252		210	B2	5			
1932, 8-100	T-109		403A	S	5 1/2			
1932, 12-160	T-252		210	B2	5 1/2			
1931, 8-98	T-109		403A	S	5 1/2			
1931-30, Cord		ET-138F T-109	138F 103R	L L	6			
1930-29, 6-80, 6-85								
1929, 78; 1928, 76, 65	T-101		101	L	5			
1930-29, 8-90, 8-95								
1928, 88								
(Above—Cast Shoe, also use Cat. 115 Steel Shoe)	T-102		115	L	5			
1930-29, 120, 125	T-102		102	L	5			
1928, 115								
BUICK								
1935-34, Series 40	T-226		253	B2	5			
1935-34, Series 50	T-627		627	H	5 1/2			
1935-34, Series 60	ET-629		629	H	5 1/2			
1934, Series 90	ET-630		630	H	5 1/2			
1933, 33-50	T-614		614	H	4 1/2			
1932, 32-50								
1933, 33-60								
1932, 32-60	T-533		533	H	4 1/2			
1931, 860								
1933, 33-80, 33-90								
1932, 32-80, 32-90								
1931, 880, 890	T-535		535	H	5 1/2			
1930, 50, 124" W.B.								
1930, 60, 132" W.B.								
1930, 40, 118" W.B.	T-533		533	H	4 1/2			
1931, 850	T-226		227	B2	5			
1930, Marquette—Ser. 30								
CADILLAC								
1935-34, V8-355D, V12- 370D, V16-452D	ET-631		631	H	6			
1933, 355-C "8," 370-C "12"	T-616		616	H	5 1/2			
1932, V8-355B, V12-370B								
1933, 452-C "16"	ET-617		617	H	5 1/2			
1932, V16-452B								
1931, V-8355	T-535		327	H	5 1/2			
1931-30, V16-452								
1931, V12-370	AT-326		326	H	5 1/2			
1930, V8-353								
1929, 341B		AT-326+	326	H	5 1/2			
1928, 341 after July		Budstuty	333					
1928, 341 before July to 1927		ET-328F Budstuty	328F 575R	I E	5 1/2			
CHEVROLET PASS.								
1935, Standard	AT-643D		643	H	4 1/2			
1935, Master, Comm. 1 1/2 ton	T-627D		627	H	4 3/4			

SYMBOLS USED:
 B2 Bendix Two Shoe Brake.
 B3 Bendix Three Shoe Brake.
 E External.
 I Internal.
 H Hook.
 L Lockhead.

- S Steeldraulic.
- SW Stewart Warner.
- F Front Brakes.
- R Rear Brakes.
- Set can be supplied undrilled.
- † Half TAILORED Set required for either front or rear brakes.

- 2 Two TAILORED Sets required for complete reline.
- 4 When relining emergency brake add additional .5 minutes labor time.
- 5 When relining emergency brake add additional .30 minutes labor time.

