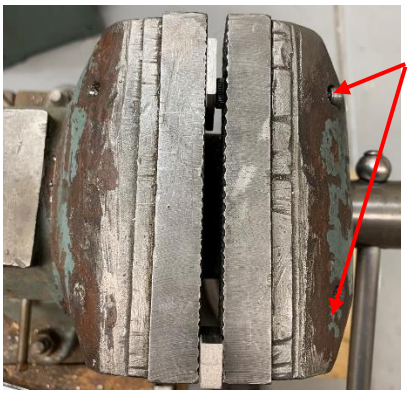
A Drop-In Bench Vise Jaw Jack, Version 1.3

By R. G. Sparber

Recently, I had to take pity on my good friend Gregg.

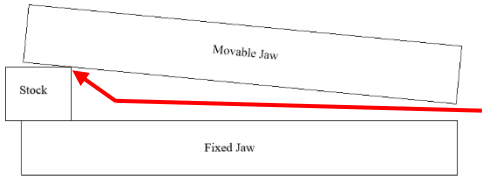


While my beat-up old Enco bench vise has through holes to secure the jaw inserts,

his high quality and well cared for bench vise does not. Clearly, any drilling of his magnificent vise in order to install a jaw jack[2] would be ill-advised.

Of course, my mind wandered off to find a solution while I went about my chores without it. Upon waking this morning, an answer was waiting for me.

The goal is to have variable thickness packing for the vise jaws. The stock is lightly clamped on one end of the vise and the packing, adjusted to be the same thickness, drops in at the other end of the vise. As the vise jaws are tightened, they remain parallel because the movable jaw is supported at both ends.

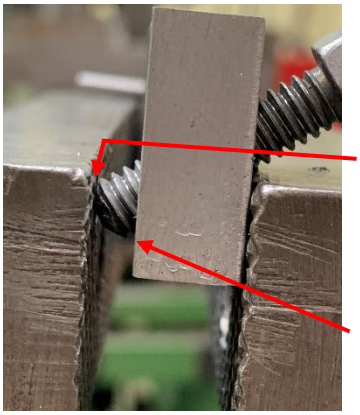


Without the packing, the movable jaw will tilt relative to the fixed jaw and the clamping action will be along one vertical line rather than across the face of the stock. The part can easily slip regardless of how much force is applied by the jaws.

---

[1] This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/ or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

[2] See https://rick.sparber.org/BenchViseJawJack.pdf.



My variable thickness packing consists of a block with a screw through it. There are a few subtle design elements:

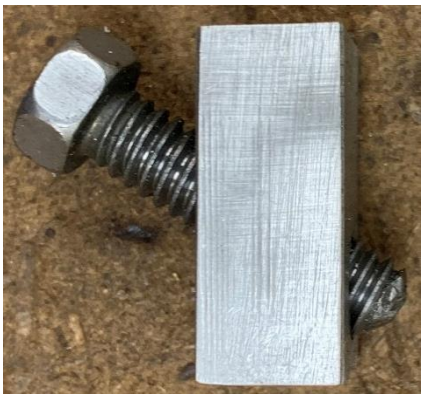
The end of the screw is beveled so it is approximately parallel to the jaw. This both improves stability and protects the threads from damage.

Secondly, the screw must not be advanced beyond the point where the lower side of the screw is supported by the block. As long as the screw's end is touching the face of the block, the clamping force will be transmitted through the screw and into the block. If the screw has any overhang, this force will tend to bend the screw plus the packing won't be as solid.

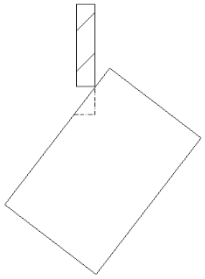
The block must be thick enough to contain 3 full threads. Interestingly, since the screw and block are in compression at all times, there is no chance of bending the block.

This is a proof of concept so I used an aluminum block and a ¼-20 bolt. The bevel on the bolt was formed freehand on my belt sander.

