Chasing Tool Analysis: Function and Form

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Introduction

This paper describes and names the types of chasing and repoussé tools. They have been used historically and across different cultures and times to create complex patterned and figurative surfaces on sheet and solid-metal objects. We will address tool purposes and procedural approaches and results. There is a little review of basic hardening and tempering for making a chasing tool. The paper touches on how to identify the shape of a tool from marks on the chased metalwork, allowing the discovery of tool forms and types from historical work. A suggestion is made that chased surfaces have a place in current production model-making as it provides detailed decorative and relief surfaces that have a "human" touch. This is a small step in reintroducing chasing as a creative and finishing technique for model-making.

One of my personal interests is cross-cultural comparison: ethnological goldsmithing. I have traveled widely and everywhere sought out goldsmiths and chasers to document how they work, to see the themes that run through all humans' methods of working with metal. Chasing tools are interesting because their shapes and uses respond to material and process (and thus reveal truths about the nature of working metal). Places I have visited and sought out this information include Denmark; Canada; across the USA; Mexico; Fiji; Bali; Singapore; Sri Lanka; Durban and Capetown, South Africa; Freetown, Sierra Leone; Dakar, Senegal; England; France; Germany; Hungary; Austria; Thailand; Australia, etc. Many master chasers were consulted for this paper including Ysela Caseres, Valentin Yotkov, Marcus Chambers, Lucinda Brogden, Nancy Megan Corwin, Henry Spencer, David Anderson, Tom Herman, David Huang, Douglas Pryor, Alan Jones, Liza Nechamkin Glasser and many others. Before we get to the tools, we should have a short discussion of why one would care about this subject, and what these tools are used for.

What Are Chasing and Repoussé?

This is one of the oldest ways that people have worked metal to create surface detail, imagery and pattern. See the examples in Figures 1-3. Almost every metal-working culture has done this. Chaser Henry Spencer wrote in a personal communication to me in 2019, "Repousage and chasing are the simplest of techniques. All one needs is a piece of flat metal, a rock and a hard, pointy stick.

As I look at historical work, I see that in every emerging society that developed the ability to create a flat piece of non-ferrous metal (sheet stock), the first thing they learned to do was emboss (repoussé) it. More often than not, these embossed designs reflected patterns familiar in local fiber and ceramic work."[1]

Figure 1 *Coffee pot by Benjamin Braywood II, active from 1755, London, England (Metropolitan Museum of Art, New York)*

Figure 2 *A chased silver fire-gilt face brooch from my youth, 1978*

Figure 3 *David Huang's Lumin Luminous Relic, 1676*

Chasing and repoussé are important historical and contemporary metal-working techniques used in all cultures across the world. Traditionally, the chasers made their own tools, exactly copying the best ones of their teachers and sometimes inheriting generations of tools from a master. My main chasing teacher, John Rimur of Denmark, had over 5000 tools, many of which had been passed on to him from his master, who in turn had received them from his master or from his forebears. Some of my best tools, a selection shown in Figure 4, were exactly copied from my teachers.

Figure 4 *A selection of my own tools*

The Response to Function, Process and Form

It is interesting that, globally, tools are very similar. They may be bronze, steel, hardened iron, soft mild steel, wood, bone and brass. The shapes that work are the shapes that work, and people worldwide found the same solutions. It turns out that process and what works in metal produce the same solutions across the world and in different times in history. Minor variations such as undercutting tools used in Asia (or independently developed by chasers in the West) or hockey stick-shaped lining tools used in Poland and Mexico are the only major differences I found in different traditions across the world. Metal moves when pushed with tools in certain ways, and everyone all over the world has responded to the material to create similar shapes and tools to create artwork, silversmithing objects and jewelry. There is a difference, however, in hammer face size, and that determines some tool-making approaches and use.

So What Is a Chasing Tool?

Generally, it is a punch—a metal rod with a shaped front end—that is hammered onto sheet metal, either against a flat hard surface or supported by a mobile, plastic material like pitch or wax. Such punches are also used for finalizing micro-surface details on metal surfaces, especially castings. Note that some 3D-printed cast pieces can be really improved by judicial chasing-tool use on the cast model.

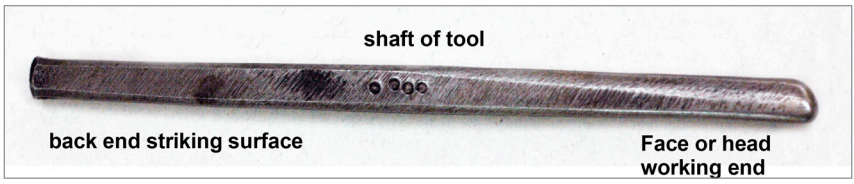

Figure 5 *A typical chasing tool with its parts labeled*

In my research the term “chasing” widened in meaning to include French repoussé, a blacksmithing approach to shaping sheet metal. It uses a stake that is worked against using hammers to shape the metal, with the stake pushing up from below as you hammer. For me, shaping, i.e., ploughing into the metal with a non-cutting punch or stamp, constitutes chasing (and repoussé) work. Removal of material (chip forming) does not constitute chasing for me. Note that the world of sculpture (and blacksmithing) has a very different meaning for the word “chasing.” It means “finishing” for them, so that using hammers on a surface, chasing tools, files or even powered angle grinders are all called chasing. This results in their tool suppliers selling chasing hammers that a jeweler would instead call a raising or forming hammer.

Why Would You Care About a Chased Surface?

Chased surfaces look like nothing else. When the metal is worked like a plastic clay by pushing it around, then the surface details and decisions at the microscopic level have all been conscious and this shows to the viewer—it enriches and deepens the viewer’s experience. As an artist/craftsperson/designer, this control is essential. The viewer has a better comprehension when every detail—every tiny light streak, thin edge, shadow or rounded edge—is experienced to its maximum. Chasing a cast object, mold or mold for production, or a finished CAD object—these all result in an enhanced sense of detail, decision, precision and quality for the buyer, the user.

Nomenclature and Language

Because chasing is done all over the world and languages have different ways of describing things, the words "punch," "chasing tool" and "chisel" get used in different cultures in various ways, and sometimes with seemingly interchangeable meanings. Some Westerners use the word chisel to mean what I would call a punch or chasing tool. My understanding is that in Japanese, they are all called chisel but with a modifying name that describes what they are used for, either pushing metal around or cutting the material. I suspect that this Japanese approach has filtered into English through translation and teaching, and that is why there is some mixing of the terms in the West. Blacksmith and steel chaser Douglas Pryor commented, “I just call the chisel by what job it does: oval planisher, large square embosser, V-cutting chisel, etc. Each chisel essentially becomes recognizable by its associated verb.”[2]

Chiseling and carving metal are quite different from chasing. Carving and chiseling remove metal (termed "chips"). Actual chunks are taken out of the material and separated from it. Chasing (and repoussé), instead, are about pushing the material, treating it like a clay, working with thickness changes and flowing material thickness sideways as much as just pushing sheet metal up and down. You change the material to make some areas thicker so you can then stretch them more for relief work. If you are pushing the metal around, changing thickness sideways, up and down without removing material, that is chasing.

As understood in the West, the activity of working the metal as a ductile plastic material with hand punches (or hammers) is broken into two different concepts. The first, repoussé, is viewed as working the metal out from behind to produce relief. Steel hammers are normally used with a soft, giving and resistant surface underneath. That could be an airspace supported on each side of where the metal is being struck, like a big crack in a wooden stump. The metal is pushed into the air with hammers, which stretches it down, thinning it more evenly than mounting it on pitch and thus shaping it. This hammering approach is part of how the Statue of Liberty was made, the largest repoussé work around, except for maybe Buddhas in Asia.

For smaller work, the forming-tool shapes used for chasing work well for repoussé as do sturdy, blunt wooden tools. "Eastern Repoussé" work as taught by Victoria Lansford and Gia Gogishvili is similar, except they define chasing as working on the front only and repoussé as working both sides of the metal. In all the master work I have observed around the world, there are no (or almost no) tool marks on the back of the sheet, i.e., the sheet was pushed out using softer tools from behind, a bit more than needed, then it was placed on pitch and worked only from the front from then on. Other materials to emboss the metal into include plasticine, wax, soft wood, lead, carpeting (common in Asia and with blacksmiths), stacked paper (like a phone book), rubber sheet, soft pitch and so on.

