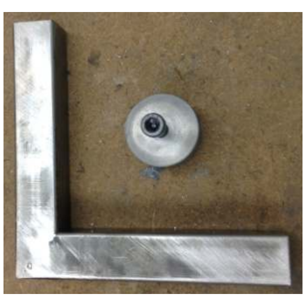
# Miter Attachment for a Horizontal/Vertical Bandsaw, version 1.0

## By R. G. Sparber



My 4 x 6 Horizontal/Vertical Bandsaw can cut +45° by simply pivoting the fixed jaw. But to cut -45° requires the part to be flipped over. This is not always practical due to the length of the material or if it will not lay flat.

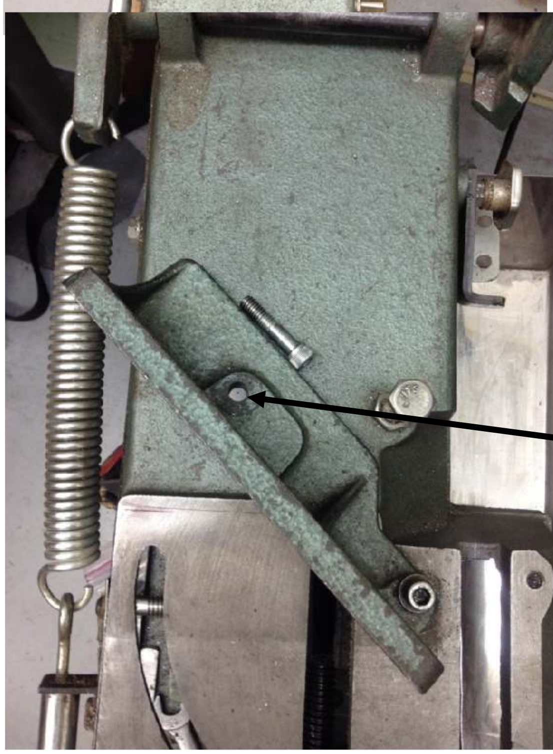
One solution is to build an attachment that permits both + and - 45° cuts with no change in saw set up or flipping of the workpiece. The picture on the left shows a -45° cut while the facing picture is +45°.



The attachment consists of two parts. One is a right angle fixture made of 16 gage 1" square tubing. The corner has been mitered, welded, and ground flat. The other part is a 1 ¼" diameter cylinder drilled to accept the hold down bolt.

You can see a video at
https://www.youtube.com/watch?v=NuCguyzV3b4&list=UUQowQlSfFxybveyBDVOHXxw

Most of the time my saw is set up to cut at 0°.



In preparation for installing the attachment, the fixed jaw is swung to -45°. This requires me to remove the bolt that moves in the curved slot plus the nut that engages this slot from the underside.

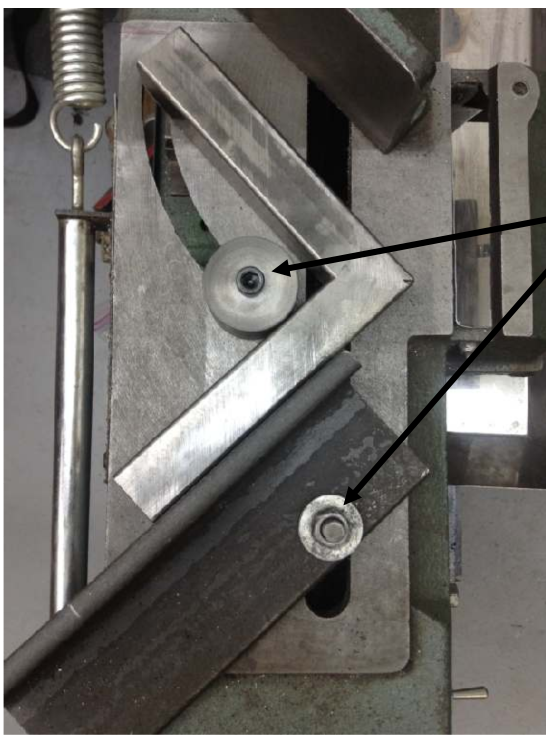
I drilled a hole through the base so the shoulder bolt drops in as a pin to prevent rotation. When not in use, I store my T handle hex drive here.

A key thing to remember is that the vise only needs to hold the workpiece tight enough for sawing, not milling. So much less force is needed.

