

# The NEMES Gazette

The Newsletter of the New England Model Engineering Society,  
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## THE JANUARY MEETING DATE HAS BEEN CHANGED DUE TO THE HOLIDAY!

**Our Next Meeting is at 7:00 PM January 8, 1998 at the Museum, 154 Moody Street, Waltham Ma.**

*Annual dues is \$20.00 - Please make checks payable to "NEMES" and send to the NEMES Treasurer: Kay R. Fisher 80 Fryeville Road Orange, MA 01364*

### From the Editor's Desk:

Time is really flying, 1998 is almost here, and pretty soon NEMES will be starting it's Third year! In the past I've put hand drawn sketches into the Gazette, and this month I'm trying something new, I did the sketches in Paint and then put them right into the computer document that gets printed out. I don't have as many drawings from the talk on patterns as I would like to have put in, but I think they're more legible and they also become part of the computer file for the the issue rather than being separate scraps of paper that get taped in before it goes to the copy machine. Hopefully I'll get better at some sort of computer generated drawings so I can do a better job with the illustrations for future speakers at meetings.

See you the SECOND Thursday night in January, scl.

### President's Corner

by Ron Ginger

#### Cabin Fever Expo

The letters with details of the bus trip went out just after the last meeting. At the time I'm writing this for the newsletter, I have received only about 10 checks for the trip. If you are interested please let me know ASAP. The deadline is December 30. If you lost your letter or have questions call me in the evening at 508/877-8217. We need 20 or more to make this trip, so there is still lots of room.

#### January Meeting.

We have shifted the January meeting to the second Thursday, January 8th, to avoid New Years Day. The meeting format will be a Poster Session. EVERYONE is asked to bring in some item. It can be a finished "thing", a part of something you are working on, plans or photos if your project is too big. Maybe a little tip or demo of some tool or technique you have found. Anything you want to show the rest of the group. No one will have to get up in front of the entire group, just an informal talk around the tables.

We will have time for some of the longer show and tell items if anyone is interested.

#### February Meeting

I have 2 events lined up for February, a "short subject" and a feature speaker. The short subject is Silversmithing by Ed Mann. (You may have missed Ed at our last couple meet-

ings, he was out for some knee surgery but is back in fine shape now) Ed will show some examples of silver work and a few of the tools of the trade.

Our featured speaker will be George King. George is the chief engineer of the steamboat SABINO of Mystic Seaport Museum. A few years ago George and some helpers pulled the engine out of SABINO and did a major re-build. He has an excellent slide show and talk about this work. It was also the subject of a long article and the cover photo for the May/June 95 LIVE STEAM.

### NEMES SHOW

**Remember our show is on for February 21. Max ben-Aaron is accepting registrations. We want to pre-register as many as possible so we can get a fair count of the table space needed.**

To encourage reservations, Steve Cushman has contacted some of the vendors to our trade and asked for raffle prizes. We will attempt to get several prizes and the rules are simple. You MUST be present to win. Only registered exhibitors will be in the raffle, and we will spread the drawings out over the course of the day.

Remember, you don't have to just show something new, most of the public that attends the show will not have seen your old items, and even the fellows in the club will likely not remember all the details of all your models.

I will have some printed flyers at the January meeting- if possible take a few copies and spread them around at work or wherever you think someone interested will see them.

-- Ron

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### Calendar of Events

Thursday January 8, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410  
Thursday February 5, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410  
Saturday Feb 21, 1998 -- Second Annual NEW ENGLAND MODEL ENGINEERING SHOW at the Charles River

Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Thursday March 5, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Thursday April 2, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

### **The Meeting, December 4, 1997**

Ron got the meeting off pretty much on time at 7 PM.

Museums survive by memberships and subscriptions, and he reminded us that now would be a good time to join the Museum to get the tax deduction for 1996. The show in October was a lot of fun, but it didn't have the number of exhibitors we had had last February. Even though it may have looked less successful to NEMES members than the earlier show it was a bigger success for the Museum than February was because the admissions for the day of the show were considerably above normal.

