Part I

Forging Dragons

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

by Dave Smucker

In this multi-part article I will review the methods Steve Williamson uses to make his dragons. The material covered in this article is based on the demonstration that Steve gave at the 2002 Tannehill Conference of the Alabama Forge Council.

If you follow the details of the methods in this article you should be able to forge a copy of Steve's dragons. What you will have when you are done will not be a Steve Williamson Dragon – but rather a copy of one. I would suggest that a much better result would be for you to use these methods as a starting point to develop a dragon that is of your own design – not a copy of Steve's. There are lots of places to look for ideas about creating you own concept of a dragon. Steve's has the head of a "beast", wings of a "bat", talons of an "eagle" and the body of a "serpent". You could get ideas for many artist drawings of "dragons". Also, more ideas could come from looking at the bodies and layout of dinosaurs, lizards, insects, and many other "animals". Some dinosaur types to look at would be the Tyrannosaurus Rex, Velociraptor and the Quetzalocoatlus just to name a few. You would be surprised at the ideas you might find in your kid's or grandkid's books, Greek and Roman Mythology and, of course "Hollywood".

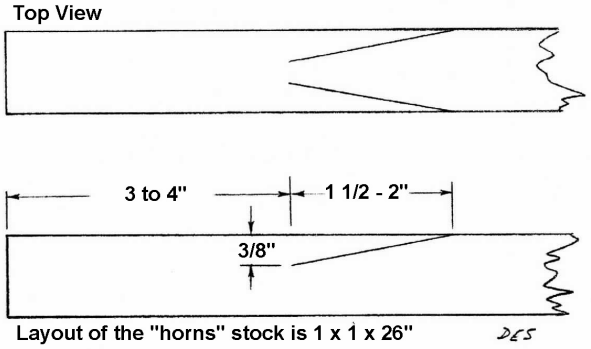
A little about Steve Williamson before we look at his methods of Forging Dragons. Steve is a Master Millwright / Welder working in the equipment maintenance side of a major automotive plant. He became interested in "blacksmithing" about 15 years ago because he wanted to learn to do two things – forge weld and make dragons. He has learned to do both well, along with many other aspects of the blacksmithing art. He is past president of the Appalachian Area Chapter and he and his wife Vicky have both been very active supporters of the AAC. Steve has taught at both John C. Campbell Folk School and the Appalachian Center for Crafts. Next fall along with Clay Spencer he will teach a class at the Folk School on forging Dragons and Wizards.

Steve starts with square bar stock about 26 inches long. He mainly uses sizes of 1-inch square, 3/4 square and 5/8 square. At Tannehill he showed dragons made from both the 1-inch and 5/8. Steve says he has used as small as 3/8 square stock and once and only once used 1 – 1/2 square. Commenting on the large size – "it would take a whole lot of money for me to ever try material that big again." The problem with the large sizes is that by the time you finish the dragon in the form that Steve likes – it becomes a very long and awkward piece of material with which to work. Steve's basic advice – " Stay with 1 inch and smaller". For this demonstration Steve used a 1-inch bar.

Steve Williamson makes quite extensive use of a treadle hammer for some aspects of his dragons. This doesn't mean you have to have one to make dragons but it no doubt makes it much easier. I will not assume that you have a treadle hammer in describing Steve's methods but will discuss forging this dragon

both with and without one. If you have a power hammer, it can be useful for some operations, but may not have the control necessary for others. Most likely if you have a power hammer you will know when and how you can use it in these operations.

The first operation on your bar is to cut the dragon's horns. Start by laying out the location of the horns. You will want the horns to start between 3 to 4 inches back from the end of the bar and to be about 1-1/2 to 2 inches long. At the base the horns will be about 3/8 of an inch wide and taper to a point over the length of the horn. Steve first lays out the horns using a hot cut to mark their shape on each side of the bar. He does this work by eye, under the treadle hammer. If this is your first attempt at something like this I suggest first marking the bar cold with a silver pencil that can be seen when hot or making a shallow outline with a cold chisel.

