



Fig. 16 Crankshaft

cooling air is utilized more efficiently, as the air is not circulated over the cooler crankcase end of the barrel where it is not needed.

#### Crankshaft

The natural crank throw arrangement for an opposed cylinder six is in three pairs, with the members of a pair spaced 180 degrees apart. The pairs are disposed 120 degrees from each other. With such an arrangement the shaft is inherently in balance. This crankpin disposition effects a considerable saving in weight, and counterweights are not considered necessary. The design adopted results in a crankshaft which weighs only 22 pounds.

The short stroke of 2.6 inches allows the use of minimum main journal and crankpin diameters. Journal overlap of .65 inch produces adequate stiffness.

Manufacture of the crankshaft could have become a major headache if the forge shop had depended on twisting to get the crankpins in position. This operation would have been more involved than for a V-8 crankshaft, because twisting in two directions would have been necessary. Engineering and the

forge shop were able to cooperatively produce a design whereby the shaft is forged with all pins in position.

At the outset it was decided that the crankshafts would be mass centered before the final balancing operation, so that the locations for drilling could be closely controlled. Four pads are forged on the crossover arm between crankpins number 1 and 2 and on the arm between pins 5 and 6 (Fig. 16).

Final balance is achieved by drilling in these pads, which are 90 degrees apart; with the location of the holes fixed, the depth of the drilled holes is the only vari-

able in correcting unbalance.

Lubrication of connecting rods by means of drilled holes from main journals to the connecting rod journals involved no unusual problems. Drilling in the shaft is somewhat similar to that in other Chevrolet crankshafts.

Peak torsional vibration amplitude of the crankshaft system is 0.5 degree (Fig. 17); therefore no damper is required. A flexible flywheel is used to mount the clutch in order to prevent bending resonance in the power train.

#### Timing Gears and Accessory Drive

Since the Corvair transmission is forward of the engine, the normal location of the timing gears would be at the rear of the engine. However, with the camshaft below the crankshaft, a gear on the rear end of the camshaft would encroach on the departure angle of the vehicle and would be vulnerable to damage. The alternative was to place the camshaft drive at the forward or power take-off end. This arrangement has proved to be completely satisfactory. In fact, the timing gears are not subject to the tooth wear that sometimes occurs because of crankshaft torsional movements, since at the

flywheel end the rotational speed is more stable. Another deviation from standard practice is that the crankshaft timing gear and flywheel flange are made in one piece. A heavy press fit on the



Fig. 18 Camshaft

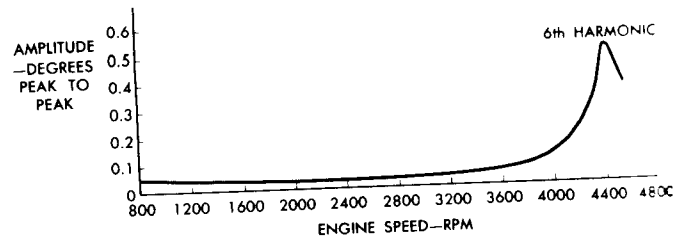


Fig. 17 Crankshaft Torsional Vibration

straight front end of the shaft provides reliable attachment. Although the gear is keyed on the shaft for positive timing, the drive is through the press fit.

Drive for the distributor, oil pump, and fuel pump is from the crankshaft. A helical gear at the rear end of the crankshaft mates with the distributor driven gear. The driving load imposed by cold oil necessitates the use of a carburized steel gear on the distributor and a bronze driving gear on the crankshaft. Camshaft drive for the distributor and oil pump is not practical because of insufficient space below the camshaft.

The conical eccentric from which the fuel pump operates is adjacent to the distributor drive gear. A new fuel pump was developed with short stroke to run at crankshaft speed. It is operated directly from the push rod, eliminating the conventional rocker arm.

#### Camshaft

The camshaft, simplified by virtue of the fact that the accessories are run by the crankshaft, is unusual also in that it has only nine cams, instead of 12 like the familiar 6-cylinder engine camshaft (Fig. 18). Only three exhaust valve

cams are needed. With the symmetrical arrangement of intake and exhaust valves in the head the bank offset allows the exhaust lifters of opposite cylinders to operate on a common cam of dou-