

The NEMES Gazette

The Newsletter of the New England Model Engineering Society,
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**Our Next Meeting is at 7:00 PM on Thursday
December 2, 1999 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*

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From the Editor's Desk:

I've been working on my calliope project this month. I was going to start with a middle C whistle, but when I got things drawn up for the pattern and corebox to make the mold to cast the chime I realized that I had to expand my foundry capacity to pour the volume of aluminum I'd need. So, I moved up an octave to C6. I cut styrofoam pieces out on the jigsaw, then glued them up with carpenters glue before ramming them up in the sand and pouring the aluminum right onto the foam. In general it works well, especially considering how sloppy the foam models I made were. I have the pattern machined now, and will do the core box next.

I've got some sodium silicate core binder that I'm going to use to make the cores. I'm looking forward to trying it - I've never cast anything with a separate sand core.

I'm planning on casting the chimes in aluminum and the bases in brass. I figure the cast aluminum will look nice with the brass, and I hope that the thermal expansion of the aluminum won't be so great that the whistles go too far out of tune as they heat up - but at the rate I'm going it'll be a long time before I have to worry about that.

It's that time of year again already, so, Ron, Ed, Bill, Bob, and I here at the Gazette wish all of you out there in reader land a Merry Christmas, Happy Chanukuh, and a Joyous New Year.

See you next Thursday night - scl

President's Corner by Ron Ginger December Meeting

As I mentioned at the last meeting, we will hold the December meeting in the lounge area, off the main walkway into the museum. DO NOT go to the main musuem building, there will be a private party there.

Since we have the lounge area, and its about time for another 'Poster Session' That will be our December meeting. Everyone bring along some item they find interesting, and we will just have a general show and tell evening. We have usually done this on the January meeting, but this year our January meeting will be on the 6th, so the holidays will be past and we will have a regular program that night.

Remember Dave Pipers suggestion to bring along a shop made Christmas toy. I think his rule was under \$5 of MATERIAL, but no limit on the labor. Now a good home shop machinist ought to be able to make some real neat toys under those terms.

Cabin Fever trip.

I have enough signed up so that the bus trip is a GO. I have made the contract with the same bus company we used last year, at the same price. So plan on \$100 for the bus, but it will likley be reduced a bit, since we may get more than 20 riders. The next newsletter will give the final price, and we will need checks at the January meeting. Still plenty of time for more to sign up.

I have a delima with the hotel. The last two years we stayed at the Inn at Reading, and I think everyone found it to be a fine hotel. We have the same rate and terms again this year, but, Gary Schonely the show promoter, has made plans to hold an evening reception at a Ramada Inn, and is suggesting everyone stay there. I have no idea how nice the Ramada is, or if it has as nice a restaurant. So, the question is, should our bus load stay at the Inn at Reading, which we know is fine, or take a chance and stay where there MAY be more people that are going to the show? Im leaning toward the Inn at Read-

ing, but I'd like to hear from others before we make a firm choice. We do need to keep everyone at the same hotel.

NAMES trip

I have requested a quote from the bus company for a trip to NAMES in April, with a stopover in Niagara Falls. No price yet, but I should have more details by meeting time, and in the next newsletter. I don't have enough firm names yet, but I think we may make it. Let me know if you are interested.

Museum Shop work day.

I mentioned at the last meeting that we would be holding a Saturday 'shop clean up' for the museum in January. Karen has had to cancel the first date we picked, but we are trying to find another date. More info in the next newsletter.

Museum Membership.

As it gets to the end of the year, and we start to think about income taxes, let me remind you that a membership in the museum is a good thing for the museum, and is a tax deduction. We benefit a lot from the museum, I'd like to see most of our members join the museum and help support the place. Museums depend a lot on membership contributions.