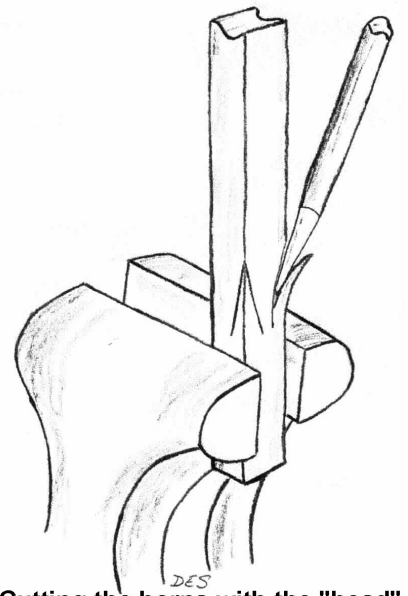


Layout of the "horns" stock is 1 x 1 x 26" DES

If you use the cold chisel method, then when you come out of the forge "hot" your hot cut can feel the line and you can make it deeper. If you don't have a treadle hammer to do this work, lay your stock on the anvil and outline the horn with your hot cut chisel. The idea here is not to cut deep into the bar with your hot cut from each side, but rather to make a good outline that you can follow as you cut the horn with the stock in the vise.

If working with a hot cut chisel, hammer and the anvil and you don't have three hands, then some method to hold the stock is a big help. Some folks do just fine holding the stock between their legs. Another idea that works well for me is a very simple hold down made from a length of chain anchored on one side of your anvil with a weight on the other side. Just slipping your bar stock under the chain holds it well enough for you to cut the outline.

You are now ready to cut the horns – bring your stock up to a good yellow heat and then clamp it head down with its head in the vise. Since you have outlined the horns on two sides you can now cut them by cutting into the bar while cutting down. Keep the hot cut pointed into the sock – it is very easy to be too vertical with your hot cut and slice the horn off: Not something you want to do. If you do cut the horns off – rest assured you will not be the first to have done it. I was very frustrated several years ago in one of Clay Spencer's classes on Wizards because I kept cutting the whiskers off. Same problem – getting the chisel too vertical, and not having first outlined them. If you do fail on your first attempt – not all is lost. Let the bar cool, then grind out the damaged area and turn the bar around and start from the other end. The cleaned up area will be drawn out anyway to make the tail of the dragon and only you will know that you screwed up one set of horns. If you do it again – get another bar of steel and try again.



Cutting the horns with the "head" clamped in the vise. Keep the hot cut point into the bar: it wants to go vertical on its own

Finish the base of the horn with a rounded chisel. What is a rounded chisel? Just that, a chisel that rather than having a cutting edge it has a radius or rounded cutting edge. Kind of like a very very dull chisel.

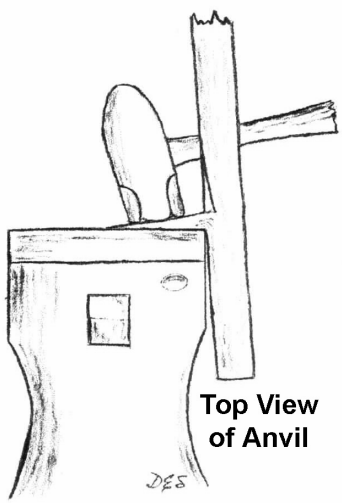
The purpose of this is to forge a radius at the bottom of your cut. This radius will stop the "crack" (your cut) from growing during later operations. If you don't do this you may find that you lose a horn when you are working on finishing details of the head. You can do the same thing with a file that has a radiused cutting edge, but I suggest you do this cold.

The next thing that Steve does is to clean up the horn with a disk sander. As a professional welder Steve is very much at home using a 4-1/2 or 5 inch grinder and isn't a bit afraid to use it as a "power file" for cleaning up work. He likes to use a sanding disk backup up with a flexible sanding pad. Steve says that sometimes he is a little hard on them because he tends to use them on hot metal – not a problem - you just have to replace them more often.