Here you see the nut,

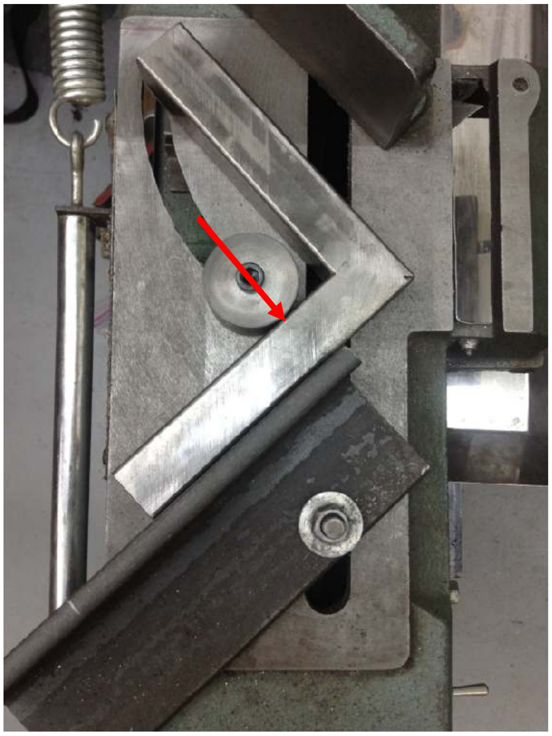
the pivot,

and the fixture.

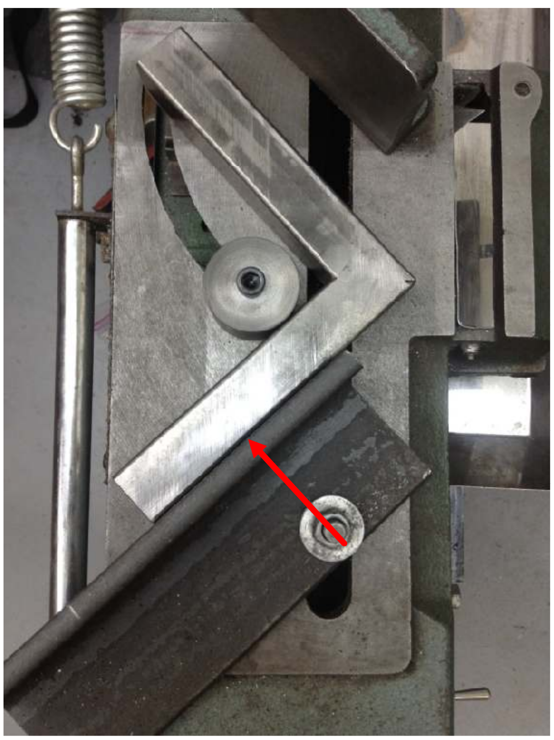


The nut is now under the base, the pivot is above it, and the bolt locks them together. The fixture rests on the pivot.

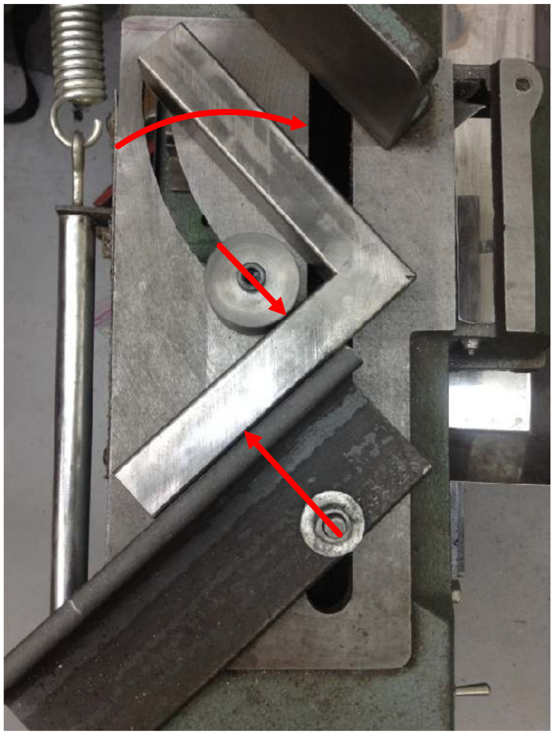
It turns out that the relative position of the pivot and the movable jaw bolt is important.



