Traditional Tool Shapes & Applications 1/

Most of the tools listed and discussed in this document have over 1000 years of history behind them and until relatively recent (the last 300 years) a striker was used, in concert with the blacksmith, for the applied work. This note is intended to cover major tool shapes that can be divided into ‘families’ such as straight chisels, curved chisels, butchers, flatters, ball tools, fullers, tear drop tools, etc.

All tool shapes are generic and can be used in the widest range of applications from something the size of a quarter to the size of a 2’x 2’ or 2’x 4’ panel.

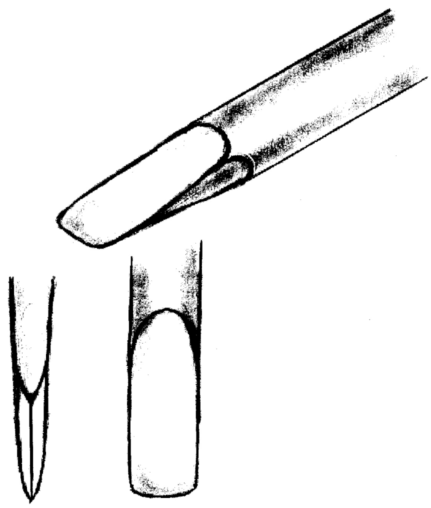
Generic tools should have incremental sizes (1/8”, 3/16”, ¼”, 3/8”and ½”). Note: ¼” diameter tools will not hold up under a treadle hammer, therefore, never use less than 3/8” to ½” tool steel and make all tools approximately 4 ½” in length. Generally, S7 has been a good tool steel and is water and/or air hardening steel designed for impact forces while at the same time, maintaining a cutting edge. W-1 can also be used for specific applications. When hardening this steel, quench all but the last ½” striking end to maintain a soft surface. This steel can be used for both hot and cold work and will provide years of service. Occasional dressing and buffing may be required.

Slitting Chisels –

A slitting chisel should have the same thickness but incremental widths. This common cutting edge thickness produces incised lines that have the same visual line-weight. They will all leave the same width line if struck to the same depth. For example, 3/16” wide, 3/8” wide and ½” wide chisels that are all similar in thickness would allow switching between them as the pattern requires, and still maintain the same visual effect in incising as if a single tool was used.

Why switch between various straight chisels? The ½” wide chisel will cut a straight line, as will the 3/8” wide and the 3/16” wide chisel. But the 3/8” wide and 3/16” wide straight chisels will cut or incise progressively tighter curves. Having the same line-weight as they cut ever tighter curves allows one to cut a near infinite range of curves as well as various length straight lines while maintaining the visual width of the cut as a decorative constant (calligraphy with a chisel). This line weight in incising can be seen in pierced work as a constant bevel along the cut edge that you will not get if the chisels have varying thicknesses when switching between them to accommodate the pattern. Visualize a set of chisels with a common wedge in vertical section compared to a set with varied vertical wedge sections.

Also, in cutting or incising intricate patterns, there may be need for varied length - straight and curved cutting capacity. In some cases, the curve is so tight that only a curved chisel will suffice in which instance, make one in the configuration the pattern demands. (All chisels should be symmetrical. Test in lead or clay before heat treatment by rotating it as it is struck. A symmetrical curved chisel will cut a core-shaped plug, where as an asymmetrical curved chisel will ride out of its track and give a choppy cut when rotated.) Otherwise, there is difficulty in moving from a straight cut into a range of broad curves using just the three sizes of straight chisels. This is true whether incising into or cutting completely through metal. Intricate repousse' and pierced patterns with areas cut out completely (negative spaces) often have various length short straight lines to be cut as well.



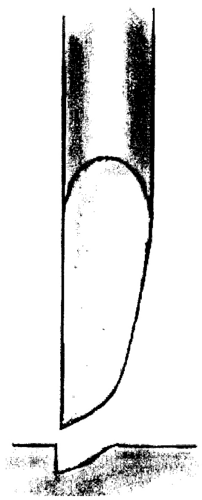
The cutting edge should be slightly crowned along the straight chisel blade length, so the center just makes contact first with both ends of the blade rounded so the cutting edge continues up the side of the chisel for a distance. Chisels intended for deep slitting should have a cutting edge that extends up the side for about half the thickness of the metal to be slit. The ideal cross section for a slitting or incising chisel is elliptical, like a canoe. The cross section of a properly formed chisel should be a progressively narrower canoe shape when approaching the blade. As a line is incised or cut, the chisel should be moved forward about one half the blade length per stroke. The cutting edge that runs from center of the blade up the side of the chisel leads the cut cleanly. The radius on the corner makes a leading cut that is a diagonal to the plane of the metal being cut. This provides a visually clean effect (a tapered cut rising through the metal) at the end of a slit and, because there is a diagonal through the metal instead of a vertical line, flexing is less likely to result in a crack. A saw cut split often cracks during flexing since it is vertical through the metal. The canoe or elliptical cross section has the effect of planishing the lead cut mark as the thicker center is moved forward a half-chisel length per cut. (Do not get the center too thick or the wedge action will cause drag as well as wedging open the cut and tearing the metal). A lead cut followed by planishing action at the middle of the chisel is produced as the chisel moves forward. Each cutting process is a series of passes; do not force the tool through material if a smooth result is desired.

