

14

# Gasoline Engine Operation

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14 GASOLINE ENGINE OPERATION

**FIGURE 14.1** The rotating assembly for a V-8 engine that has eight pistons and connecting rods and one crankshaft.



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**FIGURE 14.2** A Ford flathead V-8 engine. This engine design was used by Ford Motor Company from 1932 through 1953. In a



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14 GASOLINE ENGINE OPERATION

**FIGURE 14.3** A cylinder head with four valves per cylinder, two intake valves (larger) and two exhaust valves (smaller).



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**FIGURE 14.4** The coolant temperature is controlled by the thermostat, which opens and allows coolant to flow to the radiator when the temperature reaches the rated temperature of the thermostat.



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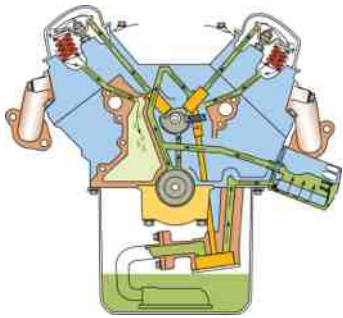
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14 GASOLINE ENGINE OPERATION

**FIGURE 14.5** A typical lubrication system, showing the oil pan, oil pump, oil filter, and oil passages.



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**14 GASOLINE ENGINE OPERATION**

**FIGURE 14.6** The downward movement of the piston draws the air-fuel mixture into the cylinder through the intake valve on the intake stroke. On the compression stroke, the mixture is compressed by the upward movement of the piston with both valves closed. Ignition occurs at the beginning of the power stroke, and combustion drives the piston downward to produce power. On the exhaust stroke, the upward-moving piston forces the burned gases out the open exhaust valve.

**THE INTAKE STROKE**      **THE COMPRESSION STROKE**

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**14 GASOLINE ENGINE OPERATION**

**FIGURE 14.6 (Continued)** The downward movement of the piston draws the air-fuel mixture into the cylinder through the intake valve on the intake stroke. On the compression stroke, the mixture is compressed by the upward movement of the piston with both valves closed. Ignition occurs at the beginning of the power stroke, and combustion drives the piston downward to produce power. On the exhaust stroke, the upward-moving piston forces the burned gases out the open exhaust valve.

**THE POWER STROKE**      **THE EXHAUST STROKE**

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**14 GASOLINE ENGINE OPERATION**

