GUNPOWDER

By Bill Utley

Until the introduction of smokeless power, black powder (also called "gunpowder") was the sole propellant for artillery, long arms, and small arms. Commonly attributed to the Chinese, it may also have Arab or English origins. Certainly, the Chinese had made pyrotechnic powders before the 13th century, but the historical record is not clear about their composition. According to the Encyclopedia Britannica something like black powder was probably being used in Chinese pyrotechnics as a propellant by at least the 10th century. Sometime in the two decades thereafter, this form of black powder began to be used as a propellant for a primitive gun – initially a bamboo tube – to shoot arrows or metal pieces. By the 13th century, true artillery, made of brass or iron, was in use in China and Western Europe.

Black powder is a low explosive – that is it usually burns at less than 2500 feet per second. Black powder deflagrates – i.e. burns – rather than detonates. In simplest terms, low explosives burn in seconds per feet, while high explosive burn in feet per second. "Modern" black powder is composed of 75-76% potassium nitrate (saltpeter), 14-15% charcoal, and 9-10% sulphur. And while potassium nitrate, sulfur and charcoal are always the primary ingredients, manufacturers did and still do add small amounts of other substances. Before the 20th century, most countries used different formulations for black powder. Formulations and percentage, additives, granulation size, and purity have varied over the centuries – original English formulation for example was about 66.6 % to 22.3% to 11.1%.

The size of the grain for black powder will make a considerable difference in the speed of the burn – the finer the grain, the quicker the speed because there is more exposed surface area. Fine-grained powder in the smooth bore weapon era was usually used in primers and fuzes, and not the main powder charge.

Low explosives such as black powder are "pusher" explosives, which makes them ideal to use as a propellant. As well as being used in weapons, black powder was the primary mining explosive until the invention of nitroglycerine and dynamites. It is used in the 21st century in fireworks as a propellant and bursting charge, in movie special effects, in some forms of mining, and in black powder shooting, among other uses.

The main problem with black powder is that it does not completely burn, hence leaving behind a residue that causes problems with gun tubes and barrels. Until the advent of smokeless powder, the firing of tens of thousands of black powder shoulder weapons and artillery literally created the "fog of war". About 40% of the powder converts to gas upon ignition and about 60% is an unburned solid product, often seen as a white smoke. It is the gas, looking to escape confinement, that is the propellant for ammunition. The unburned residue it left behind in the barrel made is impossible to use tight-fitting ammunition. Rounds for artillery and small arms had to be considerably smaller than the bore because after firing a couple shots, the diameter of the bore became reduced from unburnt powder residue. The 18th century French musket bore was .69 caliber, but the actual ammunition was in the .64-.67 range, while the English used a .75 caliber musket with ammunition in the .70-.73 range.

Black powder is relatively stable if properly stored. It is not particularly susceptible to shock but is it very susceptible to friction and heat. Unfortunately, like with many things found on the internet, there is some very poor science out there regarding black powder and age. Unlike some “statements of fact” expounded by self-made “experts” who disparage science and real experts by claiming the black powder degrades with age and becomes inert, this is false. As long as black powder is dry, it will remain viable indefinitely. But black powder is hydroscopic – it will readily absorb water and if wet, it becomes a black, gooey inert paste that can be washed away. Unfortunately, absent a gaping hole in the shell, there is now way to tell if the powder inside the shell has been exposed to moisture – even if the shell is found underwater. The bottom line is that any shell – I.e. an explosive round – should be treated with caution and turned over to a bomb disposal expert.

Remains of black powder keg – LaBelle – Nov 1996 (photo by the author)