An important principle is to use the heaviest blow possible to do the most work possible as early and as long as you can. Therefore, start with hammers over wooden hollows to sink the sheet into air supported by the rim of the depression, and then use hammers as punches on metal on the warmed pitch (striking them with a mallet). There are "dogleg" hammers in all cultures (Figure 6) that let you see better while hammering and can themselves be struck with a hammer or mallet, so they act like a "stamp on a stick" and are very precise—you hold it in place and then hit the hammer. It is only after you have done everything you can with heavier tools that you finally move to using chasing tools as the materials cool. Pitch temperature alters the resistance, so warmer lets you form deeper and faster; cooler allows you to refine surface detail. This is the most time-efficient way to go about this process.

Figure 6 *A Thai dogleg hammer*

Figure 7 A *vase by Wayne Meeten (multiple Saul Bell Design Award winner). This piece is chased with hammers, not punches, in a Japanese approach.*

Repoussage and Copper Tooling

There is a world of low-relief modeling called repoussage. This technique was very popular in the 19th century to create figurative metal low-relief work, often used as decorative medallions and components of furniture. The sheet metal is very thin (0.3 mm or less—a very thick foil). It is burnished by hand onto slightly yielding surfaces (like phonebooks) and shaped using pushing tools (not punches). Then the thin metal relief design is backed up with a solid support such as plaster or cement (epoxy these days). This approach became linked with hobby work in North America in the 1950s and was forgotten as a serious approach to art and craft making. I mention this as a lost low-relief figurative mode of working, and it is far easier and faster than chasing.

Mental Models: Metal as Clay

The most important mental model for metalsmiths and especially chasers is "metal is clay." When forging or working metal, it acts exactly as clay does. Blacksmiths practice using plasticine and the same hammer that they're planning on forging steel with because the material moves precisely the same way clay does. To understand what chasing tools and forming do to the metal, think about a slab of clay and using a sliding tool like a pencil (a lining tool) dragged across it, creating a groove and throwing up material on each side of the plowed furrow you created. This is exactly what chasing tools do. They change thickness, form grooves and model the material. In the same way, if the metal is mounted on pitch (a thick, harder tar-like mixture used by chasers to work sheet metal on), then it is like having a slab of clay on a tabletop—the bottom surface of the slab is fixed in place. When you push the clay sideways with your thumb or finger (and chasing tools are your metal fingers), the thickness changes, the bottom surface stays where it is, but the material is moved sideways, thinning it where you push but thickening ahead of the finger. This is exactly what happens in chasing, and this understanding changes how one perceives the process. Douglas Pryor uses the word "fluid" to describe this understanding.

Drawing and Model-Making for Chasing

Drawing is the easiest and fastest way of planning for a chased work. It is the quickest way of burning through bad ideas, coming up with designs, and figuring out what you are doing. In addition to ideation sketching and orthographic projection drawing (three views), it is essential to understand the space the chased object will occupy. To plan and understand what is going to be made, it is important to rehearse and learn the three-dimensional space the object will inhabit. To this end plasticine models of the object, surface and (parts) of the intended pattern are made. Formerly, chasers would take that even further—after the plasticine version they would create a block of plaster and carve, sand and finish it to the final state of the chasing. Today, this last step is frequently skipped, but a plasticine model remains quick and useful. When working with such a model, it is quite useful to use a raking light, like a flashlight, which is shone sideways at the surface to better

reveal the texture and relief. This improves your understanding of the object and the surface being made. And then you translate that information to the tools you will use or will need to design and make. I have many chasing tools, but often find that on a new project I will have to make four or five new ones.

Use of Light and Shadow on Surfaces and Edges

When you look at a coin with a head on it, the impression you have is that of higher relief than is actually there. There is an illusion that you are looking at a depth of a millimeter or so when the actual relief height is about 0.2 mm. This illusion is caused by tiny shadows (where there is a small vertical drop in the surface) and tiny light streaks on raised edges. Rounded surfaces exhibit broader lit areas and larger, softer shadows. This contrast and visual modeling are how the relatively flat surface is altered to use the viewer's own mind to create a sense of depth. Chasing uses this approach, as it does all the traditions and conventions of drawing and rendering to increase the visual depth of the piece. An example is where roof tiles (or marks) are made smaller the "further away" the part of the chasing should be (just like the roof at the Louvre or the fake village at Disneyworld). Tinier marks further back and larger marks closer to the "front" of the image use the viewer's mind and training in perspective to manipulate the visual depth of the chasing.

Models to Learn about Tools and Pattern Options

Chasing deals with pattern, line, drawing, rendering systems and techniques. Other practices of image and surface manipulation in different media share similar approaches to design. These can inform and illuminate an understanding of chasing and its tooling needs. Looking at similar problems and techniques in other fields using contrast and comparison gives a deeper understanding of chasing issues and new possible tool designs. Low-relief pictorial works in other media are examples of useful models and places to look for information.

Leather Work

Decorative leather work deals with many of the same issues of drawing, pattern use, surface manipulation, texture, shading creation, and image-making. Stamping is used extensively in leather working, and much information about the sequences of creating an apparently complex image when chasing can be found in leather-working how-to books. Pattern development from stamps is well developed in leather work. The design steps are broken into clearly defined sequences that can also be applied to metal. The tools are similar to chasing tools. They are, however, often not as hard as ones for metal and so cannot normally be used on metal.

Wood and Chip Carving

Low-relief pictorial work is done in wood and uses many conventions of use to chasers. Examples abound. One of the most important conventions used in chased works is "over and under," where part of the design appears to pass under another part. This leads to a greater feeling of visual depth. Wood carvings use this a great deal, and it is often referenced in medieval work in churches. In wood, sometimes the relief is pierced through so that a "bridge" is formed, a hole through which "air" (and space) can pass. Some chasings do this as well by forming and chasing and using cast or constructed components attached to the surface. An example is this detail in Adam's Vase (Figure 8). Thai chasers use this approach at times to deepen the viewer's experience of depth and space.

Figure 8 *Detail of Adam's Vase 1893-95, Designer Paulding Farnham, Tiffany & Company*

Ceramic Low-Relief Carving

Tiles, pots, plaques and other objects in ceramics use low-relief carving (bas-relief) and this relates closely to the design issues of chasing. Much can be learned from studying how light, shadow and relief are used in this medium. Islamic works were masterful tessellations of pattern and a lot can be gained by studying them.

Chasing Surface Levels

Chased work can be divided into three levels: flat chasing, low-relief work and high-relief work. There are overlaps between these categories. Everything is on a spectrum, not necessarily a "this" or a "that."

Flat Chasing

Flat chasing is just what is sounds like—no relief to speak of, primarily lines, texture, pattern, drawing, possibly a little bit of relief. The Magnolia Vase from 1893 (Figure 9) is an exquisite example. Stamped work would be included in flat

chasing—and there is a whole world of stamps and stamping. Patterns of all kinds lend themselves to flat chasing, so easy reproduction/production or origination (a one-off sketch that is chased through) is possible. For example, glue paper with an image onto the metal and then chase through the lines and marks. (That took me thirty years to understand.) This technique is commonly used as a production technique in Thailand.

Figure 9 *Magnolia vase, Tiffany's 1893, showing flat and low-relief*

Stamping is part of flat chasing. Matthieu Cheminée's recent book, *The Art of Stamping*,[3] covers everything and more that I could say about stamping as a part of flat chasing. I highly recommend the book; it is a seminal work. See an example of Cheminée's work in Figure 10.

Figure 10 *A close-up view of Matthieu Cheminée's stamp work on a bracelet*[3]

Low-Relief Work

This is a step up from flat chasing. Low-relief work adds bumps and bulges. Some flat chasing is combined with low-relief work. It can involve repoussé as well as chasing from the front. David Bugazzi does superb work in this mode (Figure 11).

Figure 11 *David Bugazzi's work exemplifies low-relief chasing.*

The Thais make low-relief chasing even more efficient for production by folding the metal in half before forming it (hammered out from behind onto carpeting) and then chasing the front on pitch. This means that the second layer is about 80% chased at the same time the front is and only needs a little touch-up with tools to produce a second piece. I have only seen this production approach in Chiang Mai, Thailand.

Henry Spencer writes, "Chasing tools are very simple things with only three purposes. First to create volume and contour, second to alter said contour and volume and third to effect reflective qualities."[1]

High-Relief Work

This is work that is anything from a medium projection to an almost isolated, separate sculptural figure from the main surface. Thai and Laotian work offers an example in chased aluminum shown in Figure 12. David Huang has done some lovely high-relief raising and chasing combinations like the example shown in Figure 13. The Greeks, Sythians and others raised and chased animal-related drinking vessels called rhytons. Creating a large vessel or object and then chasing it to refine it are part of this approach.