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		B.L.M.A. No.	Type Brake	Labor Hours	Labor Cost	List Price	Com- plete Reline
	Front and Rear Brakes	Front or Rear Brakes						
CHEVROLET PASS (Con.)								
1934, DA, Master Six.....	T-627D*		627	H	4 1/2			
1934, DB, 1/2-ton Comm'l.....								
1934, DC, Standard Six.....	AT-633D		623	H	4 1/2			
1933, Master Six Eagle and 1/2-ton truck.....	T-614D		614	H	5			
1933, Standard Six.....	AT-520D		520	H	4 1/2			
1932, Confederate PA.....								
1931, AE.....	T-548D		548	H	3 1/2			
1932, BB, 1/2-ton Truck.....		AT-313FD	313F	I				
1930, AD, Six.....		Nor-14RD	336R	E	3 1/2			
1929, AC, Six.....		AT-313FD	313F	I				
1928, AB, Four.....		Nor-341A	341AR	E	3 1/2			
CHEVROLET TRUCK								
1935, 1 1/2 ton.....		ST-644D	644P	H	5 1/2			
		ST-645D	645R	H	5 1/2			
1934, Utility, PA, PB, PC, PD, 1 1/2 ton.....		T-627D*	627F	H	4 1/2			
		AT-562RD	562R	H	4 1/2			
1933, Utility, 1 1/2 ton.....		T-614D*	614F	H	4 1/2			
		AT-562RD	562R	H	4 1/2			
1932, Series N, 1 1/2 ton.....		T-548D*	548F	H	4 1/2			
1931, Series LT, 1 1/2 ton.....		AT-562RD	562R	H	4 1/2			
1930, Series LS, 1 1/2 ton..... (also Step-N-Drive)								
1930, LR, 1 1/2 ton.....		T-548D*	548F	H	4			
		Nor-577	577R	E	4			
1930, AD, Six, Std., Chassis, 1 1/2 ton..... (also Step-N-Drive)	T-548D		548	H	3 1/2			
1930-28, LP, LQ, 1 1/2 ton.....		AT-313FD	313F	I	4			
		Nor-577	577R	E	4			
		AT-313FD	313F	I	3 1/2			
1929, AC, Six.....		Nor-14RD	336R	E	3 1/2			
1928, AB, Chassis, Four.....		AT-313FD	313F	I	3 1/2			
		Nor-341A	341AR	E	3 1/2			
CHRYSLER								
1935, Six, C-6.....	AT-145D*		145	L	4 1/2			
1935, Eight CZ.....	AT-174		192	L	4 1/2			
1935-34, Six, CA, CB.....								
1935, Eight C-1, C-2, C-3.....								
1934, Model Eight CU, Imperial CV.....	ET-193		193	L	4 1/2			
1935-34, Imperial Custom Eight CW.....	ET-194		194	L	5			
1933, Imperial Custom Eight, CL.....	T-616		175	L	5			
1933, Imperial Eight, CQ.....	AT-174		174	L	5			
1933, Royal Eight, CT.....	T-101		101	L	5			
1933, Six, CO.....	T-104		104	L	4 1/2			
1932, Eight.....	AT-174		174	L	5			
1932, Imperial Eight.....	T-616		175	L	5			
1931, Imperial Eight.....	T-109		103	L	5			
1930, Imperial 80.....								
1932, Six.....	T-101		101	L	5			
1931, Eight.....								
1931, Six.....	T-104D		104	L	4 1/2			
1931-30, 66.....								
1930, Fargo Freighter, 1 ton, 4 and 6 Cyl.....		T-102+	105P	L	5			
		T-616+	106R	L	5			

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		B.L.M.A. No.	Type Brake	Labor Hours	Labor Cost	List Price	Com- plete Reline
	Front and Rear Brakes	Front or Rear Brakes						
CHRYSLER (Con.)								
1931-30, 70.....								
1930, 77.....	T-102		105	L	5			
1930-29, Fargo 5, Clipper								
1929-28, 75, 65.....	T-104D*		104	L	4 1/2			
1930-29, Fargo 4, Pocket								
CONTINENTAL								
1934-33, 41, 40 Beacon, 60 Flyer.....	ET-413		413	S	5 1/2			
1933, 81 Ace (early models)	T-109		408	S	5 1/2			
1933, 81 Ace (after early models).....	T-401		414	S	5 1/2			
CUNNINGHAM								
1935-33, V10; 1932-30, V9	AT-232R:		232	B2	5 1/2			
1934, W-1; 1933-32, W.....	T-252		231	B2	5 1/2			
1929, V-8.....	T-202		202	B3	5 1/2			
1928-25, V7.....								
DE SOTO								
1935, SF.....	AT-145D*		145	L	4 1/2			
1935, SO.....	AT-174		192	L	4 1/2			
1934, SE.....								
1933, Six, SD.....	T-104D*		104	L	4 1/2			
1932-28, Six.....								
1931-30, Eight.....								
DODGE PASSENGER								
1935, DU-Six.....	AT-145D*		145	L	4 1/2			
1934, DR-Six, DS-Six.....	T-195D		195	L	4 1/2			
1933, Dodge Eight, DO.....	AT-174		174	L	5			
1933, Dodge Six, DP.....	T-179D*		179	L	5			
1932, DL-Six.....	T-101		101	L	5			
1932, DK-Eight.....	AT-174		174	L	5			
DODGE PASS. & COMM.								
1935, KC, KCL.....	AT-145D*		145	L	4 1/2			
1934, KC, KCL.....	ET-132		132	L	4 1/2			
1935-34, KH-30, KH-31, KH-32, KH-33, K-32, K-33, K-34.....	T-101* T-102*		101 105	L L	5 5			
1933, HC, HCL Delivery.....	T-179D*		179	L	4 1/2			
1932-31, Dodge Taxicab.....								
1931, DG; 1930, DC 8- Pass.....	T-101		101	L	5			
1931, DH; 1930, DD 6- Pass.....	T-104D*		104	L	4 1/2			
1931-30, UP-16, F-16, 1/2 ton.....								
1930-29, New Senior Six Pass. (Cast Shoe).....	T-102		102	L	5			
1930-29, New Sr. 6 (Steel Shoe).....	T-109		109	L	5			
1930-29, DAI, Six-Pass.....	T-102		115	L	5			
1929-28, Senior Six-Pass. (Cast Shoe).....	T-102		102	L	5			
1929-28, Sr. 6 (Steel Shoe).....	T-109		109	L	5			
1928, Victory, Six-Pass. (Cast Shoe).....	T-101		101	L	5			

