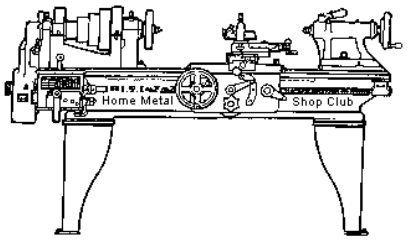
Home Metal Shop Club

June 2012
Newsletter

Volume 17 - Number 6



http://www.homemetalshopclub.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	Vice President	Secretary	Treasurer	Librarian
Vance Burns	*John Hoff*	*Martin Kennedy*	*Emmett Carstens*	*Dan Harper*
Webmaster/Editor	**Photographer**	**CNC SIG**	**Casting SIG**	**Novice SIG**
Dick Kostelnicek	*Jan Rowland*	*Dennis Cranston*	*Tom Moore*	*Rich Pichler*

About the Upcoming July 14 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.

Visit our website for up-to-the-minute meeting details and for the presentation topic.

Recap of the June 9 General Meeting

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

Vance Burns

Twenty-six members, 2 guests - Paul Jasca and Josh Light, and new member Gerald Johnston 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.

Yearly elections will be held at the July 14th meeting. If you are interested in becoming more involved in the club, we highly encourage you to run for office!

Our Vice President, *John Hoff*, does not plan to run for re-election. The Vice President is responsible for arranging the meeting location and for obtaining the quality speakers that we have enjoyed over the years. Please consider running for this position, as we could use your talents! Our thanks go out to John for his many years of service.

Monday, Sept. 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.

Bayliss Hunter

Former club member Bayliss Hunter passed away on May 12th after a one year battle with cancer. His daughter said that he always enjoyed himself at the HMSC meetings.

Safety Moment

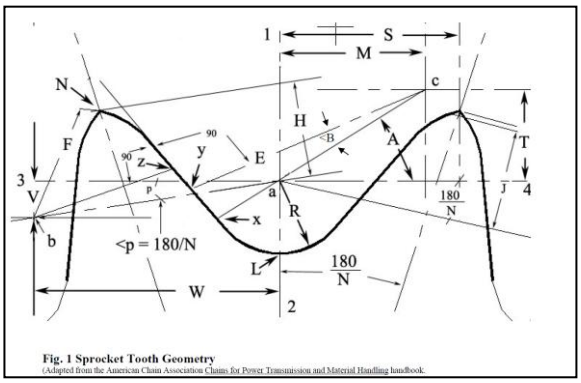
A member recounted an incident where a young person that they knew liked to listen to his portable music player through headphones while in bed. After he fell asleep, the headphone wire became tightly wrapped around his neck and strangled him.

Presentation

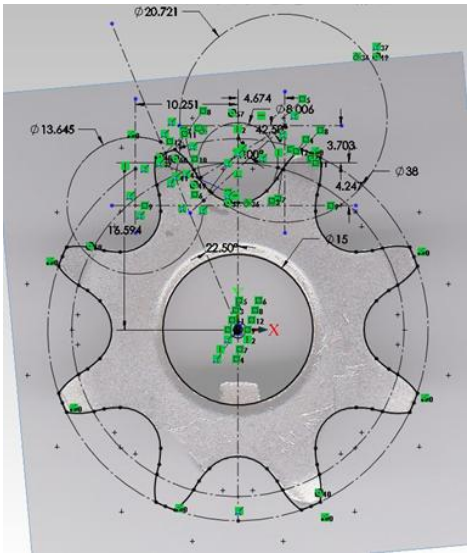
The scheduled presenter was unable to make the meeting, so Martin Kennedy and Dick Kostelnicek made extended presentations. Thanks to Martin and Dick for stepping up on short notice!

Martin Kennedy made a presentation on three small projects that he recently completed. All three projects required non-conventional broaching.

The first project was one that you attract when people know that you have a machine shop. It's presented to you as one that's "easy" and will "only take a few minutes". This project was to make two chain sprockets to replace two broken sprockets on a woodworking planer. No information was available on the brand of equipment, the size of the shafts, or the size of the chain.



