BRAKE GROUP

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HYDRAULIC BRAKE SPECIFICATIONS

TRUCK MODEL	L-110 L-111 L-112	L-120 L-121 L-122	LM-120 LM-121 LM-122	L-130 L-131 L-132	LB-140	L-150	L-151 L-152 L-153	LM-150 LM-151
Brake Type	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Brake Size (Standard): Front	12x1-3/4x3/16	12x1-3/4x3/16	12x1-3/4x3/16	12x1-3/4x3/16	12x1-3/4x3/16	12-1/8x2x1/4	12-1/8x2x1/4	12-1/8x2x1/4
Rear	12x1-3/4x3/16	12x2x3/16	12x2x3/16	14x2-1/4x1/4	14x2-1/4x1/4	14-1/8x3x3/8	14-1/8x3x3/8	14x2-1/4x1/4
Brake Size (Increased Capacity): Front (Same as Standard)	.....	.....	.....	.....	.....	12-1/8x2x1/4	.....	12-1/8x2x1/4
Rear	.....	.....	.....	.....	.....	14-1/8x3x3/8	.....	14-1/8x3x3/8
Number of Shoes: Front	2	2	2	2	2	2	2	2
Rear	2	2	2	2	2	2	2	2
Type of Anchor: Front	Single	Single	Single	Single	Single	Single	Single	Single
Rear	Single	Single	Single	Single	Single	Single	Single	Single
Wheel Cylinder Size (Standard): Front	1	1	1	1	1	1	1	1
Rear	1	1-1/8	1-1/8	1-1/4	1-1/4	1-1/4	1-3/8	1-1/4
Wheel Cylinder Size (Increased Capacity): Front (Same as Standard)	.....	.....	.....	.....	.....	1	.....	1
Rear	.....	.....	.....	.....	.....	1-3/8	.....	1-3/8
Number of Wheel Cylinders (Standard): Front	1	1	1	1	1	1	1	1
Rear	1	1	1	1	1	1	1	1
Number of Wheel Cylinders (Increased Capacity): Front (Same as Standard)	.....	.....	.....	.....	.....	1	.....	1
Rear	.....	.....	.....	.....	.....	2	.....	2
Master Cylinder: Size (Bore and Stroke)	1-1/8x1-7/16	1-1/8x1-7/16	1-1/8x1-7/16	1-1/8x1-7/16	1-1/8x1-7/16	1-1/8x1-7/16	1-1/4x1-7/16	1-1/8x1-7/16
Type	Barrel	Barrel	Barrel	Barrel	Barrel	Barrel	Barrel	Barrel
Hydrovac: Standard or Optional	.....	.....	.....	.....	.....	Optional	Optional	.....
Model No. (Bendix)	.....	.....	.....	.....	.....	374000	374000	.....
Series	.....	.....	.....	.....	.....	"C"	"C"	.....
Cylinder Diameter	.....	.....	.....	.....	.....	6-3/4"	6-3/4"	.....
Single or Tandem Piston	.....	.....	.....	.....	.....	Single	Single	.....

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HYDRAULIC BRAKE SPECIFICATIONS - Continued

TRUCK MODEL	LM-152	L-160 L-161 L-162 L-163 L-165	L-164	LC-160 LC-161 LC-162	L-170 L-171 L-172 L-173 L-175	L-174
Brake Type	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Brake Size (Standard): Front	12-1/8x2x1/4	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16
Rear	14-1/8x3x3/8	14-1/8x3x3/8	15x3x3/8	14-1/8x3x3/8	15x3x3/8	15x4x3/8
Brake Size (Increased Capacity): Front (Same as Standard)	.....	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16	12-1/8x2-1/4x5/16
Rear	.....	15x4x3/8	15x4x3/8	15x4x3/8	15x4x3/8	15x5x3/8
Number of Shoes: Front	2	2	2	2	2	2
Rear	2	2	2	2	2	2
Type of Anchor: Front	Single	Double	Double	Double	Double	Double
Rear	Double	Double	Double	Double	Double	Double
Wheel Cylinder Size (Standard): Front	1	1-1/8	1-1/8	1-1/8	1-1/4	1-1/4
Rear	1-3/8	1-3/8	1-3/8	1-3/8	1-1/2	1-1/2
Wheel Cylinder Size (Increased Capacity): Front (Same as Standard)	.....	1-1/8	1-1/8	1-1/8	1-1/4	1-1/4
Rear	.....	1-3/8	1-3/8	1-3/8	1-1/2	1-1/2
Number of Wheel Cylinders (Standard): Front	1	2	2	2	2	2
Rear	2	2	2	2	2	2
Number of Wheel Cylinders (Increased Capacity): Front (Same as Standard)	.....	2	2	2	2	2
Rear	.....	2	2	2	2	2
Master Cylinder: Size (Bore and Stroke)	1-1/4x1-7/16	1-1/4x1-7/16	1-1/4x1-7/16	1-1/4x1-7/16	1-1/2x1-7/16	1-1/2x1-7/16
Type	Barrel	Barrel	Barrel	Barrel	Barrel	Barrel
Hydrovac: Standard or Optional	.....	Standard	Standard	Standard	Standard	Standard
Model No. (Bendix)	.....	374000	374000	374000	375279 *	375279 *
Series	.....	"C"	"C"	"C"	"C"	"C"
Cylinder Diameter	.....	6-3/4"	6-3/4"	6-3/4"	9-1/2"	9-1/2"
Single or Tandem Piston	.....	Single	Single	Single	Single (Guided)	Single (Guided)

* These hydrovacs contain a residual pressure check valve and must be used with a master cylinder that does not have a residual pressure check valve.

HYDRAULIC BRAKE SPECIFICATIONS - Continued

TRUCK MODEL	LF-170 LF-171 LF-172	L-180 L-181 L-182 L-183 L-185	L-184	LC-180 LC-181 LC-182	L-190 L-191 L-192 L-193 L-195	L-194
Brake Type	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Brake Size (Standard): Front	12-1/8x2-1/4x5/16	13x2-1/4x5/16	13x2-1/4x5/16	13x2-1/4x5/16	15x2-1/4x5/16	15x2-1/4x5/16
Rear	15x3x3/8	15x4x3/8	16x4x3/8	15x4x3/8	16x4x3/8	16x5x3/8
Brake Size (Increased Capacity): Front (Same as Standard)	12-1/8x2-1/4x5/16	13x2-1/4x5/16	13x2-1/4x5/16	13x2-1/4x5/16	15x2-1/4x5/16	15x2-1/4x5/16
Rear	15x4x3/8	15x5x3/8	16x5x3/8	15x5x3/8	16x5x3/8	16x6x3/8
Number of Shoes: Front	2	2	2	2	2	2
Rear	2	2	2	2	2	2
Type of Anchor: Front	Double	Double	Double	Double	Double	Double
Rear	Double	Double	Double	Double	Double	Double
Wheel Cylinder Size (Standard): Front	1-1/4	1-1/8	1-1/8	1-1/8	1-1/4	1-1/4
Rear	1-3/8	1-1/2	1-1/2	1-3/4	1-3/4	1-3/4
Wheel Cylinder Size (Increased Capacity): Front (Same as Standard)	1-1/4	1-1/8	1-1/8	1-1/8	1-1/4	1-1/4
Rear	1-3/8	1-1/2	1-1/2	1-1/2	1-3/4	1-3/4
Number of Wheel Cylinders (Standard): Front	2	2	2	2	2	2
Rear	2	2	2	2	2	2
Number of Wheel Cylinders (Increased Capacity): Front (Same as Standard)	2	2	2	2	2	2
Rear	2	2	2	2	2	2
Master Cylinder: Size (Bore and Stroke)	1-3/4x1-7/16	1-1/2x1-7/16	1-1/2x1-7/16	1-1/2x1-7/16	1-3/4x1-7/16	1-3/4x1-7/16
Type	Barrel	Barrel	Barrel	Barrel	Barrel	Barrel
Hydrovac: Standard or Optional	Standard	Standard	Standard	Standard	Standard	Standard
Model No. (Bendix)	375278 *	375279 *	375279 *	375279 *	375278 *	375278 *
Series	"C"	"C"	"C"	"C"	"C"	"C"
Cylinder Diameter	9-1/2"	9-1/2"	9-1/2"	9-1/2"	9-1/2"	9-1/2"
Single or Tandem Piston	Single (Guided)	Single (Guided)	Single (Guided)	Single (Guided)	Single (Guided)	Single (Guided)

* These hydrovacs contain a residual pressure check valve and must be used with a master cylinder that does not have a residual pressure check valve.

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HYDRAULIC BRAKE SPECIFICATIONS - Continued

TRUCK MODEL	LF-190 LF-191 LF-192	LC-190 LC-191 LC-192	L-200 L-201 L-202 L-205	L-204	LC-200 LC-201 LC-202	L-201 L-211
Brake Type	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Brake Size (Standard): Front	15x2-1/4x5/16	15x2-1/4x5/16	15x2-1/4x5/16	15x2-1/4x5/16	12x2-1/4x5/16	16-1/2x3-1/2x5/8
Rear	15x4x3/8	16x4x3/8	16x5x3/8	16-1/2x7-1/8x5/8	16x5x3/8	16-1/2x7-1/8x5/8
Brake Size (Increased Capacity): Front (Same as Standard)	15x2-1/4x5/16	15x2-1/4x5/16	15x2-1/4x5/16	.....	15x2-1/4x5/16	.....
Rear	15x5x3/8	16x5x3/8	16x6x3/8	. ...	16x6x3/8	.....
Number of Shoes: Front	2	2	2	2	2	2
Rear	2	2	2	2	2	4
Type of Anchor: Front	Double	Double	Double	Double	Double	Double
Rear	Double	Double	Double	Double	Double	Double
Wheel Cylinder Size (Standard): Front	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/2
Rear	1-1/2	1-3/4	1-3/4	1-5/8	1-3/4	1-5/8
Wheel Cylinder Size (Increased Capacity): Front (Same as Standard)	1-1/4	1-1/4	1-1/4	.....	1-1/4	.....
Rear	1-1/2	1-3/4	1-3/4	.....	1-3/4	.....
Number of Wheel Cylinders (Standard): Front	2	2	2	2	2	2
Rear	2	2	2	2 Siamese Twin-type	2	2 Siamese Twin-type
Number of Wheel Cylinders (Increased Capacity): Front (Same as Standard)	2	2	2	.....	2	.....
Rear	2	2	2	.....	2	.....
Master Cylinder: Size (Bore and Stroke)	1-3/4x2-1/2	1-3/4x1-7/16	1-3/4x1-7/16	1-3/4x2-1/2	1-3/4x1-7/16	1-3/4x2-1/2
Type	Barrel	Barrel	Barrel	Barrel	Barrel	Barrel
Hydrovac: Standard or Optional	Standard	Standard	Standard	Standard	Standard	Standard
Model No. (Bendix)	374229 *	375278 *	375278 *	374230 *	375278 *	374230 *
Series	"C"	"C"	"C"	"C"	"C"	"C"
Cylinder Diameter	9-1/2"	9-1/2"	9-1/2"	9-1/2"	9-1/2"	9-1/2"
Single or Tandem Piston	Tandem	Single (Guided)	Single (Guided)	Tandem	Single (Guided)	Tandem

* These hydrovacs contain a residual pressure check valve and must be used with a master cylinder that does not have a residual pressure check valve.

HYDRAULIC BRAKE SPECIFICATIONS - Continued

TRUCK MODEL	LF-210 LF-211 LF-212	L-220 L-225	LF-160 LF-221 LF-222	L-230 L-231	LF-230 LF-231
Brake Type	Hydraulic	.....	Hydraulic	.....	.....
Brake Size (Standard): Front	16-1/2x3-1/2x5/8	.....	16-1/2x3-1/2x5/8	.....	.....
Rear	16x4x3/8	.....	16x4x3/8	.....	.....
Brake Size (Increased Capacity): Front (Same as Standard)	.....	.....	.....	.....	.....
Rear	.....	.....	.....	.....	.....
Number of Shoes: Front	2.	.....	2	.....	.....
Rear	2	.....	2	.....	.....
Type of Anchor: Front	Double	.....	Double	.....	.....
Rear	Double	.....	Double	.....	.....
Wheel Cylinder Size (Standard): Front	1-1/2	.....	1-1/2	.....	.....
Rear	1-3/4	.....	1-3/4	.....	.....
Wheel Cylinder Size (Increased Capacity): Front (Same as Standard)	.....	.....	.....	.....	.....
Rear	.....	.....	.....	.....	.....
Number of Wheel Cylinders (Standard): Front	2	.....	2	.....	.....
Rear	2	.....	2	.....	.....
Number of Wheel Cylinders (Increased Capacity): Front (Same as Standard)	.....	.....	.....	.....	.....
Rear	.....	.....	.....	.....	.....
Master Cylinder: Size (Bore and Stroke)	1-3/4x2-1/2	.....	1-3/4x2-1/2	.....	.....
Type	Barrel	Barrel	.....	.....	.....
Hydrovac: Standard or Optional	Standard	.....	Standard	.....	.....
Model No. (Bendix)	374230 *	.....	374230 *	.....	.....
Series	"C"	.....	"C"	.....	.....
Cylinder Diameter	9-1/2"	.....	9-1/2"	.....	.....
Single or Tanden Piston	Tandem	.....	Tandem	.....	.....

* These hydrovacs contain a residual pressure check valve and must be used with a master cylinder that does not have a residual pressure check valve.

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AIR BRAKE SPECIFICATIONS

TRUCK MODEL	L-180 L-181 L-182 L-185	LC-180 LC-181 LC-182	L-184 L-190 L-191 L-192 L-195	LF-190 LF-191 LF-192	LC-190 LC-191 LC-192	L-194 L-200 L-201 L-202 L-205	LC-200 LC-201 LC-202
Standard or Special. . . .	Special	. . . . .	Special	. . . . .	. . . . .	Special	. . . . .
Brake Size:							
Front.	16x2-1/4x5/16	. . . . .	16x2-1/4x5/16	. . . . .	. . . . .	16x2-1/4x5/16	. . . . .
Rear	16x5-1/2x1/2	. . . . .	16-1/2x6x3/4	. . . . .	. . . . .	16-1/2x6x3/4	. . . . .
Brake Chamber-Front:							
Location.	Back. Plate	. . . . .	Back. Plate	. . . . .	. . . . .	Back. Plate	. . . . .
Type	E	. . . . .	E	. . . . .	. . . . .	E	. . . . .
Size	6-3/16	. . . . .	6-3/16	. . . . .	. . . . .	6-3/16	. . . . .
Brake Chamber-Rear:							
Location.	Axle Pad	. . . . .	Axle Pad	. . . . .	. . . . .	Axle Pad	. . . . .
Type	C	. . . . .	C	. . . . .	. . . . .	B	. . . . .
Size.	8-1/16	. . . . .	9-3/16	. . . . .	. . . . .	9-3/16	. . . . .
Slack Adjuster Length:							
Front.	3-3/8	. . . . .	4	. . . . .	. . . . .	5	. . . . .
Rear	6	. . . . .	6	. . . . .	. . . . .	7	. . . . .
Brake Valve:							
Model.	D-1	. . . . .	D-1	. . . . .	. . . . .	D-1	. . . . .
Control.	Foot Pedal	. . . . .	Foot Pedal	. . . . .	. . . . .	Foot Pedal	. . . . .
Air Reservoir:							
Number Used.	1	. . . . .	1	. . . . .	. . . . .	1	. . . . .
Length and Diameter.	41-1/2x8	. . . . .	41-1/2x8	. . . . .	. . . . .	41-1/2x8	. . . . .
Air Compressor:							
Type (Westinghouse).	2-Cyl.	. . . . .	2-Cyl.	. . . . .	. . . . .	2-Cyl.	. . . . .
Capacity in Cu. Ft . .	7-1/4	. . . . .	7-1/4	. . . . .	. . . . .	7-1/4	. . . . .
Cooling.	Water	. . . . .	Water	. . . . .	. . . . .	Water	. . . . .
Mounting.	Engine	. . . . .	Engine	. . . . .	. . . . .	Engine	. . . . .
Drive.	Belt	. . . . .	Belt	. . . . .	. . . . .	Belt	. . . . .

AIR BRAKE SPECIFICATIONS - Continued

TRUCK MODEL	L-204	L-210 L-211	LF-210 LF-211 LF-212	L-220 L-225	LF-220 LF-221 LF-222	L-230 L-231	LF-230 LF-231
Standard or Special.	Special	Special	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Brake Size: Front.	16x2-1/4x5/16	17-1/4x3x3/8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Rear	16-1/2x7x3/4	16-1/2x7x3/4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Brake Chamber-Front: Location.	Back. Plate	Back. Plate	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Type	E	A	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Size.	6-3/16	6-15/16	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Brake Chamber-Rear: Location.	Axle Pad	Axle Pad	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Type	G	G	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Size.	9-7/8	9-7/8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Slack Adjuster Length: Front.	5	5	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Rear	6-1/2	6-1/2	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Brake Valve: Model.	D-1	D-1	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Control.	Foot Pedal	Foot Pedal	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Air Reservoir: Number Used.	1	1	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Length and Diameter. .	41-1/2x8	41-1/2x8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Air Compressor: Type (Westinghouse). .	2-Cyl.	2-Cyl.	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Capacity Cu. Ft..	7-1/4	7-1/4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Cooling.	Water	Water	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Mounting.	Engine	Engine	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Drive.	Belt	Belt	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .

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HYDRAULIC BRAKES

HYDRAULIC BRAKE SYSTEM

The hydraulic system used to actuate the brake mechanism consists of a compensating type master cylinder in which the hydraulic pressure is originated; individual wheel cylinders, in which the hydraulic pressure is applied, which serve to actuate the brake shoes against the brake drum of each wheel; and the "Line" consisting of steel tubing, flexible hose, brackets and unions, interconnecting the master cylinder and wheel cylinders. The master cylinder and wheel cylinders are fitted with pistons, all of which are provided with cup packings, which act as a seal to maintain pressure and prevent loss of brake fluid.

Depressing the brake pedal moves the piston within the master cylinder, thus displacing the brake fluid from the master cylinder through its outlet orifices, tubing and flexible hose connections into the wheel cylinders. The brake fluid, being noncompressible, enters each of the wheel cylinders, causing the cylinder pistons to move outward and actuate the brake shoes. As pressure on the pedal is increased, greater hydraulic pressure is built up within the wheel cylinders, and consequently greater force is exerted against the shoes.

When the pressure on the pedal is released, the brake shoe retracting springs return the brake shoes to their normal or released position. The return movement of the brake shoes, in turn, causes movement of the wheel cylinder pistons toward their released position, thus forcing the fluid back thru the tubing into the master cylinder.

Hydraulic Fluid

Always use genuine "Lockheed" or other high grade automotive type brake fluid. The use of other than genuine "Lockheed" or any high grade automotive type brake fluid or the introduction of mineral base oil into the system will cause rubber parts to swell and become inoperative.

Combination Type Master Cylinder (Fig. 1)

The combination type master cylinder consists of barrel and tank casting, double check valve (L), piston cup return spring (I), piston cup (D), piston (B), piston stop (P), boot (G) and connecting link (A).

The fluid reservoir or supply tank is cast integral over the master cylinder barrel. A combination filler and breather plug (N) permits atmospheric pressure on the reserve fluid at all times.

Depression of the pedal causes piston (B) and cup (D) to move forward in the cylinder barrel. A very small forward movement of cup (D) closes compensating port (C) and the pressure stroke commences.

Actual pressure is not built up until the fluid displaced has caused all shoes to go into contact with their drums. Additional pressure on the pedal produces hydraulic pressure within the brake system.

Removal of operator's foot from the brake pedal after each brake application permits the brake pedal and push rod (A) to return independently to their off-position.

The return of piston (B) and cup (D) is accomplished by the piston return spring (I).

The piston for this type of unit is designed to carry a primary cup (D) and a secondary cup (E). The construction of the piston is such that reserve fluid from the tank passes through vent (R) in a recessed area. Thus we have fluid on both sides of the primary cup. The secondary cup (E) is merely a seal to prevent loss of reserve fluid into boot (G).

The combination type master cylinder is also known as a compensating type. Its primary compensating function is to maintain a constant volume of fluid in the system at all times, regardless of expansion (heat) or contraction (cold). The secondary compensating function is the replacement of additional fluid into the system to counterbalance any loss due to gravity seepage.

The return to off-position of piston (B) and cup (D) is much faster in displaced volume than the return of the fluid through fitting (J) into the master cylinder. A momentary vacuum is created in the cylinder barrel and additional fluid is drawn into the system through the drilled holes in piston (B) and past the lip of cup (D). The operating fluid returns more slowly from the wheel cylinders and lines back into the master cylinder barrel. Any excess is by-passed by port (C) into the reservoir. Thus we have a cylinder full of fluid for the next brake application.

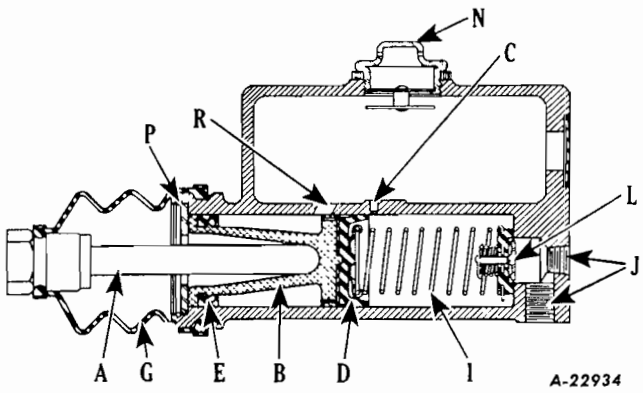

Fig. 1 - Typical Combination Type Master Cylinder.

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Check Valve

A double check valve is used in all master cylinders of the compensating type. It is held in the closed end of the master cylinder barrel by the piston cup return spring.

The valve performs two functions:

It acts as a seal to prevent fluid or air being drawn into the system through the bleeder screw during the bleeding operation.

Fluid passed through the valve on the pressure stroke can return into the master cylinder barrel only by raising the entire valve from its seat. The valve is held in place by the cup return spring.

When the pressure on the returning fluid drops below 6 to 8 pounds, the spring closes the valve and the system is under a slight pressure. This pressure will not cause the shoes to drag. It is used to assure a positive seal at the wheel cylinder cup packings.

The valve does not control brake pedal movement. Do not try to remedy this complaint by changing the valve.

NOTE: On vehicles equipped with certain models of Hydrovacs the check valve is located in the Hydrovac slave cylinder tube; and where this is the case, no check valve is used in the master cylinder. (See Hydrovac Specifications.)

Wheel Cylinders (Fig. 2 and 3)

Two types of wheel cylinders are used in the hydraulic brake system. Different combinations of these two types of cylinders are used on different model trucks. Fig. 2 illustrates a single piston wheel cylinder, and Fig. 3 illustrates a double piston wheel cylinder. The wheel cylinder assembly is the unit that changes the applied hydraulic pressure into mechanical force to actuate the brake shoes.

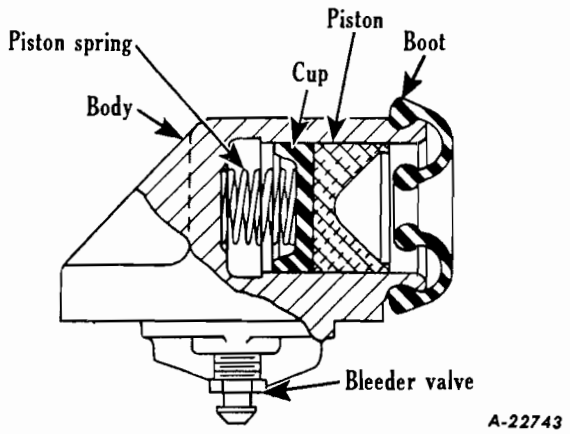

Fig. 2 - Typical Wheel Cylinder (Single-piston type).

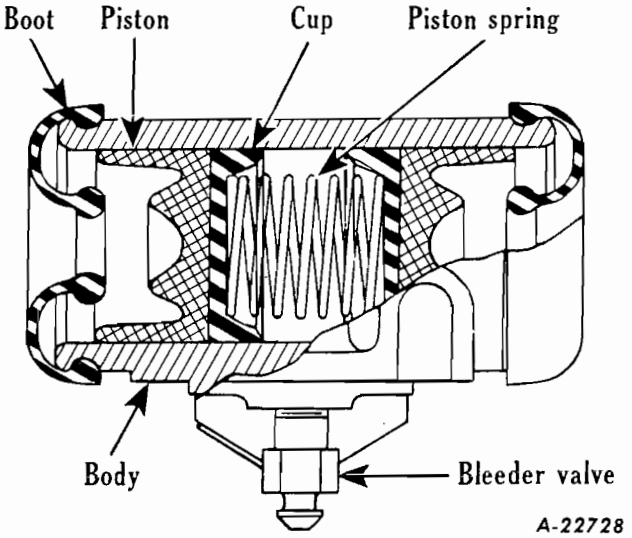

Fig. 3 - Typical Wheel Cylinder (Double-piston type).

Repairs to Master and Wheel Cylinders

It is possible to rehone the majority of cylinders and place them in good working condition; however, this requires the use of up-to-date honing equipment and plug gauges. A cylinder hone kit is available under number SE-1679, and a set of plug gauges under number SE-1000.

If this equipment is not available, we recommend that the unit be taken to the nearest Wagner Service Branch or Authorized Service Station for repairing.

Cylinders and parts must not be washed in gasoline, kerosene or oil. Use high-grade denatured alcohol.

Care

Keep all lubricant and brake fluid away from brake linings.

Inspect master cylinder at the time of making brake adjustments -- for correct fluid level. Fluid should be within 3/8" from bottom of filler neck. Do not fill supply reservoir to top of filler neck. Caution: When removing supply reservoir filler cap, extreme care must be used to prevent dirt or moisture from entering master cylinder.

Brake Pedal Adjustment

When brake control system is in release position, foot brake pedal should have 1/4" free travel (Fig. 4) before the pressure stroke starts. This free travel is required to prevent blocking of compensating port in master cylinder. Brakes will drag if compensating port becomes blocked due to pressure building up in the system. Shorten pedal push-rod to allow piston to uncover compensating port, allowing fluid to escape into tank.

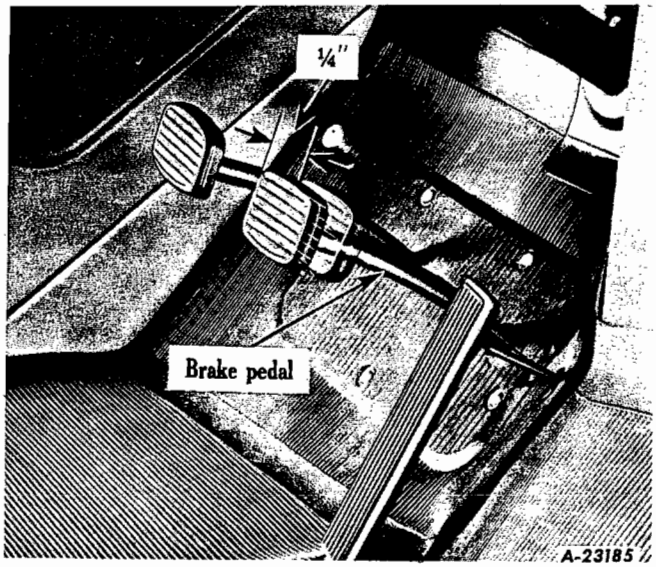

Fig. 4 - Brake Pedal Free Travel.

Bleeding The Lines (Also see Hydrovac Section)

Any air inside the hydraulic system must be removed. Whenever a line has been disconnected at master cylinder, the entire system must be bled at all wheels until all air is completely expelled. When a line has been disconnected at any wheel cylinder, this cylinder together with the cylinder on the opposite wheel must be bled. Air in the system will cause a springy, rubbery action of the brake pedal. Should a sufficient quantity be introduced into the system, the brake pedal will go to toeboard under normal pressure.

Fill master cylinder supply reservoir with genuine Lockheed or any high grade automotive type brake fluid and see that it is kept at least half full during entire bleeding operation.

Use pressure-type brake bleeder where available. Attach bleeder tube to bleeder valve by pushing tube over the end of bleeder valve. Allow tube to hang in a clean container, such as a pint glass jar. Unscrew bleeder valve 3/4 turn and depress brake pedal by hand, using half strokes, allowing pedal to return slowly. Pumping brake pedal forces fluid out into glass jar, and carries with it any air which might be present in the system. Watch flow of fluid from tube, the end of which should be kept below surface of fluid in pint bottle, and when all air bubbles cease to appear or when stream is a solid fluid mass, close bleeder valve. (See Fig. 5.)

Fluid withdrawn in bleeding operation should not be used again, unless absolutely certain that it does not contain impurities. Fluid of which the cleanliness is questionable should never be used. Fluid should be replenished in supply reservoir after each cylinder is bled. Should supply reservoir be drained during bleeding operation, air will enter the system and re-bleeding will then be necessary.

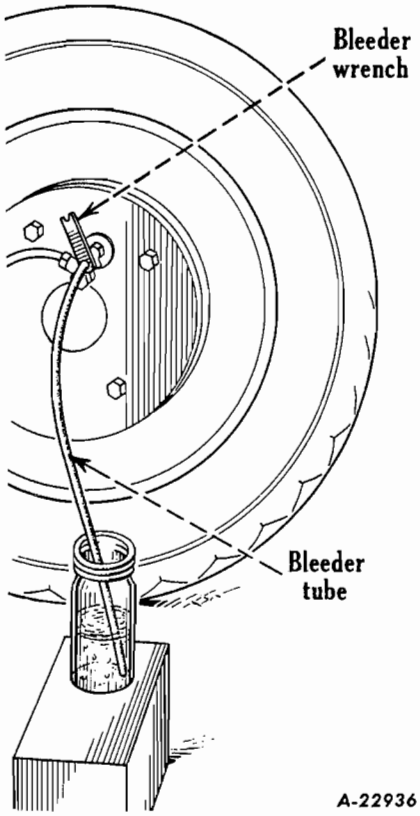

Fig. 5

Maintenance Hints

1. PEDAL GOES TO FLOOR BOARD:

Cause

(a) Normal wear of lining.
(b) Brake shoes not properly adjusted.
(c) Leak in system.
(d) Air in system.
(e) Pedal improperly set.
(f) No fluid in supply reservoir.

Remedy

(a) When brake linings become worn it is necessary to set the shoes into closer relation to brake drums. This condition is usually accompanied by the remark that it is necessary to pump the pedal several times before a brake is obtained. Shoes should be set in accordance with instructions on ADJUSTMENTS FOR WEAR. Do not disturb anchor pins when making this adjustment. Adjustment must be made while drums are cool.

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(b) In cases where the anchor pins have been disturbed and the relation of the arc of the shoes to drums changed, lining will wear rapidly and the braking efficiency of that particular wheel will be reduced. To overcome this condition, follow instructions as outlined in MAJOR ADJUSTMENTS, brake shoe adjustment sections.

(c) A leak in the system will allow the pedal, under pressure, to go to toe board gradually. If no leaks are found at wheels or joints, remove master cylinder and check bore of barrel for scores or scratches.

(d) Air in the system will cause a springy, rubbery action of the pedal. Should a sufficient quantity be introduced into the system, the pedal will go to toe board under normal pressure. System should be bled.

(e) Brake pedals should be set to give the correct amount of free movement before the pressure stroke starts. Excessive free movement reduces the active travel of the master cylinder piston, which in turn determines the amount of working fluid to be expelled from the master cylinder into the lines or system.

(f) The fluid level in the supply reservoir should be checked at regular intervals. Should the reservoir become empty, air will be introduced into the system, necessitating bleeding.

2. ALL BRAKES DRAG:

Cause

(a) Mineral oil in system.

(b) Pedal improperly set.

Remedy

(a) The introduction of mineral oil, such as engine oil, kerosene, or any fluid with a mineral base, into the system will cause the cups to swell and distort, making it necessary to replace all cups and flush system.

(b) Directly ahead of the master cylinder piston cup (when in normal release position) is a relief port. It is imperative that this port be open when the brakes are released. Brake pedal should be set to give the proper free movement before pressure stroke begins. Should this port be blocked by piston cup not returning to its proper release position, the pressure in the system will gradually build up and brakes drag. Shorten pedal push rod to allow piston to uncover compensating port, allowing fluid to return to tank.

3. ONE WHEEL DRAGS:

Cause

(a) Weak brake shoe return spring.

(b) Brake shoe set too close to drum.

(c) Cups distorted.

(d) Loose wheel bearings.

Remedy

(a) Springs sometimes lose their contracting power and take a set. Replace spring.

(b) Readjust shoes to proper clearance. Do not change anchor pin setting unless necessary.

(c) If in repairing wheel cylinders, kerosene, gasoline and other fluids are used as a cleaner, instead of alcohol, the cups will swell and distort. The return action of the shoes will be retarded and the brake drum will heat. Replace cups and wash unit in alcohol and dip all parts in fluid before reassembling.

(d) Tighten bearings.

4. TRUCK PULLS TO ONE SIDE:

Cause

(a) Grease-soaked lining.

(b) Shoes improperly set.

(c) Backing plates loose on axle.

(d) Front spring U-bolts loose.

(e) Different makes of lining.

(f) Tires not properly inflated.

Remedy

(a) Replace with new lining of same make. Grease-soaked linings cannot be salvaged by washing or cleaning.

(b) Refer to MAJOR ADJUSTMENTS, brake shoe adjustment sections.

(c) Loose backing plates permit the brake assembly to shift on the locating bolts. This shifting changes the predetermined centers and causes unequal efficiency. Tighten backing plate and readjust shoes with feeler gauge.

(d) Loose spring U-bolts permit the axle to shift on the springs and run out of line. This is noticed especially when a high braking torque is developed. Tighten U-bolts at their proper location on spring.

(e) Different makes of linings have different braking efficiency. Two different makes, one with high efficiency and one with low efficiency, would cause truck to pull to one side.

(f) All tires should be properly inflated.

5. SPRINGY, SPONGY PEDAL:

Cause

(a) Brakes shoes not properly adjusted.

(b) Air in system.

Remedy

(a) Consult remedy (b) under No. 1.

(b) Consult remedy (d) under No. 1.

6. EXCESSIVE PRESSURE ON PEDAL, POOR STOP:

Cause

(a) Brake shoes not properly adjusted.

(b) Improper lining.

(c) Oil in lining.

(d) Lining making partial contact.

Remedy

(a) Consult remedy (b) under No. 1.

(b) Specified linings have been developed to give satisfactory service and no changes should be made in the field to other makes of linings.

(c) Replace shoes.

(d) Remove high spots.

7. LIGHT PRESSURE ON PEDAL, SEVERE BRAKES:

Cause

(a) Brake shoes not properly adjusted.

(b) Loose backing plate on axles.

(c) Grease-soaked lining.

Remedy

(a) Consult remedy (b) under No. 4.

(b) Consult remedy (c) under No. 4.

(c) Consult remedy (a) under No. 4.

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HYDROVAC POWER BRAKE SYSTEM

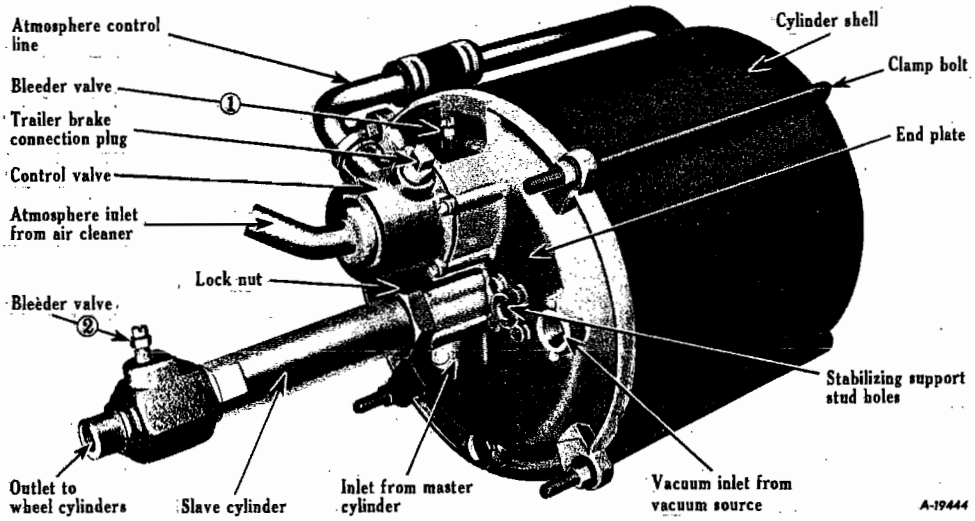

Fig. 1 - Exterior View of Third Series ("C" Series) Single 6-3/4" Diameter Piston Hydrovac No. 474000 (Fig. 2 illustrates the Interior Details of the Above Unit.)