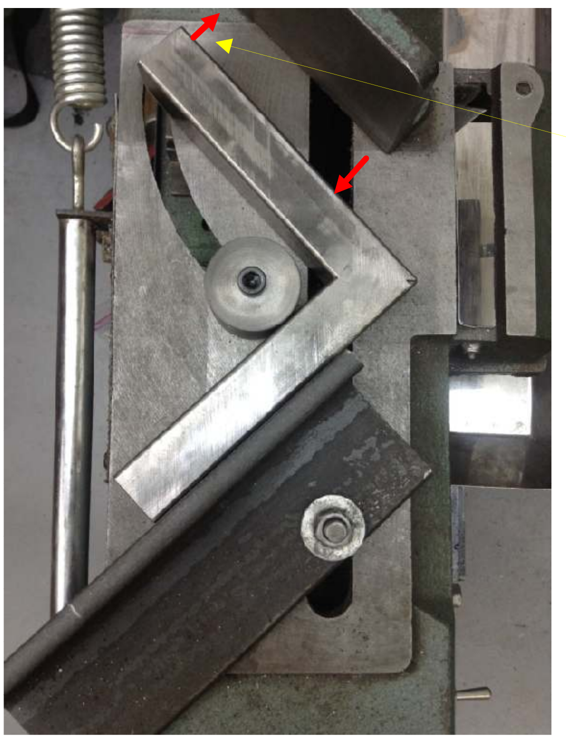
The first thing to understand is that when the cylinder presses on the fixture, the force will always be perpendicular to the surface of the bar and passing through the center. By using a cylinder, I get a smooth transition of this force vector as the fixture moves.



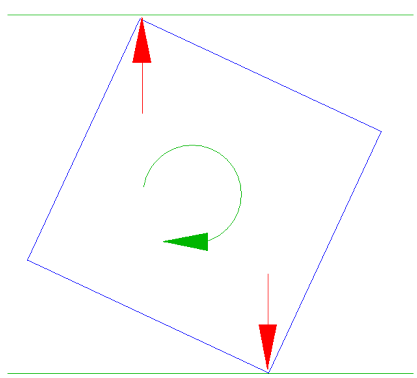
The force vector from the movable jaw turns out to be the same as for a cylinder. The vector passes through the pivot bolt. However, unlike the cylinder, there is a wide surface so friction to hold the workpiece is larger.



Looking at both vectors at the same time, we see that they do not line up. This causes the fixture to rotate clockwise as the movable jaw is tightened.

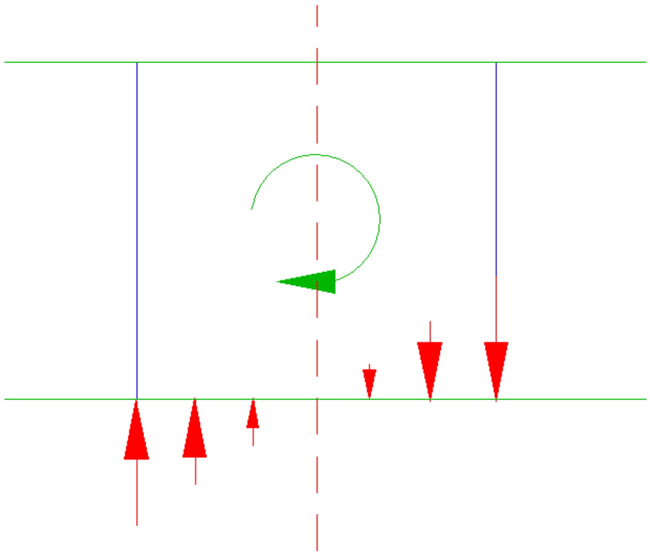


The end of the fixture will move towards the fixed jaw while closer to the 90° corner, the fixture moves away. This does not produce a usable clamping force.



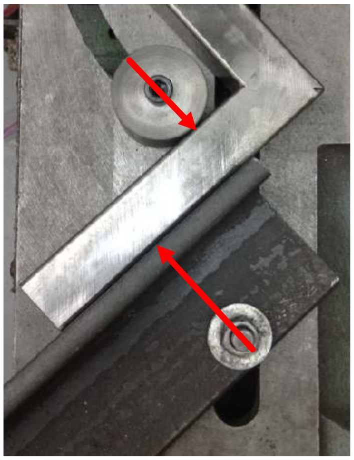
This might be clearer if you consider a square plate. Flanking the plate are two fixed walls shown as green lines. As I rotate the plate, the corners will move until they hit the walls. At this point, all of the turning force is concentrated at the two contact points shown as red arrows. No useful clamping force here.

