

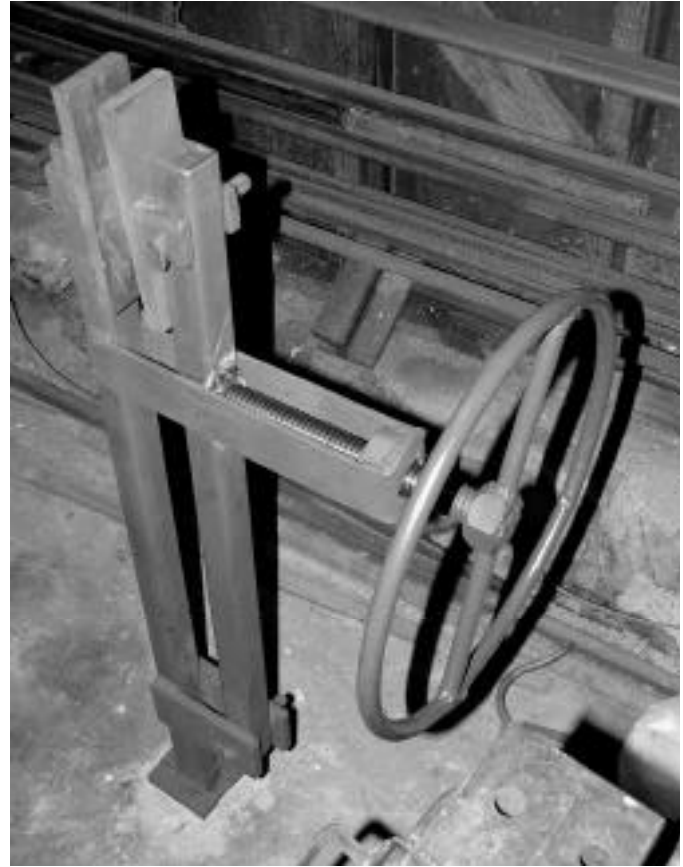
# The Vertical Vise

By Brian Gilbert

We have a number of traditional blacksmith vises at the AAC Blacksmiths club shop in Chattanooga. They are generally in great shape, and work well, but often I find myself a little frustrated while using them to hold a long bar. When upsetting the end of a bar, it's best to hold the bar vertically, but the vise jaws can't grip well this way... a deep gouge in the bar is usually the result... and they're always too high, making hammering the upset harder than it should be.

I began to think of ways around this problem, like mounting an old vise sideways and low, at about anvil height. But this seemed to be a clumsy solution, so I designed a completely new type of vise exclusively for ABANA members... well, OK, so it isn't really exclusive, anybody could build one if they wanted. But remember, you saw it in the *Hammer's Blow* first!

The main requirement for this design was simplicity. It should be easy to build with standard shop tools and over-the-counter parts. As the design evolved, it became possible to add a number of changes over the standard blacksmith's leg vise. Whether or not these changes will improve functionality will require testing a full-scale prototype, which I've built for my own shop. I'll let you know what works and what doesn't in a follow-up note in a future issue.

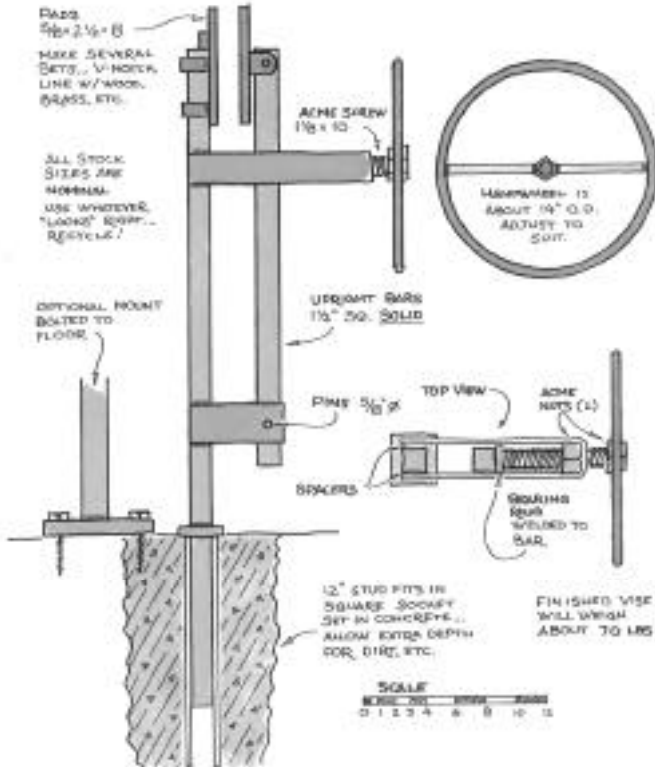


*The completed Vertical Vise*

First is the mounting. This design has a slightly smaller footprint than a standard leg vise, and it doesn't require a post for mounting. It could be made short and bolted to the floor, or it could be made longer to fit in a dedicated socket that is fabricated and cast in concrete. This way, the vise can be lifted up and moved out of the way when it isn't needed, and the socket could be used to mount other tools as well. Optionally, one could add a second socket directly under the vise jaws. Then you could lower a longer bar into the second socket for convenient forging on the end.

