

Silver Soldering Hints

by Russell Barnes and edited by the NRG Staff

Several years ago, I built a cross section model. It had a mast and I created the deadeyes and chain plates for it, rigged the shrouds, and then tied the ratlines. All well and fine until I noticed that the shrouds had, in a couple of places, gone a bit slack. How did that happen? I looked carefully and saw that several of my soldered joints in the chain plates had broken and the tension was now off. **ARRRGHHH!!!**

Why did those joints break? They were soft soldered using a soldering iron. Once they were tugged on a bit to get the shrouds properly tensioned, a few of those chain plates parted and left me with sloppy looking shrouds. Well, the experience with the sloppy shrouds did it. No more broken joints for me. I received a soldering torch as a Christmas gift and I learned to silver solder. It took a bit of practice but I got into the habit of making reasonably passable looking joints. The main thing was that the joints were now completely solid. Although I am by no means an expert, I can solder what I need for a ship model and the model's finished appearance and longevity are that much better for my having learned a bit about this particular skill.

Silver soldering, also known as hard soldering, is not difficult to learn but one must practice to get over the curve. It does not need to be expensive either. For about less than \$100, you can buy the torch and enough solder to last you several years. Of course, you can spend a lot more money as well. Silver soldering can be used in any number of applications in ship modeling. Hooks, shackles, eyebolts, chain plates, anchors, yard trusses, pintles and gudgeons, etc.

My soldering torch came from Micromark www.micromark.com. The soldering paste is already mixed with flux and can be obtained from any good jeweler's supply house. Make sure you get the kind that is cadmium free. Cadmium is toxic so avoid it. It comes in three hardnesses or melting points. This allows for soldering additional parts without melting previously made joints. If you buy only one, get the mid-range variety.



Left to right: Soldering torch, self-locking tweezers, soldering paste, various files, nippers and needle nosed pliers

You need something to hold the work while you are soldering it. I use a cheap pair of cross locking tweezers. You can also use hemostats. Objects can also be held in place with pins on a porous magnesia block. For trimming the metal, you can use end nippers or electrician's dikes. For bending the metal, use needle nosed pliers. To get better tools, you can spend a bit more money, but these will do when you are starting out. To clean the metal, I use two sets of files, one a set of larger 7" long files, and various shapes of 4" jeweler's files.

The most popular type of metal for soldering in model ship building is brass. You can also use stranded copper wire found in power cords. Both of these can be chemically blackened. I have made hooks and eye bolts out of copper wire down to very small sizes; some of the hooks were as small as about 3/32" long.

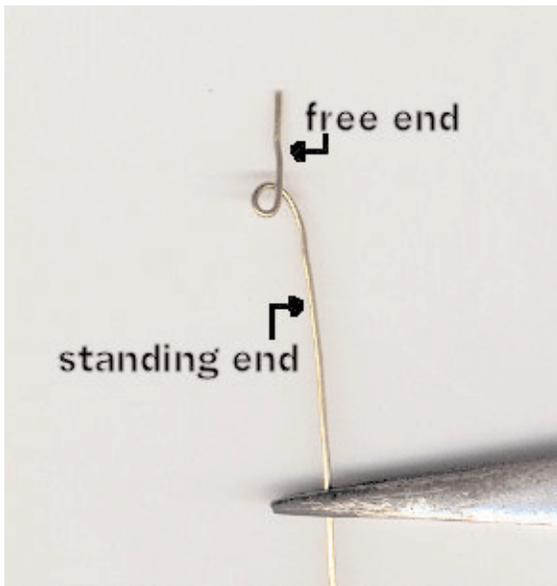
Rather than try to show you how to make every joint that you might find useful in ship modeling, I think it would be better if I showed you some basic tips on how to make "a" joint. If you can make a simple joint, then you can make any joint. In my experience, there are two keys to a good hard soldered joint. First, the pieces to be joined must be clean and bright. Second, the two pieces must be in perfect contact for the joint to be completed.

The cleaning part of it can be done with chemical pre-cleaners, such as Sparex or even vinegar. Both of these products work better when used warm. For certain soldering tasks filing the pieces until they are clean and bright is enough.

Getting the pieces in perfect contact sometimes requires some thought. For things like rings and eyebolts, the best advice I can give is let the tension in the metal work for you. This is accomplished by over bending the pieces and then springing them back so they are forced, by their own tension, to touch each other. That is much easier than trying to force them together when their tension wants to hold them apart. Even with brass that has been annealed, it is often difficult to simply bend the two pieces towards each other and have them make perfect contact. The best way is to over bend the pieces and then spring both pieces back so they will be forced against each other. Pinning pieces onto a magnesia block or wiring pieces together are other techniques.

Well, let's make a simple joint. We will make a loop such as is needed for an eyebolt or a hook. There are two reasons for using this simple joint to illustrate the process of hard soldering. One, this simple joint is a good starting point. Two, this simple joint has everything in it that any other more complex joint will have. If you can make this soldered joint, you can make any soldered joint.

