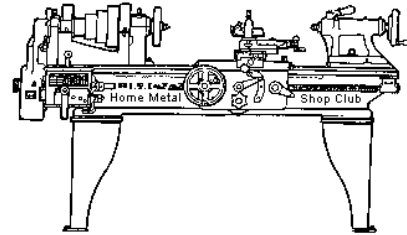




July 2012 Newsletter

Volume 17 - Number 7



<http://www.homemetalsclub.org/>

The Home Metal Shop Club has brought together metal workers from all over the Southeast Texas area since its founding by John Korman in 1996.

Our members' interests include Model Engineering, Casting, Blacksmithing, Gunsmithing, Sheet Metal Fabrication, Robotics, CNC, Welding, Metal Art, and others. Members enjoy getting together and talking about their craft and shops. Shops range from full machine shops to those limited to a bench vise and hacksaw.

If you like to make things, run metal working machines, or just talk about tools, this is your place. Meetings generally consist of **general announcements**, an **extended presentation** with Q&A, a **safety moment, show and tell** where attendees share their work and experiences, and **problems and solutions** where attendees can get answers to their questions or describe how they approached a problem. The meeting ends with **free discussion** and a **novice group** activity, where metal working techniques are demonstrated on a small lathe, grinders, and other metal shop equipment.

President <i>Vance Burns</i>	Vice President <i>John Hoff</i>	Secretary <i>Martin Kennedy</i>	Treasurer <i>Emmett Carstens</i>	Librarian <i>Dan Harper</i>
Webmaster/Editor <i>Dick Kostelnicek</i>	Photographer <i>Jan Rowland</i>	CNC SIG <i>Dennis Cranston</i>	Casting SIG <i>Tom Moore</i>	Novice SIG <i>Rich Pichler</i>

This newsletter is available as an electronic subscription from the front page of our [website](#). We currently have over 180 subscribers located all over the world.

About the Upcoming August 11 Meeting

General meetings are usually held on the second Saturday of each month at 12:00 noon in the meeting rooms of the Parker Williams County Library, 10851 Scarsdale Boulevard, Houston, TX 77089. Lee Morin will talk about the NASA [Orion project](#). Martin Kennedy will show several Knurling and Centering [videos](#) the he J. R. Williams have recently produced. Visit our [website](#) for up-to-the-minute details and for the main presentation topic.

Recap of the July 14 General Meeting

By Martin Kennedy, with photos by Jan Rowland and Dick Kostelnicek



Thirty members and three guests – Greg and Grant Fuller and Ben Ross - attended the 12:00 noon meeting at the Parker Williams County Library. President *Vance Burns* led the meeting.

We need more articles for the monthly newsletter! If you would like to write an article, or would like to discuss writing an article, please contact the Webmaster [Dick Kostelnicek](#).

Ideas for programs at our monthly meeting are always welcome.

If you have an idea for a meeting topic, or if you know someone who could make a presentation, please contact [John Hoff](#).

Monday, September 3 has been set as the tentative date for our next tailgate sale. The sale is an excellent opportunity to make some room in your shop by selling things that you no longer use, and to buy or trade for things that you need. The location will be at [Polly Ranch](#) in Friendswood TX.

Several books were donated to the club library by John Hoff and Tom Moore. Thanks!

Safety Moment

Rich Pichler said that when he was pouring liquids such as acids, he would get a chemical splash in the face about once a year. It's a good idea to wear glasses when pouring chemicals. On another topic, he keeps a hard hat in his attic within easy reach. This has kept him from hitting his head on protruding roofing nails.

Norm Burls knew of an issue caused when his neighbor bumped his head on a beam when he was working on his house. The next day, he was blind in one eye. It turned out that the bump had caused localized pressure inside of his skull, and it was affecting his brain. Again, wear a hard hat when you might bump your head.

Greg Fuller was working in his attic. When climbing down, the folding attic stair fell with him on it. It took surgery to repair his injuries. He recommended checking the screws that hold the attic stair frame to the joists to assure that they're tight, and are the right kind of screws. The screws that failed in his were drywall screws.

Emmett Carstens was injured when he was hit on the head by a falling 2x4. When he went to the doctor later, he could not raise his right arm. It turned out that he had a hematoma that had to be removed.

Vance Burns recommended putting tape over your shirt pockets to keep them from filling with shop chips. An added benefit of the tape is that he stayed in better grace with his wife on washing day!

Presentation



Matt DeWitt

Matt DeWitt, the owner of [DeWitt Calibration Services](#), was our speaker this month. Matt has been in the calibration business for 25 years. He recently started his own company after working for years with Texas Indicator and Micrometer, and before that with Lone Star Gauge.

He got in to the calibration business after working around cars as a kid. His dad was a race car owner who didn't do any work on his own car. He always took it to shops for the work. That's where Matt met Buddy, an ex-drag racer, who was a great machinist and fabricator. As a kid, he liked to hang out at his shop. He ultimately took a machine shop course at HCC, where he found that he was more interested in the measurement tools than the machines.

Matt uses old-school repair techniques to fix micrometers, calipers, indicators, etc. He has an expensive Pratt and Whitney comparator, but most day-to-day work is done by comparing tools to reference gauge blocks.

The biggest enemy of measurement devices is magnetism. It attracts trash to the mechanism. They should also be kept dry and clean. There's an easy fix for magnetized tools – inexpensive demagnetizing

plates such as this one from [Shars](#). They work quite well. Another undesirable effect of magnetism is that it can affect the measurement.

Most measurement tools are meant to function dry, and should not be oiled. They should be cleaned with denatured alcohol. Oil gums up the device, makes it stick and holds trash. If oil is required, a drop of 3-in-1 oil is good. Another good lubricant is lighter fluid. Matt uses Starrett oil because it does not have an odor.

A typical repair at Matt's shop is cleaning the measurement device and replacing the crystal. Usually no parts are required. Another repair he does frequently is to fix a micrometer that has been dropped, causing the anvils to no longer be parallel. The repair is made with light taps with a wooden mallet and an optical flat to check parallelism. Sometimes, a light tap will fix a stuck gauge. A typical repair charge to clean and replace the crystal is \$25 for a dial indicator and \$35 for a test indicator. Other devices that Matt calibrated and certifies are pressure gauges, torque gauges, gauge blocks and thread go/no goes.

