

# Drilling

## Safety

At the moment the cutting edge breaks through the underside of the piece being drilled, there is a tendency for the bit to snag. This can be dangerous, especially when a large blade is being used on a thin material. The workpiece can be forcefully yanked out of your grip and left spinning like a propeller in the drill press. To avoid this, always start with a small bit and move sequentially to larger bits.

## Step Bit

A step bit is a single tool that accomplishes this without spending a lot of time changing bits. These can be purchased in several ranges, and while they are expensive, they can pay for themselves in saved time (and saved fingers).



## General Rules for Drilling

- > Run the drill slowly.
- > Avoid wiggling.
- > Keep the bit at a constant angle.
- > Let the bit do the work; don't push.
- > Avoid creating friction heat; lubricate as needed with beeswax (health-food stores), oil of wintergreen (drugstore), or proprietary coolant (Bur-Life, etc.) from jewelry suppliers.

## Impact Method

Probably the earliest method of making holes was to pound a pointed rod through the metal. You can use a nail, but a hardened, tapered point is more effective. Do not use a scribe; this is a drawing tool and will be damaged if struck with a hammer. Work on a piece of scrap wood to avoid making holes in your bench. Strike a solid blow to create a crater, then flip the piece over and file off the tip of the conical projection. Insert the tool from this side and strike again.

## Drills

### Pin Vise

For light use, grip a bit in a pin vise or glue it into a dowel or similar rod. The tool will be more comfortable to use if it has a freely rotating knob on top, like the example shown here on the left.

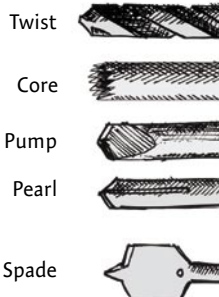


### Electric

Many jewelers today use electric and battery-pack drills or flexible shaft machines to drill holes. While these are hard to beat for ease, care must be taken not to run them too fast. Whenever possible, a drill press is preferred over a handheld model because it guarantees a perpendicular angle of attack.



## Drill Bits



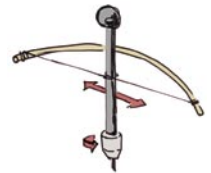
## Pump Drill

This variation allows one-handed operation. A string is tied to the shaft (or passes through a hole) and connects to a bar that is free to ride up and down along the shaft. A heavy wheel captures the momentum. To start, twist the shaft so that the string wraps around it. With a little practice you'll get the hang of an up-and-down, wrap-unwrap rhythm.



## Bow Drill

This ancient mechanism increases rotation speed and uses a graceful motion to rotate the bit. The bowstring is wrapped once around the shaft and the bow is sawn back and forth to spin the drill. A block of wood with a loose-fitting hole is used to secure the top end of the shaft. Alternately, the shaft rides in a depression in the bench and the workpiece is held in the hand.



# Scoring

## Scoring

Scoring is the process of removing metal along the line of a proposed fold. On thin sheet, it can be achieved with a sharp scribe. On metal over 24 gauge, scoring is done with a graver, a file, or a scraper made just for this purpose.

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### To Score a 90° Groove in a Narrow Band

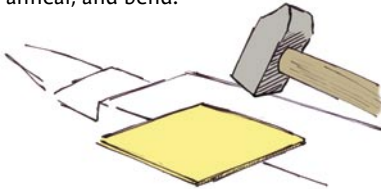
1. File one edge smooth and straight, then use a square against the edge to scribe a perpendicular line.
2. With the metal braced against the bench pin and angled, file a notch at the edge with a triangular file or the corner of a flat hand file.
3. Repeat this file stroke, tilting the workpiece a few degrees further with each pass. The file will cut a tall V that extends across the band with each stroke. Continue until this V reaches about two-thirds of the width.
4. Turn the workpiece around and repeat the process from the other side.
5. Switch to a square needle file and refine the groove to a uniform depth.
6. Bend with fingers, check against a square, flux, and solder.



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### Compression Scoring

For simple jobs you can compress metal rather than remove it. Strike over the edge of an anvil or use a hardened bar such as the corner of a punch. Strike a single blow, anneal, and bend.



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### To Score a Wide Panel

1. File one edge so it is smooth and straight.
2. Use a square against this edge to scribe a clear perpendicular line. For large-scale work use a fine-tipped permanent marker.
3. Clamp the metal onto a workbench using C-clamps and protective pads. To prevent damage to the table, set the work on a piece of scrap wood. At the same time, clamp a straight piece of wood or steel beside the marked line to guide the tool.
4. Set a sharp scoring tool near the top edge and against the fence and pull it firmly toward yourself. Pull many times with medium pressure rather than a few times with extreme force.
5. To score the top edge, use a file, or turn the piece around and repeat the process.
6. Continue until a raised line is visible on the reverse side of the sheet.



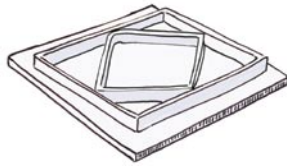
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### Scoring and Measurement

It's easy to get confused when scoring because the fold will happen at the base of the V-groove. When laying out multiple bends, think in terms of the exterior dimensions and allow a little extra material to compensate for the bend area. To make all the corners look the same, score then break off the end piece. For curved scoring with a wire, refer to foldforming earlier in this chapter.

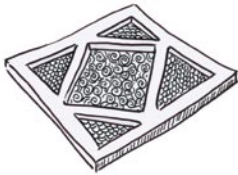


# Cloisonné & Basse-Taille



## Basse-taille

*Basse-taille, (Bas-TY),  
from the French "low cut."*



We are all familiar with the effect of looking into a brook to see the

shape and pattern of the creek bed—dim and mysterious through the watery filter. Similarly, we have seen how the sloping depth of a swimming pool is revealed by a color change in the transparent water. These effects are the essence of basse-taille enameling.

