HYDRAULIC BRAKE SYSTEMS

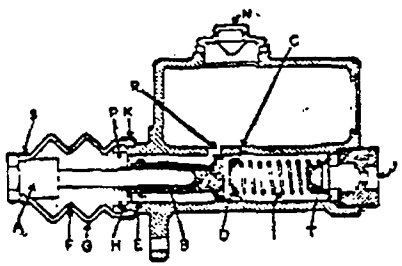

Fig. 1
Master Cylinder

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

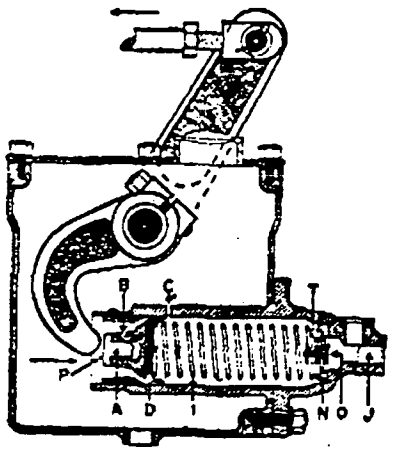

Fig. 2
Box Type Master Cylinder

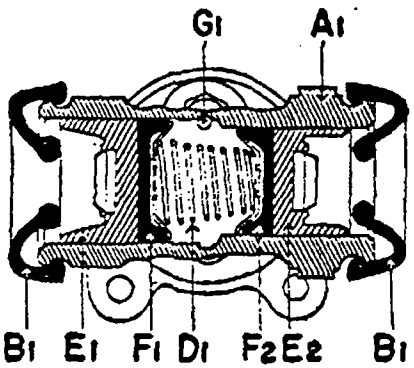

Fig. 4
Step-Bore Wheel Cylinder

A1—Outer Casing
B1—Rubber Boot
C1—Connecting Link
D1—Piston Cup Return Spring
E1—Piston
E2—Smaller Piston
F1—Piston Cup
F2—Smaller Piston Cup
G1—Bleeder Valve

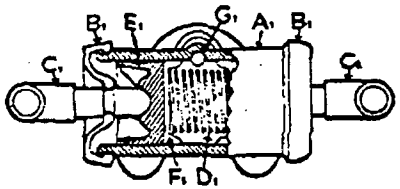

Fig. 3—Wheel Cylinder

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

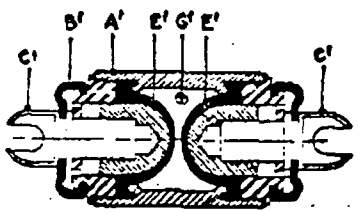

Fig. 5—Wheel Cylinder

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

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

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

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

The workings of a hydraulic system are as follows:

1. Depression of foot pedal causes piston (B) and cup (D) to move forward in the cylinder barrel. A very small movement forward of cup (D) closes compensating port hole (C) and the pressure stroke commences.
2. Fluid is forced through copper tubing and flexible hose to the wheel cylinders, which, under hydraulic pressure, causes the wheel pistons (E_1) and connecting links (C_1) to move outwardly against brake shoes, thus expanding the shoes and lining against the drum. The column of fluid being incompressible and automatically maintained at the correct volume, is, by the principle of hydraulics, transmitted to all surfaces with equal and undiminished force. This assures *equalization of pressure at all four wheel cylinders.*
3. Removal of pressure from brake pedal permits return of pedal and push rod (A) to their off position and return of piston (B) and cup (D). Removal of hydraulic pressure at the wheel cylinders allows return of the brake shoes to relaxed position because of tension of return brake springs.
4. The construction of the above type of compensating cylinder equipped with a secondary cup (E) allows fluid on both sides of the primary cup thus avoiding *air pocketing. The return to off position of piston (B) and cup (D) is much* faster than the return of fluid from the braking system through outlet (J). As a consequence a momentary vacuum is created in cylinder barrel and additional fluid is drawn into system through drilled holes in piston (B) and past lip of cup *(D) as well as through compensating port hole (C). As the fluid finally returns* to master cylinder excess is by-passed through compensating port hole (C) back into the reservoir.
5. Expansion of fluid due to heat, contraction due to cold or loss by seepage or bleeding system is compensated by flow in either direction as the occasion demands, through compensating port hole (C).
6. A double check valve (T) is used in all master cylinders of the compensating type. It *is held at the closed end of the master cylinder barrel by the piston cup return* spring (I). This valve performs two functions:
   (a) It acts as a seal to prevent fluid or air being drawn into the system during the bleeding operation and prevents entire loss of fluid in case a break in *the tubing occurs.*
   (b) It maintains a slight pressure (approx. 7 lbs.) in the brake system—not sufficient to cause the shoes to drag but enough to assure immediate action at the wheel cylinders when foot pedal is depressed. A slightly higher pressure (10-12 lbs.) is maintained in some of the newer hydraulic systems.

Wheel Cylinders on Some 1935 Models

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