The Forged Anvil by Darryl Nelson
&
Collars by Mark Aspery

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Darryl Nelson's

The Forged Anvil
By: Darryl Nelson, Washington

I have used this forged anvil as a demo piece and as an instructional project when teaching at my school.

Typically, I use a ¾-inch square bar for this project, but you can go bigger if you want to.

By forging a three sided taper to the end of the bar, I am setting the forging up for the bick and the heel. The taper on the top side will become the bick and the non-tapered bottom side will become the heel.

Draw the end of the bar down to ¾-inch tall by ½-inch wide. Try to keep the taper length to no longer than the parent bar is wide, in this case ¾-inch. Fig. 1

Using a ¾-inch diameter spring tool, fuller in the sides of the bar to a depth of about ⅛-inch. Place the fullers about 1½-inches from the end of the bar. Fig. 2

Once you have fullered the bar, flatten the material in front of the fullers to approximately a half-inch in thickness. Do not correct for any growth in width. Fig. 3

Using a suitable hot-cut, split along the centerline of the forging to leave a cut roughly ¾-inch long. Make sure that the cut is equal at the base of the cut to prevent problems with the next move. Fig. 4

Using a soft edged set tool, open the split out to 180°. Clamp the work in your post vise to keep the frustration down to a minimum. Fig. 5

Once you have opened out the cut, return to the anvil and drive what will be the face of the forged anvil down onto your anvil face to fully dress the top surface of the forged anvil. Figs. 6 & 7

To create the waist of the forged anvil, use two mismatched fullers. I used a ½-inch fuller under the horn and a ¾-inch fuller under the heel. Fig. 8

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Due to the difference in surface area, I expect the ½-inch fuller to penetrate just a little more than the ¾-inch fuller.

My handheld side set is roughly ¼-inch square at the end. The end is filed to an angle of approximately 10-15 degrees from front to back.

With the forged anvil supported in the vise or on the anvil, drive the side set in to create the step and table behind the horn. Fig. 9

Draw down what you can and hot-rasp off anything extra to finish the horn area. Fig. 10

Define the bottom of the base by butchering into the bar from all sides. Don’t go too deep, do just enough to make the bottom of the anvil obvious. Fig. 11

The feet of the anvil are created using a set of paired ¾-inch fullers driven into the anvil’s base from each side of the anvil. Fig. 12

Darryl Nelson is perhaps better known for his sculptural animal heads from bar stock. He has produced four DVDs showing his techniques with the animal heads. Darryl owns and operates his own blacksmithing school in the North West of the country.

Darryl is the treasurer for the NWBA and conference chair for the up-coming Western States conference at Mount Hood, Oregon, this August 22nd - 25th, 2013.

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NATIONAL CURRICULUM

National Curriculum
The Level II Grille
By: John McLellan, ABANA’s Education Chair
with HB Staff

The Level II grille shown on pages 10 and 11 consists of two 'S' shaped scrolls contained within a frame. The scrolls are collared together back to back within the frame (see Mark's article on page 13).

The scrolls have been divided into four families:

1. Ribbon scroll
2. Fish-Tail scrolls
   Rolled (Knib-ended, UK) scrolls
   Bolt-ended scrolls
3. Snub-Ended scrolls
   Solid snub-ended scroll
   Half-penny scroll
4. Beveled scrolls
   Beveled scrolls
   Blown-over beveled leaf scrolls

I am going to focus on the beveled scroll as it finishes the level III grille and gives me an opportunity to look at calculating the material needed to form 'S' or 'C' shaped scrolls.

This scroll is the sister to the beveled leaf scroll featured in the Summer 2012 issue of the Hammer's Blow magazine, in that the techniques are very similar.

Forming a scroll on the end of a bar doesn’t really take too much work, but forming a scroll on either end of a bar does require a little calculation. At some stage, you have to cut the bar from the 20 foot length supplied by the mill.

Cutting the bar either too short or long can cause a little indigestion. Admittedly, we can stretch or shrink a scroll a little, but we cannot compensate for major discrepancies if we do not cut the bar to somewhat near the correct length.

You can calculate the length of any un-forged material by measuring along the scroll of the drawing. What is not known is how much material is needed to make the forged scroll end.

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BEVELED SCROLL

Take a bar of steel that you want to make your scrolls from. Make a center punch mark about 4 inches or so from one end. Record the distance from the center punch mark to the end of the bar with a pair of dividers. Fig. 1

To start, draw a taper at least 2 inches in length on the end of the bar. Make the top edge of the taper slightly curved. Make sure that you bring the end down to a sharp point. Figs. 2 - 4

At this stage, measure the distance from the center punch mark to the start of the forged section of bar. Subtracting this amount from your original measurement will give you the material needed to form the forged scroll end. Fig. 5

The next step will dictate the shape and size of the finished scroll. Turning the bar on edge, turn a scroll on the end of the bar. I like to start a little way back from the end. Bend as much as you can from the top and if needed, place the bar underneath the bick and bend what is left. I like the scroll to make about one complete turn through 360-degrees. Figs. 7 - 9

Getting to the very end of the scroll can be difficult. In order to get to the tip of the scroll, you will have to knock the end out of alignment, finish turning the tip and then bring the material back into alignment. Finish scrolling using your hand hammer on the face of the anvil. Figs. 10 & 11

Once the scroll is formed, decide whether this will be a left or right-handed scroll. This type of scroll has a front and a back, making it one-sided visually.

