

# Studebaker SERVICE BULLETIN

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## BE READY FOR FALL CHANGEOVER BUSINESS

School is beginning again and autumn's leaves will soon be in the air. There will be many a chilly night in the near future.

Now is the time to give your customers an opportunity to have their cars "changed over" for fall driving. Mailing piece No. 5 of the current direct mail series is going out this month to Studebaker service customers throughout the nation.

In your newspaper advertising, radio advertising, and with your point of sale posters and banners keep that "Fall Changeover" theme in

their minds. Remind them to have all of the safety features of their cars put in top working order -- the streets and highways will be filled with children and school buses from now on. Remind your prospects and customers to have their battery and anti-freeze needs taken care of early this fall so as not to be disappointed some morning when the temperature takes a sudden drop.

The annual fall changeover program now getting under way will pay off in increased labor sales for the dealers who promote it aggressively.

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**CARBURETOR VACUUM STEP-UP JET - 2R16A, 2R17A**

*Please record this article on page 128 of your 2R Series Trucks Shop Manual.*

As a result of numerous tests both in the field and in the laboratory, it was found that a leaner carburetor mixture, offering improved fuel economy, can be obtained in 2R16, 2R16A, 2R17, and 2R17A trucks with an 8% leaner step-up jet without affecting the power at wide open throttle.

The 8% leaner carburetor step-up jet is Part No. 679288 (Carter No. 149-56S) and entered production in June. The original jet, Part No. 675440, one step rich, will continue to be available for service use where it is found desirable.

Carburetors produced with the 8% leaner jet will carry the same part number (674551), but the model number is changed to BBR1-606SA for purposes of identification.

**LUBRICATION EQUIPMENT AND ELECTRIC LIFT FOR SALE - USED**

John Dorschel Motors, Inc., 67 Ridge Rd. at Lake Avenue, Rochester 13, N. Y., has for sale a used Walker lift, 4-post, electric drive, free wheeling model. This lift raises to 5'6" and has a capacity of 7500 lbs.

There is also a high pressure lubrication pump and Aro-reel and a low pressure lubrication gear oil pump and Aro-reel for sale.

Mr. John Dorschel says this equipment retailed for \$1154 and that he is willing to sell it to any Studebaker dealer for immediate delivery at \$450.

Interested dealers should contact Mr. John Dorschel at the above address.

**T**   
**TRUCK**  
**SERVICE**  
*Information*

**AUXILIARY STEP - 2R16, 2R16A 2R17, 2R17A**

*Please record this article on page 37 of your 2R Series Trucks Shop Manual.*

In certain types of operation such as dump work, trash collection, etc., an auxiliary cab step can be used to advantage. A line drawing and photograph featuring such an installation are shown. In the line drawing, dimensions for laying out the position of the mounting holes, drill sizes, and the point from which all measurements are taken, is given. The pilot hole is in all frames and is located on the frame side rail under and approximately 3-3/4" to the rear of the cab front hold down bracket.

The holes can be readily drilled without any disassembly if a right angle drill is used. When installing an auxiliary running board on the left side it will be necessary to remove the gasoline tank in order to install the lock washers and nuts on the rear running board bracket to frame bolts.

Be sure to re-check dimensions before drilling holes to prevent any possibility of interference with the crossmember located at the rear of the cab. (Continued on next page)



VIEW OF AUXILIARY STEP AFTER INSTALLATION AS OUTLINED ABOVE AND IN DRAWING AT RIGHT



## MIDLAND HY-POWER BRAKE BOOSTER UNIT

*Please record this article on page 30 of your 2R Series Trucks Shop Manuals.*

Effective with truck Serial Nos. R16A-21121 and R17A-11675, 2000 units were produced with the Midland Hy-Power brake unit instead of the Bendix Hydrovac brake power unit.

The following article describes and gives operation, service, and diagnosis information on the Midland Hy-Power unit.