One interesting repair that Matt does is to recalibrate [gauge blocks \(Jo blocks\)](#). First, he compares them against masters. Sometimes, if the blocks are slightly out of tolerance, a wooden hammer blow to the block can disturb the molecules enough for it to come into tolerance.

Most companies Matt deals with have ISO accreditation, which requires periodic calibrations of measurement devices. Most companies designate intervals based on usage. Typically, micrometers and calipers are calibrated every year. Offshore torque devices may require calibration as often as every 90 days.

You can do some checks on your devices easily. For instance, does it say 0 when set to 0? If your device has a standard, does it give the correct reading? For calipers, test jaw wear and alignments by checking along the length with a pin gauge. Looking for light through jaws is not a reliable test. Look for dings on the rail and trash in the gear mechanism.

Matt likes Mitutoyo devices. He says that he finds Starrett devices to be cantankerous. He prefers dial indicators over digital, since the digital can develop blind spots in the magnetics. Surprisingly, he has seen good accuracy in cheap indicators, such as those from Harbor Freight, when he has checked them in his shop. He's found that Swiss made instruments, such as Interapid, are higher quality, but that parts can be hard to get.

Temperature will affect measurements. Matt keeps his shop at 68° +/- 2° and 50% humidity +/- 15%. This is the standard temperature. When making measurements, you likely won't be maintaining this temperature for both the measurement device and the part that you're measuring. What is important is making sure that the tool and part are about the same temperature. If you do this, the measurement should be good. Metals tend to shrink and grow about the same rate within the range of temperatures in your shop. The big problem is when the tool and stock are different temperatures. This should be kept in mind right after you have machined a part, since it may be significantly warmer than the measurement device.

Show and Tell



Dick Kostelnicek built a 45-degree zero flute countersink / deburring bit and attached it to a file handle hand grip (left photo). After machining, he heat-treated and spirally ground the tapered cutting head. He also demonstrated a [Harbor Freight digital](#)



[inspection black and white camera](#) that he recently acquired (above right photo). He showed how it could be used to find something like a screwdriver dropped behind drywall. His main use for the camera is to find items located on the top shelves in his shop without having to climb up and move the ladder multiple times. He noted that the end is about 5/8" diameter, which precludes it from being used through spark plug holes.

Joe Williams brought in a Jacobs 3 to Morse 2 taper that he used to adapt a drill chuck to his drill. He said that after installing it, the chuck jaws didn't work correctly. He found that the taper impinged onto the chuck jaws. He had to grind it shorter so that it would work.

Martin Kennedy brought in a diamond tool holder that was given to him by club member Ed Gladkowski, along with a piece of stock that had been cut with the tool. He said that it made an excellent finish on the cut. Some members noted that the idea was one that was originally used in the early 1900's.



Martin gave a presentation on [fabricating a replacement gear](#) for one that was broken in a manual pencil sharpener, something that only one with excess time on his hands would do!



Joe Scott talked about all the operations that were involved in making a bolt catch for a 1941 Johnson Rifle. He had a copy of the original drawing that was used to build the part that he borrowed from the manufacturer. The part was rough cut with a water jet. Joe found that there were a lot of steps required to make the part, and was amazed at how complicated parts were made in the



early 1940's on manual machines. He also showed the bolt from the rifle, and asked the attendees to look at it and imagine all the steps that would be required for manufacture.



Dan Harper showed an aluminum chuck stop that he made for his chuck from a rod (left photo). It fits through the body of the chuck, with a wide section at top. It's used to allow pieces to be placed in the chuck in exactly the same position for machining.

Problems and Solutions / Ask the Blacksmith

Dick Kostelnicek described how he put plastic check valves on the fuel pump line on 1964 car that is infrequently driven. The check valves keep gasoline in the fuel pump and float bowl, allowing shorter engine cranking after prolonged storage. He recommended that you make drawings of the serpentine belt in your car when you acquire it. If it breaks later, you'll know exactly how to thread it. This also applies to equipment like riding mowers. Dick noted that a new Harbor Freight opened on [Broadway Street in Pearland](#).

Joe Scott wanted to know how to add an inside emergency release to burglar bars in a window. The release is required to comply with state insurance code. He wanted to build one, but didn't know how. No one at the meeting was familiar with the release. Joe recommended [Craftsmanspace.com](#) as a good source for free downloadable books.

Rich Pichler has some old machinists toolboxes that were improperly stored and as a result the tools inside have a musty odor. He wanted to know how the odor could be removed. Suggestions were: 1) pet deodorizer, 2) baking soda and 3) crystal stuff available from RV stores made to remove odors from a refrigerator, and 4) Consan Triple Action 20 - an indoor/outdoor disinfectant.

Vance Burns said that the mold that forms on screwdriver handles can be cleaned off with a fine brass wire toothbrush.

Matt DeWitt recommended [Government Liquidation](#) as a good place to buy surplus equipment.

Ben Ross wanted some advice on inexpensive programs he could use to run a CNC machine that he was building. Recommendations were [Mach3](#) and [CamBam](#). He was referred to the guys at [TXRX](#) if he wanted a Linux solution.

Novice SIG Activities

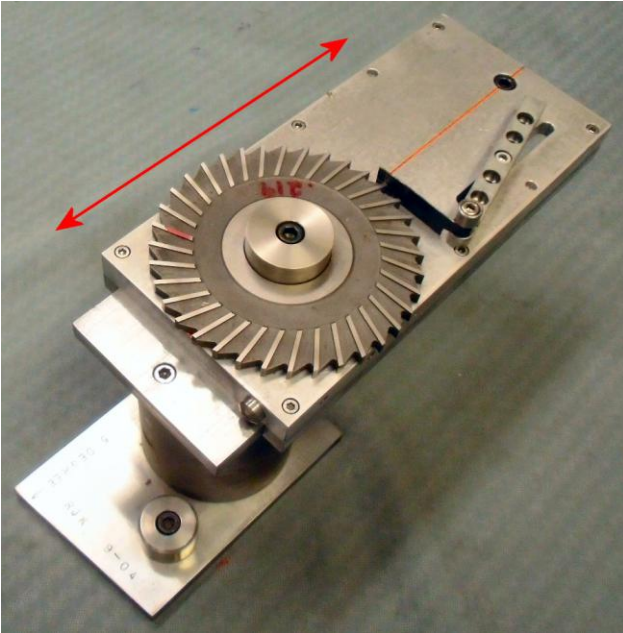
Rich Pichler and the Novice group discussed sharpening and learned to sharpen drills, chisels, and other tools using a variety of methods.

