Unit C: Agricultural Power Systems

Lesson 2: Identifying Engine Systems and Their Components

Terms

- Accessory systems
- Air cleaner
- Air cooled system
- Air intake system
- Battery-type ignition systems
- Breaker point-type battery system
- Breaker points
- Camshafts
- Carburetor
- Compression ignition system
- Condenser
- Cylinder head
- Distributor

Terms (continued)

- Distributor cam
- Electronic fuel injection systems
- Engine cooling system
- Exhaust manifold
- Exhaust system
- Exhaust valves
- Flywheel
- Fuel filter
- Fuel injection systems
- Fuel system
- Head gaskets
- Ignition coil

Terms (continued)

- Ignition system
- Intake valves
- Liquid cooling system
- Lubrication system
- Magneto-type ignition systems
- Mechanical fuel injection systems
- Operating systems
- Piston rings
- Primary system
- Pushrods

Terms (continued)

- Radiator
- Spark ignition systems
- Spring retainers
- Starting system
- Thermostat
- Valve guides
- Valve springs
- Water pump

Three categories of engine systems

- Primary system – creates the engine compression and converts the energy of combustion to mechanical energy
- Operating systems – perform the other engine functions i.e. Electrical system
- Accessory systems – are not necessary for engine operation i.e. Power steering system

Purpose of a compression system

- **To efficiently compress air to increase the potential energy resulting form the combustion of the fuel**

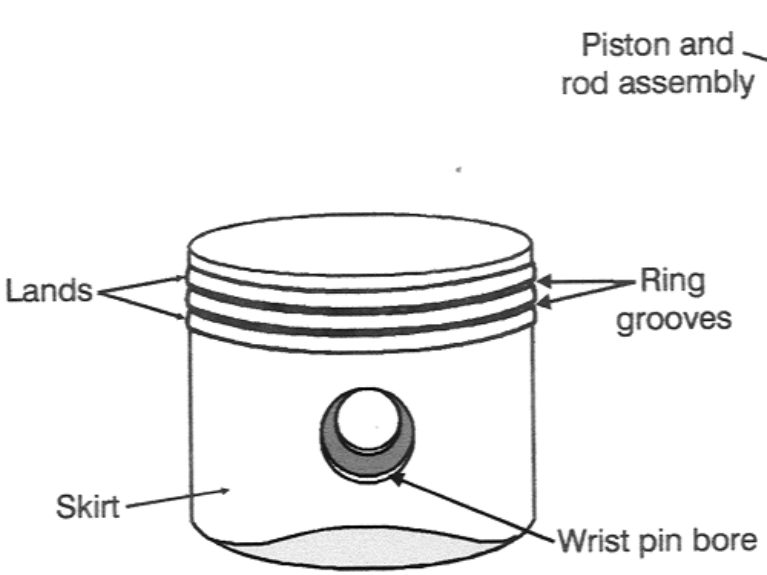
Combustion is usually lost in one of three places:

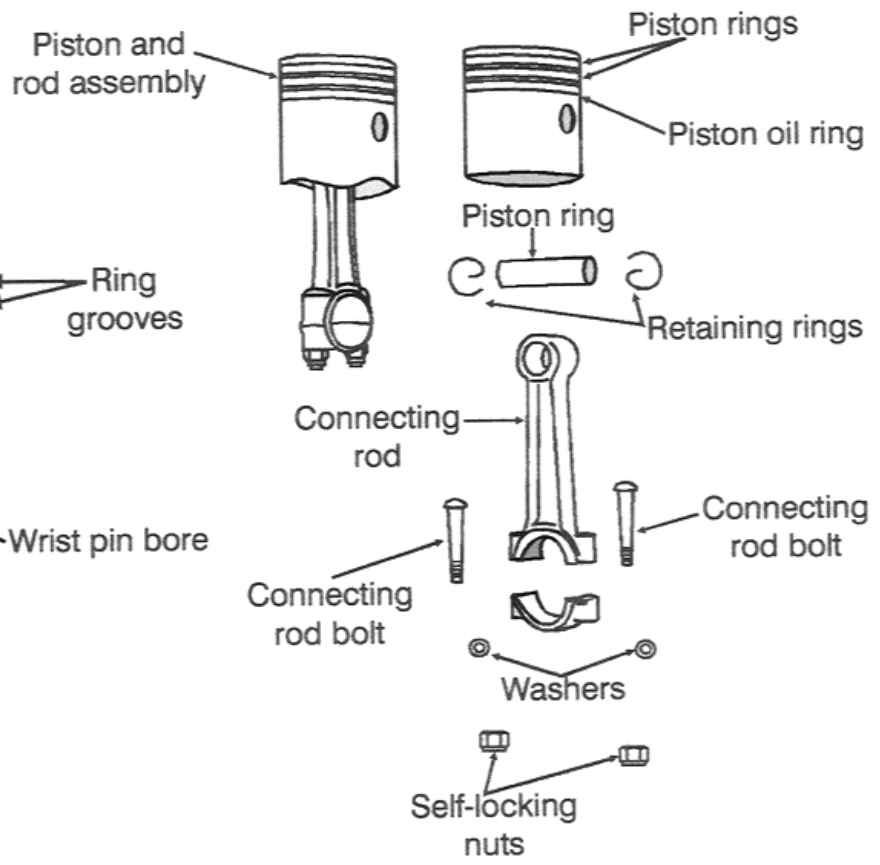
- Fit of the piston to the cylinder
- Head gasket
- Valves

Components of the compression system

- Piston – machined from lightweight alloys
