

Chasing and Repoussé



Nancy Mēgan Corwin

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Chasing and Repoussé

Methods Ancient and Modern

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Above: *Marine Life*, brooch by the author.
Sterling silver, 3" by 2½"

Endpapers: Tools from professional chaser
Ralph Charest, courtesy of Pauline Warg.
Photo by Abby Johnston.

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In researching and developing this book, I had the good fortune to meet and interact with many metalsmiths. Their insights, techniques and experiences informed the contents and structure of this book.



Fish Slice, detail. Serving piece by the author. Sterling.

Preface

Two experiences in metals changed my life. The first was when I was given a sheet of silver and taught how to raise it into a bowl. I was thrilled with the feel of the silver, its coolness, its resistance and give, and the surface sheen. I loved moving it and deforming the flat pure sheet into a simple bowl that had seemed impossible when I started.

The second experience was in graduate school at the University of Wisconsin-Madison, when Professor Eleanor Moty taught my class the techniques of chasing and repoussé. Again, I was enthralled. I felt I had discovered the technique that would be the avenue to my expression in jewelry and metalsmithing. From the beginning, chasing and repoussé seemed magical. This was the connection, the communication with the metal I had been seeking. Some artists start with an idea, then determine the best materials to express that idea. Some begin with a material and the techniques they enjoy, then let the process affect their aesthetic. I am in that second group, using tools as if they are my fingers, feeling and responding to the metal in a dynamic dialog.

I wrote this book to share the techniques that I find so enriching, and as a technical instruction manual for practicing metalsmiths. In addition, the photographs of contemporary pieces offer a survey of some of the most exciting work being done today. Although chasing and repoussé techniques are experiencing a renaissance in metal arts at this time, they are rarely a large part of academic and trade programs. My goal is that students with basic jewelrymaking experience and professional metalsmiths will find something of value to enhance their understanding of these techniques. I hope that the work shown here will stimulate imagination and encourage a new generation of artists to master these timeless techniques. The greatest proof of any book's success is in its longevity, and I hope all interested metalsmiths will find this book helpful for a long time to come.



Silver betel nut boxes from Cambodia.
Collection of Ron Ho, Seattle, Washington

Introduction

There are few other methods of manipulating metals that are as versatile and detailed as chasing and repoussé. Sometimes the results are decorative patterns in low-relief and sometimes we see abstracted images or narratives in which people and objects seem to grow out of sheet metal independent of the artist. The metal can be worked into hard-edge architectural shapes and wonderfully organic forms. The remarkable betel nut boxes from Cambodia are a testament to the versatility of this process even when using only simple tools. Elaborate Victorian tableware, vessels, and watchcases represent the work of sophisticated silversmiths and goldsmiths using the same techniques toward a quite different result.

"Repoussé" is a French word meaning "to push up or forward." Technically, "repoussé" is the adjective form of the word and "repoussage" is the noun, but because repoussé is commonly used for both in English, that is the form I will use in this book. For us it refers to a family of techniques that form sheet metal. Repoussé can be thought of as focusing on the creation of volume, while chasing includes various work done to the front such as planishing, lining, matting, and making crisp edges on forms that were raised from behind. Though chasing and repoussé are most often used together, it is possible to have either one without the other. An emphasis on frontal work may cause the piece to be referred to as chased and vice versa for repoussé. Most Victorian tableware, for instance, is referred to as repoussé, even when chasing has clearly been used to refine the forms. Watchcases and small jewelry are often called chased work even though repoussé might also be included.

There are the practical and passionate sides of chasing and repoussé. Over the centuries, master chasers have used these techniques to create representational images of important religious or mythological stories. In a more practical approach, the same techniques are used to set gemstones and to add detail to metal castings.

The techniques of chasing and repoussé have changed very little over time. The actions of striking metal to create form and detail are the same today as those used by early artisans, and similar materials are used by chasers around the world. The meditative rhythmic tapping of the hammer against the tool becomes a part of the feel of the process. Soon, the hand and the tool are forgotten. Forming and detailing the metal proceed directly from the mind and eye.

Contemporary metalsmiths continue to apply these techniques in both traditional and non-traditional ways. What makes these techniques contemporary is the freedom that many artists experience in terms of content and aesthetic. This combination of old and new is where my passion lies and why I have never stopped trying out new approaches to design and manipulation of the metal using chasing and repoussé.



David Huang

Lucent Terrain

Copper, sterling, 23k gold leaf

2³/₄" by 3¹/₄" by 3¹/₄" diameter

Photo by the artist.

