Enameling

Enameling on metal is the process of applying a thin coat of finely ground (80 mesh) glass to a metal. The metal is then heated in a kiln at a high temperature (1450 to 1500° F) causing the enamel to melt and fuse to the metal.

Enameling on metal is not difficult, and the basic skills can be taught in a few easy lessons. What an individual does with this knowledge is the unpredictable ingredient of art called "creativeness."

Enameling is an exacting art which demands careful attention to the details of **cleaning** the metal, **applying** the enamels and **firing**. Enameling can be a truly creative activity since no two pieces will be exactly alike. The layers of enamel on the metal, the length of the firing and the design techniques help to create delightful variations. The colors of enamels remain unfaded forever.

TOOLS AND MATERIALS

Enamels:

Enamels are sold in powder form or in lumps and are of four basic types:

—Opaques, which are solid colors that light cannot be seen through.

—Transparents or translucents, through which light is visible.

—Opals or opalescents, which are irridescent enamels with a cloudy or milky appearance.

—Overglazes or overpainting enamels, which are used for detail work, applied with a pen or brush over a previously fired enamel.

Flux is a clear, colorless enamel which is the basis for all transparent enamels. The opaque and transparent enamels provide a colorful palette for beginning enameling.

Enamels are ground to any degree of fineness, designated in terms of the mesh through which particles will pass. Enamels are ground to 80 mesh unless otherwise requested.

Counterenamel refers to the first layer of enamel fired on the back of a piece. It helps control the chipping caused by the difference in the rates of expansion and contraction of the copper and enamel. Counterenamel can help to prevent warping.

Base coat refers to the first layer of enamel fired on the front side of a piece of metal.

Enamels can be washed and dried before applying them to the metal surface. Place a two-ounce packet of enamel in a glass measuring cup. Fill the cup with cold water. Allow time for the enamel to settle to the bottom of the cup. Slowly pour off the soiled water being careful not to pour out any enamel. Repeat until the water is clear. Take a rubber spatula and scrape the wet enamel onto a paper towel; fold and label. Dry on top of a hot kiln or in a warm oven.

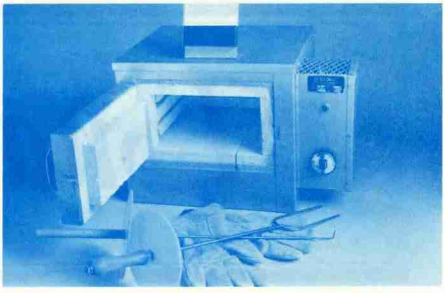
Metals:

Metals most commonly used include copper and pure silver. The ideal thickness of these metals is 18 gauge. Pre-formed copper bowls and jewelry blanks are available. Other metals which can be enameled include gold (24 K or 18 K nontarnishing gold), steel, brass, bronze, iron and aluminum. Sterling silver (92.5% silver and 7.5% copper) can be enameled when extra strength is desired. More experience is needed when enameling these metals.

Kiln and accessories:

A kiln is a small furnace which can be heated to extremely high temperatures. Size depends on the individual craftsman and what can be afforded. Always buy a kiln with a pyrometer—this measures the interior temperature of the kiln. The door should open from right to left. The inside of the kiln should be washed with kiln-wash powder and water to keep the enameled pieces from sticking if they fall.

Kiln accessories include stainless steel screen firing racks, tongs, trivets, firing forks, metal spatulas, asbestos gloves and two fire bricks placed on a sheet of hard asbestos to cool hot pieces. A metal dishpan to hold cold water and an iron to flatten warped pieces can also be handy.



Other tools and materials include:

—Steel wool (No. 000) for cleaning metal.
—Sparex No. 2, a pickling compound used to clean metal when mixed with warm to hot water in a plastic bowl. Mix according to directions.
—Klyrfyre, a binder needed to make the enamels adhere to the metal until it is fired. This solution is diluted by mixing with one part water to one part Klyrfyre.
—Atomizer, used to apply the Klyrfyre to the metal surface.
—Sifters for applying enamels.

INSTRUCTIONS

Cleaning the metal:

Before a piece of metal can be enameled, it must first be thoroughly cleaned. The cleaning needed depends on the condition of the surface or the amount of grease present.

Spun pieces always have some wax or tallow on the surface which was used by the spinner to prevent tool burn. This can easily be removed by soaking the copper piece in Sparex No. 2 pickling compound.

After soaking, dry the metal with a paper towel, and polish with fine steel wool. Always steel wool the copper in one direction to avoid scratching the metal. After polishing the copper with steel wool, wash in soapy water, rinse and dry. Do not get fingerprints on the clean copper.

This final test for readiness can be used: let water run over the copper. If the water does not form in beads on the surface, the metal is ready to enamel. Rinsing in ammonia water will also remove any oily residue.

Applying the enamel:

Choose a suitable color for the counter-enamel. Place the enamel in a sifter. Always work on a clean sheet of white paper, so any enamel that spills can be saved.

Take the clean copper piece, and spray with a thin coat of the Klyrfyre solution. Beginning at the outside edge and sifting in a circular direction, apply a thin layer of enamel to the metal. Alternate spraying on the Klyrfyre solution and the sifting of the enamel until the copper surface is covered. Try to get a smooth, even coat of enamel, approximately 1/32 inch thick.

Carefully place the copper piece on top of the kiln to dry. When thoroughly dry, place on a screen rack and fire.

After the counterenamel has been fired to an orange-peel stage, cool the metal and clean. The base coat of enamel is applied using the same method as before. Additional layers of enamel are applied and fired until the desired design is obtained.

Firing the enamel:

Enamels fire at different temperatures depending upon the color and thickness of the coat and weight of the metal. Begin with a 1500°F. kiln and adjust the temperature as needed.

