



The
NEMES
 NEW ENGLAND MODEL ENGINEERING SOCIETY INC.
Gazette

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Editor's Desk

Mike Boucher

Hi folks,

Well, the 8th iteration of our show has come and gone. As far as I could tell, it was quite successful. There were a good number of spectators all day, several new exhibitors, and several new models from "old" exhibitors.

I spoke with museum director Dan Yeager for a couple minutes, and he seemed quite pleased with the turnout.

Watch for a write up and photos of the show in next month's Gazette.

New Editor Needed!!

As I announced at the February meeting, my days as Gazette editor are numbered. The size of my family is about to increase from 2 to 3. My wife and I are expecting our first child in early August.

So, the club needs a new editor for the Gazette effective for the June issue.

Continued on Page 2

Next Meeting

Thursday, Mar 4, 2004

7:00 PM. Meetings held at:
 Charles River Museum of Industry
 154 Moody Street
 Waltham, Massachusetts

Membership Info

Annual dues of \$25 for the calendar year.

Please make checks payable to NEMES and send to our treasurer.

Missing a Gazette? Send mail or email to our publisher.

Addresses are in the left column.

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Qualifications are as follows:

- 1) A willingness to do the job! (*most important*)
- 2) A computer, with internet access.
- 3) Basic word processing skills, MS Word preferred.
- 4) 3 or 4 spare hours a month.

It's really not a lot of work. All that's required is to write a short column every month, and then proofread and assemble all the other articles submitted. Bob Neidorff, our publisher, takes care of the copying, envelope stuffing, and mailing. He's got the hard job!

The only time it takes a lot of work is if you decide to do fancy formatting for show photo articles.

You have the added advantage of hearing about any cool stuff submitted in "for sale" ads!

If you're interested, please contact me as soon as possible.

If no one volunteers, then we'll face the choice of volunteering someone or not having a Gazette. I wouldn't want to see the Gazette go away, so if you feel the same way, let us know.

C'ya
Mike



President's Corner

Norm Jones

The Meeting

Our speaker for the March meeting is Thomas Jennette. Tom's talk will be about his company, The Hudson Belt Co. This year marks the company's 150th anniversary. He will be highlighting some of the events that have shaped the company over the years.

Tom will explain the various styles of belts that they manufacture as well as discussing the materials used and methods for fastening them together.

NEMES Model Engineering Show

Once again I find myself composing copy just prior to a model engineering show. This month, it's our show. Last month, it was the Cabin Fever

Expo. I trust that everyone who made the trip to York, PA, had a great time. I can tell you that I had a great time as always.

By the time you read this, our show will be but a pleasant memory. Thanks in advance to all who donated door prizes, helped with refreshments, and worked hard to promote our event.

Retirement

Leslie and I returned from our fabulous trip to Hawaii on the morning of Feb 14th.

The jet lag is finally wearing off! We would have visited the National Energy Laboratory of Hawaii Authority if there had been more time. You can check it out at <http://www.nelha.com>.

I usually manage to visit a power plant or such on each vacation trip that we have ever taken. This is one of many good reasons to make a return trip to Hawaii!

Rider Ericsson Model "Restoration"

Just prior to the Cabin Fever Expo show, I decided that it was time to repaint and replace a number of worn parts on my engine. It has served me well for somewhere around eight or nine years now.

I was glad that I had elected to use Loctite to fasten the cylinder sleeve (steel) to the body casting (aluminum) rather than shrinking them together. The steel sleeve had rusted severely over the years and managed to fill up the water jacket with rust which has greatly reduced the cooling efficiency.

The end of December proved to be a poor choice to apply a new paint job. It was cold and damp outside at the time. I picked a color that was not as dark as the previous paint. Between the color choice and the overall results have contributed to a decision to do it all over again in the spring, when the outside temperature is a bit warmer. Theoretically. I should have the time to do so!

See you on March 4th.

Norm



The Meeting

Max ben-Aaron

The February 2004 meeting was called to order in the Jackson Room of the Charles River Museum of Science and Industry by Mike Boucher, standing in for Venerable President Norm Jones, who is on vacation.

Mike reported that the Venerable Norm Jones officially retired on the 28th of January and promptly, on the 1st of February, decamped to Hawaii. Good Luck, Norm.

Mike reported that 25 tables had been ordered for the show on Saturday, February 21st. Twenty tables would be set up in the Jackson Room, and five tables downstairs where Dick Boucher and friends would set up some track and run a live steam loco demonstration. Rollie Gaucher is bringing table covers again. Details of compressors for the Show were hashed out. Richard Sabol will be in the parking lot from 8:00 AM to 10:00 AM, with Ledloy bars for sale. Gail Martha and her trusty cohorts will handle the refreshment table, as usual. Mike will have NEMES T-shirts and sweat shirts for sale. Steve Cushman reported that door prizes were very hard to come by this year, and asked members to donate suitable stuff.

By the time this Gazette reaches you the Show will be history. Hopefully you were there. If not, read all about it in the April Gazette!

