

Annealing and forming brass and nickel silver.

Bob Alderman © October 2009

Certain kit components often have a note to anneal them to assist their forming. At a recent event I assisted with three different models where annealing was required. It was obvious that to the inexperienced, the process was something of a mystery.

Why....

The brass or nickel silver (n/s) usually supplied in kits, is in the condition known as half hard. This gives the material the basic properties to keep it flat and stiff, sufficient for the needs of the kit. However, if one attempts to bend the material in this condition, it becomes harder and stiffer, resisting the bending process. It undergoes a process called work hardening. This can be easily seen if a paper clip is repeatedly bent. The area that is bent becomes hard and resists bending.

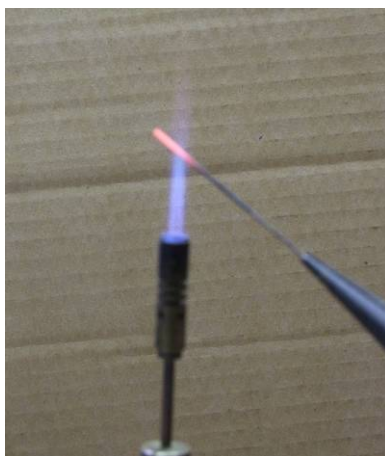
How....

Annealing is the process of heating brass and nickel silver (and other materials) to soften them, so that they may be formed to the required shape.

The heating can be easily done with a gas torch, or over the flame of the kitchen gas stove. The metal has to reach a certain temperature to soften sufficiently. The temperature can be gauged by the colour it shows when heated. Bright red is usually too much and the metal will be “butter soft”. The aim is to heat just below where the metal shows any colour or just shows dull red. Bright lighting does not help.



To the left heated to just below red heat, and to the right red heat.



When heating a wire or something small it will inevitably reach red heat.

When heating, the metal may bend out of the flat as the temperature increases, this can be quite animated. The cause is the internal stresses in the sheet being relieved. It can be ignored.

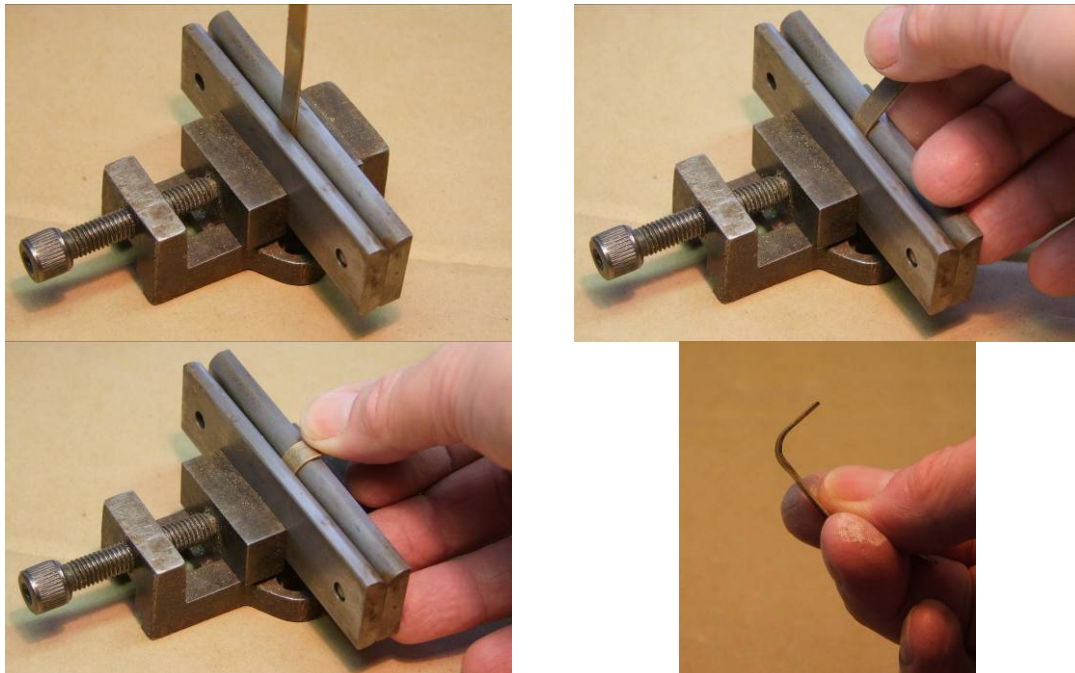
Allow it to cool in air. It is not necessary to quench the metal in water to cool it.

