

The NEMES

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

Gazette

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President's Corner

Dick Boucher

The Meeting

Our speaker this month will be Les Harriman. Les is one of the founders of the New England Dragway in New Hampshire and I had asked him if he could give us a talk on the formation and history of the dragway. He suggested that instead he speak on a consulting job he did for the General Electric Electro Motive Diesel division. The one year job was involved in bringing to bear his 37 years as a heavy metal fabricator at GE Lynn. The project involved welding of parts for a new design of engine for the GE locomotives, very reminiscent of the construction methods used in the Crossley automobile engine of the late forties. The first engines made for these cars used braze welded blocks.

Miscellaneous Ramblings

Not much rambling going on this past month. I have been kind of sticking close to home raking leaves and chopping firewood. I have been working on the boilers for the Frodo Project and raking leaves. I have also done a little more work on my Cole's Power Models Creator's popcorn engine and raked more leaves!

This past Tuesday was the last night of the night school teaching at the North Shore Technical High School. Usually Tuesday afternoon before heading to the school was spent raking leaves and as of this writing I still have more leaves to rake.

One more thing I would like to mention, besides raking leaves, is a flyer that Elln Hagney gave me at the museum last meeting. It is about an organization called the Artisan's Asylum. Their facility is located in Somerville. They have a number of shop areas including bike repair, electronics assembly,

Next Meeting

Thursday, December 6, 2012

Charles River Museum of Industry
154 Moody Street
Waltham, Massachusetts

Membership Info

New members welcome! Annual dues are \$25 (mail applications and/or dues checks, made payable to "NEMES", to our Treasurer David Baker) Annual dues are for the calendar year and are due by December 31st of the prior year (or with application).

Missing a Gazette? Send a US mail or email to our publisher. Contact addresses are in the left column.

Issue Contributions Due

JAN	DEC 20, 2012
FEB	JAN 24, 2013
MAR	FEB 21, 2013

Table of Contents

President's Corner.....	1
Miscellaneous Ramblings.....	1
Tool Corner.....	2
Shop Talk.....	4
Shop Tips.....	4
Metal Shapers.....	5
CAD Facts.....	7
Circuit Corner.....	8
Wanted.....	8
Upcoming Events.....	8

wood shop, metal / plastic machining and welding. They have spaces to lease and also have instruction available. Memberships range for full member with full time access to the facility to weekend memberships.

If anyone would like to get involved building a project but doesn't have the facility to engage in such an undertaking this might be a location for them to get involved.

For more information, visit them at WWW.ArtisansAsylum.com

Tool Corner

Frank Dorion

Last time we were discussing the several desirable features of my antique C. F. Richardson machinist's marking gage. And, as promised, here's a bit more information on how you can buy or make a similar gage.

First, if you want to take the easy route, you can still buy a very similar gage from Starrett. It's their No. 29 Scratch Gage, catalog number 29B. The Starrett No. 29 differs from the Richardson gage primarily in that the Starrett gage replaces the Richardson two-part collet type head locking mechanism with a one-piece head that uses a split bushing and thumb screw for locking. Not as elegant, but I'm sure it gets the job done. Two extra cutters come with each gage. I looked around the net a bit and it appears the best deal on a new one would be Amazon's price of \$82.45 with free shipping. With Christmas just around the corner, you may want to drop a hint to the right party that this would be an appreciated gift.