**FIGURE 14.7** Cutaway of an engine showing the cylinder, piston, connecting rod, and crankshaft.

**PISTON**  
**CONNECTING ROD**  
**CRANKSHAFT**

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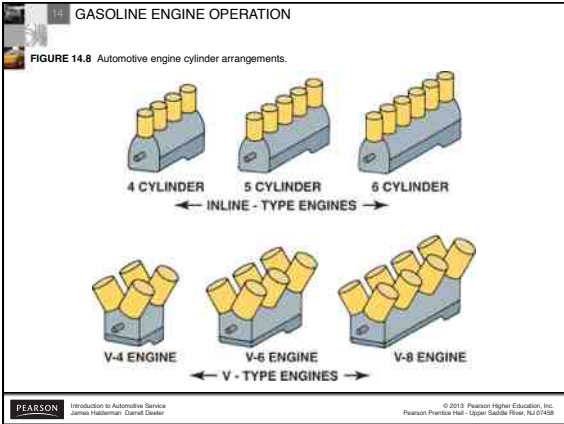
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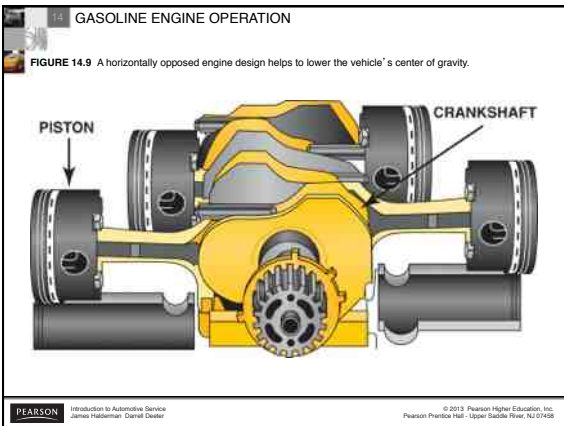
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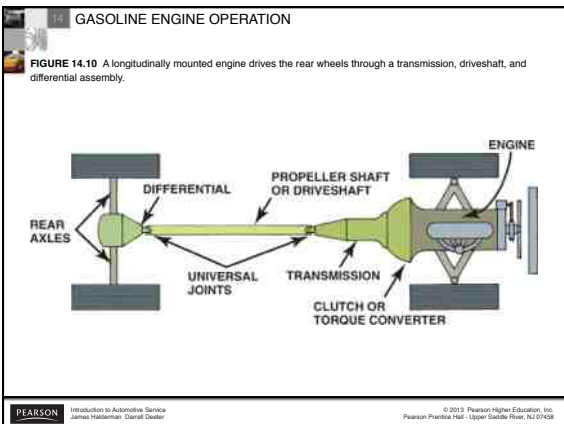
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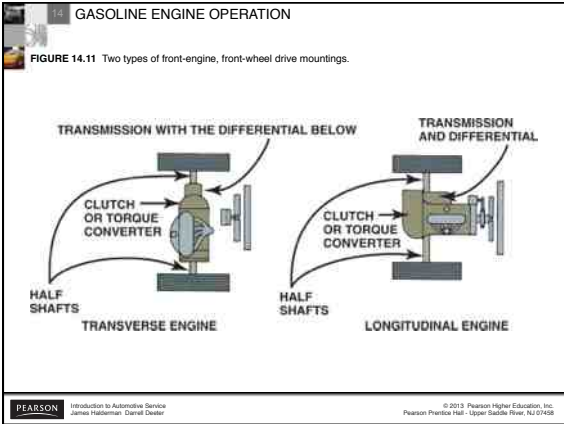
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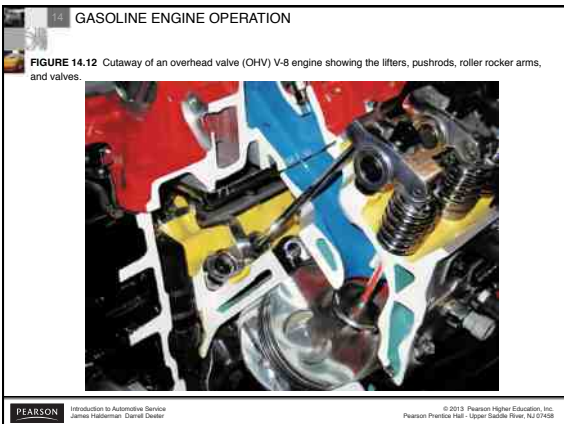
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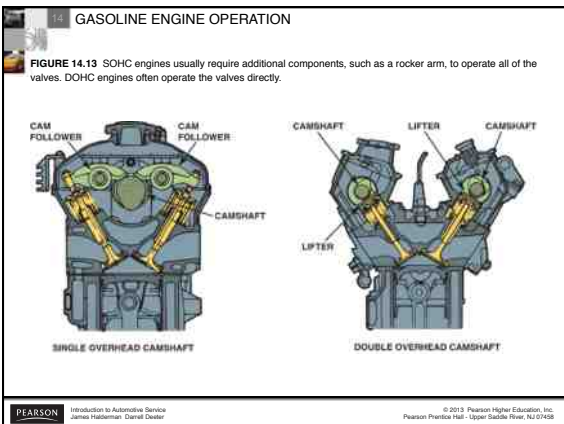
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14 GASOLINE ENGINE OPERATION

**FIGURE 14.14** A DOHC engine uses a camshaft for the intake valve and a separate camshaft for the exhaust valves in each cylinder head.



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**FIGURE 14.15** A supercharger on a Ford V-8.



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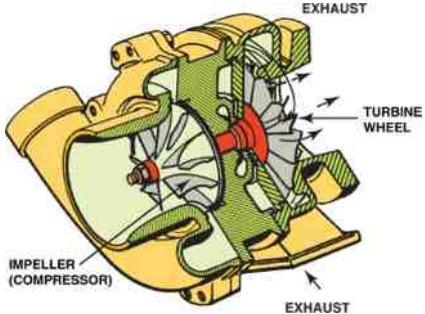
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14 GASOLINE ENGINE OPERATION

**FIGURE 14.16** A turbine wheel is turned by the expanding exhaust gases.



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**14 GASOLINE ENGINE OPERATION**

**FIGURE 14.17** A rotary engine operates on the four-stroke cycle but uses a rotor instead of a piston and crankshaft to achieve intake, compression, power, and exhaust stroke.

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**14 GASOLINE ENGINE OPERATION**

**FIGURE 14.18** The bore and stroke of pistons are used to calculate an engine's displacement.

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**14 GASOLINE ENGINE OPERATION**

**FIGURE 14.19** The distance between the centerline of the main bearing journal and the centerline of the connecting rod journal determines the stroke of the engine. This photo is a little unusual because it shows a V-6 with a splayed crankshaft used to even out the impulses on a 90°, V-6 engine design.

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**14.1 GASOLINE ENGINE OPERATION**

**FIGURE 14.20** Compression ratio is the ratio of the total cylinder volume (when the piston is at the bottom of its stroke) to the clearance volume (when the piston is at the top of its stroke).

COMPRESSION RATIO = 8:1

CYLINDER VOLUME

Piston Displacement

CLEARANCE VOLUME

BOTTOM DEAD CENTER

TOP DEAD CENTER

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**14.1 GASOLINE ENGINE OPERATION**

**FIGURE 14.21** Torque is a twisting force equal to the distance from the pivot point times the force applied expressed in units called pound-feet (lb-ft) or Newton-meters (N-m).

1 FOOT

10 POUNDS

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