Workshop Session

In the last newsletter I suggested a series of Saturday gatherings to 'talk shop' on some specific topic. I am hoping someone will offer to run one or more. I am ready to try one, on the topic of CNC. This will be a session devoted to building CNC, not to using it. I will demo my program, and a couple others I've found useful. We can talk about topics like software, stepper motors, servo motors and all the internal parts of CNC. I will do the session on Saturday, January 8. If the number of people is under 6 or 8 we will meet at my shop, if its much over that we will probably use the museum. Ill have a signup sheet for this at the December meeting.

--Ron

Calendar of Events

Dec 2, 1999 Thur 7PM

NEMES Monthly club meeting
Waltham, Ma.
Charles River Museum of Industry 617-893-5410

Jan 6, 2000 Thur 7PM

NEMES Monthly club meeting
Waltham, Ma.
Charles River Museum of Industry 617-893-5410

Jan 28-30

Cabin Fever Trip bus trip
128 T-station at noon
Ron Ginger 508-877-8217

Feb 3, 2000 Thur 7PM

NEMES Monthly club meeting
Waltham, Ma.
Charles River Museum of Industry 617-893-5410

Feb 19 Sat 10-4

NEMES show
Waltham MA CRMI Moody St.
Ron Ginger 508-877-8217

For a listing, please sent name and brief description of event, time and place and a person to call for further information to.

Bill Brackett at wbracket@ultranet.com or 508-393-6290

The November Meeting

The November meeting came very close to getting under way without a speaker, but at the last minute Max ben-Aaron made it.

Next month there will be a special event at the museum, but instead of having to hold our meeting at a different time as a result we will be meeting downstairs in the lounge area with the fish tank were we met once before a while back, courtesy of the group renting the main area of the museum. So don't come in the back door next month, and don't ever park out there. We're the only group that meet's in the museum that doesn't have to pay for a police detail to keep the resident parking lot's clear for the residents during our meetings and we need to keep it that way. (The details would cost \$100 per meeting!)

The details for the December meeting were yet to be decided at November's meeting, but it was decided to have a themed show and tell. Bring in a toy or simple thing for kid's that costs \$5 or less. And as someone pointed out, that \$5 is for material - time doesn't count.

It looks like the Cabin Fever bus trip is on again for 2000. We'll be staying at a different hotel this time, the Ramada Inn, which will have a Hospitality Suite for the people attending Cabin Fever.

At Roland Gaucher's get together there was an impromptu Knurling Seminar with a group gathered around the lathe making suggestions as Roland tried knurling a variety of materials. Ron has checked, and we could have a similar session on a Saturday morning at the

Museum. If you're interested in setting something up let Ron know. Jay Stryker has volunteered to lead one on Shapers - perhaps at his shop. He's got a big hydraulic Rockford shaper that he picked up a few years back at my urging and a couple of others as well.

The Admiral Metals Metal Source found a new location at the last minute and is now open for business again. They are now at 175 North Ave in Wakefield Mass., 781-246-0171. Get off 128 at exit 39 and head towards Wakefield. The entrance is on Armory Street, even though the address is North Ave. There is a second place open in the area now selling metals as well. It's Metal Supermarkets, "The Convenience Stores of the Metal Industry." They are also off of exit 39 on 128 at 128 Marketplace, One General Way, Reading Mass. 01867. Phone 781-944-1898. To get to Metal Supermarkets head for Reading when you get off at exit 39 or try www.metalsupermarkets.com on the web. I checked the website and it says that Thorn Mead is the Reading franchisee and you can email him at thornm@aol.com. We've heard good things about the Metal Source in the past, and look forward to reports on the Metal Supermarket.

Well, the Raytheon machine shop sale is over by the time I'm writing this, but if you were at the November meeting you got the info on how to bid. They had a lot of stuff going up for sale but it was closed bids and not an absolute auction. If anyone bid on anything let us know how you did.

