Controlled Hand Forging Lesson 11, part 2

Drawing Down- Part Two

by Jay Close
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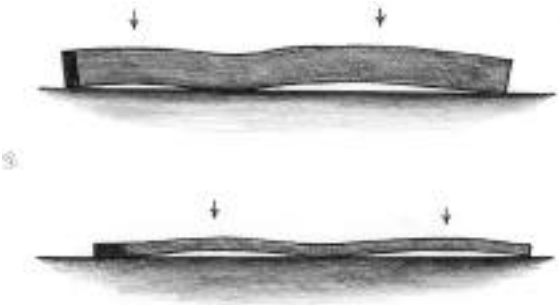
photos by Jay Close and Jane Gulden
Lesson # 11- Drawing Down- Part Two

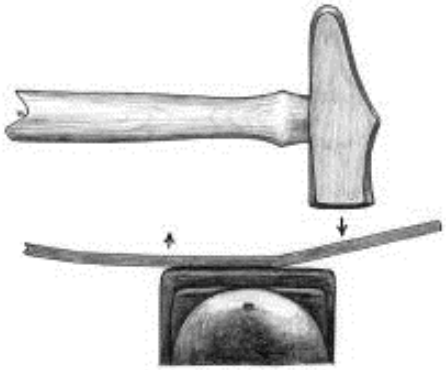
Definition: Reducing the cross-sectional area of a bar.
Lesson: Resizing a 1/2 inch square bar into a 1/4 by 5/8 inch rectangular bar by hitting the bar "on the flat."
Troubleshooting
Straightening

Straightening could be a lesson of its own. These comments will get you started.

For the sake of these directions, assume that bends, twists and dimensional issues are all independent problems that can be addressed independently. This is far from the case in reality.

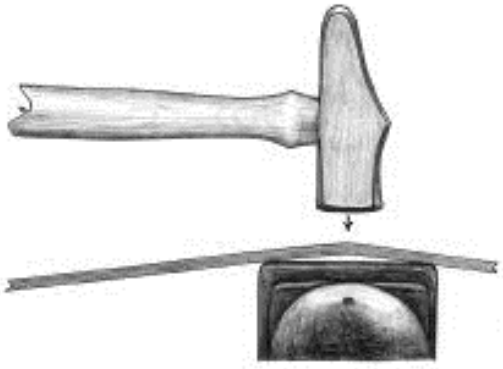


Areas to address for straightening.



Ineffective approach to straightening

If you have kept the bar relatively straight as you worked it, little additional attention to this is needed at the end of reshaping. That needed attention can be done at room temperature.



Ineffective approach to straightening

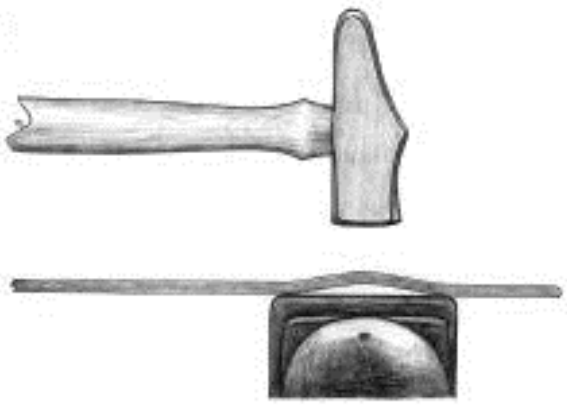
Straightening is not a single operation but a series of corrections starting from the major working toward the subtle, a process of progressive refinement.

Approach straightening with a strategy. Some work from one end of the bar to the other. Some start in the middle and "chase" any crookedness out to the ends. These approaches work well for subtle correction.

Generally it is best to tackle the big problems first, then work on the more subtle ones.

Decide which plane of the bar needs most correction. Start where the most work is needed, sorting out the major issues first.

In practice you will likely work back and forth, correcting problems both on the edge and on the face.



An isolated bend in an otherwise straight bar.

Secondary bends revealed after correction of the primary bend.

Putting the bar on the anvil with the concave part of the bend up makes for ineffective straightening. The correcting blow just levers the holding hand up. This works much better if the bar is hot.

More effective is to place the bend with the convex portion up. The bend is supported on either side by the anvil creating a “bridge” effect. Then your correcting blow will drive the bend down and straight.

Experiment making your correction different places and orientations on the anvil face. One correction might need to be angled across the face to support a long, gentle curve. A more "spot" correction can be made with a sharp blow over the hardie hole.

When straightening, as in all forging, be decisive. Inspect your work. Decide where the problem lies and how to hold the work on the anvil to correct it. Take one, maybe two, correcting blows at the appropriate spot and check your progress.