SYMBOLS USED:
B2 Bendix Two Shoe Brake.
P Bendix Three Shoe Brake.
E External.
I Internal.
H Huck.
L Lockheed.
S Stockdrum.

SW Stewart Warner.
F Front Brakes.
R Rear Brakes.
* Set can be supplied undrilled.
+ Half TAILORED Set required
for either front or rear brakes.

: Two TAILORED Sets required
for complete reline.
* When relining emergency brake add
additional 15 minutes labor time.
+ When relining emergency brake add
additional 30 minutes labor time.

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		B.L.M.A. No.	Type Brake	Labor Hours	Labor Cost	List Price	Com- plete Reline
	Front and Rear Brakes	Front or Rear Brakes						
DODGE PASS. & COMM. (Con.)								
1928, Victory 6 (Steel Shoe)	T-182		115	L	5			
1928, Standard Six-Pass.	T-481		401	S	5 1/4			
DURANT								
1932, 621, 622								
1931, 610, 612, 619; 1931- 30, 614	T-402		404	S	5 1/4			
1930-29, 6-63, Pass.	T-209		209	B2	4 1/2			
1930, 617, Pass.	AT-405		405	S	5 1/4			
1931, Rugby-516	AT-405		406F	S	5 1/4			
1930, 615-Truck			405R	S	5 1/4			
1930-29, Rugby, 1T, "401"		T-226+ T-252+	226F 210R	B2 B1	4 1/2			
1930-29, 60, 66-2 Shoe								
1929, S-4, 1/2 ton	T-209		209	B1	4 1/2			
1929, Four 40, Rugby 4M2								
1930-29, 70, 2 Shoe, 1/2 ton Truck	T-226		226	B2	5			
1929, 70, 3 Shoe	T-204		204	B3	5 1/4			
1929-28, 75								
1929, Four, 60, 66, 3 Shoe	T-203		203	B3	5			
1928, 55, 65, Rugby 4M.								
ELCAR								
1930, 130, 140								
1929, 120	T-102		102	L	5			
1930-29, 95, 96								
1929, 95, 96, 120 (Steel Shoe)	T-109		109	L	5			
1930, 29, 75, 6-Cyl. (Cast Shoe)	T-101		101	L	5			
1929, 29, 75, 6-Cyl. (Steel Shoe)	T-102		115	L	5			
ESSEX								
1934, Terraplane DeLuxe Six, Major Six, Model KU	ET-276		283	B2	4 1/2			
1933, Terraplane 8 KT	ET-276		276	B2	4 1/2			
1935, Terraplane Special G, DeLuxe GU	T-259		282	B2	4 1/2			
1934, Terraplane Std. 6, Model K								
1933-32, Terraplane 6K	T-259		266	B2	4 1/2			
1932, Super Six	T-259		259	B2	4 1/2			
1931-30, Super 6 and 1/2 ton	T-209		209	B2	4 1/2			
1929, Challenger								
1928, AU	T-203		203	B3	5			
FORD PASSENGER								
1935, V-8, 48	AT-642D		642	I	3 1/2			
1934-32, 40 "V8," 46 "4" cyl., 18 "V8," B-4 cyl.	T-515D		515	I	3			
1934-32, V8 and V4 (Worn Drums)	AT-516D		516	I	3			
1931-1929, A	T-310D		310	I	3			
1928, A								
or 1931-29, A (Worn Drums)	AT-380D		380	I	3			
1928, A (Worn Drums)								

