
ANTENNA



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Greetings Everyone,

Again I have the honour of producing ANTENNA. This issue I think we shall soar into the world of fireworks. Why Fireworks? Mostly because since I have yet to receive so much as one article from anyone and *I* think this might be interesting – That and the Adelaide Royal Show is soon to be coming to town.

I edit/create Antenna, but it is your newsletter, so please send in articles of interest or at least topics for future editions. If anyone is interested in being co-editor please send a message.

I was asked to add my picture, handsome devil I am. So now you know what your ED looks like.

Peter Toomer – antennae@anzaas.org.au

How fireworks work



If you have ever been to an aerial fireworks show at an amusement park, celebration or on New Year's Eve, then you know that fireworks have a special and beautiful magic all their own – a good show is absolutely amazing! Have you ever wondered how this magic works? What is launched into the sky to make the magic?

Basic Components

Just about everyone over the age of 5 has some personal experience with fireworks, either from New Year's Eve celebrations or other events. For example, you have probably seen both sparklers and firecrackers. It turns out that if you understand these two pyrotechnic devices, then you are well on your way to understanding aerial fireworks! The sparkler demonstrates how to get bright, sparkling light from a firework, and the firecracker shows how to create an explosion.

Firecrackers have been around for hundreds of years. They consist of either black powder (also known as gunpowder) or flash powder in a tight paper tube with a fuse to light the powder. Black powder contains charcoal, sulphur and potassium nitrate. A composition used in a firecracker might have aluminium instead of or in addition to charcoal in order to brighten the explosion.

Sparklers are very different from firecrackers. A sparkler burns over a long period of time (up to a minute) and produces extremely bright and showery light. Sparklers are often referred to as "snowball sparklers" because of the ball of sparks that surrounds the burning portion of the sparkler. If you look at US Patent #3,862,865: Sparkler composition, you can see that a sparkler consists of several different compounds: **A fuel**, an **oxidizer**, **iron or steel powder** and **binder**.

The fuel is charcoal and sulphur, as in black powder. The binder can be sugar or starch. Mixed with water, these chemicals form a slurry that can be coated on a wire by dipping or poured into a tube. Once it dries, you have a sparkler. The fuel and oxidizer are proportioned, along with the other chemicals, so that the sparkler burns slowly rather than exploding like a firecracker.

It is very common for fireworks to contain aluminium, iron, steel, zinc or magnesium dust in order to create bright, shimmering sparks. The metal flakes heat up until they are incandescent and shine brightly or, at a high enough temperature, actually burn. A variety of chemicals can be added to create colours.

Aerial Fireworks

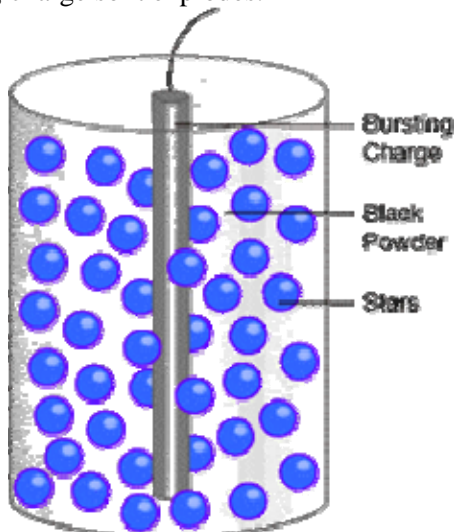
An aerial firework is normally formed as a shell that consists of four parts:

- **Container** - Usually pasted paper and string formed into a cylinder
- **Stars** - Spheres, cubes or cylinders of a sparkler-like composition
- **Bursting charge** - Firecracker-like charge at the center of the shell
- **Fuse** - Provides a time delay so the shell explodes at the right altitude

Located just below the shell is a small cylinder that contains the lifting charge.



The shell is launched from a mortar. The mortar might be a short, steel pipe with a lifting charge of black powder that explodes in the pipe to launch the shell. When the lifting charge fires to launch the shell, it lights the shell's fuse. The shell's fuse burns while the shell rises to its correct altitude, and then ignites the bursting charge so it explodes.



Simple shells consist of a paper tube filled with stars and black powder. Stars come in all shapes and sizes, but you can imagine a simple star as something like sparkler compound formed into a ball the size of a pea or a dime. The stars are poured into the tube and then surrounded by black powder. When the fuse burns into the shell, it ignites the bursting charge, causing the

shell to explode. The explosion ignites the outside of the stars, which begin to burn with bright showers of sparks. Since the explosion throws the stars in all directions, you get the huge sphere of sparkling light that is so familiar at fireworks displays.

Multibreak Shells

More complicated shells burst in two or three phases. Shells like this are called multibreak shells. They may contain stars of different colours and compositions to create softer or brighter light, more or less sparks, etc. Some shells contain explosives designed to crackle in the sky, or whistles that explode outward with the stars.

Multibreak shells may consist of a shell filled with other shells, or they may have multiple sections without using additional shells. The sections of a multibreak shell are ignited by different fuses. The bursting of one section ignites the next. The shells must be assembled in such a way that each section explodes in sequence to produce a distinct separate effect. The explosives that break the sections apart are called break charges.

The pattern that an aerial shell paints in the sky depends on the arrangement of star pellets inside the shell. For example, if the pellets are equally spaced in a circle, with black powder inside the circle, you will see an aerial display of smaller star explosions equally spaced in a circle. To create a specific figure in the sky, you create an outline of the figure in star pellets, surround them as a group with a layer of break charge to separate them simultaneously from the rest of the contents of the shell, and place explosive charges inside those pellets to blow them outward into a large figure. Each charge has to be ignited at exactly the right time or the whole thing is spoiled.

This information is sourced at:

<http://science.howstuffworks.com/fireworks.htm>

Up coming events

None noted

Other

I have taken the liberty of creating a website for ANTENNA readers:

<http://groups.yahoo.com/group/antenna-au>