Curved Chisels –

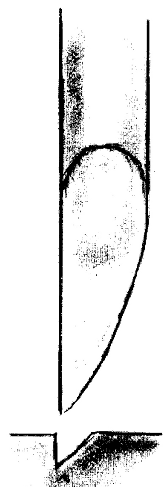
Development of curved chisels requires perfect tracking, in many cases, and therefore requires precision in curved chisel development. Using annealed tool steel, place in vice at a comfortable angle (25 to 35 degrees) and nick the edge with a triangular file to provide a tracking groove for the round file. File down to at least ½ of the files diameter, then grind a canoe shape on the convex side of the chisel which will meet at the cutting edge.

Butchers –

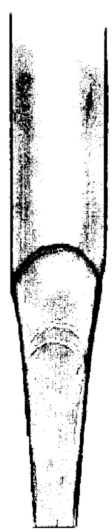
Butchers are made in pairs (first and second pass). First pass butchers are steeper in angle back from the vertical face, and second pass butchers about half as steep, about 45 degrees and 30 degrees respectively.



2nd Pass



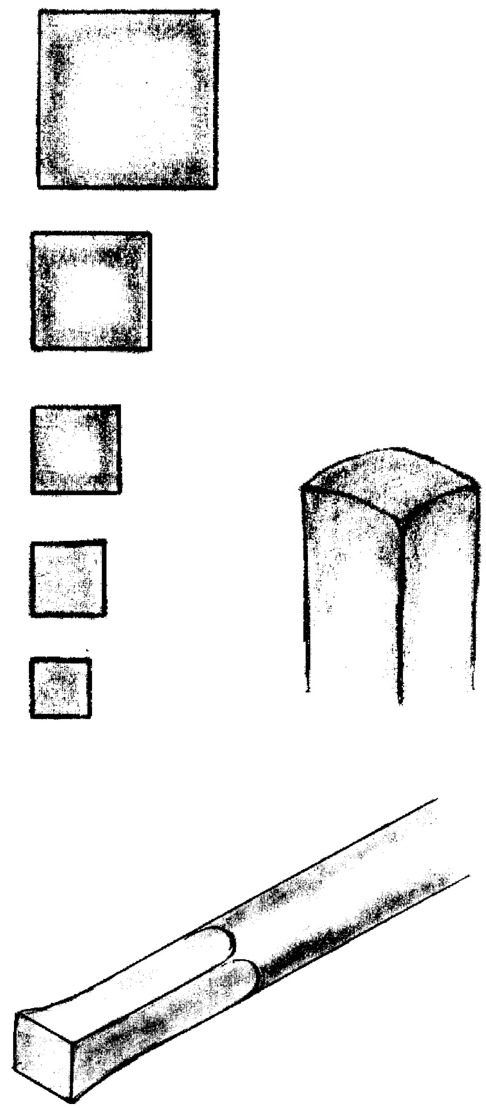
1st Pass



Front View Butcher

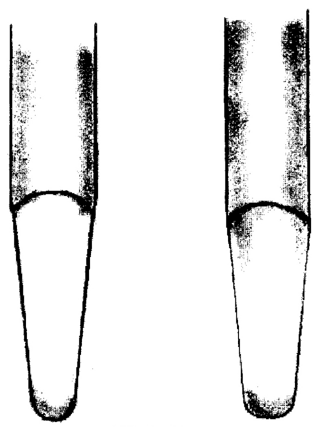
Flatters –

Flatters are produced in the same size range as all other tools and all have a slightly crowned face and less than sharp edges. Shapes can be square, triangular, rectangular, round or oval. Make flatters in special shapes as needed for particular projects.



Ball Tools -

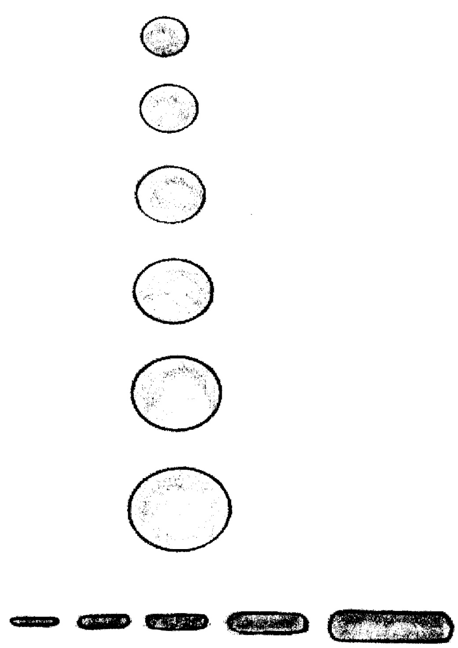
Ball tools can be in sets, one half-round and one elliptical face per size in every size of tool steel stock from 1/8” in increments up to 1”. Convex end shapes can range from shallow to deep.



