

# What to do with 1-2-3 Blocks, version 2.1

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**Edited By R. G. Sparber**

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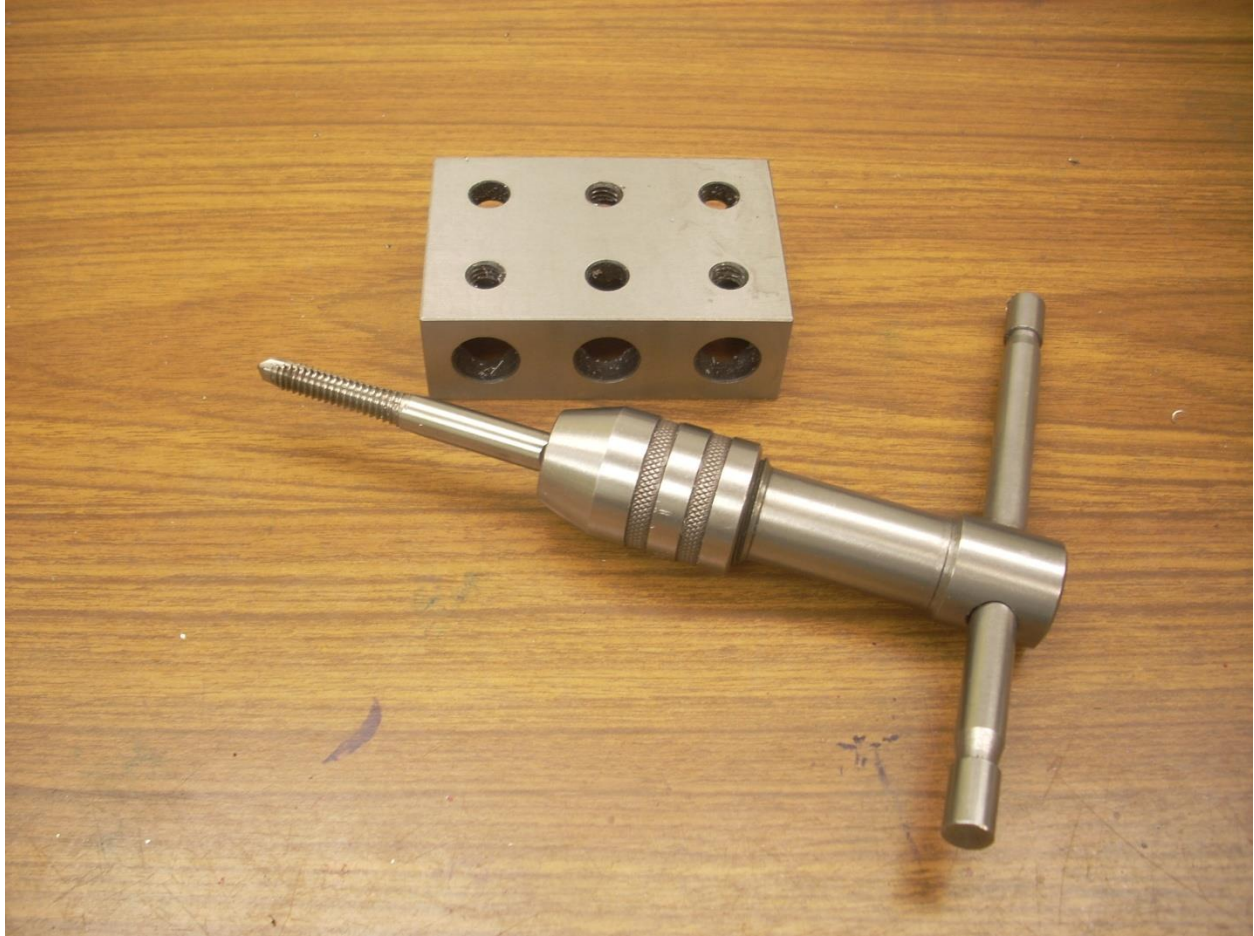


I own a set of SPI 1-2-3 blocks. When I first started this hobby, these blocks were one of many mysteries. I would see them in the catalog and wonder what they were for. Over time, I learned that they are used in a dizzying number of ways. Here are a few I have collected from people on various Yahoo groups.

If you are in the market for these blocks, be sure they have been made correctly. There should be some holes that are tapped, some that easily pass the bolt with the thread size, and some holes that can pass the head of a socket head cap screw (SHCS) with this thread size. The reason for this configuration will become evident later.

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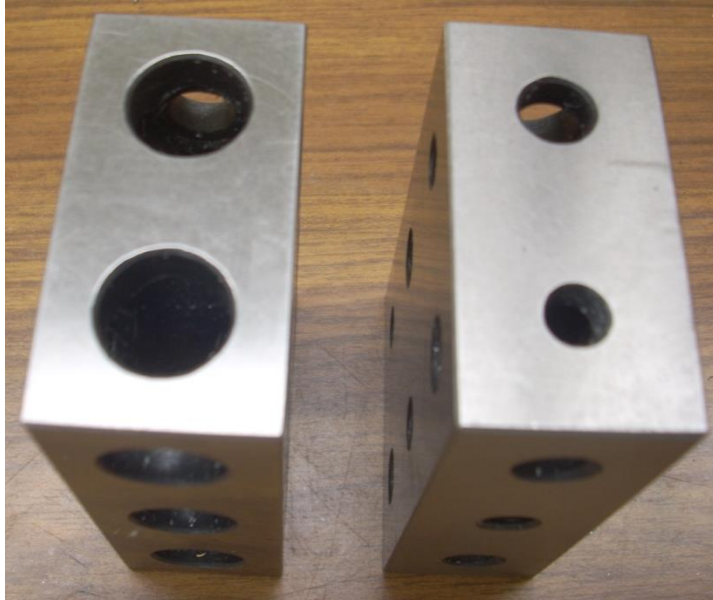
The blocks should be hardened and ground. Yet I found that the threads were full of crud. Only after carefully running my 5/16-18 tap through each tapped was I able to get bolts in.



The upper left, bottom middle, and upper right holes are tapped. The rest on this face are large clearance holes.



On the back side, all holes are large enough to pass the SHCS heads.

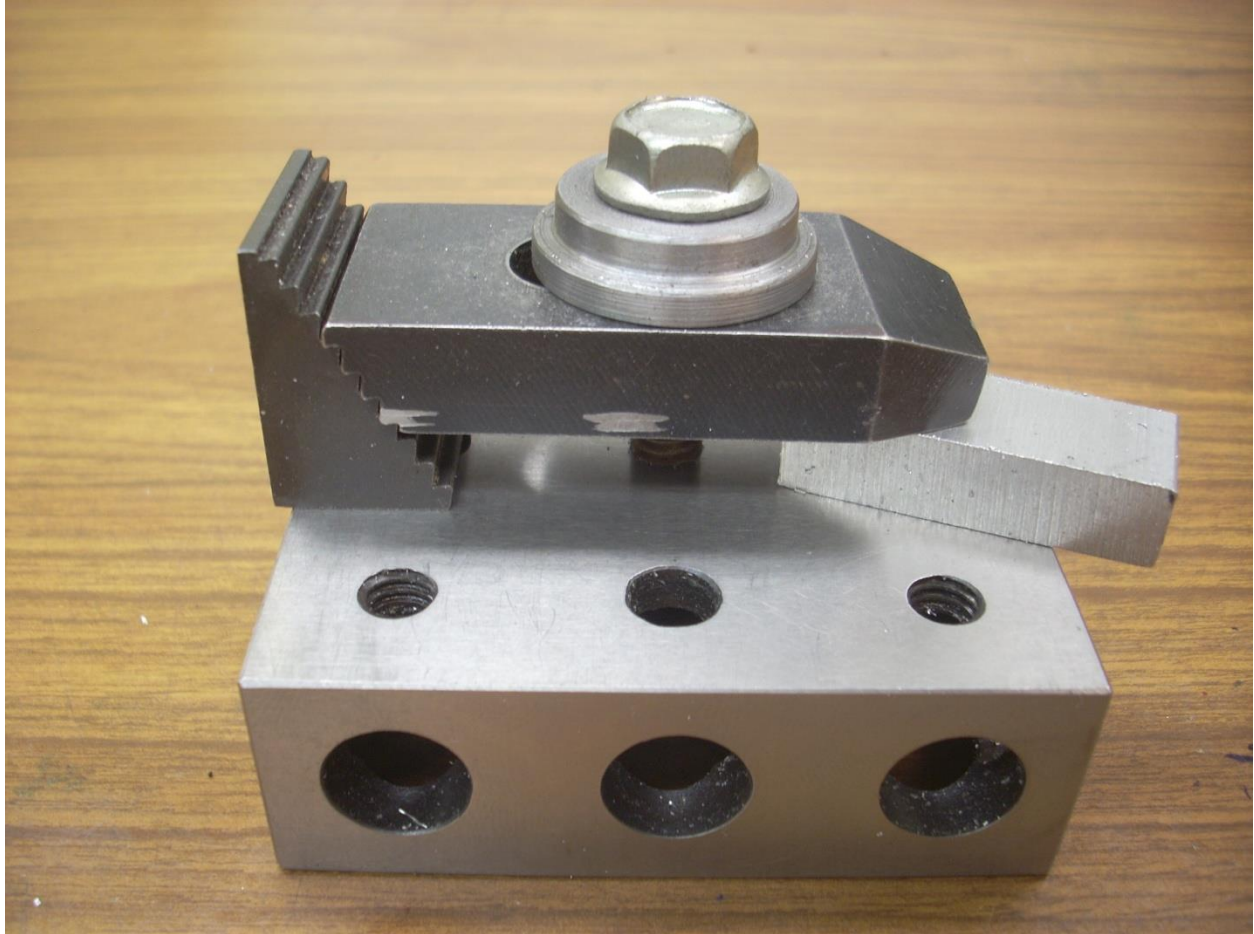


One end has large holes to pass the bolt heads, while the other has one clearance hole and one tapped hole.