Show and Tell

Gilbert Greenberg, who was tired of ruining good clothes in his shop, told of ordering some aprons from Seven Mile Creek. He saw their ad in HSM. They sell 2 different aprons: a machinist's apron and a toolmaker's apron. They are \$9.95 each, or 2 for \$17. When they arrived, he was so pleased with them, he brought some to show. He recommends them to other members (usual

disclaimer). Their telephone number is 1-800-497-6324 and their e-mail address is sevenmile@voyager.net.

Venerable President Emeritus Ron Ginger drove to Detroit after going to Cabin Fever. He went to help his brother who is mentoring a group of students competing in a robotics contest sponsored by FIRST. He gave many details of the competition. Anybody interested will find everything they need to know at the URL: <http://www.usfirst.org/robotics/>

Bill Brackett, inspired by a plastic drill gauge card, decided to make up some for himself. At Staples he bought an Avery Lamination kit which had 10 sheets of 9" x 11" material, for \$8.50. He showed a laminated card to a friend, who remarked that the Avery laminating material could easily be replaced by clear contact shelf liner. Bill went out and bought some, and it really did work just as well. It cost \$4.50 for 9 square feet. That's twice as much material at half the cost. Rollie Gaucher suggested that a stiff cardboard backing sheet would enhance the final product.

The tables Bill created are described in the "Shop Hints" column, and are also downloadable from the NEMES website.

Oil Gang Crew Supervisor Fred Widmer, on behalf of the Charles River Museum of Industry, thanked Frank Dorian for his donation of seven very nice, old, machine lights for the Museum's machine shop. Fred reports: "On a typical Saturday afternoon, when I demonstrate the machines run by the museum's overhead line shafting to Museum visitors I am pleased to observe that men, women and children alike are **fascinated** to see the 7" shaper's single point tool shear off little chips of metal from a cast iron workpiece. Frank's lights will illuminate the process of making metal chips.

Fred also thanks Henry Szostek for lending the Museum his hydrostatic pressure tester. Henry's pressure tester will allow the Museum to put our 1952 Wayne two-stage air compressor on line (state regulations, and no separation of church and state in this case). This will provide shop air in the museum and shop air for future NEMES Model Engineering Shows.

Thanks again to all from the Charles River Museum of Industry.

Frank Dorian showed a lovely little working model lathe which has a gear train inside the headstock. It is die-cast and was made by was made by Manson in the late 1040's.

The speaker

The speaker this month was George Gallant, who described his techniques for making printed circuit boards (PCBs) in his basement. He builds robots and needs boards for the control circuits he designs. He used to use Radio Shack prototyping boards but they cannot be easily reworked and are much more fragile than a custom etched board.

To demonstrate a home-made board, George built a "Propeller Clock", which has a PCB paddle with a line of 7 LEDs on it. The paddle is mounted on a motor. It spins around, and by applying power to the LED's with precise timing, a message and the time is spelled out.

This project took him 3 days from start to finish. If he had had to send the artwork out to a commercial board maker, the three iterations of the PCB would have taken 6 weeks - 2 weeks for each version. Commercially produced boards are also much more expensive. Prices vary considerably. Check on the Net, or look at the ads in "Nuts and Volts" for vendors and prices.

For his home-brew PCBs, he spent 4 hours in his basement for each version. Of course, the quality of the home-made PCBs is nowhere near the quality that would have been produced by the commercial houses, but it is good enough for home projects.

The first stage of the project was the design. He decided on an 18-pin PIC 1320 processor, which should have cost \$4.22, but the mail-order vendor charged him 37 cents each for unknown reasons, which he was not about to question. This processor, running at a 40 MHz clock rate, was more than adequate for the job.

The lower left hand corner of the paddle has a little mirror on it. When a light beam reflects off it into a sensor, the circuit 'knows' where paddle is and can start computing and timing the current to each of the LED's to produce the illusion.

All his work is done on a Linux-based system running a suite of GNU tools from the Free Software Foundation. This suite is freeware and provides schematic capture software (GSCHEM)

and layout tools (PCB) to convert the schematic into the artwork needed to etch the board. One could also do the schematic capture with a free demonstration program offered by Eagle and do the layout with a downloadable CAD tool offered by ExpressPCB, a commercial PCB house with a web site.

The circuit that you want to make is captured in the form of a net-list, which is a list of all the points in the circuit that need to be connected to each other. For example, pin 3 on part 4, pin 7 on part 10, and pin 18 on part 12. The list of all the points that need to be connected is fed into the router software which figures out how the board can be laid out so that the connections can be made by traces on the board that don't cross. Ideally, it will do it with minimum complications in terms of needing multiple layers in the board and such. The router program outputs one piece of artwork for each layer of the board and information on where to put the parts and where to drill the holes in the board. (Thanks to Steve Lovely for this explanation).

PCBs may have one, two or multiple layers. Multiple layer boards, which have to be done by commercial houses have 'vias', plated-through connections between the different layers. Homebrew boards are generally limited to one- and two-sided boards. For two-sided boards, through connections can be made by running a wire through a hole and soldering it to a trace on each side, or by using eyelets.

