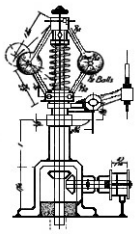

# The NEMES Gazette

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

No. 226 February 2015 © 2015 NEMES




## *Presidents Corner*

Victor Kozakevich

NEMES member Gary Phillips will be our February speaker and tell us of his adventures in restoring a theater organ, sometimes called a "Unit Orchestra" for its ability to replicate the sounds of orchestral instruments. Emblematic of the silent film era, theater organs provided a musical soundtrack to movies, or provided entertainment between different films in a matinee.

Many of these organs were scrapped as sound films took over in the 1930s. We're going to see a lucky survivor. Gary will give a condensed discussion on the restoration of this 2 manual (two keyboards), 7 rank (seven pipe sets) Wurlitzer theater organ that is an original 1927 installation in a theater in NJ. The organ was totally removed from the site and restored; restoration involved making many new parts due to severe water damage.

I believe there has been some progress on the NEMES Show location. I'll leave it to the folks spearheading that effort to update us at the February meeting. It strikes me that perhaps the club might consider a second show, maybe something in the fall, to get us some extra exposure. Perhaps one of the alternate sites would be available with the extra notice.

We can also discuss the possibility of a bus trip to Cabin Fever in mid April, or perhaps a different event. I do still miss the big get together; can we find some way to get it back?

And of course, send in your dues !

### Thursday, Feb 5, 2015

Waltham Library
735 Main Street
Waltham, Massachusetts

# Membership Info

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

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

| Issue | Contributions Due |
|---|---|
| MAR | FEB 19, 2015 |
| APR | MAR 19, 2015 |
| MAY | APR 23, 2015 |

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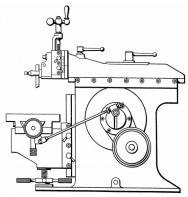


# Metal Shapers

Kay Fisher

## R. G. Sparber's Gingery Shaper - Part 58

### Fabricating the Table (part 1 of 2)

In the previous article I presented my best guess at how to build the shaper table. It came out close to this guess but also had surprises.

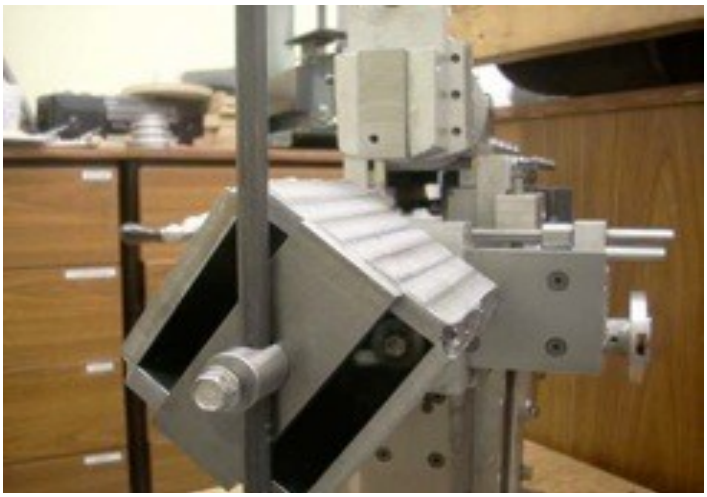


Table Completed Photo by R. G. Sparber

Here you see the table mounted on the shaper with a temporary support bar in front. It has been set to around 45°. So I how did I get here?

Clamped for Welding Photo by R. G. Sparber

I started with a piece of ½" x 4" x 45" CRS. Using my bandsaw, I cut 4 pieces of ½" x 5.1" x 5" CRS and squared them up on my mill to ½" x 5" x 5".

Clamps and a block of square aluminum were then used to fit up the corners in preparation for welding.

Tacked Photo by R. G. Sparber

I used my flux core MIG with 0.035" diameter wire to tack the ends. It only puts out 80 amps so there is minimal penetration.

Welding Starts Photo by R. G. Sparber

With all four pieces tacked together I'm ready for a bit of stick welding. I ran 6013 $^{1}/_{8}$" rod at 120 amps, electrode positive for maximum penetration.