Avoid a multitude of random, light, pecking blows. Hit with authority and immediately inspect your work. Always seek to make the needed changes with as few hammer blows as possible.

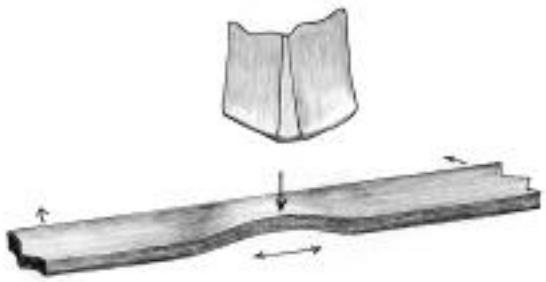
Sometimes correcting one problem reveals another. In the case below, correcting one bend as illustrated shows there are really two more bends that need addressing. Once the bar is fairly straight along one plane, repeat the straightening on the other. Recheck the bar for straightness and start to work on more subtle problems. To accommodate the inevitable thick and thin places, and wide and narrow areas, keep in mind that the goal is the mass of the bar evenly distributed around an imaginary center line.

Dealing with twist:

If you have kept after the twisting as you worked there will be little remediation needed when finished.

A variety of small problems can mask a more subtle twist, so it is often best to work on the small problem areas first. You can then be left with one or two gentle twists to correct at the last.

If the twist is localized so it can be supported on either side by the anvil, treat it like a bend. Put the twist up and hit an authoritative corrective blow.



Correcting a localized twist.

This kind of twist and this kind of correction will show that the bar is actually bent at that spot. After flattening the twist, you will have to remove a bend.

For twists that can not be readily supported on either side by the anvil, the simple cant of the bar that worked well while the iron was hot is unlikely to be effective cold.

Photo 11: Correcting a twist with a pair of tongs and the bar held in the vise horizontally.

Sometimes you must resort to the vise and a pair of tongs or twisting wrench to eliminate twist. Situations will vary, but working from the middle of the bar out to the ends is frequently convenient.

Photo 12: The bottom bar has been burned. The top bar has been burned then slightly up set and reworked – alas, the damage has been done.

Hold the bar with the twist exposed just past the vise jaws. Place the tongs or wrench at the point needed to make the correction and bring the twisted bar in alignment. Hold the bar either vertically or horizontally, as seems most handy.

Texture

Your quest for a smooth, hammered texture on the bar begins with where you heat it in the fire. Heat the bar in the neutral part of the fire. If it is poked down into the oxidizing zone, you will have increased scale and a smoothing challenge.

Do not overheat the bar. If your bar looks like a Fourth of July sparkler when taken from the fire, you have pitted its surface and made a smooth texture almost impossible, particularly if you are already near final dimensions.

Photo 13: The marks left on the bar came from this poorly dressed hammer face.

Hint: If you should overheat a section of your workpiece, immediately cool it in the slack tub to below burning temperature and get to work. You may save the bar.

Photo 13A: Can you see the corner that marked the bar?

If your hammer face is too flat or has sharp edges, this too will make a smooth texture challenging.

Keep the anvil free of scale as you work. If the bar comes from the fire excessively scaly, scrape it clean on the corner of the anvil using the hammer to apply downward scraping pressure. Do not take much time doing this as you are wasting the best, softest part of the heat. But it is sometimes necessary. A wire brush could be employed, but that needlessly involves picking up another tool and delays getting to work with the hammer.

Photo 14: Scraping along a sharp anvil corner to get rid of scale before forging. Use the hammer head to apply downward pressure.

Remember to work all sides of the bar. Not only is this critical for achieving the proper shape, but it means that scale is not being trapped between the work and the anvil where it can impress an undesirable texture.

Finally, work the bar down to a dull red. The bar has stopped scaling by then. This is your opportunity to work the surface without troublesome oxide.

Photo 15: Four sections of re-sized bar exhibiting different textures.
From left to right:
A. Smooth, even texture;
B. An acceptable texture from a hammer with a more radiused face
than the first example;
C. A fairly even texture but definitely not smooth;
D. A poor texture achieved by heating in the oxidizing part of the fire, not cleaning the anvil of scale, and not working all sides of the bar to a dull red heat.

Photo 16: A close up of D.

Photo 16A : A close up of "C."

Photo 16B: A close-up of "B."

Photo 16C: A close up of "A."

FORGING DYNAMICS

Cross-sectional area:

Comparing cross-sectional areas is a good way to compare the masses of two different bars or two different shapes.

For example, suppose you wondered whether a bar 1/2-inch by 1/2-inch had sufficient material to allow forging into a bar 1/4-inch by 1-inch.

