Automotive Ignition System

Components:

- Battery
- Coil (primary and secondary circuits)
- Distributor (rotor, breaker points, capacitor)
- Spark Plugs

With the battery connected and the distributor breaker points closed, current flows through the primary circuit of the coil, setting up a strong magnetic field. The magnetic field envelops the thousands of turns of fine wire and soft iron core in the secondary circuit of the coil.

When the breaker points open, the primary current is interrupted, and the magnetic field collapses rapidly. This induces a high voltage in the coil secondary circuit. The high voltage is conducted to the center distribution terminal of the distributor.

At the same time the breaker points open to induce a high voltage in the coil secondary circuit, the distributor rotor is also turns so that the high voltage reaching the distributor center terminal is conducted through the rotor to the terminal on the perimeter of the distributor cap that leads to the spark plug that should be firing at that time.
In addition to the high voltage that is induced in the coil secondary circuit when the breaker points open, a self-induced voltage is produced back in the primary circuit. Because the points are open, the self-induced voltage has no where to go except through a capacitor in the distributor to ground. A resonant circuit is created, alternatingly charging and discharging the capacitor through the primary windings of the coil. This in turn induces additional high-voltage pulses in the secondary winding that help prolong the spark crossing the plug gap to ground.

This happens thousands of times each minute (6,000 sparks per minute for a four-cylinder four-cycle engine turning 3000 rpm [3000 H 4 / 2]).