Articles

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Straight-Tooth Sharpening Fixture

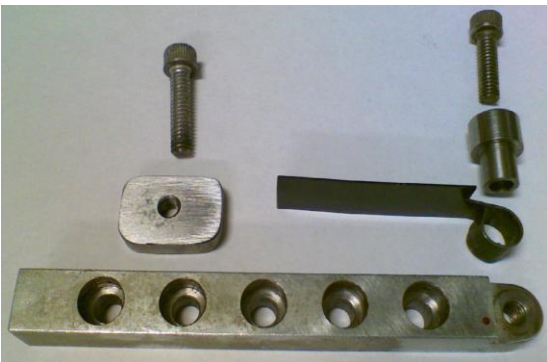
By Dick Kostelnicek



If you use straight-tooth side milling cutters or slitting saws, here are plans for a sharpening fixture. I use this fixture with a surface grinder that has a magnetic chuck and 5-inch abrasive cup wheel. You could, however, use it with a bench grinder having a suitable face wheel and rigid mounting support.

The fixture has a sliding top carriage (see red arrow in the left photo). It holds the cutter on one of two popular size arbors, 1 or 1.25-inch in diameter. An adjustable spring-finger ratchet provides indexing so that each tooth can be positioned accurately and ground in turn. In normal operation, the carriage is pulled back, cutter indexed by one tooth, then advanced toward the grinding wheel. A dead stop bumper prevents the carriage from advancing past the required distance. The actual grind depth is set by the surface grinder's cross-slide hand wheel. If you use this fixture with a bench grinder, you'll have to fashion your own adjustable depth stop.

A small 3/8-inch tubular shank diamond wheel dresser is inserted into the fixture's carriage slide and is shown truing a cup wheel (see right photo). Note that the abrasive wheel should be moving downward while dressing and grinding in order keep the milling cutter and carriage pressed against the support way. The front face of the fixture's base is cut at 5-degrees so that a nominal 5-degree primary clearance angle is automatically ground into the backside of each cutter tooth. To set this angle, the base should be placed against the raised backstop of the surface grinder's magnetic chuck.

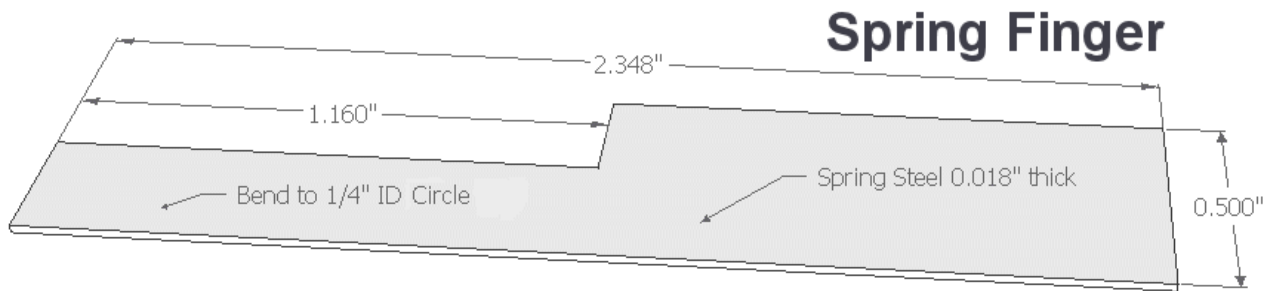
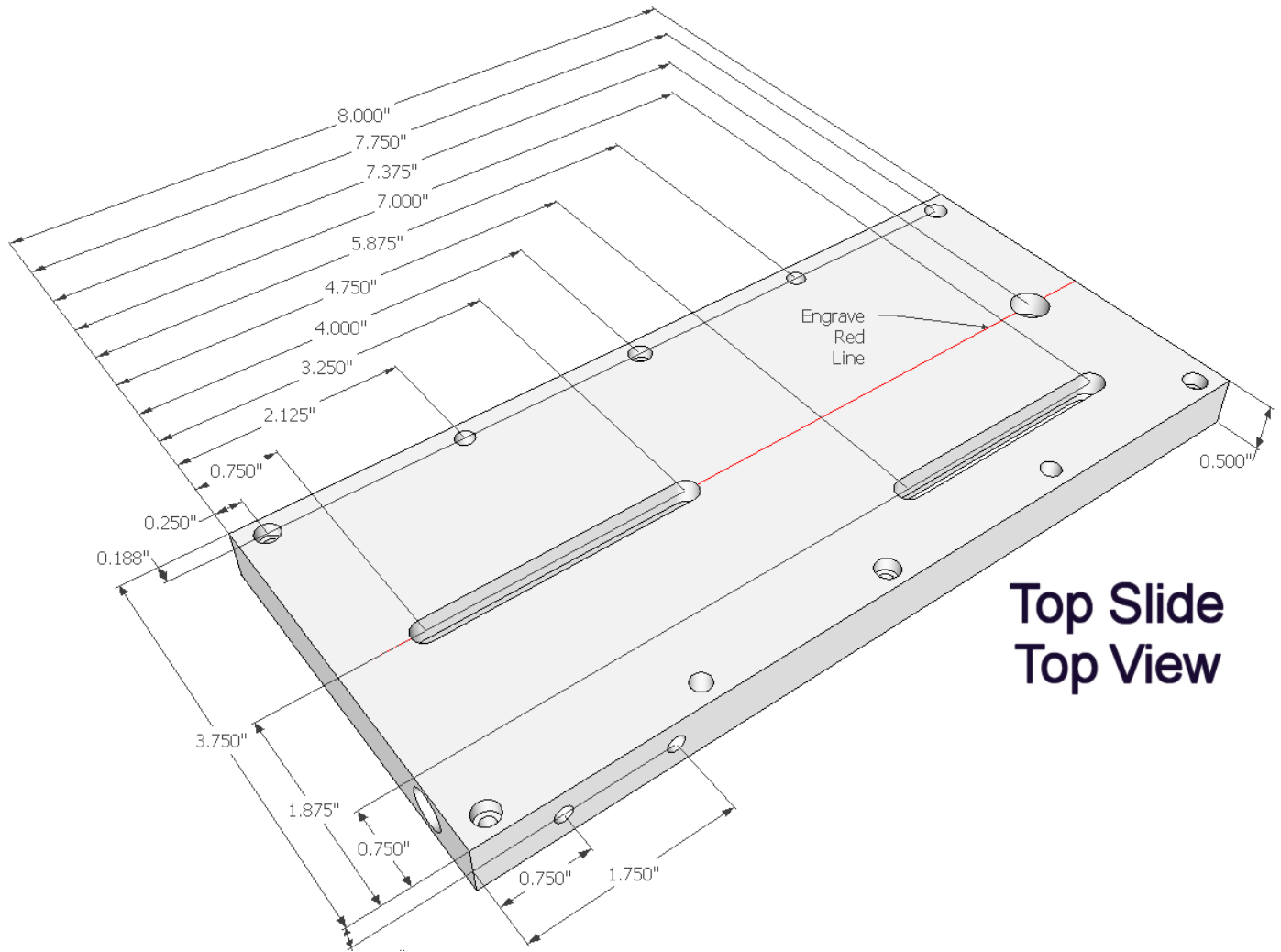


