**V8 engine**

A V8 engine is a V engine with eight cylinders. In its simplest form it is basically two straight-4 engines sharing a common crankshaft. However, this simple configuration has the same secondary dynamic imbalance as two straight-4s, resulting in annoying vibrations in large-displacement engines. As a result, most modern passenger car V8s use a complex crossplane crankshaft with heavy counterweights to eliminate the vibrations. This results in a powerful engine which is almost as smooth as the straight-6, while being considerably less expensive than the even smoother and more powerful V12 engine. However, flat-plane crankshafts are still common in purpose-designed V8 engines for racing cars, since a crossplane crankshaft results in uneven firing into the exhaust manifolds, interfering with engine tuning, and the heavy counterweights prevent the engine from accelerating rapidly.

The V8 engine is generally too long and wide to be used in the efficient transverse engine front-wheel drive layout, so with a few exceptions is limited to front-engine, rear-wheel drive cars and light trucks. Heavy trucks more commonly use the straight-6 configuration since it is simpler and easier to maintain, and truckers prefer a slow-turning engine with fewer but bigger components. Aircraft have seldom used the V8 engine since the typically heavy crankshaft weights are a liability, and modern light planes commonly use the flat-8 configuration instead since it is lighter air cool. Recently, a new aircraft turbocharged V-8 engine was introduced to the market by Trace Engines, based in Texas, USA Trace Engines Historically, the V8 was very popular in passenger vehicles in the United States, especially prior to the 1973 oil crisis but its popularity has been inversely proportional to gasoline prices, and especially after the oil price increases of 2004-2006, the V6 engine has become more common. In many cases, V6s were derived from V8 designs by removing two cylinders without changing the V-angle, as a result of which they can be built on the same assembly lines as the V8, and with modern computer-aided design they can be made almost as smooth. In modern times, V8s are generally limited to more powerful rear-wheel drive sports cars, luxury cars, pickup trucks, and SUVs.

**Pioneers of the V8**

1903 - France - Clement Ader (for the Paris-Madrid Rally; 3 or 4 built, none sold)[1]

1905 - Britain - Rolls-Royce 3.5 L V-8

1910 - France - The De Dion-Bouton Co.

1914 - America - Cadillac's L-Head

**V angles**

The most common V angle for a V8 by far is 90°. This configuration produces a wide, low engine with optimal firing and vibration characteristics. Since many V6 and V10 engines are derived from V8 designs, they often use the 90° angle as well, but sometimes with balance shafts or more complex cranks to even the firing cycle.

However, some V8s use different angles. One notable example is the Ford/Yamaha V8 used in the Ford Taurus SHO. It was based on Ford's Duratec V6 and shares that engine's 60° vee angle. A version of this engine is used by Volvo Cars as of 2005. In years past, Electro-Motive produced an 8 cylinder version of their model 567 Diesel locomotive engine, which has a 45 degree cylinder angle.

**Cross-plane and flat-plane**

There are two classic types of V8s which differ by crankshaft:

The cross-plane V8 is the typical V8 configuration used in American road cars. Each crank pin (of four) is at a 90° angle from the previous, so that viewed from the end the crankshaft forms a cross. The cross-plane can achieve very good balance but requires heavy counterweights on the crankshaft. This makes the cross-plane V8 a slow-revving engine that cannot speed up or slow down very quickly compared to other designs, because of the greater rotating mass. While the firing of the cross-plane V8 is regular overall, the firing of each bank is LRLLRLRR; this leads to the need to connect exhaust pipes between the two banks to design an optimal exhaust system. This complex and encumbering exhaust system has been a major problem for single-seater racing car designers.

The flat-plane V8 design has crank pins at 180°. They are imperfectly balanced and thus produce vibrations unless balance shafts are used, with a counter rotating pair flanking the crankshaft to counter 2nd order vibration transverse to the crankshaft centerline. As it does not require counterweights, the crankshaft has less mass and thus inertia, allowing higher rpm and quicker acceleration. The design was popularized in modern racing with the Coventry Climax 1.5 L V8 which evolved from a cross-plane to a flat-plane configuration. Flat-plane V8s on road cars come from Ferrari (the Dino), Lotus (the Esprit V8), and TVR (the Speed Eight). This design is popular in racing engines, the most famous example being the Cosworth DFV.

In 1992, Audi left the German DTM racing series after a controversy around the crankshaft design of their V8-powered race cars. After using the road car's cross-plane 90°-crankshaft for several years, they switched to a flat-plane 180° version which they claimed was made by "twisting" a stock part. The scrutineers decided that this would stretch the rules too far.

The cross-plane design was neither obvious nor simple to design. For this reason, most early V8 engines, including those from De Dion-Bouton, Peerless, and Cadillac, were flat-plane designs. In 1915, the cross-plane design was proposed at an automotive engineering conference in the United States, but it took another eight years to bring it to production. Cadillac and Peerless (who had hired an ex-Cadillac mathematician for the job) applied for a patent on the cross-plane design simultaneously, and the two agreed to share the idea. Cadillac introduced their "Compensated Crankshaft" V8 in 1923, with the "Equipoised Eight" from Peerless appearing in November of 1924.