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		B.L.M.A. No.	Type Brake	Labor Hours	Labor Cost	List Price	Com- plete Reline
	Front and Rear Brakes	Front or Rear Brakes						
FORD TRUCK								
1935, V8-50	AT-642D		642	I	3 1/2			
1935, V-8-51, 1 1/2 ton	AT-647D		647	I	4 1/2			
1934-32, BB-1 1/2 ton								
1931-30, AA and Dump 1 1/2 ton, after Jan. also Step-N-Drive	AT-555D		555	I	4			
1931-29, A, Light (Pass. Chassis)	T-310D		310	I	3			
1930-28, AA, 1 1/2 ton and Step-N-Drive, be- fore Jan. 1, 1930	T-310D+ AT-555D		310F 555R	I	3 1/2			
1928, A, Light (Pass. Chassis)	T-310D		310	I	3			
FRANKLIN								
1934-33, Series 19, Series 16 (Airman)	T-109		141	L	5			
1934-33, Series 18, 18C, Olympic	T-102		183	L	5			
1934-32, Series 17, 12 Cy.	ET-173		173	L	5			
1932, Airman (Super- charged)	T-109		141	L	5			
1931, Series 15; 1930, Series 145-147								
1929, 130, after 190590								
1929, 135, 137, after 190590	T-109		109	L	5			
1929, 130, before 190590			129F	L	5			
1929, 135, 137, before 190590	T-102		126R	L	5			
1928-27, Airman Series 119", 128", W.B.	T-102		108F 102R	L	5			
GARDNER								
1931-30, Ser. 150, 8 Cyl.	T-102		126	L	5			
1931-30, Series 135; 1930, Series 140	T-101		101	L	5			
1929-28, 85, 120, 125 (Cast Shoe)								
1929-28, 85, 120, 125 (Steel Shoe)	T-102		115	L	5			
1929-28, 130, 95 (Cast Shoe)	T-102		102	L	5			
1928, 8-95 (Steel Shoe)	T-109		109	L	5			
GRAHAM PASS. AND COMM.								
1935, 74	ET-282		1111	B2	4 1/2			
1935, 73	ET-199		199	L	4 1/2			
1934, 68 Std. Six								
1935, 72, 75								
1934, 67, Std. and Spec. 8	T-401		182	L	5			
1934, 69 Custom 8								
1933, Std. and Custom 8	T-102		191	L	5			
1933, Graham Six								
1933, Graham Six, July, 1932 Jan., 1933	T-516		172	L	5			
1932, Blue Streak								

SYMBOLS USED:

B2 Bendix Two Shoe Brake
B3 Bendix Three Shoe Brake
E External
I Internal
H Hook
L Lockheed
S Stockdrum

SW Stewart Warner

F Front Brakes

R Rear Brakes

* Set can be supplied drilled.

+ Half TAILORED Set required

for other front or rear brakes.

: Two TAILORED Sets required

for complete reline.

* When relining emergency brake add

additional 15 minutes labor time.

+ When relining emergency brake add

additional 30 minutes labor time.