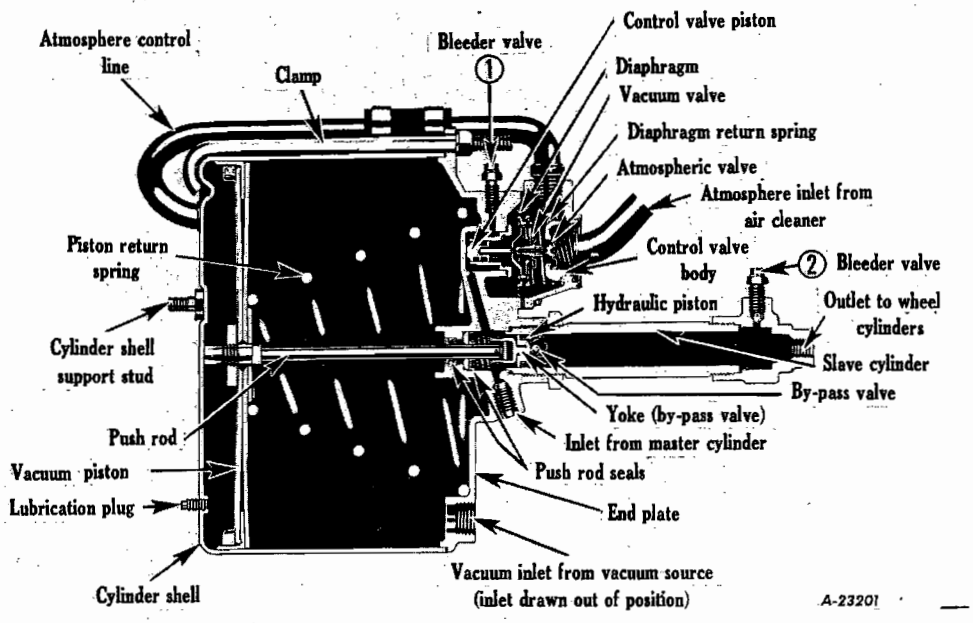

Fig. 2 - Sectional View of Third Series ("C" Series) Single 6-3/4" Diameter Piston Hydrovac No. 374000.

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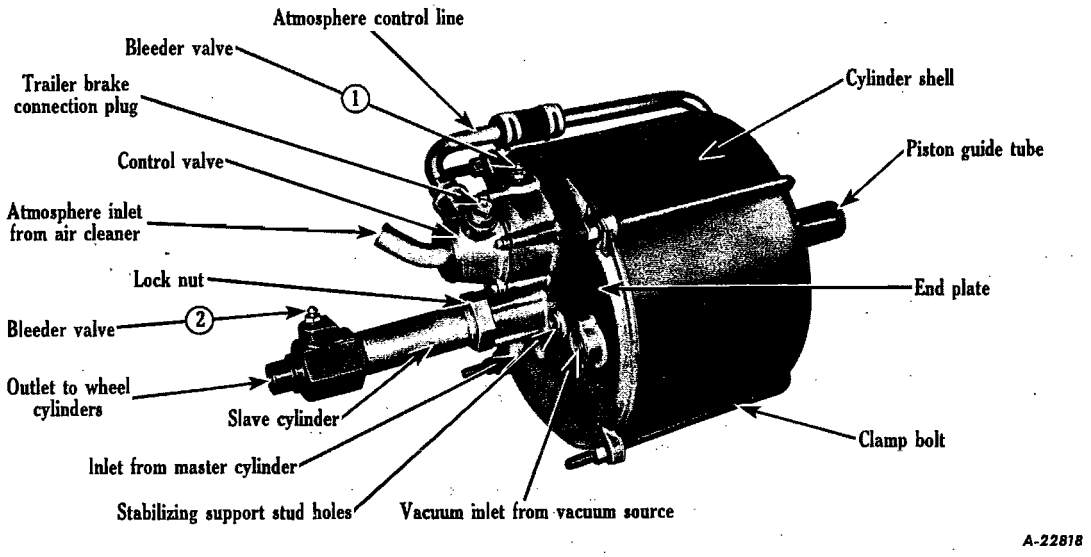

Fig. 3 - Exterior View of Third Series ("C" Series) Single 9-1/2" Diameter Guided Piston Hydrovacs No's. 375278 and 375279.

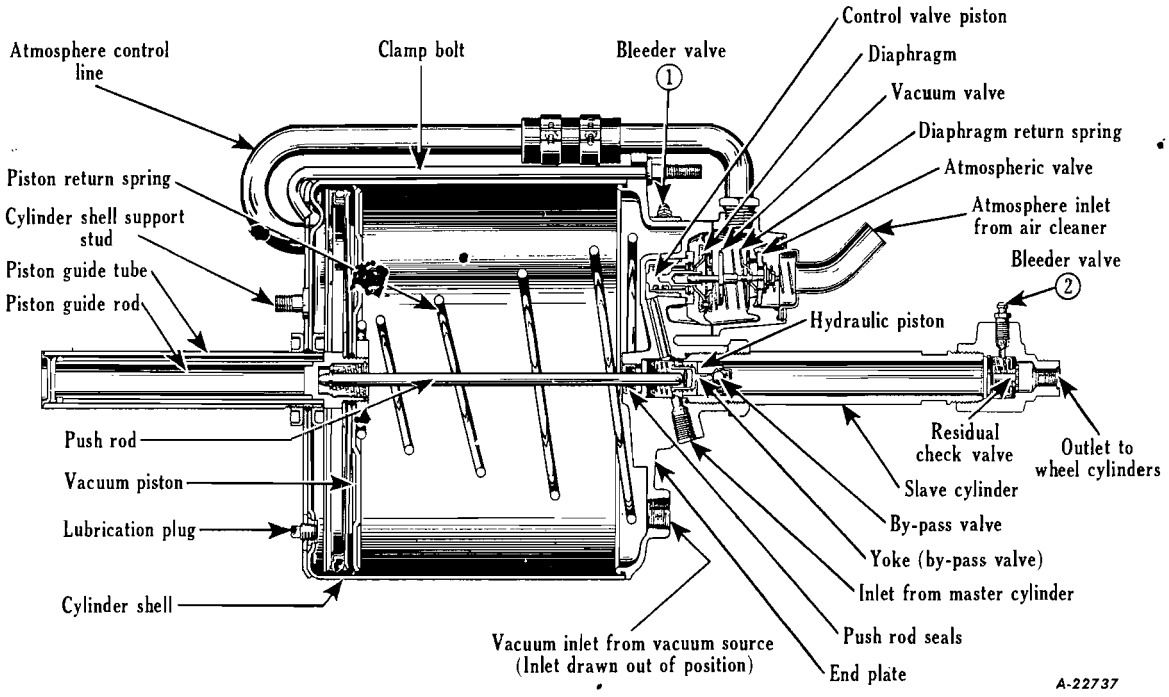

Fig. 4 - Sectional View of Third Series ("C" Series) Single 9-1/2" Diameter Guided Piston Hydrovacs No's. 375278 and 375279.

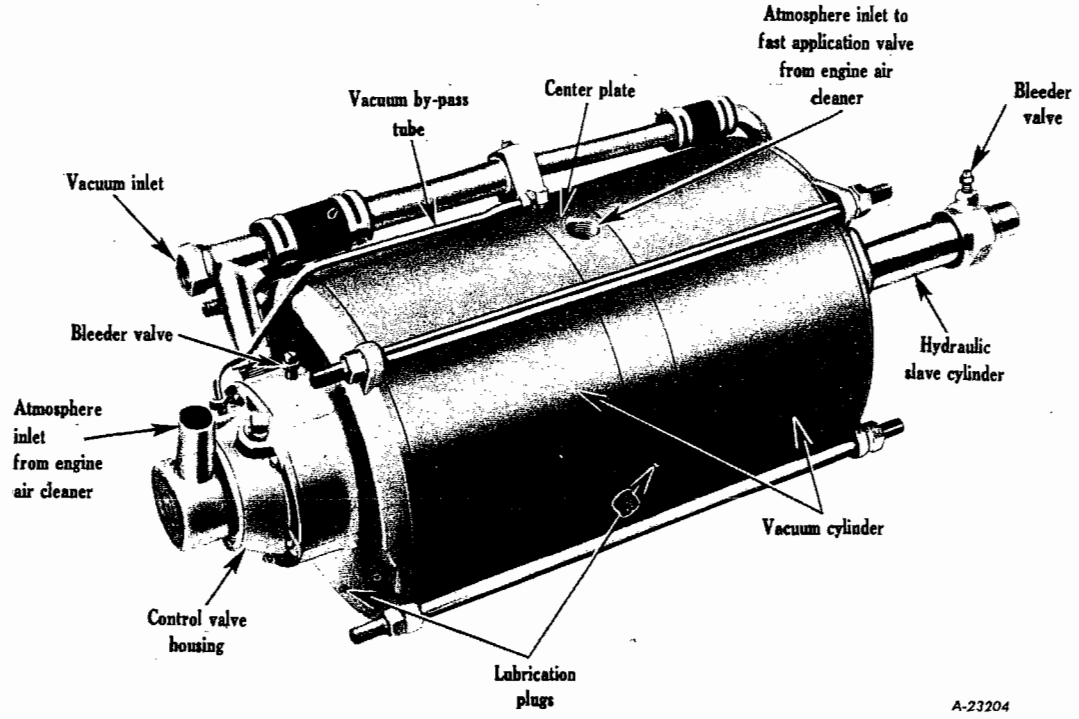

Fig. 5 - Exterior View of Third Series ("C" Series) Tandem 9-1/2" Diameter Cylinder Hydrovacs No's. 374229 and 374230.

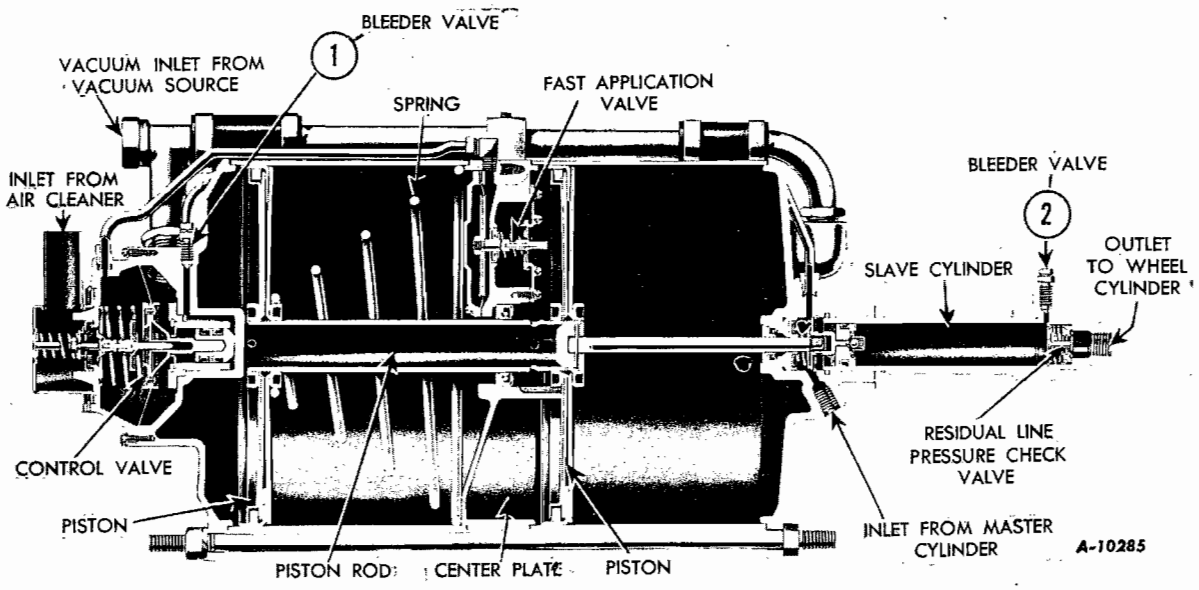

Fig. 6 - Sectional View of Third Series ("C" Series) Tandem 9-1/2" Diameter Cylinder Hydrovacs No's. 374229 and 374230.

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HYDROVAC POWER BRAKE SYSTEM
(Bendix Hydrovacs Third Series "C"
Nos. 374000, 375278, 375279,
374229 and 374230)

Hydrovac Power Brake Units
(Figs. 1, 2, 3, 4, 5, 6)

The hydrovac is installed on vehicles having the conventional hydraulic brake system to make available to the operator a greater pressure on the hydraulic brake system than could be exerted by foot pressure alone.

Description

The hydrovac is a hydraulic-vacuum power braking unit which is connected to the truck or bus braking system by a hydraulic line from the vehicle brake master cylinder to the hydrovac and a hydraulic line from the hydrovac to the wheel cylinders of the vehicle brake system. Vacuum for operation of the hydrovac is obtained from the engine intake manifold. The hydrovac is a self-contained unit having no external rods or levers exposed to dirt or moisture to rust and corrode.

Figs. 1 and 2 illustrate the single piston 6-3/4" diameter hydrovac.

Figs. 3 and 4 illustrate the single guided piston 9-1/2" diameter hydrovac.

Figs. 5 and 6 illustrate the tandem piston 9-1/2" diameter hydrovac.

Bleeding Instructions

Bleed the hydrovac and wheel cylinders with the engine stopped, bleeding the hydrovac first at the two bleeder valves (Figs. 2, 4 and 6) in the control valve and in the slave cylinder in the following manner:

1. Attach bleeder tube to bleeder valve No. 1 by pushing the end of tube over the bleeder valve.

2. Insert the end of bleeder tube in a container containing a small amount of brake fluid.

3. Unscrew the bleeder valve 3/4 turn and depress brake pedal by hand. Allow the pedal to return quickly to the "OFF" position.

   NOTE: Bleeding instructions for all vehicles having the residual check valve located in the master cylinder recommend allowing the brake pedal to return to the "OFF" position slowly. However, in brake systems where the residual check valve is located in the hydrovac slave cylinder end the brake pedal must be allowed to snap back "QUICKLY" to be released position. This rapid return of the pedal and master cylinder piston allows the master cylinder barrel to receive brake fluid from the master cylinder reservoir on the return stroke and not just draw fluid back out of the lines when the pedal is released.

   Continue bleeding until all of the air is expelled, close bleeder valve. Repeat bleeding operation at bleeder valve No. 2, making sure the master cylinder fluid reservoir is kept full of brake fluid.

4. Bleed the wheel brake cylinders in any convenient order. NOTE: Fluid withdrawn in the bleeding operation should not be used again.

Lubrication

It has been definitely established that lubrication is highly important in hydrovac maintenance and that neglect of this service adversely affects performance.

Hydrovacs should be lubricated as follows:

1. Single piston 6-3/4" diameter hydrovacs should be lubricated once a year (preferably before cold weather) or every 20,000 miles, whichever occurs first.

2. Single piston 9-1/2" diameter hydrovacs should be lubricated every six (6) months or every 10,000 miles, whichever occurs first. One of these lubrication periods should occur just prior to the start of cold weather.

3. The tandem piston hydrovacs should be lubricated once a year (preferably before cold weather) or every 20,000 miles, whichever occurs first.

The lubrication service should be performed with the hydrovac mounted on the vehicle, with the engine stopped, and brakes released.

Single piston hydrovacs have one pipe plug in the cylinder shell (Figures 2 and 4), remove pipe plug and fill cylinder with vacuum cylinder oil to the level of the bottom of the hole. Replace pipe plug. Tandem piston hydrovacs have two pipe plugs, one in the end plate below control valve and the other in the center plate between the vacuum cylinders (Fig. 5). Remove pipe plugs and fill cylinder with vacuum cylinder oil to the level of the bottom of the holes. Replace pipe plugs.

NOTE: The quantities of oil required are automatically controlled by the position of pipe plugs. They are located so as to establish the proper oil level.

HYDROVAC OIL CAPACITIES ARE AS FOLLOWS:

HYDROVAC SIZE	APPROXIMATE OIL CAPACITY	
	END CHAMBER	CENTER CHAMBER
6-3/4" Diam. Single Piston	1 ounce	None
9-1/2" Diam. Single Piston	2 ounces	None
9-1/2" Diam. Tandem Piston	2 ounces	4 ounces

Hydrovac Air Inlet Filter (Fig. 7).

On all hydrovac installations, a filter is provided to clean the air entering the power chamber whenever the brakes are applied. This filter is located on the inside of cab below driver's seat. The air cleaner should be inspected every 1000 miles. If air passages are restricted, remove the air cleaner, dismantle and thoroughly clean all parts in a cleaning solvent and allow to drip dry. Then saturate the air cleaning element with a light oil, reassemble and install on vehicle.

NOTE: Where the air inlet line is connected to the engine air filter, servicing the air filter as outlined in the Fuel System Maintenance Section will suffice.

CAUTION: All hose connections must be secure and leak-proof.

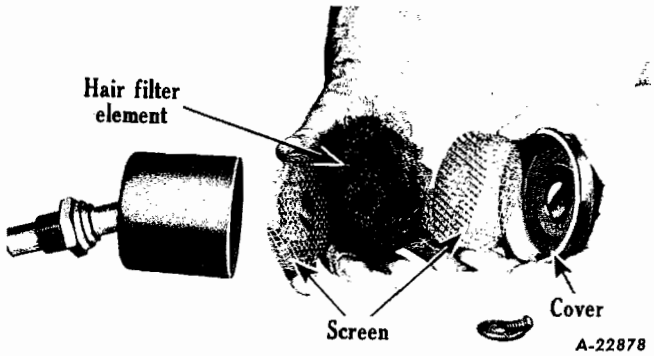

Fig. 7 - Hydrovac Air Inlet Filter.

Vacuum Line Oil Bath Air Cleaner (Fig. 8).

On trucks having a separate air cleaner for the vacuum line, this unit is located on the engine side of cowl at upper right hand corner. The vacuum line air cleaner prevents any dirt or foreign matter being drawn into intake manifold when the brakes are applied. In normal operation, service the cleaner every 5000 miles by removing oil reservoir, cleaning thoroughly in a suitable cleaning solution or kerosene and refilling with clean engine oil to indicated level on side of reservoir (Fig. 8). Use same grade of oil as used in engine crankcase.

CAUTION: Be sure that reservoir seats perfectly against gasket and that clamp is correctly installed after completing service operation. Should a leak occur, the engine performance and hydrovac operation will be seriously affected.

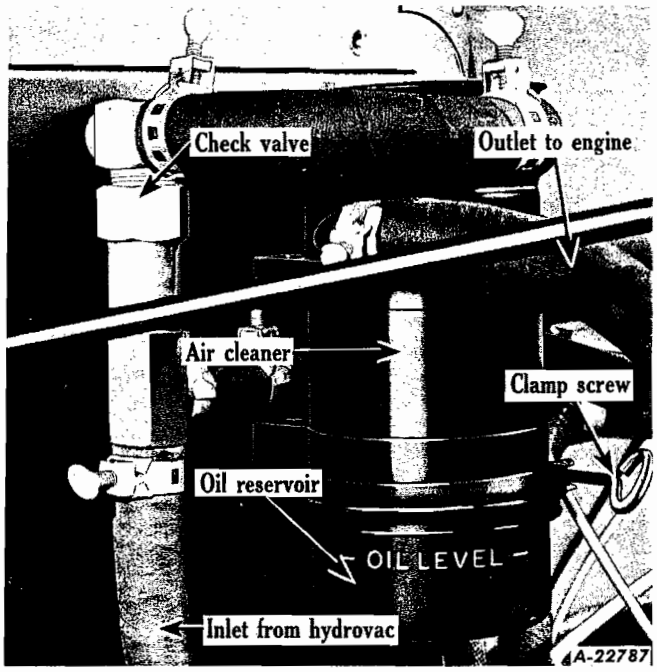

Fig. 8 - Vacuum Line Oil Bath Air Cleaner.

Vacuum Connection Service

Remove the vacuum connection elbow from the intake manifold every 10,000 miles and inspect the elbow and vacuum line for any possible obstruction. Clean the elbow and reinstall.

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BRAKE TROUBLE CHART FOR VEHICLES EQUIPPED WITH HYDROVAC UNITS

TRUCK BRAKE TROUBLES ARE EASILY DIAGNOSED IF THE COMPLAINT IS UNDERSTOOD.

THEY WILL ALWAYS SHOW UP IN ONE OR MORE OF THE FOUR WAYS LISTED BELOW.

THE DRIVER MAY REPORT OTHER SYMPTOMS, BUT THESE WILL NOT HELP IN YOUR ANALYSIS.

BE SURE TO HAVE THE DRIVER TELL YOU WHICH OF THESE FOUR CONDITIONS HE HAS NOTICED.

IF AT ALL POSSIBLE; DRIVE THE TRUCK AND ACTUALLY FEEL THE CONDITION.

THE "FOUR WAYS" OR CONDITIONS	POSSIBLE SOURCE OF TROUBLE
No. 1 Hard Pedal	1-Vacuum failure due to: (a) Faulty vacuum check valve. (b) Collapsed vacuum hose. (c) Plugged vacuum fittings. 2-Bound-up pedal shaft. 3-Glazed linings. 4-Grease or brake fluid on linings. 5-Hydrovac trouble.
No. 2 "Grabby" Brakes	1-Grease or brake fluid on linings. 2-Scored drums. 3-Anchor pins bound-up. 4-Hydrovac valve trouble.
No. 3 Pedal Goes to Floor or almost to floor	1-Brakes need adjustment. 2-Air in hydraulic system. 3-Hydraulic leak. 4-Master cylinder fluid - reservoir needs replenishing. 5-Cracked drum. 6-Hydrovac leakage.
No. 4 Brakes Fail to Release	1-Master cylinder compensating - post covered or plugged. 2-Anchor pins bound-up. 3-Bound-up brake pedal shaft. 4-Brakes improperly adjusted. 5-Faulty hydraulic check valve - at master cylinder or hydrovac. 6-Hydrovac valve or ball check trouble.

Hydrovac Check

The following data will assist in the checking of brake systems utilizing the Hydrovac Power Unit. The unit should be checked on the vehicle to determine that the trouble is not elsewhere in the brake system. The various units of the brake system should be checked individually for damage or misadjustment before proceeding with the hydrovac check.

A good quick way to check the hydrovac, to determine whether it is operating at all, is as follows:

1. With the vehicle parking brake applied, clutch released, and transmission in neutral position; press the brake pedal to about a medium brake application and hold.

2. Turn the ignition switch to "ON" and start the engine.

3. Shortly after the engine starts, the brake pedal pressure will be felt to relieve itself. This is caused by the Hydrovac picking up the brake application. The relief or movement is quite noticeable when the hydrovac is functioning properly.

If no movement or relief is felt at the brake pedal when making the above check, it is good practice to check the brake system further before centering attention on the hydrovac unit. Check as follows:

1. Master Cylinder Piston Rod Clearance:

   Make certain linkage is properly adjusted to permit opening of compensating port with brake pedal in normal full released position. Failure to properly uncover the compensating port may cause sufficient pressure to be maintained in the brake system to hold the hydrovac valve in a partially applied position and thus cause dragging brakes.

2. Restricted Vacuum Lines:

   Check for vacuum at the hydrovac by disconnecting the vacuum line at the hydrovac vacuum connection fitting and holding a thumb over the line, with the engine running. If no vacuum exists, or if air flow is slow, check vacuum line to manifold for kinks in tubing and collapsed liners in hoses. Also test the check valve to be sure it opens. Check fitting at engine manifold for restriction.

3. Restricted Air Line and Air Cleaner:

   Disconnect the air cleaner line at the hydrovac and blow into the line. If the line is restricted, check for collapsed hose or tubing. Clean or replace air cleaner.

4. Brakes:

   Check brake shoe adjustment for proper clearances. Excessive shoe clearance will cause loss of pedal reserve travel. Insufficient shoe clearance may cause dragging brakes.

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AIR BRAKES

(For Description and Operation see Shop Talk No. 24)

AIR BRAKE EQUIPMENT

Air brake equipment on trucks and truck-tractors provides a means of controlling the brakes through the medium of compressed air. Air brake equipment consists of a group of devices. Some maintain a supply of compressed air, some direct and control the flow of the compressed air, and others transform the energy of compressed air into the mechanical force and motion necessary to apply the brakes. Different types and sizes of devices are used on different types of vehicles to meet the operating requirements, but they are all fundamentally the same. Following are the devices comprising a typical truck or truck-tractor air brake system, with a brief description of the function of each device.

Compressor

The compressor supplies the compressed air to operate the brakes.

Governor

The governor controls the compression of air by the compressor. Although the compressor runs continuously when the engine is running, the governor, acting in conjunction with the unloading mechanism in the compressor cylinder head, stops and starts the compression of air by the compressor when the desired maximum and minimum air pressures are present in the air brake system.

Brake Valve

The brake valve controls the air pressure being delivered to the brake chambers and in this way controls the operation of the brakes.

Quick Release Valve

The quick release valve speeds the release of air pressure from the front wheel brake chambers.

Relay Valve

The relay valve speeds the application and release of air pressure from the rear wheel brake chambers.

Brake Chambers and Brake Cylinders

Brake chambers and brake cylinders transform the energy of compressed air into the mechanical force and motion necessary to apply the brakes. One brake chamber or one brake cylinder is used to operate the brakes on each wheel.

Slack Adjusters

Slack adjusters provide a quick and easy method of adjusting the brakes to compensate for brake lining wear. One slack adjuster is used for the brakes on each wheel.

Cocks

Cut-out cocks are used in the trailer connection lines to permit these lines to be closed when they are not being used. Reservoir drain cocks are used also, mounted at the bottom of the reservoir. The drain cocks permit draining the oil and water which collects in the reservoir.

Tubing and Tubing Fittings

Tubing and tubing fittings connect the different air brake devices in the air brake system.

Hose, Hose Fittings, Hose Couplings and Dummy Couplings

Flexible hose lines and hose fittings are used where it is necessary to have an air line between two points of the vehicle which change their position in relation to one another. Hose lines also make connections between two vehicles, and in such cases they are provided with hose couplings to permit the connections to be easily connected or disconnected. Dummy couplings seal the hose couplings against the entrance of dirt when the hose couplings are not in use. Dummy couplings on the back of tractor cabs also provide a place for attaching the free ends of connecting hose that is not being used.

Safety Valve

The safety valve protects the air brake system against excessive air pressure.

Reservoirs

Reservoirs store the compressed air until it is needed for brake operation and provide sufficient air pressure to make several brake applications even after the engine has stopped.

Air Gage

The air gage mounted on the instrument panel of the vehicle registers the pressure in the air brake system.

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Air Supply Valve

In some cases the air supply valve is included to provide an easy means of obtaining compressed air from the air brake system for such purposes as tire inflation.

Low Pressure Indicator

The low pressure indicator is often provided to warn the driver by sounding a buzzer or by lighting a warning light if for any reason the air pressure in the air brake system falls below a safe operating point.

Stop Light Switch

The air operated stop light switch provides a simple means of controlling the stop lights of the vehicle.

Air Horn

On some vehicles the air horn is included to provide an effective warning signal.

Alcohol Evaporator

On some vehicles the alcohol evaporator is included to prevent moisture freezing in the air brake system.

OPERATION OF THE AIR BRAKE EQUIPMENT

Charging

The reservoirs are charged with air by the compressor. The reservoir air has access to the inlet valve chamber of the brake valve and the inlet valve is then held closed by the tension of its spring and air pressure.

Service Application

When it is desired to apply the brakes, foot pressure is applied to the brake pedal, which action is carried through the brake rod pulling up on the lever of the brake valve. This compresses the spring, deflects the diaphragm downward, and through the medium of the rocker arm closes the exhaust valve and opens the inlet valve. Air is thereby admitted from the reservoir to the brake valve, thence out the two side outlets to the front and rear brake chambers. The power thus exerted against the brake chamber diaphragms or pistons forces the push rods out, rotating the camshafts to apply the brakes.

In flowing to the rear brake chambers the air pressure passes through the quick release valve entering at the top, deflecting the diaphragm and its seat to seal the exhaust opening while the air pressure passes around the diaphragm to the two side connections, each leading to a brake chamber.

In the case of the relay valve (6-wheel models), the connections lead to tee connections and from there to each of the four rear brake chambers.

When the pressure built up in the brake chambers and acting against the brake valve diaphragm is enough to compress the regulating spring, the diaphragm moves upward, allowing the inlet valve to close by action of its spring.

The exhaust valve remains closed by action of the inlet valve spring and tilting of the rocker arm. Further increase of brake chamber pressure is thus prevented. If, however, there should be leakage from the brake chambers or piping, while the brake valve lever remains in this position, the resulting drop in pressure under the brake valve diaphragm will cause the regulating spring to again unseat the inlet valve and restore the lost pressure.

Release

When the foot is removed from the brake pedal, the brake valve lever is moved back toward normal position again, which relieves the tension on the regulating spring so that the diaphragm will be moved upward to its normal position by brake chamber pressure underneath it. This permits the exhaust valve to be unseated by its spring which opens brake chamber line to atmosphere and allows air to exhaust from the brake chambers.

If the brake valve lever is moved all the way back to normal position and left there (foot entirely removed from brake pedal), the brakes will entirely release, but if moved only part way back (foot pressure eased), the brakes will only partially release, i.e., the exhaust valve will remain open until the brake chamber pressure has reduced to such an amount as will no longer hold the diaphragm up, whereupon the regulating spring will move the diaphragm, with rocker arm, downward again and close the exhaust valve.

The brake chamber line to the rear wheels is released only up to the quick release valve or relay valve. This allows the diaphragm to unseat, uncovering the exhaust port through which the rear brake chambers are then exhausted.

OPERATING INSTRUCTIONS

Operating the brakes of an air-braked vehicle differs very little from operating the brakes of a passenger car. Because operation of the brake pedal requires very little physical effort, proper control of the brakes is easily accomplished.

The distance the brake pedal is depressed determines the amount of air pressure delivered to the brake chambers, and the brake chamber pressure determines the braking force. Thus the driver may definitely control the brakes of the vehicle by keeping in mind the fact that he is operating a brake valve capable of giving finely graduated brake control and making full use of this feature.

An air-braked vehicle should not be moved unless the air gage shows at least 60 pounds air pressure in the air brake system, because the brakes are not fully effective at lower pressures. While operating the vehicle, the driver should periodically observe the air pressure registered by the dash gage, to be sure it is being maintained properly. If the air pressure drops to a low point, or if the warning buzzer or light signifies the pressure is low, the vehicle should be stopped and the trouble corrected.

The best stop results when the brake application is as hard at first as the speed, condition of the road, and passenger comfort permits, and then graduated off as the speed decreases. As the stop is completed, there should be only sufficient air pressure in the brake chambers to hold the vehicle stationary. The brakes must never be applied lightly at first and the braking pressure increased as the speed decreases, as this will result in a very rough stop.

The brake pedal should not be "fanned," as this merely wastes compressed air and has no bearing on correct braking results.

The brake pedal should not be fully depressed except in cases of emergency as this causes full braking force to be delivered to the wheels and this should not be necessary in ordinary service.

Normally the engine is used to assist the brakes by not disengaging the clutch until the engine reaches idling speed.

In the event a trailer breaks away from a truck or tractor, the driver must immediately apply the brakes and bring the truck or tractor to a stop. Then the truck or tractor should be held with the hand brake while the cut-out cocks in the emergency and service lines are closed. The truck or tractor air brake system will then be recharged to normal pressure.

When disconnecting trailers from trucks or tractors, the emergency feature of the air brake system on the trailer is often used to lock the trailer brakes. This is approved practice but the air brake system must not be depended upon to hold a vehicle parked. The parking brake must always be applied or the wheels blocked.

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COMPRESSOR (TYPE U)

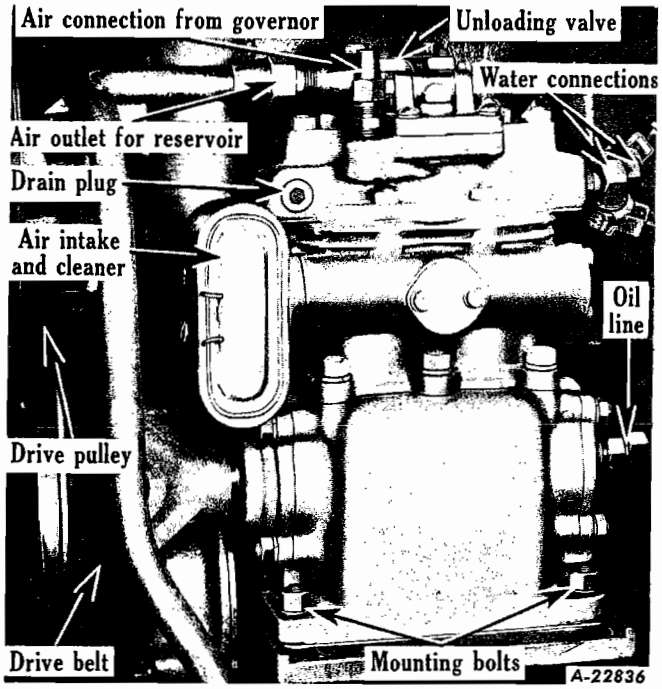

Fig. 1 - Air Compressor Installed.

IDENTIFICATION. All Bendix-Westinghouse compressors are identified by the number stamped on the name plate riveted to the side of the crankcase. Name plates also show the serial number and type of the compressor but compressors cannot be identified by the serial number or the type designation.

The type designation shown on the name plate is in accordance with the following:

Number of Cylinders	Type of Compressor	Lubrication	Rated Capacity	Type of Mounting	Type of Cooling
2 or 3	U	Eng.-E or self-S	4, 6, 7-1/4 or 12	Flange-F Horiz.-H Vertical-V	Air-A Water-W

Thus a 2 UE 7-1/4 VW compressor is a two-cylinder, type U, engine-lubricated compressor with a displacement of 7-1/4 cubic feet per minute at 1250 r.p.m., vertically mounted and water-cooled.

PREVENTIVE MAINTENANCE AND TROUBLE SHOOTING

Daily Service

(a) International trucks are usually equipped with the engine lubricated type air compressor, however, if the compressor is of the self-lubricated type, check the oil level in the compressor crankcase and replenish if necessary.

(b) Should it be necessary to drain the engine cooling system to prevent freezing, always drain the compressor cylinder head (see Fig. 1).

Every Month or After Each 2,000 Miles

(a) Service compressor air strainer. Remove and wash all parts including curled hair in cleaning solvent. Saturate curled hair with clean engine oil and squeeze dry before replacing it in the strainer.

(b) If compressor is the self-lubricated type, drain and flush compressor crankcase and refill with clean engine oil.

(c) Check compressor mounting and drive for alignment, belt tension, etc. Adjust if necessary.

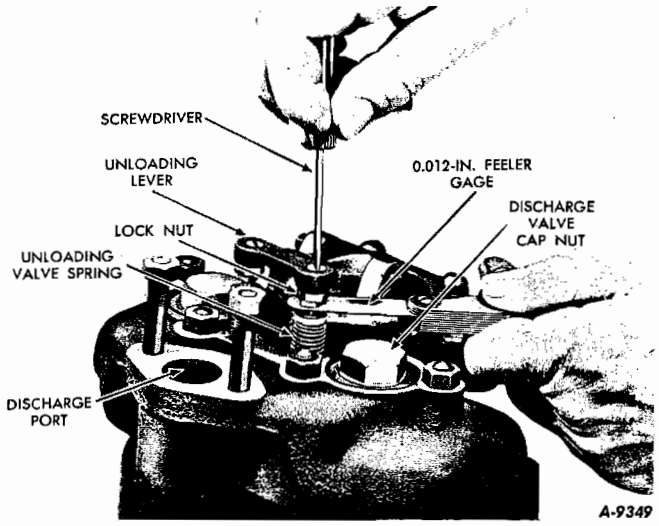

Fig. 2 - Adjusting Compressor Unloading Valve Clearance.

Every Six Months or After Each 10,000 Miles

(a) If the compressor is lubricated from the engine, clean oil supply line to compressor.

(b) Check compressor unloading valve clearance and adjust if necessary (Fig. 2). Clearance must be 0.010 inch minimum to 0.015 inch maximum. To adjust clearance, loosen lock nuts and turn adjusting screws until proper clearance is obtained. Then tighten lock nuts. Clearance can be checked only when governor is cut in (compressor not unloaded). Check unloading valve lever for binding.

(c) If compressor is the self-lubricated type, service crankcase breather. Wash breather in cleaning solvent.

(d) Remove compressor discharge valve cap nuts and check for presence of excessive carbon. If excessive carbon is found, clean the compressor cylinder head; also check compressor discharge line for carbon and clean or replace the discharge line if necessary.

Inspection

1. Be sure compressor air strainer is clean and properly installed. Also be sure blanking covers and gaskets are installed on all strainer openings not being used in the compressor intake manifold.

2. With compressor running, check for noisy operation and oil or water leaks.

3. Check unloader valve clearance.

4. Check compressor drive for alignment, belt tension, etc.

5. Check to be sure compressor mounting bolts are secure.

Operating Tests

Because of the many different types of air brake systems found on different types of vehicles, it is difficult to set up any specific series of tests to determine the serviceability of a compressor on a vehicle. Failure of the compressor to maintain normal air pressure in the air brake system of a vehicle usually denotes loss in efficiency due to wear, provided leakage in the remainder of the system is not excessive. Another sign of wear is excessive oil passing. If either of these conditions develop and inspection shows the remainder of the air brake equipment to be in good condition, the compressor must be repaired or replaced.