The upcoming February show is already being publicized by the Museum. So, we need to get things going to make the February show happen again. Max ben-Aaron did a good job as registrar last year, and has volunteered to do it again. At the January and February meetings Max will be signing people up for display space at the show. The number one reason for the show is for the club to have a fun gathering. Getting people to come and pay admission to the Museum is a plus.

"I didn't have anything new to bring" doesn't matter. Most of the people coming to the show won't have been before. Things don't have to be new, and they don't have to be finished to be interesting. If your stuff is heavy there's an elevator and a way in from ground level, but it's through a carpeted hall so use discretion.

Some of us in NEMES are on the model engineering list run by Russ Kepler in New Mexico, and he was here at our meeting tonight after a business trip to Boston.

The second Cabin Fever Show is taking place in Pennsylvania the end of January first of February. Ron and Roland are going to the show for sure (We all know Ron likes shows) and Ron is going to see about organizing a bus trip. The bus will cost \$2000, so with 20 people it'll be \$100 each. Everybody in NEMES should have gotten a letter from Ron by now about the trip. If you want to go and haven't signed up, get your money to Ron quick before it's too late.

As you've probably noticed in the big print at the start of the Gazette, the meeting in January isn't going to be on the regular day. We were all set to meet on the first, but the Museum is going to be locked up tight so we're switching to the second Thursday of the month for just this one time. We'll still go with the Poster session idea for the meeting, with no formal program. Bring in anything you've got and have a good time.

Erroll Groff had a major crash and meltdown on his computer, so he suggests you back up your files. He also says that he has contacts at Boston Digital in Milford Ma. where they make CNC machinery and wondered if there was any interest in a possible tour. There was, so he's going to look into it.

John Wasser is in the process of tooling up his lathe. He bought a set of the Carbide boring bars from New England Brass a couple meetings ago and needed a way to hold them so that he could bore the hole in the boring bar holder he's making. He got some 7/16" square steel key stock at the hardware store. It was about the biggest that would fit into the lantern toolpost on his lathe. He ground the end slightly concave to match the diameter of the boring bar and attached the bar to the key stock with an electrical grounding clamp. So, with the key stock in the tool holder he's got the boring bar attached to his lathe and he can bore a hole. He also reports that he got one of the \$200 cut of bandsaws from Asia and it cuts well and is inexpensive so he is happy with it.

Jim Chetwynd Sr reports that the Enco store in Salem NH is closing, and by the time this gets into print it will be history. MSC bought ENCO and 7 or 8 other tool distributors recently and it looks like we'll have to wait and see how it all works out.

Howard Evers had the Metal Lathe Accessories T Slot Cross slide that he had built. The casting is for a 10 inch Atlas or Craftsman lathe, and he has a 9" Logan so he had to fiddle things a little to get it to all come out right. The design thickness of it is 1 1/32 inches. It's not totally rigid, but he likes it. The T Slots are cored, but you'd have to machine them to have them useable. It's good for holding a rear toolholder and for use with a milling attachment. He hasn't added any threaded holes in it yet because he figured he'd wait until he needed them. He says that it's a little bit of a challenge as a project but that it is doable.

Don Strang has come across an interesting article about John Ericsson and the caloric ship "Ericsson" that he built in 1852 for Transatlantic service. At the time thermodynamics was still very new, and Ericsson believed in the Caloric Theory. Heat was a fluid that flowed around between the atoms to make things hot when it was present. He was a fantastic engineer, showman, and producer. We're familiar with him at NEMES from the talk Ray Hasbrouck gave a while back about the model he built of the trunk engine from the Monitor of Civil War fame and from the 1/4 scale Ryder-Ericsson hot air pump Norm Jones has built and told us about.

The "Ericsson" was 250 ft long and had side wheel paddles. It had a four cylinder engine with 14 ft diameter pistons and a 6 ft stroke. It ran at 9 RPM and on the initial New York harbor tour to introduce the ship to the press people rode on the pistons while the ship was in motion. They travelled at 6 1/2 knots and Ericsson told people that they were using only a small fraction of the available power in the Har-

bor when in fact they were under full power. It was a grand media (Newspaper) event. Because he was a believer in the Caloric Theory he planned to use the caloric over and over, expecting the fires under the cylinders to be needed only to make up for the friction losses in the engine. The engines of the "Ericsson" were said to have 1300 hp available. This output was partially based upon the 60 hp that an experimental 2 cylinder test engine was said to produce. In reality he never actually measured the output of either the test engine or the final version in the ship.