The solution took me a while to see. If the workpiece, fixed jaw, fixture, and movable jaw are all in contact before I tighten the movable jaw, there is no rotation. No space exists to rotate. So instead, the rotational force causes a variation in clamping force but no gap.

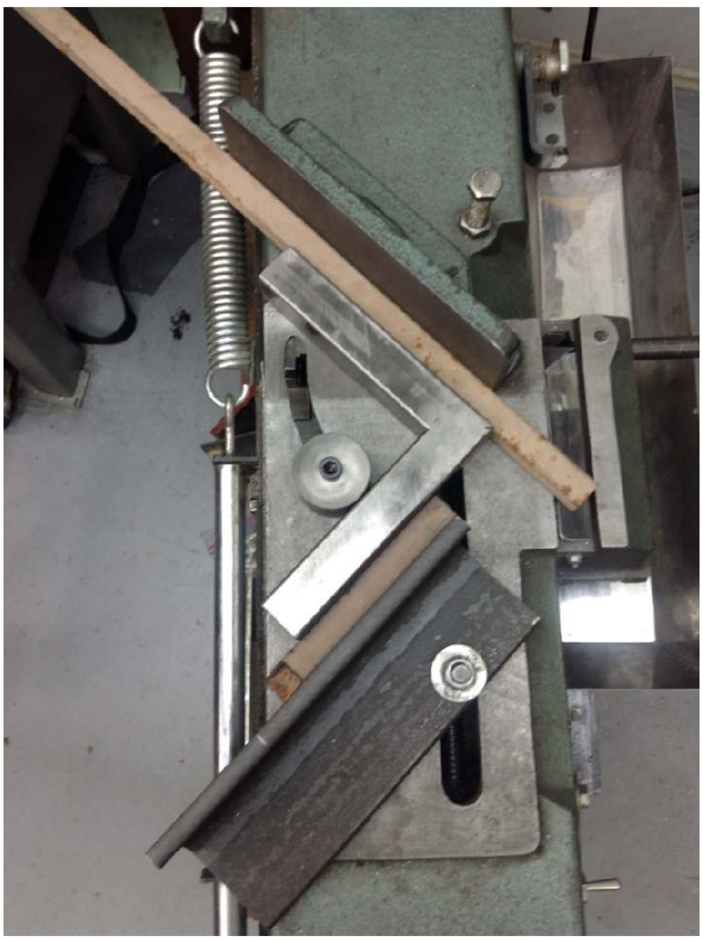


Consider our plate with a rotational force again in the center. This time the plate is sandwiched between the two walls, shown as green horizontal lines.

Note that the forces to the right of the red dashed center line all push against the lower wall. Those to the left of the center line push against the bottom of the plate. The amount of force varies from a maximum at a corner and zero at the centerline. Our clamping force is spread across the surface and not concentrated at one point.



Remember that misalignment of force vectors? The larger this misalignment, the larger the twisting force. This actually helps us. If the vectors lined up, there is no tendency to rotate and no clamping force would exist between the fixture, workpiece, and fixed jaw.



As shown here, I have first used my fingers to press the fixture against the workpiece, fixed jaw, pivot, and movable jaw. A piece of scrap is located between fixture and movable jaw. Its value will become evident soon.

As I tighten the movable jaw, the fixture wants to rotate but can't. So pressure is applied along the workpiece. This pressure is sufficient to hold the bar during the cut.

The saw cuts through the workpiece with no shifting.

With insufficient offset of the pivot and movable jaw bolt, the workpiece did shift.

After the cut is made, the movable jaw is loosened slightly. By swapping the workpiece with the scrap, minimal movement of the movable jaw is needed.

Note that the fixture must extend beyond the fixed jaw so the stock can get to the saw blade.

The fixture, scrap, fixed jaw, workpiece, and movable jaw are again pressed together with my fingers and then the movable jaw is tightened.

The +45° cut commences.

Here is the final piece cut at both + and -45°.

## Acknowledgments

Thanks to John Herrmann for helping me think this all through. Thanks to Dr. Tim Frank of South Mountain Community College, Phoenix, AZ for helping me with the force vectors.

I welcome your comments and questions.

If you wish to be contacted each time I publish an article, email me with just "Article Alias" in the subject line.

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