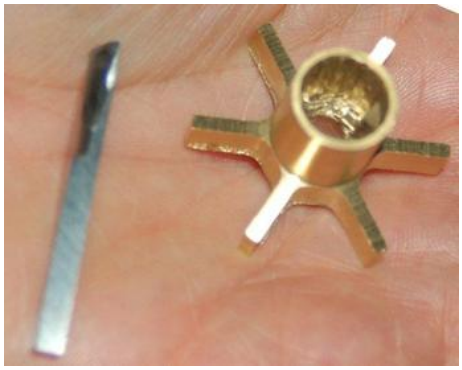
The first part of the project was research. Using the internet, a good source of information on sprocket geometry was found. It turns out that the curve of a sprocket tooth is fairly complicated, and consists of four separate curves coped into each other. Sixteen algebraic equations describe the geometry.



Martin scanned a picture of the broken gear into his CAD program, scaled it, and overlaid the curves. He used back calculation to infer the original chain size. Measurements of the broken sprocket seemed to indicate that it was built to metric dimensions (right photo).

A slight design change was made to include a broached keyway instead of an integral key in the original part.

The next part of the project was to create the G-code from the model and build the part. The original part was cast from sintered metal. The replacement part was made from leaded steel using a combination of a CNC mill and a manual lathe.



The second project described was to build a replacement impeller for a mill coolant flood pump. The project was similar to the first project, except that no complicated equations were required to model the impeller. Once again, broaching figured prominently in the project (left photo).

The third project came about as part of a project to replace the timing belt in a Chevrolet Aveo. Like many car engine repair projects, the instructions called for the use of "special tool so-and-so". It's not usually necessary to obtain one of these high-priced special tools, as a wrench, pliers or screwdriver will suffice. Unfortunately, in this case, a special tool was required to rotate the water pump and because of limited access, was really necessary. The tool was expensive and was not available on the weekend, so Martin built one. He found a picture on the internet and scaled it based on the dimensions of the water pump. A square hole was required to adapt the tool to a ratchet wrench, and for the third time broaching was used. The hole was first cut with rounded corners using a 1/8" mill, then a 3/8 inch square lathe tool steel was driven through the hole with an arbor press. Ed Note: Martin's article covering unconventional broaching techniques will appear in the July newsletter.

Dick Kostelnicek brought in air shears, used to cut sheet metal that he bought at Harbor Freight (left photo). He described how the mechanism worked by using a pneumatic motor driving an eccentric shaft that wiggles the center shear knife up and down. The air operated shears cost about half the price the electric shears that we saw at the meeting last month.

Dick demonstrated the operation of an interactive screw chart that is now available on our website that he wrote in Javascript. The table is an expanded version of George Carlson's Screw Table. You can select a screw size from a drop-down list and all data for the various screw types will be updated. Items added to the original table are:

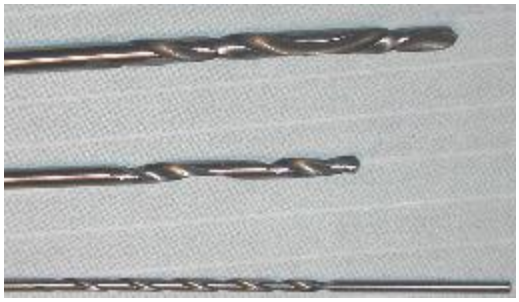
- Regular and jam nut thickness
- Set screw hex key size
- UNF and UNC tap drill sizes
- Body clearance drill size

The screw size last selected on the page will be remembered and selected the next time you visit the web page. There are also some special features available by pressing the [F1] key.

The table is a reverse directory. For example: If you measure the head diameter of a button head screw, select that diameter from the button head drop-down list and all screw data for that screw and all other similar sized screw types will appear.

Inspired by a design from *Joe Williams*, Dick built pneumatic lathe cut off saw from an air operated drill (right photo). He showed a video of its operation. See the article Air Operated Lathe Cut-Off Saw at the end of this newsletter.