Air Leakage Tests

1. Excessive leakage past the discharge valves can be detected by fully charging the air brake system and then with the engine stopped, carefully listening at the compressor for the sound of escaping air. This must be done in a quiet place and if air pressure can be heard escaping inside the compressor, the discharge valve leakage is excessive, and the compressor cylinder head or the complete compressor must be replaced.

2. With the air brake system fully charged (governor cut out) coat the unloading box cover with soapsuds to check for leakage past the unloading diaphragms. Leakage of a one-inch soap bubble in three seconds is permissible. If excessive leakage is found, the compressor cylinder head or complete compressor should be repaired or replaced.

Trouble Shooting

Compressor fails to maintain adequate pressure in the air brake system.	Dirty intake strainer. Excessive carbon in compressor cylinder head or discharge line. Discharge valves leaking. Excessive wear. Drive belt slipping. No clearance at compressor unloading valves. Unloading valves stuck open. Excessive leakage of unloading valves.
Compressor passes excessive oil.	Excessive wear. Dirty air strainer. Excessive oil pressure. Oil return line or passage to engine crankcase plugged. Compressor crankcase flooded. Back pressure from engine crankcase. Oil rings improperly installed.
Noisy operation.	Back lash in drive coupling or drive gears. Loose drive pulley. Excessive carbon in cylinder head or discharge line. Worn or burnt-out bearings. Excessive wear.
Compressor does not unload.	Defective unloading diaphragms. Excessive clearance at unloading valves. Unloading cavity plugged with carbon. Unloading mechanism binding or stuck.

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BRAKE VALVE
(See Fig. 3)

Description

The brake valve is fitted with a lever suitable for connecting to the brake pedal. The pedal controls the movement of an inlet valve and exhaust valve which in turn controls the air pressure being delivered to or released from the brake chambers on the vehicle. To fully apply the brakes, the brake pedal must be fully depressed; whereas when the pedal is only partially depressed, correspondingly less braking force is developed. In other words,

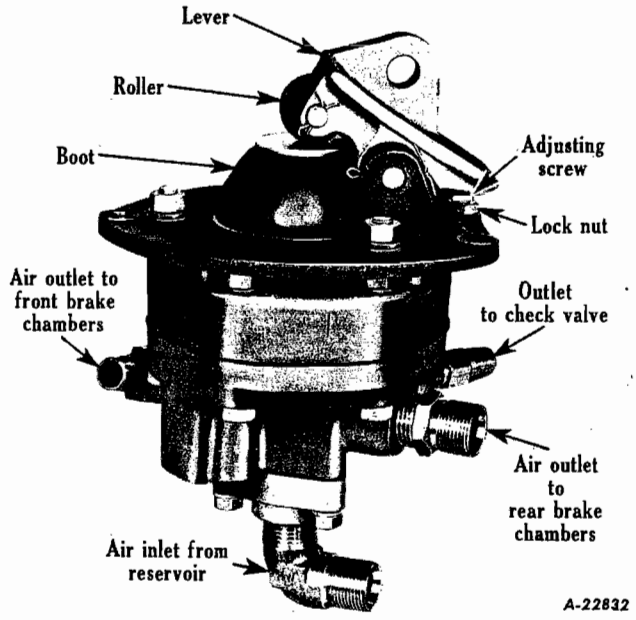

Fig. 3 - Brake Valve.

the farther the driver depresses the pedal, the greater the air pressure delivered to the brake chambers and the more effective the brake application. At any time the brakes of the vehicle may be partially released by the driver permitting the brake pedal to partially return towards released position or they may be entirely released by permitting the pedal to return to full released position. In this manner the amount of force being applied to the brakes of the vehicle is always under control of the driver.

Preventive Maintenance

Every Month or After Each 2,000 Miles

(a) Lubricate all linkage between the brake valve and brake pedal; also lubricate the brake valve lever pin.

(b) Check to be sure that no strain is placed on the brake valve lever, because the lower edge of the lever cap strikes the cover when the brake pedal is fully depressed. Adjust

pedal stop or linkage, if necessary, to prevent this interference. After any adjustment, check brake valve delivery pressure.

(c) Be sure the brake valve lever strikes the cover of the valve when the brake pedal is in released position. If necessary, adjust pedal rod length.

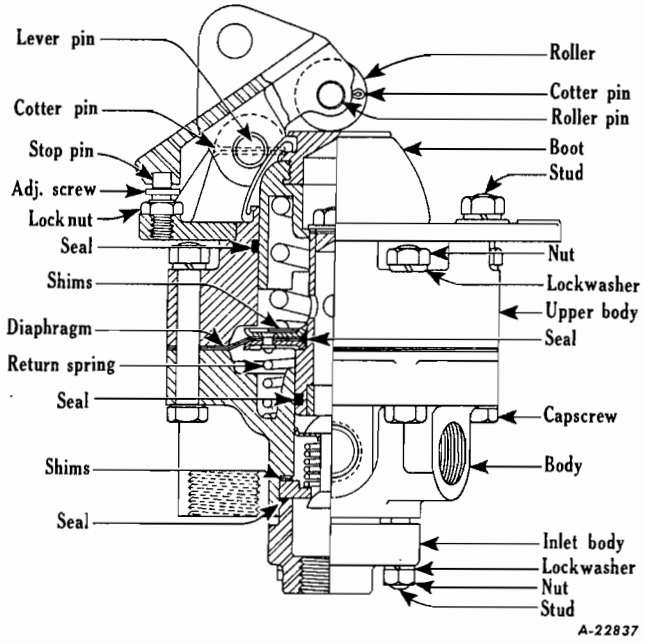

Fig. 4 - Sectional View Of Brake Valve.

Testing For Serviceability

Operating Tests

1. Check the delivery pressure of the brake valve using an accurate air pressure test gage. On vehicles having trailer connections the test gage may be conveniently connected to the service line outlet at the rear of the vehicle. Note that the first movement of the brake pedal towards applied position, after the slack is taken up, causes the brake valve to deliver approximately five pounds air pressure. Note that approximately full reservoir pressure is delivered by the brake valve when the brake pedal is fully depressed. If the brake valve does not deliver approximately full reservoir pressure, when the brake pedal is fully depressed, adjust the pedal stop or linkage so as to increase the travel of the brake valve lever. This should increase the delivered pressure. On some vehicles the pedal stop is so arranged as to prevent the brake valve from delivering full reservoir pressure. This arrangement must not be altered on such vehicles unless a higher delivery pressure is desired in order to increase the effectiveness of the brakes. When making this adjustment, be sure no strain is placed on the valve lever due to the edge of the lever cap striking the cover when the brake pedal is fully depressed. Also be sure the brake valve lever returns to full release position when the brake pedal is released.

2. Hold brake pedal at several different positions between release position and fully depressed position and observe that intermediate delivered pressures between five and seventy pounds are definitely determined by the position in which the brake pedal is held.

Leakage Tests

1. With brakes released, coat the exhaust port with soapsuds.

2. With brakes fully applied, coat the exhaust port with soapsuds.

3. Leakage in excess of a one-inch soap bubble in one second is not permissible in either of these tests. If excessive leakage is found, the brake valve must be repaired or replaced.

4. With brakes applied check for leakage out the top of the brake valve. No leakage is permissible. If leakage is found, the brake valve must be replaced.

BRAKE VALVE
(Hand Operated) Type HP

Description

Type HP brake valves (Fig. 5) are used for controlling the brakes on a trailer independently of the brakes on the towing vehicle. They are usually mounted on the steering column or on the dash and the driver may put the handle in any one of several positions between brakes released and brakes fully applied position so the brakes on the trailer are kept applied until the brake valve handle is returned to release position. The distance the brake valve handle is moved in a clockwise direction toward applied position determines the severity of the brake application. The driver may, therefore, control the brakes on the trailer as the speed, load, and road conditions require.

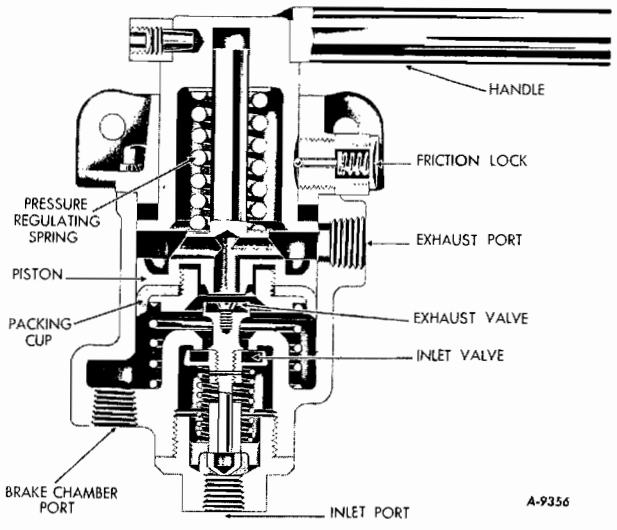

Fig. 5 - Sectional View Of Hand Brake Value.

Testing for Serviceability (Hand Brake Valve)

Operating Tests

1. Check the delivery pressure of the brake valve using an accurate air pressure test gage. The test gage may be conveniently connected to the service line outlet at the rear of the vehicle. With the brake valve handle moved to its fully applied position, the brake valve must deliver at least sixty pounds pressure.

2. Move the brake valve handle to several different positions between fully applied and fully released positions and observe that the air pressure registered by the test gage varies in accordance with the position to which the handle is moved.

Leakage Tests

1. With brake valve handle in released position, coat the exhaust port with soap suds to check for leakage.

2. With brake valve handle in fully applied position, coat the exhaust port with soap suds to check for leakage.

3. Leakage in excess of a one inch soap bubble in one second is not permissible in either of these tests. If excessive leakage is found it will usually be caused by dirty or worn valves or valve seats and the inlet and exhaust valve assembly or the complete brake valve must be repaired or replaced. Leakage due to dirty valves and valve seats may be corrected by removing the inlet and exhaust valve assembly and cleaning the valves and valve seats. Leakage due to worn valves may be corrected by installing a new inlet and exhaust valve assembly. If the valve seats are pitted or worn excessively or if the installation of a new inlet and exhaust valve assembly does not correct the leakage, the brake valve must be repaired or replaced.

QUICK RELEASE VALVE

Description

The purpose of the quick release valve is to reduce the time required to release the brakes by hastening the exhaust of air pressure from the brake chambers. It is most commonly used with front wheel brake chambers.

The valve consists of a body containing a spring loaded diaphragm so arranged as to permit air pressure to flow through the valve in one direction; but when the supply pressure is reduced, the air which has passed through the valve is permitted to escape through the exhaust port (Fig. 6).

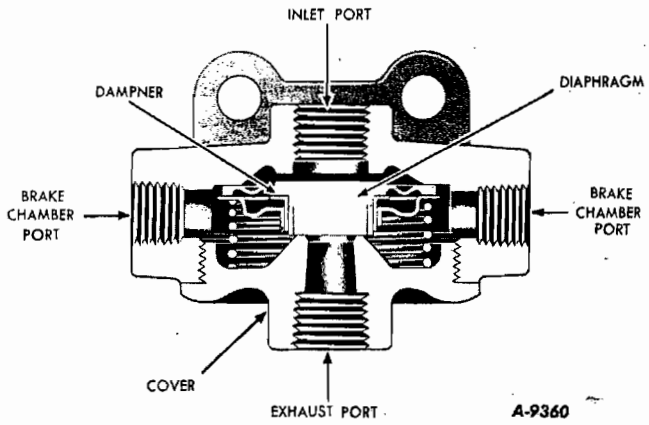

Fig. 6 - Sectional View Of Quick Release Valve.

Operating Tests

Apply the brakes and observe that when the brakes are released, air pressure is quickly exhausted through the exhaust port of the valve. Be sure the exhaust port is not restricted in any way.

The valve must be tested at regular intervals for leakage by applying soapsuds on the exhaust port with the brakes applied. On releasing the brakes see that the valve releases immediately with the corresponding return movement of the foot pedal. Leakage may be caused by dirt in the valve or a defective diaphragm. As a rule the diaphragm should be replaced at least once every year.

The air line from the brake valve to the rear wheel chambers is released back to the quick release valve. This allows the diaphragm in the quick release valve to unseat, uncovering the exhaust port in the valve and permitting the air in the brake chambers to escape quickly at the quick release valve.

On some trucks air is released from the front wheel brake chambers back through the lines to the foot brake valve and exhausted at that point. Where this is the case, the quick release valve housing installed at the front of the vehicle serves merely as a connector and does not contain either a diaphragm or diaphragm spring and the exhaust opening in the quick release valve housing is closed with a plug.

IMPORTANT: DO NOT REMOVE THIS PLUG, TO DO SO WILL RENDER THE FRONT WHEEL BRAKES INOPERATIVE.

Leakage Tests

1. With brakes released, coat the exhaust port with soapsuds to determine leakage.

2. With the brakes fully applied, coat the exhaust port with soapsuds to determine leakage.

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3. Leakage in excess of a one-inch soap bubble in one second is not permissible in either of these tests. If excessive leakage is found, the relay valve must be repaired or replaced.

DOUBLE CHECK VALVE

Description

A double check valve is used on the tractor truck at the frame side rail (Fig. 7). It is connected into the air lines from the relay valve to the trailer lines. The purpose of the double check valve is to control the brakes on the trailer or towed load. If the double check valve were not used when one of the brake valves was moved to its applied position, air pressure from the reservoir would escape through the exhaust port of the other brake valve, whose exhaust valve would be open. When the double check valve is used and one of the brake valves is moved to the applied position, the double check valve blocks off the line leading to the other brake valve, in this manner preventing any loss of air pressure through the open exhaust valve of the brake valve not being operated.

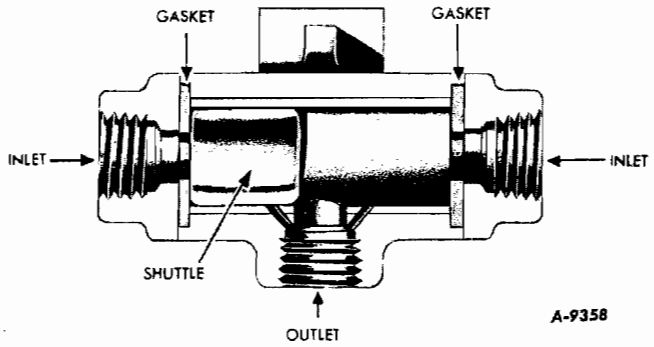

Fig. 7 - Sectional View Of Double Check Valve.

Testing

With the brake system fully charged and both brake valves in released position, move one of the brake valves to applied position, and check with soapsuds for leakage at the exhaust port of the brake valve not being operated. Repeat test with the other brake valve. Leakage in excess of a 3-inch soap bubble in 3 seconds is not permissible. If excessive leakage is found, the defective double check valve must be replaced.

RELAY VALVE

Description

The relay valve (Fig. 8) speeds up the application and release of the rear wheel brakes. It is controlled by the brake valve and keeps the air pressure in the rear brake chambers the same as the pressure being delivered by the brake valve. It reacts to even slight changes in pressure and raises, lowers, or completely exhausts the air pressure in the rear brake chambers as the brake valve raises, lowers, or completely exhausts air pressure from it.

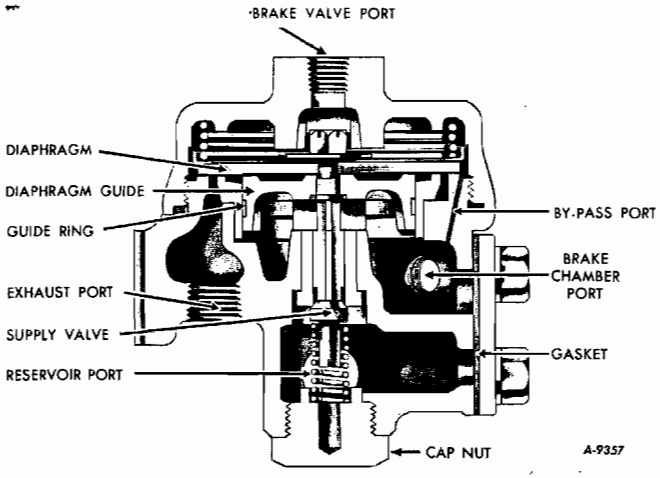

Fig. 8 - Sectional View Of Relay Valve.

Testing for Serviceability

Operating Tests

1. With the air brake system charged, apply brakes and check to be sure the rear wheel brakes controlled by the relay valve apply promptly.

2. Release brakes and check to be sure air pressure is exhausted from the exhaust port of the relay valve promptly.

Leakage Tests

1. With brakes released, coat the exhaust port with soapsuds to determine leakage.

2. With brakes fully applied, coat the exhaust port with soapsuds to determine leakage.

3. Leakage in excess of a one-inch soap bubble in one second is not permissible in either of these tests. If excessive leakage is found, the relay valve must be repaired or replaced.

GOVERNOR (TYPE O-1)

Description

The purpose of the compressor governor is to automatically control the air pressure being maintained in the reservoirs of the air brake system by the compressor, between the maximum pressure desired (100-105 lbs.) and the minimum pressure required for safe brake operation (80-85 lbs.). To understand this function of the governor, it should be remembered that while the compressor may run continuously, actual compression of air is controlled by the governor, which, acting in conjunction with the compressor unloading mechanism, stops or starts compression when these maximum and minimum reservoir pressures are reached.

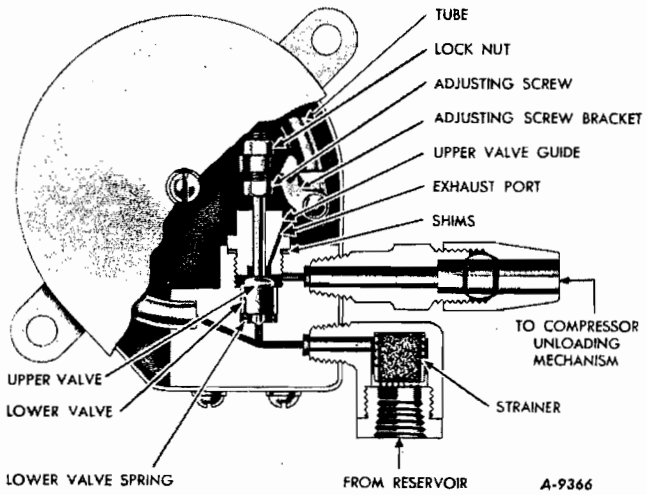

Fig. 9 - Sectional View Of Governor.

The design of the compressor governor is based on the principle of a Bourdon tube which is a flattened metal tube bent to a curve that tends to straighten under internal pressure (Fig. 9). This reaction by the tube, due to changes in the air pressure in the tube, increases or decreases the spring load on the valve mechanism of the governor and makes the valve mechanism assume its "cut-in" or "cut out" positions in accordance with the air pressure in the reservoir. Two types of governor cases will be found in service, one being a die cast case and the other a pressed steel case. Both types of cases are interchangeable with each other and the working parts of the governor used in both types of cases are identical.

Preventive Maintenance

Every Six Months or After Each 10,000 Miles

Remove the governor air strainer and wash all parts in cleaning solvent. Lamb's wool in the air cleaner may be used again if it can be washed thoroughly clean in cleaning solvent, otherwise it must be replaced.

Every Year Or After Each 25,000 Miles

(a) Disassemble governor and clean all parts.

(b) Clean or replace both tubing lines connected to the governor.

Testing for Serviceability and Adjusting

Operating Tests

1. With the engine running, build up air pressure in the air brake system and observe at what pressure registered by the dash gage the governor cuts out stopping further compression. The governor must cut out between 100 and 105 pounds.

2. With engine running, slowly reduce the air pressure in the air brake system by applying and releasing the brakes and observe at what pressure registered by the dash gage the governor cuts in and compression is resumed. The governor must cut in between 80 and 85 pounds.

3. Before condemning or adjusting the pressure settings of the governor, be sure the dash gage is registering accurately. This may be done by using an accurate test gage to check the pressure registered by the dash gage.

4. When necessary, the pressure settings (cut-in and cut-out pressures) may be adjusted after removing the cover. The pressure settings are raised by loosening the adjusting screw lock nut and turning the adjusting screw clockwise viewed from the top (Fig. 9). Pressure settings may be lowered by turning the adjusting screw counterclockwise. The lock nut must be tightened after any adjustment.

5. If the governor cannot be adjusted to cut-in and cut-out at the proper pressure settings, it should be replaced.

6. Adjustment of the range between the cut-in and cut-out pressure is made by removing shims beneath the upper valve guide (Fig. 9) to increase the range or by installing additional shims to decrease the range.

Leakage Tests

1. Remove cover and with the governor in its cut-out position, test for leakage by applying soapsuds to the exhaust port.

2. With the governor in its cut-in position test for leakage by applying soap suds to the exhaust port.

3. Leakage in excess of a one-inch soap bubble in three seconds is not permissible in either of the above tests. If excess leakage is found, the governor must be replaced.

4. Install cover after making tests.

SAFETY VALVE

Description

1. The purpose of the safety valve is to protect the air brake system against excessive air pressure. Should the air pressure in the air brake system rise above the setting of the safety valve at 150 pounds, the valve opens and permits pressure above 150 pounds to be exhausted. It is located on one of the reservoirs.

2. The safety valve consists of a spring-loaded ball check valve which is set to "blow off" at 150 pounds air pressure. (Fig. 10).

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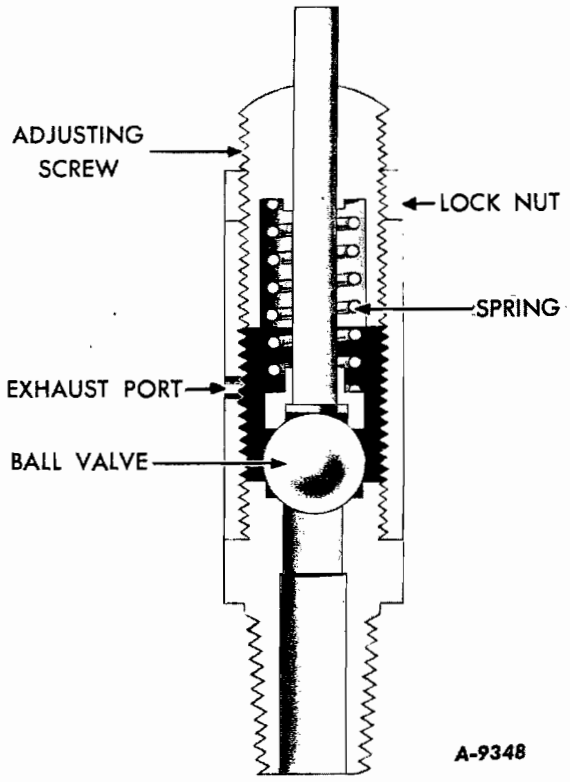


Fig. 10 - Sectional View Of Safety Valve.

Testing

Pressure Setting Tests

1. Connect a test gage known to be accurate into the air brake system so as to register reservoir pressure. A simple way to do this is to connect the air gage to the emergency line at the rear of the tractor truck and open the emergency line cut-out cock. With the motor running, temporarily stop governor operation by turning the air supply valve on the dash panel to its air supply position, and permit the air pressure in the air brake system to rise until the test gage registers 150 pounds. When the test gage reaches 150 pounds, the safety valve must release, or "blow off." If the safety valve does not release, stop the engine immediately, and adjust the pressure setting of the safety valve. Do not permit air pressure in the air brake system to build up higher than 150 pounds, otherwise the compressor may become damaged.

2. To adjust the pressure setting of the safety valve, loosen the lock nut and turn the adjusting screw. Turning the adjusting screw counterclockwise lowers the pressure setting. Turning the screw clockwise raises the pressure setting. Turn the adjusting screw as required until the safety valve releases at 150 pounds pressure registered by the test gage. Then tighten the lock nut to hold the adjusting screw at the proper setting. Reduce air pressure in the air brake system to normal of approximately 100 pounds by applying and releasing the brakes.

Leakage Tests

With the air brake system fully charged to approximately 100 pounds, coat the safety valve all over with soapsuds to check for leakage. Leakage of a 1-inch soap bubble in 5 seconds is not permissible. Slight leakage may sometimes be corrected by lightly tapping the end of the release pin. If this fails to correct the leakage, replace the safety valve.

SLACK ADJUSTER

Description

One slack adjuster is used at each brake chamber. Slack adjusters consist of a worm and gear enclosed in a body which also serves as an adjustable lever (Fig. 11). They provide a quick and easy means of adjusting the brakes to compensate for brake lining wear. During brake operation, the entire slack adjuster rotates bodily with the brake camshaft. During brake adjustment, the worm moves the gear so as to change the position of the lever arm in relation to the brake camshaft.

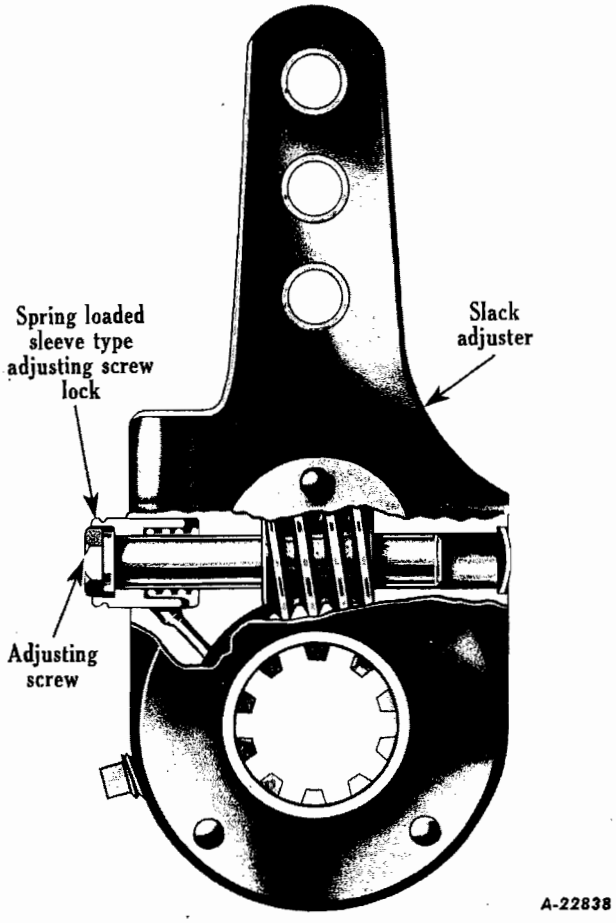
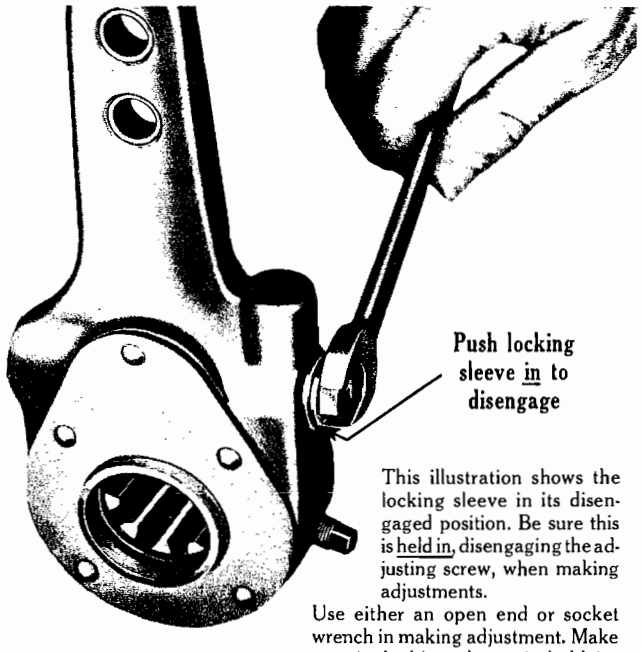


Fig. 11 - Sectional View Of Slack Adjuster.



This illustration shows the locking sleeve in its disengaged position. Be sure this is held in, disengaging the adjusting screw, when making adjustments.

Use either an open end or socket wrench in making adjustment. Make certain locking sleeve is held in, thereby disengaging the locking mechanism. Never use a wrench on the sleeve portion.

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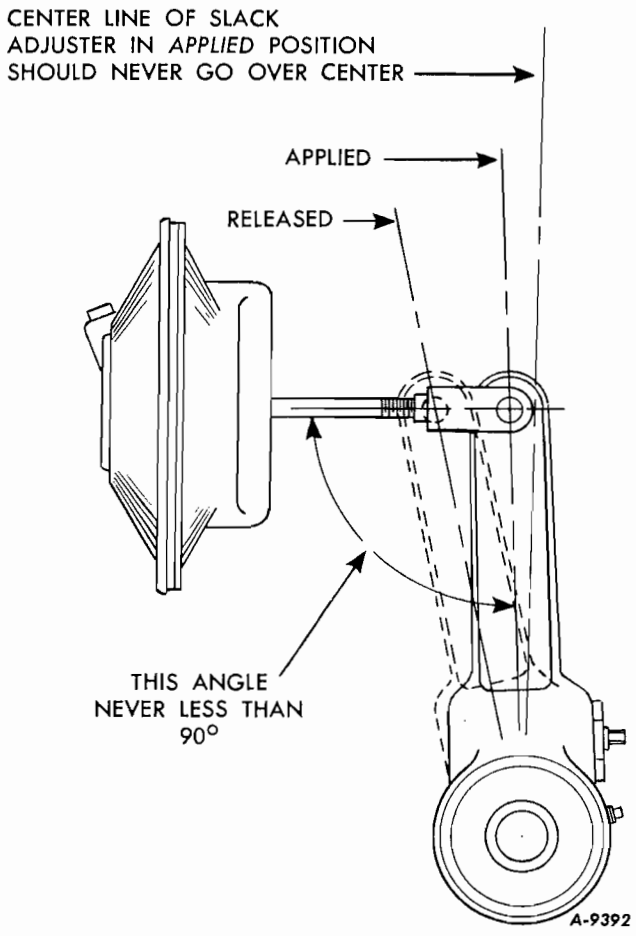
Fig. 12 - Illustrates Locking Sleeve On Adjusting Nut.



Testing

Adjust brakes and note brake chamber push rod travel when brakes are applied. Make several brake applications, and again check push rod travel. Push rod travel must remain the same as it was after adjustment. If the push rod travel increases, or if difficulty is experienced in keeping the brakes adjusted in service, the slack adjuster must be replaced.

When slack adjuster movement does not give the desired brake action, adjustment of the push rod length by altering the location of the yoke may be necessary. With brakes released the angle formed by the push rod and slack adjuster must be greater than 90°, and all slack adjusters should be set at the same angle. With the brakes fully applied, after being adjusted, this angle should still be greater than 90°. In other words, the slack adjuster should not go "over center" when the brakes are applied (Fig. 13). The position of the push rod yoke on the push rod should be adjusted if necessary until these conditions prevail.

Maintenance

The worm gear and worm should be kept well lubricated. This can be done by removing the plug and filling the cavity with a good grade of chassis lubricant every 1,000 miles.

LOW PRESSURE INDICATOR

Description

The low air pressure indicator (Fig. 14) is a safety device designed to give an automatic warning whenever the air pressure in the air brake system is below approximately 60 pounds. Operating as an air-controlled switch of an electrical circuit, the low pressure indicator automatically sounds a buzzer when the air pressure drops too low. On some vehicles a light is used to indicate low pressure, in place of the buzzer.

Testing

1. Drain air brake system, turn on ignition key, and start engine. The low pressure indicator buzzer must sound until the air pressure in the air brake system reaches a point between 54 and 66 pounds when the buzzer must stop sounding.

2. Continue to build up air pressure in the air brake system until the pressure reaches at least 75 pounds, stop engine, and reduce the air pressure in the air brake system by making brake applications. Check to see at what pressure the buzzer again sounds. The buzzer must sound when the pressure in the air brake system reaches a point between 66 and 54 pounds.

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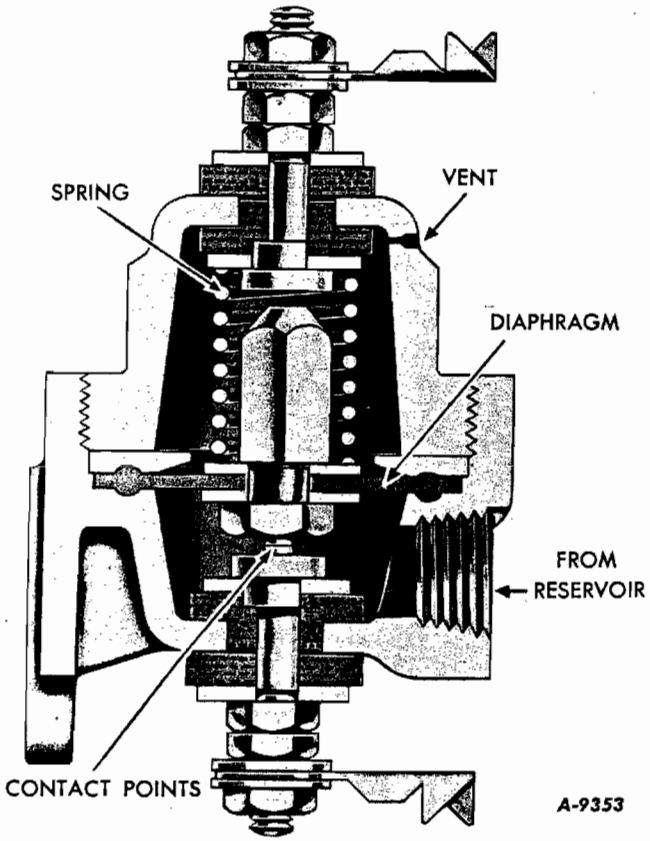

Fig. 14 - Sectional View Of Low Pressure Indicator.

Leakage Test

With the air brake system fully charged, coat the outside of the low pressure indicator with soapsuds to check for leakage. No leakage is permissible. Leakage at the lower diaphragm screw can sometimes be corrected by removing the electrical connection and carefully tightening the terminal screw nut. Leakage through the small vent hole in the cover signifies a leaking diaphragm, and the low pressure indicator must be replaced.

STOP LIGHT SWITCH

Description

The stop light switch is mounted on the left-hand frame side rail. Stop light switches are electro-pneumatic switches which close the stop light electrical circuit when the brakes are applied (see Fig. 15).

Testing

1. With all air pressure exhausted from the air brake system, move the brake valve to applied position, and start the engine. Observe at what pressure registered by the dash gage the stop lights light. Stop lights must light before the dash gage registers 10 pounds pressure.

2. With brakes applied, coat the stop light switch with soapsuds to check for leakage. No leakage is permissible. If leakage is found, the stop light switch must be replaced.

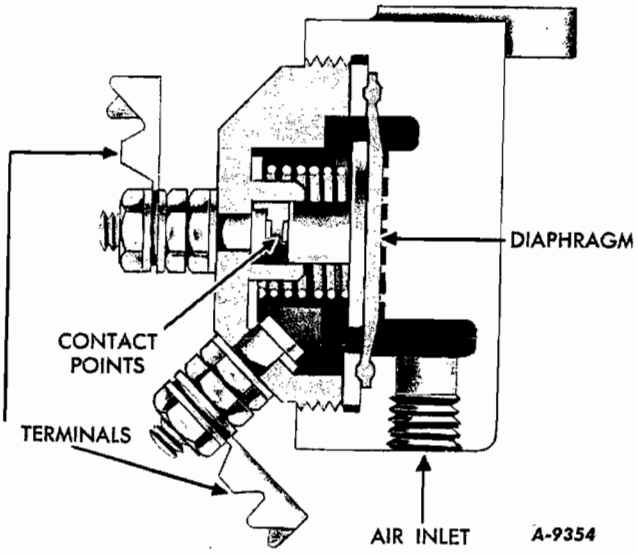

Fig. 15 - Sectional View Of Stop Light Switch.

BRAKE CHAMBER (BENDIX-WESTINGHOUSE)

The Bendix-Westinghouse brake chamber consists of two dished metal plates, namely: the non-pressure plate, and the pressure plate separated by a diaphragm (see Fig. 16).

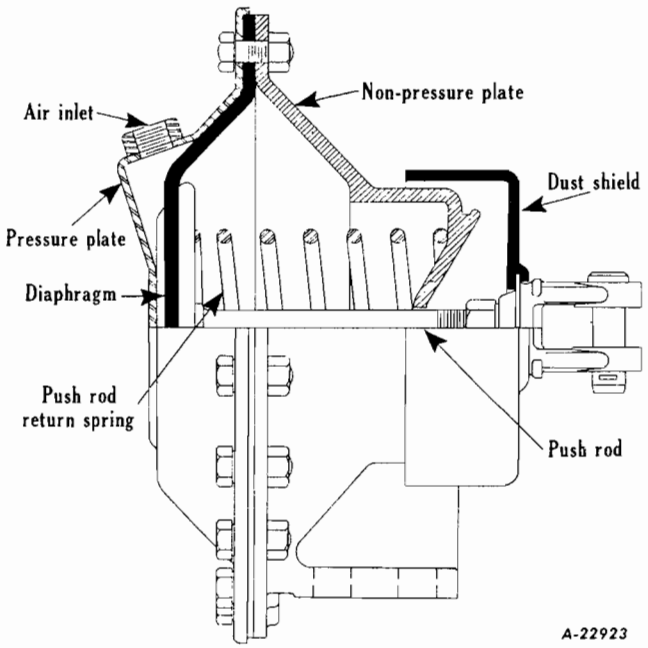

Fig. 16 - Typical Brake Chamber (Diaphragm Type).