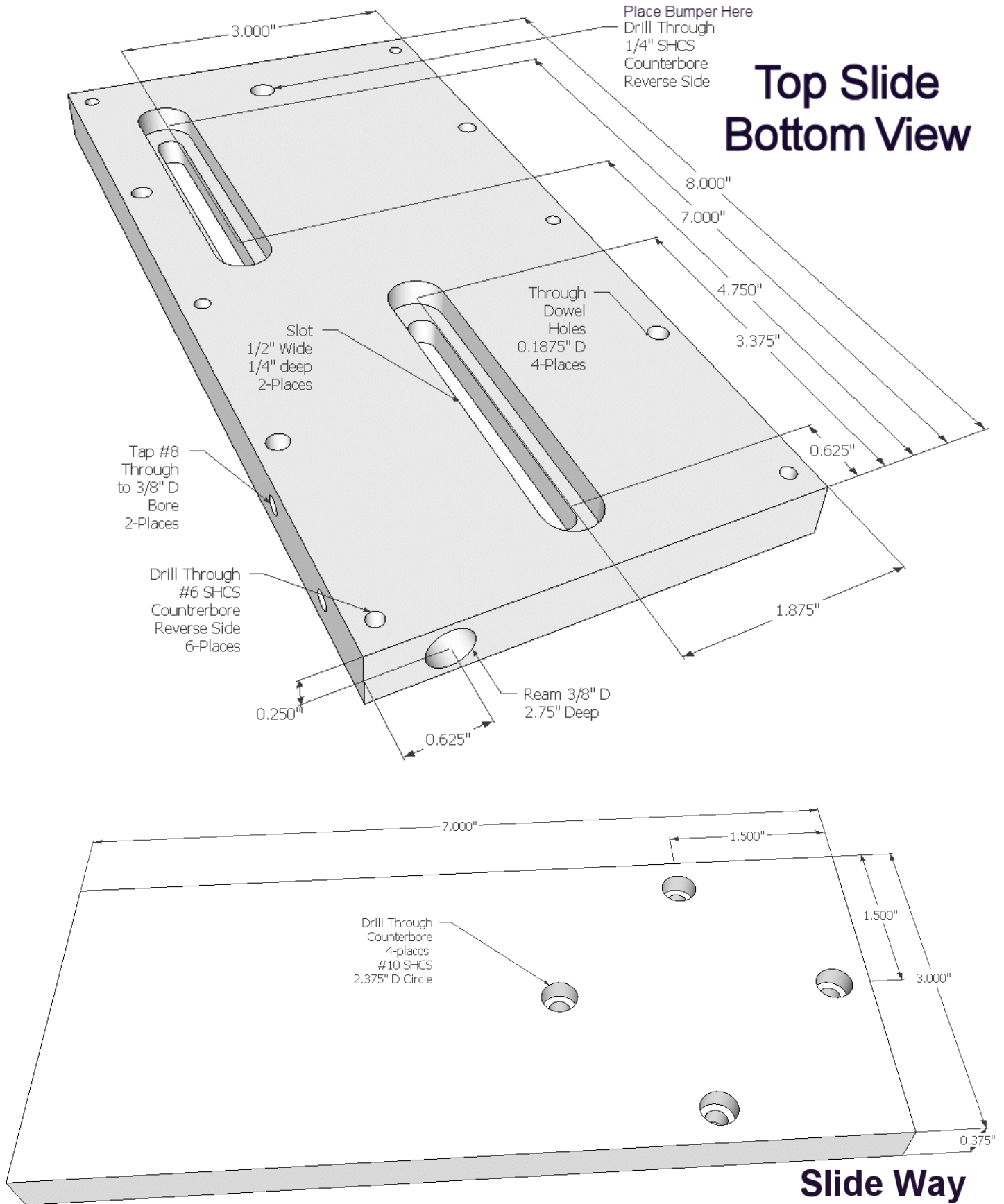
The left photo shows assembly details for the spring-finger ratchet mechanism. An engraved red line on the carriage slide (see uppermost photo) passes through the cutter's center. It is used to align a tooth's cutting edge on center. Then, the spring finger is set against a diametrically opposite tooth to provide rotational support and indexing. Don't forget to witness the starting tooth, so you can monitor your progress!