Show and Tell



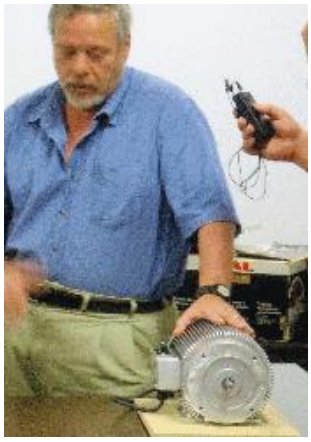
Joe Williams brought in some unusual drill bits. One had been partially twisted in reverse, one had the flutes only in the middle, and one had a manufacturing defect where the twist was not uniform (left photo).

Joe showed the results of a project where cross hatched serrations were required on the end of rod. He cut them in two passes of a carbide thread mill run at 90° to each other. See the article Milling Serrations at the end of this newsletter.

Norm Burls

Norm Burls gave high praise to a book he recently acquired called *Heat Treatment, Selection, and Application of Tool Steels* by William Bryson.

Norm was using the top face of an imported anvil to back up sandpaper for sanding. He noticed that the top was not very flat, so he clamped it in his mill to surface it. He then noticed that the bottom was not parallel to the top, so he flipped it over to surface the bottom. He had trouble holding it in his vise, and it kept rotating during machining. He found that if he put three round pins between the irregular surface of the side of the anvil and this vice, two on one side and one on the other, it kept it from rotating.


Shannon DeWolfe

Shannon DeWolfe obtained a sample of a variable speed motor being developed by Dynamotor. The 3800 rpm motor is a 1.25 hp. two pole impulse motor. The amazing thing is that it is variable speed and reversible, and it runs on 120V AC. Production versions of the motor will be 4-pole, fractional to 5 HP. In the demonstration, it hunted for a speed somewhat when first turned on. It is supposed to respond better when it's under load. The motor is expected to sell for about $800. It has 82% efficiency and develops full torque at 800 rpm.

Problems and Solutions and **Ask the Blacksmith**

A member asked why do you *strop* razors? The Blacksmith answered to remove the curl or a slight amount of metal from the edge of the blade.

A member asked where he could buy 1 pt or 1 qt of muriatic acid? He said that it used to be available in drug stores in small quantities. It was suggested that a hobby shop that sells supplies for silver jewelry work might have small containers.

A member recommended Fluid Film spray for corrosion prevention, which contains lanolin. It is available from John Deere and Grainger for about $9.

A member said that he bought some Tear Mender from Ace Hardware. The company said in a reply email that it should work to repair sanding belts, and he plans to try that application. Other members said that it might be available at fabric supply stores. Ed Note: *The club member who commented about "Tear Mender" for sanding belt repair, reported later in the Tinkering email newsgroup that it did not work.*

A member's planned project had the need for a shaft bearing that allowed the shaft to move +/-45°. The standard for commercially available products is +/- 11°. For the part, he plans to use the ball out of a 1/4 turn valve. He wondered how he could machine a spherical cavity? In reply, the club's librarian, Dan Harper, said that the book Metalworking Sink or Swim: Tips and Tricks talks about doing this with a mill by rotating the stock with a vertical rotary table and using a fly cutter.

Novice SIG Activities

Rich Pichler and the Novice group discussed tapping and learned to use a hand tapping machine.

Air Operated Lathe Cut-Off Saw

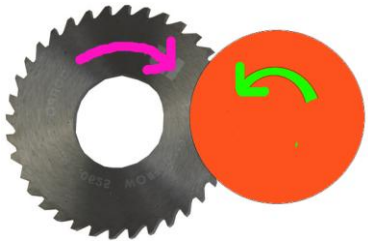
By *Dick Kostelnicek*

This article describes a pneumatic saw for cutting off work chucked in a lathe. Instead of using a conventional single blade cut-off tool, I've adapted an air operated drill motor to drive a circular slitting saw blade. J. R. Williams has described an electric motor version of this lathe cut-off technique.

