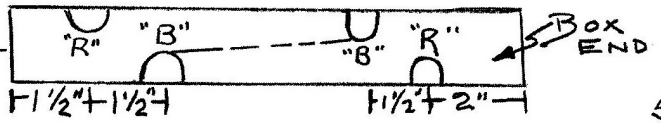
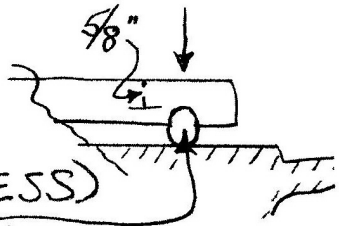
Darryl Nelson's Box Jaw Tongs by Don Kemper

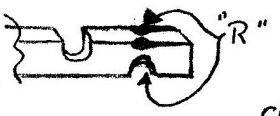
"BASIC" --- 5/16" X 1" X 16" STOCK - B

SETUP --- 

1) FORGE INDENTS @ "R" & "B"
(MAINTAIN 5/8" WIDTH & 5/16" THICKNESS)

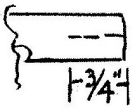


2) ROUND OVER EDGES OF INDENTS "R" ---



3) CHISEL CUT FROM "B" TO "B" - (DRAW INTO REINS & CHAMFER)

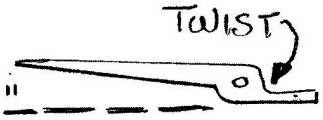
4) SPLIT 3/4" @ BOX END -



5) BEND SPLIT END, FORGE TO 90° ---

6) PUNCH FOR 5/16" RIVET (BOTH PIECES)

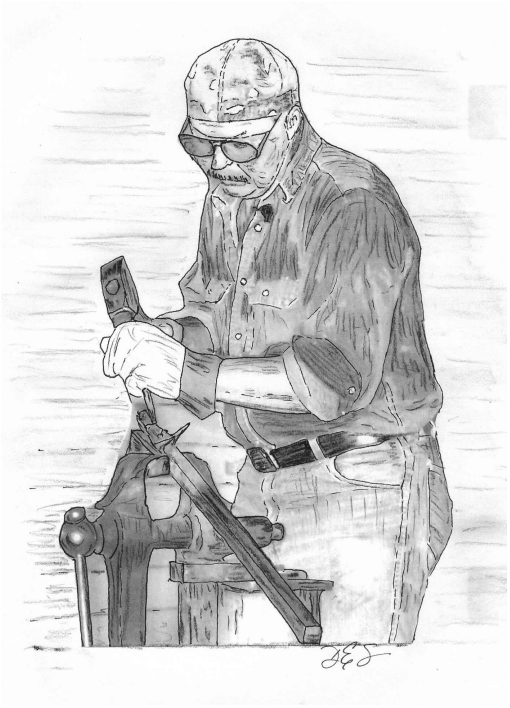
7) TWIST 90° @ ROUNDED "R" ---



8) BEND BOX END @ 90° OVER DESIRED STOCK -

9) RIVET (5/16") & TUNE TO FINISH -

NORTH WEST BLACKSMITH ASSOCIATION



Part 2

Forging Dragons

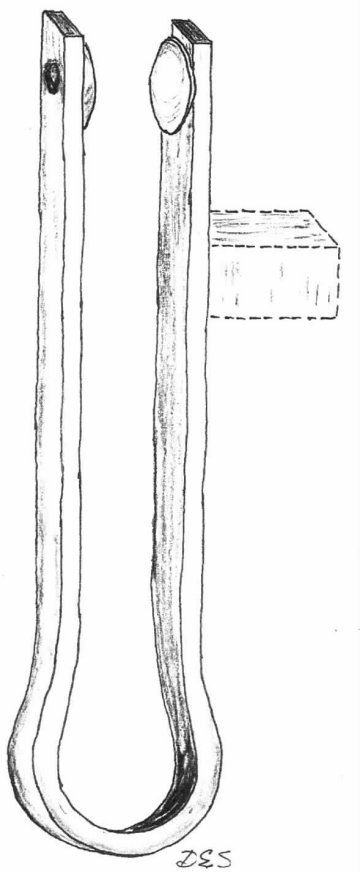
An article on Steve Williamson's methods of forging dragons.

by Dave Smucker

In the last issue of the newsletter, we completed forging the dragon's head except for the mouth and "beak" area. Now to continue, the next operations is to forge the neck area and complete 2 to 3 back ribs, (scales or vertebra – "whatever you want to call them"). They are the pulled out ridges that define the back of the dragon and extend from the base of the head to the end of the tail – except where the wings attach to the body of the dragon. While we didn't make much use of the treadle hammer in Part I – if you have one you will make a lot of use of it for the vertebra. If you don't have a treadle hammer you can still do this work at the anvil with the correct tooling – it will just take more heats and effort.

