
**Operating Theory For A
4 Cycle Gas Powered
Engine**

Table Of Contents

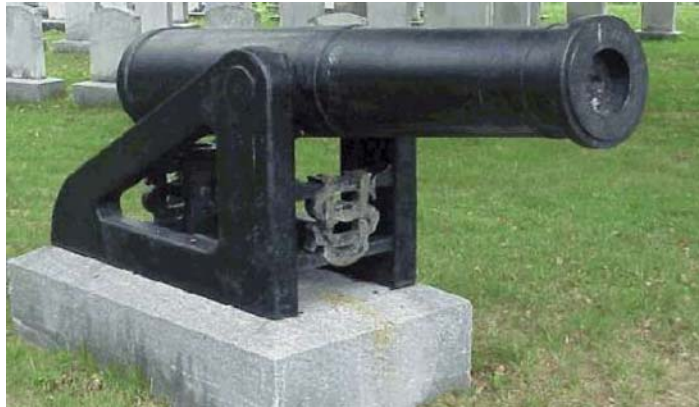
Section Title

Page Number

ENGINE OPERATING PRINCIPLE	3
ENGINE PARTS AND TERMS	4
FOUR STROKE CYCLE	8
INTAKE STROKE	9
COMPRESSION STROKE	10
POWER STROKE	10
EXHAUST STROKE.....	11
THE CYCLE.....	11

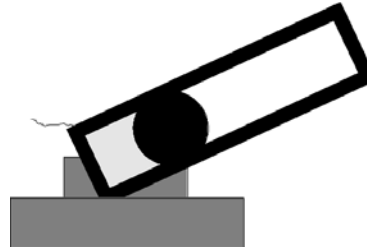
ENGINE OPERATING PRINCIPLE

The principle which causes the ball to fly out of the cannon also causes a small engine to run.



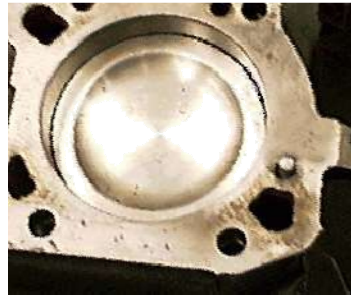
ENGINE OPERATING PRINCIPLE

When the wick of the cannon is lit, it ignites the gunpowder. As the gunpowder burns it expands, this builds up the pressure behind the ball and forces it out of the cannon.



Instead of a cannon barrel the engine has a cylinder and instead of a cannon ball the engine uses a piston.

Instead of a cannon barrel the engine has a cylinder and instead of a cannon ball the engine uses a piston.



ENGINE PARTS AND TERMS

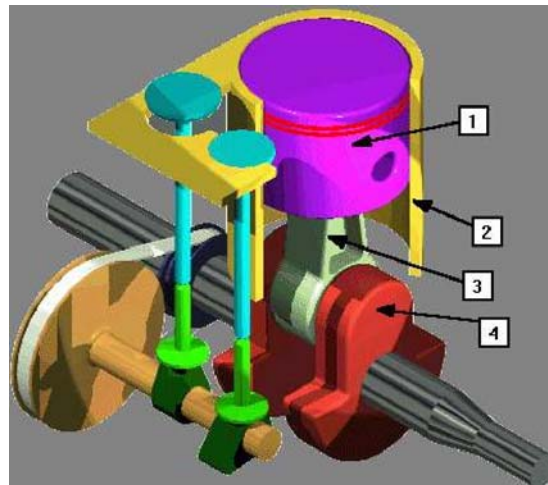
Even though most small 4 cycle engines look different from each other they are still made of the same main parts or sections.

Knowing these parts and what they do will help you better understand how to repair and service the engine.

Some of the main parts are shown below.

[1] Piston [2] Cylinder [3] Connecting Rod [4] Crankshaft

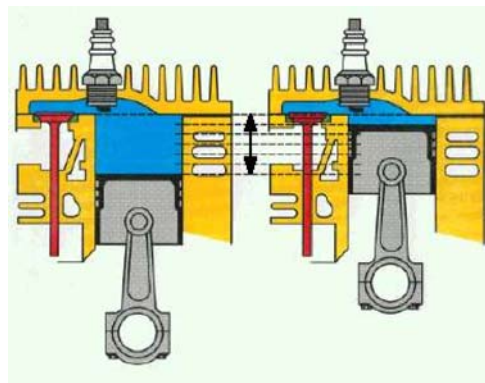
You should be able to locate these parts on your engine.



The lowest piston position is called Bottom Dead Center.

The highest piston position is called Top Dead Center.

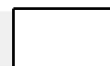
The distance between these two positions is called the Stroke.



What modifications might be done to an engine to make it more powerful?



Sign up to have your work checked, then proceed.



