

## **From Touchholes to Percussion Caps: The Evolution of Firing Mechanisms**

Advances in firearm technology have often amounted to new ways to formulate or ignite gunpowder. All firearms, from the earliest cannons to modern handguns, work essentially the same way: gunpowder is ignited in a tube with a sealed end, and the expanding gases send a projectile flying out the other end.

The challenge, especially for early gunsmiths, was to find a method for loading and firing that was fast, reliable, and safe for the weapon's user.

### **Touchholes**

The earliest known firearm is a cannon made in thirteenth-century China. Similar weapons appear in European records from early in the subsequent century. These guns were simple metal or bamboo cylinders that fired balls, shot, or darts. The firing mechanism was straightforward: the gunner ignited the gunpowder inside the barrel using a slow match held on a long rod (called a "linstock") that was touched to a small hole in the sealed end.

Touchhole firing was adequate for fixed or wheeled artillery, but it was awkward for handheld weapons, since the gunner generally needed both hands to hold and aim the gun.

### **Matchlocks**

One of the biggest steps in the development of firearms was the invention of spring-loaded mechanisms that could ignite the charge at the pull of a trigger. The first spring-loaded locks were called "matchlocks," named after the slow-burning match cords they used. Developed in Europe in the fifteenth century, matchlocks used an S-shaped arm called a "serpentine" to apply the flame to the gunpowder. The serpentine held a lit match cord; when the gunner pulled the trigger, the serpentine snapped forward and ignited a pan of priming powder, which in turn set off the main charge inside the barrel.

Matchlocks were a big improvement over touchholes, but they had their drawbacks. A gunner in battle or on sentry duty had to keep their match cord constantly lit. A single sentry station could consume a mile of match cord each year, and keeping the flame burning was not always safe or easy. Rain or mud could easily snuff out the match, and the light and smell of a lit cord could give away a gunner's position, especially at night.

### **Flintlocks**

To eliminate the need for match cords, gunsmiths invented mechanical parts called "locks" that could create sparks to ignite the gunpowder. Several different varieties of mechanism were developed, but flintlocks offered a combination both reliability and efficiency.

In place of a match-holding serpentine, a flintlock employed a spring-loaded hammer that gripped a piece of flint. When the gunner pulled the trigger, the flint struck a hinged steel plate (called a "frizzen") above the priming pan, creating a spark that ignited the powder.

Flintlocks were the main firearms used by European armies from the mid-seventeenth to the mid-nineteenth centuries, but they were never adopted in Japan.

### **Percussion Caps**

A percussion cap is a small brass or copper charge of volatile chemicals that explodes when struck. A cap could be used in place of a spark or flame to ignite the powder charge. Caps were also more reliable, and cap-based firing mechanisms began to replace flintlocks in the first half of the nineteenth century.

Percussion caps were first used in muzzle-loading muskets and later in breech-loading rifles and pistols. Eventually, small, percussion-detonated primers became part of integrated cartridges, the ammunition used in modern firearms.