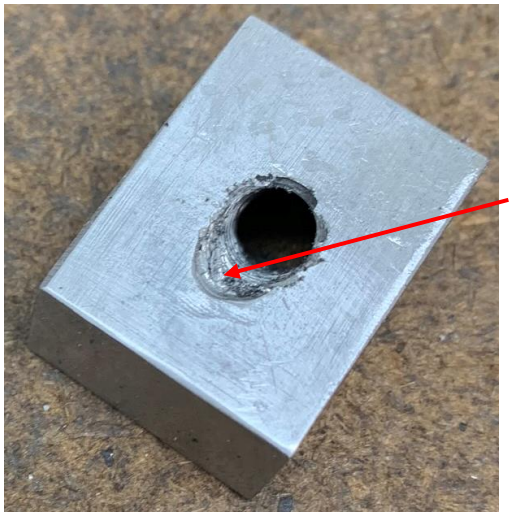
The finished tool will be made of cold-rolled steel and a 3/8-16 bolt. I will cut the bevel on my lathe. A Socket Head Cap Screw would probably give me a nicer knob to turn as I adjusted the packings thickness. Since force is only applied after the thickness is set, there is no need to put a wrench on the bolt.



Drilling that diagonal hole was a little tricky on my drill press.

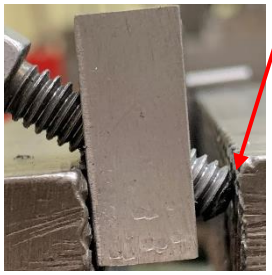


If done on my mill, I would have first used an end mill to cut a flat surface on the tilted block. Then running the drill would not have been done on a sloped surface.

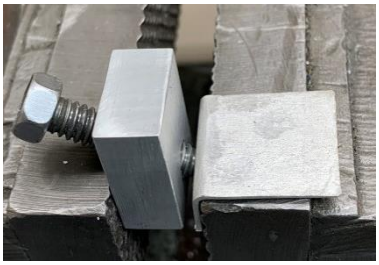


On my drill press, I first drilled down about 1/8 inch with my #4 with the block flat on the table. Then I tilted the block and drilled through with the same drill. This reduced side movement but did not eliminate it. You can see how the hole was a little buggered up. Not pretty but certainly functional.

I used a #4 drill rather than the traditional #7 for my ¼-20 tap hole. It gives me 55% thread engagement which is plenty strong plus is far easier to tap.

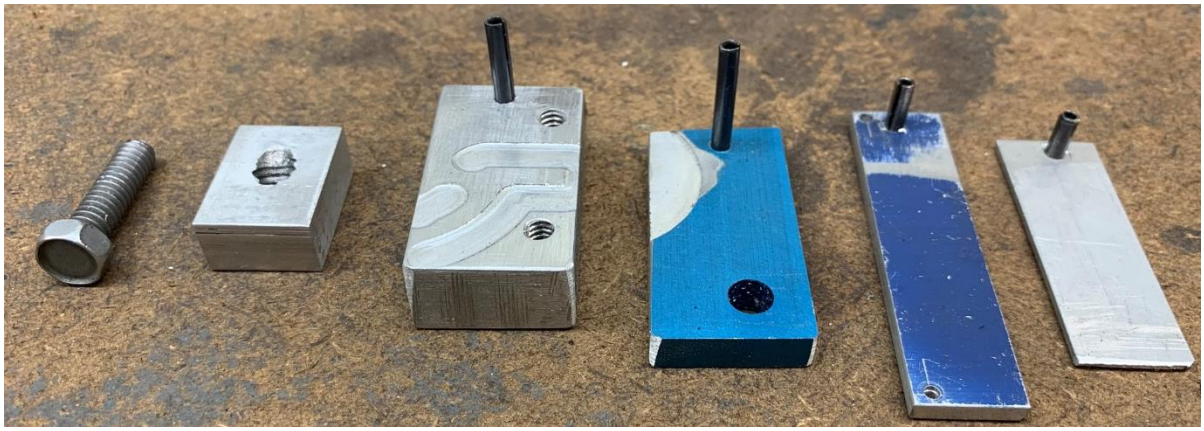


After gaining some experience with this tool, I realized that the bevel on the end of the screw was being chewed up by the sharp and hardened surface of the fixed jaw.