- **Piston Rings** – made of cast iron and/or steel
  - Compression rings
  - Oil rings

Piston Rings





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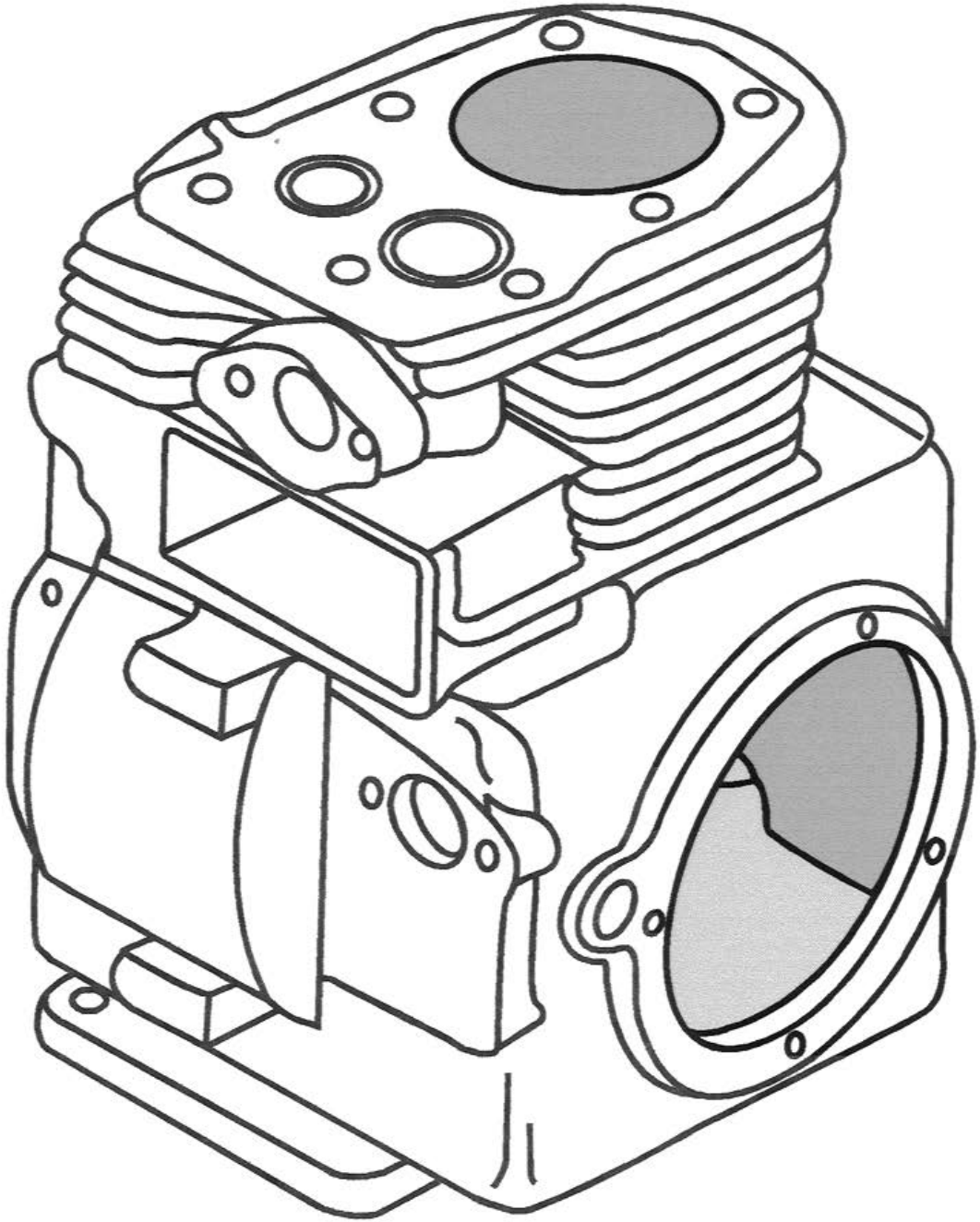
Components (continued)