Based on the power required to drive ships at known speeds it was estimated that the power output was 247 to 276 hp. Scientific American calculated the power at 244.572 hp. The author of the paper calculated that the power piston produced 800 hp, but that the compressing piston consumed 550 hp, leaving 250 net hp, which is in line with the more realistic contemporary estimates.

Ericsson's hot air engines were of the Caloric type, not Stirling Cycle engines. The Stirling Cycle is a closed cycle with a hot end and a cold end. The caloric engine dumps the hot air, relying on the regenerator to capture the caloric from the hot air being expelled so that it could be added to the compressed air going into the power cylinder for the next stroke. While Ericsson was sticking with the Caloric Theory Sadi Carnot (1796-1832) had already developed a theory of heat (although it wasn't published till later, in 1870) that showed Heat flows from Hot to Cold and never back again by itself. Count Rumford, Joule, Faraday, and Clausius in the meantime had all produced work that was leading to the Jelling in about 1850 of Modern Thermodynamics - which would soundly demonstrate why engines such as the "Ericssons" could never produce the kind of power that Ericsson hoped for.

Don has a great respect for Ericsson as an engineer, but this whole incident shows how even great men can bamboozle themselves when they let their enthusiasm run away with their practical engineering side. Fortunately for the Union, he finally paid attention to the actual results from his caloric ship, the garbage ports were left open on a private trial with new engines and the ship foundered. It was raised and refitted with steam engines and Ericsson went on to steam power, leading to the Monitor of Civil War fame.

The main speaker for the evening was Robert P. Nelson, proprietor of Nelson Industries, 15 Cannon Hill Road Extension, PO Box 164, Groveland, Ma. 01834-0164. Rob is a pattern maker and brought the "Down and Dirty" patterns and some of the parts cast from them for his telescope. (He is president of the North Shore Telescope Society.) Right off I'd like to say that "Down and Dirty" was his description of the patterns he had with him. I'd be more inclined to say that they were quite nice, they certainly make my attempts at pattern making look like soggy mud.

To make a pattern you need to start with the drawing for the part. Where the part is going to be machined you need to build up a finish allowance on the pattern so the casting will

have enough material there that it will finish clean when it is machined. For this you need to add a minimum of 1/16", and 1/8" is better. Start with a piece of birch plywood that is smooth and flat and draw center lines for the pattern on the plywood with an X-Acto brand knife. Build the pattern up from the centerlines drawn on the wood with the knife.

(Knife cuts are sharp and precise and won't smudge as you are working. With the center lines down, use a calculator and calculate the various sizes that you need to make things so that the correct shrinks are included. You can buy a special shrink rule for doing patterns, but you need a different rule for each kind of metal and they are expensive.

If you are making a pattern for cast iron contact the foundry that will be casting the parts to find out what shrinkage factor to use. The shrinkage will vary depending on the conditions in the foundry and the type of sand they use. Green sand, which uses clay and water to bind the grains into the mold will give as the metal cools and shrinks. CO2 bonded sand is much harder and will keep the metal from shrinking quite as much so the shrinkage factor will be less.

You need a cope (top part) and drag (bottom part) for each mold. Cut a runner in the drag sand and then gates to get the metal to the pattern. Cut a riser and a sprue up through the cope sand. Pour the metal into the sprue and when the mold is full the metal will fill the riser, indicating the mold is full.

Patterns need draft so that they can be loosened in the sand and pulled out without interference. For up to 6" you need at least 1/32" of draft. Typically use 2 degrees, although more is better. Shorter pieces need more angle of draft because you still need at least the 1/32", even if the protrusion from the rest of the pattern is only 1/4" or so. Backdraft is fatal for a wooden pattern. A nobake or CO2 sand will bust a pattern with backdraft when the foundry tries to pull it out of the mold. That won't make either you or the foundry happy.