### VACUUM CHAMBER

The vacuum chamber portion (2 and 5) consists of a pressure plate and diaphragm assembly (3), push rod (7), vacuum seal (8), seal retainer (41) and gasket (39).

### HYDRAULIC CONTROL VALVE

The hydraulically actuated control valve portion contains atmospheric poppet (11), return spring (12), diaphragm return spring (14), diaphragm (15), piston plunger (17), and piston seals (18).

### HYDRAULIC SLAVE CYLINDER

The hydraulic slave cylinder contains outlet port (23), end cap (24), copper gasket (25), return springs (26 & 27), unloader valve (28), piston cup (29), piston (30), by-pass valve (32), inlet port (35), push rod seal (36), and push rod guide (37).

### OPERATION

With the engine running and the brake released, vacuum is maintained on both sides of the pressure plate and diaphragm assembly as may be seen by tracing the connections from the manifold through the check valve to vacuum inlet (38) on front chamber (5) through vacuum passage (9) to by-pass hose (1) into rear chamber (2). The pressure plate and diaphragm assembly is, therefore, vacuum suspended and held to the left or inactive position by the diaphragm return spring (6).

There is residual line pressure of approximately 5 to 12 lbs. per square inch in the hydraulic system that exists through inlet connection (35) upward through holes in slave cylinder piston (30) and against the inner cup (18) of control valve piston (17); also past by-pass valve (32) directly to wheel cylinders through port (23). Spring (14) forces the control valve piston assembly (17) downward to the released position. This keeps the atmospheric poppet (11) closed and the vacuum passage in control valve plunger (17) open.

The by-pass valve (32) in the slave cylinder piston (30) is open and hydraulic brake fluid is therefore free to pass directly to the wheel cylinders from the master cylinder.

As the pedal is depressed by the operator, hydraulic pressure increases in the master cylinder. This increased pressure is transmitted through passage (20) and is exerted upon the valve piston (18). The valve piston, therefore, overcomes the resistance of valve spring (14) and moves upward; this closes vacuum passage (9) in control valve plunger (17) and opens atmospheric disc (11).

Atmosphere now enters through passage (13) and flows past poppet (11) into by-pass hose (1) and into rear chamber (2); the front chamber (5) remains connected to the vacuum source at all times. Thus the effect of the atmosphere flowing into rear chamber (2) is to cause the diaphragm and pressure plate assembly (3) and push rod (7) to move to the right. This movement first closes by-pass valve (32) and thereby shuts off the fluid connection between the brakes and the master cylinder at this point.

The pressure plate (3) then forces the slave cylinder piston to the right. This enlarges slave cylinder chamber at the left of slave cylinder piston, meaning that fluid from beneath valve piston (18) will escape into this chamber, thereby permitting the valve piston to move downward by valve return spring (14) and arresting the application of the brakes, unless the operator depresses the pedal far enough to supply from the master cylinder all of the fluid required to keep chamber at the left of slave cylinder piston filled.

Thus, the requirement of "follow up control" is met and position of the brake pedal corresponds with movement of the brake shoes. The two are tied together through a column of brake fluid so that the operator can control the brake shoe position just as he does with a light vehicle having no power brake.