To forge the vertebra you will need a special tool, a type of spring fuller that will allow you to forge both sides of the vertebra at one time. Steve makes up two forms of this tool based on a design from Clay Spencer. Clay's original design is one that he came up with to form the "pulled out" nose on his rail spike wizards. Clay made these original spring fullers by welding two large steel balls (3/4 to 1 inch diameter) to the "U" of the spring fuller. For Clay's spring fuller you can get these balls from a large ball bearing or they can purchased from someone like MSC. Steve's tools uses large carriage bolt heads in place of the ball bearings. This, in effect, gives you a spherical surface that has about double the radius of the 3/4 to 1 inch ball bearings. Carriage bolts are officially know as American National Standard Round Head Square Neck Bolts – but don't try that name at your local hardware store unless you enjoy a good laugh. The 1/2inch size has a head diameter of about 1.050. The 5/8 inch size has a head diameter of about 1.250. They have a spherical "size" of about 1 3/4 and 2 inch respectively. (from Machinery's Handbook Industrial Press Inc.)

To make the spring fuller you will need carriage bolts and 1/4 x 1 inch flat stock for the "spring". I suggest that you make two of these tools, one with and one without a hardie tang. Cut your flat stock to a length of 26 to 28 inches, then find and mark the center of your stock. I use a square point center punch for this because it is easier to see when hot. Now heat the center of your bar and then bend it around a cylindrical form or the horn of you anvil. I like a piece of 1 – 1/2 inch pipe clamped vertical in my vise to make this bend around. What you are bending here is a large "U". Don't worry if the ends are not exactly the same length, you can trim them off later. Let your "spring" air cool. Now select the location on the shorter leg and center punch where you will bolt will go. Cut a piece of scrap wood that will just fit between the two legs of the "U". (All blacksmith shops should have some wood around – it is useful for other things than just starting fires.) Clamp your wood scrap between the legs of the "U" and drill through both legs and the scrap. If you are doing this in a drill press use a C-clamp or if using a hand drill just clamp the "U" in a vertical position in your vise. For this type of operation, I suggest first drilling with a 3/16 or 1/4 pilot drill and then opening up the hole to 1/2 inch for the carriage bolt. By drilling through both legs of the "U" and the wood scrap at the same time, you assure that the two bolt heads will be in alignment.



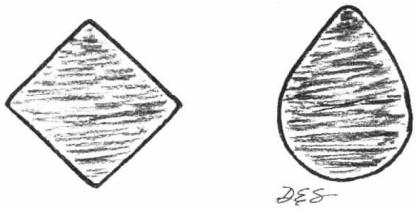
Spring Fuller – from 1/4 x 1 inch stock with 1/2 carriage bolts heads used for "tool surfaces". A tang can be welded on one side for your hardie hole.

Now you can install the carriage bolts from the inside of the "U". Most likely, the carriage bolts are galvanized. It is hard to buy black steel ones anymore so I suggest that you heat them in your forge to burn off the zinc plating. Be very careful to avoid the fumes from the zinc. Let them cool and then file or grind the corners off of the square shank so that they are not too hard to install in the "U". Press into place from the inside of the "U". You can tap it into place or drop several washers on the bolt and run a nut up and pull the carriage bolt into place. Cut the treads off.

Now plug weld them from the outside of the "U". Do a good job here and build up some weld material on the surface because this will be the striking surface for the tool. Clean up with that grinder or disk sander. Now, as I said before, I recommend that you make two of these tools. One to use free hand and the other to use with a hardie hole tang in either the anvil or treadle hammer. If you are going to do this work without a treadle or power hammer than you will need one with the hardie tang unless you have a striker.

Now that you have the tools, let's get on with more work on the dragon.