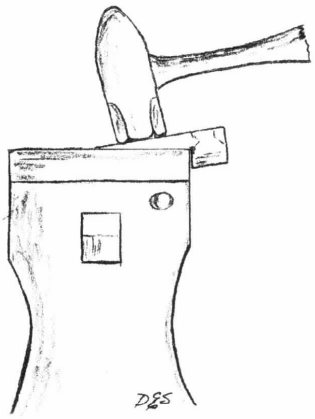
It is really important to do this clean up at this stage. If you leave "rags" or a torn surface on material from your hot cutting these will develop into cracks as you draw out the horns. Some folks call these "cold shunts". I am not sure where the term comes from. It's maybe a steel industry term for defects that come from ingot cracks that were not scarfed out and ended up in the finished product. In blacksmithing they are cracks or folds that just continue to grow the more you work the material. No matter what you call them – you've got to get rid of them or they will cause you major problems as you work the piece further. Grind them out or file them out, but take them out.

Now you are ready to draw out the horns. Steve does this on the anvil much as you would the tines of a fork. First heat your stock to a good heat and partially bend one of the horns out from the body. Now you can work that horn on the anvil, in fact taking it to a near 90-degree angle from the body. What you start with is a triangle section – work it to a square section. Continue to draw it out as a square section. Your hammer forges one side; the anvil forges the other. Frequently rotate back and forth so you work two adjacent faces. You can use the back of the anvil to straighten your work. When you have one horn the length you want you can then round it up. Be careful as you reheat the horn for more forging. It is really easy to burn it at this point. It doesn't take much time to reheat the horn – so be careful.

Now do the same process with the second horn. When you get it to an equal length with the first, round it up too. Steve likes to let the piece cool some at this point and then do a final clean up with the "power file", a sanding disk in his 5inch grinder.



Drawing out the horns– work with square cross section— first one side then rotate 90 deg and work the other.

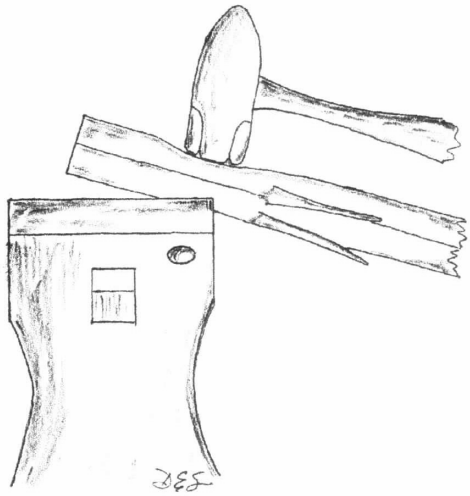


Working the other side—hand holding the bar not shown, it would be in the foreground.

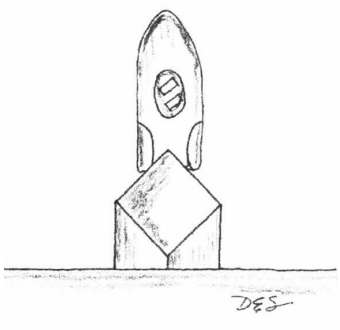
At this point you have "nearly finished" horns – you will need to give them their final positioning as one of the last steps in forging the dragon. For now heat and then gently fold them back against the body of the dragon. Use either very light hammer blows or a wooden mallet to "tap" them back towards the body. They do not need to be tight to the body, just close to the body to be out of the way for your next operation – forging the eye sockets.

The first step in forging the eyes is to set the area for the eye socket. To do this you select the position ahead of the horns where the eye will fall and inset an area on a sharp edge of your anvil. You will be forging on the diamond and the eye area will be in contact with the face of the anvil. Use half on half off blows of your hammer to the "bottom " or under side of the head to inset the area for each eye. You will be doing two things at once – one is to inset the area for the eye, the second is to round up the bottom of the head. The critical operation here is the insetting of the area for the eye, the rounding up of the underside of the head just come along for the ride and isn't critical.

You want both of the eyes to be equal distance in front of the horns. To make this happen, I suggest that you use a cold chisel to make a small cut on the corner of your bar where the inset will fall. Then when you come out of the fire to do the half on half off hammering, you can "feel" the sharp corner of your anvil by sliding the bar up and down the edge of the anvil. If you don't have a good sharp edge on your anvil for this operation you can make a hardie tool that is nothing more than a block of steel with a sharp edge and a hardie tang on the bottom. It's a useful tool to have anyway, when your anvil is too wide for some operations.



Setting the eye area on the sharp edge of your anvil. Note that the hammer blows are direct to the underside of the head and are "half on half off" the edge of the anvil. This is the first eye; the second one hasn't been started yet.