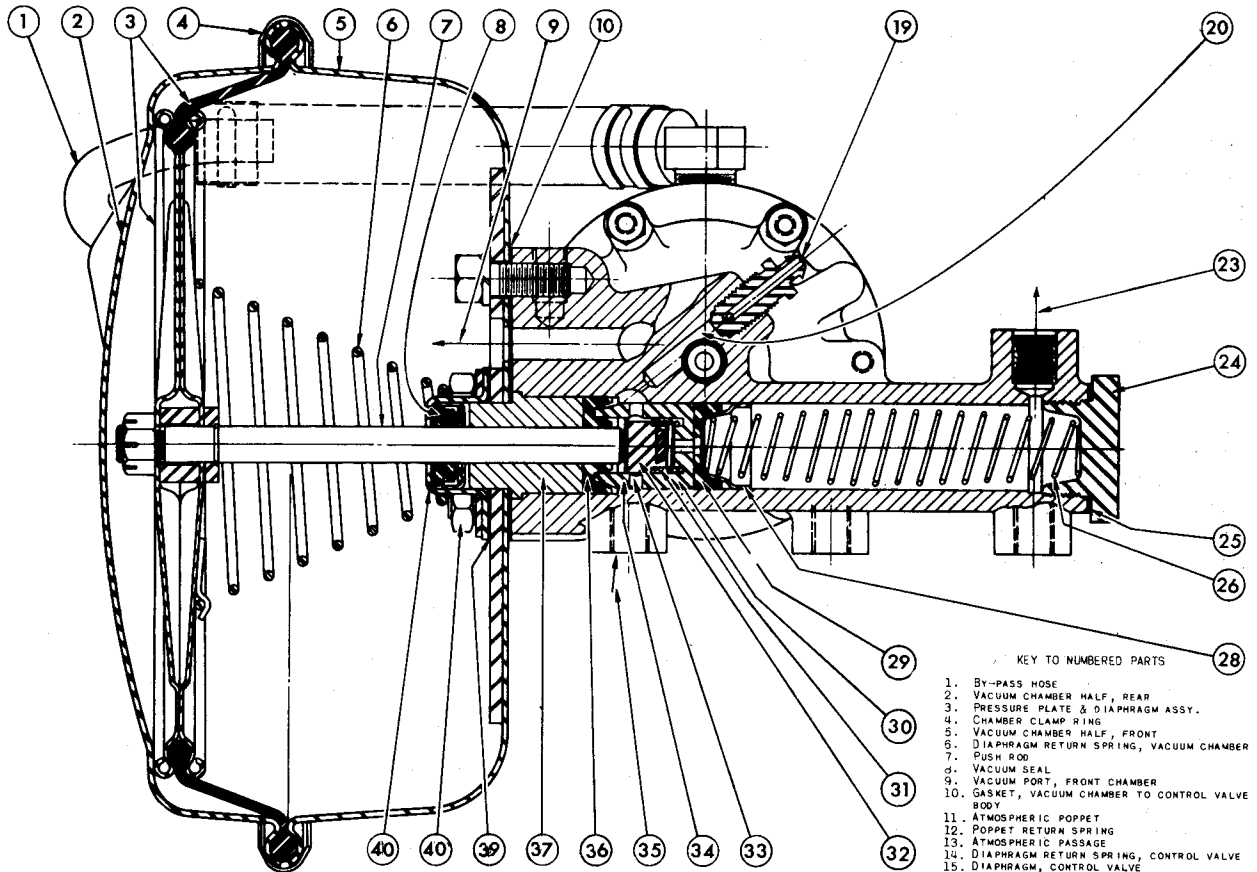
Assume the operator wants to make a partial brake application. He pushes on the pedal which forces hydraulic pressure from the master cylinder to the lower seal of the control valve. This pressure overcomes the control valve diaphragm return spring (14) and opens atmospheric poppet (11), allowing atmospheric pressure to pass through by-pass hose (1) to the rear chamber (2).

The control valve of the Hy-Power automatically regulates the vacuum in the rear chamber (2) in accordance with the pressure exerted by the operator upon the brake pedal.

The more atmosphere allowed to enter rear chamber (2) past poppet (11), the lower the vacuum becomes in rear chamber (2). Consequently, the greater the thrust of the push rod (7) against the slave cylinder piston (30), the higher the hydraulic pressure will be in slave cylinder to the right of slave cylinder piston or slave cylinder outlet.