In general the process is the same as for champlevé, with a few refinements. The floor of the recess is often patterned or ornamented. This can be part of the recess-making step or a second process altogether. For instance, recesses could be created by piercing, then ornamented by engraving.

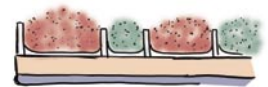
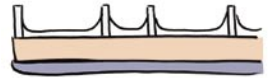
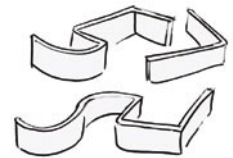
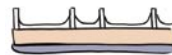
Depending on the colors being used, the depth of the recess and the desired effect, layers of clear flux might be used over a color to fill up the recess. After all firing is complete, stone and polish to a bright luster to take full advantage of the effect.

## Cloisonné

*Cloisonné (kloy-zo-NAY) from French cloison, "compartment, partitioned area."*

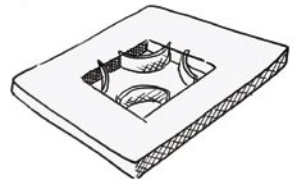
In champlevé and basse-taille, enamel is contained in miniature chambers that have been carved out of thick metal. Seen this way, it is a small step to fabricating these chambers by creating walls from wire. Cloisonné work has been found from as long ago as the fourth century BC. As with every technique, variations abound, but here is a basic sequence of steps.

1. Prepare the metal with counterenamel on the back and a layer of flux on the front. Dry, fire, and cool.
2. Bend lengths of wire to create the various compartments of the design. The wire is usually rectangular in section (set vertically) and made of fine silver or fine gold. If necessary the wires can be lightly glued in place with gum tragacanth.
3. Dry and refire. As the flux melts, the wires will sink into the gooey flux where they will be securely anchored. Withdraw and cool.
4. Fill the various chambers (cloisons) with clean and dampened enamel, using a watercolor brush or miniature spatula. Dry and fire.
5. Repack as necessary until the chambers are filled or nearly filled.
6. Stone the surface until it is flush and either leave it matte, polish with abrasives, or flash fire after careful cleaning.



## Variations

- In addition to commercially prepared cloisonné wire, make your own wires of varying thickness.
- For lines that change from broad to narrow, forge wires with planishing hammers.
- Use transparent or opaque enamels—or a combination of both.
- Decorate the floor of the cloisons as in basse-taille.
- Allow the enamel to slump naturally by filling each space less than full. The resulting surface has many concave facets that increase the play of light. An additional variation of this uses flattened twists of wire to form the cloisons.
- The wires can be soldered in place rather than fastened with flux.
- The initial layer can be white rather than the clear flux. This will brighten colors, even opaques.
- Wires can be used to subdivide chambers made through other methods—a combination of cloisonné and champlevé, for example.



# Basic Loop-in-Loop Chains

## The Loop-in-Loop Family

Chains in this family share a common building block—links that are soldered or fused closed before assembly. In most cases the links are made round and shaped into long ovals before they are slid one into the next. Thanks to Jean Stark, whose excellent book, *Classical Loop-in-Loop Chains and Their Derivatives* provided a lot of this information, used with permission.

### Terminology

The wealth of variations within the loop-in-loop family makes it easy to get confused when we start talking about these chains. Here are a few guidelines:

**Single** = 1 loop through 1 loop.

**Double** = 1 loop through 2 loops.

**One way** = new loops always added along a single axis, for instance, north/south.

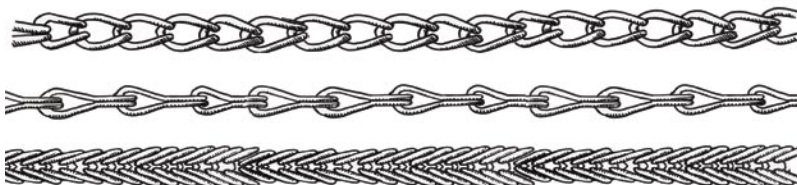
**Two way** = new loops are added on two axes, typically each perpendicular to the preceding one.

**Pinched** = any chain in which the links are pinched at the waist (e.g. Sailor's).

These terms can be combined to describe all chains, such as, *two-way double*.

### Basic Loop-in-Loop

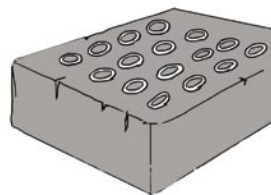
This ancient chain is popular for its versatile beauty. It takes a while to make, but the procedure is simple. Unlike other members of the family, almost any combination of wire size and loop diameter will look attractive.



1. Wrap wire around a rod and cut the rings, typically with small scissors. In the basic chain almost any wire-to-loop proportion will look good, but the effect can be quite different. For this reason, it's a good idea to make a sample before cutting out too many rings.



2. Bend each loop so the ends come together to make a tight joint. Fuse or solder the rings closed, ideally with an invisible joint. If you use solder, keep the chips as small as possible. Roll a sheet of solder through the mill until the rollers cannot be brought any closer together. Cut this very thin sheet into tiny pieces and use only one on each joint. A biology needle makes a good solder pick.



3. With round-nose pliers, pull each ring into a long oval. Try to avoid stretching the rings; the goal is to achieve uniform size. To maintain a uniform size, some people mark their pliers, either with ink or by filing a small groove.



# Melting Points

## Melting Points

Even if you don't commit to memory all these numbers, it is helpful to have a general understanding of the relative melting points of various materials. Elements have fixed numbers (determined at sea level), but alloys and the miscellaneous materials below show approximations.

