

Etching a Sill Plate or Identification Tag

Ray Brown owns a lovely 1923 Buick Roadster. It runs well and looks good. Like most of our cars, restoration is an ongoing process - we are never quite finished. As indicated below, the factory-original sill plates on the Buick - after 93 years and from hundreds of feet stepping on them - were pretty well worn. The aluminum was torn and missing pieces, and the image was barely discernible, covered with scratches abrasions and dents.

Ray is a very precise workman, and he enjoys doing as much as he can himself. He took on the challenge of replicating the original sill plates at home, and came up with a solution that is suitable for other applications as well.

The finished job is etched into the aluminum, not painted or printed on. The design and the background are differentiated by the fact that the acid has removed the surface of the metal leaving a contrasting color/texture.

Intaglio is one of the four major classes of printmaking techniques, distinguished from the other three methods (relief printing, stenciling, and lithography) by the fact that the ink forming the design is printed only from recessed areas of the plate. Among intaglio techniques are engraving, etching, drypoint, aquatint, and mezzotint.

Intaglio printing is the opposite of relief printing in that the printing is done from ink that is below the surface of the plate. The design is cut, scratched, or etched into the printing surface or plate, which can be copper, zinc, aluminum, magnesium, plastics, or even coated paper.

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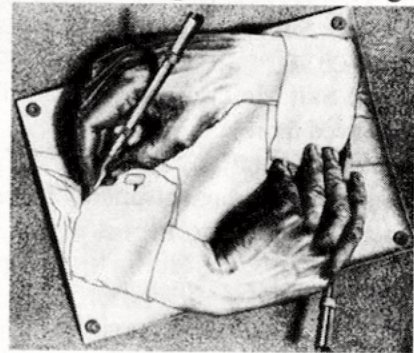


Intaglio Plate Etching

by Ray Brown

Often our cars have identification plates or sill protectors that have been damaged over the years. I recently decided to replace the badly worn sill plates on my 1923 roadster; they can be purchased but only if custom made. In addition, since restoring my car is a hobby, I attempt to do as much of the work as I can to both save money and maximize my 'fun.'

I began by doing a Goggle search on the internet for aluminum etching and found many written articles and a few YouTube videos on the process. Basically, the process uses a coating on the aluminum where you do not want to remove material and a chemical solution that will dissolve the aluminum in the unprotected places. This technique was developed hundreds of years ago to create copper printing plates to reproduce drawings called Intaglio. The process is still used for paper money and some stamps plus artworks such as the Escher print. I had no intention of printing using my etched plates, but the process is the same.



Drawing Hands 1948
Maurits Cornelis Escher

The usual etch solutions require strong acids for copper. Aluminum can be etched by other methods, however most use hazardous acids or caustic lye solutions. I was lucky to

find a process that uses commonly available, relatively safe materials which work well with aluminum. The process was perfected by Nik Semenoff while teaching a class in Intaglio printing at the University of Saskatchewan in 2001. Students were required to buy zinc plates to be etched. A student came to him and said she couldn't afford the plates. Nik had read of a technique using etched aluminum in place of zinc or copper and discussed the process with the chemistry department. They came up with a solution (no pun intended) that would do the job and was safe to use in the classroom. This solution depends on a replacement reaction instead of acid etching and uses commonly available chemicals. Following is the composition of Mr. Semenoff's etching solution he developed and which I adapted to use common units of measure:



- Copper Sulfate** (used to treat ponds for alga growth) 1/3 cup
- Table Salt** (don't use coarse salt like kosher or you will need more) 1/3 cup
- Sani Flush** (sodium bisulfate, & available at spa suppliers for pH control) 1 teaspoon
- Tap water** 1-2 quarts

That's it. Just measure out the dry materials and mix them together. When ready to etch, just add water. Although the chemicals are not particularly toxic, the copper sulfate and Sani Flush are mild poisons so follow the cautions on the package labels.

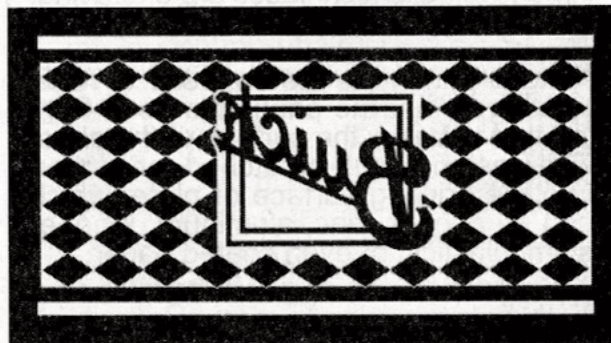
The Process

I will describe how to develop a pattern for use in etching an aluminum plate such as used for firewall ID information, sill plates, etc.