The second improvement is the screw. This vise uses a standard acme screw and nut, but rather than passing through the short arm of the vise, it is set up to push against it. This makes fabrication easier... no large hole to slit and drift. Since there's no hole, the short arm is a little stronger as well. And since we've moved the vise screw to the outside of the short arm, it's out of the way. Longer bars can be clamped in the center of the vise jaws, with clearance all the way to the floor.

A third improvement are the vise jaws themselves. Since this vise is built from scratch, you can make them any size or shape that you want, and from several different materials. I made one pad

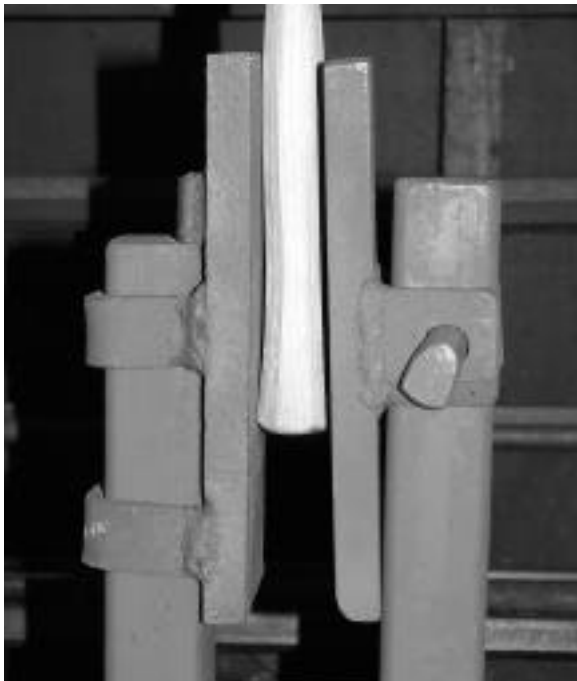


*Vise construction details*

swivel so that I get maximum contact with the work, and another pad that slips on over the top of the vise leg. No matter how wide the vise is opened, the jaws will always be parallel, provided the work being held is clamped near the center of the pad. I can change one or both of the pads depending on the work that I'm doing. For example, if I wanted to clamp a piece of 1/2" square parallel to the ground, I could replace the swiveling pad with a rigid sleeved pad.

Building the vise was a fairly straightforward fabrication. Stock was cut with a chop saw, and drilling was done on a floor-model drill press. Working 1 1/2" solid steel requires some patience. Drill pilot holes using a small diameter bit, then move up to a larger size, always using sharp bits with plenty of oil. Materials for the vise cost about fifty dollars... forty for ten feet of 1 1/2" solid square stock, and about twelve dollars for three feet of 1 1/8" acme threaded rod and two nuts. The rest was made up of bits and pieces of large scrap. A vise can develop a lot of pressure, so you'll need to use fairly large, heavy material.

The trickiest part of the whole thing was the strap assembly which houses the screw. This is simply a piece of large bar stock with a hole through it which is bent around the nut. One way to do this would be to slit and drift a hole, weld the nut to a piece of strap and then bend the strap into place, but I wanted to make the nut replaceable. This may have been a mistake, for not only did it complicate things, it resulted in the main screw being misaligned a little. I corrected this misalignment by heating the whole strap assembly in the forge, inserting the nut threaded on the rod, and adjusting the whole thing until the alignment looked right. The moral of the story here is to fabricate the strap assembly, set the screw and nut in place to check the alignment, and *then* weld it to the vise.



*A pivoting jaw grips better on compound shapes*

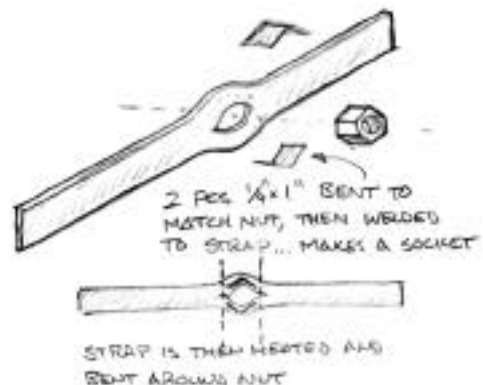


*A closeup look at the bearing ring*

This is one area of my design/assembly that's ripe for variation or improvement. Perhaps I should have scrapped the replaceable nut idea. Or maybe I should have bent the strap before I welded up the small bent pieces that cradle the sides of the nut, or maybe the strap should have been welded rather than bent. Either way, be forewarned that the tolerances in the nut area are pretty tight, and it will take some care to get this area right.