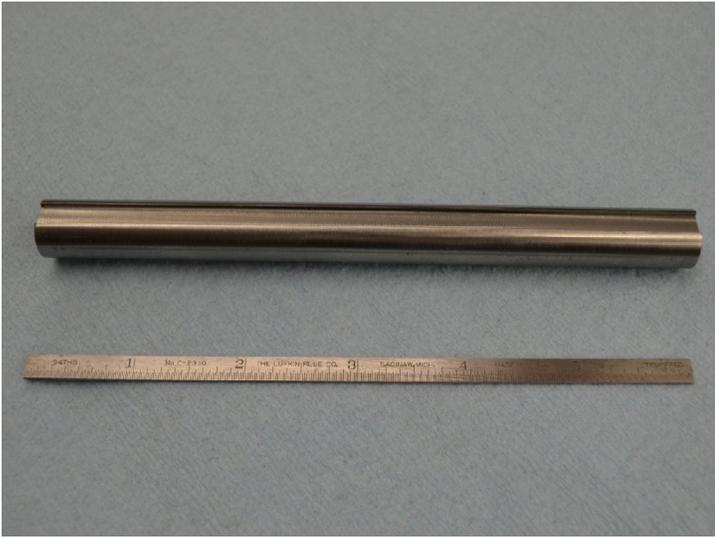
On the other hand, if the Starrett gage strikes you as being a bit expensive, there is another way to own this type of gage – make one yourself! The main challenge lies in graduating the gage. As we discussed last time, the most desirable graduations would be $1/64$ " increments. Although the graduations could be done in a home shop, engraving them and stamping the numbers would be a tedious process that would also be easy to mess up. So, I came up with the idea of inlaying a narrow 6" machinist's scale on the gage's beam to get the required graduations. These narrow scales were made by all the major manufacturers of machinist's tools and they all seem to run about the same size, approximately $3/16$ " wide and varying in thickness. The one I used was a Lufkin rule that measured $.200$ " wide by $.040$ " thick. Using $3/8$ " diameter stock for the beam as in the original Richardson gage doesn't leave much room for inlaying the rule, so I increased the beam diameter on mine to $1/2$ ". This increase in the beam diameter would tend to make the gage a bit heavy in the hand so I compensated for the larger diameter by drilling a $9/32$ " hole almost the full length of the beam to lighten it up. Just leave some stock on the end that will carry the cutter so that end can be drilled and tapped for the cutter's retaining screw. The hole on the other end is a great opportunity for mounting a nice little finial that will add a bit of pizzazz to your gage.

By the way, you don't need to have a perfect rule for this project. The one I used had a fair amount of rust on it, but the graduations and numbers are cut deep enough that I was able to clean off the corrosion and still have nice sharp graduations. Of course, deep rust pits would probably make a rule unusable.

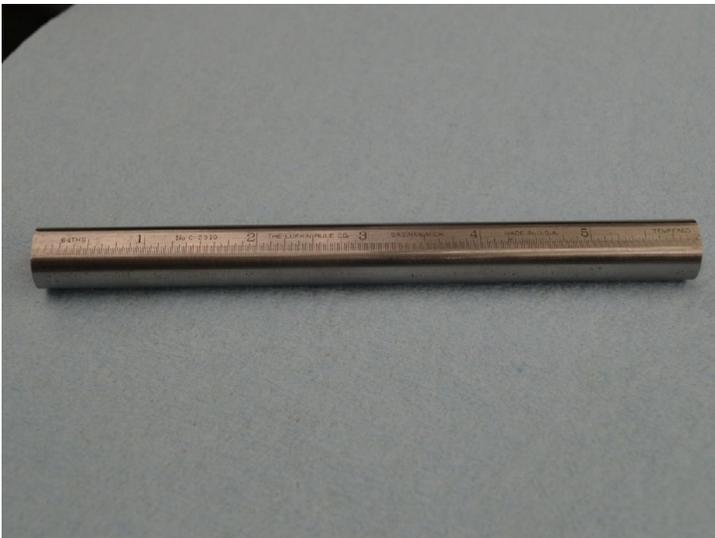
Here's a look at milling the initial groove for the rule.



