

Forging Tongs- Part Two

Lesson 22B- Drawing the Reins, Assembly and Adjustment

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Lesson 22B- Drawing the Reins, Assembly, and Adjustment

Step Six (drawing the reins):

There will be about 2 inches or 2 and half inches of unworked bar left before the layout mark you made in Step One. Photo 15 shows the bar, the forged jaw and pivot bolster with punched hole along with the unworked bar left to form the reins.

Ideally, the jaw and pivot bolster are in their final form and there should be little reason to reheat them. Efficient forging technique dictates that the reins be drawn out sequentially working from the bolster to your cut-off mark, finishing each section before moving to the next.



Photo 15.

We are forging tongs without using tongs so heat transfer to the holding hand may be an issue. A longer starting bar can overcome this, but too long a bar can be awkward. A gloved hand is an option, but this too has drawbacks (see note below regarding the gloved hand). Regular cooling of the bar in the slack tub is also a useful strategy.

Another technique that can be used is to forge a "heat stop." When an abrupt change in the bar mass exists and the heat is transferring from the smaller mass to the larger, the heat transfer will be dramatically slowed at the juncture of the two masses. We can use this to good effect in forging these tongs.

Take a yellow heat on the area near the layout mark. Set the bar on the near rounded edge of the anvil with the layout mark about 1/2 inch from that edge. See Drawing 6. Keep the work as horizontal as possible. Forge a shoulder here on two adjacent flats of the bar.

Hit the bar with half faced hammer blows driving it into the rounded corner of the anvil. Rotate the bar 90 degrees- left or right, it does not matter- and forge in a shoulder adjacent to the first. Work back and forth between the two shoulders using the "hit turn, hit turn" rhythm you learned when drawing a taper.

Work these two shoulders until the bar is reduced to about half of its original dimension or 5/16 inch square at the shoulder. Photo 16 shows the result.



Drawing 6.

Target: Take no more than two heats to reduce the bar to 5/16" square at the shoulder.

You have dramatically

reduced the bar mass at the adjacent shoulders. This should help reduce heat transfer to your holding hand.



Photo 16.

You have also established a target dimension on the small end of the reins. With the pivot bolster forged to final form and the small end

target dimension established, the drawing down of the reins becomes a matter of working the mass in the middle into final form.

Move to the horn and draw the rein striving for an even taper in width from the bolster at about 5/8 inch wide to the adjacent shoulders at about 5/16 inch wide. Retain the bar thickness of about 5/16 inch from the bolster to the shoulders.

Use the horn to accomplish 90% of the mass reduction and then move to the anvil face to refine the shape and surfaces. Even using the horn to best effect expect to take several heats to draw down the mass of the rein. (Photo 17)

Once the mass in the middle of the rein is reduced over the horn and the rein has begun to stretch, you should re-establish the linear and sequential approach to drawing down: work a short section complete in each heat; rough it on the horn and finish on the anvil face; work down the length of the rein finishing the area near the "heat stop" last. Compare Photos 17 and 18.

Photo 19 shows the reins drawn and the shape refined.

At the end of your heat cut the bar free on the hot hardy (Photo 20).

The shape is shown in Photo 21 compared to a completed forg-



Photos 17 and 18.

ing.

Step Seven (finishing the reins):

The tong blank should be at least 12 inches overall. With care this is enough length to hold the jaw in the hand while finishing. The faster you work the less heat transfer there will be, but if the jaw gets uncomfortable to hold, cool it in the slack tub.

As the bar heats in the forge, keeping a sopping wet rag on the end you want to hold is another strategy to help maintain a bar cool to the touch.

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Photos 19, 20, and 21.

Hint: As a point of preference many smiths work with a gloved left hand which allows them to hold a workpiece that might otherwise be too hot to handle. The drawback to this practice is that it can instill the habit of grabbing a bar without first testing for radiant heat. Tongs are designed for holding hot bar. Otherwise, keep the bar cool to the touch.

With a yellow heat on the end of the bar, draw the remainder of the 5/8-inch square stock. Continue the taper from the bolster to the end.

To keep a cold shut from developing, your first hammer blows on each shoulder should hit at an angle. This pushes the upper edge of the shoulder forward toward the end of the rein. Photo 22 shows the shoulders being struck this way.

Note (forging dynamic): The forged material will move in the path of least resistance. When striking straight down on a corner, the path of least resistance is into the open air. The corner flows out. If that corner is the top of a shoulder being forged flat, the outward flow can result in a cold shut as illustrated in Drawing 7. Avoid this by first hitting the corner at an angle.



Photo 22.

Forge the end of the rein to 5/16 inch square using the horn to accomplish most of the forging (Photo 23).