CHAPTER 1

Materials, Tools, and Studio

What You Need To Know Before Starting

Knowledge of basic jewelry and metalsmithing techniques is useful before attempting chasing and repoussé. You need to know how to anneal nonferrous metals. Soldering skills will allow you to finish designs that call for attachments such as flat backs and earring posts. If you already know how to create a vessel, you will be able to use chasing and repoussé to add form and decoration. Although this book will not teach you to use a hydraulic press, if you are experienced with that tool, you will be able to use information provided here on how to use the press to replicate and enhance traditional chasing and repoussé.

Safety with Chasing and Repoussé

It is important that you approach any new technique with respect for safe studio practices. Common sense is one of the most important factors in safety, but it is also wise to add education to common sense for a complete understanding of safety in the studio. The usual warning about power tools applies: Always tie back your hair, wear goggles and, when necessary, wear the correct respirator for the materials being used.

Wear goggles or safety glasses when working with hot materials, or dark glasses when using a high-temperature torch. You need an apron (or cotton clothing), close-toed shoes, and protective gloves when forging or handling hot steel. Keep a bowl of clean water nearby

to quench your hand in case a bit of hot pitch should drip on it. Wear goggles or safety glasses when chasing in pitch to protect your eyes from pieces of pitch that sometimes chip off during work. Earplugs are a good idea when hammering steel tools with steel hammers.

Depending on the size and location of the studio and the scale of the work being done, specific ventilation might be needed for working with pitch. If ventilation is not available, use a respirator matched to the hazard at hand. The rule of thumb is this: If you can smell it, you do not have the right respirator or effective ventilation. Be certain that your studio is equipped with an up-to-date fire extinguisher, located where it can be efficiently reached if needed. Anyone using a torch should know that gases and oil of any kind should not come into contact with each other. Mixing oil and oxygen will cause an explosion. In chasing and repoussé we sometimes have occasion to use mineral oil, so the warning deserves a reminder.

Chasing and repoussé can be hard on the hands and arms, so here are a few basic tips to avoid stress-related injuries to those areas:

- Avoid squeezing the tools and do not allow your hands and arms to become tight.
- Take breaks every ten to twenty minutes to relax your hands and stretch your fingers.
- Never hunch over while chasing.
- Keep shoulders relaxed and your back straight.
- Bend from your hips.

Chapter Three offers specific advice on how to sit to chase without hurting your back. You will be in this position for hours and a backache can interfere with your ability (or desire) to continue to work. If you are like me, you will want to keep on working without stopping, and if you love these techniques as much as I do, you will want to chase into your old age. Relaxing is the key.

Metals for Chasing and Repoussé

Nonferrous metals, from ordinary copper to precious metals such as gold and silver, are worked cold with chasing and repoussé techniques. Chasing and repoussé can be practiced on many metals, but working with steel is different enough to warrant a book on its own so won't be covered here. It is important to know something of the characteristics of each metal to obtain the best results.

Copper and Its Alloys

Copper (Cu) is a pure metal, and it is the dominant ingredient in brass (with zinc) and bronze (with tin).

Pure copper is ideal for chasing and repoussé. It is extremely malleable (or "soft") and it can be worked heavily between annealings. Its relatively low cost, lovely color, and easy availability make copper an excellent choice for beginning chasing and repoussé artists.

In the case of brass, it helps to know that the higher the percentage of copper, the more malleable the alloy. Brasses with more than 30% zinc are rarely used in jewelry at all because they are very hard, brittle, and can collapse when overheated. Bronze, in its modern usage, is often a misnamed brass, or a three-part alloy such as silicon bronze. This confusing state of affairs could daunt a beginning metalsmith, because while genuine bronze is malleable, silicon and other modern bronzes are as hard as steel. A commercial alloy called Nu-Gold is a brass alloy with 12% zinc and 88% copper which has good working properties and a rich golden color. A similar alloy called commercial bronze has the same two constituents (90 Cu–10 Zn) and is also a good choice for hand-working, though it is difficult to find outside of large industrial sources.



Lucinda Brogden

Parasites Feed on Martyrs (detail)

Bronze, pewter, slate, 17½" by 14½", detail is 10" by 8"

Photo by the artist.



Catherine Clark Gilberston
Helmet
 Sterling silver, 8" by 10" oval, 6½" high
 Photo by Eric Tadsen.



Silver and Its Alloys

Fine silver has been known since ancient times. It is a beautiful milky white metal that is resistant to tarnish, soft, and easy to manipulate. However, if overworked or overheated, the surface will crack or develop an orange peel texture. Another drawback of fine silver is that, like copper, it is very soft and flexible at thinner gauges such as 24 gauge. Although it will work harden, it will never achieve the hardness of sterling. Once it is heated, it becomes practically as soft as butter. Chased and repoussé pieces in fine silver are most successful when the last process is a hardening one or the design involves a fair amount of deformation of the sheet metal (raised, folded, and creased areas).