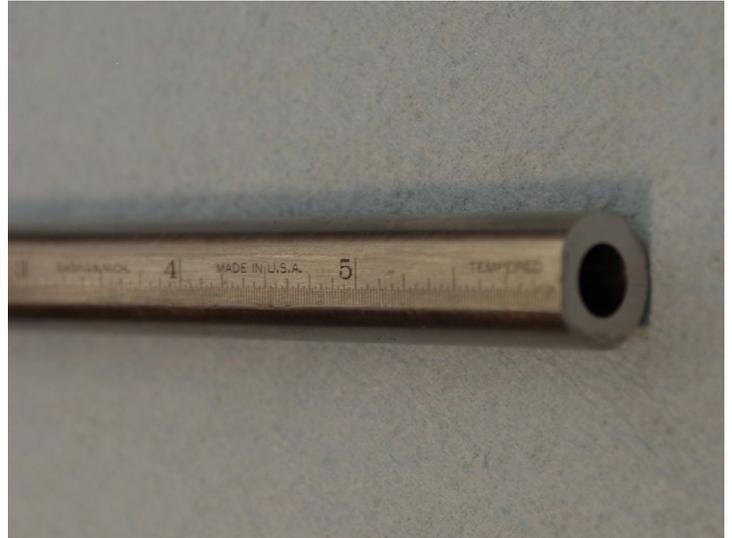
It's a good idea to have an extra $3/4$ " or so of stock length so you have room to start the cut and check its size before you cut into the actual 6" of beam stock. If, by some improbable chance, you have an end mill that is nominally the same size as the rule's width, don't use it. What we are shooting for ideally is to have the rule be a light press fit into the groove and end mills tend to cut a bit oversize. So, start with an end mill that's a bit narrower than the rule, then measure the actual cut and take another light cut down each side of the beam to remove the remaining material and nail the exact rule width. As far as how to cut to the correct depth, keep in mind that you can't measure the depth of the groove accurately until you have cut its full width. So note your final width settings carefully – you need to repeat them to make the final cuts to depth. Keep checking your cuts on the first half inch of the waste stock end so you can tweak your cut if it's off a bit. Finally, it's a good idea to make the groove a few thousandths deeper than the rule's thickness to be sure the rule can be seated at the proper height. If the groove is too shallow, the rule's edges will be proud of the circumference of the beam and thus interfere with the gage head's movement. With a bit of extra groove depth, a touch of a fine file will bring the edges of the groove down flush with the rule's face and you are good to go. If all goes well, here's what you end up with:



I managed to get a pretty good fit of the rule into the groove, so I used Loctite retaining compound and pressed the rule into the groove with my milling vise. Epoxy would no doubt work well also and would be more forgiving if your slot width winds up a bit oversize. Clean the rule and the groove with a good solvent so the adhesive you use will bond properly. Also, be careful to keep the beginning of the rule exactly flush with the end of the beam – the accuracy of the graduations depends on it. Finally, be sure the beginning of the rule is at the solid end of the beam and not at the end that has the hole in it. If you use your milling vise as a clamp, put a piece of waxed paper between the beam and the vise jaw so you don't accidentally glue the beam to the vise jaw. Here's the result:



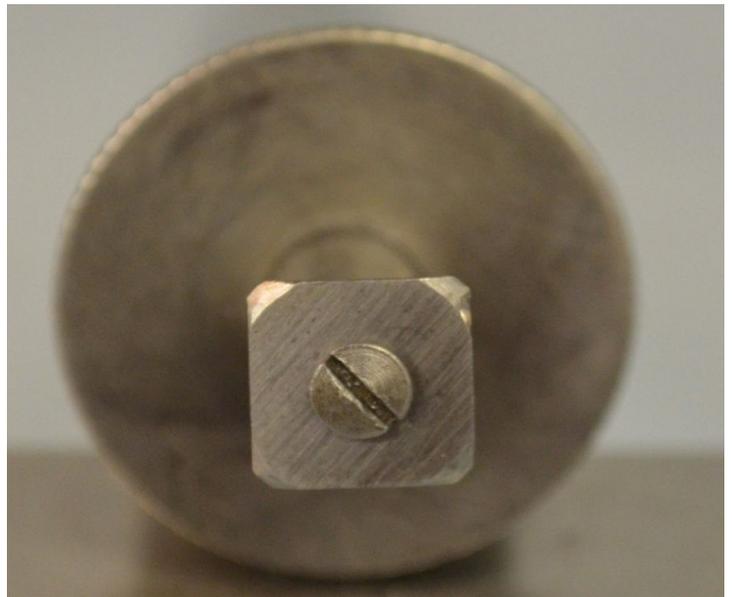
After you cut off the extra stock and face the end of the beam flush with the far end of the rule, here's the end view:



This is as far as I am going to take my marking gage project in this article. You can make the head according to the collet-type Richardson design shown in the last Gazette, or you can use a simple thumbscrew to lock the head in place. Look up the Starrett No. 29 scratch gage to see their design for a one-piece head. Also, consider making the head in an octagonal shape so the gage won't be rolling off the bench onto your concrete floor. Review last month's photo of the Richardson collet type head construction.

Note: Don't fuss too much with the internal female taper on the collet locking nut. On the Richardson gage, it isn't even a taper, just roughly machined steps that bear on the male taper in only two narrow contact bands. No matter, with the fairly long, acutely-angled taper you can see on the male end, the fence locks up smoothly and solid as a rock.

The last piece you need is the cutter. Here's another look at it in the same photo I showed last time:



Make the cutter from a piece of 1/32" thick O1 tool steel. The edge length of the square cutter should be about 1/8" more than your beam diameter. Drill and countersink the cutter for a small flat-head screw. Harden the cutter and then temper it for one hour at 375° F to get a hardness of around 60 Rockwell C.

Note how the cutter is ground with a small flat on each corner so you have eight different cutting points. Also, be sure you bevel the cutting edges at the corners on one side only, so the sharp edges will be exactly in line with the end of the beam. To get the very fine scribed line you want, touch up the corners of the cutter with a fine oil stone to remove any burrs. When honing the side opposite the beveled corners, take care to keep the cutter flat on the oil stone.

And now, just a comment on using this style of gage. The cutting edges at each corner will be very sharp and consequently quite delicate. The idea here is to scribe a very fine line through the Dykem blue or other marking medium. There is no need to cut into the metal surface below, although a very light scratch is tolerable. Heavy pressure on the gage will soon blunt all its edges and the quality of the scribed lines will deteriorate accordingly. There will likely be occasions when you might want to scribe a cut line on bare metal, and that's fine – just keep another gage for that type of work.

Whether you decide to buy or make a gage in the above style, I'm betting that, once you try it out, it's the one you will reach for when it's time to scribe layout lines on a project.



Shop Talk

Max ben-Aaron

At Rollie's shop meet he brought out a very exotic piece of machinery – a Leland-Gifford Drill PointMaster sharpening machine. It is so rare that not even Frank Dorion has one (I think). This is its story:

When the Leland-Gifford company was sold, (they went to Cleveland), a friend of Rollie's attended the auction and bought an incomplete Drill PointMaster, a drill sharpener for sharpening very small drill bits. He had no use for it, so he gave it to Rollie. Eventually, Rollie met a fellow who had been a salesman for Leland-Gifford when they were marketing the machine (only a few were made, and fewer even were bought). He looked through his files and found the manual for the machine, which he gave to Rollie. With the aid of the manual, Rollie was able to replicate or fabricate some of the missing parts.

One of the sales advantages of the sharpener was an ability to thin the point of the drill. To do this for, say, a #60 drill, the corner of the stone must be very sharp, and the machine had a method of dressing the both circumference and the face to achieve this end.

Furthermore, there was an elaborate optical system (many, many special lenses of different focal lengths) to give the operator a good view of the point to ensure sharpening symmetry.

Rollie thought that the following paragraph contained some not-well-known information of sufficient value to be worth the effort to put it in the Gazette, so here it is.