Walter Winship brought in his set of Quorn drawings, complete with the notes on them from when he made his Quorn from scrap in his scrap box. He brazed up the "castings" from hunks of cast iron he had lying around and the only parts he purchased for the whole machine were the spindle bearings. He's had at least one person refuse to believe him when he told them there were no castings in his Quorn. I've heard people discussing whether a Quorn could be built from durabar without buying the castings, and I guess Walter has answered the question - yes it can be done.

Mike Boucher has completed the NEMES corporation Annual Report to the State of Massachusetts, which is due to the state November first every year. Thanks Mike.

Ron Ginger Retired from Compaq the Friday before the meeting. On the Monday before

the meeting he started his new Job as Director of Operations for a computer company in New Hampshire.

The club needs a locking cabinet to store stuff at the museum between meetings. Check with Ron if you have a likely candidate before you pick one up though - we need one, not several.

The museum will have finalized it's plans for the shop area by Saturday 15 Jan. 2000. They want a sample of the stock that would go into each machine and a sample of the sort of part that would be made on each machine as well.

Don Strang has found more info on 3 phase converters for shop use. The solid state units continue to get cheaper and more convenient. Their only real drawback is that you can only run one motor at a time on one, although you can control the speed of the motor by varying the frequency.

Conrad Milster is having a whistle blow to welcome in the new year at the Pratt Institute in Brooklyn New York this December 31st.

Don has talked in the past about the problems of putting grease into an oil fitting, and this meeting he brought us in the lead screw from the Surface Grinder he just bought as an example. About 6 inches in the middle of the 3/4 8 Acme lead screw used to raise and lower the grinding head was worn to the point where he cautioned us not to cut ourselves on the sharp threads in the worn section. The two ends were like new, but the grease where oil should have been had done it's damage.

Max ben-Aaron is the principal speaker for the evening. The title of his talk is "How to Grind a Mirror" but that is just the place where he'll hang his hat to get started.

It all began when Max was an undergraduate and came across a book called "The Amateur Telescope Maker" by Engels. We take it for granted here that you can look in the phone book and buy almost anything you can think of, but many places in the world it's almost impossible to get anything. The book said to use Pyrex to grind the mirror from, and Max couldn't find any Pyrex anywhere. It didn't occur to him then that he could grind the mirror out of plate glass.

Back then Optics was something for high school physics classes - it was an almost dead field. Now, in the last 20 years or so it come

wide open with the advent of lasers such requiring sophisticated optics to do all sorts of things.

Max became interested in the possibility of making a telescope from a magnifying shaving mirror. That lead him eventually to the Boston Amateur Telescope Society at the Old Swan Mill in Arlington. People used to build telescopes because they could not afford to buy one. Telescopes were expensive. Then in the 60's and into the early 70's Bob Goff at Celestron made fixtures to cut the cost of making telescopes. The result was that prices came down, a market developed, and lots of telescopes got made, which brought the price down to the point that amateur mirror grinding virtually died out.

A telescope mirror is a parabaloid. They used to be silvered to make them reflective, today they are aluminized. To grind a mirror to a spherical shape you start with two round, flat pieces of glass. The tool is mounted on the bench, an abrasive slurry is put on the tool, and the mirror is then rubbed on the tool in a series of strokes in random directions to generate a concave sphere on the mirror and a convex one on the tool. The tool wears more on the edge, the mirror wears more in the middle. (A flat surface is a spherical surface of infinite radius.)

"Hogging Out" is done with coarse carborundum and is a good way to work off any aggression that's been building up. When you have the basic shape you want, go from carborundum to aluminum oxide and keep grinding until you have a smooth gray surface with no pits visible when you examine it with a magnifying glass.

An amateur mirror maker makes a mirror that is about the focal length he wants, then builds a telescope to suit the mirror. A professional on the other hand is making a mirror to a specification - such as the radius of curvature will be 63.427 centimeters. The focal length is $1/2$ the radius of the sphere. The focal length divided by the diameter of the mirror is the F number. The radius of curvature of the mirror can be determined by use of a straight edge and feelers or with a spherometer to get the radius of curvature.