The heating of the metal will create an oxide film on the surface. This film needs to be removed before soldering, as even the most aggressive flux will not cut through it. An abrasive block or fine wet and dry will clean it off to leave bright metal. Have a care as the metal may still be soft, and unwanted bends may be created.

Making the bend....

Once cool, mark the position of the bend with either a soft pencil or a fine felt tip marker.

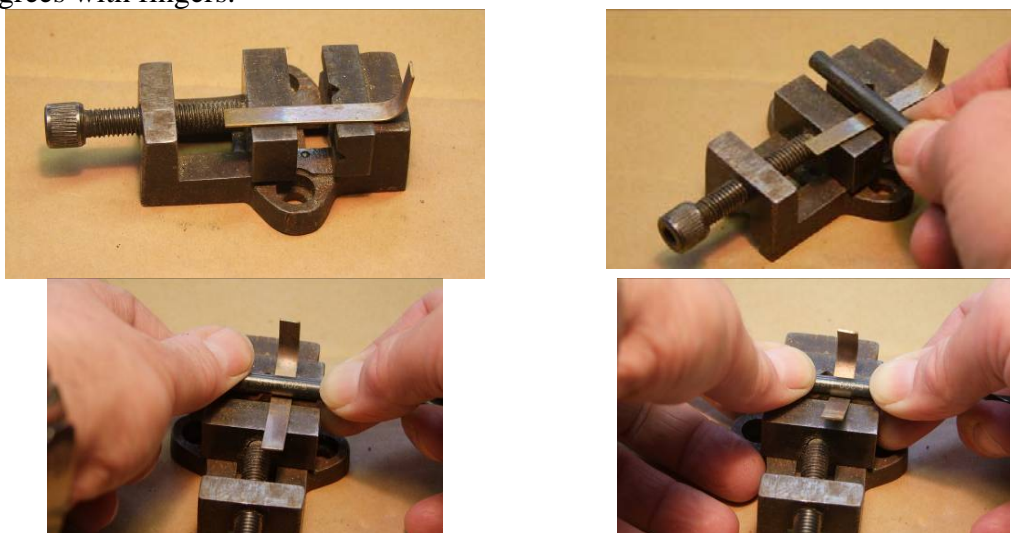
Sharp bends are made by the corner of bending bars; radii around an appropriate sized rod or bar, or for circular items, rolling bars. Note when making a bend there is an element of “spring back” in the material. This means that when you are making the bend, then bend it slightly more than the desired finished angle. This is less likely when the metal is soft.



The next illustrations above show a bend made around a radiused bending bar.

If no special tool is available then using a drill shank or bar of the appropriate diameter can be used, In this case the jaws of a small vice have been used but two pieces of hardwood can be used too or the open jaws of a pair of bending bars.

The sequence shows the piece to be formed placed over the vice jaws. The drill shank is positioned between and pressed down. The bend can be finished beyond ninety degrees with fingers.

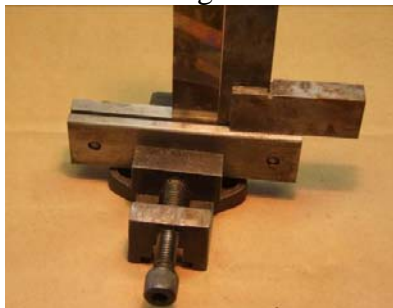




If you have ordinary bending bars with square edges, radii can still be made. Open up the bars and insert a rod or bar of suitable diameter to bend the part over and then clamp. Note this is a juggling act to get all the parts aligned!