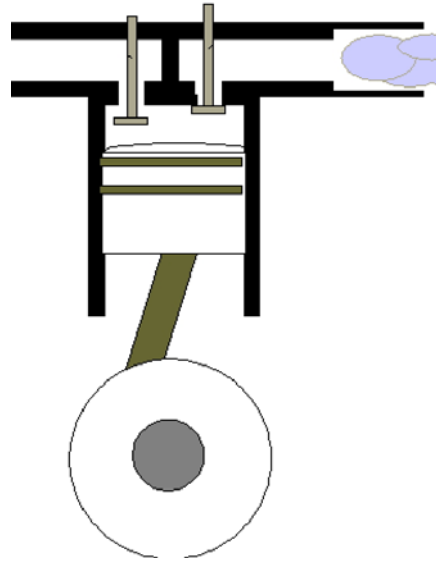
**Instructor's
Initial**

Refer to pages 8 to 16 in the Mechanics of Small Engines Textbook.

Look at the diagrams and read all the descriptions carefully.

QUESTIONS

- 1) What very important part is missing from the diagram.



- 2) Which statement below best describes the camshaft.
- A) Closes the valve.
 - B) Creates electricity for a spark.
 - C) Travels up and down in the cylinder.
 - D) Housing for the crankshaft.
 - E) Large hole where the piston travels.
 - F) Opens the valves.
 - G) Allows burnt gases out of the cylinder.
 - H) Connects the piston & crankshaft.
 - I) Allows fuel into the cylinder.
 - J) Cause the crankshaft to rotate smoothly
 - K) Mixes the air and fuel together.

- 3) Which statement below best describes the exhaust valve.
- A) Closes the valve.
 - B) Creates electricity for a spark.
 - C) Travels up and down in the cylinder.
 - D) Housing for the crankshaft.
 - E) Large hole where the piston travels.
 - F) Opens the valves.
 - G) Allows burnt gases out of the cylinder.
 - H) Connects the piston & crankshaft.
 - I) Allows fuel into the cylinder.
 - J) Cause the crankshaft to rotate smoothly
 - K) Mixes the air and fuel together.

- 4) Which statement below best describes the flywheel.
- A) Closes the valve.
 - B) Creates electricity for a spark.
 - C) Travels up and down in the cylinder.
 - D) Housing for the crankshaft.
 - E) Large hole where the piston travels.
 - F) Opens the valves.
 - G) Allows burnt gases our of the cylinder.
 - H) Connects the piston & crankshaft.
 - I) Allows fuel into the cylinder.
 - J) Cause the crankshaft to rotate smoothly
 - K) Mixes the air and fuel together.

- 5) Which statement below best describes the magneto.
- A) Closes the valve.
 - B) Creates electricity for a spark.
 - C) Travels up and down in the cylinder.
 - D) Housing for the crankshaft.
 - E) Large hole where the piston travels.
 - F) Opens the valves.
 - G) Allows burnt gases out of the cylinder.
 - H) Connects the piston & crankshaft.
 - I) Allows fuel into the cylinder.
 - J) Cause the crankshaft to rotate smoothly
 - K) Mixes the air and fuel together.

----- End Of Questions -----

Refer to pages 123 to 129 in the Mechanics of Small Engines Textbook.

Look at the diagrams and read all the descriptions carefully.

You should be able to explain why governors are installed in small engines.

You should be able to name two types of governors used on small engines.

Exercise:

Use the model of the mechanical governor to explain to the instructor how a governor works.



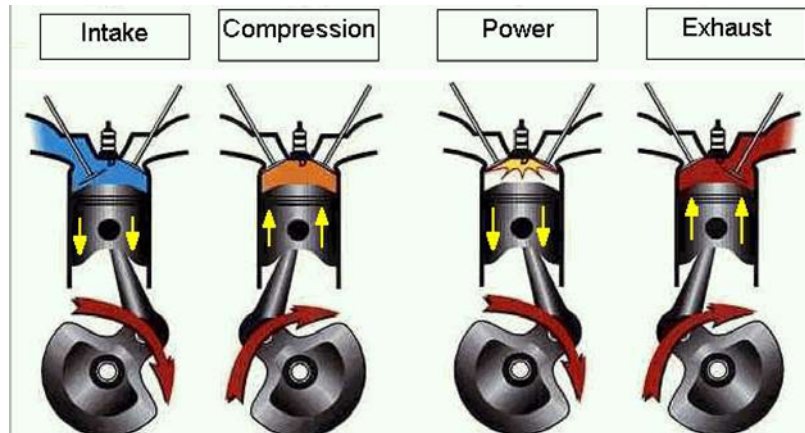
Sign up to have your work checked, then proceed.

**Instructor's
Initial**

FOUR STROKE CYCLE

Many small gasoline engines operate on a process known as the four stroke cycle.

This means the piston must move up or down four times in order for the process to be completed.



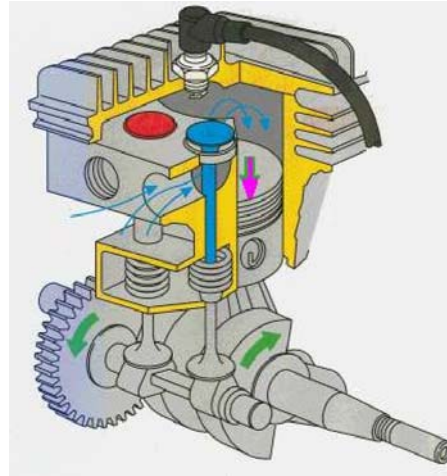
INTAKE STROKE

The purpose of the Intake Stroke is to fill the cylinder with fresh fuel.

