

Splitting the End of a Bar

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Lesson #19. Unit: Cutting

Definition: Using a sharp edged tool to cut or alter a bar, or to remove material from a bar.

Intent: To learn to use a hot-cut chisel to cut down the centerline from the end of a bar.

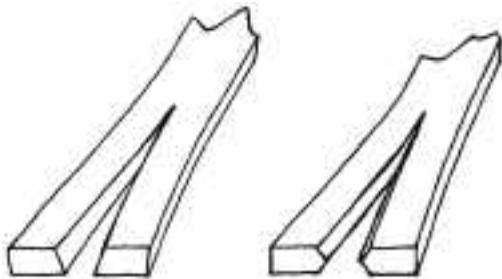
Tools: Basic tools, plus a hot-cut chisel, cutting plate or saddle, tool to hold the hot cut, tool to hold the work-piece.

Material: 2 pieces of 1/4" x 1" x 24".

Note: There are two methods of cutting we will teach in this lesson. Method one(M1) will teach cutting a bar from one side all the way through. Method two(M2) will teach cutting a bar from opposing sides.

Each method leaves a very distinctive kerf. (See Drawings #1 and #2.) Image #1 shows the kerf made by method one. Image #2 shows a kerf made by method two.

It is important to determine which method to use in order to achieve a specific goal. Thinner materials, 1/4" (one quarter inch) or less, are often (but not always) cut using method one. Thicker materials are often (but not always) cut using method two.



1 & 2. Method 1 kerf, left, and method 2 kerf, right

Forging Dynamics: On either side of the kerf, the bar-stock will be displaced by the thickness of the chisel. The chisel should be thin so the amount of stock displaced is minimal. As the bar begins to split, the opposing sides of the kerf (legs) will peel away from the line of the cut. This stretching is caused both by the material being pushed apart by the hot-cut chisel.

Note: It is important to use the correct chisel. A cold-cut chisel, as the name implies, is used to cut cold stock. This type of chisel needs to be heavier, or backed up by enough material so the chisel does not snap or crack from the shock of cutting the harder cold stock. Because it is cutting softer material, the hot-cut chisel receives less shock, and can have a more acute bevel. (Photo #3 a+ b shows the difference in blade bevels of the hot-cut chisel and the cold-cut chisel.) Note that both chisels have

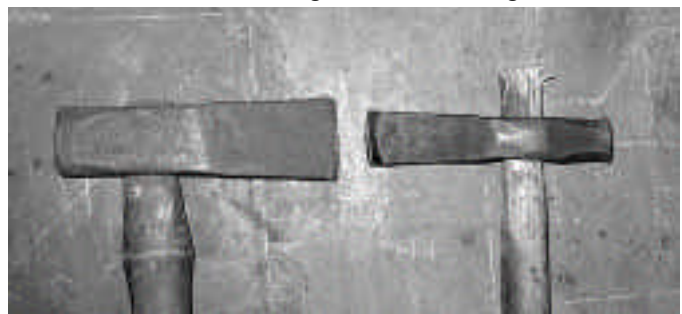


3. Notice the difference in the thickness between the cold cut (left) and the hot cut (right).

rounded, not square edges. This allows the chisels to easily track in the kerf, and in some cases, allows you to make a curved kerf. (Photo #4 a+ b shows the side shape of the two chisels.) A square chisel is harder to control, as the abrupt wall left by its impression makes it necessary to lift the blade out of the kerf track to advance. (See Drawing # 5 of the potentially bad kerfs made by a square chisel) In this lesson, we will be using the hot-cut chisel.

The specific purpose of the cut may determine which method you choose. For example, if the legs formed by the cut are to be drawn out, it would be easier to draw out a M2 kerf, which has a center crown, being beveled from both sides, rather than a section with one tall beveled edge as seen in the M1 kerf. On the other hand, an M1 kerf might be desirable as the naturally beveled edge left from cutting may serve as a decorative accent. Method one could be used for making a split scroll with a beveled edge, while method two could be used for beginning the end of a fork.