Figure 12 *An example of high-relief work, deeply undercut, from Chiang Mai, Thailand*

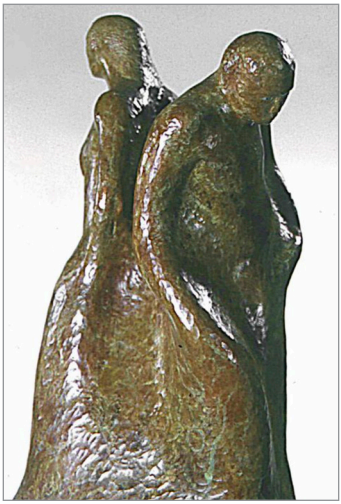

Figure 13 *David Huang's very high-relief chasing on a raised vessel*

Chasing Castings

Chasing is used on castings to finish, smooth and refine the surface detail. In the world of sculpture and cast jewelry, the surfaces are chased (hammers and punches) to produce a final, delicate, crisp micro-surface—a reflection of the ductility and detail possible, the moment of "frozen flow" that makes the look distinctive. When the jewelry industry discarded chasing as being too costly in time, it also threw away the detail that chasing affords, which can really improve an original casting model used for production. One branch of chasing castings is chasing decorative cast accents and details for baroque wood furniture. In France this is considered a distinct profession.

Chasing Steel Dies

This is the last place chasing was widely used in the jewelry industry in the West. The steel die would be carved, chased, finished (with weeks of fine abrasion with ruby stones and copper tools using fine diamond-abrasive slurries), then hardened, tempered and used for stamping sheet-metal parts for jewelry assembly. Four weeks of carving and chasing a die was worth it in the thousands of stampings that resulted. These steel stamping dies were hand created by chiseling, carving, chasing and etching the steel hollow that sheet metal would be stamped into to make thinner jewelry that was lighter and more cost effective. As labor costs made chasing less desirable to use in production work, the practice was squeezed into higher return areas such as custom work, silversmithing, trophies, awards and specialty items.

Chasing tools for working on steel are often sharper and have crisper edges than those for other metals because steel is harder than precious metals. I believe that this influenced the shapes of commercially supplied tools to the jewelry world and, as a result, many commercial tools are far too sharp to actually chase precious metals without damaging the surface.

Western and Japanese Approaches to Changing Metal Thickness

Western chasers generally use polished tools for forming metal. There is another approach. For example, when blacksmiths use a flat hammer face to taper and shape hot steel (like a ball peen hammer with one flat side, as is their norm), there is no directional forging happening as with a cross peen hammer. Instead, the flat face grabs the top surface of the red-hot metal (which is clay-like and ductile) and, using this contact and friction, the hammer pulls or drags the metal sideways to create the forged taper and shaping that is intended. The metal underneath the surface is dragged along. This method of friction dragging is very effective and fast.

The same idea can be used in chasing, and the Japanese do. In the West, one does move material sideways, like pushing with your fingers sideways on the clay to change thickness, but in Japanese chasing some of the shaping and forming tools are slightly textured or finely toothed so that they literally grab the top surface of the metal. Then, when moved sideways, they increase the speed and effectiveness of moving material thickness by combining the blacksmith's approach with the cold-worked metal being used on pitch. Valentin Yotkov notes that he does not polish some of his forming tool ends but leaves a very finely sanded tooth on them for this exact reason—they grip the surface and move the metal thickness sideways better. Marcus Chambers writes, "The roughened punches are used to gather the metal in and up so as to create a thicker form than the original sheet thickness, if done correctly. Also, once the necessary volume is formed from the back, traditionally using only wood or horn punches, the back is never touched again during the process. In fact, my teacher, Ford Hallam, told me the paper or orange-peel texture that develops subsequently is prized and referred to in Japanese studios as はたす (or Hatasu) and is said to refer to the inner life of the material."[4]

In response to my questions about this, Momoko Okada wrote, "Yes, the moving metal chisels (chasng tools) have textures, otherwise it slips and won't really work. Usually tap the tool with a coarse file to make scratches on the chisel surface. To polish, we use mirror finished planishing chisels to make smooth surface after this. Not only to smooth the surface but also to harden the metal to finish up."[5] Ysela Caseres was aware of this idea as well and sometimes used unpolished, sanded tools because she felt it moved metal thickness better.

Figure 14 *Marcus Chambers' Japanese-style textured forming tools*

The Individual Chaser's Tools

While I will be discussing specific types and names of tools, the professional chasers I interviewed each said that many of the tools they made and used were in response to the process of working the metal, that many tools had not been shown to them but had emerged to deal with different working problems. As tools in all cultures and made by different people seem to have the same shapes, it is clear their forms derive from function. Spencer writes, "I work with four basic shapes: straight, wedge, double angle (bias) and lozenge. Of course, there are myriad variations of each shape's uses; thus, each shape contains about 20 examples in my tool set."[1] This typifies chasers' experience though, clearly, many, as I did, copy their teachers' tool shapes. Victoria Lansford's tools are of interest. Because each tool is part of a very specific step in the making of a chasing, and there are deliberate limitations in Eastern repoussé procedure, there are only eight tools. I think it is a brilliant approach. One day, however, as we were walking together at a conference, I was complimenting her on this approach, and she said, "Well, you know, sometimes I wish I had more tools."

Figure 15 *A look at Victoria Lansford's set of eight*

Principles of Chasing Tool Design

Chasing tools can be very straightforward rods, but there are ways of making them easier to use and better balanced. Length is obvious as a starting point. Many Asian tools are shorter than Western ones. I believe that is originally a reflection of historic material cost. When you are earning the equivalent of 25 cents a day, then spending a dollar on steel is difficult. For the same reason, tools can be in brass or soft mild steel. The tools are sometimes twisted to strengthen them, and shorter is more stable. I was taught that a tool should run from the index fingertip to two-thirds of the distance from where the finger joins the hand and the thumb begins. In practice, around 10 cm is a useful length.

Backs of Tools

A tool's back end has some importance. It should be annealed or at least softer than the hammer face to avoid being shattered. In the West the back is usually filed into a cone shape (Figure 16) or, in the old days, an octagonal pyramid. The reason for this is twofold. If you have a big, flat end on the tool, then the chance of striking on an edge first is high. When you hit an edge first, it pushes the tool sideways into your hand, which is painful and a waste of the energy being delivered to the tool. The smaller the surface contact area at the back, the more efficiently energy goes straight down the shaft of the tool and onto the metal being worked. The second reason is that a cone has to thicken back to the original rod thickness before it mushrooms over (Figure 17). Chasers in the West maintain their chasing tools by grinding off the overhanging metal. And the cone makes this task much less frequent. The mushroomed-over steel is brittle, and chasers have been blinded by pieces flying off when struck, which is a rationale for keeping them ground back in the Western tradition.

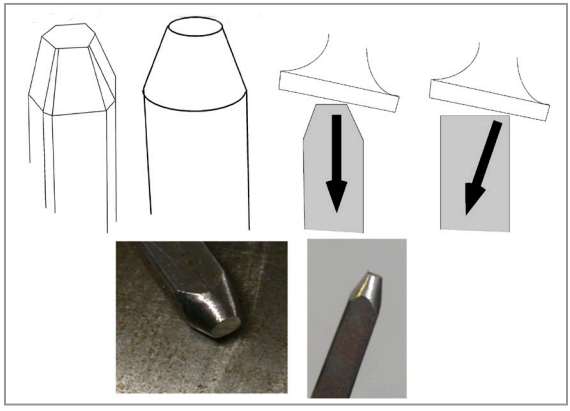

Figure 16 *The conical end at the back of a tool*

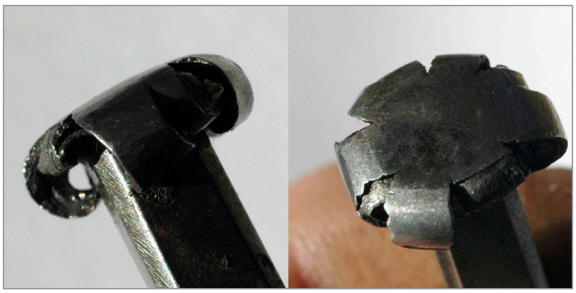

Figure 17 *An example of a thickened back of a tool from use*

There is a difference in approach between European/North American chasers and chasers in other parts of the world. It is the hammer type used (Figure 18). European chasing hammer faces are quite wide so that there is a large area to strike the narrow-ended tool in your hand, even if you are not in exactly the same place with each blow. Many chasers outside of Europe have shorter tools and they are heavily mushroomed over (Figure 19). With shorter tools it is easier to hit your knuckles, and the mushroomed-over material provides some protection. The main advantage, however, is that when you have a small hammer face, the large mushroom is easier to hit and so is left on and is even desirable with smaller hammers. So there are two options: a small tool end and a large hammer face or a small hammer face and a large tool end.