As we left the dragon in the last issue the horns where laid back against the body so that we could work on the details of the head. Now you need to heat them and gently bend them forward so that you can work on the neck and body area. They do not have to come too far forward – vertical to the body is fine. We now want to forge and draw out the neck area but retain most of the mass in the body area where the wings and talons will attach. Steve draws and forges this area to what I would call a "fat tear drop" cross section with the top of the tear where we will form the neck fins or vertebra. You want this length to be long enough for two to three fins but not more. Another way to think about this cross section is to think about it as a diamond with the bottom of the diamond rounded. This is also the best way to obtain the desired shape – first forge the area into a square set on the diamond to the head and then round up the bottom. You can do this by keeping the bottom against the anvil and working the top two side of the "tear". Forge a smooth transition back into the body section.



Square section on diamond – Fat Teardrop

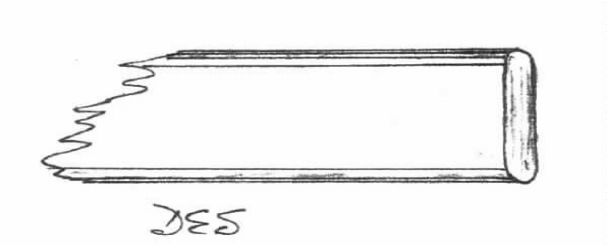
Now you can put your tooling for forming the fins to work. Steve does the neck fins with the tool fastened via the hardie hole tang in his treadle hammer. This allows very close control on the placement of the fins. With this arrangement in a treadle hammer, you can hold the dragon by the "tail" and also use tongs in the other hand to give two-handed control of placement.

If you are working on the anvil – you will also need the tool with a hardie tang but will only have one free hand to hold the dragon (the other one has your hammer) unless, of course, you are blessed with a striker.

With these, two (or three) fins in place it is time to set the curve of the head and neck to the body section. Also, while you have everything in the area warm, heat up the horns and get them into the final location over the neck area. Take some care here, take a good look at the metal at the base of the horns, and look for cracks – if you have any, dress them out before making your final bends. A small rat-tail file or small chainsaw file works well for this.

The dragonhead and neck are now complete, except for the "beak" and tongue, but we are going to move on towards the tail before finishing the head. Round up the body section – the mass in this area stays the closest to the original stock section but is rounded up and drawn out a little. Then start the drawing process for the rest of the long tail of the dragon. Like the short section of the neck, that we have already done, this will be a "fat teardrop". As before first draw this out as a square section but set on the diamond to the body. Then form the tear by working the bottom area against the anvil, rounding it by working the top sides of the teardrop with the hammer. This will round the bottom with the anvil and sharpen the top of the tear. When we have 4 to 6 inches of the tail shaped, we are ready to put a slot in the back for installation of the wings. Don't put the fins on this section yet.

Steve now punches a slot in the back (top) of the body by using a 1 inch slotting punch – **but doesn't punch through.** Make you punch about 1 inch wide by 1/4 inch with rounded corners.

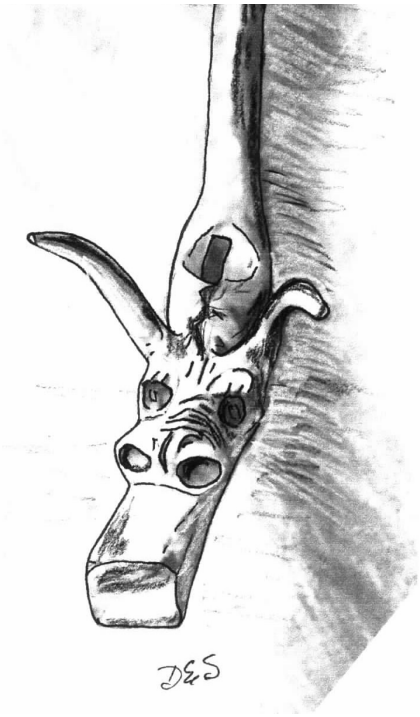


Working end of punch, grind end flat with sharp edges to body

You can make your punch from 5160 (coil spring) or W1 tool steel and it will work fine – but this is one application where I prefer H13 or S7 tool steel. The reason is that this type of tool will remain in contact with hot metal for longer periods – and the hot work tool steel in H13 or S7 just plain holds up better than others when it has to work at higher temperatures. While this is a punch required for this application, you will find many other uses for this punch in other work too.

To do this punching, set the heated body section of your dragon in a 1-inch or 1 – 1/4 inch bottom swage set on your anvil. If you have a large swage block with this size, usually on an edge, that can be used too.