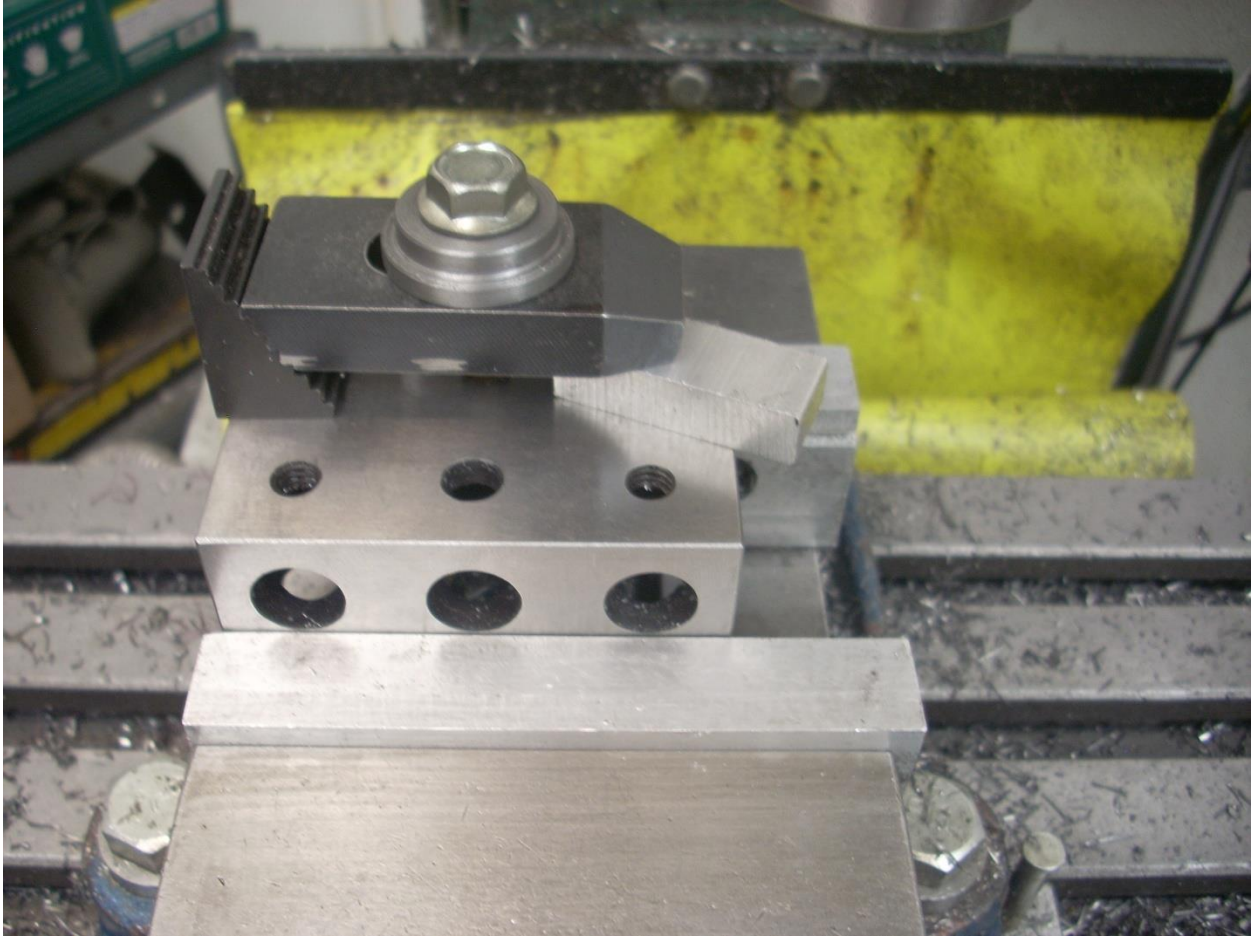
Similarly, one edge is all large holes to pass the bolt heads, while the other edge has clearance holes top and bottom with a threaded hole in the middle.

I'm sure many more patterns are just as good. However, blocks with all holes the same are not good. Neither is having holes only large enough to pass the tap used to cut the treads in the opposite face of the block.

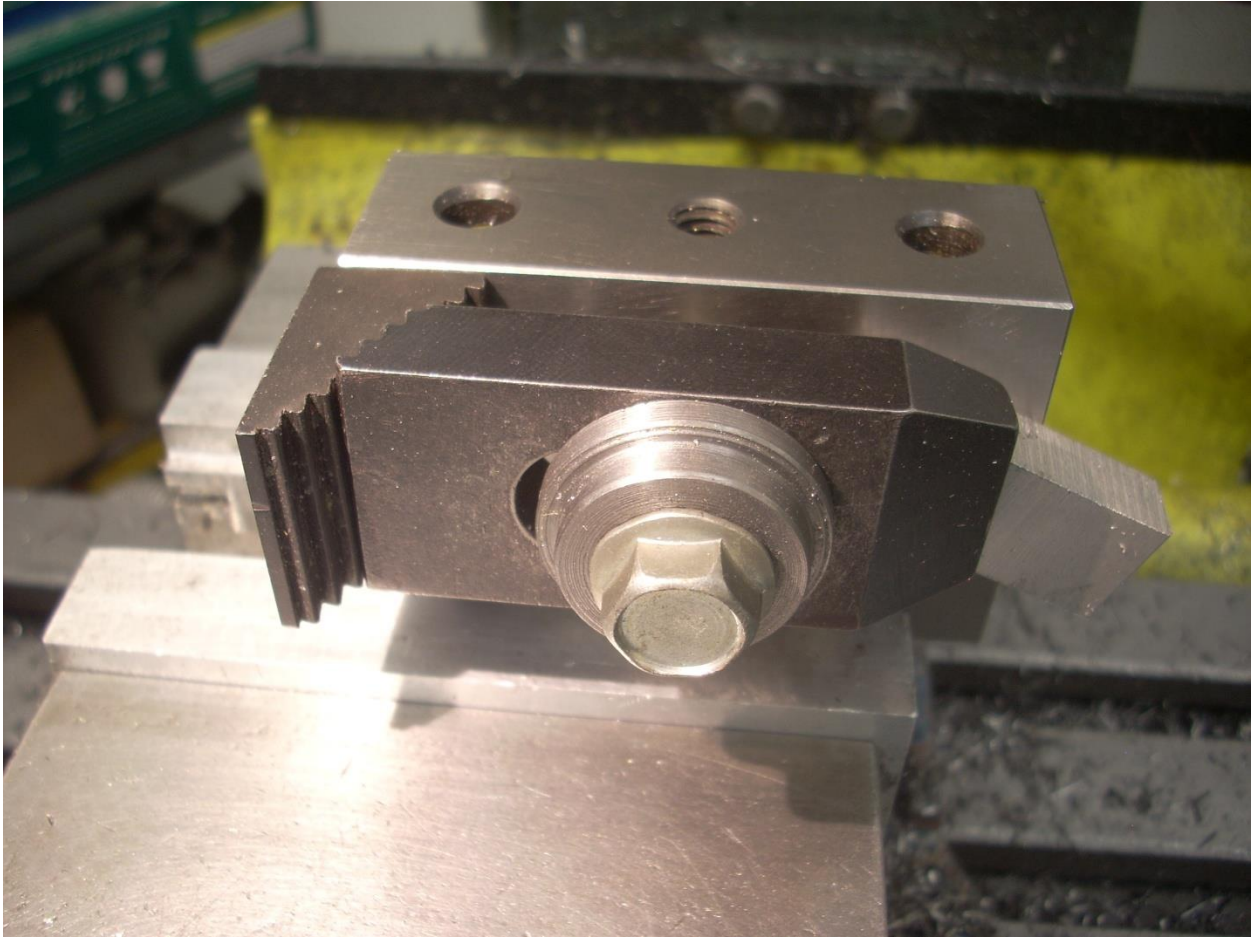


I have borrowed a clamping strap and step block from my mill's clamping set. The clamping set uses a 3/8" threaded rod rather than the 5/16" of the block. The solution was to add a thick washer under the head of the bolt. I was then able to clamp a small block of metal down securely.