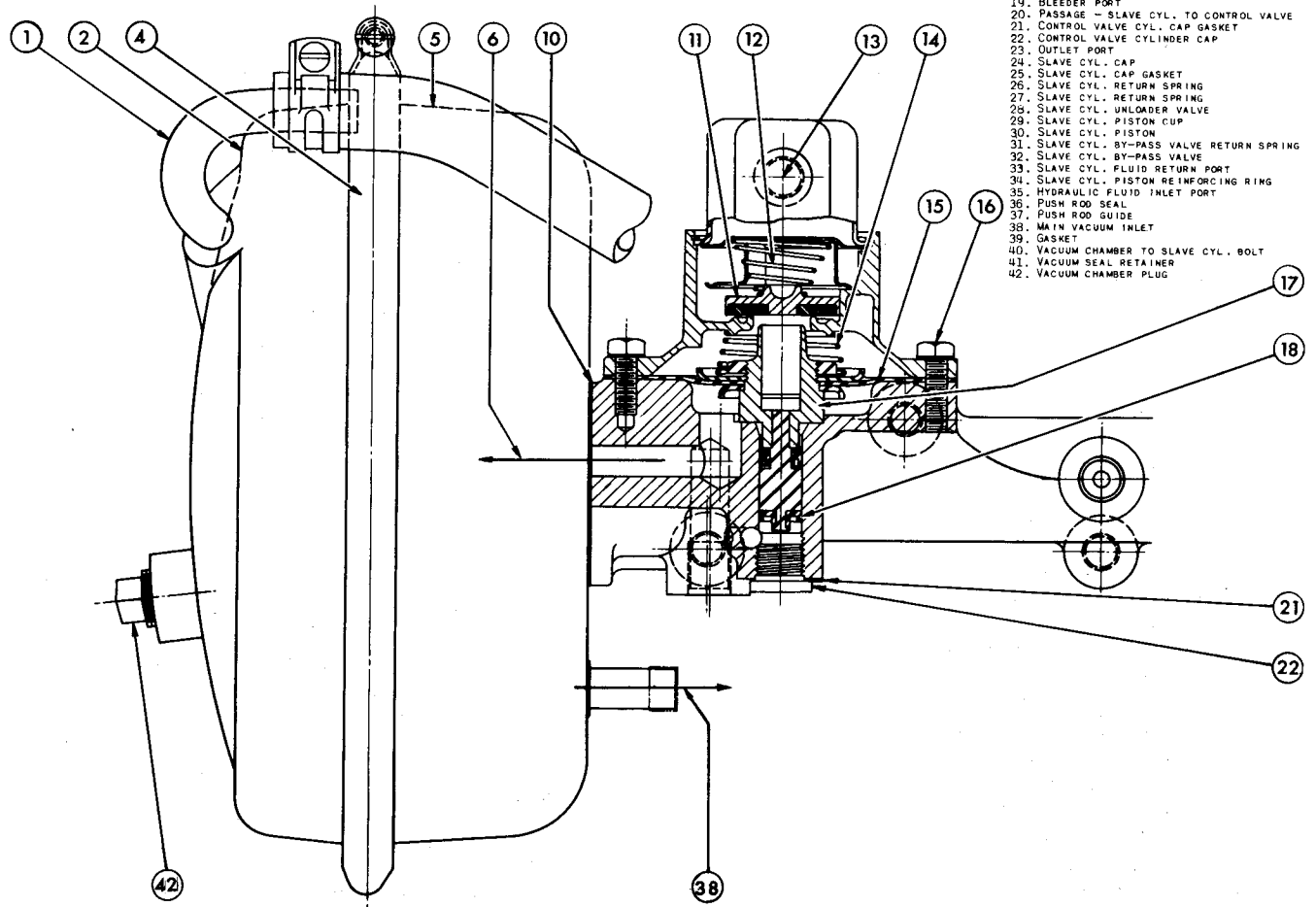
Master cylinder hydraulic pressure is exerted against the left hand side of the slave

(Continued on page 6)