A twist drill, unlike other tools, is structurally weak, because almost one-half of its volume has been cut away in the form of flutes to allow for discharge of the chips formed by the

cutting lips, and the remainder of the tool must remove a volume equal to its own original volume. Further, it is a long, slender cut-away column under compression and subject to column action or bending at the midpoint between its support in the spindle and the drill bushing, or the work, if no bushing is used. This bending is a major factor in drilling off-line holes. Thus, you will see that for small drills, particularly, where the ratio of length to diameter is great (for example, a ratio of length to diameter equal to about 40:1), it is of utmost importance to keep the end-thrust pressure to a minimum. This is accomplished best by notching or thinning the point to eliminate as much as possible the non-cutting chisel point.

In addition to this end-thrust or column action, the drill is also subject to severe torsional stresses which are set up by the cutting lips forming the chips and by the drag of the chips in the flutes. These forces tend to make the flutes 'unwind'. Too much torsional stress, like too much end-thrust, will, of course, cause breakage. Therefore, it is important to keep your drills sharp to minimize these destructive forces.

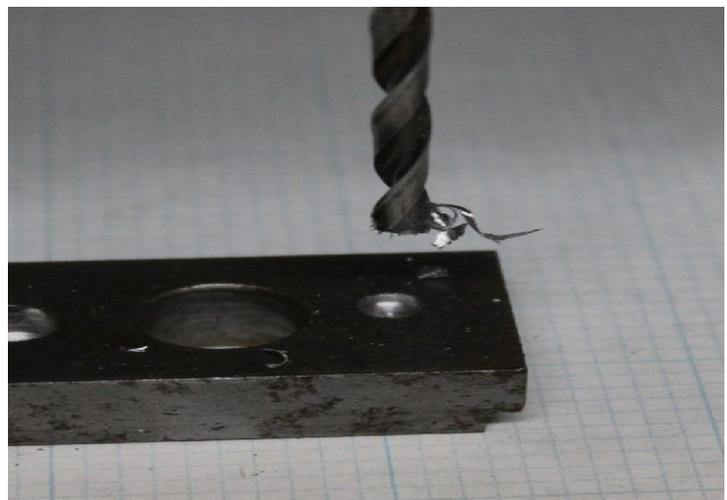


Shop Tips

Bob Neidorff

This short article will describe something that could be very useful in any shop. It's not technically a tool. Perhaps a better term for it is a machine. The device is a demagnetizer.

Have you ever seen chips stick to a tool, on the lathe, on the mill, on the drill or on some other tool? Here is an example:



This means that your drill is probably magnetized, so beware. A magnetized drill will hold chips rather than clearing them, so it will clog sooner, dull faster, and cut a poorer hole. When you see this, immediately remove the tool and demagnetize it.

There are many devices available for demagnetizing. My demagnetizers were made for erasing audio tape, but work fine for tools, too. You can find used tape erasers at yard sales and flea markets, or you can buy a new demagnetizer. I see lots of them on ebay for \$5 to \$15. McMaster-Carr Supply and MSC sell new demagnetizers for under \$100.

This small device is made for erasing cassette tapes and 7"

reels of tape. It is a handy size and very powerful:



This larger demagnetizer is made for 10½” reels of tape and is equally powerful and useful, just a bit larger, so takes up a little more room on the shelf:



Both of these work well on any sort of iron or steel tool, large or small.

It's important to use a demagnetizer correctly. To demagnetize a tool,

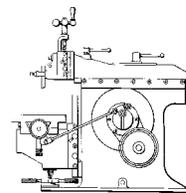
1. Place the demagnetizer on a table away from anything metal.
2. Plug in and turn on the demagnetizer.
3. Bring the tool to the demagnetizer. You will feel the tool vibrate when it touches the part of the demagnetizer with the highest magnetic field.
4. Slowly move the tool around – back and forth, left and right, then slowly pull the tool at least 24” away from the demagnetizer.
5. Do the same for any other tools that you want to demagnetize.
6. With all tools far from the demagnetizer, turn off power.