- **Head gaskets** – provide a seal between the cylinder head and the cylinder block
- **Cylinder head** – forms the top of the combustion chamber
- Cylinder block – houses the cylinders and crankshaft

Cylinder Block



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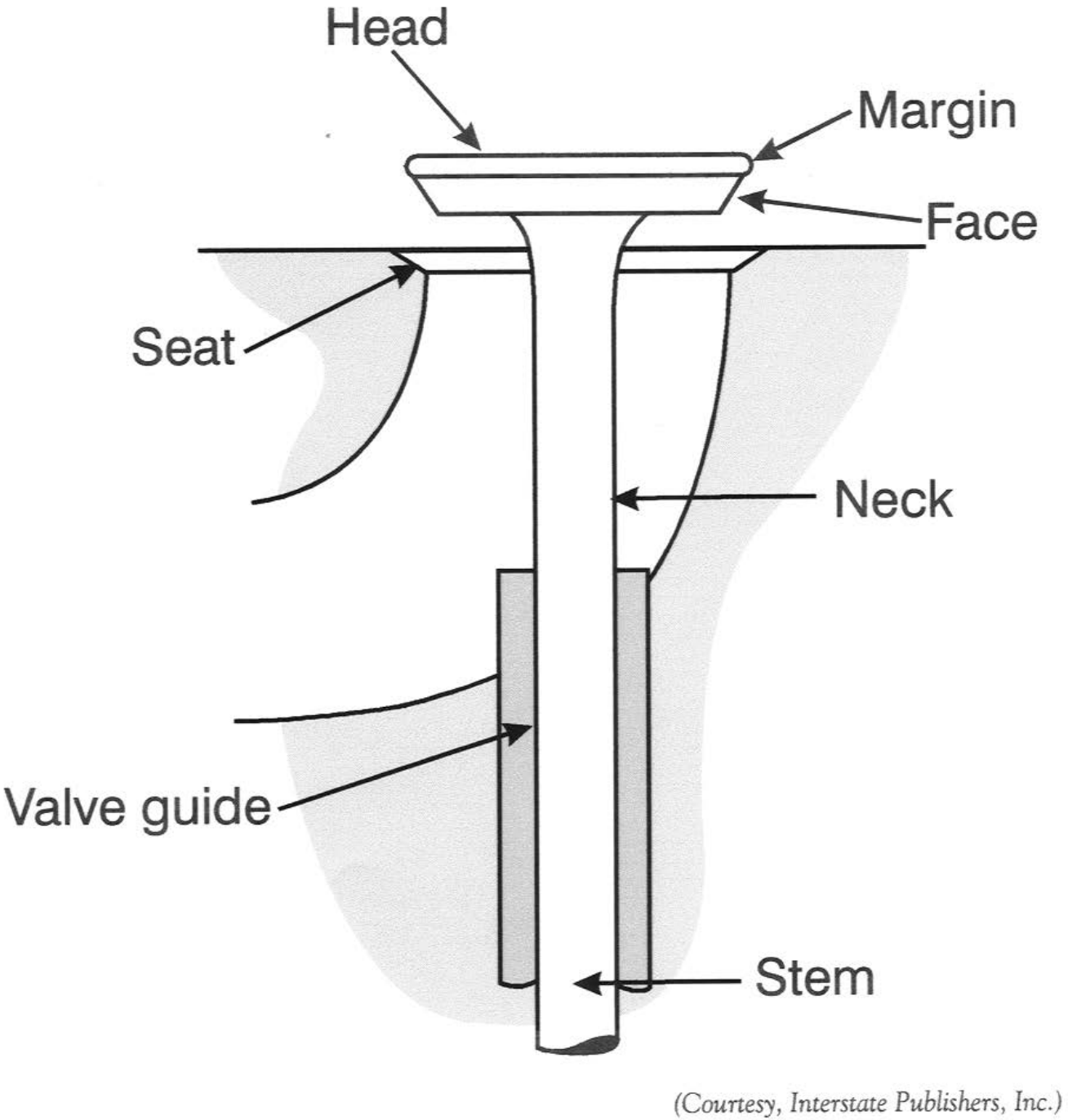
Components (continued)