Design rules have to be adhered to in laying out boards. Traces have to be at least 20 mils wide, with 25 mils separating them. If a significant current-flow is required, traces have to be wider. Blank copper-plated boards with either 1 oz/sq. ft. or 1/4 oz/sq. ft. of copper are used. The thinner copper etches faster, with less copper waste, but the downside is that the current-carrying capacity is less and they are terrible to rework. Avoid 'inside traces' i.e. traces that terminate under a component - they are very difficult to solder.

After the schematic has been captured and the 1:1 artwork has been prepared by the layout program, it is time to transfer the pattern to the board. Take a moment to check that traces don't cross. Occasionally, it may be necessary to add one or two jumpers to prevent this happening.

For single-sided board, there is no registration problem. Double-sided boards need too have

'targets' added to ensure precise registration. Remember that the art-work for the second side has to be reversed - it has to be the 'mirror-image'.

There are two methods used to ensure registration.

Method 1: Etch the image on one side. Drill any necessary holes. Use the holes for registration for the other side. This technique is not recommended for boards greater than 3" square.

Method 2: Make both transfer films at the same time and tape them together into an 'envelope' with perfect alignment. Then slide the board into the envelope and transfer both sides at the same time.

To make life better put some dummy pads (no wire will lead to it). After being used for registration scrub the dummy pad off.

Before transferring the image, the copper has to be very clean. Use 'Soft Scrub' and a green *Scotchbrite* pad. **Do not to touch the copper between cleaning and doing the transfer.** George uses board that has a sheathing of plastic protecting the copper. He peels the sheath off at the last minute, leaving a pristine copper surface. If you buy RadioShack board, you must clean it thoroughly.

There are two available systems to transfer the artwork to the copper: Toner Transfer System, by DynaArt Designs uses a piece of paper coated with a special sugar-type coating; and Press-n-Peel, a blue coated plastic film, from Techniks, Inc.

For both of these, the artwork is printed on a transfer medium with a laser printer or Xerox machine. Inkjet printers will not work. When the transfer medium is pressed against the copper and heat is applied with an iron (no steam), the toner is transferred to the copper leaving the toner image on the copper to resist the etchant.

Press-n-Peel is a Mylar™ sheet with one side glossy and one side matte. When it is ironed onto the clean copper surface, the part with the toner sticks to the copper. This leaves a thick layer of resist, including the toner plus the blue layer. You don't need to use a full sheet for each board. Just cut it to the size of the artwork. If possible, open the printer drawers so the Mylar™ can follow a straight path from input to output.

For the Toner Transfer System, the toner sticks to both the copper and the sugar. After heating and pressing, the whole thing is immersed in warm water. The sugar then dissolves, leaving the just the toner on the copper, ready to etch. With this system, virtually all of the paper can be used. After the image is printed on the paper, it can be cut out, and the rest of the paper saved for another day. It takes 20 minutes for the paper to dissolve. Toner paper costs \$30 for 20 sheets.

Press-n-Peel is more accurate than sugar paper. Mylar™ does not shrink, but paper will shrink about .050" over 4".

In any case, be sure that the transfer extends for at least ¼" outside any circuit traces.

You should use an iron without steam holes. These are not common, but you can adapt a standard iron with a new flat bottom. It takes about 1 minute of both heat and pressure to iron the artwork on to the copper. They don't tell you either the appropriate temperature or how much pressure is needed. If the board is big enough that the iron cannot cover it all, the iron must be moved. This makes it difficult to apply even heat over the entire board.

There are two commercial irons available at a cost of about \$300. One is like a waffle iron - it heats the PCB top and bottom as you close the cover down. The other is a heated wringer and the copper and artwork is rolled through it.

Funny things happen as the artwork is ironed down. Traces less than 10 mils wide get narrower. Traces greater than 50 mils wide get even wider, possibly due to toner build-up.

The paper in the Toner Transfer System sticks to the copper. To peel it off, use the iron again, over a phenolic board (one that won't melt), and then put it under the tap and the water will take the transfer off. For the Mylar™, use acetone to wipe off the transfer.

After the toner is deposited on the copper, the toner may need to be touched up. If light areas or thin areas in traces do exist, heat the board with a heat gun (or a hair dryer), then use a Sanford Sharpie permanent marker to touch up the affected areas. The board should then be reheated to make sure the marker is completely dry before etching.

If you get a bad transfer, use acetone to remove the bad transfer, clean the copper as before and try again.

Etching is done with ferric chloride. **Caution:** This is nasty stuff. It smells horrid. It ruins clothes, paint, Formica and even stainless steel. If you pour it down the sink it will corrode the pipes.

Use a glass or plastic tank or tray for the etchant and a holder to suspend the board. Use an aquarium aerator to pump air through the etching solution for more uniform etching. Heating the solution to 120° F to speed etching.