Elliptical face **Half-round face**

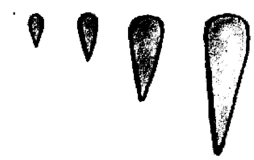
Chasing Tools -

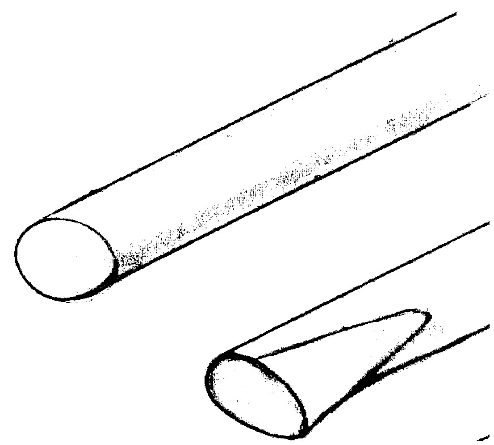
Chasing tools have work faces that can range all over the map. Begin with oval and rectangular faces, slightly crowned in sizes similar to those cited above. Ball end tools are also used in chasing.

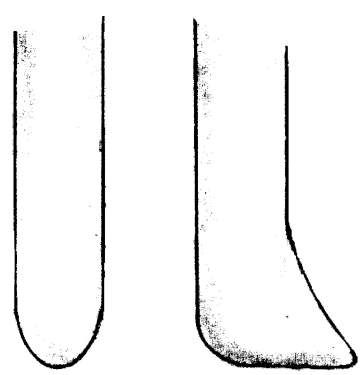


Teardrop Flatters or ‘Shoes’-

These tools have a teardrop shaped perimeter to the working face that is slightly crowned in some while others with the same ‘footprint’ are dead flat. There are also those that are curved and should be made in pairs. Incremental widths at the heel range from 1/8” to 3/8”.







Teardrop Flatters in Various Sizes – Side/End View

Fullers –

The most common fuller shape is a tapered wedge that ends in various half-rounds or elliptical working faces. Sides are somewhat squared off. This configuration is intended to span the material to be fullered. For repousse' and chasing, a fuller that has the ends tapered and rounded with a slight crown along the work face is better. This blunt version of a chisel, with less of a canoe-like section, allows conventional fullering, set and strike … but also allows the tool to be slid a half-tool length per strike to leave a fullered line that has no tool marks. Conventional fuller shapes can dig in at the ends if they are not held perfectly vertical.

All tools should be heat treated except the last ½" striking end in order to prevent spalling when struck. Full length heat treatment allows a ¼" W-1 (water hardening drill rod) too, for example, to survive treadle hammer work all day long. 3/8" to ½" round S1 is more commonly used, because of heat resistant properties needed for thin bladed tools (hot or cold work). All work is laid out then marked cold with the tool to be used in the subsequent process, either hot or cold), many chasing (repousse') tools can be ¼", 5/16" or 3/8" round W-1. Because of the mass of blunt working ends (small flatters, ball shapes which are crowned work surfaces), W-1 is acceptable for chasing tools smaller than ½" diameter.

Although tools described may seem somewhat small, the scale of work ranges from very small to large. A small tool is more versatile, it fits into more spaces and a small tool transfers more energy from the hammer (hand or treadle) to the work face due to its small footprint. This makes a marked difference in deep cold chasing. Shapes are more generic than specific in that there are very few that give a single effect. This allows more versatility of work. Period European motifs have a huge range of patterns and shapes. The generic, small tool approach allows a smaller set of tools to do a wider range of work in a wider range of sizes than any other approach.

Use of tools relates to specific action in applying the tool to metal. Although there are plenty of times that a tool is set and struck as a single operation, most application of tooling to metal (hot or cold) involves setting the tool and maintaining continuous contact (as opposed to set and strike, set and strike) while striking and dragging the working end along the layout. Crowned faces of tools makes dragging the tool easier; move one-half tool width per strike without lifting and setting tool. This dragging or continuous contact approach gives a much smoother effect to whatever tool process one is applying. Cutting, chasing, piercing, incising, etc., are all made much cleaner with this approach. There is also less of a miss-strike. When one lifts the tool and sets it anew with every strike it is easy to set the tool off and strike it anyway due to the rhythm that develops. Therefore, set the tool on the layout or previous pass, and with a rocking and dragging motion …drag and strike. This applies to either hand or treadle hammer driven tooling.

When making tools, give close attention to details of form, edge, radius and finish (polish the working end like a mirror – less friction as it moves across or through the metal).

This attention to the tool will aid in refinement if it does not work as intended. The difference between a tool that works VERY WELL and one that does not is often very subtle. Those subtleties will not be apparent without trial and error and close attention given to the result of every nuance of modification.

1/ Most of this information was provided by George Dixon, A Review of Tool Shapes and Applications, 1997 and supplemented by Ernie Dorrill (2009) based on actual trial and error experience.