- Valves –
  - **Intake valves** – open and seal the intake ports
  - **Exhaust valves** – open and seal the exhaust ports
  - **Valve springs** – both close the valves and hold them open
  - **Spring retainers** – hold the springs on the end of the valves

Components (continued)

- Valves –
  - **Valve guides** – support the valve stem as the valve moves back and forth
  - **Camshafts** – open and close the valves
  - **Pushrods** – transfer the rotating movement of the camshaft to the linear movement of the valves

Parts of an engine valve



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Operating System Components

- **Air intake system** – provides a source of clean air necessary for combustion
- **Fuel system** – delivers clean and adequate amounts of fuel to the cylinder
- **Exhaust system** – removes the exhaust gases and particles from the combustion chamber

Operating System Components (continued)

- **Engine cooling system** – manages the heat produced by the combustion of the air-fuel mixture
- **Ignition System** – starts the combustion of the air-fuel mixture

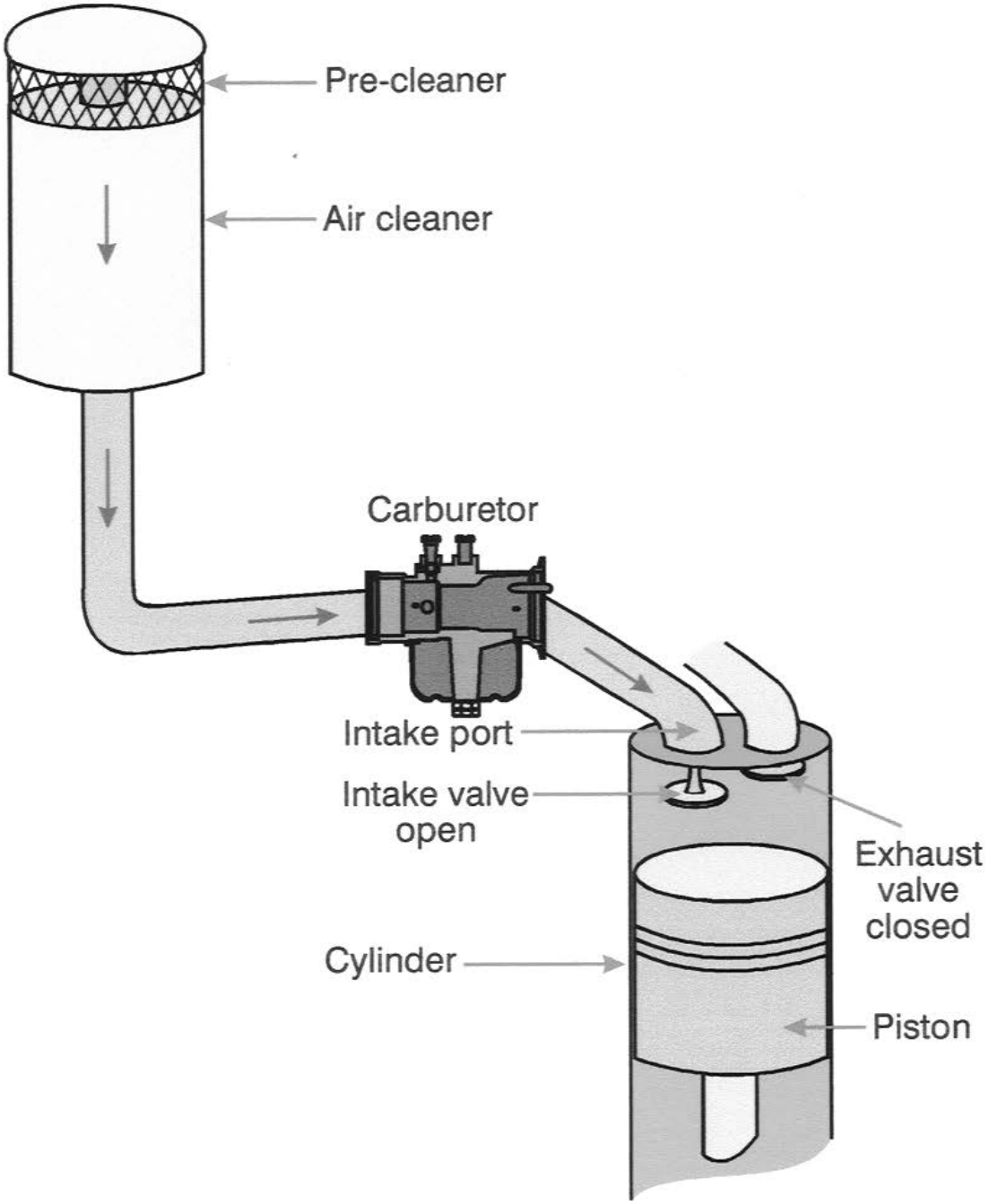
Operating System Components (continued)

- **Lubrication system** – deeps internal engine parts coated with oil to reduce friction, enhance cooling, seal internal engine components, and clean internal parts
- **Starting system** – used to turn the engine crankshaft until the engine starts

Air intake system

- Air must first be cleaned by passing through the **air cleaner** – a filtering device
- Fuel and air are mixed in the **carburetor** – provides fuel and air to the engine in correct proportions and volume
- Fuel-air mixture enters the engine cylinder through intake valves