KEY TO NUMBERED PARTS

- 1. BY-PASS HOSE
- 2. VACUUM CHAMBER HALF, REAR
- 3. PRESSURE PLATE & DIAPHRAGM ASSY.
- 4. CHAMBER CLAMP RING
- 5. VACUUM CHAMBER HALF, FRONT
- 6. DIAPHRAGM RETURN SPRING, VACUUM CHAMBER
- 7. PUSH ROD
- 8. VACUUM SEAL
- 9. VACUUM PORT, FRONT CHAMBER
- 10. GASKET, VACUUM CHAMBER TO CONTROL VALVE BODY
- 11. ATMOSPHERIC POPPET
- 12. POPPET RETURN SPRING
- 13. ATMOSPHERIC PASSAGE
- 14. DIAPHRAGM RETURN SPRING, CONTROL VALVE
- 15. DIAPHRAGM, CONTROL VALVE
- 16. CONTROL VALVE HOUSING BOLT
- 17. CONTROL VALVE PISTON PLUNGER
- 18. VALVE PISTON SEALS
- 19. BLEEDER PORT
- 20. PASSAGE - SLAVE CYL. TO CONTROL VALVE
- 21. CONTROL VALVE CYL. CAP GASKET
- 22. CONTROL VALVE CYLINDER CAP
- 23. OUTLET PORT
- 24. SLAVE CYL. CAP
- 25. SLAVE CYL. CAP GASKET
- 26. SLAVE CYL. RETURN SPRING
- 27. SLAVE CYL. RETURN SPRING
- 28. SLAVE CYL. UNLOADER VALVE
- 29. SLAVE CYL. PISTON CUP
- 30. SLAVE CYL. PISTON
- 31. SLAVE CYL. BY-PASS VALVE RETURN SPRING
- 32. SLAVE CYL. BY-PASS VALVE
- 33. SLAVE CYL. FLUID RETURN PORT
- 34. SLAVE CYL. PISTON REINFORCING RING
- 35. HYDRAULIC FLUID INLET PORT
- 36. PUSH ROD SEAL
- 37. PUSH ROD GUIDE
- 38. MAIN VACUUM INLET
- 39. GASKET
- 40. VACUUM CHAMBER TO SLAVE CYL. BOLT
- 41. VACUUM SEAL RETAINER
- 42. VACUUM CHAMBER PLUG



cylinder piston. This pressure helps the push rod move the slave cylinder piston to the right. Total hydraulic pressure created in the slave cylinder at the right of slave cylinder piston and passed along to the brake system to apply the brake, is therefore, the sum of the pressure developed as a result of push rod thrust, and pressure received by the Hy-Power from the master cylinder.

As the control valve is held in its applied position with atmospheric poppet (11) open, atmosphere continues to rush into the chamber above the diaphragm (15) and also into the rear chamber (2); as the degree of vacuum in these chambers decreases, the pressure plate and diaphragm in chamber (2) delivers more and more rightward thrust to the slave cylinder piston (31) and, in the same proportion, diaphragm (15) delivers more and more downward thrust against the control valve piston (18).

If the operator holds the brake pedal partially applied, atmospheric poppet (11) and vacuum plunger (17) will close or come to a lap position. The degree of brake application will not change unless the operator increases or decreases pressure on the pedal.

If the operator increases pedal pressure, atmospheric poppet (11) reopens momentarily slightly increasing the power brake application.

If the operator decreases pedal pressure, the downward force of control valve diaphragm (15), with high vacuum below it and reduced vacuum above it, pushes the valve plunger downward. This opens the vacuum plunger (17) tending to balance vacuum above and below the diaphragm.

### SERVICING OUTLINE OF MIDLAND HY-POWER BRAKE UNIT

#### 1. Disassembly

- a) Plug all openings and clean thoroughly with a suitable cleaning solution. Dry with compressed air.
- b) Screw 2-7/16 fine thread studs into slave cylinder mounting bosses and clamp securely in vise. Scratch mark control valve and chamber bodies to facilitate assembly.
- c) Remove hose (1) that connects control valve body to rear chamber.
- d) Remove chamber clamp ring (4) while pressing firmly against rear chamber (2) to prevent rear chamber from being forced out of position by return spring (6).
- e) Remove rear chamber and diaphragm assembly.
- f) Remove cap screws that hold the front chamber to the slave cylinder casting.
- g) Remove front chamber slowly at the same time catching the push rod seal and slave cylinder piston and cup that will be forced out by slave cylinder piston return springs.
- h) Remove cap screws holding control valve body.