In front of the diaphragm are the non-pressure plate, push rod and push rod spring. Behind the diaphragm is the air-tight cavity into which is connected a tubing line from the brake

valve. Due to the extreme sensitivity of the diaphragm, this arrangement permits push rod to respond to the slightest variation of air pressure from the brake valve, thus permitting the driver to apply or release brakes as rapidly or gradually as the various road and operating conditions warrant.

In order to meet requirements for different braking forces, brake chambers are made in several different sizes. All sizes are made for several different types of mountings, such as stud mounting, bracket mounting, and flange mounting.

The following table shows different types of standard brake chambers:

Type	Outside Diameter	Effective Area Square Inches	Normal Working Stroke	Maximum Working Stroke	Maximum Stroke
A	6-15/16"	12	5/8"	1-3/8"	1-3/4"
B	9-3/16"	24	3/4"	1-3/4"	2-1/4"
C	8-1/16"	16	3/4"	1-3/4"	2-1/4"
D	5-1/4"	6	1/2"	1-1/4"	1-5/8"
E	6"	9	5/8"	1-3/8"	1-3/4"
F	11"	36	3/4"	2-1/4"	3"
G	9-7/8"	30	3/4"	1-3/4"	2-1/2"

Preventive Maintenance

Every Month or After Each 2,000 Miles

Check travel of brake chamber push rods and adjust brakes if necessary. Push rod travel should be kept at the minimum without brakes dragging. Excessive travel shortens the service life of brake chamber diaphragms and also results in slow braking response.

Every Year or After Each 50,000 Miles

Disassemble brake chambers and clean all parts. Install new diaphragms. When replacing release springs be sure to use the correct spring, otherwise uneven braking will result.

Leakage Tests

1. With brakes fully applied, coat the brake chamber bolting flanges holding the diaphragm in place with soapsuds to check for leakage. No leakage is permissible. If leakage is found, tighten flange bolts. All flange bolts must be tightened evenly but only sufficiently to prevent leakage, otherwise the diaphragm will be distorted and premature failure will result.

2. With brakes fully applied, check for leakage through the diaphragm by coating the clearance hole around the push rod and the drain hole in the non-pressure plate with soapsuds. No leakage is permissible. If leakage is found, the diaphragm must be replaced.

Testing for Serviceability

Operating Tests

1. Apply brakes and observe that push rods move out promptly without binding.

2. Release brakes and observe that push rods return to release position promptly without binding.

3. Check travel of push rods to be sure it is at the minimum without brakes dragging.

Caution!

Always be sure the correct release spring is used in any brake chamber. Also be sure the brake chamber on the opposite side of the axle of the vehicle has the same release spring; otherwise uneven braking will result.

If a new diaphragm is installed in the brake chamber on one side of the vehicle, a new one also should be installed in the corresponding brake chamber on the other side, otherwise this may also cause uneven braking.

After the brake chamber is installed the brakes must be adjusted and checks made to be sure the linkage does not bind. Adjustment of the push rod length by altering the location of the yoke may be necessary. With brakes released the angle formed by the push rod and slack adjuster must be greater than 90°, and all slack adjusters should be set at the same angle. With the brakes fully applied, after being adjusted, this angle should still be greater than 90°. In other words, the slack adjuster should not go "over center" when the brakes are applied (Fig. 13). The position of the push rod yoke on the push rod should be adjusted if necessary until these conditions prevail.

BRAKE CHAMBER - PISTON TYPE (MIDLAND)

The Midland air cylinder (Fig. 17) requires very little attention, but to insure proper operation, the cylinder should be kept lubricated. At intervals of approximately four months or 15,000 miles, the air connection at the rear of the cylinder should be removed and one quarter pint of lubricant (similar to Elso's (150-LO) graphite type grease with 10% neat's-foot oil), inserted.

At regular truck overhaul periods, the cylinder should be removed, taken apart and thoroughly cleaned. The piston cup should be inspected and free from cracks, scratches and dirt particles. If the piston cup is hard or dry, it should be immersed in neat's foot oil before reassembling in cylinder. If it becomes necessary to replace the piston cup, shellac both

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sides of piston stem plug gasket, also shellac threads of piston stem plug and draw up piston stem plug just snugly on ball end of piston stem.

The inside of the air cylinder and complete piston assembly should be thoroughly cleaned and the wall of the cylinder, as well as the entire piston assembly, should be covered with a lubricant as outlined in first paragraph.

Clean breather hair in piston stem assembly with cleaning solvent and dip in light lubricating oil before replacing.

Care should be exercised to make sure the rubber boot is in good condition and properly installed to protect the piston shaft from the element.

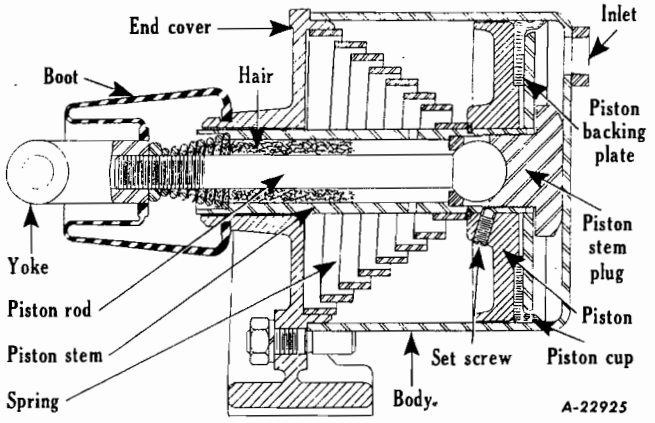

Fig. 17 - Typical Brake Chamber (Piston Type).

AIR PRESSURE GAGE

Description

1. The purpose of the dash-mounted air pressure gage is to register the amount of air pressure in the air brake system. While air pressure gages of this type are commercially accurate, they must never be confused with, or substituted for, test air gages which are intended primarily for accurately checking air pressure in the air brake system.

2. Only test gages known to be accurate are to be used for checking brake valve delivery pressures, governor pressure settings, and other tests. Test gages differ from ordinary dash gages in respect to material and workmanship much as an expensive watch differs from a cheaper one, and due to these differences they are more accurate over their entire range, and maintain their accuracy over longer periods.

Testing

1. Check the dash air gage for accuracy. The simplest way to do this is to compare the pressures registered by the gage over its normal pressure range with the pressures registered by a test gage known to be accurate.

2. A dash gage which loses its accuracy must be replaced. The continued use of a dash gage showing an error of more than 5 pounds is not recommended.

CUT-OUT COCKS

Description

1. Cut-out cocks have a tapered key ground to the body to prevent leakage. A passage is provided through the key so that when the key is turned to its open position air is permitted to flow through the cock, but when the key is turned to the closed position air is prevented from flowing through the cock. Cut-out cocks are used in the service and emergency lines of the tractor truck to provide a means of closing off these lines when they are not being used.

2. The cut-out cock is open when the handle is at a 90-degree angle with the body of the cock, and closed when the handle is parallel with the body of the cock. Stops are provided so that the handle cannot be turned beyond its normal positions.

3. Always open and close a cut-out cock by hand. Never strike the handle with a hammer, or similar instrument, as the cock would be damaged and leakage would develop.

Testing

1. With brakes applied and cut-out cock closed (hose line disconnected), test with soapsuds for leakage past the key. Also check for leakage through the body by coating the outside of the cut-out cock with soapsuds.

2. With brakes applied and cut-out cock open (hose line connected), check for leakage through the body by coating the outside of the cut-out cock with soapsuds.

3. Leakage in excess of a 3-inch soap bubble in 3 seconds in either of these tests is not permissible.

4. Leakage is caused by a dirty or scored key or body. Leakage due to dirt is corrected by cleaning parts and applying a light coating of cup grease to the key. Leakage due to a scored key or body cannot be repaired, and the cut-out cock must be replaced.

RESERVOIRS

1. Reservoirs are tested against a 200-pound pressure, and treated on the inside with a rust preventive.

2. The purpose of reservoirs is to provide a place to store compressed air so that there will be an ample supply available for immediate use in brake operation. They also provide storage for sufficient compressed air to permit several brake applications after the engine has stopped. Another function of a reservoir is to provide a place where the air, heated during compression, may cool and cause the oil and water vapors to condense.

Testing

1. LEAKAGE TESTS. With the air brake system charged, coat the outside of the reservoir with soapsuds to check for leakage. If any leakage is found, replace the reservoir.

2. INSPECTION. Inspect inside and outside surfaces for damage or corrosion. A small flashlight is helpful when inspecting the interior. If damage or corrosion is found that would weaken the reservoir, replace the reservoir.

3. Moisture taken in with the air through the compressor inlet valves collects in the reservoirs and necessitates draining the reservoirs daily in cold weather and every week in warm weather by opening the drain cock located on the bottom. Be sure to close the drain cocks after all moisture has been removed.

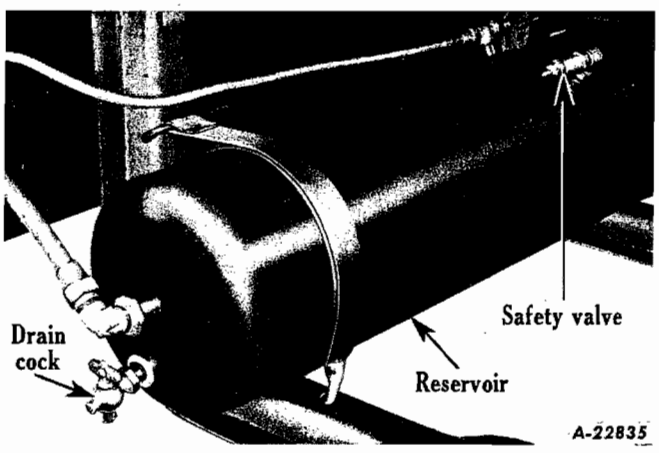

Fig. 18 - Illustrates Reservoir, Safety Valve, and Drain Cock.

DRAIN COCKS

Description

1. Drain cocks have a brass body fitted with a tapered brass key. The drain cock is open when the handle is parallel to the body, and closed when the handle is at right angles to the body. Drain cocks are installed in the bottom of each reservoir in the air brake system to provide a convenient means of draining the condensation which normally collects in the reservoirs.

2. Always open a drain cock by hand. Never strike the handle with a hammer or any other instrument, as the cock would be damaged and leakage would develop.

Testing

1. With the air brake system charged, test with soapsuds for leakage past the key. Also check for leakage through the body by coating the outside of the drain cock with soapsuds. Leakage in excess of a 3-inch soap bubble in 3 seconds is not permissible.

2. Leakage is caused by dirty or scored key or body. Leakage due to dirt is corrected by cleaning parts and applying a thin coating of cup grease on the key. Leakage due to a scored key or body cannot be repaired, and the drain cock must be replaced.

HOSE, HOSE ASSEMBLIES AND HOSE CONNECTORS

Description

Hose and hose fittings provide a means of making flexible air connections between points on a vehicle which normally change their position in relation to each other, also of making flexible connections between two vehicles. All hose assemblies include detachable-type hose connectors with spring guards. Hose assemblies used to connect the air brake system to another vehicle are fitted with hose couplings. The two hose lines or hose couplings at the rear of the tractor truck are marked by tags identifying them as "SERVICE" or "EMERGENCY."

Testing

1. If any evidence is found indicating that a hose line is restricted, remove and blow air through it in both directions to be sure the passage through the hose is not obstructed in any way.

2. With the brakes applied to be sure that the hose line being tested is under pressure, coat the outside of the hose and connections with soapsuds to check for leakage. No leakage is permissible. Leakage at the connectors is sometimes corrected by tightening the connector nut. If this fails to correct the leakage, replace the connectors, hose, or both.

Replacement

Hose assemblies are easily replaceable by removing the detachable connectors and installing a new piece of hose.

1. Remove connector nuts, and pull hose out of connector body.

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2. Do not attempt to remove used sleeve from hose.

3. Cut a piece of new hose to required length, being sure that cut is made at right angles to outside wall of hose, and that end of hose is smooth.

4. Blow out hose with an air line to remove all cuttings.

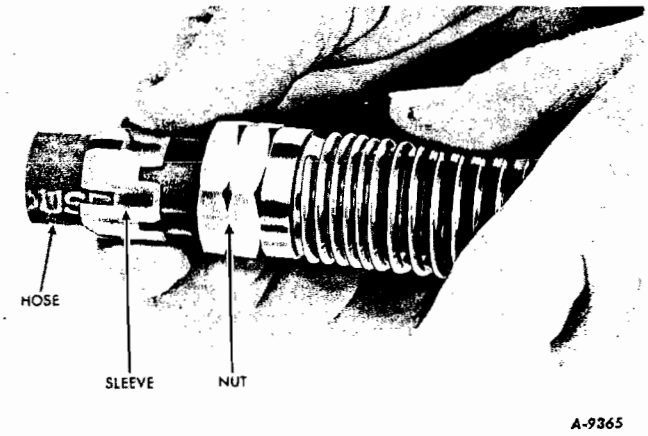

Fig. 19

5. Place connector nut and sleeve on hose (Fig. 19), being sure that barbs on inside of sleeve point toward end of hose that is being connected.

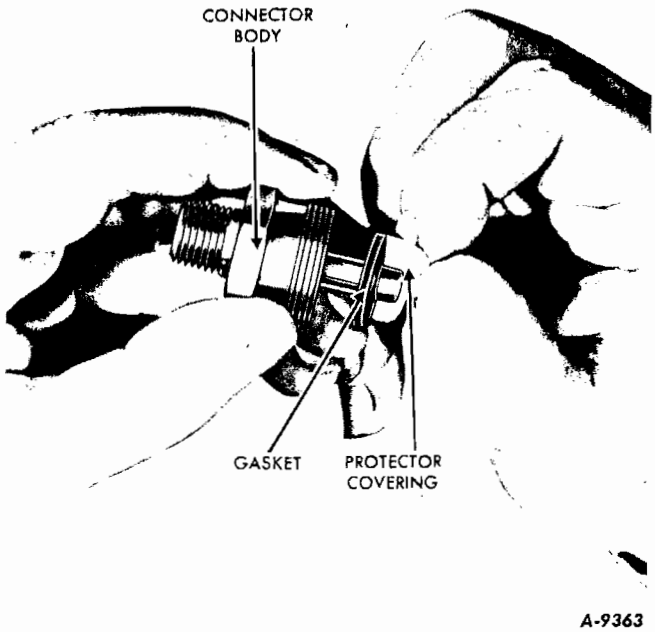

Fig. 20

6. Place new gasket over end of guide in connector body so that side with removable protector covering is next to hose. Remove protector covering from gasket (Fig. 20).

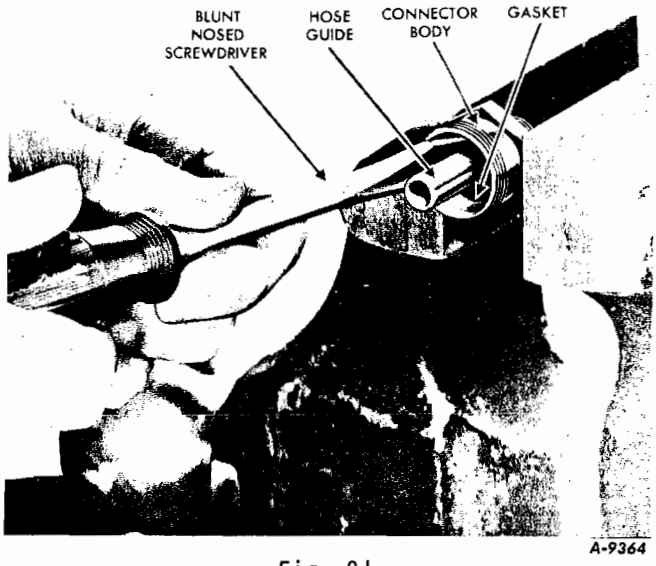

Fig. 21

7. Push gasket into bottom of recess in connector body (Fig. 21).

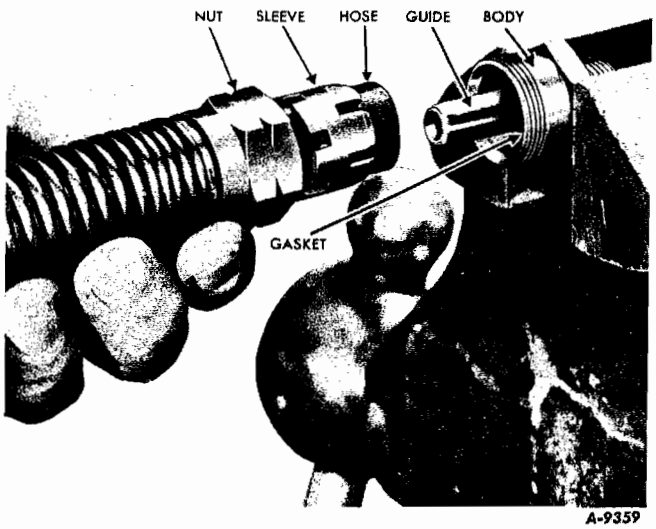

Fig. 22

8. Put end of hose in connector body, making sure that end of hose is against gasket at bottom of the recess (Fig. 22).

9. Move sleeve, if necessary, until it is against edge of connector body. Tighten connecting nut. It is only necessary to tighten nut sufficiently to insure an air-tight joint.

10. When installing a hose assembly where both ends are permanently connected, the hose connector at either end is used as a swivel by loosening the nut on one of the connectors. Turn the hose in the loose connector before the connector nut is again tightened. This permits the installation of the hose without kinking or twisting.

HOSE COUPLINGS AND DUMMY COUPLINGS

Description

1. Hose couplings provide an easy and convenient method of connecting and disconnecting air lines between vehicles by hand. The design of the hose couplings is such that when two of them are coupled together pressure is put on two rubber gaskets, making an air-tight seal.

2. Dummy couplings are made in two general designs, some being fitted with brackets to permit them to be rigidly mounted on the vehicle, while others are fitted with a chain attaching them to the vehicle. The bracket type is used where the dummy coupling is to serve as a fastening for holding hose lines when not in use, whereas the chain type is used for blocking off hose couplings rigidly mounted on the vehicle as used on the tractor truck. The purpose of the dummy coupling is to prevent the entrance of dirt or other foreign matter into the air brake lines when the lines are not being used.

Testing

1. With the hose couplings connected and brakes applied, coat the hose couplings all over with soapsuds to check for leakage. There must be no leakage.

2. Leakage is usually caused by worn, damaged, or improperly installed gaskets. To correct leakage, install new gaskets.

3. Remove old gasket by prying out with a screwdriver. Before attempting to install a new gasket, be sure the groove in the coupling in which the gasket fits is thoroughly cleaned. Otherwise it will be impossible to install a new gasket properly.

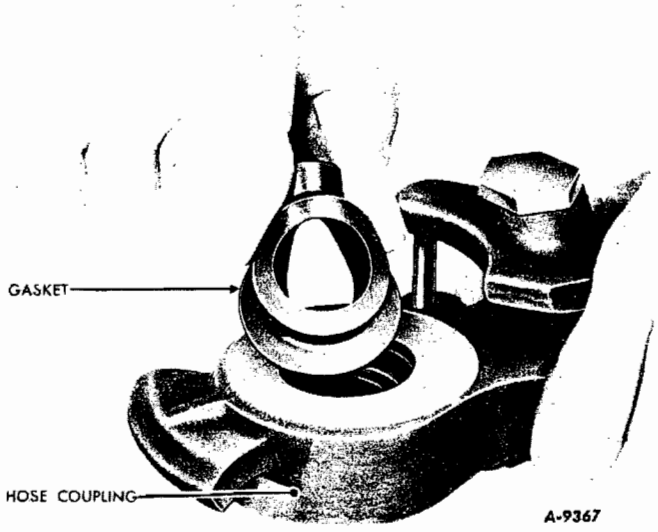

Fig. 23

4. To install a new gasket, partially collapse it with the fingers (Fig. 23), and enter one side of the gasket flange in the groove in the coupling.

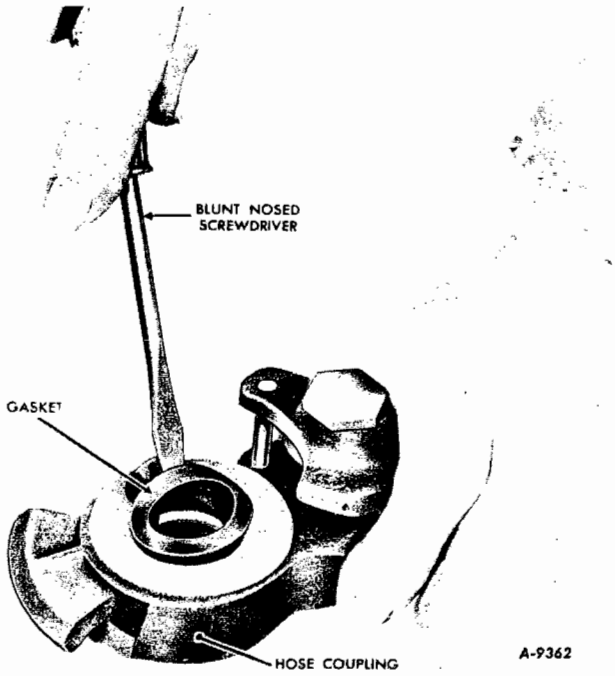

Fig. 24

5. Then use a blunt nosed screwdriver or similar instrument to push the gasket into place (Fig. 24). When properly installed, the exposed face of the gasket will be flat, not twisted or bulged at any point.

TUBING

Operating Tests

If any evidence is found that a tubing line is restricted, remove and blow air through it in both directions to be sure the passage through the tubing is not obstructed in any way. Inspect tubing for partial restrictions such as may be caused by dents or kinks. Damaged tubing must be replaced.

Leakage Tests

With the air brake system fully charged, the governor cut out, and brakes applied, coat all tubing lines and fittings with soapsuds to check for leakage. No leakage is permissible. Leakage at a tubing fitting is sometimes corrected by tightening the tubing fitting nut. If this fails to correct the leakage, replace the tubing fitting, the tubing, or both.

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HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-110, L-111, L-112 { 12x1-3/4" FRONT / 12x1-3/4" REAR

L-120, L-121, L-122 { 12x1-3/4" FRONT / 12x2" REAR

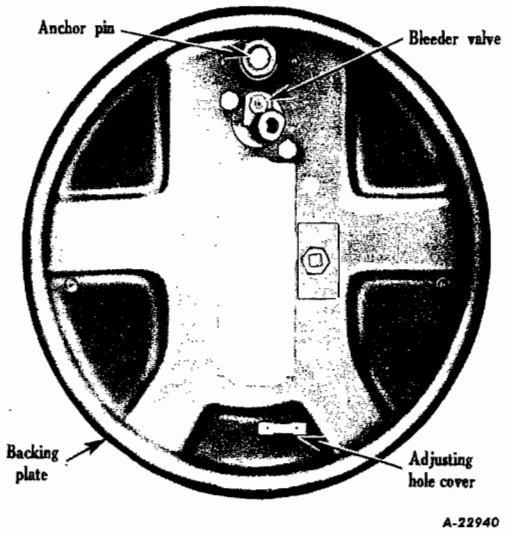

Fig. 1 - (Front) External View.

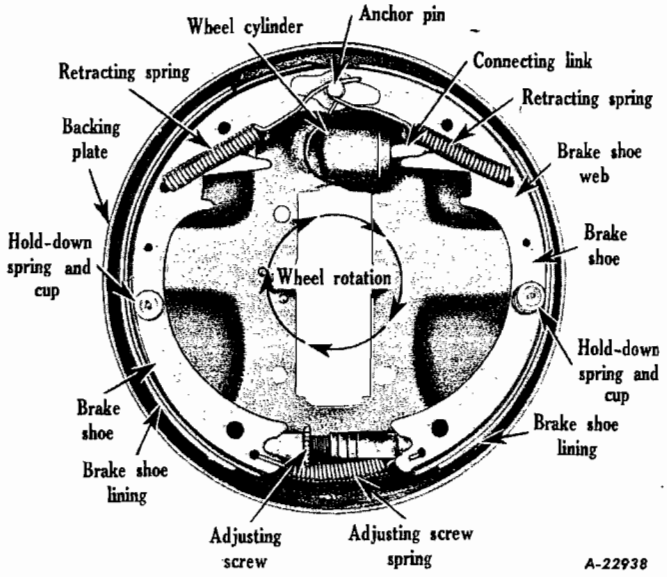

Fig. 2 - (Front) Internal View.

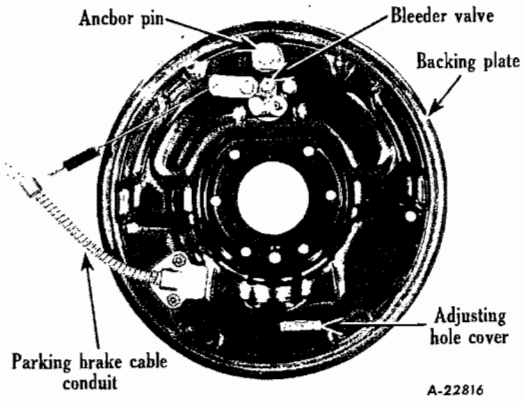

Fig. 3 - (Rear) External View.

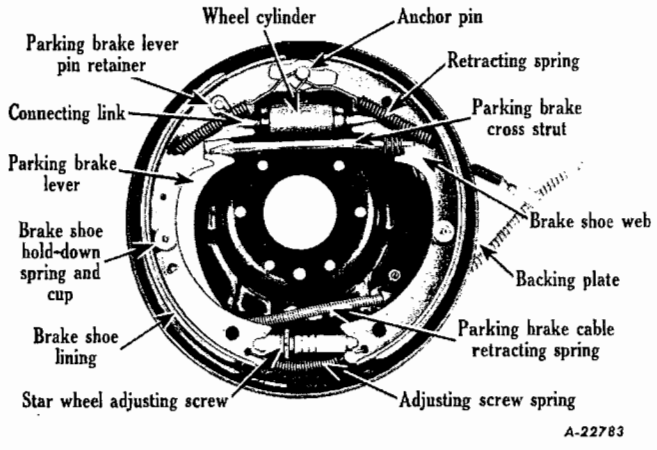

Fig. 4 - (Rear) Internal View.

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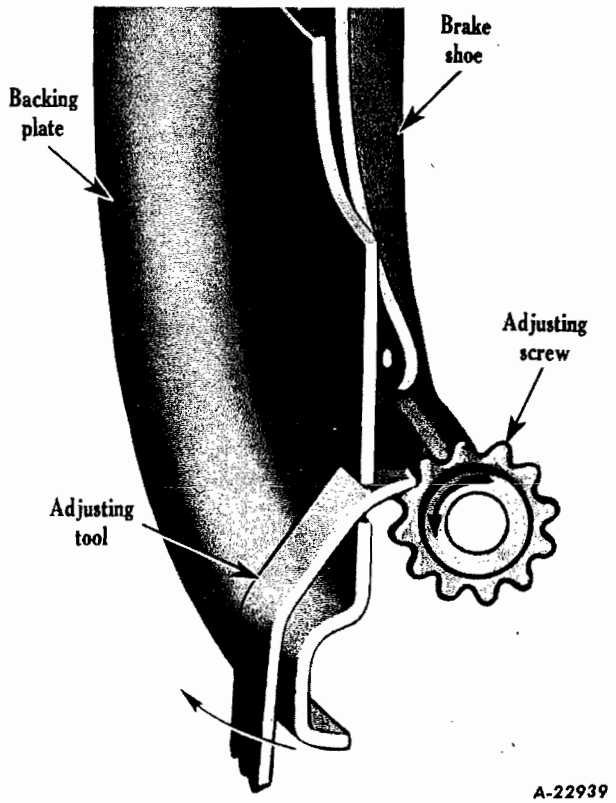

Fig. 5

BRAKE ADJUSTMENT INSTRUCTIONS

Before attempting to make any brake adjustments - whether minor or major - be sure that wheel bearings are properly adjusted and that brake backing plates are tight.

Adjustment For Wear (Minor) (Figs. 1, 2, 3, 4 and 5)

NOTE: Perform Operations in Sequence Given (At Both Front and Rear Brakes Unless Otherwise Noted.):

1. Place parking brake lever in fully released position.
2. Jack up truck until the wheels are free from floor.
3. Remove adjusting hole covers.
4. Insert screwdriver or special adjusting tool in slot of backing plate to engage star wheel adjusting screw (Fig. 5).
5. Move outer end of screwdriver or special tool toward axle, expanding brake shoes to the point where the wheel can just be turned by hand.
6. Rear brakes only. NOTE: Parking brake cable adjustment should be made at this time. With brake shoes still expanded, disconnect the parking brake cable at the intermediate lever end. With parking brake lever applied approximately 1" from fully released position, pull cables by hand to remove all slack. Adjust cables as required at yoke ends so that clevis pins can be inserted. Insert clevis pins and new cotter pins.
7. Back off star wheel adjusting screw 12 to 14 notches and then check to see that brake drum turns freely. It may be necessary to tap the backing plate lightly to permit the brake shoes to take a central position.
8. Rear brakes only. Pull parking brake lever back until the rear wheel can just be turned by hand. Check rear wheels for even brake drag. If drag is uneven, loosen the tight brake to provide even drag.
9. Replace adjusting hole covers.

Major Adjustments and Servicing (Figs. 1, 2, 3, 4 and 5).

The following adjustments are performed only when adjustments under "Minor Adjustments" fail to give satisfactory results or when installing new shoes or linings.

NOTE: Perform Operations in Sequence Given. (At both front and rear brakes unless otherwise noted.)

1. Place parking brake lever in fully released position.
2. Jack up truck until wheels are free from floor.
3. Remove wheels, hubs and drums.
4. Remove adjusting hole covers.
5. Remove brake shoes and inspect linings for excessive wear, grease, loose rivets or other damage. Install new lining if old lining shows excessive wear or is saturated with grease or brake fluid.
6. Inspect brake drums for scores, run-out or cracks. If scores are not too deep or "run-out" does not exceed .010", drums may be machined. If drums are badly scored or cracked, they should be replaced.
7. Inspect wheel cylinders for signs of fluid leakage or deteriorated rubber dust boots. If brake fluid is leaking out of wheel cylinders, replace or recondition wheel cylinders.
8. Clean grease and dirt off backing plate and sand down shoe ledges if rusted or ridged.

9. Disconnect parking brake cables to rear brakes at intermediate lever end. Wipe off dirt and grease from exposed portion of cables and pull cables through conduits as far as possible from the brake end and wipe off old grease.

10. Apply a generous coating of cable lubricant to cables and slide cables back through conduits. Wipe off excessive grease from backing plate.

11. Apply a thin coating of suitable lubricant comparable to "Lubriplate" to shoe ledges and on rear brakes apply to the parking brake lever fulcrum and strut contact points.

12. Thoroughly clean star wheel adjusting screws, pivot nuts, hold down pins, springs and cups. Apply a small amount of suitable lubricant comparable to "Lubriplate" to the threaded end of the adjusting screw and to contact points on the shoe webs.

13. When installing new shoes, lay the shoes out in pairs according to their position on the truck. The rear (secondary) shoe is the shoe with longer lining.

14. Rear brakes only. On rear brake shoes attach parking brake levers to backing plate side of shoe web, using lever pin, spring and retainer. Squeeze ends of retainer lock together after assembly of retainer.

15. Thread the star wheel adjusting screw into the pivot nut to the limit of the thread and assemble star wheel adjusting screw and adjusting screw spring to the adjustment end of the shoes with pivot nut against the right hand shoe. NOTE: Always assemble pivot nut on the right hand shoe regardless of position of shoes on the truck.

16. Guide forked end of shoe links over anchor end of shoe web, and attach shoes to backing plates by means of shoe hold down pins, springs and cups.

17. On rear brakes only, assemble spring on strut against strut shoulder and assemble strut between front (primary) shoe and parking brake lever. The small loop of spring rests against inside of shoe web on right hand brake and on outside of shoe web on left hand brake.

18. On rear brakes only, attach cable to parking brake lever by compressing cable retracting spring and sliding cable into loop at end of lever.

19. Attach retracting springs to shoes and anchor pins. If springs show signs of having been overstressed, they should be replaced.

20. Install brake drums. (For lubrication and adjustment of front wheel bearings see "Wheel Section".)

NOTE: DO NOT LOOSEN ANCHOR PINS UNLESS INSPECTION OF LINING-TO-DRUM CLEARANCE INDICATES A NEED FOR REPOSITIONING OF ANCHORS.

21. Insert a .015" feeler gauge between the lining and drum of the rear (secondary) shoe about 1-1/2" from the star wheel adjusting screw end of the shoe and expand shoe by turning star wheel adjusting screw until feeler gauge cannot be withdrawn. Then turn star wheel adjusting screw in opposite direction until there is but a light drag on the feeler gauge.

Withdraw feeler gauge. NOTE: Expanding shoes until feeler gauge cannot be withdrawn insures that shoes are resting against the anchor pin.

22. Revolve brake drum so that feeler gauge hole is about 1-1/2" from the anchor end of the rear (secondary) shoe lining. There should be a slightly heavier drag on the feeler gauge at this point. If the clearance at the anchor end of the shoe is greater than the clearance at the adjustment end by .003" or more, it will be necessary to adjust the anchor pin.

23. To adjust anchor pin, loosen locknut 1/4 to 1/2 of a turn and tap anchor pin either up or down to provide the correct anchor pin position. After positioning the anchor pin to provide the correct rear (secondary) shoe clearance, tighten the anchor pin locknut with a 16" wrench and then recheck anchor and adjusting end clearances.

NOTE: If anchor pin nut is loosened too much, the anchor pin may shift when tightening the locknut.

24. To adjust rear parking brake cables expand shoes at both rear brakes until tight against brake drums. With parking brake lever applied approximately 1" from fully released position, pull cables by hand to remove all slack. Adjust cables as required at yoke ends so that clevis pins can be inserted. Insert clevis pins and new cotter pins.

25. At both rear brakes back off star wheel adjusting screw 12 to 14 notches.

26. To check rear brakes for balance, pull parking brake lever back until rear wheels can just be turned by hand. Check rear wheels for even brake drag. If drag is uneven, loosen the tight brake to provide even drag.

27. Replace adjusting hole covers.

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HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

LM-120, LM-121, LM-122 { 12 x 1-3/4" FRONT
12 x 2" REAR

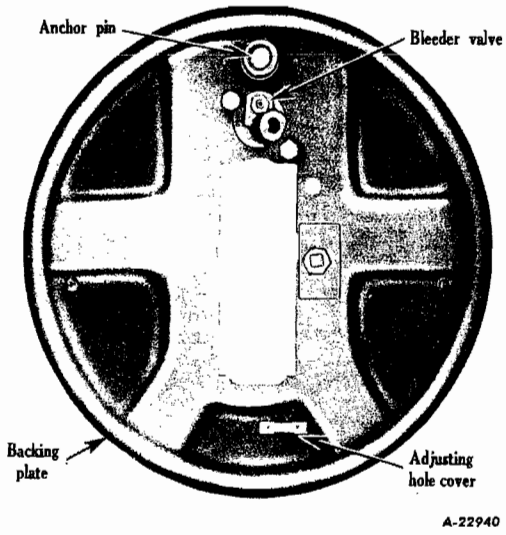

Fig. 1 - (Front) External View.

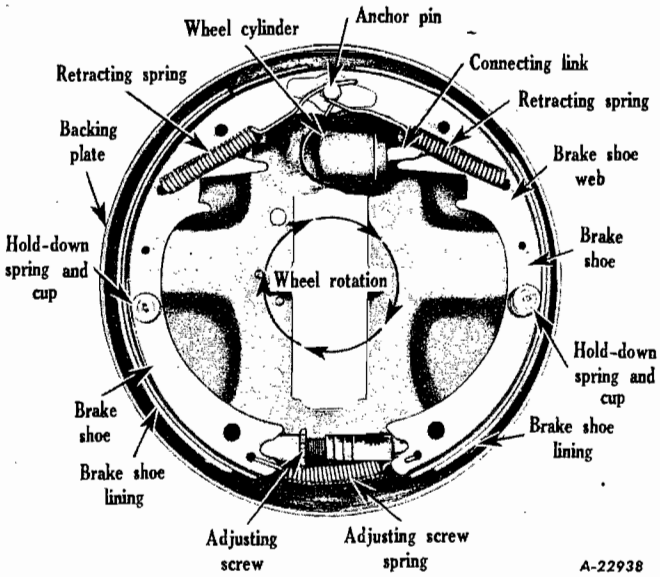

Fig. 2 - (Front) Internal View.