Do not turn off power with the tool touching the demagnetizer. That can actually magnetize the tool.

If you want to test a tool to tell if it is magnetized, use a portable compass. It will tell you more than a pile of iron filings, and it is cleaner to use.

Keep in mind that these demagnetizers will vibrate your tool as they demagnetize it, so you may not want to use it for something fragile, like a dial indicator or a greaseless ball bearing.

There is another kind of demagnetizer available that is simply a permanent magnet in a casing with instructions on how to use this for magnetizing and demagnetizing. These are small and inexpensive but I've never tried one and can't say if it works well or not. Web reviews of this type of demagnetizer are mixed with some saying that it is too weak to be useful and others saying that it is good for magnetizing screwdriver tips. Here's a photo of one of these inexpensive demagnetizers:



Metal Shapers

Kay Fisher

R. G. Sparber's Gingery Shaper - Part 31 Machining and Assembling the Down Feed (part 1)



Down Feed Assembly Photo by R. G. Sparber

Above we have the down feed almost done. The round bar sticking up, the disk, and the rectangular part with the slot in it make up the slide and was described earlier. Next, I will describe machining the L shaped casting, fitting the slide

clamps, and fitting the previously turned drive screw.



Casting Photo by R. G. Sparber

This photo is the rough casting after the gates and flash have been removed with a bandsaw and disk sander. This is one of my last castings with old Petrobond. It looks rather sad but a bit of machining will remove most of the defects.

One thing that machining will not improve is the space between the two raised blocks. By the time I had this space nice and clean, it was $\frac{1}{8}$ " wider than expected. In the spirit of turning lemons into lemonade, I added a second strip of brass as you will see.



Setting Reference Planes Photo by R. G. Sparber

The first step is to identify my reference surface. This part is nice in that these surfaces are easy to reach. Once these surfaces have been cut flat, they will provide alignment for all other cuts. If I had needed a third reference surface, it would be the outside vertical surface on the left side of the casting.

You will see in the following pictures lots of swarf laying around. If any of this gets between a reference surface and a support or knee, the casting will be cut with an error equal to the diameter of the largest piece of swarf that is in the way.

To avoid this problem, I spray WD-40 on all reference surfaces and then wipe them off with a few sheets of toilet paper. A close inspection with a bright light is performed to verify all is clean. Without this attention to cleanliness, no amount of precision will give decent results.



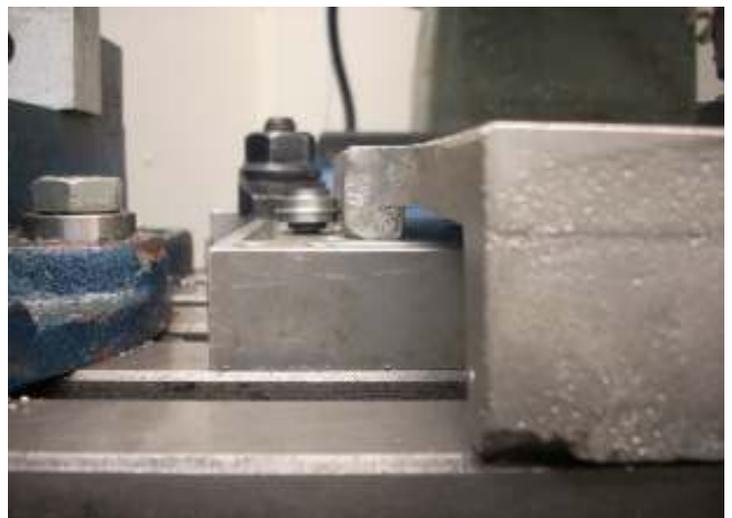
Mill Setup 1 Photo by R. G. Sparber

Before I can cut "Reference 1", I choose to roughly support the casting and cut "Reference 1 prime", the tops of the two pads. They give a solid surface to support the casting as I cut Reference 1. Not visible here is the jack that is under the hold down clamp.