Hundreds of years ago, it was discovered that adding a small amount of copper to silver created an alloy that retained most of the good qualities of pure silver but also increased its strength. That mixture has been fixed at 925 parts silver per 1000 (or .925) and is called sterling silver.

Sterling silver is significantly harder than fine silver. It is an excellent material to chase and repoussé because it responds well to being raised and formed, and yet can be hardened to a very crisp edge. This means that fine details are easy to achieve and maintain. It is strong even at 22 and 24 gauge (about 20 thousandths of an inch, or a half millimeter). The biggest drawback of sterling is its tendency to develop an internal stain called firescale. Firescale is an oxide of copper that forms inside the metal structure when the sterling is heated in the presence of oxygen—a very typical situation when annealing and soldering. These areas show up as gray splotches on the surface and can penetrate the metal. Removal often means abrading away the surface, which risks removing the chasing as well. Artists working in sterling use protective fluxes to minimize oxidation, and take pains to heat the piece only to required temperatures.



Davide Bigazzi
Superfici
 Sterling, 4½" by 7"
 Photo by George Post.

Argentium Sterling Silver

Argentium Sterling Silver is a patented silver alloy invented by Professor Peter Johns at Middlesex University, England in 1996. It is basically sterling with at least 92.5% pure silver and the remainder copper with trace amounts of germanium. When this metal is heated, the germanium oxidizes before the silver and copper, preventing the production of cuprous oxide (CuO_2 , the cause of firescale) within the metal and forming a transparent protective coating of germanium oxide that reduces the formation of tarnish-causing sulfur compounds in the air.

Argentium Sterling Silver is an excellent metal to chase. It is much softer than sterling when annealed and quenched at the optimum time. It forms easily and textures well. I was able to chase a piece of 26 gauge Argentium Sterling Silver far longer between annealings than sterling. It stretched farther before tearing as well. The fact that it can be heat hardened

makes working in thin gauges a practical alternative. The color is a little whiter than sterling however, which may not be to your liking.

Gold and Its Alloys

Not surprisingly, gold is considered a royal metal. In addition to its beautiful color and ability to resist oxidation, gold is one of the easiest metals to chase and repoussé. Pure gold is so malleable, in fact, that objects made in it will not stand up to normal wear, so for centuries gold has been alloyed, usually with copper and silver, to create metals that are hard enough to be practical and yet maintain some of the beauty of the pure metal. Gold alloys are described in a system that assigns the designation of 24 parts (called karats) to a pure metal, and describes the ratio of noble metal to alloy. If 12 of the 24 parts are pure gold, for instance, the alloy is 50% gold. The most common alloys in the United States are 14k (58.5% gold) and 18k (75% gold). Both of these are suitable for chasing and repoussé.



Kate Case, Two brooches, 18k gold, 3.3 inches long. Photo by the artist.

In addition to changing toughness, alloy metals are used to alter the color of gold. If more copper is added, the gold has a pink color and becomes easier to repoussé. Whiteners like platinum, palladium, or nickel make the metal harder to work.

Steel

Mild steel, also known as low-carbon steel (approximately 0.3% and lower carbon) is weldable and easy to forge when hot. It is used for decorative ironwork

as well as steel construction. Mild steel can be annealed by heating to cherry red and cooling slowly. It can be worked in the same way as nonferrous metals, but it is harder and not as plastic when worked at room temperature. Heavier punches and hammers are needed to move steel than those used for more malleable metals.

Kirsten Skiles
Forged and formed
detail in steel.
Photo by the artist.





Jim Kelso
Adzuki Leaf

Copper, shibuichi, shakudo, 2¾"
Photo by the artist.

Specialty Metals

Mokume Gane

Mokume gane (meaning “wood grain” in Japanese) is not a metal, but a constructed panel made up of fused layers of nonferrous metals, often fine silver and copper with some brass. Fused and forged mokume gane can be easy to chase and repoussé.

Shibuichi and Shakudo

These traditional Japanese alloys are used primarily because of the unusual colors that can be achieved through patinas. Shibuichi is an alloy of three parts copper and one part silver; shakudo is an alloy of copper and gold. Both lend themselves to chasing and repoussé.

Bimetal

This is a manufactured product in which sheets of either 22k or 18k gold are fused onto a base of sterling. This can be used for chasing and repoussé as long as the gold layer is not too thin. I have used 24 gauge gold laminate with success, though there is a limit to the height of relief that is practical and how often the metal should be annealed.