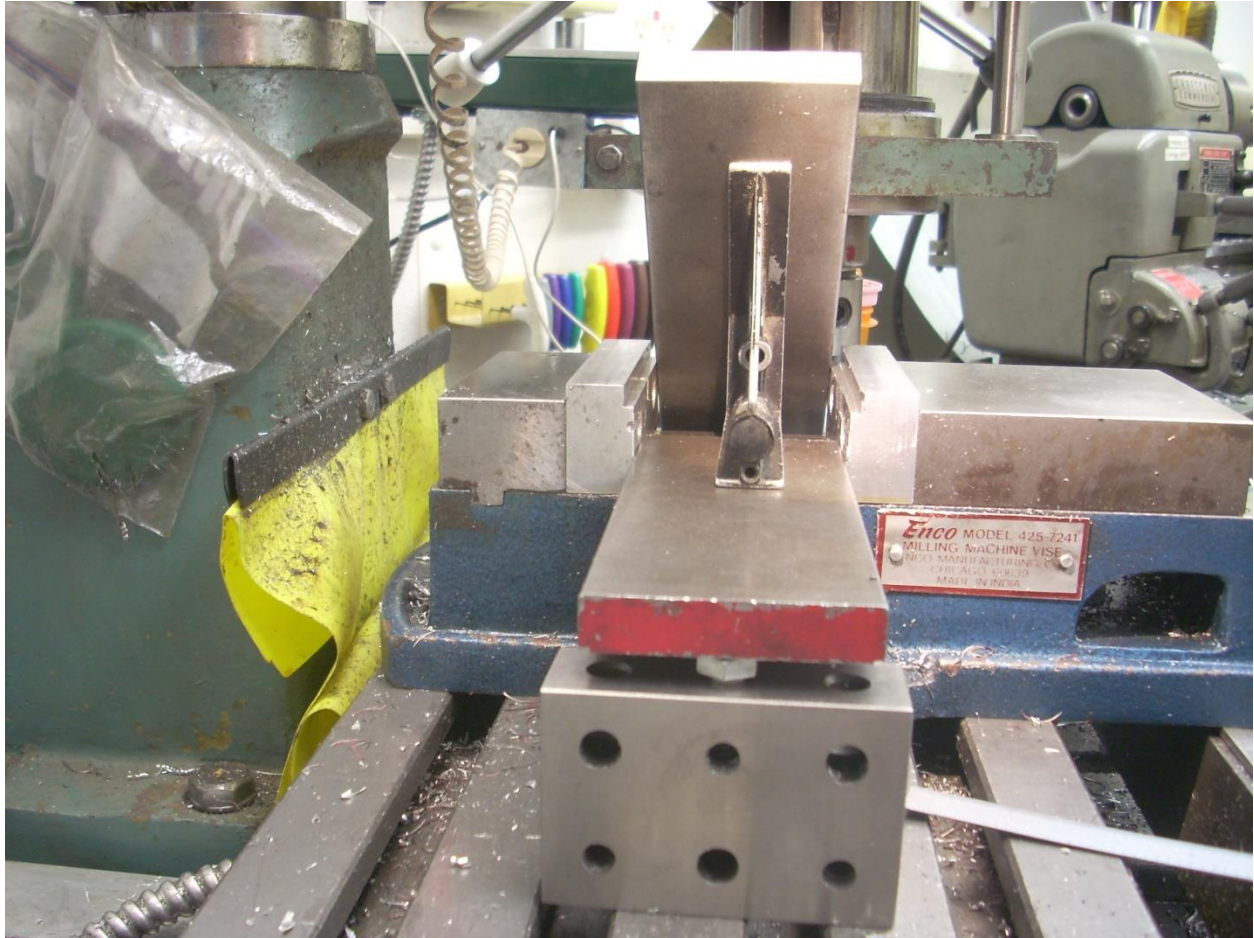
Do not get crazy with this arrangement. If over-tightened, the block might bend, or the threaded hole strips out.



I could then clamp the 1-2-3 block into my mill vise and do light milling or drilling on the block. If the block were removed and replaced, the workpiece would remain in the same position.

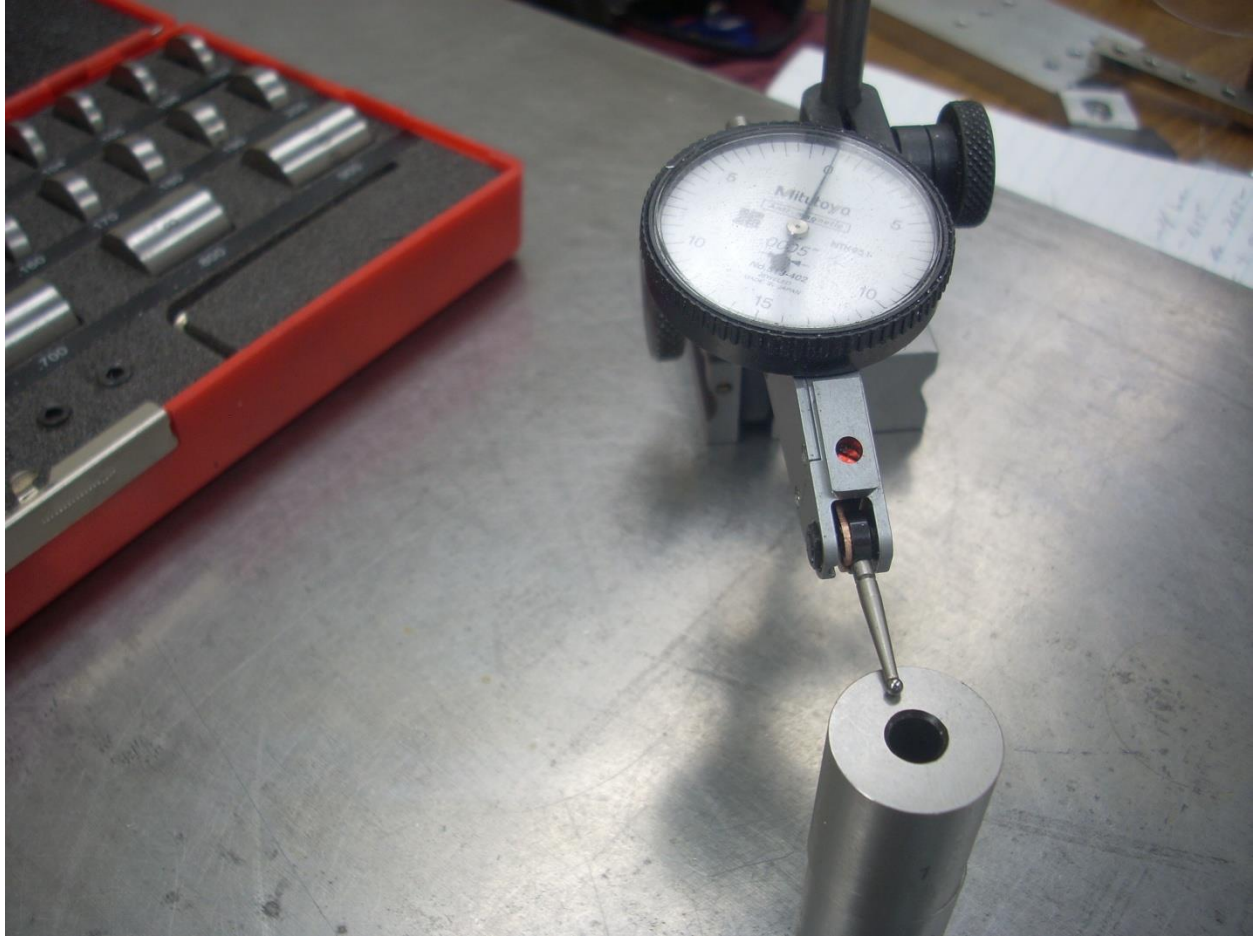


I could then remove the block, turn it on edge, and clamp it back into the mill vise. Although the workpiece is at an odd angle, I could rotate it precisely  $90^\circ$ .

