

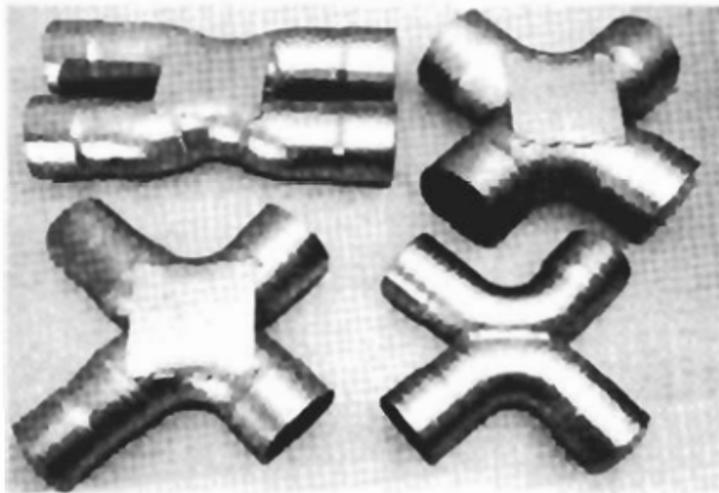
the profile of the camshaft. Naturally, the ability of the human ear to hear a defined frequency of sound complicates matters.

## **Frictional Flow Losses and Restrictions**

The ideal path is a straight line; otherwise, internal friction will diminish flow. Turns in the pipe must be gentle; the gentler they are, the greater the flow. Tight right-angle turns generate the highest flow loss. Many automakers place numerous right angles in the exhaust system, especially if it is for a V-shaped engine with a single exhaust pipe. A good rule of thumb: The farther the restriction is from the exhaust port, the less effect it will have. A restriction in the exhaust manifold will degrade power more than one nearer the tailpipe. Flow losses can also be attributed to the diameter of the pipe and surface of its internal walls. Cast-iron exhaust manifolds with very rough internal surfaces magnify flow friction. In contrast, the smooth internal wall of a tubular header pipe reduces friction.

## **How Do Headers Make Power?**

Rapidly and efficiently filling and emptying the cylinder helps produce power. Headers help empty the cylinder via better flow characteristics by using an individual primary tube for each bore and by having the inertia column help scavenge the other



**Above and below: The exhaust crossover produced by Dr. Gas features an efficient X pattern.**