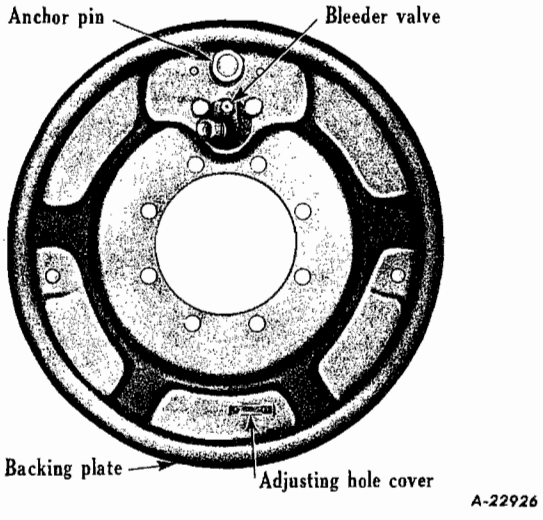

Fig. 3 - (Rear) External View.

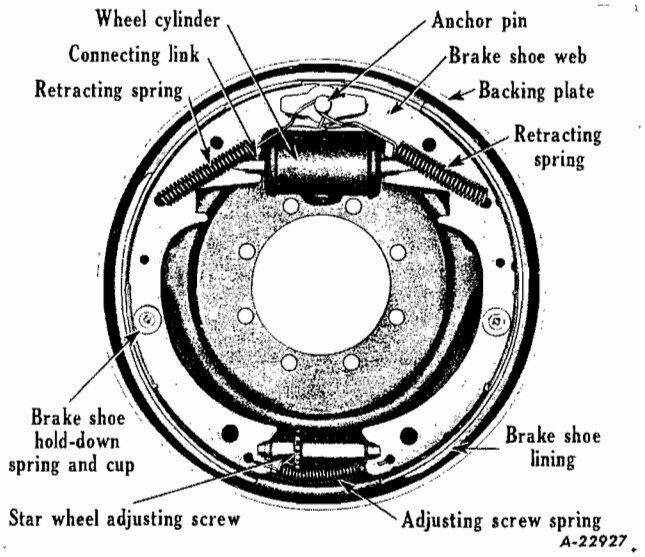

Fig. 4 - (Rear) Internal View.

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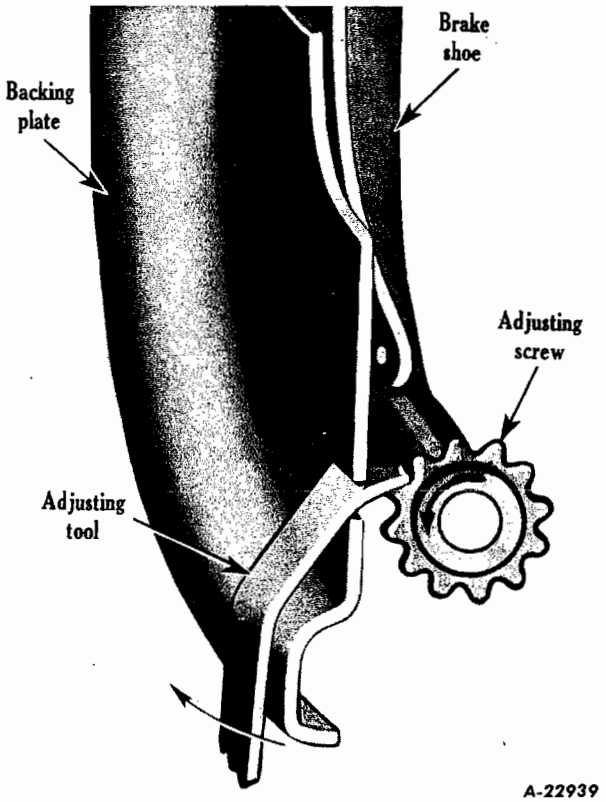

Fig. 5

BRAKE ADJUSTMENT INSTRUCTIONS

Before attempting to make any brake adjustments whether minor or major, be sure that wheel bearings are properly adjusted and that brake backing plates are tight.

Adjustment For Wear (Minor)

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED):-

1. Place parking brake lever in fully released position.
2. Jack up truck until the wheels are free from floor.
3. Remove adjusting hole covers.
4. Insert screwdriver or special adjusting tool in slot of backing plate to engage star wheel adjusting screw (Fig. 5).
5. Move outer end of screwdriver or special tool toward axle, expanding brake shoes to the point where the wheel can just be turned by hand.
6. Back off star wheel adjusting screw 12 to 14 notches and then check to see that brake drum turns freely. It may be necessary to tap the backing plate lightly to permit the brake shoes to take a central position.
7. Replace adjusting hole covers.

Major Adjustments and Servicing (Figs. 1, 2, 3, 4 and 5).

The following adjustments are performed only when adjustments under "Minor Adjustments" fail to give satisfactory results or when installing new shoes or linings.

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED):-

1. Place parking brake lever in fully released position.
2. Jack up truck until wheels are free from floor.
3. Remove wheels, hubs and drums.
4. Remove adjusting hole covers.
5. Remove brake shoes and inspect linings for excessive wear, grease, loose rivets or other damage. Install new lining if old lining shows excessive wear or is saturated with grease or brake fluid.
6. Inspect brake drums for scores, run-out or cracks. If scores are not too deep or "run-out" does not exceed .010", drums may be machined. If drums are badly scored or cracked, they should be replaced.
7. Inspect wheel cylinders for signs of fluid leakage or deteriorated rubber dust boots. If brake fluid is leaking out of wheel cylinders, replace or recondition wheel cylinders.
8. Clean grease and dirt off backing place and sand down shoe ledges if rusted or ridged.
9. Apply a thin coating of suitable lubricant comparable to "Lubriplate" to shoe ledges.
10. Thoroughly clean star wheel adjusting screws, pivot nuts, hold down pins, springs and cups. Apply a small amount of suitable lubricant comparable to "Lubriplate" to the threaded end of the adjusting screw and to contact points on the shoe webs.

11. When installing new shoes, lay the shoes out in pairs according to their position on the truck. The rear (secondary) shoe is the shoe with longer lining.

12. Thread the star wheel adjusting screw into the pivot nut to the limit of the thread and assembly star wheel adjusting screw and adjusting screw spring to the adjustment end of the shoes with pivot nut against the right hand shoe. NOTE: Always assemble pivot nut on the right hand shoe regardless of position of shoes on the truck.

13. Guide forked end of shoe links over anchor end of shoe web, and attach shoes to backing plates by means of shoe hold down pins, springs and cups.

14. Attach retracting springs to shoe and anchor pins. If springs show signs of having been overstressed, they should be replaced.

15. Install brake drums. (For lubrication and adjustment of front wheel bearings see Wheel Section.)

NOTE: **DO NOT** LOOSEN ANCHOR PINS UNLESS INSPECTION OF LINING TO DRUM CLEARANCE INDICATES A NEED FOR REPOSITIONING OF ANCHORS.

16. Insert a .015" feeler gauge between the lining and drum of the rear (secondary) shoe about 1-1/2" from the star wheel adjusting screw end of the shoe and expand shoe by turning star wheel adjusting screw until feeler gauge cannot be withdrawn. Then turn star wheel adjusting screw in opposite direction until there is but a light drag on the feeler gauge.

    Withdraw feeler gauge. **NOTE: Expanding** shoes until feeler gauge cannot be withdrawn insures that shoes are resting against the anchor pin.

17. Revolve brake drum so that feeler gauge hole is about 1-1/2" from the anchor end of the rear (secondary) shoe lining. There should be a slightly heavier drag on the feeler gauge at this point. If the clearance at the anchor end of the shoe is greater than the clearance at the adjustment end by .003" or more, it will be necessary to adjust the anchor pin.

18. To adjust anchor pin, loosen locknut 1/4 to 1/2 turn and tap anchor pin either up or down to provide the correct anchor pin position. After positioning the anchor pin to provide the correct rear (secondary) shoe clearance, tighten the anchor pin locknut with a 16" wrench and then recheck anchor and adjusting end clearances.

    NOTE: If anchor pin nut is loosened too much, the anchor pin may shift when tightening the locknut.

19. Replace adjusting hole covers.

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HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-130, L-131, L-132 { 12 x 1-3/4" FRONT
14 x 2-1/4" REAR

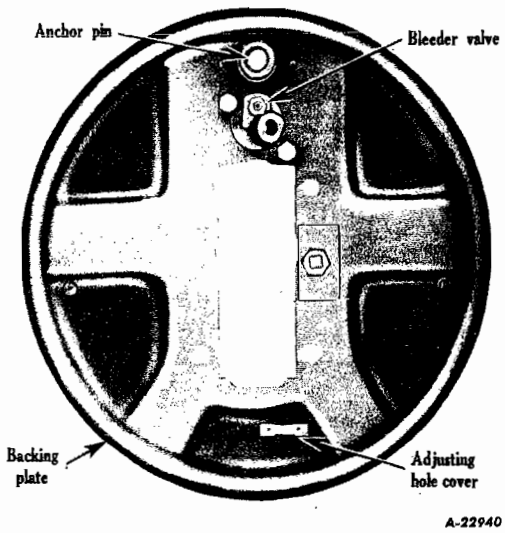

Fig. 1 - (Front) External View.

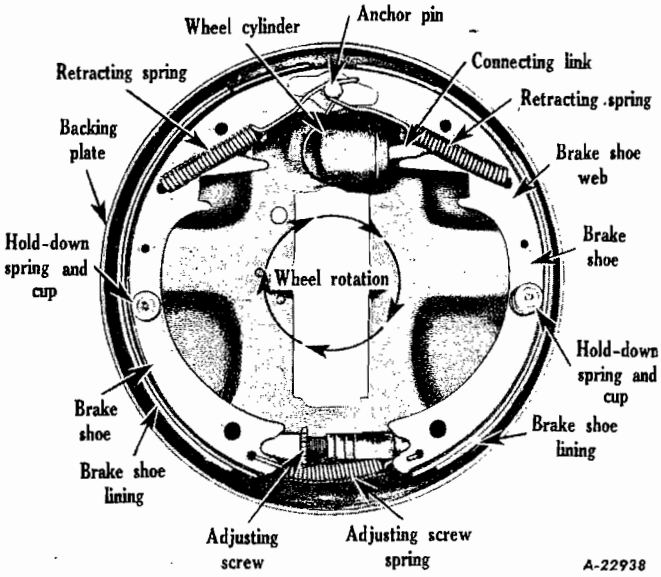

Fig. 2 - (Front) Internal View.

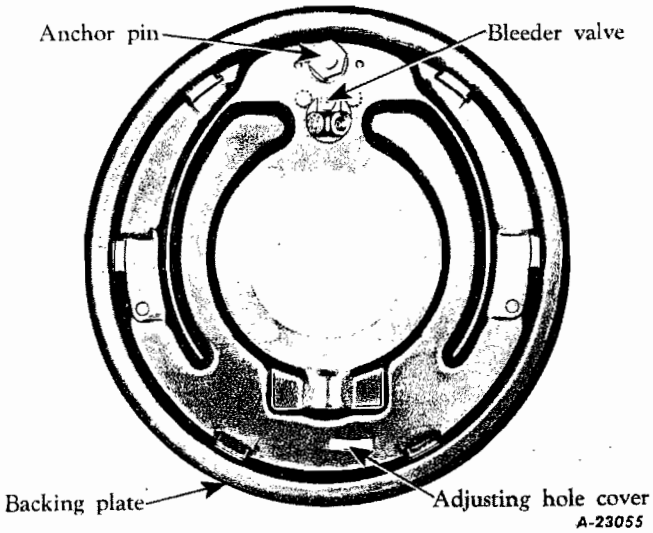

Fig. 3 - (Rear) External View.

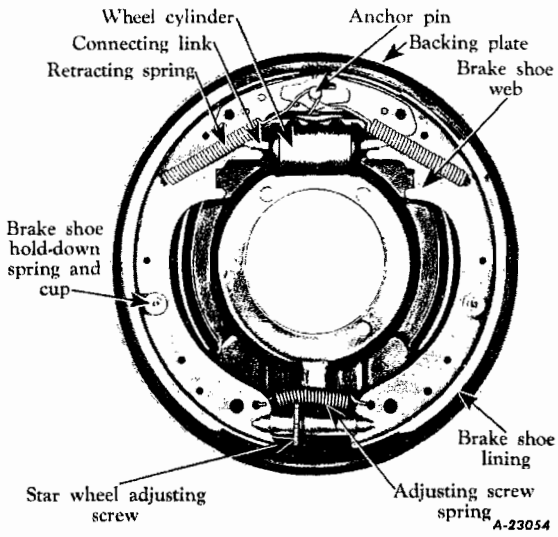

Fig. 4 (Rear) Internal View.

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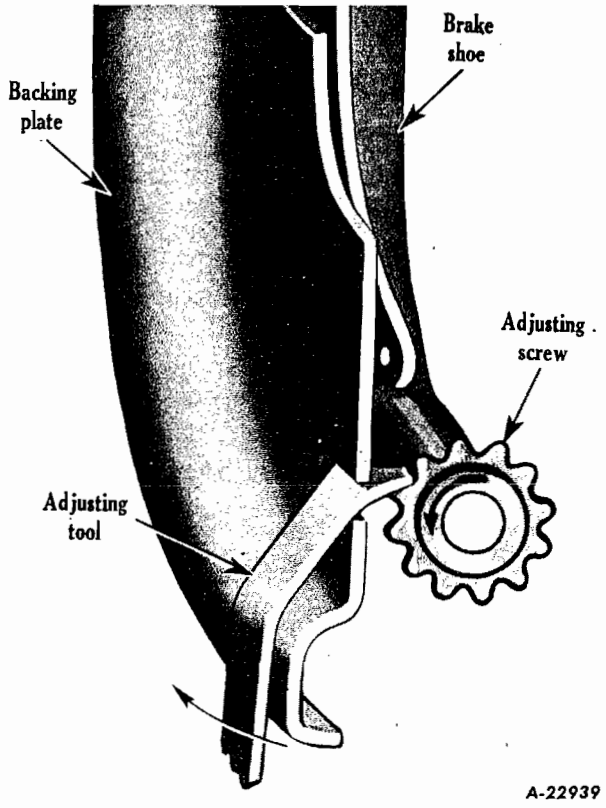

Fig. 5

BRAKE ADJUSTMENT INSTRUCTIONS

Before attempting to make any brake adjustments, whether minor or major, be sure that wheel bearings are properly adjusted and that brake backing plates are tight.

Adjustment for Wear (Minor)

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED):

1. Place parking brake lever in fully released position.
2. Jack up truck until the wheels are free from floor.
3. Remove adjusting hole covers.
4. Insert screw driver or special adjusting tool in slot of backing plate to engage star wheel adjusting screw (Fig. 5).
5. Move outer end of screw driver or special tool toward axle, expanding brake shoes to the point where the wheel can just be turned by hand.
6. Back off adjusting screw 12 to 14 notches and then check to see that brake drum turns freely. It may be necessary to tap the backing plate lightly to permit the brake shoes to take a central position.
7. Replace adjusting hole covers.

Major Adjustments and Servicing (Figs. 1, 2, 3, 4, 5).

The following adjustments are performed only when adjustments under "Minor Adjustments" fail to give satisfactory results or when installing new shoes or linings.

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED):

1. Place parking brake lever in fully released position.
2. Jack up truck until wheels are free from floor.
3. Remove wheels, hubs, and drums.
4. Remove adjusting hole covers.
5. Remove brake shoes and inspect linings for excessive wear, grease, loose rivets or other damage. Install new lining if old shows excessive wear or is saturated with grease or brake fluid.
6. Inspect brake drums for scores, run-out or cracks. If scores are not too deep or "run-out" does not exceed .010", drums may be machined. If drums are badly scored or cracked, they should be replaced.
7. Inspect wheel cylinders for signs of fluid leakage or deteriorated rubber dust boots. If brake fluid is leaking out of wheel cylinders, replace or recondition wheel cylinders.
8. Clean grease and dirt off of backing plate and sand down shoe ledges of rusted or ridged.
9. Apply a thin coating of suitable lubricant comparable to "Lubriplate" to shoe ledges.
10. Thoroughly clean star wheel adjusting screws, pivot nuts, hold down pins, springs and cups. Apply a small amount of suitable lubricant comparable to "Lubriplate" to the threaded end of the adjusting screw and to contact points on the shoe webs.
11. When installing new shoes, lay the shoes out in pairs according to their position on the truck. The rear (secondary) shoe is the shoe with longer lining.

12. Thread the star wheel adjusting screw into the pivot nut to the limit of the thread and assemble star wheel adjusting screw and adjusting screw spring to the adjustment end of the shoes with pivot nut against the right hand shoe. NOTE: Always assemble pivot nut on the right hand shoe regardless of position of shoes on the truck.

13. Guide forked end of shoe links over anchor end of shoe web, and attach shoes to backing plates by means of shoe hold down pins, springs and cups.

14. Attach retracting springs to shoes and anchor pins. If springs show signs of having been overstressed, they should be replaced.

15. Install brake drums. (For lubrication and adjustment of front wheel bearings see Wheel Section.)

NOTE: DO NOT LOOSEN ANCHOR PINS UNLESS INSPECTION OF LINING TO DRUM CLEARANCE INDICATES A NEED FOR REPOSITIONING OF ANCHORS.

16. Insert a .015" feeler gauge between the lining and drum of the rear (secondary) shoe about 1-1/2" from the star wheel adjusting screw end of the shoe and expand shoe by turning star wheel adjusting screw until feeler gauge cannot be withdrawn. Then turn star wheel adjusting screw in opposite direction until there is but a light drag on the feeler gauge. Withdraw feeler gauge. NOTE: Expanding shoes until feeler gauge cannot be withdrawn insures that shoes are resting against the anchor pin.

17. Revolve brake drum so that feeler gauge hole is about 1-1/2" from the anchor end of the rear (secondary) shoe lining. There should be a slightly heavier drag on the feeler gauge at this point. If the clearance at the anchor end of the shoe is greater than the clearance at the adjustment end by .003" or more, it will be necessary to adjust the anchor pin.

18. To adjust anchor pin, loosen locknut 1/4 to 1/2 turn and tap anchor pin either up or down to provide the correct anchor pin position. After positioning the anchor pin to provide the correct rear (secondary) shoe clearance, tighten the anchor pin locknut with a 16" wrench and then recheck anchor and adjusting end clearances. NOTE: If anchor pin nut is loosened too much, the anchor pin may shift when tightening the locknut.

19. Replace adjusting hole covers.

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HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

LB-140 { 12 x 1-3/4" FRONT
14 x 2-1/4" REAR

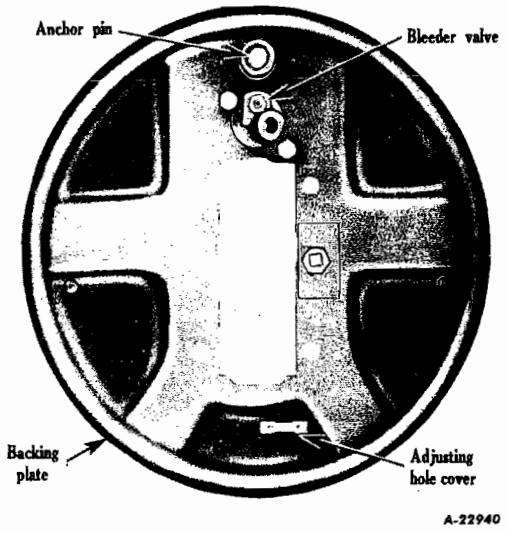

Fig. 1 - (Front) External View.

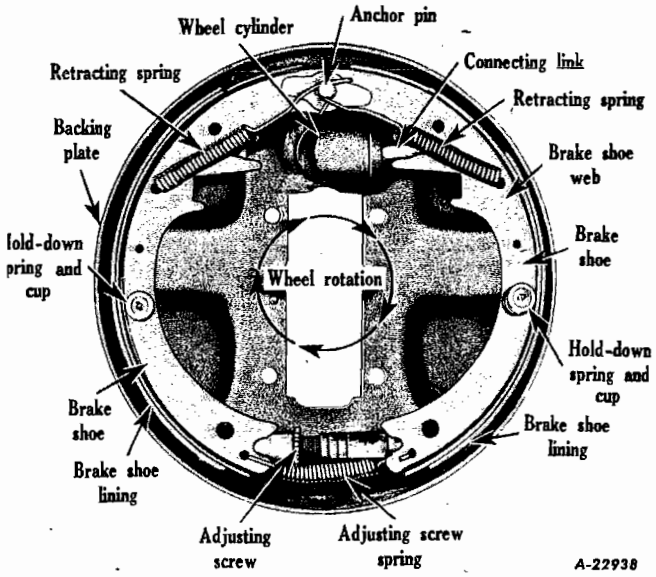

Fig. 2 - (Front) Internal View.

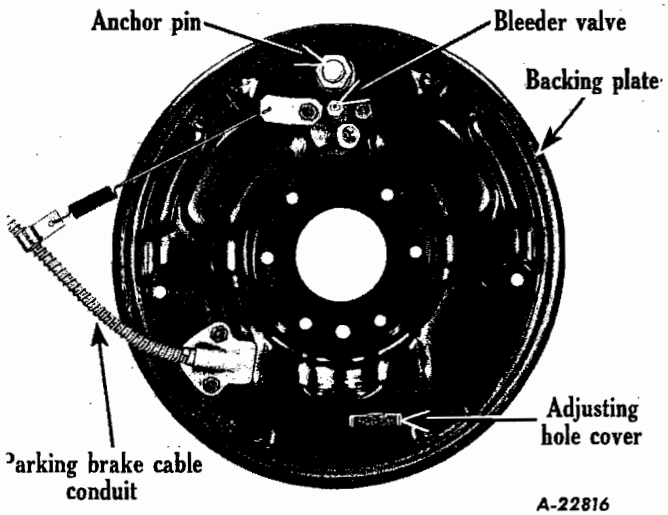

Fig. 3 - (Rear) External View.

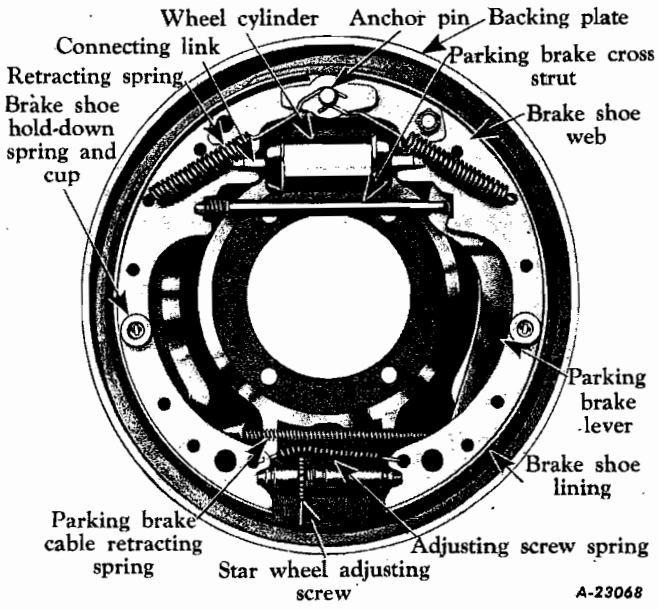

Fig. 4 - (Rear) Internal View.

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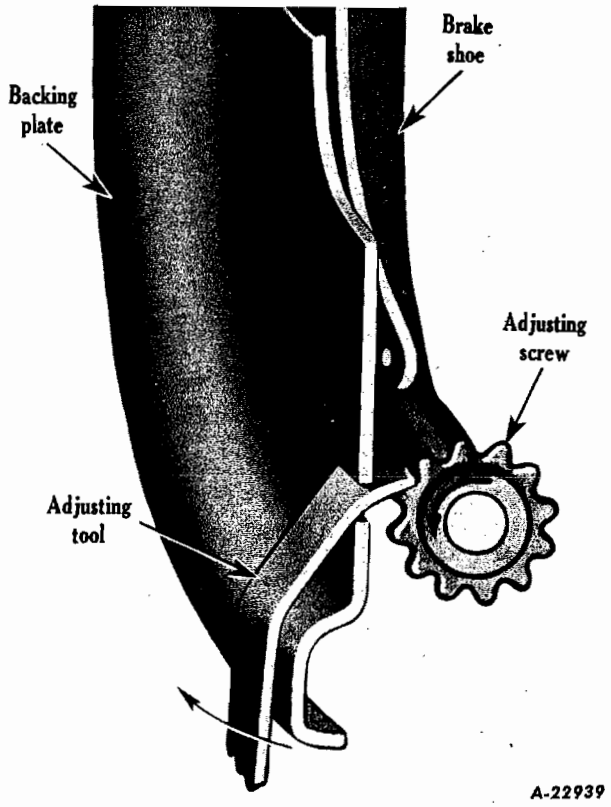

Fig. 5

BRAKE ADJUSTMENT INSTRUCTIONS

Before attempting to make any brake adjustments, whether minor or major, be sure that wheel bearings are properly adjusted and that brake backing plates are tight.

Adjustment For Wear (Minor)

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED): -

1. Place parking brake lever in fully released position.
2. Jack up truck until the wheels are free from floor.
3. Remove adjusting hole covers.
4. Insert screwdriver or special adjusting tool in slot of backing plate to engage star wheel adjusting screw (Fig. 5).
5. Move outer end of screwdriver or special tool toward axle, expanding brake shoes to the point where the wheel can just be turned by hand.
6. REAR BRAKES ONLY. NOTE: Parking brake cable adjustment should be made at this time. With brake shoes still expanded, disconnect the parking brake cable at the intermediate lever end. With parking brake lever applied approximately 1" from fully released position, pull cables by hand to remove all slack. Adjust cables as required at yoke end so that clevis pins can be inserted. Insert clevis pins and new cotter pins.
7. Back off star wheel adjusting screw 12 to 14 notches and then check to see that brake drum turns freely. It may be necessary to tap the backing plate lightly to permit the brake shoes to take a central position.
8. REAR BRAKES ONLY. Pull parking brake lever back until the rear wheel can just be turned by hand. Check rear wheels for even brake drag. If drag is uneven, loosen the tight brake to provide even drag.
9. Replace adjusting hole covers.

Major Adjustments and Servicing (Fig. 1, 2, 3, 4 and 5).

The following adjustments are performed only when adjustments under "Minor Adjustments" fail to give satisfactory results or when installing new shoes or linings.

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED): -

1. Place parking brake lever in fully released position.
2. Jack up truck until wheels are free from floor.
3. Remove wheels, hubs and drums.
4. Remove adjusting hole covers.
5. Remove brake shoes and inspect linings for excessive wear, grease, loose rivets or other damage. Install new lining if old lining shows excessive wear or is saturated with grease or brake fluid.
6. Inspect brake drums for scores, run-out or cracks. If scores are not too deep or "run-out" does not exceed .010", drums may be machined. If drums are badly scored or cracked, they should be replaced.
7. Inspect wheel cylinders for signs of fluid leakage or deteriorated rubber dust boots. If brake fluid is leaking out of wheel cylinders, replace or recondition wheel cylinders.
8. Clean grease and dirt off of backing plate and sand down shoe ledges if rusted or ridged.
9. Disconnect parking brake cables to rear brakes at intermediate lever end. Wipe off dirt and grease from exposed portion of cables and pull cables through conduits as far as possible from the brake end and wipe off old grease.

10. Apply a generous coating of cable lubricant to cables and slide cables back through conduits. Wipe off excessive grease from backing plate.

11. Apply a thin coating of suitable lubricant comparable to "Lubriplate" to shoe ledges and on rear brakes apply to the parking brake lever fulcrum and strut contact points.

12. Thoroughly clean star wheel adjusting screws, pivot nuts, hold down pins, springs and cups. Apply a small amount of suitable lubricant comparable to "Lubriplate" to the threaded end of the adjusting screw and to contact points on the shoe webs.

13. When installing new shoes, lay the shoes out in pairs according to their position on the truck. The rear (secondary) shoe is the shoe with longer lining.

14. REAR BRAKES ONLY. On rear shoes attach parking brake levers to backing plate side of shoe web. Place spring washer on parking brake lever pin and insert pin through lever and shoe from the backing plate side. Assemble lockwasher and nut. Adjust nut so that parking brake lever is under spring tension, but free of bind.

15. REAR BRAKES ONLY. Attach parking brake lever strut to parking brake lever from side opposite backing plate with conical spring, flat washer and cotter pin.

16. Thread the star wheel adjusting screw into the pivot nut to the limit of the thread and assemble star wheel adjusting screw and adjusting screw spring to the adjustment end of the shoes with pivot nut against the right hand shoe. NOTE: Always assemble pivot nut on the right hand shoe regardless of position of shoes on the truck.

17. FRONT BRAKES ONLY. Guide forked end of shoe links over anchor end of shoe web, and attach shoes to backing plates by means of shoe hold down pins, springs and cups.

18. REAR BRAKES ONLY. Place parking brake lever strut spring against shoulder at front (primary) shoe end of strut. Guide forked end of strut and shoe links over anchor end of shoe webs. Attach shoes to backing plate by means of shoe hold down pins, springs and cups.

19. REAR BRAKES ONLY. Attach cable to parking brake lever by sliding yoke at brake end of cable over hook end of packing brake lever.

20. Attach retracting springs to shoes and anchor pins. If springs show signs of having been overstressed, they should be replaced.

21. Install brake drums. (For lubrication and adjustment of front wheel bearings see Wheel Section.)

NOTE: DO NOT LOOSEN ANCHOR PINS UNLESS INSPECTION OF LINING TO DRUM CLEARANCE INDICATES A NEED FOR REPOSITIONING OF ANCHORS.

22. Insert a .015" feeler gauge between the lining and drum of the rear (secondary) shoe about 1-1/2" from the star wheel adjusting screw end of the shoe and expand shoe by turning star wheel adjusting screw until feeler gauge cannot be withdrawn. Then turn star wheel adjusting screw in opposite direction until there is but a light drag on the feeler gauge.

    Withdraw feeler gauge. NOTE: Expanding shoes until feeler gauge cannot be withdrawn insures that shoes are resting against the anchor pin.

23. Revolve brake drum so that feeler gauge hole is about 1-1/2" from the anchor end of the rear (secondary) shoe lining. There should be a slightly heavier drag on the feeler gauge at this point. If the clearance at the anchor end of the shoe is greater than the clearance at the adjustment end by .003" or more, it will be necessary to adjust the anchor pin.

24. To adjust anchor pin, loosen lock nut 1/4 to 1/2 turn and tap anchor pin either up or down to provide the correct anchor pin position. After positioning the anchor pin to provide the correct rear (secondary) shoe clearance, tighten the anchor pin lock nut with a 16" wrench and then recheck anchor and adjusting end clearances. NOTE: If anchor pin nut is loosened too much, the anchor pin may shift when tightening the lock nut.

25. To adjust rear parking brake cables expand shoes at both rear brakes until tight against brake drums. With parking brake lever applied approximately 1" from fully released position, pull cables by hand to remove all slack. Adjust cables as required at yoke ends so that clevis pin can be inserted. Insert clevis pins and new cotter pins.

26. At both rear brakes back off star wheel adjusting screw 12 to 14 notches.

27. To check rear brakes for balance, pull parking brake lever back until rear wheel can just be turned by hand. Check rear wheels for even brake drag. If drag is uneven, loosen the tight brake to provide even drag.

28. Replace adjusting hole covers.

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HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-150, LM-150, LM-151 { 12-1/8 x 2" FRONT
14 x 2-1/4" REAR

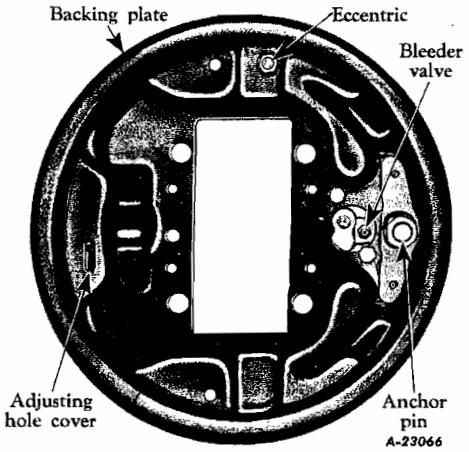

Fig. 1 - (Front) External View.

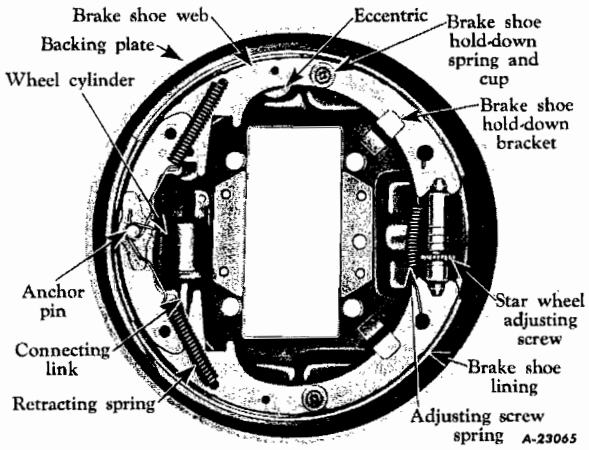

Fig. 2 - (Front) Internal View.

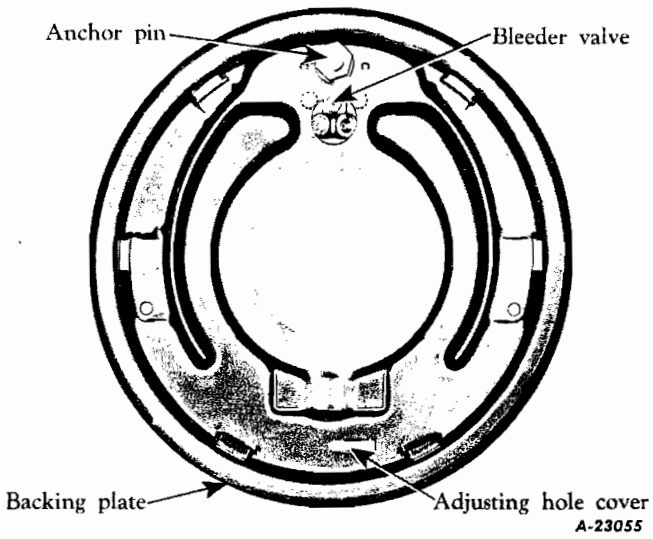

Fig. 3 - (Rear) External View.

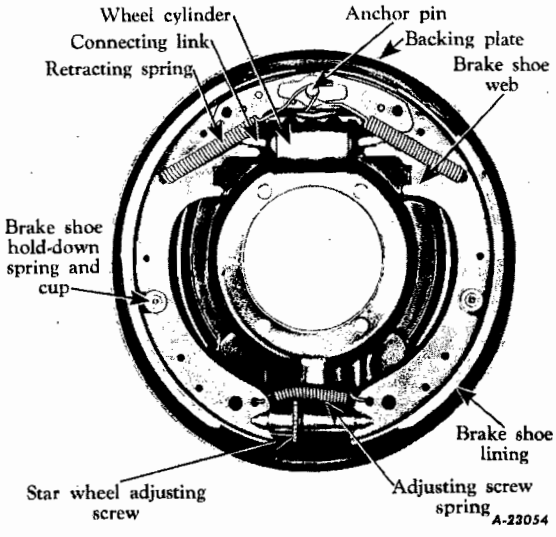

Fig. 4 - (Rear) Internal View.

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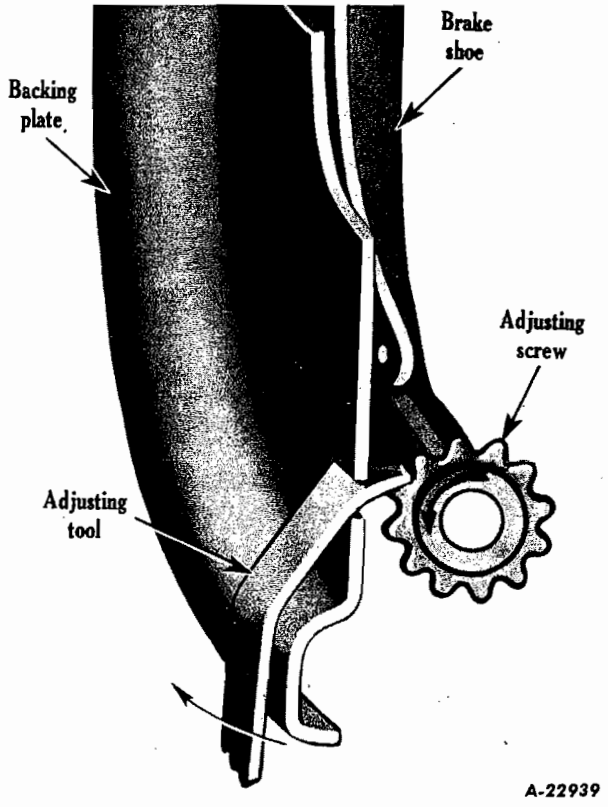

Fig. 5

BRAKE ADJUSTMENT INSTRUCTIONS

Before attempting to make any brake adjustments, whether minor or major, be sure that wheel bearings are properly adjusted and that brake backing plates are tight.