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NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		H.L.M.A. No.	Type Brake	Labor Hours	Labor Cost	List Price	Com- plete Reline
	Front and Rear Brakes	Front or Rear Brakes						
NASH								
1935, 3540.....	ET-293		293	B2	5			
1935, Lafayette, Nash 3520.....	T-259		259	B2	4 1/4			
1934, Big Six 1270; La- fayette 110.....	ET-280		280	B2	4 1/4			
1935, Nash 3580.....	AT-251		273	B2	5			
1934, 1280, Advance 8.....	T-109		412	S	5 1/2			
1934, Ambassador 8 1290.....	ET-265		265	B2	5			
1933, 1120, Big Six.....	T-252		252	B2	5			
1933, 1130, Std. 8.....	T-189		403A	S	5 1/2			
1933, 1180, Advance 8.....	T-189		408	S	5 1/2			
1932, 1080, Special 8.....	T-252		231	B2	3			
1933, 1190, Ambassador 8.....	T-226		226	B2	5			
1932, 990, 1090 Advance and Ambassador 8.....	T-189		403	S	5 1/2			
1933, 1170, Spec. 8; 1932, 1070, Std. 8.....	AT-301F Busduty	307F	307F	I	5 1/2			
1932, 980.....	AT-301F	307R	307R	E	5 1/2			
1932, 1060 Big 6, 960; 1931, 6-60.....	ET-301R	301F	301F	I	5 1/2			
1932, 970; 1931, 8-70, 8-80, 1931, 8-90.....	AT-303F	302F	302F	I	5 1/2			
1930, Twin Ign. 8 (490).....	Busduty	302R	302R	E	5 1/2			
1930, Twin Ign. 6 (480).....	AT-301F	304F	304F	I	5 1/2			
1930, Single Ign. 6 (450).....	Busduty	307R	307R	E	5 1/2			
1929, Special Six (400).....								
1929-26, Adv. 6 (400).....								
1925, Big Six, 161-9.....								
1929-27, Std. 6 (400).....								
1928-27, Ajax Light 6.....								
1928-27, Spec. 6, 131, 132, 133, 231 to A58246.....								
OAKLAND								
1931, Eight.....	T-189		403A	S	5 1/2			
1930, Eight.....	T-401		403	S	5 1/2			
1929, All American Six.....			401	S	5 1/2			
OLDSMOBILE								
1935, L-35, Eight.....	ET-281		281	B2	5			
1935, F-35, Six.....	ET-281		287	B2	5			
1934, Six F-34.....	T-259		259	B2	5			
1934, Eight L-34.....								
1933, F-33, 6 Cyl., L-33, 8 Cyl.....	T-226		253	B2	5			
1932, F-32, 6 Cyl.....								
1932, L-32, 8 Cyl.....	T-233		233	B2	5			
1931, F-31; 1930, F-30.....	T-252		210	B2	5			
1931-30, Viking V-30; 1929, V-29.....	T-284+		204F	B3				
1929, F-29.....	Busduty	344R	344R	E	4 1/2			
1928, F-28.....								
1928-27, 30-E.....								
OVERLAND PASS.								
1931, M96A, Whippet 4.....	T-209		209	B2	4 1/2			
1930, M96A, Whippet 4.....								
1929, 96, 96A, Whippet 4.....	T-209+		209F	B2	4 1/2			
1928, 98, Whippet 6.....	Busduty	342R	342R	E	4 1/2			
1929, 98A, Whippet 6.....								
1928, 93A, Whippet 6.....	T-283+		203P	B2	4 1/2			
1928, 96, Whippet 4.....	Busduty	342R	342R	E	4 1/2			
1928-26, 96, Whippet 4.....	T-283		203	B2	5			

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		H.L.M.A. No.	Type Brake	Labor Hours	Labor Cost	List Price	Com- plete Reline
	Front and Rear Brakes	Front or Rear Brakes						
PACKARD								
1935, 120.....	T-226		253	B2	5			
1935, Super Eight 1203, 1204, 1205, Eight 1200, 1201, 1202.....								
1934, 1100, 1101, 1102 Eight, 1103, 1104, 1105, Super Eight.....	ET-271F AT-251	271F 273R	B2 B2	5 1/4				
1933, 1003, 1004, Super Eight, 1001, 1002 Eight.....								
1935, Twelve, 1207, 1208 1934, 1107, 1108, Twelve 1933, 1005, 1006, Twelve 1932, Light Eight Model 128.....	ET-272F AT-232R	272F 274R	B2 B2	5 1/4				
1932, Twin Six, Model 142-147.....	ET-263		263	B2	5			
1932, 901, 907.....	AT-251		251	B2	5 1/2			
1931, 826, 833; 1930, 726, 733.....	AT-228		228	B3	5 1/2			
1932, 903, 904.....								
1931, 840, 845.....								
1930, 734, 740, 745; 1929, 640, 645.....	T-202		202	B3	5 1/2			
1928, 443, after No. 225013 1929, 626, 633.....								
1928, 526, 533 Six.....	T-201		201	B3	5 1/2			
PEERLESS								
1932-30, Standard 8, "A".....	T-233		233	B2	5			
1932-30, Master 8, "B".....								
De Luxe.....	T-252		210 231	B2 B2	5			
1932-30, Custom 8, "C".....								
De Luxe.....								
1930, 61A (Sixes).....	T-101		101	L	5			
1929, 81, 61 (Cast Shoes).....								
1930, 61A (Sixes).....	T-102		115	L	5			
1929, 81, 61 (Steel Shoes).....								
1929, 8-125.....	AT-405		121	L	5			
1929-28, 91 (6) (Cast Shoes).....	T-102		102	L	5			
1929-28, 91 (Steel Shoes).....	T-109		109	L	5			
PIERCE-ARROW PASS.								
1935, 845, 1245, 1255.....								
1935-34, 840A, 1240A, 1248A.....	ET-625		625	SW	5			
1933, 836, 1236.....								
1933, 1242, 1247.....	ET-626		626	SW	5			
1932, 51, 52, 53, 54.....	AT-251		251	B2	5 1/4			
1931, 137, 142, 147, 234.....	T-239		239	B2	5 1/4			
1930, 133-43, A, B, C, 132, 139, 125-3rd; 125-3rd.....	AT-214		214	B3	5 1/2			
1929, 125, 126.....								
1928-26, 36.....	T-239+		312F	I	5 1/2			
1926-24, 33.....	Busduty	524R	524R	I	5 1/2			
1928, 81; 1927-24, 80.....	T-401		311	I	5			