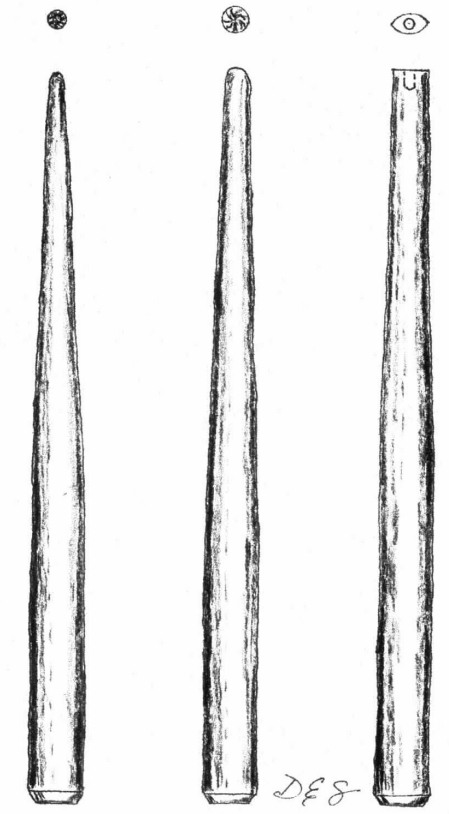
Looking from the side of the anvil setting the eye is done "on the diamond". The second eye will be done by turning the stock 90 degrees and also on the diamond.

Now you are ready to forge the eyes themselves. To do this I highly recommend a vise anvil or detailing wedge. See the short article **"For your toolbox"** in this issue for details on how to make one if you don't already have this very useful detailing tool. You will also need three or four "punches" to form the eyes. Two to three simple punches and an eye punch. I suggest that you make these punches out of either 5160 (coil spring) material or W1 tool steel (water hardening drill rod). Both of these will work very well for these types of tools. You could use more expensive and exotic tools steels such as H13 or S7 but this is over kill. Save these tool steels for hot cuts, punches and other uses where you have long contact times with the hot steel.

To make the simple punches "long center punches", forge out the taper and then grind the end to the desired cross section and shape. I make my punches 9 to 11 inches in length. This length lets you hold them near the hot metal without your hand getting too hot. While I would heat treat these tools some folks just forge them, grind them and use them. I suggest that as minimum you at least normalize the tools after you finish forging them. To do this heat to just above the non-magnetic point (transition temperature) and let them air cool.

Making the eye punch itself is a little more complex than the socket punches. First I forge to the general shape of the punch and then touch it up by grinding to get the final eye shape cross-section. Now put the pupil in the end of the punch. To do this I like to drill the "hole" in the end of the eye punch. First you need to anneal the punch – heat to just above the non magnetic point and then place in either wood ashes or vermicu-

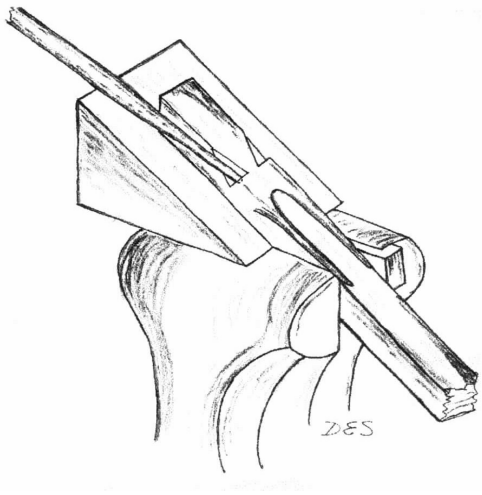
lite and let it slow cool overnight (or for at least several hours.) I have a metal garbage can filled with vermiculite for just this purpose. You can find vermiculite at the garden supply store or the garden department of Home Depot etc. After annealing it is a simple matter to drill the hole in the end of the punch. Now finish by heat-treating the eye punch or at least normalize it. If you are using 5160 you will get fair hardness in the tool by the "air quench" of the normalizing.