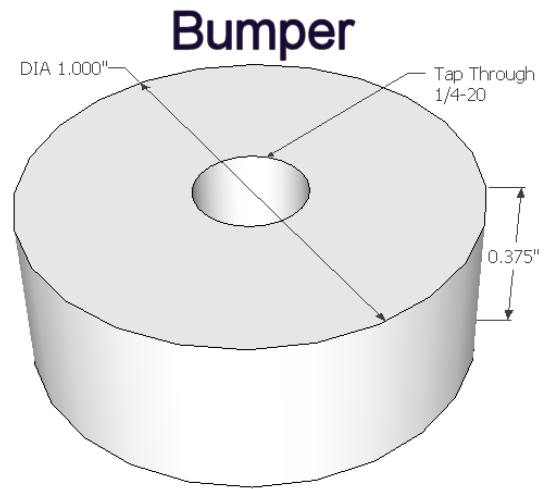
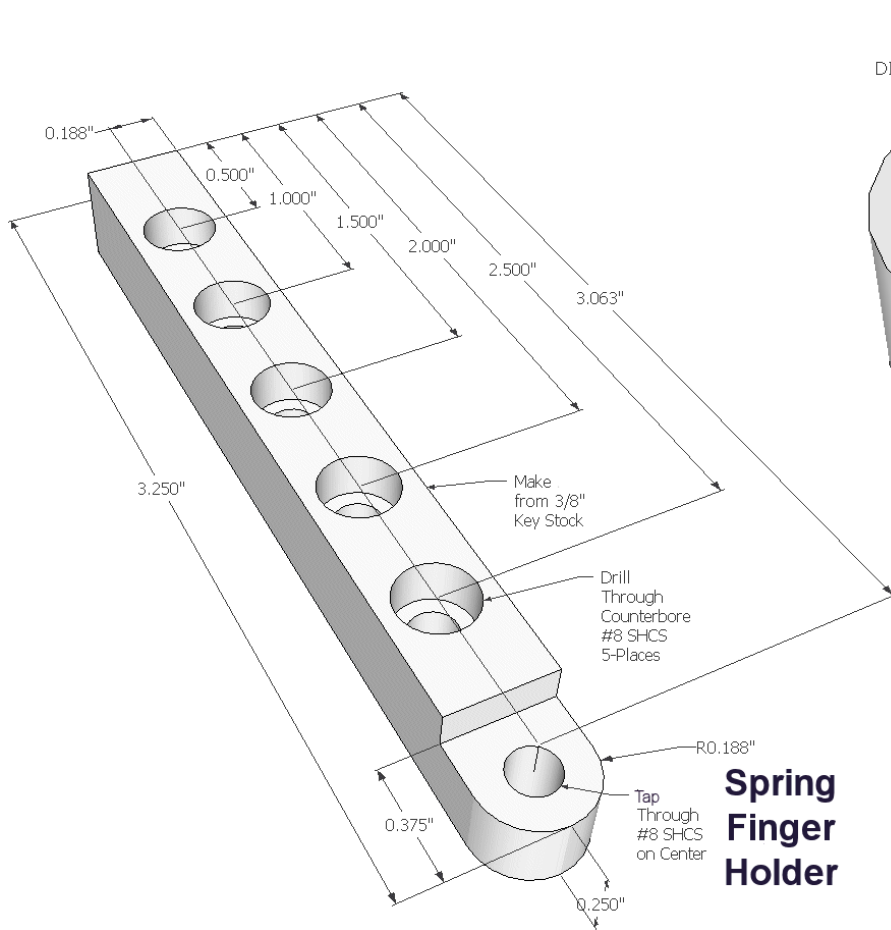
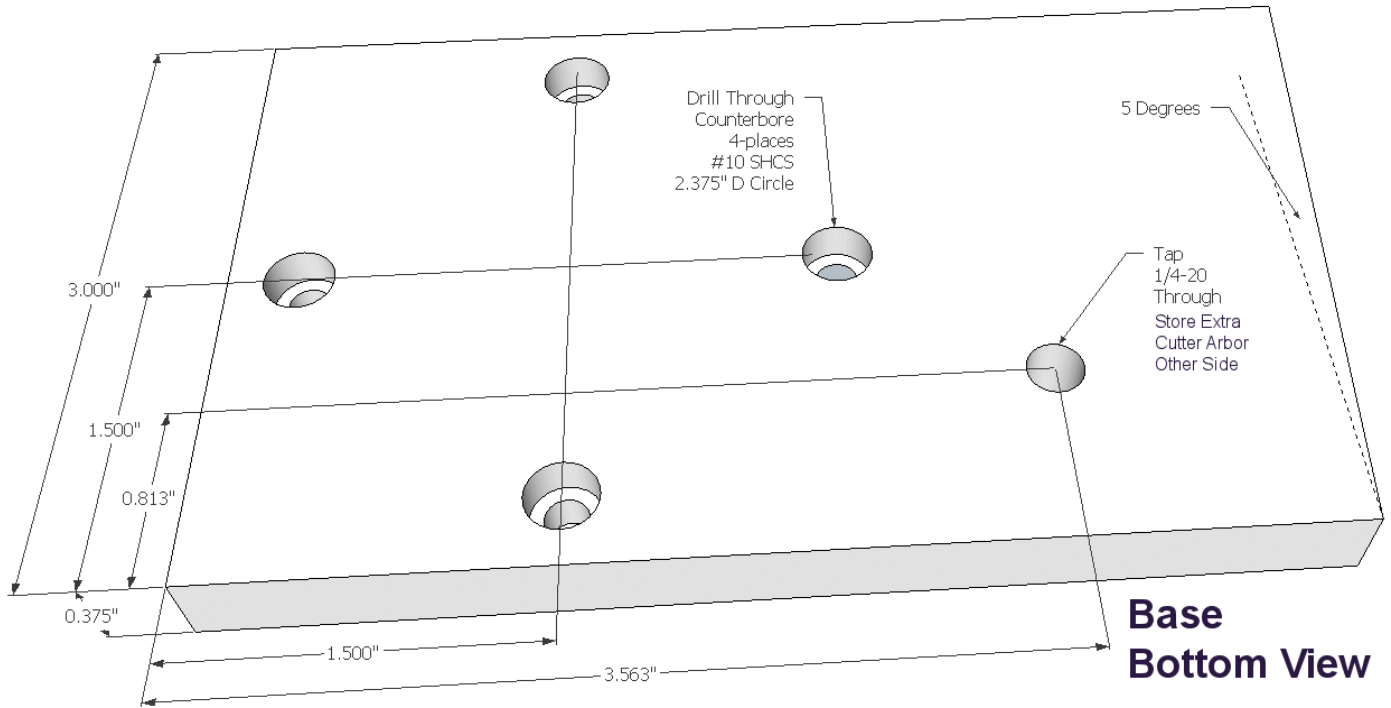
Normally no other grinding is necessary aside from that on the primary clearance surface behind each tooth's cutting edge. However, after grinding a cutter a number of times, it may be necessary to increase the depth of the secondary clearance on each tooth in order to regain an adequate amount of chip sweep-out volume in the gullets. Grind the secondary clearance after rotating the fixture clockwise a few degrees beyond the built in 5-degrees angle. The exact angular setting will depend on the cutter's diameter and pitch.