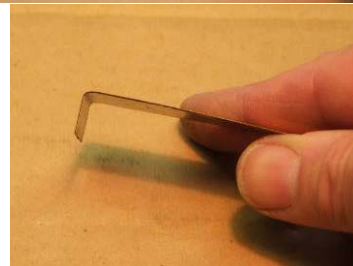
It is usual in most kits that a right angle bend is made on a half etch line. No annealing is needed for this and bending tools are optional. However sometimes such a bend is required when no half etch is provided. In this case a pair of bending bars with a square edge is needed. Anneal the bend area, mark the position of the bend and push around the corner. A block of wood sometimes helps to push the metal as it can be pressed against the part close to the bend. This was not done on the part illustrated and the bend remains a tight radius.



Setting up the part in the bending bars and starting the bend.



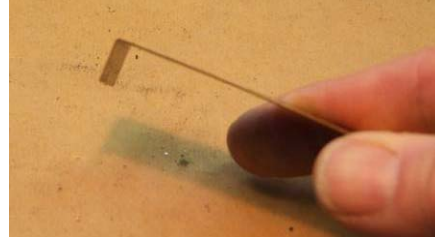
Pushed home and a tight radius remains.



Tightening the bend with a hammer. Use a piece of wood to protect the part as you apply the hammer. Final tightening of the bend can be done with the hammer directly. Note if the face of the hammer has any damage this can be transferred onto the part. Before this can be done on thick material, further annealing will be necessary.



Radius removed to give sharp corner.

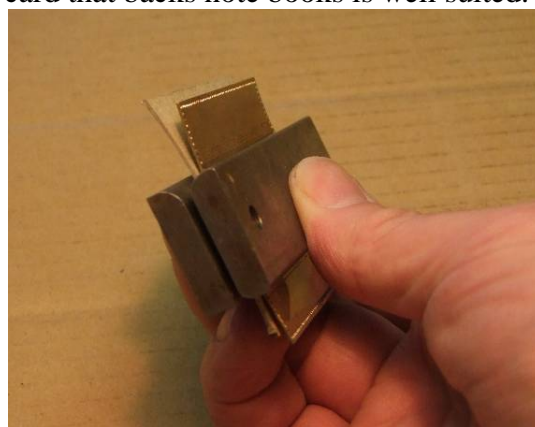


For a saddle tank with radiused corners or a firebox wrapper it is not necessary to anneal the whole item. Only the area of the bend needs to be done, the remainder does not need to be specifically heated. A gas torch with a small flame is better than a gas ring for this.

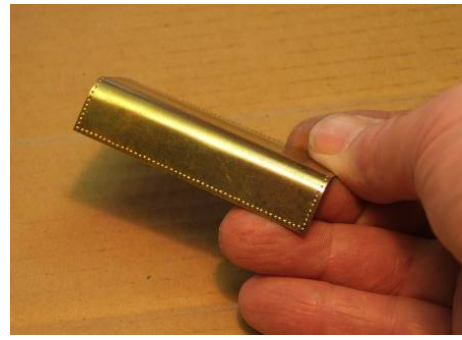
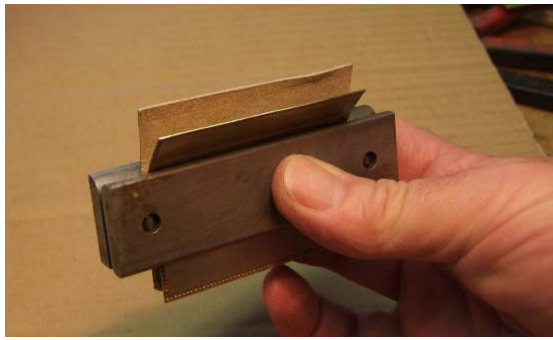
Heating along the bend area only.



The tank top in the illustration has embossed rivet detail. It is always easiest to raise these in the flat. To protect them from the bending bars or rollers place a piece of card against the heads; the card that backs note books is well suited.