It takes 5 minutes to etch ¼ oz copper and 20 minutes to etch 1 oz copper. If the board is in the etchant too long, it starts to undercut the copper traces.

After etching, cut the PCB to shape. I use a plywood saw blade in a radial saw.

A .031" carbide bit is needed to drill the PCB. Carbide lasts longer than HSS, but break easily so hold the board firmly. When drilling larger holes, use a smaller bit first and work up, minimizing bit changes.

Use a mask so as not to breathe the dust. Some talc powder on the drill table makes it easier to maneuver the board. After drilling, clean the board with acetone.

To avoid tarnish, plate the traces with 'liquid tin'. This makes the trace last longer and also easier to solder. Mix the plating solution in a plastic tray and immerse the board. Plating solution comes either as a powder that has to be dissolved, or as a pre-mixed solution. One brand is called 'Tin-It'.

The board is now ready for components. Use fine silver-bearing solder, the 5% stuff you can get at Radio Shack, but NO FLUX!

Surface-mount components need only half as many holes, which also means half the registration problems. Use solder paste, hold the component with a pair of needle-nose pliers and use two 30 watt soldering irons simultaneously.

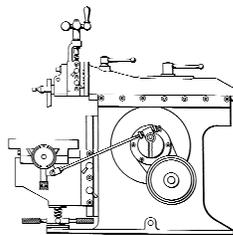
The talk concluded with a demonstration of the working propeller clock. Very impressive - especially for a 3-day project. Well done George!

An alternative etchant is ammonium persulfate. Buy it in a powder form and mix it with water. One pound of dry etchant is mixed with one gallon

of water. It is less noxious than ferric chloride and much easier and safer to work with. Results are the same. ---Mb-A

POSTSCRIPT: It turns out the inventor of the 'magic wand' system used in the propeller clock was in the audience. Bob Freedman, one of our members invented it in the 1970s. Small world, isn't it?

Max



Shaper Column

Kay Fisher

South Bend Start-up Tale

Ron Carroll from Clearmont, Missouri, recently started up his South Bend shaper for the first time. I think we can all relate to his story.

"I am a newbie to using a shaper, even though I have been accumulating for years. Retirement, time and space are finally lining up to allow for some enjoyment of the accumulation.

Today, Feb 8, 2003, I decided to see if I could make chips with the South Bend 7". I have read the manual, followed discussions on the web http://groups.yahoo.com/group/Metal_Shapers, watched a video, and generally educated myself way beyond reason.

The first thing that I noticed was I couldn't get the cutting tool to adjust to a steady height. It was either too high or too low, hitting the work and jamming the shaper. I gave my first attention to the drive system and found a loose set-screw in the large pulley on the motor drive side. Also, a belt was a little slack. I tightened the screw and applied some belt dressing. That had the effect of allowing the tool to smack the side of the work with much more vigor.

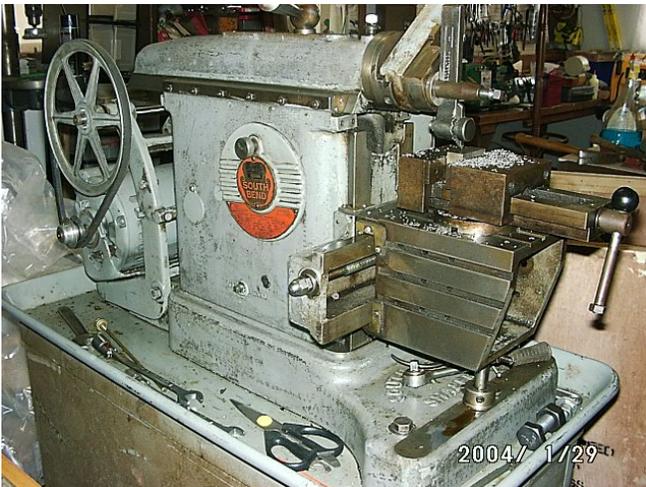
When it was cutting, the vise was rocking a little. I stopped and tightened the bolt that holds the vise. The rocking stopped but the tool height adjustment was still problematic, either too shallow or smacking the side of the work.

When I brought home the shaper, the clapper was locked with a set screw. Loosening the set-screw and spraying with Gibbs allowed the clapper to

swing. I noticed that the clapper was **not** seating all the way down. When the tool hit the work, the clapper dug in and seated. That was the cause of the height adjustment difficulty.

Spraying with more Gibbs didn't help. So, I drove out the tapered hinge pin and examined the sides of the clapper. They still have the grinding marks South Bend put on them in manufacturing but no signs of any wear. After spraying, wiping, and cleaning, it was still tight. So, I took the risk of honing a little metal off the sides of the clapper with my diamond knife sharpening tool. It only took a few strokes on each side and the clapper was swinging freely.

I then reassembled and cranked it up and **wow!** It adjusts and it holds adjustment all the way across the work piece. Will it go faster? I moved it progressively from its slowest to its fastest speed. The chips do smoke when jumping off the work. Neat!