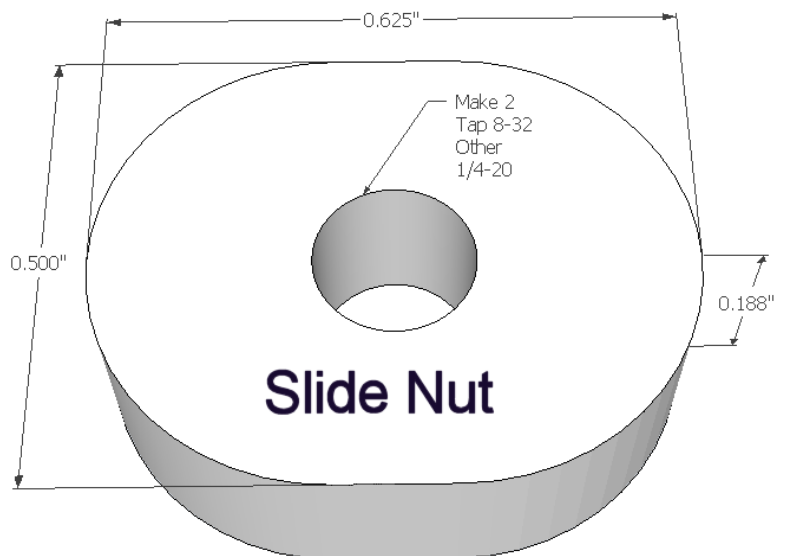
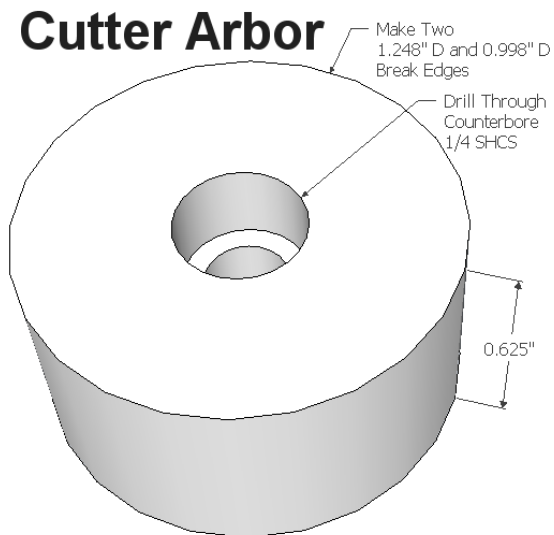
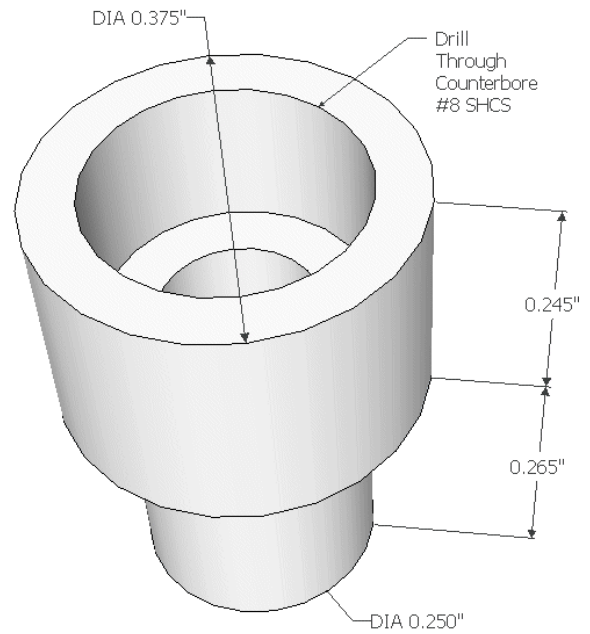
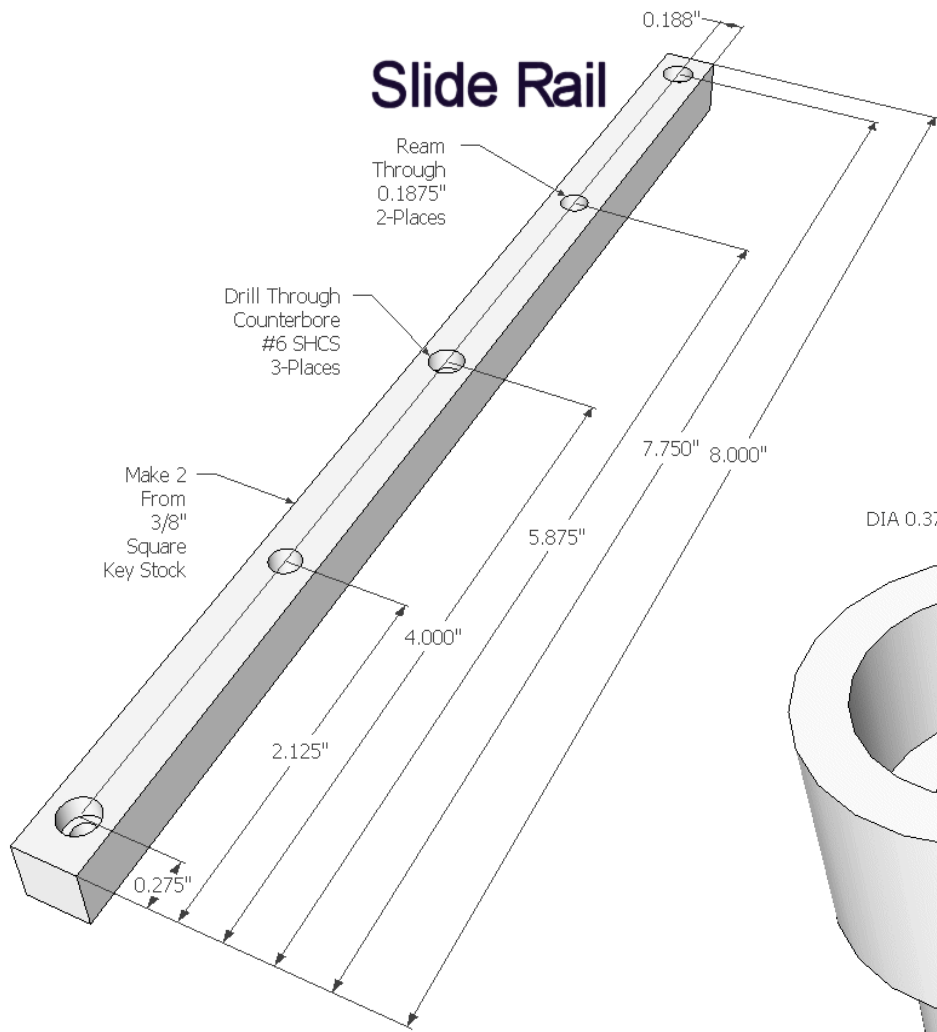


This grinding fixture can be made from mild steel and / or aluminum. Of course, steel is required for the fixture's base if you intend to use it with a magnetic chuck. The top slide's two side rails and the spring-finger ratchet arm are made from 3/8-inch square key stock. The spring-finger is made from a piece of salvaged steel strapping that once bound a pallet of construction bricks.





