

## Newsletter for Jan 2021 – Fire

Fire is an amazing tool, and a devastating enemy.

You can cook food with it, heat your homes, melt and form metals, propel your vehicles, get rid of weeds, and many other functions.

Fire needs 3 items to live, fuel, heat and oxygen. If you deprive it of any one of the three, it dies, which tells you how to extinguish a fire.

You also need 3 items to start and maintain a fire; tinder, kindling and fuel.

As related to the body, tinder is something very fine and easily ignited with a match, like hair. Next is kindling which is about the size of any finger, to be ignited by the tinder. Last is the fuel which is about the size of an arm or leg. This is what maintains the fire once it has been ignited.

When you look at a campfire from the outside, what do you see?

Yellow and blue flames licking at the logs and traveling upwards toward the sky.

When you look at the inside of a fire you see something quite different.

As wood heats up in a fire, it starts to smoke. The wood starts giving off flammable vapors which burn readily and help the carbon of the wood to start to burn. (Have you ever watched a fire and seen jets of flames emitting from the wood? This is the burning of those flammable vapors). This is what contributes to the bright yellow flames you see. Yellow is basically vaporized carbon, incompletely oxidized, glowing incandescently beautiful. The temperature of the fire can reach 2000 F, depending on the wood burned.

Deeper in the fire you may notice a beautiful blue flame. This is the result of complete combustion of the carbon of the wood, similar to the blue gas flame of your stove or torch.

Finally, with all the volatile gases expelled from the wood, it glows orange. The beautiful quality of cooking coals. This is the carbon burning and produces a temperature of about 1000 F.

You might think that the wood is burning but it is not. Solids do not burn whether wood, paper or candles (neither do liquids for that matter). Only gases burn. Everything has to be heated to the point of vaporization to support combustion.

**The Miracle of Candles:**

If you were to put a small tube inside the dark cone of a burning candle, you would see gasses coming out the other end of the tube, which can be easily ignited. Sometimes you can see bubbles inside the candle melt zone. When you blow out a candle, if you hold a lit match in the vapor trail, it will carry the flame back to the wick.

Candles are indestructible except when burned. Waterproof, excellent lubricator for sticking doors and windows, etc.

For more interesting information, see the 200 page document below:

<http://www.engineerguy.com/faraday/pdf/faraday-chemical-history-complete.pdf>

If you back engineer the above URL, you get <http://www.engineerguy.com> where you will find various information as well as youtube videos of some of the book's components, such as this one;

[https://youtu.be/RrHnLXMTOWM?list=PL0INsTTU1k2UCpOfRuMDR-wlvWkLan1\\_r](https://youtu.be/RrHnLXMTOWM?list=PL0INsTTU1k2UCpOfRuMDR-wlvWkLan1_r)

If you were to bend a skin of a citrus fruit towards the center, holding the outside of the peel towards a lit candle, you will see a marvelous display of fireworks as the oils in the peel, expel towards the flame and catch fire immediately.

You may have heard of flour mill explosions. When a finely divided solid is mixed with air, it behaves as a gas and thus is capable of burning, even very rapidly as in an explosion. In the early days of automobiles, a small ball mill was attached to the air intake of an engine and charcoal was placed in the mill. The charcoal was powdered and fed into the engine with air where it acted like a gas and fueled the engine.

Wood has also been vaporized into carbon monoxide and fed into an engine as a fuel source in a device called a producer gas generator. During WWII, half of the engines in Europe were fueled with charcoal as liquid fuel sources were scarce. Note: when you heat wood in an environment without air, the water and other volatiles are driven off leaving almost pure carbon, ie, charcoal. If you inject steam into the incandescent bed of carbon, the water dissociates into hydrogen and oxygen, an energy intensive process, enriching the gas with the higher btu hydrogen gas and more carbon monoxide as the oxygen combines with the carbon.

Measurement of heat – BTU

Amount of heat required to raise the temperature of a pint of water 1 degree Fahrenheit.  
The amount of heat produced by one wooden kitchen match.

Candle power – obsolete measurement of light requiring the use of a spermaceti candle of a specific size with a wick of a specific size.

I camped in an Elk City, Idaho campground. There were no lights around at all and I literally couldn't see my hand in front of my face. I lit my folding candle lantern and the light emitted was amazing.

I hope we can all appreciate and respect fire and remember that the Lord showed his mighty power through the use of fire.