South Bend Shaper

photo by Ron Carroll

I sprayed and generally made a lubricated mess of the shaper before cranking it up. While it is running, I could see that it was pumping oil up onto the ways. They will never wear, as they are flooded. So flooded that oil was running down one side of the shaper. I cleaned out the little channels at the ends of the ways so oil can return to the inside and that helped, but it was still pumping more than it needs. I will read the manual and adjust it later.

Next, I need to find some bolts to fit into the stand adjustment so the shaper can rest on them rather than the caster wheels as it does dance a little on the highest speed. Also, drain the oil, clean the bottom of the oil reservoir, and refill with the

proper oil. I have one quart of South Bend oil from Blue Ridge Supply and am looking for more.

Finally, I removed the piece of steel that the shaper had been chewing on and took it to the bench. The finish was slightly rough. A few strokes of the aforementioned diamond stone brought out a smooth, almost polished finish. I think some attention to tool grinding and cutting fluid will work wonders.

While sitting and watching the South Bend make its cuts, I gave thought to magnetically mounting two micro switches, one at either end of the table travel, to serve as limit switches so that the shaper can work on its own, stopping after each travel. It won't take much of a switch, as the motor is only 1/2 HP."

Thanks for that story, Ron. Keep sending me letters and email with questions and interesting shaper stories.

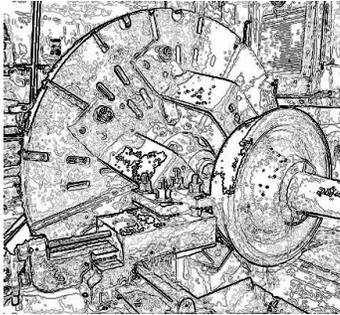
My mailing address is:

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Kay



Shop Hints

Compiled by
Mike Boucher

Drill Size Charts

By Bill Brackett

At the February meeting, I showed some handy charts, printed out and laminated for use in the shop. Here they are, with a brief description:

[Editor's Note: For ease of copying and use, they are included as the last pages of this Gazette]

Screw Sizes

Metric screws are appearing more and more these days. In order to properly identify them, I purchased an electric dial caliper that can switch from decimal to mm and metric thread gage. I also made a chart that lists both metric and fractional screws giving the dimensions in both systems.

The lines in italic are for metric screws. These are specified by diameter and pitch in mm. i.e. M3 0.5. Given this data the spread sheet will calculate the diameter in inches and the threads per inch.

The bold lines do the opposite, i.e. given diameter in inches and threads per inch, the corresponding data in the metric system is calculated.

It should be easy to add to the chart by selecting the proper line and entering the data.

Tap Sizes

This chart contains a list of Allen-head cap screw sizes. The columns list the thread size, the tap drill size, the clearance hole diameter (and drill size), the "closest" drill size, and the counter bore size.

The counter bore size was taken from my set of counter bores. It differs slightly from other counter bores that I own and those listed in the machinist handbook.

[Editor's note: Bill's charts originally had rows alternating in color. Knowing this wouldn't photocopy well, I changed it to alternate between bold and italic. Hopefully this formatting difference makes it no harder to read.]

Bill



Treasurer's Report

Rob McDougall

As of 01/31/2004

Balance as of: 12/31/2003	\$4,998.08
Cabin Fever Dinner Rec.	521.25
Cabin Fever Bus Fare Rec.	1,015.50
Dues Received for 2004	1,025.00
Interest Income	.50
Balance as of: 01/31/2004	\$7,560.33

Cabin Fever trip

We had 25 people on the bus this year versus almost 40 for the past 3 years. This made for some last minute updating of the amount each person paid, and some people who signed up could not go in the end. To make the club around even on the deal, only partial refunds were possible. Next year will probably require up front, non-refundable payment if we are to do a bus trip again.

Club coffers

The treasury is at the yearly high again, as we have just collected most everyone's annual dues. As of this writing, around 20 members from last year have not renewed or have forgotten to renew (Henry?). We picked up around a half dozen new members in recent months. As of this writing, membership is 145, which includes 10 complimentary memberships that we extend to trade related entities and Museums, etc.

I'm expecting "a really big show" next week. Between the fantastic job the ladies auxiliary do on the refreshments and the cost the club incurs in renting the tables, the club tends to breakeven on the day.

Rob



Ron's Ramblings

By Ron Ginger

On the road again...

I left early Thursday, January 15 for Cabin Fever. I took my Aamco shaper, a Prazi BF400 mill, and a couple of extra items that I was not using to sell in the auction on Friday. When I left home it was -7 °F. It got all the way up to about 15°F by the time I got to York, a cold but nice clear day.

The auction was interesting. I did not find anything to buy and sold all my items. I just got my reserve price on each, but at least I didn't have to haul them back home.

The show was as good as usual, although the weather kept the attendance a bit below the past years. There was a lot of activity in the model boat area. I've got to get started on a boat project!