Figure 18 *Chasing hammers: The two bottom ones are European; above them in order are Indian, Japanese, Thai and Korean. Note the differences in hammer face size.*

Figure 19 *Mushroomed-over tools in Thailand*

Necking in a Tool

Some of the nicer tools to use are "necked-in" (Figures 20 and 21). The shaft narrows behind the head. This lets your fingers sit in comfortably and allows better control of the tool. This approach is often used on round stock tools and planishing tools because it is fast and easy to rotate a rod against a grinding/

sanding tool to neck it in, and those tools are not directional, i.e., you don't need to know which way it is facing when in use.

Figure 20 *Examples of the front ends of necked-in tools*

Figure 21 *Another example of a necked-in tool*

Making Chasing Tools

It is pretty easy and fast to make chasing tools today. A grinder, a belt sander, a rolling mill to step-roll (taper) and polishing compounds like Fabuluster® let you make a tool in about ten minutes. I have step-by-step instructionss available on YouTube, and a lot of information on the procedure is online.

There are a number of steel types that can be used. (In a standard car there are over 250 kinds of steel.) I recommend W1 (which stands for water hardening 1) as the simplest steel for jewelers to use or O1 (oil hardening). Other types can be used. The most basic procedure is to use W1. It comes as round stock (drill rod) and as square stock. In England and Australia, it is called "silver steel." Order it dead soft. Then you shape the tool, step-rolling, filing, grinding, cold-forging or hot-forging until it looks exactly like what you want. Then sand and polish the areas that need to be smooth. The hardening and tempering process for W1 is this:

1. Shape the tool exactly as you want it to be.
2. Harden it by warming it, applying bar hand soap (this protects your surface and preserves fine detail) and then heating the steel up to a uniform bright orange.
3. Quench it vertically in swirling water to avoid warping. That is called hardening. The steel is now so hard that if you dropped it on concrete it might shatter, so the tool now needs to be softened to a useable state.
4. The softening process is called tempering. The steel tool is sanded on one side and then heated gently from back to front (Figure 22). The surface of the steel oxidizes and discolors in this sequence: light yellow, straw yellow, brown, purple and blue. The oxidation colors are carefully observed. When the body is mostly blue/purple and a light yellow arrives at the tip, it is quenched to fix the crystal structure to be able to use it as a finished chasing tool.

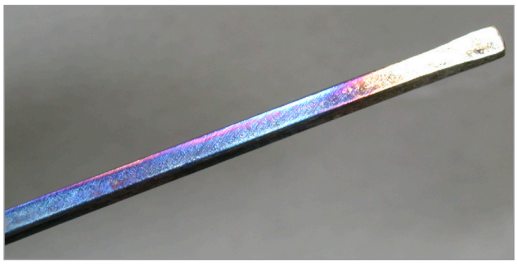

Figure 22 *After hardening, the tool is sanded and then heated from back to front. When it discolors, as shown, it is quenched to fix the temper as appropriate for a chasing tool.*

Wrapping Tools to Increase Gripping Diameter

In order to improve the grip and control of tools, chasers across the world will bulk up the middle of tools by winding a narrower tool using electric tape, inner tube, rubber bands, string, etc. to thicken a tool and cushion it in the hand (Figures 23–25). This is especially useful with round-shaft tools to improve control. It should be noted that the larger the diameter held, the more effective is a minor change in holding position. The bigger the thickness held, the more the movement is controlled. Wrapping also aids in rapidly identifying frequently used tools.

Figure 23 *A wrapped tool from Ysela Caseres*

Figure 24 *A tool from Thailand wrapped in rubber bands*

Figure 25 *One of Valentin Yotkov's tools wrapped in electrical tape*

Textured Sides on Tools

Texture on the sides of the shaft improves control of the tool (so you don't have to look at it and your hand in order to know where it is going). It makes the grip better. I leave file marks on the shafts of my tools for this reason. Ysela Caseres uses a center punch to heavily texture sides for control on some tools, as in Figure 26.

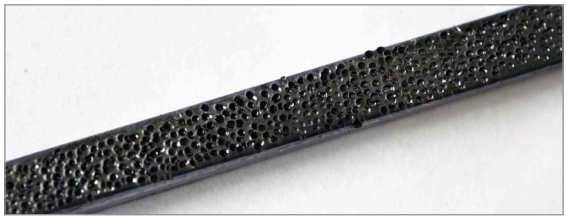

Figure 26 *An example of Ysela's highly textured tool side*

Variations of the Same Shape

Note that for any given shape there are many versions possible in different sizes. For example, basic planishing tools are square, rectangular or triangular, but for every one there is a large range of sizes, so the same tool shape can end up in thirty different sizes. I believe that most chasing tools should not be sharp, so they don't cut or mark the metal. Some can be almost sharp, and a very few are sharp for fine definition and use on harder metals like steel. But, for me, I take the final tool shape (before hardening and tempering) and press it against my cheek. If it hurts, then it is too sharp for the metal and needs its edges further rounded and smoothed.

Hard Tools and Soft Tools

Most chasing tools are metal, historically bronze or brass and, these days, steel. But soft tools are used when working tools onto carpet or into depressions; with broad, larger area shaping (such as in repoussé work); when fixing mistakes and/or only a little movement is needed; or when the surface should not be damaged. Many soft tools are wood (Figure 27), and hard woods such as ash, hickory, oak, ebony and exotic hard woods are preferred. Sometimes rawhide, bone, nylon, Delrin® and similar materials serve this purpose. Bamboo chopsticks are pretty good. Figure 28 shows some of my soft tools.

Figure 27 *Wooden tools from the studio of Miriam Hanid (http://miriamhanid.com)*

Figure 28 *A selection of my soft tools: wood, rawhide, bamboo and plastic*

Lining Tools

Liners are also called tracers or tracing tools. I will call them lining tools in this paper. Their purpose is to make a narrow linear groove in the metal (outlines, drawing, detail, texture). They can also be used as stamps to make patterns by repeated, close, swiveling blows. They are usually used with continual tapping while tipped slightly, which advances the line produced automatically with every blow. This angling is what advances them. A right-handed person will hold them in the left hand and the line progression is in the direction of the arm, towards the body. While these tools make lines in the metal, the effect is like dragging a stick through clay or mud; it leaves a plowed furrow with some material thrown up on each side of the groove.

A second important approach to using liners is common in Thailand (Figure 29) and with southwest Native Americans,[6] where the liner is used like a stamp, punched down with a single blow and then moved over and punched again, more or less extending the line. This is then smoothed out and made fully contiguous by going back over the line again in a softer stamping motion to blend the line (or possibly a gentle, repeated version of the slightly tilted sliding approach for a final blending and smoothing). When closely examining chased work, you can usually tell if this stamped approach has been used as there will be traces of the punching technique evident.

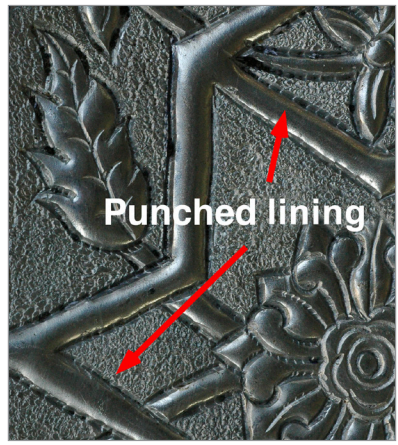

Figure 29 *An image of Thai work showing typical punched-line markings*

Wearing In a Liner

It is standard when making a liner that you file and sand it close to the final shape and then test it on sheet metal to make sure it does what you want, that the corners are not too sharp, which results in choppy marks in the line. Normally, when making a liner it is tested on copper or silver sheet metal and then refined with fine sandpaper to decide when it is done and ready for hardening and tempering, thus fixing it as a permanently finished shape.

A European approach to making liners is worth mentioning. You get the tool close to finished and then you use it, still annealed without hardening, on projects for about six months. This pushes and flows the steel itself gently into the way it is actually used, producing a perfect liner. I find that keeping track of what got hardened or not is too difficult for me, though I like the idea of this approach. I have found that you can speed the process of shaping in-use by taking an annealed lining tool at the final stages and using it on cold-rolled sheet steel, which has a similar effect to time of wearing the subtleties of the shape into a good final form. Then you harden and temper it. This process is faster and means that you do not have to worry about remembering whether you hardened a tool or not.

Straight Liners

When you make straight or slightly curving lines, you use these tools. They can range from being straight all the way across with sharp corners or have various degrees of rounded corners. The rounded corner enables you to tip the tool and "walk" it forward more easily with every light blow, and to create curves using the same tool (see Slightly Curved Liners). They are generally thin to produce thin lines. Many are bilaterally symmetrical and have an even cross-section. The ones I like are flat across most of the top surface and rounded at the corners. Valentin Yotkov says that he likes a straight liner with a very gentle curve to the middle

as he has more freedom to move it forwards by tipping slightly as a result, and I would agree. They come in all sizes, from large to almost invisible tiny ones.