Holding the bar steady while cutting must be considered. There are several methods of holding the bar for cutting. One method



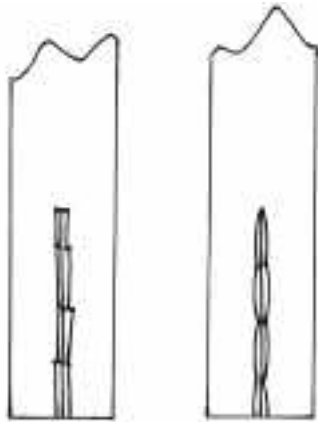
4. This photo shows the rounded edges of the hot and cold cut, which allows the tool to slide along the workpiece more easily. than if the edges were square.

for cutting short bars is to use a holdfast, as seen in Photo #6. A holdfast can easily be made out of mild steel, of a slightly smaller diameter than your anvil's pritchel hole. To use the holdfast, simply slide the shank into the pritchel hole, and place the flange on top of the work-piece. Lightly tap the top of the holdfast to secure the work-piece onto the anvil.

For longer bars, you could use a "blacksmith's helper" which is an adjustable stand. Some smiths prefer to use a weight to keep the piece steady while cutting. One way to apply the weight is to attach a chain to an "S" hook, and attach the weight at the end of the chain. (See Photo 7.) When using the blacksmith's helper, adjust the stand so the bar rests flat on the face of the anvil.

The important thing is to keep the piece flat and stationary on the anvil while cutting. If the bar is not resting flat on the anvil face, the bar will bend more dramatically, and the impact of the chisel will be lessened as well.

Holding the chisel is also a consideration. If you have a chisel with a long enough shank, you may be able to hold it while cutting without burning your hand. It might be easier for some to use a pair of chisel tongs to hold the chisel. Many smiths prefer



5. Scars potentially produced by a square-edged chisel and a wavy cut potentially produced by an overly rounded chisel.

to use a chisel with a solid handle of either a bar wound around the chisel, or a wood handle that pierces the chisel. (See Photo #8 showing the tongs, and two types of handles) For this lesson, we will use a chisel with a wooden handle.

Cutting Method #1

Step One

Measure 2" from the end of the bar, and with a centerpunch, mark the exact center of the bar. Make the punch mark large enough to see when the bar is hot, but not too large, as a large punch mark might remain visible after cutting.

Step 2

Heat 3" of the end of the bar to yellow. Place the end of the bar flat on the anvil. Place the center of the chisel on the end of the bar at the bar's center. Lightly tap the chisel to create a light

impression, about 1/32" or less deep.

Note: In this step, you do not wish to drive the chisel through the bar, nor create a bold kerf as you need to first establish the proper kerf track. If your judgement is off, the light impression will not usually be deep enough to ruin the project, and can be corrected by simply adjusting the chisel to create a new kerf. The new kerf will push material towards the old kerf, closing it up. Unless you are dramatically off in your initial judgement, this correction will likely be undetected in the finished piece.

In the same heat, move the chisel by sliding, not lifting it, one half the width of the chisel, and take another light tap. You should always slide the chisel towards you, as you can see where the chisel is in relation to the bar. When moving the chisel, always leave a portion of the cutting edge in the track of the kerf



6. The holdfast slides into the pritchel hole, and holds the workpiece firmly with a light tap of the hammer above the holdfast's vertical shank. To remove the holdfast, lightly tap the side of tool's vertical shank with the hammer.

from the previous blow. Some smiths prefer to linearly rock and then slide to advance the chisel. These procedures insure that a double kerf line isn't accidentally formed.

Continue the light kerf all the way down to within 1/16" of the center-punch mark, making sure you remain in the middle of the bar. If you make an errant blow along the way, make the correction immediately before continuing down the bar. Make sure the chisel remains perpendicular to the workpiece at all times.