We will begin with a roll of 24 gauge brass wire. Snip off a piece about 6 inches long. Holding it in a pair of cross locking tweezers or your pliers, anneal the wire. I use my trusty kitchen gas stove. Light the burner and hold the end of the piece in the flame until it glows red and then remove it. Do not quench it. After it cools, use your pliers to bend the end of the piece back across itself. Place the pliers about 1 inch back from the end and bend that outer leg so it crosses over the wire. You can use the shank of a drill bit as a former for the loop you want to make. Now, you have the free end of the wire crossed over the standing part of the wire that you are holding. With the loop formed, pry the free end of the wire out a bit from the standing end of the wire so you can use your end nippers to cut off the excess part of the free end. Again, over bend here just a bit so after you snip off the excess, you can pull the free end of the wire back a bit and have it close up against the standing part of the wire.



Before you close up the free end of the wire, square up the very end of the wire with a file. All end nippers, even supposedly flush cut nippers, will leave an angled cut on the end. I use a 7 inch file for this along with some head mounted magnifiers to make sure I can see what I am doing.

When the free end of the wire is squared up, close the joint. Hold the piece up to the light and look carefully to make sure there is no light coming through the joint. You may have to work with this joint a bit the first few times around. Do not worry though. This forming and checking is where the joint is made. In this operation, preparation is everything. That may sound like hyperbole but it is not. Use your pliers to make sure the free end is snug against the standing part and that everything is lined up along the line of the wire as well. What you should have is the standing part of the wire with a loop in the end where the free end of the loop is coming into the standing part at close to a 90 degree angle. With the brass softened through annealing, this will be no problem.



Once the pieces are in perfect contact, apply the solder. I use pre-fluxed solder paste because it is easy to control the application. It will stick to the metal so you do not have to worry too much about it wandering once it is applied. You only need a small speck of it. On the example I created here, I probably overdid it a bit so you could actually see the solder on the joint. I applied it with a toothpick. The solder should sit on the side of the joint opposite to where the heat source will be applied.

It is time to fire up the torch. Before we do that, let me say a few words about safety. Make sure the work area is clear and you have a nice flat area to place the torch when you are not using it. **Always turn the torch off after you use it and before you set it down.** Keep water or fire extinguisher nearby in case of emergency. Make sure there are no other flammable materials nearby, including chemicals, wood and shirtsleeves. Watch your hands when using the torch. Above all else, please, please, please be careful. Think carefully about the workspace, what you are doing, and any possible problems that may arise from the use of an open flame.

I use a candle to light my torch. An instant-on butane torch like you would use to light the fireplace also works well. First, I light the candle and then open the valve on the torch, holding the end of the torch in the flame, igniting it. The brass wire is held in the cross locking tweezers with the solder

paste applied to the joint, away from the tweezers. I hold the tweezers in the left hand and the torch in my right. I put the flame to the tweezers side of the joint. After about two seconds, the solder flashes and bubbles and the solder runs along the joint. I remove the flame, place the tweezers on the bench so they will hold the wire off the work surface, **turn off the torch** and set it down carefully. If this is your only joint, blow out the candle (if using) as well.

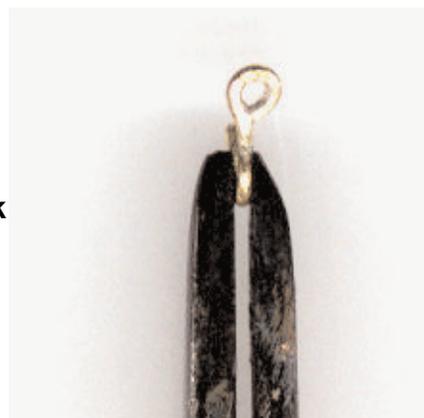
Picking up the tweezers, I examine the joint using my magnifiers. Perfect. It is a nice solid joint. Note in the photograph that the joint still looks a bit messy. That is normal in a freshly soldered joint. It needs to be cleaned up a bit. This can be done by soaking the piece in white vinegar. If there is excess solder, use a file to clean up the joint.

The picture shows the joint after it has been cleaned up.

What you see at this point is an eyebolt only wanting the stem snipped off to the proper length. If you wish to make a hook like I did, take the standing end of the brass wire and bend it over towards the loop. I used the pliers to squeeze the hook part slightly while pulling outward on the end of the wire that will be the end of the hook. Snip off the end and you will have a nicely formed hook every time. Twist the loop so it is at 90 degrees to the hook.



Completed hook



To make this joint took about 10 minutes, all except two seconds of which were used in preparing the joint and cleaning it afterwards. As I said, preparation is everything. It takes a bit of time, patience, and practice, but the time spent is worth it. That joint will never fail. I can now blacken the piece and it will look just like iron on the model. If you are interested in creating good looking metal work that will stand the test of time and help you create a better looking and better made model, then you should give hard soldering a try.

This simple joint is like any other you will make in the process of ship modeling. If you can make this soldered joint, you can make any other soldered joint. More complicated joints take some practice to make, but once you get into the habit of using clean metal with perfectly touching joints, hard soldering will become a joy to do and you will never want to use any other kind of solder. So, gather your tools and materials, and begin practicing making some of these simple joints. The more you practice, the better you will become and the more enjoyment you will get out of metal work.