Parts of an air intake system



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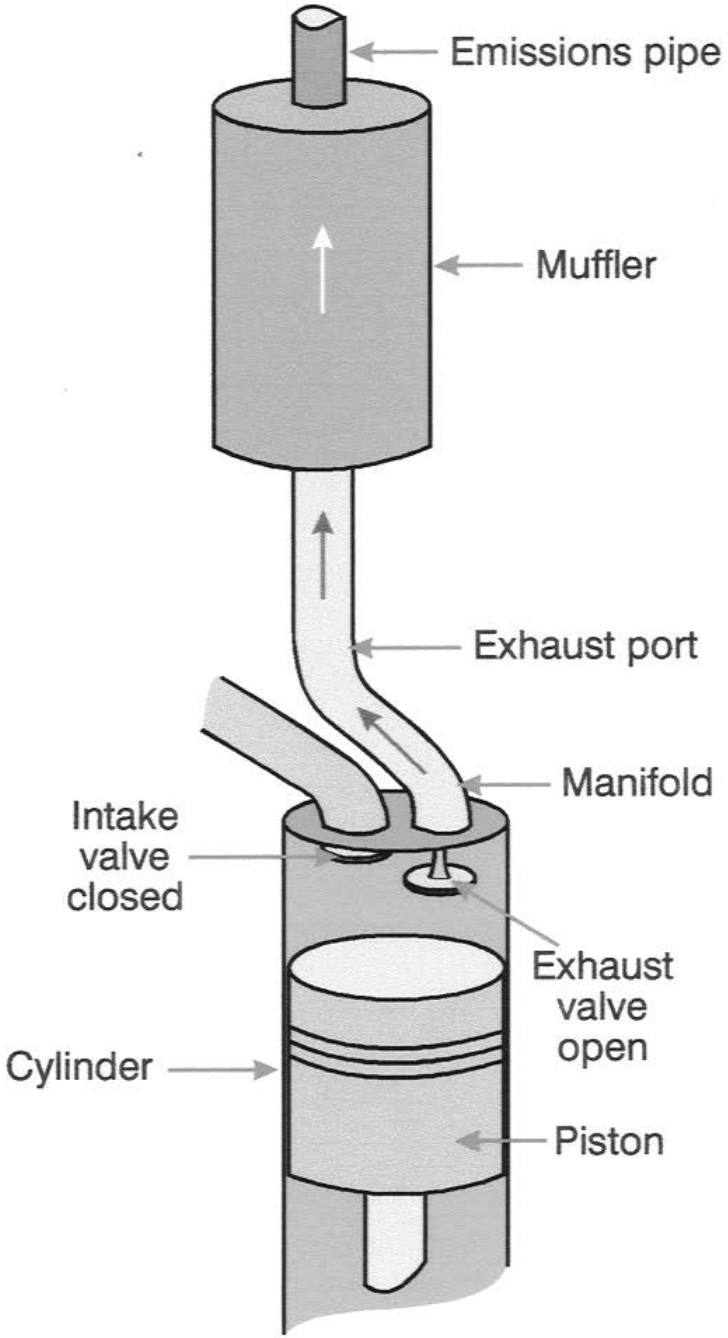
Fuel system

- Fuel tank stores fuel
- **Fuel filter** cleans the fuel that passes through it
- **Fuel injection system** inject fuel into the combustion chamber
  - **Mechanical fuel injection systems**
  - **Electronic fuel injection systems**

Exhaust system

- **Exhaust manifold** – collects gasses from one or more individual cylinders
- Exhaust pipe connects exhaust manifold to the muffler
- Muffler is the sound deadening device used to quite engine operations