The drill's original 3-jaw chuck was replaced with a homemade Slitting Saw Chuck. A Drill Holder was constructed that allows the drill body to be securely held in an Aloris style tool holder (left photo). The Saw Chuck holds blades between 2 and 4 inches in diameter with arbor holes spanning 1/2 to 1 inch. I do most of my sawing with blades with a thickness of M1 = 0.039 inches, but prefer a very thin 0.014 inch thick blade when I have a tight allowance for the saw kerf. Thin blades remove a small amount of stock, and thereby, reduce the cut-off time. Caution, they are more susceptible to breakage.

This Air Operated Cut-Off Saw struggles a bit when powered by a single stage 3 HP air compressor. A 5 HP unit would be ideal because it could continuously maintain the inlet air pressure at 120 PSI. Click here to see it operate.

The ½-inch air drill is a Harbor Freight model 98896 that costs under $30. It has two tandem radial ball bearings in its spindle and employs double reduction planetary gears. No load speed is 700 RMP. The surface cutting speed is, therefore, 360 **F**eet-**P**er-**M**inute for a 2 inch diameter blade and 720 FPM for 4 inch. This is too fast for cutting steel but is acceptable for brass and aluminum. However, I usually operate the air saw in the lathe while the work is turning. With the work rotating in the normal direction and the saw turning in the forward direction, the surface cutting speed is reduced to the difference in peripheral speeds between blade and the depth of cut into the work (right drawing). Hence, the actual blade cutting speed can be maintained at around 100 FPM by altering the lathe's spindle speed. 100 FPM is an ideal speed for cutting mild steel. As the cut deepens, increase the lathe's RPM to maintain a constant surface cutting speed. An advantage of cutting while rotating the work is that the blade only needs to pass half way through to completely cut-off the stock. Additionally, the cut is symmetric around the stock's cut end even if the blade in not precisely perpendicular to the work.

