

travel from the relay to the power cylinder in order to apply the trailer brakes.

A regulating valve may be installed on the dash, so that the driver may control the amount of vacuum in the system.

A pneumatic relay valve is used when it is desired to operate a trailer equipped with vacuum brakes in conjunction with a tractor equipped with air brakes.

A conversion relay valve is used when it is desired to operate a trailer equipped with an atmospheric suspended vacuum brake system in conjunction with a tractor equipped with a vacuum suspended power brake system.

A synchronizer valve is occasionally used to obtain the proper relative amounts of braking between tractor and trailer on tractor-trailer combinations.

In some cases a vacuum chamber and diaphragm are used instead of a vacuum cylinder and piston but the operation of the power system is the same in either case.

The power cylinder in a vacuum brake system may be mounted so that the piston exerts a "pulling" action in applying the brakes, as shown in Figure 31 and 32, or it may be mounted so that the piston exerts a "pushing" action in applying the brakes. In most hydraulic systems it is built integral with a hydraulic cylinder.

SERVICE HELPS

In order to check a vacuum power brake system for leaks, it is necessary to have a vacuum gauge, hose and fittings. The vacuum gauge is graduated from 0 to 30 inches of mercury. Atmospheric pressure is normally equal to about 15 pounds per square inch and this pres-

sure will support a column of mercury 30" high. Therefore a perfect vacuum would show a reading of 30" mercury on the vacuum gauge. However, the vacuum in automotive engines is never perfect but in engines in good condition it should range between 20" and 26" of mercury. For satisfactory brake operation a vacuum booster system should show a reading of 16" on the test gauge. On a truck or bus installation the vacuum leakage when tested should not exceed 3" per minute. In the case of a tractor-trailer combination which must conform to trailer break-away laws the leakage should not exceed $\frac{1}{3}$ " per minute. (1" in 3 minutes.)

Vacuum power units of the piston-cylinder type should be lubricated with about 2 ounces of vacuum cylinder oil for every 5,000 miles of operation.

Vacuum power units of the diaphragm-chamber type require no lubrication but the diaphragm and seal should be inspected regularly and replaced if necessary.

In cold weather, there is always danger of moisture condensing and freezing in the lines and other parts of a vacuum power brake system. In order to prevent freezing, we recommend placing a small amount of permanent type anti-freeze in the lines and a small amount in the power unit. In diaphragm-chamber type units about $\frac{1}{2}$ ounce of anti-freeze is sufficient, while in the piston-cylinder type units, it is best to place about 2 ounces on each side of the piston.

The air cleaners used at different points on a vacuum power system should be cleaned regularly to insure efficient operation of the brakes.