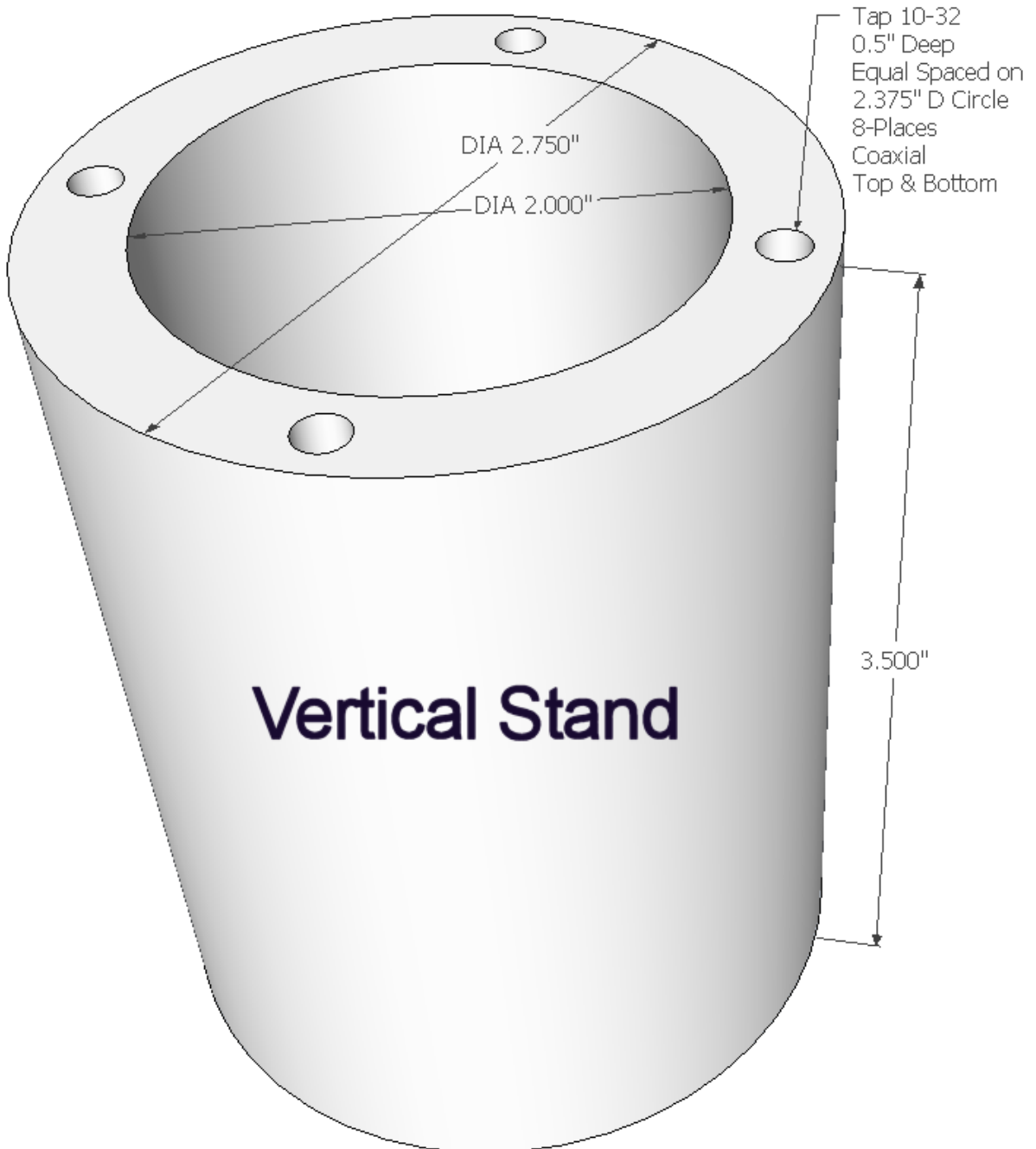




Standard Hardware and Fasteners

Quantity	Description
2	8-32 X 1/2 SHCS
8	10-32 X 1/2 SHCS
2	1/4-20 X 3/4 SHCS
1	1.4-20 X 1/2 SHCS
1	10-32 X 5/8 SHCS

Quantity	Description
6	6-32 X 5/8 SHCS
4	3/16 X 7/8 Dowel Pin
2	8-32 X 3/8 Set Screw
1	3/8 D X 3 Diamond Dresser



Unconventional Broaching

By *Martin Kennedy*

Linear broaching is frequently used in machining to produce slots inside of cylindrical openings to key them to shafts. There are many other uses for broaching, and a good description can be found [here](#). It is typically used in production runs because although the equipment is expensive, it is also fast and accurate.

I want to talk about another type of broaching more appropriate to the home machinist – how to broach when you don't have the right broach!

In some of my recent projects, I had a need to broach slots in some parts. I have a set of small broaches, but I couldn't use them, because each project had a challenge:

- Broach a slot for a metric key. My broaches are not metric
- Make a blind broach that doesn't go all the way through the part
- Broach and leave two small internal keys. This is like the reverse of a broach, where other than the keys, I needed everything cut away
- Cut a square hole

For each of these, there's an inexpensive way to broach. If you have a small machine shop, you probably already have all or most of everything you need!