During this stroke the intake valve is open.

The crankshaft rotates causing the piston to move down. This produces a low pressure area in the cylinder.

Atmospheric pressure pushes the air/fuel mixture through the intake port, past the intake valve and into the cylinder.



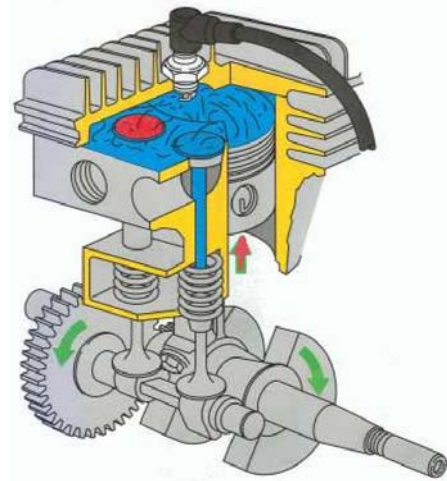
COMPRESSION STROKE

The purpose of the Compression Stroke is to squeeze the air fuel mixture into a small space, this will encourage rapid burning.

During this stroke the intake and exhaust valves are closed.

The crankshaft rotates causing the piston to move up.

The air fuel mixture is squeezed into the small space at the top of the cylinder.

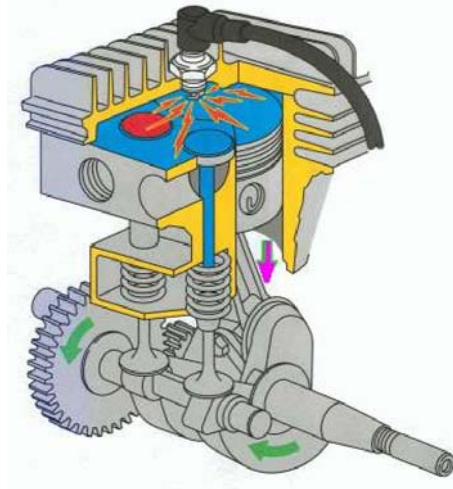


POWER STROKE

During the Power Stroke the intake and exhaust valves are closed.

A spark occurs at the spark plug. The fuel is ignited and begins to burn.

The burning fuel expands, pushing the piston downward. This causes the crankshaft to rotate.



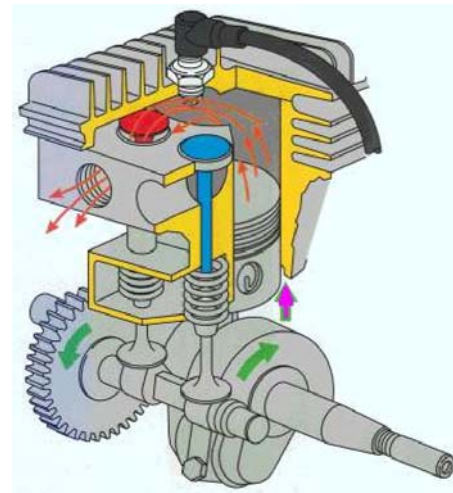
EXHAUST STROKE

The purpose of the Exhaust Stroke is to remove the burnt fuel from the combustion chamber.

During this stroke the exhaust valve is open.

The crankshaft rotates causing the piston to move up. This produces a high pressure area in the cylinder.

The burnt fuel is pushed past the exhaust valve, through the exhaust port and out of the engine.



THE CYCLE

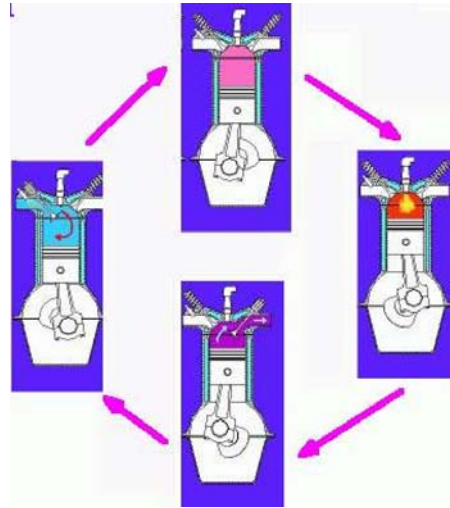
The engine continues to cycle through the four strokes as long as it is running.

Intake, Compression, Power, Exhaust

Intake, Compression, Power, Exhaust

Intake, Compression, Power, Exhaust

Intake, Compression, Power, Exhaust



Review the diagrams and the position of the valves in each diagram of the four stroke cycle in the previous steps.

Rotate the cutaway automobile engine to position the first piston so that it is on the compression stroke. Be prepared to explain to the instructor why you feel this is the compression stroke.



Sign up to have your work checked, then proceed.

**Instructor's
Initial**