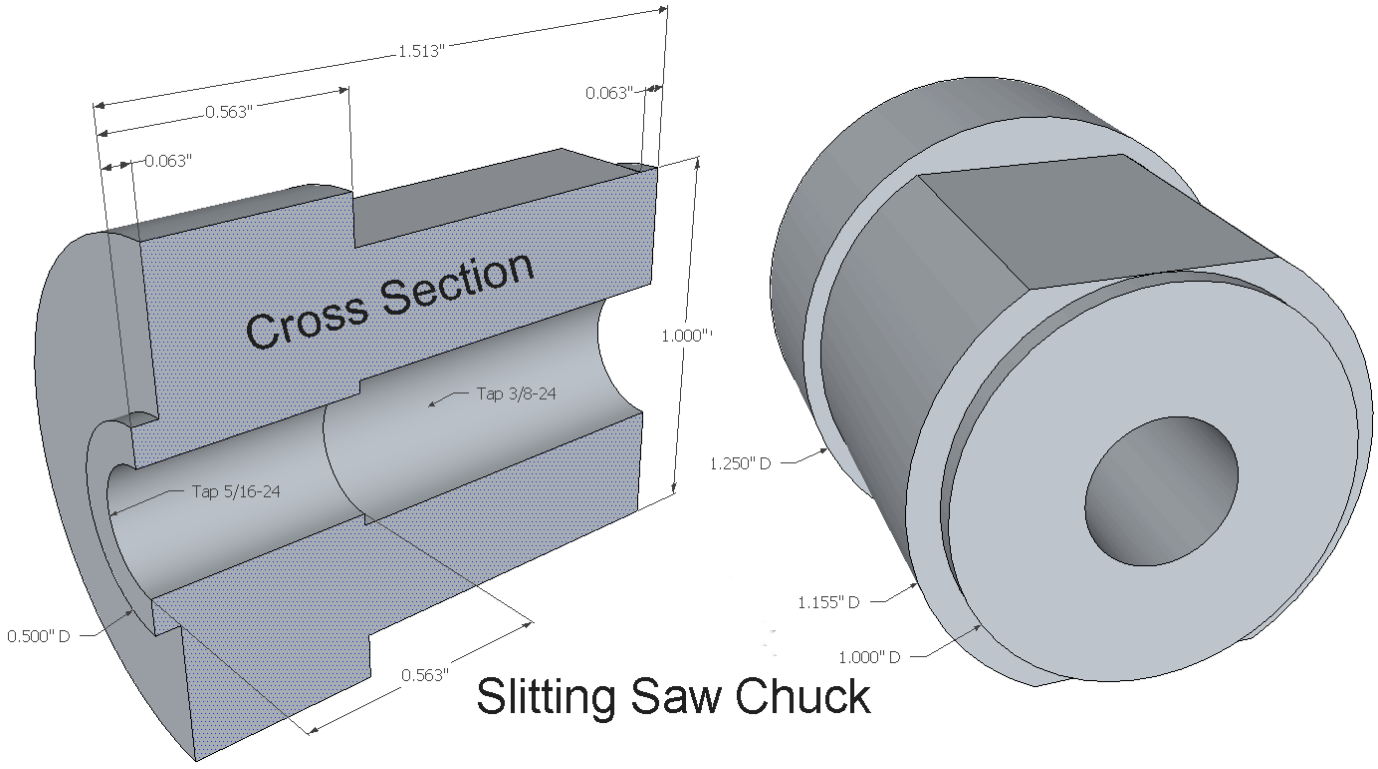


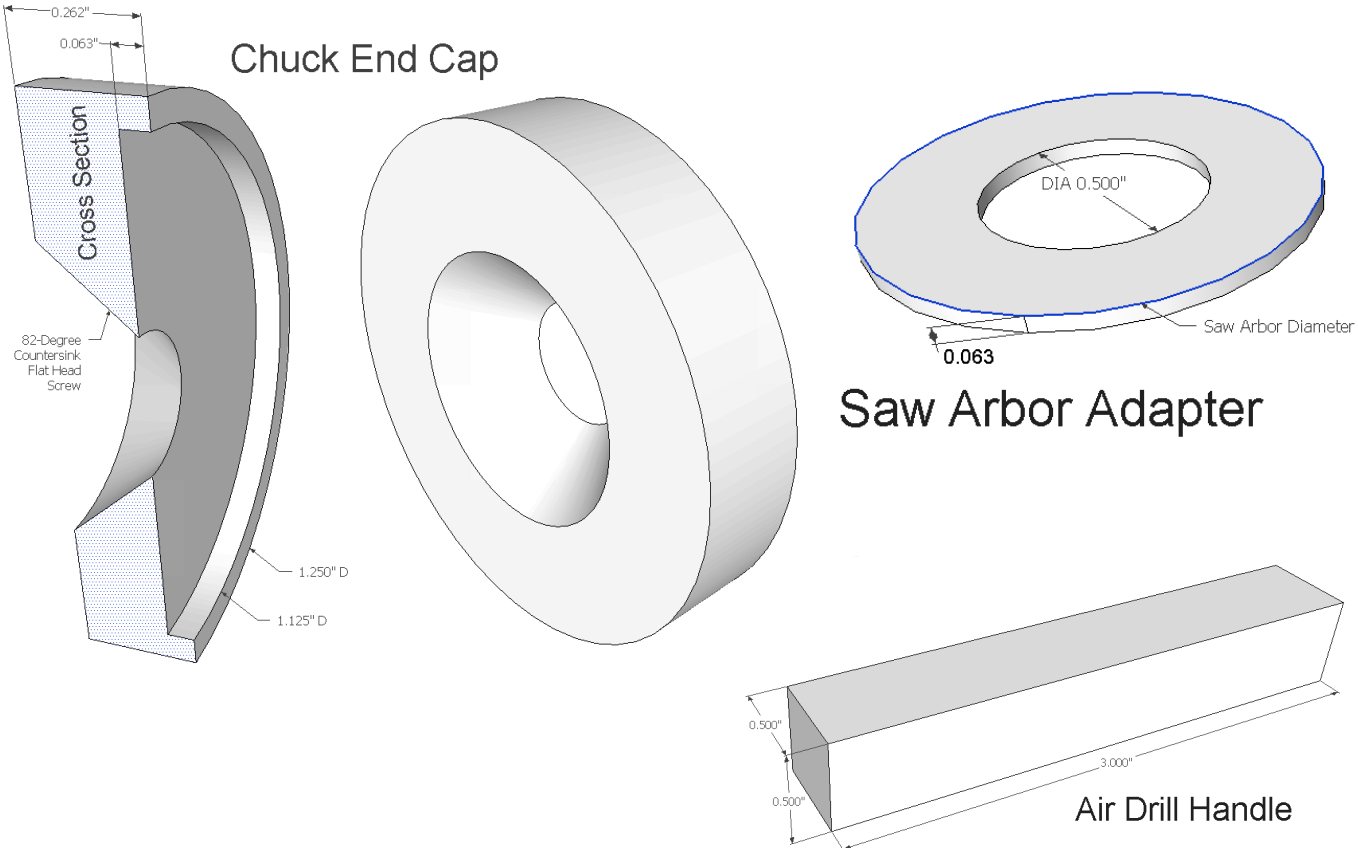
First, remove the 3-jaw drill chuck from the air drill. Completely open the jaws and unscrew the left hand #10-32 slotted head retaining screw located in the bottom of the open jaw cavity. You won't need the retaining screw since the air drill will be operated only in the forward direction. Tighten the jaws of the chuck around the short arm of a 3/8 inch bent hex key wrench. Loosen the chuck by smartly striking the long arm of the hex wrench with a mallet in the counter clockwise direction. Safety glasses are a must here. Unscrew the chuck from the drill's 3/8-20 right hand threaded spindle.

