

# Forging a Shoulder

by Bob Fredell

Illustrations by Tom Latané

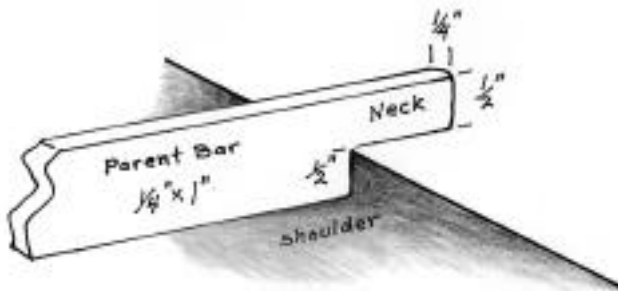
## Lesson #12- Forging a Shoulder

*Definition:* A shoulder is the abrupt change in width and/or thickness of a bar. A shoulder is normally made by decreasing a dimension by drawing down, although it may be formed by upsetting.

*Intent:* To learn how to forge two different shoulders using a minimum of tools. The use of few tools emphasizes the hand-forging processes, which with practice, allows one to more readily master the procedures.

### Near-side Shoulder

*Definition:* A near-side shoulder is formed on the near edge of the anvil with the neck extending from the end of the bar.



*Near-side shoulder.*

Tools: Anvil, hammer and center punch.

Materials: Mild steel 1/4"x1"x24".

*Intent:* To forge a near-side shoulder on one side of a bar using the near edge of the anvil.

*Note-* See Drawing under Definition, above,

### Step One

Place a center punch mark on the wide side of the bar next to the edge, and 1/2" from the end. This measurement will make a 1/4" x 1/2" x 1" neck.



*Bar marked with punch.*

### Step Two

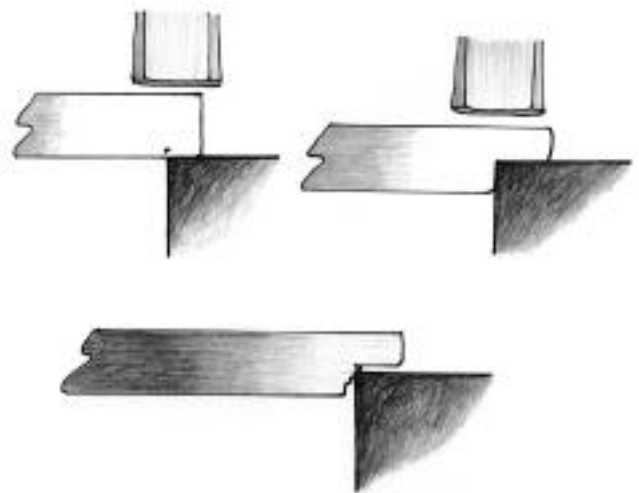
Heat two inches of the end of the bar to a light yellow. Place the punch mark at the near edge of the anvil with the 1/4" side of the bar flat on the face of the anvil (the bar is to be horizontal at all times to make the shoulder as close to 90° as possible.) Strike one or two light blows to establish this location on the bar. Be sure that (1) the face of the hammer is half on and half off the edge of the anvil and (2) the face of the hammer is parallel to the upper edge of the bar.

Continue forging until the shoulder is almost halfway through the bar.

#### Hint:

—Be sure to maintain a steady and gentle pressure on the bar to keep the now-forming shoulder tight to the edge of the anvil. Failure to do this will result in a ragged shoulder.

—Should a specific project call for an angled shoulder, the bar must be placed at an angle to the face of the anvil.

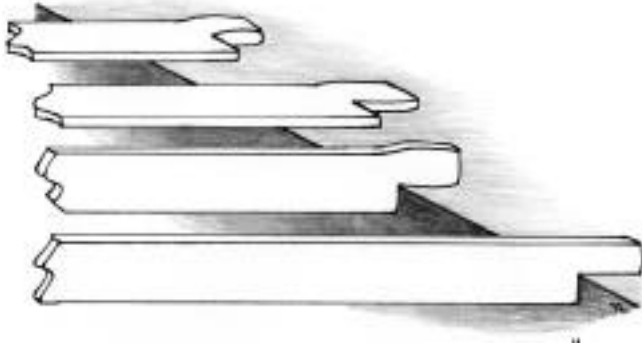


*Shouldering on the near edge of the anvil with hammer blow half over anvil and half off. In the third example, steps and cold shuts formed when the bar bounces because it is not held firmly against the anvil.*

### Step Three

At this point, the bar has become thicker. Place the wide side of the bar on the anvil and forge it back to the original 1/4". Rotate the bar 90° and return it to the edge of the anvil with the shoulder facing down. Continue forging as in Step #2 and Step #3 until the shoulder is halfway through the bar (the neck will be 1/4"x1/2"x1").