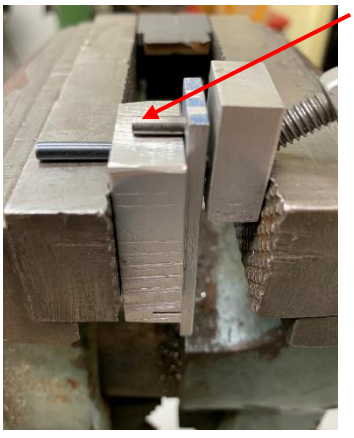
This was easily solved by dropping in a thin piece of aluminum bent into an “el”. Now the bevel turns in a depression lined with soft aluminum.

After posting this article on homemadetools.net, two readers[3], “madokie” and Marv, proposed using stacks of disks to form the needed variable thickness packing. This works well for getting close to the needed thickness and may be sufficient in some applications. The problem is that some tilting will occur unless the needed thickness is exactly equal to a given number of disks. On average, the resulting error will be ½ the thickness of a disk, assuming all disks are of the same thickness. It also can take a lot of disks. Assume a disk is 0.05 inches thick and have a 1.4 inches gap. I



will need 28 disks.

An alternate approach is to use binary weighted packing blocks: 0.5 inches, 0.25 inches, 0.125 inches, and 0.063 inches. The jack has a range of 0.375 to about 0.5 inches. So this set of 4 blocks plus the jack can be adjusted to any thickness from 0.375 inches up to about 1.4 inches.



The roll pins are a quick and dirty way to reduce the chance of a block dropping down through the jaws before being tightened. If I change to steel blocks and put a magnet in each one, it should be easier to manage.

I set up this stack by first lightly clamping the stock which can be seen in the distance. Then I placed the jack which clearly did not enough thickness. Next the 0.5 inch block went in and fit with plenty of extra room so it stayed. I tried the 0.25 inch block next and it did not fit so was put aside. Then I tried the 0.125 inch block and it fit so stayed. The 0.063 inch block did not fit so was put aside. I then turned the screw on the jack until it was snug. After tightening the vise, the stack was solidly held and the jaws were parallel.

[3] https://www.homemadetools.net/forum/drop-bench-vise-jaw-jack-77976

As I was rummaging around in my steel scrap drawer, I came upon a box of left over lock parts. Each is about 0.1 inches thick. They just scream to be bolted together in the fashion described by madokie and Marv.

With the hole in one end of each strip, the bars tend to just flop down.

I found it easy to place my jack on the movable jaw and drag the stack of spacers into the remaining space. Those spacers that fit the void flopped in while the rest stacked up on top of the fixed jaw. So while this arrangement contains more parts, it is much easier to use.

The next evolution of the design was to integrate the jack into the stack of spacers. This was done by adding a ½ inch by ½ inch bar to the stack. The bar contains the angled screw so I now have one assembly. The bar was also drilled and tapped ¼-20 to accept the long bolt. In this way, the spacers are secured without having to contend with the bolt head interfering with the angled bolt.

Since this is starting to look like a finished tool, I spent the effort to put the angled screw on my lathe and cut a proper 45° bevel.

Acknowledgments

Thanks to Gregg Kricorissian for the great problem to solve. Thanks to “madokie” and Marv of Homemadetools.net for their alternate solutions. All of us are truly smarter than any one of us.

I welcome your comments and questions.

If you wish to be contacted each time I publish an article, email me with just "Subscribe" in the subject line. If you are on this list and have had enough, email me "Unsubscribe" in the subject line.

Rick Sparber
Rgsparber.ha@gmail.com
Rick.Sparber.org