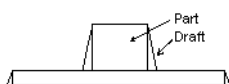
Put a centerline on everything on a pattern. If the pattern has a hole on the inside add the material to the outside of the hole with the draft already applied. If you need to make a piece that is 1/2" thick and 2" tall outside the hole start with a 2" square piece and put the draft on the inside. Glue the piece in place with the inside in the proper position with the proper draft. When the glue is dry cut the outside to shape and sand the proper draft on the outside. It is virtually impossible to get the pieces aligned correctly when they are tall and skinny, so don't even try. Glue up reasonable pieces and then cut the outside to shape.

A good pattern has no sharp corners. The minimum radius anywhere on the pattern should be 1/32" so that the sand never comes to a sharp corner where it is apt to break away from the rest of the mold and mess up the casting. Wax fillets are applied with a metal ball on the end of a rod. Heat the ball in an alcohol lamp and use it to push the wax into the corners. When the wax is hard smooth it with a scotchbrite brand scouring pad. You can also get leather to

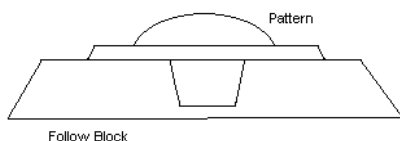
go into corners. Soak it in water to get it pliable and then fasten it with white glue. Leather fillets are expensive. The universal solution for fillets today is polyester body filler. Put about a 1/4" of hardener into a golf ball sized lump of filler. Don't mix it too hot, it'll set up too fast. Slick it on and when it gets to bubble gum consistency cut the excess off with a knife. Clean your tools between mixes and figure on more than one layer of filler to build up to the final correct profile. If you try to put too much on at once it will sag. When it's hard go over it with 80 then 120 grit and you should be done.

Use clear lacquer for a finish on patterns. Polyurethane is fine but takes forever to dry compared to lacquer.

Let's start with a simple pattern for a handle. Determine the parting line - it has a natural one as it has a flat top. The part has a 1/2" drilled and tapped hole in it - ignore it in the pattern and machine it out of the casting. The dimensions start at the top of the pattern and the draft is added on the way down to the parting line, so the base of the pattern will be bigger than the dimension of the part.



The ball foot is still a loose pattern, but it is no longer a simple flat backed pattern any more. Make it a flat back by adding a follow block. Put a healthy taper on the follow block and add a hole in the middle of it to take the protrusion on the back of the pattern.



This idea of a follow block can be used for a ring pattern for a telescope. Without the follow ring the pattern would have to be cored to get it out of the sand.

In the local area 12 by 16 inches is a common flask size for aluminum foundries. So, when you are making a pattern on a board you need to start with a board that is bigger than the flask it will be used in. As always, lay out the centerlines and also mark in the outline of the flask. For aluminum you need a minimum of 3/4" of sand all around the pattern. It's probably a good idea to check with the foundry about where to place the pattern on the board so that they can have room to gate the pattern the way they want to.

To make a pattern in two halves to go on opposite sides of the board you will need to do split turning. Take the wood and glue it together with just enough glue to hold it while you screw the two halves together, making sure that the metal screws are positioned BELOW the profile that you will be turning the wood to. Rabbet the ends to fit into a set of split pattern chucks. These are available commercially

for big bucks but should be a fairly simple metal shop project. The headstock end goes into the spindle taper and the tailstock end should be mounted on a ball bearing so it's a live center. Turn to shape, drill through the pattern to produce alignment holes to fasten the two sides of the pattern in the correct orientation on the board. Remove the screws and with one half on the board drill through the alignment holes to align the pattern to the board.

If you want to make anything with any undercuts or holes, you are probably going to have to use cores. Iron foundries typically have standard cores for plain round holes, but if you need something more complicated or if you are going to an aluminum foundry then you will need to make a core box.