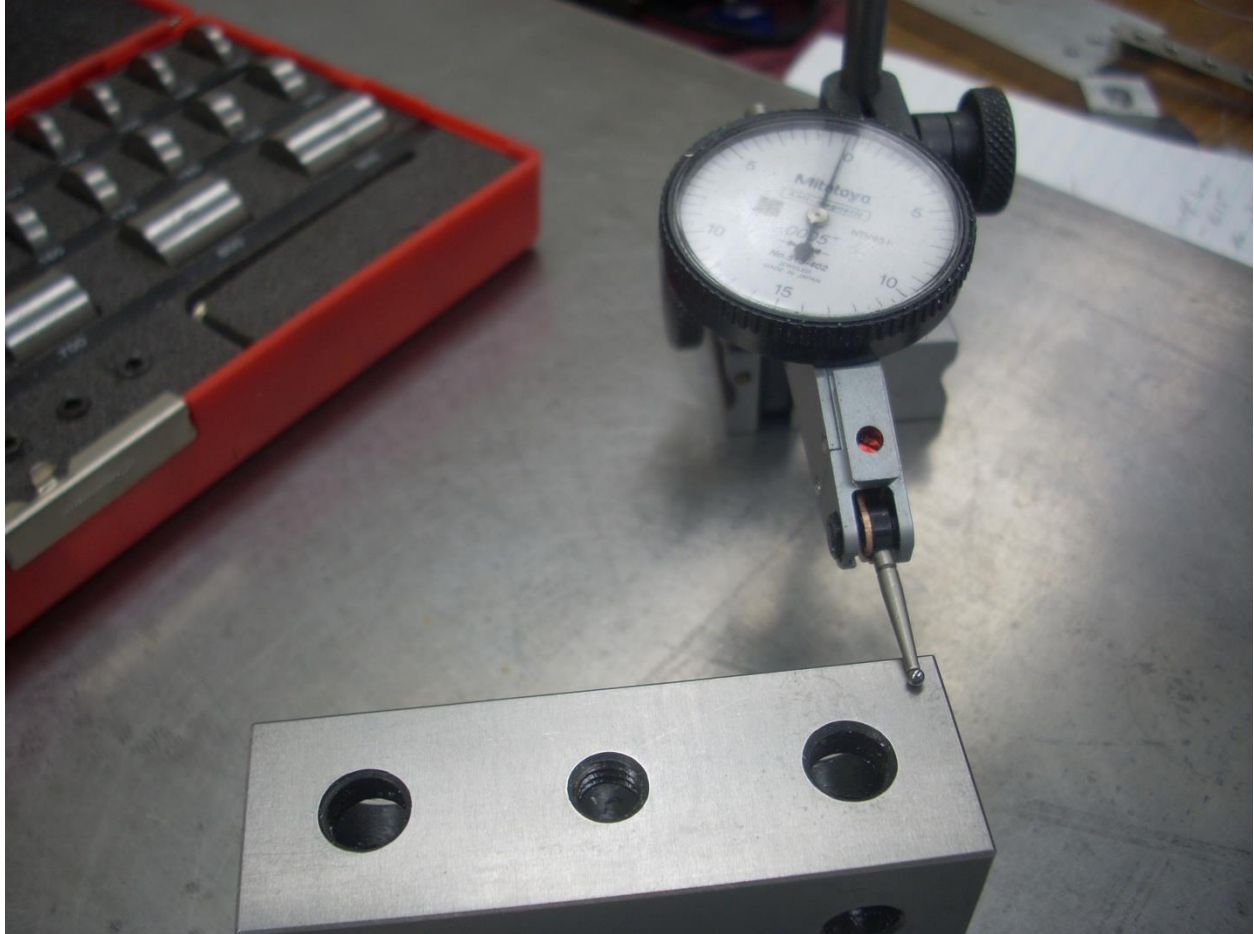


Here you see a 1-2-3 block with a bolt screwed into a top edge hole. It acts as a jack which is shorter than my store-bought jack.





I can use the blocks as secondary references if I know their exact size. To do this, I started by setting a height of 2.000" using my spacer blocks and Dial Test Indicator. Note that the DTI has been set to zero.



I then put my first 1-2-3 block under the finger and saw that it was about 0.0004" under. Moving the block under the finger for the length of the block showed a variation of less than 0.0001".

Similarly, I tested the 1" thickness and found the same error. The 3" dimension was off by about 0.0008".

Of prime importance here is not that the dimensions are perfect but that the distance between faces is uniform.



Say I have a block resting on a surface.



If I put my 1-2-3 block under it, I raise it by almost exactly 1". I can also raise it by 2" or 3". This can be very handy when doing layout work.

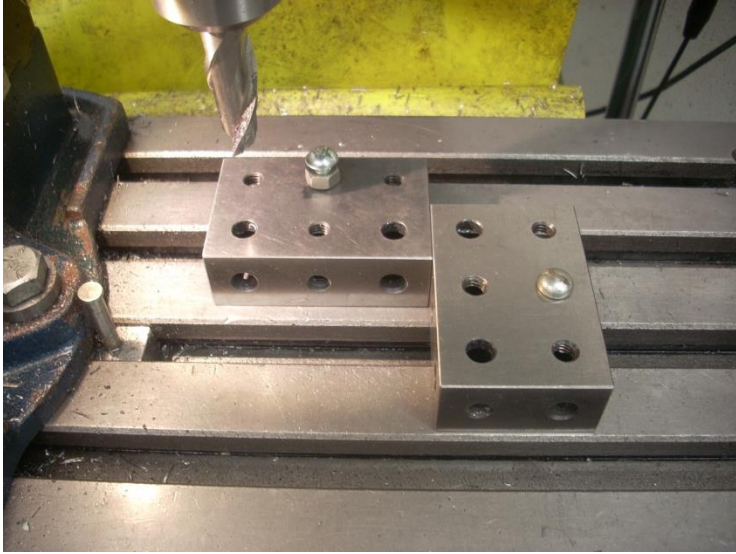


I can use this same trick on my mill table. The end mill can be used to cut a reference surface.

Clamps have been omitted in these pictures for clarity.

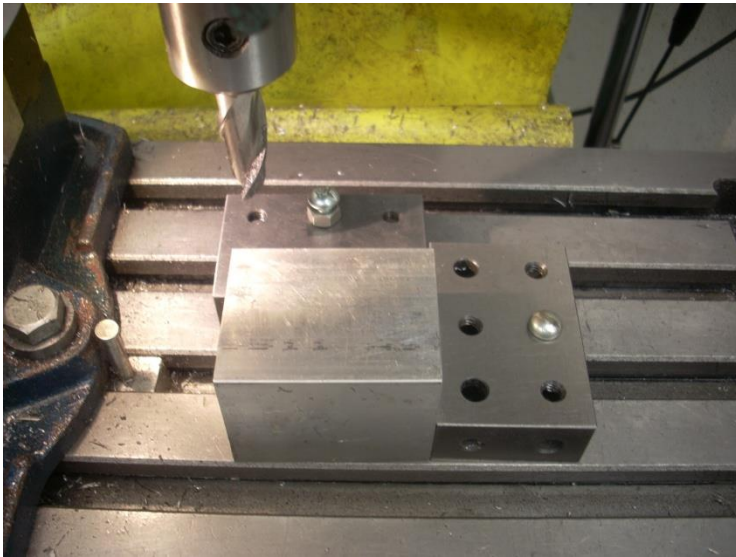


Then, without disturbing the Z axis, I can raise the workpiece up on a 1-2-3 block to cut a surface 1" below the surface. Similarly, we can get 2" or 3" below the surface. This can speed up machining if doing a production lot.



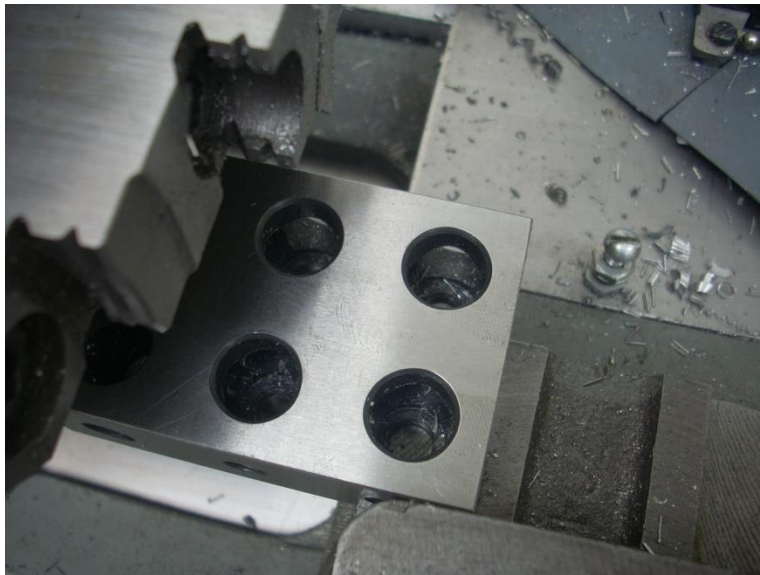
If two blocks are bolted down on the mill table, I can get precision alignment of the workpiece.

Clamps have been omitted in the picture for clarity.

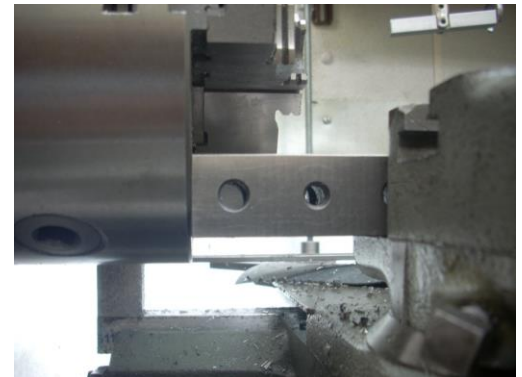




Moving over to the lathe, we can use a 1-2-3 block to align the compound to the face of the 3-jaw chuck.



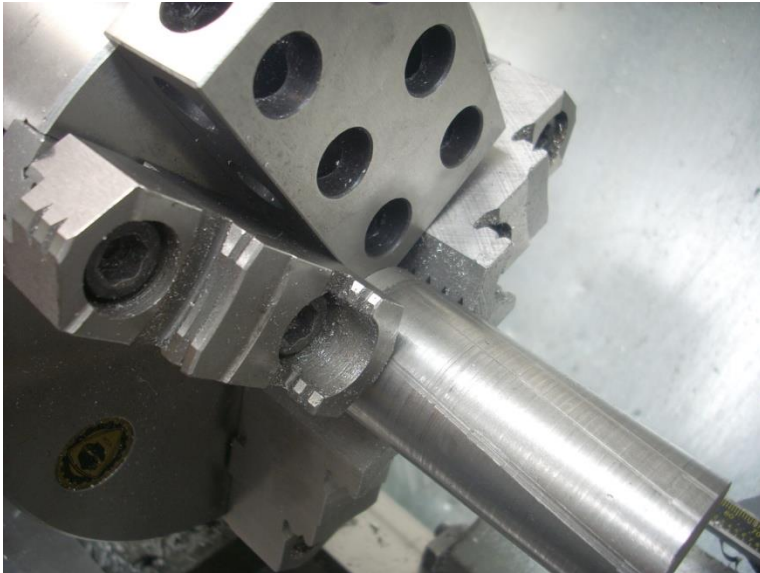
This is a top view. The compound's ways are on the right, and the 3-jaw chuck's face is on the left.