To make the slot, heat your dragon to a good orange, place it in the swage block and punch down from the top or back of the dragon. You want to make a deep slot for the wings but do not want to punch through as you would in most applications. Position your punch and take the first blow or two to start the process. Cool you punch and drop a little fine coal dust in the started slot and continue punching. You may have to do this several times but you should be able to deepen the slot with only one heat.



A View of the Dragonhead after the slot has been punched for the wings, but before the tail has been completed or the saw cut made for the mouth.

We are not going to install the wings yet, but we are ready to draw out the rest of the body / tail of the dragon. We produce a long gradual taper over the total length of the body /tail until we reach the very end of the tail. Use the same procedure as before, first drawing it

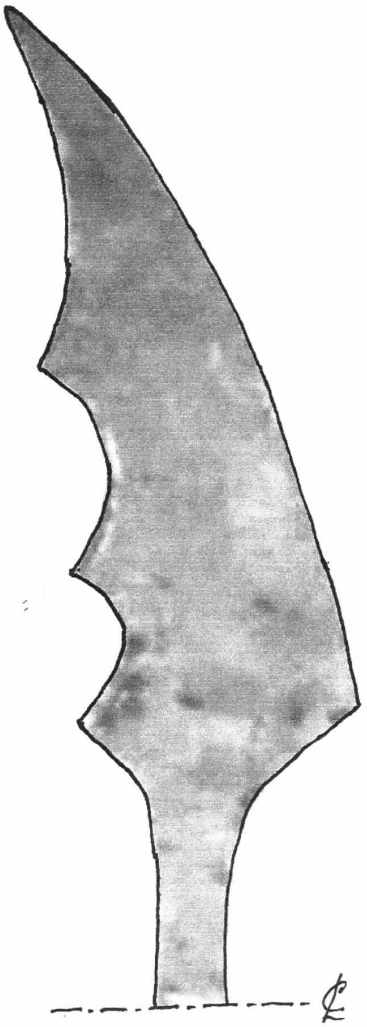
out a square section then rounding into the fat teardrop. Here is where if you don't have a treadle hammer or power hammer you will wish you did. Never the less, all of this drawing can be done on the anvil, as it was done for centuries by many blacksmiths. About half-way through you will want to turn your work around and hold it by the dragonhead. Steve works to have his 1-inch stock dragon reach a length that measures from his waist to the floor.

Most likely, you will have some stock left as you reach the end of the tail. Cut this off, leaving enough material to form the "rattle" or "spear" on the end of the tail. You form this rattle / spear just as you would a leaf. Set off some material on the edge of the anvil or using a spring fuller and then form into the leaf shape.

You are now ready to put all of the fins or vertebra on the back of the dragon over the total length of the body / tail. For this part of the dragon, Steve Williamson uses the same spring fullering tool but uses the free hand one and does the work in the treadle hammer. He finds that this is the fastest way for him to work. He heats a section of the dragon and then draws out each one of the fins – being able to do three fins with each heat. As you draw out the fins, it will cause the body / tail of the dragon to curve because it becomes longer on the fin side. You need to adjust for this at least every other heat. Steve recommends using a wood mallet to do this so that you don't damage your dragon. Another important recommendation of Steve's is to heat you dragon with the fins up in your fire or your will have real danger of burning them. Working from the head to the tail makes the fins small towards the tail with closer spacing.

If you are doing this for the first time, you may find that it is easier to use the fuller with the hardie tang attached. If you are working under a treadle hammer this allows you to use two hands to position the work piece. For me, I would hold the dragon itself with my left hand, using a Kevlar glove if necessary and using tongs in my right hand. Without a treadle hammer, working on the anvil I would for sure want to use the fullering tool with the hardie tang. Again, being right handed, I would hold the dragon with my left and use the top of my hammer to help position the work piece into the spring fullering tool – then strike it with my hammer when correctly positioned. While not as easy to use as tongs to help position the work piece I find that I can both push and pull with my hammer when using a spring fuller. You may have to "adjust" the spring of your fullering tool so that it has a light spring effect on the work piece. This is easier for me to work with than when the fuller halves (top and bottom) have a gap to the work piece.