You will need 3 to 4 punches for the eyes. The first ones form the eye socket while the last one is the "eye" punch itself. Make you punches from 9 to 11 inch long 5/8 to 7/8 dia. These are shown about half size

Rather than drilling the hole in the eye punch, you can forge it. It is just harder for me to get it placed where I want it doing it this way. To forge the hole, heat your punch, place it vertical in your vise and use a small center punch to drive the hole into the end of the hot punch. Now clean up the resulting upset by grinding and finish up the eye punch. Again I would heat treat the punch as the final step.

Now that you have your punches, heat the dragon's head and clamp it in the vise with the area below the horns clamped. The underside of the head should be resting on the detailing wedge. Start with the sharpest punch and set in the location of each eye. Steve likes to work by taking 3 hits on one side and them moving to 3 hits on the other eye. If needed, come back to the first eye and then to the second. This method of Steve's of alternating between one side and the other helps to keep things equal as the metal cools. It also helps minimize bending of the dragon's head at the neck area where it is clamped in the vise.



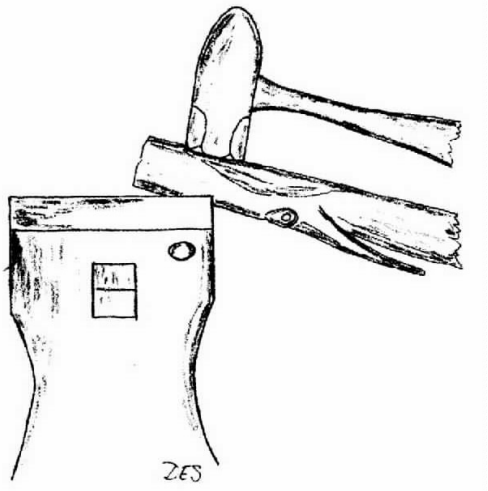
Starting to punch the first eye socket. Alternate from eye to eye with no more than 3 blows to one side at a time. Then move up to your next larger punch – finishing with the "eye punch".

Now proceed to the next punch and deepen and raise the eye socket. You may need to go back into the forge for another heat if your piece has cooled too much – remember to work it hot. Or if you like, you can reheat the area of the eye with a torch with the work held in the vise. If you do this try hard to get both eyes up to the same temperature so that they forge the same.
You are now ready for the last punch, the eye punch itself. The angle that you hold this punch can have quite an effect on the final look of the dragon. The eyes in a figure like this always seem to set much of the dragon's character. You can also experiment with different

shapes to the eye punch including a tear drop cross section. If you use this type of eye make sure you turn the punch over as you move from eye to eye. For some eye shapes you will need a right and left punch.

Variation on eye punch shapes. Just some ideas for you to consider and play with. You can change the "face" of your dragon more by changing the eyes than almost anything else. We are all drawn to how the eyes on a figure look at us.

Next the nose !! Forging the nose is much like doing the eyes, first we set an area for the nose and then we punch in the nostrils. In setting the area for the nose we want to work across the full width of the head – rather than on each "corner" of the stock. Steve forges a step where he wants the finished nose to fall on the head. Heat your dragon and then place the nose area down on the sharp edge of your anvil and forge the step with half on half off blows to the underside or bottom of the head.

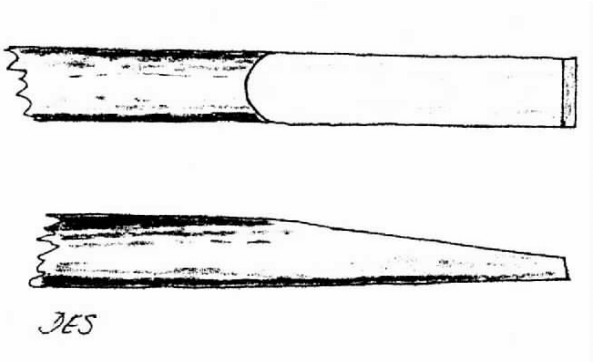


Setting the nose area. The top face of the stock is set against a sharp edge of your anvil. Again the half on half off hammer blows are directed to the underside of the head. The anvil forms the top.

This procedure again lets us put the most visible side of the head against the anvil and bottom side takes the hammer blows. Also since the underside of the head has no fine details you can clean it up with the disk sander or you can file it.

Steve then deepens, upsets and raises the nose area some by using a "butcher" with the dragon held in the vise against the detailing wedge.