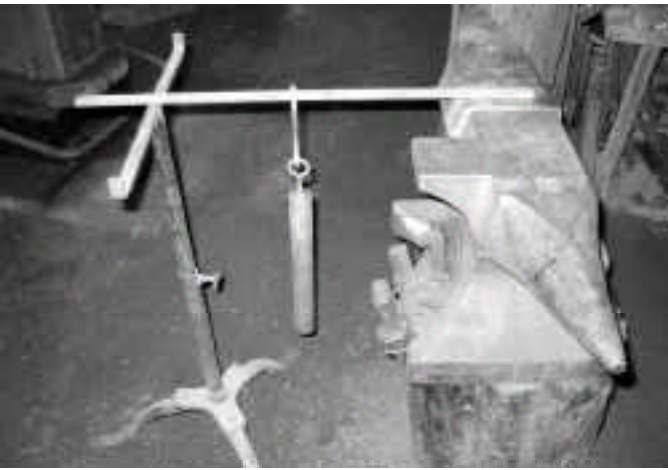
Forging Dynamics: The bar will begin to curl upward as the force of the chisel makes impact. To cut properly, the bar must be tapped down flat on the anvil every time you retrace the kerf to deepen the cut.

Note: When cutting heavy stock, some smiths prefer to quench the chisel after four or five blows to keep the chisel blade cool. This is more important when using a chisel of simple carbon steel.

Step 3

Take another yellow heat 3" long. Place the bar on the cutting surface.

CONTROLLED HAND FORGING



7. A blacksmith's helper stand helps to hold longer bars. The attached weight helps keep the workpiece steady. Adjust the blacksmith's helper so the workpiece lies flat on the anvil or cutting saddle.

Note: STOP! Do not even think about cutting through the bar on an unprotected anvil. It is believed by some that the table of the anvil, sometimes referred to as the step of the anvil, is to be used for cutting. Doing so will only scar the surface to the point where it is no longer useful. The bottom of the hot bar will sink into the scars left by the chisel from past cuttings, leaving unsightly marks on the work piece.

A piece of 1/8" to 3/16" thick (or thicker) plate of copper, brass, or a piece of low carbon steel can easily be used as a base beneath the bar being cut. Make sure it is large enough to effectively support the workpiece. Some smiths prefer a more stable cutting surface, and may shape the cutting plate to fit snugly over the edges of the anvil. This tool is called a cutting saddle. (See image 9 of a cutting saddle.) This not only protects the anvil, but also protects the chisel edge. When the surface of the plate or saddle becomes scarred, simply throw it away and make a new one, or if it is thick enough, you may remove the scars by grinding or forging.



8. A wooden-handled chisel, left, dedicated chisel-holding tongs, center, and a wrapped handle (on a punch), right.

As you did in step two, place the chisel at the end of the bar and this time strike the chisel with a medium to heavy blow as now your aim is to drive the chisel through the bar.

Move the chisel down the bar as you did in step two, creating a deeper kerf. Again, stop short of the center-punch mark. If you have not split the bar at this point, repeat the process until the bar is split through, hitting with less force to save the cutting plate from getting deep scars.

Step 4

You now want to finish the cut with a nice square edge at the bottom of the cut. The reason the initial cut is not cut right down to the center-punch mark is that since the chisel is curved, you will not have a clean square kerf at the end of the cut.

Note: In some cases, a tapered kerf at the end of the cut may be desired as a design element. For the purpose of this lesson, we are explaining how to finish the cut with a squared termination. (See image 10 showing the two types of terminations.)

To finish the cut, place the bar tightly in a vise with the center-punch mark 1/4" above the vise jaws with the legs in the vertical position. Place the chisel between the legs of the cut and carefully drive the chisel straight down until the chisel just pierces the center-punch mark. This last step can be done at a low orange to orange heat. A lower heat may be easier to control, as the chisel will meet more resistance, and you are less likely to cut too deep. Properly executed, the bar should now look like image 10.



9. This cutting saddle was made from 1/2" x 3", lies flat on the anvil face and fits snugly over the edges. The thickness has been reduced by re-dressing the surface to eliminate surface scars made from cutting through the workpiece. "blacksmith's helper so the workpiece lies flat on the anvil or cutting saddle.

Targets

- The kerf must be through the middle of the bar within 1/32" per side.
- The kerf must have a clean appearance, with no ragged edges.
- There must be no double kerf lines.
- The kerf must be 2" long within 1/64" (one sixty fourth inch).