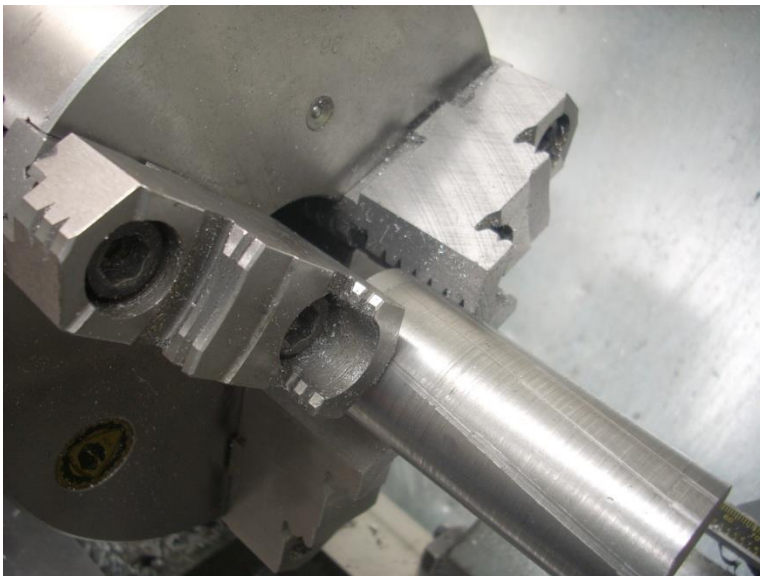
This is a front view. The 3-jaw chuck's face is on the left.

Also, we have

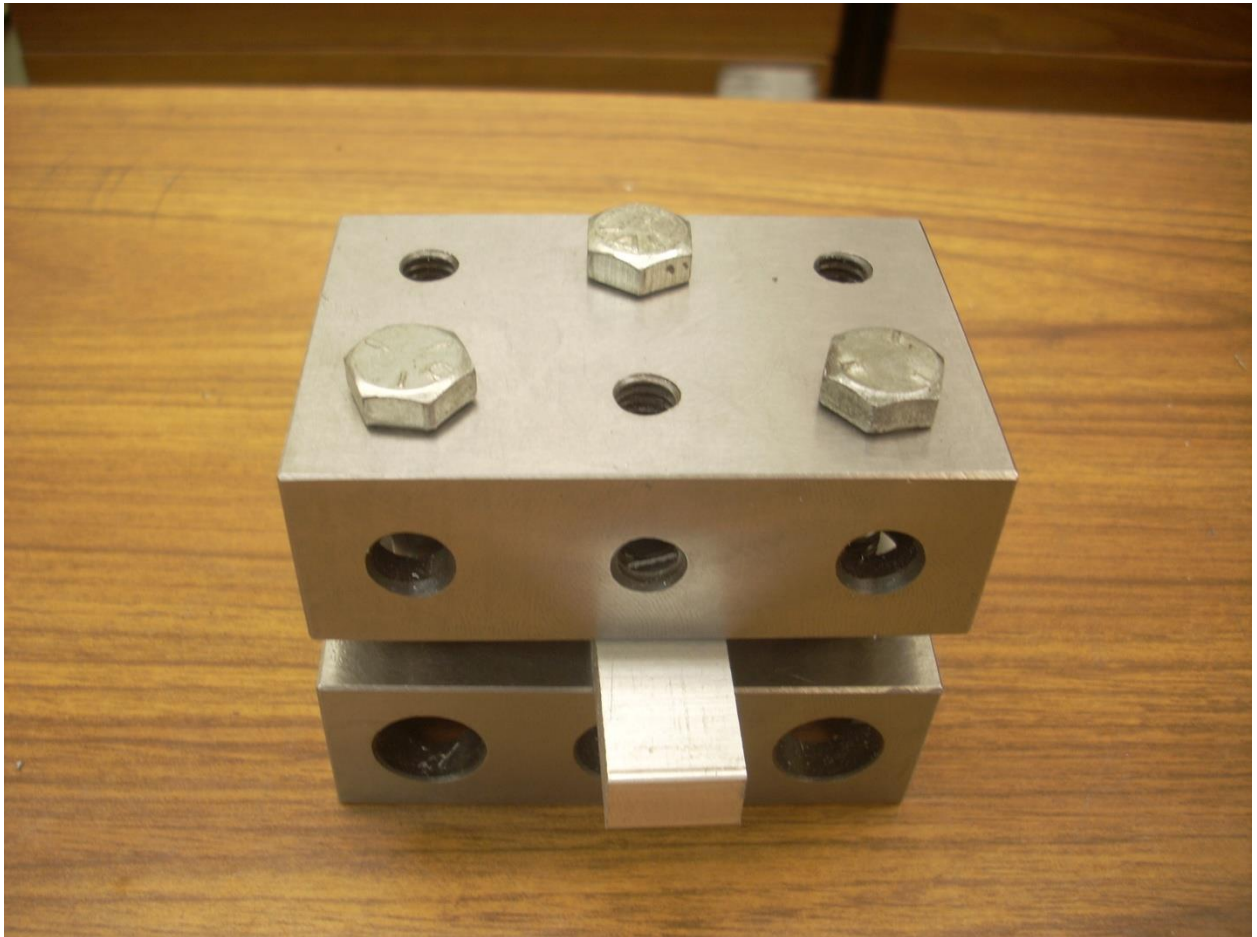
- use a 1-2-3 block to square a QC tool post to the compound slide on a lathe by holding it tight against both surfaces when tightening down the tool post.
- use it to square the compound to the chuck by running the cross slide across then bringing it up to the chuck. Out of square is visible when bringing them together.
- use them under machine jacks that are too short



Here I'm using a 1-2-3 block to set the distance from the 3 jaw chuck's face to the bottom of the workpiece.

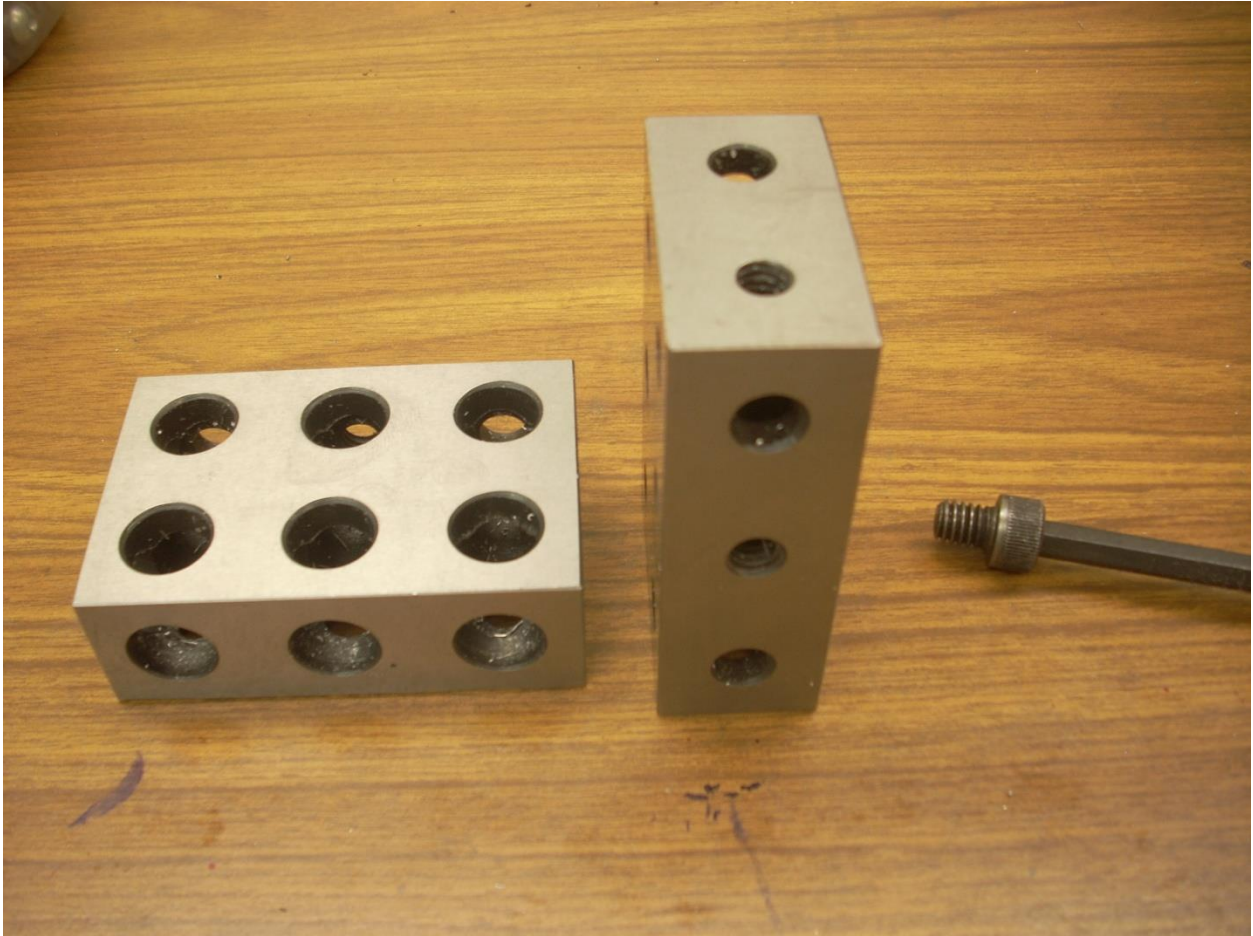


Once the jaws are tight, the block is removed.