Mill Setup 2 Photo by R. G. Sparber

My mill table is true and I have placed a support plate down that is of uniform thickness. As long as Reference 1 prime is firmly against the support plate, Reference 1 will be parallel to it.



Hold Down Screws Photo by R. G. Sparber

Note the two screws on the left side of the casting. They are eccentric hold down screws.



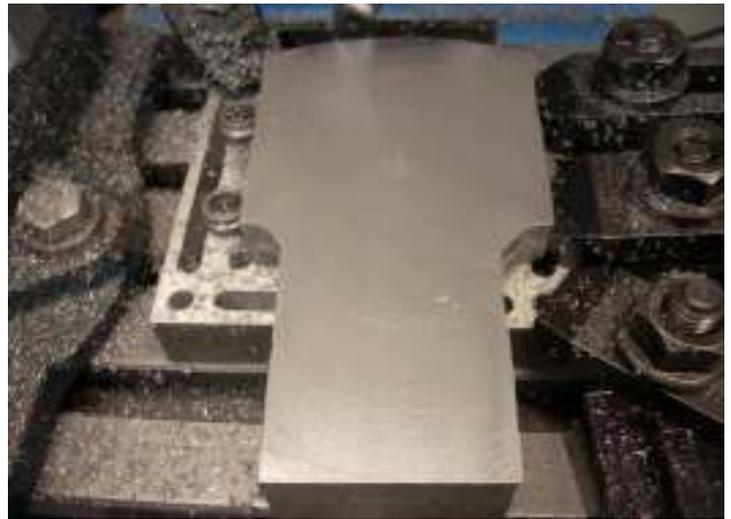
Hold Down Clamps Photo by R. G. Sparber

On the right side are two hold down clamps that are raised slightly as you will also see below. The eccentric screws are first turned so the narrow part is facing the casting. Then the casting is pressed against these screws. Next the two hold down clamps are pressed against the casting. A quarter turn on the screws and the casting is pushed towards the clamps and down onto the support plate.



After Shell Mill Photo by R. G. Sparber

With all clamping done on the edges, it was easy to run my shell mill across the Reference 1 surface. This shell mill is the one that came "free" with my mill/drill and is almost 20 years old. Many people think it is a piece of junk but just this year I learned how to use it correctly. I run the tool at 2500 RPM (my mill's highest speed). The surface is flooded with WD-40. I know this finish looks terrible but it really is not so bad. You can see the effects of my mill head not being perfectly trammed. The back side of the cutter runs slightly deeper than the front, producing an arc half way down the casting.



After 3M pad Photo by R. G. Sparber

Then a few passes with a 3M pad really polishes the surface. Stay Tuned for part 32 from R. G. Sparber next month. Keep sending me email with questions and interesting shaper stories.

My email address is: KayPatFisher@gmail.com



**CAD
Facts**
Ed Brudz

There is an AutoCad clone freeware on the internet called DraftSight by Dassault Systems. This is a neat program which has most of the features of AutoCad and I have found it simple to use in drafting up an EDM Machine designed by George Gallant. I found I can open AutoCad programs, modify them with Draft Sight and save them in the *.dwg format. However, drawings saved in Draft Sight cannot be opened by AutoCad, (by me anyways!!). I can also export the drawing into Adobe PDF format so any one can read them with adobe reader. I like to design & draft in "A" or "B" size so I can output to a standard printer rather than an expensive plotter. I have yet to find an export to dxf format in Draft Sight.

The program has most of the same features but not the same Tool bars as AutoCad so you have to hunt for the features, dimension styles, properties, etc you want to use, but they are all there. One feature I find better than AutoCad is the automatic feature locator. As you move the cursor near or over a line, Draft sight automatically highlights the nearest endpoint with a Box and a caption "Endpoint". It also highlights Intersection, midpoints, perpendiculars and circle centers without having to go to a Toolbar Icon.