The term “gold-filled” refers to a variation on bimetal that is not recommended for chasing and repoussé because it is difficult to anneal without burning the relatively thin gold layer.

Aluminum

Aluminum (Al) is the most abundant metal in the earth’s crust. It is a silver-colored, ductile, corrosion resistant material that is very soft in its pure state. It is somewhat difficult to find pure aluminum, so I have been using 5052 and 6061 series alloys for chasing and repoussé. The alloy 5052 contains 2.5% magnesium and .25% chromium. The alloy 6061 contains 1.0% magnesium, 0.6% silicon, and 0.25% each of chromium and copper. Both alloys are much harder than pure aluminum and take several annealings to work. Aluminum is lightweight and maintains a beautiful gray color while being chased. When using pitch, it is better to wipe the residue away than to burn it off.



Trudee Hill
Bettie Paige Belt Buckle
Aluminum, copper, and bronze
4" by 5½" Photo by the artist.

Niobium

Niobium is a metal in a group called the reactive metals, which also includes titanium and tantalum. It is a beautiful bluish-gray color until it is anodized, at which point the color possibilities are broad and dynamic. It cannot be annealed in the standard studio (reactive metals are annealed in a vacuum), but it is so slow to harden that a great deal of forming can be done before annealing is needed. Niobium is a soft, ductile metal that can be chased in pitch, low-temperature thermoplastics, and in wood. Niobium can be colored with heat, but most people color it using the more predictable and precise process of anodizing, in which the metal is suspended in solution and an electric current is run through it. The different levels of current create different oxide layers and colors. If you are planning on anodizing the niobium, you should take care not to heat it when removing it from the pitch.

Annealing

The shape, size, and grouping of crystals that make up the structure of a metal determine its ability to bend, stretch, fold, and twist. All of these actions break larger crystals into smaller ones, and this has the effect of making the metal less malleable. Fortunately, we can use the process of annealing in which small crystal groups realign themselves into larger crystals, to restore the malleability of a metal. It is this single ability that allows us to raise flat sheets into vessels and to forge spoons from flat bars—and to create the lovely work you see throughout this book.

Each metal and alloy has a specific annealing temperature, but the general rule for traditional jewelry metals is to heat to the point where a dull red color (pink in the case of silver and very faint pink for Argentium) appears when viewed in dim light. It is best to achieve this with a broad, bushy flame so the effect is uniform throughout the piece. To ensure this, warm the entire piece, keeping the torch in motion the whole time. Especially in chasing and repoussé, it is important to avoid uneven workability that can result from selective overheating or underheating. Hold at annealing temperature for a few seconds, then quench in water only after the red color fades. Heavily worked sterling can crack when thrown immediately into room temperature water at red heat. Argentium Sterling Silver is even more sensitive.



Niobium sample plate by the author.

Chasing and Repoussé Tools

Steel

It takes only a trace amount of carbon mixed with iron to make steel. The steel used in making chasing tools contains between ½ and 1½% carbon, a specific amount that creates a steel that can be hardened and tempered. The process is explained in detail in Chapter Eleven, but for now, we'll focus on the shapes of the tools themselves.

Most tools are made from round and square rods, but some of my favorite tools are from rectangular and hexagonal stock. Tool stock is commercially available in rods of various cross sections and in several grades of steel. The most common are oil-hardening (O1) and water-hardening (W1). A third type, called air-hardening (A1), is used in industry but rarely by studio artists. The “1” in these designations indicates that they contain 1% carbon, which places them in the center of the ideal range. Of these three, oil-hardening steel is by far the most common.

Most chasing tools use stock in the quarter-inch to half-inch range. Repoussé tools are usually made from larger stock. The length of chasing and repoussé tools depends on the process (whether the tool will move across the surface of the metal or will be held vertically as in the stamping process) and the size of the



Tool blanks come in many sizes and shapes.

area being manipulated. The length of your fingers makes a difference as well. Too short a tool will cause cramping in the fingers and the hand; too long a tool will be hard to control. Tools can be left with a consistent cross section or tapered toward both ends, as is traditional with Japanese-style chasing tools. These popular tools are very small and can be purchased as blanks that can be given the desired shape.

Chasing Tools

Liners

Straight liners are used to make sharp indents in metal sheet without cutting through. This results in raised lines on the back side. In a sense, liners are to a chaser what a pencil is to an illustrator—the best way to sketch a line. The working tip (the end that contacts the work) is tapered to a wedge to allow the best view of the working zone. This is first made sharp, then “softened” just a bit by dulling the edge with sandpaper so the tool doesn’t cut through the metal. A full kit will include liners in various sizes to match specific tasks. Liners with wide profiles are used for long straight lines, where they provide control and efficiency. Short lines and tight curves require tools with narrower profiles.