If, when you lay it on the anvil face to be beveled, the bar is scrolling to the right, it will produce a right facing scroll, and of course vice versa.

At this stage bevel the edges. The inside edge will receive most attention visually and so requires a little more effort than the outside edge. Fig. 12

When you bevel the inside edge the scroll will open. When you bevel the outside edge, it will close the scroll, making it tighter.

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I like to have to chamfers meet in the middle of the bar for the first couple of inches. After the chamfers are complete, the scroll must now be turned 90-degrees to the parent bar. Fig 13

To better understand how to turn this type of scroll, get a piece of cardboard (a breakfast cereal box will do nicely) and draw the outline of your forged and bent scroll on the cardboard. Cut out the cardboard scroll with scissors.

Holding the cardboard in one hand between the thumb and forefinger, start at the end and make a bend 90-degrees to the centerline of the scroll. Feed about 1/4-inch out and do the same thing.

Continue this along the entire scroll. You should find that the scroll end has made a slow 90-degree turn and is now resting in line with the rest of the scroll. That knowledge helps you when you go to the anvil.

You can turn these scrolls off the heel of the anvil if you didn’t need some clearance for the scroll tip to move around in. As such, we turn these scrolls at the tip of the bick as it allows us the clearance that we need for turning the scroll.

Keep the centerline of the scroll perpendicular to the centerline of the support. This will mean moving your tong hand after each hit as you feed more scroll past the pivot point. Figs. 14 - 18

John McLellan owns and operates his own commercial blacksmithing company and teaches classes at his place of business near Sacramento, California.

John is the current ABANA Education Committee chair and serves on both the ABANA and CBA board.

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Both the level II and the level III grilles contain collars. Each collar has its own challenges, with the bead on the level III grille presenting the biggest problem.

Collars are generally fit to embellish your work. Collars should not be considered structural. If it is important that your connection does not move, use a blind rivet or other connection to secure your work before fitting the collar.

My preference is the blind rivet as I find a weld to difficult to clean up without leaving tell-tale marks.

There are many different types of collar and their construction. For me, they fall into two categories:

- Wrap around
- Forged

The first of these three types is the wrap around. This type is typically un-forged and bent around the bar to fit.

The ends can be tapered so that they overlap each other when the collar is applied or they can be plain, butting up against each other when the collar is closed.

I am going to start with a tapered end wrap around collar and apply it to the level II grille.

There is a formula for calculating the length of material needed to make the wrap around collar from. As the types of collar change, this formula may not be as accurate—but it can represent a good place to start from.

The length of bar needed to form a wrap around collar is equal to:

The perimeter of the bars to be collared, plus two-and-a-half times the collar stock thickness.

Taking collar stock that is ¾-inch in thickness and wrapping it around two ¾-inch thick by ¾-inch wide bars nested together so that they form a ¾-inch square, the formula would look like this:

\[ \frac{3}{4} \times 4 + (2.5 \times \frac{3}{16}) = \text{Length of bar needed to form the collar} \]

\[ 3 + 1\frac{3}{4} = 3\frac{3}{4} \text{ or } 3\frac{7}{16} \text{ (rounding down)} \]

That measurement is correct for a wrap around collar with either a butt or tapered end. The tapered end collar is measured shoulder to end on one side only.

I start with the perimeter of the material to be collared plus one-and-a half times the starting thickness of the collar stock for forged collars and construct a test piece.
The issue in the level II grille is that you are collaring two curved 3/8-inch thick bars. Where the bars touch each other, they measure 3/4-inch thick. The collar wraps around above and below that contact point and must include the gap between the two bars in the measurements and formula.

There are two methods of attaining the taper to the ends of the collar stock: forged and cut. The two important things in forging the tapered ends to the collars are:

1. Consistent hammer angle to the collar stock. If the tapers don't match there will be a gap and one of the two ends will be displaced.

2. Tapers are forged on opposite sides of the bar to each other, so that they nest together when closed.

Cutting the collar stock with tapered ends from a larger bar presents its own challenges—especially if your equipment is as basic as mine is.

To control the spread at the end of the bar when forming the taper, form a blunt taper perpendicular to the intended taper. Dressing the edges of the taper later can cause buckling.

Using an anvil block, draw the end of the bar down to form your intended taper to give your tongs some clearance from the anvil face.

Check the bar length along one side.

Center the collar stock across the collar forming swage.

To create a push bar, use a bar the same width as the bars to be collared. Make the bar taller to allow for clearance of the ends of the collar when they come up, drive the collar stock down to the bottom of the swage.