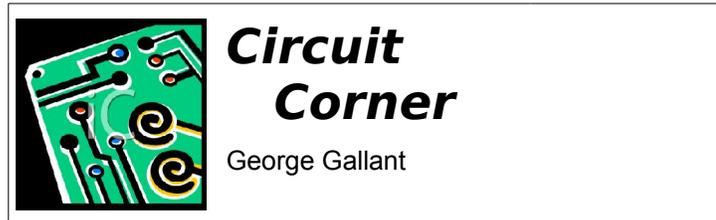
You can also move a block of features from one drawing sheet to another, by highlighting the features with a box and then use Microsoft's Std COPY Command (CTL C) to copy it to desktop and the Paste (CRL V) to paste it on to the drawing sheet you want. The pasted feature will have grips so it is easy to position it anywhere in the new drawing you wish. Scaling a dimensioned feature is a little cumbersome

as the dimensions text does not scale automatically. However, if you highlight the dimension you wish to change and use the Explode command you can modify the text of the dimension to the new value.

I was skeptical of the program at first but now I like it better than AutoCad.

Editors Notes:

1. Dessault is the company that brought you SolidWorks.
2. There are MAC and Linux versions available.
3. You are prompted to register your copy. It took me 4 tries.
4. The CAD drawings for my EDM project can be found on the NEMES web site.



Schematics and art work for the pulsing EDM are finished and have been sent off to a board fabrication service. Should be about a three week turn. I decided to make two PCBs because mixing the 120VAC, 70V arc & spark, and 3.3V logic was getting too risky. This way I can debug the much of the system without worrying about touching any high voltage.

The first board contains the processor, stepper motor drivers, and user interface ports while the second contains the power components. Each board is 2.8" x 2.8" with a 12 conductor header providing the interconnect. Each board has 4 mounting holes on 2.5" spacing. Hopefully the two boards can be stacked in the finished configuration while debugging will use discrete wires. Each blank board costs approximately \$13.00. Still working on BOM so the parts cost is not yet available.

The ON/OFF switch, transformers, power rectifier, load resistor, and power capacitors are all external. Connections to the power board are with screw down terminals.

120VAC is being switched ON/OFF with a triac. Triacs are a three terminal device, 2 power and 1 gate. They have the characteristic of turning OFF when the voltage power terminal nears zero.

An optocoupler across the AC generates a signal to the processor on every zero cross. The CPU can use those events to time the triac ON signal during the next half cycle. In this setup, two triacs are being used. A low power optically coupled triac is driven by the CPU which in turn activates the high power triac. The load on the CPU for servicing the triac at 60Hz will be insignificant.

The processor also monitors the electrode voltage. Combining this with the triac control, it should be able to roughly regulate the voltage supplied to the electrode. This way, the voltage can be set low (5 volts) when advancing the electrode and the processor should be able to detect when

the electrode touches the work. Then it can raise the electrode by 0.005" and ramp the voltage up to 70V to starting sparking. That's the plan anyways.

I did let the smoke out of a high wattage wire wound resistor that was enclosed in a heavy duty aluminum casing. It was quite spectacular. Big bang followed by a basement full of stinky smoke. Since it was Saturday night in Maine, it was time for a change of underwear anyways. Hopefully, the embedded CPU will be able to detect an extended short and turn off the power.

These electronics could make an expensive dimmer!



My nephew is interested in learning machining and would like to buy an inexpensive lathe, in the 9" to 12" range. He's OK with something old, as long as it is serviceable.

Bob Neidorff
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To add an event, please send a brief description, time, place and a contact person to call for further information to Bill Brackett at events@neme-s.org

Dec 6th Thursday 7PM NEMES Monthly club meeting
Charles River Museum of Industry 781-893-5410
Waltham, MA

Dec 15 2PM Third annual NEMES dinner
Woodman's
Essex MA

Jan 1st New Years day run
Waushakum Live Steamers
Holliston MA.