First you will need artwork. It could be as simple as text or an original drawing. For the sill plate artwork I needed a Buick logo as used in 1923 and a diamond pattern plus straight lines. I copied a Buick logo off the internet and used simple drawing tools available on a word processor to lay out the rest of the artwork. I decided to start with a test pattern about the size of a business card so I could evaluate the etching process without using too much aluminum or etch solution. The test pattern I developed represents the center part of the 1923 Buick sill plate.



All the shiny places, that is, the un-etched areas, have to be protected from the etch solution, because anything exposed to the solution will be slowly dissolved. A simple process to do this has been developed for making printed circuit boards using copper coated fiberglass. I chose this process for my sill plates. The process uses a sheet of material called Press-N-Peel Blue® or PnP Blue and a laser printer¹ (an ink jet printer won't work). I made a mirror image negative of my artwork and printed the pattern on the PnP Blue sheet. The following describes the etching process:



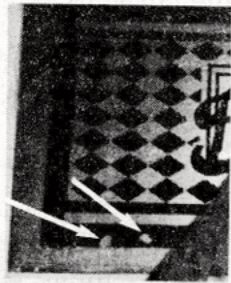
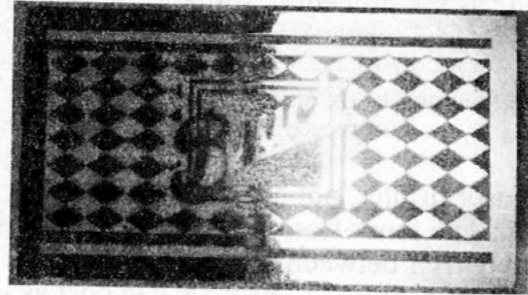
A pattern on PnP Blue was cut out and taped to a piece of dead flat² 20 gauge (0.032" thick) 1100 aluminum alloy sheet. Alloys other than AL 1100 may not etch as well.

The laser printed image is then transferred to the plate by heating with a clothes iron set on the highest setting. (The transferred image is now correct, not a mirror image.)



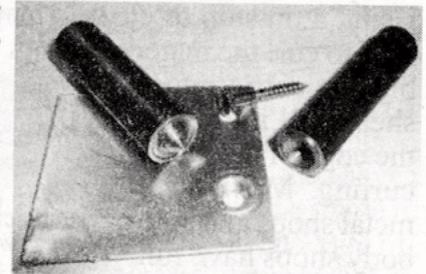
the aluminum from the etching bath and wash in water. Do not re-use the etch solution. The acidity is effectively exhausted.

The etching mask is removed with acetone and the etching is finished.



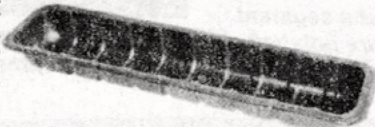
The PnP backing is peeled from the aluminum leaving the laser toner and some of the PnP material as a resist that protects the aluminum from dissolving. Removing the PnP may lift some toner off the aluminum plate (arrows) and will have to be repaired³.

The test pattern looked good and closely matched the original sill plate. To make a complete sill plate I expanded the artwork to its full size⁴ and added the additional diamond pattern. I also made a special tool to make debossed rims around each screw.

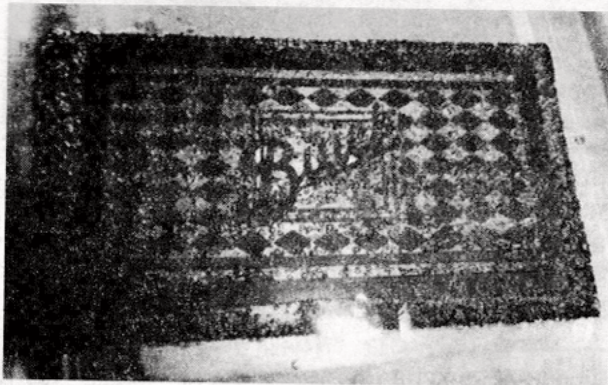


The full sized sill plate was installed on the car and provided a finished look that was a very good replica of the original down to the Buick logo and the debossed holes around the mounting screws. Total cost for all materials, including chemicals, PnP Blue, and the aluminum sheet metal was under \$5.00 per sill plate. Of course the cost of the laser printer, electric shear and other equipment has to be figured into the total job's cost. Still, it's less than farming it out to a custom shop, and you will have had the satisfaction of doing it yourself.