Adjustment For Wear (Minor)

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED): -

1. Place parking brake lever in fully released position.
2. Jack up truck until the wheels are free from floor.
3. Remove adjusting hole covers.
4. On front brakes only loosen eccentric locknut and turn eccentric adjustment in the direction of forward wheel rotation until upper (secondary) brake shoe drags. Then turn eccentric in opposite direction until upper (secondary) brake shoe is free of drag. Hold eccentric and tighten eccentric locknut.
5. Insert screwdriver or special adjusting tool in slot of backing plate to engage star wheel adjusting screw (Fig. 5).
6. Move outer end of screwdriver or special tool toward axle, expanding brake shoes to the point where the wheel can just be turned by hand.
7. Back off star wheel adjusting screw 12 to 14 notches and then check to see that brake drum turns freely. On rear brakes it may be necessary to tap the backing plate lightly to permit the brake shoes to take a central position.
8. Replace adjusting hole covers.

Major Adjustments and Servicing (Figs. 1, 2, 3, 4 and 5).

The following adjustments are performed only when adjustments under "Minor Adjustments" fail to give satisfactory results or when installing new shoes or linings.

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED): -

1. Place parking brake lever in fully released position.
2. Jack up truck until wheels are free from floor.
3. Remove wheels, hubs and drums.
4. Remove adjusting hole covers.
5. Remove brake shoes and inspect linings for excessive wear, grease, loose rivets or other damage. Install new lining if old lining shows excessive wear or is saturated with grease or brake fluid.
6. Inspect brake drums for scores, run-out or cracks. If scores are not too deep or "run-out" does not exceed .010", drums may be machined. If drums are badly scored or cracked, they should be replaced.
7. Inspect wheel cylinders for signs of fluid leakage or deteriorated rubber dust boots. If brake fluid is leaking out of wheel cylinders, replace or recondition wheel cylinders.
8. Clean grease and dirt off of backing plate and sand down shoe ledges if rusted or ridged.
9. Apply a thin coating of suitable lubricant comparable to "Lubriplate" to all shoe ledges.

10. Thoroughly clean star wheel adjusting screws, pivot nuts, hold down pins, springs and cups. Apply a small amount of suitable lubricant comparable to "Lubriplate" to the threaded end of the adjusting screw and to contact points on the shoe webs.

NOTE: PERFORM THE FOLLOWING OPERATIONS AT EACH FRONT WHEEL (SEE FIGS. 1 AND 2):-

11. When installing new brake shoes, lay the shoes out in pairs according to their position on the truck. The upper (secondary) shoe is the shoe with the longer lining.

12. Thread the star wheel adjusting screw into the pivot nut to the limit of the threads and assemble star wheel adjusting screw and spring to the adjustment end of the shoes. NOTE: Always assemble pivot nut on the right hand shoe as viewed from the adjusting screw end of the shoes regardless of whether the brake shoes are for left or right side of truck.

13. Assemble shoe links to wheel cylinder and and guide forked end of shoe links over anchor end of shoe webs.

14. Attach brake shoes to backing plates with shoe hold down pins, springs and cups.

15. Attach retracting springs to shoes and anchor pin. If springs show signs of having been overstressed, they should be replaced.

16. Install brake drums. (For lubrication and adjustment of front wheel bearings see wheel section). NOTE: It may be necessary to change the position of the shoe eccentric when assembling drum over shoes. NOTE: DO NOT LOOSEN ANCHOR PINS UNLESS INSPECTION OF LINING TO DRUM CLEARANCE INDICATES A NEED FOR REPOSITIONING OF ANCHORS.

17. Loosen eccentric adjustment locknut and turn eccentric adjustment in the direction of forward wheel rotation until the upper (secondary) shoe begins to drag. Then turn eccentric in opposite direction until brake is just free of drag. Hold eccentric and tighten eccentric locknut.

18. Check lining to drum clearance at both ends of the upper (secondary) shoe. The clearance at both ends of the upper (secondary shoe should be .010". If the clearance at the anchor end of the shoe is greater than the clearance at the adjustment end by .003" or more, it will then be necessary to adjust the anchor pin.

19. To adjust anchor pin loosen locknut 1/4 to 1/2 turn and tap anchor pin toward the front or rear of truck to provide the correct clearance. When the desired lining to drum clearance is obtained, tighten anchor pin nut with a 16" wrench and then recheck (secondary) shoe clearances. NOTE: If anchor pin nut is loosened too much, the anchor pin may shift when tightening the locknut.

20. Expand brake shoes by tightening star wheel adjusting screw to the point where wheel can just be turned by hand and then back off star wheel adjusting screw 12 to 14 notches. Replace adjusting hole covers.

NOTE: PERFORM THE FOLLOWING OPERATIONS AT EACH REAR WHEEL (SEE FIGS. 2 AND 3):-

21. When installing new shoes, lay the shoes out in pairs according to their position on truck. The rear (secondary) shoe is the shoe with longer lining.

22. Thread the star wheel adjusting screw into the pivot nut to the limit of the thread and assemble star wheel adjusting screw and adjusting screw spring to the adjustment and of the shoes with pivot nut against the right hand shoe. NOTE: Always assemble pivot nut on the right hand shoe regardless of position of shoes on the truck.

23. Guide forked end of shoe links over anchor end of shoe web, and attach shoes to backing plates by means of shoe hold down pins, springs and cups.

24. Attach retracting springs to shoes and anchor pin. If springs show signs of having been overstressed, they should be replaced.

25. Install brake drums.

NOTE: DO NOT LOOSEN ANCHOR PINS UNLESS INSPECTION OF LINING TO DRUM CLEARANCE INDICATES A NEED FOR REPOSITIONING OF ANCHORS.

26. Insert a .015" feeler gauge between the lining and drum of the rear (secondary) shoe about 1-1/2" from the star wheel adjusting screw end of the shoe and expand shoe by turning star wheel adjusting screw until feeler gauge cannot be withdrawn. Then turn star wheel adjusting screw in opposite direction until there is but a light drag on the feeler gauge. Withdraw feeler gauge. NOTE: Expanding shoes until feeler gauge cannot be withdrawn insures that shoes are resting against the anchor pin.

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27. Revolve brake drum so that feeler gauge hole is about 1-1/2" from the anchor end of the rear (secondary) shoe lining. There should be a slightly heavier drag on the feeler gauge at this point. If the clearance at the anchor end of the shoe is greater than the clearance at the adjustment end by .003" or more, it will be necessary to adjust the anchor pin.

28. To adjust anchor pin, loosen locknut 1/4 to 1/2 turn and tap anchor pin either up or down to provide the correct anchor pin position. After positioning the anchor pin to provide the correct rear (secondary) shoe clearance, tighten the anchor pin locknut with a 16" wrench and then recheck anchor and adjusting end clearances. NOTE: If anchor pin is loosened too much, the anchor pin may shift when tightening the locknut.

29. Replace adjusting hole covers.

HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-151, L-152, L-153, LM-152 { 12-1/8 x 2" FRONT / 14-1/8 x 3" REAR

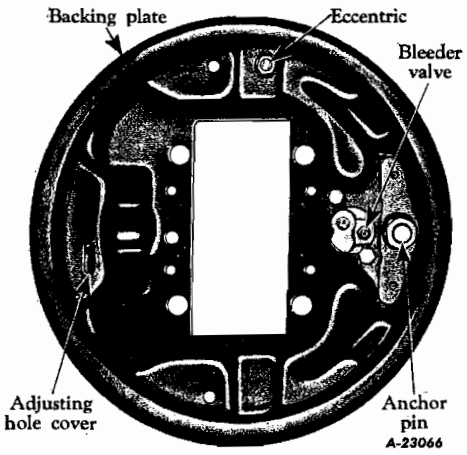

Fig. 1 - (Front) External View.

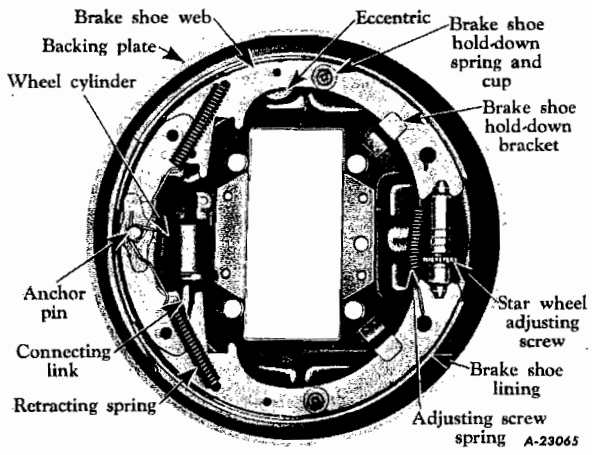

Fig. 2 - (Front) Internal View.

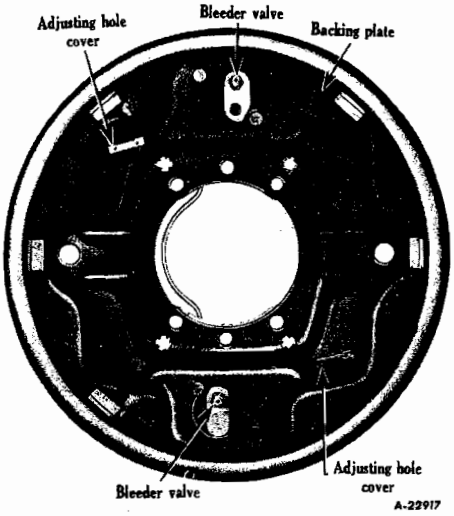

Fig. 3 - (Rear) External View.

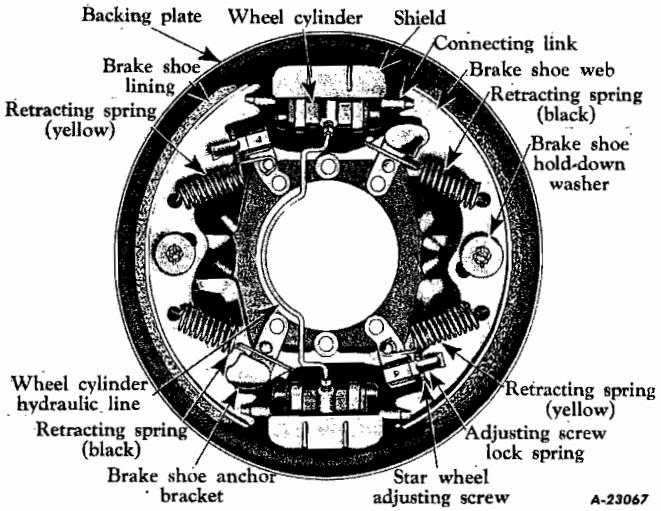

Fig. 4 - (Rear) Internal View.

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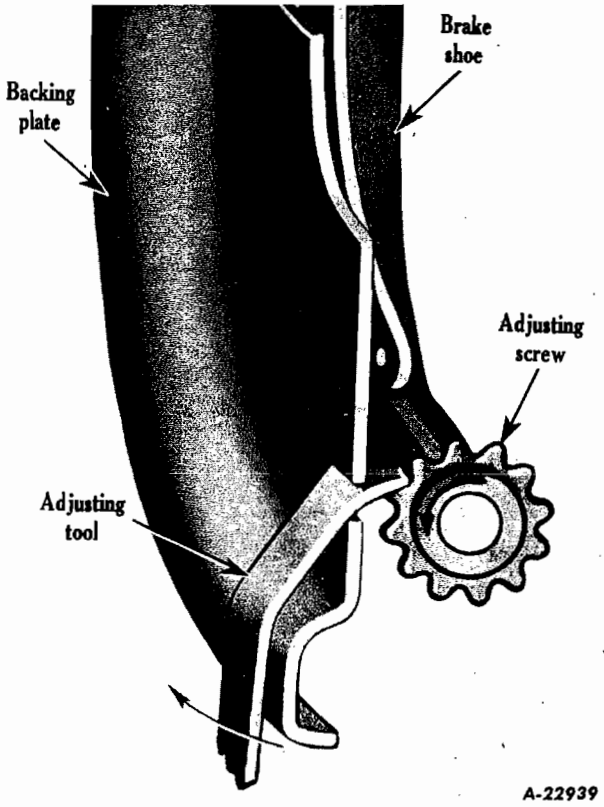

Fig. 5

BRAKE ADJUSTMENT INSTRUCTIONS

Before attempting to make any brake adjustments, whether minor or major, be sure that wheel bearings are properly adjusted and that brake backing plates are tight.

Adjustments For Wear (Minor)

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED): -

1. Place parking brake lever in fully released position.
2. Jack up truck until the wheels are free from floor.
3. Remove adjusting hole covers.

NOTE: PERFORM THE FOLLOWING AT EACH FRONT WHEEL (SEE FIGS. 1 AND 2): -

4. Loosen eccentric locknut and turn eccentric adjustment in the direction of forward wheel rotation until upper (secondary) brake shoe drags. Then turn eccentric in opposite direction until upper (secondary) brake shoe is free of drag. Hold eccentric and tighten eccentric locknut.
5. Insert screwdriver or special adjusting tool in slot of backing plate to engage star wheel adjusting screw (Fig. 5).
6. Move outer end of screwdriver or special toward axle, expanding brake shoes to the point where the wheel can just be turned by hand.
7. Back off star wheel adjusting screw 12 to 14 notches and then check to see that brake drum turns freely.
8. Replace adjusting hole covers.

NOTE: PERFORM THE FOLLOWING AT EACH REAR WHEEL (SEE FIGS. 3 AND 4): -

9. Insert screwdriver or special adjusting tool into upper or front shoe adjusting screw slot of backing plate to engage star wheel adjusting screw (Fig. 5).
10. Move outer end of screwdriver or special adjusting tool toward axle, expanding front brake shoe to the point where the wheel can just be turned by hand.
11. Back off star wheel adjusting screw until brake drum is just free of brake drag, approximately 6 notches.
12. Insert screwdriver or special adjusting tool into lower or rear shoe adjusting screw slot of backing plate and expand rear brake shoe to the point where the wheel can just be turned by hand.
13. Back off star wheel adjusting screw until brake drum is just free of brake drag, approximately 6 notches.
14. Replace adjusting hole covers.

Major Adjustments and Servicing (Figs. 1, 2, 3, 4 and 5).

The following adjustments are performed only when adjustments under "Minor Adjustments" fail to give satisfactory results or when installing new shoes or linings.

NOTE: PERFORM OPERATIONS IN SEQUENCE GIVEN. (AT BOTH FRONT AND REAR BRAKES UNLESS OTHERWISE NOTED): -

1. Place parking brake lever in fully released position.
2. Jack up truck until wheels are free from floor.
3. Remove wheels, hubs and drums.

4. Remove adjusting hole covers.

5. Remove brake shoes and inspect linings for excessive wear, grease, loose rivets or other damage. Install new lining if old lining shows excessive wear or is saturated with grease or brake fluid.

6. Inspect brake drums for scores, run-out or cracks. If scores are not too deep or "run-out" does not exceed .010", drums may be machined. If drums are badly scored or cracked, they should be replaced.

7. Inspect wheel cylinders for signs of fluid leakage or deteriorated rubber dust boots. If brake fluid is leaking out of wheel cylinders, replace or recondition wheel cylinders.

8. Clean grease and dirt off of backing plate and sand down shoe ledges if rusted or ridged.

9. Apply a thin coating of suitable lubricant comparable to "Lubriplate" to all shoe ledges.

10. Thoroughly clean star wheel adjusting screws, pivot nuts, hold down pins, springs and cups of front brakes and clean star wheel adjusting screws, locksprings, hold down nuts and washers of rear brakes. Apply a small amount of suitable lubricant comparable to "Lubriplate" to threaded end of the adjusting screws and to points of contact of the shoe webs with the shoe links and anchor buttons.

NOTE: PERFORM THE FOLLOWING OPERATIONS AT EACH FRONT WHEEL (SEE FIGS. 1 AND 2):-

11. When installing new brake shoes, lay the shoes out in pairs according to their position on the truck. The upper (secondary) shoe is the shoe with the longer lining.

12. Thread the star wheel adjusting screw into the pivot nut to the limit of the threads and assemble star wheel adjusting screw and spring to the adjustment end of the shoes. NOTE: Always assemble pivot nut on the right hand shoe as viewed from the adjusting screw end of the shoes regardless of whether the brake shoes are for left or right side of truck.

13. Assemble shoe links to wheel cylinders and guide forked end of shoe links over anchor end of shoe webs.

14. Attach brake shoes to backing plate with shoe hold down pins, springs and cups.

15. Attach retracting springs to shoes and anchor pin. If springs show signs of having been overstressed, they should be replaced.

16. Install brake drums. (For lubrication and adjustment of front wheel bearings see wheel section.) NOTE: It may be necessary to change the position of the shoe eccentric when assembling drum over shoes.

NOTE: DO NOT LOOSEN ANCHOR PINS UNLESS INSPECTION OF LINING TO DRUM CLEARANCES INDICATE A NEED FOR REPOSITIONING OF ANCHORS.

17. Loosen eccentric adjustment locknut and turn eccentric adjustment in the direction of forward wheel rotation until the upper (secondary) shoe begins to drag. Then turn eccentric in opposite direction until brake is just free of drag. Hold eccentric and tighten eccentric locknut.

18. Check lining to drum clearance at both ends of the upper (secondary) shoe. The clearance at both ends of the upper (secondary) shoe should be .010". If the clearance at the anchor end of the shoe is greater than the clearance at the adjustment end by .003" or more, it will then be necessary to adjust the anchor pin.

19. To adjust the anchor pin loosen locknut 1/4 to 1/2 turn and tap anchor pin toward the front or rear of truck to provide the correct clearance. When the desired lining to drum clearance is obtained, tighten anchor pin nut with a 16" wrench and then recheck upper (secondary) shoe clearances. NOTE: If anchor pin nut is loosened too much, the anchor pin may shift when tightening the locknut.

20. Expand brake shoes by tightening star wheel adjusting screw to the point where wheel can just be turned by hand and then back off star wheel adjusting screw 12 to 14 notches. Replace adjusting hole covers.

NOTE: PERFORM THE FOLLOWING OPERATIONS AT EACH REAR WHEEL (SEE FIGS. 3 AND 4):-

21. Thread star wheel adjustment screws into anchor brackets to the limit of the thread and assemble locksprings over anchor brackets with long end of lockspring in contact with star wheel.

22. Assemble shoe links to wheel cylinders.

23. Hold anchor button in place against cut-out of rear shoe web and guide anchor button into the notch of the anchor bracket. Guide forked end of shoe links over shoe web.

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24. Apply a thin coating of suitable lubricant comparable to "Lubriplate" to one side of shoe hold down washer and assemble this side of hold down washer against shoe web. Place a .006" feeler gauge between center shoe ledge and rim of shoe, with shoe in place against the anchor bracket and adjusting screw pad assemble hold down nut and draw down tight against washer, back off one castellation and insert cotter key.

25. Attach retracting springs (black spring) to brake shoe and anchor bracket and (yellow spring) to brake shoe and anchor bracket stud.

26. Assemble front shoe to backing plate in the same manner.

27. Install brake drums.

28. To adjust front shoe insert screwdriver or special brake adjusting tool through slot in backing plate (upper front) and expand front brake shoe to the point where the wheel can just be turned by hand.

29. Back off star wheel adjusting screw 6 notches.

30. To adjust rear shoe insert screwdriver or special brake adjusting tool through slot in backing plate (lower rear) and expand rear brake shoe to the point where the wheel can just be turned by hand.

31. Back off star wheel adjusting screw 6 notches.

32. Replace, adjusting hole covers.

HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-160, L-161, L-162, L-163, L-164, L-165, LC-160, LC-161, LC-162, L-170, L-171, L-172, L-173, L-174, L-175, LF-170, LF-171, LF-172	FRONT BRAKE 12-1/8" x 2-1/4" (TYPE "F")
L-180, L-181, L-182, L-183, L-184, L-185, LC-180, LC-181, LC-182	FRONT BRAKE 13" x 2-1/4" (TYPE "F")
L-190, L-191, L-192, L-193, L-194, L-195, LF-190, LF-191, LF-192, LC-190, LC-191, LC-192, L-200, L-201, L-202, L-204, L-205, LC-200, LC-201, LC-202	FRONT BRAKE 15" x 2-1/4" (TYPE "F")

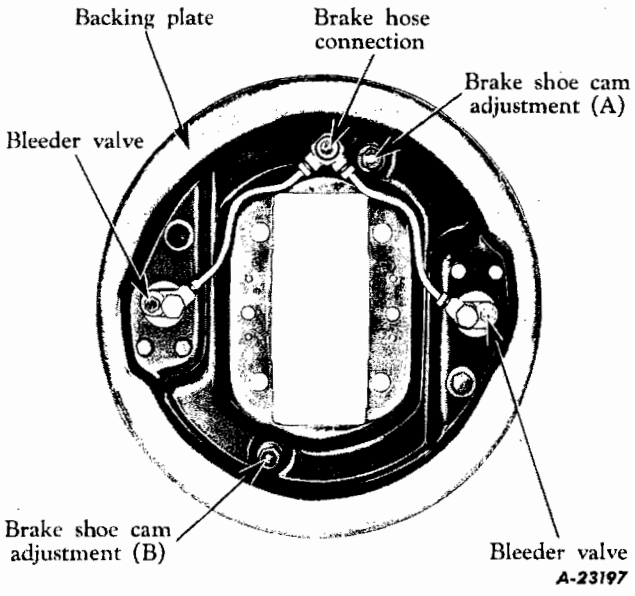

Fig. 1 - Front Brake - External View - Type "F".

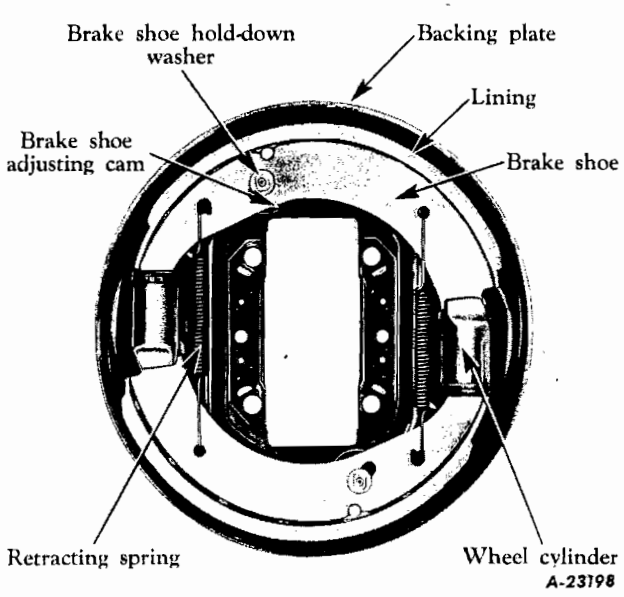

Fig. 2 - Front Brake - Internal View - Type "F".

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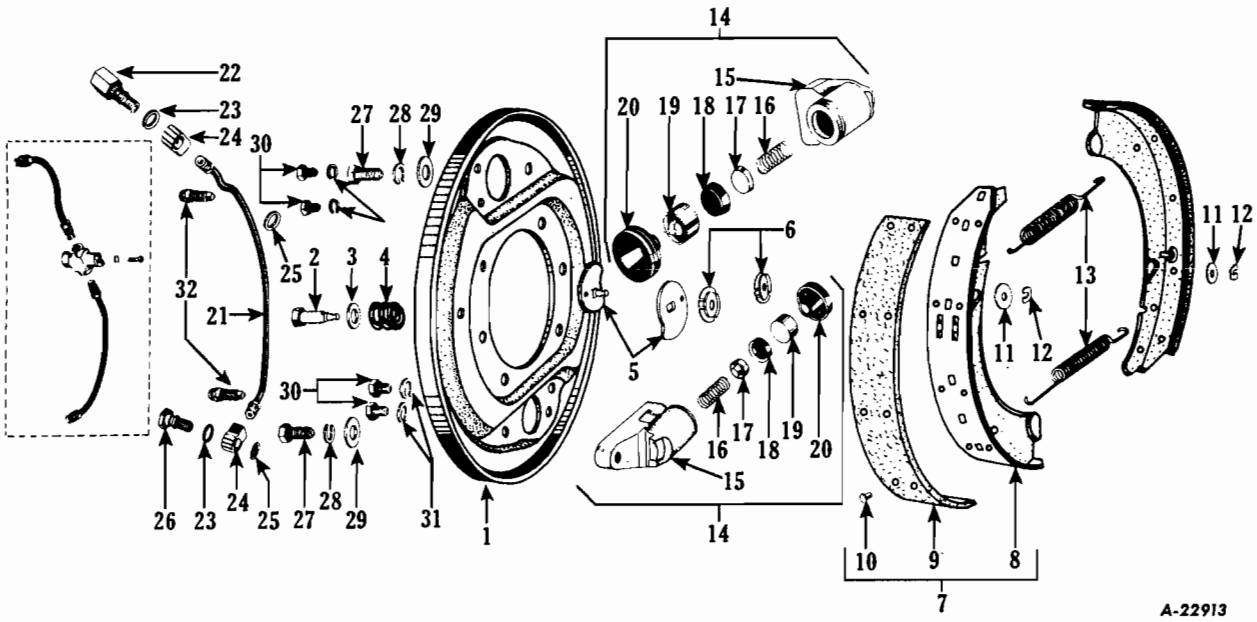


Fig. 3 - Front Brake - Exploded View - Type "F".

Item No.	DESCRIPTION	Item No.	DESCRIPTION
1	Plate assembly, brake backing.	19	Piston assembly.
2	Stud, adjusting cam & shoe guide.	20	Boot.
3	Washer, plain, cam stud.	21	Tube assembly, connector, wheel cylinder.
4	Spring, adjusting cam.	22	Bolt, fitting, inlet, brake line to cylinder & tube.
5	Cam, shoe adjusting.	23	Gasket, bolt.
6	Washer, spring, anti-rattle, shoe guide.	24	Fitting, inlet, fluid, connector tube.
7	Shoe & lining assembly.	25	Gasket, fitting.
8	Shoe.	26	Bolt, fitting, inlet, connector tube to cylinder.
9	Lining.	27	Screw, anchor, cylinder.
10	Rivet, lining.	28	Lockwasher, cylinder anchor screw.
11	Washer, plain, shoe guide.	29	Washer, plain, cylinder anchor screw.
12	Washer, "C", shoe guide stud.	30	Screw, fastening, wheel cylinder.
13	Spring, retracting, brake shoe.	31	Lockwasher, fastening screw.
14	Wheel cylinder assembly.	32	Valve, bleeder, cylinder.
15	Body, wheel cylinder.		
16	Spring.		
17	Filler, piston cup.		
18	Cup, piston.		

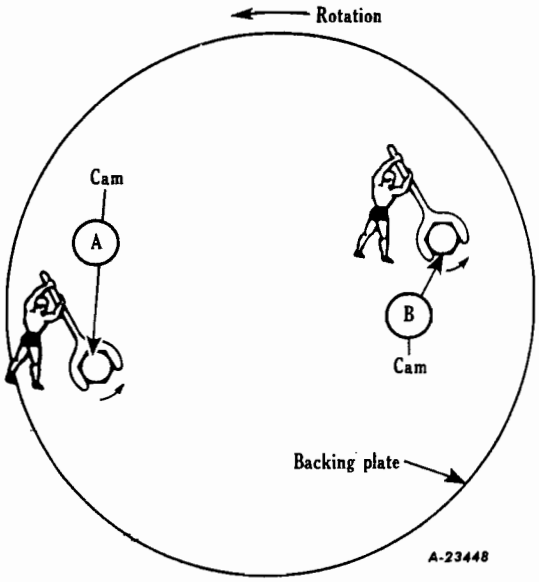


Fig. 4 - Brake Adjustment, Type "F" Brake.

MAINTENANCE AND ADJUSTMENT WAGNER SELF-CENTERING TYPE "F" BRAKES

(See Figs. 1, 2 and 3)

This Wagner self-centering Hi-Tork Brake, Type "F", is a "Floating-Shoe" type which has two identical shoes (7), (Fig. 3) arranged on the backing plate (1) so that their toes are diagonally opposite. Two single-end wheel cylinders (14) are arranged so that one cylinder is mounted between each shoe toe and the opposite shoe heel.

The two-wheel cylinder pistons (19) apply equal amounts of hydraulic force to each shoe toe. Each cylinder body is shaped to provide an anchor block for the opposite shoe heel. Each cylinder anchor block serves as a shoe stop and shoe centering point and provides the fulcrum around which the shoe heel pivots when the brakes are applied.

Each shoe is adjusted by means of an eccentric cam (5) which contacts the underside of the shoe table. Each cam is attached to the backing plate by a cam and shoe guide stud (2) which protrudes through a slot in its shoe web and, in conjunction with washers (11) and "C" washers (12), also serves as a shoe "hold-down". Two retracting springs (13) are connected between the shoes at each toe and heel.

Upon brake application, the wheel cylinder pistons transmit pressure to the toes of the shoes, forcing the shoe linings into contact with the brake drum. If the vehicle is moving forward, the drag of the drum against the shoe lining produces "self-energization" which tends to help rotate the shoes outwardly about their anchor points. This action multiplies the forces exerted against the drum and produces additional braking effect. Both shoes are forward acting (primary shoes), self-energizing in the forward direction of drum rotation.

If the vehicle is moving backward, the drag of the drum on the linings is in the opposite direction and produces "de-energization" which tends to move the shoe heels away from their anchor blocks. Piston forces at the shoe toes are large enough to overcome this action, but the shoes tend to rotate inwardly about their anchor points and attempt to leave the drum. Both shoes are reverse acting since neither is self-energized in the reverse direction of drum rotation.

Cylinder anchor block sides are aligned on the axle radius. As the shoes roll upon their anchor blocks to contact the drum, the heels may also slide radially upon the anchor block surface. The shoes thus automatically "self-center" in relation to the drum.

The self-energization factor causes this brake to be approximately three times as effective during forward operation as it is during reverse operation; therefore its use is generally confined to the front axle of vehicles in conjunction with a rear axle brake of a type providing effective stopping ability in reverse as well as forward motion.

Disassembly

Note **A.** The first disassembly operations is always removal of brake shoe retracting springs (13). With brake spring pliers, pull one hooked end of spring free of shoe web.

Note B. If wheel cylinder connector tubes (21) are removed, mark wheel cylinder ports to which tubes are attached to avoid error in re-assembly. Difficulty will be encountered in bleeding operation if tubes are assembled in wrong location.

Step-By-Step Procedure (Disassembly)

I. REMOVAL OF SHOE ASSEMBLIES:

1. Remove both brake shoe retracting springs (13). (Refer to Note A).

2. Remove each shoe hold-down "C" washer (12) and washer (11), Shoes easily lift off.

II. REMOVAL OF WHEEL CLYINDERS:

1. Remove brake shoe assemblies (7).

2. Remove connector tubes (21) and wheel cylinder fittings (24). (Refer to Note B.)

3. Remove each cylinder anchor screw (27) (large) and washer (29).

4. Remove cylinder mounting screws (30) (small). Cylinders easily lift off.

III. WHEEL CYLINDER DISASSEMBLY:

1. Pull boot (20) from wheel cylinder. Piston (19) should come with boot. Pull boot from piston.

2. Piston cup (18), cup filler (17), and spring (16) may be pulled from cylinder.

Assembly

Note C. Adjustment cam and shoe guide studs (2) are equipped with friction springs (4). They should easily turn with an 8" wrench, but should not be loose. If frozen, lubricate with kerosene or penetrating oil and work free.

Note D. The two wheel cylinders mounted on one brake are identical; HOWEVER, CYLINDERS FOR LEFT OR RIGHT HAND BRAKES HAVE OPPOSITE CASTINGS (15).

Note E. Clean mating surfaces of cylinders and backing plate before assembly to insure proper alignment.

Note F. When replacing shoe retracting springs (13), place spring end with long hook in heel of shoe and then, with brake spring pliers, stretch spring to secure short hook end in toe of opposite shoe. Use new springs if there is evidence of spring fatigue, (rust, set springs, etc.).

Note G. For best results, new shoe and lining assemblies (7) should have linings (9) of correct thickness, ground (not buffed) to correct radius, concentric with the brake drum. If this is not done, readjustment may be required after linings are "worn-in".

Note H. Do not lubricate brake mechanism except as noted in "C".

Step-By-Step Procedure (Assembly)

IV. WHEEL CYLINDER ASSEMBLY:

1. Do not assemble parts dry. Coat parts and inside of cylinder bore with clean brake fluid.

2. Insert spring (16) cup filler (17), and piston cup (18) into cylinder bore. Cup filler "bumper" and cup lip should face closed end of cylinder.

3. Place boot (20) on piston (19), making sure boot snaps over shoe guide.

4. Install piston and boot. Align piston shoe guide slot to accommodate the shoe toe. Push boot lip into place in groove machined on end of cylinder.

V. REPLACEMENT OF WHEEL CYLINDERS:

1. Place one cylinder in position on backing plate. Install mounting screws (30) and lockwashers (31) (small). (Refer to Notes D and E).

2. Install cylinder anchor screw (27), washer (29), and lockwasher (28) (large).

3. Repeat steps 1 and 2 for second cylinder.

4. Install wheel cylinder fittings (24) and tubes (21). (Refer to Note B under disassembly.)

VI. REPLACEMENT OF SHOE ASSEMBLIES:

1. Install spring anti-rattle washer (6) on cam and shoe guide stud (2), pronged side facing adjusting cam (5).

2. Place shoe assembly on backing plate with cam and shoe guide stud protruding through shoe slot. Locate shoe toe in piston slot and shoe heel in anchor block slot. (Refer to Note G.)

3. Replace hold down washer (11) and "C" washer (12) on cam and shoe guide stud. Crimp "C" washer on stud.

4. Repeat steps 1, 2, and 3 for second shoe.

5. Replace shoe retracting springs (13). (Refer to Note F).

Adjustment

Lining to drum clearance adjustment is required when shoes are relined and, on occasion, to compensate for normal lining wear. Clearance should be sufficient to avoid "brake drag" and yet close to afford a good "pedal reserve".

Manually operated and vacuum-hydraulic actuated brakes require adjustment (or relining) when pedal reserve approximates 2"; that is, when the brake pedal drops to within 2" of floor board on hard application.

Adjustment may be made with the vehicle resting on jacks. On jacks, brake drag is checked by "feel", rotating the drum in the direction of forward rotation as adjustment is made.

Step-By-Step Procedure (Adjustment)

1. Make all adjustments with drums cool.

2. Make sure wheel bearing is correctly adjusted.

3. Place wrench (5/8") on cam and shoe guide stud (A or B) (Figs. 1 and 4) to adjust one shoe. Rotate wrench in the direction of FORWARD wheel rotation to decrease lining to drum clearance. Reduce clearance until lining drags on drum.

4. Move wrench slightly in opposite direction, to increase clearance, until drag is relieved. Then move wrench slightly (7° to 10°) to increase the working clearance (1" to 1-1/2" movement through arc swung by 8" wrench).

5. Place wrench on opposite cam and shoe guide stude (B or A) to adjust second shoe. Repeat steps 3 and 4.

"Bleeding" The Hydraulic Brake System

Vehicle brake systems using the self-centering hi-tork foundation brake are bled in similar manner to other hydraulic systems.

METHOD A: -

Bleed wheel cylinders in the following order:

1. Cylinder lowest to road.

2. Cylinder highest from road.

METHOD B: -

If brake is mounted so that both cylinder bleeder valves are not at the highest point of their respective cylinder bores, it may be necessary to "surge bleed" the system.

1. Bleed brakes at all wheels in regular manner, using Method A.

2. At each wheel cylinder in turn, open bleeder valve and then kick brake pedal down sharply several times. Close bleeder valve. This action creates turbulance in each cylinder, forcing out any remaining trapped air.