I left the show Sunday just after the bus left. I drove north to Harrisburg, PA, and got on the PA Turnpike westbound. I drove out of the snow, and even got a few brief views of sunshine as I headed across Pennsylvania. I had not driven the PA Turnpike before and was interested in the tunnels. There are several, one that seemed to be nearly a mile long. It's a nice ride, and very scenic, with long rolling views of the hills. I crossed into Ohio just about dark, and decided I was awake enough to continue to Detroit. I was in my dad's house by 10:30PM.

I spent the next several days helping to design and build a robot with my brother and the high school class he teaches. This is part of the First program. If you have not heard of it I urge you to look up <http://www.usfirst.org> on the web and read all about it. It is a great program that encourages kids to get involved in some real design and building, and creates a very exciting competition around it. The New England regional event is March 4th and 5th at the big arena in the center of Manchester NH. It's free and open to the public. It's worth the ride up to see some of the interesting work being done.

We used an extruded aluminum product for the frame of the robot. This is about 1" square (all metric sizes) with a T slot down all 4 faces. There are a variety of angle connectors, hinges,

brackets, etc. designed to fit the slots. It's all held together with T bolts. It was very fast to use, nice and stiff, and very simple to mount components to anywhere along the slot. It would be nice stuff for making things like machine stands, and good for the frame of a CNC router. It is a bit more expensive than plain aluminum angle or tube, but makes a very finished looking project. We used a brand sold by Bosch. There is also one called 8020 that has a local dealer in the Foxboro area.

On my way back to Maine I stopped in Shrewsbury, MA, to pickup a larger Prazi mill from Steve Peters. Steve had purchased it to make a CNC machine, but he decided he wanted to USE a CNC machine, not MAKE one, so he purchased the ready to run version and sold me his manual machine.

I was back home on Saturday with another 2400 miles on my red truck.

I started to work immediately on the Prazi conversion and had it running before the week was out. I think this is going to be a fine machine. It has a table of about 7"x17", with over 10" of Z travel. It has a variable speed DC drive motor and an MT2 spindle. I made a stand and permanently mounted a computer and monitor to it, making a complete package. I've made a few test runs on it; no real parts yet, but it performs well.



Prazi Mill and monitor

Ron Ginger photo

Just a couple miles from my house is the Boothbay Railway Village. They have just under a mile loop of narrow gauge railroad, 2 fully functional steam locomotives, a third under restoration, a gasoline powered switcher engine, and lots of interesting building and shops to visit. They are developing the ability to do some

substantial machine shop work, with a lathe large enough to turn wheel sets - about 36" diameter, over 3 ft between centers.

When I was there the last time, they had devised a most interesting 'putting on' tool. One of their locomotives has very soft iron wheels, so they decided to hard face it with a MIG welder. They setup a jig built of railroad track in the form of a large V-block. The wheel set is placed in the V, running on its normal journals. A MIG welding torch was attached to an arm and positioned so it could lay a bead of weld on the wheel. The wheel is rotated by a belt drive from the lead screw of the lathe.

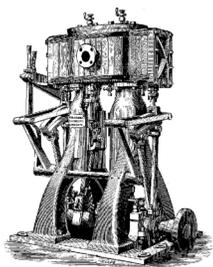
When they first used this rig, it was turned by a spit for pig roasts!. The setup would make Rube Goldberg smile, but it works just fine.



Wheel Tread Beading device Ron Ginger Photo

The first wheel done has now run several years with no noticeable wear, and they are set up now to do the wheels on the engine under restoration.

Ron



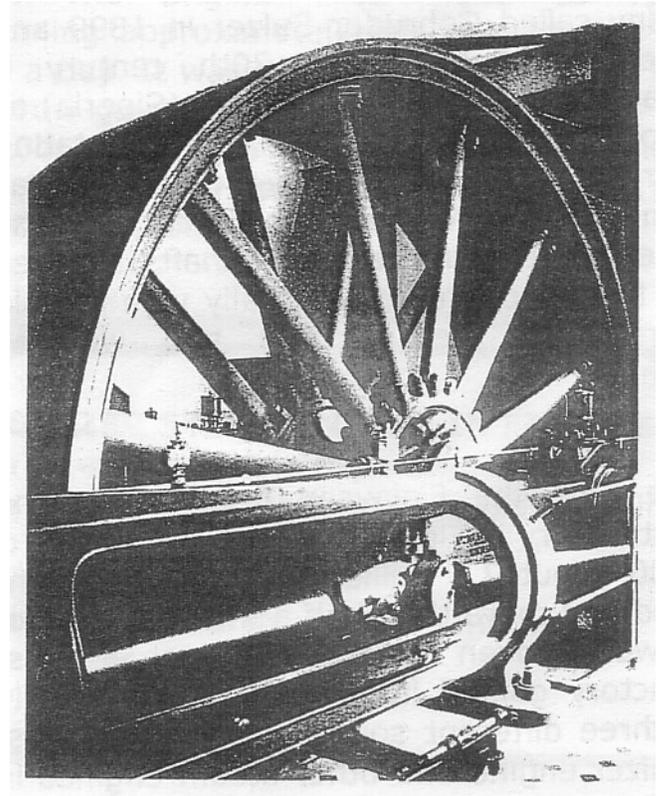
Finnish Stationary Steam

By Max ben-Aaron

In Tampere, Finland, there is a Museum in an old cloth mill built at the end of the nineteenth century by a Scotsman named Finlayson. In 1900, in this mill, about 2.5 million kilos of yarn were spun and more than half a million bolts of cloth were woven by over 3000 employees. The factory, the biggest

factory in Finland at the time, was driven by energy from three sources: water turbines, a giant steam engine and some smaller steam engines.