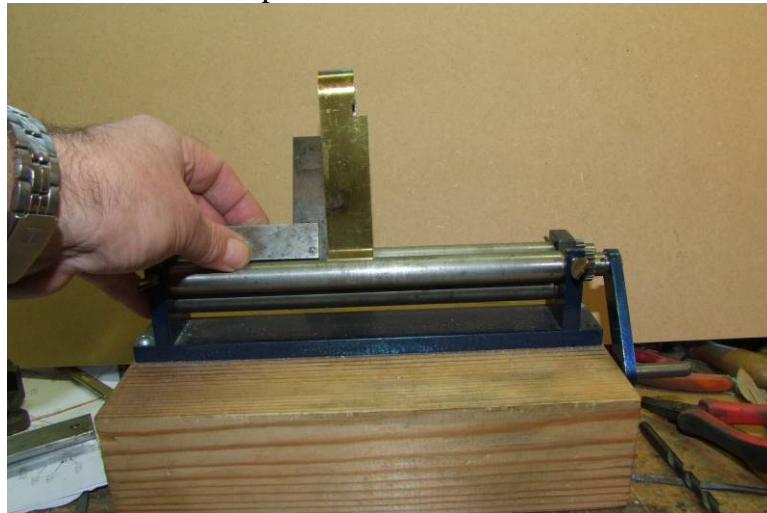
Push the part around the bending bars with a piece of wood keeping the card between the wood and component.



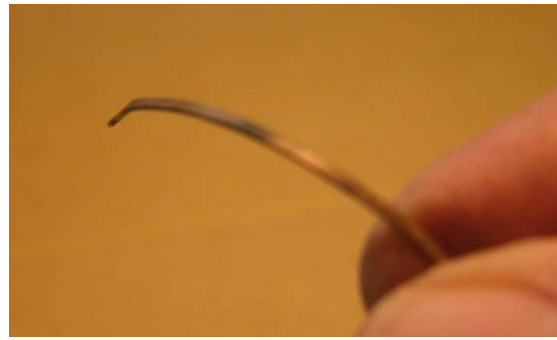
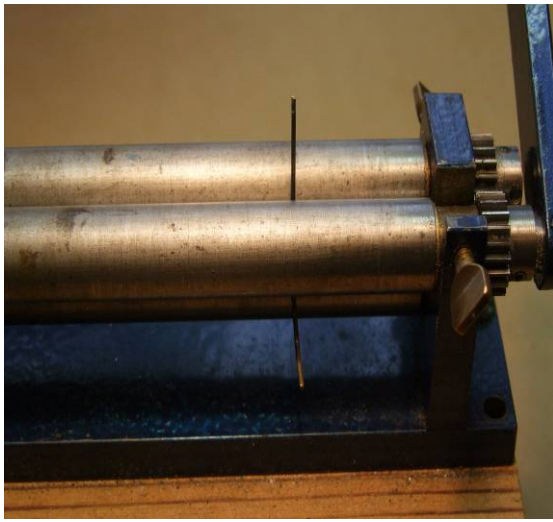
Rolling bars are simple to use. There are three rollers in the system two are driven, linked with gears. These pinch the part and drive it through and the third applies pressure to push the part around.

It is possible to roll parts to shape without annealing, but this often means that the leading part remains flat. This is because it passes through the first rollers without initially touching the third. Annealing will enable this part to be pushed around the rollers.

Insert the part into the rollers, adjusting the pinch so that it is driven. Ensure the part is square to the rollers. Adjust the third roller so that it pushes the part. The initial pass may not give sufficient curvature so increase the pressure of the third roller. It should be possible to get a part almost curved around the pinch roller. In this case the roller is generally removed to release the part.



Another use for rolling bars is to flatten round wire. Anneal the wire and pass through the rollers. If a particularly flat section is needed annealing between passes will be needed. Note that if the wire is in the centre of the rollers the bars will deflect and maximum squeeze will be lost so pass the wire near the end.



Wire now a close rectangular section

To create a flat on the end of a piece of wire for putting a pin through or for larger sections of brass wire these can be flattened blacksmith style. Heat up the area to be flattened and, on a suitable anvil, use a hammer. Heat several times and strike the wire on opposite sides to maintain symmetry.