

EARLY BRAKES

One technique that was used in some of the early automotive brake systems was a leather-faced metal strap wrapped around the fly-wheel, driveshaft, axles or a drum on the rear wheels. One end of the strap was fixed and the other pulled by means of a lever or cable. Pulling the strap tightened it and made it rub to provide a braking action. These early "transmission brakes" and "external band brakes" (see Figure 1.1) worked well enough on low powered, slow speed vehicles. But as power and speed increased, so did the need for better brakes.

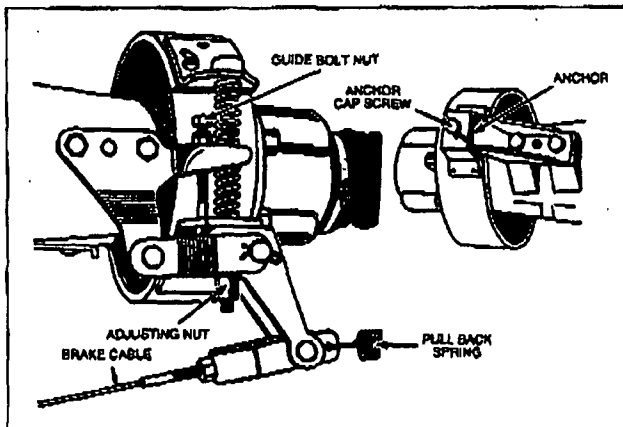


Figure 1.1, Example of an early external band brake on the transmission (courtesy of Chrysler Corporation).

One of the major problems that had to be solved was that of finding a friction material that would provide adequate friction (but not too much friction) ... would wear well ... and also would be capable of withstanding high temperatures without charring or burning. Brake linings made of cotton webbing were tried but didn't work very well because they burned easily if overheated. Inventors tried various materials ranging from walrus hide to concoctions made of camel hair and ground up walnut shells.

ASBESTOS BRAKE LININGS

In 1908, the friction material that was to become the basis for all future brake linings was introduced by Herbert Froot: asbestos. The first asbestos linings were made of cloth woven from asbestos yarn and reinforced with brass wire. The material was impregnated with a resin to add strength and to increase its frictional properties. Four years later, Froot made brake linings that were pressed into shape by dies. This improved the wear characteristics of the linings and reduced the amount of time needed for break-in. And in 1921, he introduced the first molded brake linings made of chopped asbestos — a change which significantly lowered manufacturing costs. The types of materials that are used in brake linings today are discussed in Learning Unit 5.

DRUM BRAKES EMERGE

At the same time the friction material problem was being addressed, automotive engineers were trying to perfect the brake system itself. The first drum brakes made their appearance on the 1902 Renault. These had their linings located inside the drum. They expanded outward rubbing on the inside rather than the outside of the drum (see Figure 1.2). The shoes were forced outward by a mechanical cam connected to a lever and cable. These

internal drum brakes were found to require less braking effort than external drum band brakes. The brake shoes had a "self-energizing" effect that tended to pull them tighter and increase friction.