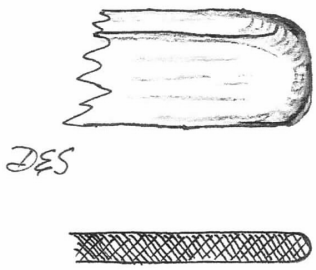
You have now finished much of the dragon and it is now time to move on to the wings, talons, forked tongue and beak. Let's start with the wings. Steve makes the wings – both wings at the same time from a single piece of 16 or 18 gauge mild steel. (Steve used to make two separate wings and join them in the body slot – but one day he decided that he could make as one piece and fold them.)



I have included one half of a general pattern (about 3/4 size) for the wings based on a photo I took of one of Steve's blanks – it is not an exact copy but should be good enough to give you an idea to work with.

Base you own pattern on your ideas and a little experimentation. The long section in the middle of the two wings may seem longer than necessary but as you will see, much of it is captured inside of the dragon's body.

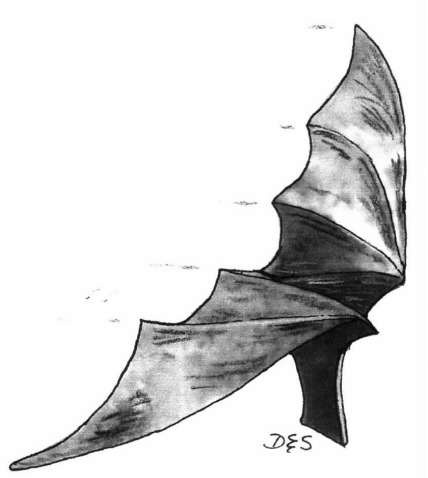
Start by tracing your wing pattern on your sheet steel and the cut it out. In my shop, I would do this on the vertical band saw, but you can do it other ways too. You could use a Beverly shear, a plasma-cutting torch; you could burn it out with an oxy-acetylene torch, cut it with a hand fret saw or with a cold chisel. I think Steve uses a Beverly shear to cut his. The plasma torch does a nice job but unless you have one you're not going to buy one for just dragon wings. The oxy-acetylene gives a somewhat rough job unless you have a very small tip. The fret saw does a beautiful job and is a low cost tool but is too slow for some of you. Last, but not least, is using a small cold chisel to do this. If you have never tried this is goes much faster than you would think. Your chisel needs to be **sharp**. I like to do this kind of thing seated at a solid bench working on a heavy piece of steel plate as my cutting anvil. If your wings have rough edges, clean them up using a file. If you hold the wings vertical in the vise with the working edge close to the vise jaws, you can quickly move all the way around the piece.



Working end of typical repoussé tool for forming wings. Round polish the working surfaces.

For the next operation we are going to form the wings, giving them both shape and depth. Steve does this under the treadle hammer using a repoussé technique. First it is important to anneal (normalize) the sheet steel. To do this heat it above the non-magnetic point and let air cool. This is technically a normalizing or partial anneal but is effective for what you are doing here. Steve uses two very simple rounded end tools to form the major wing "veins" from the backside of the wing. This gives the wings a structured detail and produces a natural wing curvature at the same time. After you have the veining, you can further refine this curvature or add more dishing by using a ball bean hammer or rounding hammer.

Steve does the veining working on a lead surface as the anvil. He made this by welding a bottom onto a short section of 3-inch pipe, forming a cup in which he melted the lead. Caution – about lead, breathing the fumes from lead or ingesting lead or lead oxide is bad news and can cause serious lead poisoning. Lead fumes are not an issue at room temperature but melting lead without good ventilation is a hazard. Lead or lead oxide dust can also be a problem as can transferring lead from your hands to your mouth, i.e. wash your hands before eating. Other surfaces will also work for this. One good surface is wood end grain in the form of a wood block or stump. Another is pitch (which I have not tried) or a very hard urethane rubber.

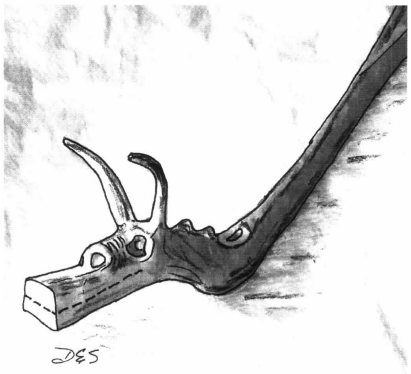


The completed and folded wings – ready for welding into the body.