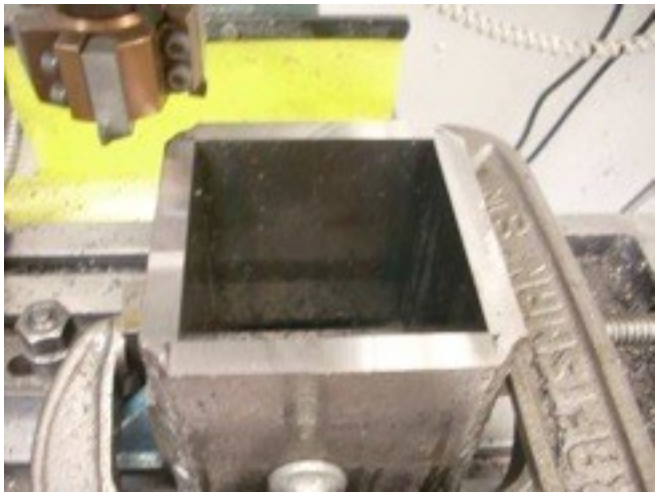
Following great advice from people on line, I started by running 1" long beads on diagonally opposite corners to balance the stress. Then I ran a second bead all the way across the corner again doing opposite corners. This was followed by a cover bead of 6011 $^{1}/_{8}$" rod at 90 amps, electrode positive.

Welding Done Photo by R. G. Sparber

The result was amazingly undistorted. It took about 2 hours to cool enough to handle without gloves.

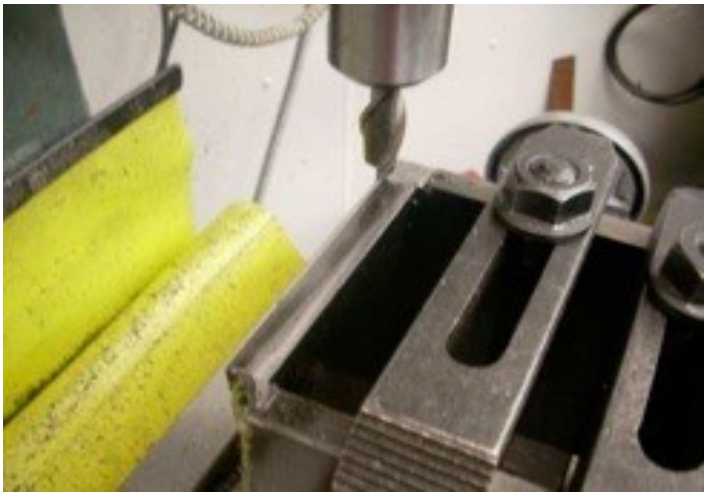
Mill Setup Photo by R. G. Sparber

The ends must be milled true before I weld on the back plate. I am using my carbide shell mill running at 2500 RPM. It gave a very nice finish but also a shower of very hot swarf that looked like sparks. I was afraid it would set my shop on fire so later changed to a far tamer $^{5}/_{8}$" end mill.



1st End Done Photo by R. G. Sparber

The above photo shows the first end done. I am ready to turn the box over to true up the side that will take the end plate.



Cutting 1 Edge at a Time Photo by R. G. Sparber

I have the machined end down on the mill table and use hold-down bolts to secure the box. After cutting each edge, I moved the clamps to provide full access to the next edge.

Box Done Photo by R. G. Sparber

The box is now ready to accept the back plate.

Backplate Clamped Photo by R. G. Sparber

There is a small overlap between backplate and the rest of the box which permitted me to clamp the plate without having it fall through.

Backplate Welded Photo by R. G. Sparber

The back plate is now welded in place and I'm ready to start machining all faces true.

Some of my first 6013 beads came out really ugly so I was relieved to be able to hide them with material from the 6011 rod.

Inside View Photo by R. G. Sparber

Face Ground Photo by R. G. Sparber

Keep sending me email with questions and interesting shaper stories.

## *Shop Talk*

Norm Jones

Last month's NEMES meeting was fairly well attended considering that it was a week later than usual with some less than ideal weather conditions in play as well. The "Poster Session" format allows for us to show off current projects and to engage in pleasant conversation on just about any subject that comes to mind.

I met a fellow while waiting for the auditorium to be opened up. His name is Hugh Ross. A first timer to our group! Hugh had driven about four hours from New York State that day. He quickly became the center of attraction during the meeting, explaining his latest project. Hugh is building a scale model of a : William Doxford & Sons 1914 opposed piston oil engine prototype. At 1/10 scale, the model will be about 36" tall.