Parts of an exhaust system



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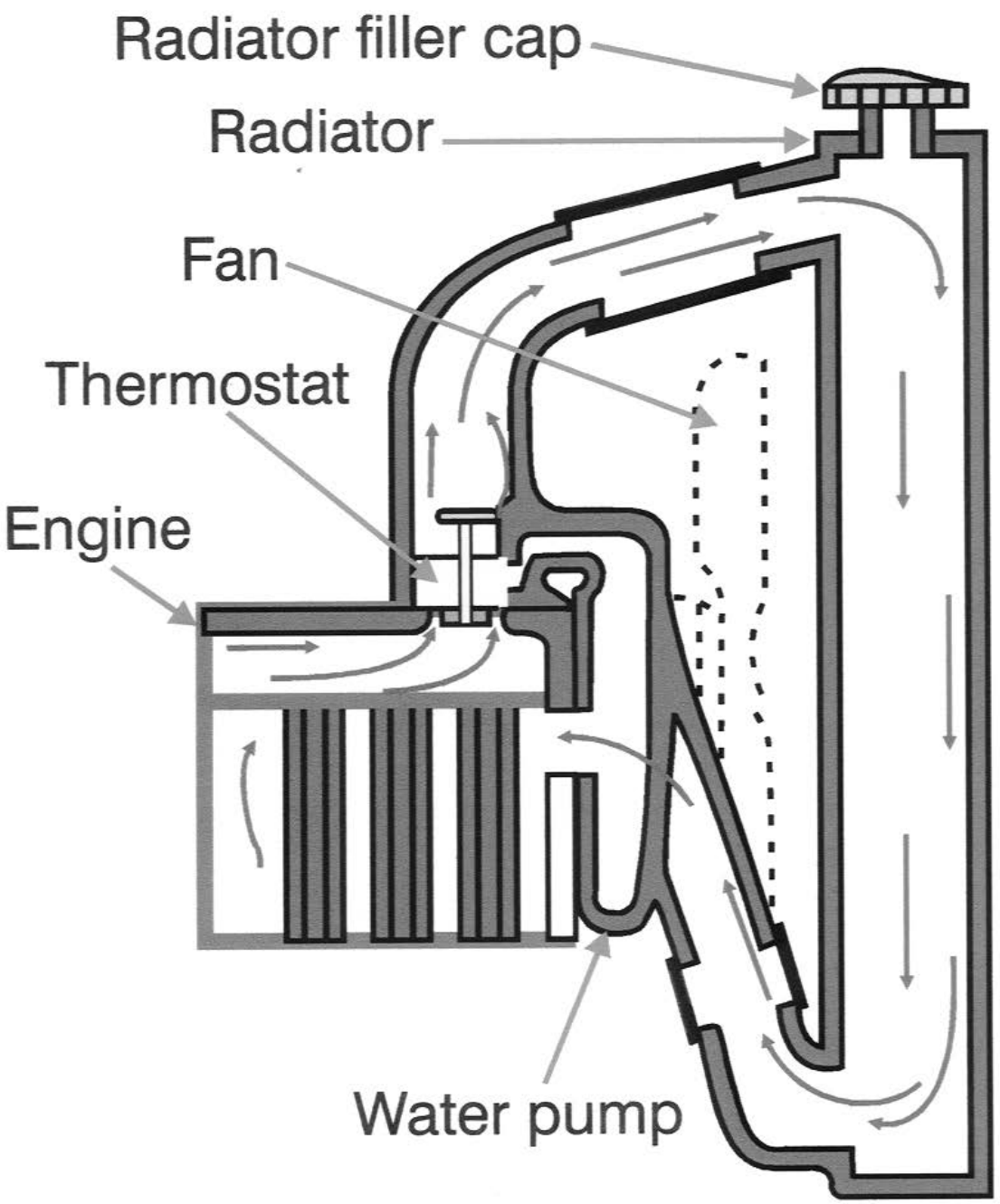
Engine cooling system

- **Liquid cooling system** – uses a liquid to transfer heat from engine components to the surrounding air
- **Air-cooled system** – transfers the heat of the engine components directly to the surrounding air

Components of a liquid cooling system

- **Radiator** – a heat transfer device
- **Water pump** – forces the coolant to flow thorough the system
- **Thermostat** – a flow control valve
- Additional components: radiator cap, water jacket, fan, fan belt, and temperature gage

Parts of a liquid cooling system



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Ignition system

- **Compression ignition system** – does not consist of any unique parts
- **Spark Ignition systems** – uses high voltage electrical spark to ignite the compressed air and fuel mixture

Spark ignition systems

- **Magneto–type ignition systems** – use magnets and coils to generate electrical pressure to ark the spark plug
- **Battery-type ignition systems** - use the energy from a battery and/or alternator to create the ignition spark