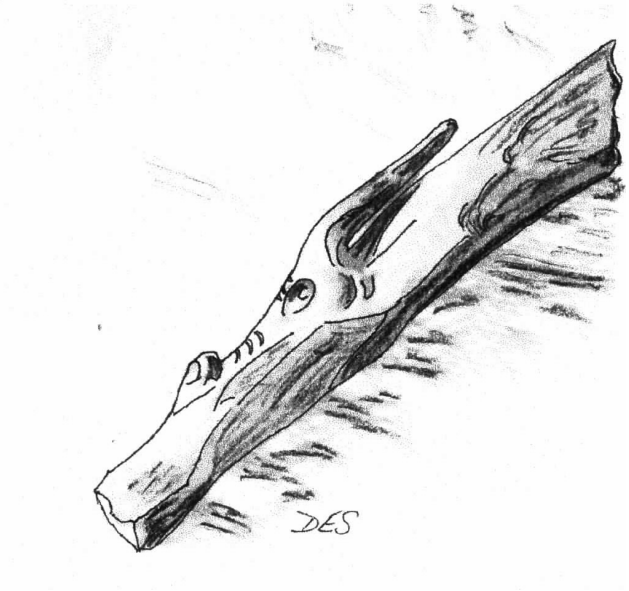
Now that you have a good sized step and have raised the area and better defined it with the butcher your are ready to punch the nostrils in the beast. Follow basically the same procedure that you did for the eyes (without the eye punch of course). Start with the smallest punch and work your way up alternating from side to side to keep it balanced. You can angle the punch to make the nostrils flare to the outside and also raise them by controlling the angle of your punch. This is one of the real advantages of working the head while holding it against a detailing wedge in your vise. It allows you to work around the head and gives you a solid surface to punch against.



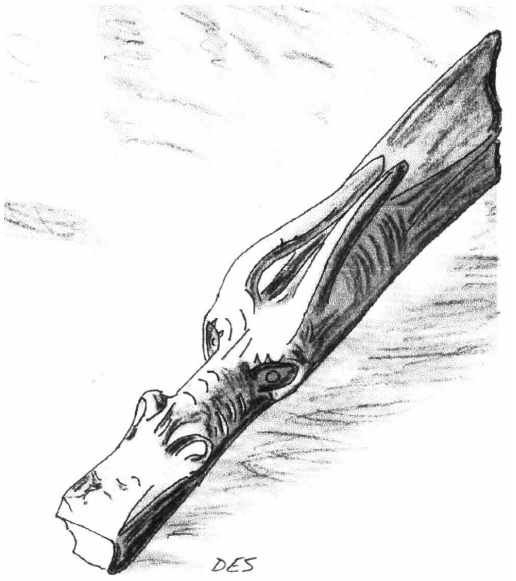
Forge your butcher from tool steel, I like 5160 (coil spring) or W1 (water hardening drill rod) for making this tool. Like the punches I would make this tool 9 to 11 inches in length and from 5/8 to 7/8 diameter material.

Steve adds details to the eyebrows and nose at this time. With the eyes and nostrils in place you can take a small hot cut and / or other punches and add some more details to the face. Here is another place for you to add to your growing collection of punches. Some curved hot cuts come in handy here. They look like a range of wood carving gouges. You make them the same way you did the other punches for your dragon.

At this point you head could look something like this.



Side view of the partially finished Dragon's head. Note the underside that was forged by the half on half off hammer blow while forging the eye and nose sets. Steve has cleaned this area up a bit with the sanding disk.

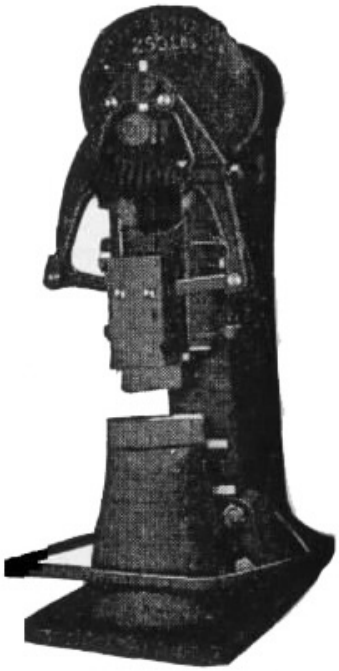


A top view of the head at this point. The stock forward of the nostrils will become the mouth and the "beaks" as Steve calls them.