Small Broach Set

Instructions:

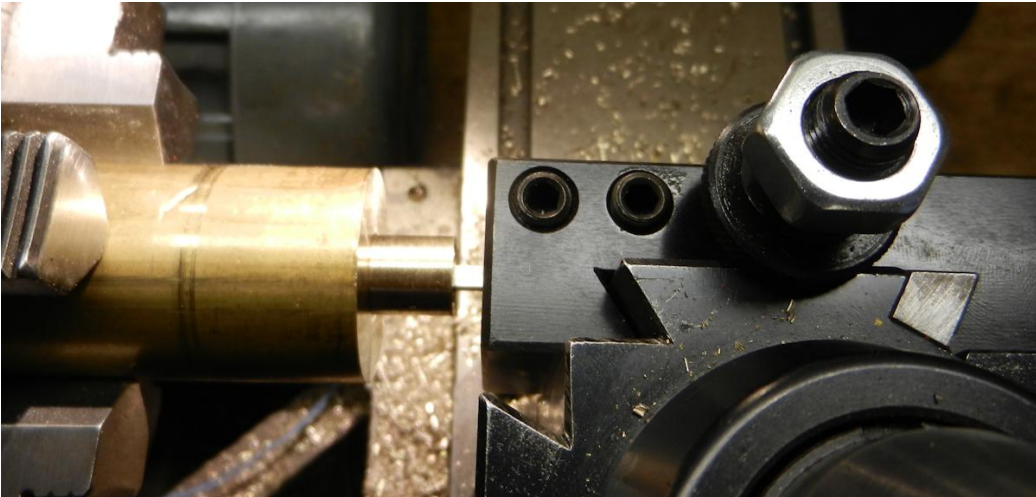
1. Mount the part to be broached in the lathe chuck. You do not need to rotate the part, so secure the chuck from rotation, if possible. This is a hand project, and we're going to provide all the motive force.
2. Grind the tool steel so that there's a slight bevel at the end. The ones that I have already have about a 10° bevel on the ends right out of the package, and that works fine.



Slight Bevel on End of Tool Steel

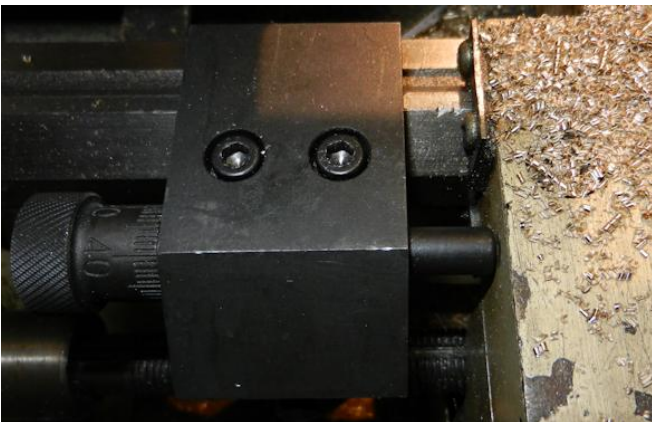
3. Put the tool steel in the tool post, parallel to the axis of the lathe. The cross section of the tool steel should be the size and geometry that you want to broach.

4. Adjust the tool post to hold the tool at an elevation just touching where you want to start the broach. You can broach the top, bottom, near side or far side of the part. You may want to select the top if there's play in your lathe in the other directions, like mine. Cutting on the top pushes the carriage into the ways just like it does when you're cutting on the lathe.



Lathe Set Up, Ready To Broach

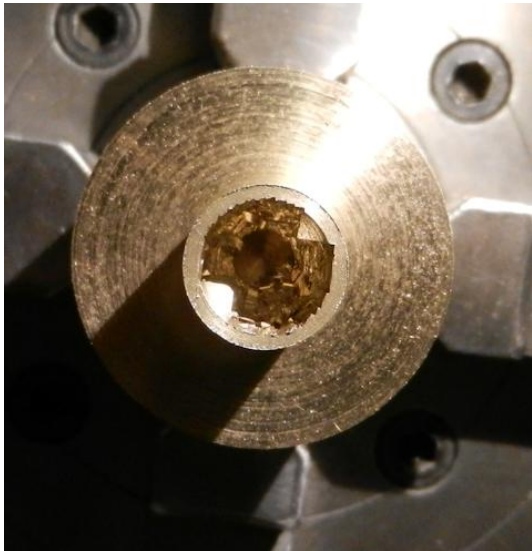
5. Although only recommended for blind broaches, a carriage stop can be used to set the total carriage travel. For through broaches, you can easily feel when you break through.



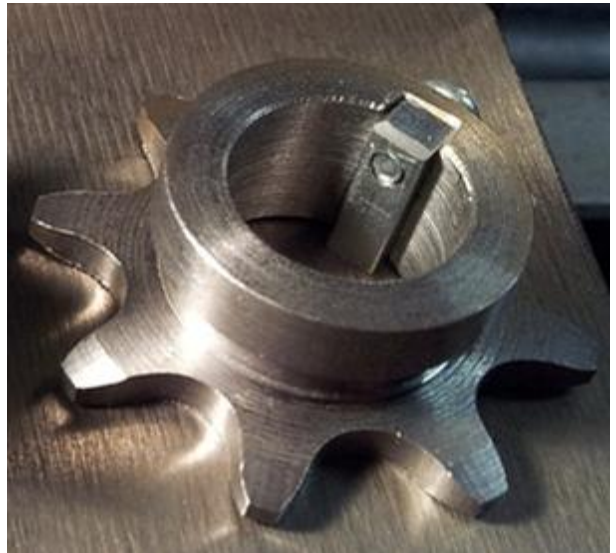
Adjustable Carriage Stop

6. Stroke the tool into the part using the carriage handwheel. If you're making a blind broach, be sure and stroke all the way to the same point each time.
7. Move the tool slightly to take a bigger cut. "Slightly" is a few thousandths. On my Aloris-type toolpost, it's about 1/8 revolution of the height adjustment screw. The more you cut, the harder it'll be to turn the handwheel. Light cuts put less strain on your lathe. Heavy cuts can rotate the tool post slightly and result in a distorted cut.
8. Repeat until you reach the desired depth. This generally takes a relatively short time to complete.

That's all there is to it! Congratulations, you're using your lathe as a manual [shaper](#). I have a 9" x 20" lathe and I've cut keys in brass and steel. To cut the metric slot, I ground down a 1/8" square tool steel to the desired width. For the broach that had two small internal keys, I just rotated the chuck slightly by hand after completing a key slot, and ran the broach in again, linking the slots together.



Metric Broach, Metric Key



Blind Broach with Two

For the square hole, I drilled a round hole that fit inside the square. I made the hole square with round corners with a mill. I then used a piece of tool steel (the one shown above in step #2) and drove it through the hole using an Arbor Press. Even though the steel was 1/4" thick and the tool steel was 3/8" square, it wasn't that hard. Had I not had an Arbor Press, I could have probably driven it through with a hammer.



Square Broach