Figure 30 *Ysela Caceres' straight liners*

Figure 31 *Straight liners from Chiang Mai, Thailand*

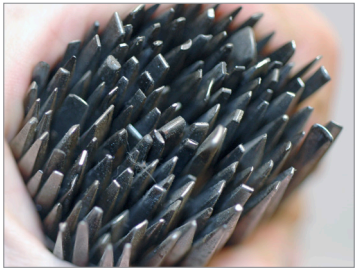

Figure 32 *A group of my smaller liners*

Slightly Curved Liners

A liner that is slightly curved from the top and end view lets you do both straight and curving lines easily, again best if the corners are slightly rounded. This is related to the Betteridge liner, which is described in the following paragraph.

Figure 33 *Some of my slightly curved liners*

Quarter-Moon Liners

These are a blend of curved and straight liners, where one side is curved and the inside of the curve is a sloping shelf towards the top ridge of the tool. If the corners are rounded, these can be used for both straight and curved lines, but because of the sloping side they shape and form the inside of the curve, producing an emphasized (shadow/light) feel to the inside of any curve and to one side of a straight line. This is a kind of combination tool, where a line and a sloping surface are produced simultaneously. This takes the place of two tools, a sharp liner and a planishing tool to slope the inside of the curve, which can then be followed up with planishing tools or side/step-down tools to emphasize the effect. The Betteridge liner is in this family. When I was a young student, Lois Betteridge gave a chasing workshop and I copied some of her tools exactly. One of them is something I call Lois' wonder liner. She herself had copied it from a teacher. It is a liner that does both straight and curving lines of any kind, depending on the degree to which it is tipped. Normally, it is made as a fairly narrow liner, flatter than a quarter-moon liner. The key to it is that there is a slight internal curve made in the liner (from the side view 80% of it is flat/straight) and then the corners are gently rounded. The tool is usually quite narrow and so produces a very fine line but, again, it replaces dozens of different straight and curved liners with what you can do with it.

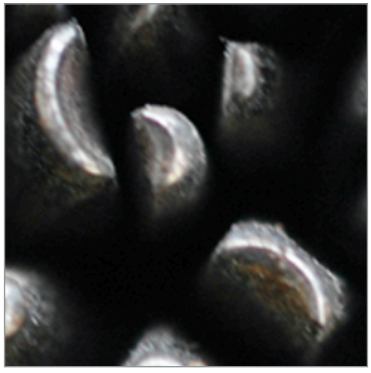

Figure 34 *Three quarter-moon liners*

Curved Liners

There are as many curved liners as there are curves—a lot of them. Most are specific to a particular curve or part of it (thus making them part of the spectrum towards pattern tools). They can be used as a stamp (single blow) or as a sliding, multiple-blow, extended-curved line. They can be lifted, reversed and used to create sinusoidal repeated patterned curves.

Figure 35 *A selection of Ysela Caseres' curved liners*

Longitudinal Curved Liners

I first ran across this form as a Polish liner, and also in Mexico, but others use it. Valentin Yotkov, for instance, knew the design. It looks like a hockey stick. The idea is that, because of the long curving surface, you can tip the shaft easily and guide it, using different parts of the curve for lining, which provides a different way of lining than a standard straight or slightly curved tool. Because you can vary the V-shape in different parts of the tool, you can get different line widths with the same tool, and the ability to tip it means you can approach the work from more angles than a straight tool. Victoria Lansford saw Gia Gogishvili and Richard Mafong use this tool to make scrolls, as on the frames of icons.[7]

Figure 36 *An example of a Polish-style lining tool*

Figure 37 *A side view of the longitudinal liner*

I have seen a Mexican relative of this tool, and Ysela Caseres has seen them, too. Gadrooning tools can also be designed this way, with a curving surface. There is a slight relationship to curved, boat-shaped forming and gadrooning tools.

Figure 38 *The entire length of the curving part can be used as the shaft of the tool is tipped.*

Pattern Tools

Pattern tools are used in production or repetitive chasing. When you have to do a hundred or a thousand of a flat chasing or simple relief design, if you break the whole pattern into parts you can create a tool specific to that part to be used as a stamp. It will appear visually to be part of a standard chased, multiple-blow line or mark. The tools are specific to the pattern. Mark-making as a stamping motion is much faster than the continual blows and going over the same place repeatedly with the same tool that is typical of much chasing.

You can examine old production work—teapots, vessels, etc.—and determine what pattern tools were used to make them. This is about repetitive designs or just parts of a design. The point is to combine marks to reduce work.

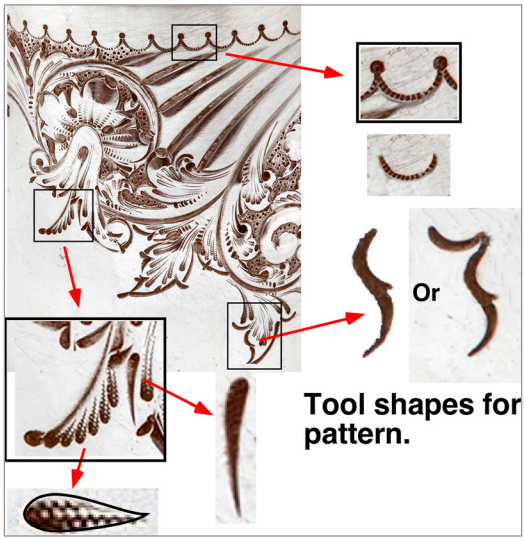

Figure 39 *This illustrates how patterns can be broken into tool "stamps" that are part of a complex pattern.*

In the 1980s, I knew a chaser in Toronto, Yas Iwashita, who had a production line chasing system. They did, among other things, a bridal cup for Birks (one of Canada's premier jewelry chains). They would get the spun copper cups and then chase a decorative shield design onto them, four workers in a line, round holes cut into the long benchtop to hold the pitch bowls. The cups were filled with pitch, then the first person would stamp their part of the pattern with specific tool shapes, pass the cup to the next person who would stamp their part of the pattern. and so on. The last person would add a graver wiggle, and the pattern would be done. They could produce 400 finished chased goblet cups a day, which would then be soldered to a base and silver-plated.

An interesting production trick I have seen in Chiang Mai is to fold a whole sheet of metal in half and then chase and form two layers at once. While the top surface is finished in full detail, the second layer has all the forming already done and is about 80% finished. All that remains is to chase in the detail on the second layer.

Combination Tools

One of the most important types of tool is a combination tool, where several tooling steps are combined into a single shape. Examples include quarter-moon liners, step-down tools, gadrooning tools, chain tools, rail tools and others. The premise is this: Can you combine two (or more) individual tool actions into a single shape so as to cut down on time and work? Gadrooning tools, for instance, produce a repeated complex groove (Figures 40–42). Normally, this effect would be produced by using different liners, followed by planishing and shaping tools. The gadrooning tool combines these multiple actions into one.

Figure 40 *These are gadroons, a kind of parachute-like scalloping seen on toilet ball floats and chalices. See Wikipedia for more information.*

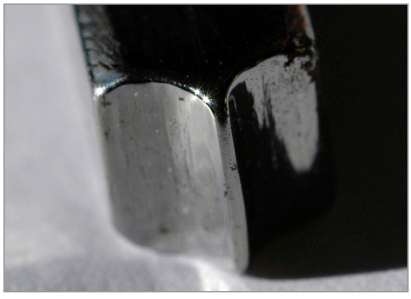

Figure 41 *This is a gadrooning tool of Ysela Caseres, which combines a number of actions.*

Figure 42 *A group of my gadrooning tools*

Forming Tools

Forming tools are some of the most important tools in chasing and repoussé for shaping relief areas. The most effective ones have a "loaf" or "bread" shape (a reflection of the finger shape). They do not tear the metal but rather move the metal thickness sideways very well and are fast to use. Many variations are possible such as tear-drop, round, square, and angled versions (see examples in Figures 43–46).

Figure 43 *Some of my general forming-tool shapes*

Figure 44 *Small forming and planishing tools*

Figure 45 *Very useful forming tools*

Figure 46 *Larger Thai rounded forming tools*

Upset Forming Tools

Upsetting is a blacksmithing term for striking against an edge or end of a rod, which thickens it. This is really red-hot riveting (Figure 47). It creates a large face area, with a place for the fingers behind the head, allowing much more control and comfort in use, necking the tool in behind the head (Figure 48).