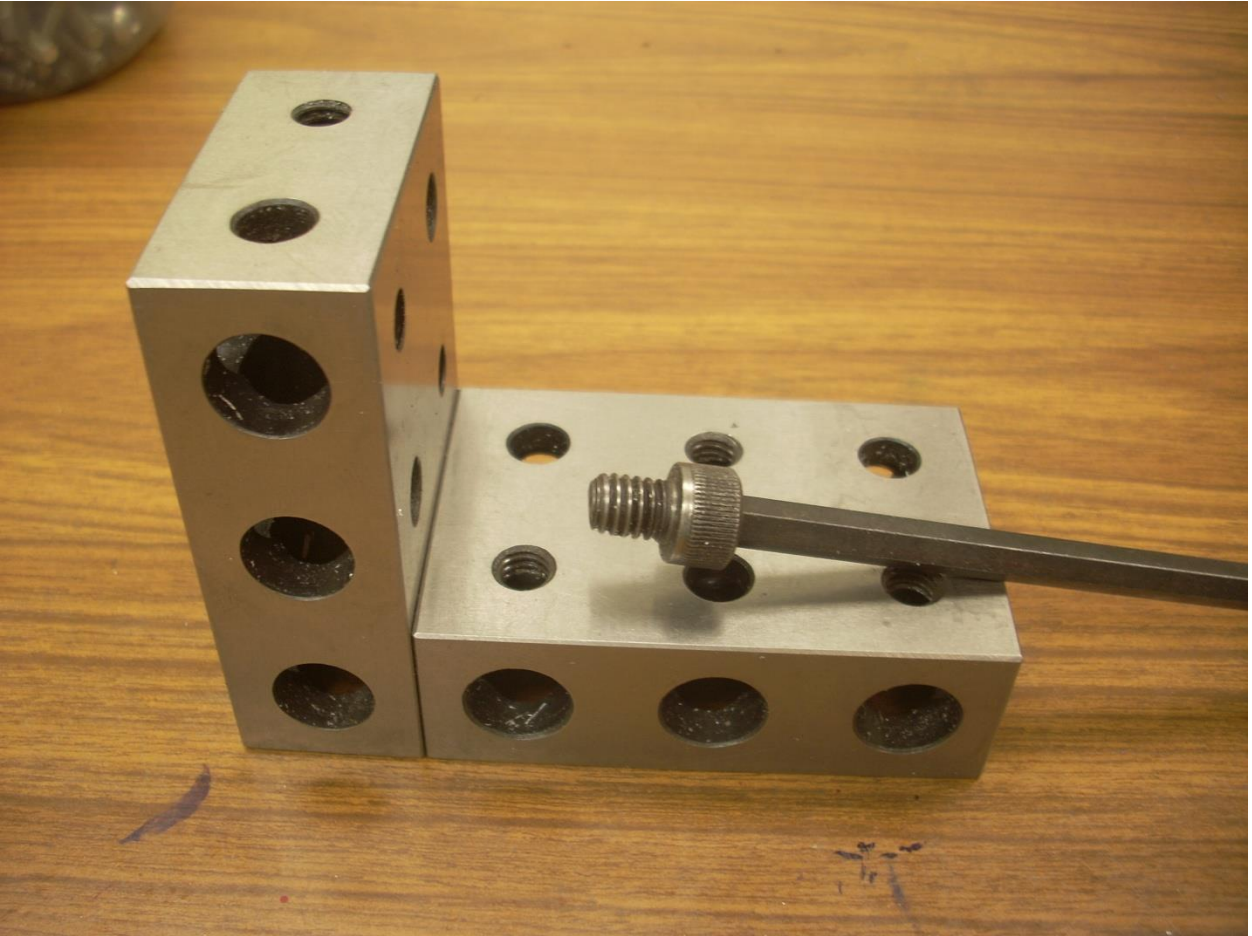


I do not use my 1-2-3 blocks this way because they are precision. But if you had a set of poor-quality blocks, you could use them as a vise. If over-tightened, the blocks might bend.

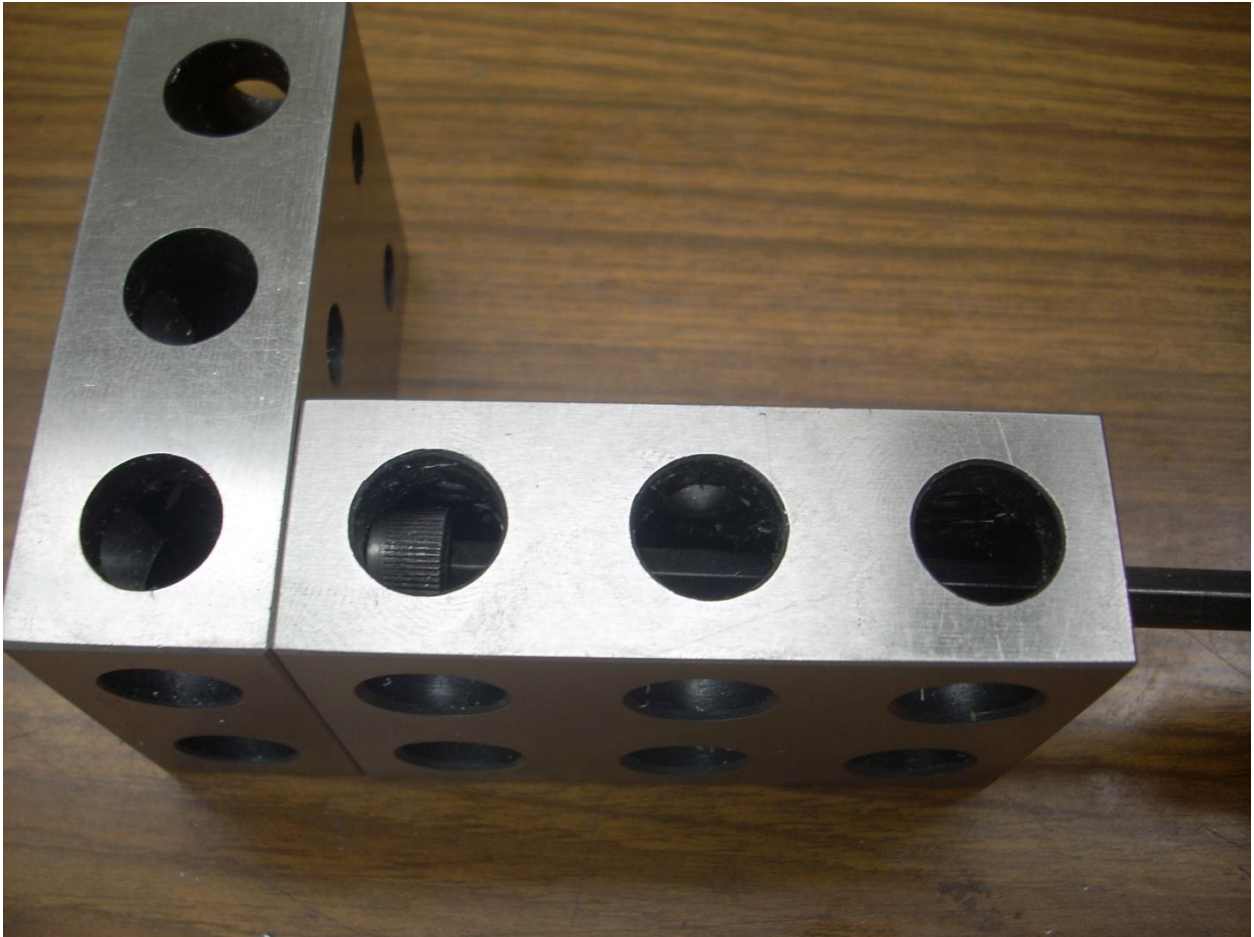




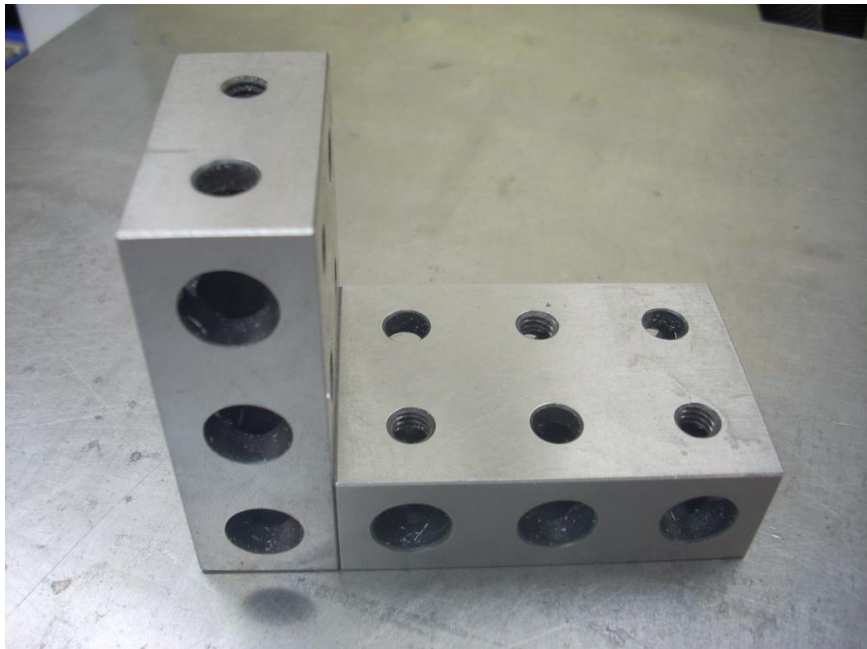
Next, we will look at using a set of blocks to make new shapes. I am using a SHCS that came in the set.