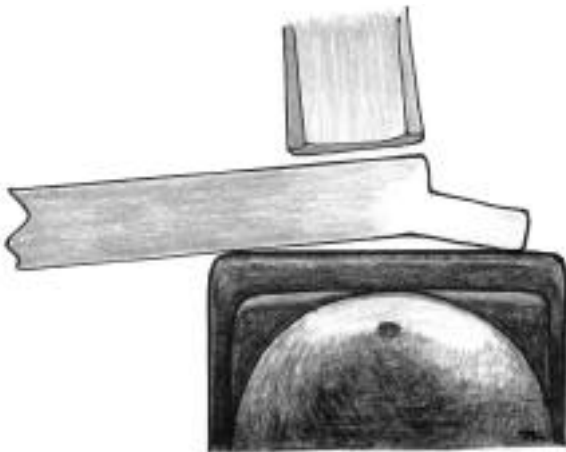
# CONTROLLED HAND FORGING



*Forging the thickness of the bar back to 1/4" and returning the shoulder to the edge of the anvil to reduce the width of the neck to 1/2".*

## Step Four

Depending on the effectiveness of Step three, the bar may be misaligned. The most common misalignment is a bend in the neck, away from the shoulder, caused by holding the end of the bar too high. This can be corrected by placing the bar on edge, shoulder up and striking the parent bar.



*Correcting a bend.*

### Targets:

The neck is to be 1" long and 1/2" wide; the thickness remains 1/4".

To emphasize craftsmanship and accurate forging, the finished shoulder and neck should be within 1/16" of the required dimensions.

It is to be straight according to the eye, although a beginner may need to use a straightedge.

The angle of the shoulder may be slightly more than 90°.

Note that the outside corner will not be 90° using this method. The material at the corner will be pulled down by the forging action.

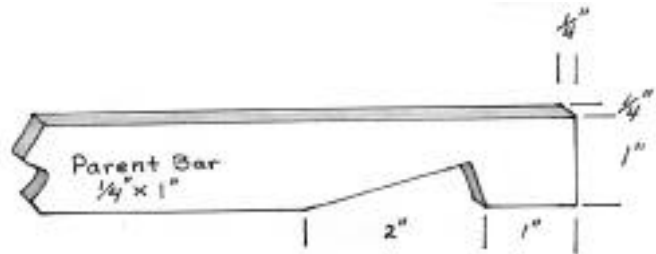
Practice this lesson until you can complete it in one heat.

*Note:* An alternative to using a center punch to mark where the shoulder is to be placed on the bar is to mark the face of the anvil with soapstone, chalk, or a felt tip marker. Mark the 1/2" length with a line on the face of the anvil, 1/2" in from the new side of the anvil. When the bar has reached forging temperature, place the end of the bar even with this line. Apply downward pressure to ensure that the bar does not move. Proceed to forge the shoulder as in Step two.

Soapstone and chalk marks are easily erased from the anvil's face. The felt tip marker will provide a line that lasts longer if you need to make several shoulders.

## Part Two- Far-side Shoulder

Definition: A far-side shoulder is formed on the far edge of the anvil and will result in a taper from the full width of the 1" bar to the 1/2" inside shoulder.



*Far-side shoulder.*

Tools: Anvil, hammer and centerpunch.

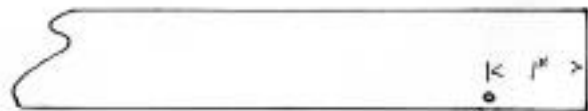
Material: Mild steel, 1/4"x1"x24".

Intent- To forge a far-side shoulder on one side of a bar using the far edge of the anvil.

Note: See drawing under Definition above.

## Step One

Place a center punch mark on the wide side of the bar next to the edge, and 1" from the end.



*Bar marked with a punch.*

# CONTROLLED HAND FORGING

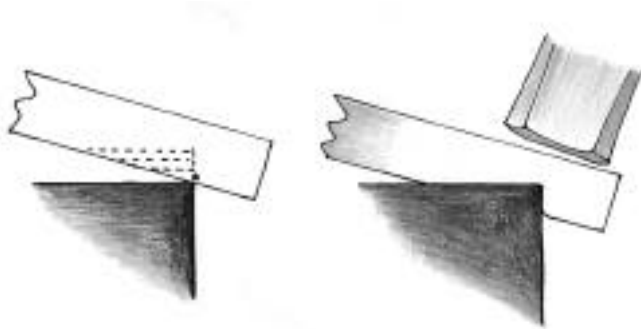
## Step Two

Heat three inches of the end of the bar to a light yellow. Align the punch mark on the far edge of the anvil. The angle of the bar to the anvil face should approximate the angle of the finished 2" taper. Strike *one or two light blows* to establish this location on the bar.

Be sure that (1) the face of the hammer is half on and half off the edge of the anvil and (2) the face of the hammer is parallel to the upper edge of the bar.

Continue forging until the shoulder is not quite halfway through the bar and the hammer remains half on and half off the anvil.