SYMBOLS USED:
B2 Bendix Two Shoe Brake.
B3 Bendix Three Shoe Brake.
E External.
I Internal.
H Huck.
L Lockhead.
S Steckrueck.

SW Stewart Warner.
F Front Brakes.
R Rear Brakes.
* Set can be supplied under lnd.
* Half TAILORED Set required
for either front or rear brakes.

1 Two TAILORED Sets required
for complete reline.
4 When relining emergency brake add
additional 15 minutes labor time.
1 When relining emergency brake add
additional 30 minutes labor time.

NAME OF CAR YEAR AND MODEL	TAILORED SET NO. Front and Rear Brakes	S.L.M.A. No.	Type Brake	Hours	Cost	Est Price	Com- plete Refine
PLYMOUTH							
1935, P.J. PJX	AT-145D*	145	L	4 1/2			
1934, Six PE	T-195D	195	L	4 1/2			
1934, PF, Std. PG							
1933, Six PC (after 1817101), PD	T-187D	187	L	4 1/2			
1933, Six PC (before 1817101)	T-179D*	179	L	4 1/2			
1932-29	T-104D*	104	L	4 1/2			
PONTIAC							
1935, Six, Eight	T-226	226	B2	5			
1934, 8 Cyl.	T-226	226	B2	5			
1933, 8 Cyl.	T-614D	614	H	5 1/2			
1932, Pontiac V-8; Pon- tiac "6"	T-226	226	B2	5			
1931	T-109	408	S	5			
1930	T-402	404	S	5 1/2			
1929, All		402	S	5			
1928, Pass. Cars and Trucks	AT-513FD Busduty	513FD 5165R	I E	5			
REO PASSENGER							
1935, 6A, Flying Cloud	ET-1102	1117	L	4 1/2			
1935, 7S, Royale							
1934-33, S-4, S-3, S-2, Flying Cloud 6	T-102	183	L	5			
1932, S Flying Cloud 6-25							
1934, R-N1, R-N2	ET-152	152	L	5			
1934, 22, Aerom	T-102	140	L	5			
1932, 31, 8-21							
1933, N1, N2, Royales	ET-152	152	L	5			
1932, 31, 8-31, 8-35, 8-52, 8-59, 8-62, Royales							
1932-31, 8-25; 1932-30, 6-25							
1932-31, 6-21; 1930, 20 to Nov. 1929	T-102	140	L	5			
1929, Master; 1928-27, F.C.							
1930, 20, from Nov. 1, 1929							
1930, 15; 1929 Mate	T-101	101	L	5			
1929-27, Wolverine							
1929, Mate (Steel Shoe)							
1929-27, Wolverine (Steel Shoe)	T-182	115	L	5			
ROCKNE							
1933, 10	ET-275	275	B2	5			
1933-32, 75	T-213	254	B2	5			
1932, 65	T-209	258	B2	4 1/2			
ROOSEVELT (See Marmon)							
STAR							
1928, J5	T-204	204	B3	5 1/2			
Six (California) R	T-203	203	B3	5			
M (Four)							

