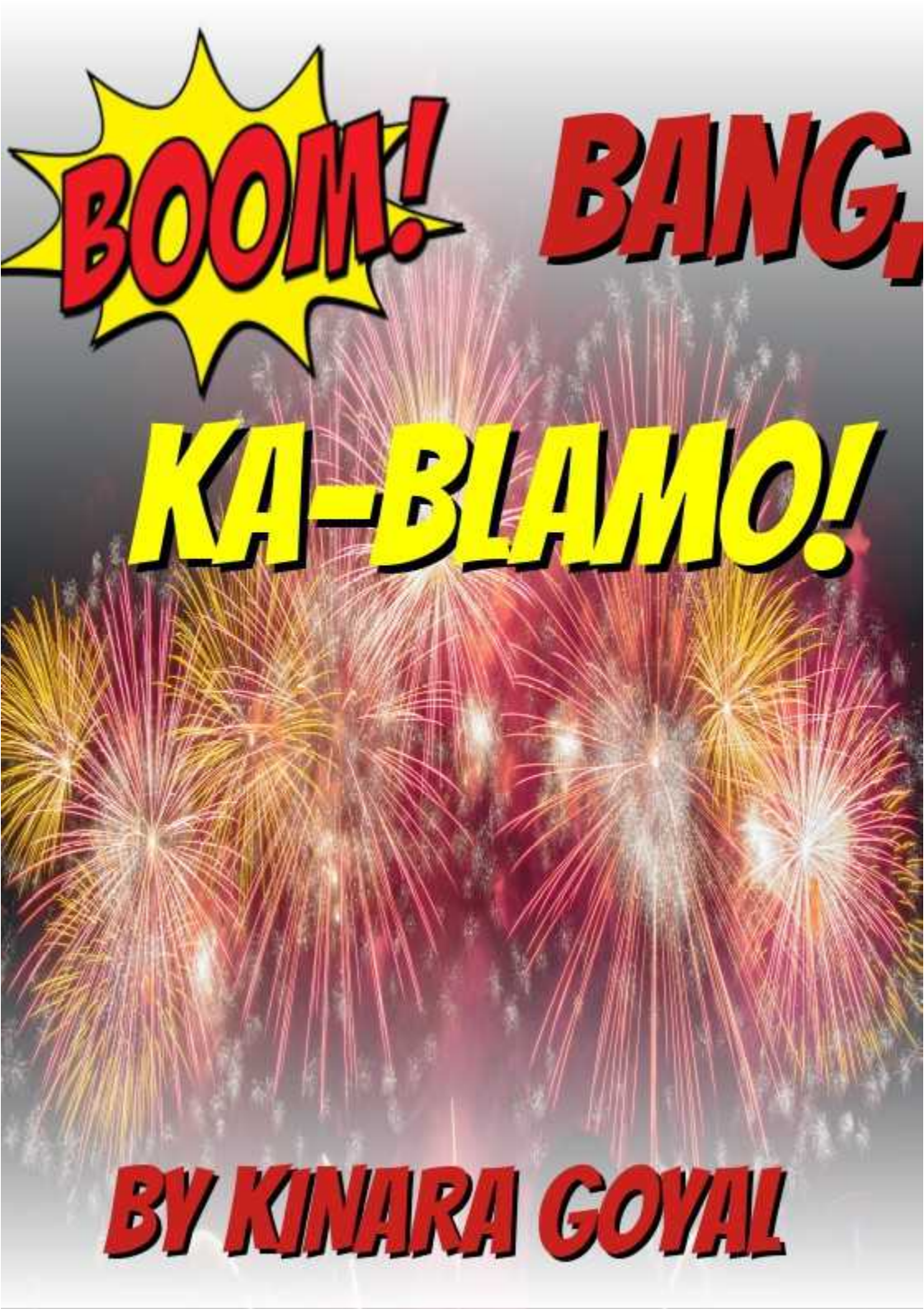
BOOM!
BANG,
KA-BLAMO!
BY KINARA GOYAL

Boom, Bang, Kablamo!

By

Kinara Goyal

Gunpowder, Dynamite and Firecrackers

During many, many festivals, a lot of people burst firecrackers. Did you know that the core of a firecracker is a highly flammable material invented in China hundreds of years ago? It's gunpowder.

Strap on your seat belts to go on a dangerous journey through the history of weapons and explosives.

Gunpowder History

Invention

Gunpowder was invented in China during The Tang Dynasty. It was the first ever explosive created and is considered one of the four greatest inventions of China. Gunpowder's first mention was in a book by an alchemist from Eastern Han dynasty. At this time gunpowder was often referred to as the fire drug. This fire drug was a less refined version of modern gunpowder.

Although gunpowder was invented in the 9th century the first chemical formula for it was in a book written from the time of the the Song Dynasty during the 11th century.

In between the 9th and 11th centuries fire crackers were invented in China.

Application in Weapons

In between the 10th and 12th centuries a weapon called the *huo qiang,* meaning fire lance, was invented. It had a trigger and a bamboo tube filled with gunpowder and bullet like metal pieces. Pulling the trigger would ignite the gunpowder creating a huge energy buildup which forced the metal pieces out along with a quite large flame. Although this weapon was deadly at short ranges, it was practically useless at long ranges.

Just before the 13th century, the Chinese were employing more powerful guns made of brass or iron.