You have now finished all of the head that Steve does at this point. From here he moves to the neck, body and tail. Then back to finish head, wings and talons.

We are going to stop at this point until the next time. In the next part we will detail the special tooling Steve made to produce the "scales" or "ridge back" to the neck and tail. We will also continue with the other portions of this dragon.

Part 2. Will be in the next newsletter!



Scrap Tips from the BAM Newsletter

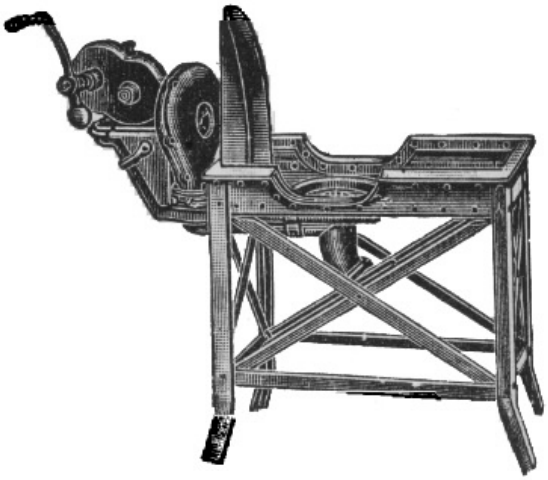
Sized to be seen

Weather vanes come in all sizes and Ray Phelps recently had a sheet which sets forth guidelines on letter sizes vs. viewer distances. Here is that information:

Letter size	Viewer Distance
4 inch	150 feet
6 inch	200 feet
8 inch	350 feet
10 inch	450 feet
12 inch	525 feet
15 inch	630 feet
17 inch	710 feet
24 inch 1	000 feet

If you want to add a ball to your weather vane and don't know where to find one try: WE Norman Corp., P0 Drawer 323, 214 N. Cedar, Nevada, Mo. or call 1-800-641-4038. (Ed. note: they also make punched tin ceilings) Another source is J.G. Braun Company, 7540 McCormick Blvd., Skokie, Ill. 60076, 1-800-323-4072. This firm carries balls in steel, stainless, aluminum and brass.

— Indiana Forge Fire



For safety's sake

If you are doing your forging in a place like a garage that serves another function, take a minute to make sure there isn't something laying around that doesn't mix with open fires. I was attempting a forge weld the other day and followed the path of the flying sparks when I saw them land on the lawn mower parked at one end of the shop. I also had a couple of gas tanks in the room. These are now kept at a safe distance but they could have gone boom. Another common problem in my shop is fallen leaves that blow in through the open doorway. It wouldn't take much to set these on fire, perhaps after you have closed up for the night and think the fire is out. If you keep paint in the shop put it inside a closed metal cabinet. Also make sure greasy rags go in an airtight container and never leave anything flammable hanging on a gas welding rig.

Supplier: "Double 00 Iron

"After three years of effort, a reliable source of Iron for Blacksmiths has been secured domestically. This 'Double Aught' Iron is equal, if not superior to, the 'Pure Iron' that is no longer being imported into this country.

"22 tons of Double Aught Iron should arrive within [a? -- sic.] month. 1/4" [thick] x 1/4", 1/2", 3/4", 1", 1 1/2", [and] 2" bars have been ordered to start and inventory will be expanded as soon as sales response permits.

"Until such time as the acceptance of credit cards has been established, and shipping can be handled, etc., all sales will be at Tailgating functions.

Suggestions as to locations will be appreciated.

"Cost of Double 00 iron is expected to be about $1.65/lb for quantities under 100 lbs, and $1.50/lb thereafter."

"Contact Roger Duncan at 410.357.4444, or Shawn Duncan at dunkybones@yahoo.com"

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Join ABANA or Check out other area chapters!

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.

Contact : Tim Neu
to register for hammer-ins
or subscribe to the newsletter;
Tim Neu, Ashokan Field Campus,
447 Beaverkill Rd.
Olivebridge, N.Y. 12461 [914]657-8333
For more information check out the web site; <http://nba.abana-chapter.com/>

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Name _____

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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

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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.

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