- i) Remove lock ring or cap screws from control valve body that holds atmospheric disc and air cleaner cover.
- j) Remove slave cylinder end cap and also the plug in the control valve bore if unit has same.

#### 2. Inspection

NOTE.--Wash thoroughly all internal parts and slave cylinder bores in alcohol.

- a) Examine all bores in slave cylinder casting. They must not be pitted or corroded. If corrosion or pitting cannot be polished out with *Crocus Cloth 131A* or its equivalent, slave cylinder should be replaced.
- NOTE.--If the unit shows excessive fluid leakage, it is advisable to replace it with a new slave cylinder casting that has the valve bore drilled through.
- b) Examine control valve piston plunger assembly. If piston shows excessive wear on one side, replace. Always replace with the new double seal piston assembly. Seat on end of valve plunger must be smooth and free from nicks, it can sometimes be made smooth by using an aluminum oxide abrasive cloth.
- NOTE.--If seal next to the diaphragm shows excessive wear, complete new piston assembly must be replaced as the inner seal cannot be replaced in the field.
- c) Replace control valve diaphragm, if it is ruptured or wrinkled. NOTE.--In replacing diaphragm, the small washer goes next to the piston seals. Use a small amount of shellac around the threads and tighten just so that you do not wrinkle the new diaphragm and stake the nut.
- d) Remove by-pass valve in slave cylinder piston. If same is cut or deeply grooved, replace. Examine slave cylinder piston; if signs of excessive wear are shown, replace.
- e) Examine atmospheric disc. It must be smooth and free from cuts or deep grooves. Examine seat in valve housing. It must be smooth and free from nicks. Seat can sometimes be made smooth by using an aluminum oxide abrasive cloth. Replace diaphragm return spring, if rusty. Replace atmospheric disc spring, if rusty. The disc metal guard has three prongs; these must be straight. NOTE.--A bent prong can cause the atmospheric disc to leak when the brakes are applied.
- f) Examine the diaphragm pressure plate assembly. If diaphragm is swollen or ruptured, replace.
- g) Examine the push rod. It must be free from nicks or scratches. (Never grind off the end of the push rod.)
- NOTE.--When replacing push rod or diaphragm assembly, hold push rod in radius blocks as close to ring groove as possible. Use a sealing compound on threads and make sure you use the proper length rod and proper size diaphragm.

EXAMPLE: A C-433 push rod and diaphragm assembly will not work in a C-440 unit and vice versa.

- h) hole in aluminum push rod bushing should be elongated; *replace*. Remove vacuum seal from retainer and *replace*. (Lip of seal must face toward slave cylinder.)
- i) Examine rear chamber for dents. If dented, *replace*. (A dented rear chamber will result in brakes not releasing.)

### 3. Assembling for Test

- a) Place slave cylinder in vise, tighten plug and copper gasket into slave cylinder valve base, install push rod seal with lip of seal toward slave cylinder end cap, install push rod aluminum bushing. Install gasket, front chamber, vacuum seal, retainer and gasket, and tighten securely with 5 cap screws. Place the diaphragm and pressure plate assembly in rear chamber and enter push rod into slave cylinder and clamp chambers together with clamp strap.
- b) Install slave cylinder piston with open

end toward chamber body, piston cup with lip of cup toward end plug, spring retainer and return springs, using new copper gasket. Tighten slave cylinder end plug securely.

- c) Install control valve piston plunger assembly. (Put a little brake fluid on seals.) Place diaphragm return spring with large coil toward diaphragm and bolt control valve body securely to slave cylinder casting.