Figure 47 *Striking a red-hot tool to upset it*

Figure 48 *A group of upset forming tools*

Ball Shapes

Some chasing tools are ball-shaped such as pearl punches (Figure 49). Dapping tools, which are relatively cheap and available, work well for a number of chasing applications. Because they are a sphere, however, they contact the metal at a single tangent point and, thus, thin it, but not in a controllable directional manner. They do work well for chasing on air (a part of the foldforming system) because they stretch the metal near the strike point as well. Used on metal over pitch, they tend to thin the metal to the point of breaking through the sheet. They are intended for making domes and beads.

Figure 49 *A group of ball punches*

Planishing Tools

Planishing is very important. It is smoothing and blending surfaces, making them flat or blended so that the surface is even, smooth, and can be further finished by abrasion, if necessary. Planishing tools tend to have a larger flat area on the face and have rounded edges (Figures 50 and 51). There are two ways that they are used. One is to tap and slide the tool to smooth; the other is to hold it and strike like a pile driver, lifting between each blow so you can see where to strike next to eliminate marks.

Figure 50 *Some of Ysela Caseres' planishing tools*

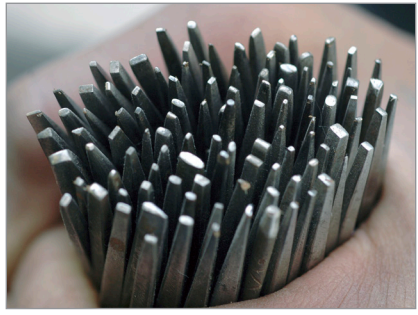

Figure 51 *Some of my smaller planishing tools*

Veining Tools

Veining is used to create rounded, raised linear areas like grape vines, branches, veins on the back of a hand, etc. The tools are linear hollow grooves (Figures 52 and 53) and are used by sliding along a raised line to define it. They, like gadrooning tools, are a combination tool that replaces a sequence of other tools such as liners and forming and planishing tools.

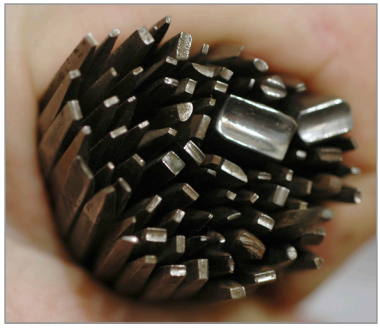

Figure 52 *Examples of veining tools*

Figure 53 *These are Mexican tools for necking in a veined line, creating a series of bumps from the raised line.*

Hair Tools

Hair tools are used to create parallel striations and complex mixtures of parallel lines (Figure 54). They are used for making hair and similar linear designs. They are both a stamp and a sliding continual-pattern tool.

Figure 54 *These are Mexican hair tools.*

Rail Tools

Rail tools are linear tools. They are self-registering and produce smooth parallel furrows, combinations of lining, gadrooning and dished furrows. There are two steps. First one lines the metal with a heavy rounded lining tool. This creates a solid, controllable groove in the metal. Then the narrow protrusion on the rail tool can fit in the first groove and guide the tool along, creating a larger furrow parallel to the first one. This principle can be adapted in different ways to create parallel grooves, lines and furrows.

Figure 55 *Two different rail tools from varied angles*

Pearl Punches (Beading Tools)

Pearl punches come in both convex and concave forms (Figure 56). They are uniformly rounded and create dimples and bumps in the metal, a kind of stamp, but a bump can be gently gathered by a concave one and by tapping become a uniform smooth dome with a defined edge. They can also be in shapes other than round, for example, sort of hollowed shapes, diamonds, rectangles, half circles, etc, all hollowed like a pearl punch.

Figure 56 *A group of concave and convex pearl punches*

Figure 57 *Ysela Caseres' hollow punches*

Chain/Rope Tools

Chain tools are singular to chasing; for instance, leather workers do not seem to use them. The idea is that you have bumps on both ends of the tool as seen in Figures 58 and 59. When you strike you get two dents. Then you move it over, feel one bump click into place and strike again, thus extending the line of dents one at a time but perfectly lined up. They are a self-registering punch for lines of decoration. As long as you have a bump on each end, you can put any pattern-stamp shape in between, and now you can self-register complex patterns. A relative is a straight- or curved-line tool with ridges along the edge (Figures 61–64). Again, the ends click into place, allowing a decorative line of dots to rapidly and accurately extend. Rope tools are similar but the bumps, instead of being round, are slanted ovals so that the impression looks like a twisted rope, as seen in Figure 64.

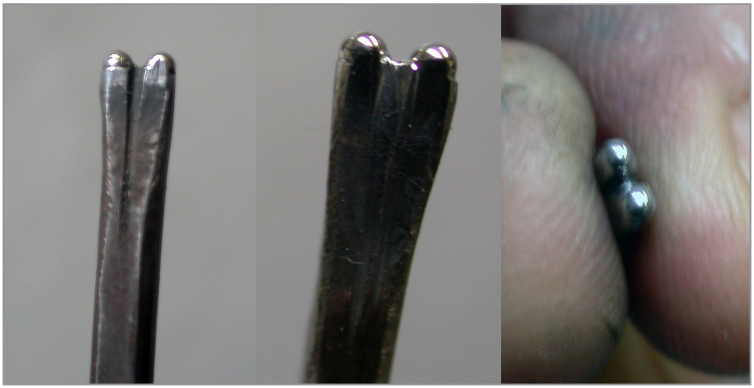

Figure 58 *A simple chain tool*

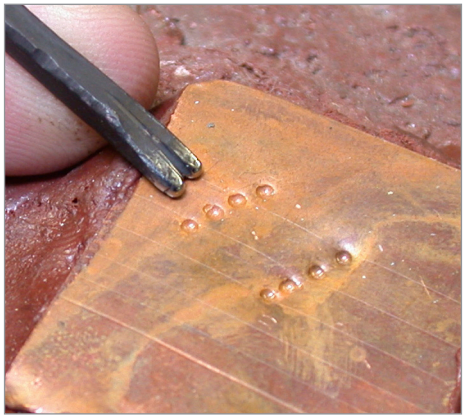

Figure 59 *A chain tool in use, showing the extended row of marks*

Figure 60 *The end of Alberta's Black Rod (which I made), showing how this chain tool can be used. The black rod is used in the Legislature of Alberta as a ceremonial parliamentary object when the budget is presented.*

Figure 61 *A group of small chain tools*

Figure 62 *These are Mexican line chain tools, where the end of the tool registers into the last dent of the previous strike.*

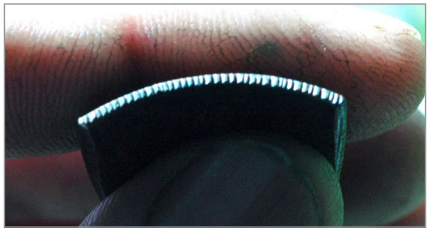

Figure 63 *Ysela Caseres' curved line chain tool*

Figure 64 *A rope tool (version of a chain tool)*

Stamps

A stamp is a punch that is intended to make a distinct image, letter or mark in the metal (Figure 65). It is often struck just once to affect the surface and may be struck hard. Many stamps are thicker than other chasing tools to better transfer the heavy blow. While they are not usually used just for textures, they can be by rotating them while striking. Letter and number stamp sets are quite cheap and tend to be good steel. The letters can produce very complex textures when treated as tools for that purpose (Figure 66). Again, I recommend Cheminee's book[3] as a complete resource.

Figure 65 *A group of Matthieu Cheminée's stamps*

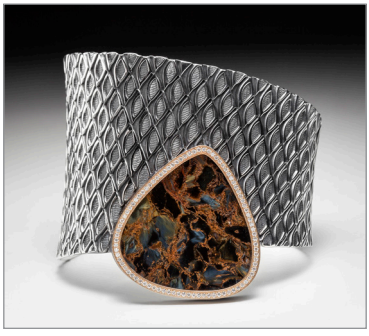

Figure 66 *A bracelet by Cheminée showing the control with which he uses stamping*

Cones, Pyramids and Angled Stamps

These tools are what they sound like—a range in sizes and angle of cones. They produce round indentations. Variations on these include angular and oval versions (Figure 67).

Figure 67 *A selection of conical punches*

Matting and Texturing

Matting tools are very important for chasing. Figure 68 shows typical matting tools. They differentiate backgrounds from foregrounds, create visual shading and produce textures. They are a "tessellation" tool; unlike a stamp that makes a specific singular mark, they are designed to be struck repeatedly and produce a uniform texture over an area. They are made in a number of ways. The tool face can be ground into, filed, sawn into, chiseled, engraved or other stamps used on it to create texture. For instance, a "grain" or "dust" matting tool is made by striking the tool-blank face with pointed punches like a center punch making dots. It produces a lovely texture and, as usual, can be done in all sizes and variations. Other ways of getting texture onto the steel tool blank include milling, etching, pounding onto rusted steel, old files, and so on—any way you can think of texturing the annealed steel, which is then hardened and tempered.