NAME OF CAR YEAR AND MODEL	TAILORED SET NO. Front and Rear Brakes	S.L.M.A. No.	Type Brake	Hours	Cost	Est Price	Com- plete Refine
STEARNS-KNIGHT							
1930, H8-90, J8-90	AT-232R	232	B2	5 1/2			
1929-27, H8-90, J8-90	AT-208R	208	B3	5 1/2			
STUDEBAKER							
1935, Dictator	ET-1101	1101	L	4 1/2			
1935, Commander	ET-1102	1102	L	4 1/2			
1935, President	ET-1103	1103	L	5			
1935-34 Dictator A (late models) Dictator Spec.	ET-416	416	S	5 1/2			
1935-34, Commander 8, Model B	AT-255	255	B2	5			
1933, 56, 73							
1935-34, President 9, Model C	AT-256	256	B2	5			
1933, 82 Commander							
1934, Dictator 6, Model A	ET-415	415	S	5 1/2			
1933, 92, President	AT-251	257	B2	5 1/2			
1932, 55, 62	AT-255	255	B2	5			
1932, 71, Commander	AT-256	256	B2	5			
1932, 91, President	AT-251	257	B2	5 1/2			
1931-30, Dictator 6 and 8	T-233	233	B2	5			
1930, Engine 53							
1931, Commander 124"	T-226	226	B2	5			
1931, President 80, 90	T-239	239	B2	5 1/2			
1931, S-1, Del. 114" W.B.	T-209	209	B2	4 1/2			
1930, Pres. 135", 125" W.B.							
1929, Pres. 121", 131" W.B.							
1930, Hearse and Amb. 145" W.B., 8, 30, 40	AT-214	214	B2	5 1/2			
1930, Hearse and Amb. 155" W.B., 8							
1930, Commander 6 and 8							
1929, 1/4-ton Truck							
1930, 20							
1929, Commander 6 and 8	T-204	204	B3	5 1/2			
1929, Dictator before June							
1928, Dictator							
1930-29, 77, 88	AT-208R	208	B3	5 1/2			
1928, Light Bus							
1929, New Dictator, 6 and 8, 115" W.B., after June	T-203	203	B3	5			
1929, 1/4 ton; 1929-27 Engine							
1928, Commander							
1928, Pres. 121", 131" W.B.	T-201	201	B3	5 1/2			
STUTZ							
1935-31, CS16, CD32	T-109	151	L	5			
1933-32, LAA; 1931, LA (late)	T-109	141	L	5			

SYMBOLS USED

B1 Bendix Two Shoe Brake.
B3 Bendix Three Shoe Brake.
E External.
I Internal.
H Hook.
L Locked.
B Stocking.

SW Stewart Warner.
F Front Brakes.
R Rear Brakes.
Set can be supplied undrilled.
* Half TAILORED Set required
for either front or rear brakes.

* Two TAILORED Sets required
for complete refin.
* When relining emergency brake add
additional 15 minutes labor time.
* When relining emergency brake add
additional 30 minutes labor time.

NAME OF CAR YEAR AND MODEL	TAILORED SET NO.		H.L.M.A. No.	Type Brake	Labor Hours	Labor Cost	List Price	Com- plete Retire
	Front and Rear Brakes	Front or Rear Brakes						
STUTZ (Con.)								
1933-32, SV-16; 1933-31, DV-32.....	T-109		151	L	5			
1931, MA, MB (except early models).....	AT-405		121	L	5			
1931, MA, MB, early....	T-109		109	L	5			
1931, LA, early models..	AT-405		122	L	5			
1930, MA, MB; 1929, M	T-109		109	L	5			
1929, L, Blackhawk, 6 & 8	AT-405		122	L	5			
1928, BB.....	T-109		109	L	5			
TERRAPLANE (See Essex)								
VELIE								
1929-28, 55, 68 (Cast Shoe).....	T-102		102	L	5			
1929-28, 77, 78 (Cast Shoe).....								
1929-28, 88, 90 (Cast Shoe).....	T-109		109	L	5			
1929-28, 66, 68, 77, 78, 88, 90 (Steel Shoes)								
WHIPPET (See Overland)								
WILLYS-KNIGHT PASS.								
1935-33, 77-Four.....	T-259		266	B2	4½			
1933, 99-Six; 1932, 95, Knight.....	T-233		254	B2	5			
1932, 6-90-A, 6-90, Willys Six.....								
1932, 8-88-A, 8-88, Willys Eight.....	T-226		226	B2	5			
1932, 66-E, Willys-Big Knight.....								
1932, 66D-Knight.....								
1931, 95-Knight.....	T-209		209	B2	4½			
1931, 97, 98D; 1930, M98B (6 Cyl.).....								
1931, 66D-Knight.....	T-226		227	B2	5			
1931, 8-80D.....								
1930, 8-80 (8 Cyl.).....	T-232		210	B2	5			
1930-29, 56-B (Great 6)	T-226		227	B2	5			
1930, 87, 70B.....								
1929, 70B, 56.....		T-294† Busduty	342R	E	5			
			331F	I	5			
			347R	E	5			
1928, 66-A.....	AT-487		358P	I	5			
		T-109† Busduty	359R	E	5			
1928, 70-A.....								