- The face of the bar must be flat.
- The inside end of the kerf must be square to the face of the bar.
- You should be able to split the bar in three heats. With practice, you could split it in one heat.

Cutting Method #2

(Review method one for forging dynamics, and notes to the cutting procedure.)

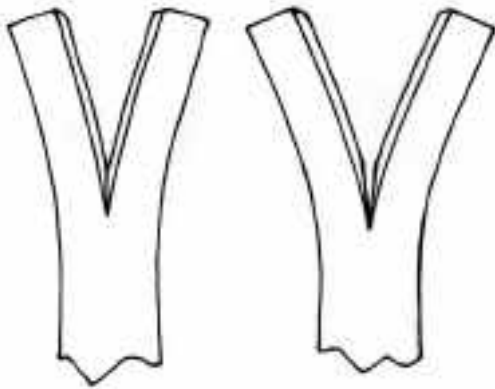
Step 1

Measure 2" from the end of the bar, and with a center punch, mark the exact center of both sides.

Step 2

Heat 3" of the end of the bar to yellow. Place the end of the bar flat on the face of the anvil. Place the center of the chisel on the end of the bar at the bar's center. Lightly tap the chisel to create a light impression, about 1/32" or less deep. Move the chisel by sliding, not lifting it, one half the width of the chisel and take another light tap. Continue the light kerf down to within 1/16" of the center punch mark.

In the same heat, tap down the end of the bar to regain a flat



10. A tapered kerf end, left, and a straight kerf end, right.

bar. Retrace the kerf with the chisel, taking a heavy enough blow to cut half-way through the bar.

Step 3

Heat 3" of the end of the bar to yellow. Rotate the axis of the bar 180 degrees. As you did in step two, cut a light kerf to within 1/16" of the center punch mark, then tap the end of the bar to regain a flat bar.

Note: Accuracy is important! If you do not cut a line down the middle of the bar, you will get a kerf offset from the kerf on the other side. (See Drawing #11 of offset kerfs vs. two opposing kerfs.) To make sure you begin the second kerf in exact opposition to the kerf on the other side, look at the end of the bar to view both kerfs simultaneously. If they are offset, make the correction immediately.

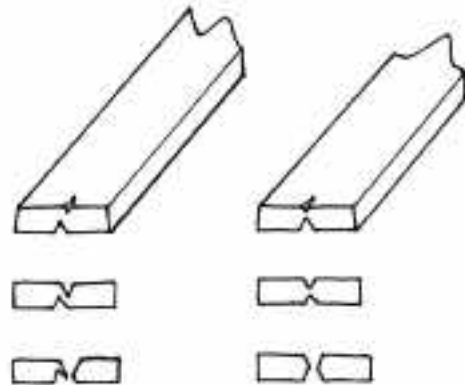
Next, with heavier blows, retrace the shallower kerf with the chisel, and drive the chisel through the bar. Remember to use a cutting plate or saddle!

Step 4

To finish the cut, at a low orange to orange heat, place the bar tightly in a vise with the center punch mark " (one quarter inch) above the vise jaws, with the legs in the vertical position. Place the chisel between the legs of the cut and carefully drive the chisel straight down until the chisel just pierces the center punch mark.

Targets

- The kerf must be through the middle of the bar within 1/32" (one thirty second inch) per side.
- The kerf must have a clean appearance, with no ragged edges.
- There must be no double kerfs.
- The opposing kerfs must meet cleanly; no heavy burr from off-set kerfs.
- The kerf must be 2" long within 1/64" (one sixty fourth inch.)
- The face of the bar must be flat.
- The inside end of the kerf must be square to the face of the bar.
- You should be able to split the bar in three heats. With practice



11. The result of off-set kerfs (right) compared to opposing kerfs (left).

you could split in two heats.

Notes about dressing the edge of the kerf:

- 1.) The kerf can be filed to suit the job.
- 2.) The legs can be bent away in a "Y" shape to 90 degrees, or one leg may be gently folded over the bar. The kerf can then be lightly forged with the face of the hammer, retaining the beveled edge. Afterward, the legs may be bent back.
- 3.) The legs can be bent or folded as above, then the kerfs can be forged so the cut edge is square to the face of the bar.