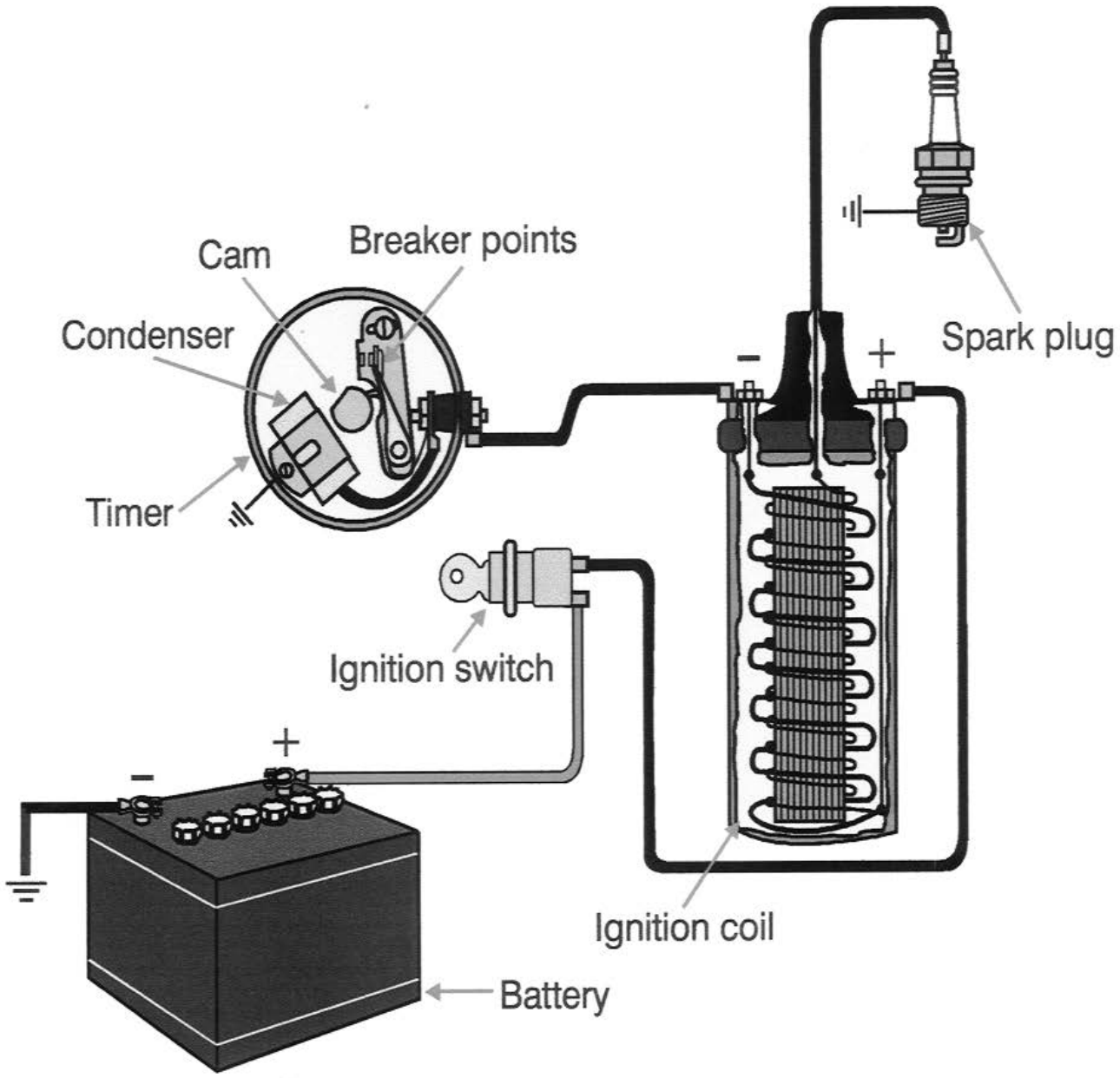
Battery-type ignition systems

- **Breaker point-type battery system** – an ignition switch begins the process
- **Ignition coil** – converts low battery voltage to high voltage
- **Distributor** – sends the high voltage current to the correct spark plug
- **Condenser** – function as a capacitor which stores electrical energy

Battery-type ignition systems (continued)

- **Breaker points** – provide a switch to initiate the spark in the engine
- **Distributor cam** –controls the opening and closing of the breaker points, and regulates through the distributor rotor the timing of the engine spark

Breaker point-type battery ignition system



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Lubrication system

- **Oil filter – removes dirt particles from oil**
- **Pressure regulator – maintains the operating pressure of the system**
- **Sump – a reservoir for the engine oil**
- **Oil pump – circulates oil through the engine**

Starting system

- **Manual – manually turning the crankshaft – rope starter**
- **Electrical – solenoid-type switch controls the voltage going to the starter**
  - **Flywheel** – a gear which is attached to the crankshaft

Review/Summary

- What are the three categories of internal combustion engine systems?
- Identify the components of the primary or compression system
- What components make up an engine's operating system?