Round the square section end of the rein. It should look like Photo 24 with at least 3 inches of the rein rounded in section for a comfortable grip. See previous lessons on the proper rounding technique.

The tong blank should look like Photo 25 and measure

at least 12 to 13 inches from the center of the pivot hole to end of the rein.

If needed, adjust the jaw on the anvil so that it is parallel to the rein. We will alter that in fitting to a specific bar thickness, but parallel is a good place to start. Drawing 8.

Step Eight (the other half):

If you began with a 5/8-inch square bar 24 inches long, 18 1/2 inches of it remains after cutting away the first tong half.

Keeping the held end cool, repeat the above eight steps forging the second half of the tongs.



Photos 23 and 24.

Step Nine (assembly):

Match the tong halves for length of the reins measuring from the center of the pivot hole. Match for the width and thickness of the jaw. It may require reheating one or both of these tong halves to make needed adjustments. Once assembled, changes are awk-



Photo 25.

ward.

Assure yourself that the halves accurately mate with the punched holes aligned. Sometimes the bottom of the shoulder at the base of the jaw needs to be filed so the halves lie flat to each other. This is the "web" mentioned in Step Four. Photo 26 shows the problem area corrected.



Drawing 8.

Use a convenient length of 5/16 inch diameter bar for the rivet. It should be an easy sliding fit in the two pivot holes. If not, slightly forge the rivet stock smaller in diameter or open the pivot holes by re-drifting (they may have distorted in completing the jaw blank) or by filing with a round file.

At light orange heat cut a ring around the bar on the hot hardy 1

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and 1/4 inches from the end so that it is almost cut through. See Photo 27. A set of dividers with this distance between the points makes a useful reference. This length of stock will allow a bit more than the equivalent of one diameter length of the stock to extend on either side of the join. Reference Drawing 9. Keeping the rivet stock attached to the end of the bar provides a handle for the next heat.

Take a light orange to yellow heat on the rivet. Holding the tong halves in their proper orientation, insert the rivet and twist off the excess stock setting it aside.

Work quickly with the peen of your forging hammer to spread the rivet on one end. Flip the assembly to address the other end



Photo 26.

in the same way. Keep the tongs properly aligned and the inside surfaces of the pivot bolsters in contact.

Make sure that the amount of rivet on either side of the joint is approximately equal. Make needed corrections by placing the short side into a thick bolster block or into the pritchel hole and



Photo 27.

tapping the long side down to match. See Drawing 10.

Switch to the face of the hammer and flip the tong again. Forge down the edges of the peened end. Angle your hammer to make a short pyramid shape like Photo 28 on one

side then flip to develop it on the other end.

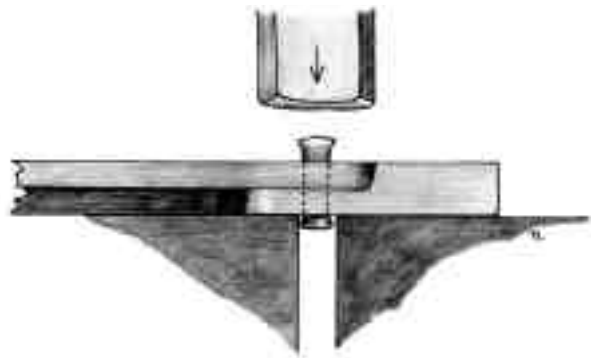
Turning back to the initial end (which will have lost its peak) work around the circumference of the head forging the edges down. Repeat on the other side.

You can continue to work opposite ends of the rivet this way as long as there is visible heat in the material. Once that visible heat has been lost, stop forging. The steel will be most prone to cracking at this temperature.

Photo 29 shows the assembled tongs.



Drawing 9.



Drawing 10.

Hint: If the rivet is not sufficiently headed on this one heat, you can work the head once it has cooled to room temperature. If you feel it necessary to take an additional heat to finish, do so with the following caution: heating in the forge it will be impossible to heat the rivet without also heating and softening the bolster around it. In re-heading, if you hit straight down on the rivet you will upset it through its entire length. It will quickly shorten as the hole surrounding it will widen to accommodate the rivet's increased girth. Worked to an extreme, you can forge the rivet flush with an ever expanding bolster and no rivet head. Consequently, when taking a second heading heat, only work the edges of the rivet head, angling your hammer and drawing the edges down to the bolster surface.

Note: Some smiths use a round faced hammer for heading rivets in this way or a ball peen. Both can be effective, but the job can



Photos 28 and 29.

be accomplished well with the regular cross peen forging hammer too.