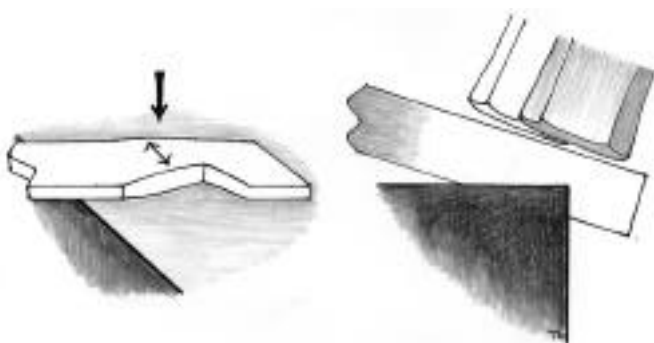
*Hint.* Be sure to maintain a steady and gentle pressure on the bar to keep the now-forming shoulder tight to the edge of the anvil. Failure to do this will result in a ragged shoulder.



*Shouldering on the far edge of the anvil— matching the hammer angle to the angle of the bar.*

## Step Three

At this point the taper has become thicker. Place the wide side of the bar on the anvil and forge it back to the original 1/4". Rotate the bar 90° and return it to the edge of the anvil with the shoulder facing down. Continue forging as in Step two and Step three until the shoulder is halfway through the bar (the taper will be 2" long and 1/4" thick).



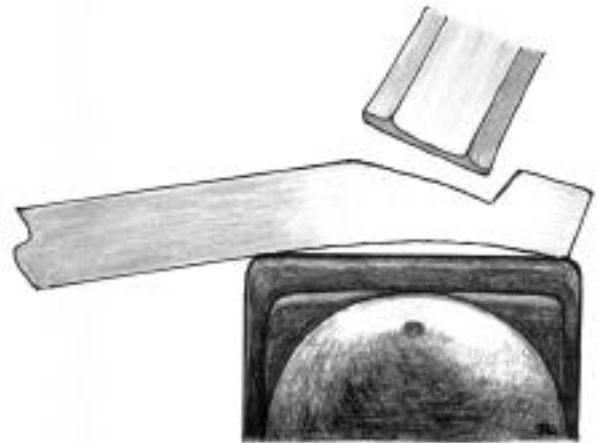
*Forging the thickness of the bar back to 1/4", then dressing the tapered neck.*

## Step Four

The bar may have a tendency to form an arc. Straighten the bar by placing it on the anvil with the concave side of the arc down, making sure the two ends of the arc are touching the anvil. The taper is now facing up. Strike the taper with one or two decisive blows until the bottom edge of the bar is flat to the anvil.

Note: You may find (through forging dynamics) that from the initial downward blows to shape the shoulder, a thick mass is created in the neck, and when forging the neck back down to the original thickness of 1/4", this arched shape is eliminated during this part of the procedure.

*Hint:* To avoid nicking the taper with the edge of the hammer, be sure to match the face of the hammer with the taper.



*Correcting a bend.*

Note: An alternative to using a centerpunch to mark the bar where the shoulder is to be placed is to mark the face of the anvil with soapstone, chalk or a felt-tipped marker. Since the end of the bar will be placed off the far side of the anvil, (and you cannot draw a line in space), you must draw your line measuring 1" in from the far edge of the anvil on the anvil's face.

When the bar has reached forging temperature, place the end of the bar even with the far edge of the anvil. Next, take your hammer and press the edge of the hammer's face to the bar at the 1" line. Slide the bar and the hammer beyond the far-side edge of the anvil until the hammer edge meets the edge of the anvil and stop. Apply downward pressure to insure that the bar does not move. Proceed as in Step two.

Soapstone and chalk are easily erased from the anvil's face. The felt tip marker will provide a line that lasts longer if you need to make several shoulders.

## CONTROLLED HAND FORGING

---

### Targets:

The shoulder is to be 1" from the end of the bar. Halfway through the bar, the thickness remains 1/4" and the length of the taper is 2".

The finished shoulder is to be within 1/16" of the required dimensions.

It is to be straight according to the eye. However, a beginner may need to use a straightedge.

The angle of the inside corner will be slightly more than 90°.

Note that the outside corner will not be a 90° angle using this method because the material at the corner will be pulled down by the forging action.

Practice the lesson until you can complete it in two heats.

*Alternate method:* In Step two, we say "The angle of the bar to the anvil face should approximate the angle of the two-inch taper." It must be said that a far-side shoulder can be created with the edge of the bar laying flat on the anvil face. You may note when using this method that a longer taper is created, and a greater area must be forged back down to the original 1/4" thickness.

*Other notes:* You may desire to form sharper corners. To accomplish this, take a yellow heat and place the inside of the shoulder over the far-side edge of the anvil. Pull the bar towards you so it meets the far vertical side of the anvil. Proceed to upset the end of the bar by lightly hitting the end of the bar into the far vertical side of the anvil. Hitting the bar too hard may cause the bar to fold, and this error must be corrected by lightly hitting the width of the bar.

Note that this procedure will somewhat reduce the length of the end of the bar, and increase the thickness and the width of the bar. Forge the bar back to the 1/4" thickness, and the 1" width of the bar (Similar to Step three).

If a precise measurement is desired at the end of the bar, you may want to use a test bar to determine how much length (if any) is lost by this procedure.

---

VAN'S GUN BLUE  
1/4 PG

PERSIMMON FORGE  
1/4 PG