The main engine, a Sulzer steam engine, was manufactured by a Swiss company, Gebruder Sulzer (Sulzer Brothers) in 1899, and is the biggest steam engine ever used in Finland. It powered the spinnery and the then new weaving mill. The engine generated 1650 horsepower at about 60 rpm. The flywheel has a diameter of 8.1 meters and it drove the line-shafting through a rope drive, with the normal belt drive between the jack-shafts and the machinery.



Flywheel of Sulzer steam engine

The engine is a four cylinder, triple expansion engine with a working pressure of 12 bar.

[Editor's note: 1 bar is approximately 14.5 psi, so 12 bar is approximately 175 psi.]

There is a pair of cylinders on each side of the flywheel, one pair called Helene, and the other, Marie. They are named after the wives of the main stockholders of the time. There were six boilers in the boiler room, located adjacent to the engine room. The fuel was wood, burnt at the rate of approximately 50 cubic meters a day. The wood was delivered on a narrow-gauge railway by

an electric locomotive called 'The Ram'. The track was demolished in the 1950s.

The engine was in use until the decade of the 1950s, when it was 'retired'. A wise decision was made to preserve it, and the Museum opened its doors to the public in 2002. In addition to the huge steam engine, the Museum also houses Edison's dynamo number 24 and a bulb used in the first electric lighting system in Finland.

My daughter, who teaches in Finland, is interested in steam engines (I wonder why?) and she sent me this information, as a well-trained daughter should.

Mb-A



For Sale

Atlas Lathe

As part of an estate sale, a good condition small lathe offered at a reasonable price:

Atlas 9" metal lathe, (4.5" swing), approx 46 overall length. Used very little, but does need cleaning. Included with the lathe are 2 centers, drill chuck, jackshaft, and a 120 V single phase motor. Asking \$350 or Best reasonable offer.

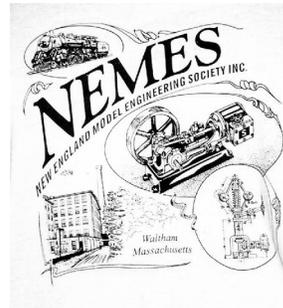
Located in Grafton, MA. For more info, contact:

Bill Hill
15 Birchwood Dr
Holden, MA, 01520
(508) 845-9424

Shaper Work CD

Put out in 1944 by the New York State education Department this 326 page manual is chock full of valuable tips and information on using the King of Machine tools....The Shaper. Covered is everything you need to know about the care and feeding of the shaper, use of the shaper, even how to sharpen tools for the shaper. Scanned and saved in Adobe Acrobat format. \$5.00 shipping included.

Errol Groff
180 Middle Road
Preston, CT 06365 8206
errol.groff@snet.net

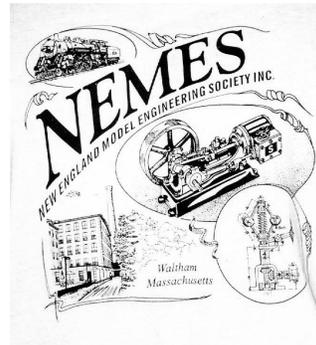


NEMES clothing

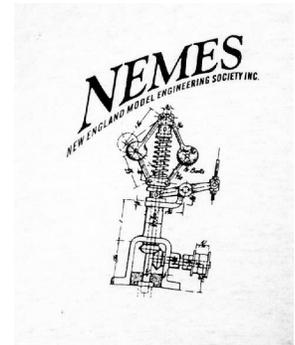
NEMES Tee Shirts

NEMES tee shirts and sweat shirts are available in sizes from S to XXXL. The tee shirts are gray, short sleeve shirt, Hanes 50-50. You won't shrink this shirt! The sweat shirts are the same color, but long sleeve and a crew neck. Also 50-50, but these are by Lee. The sweat shirts are very comfortable!

Artwork by Richard Sabol, printed on front and back:



Rear



Front

Prices:

	Tee Shirts	Sweat Shirts
S - L	\$12.00	\$22.00
XXL	\$14.00	\$24.00
XXXL	\$15.00	\$25.00

Add \$5 shipping and handling for the first tee shirt, \$1 for each additional shirt shipped to the same address. Sweat shirts are \$7 for shipping the first, and \$1.50 for each additional sweat shirt.

Profits go to the club treasury.