Once the nut was correctly aligned, I fabricated a set of jaws. One jaw pivots, assuring that the surfaces of the jaws get maximum surface contact on your workpiece. They can be any size or shape you want, and you could easily face a set with different materials, like aluminum, brass, or even high-density plastic or wood. Just remember to make them fairly stout, since this part of the vise should be able to take a beating.

I wanted to try something different for the handle, too. The standard sliding bar-type handle is useful, since it takes up very little space at rest. But the ball ends are constantly pinching my



*One method of building the strap*

fingers, and I've nearly taken out my kneecaps on more than one occasion. For the prototype, I've forged a ring of 5/8" round bar with a second Acme-threaded nut in the center. This can be screwed onto the threaded rod and spot-welded on the outside edge of the nut. This way, if I decide to try a different handle idea later, I can grind off the spot weld and unscrew the handle.

I mounted my vise to a socket that was set into my floor. Cutting a hole for the socket was a pain, because I have a concrete floor in my shop. It took about an hour of pounding and chipping with a wrecking bar. Fortunately, the concrete was thin and had no metal reinforcing in it. A hammer drill or other heavy equipment would be nice to have here. Of course, the problem is greatly simplified with dirt, brick, or gravel floors. There are several sizes of square tube that will give a good sliding fit around 1 1/2" solid. I just found a piece of scrap that fit well, cut it to length, and bedded it in concrete.

Once the whole thing was assembled, I did some early testing. The vise worked OK, but as the screw came under pressure, it started to wander around the bar that it presses against. I solved



*The handwheel fabrication*

that problem by welding on a small bearing ring. This might be problematic if the vise is routinely opened to its maximum, but there's enough play in the nut to accommodate a small amount of swing. If you expect you'll need a wide opening vise, then you can make the bottom pivot bar longer and drill several holes. Then the bottom pivot point could be adjusted to keep the two bars of the vise close to parallel.

I can imagine people thinking, "What about the spring? *Everyone* knows you've got to have a spring on a blacksmith's vise!" I've been using mine for a few weeks now without a spring, and it really isn't that big a deal. A traditional leaf spring would block long bars, but a coil spring could easily be set up to pull the bar back against the screw. The biggest advantage of a spring is that it would keep the screw seated in the bearing ring. One could even use a bungee cord or an inner tube underneath the screw. Naturally these would be easily damaged if the vise got hot or held a long bar that was heated in a gas forge.

After using this vise for a few weeks, I can happily report that it works pretty well. I still need to make some various pads for it, especially a wood-lined one. The wheel could be a touch smaller, about twelve inches or so. I used a 14-inch wheel because I already had that size bender, and it looked about right. Make your socket fit as tightly as possible or your vise will wobble in use.



*The separate parts before assembly*

# THE VERTICAL VISE

BY BRIAN GILBERT  
 EDITOR, THE HAMMER'S BLOW, 10/03

PADS  
 $5/8 \times 2\frac{1}{2} \times 8$

MAKE SEVERAL  
 SETS... V-NOTCH,  
 LINE W/ WOOD,  
 BRASS, ETC.

ALL STOCK  
 SIZES ARE  
 NOMINAL  
 USE WHATEVER  
 "LOOKS" RIGHT...  
 RECYCLE!

OPTIONAL MOUNT  
 BOLTED TO  
 FLOOR

ACME SCREW  
 $1\frac{1}{8} \times 10$

UPRIGHT BARS  
 $1\frac{1}{2}$ " SQ. SOLID

PINS  $5/8$ "  $\phi$

SPACERS

TOP VIEW

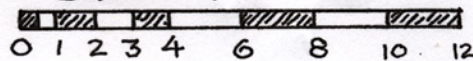
ACME  
 NUTS (2)

BEARING  
 RING  
 WELDED TO  
 BAR

12" STUD FITS IN  
 SQUARE SOCKET  
 SET IN CONCRETE...  
 ALLOW EXTRA DEPTH  
 FOR DIRT, ETC.

FINISHED VISE  
 WILL WEIGH  
 ABOUT 70 LBS

SCALE  $3/16$ " = 1"



10/27/03

Brian Gilbert