Figure 68 *Some of my matting tools*

One of the important methods of creating matting tools is to make the first one, then use it on an annealed tool blank so that every matting tool can make its own negative. This multiplies the effectiveness of making matting tools—for every one you make you get two. Very occasionally one comes across matting tool plates (if you find one, I want it, please). A tool-steel block was struck with existing matting tools while annealed, then hardened to become a negative block to make reproductions of the original tool by stamping an annealed tool-steel blank into the hard textures (Figure 69). Tool-steel plates can also be milled, etched, etc., to become hard matting tool plates for creating texture tools. Figure 70 shows such a matting tool plate for stamping tool blanks into.

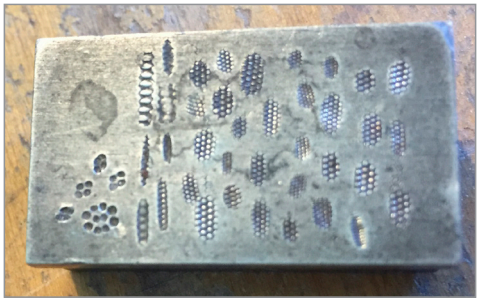

Figure 69 *This is a matting tool plate owned by Tom Herman.*

Figure 70 *Handmade antique roller die plates like this can serve as matting tool plates.*

Half Matting Tool/Half Smooth

A variation that Valentin Yotkov had was a mixture between a matting tool, a planishing tool and a gadrooning tool (Figure 71). It created a wide groove with texture on one side.

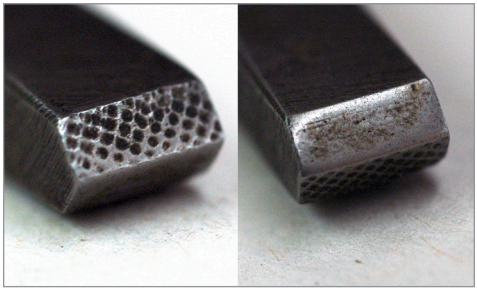

Figure 71 *Valentin Yotkov's mixed punch, view of each side*

Side/Step-Down Tools

These are used to create a vertical drop in the metal surface, a shadow and light streak. They replace the use of a lining tool followed by planishing tools. They are very important to create shadows that animate a chased surface. The face of the tool is angled (Figure 72). To use them you use a lining tool first, then follow with the side tool. This drops the surface and slopes it from the bottom of the drop back up to the surface on one side. This step is then undercut with blunt liners to create a more precise shadow and visually "lifts" that part from the piece (Figure 73). Figures 74 and 75 show other examples of side tools.

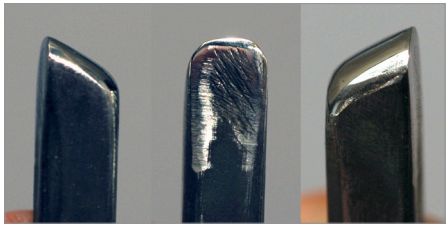

Figure 72 *Views of a side tool used for step-down work*

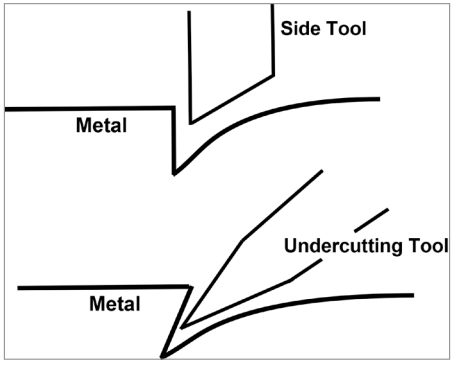

Figure 73 *This is a diagram of how a side tool creates a vertical drop in the sheet-metal surface and is then undercut with a different tool to increase shadows.*

Figure 74 *A group of side tools*

Figure 75 *A sharpish side tool from Ysela Caseres*

Side tools appear to be a real bridge between forming, planishing and undercutting tools. They have a large spectrum of possible shapes, with many being rounded. Japanese undercutting tools are close relatives and are clearly part of the same spectrum of working. Many chasers I interviewed had standard side tools but also had developed (or copied) such bridging tools with a sloping face, rounded, everything from an oval to a teardrop cross section. See examples in Figures 76–78. A number commented that these sloping tools are very important. Side tools as a form are strongly related to undercutting tools.

Figure 76 *David Huang calls these side tools "round liner" and "flat liner."*

Figure 77 *Huang calls these tools "corner tucking" tools.*

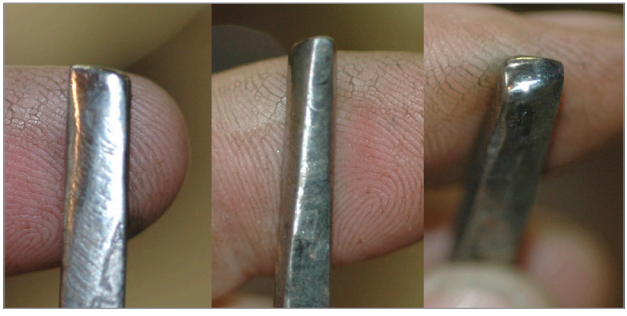

Figure 78 *Caseres' side forming tool, clearly a relative of Huang's*

Undercutting Tools

Undercutting tools are important in various cultures. The idea is that once areas are raised by hammerwork or repoussé, you push material in sideways, increasing shadows and modeling depth. Some Japanese tools are specific for this, and many other cultures use them. They are curved and allow one to tuck in the metal to create larger indentations—undercuts (Figures 79–81). In the West the chasers I consulted knew the shape and purpose and had independently developed them or derived them from Japanese models. I first ran across this form in Thailand, where they were referred to as Laotian tools (Figure 82).

Figure 79 *Douglas Pryor using an undercutting tool*

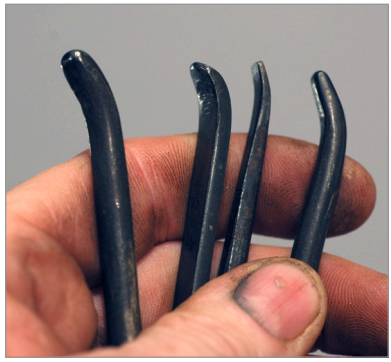

Figure 80 *Several of my undercutting forming tools*

Figure 81 *Marcus Chambers' undercutting tools*

Figure 82 *Thai/Laotian undercutting tools*

Japanese Tools

Blacksmiths, bladesmiths and chasers in North America have learned and adopted Japanese approaches and tools. Megan Corwin, whose excellent book, *Chasing and Repoussé*[8] (the only contemporary full text on the subject), uses primarily Japanese tools.

There are many kinds of named, very specific Japanese tools. As mentioned, they are all called "chisel" with modifying names as to whether they cut or flow the metal. Momoko Okada says "Tagane" (in English, chisel) means a steel rod that is used as a tool. For example, Senbori Tagane means line carving chisel (sen means line, bori or hori means carving and tagane means chisel).

Japanese tools have a number of slight differences from many standard Western tools. Wedge-shaped side tools, sharpish-edged undercutting tools and round forming tools with a slight curve near the front end and pushers are examples. Many are complex versions of side tools.

Lucinda Brogden writes, "My tools are mostly handmade Japanese-style Dashitagane, which are flat ovals with matte texture in a variety of sizes that range from pin head to about 3/8 inch (9.5 mm). I also have adapted them to make sets that are more rounded, have sharper edges so they can be used to define edges, kind of like a fat liner, and polished Dashitagane for planishing. There is also a small tear dropped shape planisher that I use a lot that is flat, plus my adaptations to the shape, rounded, polished, etc."[9]

Megan Corwin shared several of her tool shapes, many for undercutting (Figures 83–87).

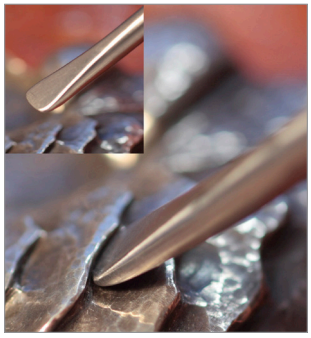

Figure 83 *A fan under-cutter*

Figure 84 *An angled under-cutter*

Figure 85 *A steep under-cutter*

Figure 86 *Curved under-pushers*

Figure 87 *Curved repoussé under-pushers*

Tool Conversions

If it looks like a chasing tool, IT IS! You are looking for a rod-like thing you can strike to shape metal where you hit…it's a chasing tool. So, all kinds of objects can be adapted as chasing tools. For instance, rawhide dog chews make good soft chasing tools, and bolts are rapidly converted into good forming tools (Figure 88).

