Track's FRIZZEN HARDENING recipe using TRU-SPARK® compound

Tools required:

TRU-SPARK compound, available from **Track of the Wolf, Inc.**
Vise grip pliers (preferably old worn cam-action pliers dedicated to welding work).
Oxygen - Acetylene torch with small tip, plus a Propane or MAPP gas torch.
Quench water, at least one gallon of clean hot tap water, in a large mouth metal bucket or can.
Watch or clock, with second hand or one second indicator.
Grinder, with a fine grit wheel. A Buffing Wheel or fine emery paper is also useful.
A small inexpensive magnet, such as sold by Radio Shack (optional).
Protective gloves and goggles, i.e. welder's gloves, welder's safety goggles.

To harden a frizzen:

Lightly grind the face of the frizzen. Remove all scratches and marks. Polish the face ***bright and smooth lengthwise***. A textured frizzen face slows lock time, erodes the flint edge, and reduces sparking.

Clamp the frizzen across the pivot screw hole in the toe, using vise grip pliers. The pliers serve as a heat sink to avoid over-hardening the toe, and as a convenient handle.

Fill a metal container with hot tap water. The temperature differance between cold water and hot tap water can be enough to cause cracking in some frizzens. Clean water is essential. Soap contaminates quench water.

Adjust your oxygen - acetylene torch for a slightly fuel rich (reducing) flame, not smoking, only slightly fuel rich (i.e. more than 50% acetylene in mix). Apply the flame point to the ***back*** of the frizzen, opposite the face. Heat the frizzen to a temperature higher than 1650 F, a medium cherry red when viewed indoors. The frizzen will become non-magnetic.

Scoop the hot frizzen into the TRU-SPARK powder, causing a skin of powder to melt and adhere to the face. Point the flame straight up. Hold the frizzen over the flame, allowing the flame to touch and heat the back, not the face. Hold the frizzen at above 1650 F cherry red heat, for at least 120 seconds or more, not less. The hardening compound will slowly bubble and burn away. Do not overheat the frizzen. It must not become yellow hot. Time increases case harden depth.

Immediately quench the frizzen. Insert it into quench water, making a figure eight to allow it to cool quickly.

Use fine emory cloth to clean the face of the frizzen bright. Polish length wise, not across the frizzen face.

You must temper the frizzen toe before use. Polish the bottom of the pan cover with fine emery paper until it is bright, this will allow you to easily see the temper color change. Apply heat from a small Propane torch flame, to the tip of the toe until it is a temper blue. Slowly lead the temper blue down the pan cover, remove the heat as it just creeps over the corner to the frizzen face. Let the frizzen air cool, then polish the pivot hole and apply ***Birchwood Casey's Choke Tube Lubricant*** to the pivot screw.

Use a best quality hand knapped gun flint. Never dry-fire or snap a flint lock, with an open frizzen. Tuning a flint lock gun requires much more than simply hardening the frizzen. The vent liner must be located above the pan, and properly counterbored inside the barrel. The lock must have minimum friction, and maximum spring tension. The frizzen must be adjusted to snap open at the proper time, yet not rebound. Simple problems such as tight inletting, over tightened internal screws, or tight lock bolts can slow lock time.

Track of the Wolf, Co. Inc.
18308 Joplin Street N. W.
Elk River, MN 55330-1773
Tel: 763-633-2500 sales@trackofthewolf.com Fax: 763-633-2550

Factors affecting flint lock operation:

When released by the trigger, the flint strikes a glancing blow to the frizzen face, shearing hot sparks of steel, opening the frizzen to expose priming powder in the pan. Flint chards do not aid ignition. Natural flints, hand knapped along natural grain boundaries, are best. Saw-cut agate, noviculite or ceramics are not as sharp.

Frizzen face steel grain size:

The microstructure of the frizzen face must consist of very fine grain steel. Smaller grains of steel become hotter as they are sheared by the flint. To achieve a tiny grain structure, the steel face must be extremely hard, in the range of R_c60 to R_c64, or harder. It must be free of alloying elements that promote grain growth.

Frizzen face steel grain brittleness:

The grains of steel must be small, and must be easily sheared from the frizzen face. Modern alloying elements add hardness, but promote grain growth, producing large grains with strong bonds to neighboring grains. "Tool steels" resist brittle fracture and shear. Strong and tough, they are the worst choice for a frizzen.

Frizzen body toughness:

The body of the frizzen must have a soft tough core that will not fracture during repeated shock loads from flint impact. If hardened through, the frizzen will soon fracture at the pivot hole, toe, or pan cover joint.

Lock energy:

The flint lock must have a strong mainspring, and minimum internal friction. Hot sparks require energy!

Lock geometry:

The flint lock must have reasonably correct geometry. The cock should hold the flint at a proper angle, and strike the frizzen face at about two thirds of its height. The frizzen toe should cause the frizzen to snap fully open when the flint reaches the bottom of the frizzen face. Lock design changes are usually not wise. A correct replica Northwest Trade Gun lock, circa 1800, will not have the near perfect geometry of a fine London fowling gun lock, circa 1820, nor should it. Each lock can be made to work well, within its design limits. Most modern flint locks from Italy, Spain, or Korea are not a correct replica of any original, and suffer from serious geometry problems. If your lock is color case hardened, with cast-in engraving, or the country of origin is stamped inside, it probably never sparked well. It may not be a good candidate for rework.

Lock tuning:

The flint lock must have reasonably good tuning and balance. The frizzen spring should not be so powerful as to prevent the frizzen from opening correctly. Never shorten the toe of the frizzen, to lighten the spring.

The magic of the "secondary reaction" effect:

If the grains of steel are small enough, and if the flint has sufficient energy to raise their temperature above their ignition point, a secondary reaction occurs, releasing energy. The iron reacts with oxygen, forming Fe_2O_3 and Fe_3O_4. Carbon reacts with oxygen forming CO and CO_2. These reactions release heat, causing the sparks to burst again, like miniature fireworks. When dry-fired in dim light, such a well tuned lock will throw a shower of sparks that will sparkle or "dance" in the pan for another second, due to this secondary reaction.

The reality of modern made flint lock production:

Modern flint locks are made from "lost wax" castings, using tool steel alloys which pour well, resist fracture, and harden easily. None are made from plain low carbon steel, then carburized to produce a hard skin. All suffer from grain growth problems due to the wrong alloy content listed above, plus the problem of surface decarburization if heated in open air. This can case a soft face and a brittle hard core, after a severe quench.

Use TRU-SPARK to carburize your frizzen's face, producing very hard steel face with small grain structure. TRU-SPARK's nitrogen combines with alloying elements, causing them to precipite to grain boundaries. Your quench must be suitable for the alloy content of the frizzen body, often unknown. Water quench is best (i. e. most severe), if your frizzen will tolerate it. We recommend using hot from the tap water.

No warrantee:

When you modify an existing flint lock, you risk ruining the frizzen! With practice, experience, and luck, you can improve frizzen hardness. Be certain that you can buy a replacement frizzen, before you take a risk. The lock maker has intentionally chosen a safe level of hardness. Your work will void the maker's warrantee!