Each layer of enamel is fired separately. The firing fork is used to place a piece into the kiln and to remove it when firing is completed. Check the firing after about 90 seconds by opening the door a crack and looking in. Keep checking every 30 seconds or so.

The enamel will go through three stages during firing. **First**, it will look grainy. **Second**, it will develop an orange-peel texture; and **third**, it will glow slightly and become smooth and shiny. When it becomes smooth and shiny, it has been fired to maturity.

Using the firing fork, remove the piece from the kiln and place it on the asbestos sheet to cool. As a piece cools, the true color will appear.

Counterenamel is fired to the orange-peel texture stage, while the base coat and subsequent layers are fired to the smooth and shiny stage.

Finishing:

When the enameled design has been completed, the exposed copper edges must be cleaned. The black firescale on the edge can be removed with a long flat file. Hold the copper piece firmly while supporting it against the body, and file the edge in a curved direction. Bevel the back edge with the file, then bevel the front edge. Repeat several times for a smooth edge.

This filing makes a difference in a well-designed piece of enamel. After filing is completed, the edge can be polished with Rouge or Tripoli (a polishing compound).

DESIGN IT YOURSELF

There are six classic enameling techniques still called by their French names. A single enamel piece may employ one or more of these techniques. These include Cloisonne, Champleve, Bassetaille, Plique-a-jour, Limoges and Grisalle.

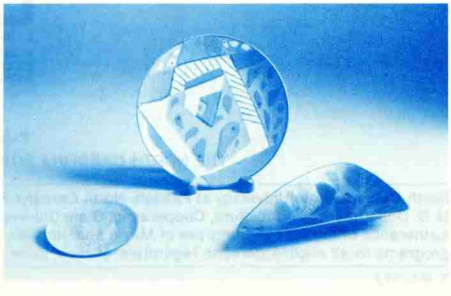
The beginning enamelist may choose from the following projects:

Feathered edge design:

1. Select a copper piece (saucer or tray), and clean thoroughly.
2. Select enamel color, and sift on counter-enamel. Dry and fire. Clean off fire scale. Wash.
3. Sift light opaque enamel on for the base coat.
4. Sift a dark enamel (transparent or opaque) for feathered edge design. Dry, and fire. Let cool.
5. File edges, and polish exposed copper with fine steel wool or polishing compound.

Stencil design:

1. Select a bowl, and clean thoroughly.
2. Counterenamel. Use either transparent or opaque. Dry, and fire.
3. Apply and fire base coat on tray front.
4. Cut stencil design using paper towel. (Stencil designs may include real leaves from trees, flowers or house plants.) Place cut stencil on the fired base coat. Note: A paper stencil will be cut for each color used.
5. Dry and fire after each color until design is completed.
6. File edges, and polish.



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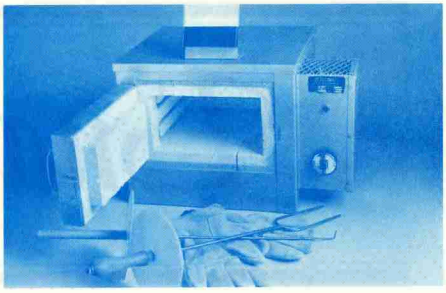

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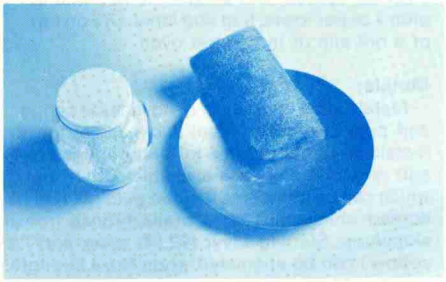

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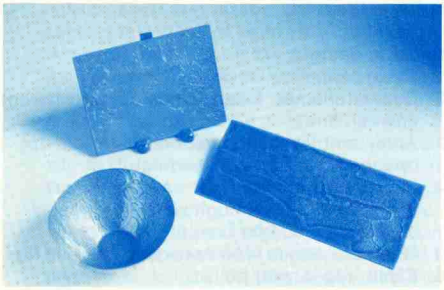
Etched design:

1. Clean copper.
2. Paint sections of copper with black asphaltum that should **not** be etched.
3. Study lesson sheet, "Metal Etching," HE-16, for details of the etching procedure.



4. Pour the etching compound into the bowl. The exposed copper area will etch to a lower surface level.
5. After the areas are etched, clean off the asphaltum with a solvent.
6. Clean copper using steel wool and liquid soap.
7. Counterenamel. Dry, and fire.
8. Apply a transparent enamel over the etched design. Dry, and fire.
9. File edges, and polish.

Jewelry:

1. Select copper pieces, and clean.
2. Counterenamel. If designs are kept simple, the counterenamel may be omitted.
3. Apply base coat. Dry, and fire.
4. Use any design techniques described above.
5. File edges, and polish.
6. Glue findings to jewelry pieces. Use epoxy glue or jeweler's glue.
7. Findings may be soldered with an IT solder for enamels.

SOURCES FOR SUPPLIES AND EQUIPMENT

Thompson Inc., P.O. Box 310, Newport, Ky. 41072.

Allcraft Tool & Supply Co., 100 Frank Rd., Hicksville, N.Y. 11801.

REFERENCES

Bates, Kenneth F., *Enameling Principles and Practice*, The World Publishing Company, Cleveland, 1951.

Reader's Digest, *Crafts and Hobbies*, The Reader's Digest Association, New York, 1979.

Harper, William, *Step-by-Step Enameling*, The Western Publishing Company Inc., Racine, Wisc., 1973.

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