

## Chapter 2. Charcoal and Forging—the Birth of a Katana.

Why is the Japanese sword different to every other traditional craft? Is it because it is a symbol of the Japanese origins of spirituality? In order to answer these questions, first I must give a brief explanation of the Japanese sword production process.

In brief, the Japanese sword's character derives from being made from steel (*hagane*), which is repeatedly forged and folded. *Hagane* is made from *satetsu* (sand-iron). Nowadays, steel made from sand-iron is rare in Japan. In fact, this kind of steel production process is uncommon in the world. You may have already heard of the *tatara* steel making process—a rectangular clay furnace in which sand-iron and charcoal are smelted to produce steel. The main smelting process takes three days and nights with air constantly pumped into the furnace (an essential part of the process). Extremely high temperatures are not required. A relatively low temperature of about 1200 - 1400 degrees is used. In foreign countries where coke instead of charcoal is used, temperatures of 1500 degrees or more are necessary in order to smelt the iron-ore.

The furnace creates temperatures of about 1400 degrees Celsius. During the three-day smelting period, the inner part of the clay walls of the furnace become incorporated into the large block of molten steel. At this point I will cease with the scientific information. In short, the sand-iron and charcoal elements transform inside the base of the furnace to form the *kera* (large block of steel). This is the raw material from which Japanese swords are made. This kind of steel is called *tamahagane* (jewel steel). *Tamahagane*, like other steels can be graded: 1<sup>st</sup> class, 2<sup>nd</sup> class, etc. As you would expect, this top quality steel is used to make Japanese swords. The word *tama* is not only used for steel, it also has a spiritual meaning. It becomes the *tama*-steel (steel of life), from which the pride of the swordsmith is born. This can be used with steel refined by the swordsmith himself called *oroshi-gane*, to obtain the required amount of carbon.

From here onwards is the job of the swordsmith. Well, you may ask, why is the fold forging method used? You have probably seen photographs of swordsmiths sitting in front of a forge gripping the hot steel with long pliers and assisted by 1-3 apprentices using large hammers. They are performing the fold forging process. It is a popular sword-making scene. This is called *tanren*—forging. This word *tanren* can also refer to modern young men. If they do not have some kind of spiritual forging, they will not grow up to be good men. The smith and the apprentice take turns to hammer the steel. This kind of exchange is where the phrase *aizuchi wo utsu*—to cooperate together—comes from.

The *tamahagane* is heated and crushed into a flat plate. It is then broken into smaller pieces approximately 2 cm in diameter. Next, the swordsmith makes a tool called a *teko*. This is an iron bar with a plate (*teko-dai*) attached used for placing the billet of steel into the forge. The small pieces of *tamahagane* are stacked onto the *teko-dai* and wrapped in a sheet of Japanese paper to prevent it from falling off. Then, burnt rice straw is placed on top of the billet followed by an application of clay slurry. This

application of burnt rice straw and clay insulates the steel, preventing oxidization. The billet is then placed in the fire to be heated (*tsumi-wakashi*).

When it reaches the correct temperature, the steel is removed from the fire and beaten using large hammers. An incision is made in the center of the block before it is folded back on itself. Depending on the school or swordsmith, this process is usually repeated between 10-15 times. The steel is not only folded horizontally, but is also folded vertically (lengthwise) whilst repeatedly being heated and hammered. This method is referred to as *orikaeshi-tanren* (fold-forging). Using this process, if the steel is folded 15 times it produces 33,000 layers of strong steel. This repeated folding of the steel helps to remove any impurities—a fact which has been verified by modern scientific study. Gradually, through the repeated heating and forging, the weight of the steel decreases. I am very impressed with the ingenuity of our ancestors.

Once production of the *kawagane* (outer-steel) has been completed, the blade's lower carbon, softer steel inner-core (*shingane*) is produced by the same folding method. This time folding only takes place between 7-10 times. The *kawagane* (outer-steel) is then fashioned into a U shape, the *shingane* (core steel) is inserted into it, and they are then heated and welded together. This process is called *tsukuri-komi*. This particular method of *tsukuri-komi* is called *kobuse*. There are other methods such as *sanmai-gitae* in which a harder piece of steel for the cutting edge is placed under the *shingane* in addition to *kawagane* on either side. This combination of hard and soft steels produces swords that are resistant to bending and breaking.

Note: Do you know the average weight of a Japanese sword? Blades weigh between 750 to 1100 grams. Once they are fully mounted they average around one kilo. This is why it is good to use a *bokuto* (wooden practice sword) of over one kilo. It is not good to always practice with a light *bokuto* if you intend to use a real sword.

The remaining processes are *sunobe*, *hi-zukuri*, *tsuchioki* and *yaki-ire*. Followed by the finishing processes *kajitogi*, *nakago-shiage*, *mei-kiri*, etc. I thought I would be able to give a simple explanation in a single article, but it has turned out to be rather long. I think I need to take a rest and smoke my pipe. I will continue with the katana making process next time.

### (Preview) Chapter 3: Purification by Fire and Water

Many swords from sword making towns, such as Osafune in Bizen province (present day Okayama prefecture), are ranked as National Treasure or Important Cultural Property. There are also many swords made by the same smiths that do not attain these standards. Why is there such a gap in the workmanship of the same smiths? This is because the Japanese sword is baptized by fire (*yaki-ire*). Our ancestors believed that although the sword is produced by man from natural resources, the fate of its completion is decided by the gods.