How long does it take to make a mirror? Sam Brown, in the book "All About Telescopes" say that It takes about 8 hours to hog out a mirror. It's done in a series of "Wet's" where the grit and water are added and then the mirror is

stroked on the tool until there is no more noise from the grit. Max says that 8 hours is about what it takes him. Then the mirror needs to be brought to a state of polish in preparation for aluminizing.

After grinding a pitch lap is used to polish the mirror that is already ground to a satin finish. Use cerium oxide or rouge dust on the glass, cold press the pitch to take the form of the glass, then polish.

A mirror needs to be a parabaloid, not a sphere. However, at F 9 or more they are so close that the difference doesn't matter. The difference between a parabaloid and a sphere is a couple of millionths. To test a mirror you use the Foucault test. To do this you illuminate the mirror with a point source, then move an edge, such as a razor blade, into the path of the light from the point to the mirror. If the mirror is correct then it will go dark all at once. If it doesn't go dark all at once there is a problem, and the appropriate math will tell you what the problem is.

Looking at the stars, magnification is not what is of primary importance, it's how small the image is and how much light is gathered that is important. Looking at the moon, the planets, and the sun requires magnification, but that's a different thing than looking at the stars..

In the mid 13th century the first known written record of using a lens to magnify is credited to Roger Bacon who wrote that a segment of a sphere over writing would magnify it. He paid someone 100 Pounds to make a spherical mirror. According to rumor, he left it to Oxford University who later destroyed it because it was taking the undergraduates away from their work as they spent too much time with it.

In 1352 a frescoe in Italy shows a Bishop with spectacles. Then in 1608 two lenses together were first fashioned into a telescope. It took almost 300 years to go from a single magnifying lens to a pair together forming a telescope. Galileo heard about the lenses in 1609. He believed it was a significant discovery and brought it to the Doge in Venice. The spyglass was a significant tool for sea captains who could use it to see things across the water that they could not otherwise see. Galileo used the telescope to discover the moons of Jupiter and sunspots. The Galilean telescope has a negative lens at the eyepiece and a positive lens at the other end.

Kepler designed the Keplerian telescope, with a positive lens at both ends, although he didn't actually build one. A Jesuit made the first Keplerian telescope in 1630.

A problem with refracting telescopes is chromatic aberration - the lenses bend different colors of light different amounts so the different colors are in focus at different distances. It was discovered that making lens elements from flint and crown glass could correct chromatic aberration.

In 1663 James Gregory in Scotland invented the Gregorian Telescope. This is a telescope using two mirrors, one a paraboloid and the other elliptical in shape. Newton suggested another design, with a paraboloid for the main mirror and a small mirror at an angle at the foci of the paraboloid.

Herschel used a telescope to look at the sky, and became Astronomer Royal in England. Because the Foucault test for mirrors didn't exist yet he would make a specular mirror and try it in the telescope to see if it worked. If it didn't he'd take it back out of the telescope and polish it up some more, then try it again.

As recently as 30 years ago a 36 inch telescope was a respectable professional instrument. In the mid 19th century Lord Ross built a 48 inch telescope using specular metal for the mirror. (Specular metal is an alloy of 126.4 parts Copper and 59 parts Tin - similar to bell metal.) When it was built, Ross's mirror was considered HUGE.

Arthur Hale was a man who wanted to build big telescopes. He kept meeting millionaires and convincing them that their goal in life was to build the worlds largest telescope. He managed to get a 42 inch lens for a refracting telescope built by Alvin Clark in Cambridge. Later on he got the 100 inch mirror for the Mount Wilson observatory and the finally the 200 inch mirror for the Mount Polamar Observatory.

The 200 inch mirror was made with a honey combed structure on it's rear face to keep the weight down. It was cast in a large specially built oven as a paraboloid and was then cooled gradually over a long period of time. A 120 inch glass flat was built to test the 200 inch mirror, and it was later also ground into a mirror.