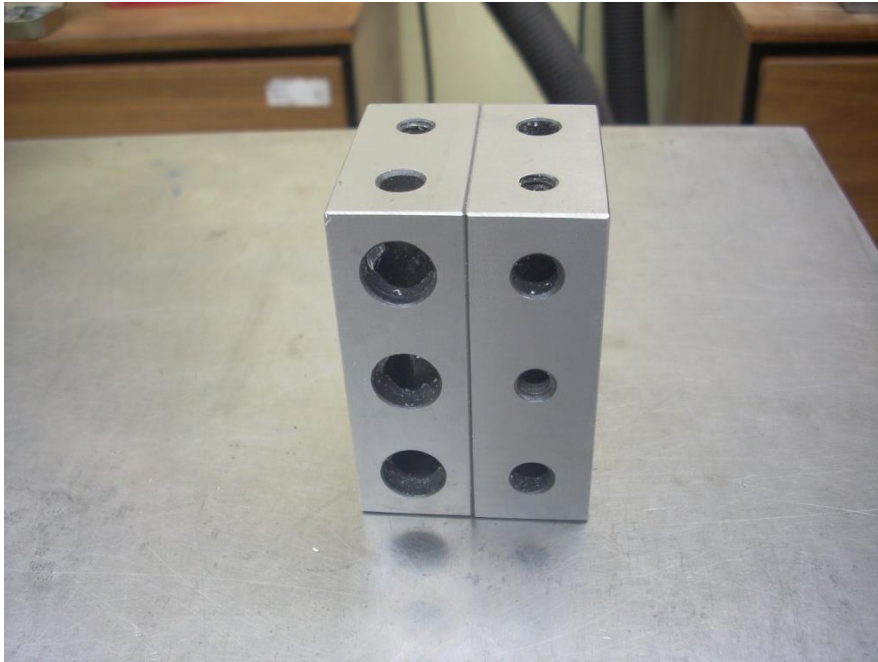
A pair of these screws will let me secure the two blocks into a very solid right angle.



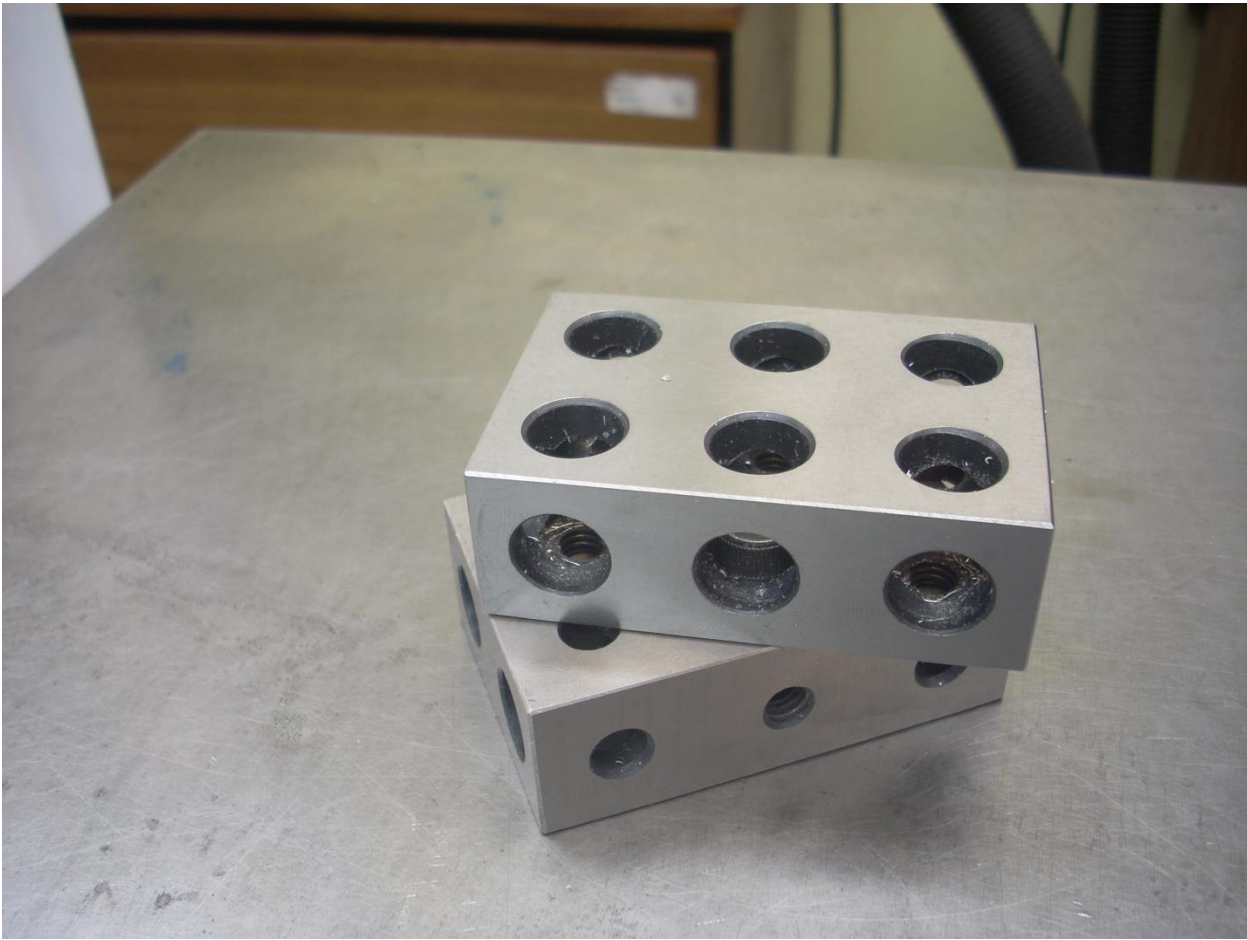
An Allen wrench has been slid through the block with a SHCS on the end. The



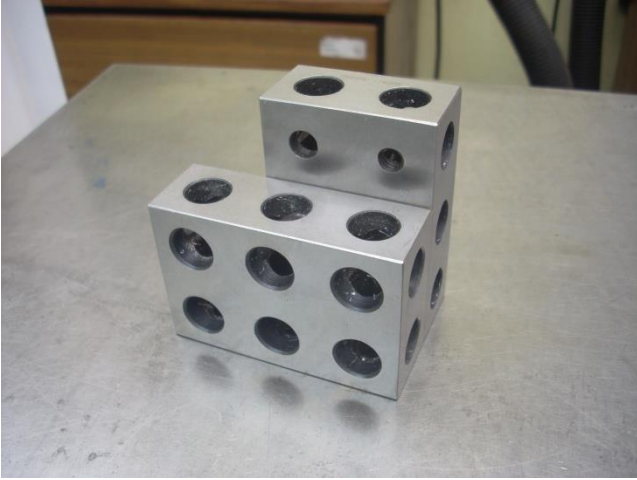
screw passes through a clearance hole in the horizontal block and engages a threaded hole in the vertical block. A second SHCS feeds in from the other side to securely lock the two blocks together.



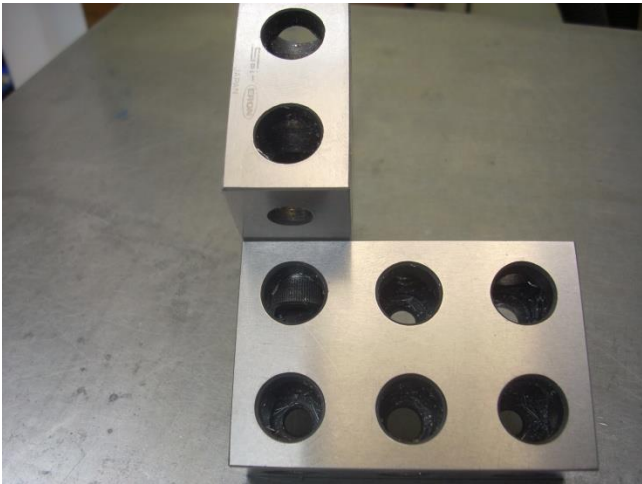
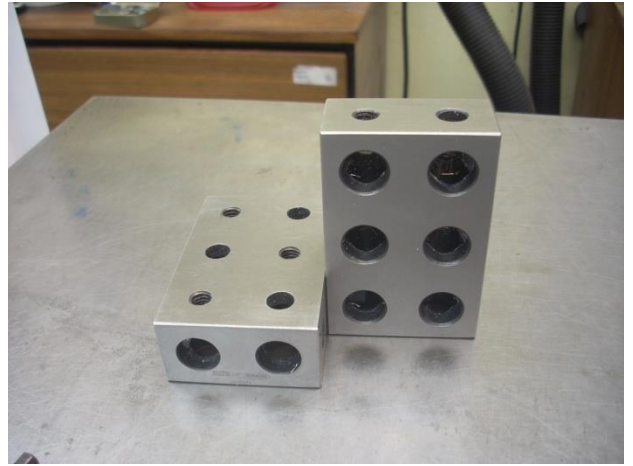
Similarly, we can lock the blocks along any of the faces.