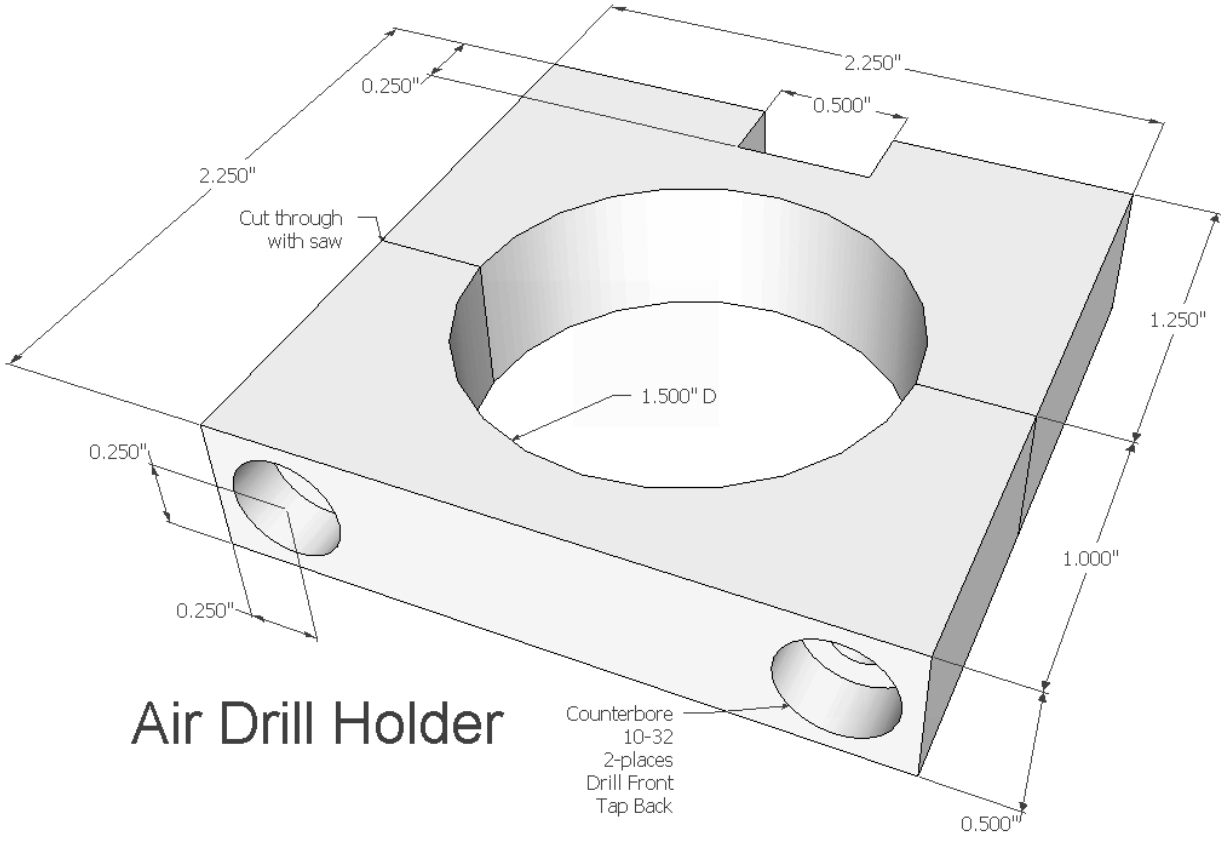
The air drill motor is mounted on my lathe's Aloris style tool post with a homemade Drill Holder that clamps around a 1½ inch diameter boss located on the barrel of the drill motor just behind where the 3-jaw chuck was attached. This machined boss is located on the tubular housing that contains the spindle bearings and double reduction gears. It is important that the tubular housing be screwed tightly in the clockwise direction in order to prevent it from rotating in relation to the air motor. The spindle bearing's outer races and the annulus gears of the planetary gear train are held stationary when the tubular housing is torqued tightly against the body of the air motor. If loose, the annular gears may rotate and power to the saw blade will be reduced.