Gunpowder Usage Outside China

By 1304 the Arabs were using a charge of gunpowder in guns to fire arrows. The Europeans soon adopted gunpowder for firearms, but they were not really keen on adopting it for mining or simple fire crackers and other peaceful or recreational purposes.

It is possible that this invention spread to the Middle East and Europe so quickly due to the Mongol empire conquests during the 13th century as the Chinese used gunpowder to hold off the Mongols for several decades.

When the silk route opened during the 13th century the secrets of gunpowder were passed on to the India and some other south-east Asian countries. In southern India, usage of gunpowder based weapons and artillery increased in 1490s after the arrival of the Portuguese and Babur's invasion in the 15th century.

Although China's south-eastern neighbors were using guns by the end of the 13th century, China's north eastern neighbors Korea and Japan were not so quick to adopt gunpowder. Only during the early 16th century did they start using gunpowder.

In Europe, it was 100 years after Korea adopted the gun that gunpowder was first used for peaceful and recreational purposes.

Until the 20th century refined gunpowder was still used for exploding mountains and mining material. In the 20th century gunpowder was almost completely replaced by dynamite and other explosives, except for in a few weapons and firecrackers.

Gunpowder Chemical Composition

Gunpowder is 75% potassium nitrate, 10% charcoal and 5% sulphur. There are traces of other chemicals as gunpowder is not completely pure.

According to Wikipedia, the following exothermic chemical reactions usually take place when gunpowder is ignited:

$2\ KNO_3 + S + 3\ C \rightarrow K_2S + N_2 + 3\ CO_2$.

$10\ KNO_3 + 3\ S + 8\ C \rightarrow 2 + 3\ + K_2SO_4 + 5\ N_2$.

The number of atoms of each type on both sides of the equation must be the same as in any chemical reaction atoms are neither created nor destroyed.

Throughout the history of gunpowder the exact amount of each ingredient has radically changed. A concoction would be assembled and then tested. It is believed that some Islamic empires were stable only after they had access to weapons using gunpowder and so were called the Gunpowder Empires.

Dynamite

Did you know, dynamite is 1,000 times more powerful than gunpowder?

Alfred Nobel had been fascinated by Nitroglycerin ever since he started inventing. He found it so interesting because of its instability, but he wanted to make it safer to use.

In 1864, Nobel's brother died from an explosion at a nitroglycerin factory, belonging to Nobel himself. This drove Nobel to find a way to make nitroglycerin safer. Two years later, in 1866, Nobel discovered that adding a kind of absorbent like mud would reduce the chance of explosion, and when the nitroglycerine exploded the mud would increase the time it took to burn out. He called the substance dynamite because dynamis is the Greek word for power. Nobel patented this discovery in 1866. His original formula for dynamite was 75% dynamite (nitroglycerin) and 25% absorbent which he called 'dope'.

After further experiment, Nobel discovered that although the nitroglycerin with dope was safer, it was less efficient. So he made dynamite ranging from 40 to 75% efficiency using

ingredients like wood pulp and sodium nitrate.

Lower efficiency means that the amount of nitroglycerin is less than the amount of dope, making the dynamite stable, but yielding smaller explosions. On the other hand, higher efficiency means that the amount of nitroglycerin is more than the amount of dope, making the dynamite more unstable, but resulting in larger explosions.

The next important invention was gelatinous dynamite. Legend has it, that one day Nobel hurt his his finger and could not sleep due to the pain and so he went to is laboratory and put nitroglycerine on collodion, curious about the effect. To his satisfaction, a thin plastic like material remained. This was gelatinous dynamite a powerful, water resistant explosive.

In the US, mass production of dynamite was initiated by George Mowbray, in 1867. His factory was over a tunnel and so most of the dynamite fell intro the tunnel until he started selling frozen dynamite. He sold 1,000,000 pounds of frozen dynamite before his business was shut down due to patenting issues. The main use for dynamite was for opening more chambers in oil wells, which increased their output. This idea was patented by E.A.L Roberts but his competitors ignored his rights.

Apart from oil well shooting, dynamite was not used for anything much in the US. But by 1895 dynamite was being used in mines in South Africa.

Dynamite, contrary to popular belief, was never used much in weapons due to its instability. TNT was used in its place. Dynamite is almost 4 times as powerful as TNT but far more unstable. Even chemically TNT and dynamite are quite different. TNT was used in weapons because of its stability. If they had used dynamite, there would have been more accidental casualties. The full form of TNT is trinitrotoluene.

Firecrackers

During the Han dynasty, people threw bits of bamboo into fire to generate loud sounds and lots of little sparks in the night sky. In the 9th century, at around the same time as the invention of gunpowder, firecrackers with gunpowder cores were invented. Firecrackers gained popularity along with gunpowder weapons, but only in Europe a few hundred years after they adopted gunpowder, did they use gunpowder for firecrackers.

Firecrackers come in many colors. Let us discuss the ingredients used to make those colors.

1. Red – Strontium
2. Orange – Calcium
3. Yellow – Sodium
4. Green – Barium
5. Blue – Copper
6. Purple – Strontium, Copper
7. Silver - White hot magnesium and aluminium

If you read my article, the next time you burst firecrackers, in addition to enjoying the glorious displays, you will have the satisfaction of knowing what they contain and how they work.