SERVICE SPECIFICATIONS

LINING LENGTH (MEASURED INSIDE ARC) (BOTH LININGS)

12-1/8" Drum Diameter (128°)	12-7/8"
13" Drum Diameter (127°)	13-23/32"
15" Drum Diameter (127°)	15-15/16"

LINING WIDTH

12-1/8" Drum Diameter	2-1/4"
13" Drum Diameter	2-1/4"
15" Drum Diameter	2-1/4"

LINING THICKNESS (STANDARD LINING)

12-1/8", 13", 15" Drum Diameters	5/16"

LINING RIVET, STANDARD NUMBER

12-1/8", 13" Drum Diameters	7-5
15" Drum Diameter	7-6

WRENCH SIZE

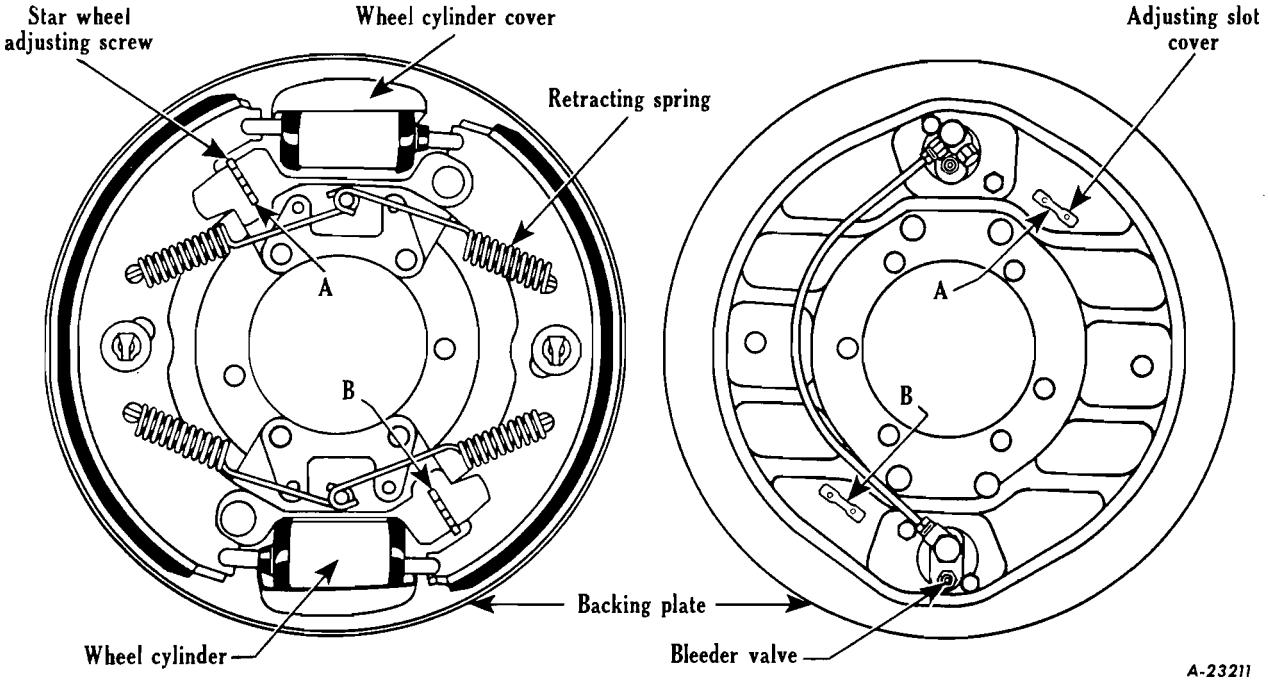
Adjustment cam and shoe guide stud (2) head	5/8"

LINING TO DRUM CLEARANCE

Freedom from drag plus cam rotation of	7°-10°

HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-160, L-161, L-162, L-163, L-165, LC-160, LC-161, LC-162	REAR BRAKES 14-1/8" x 3" (TYPE "FR-2") FIGS. 1 and 2
L-164, L-170, L-171, L-172, L-173, L-175, LF-170, LF-171, LF-172	REAR BRAKES 15" x 3" (TYPE "FR-2") FIGS. 1 and 2
L-174, L-180, L-181, L-182, L-183, L-185, LC-180, LC-181, LC-182, LF-190, LF-191, LF-192	REAR BRAKES 15" x 4" (TYPE "FR-2") FIGS. 1 and 2



Internal View

External View

Fig. 1 - Rear Brake - Type "FR-2".

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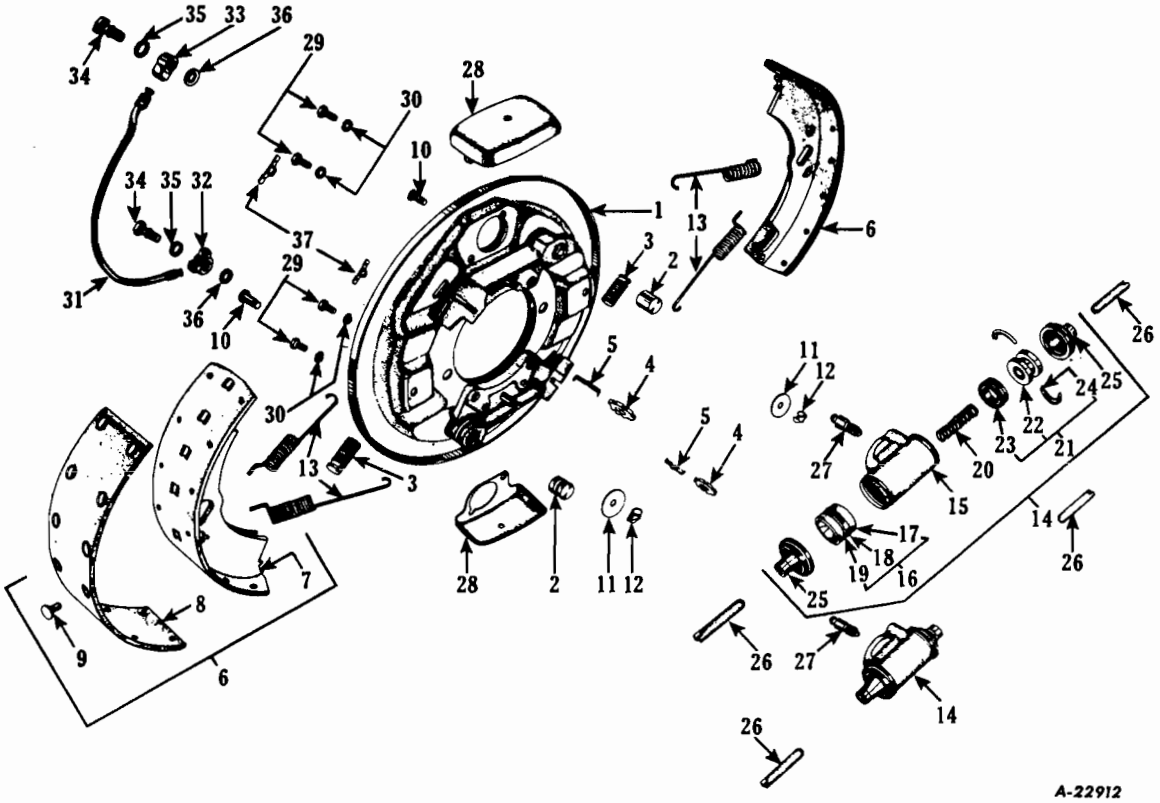
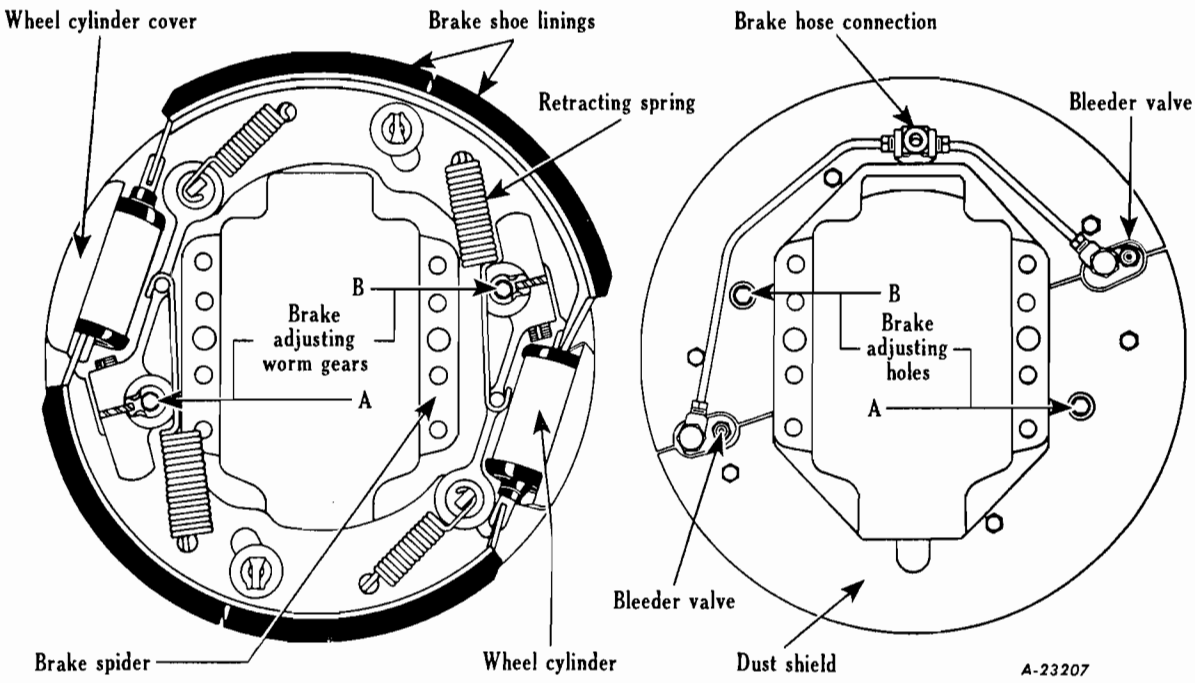


Fig. 2 - Rear Brake, Type "FR-2" - Exploded View.

Item No.	DESCRIPTION	Item No.	DESCRIPTION
1	Plate, brake backing.	20	Spring.
2	Pin, anchor.	21	Piston assembly (short piston).
3	Screw, adjusting.	22	Piston (short).
4	Wheel, star, adjusting.	23	Cup, piston.
5	Lockspring, adjusting.	24	Protector segment, cup, piston.
6	Shoe and lining assembly.	25	Boot assembly.
7	Shoe.	26	Push rod.
8	Lining.	27	Valve, bleeder.
9	Rivet.	28	Cover, wheel cylinder.
10	Pin, shoe guide stud.	29	Bolt, wheel cylinder.
11	Washer, shoe guide.	30	Lockwasher, wheel cylinder bolt.
12	Clip, "C", spring, shoe guide.	31	Tube assembly, connecting.
13	Spring, brake shoe retracting.	32	Fitting, tube, connecting.
14	Wheel cylinder assembly.	33	Fitting, tube, connecting.
15	Body, wheel cylinder.	34	Bolt, fitting, tube, connecting.
16	Piston assembly (long piston).	35	Washer, fitting, bolt.
17	Piston (long).	36	Washer, fitting, bolt.
18	Cup, piston.	37	Cover, adjusting slot.
19	Protector segment, cup, piston.		

HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-210, L-211,
LF-210, LF-211, LF-212, LF-220, LF-221, LF-222 } FRONT BRAKES
16-1/2" x 3-1/2"
(TYPE "FR-2S")
FIGS. 3 and 4



Internal View

External View

Fig. 3 - Front Brake - Type "FR-2S".

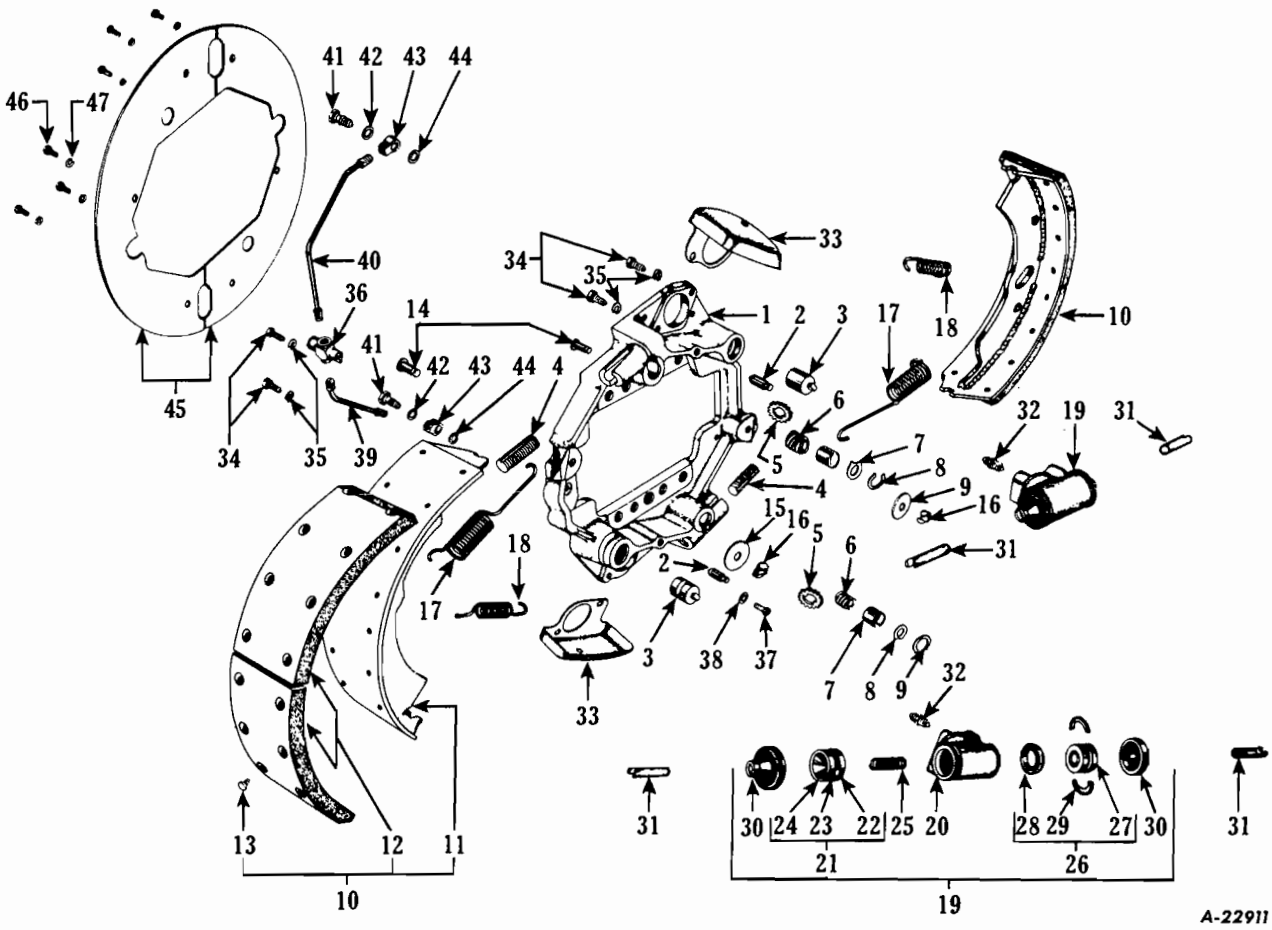
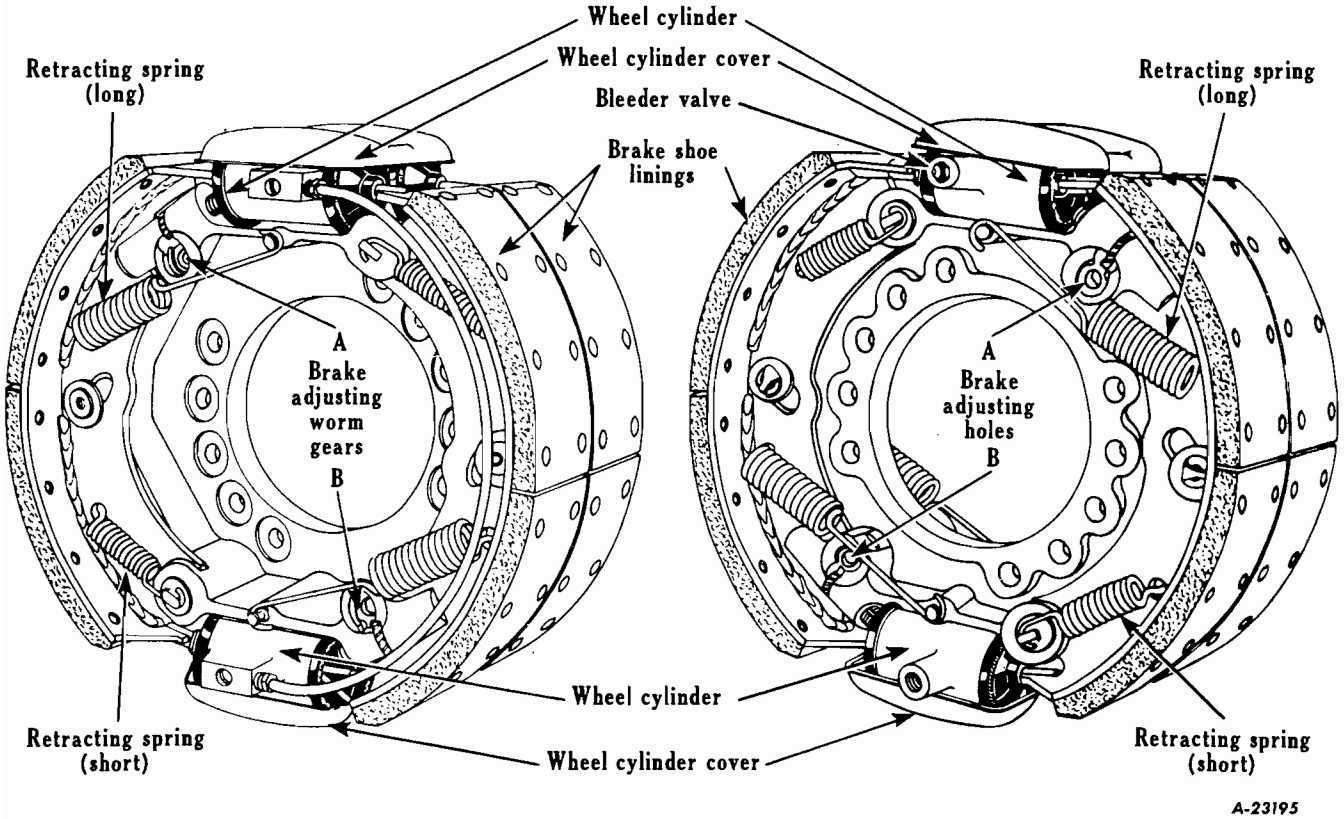


Fig. 4 - Front Brake, Type "FR-2S" Exploded View.

Item No.	DESCRIPTION	Item No.	DESCRIPTION
1	Spider and pin assembly.	25	Spring.
2	Pin, retracting, spring.	26	Piston assembly (short).
3	Pin, anchor.	27	Piston (short).
4	Wheel, driven, adjusting worm.	28	Cup, piston.
5	Wheel, driven, adjusting worm.	29	Protector segment, cup, piston.
6	Worm, adjusting shoe.	30	Boot assembly.
7	Sleeve, adjusting worm.	31	Push rod.
8	Washer, end thrust, adjusting worm.	32	Valve, bleeder, wheel cylinder.
9	Ring, snap, worm retainer.	33	Cover, wheel cylinder.
10	Shoe and lining assembly.	34	Bolt, mounting, wheel cylinder.
11	Shoe.	35	Lockwasher, cylinder mounting bolt.
12	Lining.	36	Fitting, distributor, fluid.
13	Rivet.	37	Bolt, mounting, distributor fitting.
14	Pin, shoe guide.	38	Lockwasher, distributor fitting bolt.
15	Washer, shoe guide pin.	39	Tube assembly, connecting (short).
16	Clip, "C", spring, shoe guide.	40	Tube assembly, connecting (long).
17	Spring, retracting, shoe toe (long).	41	Bolt, fitting, wheel cylinder.
18	Spring, retracting, shoe heel (short).	42	Gasket, fitting, inlet.
19	Wheel cylinder assembly.	43	Fitting, inlet, fluid.
20	Body, wheel cylinder.	44	Gasket, bolt, fitting.
21	Piston assembly (long).	45	Dust shield.
22	Piston (long).	46	Bolt, mounting, dust shield.
23	Cup, piston.	47	Lockwasher, dust shield mounting bolt.
24	Protector segment, cup, piston.		

HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-204, L-210, L-211 { REAR BRAKES
16-1/2" x 7-1/8"
(TYPE FR-2-SD)
FIGS. 5 and 6)



Internal View.

External View (Dust Shield Removed).

Fig. 5 - Rear Brake - Type "FR-2SD".

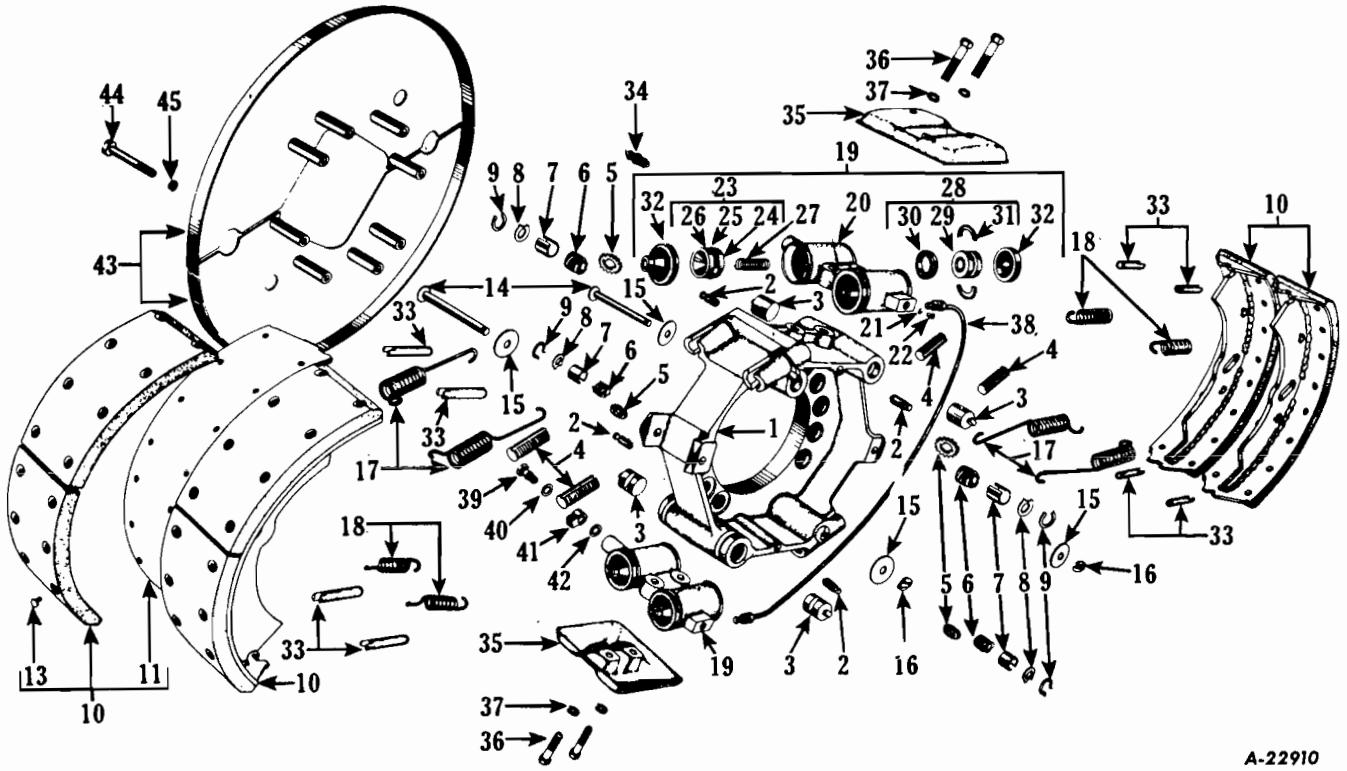


Fig. 6 - Rear Brake - Exploded View - Type "FR-2SD".

Item No.	DESCRIPTION	Item No.	DESCRIPTION
1	Spider and pin assembly.	23	Piston assembly (long).
2	Pin, retracting spring.	24	Piston (long).
3	Pin, anchor.	25	Cup, piston.
4	Screw, adjusting.	26	Protector segment, cup, piston.
5	Wheel, driven, adjusting worm.	27	Spring.
6	Worm, adjusting, shoe.	28	Piston assembly (short).
7	Sleeve, adjusting worm.	29	Piston (short).
8	Washer, end thrust, adjusting worm.	30	Cup, piston.
9	Ring, snap, worm retainer.	31	Protector segment, cup, piston.
10	Shoe and lining assembly.	32	Boot assembly.
11	Shoe.	33	Push rod.
12	Lining.	34	Valve, bleeder, wheel cylinder.
13	Rivet.	35	Cover, wheel cylinder.
14	Pin assembly, shoe guide.	36	Bolt, mounting, wheel cylinder.
15	Washer, shoe guide pin.	37	Lockwasher, cylinder mounting bolt.
16	Clip, "C", spring, shoe guide.	38	Tube, assembly, connecting, wheel cylinder.
17	Spring, retracting, shoe toe (long).	39	Bolt, fitting, inlet.
18	Spring, retracting, shoe heel (short).	40	Gasket, fitting, inlet.
19	Wheel cylinder assembly, upper. Wheel cylinder assembly, lower.	41	Fitting, inlet, fluid.
20	Body, wheel cylinder, upper. Body, wheel cylinder, lower.	42	Gasket, bolt, fitting.
21	Gasket, port plug.	43	Dust shield, assembly.
22	Screw, port plug.	44	Bolt, mounting, dust shield.
		45	Lockwasher, dust shield mounting bolt.

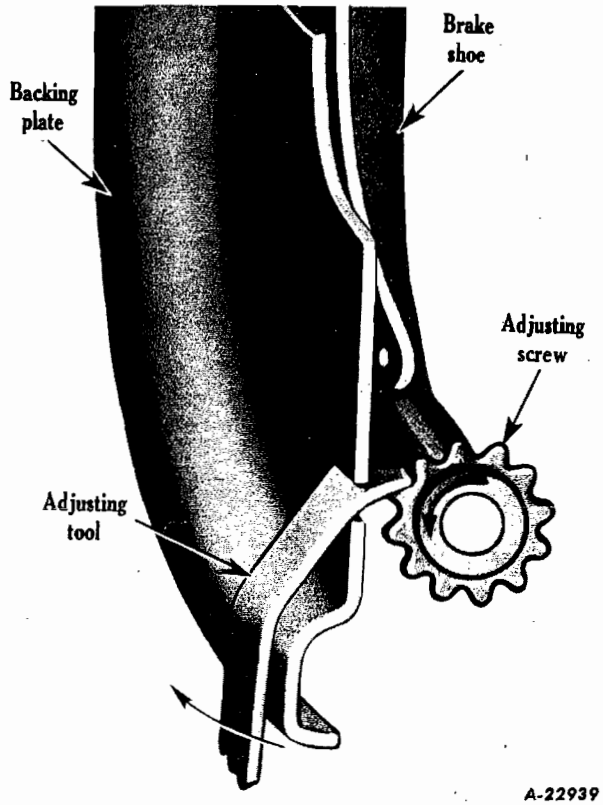


Fig. 7 - Brake Adjustment, Type "FR-2" Brake.

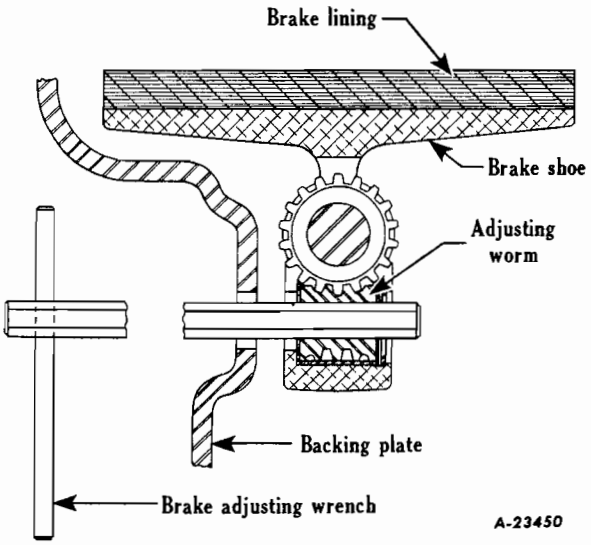


Fig. 8 - Brake Adjustment, Type "FR-2S" Brake.

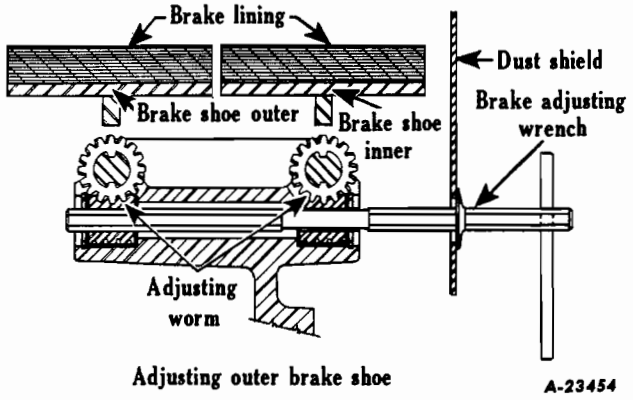


Fig. 9 - Brake Adjustment, Type "FR-2SD" Brake.

To adjust outer brake shoe, insert wrench in adjustment slot until flat washer on wrench contacts dust shield (see Fig. 9).

To adjust inner brake shoe, insert wrench in adjustment slot until recessed area on wrench just enters dust shield; this will assure proper engagement of brake tool in inner adjustment worm.

MAINTENANCE AND ADJUSTMENT

WAGNER SELF-CENTERING TYPE FR-2, TYPE FR-2S AND TYPE FR-2SD BRAKES

The development of the Wagner type FR-2 (Figs. 1 & 2), type FR-2S (Figs. 3 & 4), and type FR-2SD (Figs. 5 & 6) brakes has created new vistas of greater braking efficiency in the medium and heavy duty truck field. The type FR-2 brake makes available to medium weight trucks the advantages of full self-energization (shoe wrapping action caused by the drag of the drum on the liners). The type FR-2S and the type FR-2SD bring the advantage of full self-energization to the heavy duty field, and, in addition, make it possible for vehicles of 30,000 to 45,000 lbs. gross weight to utilize the high efficiency of hydraulic braking power to the fullest extent. Heretofore, heavy vehicles have been limited to a very few special applications of hydraulic braking power. The fact that these brakes incorporate the greatest possible use of self-energization in drums of the same or smaller sizes than those now in use is of tremendous importance in solving the braking problems of medium and heavy duty trucks.

The basic design of these brakes is the same. The FR-2 and the FR-2S each incorporate two identical shoes and two identical wheel cylinders. The major difference is that the FR-2 uses a backing plate while the FR-2S is mounted on a spider. The FR-2SD is a dual type brake, equipped with four shoes. Its appearance is comparable to two FR-2S brakes placed back to back, and it employs two Siamese Twin-type

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wheel cylinders to actuate the dual shoes. The shoes of all these brakes are arranged with the toes diagonally opposite each other and the double end wheel cylinders are placed between the toe of one shoe and the heel of the other.

An equal amount of hydraulic pressure is thus applied at each end of each shoe. Shoes are always forward acting, independently actuated in the direction of rotation. Shoes anchor at either toe or heel depending upon the rotation of the drum.

The FR-2 brake is constructed for use on the rear axle of medium weight trucks and buses. As previously mentioned, the major difference of this brake from the other two is that the assembly is mounted on a backing plate. Riveted to this backing plate are two anchor and adjusting supports. Into each anchor and adjusting support is placed on anchor pin at one end of the support and a star wheel and adjusting screw at the other end. The adjusting mechanism is assembled as follows: The adjusting screw is threaded into its end of the support, the star wheel is placed in the slot of the support so that the keys inside of the wheel fit into the lengthwise grooves of the adjusting screw, the star wheel being held in the correct adjustment position by a lockspring.

Adjustments are made through a slot in the backing plate opposite the star wheel by placing the special adjusting tool or screwdriver through the slot and turning the star wheel to achieve the desired adjustment.

The FR-2S is constructed for the front axles of vehicles having a gross weight of 30,000 to 45,000 lbs. and is used in conjunction with the FR-2SD rear axle brake. These brakes are mounted on malleable iron spiders, the FR-2S on a single sided spider, and the FR-2SD on a double sided spider. The adjusting and anchor support on these brakes is cast as an integral part of the spider. The principle adjustment difference is that the adjusting screw is operated by a worm and worm wheel instead of a star wheel. The FR-2SD is designed with four shoes, two on each side of the spider. These four shoes offer advantages over two wide shoes in that they provide greater equalization of brake lining pressure on the entire width of the drum surface, more rapid heat dissipation, and longer lining and drum life. Dual shoes also simplify and yet permit greater accuracy of adjustment when compensating for lining wear.

Adjusting mechanisms are similar to the adjustment mechanism on type FR-2. Each adjusting screw is threaded into a worm wheel placed in a slot located in its support. The worm wheel is engaged with a worm which is rotated to effect adjustment. The worm is enclosed in a removable sleeve and worm and sleeve are held in the support by a thrust washer and a retainer snap ring. Adjustments are made by inserting a 3/8" hex wrench in the worm and turning in the proper direction for the desired adjustment. The worm rotates the worm wheel which, in turn, threads the adjusting screw in the direction which the wrench is turned.

When the brakes are applied the wheel cylinder pistons apply force against the toe and heel of each shoe. As the shoe linings come into contact with the drum, self-energization develops. The rotation of the drum pulls the shoes against the drum surface to multiply the forces exerted on the drum and produce additional braking action. If the vehicle is in forward motion, this self-energization, or wrapping action, pushes the shoe heels against the anchor pins. In backward motion the shoe toes are forced against the adjusting screws which then serve as anchor pins. The anchors are free to rotate within their supports, so that when the brake is applied the pin will turn with the shoe. In addition, the anchors are slotted to allow the shoe heel to slide inwardly or outwardly along the axle radius to center the shoe properly in relation to the drum. Self-centering of shoes when the vehicle is in backward motion is accomplished by rounded shoe toes which pivot on the adjusting screws.

The shoes on these brakes are floating shoes. Each shoe is held in position by a shoe guide pin, washer, shoe guide spring "C" clip and two shoe return springs. On the FR-2 brake the toe and heel shoe return springs are the same. On the FR-2S and the FR-2SD, each shoe heel spring is short, hooked to the anchor end of the shoe and a projection on the anchor pin; each shoe toe spring is long, hooked between the toe end of the shoe and a spring pin centered on the spider.

Disassembly

FR-2 (Fig. 2), FR-2S (Fig. 4) and FR-2SD (Fig. 6) Brakes

Note A. The first disassembly operation is always removal of the brake shoe retracting springs. With brake spring pliers, slip looped ends off pins or projections on the anchor and adjusting supports.

Note B. When the wheel cylinder connecting tube is removed, not position of tube and fittings on the brake to avoid error in reassembly. Difficulty may be encountered in the bleeding operation if tube is assembled in the wrong location.

Note C. Whenever shoes are removed, always dismantle adjusting mechanism and clean dirt, dust and grease from the parts and supports. Care should be taken to distinguish the adjusting

screws as those of the left or right brake. The left brake adjusting screws have a left hand thread, and the right brake screws have a right hand thread. Neither can be assembled to the opposite brake.

Step-By-Step Procedure (Disassembly)

Before beginning the following steps on the FR-2S and FR-2SD, remove the dust shield attaching bolts and lift off the dust shields.

I. TO REMOVE SHOE ASSEMBLIES:

1. Remove brake shoe retracting springs. (Refer to Note A.)
2. Pry off shoe guide spring "C" clip and lift washer off of shoe guide stud. Shoes will slide off easily.
3. The anchor pins should easily pull out of the supports.

II. TO REMOVE WHEEL CYLINDERS WITHOUT DISTRUBING SHOES:

1. Remove brake shoe retracting springs. (Refer to Note A.)
2. Remove connecting tube fitting bolts from wheel cylinder.
3. Remove wheel cylinder bolts.
4. Spread shoes away from cylinder until push rods are cleared. Lift out cylinder and cover.

III. TO REMOVE ADJUSTING MECHANISM:

1. Remove shoes from brake.
2. Rotate adjusting screw, backing off adjustment to thread it free of star wheel or worm gear.
3. Push adjusting screw out of support. On FR-2 type, lift star wheel and lock spring from slot. On FR-2S and FR-2SD types, pry worm retainer snap ring from support and remove thrust washer, worm and worm wheel from slot.

IV. TO DISASSEMBLE WHEEL CYLINDERS:

1. Take push rods out of boot assemblies and slip boots off ends of cylinders.
2. Remove pistons and spring by pushing either piston through and out of cylinder.
3. Cups are removed by slipping cup protector segments off and working cups over the end of the pistons.

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Assembly

Note D. Each brake utilizes two wheel cylinders which are identical. The piston actuating the toe of each shoe has provision for a longer stroke than the other piston. This is to compensate for adjustments made on the shoe which move the shoe toe away from the wheel cylinder. Thus the long stroke piston is built longer than the short stroke piston, and is also identified by a circular groove machined at the bottom of the push rod socket. The cylinder casting is constructed with the bleeder valve and connecting tube inlets offset toward the short stroke end of the cylinder. PISTONS MUST BE ASSEMBLED IN THE PROPER ORDER WITHIN THE CYLINDER. Otherwise, fluid will enter the cylinder chamber improperly and may be forced out past the short stroke piston.

Note E. Do not lubricate shoe adjustment mechanism or other parts of the brake. Lubrication will cause dirt and dust to collect and solidify in the adjustment mechanism.

Note F. When replacing shoes make certain that the toe or cutaway end of each shoe is aligned with the adjusting screw, and the heel of each shoe with the anchor pin -- otherwise, adjustments cannot be made.

Note G. When replacing shoe retracting springs, place the straight ends of the springs in the notched holes in the brake shoes, and, with a brake spring pliers, slip the looped ends over the pin or anchor pin projection as required. The FR-2 type retracting springs are of equal length and loop over a pin mounted in the anchor and adjusting support. Each shoe on the FR-2S and the FR-2SD type brakes has one long toe spring which loops over a pin mounted on a centered location on the spider, and one short heel spring which loops over a projection on the anchor pin.

Step-By-Step Procedure (Assembly)

The brakes are easily assembled in reverse order to disassembly.

V. TO ASSEMBLE WHEEL CYLINDERS:

1. Do not assemble parts dry. Coat parts and inside of cylinder bore with clean brake fluid before assembly.

2. Stretch cups into place on the pistons. Cup lip must face inward toward spring groove side of piston.

3. Slip cup protector segments into place on each piston. Protector segment is placed behind cup with segment lip facing same direction as cup lip.