The saw blade is cinched between the face end of the Slitting Saw Chuck and its End Cap (see drawings below). The chuck and cap were made from cast iron, but bar steel or brass would do just fine. The Chuck End Cap is fastened to the chuck's body by a ½ inch long 5/16-24 flat head socket screw. Two flats on the barrel of the Saw Chuck allow it to be held stationary by a 1 inch open end wrench while the flat head screw is torqued. The saw blade is centered by a 1/16-inch thick Arbor Adapter washer that has a ½ inch diameter hole. The outside diameter of the washer fits snugly into a blade's arbor hole. M1 (0.039 inch) thick saws blades with M22 and M16 arbor holes are readily available on Ebay for $3 - $5, including shipping. Make the appropriate arbor washer to center your saw blade on the ½ inch arbor located on the face of the Saw Chuck.

A ½ inch square Drill Handle was cut from key stock and silver soldered into the rectangular notch in the Drill Holder (see drawings below). The Drill Holder was made as a single piece of steel, bored, drilled and tapped, and finally cut in half on a band saw. However, before cutting, the hole in the Drill Holder should be bored to exactly match the nominal 1½ inch diameter of the machined boss on the barrel end on the drill motor. The cut's kerf provides the necessary gap so that two socket head cap screws can tightly cinch the Air Drill Holder around the drill motor's barrel. Finally, the drill holder and handle parts were Parkerized to inhibit rusting.




Chuck End Cap
0.262"
0.063"
Cross Section
82-Degree Countersink Flat Head Screw
1.250" D
1.125" D
DIA 0.500"
Saw Arbor Diameter
0.063
Saw Arbor Adapter
0.500"
3.000"
0.500"
Air Drill Handle


2.250"
0.250"
0.500"
2.250"
Cut through with saw
1.250"
1.500" D
0.250"
1.000"
0.250"
Counterbore 10-32 2-places Drill Front Tap Back
0.500"
Air Drill Holder

Milling Serrations

By *J. R. Williams*

A member of the club wanted a good method to provide a serrated surface on the flat end of a round rod. My solution to the problem was to use a milling cutter with uniform triangular teeth spaced at the desired pitch. The cutter is normally used for cutting 20 TPI threads in a CNC operated mill (right photo).

The work piece was mounted in a standard square collet block (left photo) with a mechanical stop to maintain end location. The cutter was located to cut at approximately 0.030 inch deep and one pass was completed and then the work was rotated 90 degrees to complete the second cut.

The finished sample is shown below in a close-up end view. The photo shows uniform pyramids with a small flat top.