Make your core boxes the way that you make your patterns. Lay them out with centerlines every where and glue things up with substantial pieces of wood. Once the box is glued up and stable cut things to the proper length. Put plywood around the outside of the core boxes for strength, and be sure that the plywood doesn't interfere with the use of the box to make cores. Put alignment pins off center so that the box will only go together one way. Make the drag print longer than the cope print, so the mold won't close if the core is in upside down. Put a one degree draft on the drag print, and a 5 degree draft on the cope print. Use matching draft on the cores, and make the core prints 1/64" oversize so the cores go right in. If a vertical core is 1" long, then the print should be 1" long too. The core needs to be held in position where you want it to be and if the prints aren't big enough you can't count on the hole in the casting being where you want it to be. Make a witness print if the core isn't symmetrical. Be sure that the only way the core will go in is the way that it's supposed to go in, otherwise the foundry will put it in wrong and the casting will be useless.

If you need to make a complicated core box you can make a male part and then use a resin casting compound to make the actual core box around the pattern. If you get a product called Dynacast it'll shrink on cure and build in the shrink allowance. Don't cast a big mass of resin at one time, build it up in thin layers so it won't overheat and shrink too much when it cures.

Standard colors for patterns today are black and gray. Ferrous patterns are black with gray prints, and non-ferrous patterns are gray with black prints. Don't bother to use colors, use a plain lacquer sanding sealer. Put on a coat and sand with 120 grit. Put on another coat and use scotch brite brand pads on it and the finish is done. If you leave a mark on the pattern it'll show in the sand and then in the casting. Rob uses Burlington Foundry in Burlington for aluminum, and Mystic Valley Foundry in Somerville for Bronze. Dave Piper had his iron steam engine parts done at the Nashua Foundry in New Hampshire. Marlborough Foundry is good, and Specialty Al in Revere does precision casting. For lost wax casting try Hebert Foundry in NH.

Most of his castings are done in 356 Aluminum alloy and T6 heat treated. AlMag alloy is very nice to machine, turning up like bar to a nice shiny mirror like finish.

**Dec-1997 Treasurers Report**

Previous balance -----	\$1601.16
Dues Deposit -----	20.00
Books Deposit -----	46.00
Books Withdrawal -----	-46.00
News letter postage -(Steve)-----	-66.15
News letter postage -(Don)-----	-37.12
Speaker fee (Robert Nelson) -----	-50.00
Dues Deposit -----	50.00
Interest -----	.82
Service Charge -----	-3.00
New balance -----	\$1515.71

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Good news guys. I just got off the phone to Village Press and placed our next book order. On the suggestion of John David Heinzmann I tried to negotiate a club discount for magazine subscriptions. So as of now when you renew or make new subscriptions to any Village Press magazine be sure to take 25 percent the price and note that you are a member of NEMES.

Respectfully,  
Kay R. Fisher

**TIPS AND TECHNIQUES  
by Ed Kingsley**

**First it went, "HUM" and then it went, "BRAAAAPP"! (Motor Woes)**

A few months ago, the 3/4 hp motor on my band saw refused to start. I threw the switch and it just sat there and HUMed. Sensing something was wrong, I shut off the switch and tried again. Same thing. Annoyed (I was in the middle of something), I wrapped a cord around the motor pulley, pulled, and threw the switch "on" as the cord came off. The motor started right up, I made the cut I had started to make, and more or less forgot about it. That means I was hoping it would somehow fix itself by the next time I needed it.

Alas, the next time was the same and the time after that, but the time after that, the fuse blew. I went off to reset it, but I forgot to turn off the switch on the saw, before I left, and was halfway back when the fuse blew again. Being more annoyed than alert, I went back and reset the fuse again. Reason returned in conjunction with the second blackout, but now the problem had changed. The motor no longer "HUM"ed, it "BRAAAPP"ed - and really loudly! It would still jump-start with the cord, but if it didn't "catch" right away - there went the lights.

I aired my problem on RecCraftsMetalworking, and received the answer that it was probably either the starting

capacitor or the centrifugal switch. I wasn't sure how to test the capacitor, but the problem sounded mechanical, so I tried looking at the switch. To do this, I had to remove the end of the motor cover, opposite the pulley, and this was no easy thing to accomplish. The housing would only move 1/4", and then move no more. After much frustration, I tried the Internet once again and was told to, "try harder"! I thought I would break something off if I did, and gave up for the moment.