Multiply the width times the thickness of each bar–

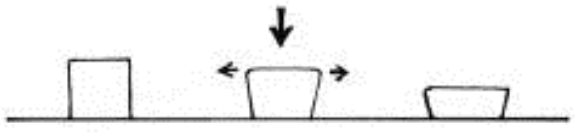
1/2-inch times 1/2-inch equals 1/4-inch

1/4-inch times 1-inch equals 1/4-inch

Each bar has the same cross-sectional area and it seems like you should be able to get the needed 1/4 inch by 1 inch bar from the one that is 1/2-inch square.

However, hitting with the face of the hammer spreads the work all directions from the middle of the face. Material is used stretching the bar longer as well as wider. In practice, you can not readily forge 1/4-inch by 1-inch bar from another bar with equal cross-sectional area.

Work all sides. Achieving a smooth, hammered texture is not the only reason to work all sides of the bar. It also helps to achieve the proper shape. The force of the hammer blow on the face of the bar is absorbed so that the force is not transferred all the way through. Were you to hit from only one side, particularly on a thick bar, you would soon create a trapezoidal cross-section.



Cross-section of a bar becoming trapezoidal when hit only from one side.

The I-beam effect:

You may notice the edges of your bar mushroom out, creating a hollow on the flat surfaces. The cross-section looks like an I-beam. This happens because you are working the edges (1) at too low a heat, (2) hitting too lightly, or (3) with a combination of the low heat and light hammering. The ef-

fect of your hammer blow is dramatically concentrating on the bar surface. The shape change is not being forced into the middle of the bar. (See Photo 18)

Photo 18: A really bad case of the the I-beam effect.

Ergonomic tips

Stand comfortably, weight on both feet evenly. Get close to the anvil so you can hit down on the work– you shouldn't have to reach for it.

Don't bend at the waist. It is hard on the back and makes your face more vulnerable to the rebound of a misplaced hammer blow. The bend at the waist also limits the acceleration of your hammer swing to a very small arc. An ineffective blow results.

Take long, smooth hammer strokes. As you raise your hammer, at the top of its swing it should be outside of your vision. If you can see your hammer head at all times you are limiting its travel, its speed and the strength of its blow.

Do not keep a white-knuckle grip on the hammer. Propel the hammer forward, then hang on for the ride. Feel how the hammer rebounds and make use of the rebound to help bring the hammer back.

Use the handle length. If you must choke up on the hammer handle, your hammer is probably too heavy for you. By using the full length of the handle you increase the speed and the power of the blow.

RELAX

Above all pay attention to your body and what it is telling you. Hand forging is physical. If you are not conditioned, injuries are a possibility even with the best technique. Warm up. Stretch and continue to stretch as you work. If it hurts, **STOP!** Evaluate what you are doing. Rest and recover. If problems persist, seek professional help.

Photo 19: What is wrong with this picture?
The bend at the waist is hard on the back. The face is more vulnerable to anything coming off the anvil. The waist bend also minimizes the travel of the hammer, hammer speed and the power of the blow are negatively effective. The grip close to the hammer head suggests the hammer may be too heavy. The "choked" grip shortens the arc of hammer travel. and the power of the blow.

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Spring 2005

Photo 20: Do not be afraid of the the anvil. Step up close to it so you are not reaching for the work, but can strike downward with authority.

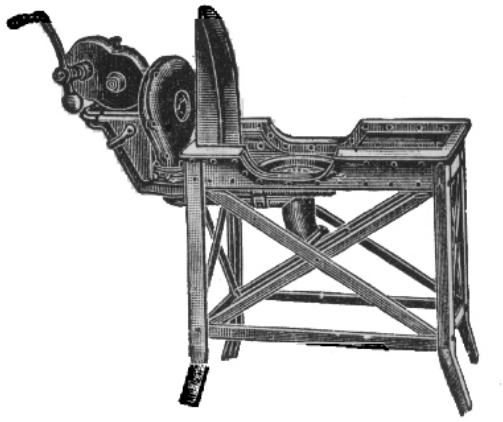

Photo 21: Perhaps not the paragon of forge technique, this smith is standing upright and is close to the anvil. He is gripping the handle near its end. He has raised his hammer out of his field of vision and is thus beginning to maximize the effect of the hammer swing.

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Please contact, Larry Brown, Editor.
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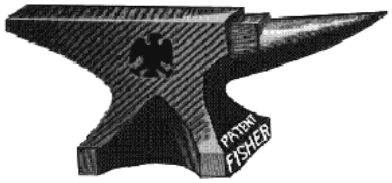

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