### 4. Leakage Test Procedure

- a) Apply 3 to 7 lbs. of compressed air, close shut-off valve. *Gage should not fall to zero*. Repeat as above at 80 lbs. air pressure. NOTE.--Inasmuch as push rod seal and valve seals are new, if gage falls to zero, this indicates that valve bore or push rod bore is bad or the casting is porous.

NOTE --Always plug the inlet and outlet ports of the Hy-Power after service to prevent dirt or foreign matter from getting into the unit.

## HY-POWER DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	REMEDY
LOSS OF FLUID IN THE MASTER CYLINDER	Master cylinder fluid should be checked every 1000 miles	
	Fluid leaking by secondary cup in master cylinder	Replace
	Wheel cylinders leaking	Replace
	Loose hydraulic lines	Tighten
	Hy-Power unit leaking	Repair
BRAKE PEDAL KICKS BACK AGAINST FOOT	Defective by-pass valve (32)	Remove end cap (24) and replace slave cylinder piston and piston assembly
	Defective slave cylinder piston cup (29)	
BRAKES SLOW TO RELEASE NOTE.--Before making any checks on the power booster the vehicle should be jacked up to make sure that all wheels are free; possibly trouble can be traced directly to any wheel which is dragging.	Incorrect pedal linkage adjustment	Adjust
	Master cylinder piston sticking	Replace
	Compensating port in master cylinder plugged	Clean master cylinder with alcohol
	Brake shoes sticking on anchors	Free sticking shoes
	Weak brake shoe return spring	Replace
	Control valve plunger (17) sticking	Remove air cleaner cap holding the tube that runs to air cleaner in the cab.  Operate brake pedal and be sure valve plunger (17) moves in and out freely. If plunger sticks, remove Hy-power unit and service.
	A dented rear chamber	Replace rear chamber
Push rod (7) too long	Examine rear chamber (2) for a dent. Replace chamber.	

CONDITION	POSSIBLE CAUSES	REMEDY
BRAKES SLOW TO RELEASE (Continued)	Control valve diaphragm return spring (14) missing.	Replace
	Defective by-pass valve (32) in slave cylinder piston	Remove end cap (24) and replace slave cylinder piston assembly
	Residual pressure in master cylinder too high	Be sure control valve plunger (17) moves in and out freely before making this test.  Start engine, apply brakes and release. Open bleeder screw (19) at Hy-Power unit. <i>If brakes release, this indicates residual pressure in master cylinder is too high.</i>
	Swollen or ruptured diaphragm	Replace master cylinder  <i>If brakes do not release, open bleeder screw at wheel cylinder. If brakes release, Hy-Power unit should be removed and serviced.</i>

**ENGINE RUNS UNEVENLY ON IDLE WITH THE BRAKES RELEASED**

*NOTE --If the following tests are made on a tractor, be sure shut-off valves at trailer outlets are closed.*

Vacuum leaks	Check all connections from the manifold back to Hy-Power unit.  Check chamber clamp (4). Check nuts of by-pass tube (1). Check control valve body cap screws (16). Check plug (42).
Dirt under atmospheric poppet (11)	Remove 3 cap screws and remove air cleaner connection cap.  Check atmospheric poppet. Rubber seat should be free of dirt.  Replace  Presence of dirt or water at this point indicates improperly mounted air cleaner.
<b>AIR CLEANER SHOULD BE INSIDE THE CAB</b>	

**ENGINE RUNS UNEVENLY ON IDLE WITH THE BRAKES APPLIED, OR HARD PEDAL**

Control valve plunger (17) not seating properly on atmospheric poppet (11).	Remove 3 cap screws and remove air cleaner cap. Atmospheric poppet (11) must have a clean seat, also seat of valve plunger (17) must be free of nicks.
Bent prong	Replace disc metal plate
Control valve diaphragm (15) defective	Replace
Pressure plate and diaphragm assembly (3) defective	Replace

**HARD PEDAL (PERIODICALLY)**

Defective manifold check valve.	Replace
Slave cylinder piston (30) sticking in bore, due to dirt or inferior brake fluid.	Remove Hy-Power unit and service.