Smokeless Powder Encyclopedia Article

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Smokeless Powder

Smokeless powder was the long-sought successor to gunpowder, which had reigned as the chief military and commercial explosive for nearly 500 years. Advances in scientific knowledge and experimental methods created an environment ripe for new inventions by the mid-nineteenth century. Ironically, Ascanio Sobrero's (1812-1888) discovery of nitroglycerin--which would later become a key ingredient of smokeless powders--was largely overlooked when first introduced in 1846. Instead, it was Christian Schönbein 's formation of guncotton the same year which attracted widespread excitement for its powerful explosive properties.

To create guncotton, Schönbein, through a process termed nitrating, dipped cotton (cellulose) in nitric acid and sulfuric acid, and then removed the acids by washing the cotton with water. This explosive underwent a series of improvements culminating in French chemist Paul Vieille's (1833-1896) derivation of smokeless powder, or Poudre B, in 1884. Alfred Nobel's ballistite and Frederick A. Abel's cordite, discovered in 1888 and 1889, respectively, were other popular powders founded on the same principles of nitrating the mixture to a specific ratio, which encouraged rapid burning without explosion. Other early experimenters with smokeless powder include Prussian officer J. F. E. Schultze (1825-1874), who combined nitrated wood with potassium nitrate, and chemists at the Explosives Company in England, who treated guncotton with potassium nitrate, alcohol, and ether. Gunpowder's major drawbacks--its tendency to flash, smoke, and corrode, as well as its limited power--sparked all of these discoveries.

Unlike gunpowder which is a mixture of three commonly found elements, this new class of smokeless powders was based on an organic compound called nitrocellulose. Upon combustion, this compound produces a swift and predominantly gas reaction which enhances bullet propulsion. When nitroglycerin is added to nitrocellulose a hard gelatin may be formed, allowing for the precise formation of a wide range of charges. Perhaps most significantly, the invention of smokeless powder engendered related inventions in bullet and rifle technology such as longer, slimmer cartridges, magazines and repeating rifles, each of which took advantage of the powder's promotion of higher velocities, lower trajectories, and increased accuracy.