LESSON
10.1

NAME ______________________ DATE __________

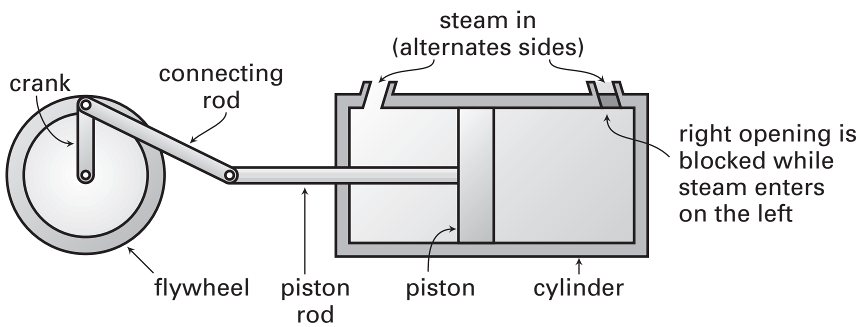
Available as a transparency

Application Lesson Opener

For use with pages 595–602

The steam engine was the first effective machine for producing power independently of human and animal muscle, wind, or flowing water. James Watt was a Scottish inventor and engineer whose improvements to the steam engine in the late 1700s were key technological foundations of the Industrial Revolution. One of his improvements was a "double-acting" engine, in which steam powered a piston in both directions of its movement. This made it possible to attach a rod to a crank to produce rotary (circular) motion. This, in turn, made the engine useful for running machinery or even driving the wheels of a carriage or the paddles of a riverboat. By the end of the 18th century, the steam engines designed by Watt were providing power for factories, mills, and pumps both in Europe and America.

The diagram shows some key parts of a simple steam engine. A sliding valve (not shown) lets steam in on the left (pushing the piston to the right) and then lets steam in on the right (pushing the piston to the left.)



1. As the piston moves back and forth in the cylinder, the flywheel rotates. In the diagram, the crank points up while the piston is in the center of the cylinder. Draw diagrams of 90°, 180°, and 270° clockwise rotations of this crank. In each diagram label the position of the piston. (Note that the piston rod remains horizontal.)

2. The length of the crank (or the radius of the flywheel) is called the *throw* of the crank. How does the throw of the crank relate to the distance the piston moves? Give an example.