4. Slide pistons with spring between them into cylinder chamber. Be sure long stroke piston. and short stroke piston are at the correct ends of the cylinder and the push rod socket in each piston faces outward. (Refer to Note D.)

5. Slip boots over ends of cylinder so that the boot edges fit squarely into the grooves on the casting. Place push rods into assembled boots and cylinder.

VI. TO REPLACE ADJUSTING MECHANISM:

1. Do not lubricate parts. (Refer to Note E.)

2. On the FR-2S and FR-2SD types, place worm in sleeve and slip them into hole in adjusting support. Open side of sleeve must face worm wheel slot. Insert thrust washer and snap ring; be sure snap ring fit firmly into groove in wall of worm hole. (Omit this step with the FR-2 type brake.)

3. Hold star wheel (FR-2) or worm wheel (FR-2S, FR-2SD) in slot in adjusting support and slide adjusting screw into the outer end of the support so that the keys machined on the inner circumference of the wheel engage into the keyways on the adjusting screw. Be certain to use the correct adjusting screws for the left and right brakes. (Refer to Note C.)

4. Rotate worm or star wheel to thread adjusting screw into support.

VII. TO REPLACE WHEEL CYLINDER WITHOUT DISTRUBING SHOES:

1. Be sure backing plate or spider is clean so that cylinder and cover will fit properly when mounted.

2. Spread shoes as far apart as possible.

3. Place cylinder and cover in proper position on the backing plate or spider and fasten securely with wheel cylinder bolts and lockwashers. Screw in connecting tube fitting bolt. (Refer to Note B.)

4. Engage notched push rod ends into slots provided at each end of the shoes.

5. Replace brake shoe retracting springs. (Refer to Note G.)

VIII. TO REPLACE SHOE ASSEMBLIES:

1. For best results new shoe and lining assemblies should have liners of correct thickness, ground (not buffed) to the correct radius, concentric to the brake drum.

2. Slide anchor pins into supports so that anchor can be engaged by the shoe heel.

3. Replace shoe on backing plate or spider making sure that toe is aligned with the adjusting screw and heel with the slot provided in the anchor pin. Slip shoe guide pin through spider or backing plate guide hole located in shoe web. Install washer and shoe guide spring "C" clip. Repeat step for other shoe or shoes.

4. Replace shoe retracting springs. (Refer to Note G.)

On FR-2S and FR-2SD type brakes, replace the dust shield enclosure after completing assembly of the brake.

Adjustment

Lining to drum clearance adjustment is required when the shoes are relined, and, on occasion, to compensate for normal lining wear. Clearance should be sufficient to avoid "brake drag" and yet close enough to afford a good "pedal reserve".

Manually operated and vacuum-hydraulic actuated brakes require adjustment (or relining) when the pedal reserve approximates 2"; that is, when the pedal drops to within 2" of the floor board on hard application.

Adjustment may be made with the vehicle resting on jacks. On jacks, brake drag is checked by feel, rotating the drum in the direction of forward movement as the adjustment is made.

Step-By-Step Procedure (Adjustment) Type FR-2 Brake (Figs. 1 and 7)

1. Make all adjustments with drum cooled to normal temperature.
2. Make sure wheel bearing is correctly adjusted.
3. Remove adjustment slot covers.
4. Insert special adjusting tool or screwdriver into adjustment slot (A or B) to contact the star wheel. Rotate star wheel toward axles, using outer edge of slot as fulcrum for tool handle, until lining "drags" on the drum.
5. Back lining off drum by rotating star wheel TWO notches away from axle. This will provide sufficient working clearance.
6. Repeat Steps 4 and 5 on Second shoe (B or A).
7. Replace adjustment slot covers.

Step-By-Step Procedure (Adjustment)

Type FR-2S Brake (Figs. 3 and 8)

1. Make all adjustments with drum cooled to normal temperature.

2. Make sure wheel bearings are correctly adjusted.

3. Insert brake adjusting wrench (Figs. 3 and 8) through adjusting hole (A or B) in dust shield to fit firmly in adjusting worm. Rotate wrench in direction of forward wheel rotation until lining "drags" on the drum.

4. Rotate wrench in opposite direction to increase clearance until drag is relieved. Then rotate wrench one additional turn to provide working clearance.

5. Repeat Steps 3 and 4 on the other shoe, or shoes (B or A).

Step-By-Step Procedure (Adjustment)

Type FR-2SD Brake (Figs. 5 and 9)

The rear wheel brakes are adjusted by means of a special 3/8" hex wrench (IH No. SE-1731) which has been designed for the purpose of adjusting either the inner or outer brake shoe but not both shoes at one time.

1. Make all adjustments with drum cooled to normal temperatures.

2. Make sure wheel bearings are correctly adjusted.

3. Insert special wrench (IH No. SE-1731 Figs. 5 and 9) in adjustment slot (A or B) to engage either the inner or outer brake shoe adjusting worm. Rotate wrench in the direction of FORWARD wheel rotation to decrease lining to drum clearance. Reduce clearance until lining "drags" on drum.

4. Rotate wrench in opposite direction, to increase clearance, until "drag" is relieved. Then rotate one (1) additional turn to provide the proper working clearance.

   CAUTION: Repeat operation at each shoe (two shoes to be adjusted at each adjustment slot in dust shield).

5. Repeat Steps 3 and 4 at opposite adjustment slot (B or A).

   NOTE: For most accurate adjustment it is not advisable to attempt to adjust both brake shoes simultaneously, always proceed as outlined above.

"BLEEDING" THE HYDRAULIC BRAKE SYSTEM

Vehicle brake systems using the Type FR-2, FR-2S, FR-2SD foundation brake are bled in similar manner to other hydraulic systems.

METHOD A:-

Bleed wheel cylinders in the following order:

Type FR-2 and FR-2S only

1. Cylinder nearest to road.

2. Cylinder highest from the road.

Type FR-2SD Dual Brake only

1. Bleeding both cylinders of the FR-2SD brake is accomplished through one bleeder valve located on the high cylinder.

METHOD B: -

If brake is mounted so that both cylinders are almost in a vertical plane, it may be necessary to "surge bleed" the system.

1. Bleed brakes at all wheels in regular manner, using Method A, above.

2. At each wheel cylinder in turn, open bleeder valve and then kick pedal down sharply several times. Close bleeder valve. This action creates turbulence in each cylinder, forcing out any remaining trapped air.

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SERVICE SPECIFICATIONS

LINING LENGTH (Measured Inside Arc)
(Both Linings):

FR-2 Brake

14-1/8" Drum Diameter . . . . . .14-1/8"
15" Drum Diameter . . . . . 15"

FR-2S Brake

16-1/2" Drum Diameter . . . . . 7-3/4" Block
(Two used per shoe)

FR-2SD Brake

16-1/2" Drum Diameter . . . . . 7-3/4" Block
(Two used per shoe)

LINING WIDTH:

FR-2 Brake

14-1/8" Drum Diameter . . . . . 3"
15" Drum Diameter . . . . . 3"
15" Drum Diameter . . . . . 4"

FR-2S Brake

16-1/2" Drum Diameter . . . . . 3-1/2"

FR-2SD Brake

16-1/2" Drum Diameter . . . . . 3-1/2"

LINING THICKNESS (Standard Lining):

FR-2 Brake

14-1/8" and 15" Drum Diameter . . . . . 3/8"

FR-2S Brake

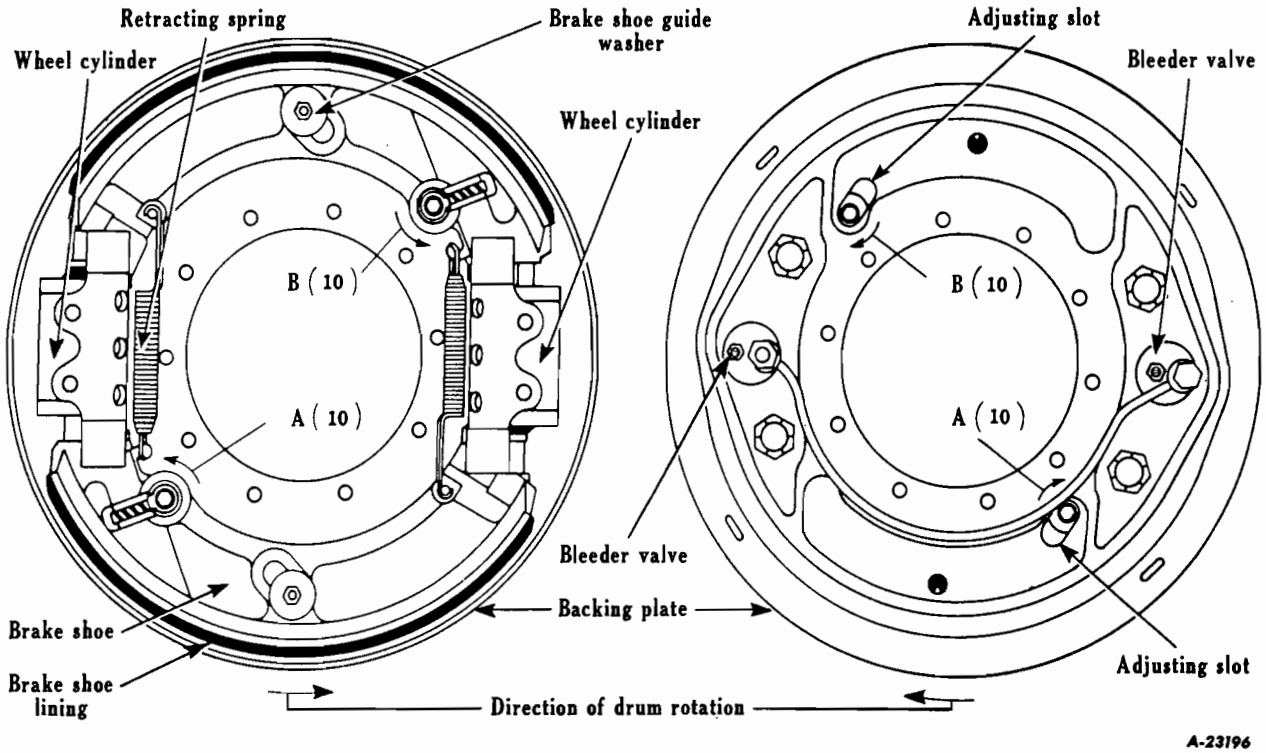
16-1/2" Drum Diameter . . . . . 5/8"

FR-2SD Brake

16-1/2" Drum Diameter . . . . . 5/8"

HYDRAULIC BRAKES
BRAKE SHOE ADJUSTMENTS AND SERVICING

L-184, L-190, L-191, L-192, L-193, L-195, LC-190, LC-191, LC-192, LF-210, LF-211, LF-212, LF-220, LF-221, LF-222	REAR BRAKES 16" x 4" (TYPE "FR")
L-194, L-200, L-201, L-202, L-205, LC-200, LC-201, LC-202	REAR BRAKES 16" x 5" (TYPE "FR")



Internal View

External View

Fig. 1 - Rear Brake - Type "FR".

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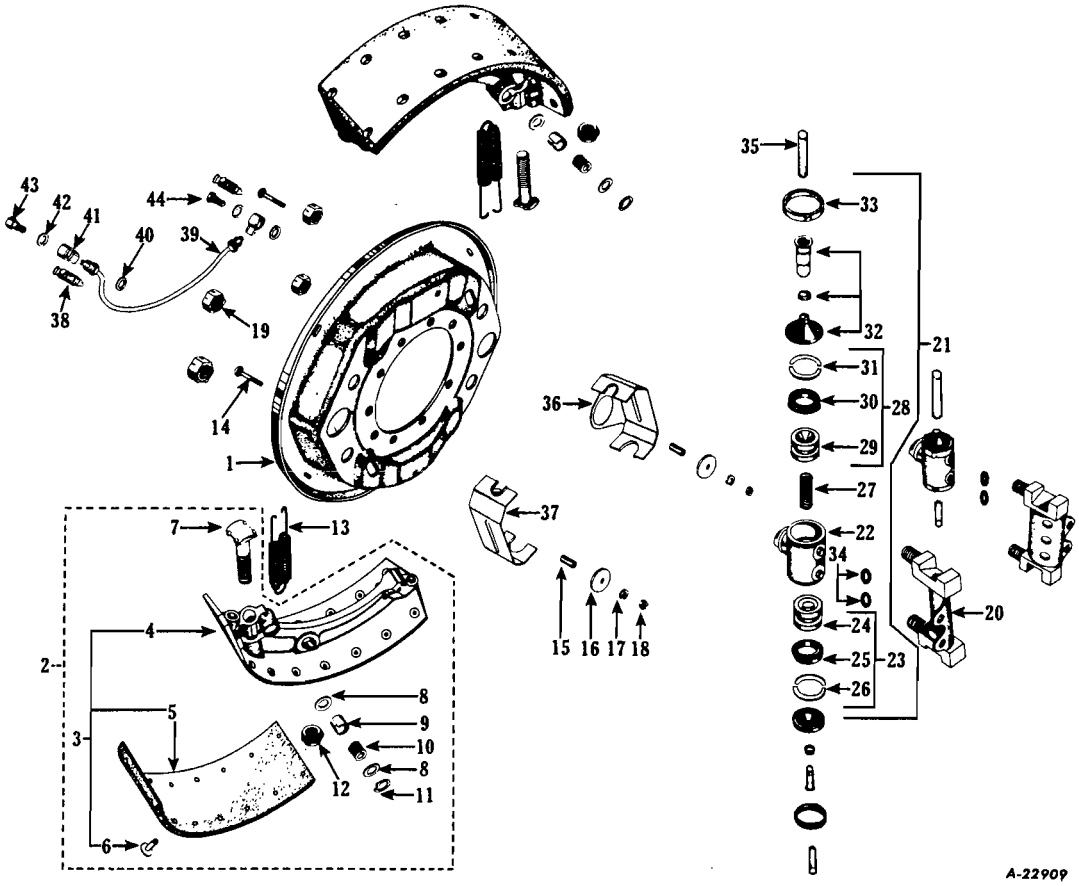

Fig. 2 - Rear Brake, Type "FR" - Exploded View.

Item No.	DESCRIPTION	Item No.	DESCRIPTION
1	Plate, brake backing.	25	Cup, piston.
2	Shoe, lining & adjuster assembly.	26	Ring segment, back-up, piston cup.
3	Shoe & lining assembly.	27	Spring.
4	Shoe & insert assembly.	28	Piston assembly (short).
5	Lining.	29	Piston (short).
6	Rivet lining.	30	Cup, piston.
7	Screw, adjusting, shoe.	31	Ring segment, back-up, piston cup.
8	Washer, end thrust, adjusting worm.	32	Boot.
9	Sleeve, adjusting worm.	33	Cap, boot retainer.
10	Worm, adjusting, shoe	34	Washer, spring, cylinder mounting.
11	Ring, snap, worm retainer.	35	Link, connecting, piston to shoe.
12	Wheel, driven, adjusting worm.	36	Cover, wheel cylinder.
13	Spring, brake shoe retracting.	37	Cover, wheel cylinder.
14	Bolt, shoe guide.	38	Valve, bleeder, cylinder.
15	Sleeve, shoe guide bolt.	39	Tube, assembly connector, wheel cylinder.
16	Washer, plain, shoe guide bolt.	40	Gasket, fitting.
17	Lockwasher, shoe guide bolt.	41	Fitting, inlet, fluid, connector tube.
18	Nut, shoe guide bolt.	42	Gasket, bolt.
19	Nut, lock, shoe anchor block.	43	Bolt, fitting, inlet, brake pipe to cylinder & tube.
20	Block assembly, shoe anchor.	44	Bolt, fitting, inlet, connector tube to cylinder.
21	Wheel cylinder assembly.		
22	Body, wheel cylinder.		
23	Piston assembly (long).		
24	Piston (long).		

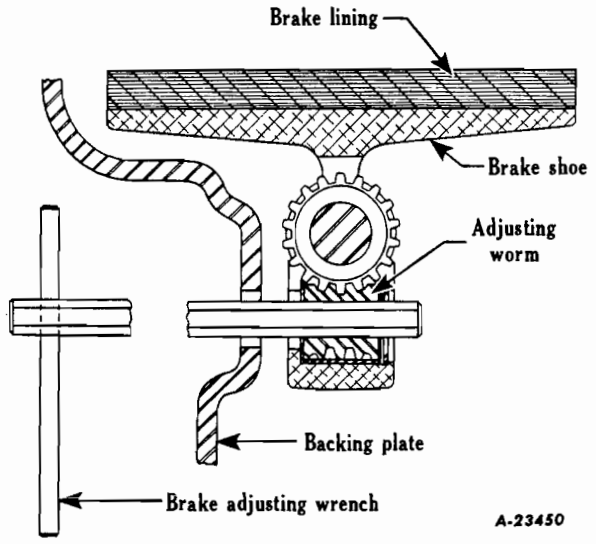

Fig. 3 - Brake Adjustment, Type "FR" Brake.

MAINTENANCE AND ADJUSTMENT WAGNER SELF-CENTERING TYPE "FR" BRAKES (Figs. 1 and 2)

The Wagner self-centering Hi-Tork Brake is a "floating shoe" type which has two identical shoes (2) (Fig. 2) arranges on the backing plate (1) so that their toes are diagonally opposite. Two double-end wheel cylinders (21) are arranged so that one cylinder is mounted between each shoe toe and shoe heel. An equal amount of hydraulic force is thus applied at each end of each shoe. The wheel cylinders are not bolted directly to the backing plate; instead, they are held in position by shoe anchor block (20). The anchor blocks are bolted to the backing plate. Each anchor block serves as a shoe stop and shoe centering point and provides the fulcrum around which the shoe pivots when the brake is applied. Both shoes are always primary shoes (forward-acting), independently actuated in either direction of rotation. Shoes anchor at either toe or heel depending upon the rotation of the brake drum. A pivot pad is placed at both shoes toe and shoe heel. The pad at the shoe toe is an integral part of the shoe adjusting screw (7), a component of the adjusting mechanism, which is placed in the shoe toe on this brake. The adjusting screw is held in the shoe toe by means of worm wheel (12) which threads onto the screw. The worm wheel, in turn, meshes with a worm (10) which is rotated to effect brake adjustment. The worm has a hex bore so that it can easily be turned with a 3/8" hex brake wrench. Adjustment slots (A and B) (Fig. 1) in the brake backing plate, provide access to each of the shoe adjusting worms.

Upon brake application, the wheel cylinder pistons (23 and 28) (Fig. 2) apply force against toe and heel of each shoe. Upon contact of shoe liners (5) with the drum, self-energization (shoe wrapping action caused by drag of the drum on the linings) wraps both shoes into the drum. If the vehicle is moving forward, the shoe heels are wrapped against their anchor blocks by the drum rotation. If the vehicle is backing, the shoe toes are forced against their anchor blocks. Anchor block sides are aligned on the axle radius. Upon contact with the anchor blocks the shoes pivot and, at the same time, move radially along the anchor block sides until they are centered in relation to the drum.

Self-energization assists brake application equally regardless of the direction of the drum rotation. The brake is thus capable of developing the same maximum torque output for a reverse stop that is used for a forward stop, and it is always automatically self-centering.

Disassembly

Note A. The first disassembly operation is always removal of brake shoe retracting springs (13) (Fig. 2). With brake spring pliers, slip looped end of spring off of the spring hook located at the toe or adjustment end of each shoe.

Note B. If wheel cylinder connecting tube (39) and bleeder valves (38) are removed, mark wheel cylinder ports to which connecting tube is attached to avoid error in reassembly. Difficulty will be encountered in bleeding operation if tube is assembled in wrong location.

Note C. Whenever shoes are removed, always dismantle adjusting mechanism and clean grease, dust, and dirt from parts and from chambers within the shoe.

Step-By-Step Procedure (Disassembly)

I. REMOVAL OF SHOE ASSEMBLIES (2):

1. Remove brake shoe retracting springs (13). (Refer to Note A).
2. Remove shoe guide bolt nut (18), lockwasher (17), and washer (16), holding shoe in place. Shoe (2) easily lifts off.
3. All other parts may then easily be removed. (Refer to Notes B and C).

II. REMOVAL OF WHEEL CYLINDER (21) WITHOUT DISTURBING SHOES:

1. Remove brake shoe retracting springs (13). (Refer to Note A).
2. Disassemble cylinder connecting tube (39) and tube fitting (41). (Refer to Note B).
3. At anchor block (20) of cylinder, loosen anchor block lock nuts (19). It is not necessary to completely remove these nuts.

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4. Spread shoes away from cylinder until connecting links (35) are cleared.

5. Push anchor block (20) away from backing plate (1) until clearance is sufficient for cylinder removal.

6. Lift out cylinder, complete with connecting links. Be careful not to misplace spring washers (34).

III. REMOVAL OF SHOE ADJUSTMENT MECHANISM:

1. Remove shoes (2) from brake.

2. Rotate adjusting screw (7), threading it free of worm wheel (12).

3. Pry worm retainer snap ring (11) from shoe.

4. End thrust washers (8), sleeve (9), worm (10), and worm wheel (12) may now easily be removed.

IV. WHEEL CYLINDER (21) DISASSEMBLY:

1. Pry off each boot retainer cap (33). Boot (32) and connecting link (35) will come with the cap.

2. Internal parts may now be forced out of one end of cylinder.

3. Slip cup back up ring segments (26, 31) off of each piston assembly (23, 28).

4. Cups (25, 30) can now be stretched and forced off of each piston. Take care not to mar piston bearing surface or cup groove.

5. In turn, clamp each connecting link (35) in vise. Pry off each boot retainer sleeve. Remove boots (32).

Assembly

Note D. Wheel cylinders are identical. One side of the cylinder has a long stroke, in comparison to the other side, to take care of increased piston travel made necessary when the brake is adjusted to compensate for lining wear. The cylinder inlet and bleeder ports are offset toward the short stroke side. The long stroke piston has greater length than the short stroke piston and is also identified by a circular slot machined at the bottom of the connecting link socket. Pistons must be assembled in proper position within the cylinder. If pistons are reversed, fluid will have difficulty entering the cylinder chamber and it may be forced out of the short stroke side of the cylinder. The long stroke side of the cylinder (Greatest length from inlet port to end of cylinder) must be assembled to the backing plate so that it faces the: (1) Shoe Toe (adjustment end of shoe). (2) Adjustment slot in backing plate.

Note E. Do not lubricate shoe adjustment mechanism or other parts of the brake. Lubrication will cause dust and dirt to collect and solidify in the adjustment mechanism.

Note F. When replacing shoes, make sure that shoe adjusting worm (10) (Fig. 2) is aligned with adjusting slot (A or B) in backing plate. Shoes (2) can be assembled backward, however, the brake cannot be adjusted.

Note G. When replacing shoe retracting springs (13), place hooked end on shoe pins at shoe heel and then, with brake spring pliers, slip looped end of spring on hook at toe end (adjustment end) of shoe.

Step-By-Step Procedure (Assembly)

The brake is easily assembled in reverse order to disassembly.

V. WHEEL CYLINDER ASSEMBLY:

1. Do not assemble parts dry. Coat parts and inside of cylinder bore with clean brake fluid before assembly.

2. Stretch cups (25 and 30) into place on pistons (24 and 29). Cup lip must face inward toward spring groove side of piston.

3. Slip cup back up ring segments (26 and 31) into place on each piston. Segment must be placed behind the cup lip and segment lip must face in same direction as cup lip.

4. Assemble boots (32) and boot retainer sleeves to connecting links (35). Force sleeves over boots to hold boots in place on links.

5. Place long stroke and short stroke piston assemblies (23 and 28) in correct positions in cylinder with spring (27) between pistons. Piston connecting link sockets must face outward and cup lips face inward. (Refer to Note D).

6. Place assembled boots and links in boot retainer caps (33) and fit on cylinder. Crimp each cap, in at least three places, into grooves machined on ends of cylinder.

VI. REPLACEMENT OF SHOE ADJUSTMENT MECHANISM:

1. Do not lubricate parts. (Refer to Note E).
2. Assemble end thrust washers (8), sleeve (9), worm (10), and worm wheel (12) in place. Sleeve slot must face the worm wheel to allow worm and wheel to mesh.
3. Push worm retainer snap ring (11) in place, making sure it snaps into the groove provided in the shoe.
4. Start adjusting screw (7) into worm wheel (12) thread. Adjust to full off position. Curvature of pad on adjusting screw must be in proper plane to permit it to rock on anchor block when shoe is replaced on backing plate.

VII. REPLACEMENT OF WHEEL CYLINDER WITHOUT DISTURBING SHOES:

1. Make sure that backing plate is clean so that cylinder and anchor block (20) will fit properly when mounted.
2. Make sure spring washers (34) are in position on the two lugs machined on the cylinder casting.
3. Spread shoes as far apart as possible.
4. Holding wheel cylinder so that long stroke side of cylinder faces shoe toe and backing plate adjustment slot, slip mounting lugs into place in the anchor block (20). (Refer to Note D).
5. Slip connecting link ends into sockets provided in the shoes.
6. Tighten anchor block locknuts (19), with a TORQUE WRENCH. Self-locking nuts, to be effective, must not be over tightened.
7. Assemble cylinder connecting tube (39). (Refer to Note B under Disassembly.)
8. Replace brake shoe retracting springs (13). (Refer to Note G).

VIII. REPLACEMENT OF SHOE ASSEMBLIES

1. For best results, new shoe and lining assemblies (2) should have liners of correct thickness ground (not buffed) to correct radius, concentric with the brake drum. If this is not done, readjustment may be required after liners are "worn in".
2. Replace one shoe on backing plate (1) making sure adjustment worm (10) is aligned with adjustment slot (A or B). (Refer to Note F.)
3. Slip guide sleeve (15) on guide bolt (14). Assemble guide washer (16), lockwasher (17), and lock nut (18). Tighten nut securely.
4. Repeat Steps 2 and 3 for second shoe.
5. Replace shoe retracting springs (13). (Refer to Note G.)

Adjustment

Lining to drum clearance adjustment is required when shoes are relined and, on occasion, to compensate for normal lining wear. Clearance should be sufficient to avoid "brake drag" and yet close to afford a good "pedal reserve".

Manually operated and vacuum-hydraulic actuated brakes require adjustment (or relining) when pedal reserve approximates 2"; that is, when the brake pedal drops to within 2" of the floor board on hard application.

Adjustment may be made with the vehicle resting on jacks. On jacks, brake drag is checked by "feel", rotating the drum in the direction of forward rotation as adjustment is made.

Step-By-Step Procedure (Adjustment)

1. Make all adjustments with drum cooled to normal temperature.
2. Make sure wheel bearing is correctly adjusted.
3. Remove adjustment slot covers.
4. Insert brake adjusting wrench in adjustment slot (A or B) (Figs. 1 and 3) to contact shoe adjusting worm (10). Rotate wrench in the direction of FORWARD wheel rotation to decrease lining to drum clearance. Reduce clearance until lining "drags" on drum.
5. Rotate wrench in opposite direction, to increase clearance, until drag is relieved. Then rotate wrench one additional turn to provide working clearance.
6. Repeat Steps 4 and 5 on the second shoe (Adjustment Slot B or A).
7. Replace adjustment slot covers.

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"BLEEDING" THE HYDRAULIC BRAKE SYSTEM

Vehicle brake systems using the self-centering hi-tork foundation brake are bled in similar manner to other hydraulic systems.

METHOD A: -

Bleed wheel cylinders in the following order:

1. Cylinder lowest to road.
2. Cylinder highest from road.

METHOD B: -

If brake is mounted so that both cylinders are almost in a vertical plane it may be necessary to "surge bleed" the system.

1. Bleed brakes at all wheels in regular manner, using Method A.
2. At each wheel cylinder in turn, open bleeder valve and then kick brake pedal down sharply several times. Close bleeder valve. This action creates turbulence in each cylinder, forcing out any remaining trapped air.

SERVICE SPECIFICATIONS

LINING LENGTH (measured inside arc) (Both Linings):

16" Drum Diameter . . . . . 16-1/8"

LINING WIDTH:

16" Drum Diameter. . . . . 4", 5"

LINING THICKNESS (Std. Lining):

16" Drum Diameter . . . . . 3/8"

TORQUE WRENCH READING, SHOE ANCHOR BLOCK LOCKNUT:

16" Drum Diameter
(3/4"-16 Thrd.) . . . . . 175-219 lb. ft.

PARKING BRAKE

FOR LM-120, L-130, L-150, LM-150, L-160, LC-160, L-170, LF-170 SERIES TRUCKS

Parking Brake Adjustments (See Fig. 1)

Note: Perform operations in sequence given:-

1. Place parking brake lever in extreme forward (release) position. NOTE: Brake cam lever must rest squarely on the upper brake band bracket. If necessary readjust linkage.
2. The lining to drum clearance of .020" to .030" is obtained as follows:
   (a) Adjust anchor screw nut (1) until .020" to .030" clearance is obtained at side of the stop screw.
   (b) Tighten nuts (4) on adjusting screw bracket bolt (5) to give .020" to .030" clearance between lower half of lining and drum.
   (c) Adjust lining clearance for upper half of band to .020" to .030" by turning nut (2) on adjusting bolt (3).
   (d) Lock all adjustments and recheck clearances.

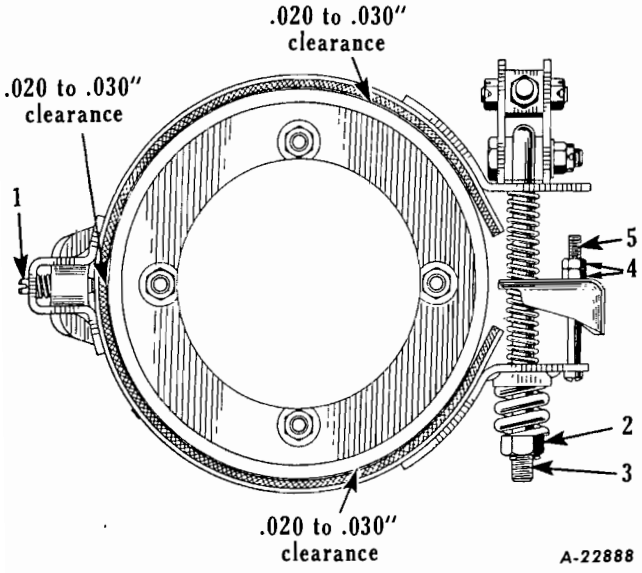

Fig. 1

PARKING BRAKE

FOR L-180, LC-180 SERIES TRUCKS

Parking Brake Adjustments (See Fig. 2)

Note: Perform operations in sequence given:-

1. Place parking brake lever in extreme forward (release) position. NOTE: Brake cam lever must rest squarely on the upper brake band bracket. To correct this position, remove clevis pin and readjust yoke.
2. The lining to drum clearance of .020" to .030" is obtained as follows:
   (a) Adjust anchor screw nut (1) until .020" to .030" clearance is obtained at side of the stop screw.
   (b) Tighten nuts (4) on adjusting screw bracket bolt (5) to give .020" to .030" clearance between lower half of lining and drum.
   (c) Adjust lining clearance for upper half of band to .020" to .030" by turning nut (2) on adjusting bolt (3).
   (d) Lock all adjustments and recheck clearances.

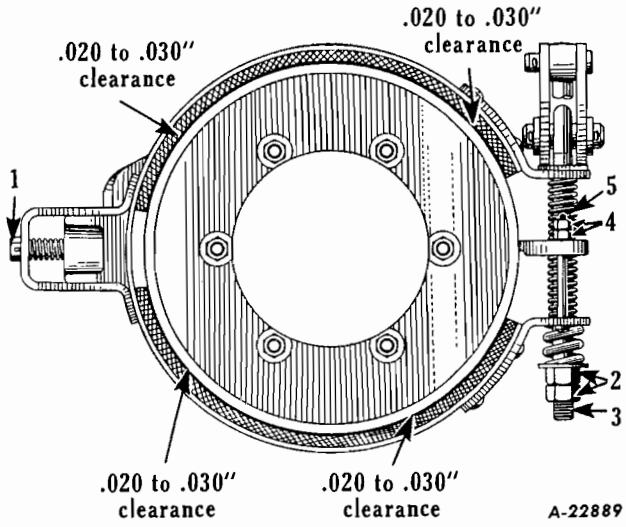

Fig. 2

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PARKING BRAKE

FOR L-190 AND LF-190 SERIES TRUCKS, L-200, L-201, L-202, L-204 TRUCKS

Parking Brake Adjustments (See Fig. 3)

Note: Perform operations in sequence given:-

1. Place parking brake in extreme forward (release) position. NOTE: Brake cam lever must rest squarely on the upper brake band bracket. To correct this position, remove clevis pin and readjust yoke.

2. The lining to drum clearance of .020" to .030" is obtained as follows:

   (a) Adjust anchor screw nut (1) until .020"to .030" clearance is obtained at side of the stop screw.

   (b) Tighten nuts (4) on adjusting screw bracket bolt (5) to give .020" to .030" lining clearance to drum for lower half of shoe.

   (c) Adjust upper half of shoe lining clearance to .020" to .030" by turning nut (2) on adjusting bolt (3).

   (d) Lock all adjustments and recheck clearances.

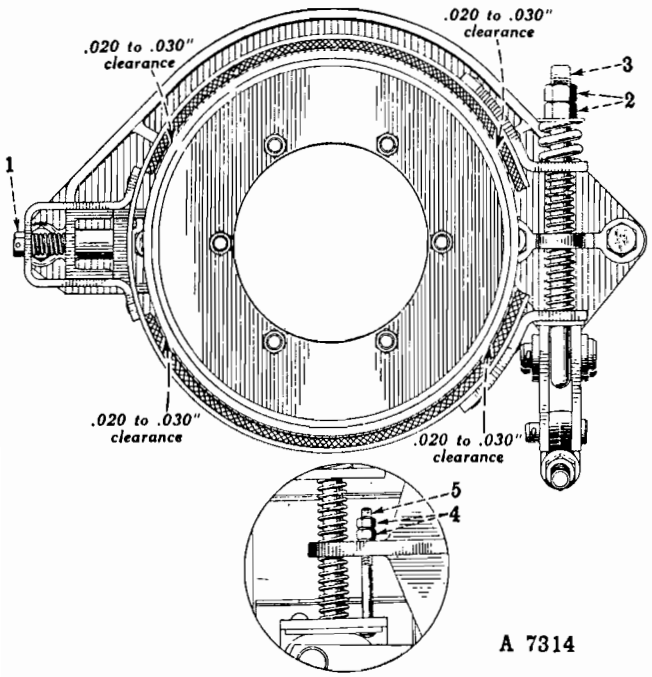

Fig. 3

PARKING BRAKE

FOR L-205, L-210, L-211, L-212, LF-210, LF-211, LF-212, LF-220, LF-221 LF-222 TRUCKS

Parking Brake Adjustments (See Fig. 4)

Note: Perform operations in sequence given:-

1. Place parking brake lever in extreme forward (release) position. NOTE: Brake cam lever must rest squarely on the upper brake band bracket. To correct this position, remove clevis pin and readjust yoke.

2. The lining to drum clearance of .020" to .030" is obtained as follows:

   (a) Tighten nuts (3) on bolt (4) to give .020" to .030" clearance between lower half of shoe and drum.

   (b) Tighten nuts (1) on adjusting bolt (2) to give .020" to .030" clearance between upper half of brake shoe and drum.

   (c) Tighten nuts (5) on bracket bolt (6) just enough to hold adjustment obtained in paragraph (b).

   (d) Lock all adjustments.

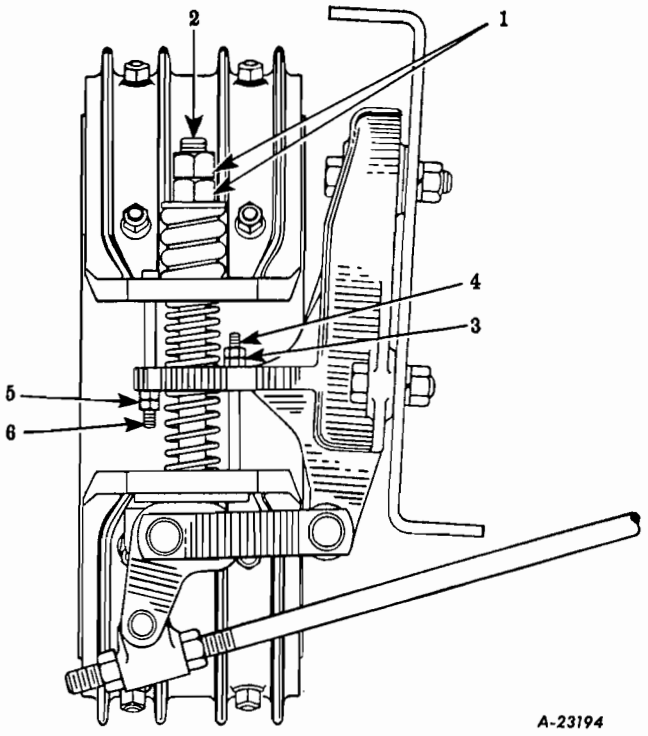

Fig. 4