Then, Leo Klos brought a used (but good) capacitor from a similar motor to the NEMES meeting, in June. I substituted it for the suspect one on my motor and voila - it "HUM"ed again! It didn't start, but the awful "BRAAPP" noise was gone. I reasoned that the return of the "HUM" meant that the first capacitor had been OK, until I killed it by blowing the fuse a couple of times. That seemed to indicate that it was the centrifugal switch. Back to work.

I rigged up a puller sort of thing on the end plate and, just when I thought it was about to split in two, it slid off. The ball bearing is fastened in the end cover and, being a tight fit over the motor shaft, makes for the difficulty in separating the parts, but separate they finally did.

The contacts on the centrifugal switch were quite corroded and pitted, and hard to get at, but I managed to abrade them more or less evenly clean and got all the parts back together again. When I threw the switch, it started right up and has continued doing so ever since. If my motor was typical, a "HUM" means your capacitor is OK, but you need to clean the centrifugal switch and a, "BRAAPP" probably means they're both screwed up.

My thanks to all of the NEMES members who offered help and suggestions during my time of need. I hope this story will help someone else, down the line.

**"AutoCAD" - Not just a used car salesman, anymore --** I just finished an 11 week, 33 hour course in "AutoCAD", at the Regional Voc-Tech in Wakefield, MA., and I'm psyched. Over the past 12 years I've owned or tried several inexpensive CAD drawing programs, but I've never taken the controls of anything even remotely like this program.

"AutoCAD" is definitely what Computer\_Aided\_Drafting is all about. I'm an Architect, and I took this course for that aspect, primarily, but almost all of the course focused on mechanical drafting.

The ability to design in 3D, with the program able to generate all of the views you require is amazing. Drawing in "full scale", with "automatic" dimensioning, precise to 14 decimal places, is very impressive, too. Layout of bolt circles is instantaneous, and a marvel to behold. I could go on, (and on) but why torture myself, too.

At somewhere around \$3700, it's not a program I can recommend to everyone to run out and buy, but there is a "slightly scaled down" version called, "AutoCAD-Lite", which can be purchased by HS and college students for something like \$195, (you must know one or two) and while still certainly not cheap, is a lot less than \$3700. And, from

what I've been told, it does pretty much all the important things that the full blown version does.

The current version of "AutoCAD", is R14. Copies of R12 or R13 might be available on the used market. If I can locate a copy for myself, I will bring it to a meeting and demonstrate it for you. On the other hand, I think CAD would be interesting enough to everyone, to try to arrange to have a CAD professional come by and give a talk and a demonstration. Any of you know of anyone that might be interested or persuaded? AutoCAD is not the only game in town, although it does have approximately 60-70% of the market, presently.

#### **THE TOOL SHED**

Andy has been notified that NEMES is meeting on the 8th of January (there's a song there, somewhere) and not on the 1st, as he originally thought, and he has agreed to stay open late for us, as usual, on the evening of the eighth.

I hope all of you enjoyed the holidays and had a happy and libatious New Year.

-- Ed Kingsley

#### **Letters**

Dear Stephen,

Leon received the Nemes Gazette but you can discontinue sending it, as Leon died of Cancer Oct. 15th. I know he looked forward to receiving this each month.

Sincerely, Mrs. Claire A Jones.

*This is not the kind of letter I like to get, but I'm printing it so that the news of Leon Jones's passing will get out to the membership.*

#### **Classifieds:**

14 1/2" Southbend Lathe. 5C Collet Closer. Chucks, Aloris Toolpost, odds and ends of tooling, Mint Bed. \$3500

Belongs to a friend of Don Strang. See Don for details.

Also see Don for a selection of 1/4 to 1 1/2 hp single phase motors, 110, 110-220, and 220 volts, individually priced.

# *The NEMES Gazette*

c/o Stephen C. Lovely

Post Office Box 277

Milford, Ma. 01757-0277

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