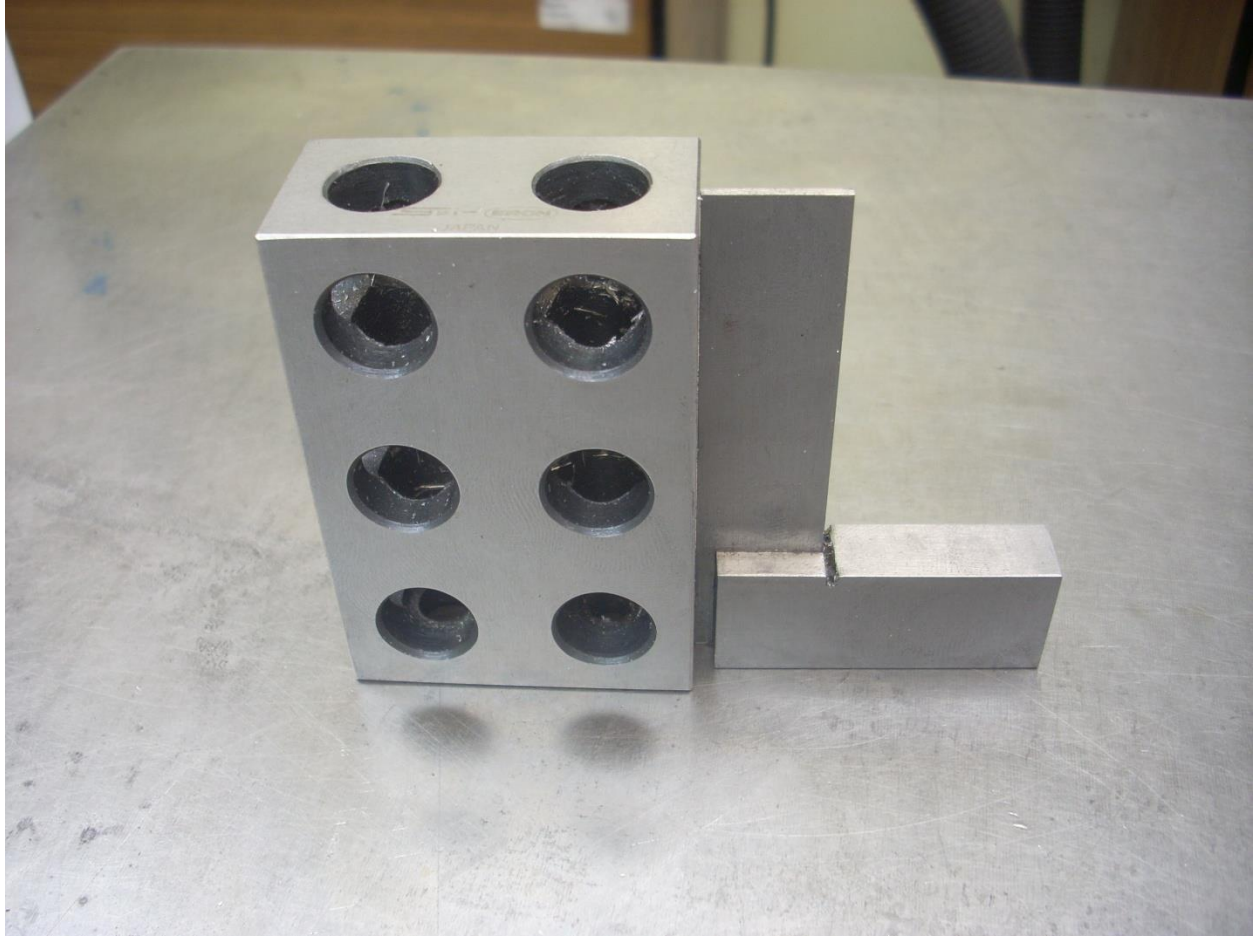


You can also lock the blocks at an arbitrary angle, although typically, only one bolt will secure them. Yet this is a great way to set an angle for later reference.

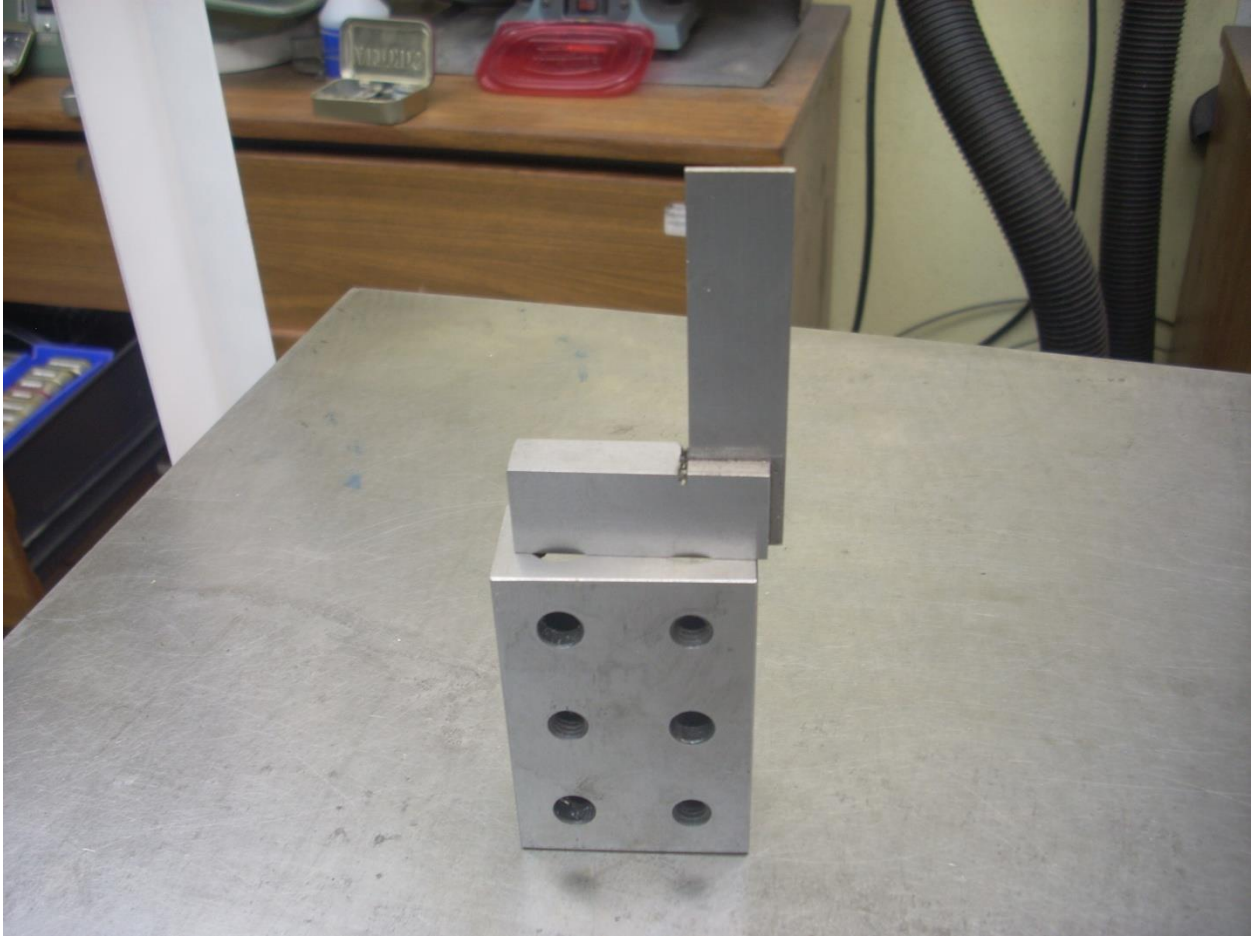


With a little thought, many configurations are possible.





If your block is as square as your machinist square, you can use them interchangeably.



Sometimes it is handy to raise the square off of a surface. The blade may face up or down.





My lathe has the center of rotation exactly 6" above the ways, so I can stack two blocks to set my cutter.

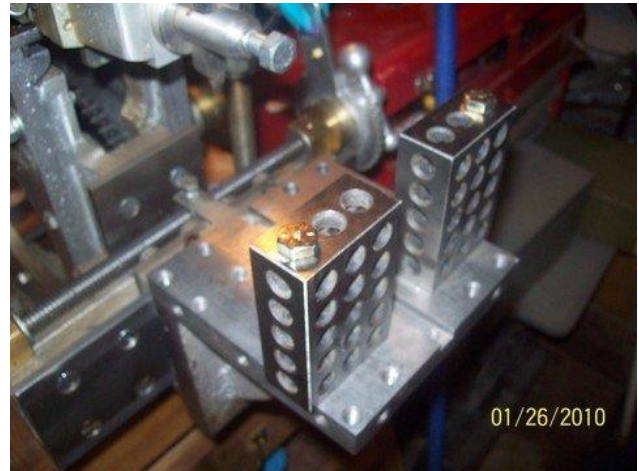
Larry of the metal\_shapers group said:

One of the best uses I ever got from 1-2-3 blocks was to fixture some pulleys onto my shaper so I could cut keyways. The setup was very rigid and accurate.



I drilled fixturing holes through the pulleys first.

Blocks were then bolted to the table loosely.



The pulleys were bolted to the blocks, and then the table bolts were tightened.

## Acknowledgements

The following generous people contributed to this article:

Rex B., Larry, Jim S., Tom A, Brian Lamb, GreggK, Arthur Marks, Bill , Russ Gray, epa, Ron Thompson, Matthew Tinker, Nelson Collar, Michael Fagan, Russ Kepler, monty621, EdwinB, jerdal, John Martin, and Jon Sumpter. Thanks to Carl Blum for pointing out that clamping to a 1-2-3 block can also damage it.

These generous people again demonstrate that “all of us are smarter than any one of us”.

I welcome your comments and questions.

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