The advantage of working under the treadle hammer for this is that it allows holding the tool with one hand and the wing with the other. Use very light blows. It can also be done with just the tool and a hammer to provide the blows. With a little practice, you can learn to hold the work (wing) with the tool and slide it to the next position for the next blow. Light blows, small steps, this is bench work. Don't over work an area or you will go through the material. You may find you want to anneal a

second time. If this is your first use of these methods, do a little practice on some scrap. You should now have a set of wings – that just lacks the centerfold. To make this fold start by gapping you vise and then gently driving the center of the wing into the gap using a rounded tool. Now heat your wings and you can the bend the wings together. Then clamp about 1 to 1 1/2 inches in the vise or tongs and bend the wings down to a natural position. Set the wings aside, we will install them after we finish the beak.

To make the beak Steve first makes a deep sawed slit for the month. Sawing is the way to go here since so much of the dragon is already done. Steve uses a Milwaukee Portable Band Saw for this operation. It makes quick work of this and lets him see both sides of the mouth while cutting. You can do this on a vertical band saw too – but watch that you make an even cut since the bottom side is hidden from you. Before Steve got his band saw, he made many of these cuts using a hand hacksaw. The hacksaw does a good job – have a sharp (new) blade and take your time. Make the cut deep, to almost under the eyes.



Another view of the dragonhead before completing the tail – the dotted line shows the location of the saw cut for the mouth.

Now take a good deep heat on the mouth area and then set your dragon vertical in the vise holding it in the body / wing area. Take a chisel and open up the mouth. Now **- this is very important -** take a punch and establish the location in the center for a drilling to install the tongue. After the metal is cool you can then drill a 3/16 hole for the tongue. If you don't use a punch to establish this opening for the drill, it will grab and most likely break the drill as well as damaging the dragonhead. Do the punching now, don't put off for later. You can then drill for the tongue when all of the rest of the mouth is done.

With the mouth cut, opened and the punching done for the tongue, take another heat and the draw out the top beak much like you would the tine on a roasting fork. Steve now cleans up this upper beak with his sanding disk. He then heats the beak and makes the "S" bend in the upper beak. This both finishes the upper beak and gets it out of the way for drawing out the lower beak. Repeat the steps on the lower beak of drawing out, cleaning up and making its S bend.

Make the forked tongue out of 1/4 diameter round stock. On one end draw it out to 3/16 dia. For installing in the mouth and on the other end flatten and then split into the two halves – to form the forked tongue. Steve installs the tongue by peening on each side of the tongue using a small diameter punch.

Now let's make the talons. In Part I of this article I told you that more than 15 years ago Steve set out to learn two things, make dragons and forge weld. He has learned both well and uses a forge weld to assemble the talons. He uses 1/4 dia stock for the "leg" portion and 3 pieces of about 1/8 to 5/32 dia stock for the three "claws". Most likely the 1/4 dia material will be cold rolled mild steel, this will work well. For the small diameter, a good material is common 16-penny nails (with the heads cut off). This is 1006 steel and very low carbon and that makes for good welding. If you can find them, 40-penny pole barn spikes are about the right diameter for the 1/4 inch and 1006 too.

Tack weld the three pieces of 1/8 inch material together. Upset the end of the 1/4 inch material and then form your scarf. Now heat your pieces, flux and then bring up to a welding heat. Make a drop tong weld. Reflux and finish the weld if necessary. With small welds like this, it helps to preheat your anvil and some folks place a small anvil (piece of railroad rail) right on their forge. This saves heat in moving from the forge to anvil. Use a small hammer and light blows – remember it is largely the temperature and not the force of the blows that make the weld.

You can then draw out the talons and form them into the shape you want. The leg end needs to be thread using a 1/4 / 20 die. You will then drill (# 7 drill) and tap the dragon body for installing the legs.

It is now time for the other welding operation – in-

stalling the wings. Steve does this using an anvil swage block held in the hardie hole. This allows clearance for one wing to hang over the side of the anvil while closing the weld. Before starting the welding operation, make sure your wings fit into the slot in the back and adjust if necessary.

Take some time to plan the set up for your weld. When coming out of the fire you will have the dragon in one hand and the wings held by tongs in the other. For a right-hander make your arrangement so that the wings are held with the left hand and the dragon with the right. Then have something at the correct height for dragon tail to set on when the body is in the swage. This will allow you to insert the wings, and "drop" the dragon (really set it down) and quickly pick up your hammer with you right hand to make the weld. The wings remain held in the tongs by the left hand. It is kind of drop tong weld. To make the weld heat, flux, and then bring to welding heat both the body and the wing tang. Keeping in mind that it will take a lot longer to heat the body than the wings. You will want to heat with the horns up and it is good to cool the head portion of the dragon once or twice as you bring the body up to temperature to prevent damage to the head. You make the weld by forging the wing slot closed, striking the body on the side.