Figure 88 *This is a set of forming tools ground out of bolt heads.*

An advantage to changing an existing tool is speed. It the tool is good pre-hardened steel, then all you have to do is grind, sand and polish it (as long as you don't overheat the steel, have it discolor and thus lose its temper). Examples of easily adapted, already hardened and tempered tools include chisels, screwdrivers, driver bits, nail sets, concrete nails, post/barn ring nails, watchmaker's staking sets, transfer punches, etc. File handles and various hardware knobs can make useful tools as well.

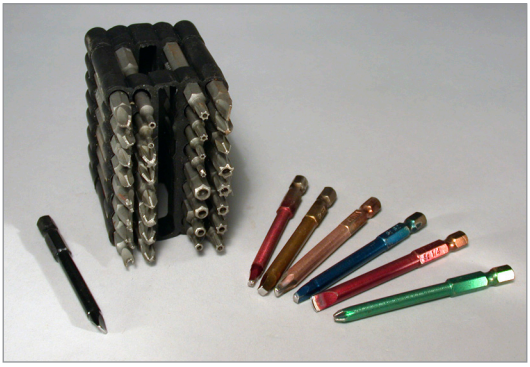

Figure 89 *Security driver bits as stamps and screwdriver bits converted into chasing tools*

Matthieu Cheminée prefers to find old tools in flea markets from which to make stamps, as he feels the steel is better than more recent material.[6] He does not merely change a tool close to what he needs; he sees it as a source for quality steel for stamp making. To anneal W1 tool steel so you can work it (before hardening and tempering again), you heat it to glowing orange and then cool it as slowly as possible, preferably overnight. Other steels that are used across the world by chasers for toolmaking include chisels, files, nail sets, car springs, valve stems, rebar, concrete nails and hardened rods of all kinds (Figure 90).

Figure 90 *A mixture of Mexican tools made from valve stems, rebar, other punches, etc. The same is done across the world. Note the wrapping of tools to improve the grip.*

Some tools are pretty much ready to use, such as nail sets (Figure 91). Three of them cost a dollar at a dollar store and the steel is good. They also come in many different sizes (the sizes can vary a bit between manufacturers), so a collection of them becomes a bunch of pearl punches. As well, if you grind off a third to a half of the front, you have scale stamps for fish or dragons.

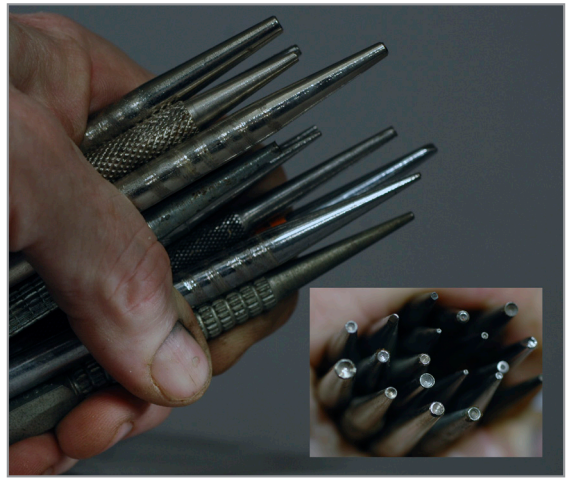

Figure 91 *Some nail sets and their front ends*

Snarling Irons

Snarling irons are an essential tool for chasing. They bump out hollow objects from the inside of a vessel so you can then fill the vessel with pitch and chase back down. They are usually a Z-shaped rod of steel with one end rounded. One arm of the Z is placed into a vise and struck; the other end moves up sharply, pushing a vessel out from the inside (Figure 92). The bumped-out vessel can then be filled with pitch and the outside chased. Examples of snarling irons can be seen in Figures 93–95.

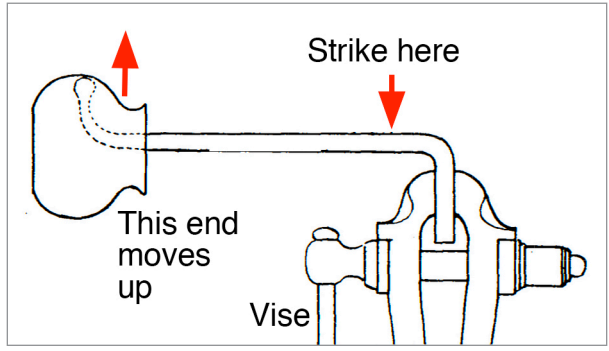

Figure 92 *This is how a snarling iron works. It is very effective.*

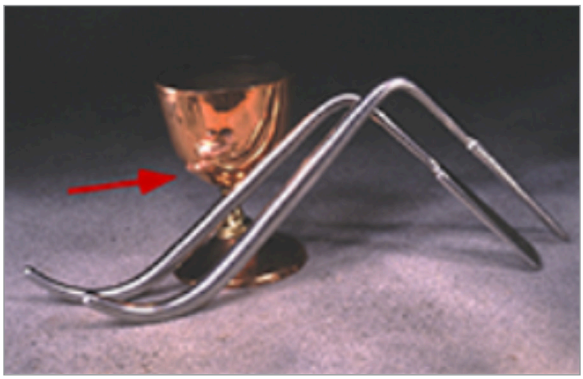

Figure 93 *Two of my snarling irons. Note the bumped-out areas on the cup. These were made from male urethral dilators*

Figure 94 *Examples of Mexican snarling irons from the TANE factory in Mexico City*

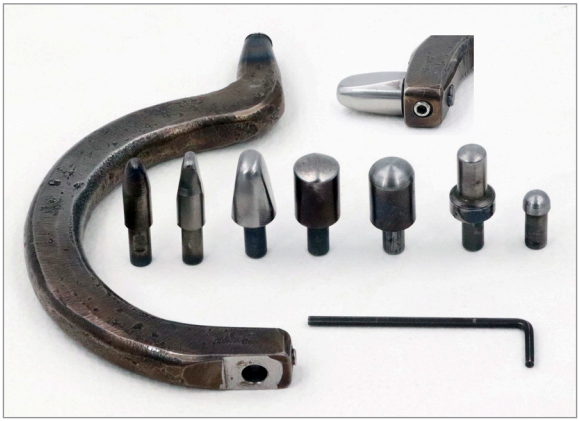

Figure 95 *Chaser David Anderson made a curved tool with interchangeable faces to work vessels out from the inside. It is used as a punch but reaches inside the vessel.*

French Repoussé

This is a method used primarily by blacksmiths and armorers but also by silversmiths. For instance, Valentin Yotkov has a great set of these stakes and tools (Figure 96). In this approach the tools are much bigger and are used as stakes that the sheet metal is held against; then hammers are used to push down onto, around and into them.

Figure 96 *Some of Yotkov's French repoussé stakes*

So What If You Don't Want To Make Your Own Chasing Tools?

Most commercial sets are clearly produced by people who have never chased and don't really have a clue what the shapes are for. Their shaft corners are sharp, which hurts when using them. The faces are either too sharp, too flat, edgy, etc. and they are not necked in for comfort and control. If you have a belt sander and polishing machine (I like Fabulustre® compound for steel), it is just a matter of minutes to improve them a lot. But there are also some quality sets available.

There are several people who are currently producing very nice sets of tools for sale. They include Valentin Yotkov, Saign Charlestein, Victoria Lansford and Liza Nechamkin Glasser (see their sets in Figures 97–100).

Figure 97 *Yotkov's set of tools*

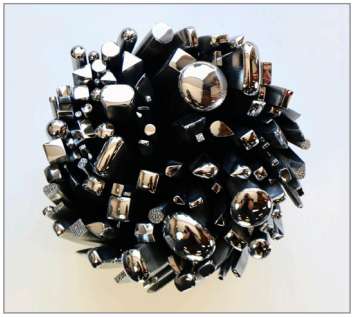

Figure 98 *Charlestein's tool set*

Figure 99 *Victoria Lansford's tool set*

Figure 100 *Liza Nechamkin Glasser's set of tools*

Conclusion

People have used chasing tools since the beginning of working metal. The tools that emerged in different cultures are remarkably similar across the world. This appears due to individuals' response to the process of chasing and the nature of metal. Diffusion of technology and examples is likely, but there are enough similarities around the world to conclude that chasers have found, through working the material, near optimum shapes and forms for treating metal as a plastic medium.

Acknowledgements

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