Step Ten (freeing the jaws):

Likely you have riveted the tongs tightly together so they will not move. Free the jaws by putting the pivot area of the tongs in the forge fire and heating to a bright red or orange heat. Pull them from the fire and work the reins open and closed through their full range of movement. Keep moving them as the tongs cool to well below red.

Make sure the tongs do not distort while doing this.

Hold the tongs horizontally as if gripping a bar. The tongs should fall open when the fingers release the bottom rein. There should be no sticking or tight spots. If this is not the case, they

may need another round of heating and working.

Step Eleven (adjustment):

These tongs can be sized to hold anything from sheet to a bar about 1/2 inch thick. Above 1/2 inch thick usually requires a slightly different set up for the jaws.

We will size these tong to hold 1/4 inch thick flat bar.

Select a short piece of 1/4 inch thick scrap bar as the "sizer." Three or 4 inches long is plenty.

Heat the jaws of the tongs to an orange heat and grab the sizer bar in the tongs. There ought to be enough grabbing effect even with the heated jaws to accomplish this.

Place the jaws on the anvil and forge them to fit with careful hammer blows. Work both jaws equally so they are pushed into full length contact with the sizer bar.

If a post vise is available, it can be used to squeeze the jaws to the sizing bar. Photo 30.

Photo 31 show fitted tong jaws with each jaw making full contact with the bar.

In a similar fashion, the reins can be adjusted to a comfortable hand hold. Small adjustments can easily be done cold on the anvil. Greater change is best done at heat.

This is mostly a matter of changing the angle the reins make where they intersect the pivot bolster. Small changes there will cause significant changes in distance between the two reins where they are held.

A red heat on the area where the reins meet the bolster is usually sufficient, but creativity is often call for holding the assembled tongs on the anvil to effect the needed alteration.

If you have adjusted the reins on the anvil you will probably also need to recheck their fit to the sizer bar.

A post vise can ease the task of rein adjustment. Heat the reins where they meet the bolster and then put the sizer bar in place. Hold the jaws and sizer bar in the vise as illustrated in Photo 30 and manually adjust the reins for comfort and symmetry.

Targets:

It is most important that the two halves of the tongs match. The measurements shown in Drawing 1 are a good guide. Following the method outlined you ought to match the dimensions of one tong half to the other to within plus or minus 1/8 of an inch in linear dimensions. Widths and thicknesses can be forged to within plus or minus 1/16 inch.

Plan on a heat each for the three shoulders needed for the jaws



Photos 30 and 31.

and pivot bolster.

Use one heat to punch and drift the pivot hole. That hole should be centered in the area of the pivot bolster.

Drawing down the reins may take several heats. From the point that the bolster is punched and drifted, use no more than ten heats to produce a ready-to-assemble tong half.

The tongs should tightly grip the bar they were sized to fit, in this case 1/4-inch-thick flat bar. Hold the "sizer" bar in the tongs and the free hand should not be able to easily dislodge the bar from the tong grip.

The joint should work freely without sticking. With the tongs horizontal, as if holding a bar, the bottom rein should fall completely open without sticking when it is released by the fingers.

The reins should be a comfortable distance apart when holding the appropriate dimension bar stock.

The reins should be symmetrical, virtual duplicates of each other.

Further Steps:

Now that you can make tongs, having tongs opens up two more effective approaches to their forging.

1. The first alternative is to proceed as outlined above through Step Five (punching of the pivot hole). At that point cut the forging free at the layout mark. Then use tongs to hold the jaw while the rein is drawn down. Try to organize your forging in a sequential manner. Heat a small section to yellow and draw it on the horn of the anvil. Finish the shape on the anvil face to final dimension then move to the next section.

2. The second alternative forge welds round stock onto the jaw blank using a drop tong scarf weld. This, of course, saves the effort of drawing down the reins. Review the prior lessons on welding.

Less than 3 inches of the 5/8 inch square stock will be needed for each jaw. About 9 inches of round stock 3/8 inch in diameter is about right for each rein.

After forging the third shoulder and drawing a bit of the transition to the reins, leave the bar about $\frac{1}{2}$ inch square on the end and forge a scarf. Note that the scarf must be oriented so that the jaw blank will lie on the anvil face for the weld.

Upset the round stock (the vise and a light hammer is useful for this) and forge it to about $\frac{1}{2}$ inch square on the upset end and provide it with a scarf.

The drop tong weld proceeds in the normal fashion. After the two parts are joined, forge the area at the weld into a smooth transition from rectangular section to round section. Finally punch and drift the pivot hole.

A refinement of the welding procedure is to weld one jaw section to a round about 18 inches long, enough for two reins. Then weld the second jaw to the other end of the round and cut the two halves free before assembly.

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