With the wings in place you can drill and tap for the talons and then install. You can also install the tongue if you haven't done that yet.

All that remains is to shape the dragon body and tail into its final coiled shape, and then clean up and finish your dragon. Steve uses a scrolling jig to help form part of the coiled shape to his dragons.

I have discussed other methods of attaching the wings, tongue and talons with Steve. First, Steve is not 100 percent sure that he gets a true forge weld with the wings – but he is sure that they in fact are very tightly held and will not come loose. It may be possible to hold the wings with a small amount of brazing rod and flux placed in the bottom of the body slot. When I last talked to Steve he had not tried this on the wings. One caution here is to not use too much brazing material or it will show on the finished dragon. Steve has used a small amount of brazing rod to install the tongue. With this technique, you can make your assembly and then heat to brazing temperature with a torch. This could also possibly be used as the attachment method for the talons. I suggest experimenting first on some scrap pieces to get a feel for how much brazing material to use and how well it might work.

I want to close with a special thank you to Steve Williamson for freely sharing his methods with other blacksmiths and demonstrating at Tannehill last fall. As I noted in Part I of these articles, I hope that you will use this information to make your own version of a dragon and not just a copy of Steve's work. Remember that Steve and Clay Spencer will be teaching a class on Wizards and Dragons this coming fall at John C. Campbell Folk School.

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Northeast Blacksmiths Association

Northeast Blacksmiths holds its meets twice a year at the Ashokan Field Campus in New York State.

The Ashokan campus is located in Olivebridge, N.Y., several miles west of Kingston, N.Y. The meets are held the first weekend in May and in the first weekend in October every year. The main demonstration is in the blacksmith shop and there is a "Hands On" workshop for beginners. A main demonstrator is brought in for each meet, food and bunk-house style lodging are provided as part of the cost of the weekend long meet.

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Tim Neu, Ashokan Field Campus,
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Olivebridge, N.Y. 12461 [914]657-8333
For more information check out the web site; <http://nba.abana-chapter.com/>

Join The Pennsylvania Blacksmiths Association!

Name _____

Address _____

City, State, Zip code _____

Home / work Phone # **E-mail (optional)**

ABANA Member? O **Yes** O **No**
Can you host a PABA meeting? O **Yes** O **No**
Are you willing to demonstrate at a PABA meeting? O **Yes** O **No**

Suggestions for PABA demonstrations _____

What is your skill level?
O Beginner O Intermediate O Advanced O Professional

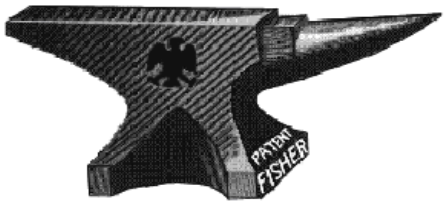
Send your completed application with $ 10 (one year dues) to;
Treasurer Gene Degenhardt
271 Stoney Lane
Lancaster, PA 17603

PABA Membership Application
Membership is from
Jan. 1 — Dec. 31

PENNSYLVANIA Artist BLACKSMITHS' ASSOCIATION

New Jersey
Blacksmiths Association
90 William Avenue
Staten Island, New York 10308
Attn: Larry Brown, Editor

New Jersey Blacksmiths Association



"EAGLE"
FISHER & NORRIS, Trenton, N. J.

How to Join or Renew your Membership in NJBA:

NJBA Dues are $18 per year (as of July 1, 2001).
Please make your check out to: "NJBA"
Please mail checks to:
NJBA, P.O. Box 761, Mt. Laurel, NJ 08054

Please include payment with the information listed below. You will receive a postcard confirmation of your membership, and will receive a newsletter within a month. NJBA's "year" runs from June to June. If you join mid-year, the postcard will offer a prorated dues option which will then allow you to extend your membership till the following June. The following information will be listed in a roster available to other members.

Name _____ Home Phone_____
Address _____ Day Phone _____
City _____
State _____ Zip _____
E-Mail _____ Skill Level (optional)_____
Comments _____