Tuck the ends in where they are open.

Remove the collar and check to make sure that the collar is not racked or twisted. Correct as required.

If you are ready to fit the collar to your work, re-heat the collar. Place the collar in the collaring vise and then add your scrolls or grill to the mix. Close the leg of the collar that has its tallest side next to the scrolls.

Close the second side and tighten the post vise to make sure that everything is nice and snug.

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A blind rivet goes a long way towards keeping everything in unison as you fit the collar

I have decided to chisel a groove on the outside of the collar stock. This does mean no forged ends though...

Cut or forge your stock to equal lengths. These collars have been hacksaw cut to preserve the grooved surface

Center the collar stock on the jig, make sure that it rests against the alignment blocks, pattern side down

The push bar has been centered on the collar stock and driven down, forming the 'U' shape for the collar

The hot collar is shown in the collaring vise (page 18) awaiting the scrolls

I like to use a set hammer and close each side of the collar to prevent galling the vise or the scrolls

Here is the collar fitted around my faux scrolls. Give the vise a squeeze to snug the collar up around the scrolls

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You will want a pair of bow tongs available as you fit the collar. The bow tongs help align the ends of the collar and prevent it from opening as it cools down.

The forged collar uses a mandrel of the same size as the bars to be collared. Fold the scroll material back on itself to prevent any size discrepancies when making the mandrel.

Use a piece of the scroll material folded back on itself to make the mandrel. Taper the end to allow easy removal.

Use a suitable swage to complete the initial bend of the collar.

Fit the mandrel and close the first corner of the collaring stock.

Fold the second corner of the collaring stock in.

Get both ends roughly even.

Place the ends on the face of the anvil and strike a blow over each corner of the back of the collar.

Dress each side in turn before moving to the side with the ends located on it.

Keep your blows centred on the corners of the collaring stock.

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NATIONAL CURRICULUM COLLARS

This collar is fitted to the back of the grille with the collar seam landing on the seam of the two scrolls, not an ideal situation.

Straighten the collar as necessary

Finish dressing the corners of the collar. Keep your hammer flat so as not to pinch the corners

Place the collar over the edge of the anvil to remove it from the mandrel

If you dress the sides of the collar you may have to re-fit the mandrel to shrink the collar

Use two pairs of scrolling tongs to open the collar sufficiently to allow it to fit the collared stock

Squeeze the hot collar together with large tongs to fit it to the scrolls

Keep the collar closed with bow tongs to prevent it from opening as it cools down

Here is the collar fitted to the two representative scrolls of the National Curriculum level II grille

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The Collaring Vise

I used a 5¼-inch length of ¾-inch square bar for this vise.

Once you have made one, the measurements fall into place quite quickly if you want to make another of a different size.

This vise was built for the level II grille collars and is about ¾-inch tall at the working end to accept a ¾-inch thick collar and ¾-inch tall material.

The vise is used in a post vise that has about 1¼-inch deep jaws.

These two measurements dictated my lay-off distances to ensure spring clearance and jaw functionality. Fig. 32

The collaring vise allows you to fit the wrap around collar without the sides blowing out as you bend the top two ends in around the scrolls. Figs. 13 - 15

It also allows you to squeeze the collar a little if it is a touch too wide in the fit. Don’t use it to close gaping gaps as the collar can bow out on the bottom.

This should be seen as a fun forging and a precursor to making a pair of box-jaw tongs within the National Curriculum.

The bottom of the vise, relative to the jaws of the post vise, can be changed by changing the measurements of the initial offset. Figs. 33 & 34

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Lay-off ¾” of material over the offside edge of your anvil block

Place the nearside edge of your set hammer about ¼” back from the offside edge of the anvil block

Drive the set hammer down to a depth of about ¾”

Tidy up the end a little

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37 Protecting the end, fuller in about 3/8" behind the set transition. Leave room for a little clean up later

38 Repeat at the other end and draw down the material in-between to 1/4" thick and 3/4" wide

39 Dress the edges as you work

40 Clean up the transition using the bick or horn

41 I use two sets of dog wrenches to bend the transition area to 120 degrees. Keep the bend as tight as you can without causing damage to the material

42

43 Upset the end back to clean up the bend. Aim the hammer towards your knee otherwise the material will roll away from you as you upset and clean up the transition area

44

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I used a section of 1⅛" ID Sch. 40 pipe to wrap the material around. Close the vise using a hand hammer and your tongs. Don’t put too much effort in here as this ring can go pear-shaped quite quickly later on in the process, and may need tweaking.

A 1⅛" square bar is used as a spacer, it is the same size as the ¾" thick collar wrapping around the ¾" scrolls.

Pull half of the block down with a fuller. This will pull the material away from the spacer.

Turn the fuller 90° and close the gap to the spacer block. Repeat for the other side.

You may have to repeat the process once more to get a nice fit to both the block and the top of the post vise jaws.

The jaws are then filed to suit your needs. The working jaws need to allow you to reach the collar, when fitting, without impediment.

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