The aluminum, with etch resist, is placed in the etching solution. An inexpensive wallpaper tray, available at home building centers or paint stores, is long enough and works well.



Soon particles of copper begin to form on the bare areas along with bubbles of hydrogen gas.



After about 20-25 minutes, the etching should be deep enough for most uses; remove

a. There are two reactions that etch the aluminum. The primary reaction involves copper ions from the copper sulfate replacing aluminum which goes into solution. The copper comes out of solution as small reddish brown copper metal particles. The second reaction is caused by the Sani Flush which produces a weak acid that etches the aluminum and releases bubbles of hydrogen gas. These bubbles help carry off the copper particles and makes the etching more uniform.

b. The used etch solution can be neutralized by adding a piece of scrap aluminum overnight until the blue color is gone. At this point there are no toxic materials left in solution.

Simple as the procedure sounds, and actually is, several unexpected problems did occur.

The footnotes below refer to the numbers in the preceding text.

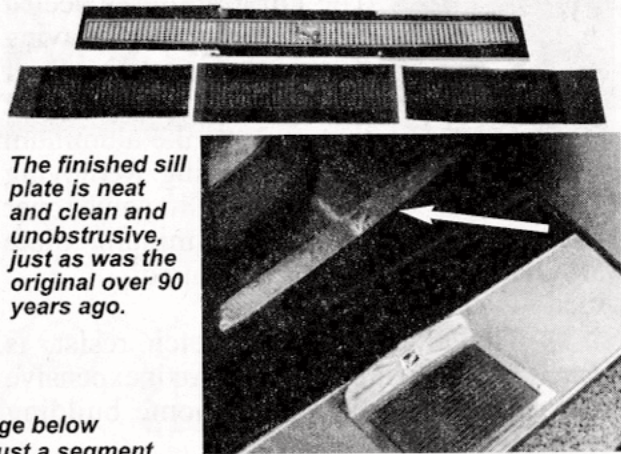
1. A laser printer, not an ink jet printer, is required. The toner from the laser printer is the actual barrier between the metal and the etching solution. 8½"x11" printers can cost as little as just over \$100.

2. The aluminum material must be dead flat to accept the PnP without ripples or distortion. Using a tin snip or electric metal scissor will tend to curl the material as you cut it. A multi-blade electric metal shear will minimize the edge of the metal curling. Most sheet metal shops and auto body shops have full sized shears and will often cut your stock for you as a favor, or for a reasonable fee.



3. It is possible that, in removing the iron-on PnP some of the material may lift off leaving voids. These voids can be filled with two applications of a Sharpie® black marker. The marker ink acts as an effective resist material.

4. The sill plate for the 1923 Buick was just under two-feet long - too long for the entire pattern to be printed in the laser printer. The artwork was divided into three segments, with alignment marks. The three segments were printed, side by side, on the sheet of PnP material. They were then trimmed and taped together as full size to allow application onto the aluminum stock.



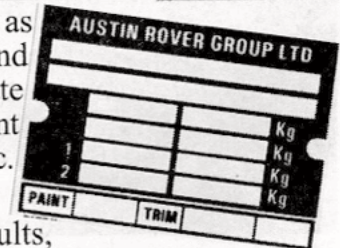
The image below shows just a segment of the entire finished sill plate. The completed aluminum plate is just under two-feet long. This photo represents just over a foot of the entire plate.



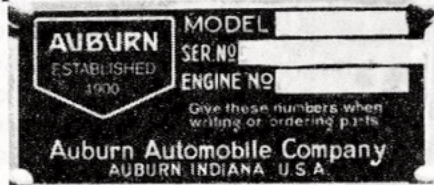
BESIDES SILL PLATES this same technique can be used to replicate various other types of etched

aluminum plates. The key, of course, is the artwork. A sample of the plate that you are replicating is best, but even a good photograph, with meas-

urements, will work as well. Double (and triple) check plate size, font size and font style, line lengths, etc.



The results, if carefully done, will be very close to the original etched plate.



S.K.