LIST PRICES of TAILORED and NORFOLK SETS

These prices effective July 1, 1935. Subject to change without notice.

TAILORED Sets		Additional TAILORED Sets		Exact TAILORED Sets	
Set No.	List Price	Set No.	List Price	Set No.	List Price
T-101	\$6.89	AT-145D*	\$6.85	ET-122	\$5.58
T-102	8.95	AT-174	8.10	ET-128F	4.50
T-1040*	5.05	AT-208R	13.60	ET-152	12.50
T-109	10.20	AT-214	16.10	ET-173	15.90
T-179D*	5.45	AT-228	13.70	ET-193	11.60
T-187D	4.40	AT-232R	10.80	ET-194	18.85
T-195D	5.50	AT-251	18.30	ET-199	9.85
T-201	13.10	AT-255	10.50	ET-205	20.70
T-202	15.20	AT-256	12.20	ET-206	17.80
T-203	7.15	AT-301F	5.05	ET-263	9.60
T-204	10.00	AT-303F	3.10	ET-265	9.30
T-209	5.70	AT-313FD	2.00	ET-271F	7.30
T-224	8.65	AT-326	9.70	ET-272F	8.50
T-233	7.35	AT-380D*	6.15	ET-275	9.70
T-239	13.40	AT-405	12.85	ET-276	7.70
T-252	11.30	AT-407	13.70	ET-280	8.55
T-259	7.15	AT-516D	7.20	ET-281	8.50
AT-310D*	6.60	AT-520D	4.15	ET-282	7.70
AT-401	12.00	AT-548MWD	4.70	ET-283	9.00
AT-402	8.60	AT-555D*	20.20	ET-287	10.00
AT-515D	7.30	AT-562RD	7.50	ET-301R	10.00
T-533	6.70	AT-633D	5.65	ET-328F	7.30
T-535	7.90	AT-642D	6.50	ET-329F	7.00
T-548D	4.50	AT-643D	6.20	ET-412	2.60
T-549D*	5.70	AT-647D	19.45	ET-413	1.80
T-577D	6.75			ET-415	11.55
				ET-416	11.50
				ET-417	12.40
				ET-425	20.30
				ET-426	22.80
				ET-428	6.80
				ET-429	8.55
				ET-430	11.70
				ET-431	9.10
				ET-1101	10.55
				ET-1102	11.85
				ET-1103	12.40

NORFOLK SETS

Set No.	List Price	Set No.	List Price	Set No.	List Price
Nor-140	\$5.20	Nor-520D	\$2.90	Nor-5001	\$2.00
Nor-145D (13FD)	1.80	Nor-548D	3.00	Nor-5824	1.60
Nor-147D (335RD)	3.40	Nor-549	1.20	Nor-5827	3.35
Nor-104D*	3.65	Nor-555D*	10.75	Norfolk	
Nor-179D*	3.55	Nor-562RD	4.90	Ford Model T	
Nor-187D*	3.25	Nor-577	3.70	Transmission	
Nor-195D	3.60	Nor-577X	5.10	1925 (Early)	1.20
Nor-310D*	3.15	Nor-614D	3.75	1926 (Late)	1.30
Nor-341A	3.00	Nor-627D	4.90		
Nor-515D	3.40	Nor-633D	3.80		

*Also supplied undrilled.