Before aluminizing mirrors were silvered, but sometime in the 1930's when John Strong first came up with vacuum sputtering aluminum

aluminizing took over. The aluminum coating on the mirror is only a couple of millionths of an inch thick so it doesn't distort the mirror's shape and it has good optical properties, reflecting a large per cent of the light.

Today there are two techniques for making mirrors. One is to spin a container of mercury to use as the mirror. This works well as the mercury assumes a paraboloidal shape when it is spun. But, mercury is toxic, and you can only look straight up. The other method is to use a diamond point in a CNC machine to machine a mirror directly.

To wind up his talk Max brought us to an island in the Baltic Sea in 1879, where young Bernard Schmidt was experimenting with some homemade black powder on the way to church. He had made a quality product, and blew his arm off at age 11. He applied a tourniquet and his main concern was that his parents were going to be upset because he'd ruined his good Sunday suit. He went on to get a cigar box and some film, then to grind a lens from some glass to make a camera. Then he went on to invent the Schmidt Telescope. Max says more next time. I was sorry he had to stop - it's always enjoyable to listen to an articulate person talk about an interesting subject that they are passionately interested in.

Bill Brackett brought in two items for show and tell. First was the steady rest he's built for his lathe from the Metal Lathe Accessories casting set. The castings cost him \$63 and he says that they were good castings. He spent 30 or 35 hours making it, and made 4 mistakes along the way. He has a jointer and a 10 inch wide planer in his wood shop, and needed a way to sharpen the blades. The Lee Valley Tools catalog has a hone for sharpening 8" blades by holding the blades at the correct angle to a piece of sandpaper lying on a flat surface. Bill drew up a version of the hone 10 inches wide, then made a wooden pattern for it. He came over to my house one Sunday after noon with some aluminum pieces from his scrap box and we rammed the pattern up and cast it. He had the casting at the meeting and will bring the finished hone to a future meeting.

Roland Gaucher had a trottle plate to make for a Case tractor. He looked at it and realized that it wasn't a straight forward ellipse because the sides were tapered so that it would

seal against the bore of the carburetor when it rotated closed. So, he took an oversized piece of steel and cut a 10 degree angle on the end of it. Then he soldered a piece of 1/32 brass onto it, put it into the lathe and turned it to the right diameter to fit the bore. He took it off the steel fixture, put the mounting holes into it, and it was a perfect fit into the carburetor bore and sealed up perfectly when it rotated closed. If he'd been going to make a bunch of them, rather than just one, he'd have tapped some holes into the steel fixture and screwed the brass onto the fixture with the same holes that they'd later mount to the throttle shaft in the carb.

Letters

Hi Steve,

A neat machine tool for NEMES folks to know about is the

Metal Master

It is a universal, small, portable, and operator alignable machine tool which combines lathe, horz mill, vert mill, and horz boring mill.

The design was commercialized by Anthony Croucher company and was used by the Royal Navy as a one tool machine shop, especially on submarines, and also in research lab machine shops..

For Model Engineers, it answers the question of how to get a lot of shop into a smallish space....

It is also the answer to the question -- "If you were going to the South Pole for 6 months, what small machine tool would you take?"

I have a set of castings here... not the built up machine... and a set of drawings.... NEMES members can visit me here in Deerfield to examine the casting and get an idea of the size. I am considering using a standard Logan lathe headstock on my machine. As a lathe, it is a 7" diameter swing = roughly the same as the Atlas, Logan, South Bend, but much more adaptable.

For the complete story about Mr David Urwick (a talented model engineer) who designed, built and used the Metal Master, see

www.btinternet.com/~sylvestris/index.com

Mr Mick Collins.... who also established the Model Engineer mailing list, has the original MM and will assist anyone who wishes to construct one... either from a casting set, or fabricated...

and his email is

sylvestris@btinternet.com

Cheers from Deerfield

Jay Stryker

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