The most common use for straight liners is to outline the design on the front side of the metal, cre-

ating a raised line on the back. They are also used to create crosshatching and a variety of decorative textures and designs. Liners are also used to undercut metal to give the illusion that one section folds over or rests upon another. In Chapter 3 you will learn how to create these effects using the various liners.

Curved liners have the same near-sharp working edge of liners, but they are curved into arcs of various radii. Like straight liners, the curved versions come in various sizes. Broad curves can be traced with straight liners, but as the curves get small, it becomes necessary to switch to curved liners.

Both straight and curved liners can be used as stamps, a straightforward process of vertically striking a tool into metal to impress its shape.

Running Punches

These chasing tools look like liners with a wider working edge. They make wider rounded indentations on the back or front for diverse effects.

Textured Chasing Tools

Chasing tools with textured working faces can add a great deal to your repertoire of surface textures and background effects. See Chapter Eleven for instructions on how to texture the face of a chasing tool.



Liners are perhaps the most frequently used of all chasing tools. They are equivalent to pencils on paper for making lines, patterns, and textures.



The profile shot shows a cross-section of the groove made by a liner.



A selection of curved liners.



This cross-section photo shows the grooves made with running punches. Compare this curved gentle indentation to the sharper mark made by a liner.

Hardware stores and jewelry suppliers sell a variety of tools that can be used to texture metal. Nail sets, for instance, are steel punches used to countersink finishing nails into woodwork, but they also make circle patterns, and even come in various sizes. Centerpunches are stout hardened steel rods with sharp or blunt points that will create a variety of dimpled textures. These can be ornamental when struck from the front, or you can work from the back to create bumps. An automatic centerpunch is a spring-loaded tool that is easier to use when making bumps of equal height. In both the standard and automatic versions, you can modify the commercial points with whetstones, grinding wheels, or sandpaper to offer an even wider array of possibilities. Chisels with wooden or metal handles can be used as purchased to make sharp lines, or the blades can be sanded to convert them to forming tools.

Matting Tools

Matting tools have working faces with subtle all-over marks that create consistent textures rather



Textured chasing tools are used in repeated strokes to develop a pattern. They can be made from scratch or improvised from common hardware store tools.



Running punches in a variety of sizes and shapes. Notice that some are wrapped with rubber tape, which makes for a more comfortable grip.

than recognizable patterns. The matte finish made by these tools is subtle enough to create a non-reflective soft appearance that will cover up superficial scratches and slips. These finishes are commonly used on the entire background of an image that has been developed through chasing and repoussé. Matting tools can be purchased or made in the studio; a common approach is to strike annealed steel onto a file to pick up the impression of the teeth.



Stamps

Stamps differ from chasing tools because they impress marks exactly as built into the tool. Stamping is usually done with the metal supported by a hard surface, such as steel. This arrangement will yield a sharp and precise image on the front side while leaving a flat surface on the back of the metal. Stamping on pitch will produce a softer image with an embossed reverse side.

Perhaps the most familiar stamping tools are letter and number stamps, which can be purchased at most hardware stores. Jewelry suppliers often sell commercially made stamps with familiar shapes, many borrowed from Native American imagery.



Matting tools along with a sample of the rich textured surfaces each one creates.



Stamping tools like these can be used to make individual marks or they can be overlapped to create texture and pattern.

Most chasing and repoussé punches are made without sharp edges, but stamping punches usually benefit from crisp edges because these translate to sharper impressions. Commercially made chasing tools are often too sharp for chasing when purchased, and require sanding to make them ready to use. As they come, they make better stamps than chasing tools.

Undercutting Tools (also called *Setting Punches*)

Undercutting is the process of folding, flattening, or pushing a low part down to give the illusion that the higher form sits on (or floats above) the background. This is an important technique and, more than any other, shows the elasticity of metals. The shapes of undercutting tools are specific to individual chasers, and are typically made by the artist for a particular effect. An undercutting tool is used to push in from the top side of the metal at the bottom edge of the form, forcing the bottom edge in and under.

Planishing Tools

Planishing is the process of smoothing a metal surface using tools with flat or slightly curved highly polished working faces. Depending on the size of the tool, planishing marks can be almost invisible (leaving a mirror shine), or they can create a subtle all-over faceted surface. The act of planishing also work-hardens the metal, and for this reason, planishing should be one of the last processes performed on a chased piece.

Planishing should be done with the metal secured against a hard surface such as cold pitch, a steel



Familiar tools like these can be used as texturing stamps, often without any modification.