Mike Boucher
10 May's Field Rd
Lunenburg, MA 01462-1263
mdbouch@hotmail.com



**MARK
THIS
DATE**

Upcoming Events

Bill Brackett

To add an event, please send a brief description, time, place and a contact person to call for further information to Bill Brackett at wbrackett@rcn.com or (508) 393-6290.

Mar 4 - NEMES Monthly club meeting

7PM - Charles River Museum of Industry,
Waltham, MA (781) 893-5410

Mar 4-6 - 2004 FIRST Robotics Competition

Regional Competition. Verizon Wireless Arena,
Manchester, NH

<http://www.usfirst.org/robotics/2004/rgevents.htm>

Apr 4 - NEMES Monthly club meeting

7PM - Charles River Museum of Industry,
Waltham, MA (781) 893-5410

Apr 18 - 11th Annual Contest fire- fighting robot contest

Competition starts at 11 am, Trinity College,
Hartford, CT

<http://www.trincoll.edu/events/robot/schedule.htm>

Apr 18 - MIT Flea Market

9AM-2PM Albany Street Garage, corner of Albany
and Main St, Cambridge, MA

<http://web.mit.edu/w1mx/www/swapfest.html>

Apr 24-25 - 15th Annual NAMES Model Engineering Expo

Southgate, Michigan.

<http://www.modelengineeringsoc.com/>

Bill



Web Sites of Interest

Bolt Grade Chart

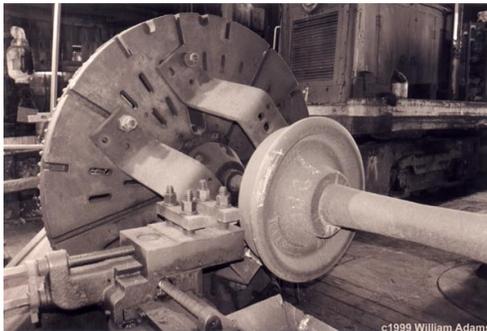
Great chart to easily identify various bolt grades, including the relative strengths of each grade

http://www.clarcorp.com/web/a4_techtip.htm

FIRST

As described at the February meeting, First sponsors robotics competitions for high school students. This group used to call themselves USFirst, but changed their name to FIRST as they grew outside of the 50 states.

<http://www.usfirst.org>



Shop Hints, Part II

As described on page 8, here are the charts Bill Brackett produced:

Screw sizes for US and Metric

size #	inches		mm		threads per	
	inches	mm	inch	mm	inch	mm
0	0.0600	1.52	80	0.318		
<i>M1.6</i>	<i>0.0630</i>	<i>1.60</i>	<i>73</i>	<i>0.350</i>		
1	0.0730	1.85	64	0.397		
<i>M2</i>	<i>0.0787</i>	<i>2.00</i>	<i>64</i>	<i>0.400</i>		
2	0.0860	2.18	64	0.397		
<i>M2.5</i>	<i>0.0984</i>	<i>2.50</i>	<i>56</i>	<i>0.450</i>		
3	0.0990	2.51	48	0.529		
4	0.1120	2.84	40	0.635		
<i>M3</i>	<i>0.1181</i>	<i>3.00</i>	<i>51</i>	<i>0.500</i>		
5	0.1250	3.18	40	0.635		
6	0.1380	3.51	32	0.794		
<i>M4</i>	<i>0.1575</i>	<i>4.00</i>	<i>36</i>	<i>0.700</i>		
8	0.1640	4.17	32	0.794		
10	0.1900	4.83	24	1.058		
<i>M5</i>	<i>0.1969</i>	<i>5.00</i>	<i>32</i>	<i>0.800</i>		
<i>M6</i>	<i>0.2362</i>	<i>6.00</i>	<i>25</i>	<i>1.000</i>		
1/4	0.2500	6.35	20	1.270		
5/16	0.3125	7.94	18	1.411		
<i>M8</i>	<i>0.3150</i>	<i>8.00</i>	<i>20</i>	<i>1.250</i>		
3/8	0.3750	9.53	16	1.588		

Tap and clearance drill sizes with counter bore
for Allen Head Cap screws

Size	Tap Drill	Clear Drill	Close Drill	Counter Bore
0-80	3/64	1/16		
1-64	53	49		
1-72	53	49		
2-56	50	0.086	0.093	0.155
2-64	50	44	42	5/32
3-48	47	0.099	0.106	0.176
3-56	45	39	36	16
4-40	43	0.112	0.125	0.198
4-48	42	33	1/8	8
5-40	38	0.125	0.141	0.220
5-44	37	1/8	9/64	2
6-32	36	0.138	0.154	0.241
6-40	33	28	23	C
8-32	29	0.164	0.180	0.285
8-36	29	19	15	L
10-24	25	0.190	0.206	0.327
10-32	21	11	5.000	21/64
1/4-20	7	0.250	0.266	
1/4-28	3	1/4	17/64	
3/8-16	5/16	0.375	0.391	
3/8-24	Q	3/8	25/64	