He spent over a year developing drawings for the project, using information provided on the web site. His initial challenge was to prove to himself that he could fabricate some unique 1/1 helical gears. We admired his handiwork and there was much discussion as to how the task was performed. Hugh is now about four years into building a very complex engine. We look forward to hearing about continuing progress and ultimately seeing the completed project. Take a look at:" William Doxford & Sons opposed piston two stroke diesel", Doxford Marine Engines Page 1 – Old Engine .org Homepage to view the pictures that Hugh has been working from. Thanks Hugh. Hope to see you again soon!

## *Shop Talk*

Max ben-Aaron

**The invention of radio transmission**

Early attempts at telegraphy failed largely because of the number of conductors thought to be necessary to carry a message (based on a written alphabet) between the transmitter and the receiver. Morse's breakthrough was the use of a code, a group of short and long pulses of 'noise' ('dits' and 'dahs' separated by intervals of silence) for each character, with characters separated by longer intervals of silence.

Telegraphic and telephonic communications need at least one conductive channel to make a connection between the transmitter and the receiver of a message. A telegraphic message can be transmitted using a single conductor, with ground return, while a twisted pair is all

that was necessary for the early telephone.

The development of the radio began with James Clerk Maxwell's Electromagnetic Theory (1873), which predicted that electromagnetic waves (now called radio waves) could be propagated through space, opening up, as we now know, the possibility of communication without having to connect transmitter and receiver with a concrete physical connection. Radio was the first technology to allow for mass communication. It has enabled information to be transmitted far and wide, both nationally and internationally, and, these days, between planets, too. The meaning and usage of the word 'radio' has developed in parallel with developments within the field of communications and can be seen to have three distinct phases:

- Electromagnetic waves and experimentation
- Wireless communication and technical development
- Radio broadcasting and commercialization.

In 1878, David E. Hughes invented the carbon microphone. While experimenting with it he noticed that, when sparks were generated, they could be detected in the receiver, so he developed his carbon-based detector further and eventually he could detect signals over a few hundred yards. He demonstrated his discovery to the Royal Society in 1880. This phenomenon was attributed merely to induction, so he abandoned further research.

Between 1886 and 1888, Heinrich Rudolf Hertz first decisively demonstrated radio transmission through free space so he gets the credit for this discovery. He was able to transmit electromagnetic waves (radio waves) through the air, publishing the results of his experiments and verifying Maxwell's theory. Radio waves were initially referred to as 'Hertzian waves'.

In 1884, at Fermo in Italy, Temistocle Calzecchi-Onesti experimented with tubes containing powdered metals (nickel silver with traces of mercury metal filings) as they conducted electricity, and used them as a radio detecting device, although this invention is usually credited to Edouard Branly (the Branly 'coherer').

After experiments at Menlo Park, Thomas Edison and his employees applied in 1885 to the U.S. Patent Office for a patent on an electrostatic coupling system between elevated terminals, and the patent was granted as U.S. Patent 465,971 on December 29, 1891. (To protect themselves legally from lawsuits, the Marconi Company later purchased rights to the Edison patent).

In 1892, physicist William Crookes, speculating on the possibilities of wireless telegraphy based on Hertzian waves, proposed electromagnetic or Hertzian waves as a navigation aid and as means of communication.

After learning of Hertz demonstration of wireless transmission, inventor Nikola Tesla concluded that Hertz had not demonstrated airborne electromagnetic waves (radio transmission), and he tried to develop a system based on what he thought was the primary conductor -- the earth. In 1893 Tesla demonstrated his ideas in St. Louis, Missouri and at the Franklin Institute in Philadelphia, and proposed that wireless power technology could incorporate a system for the telecommunication of information.

Professor Oliver Lodge and Alexander Muirhead publicly demonstrated wireless signaling using Hertzian (radio) waves in the lecture theater of the Oxford University Museum of Natural History on August 14, 1894, when a radio signal, sent from the neighboring Clarendon laboratory building, was received by apparatus in the lecture theater. Lodge predicted that the maximum transmission distance for radio waves would be 1/2 mile.

In 1894 the young Italian inventor Guglielmo Marconi noted that other inventors did not seem to be pursuing the possibility of building a commercially viable wireless telegraphy system based on the use of Hertzian waves (radio waves, so began working on the concept to turn what was essentially a laboratory experiment into a useful communication system. He began developing portable transmitters and receiver systems that could work over long distances. Marconi was field testing his system by August 1895 but was only able to transmit signals no further than half a mile. His ideas, grounding his transmitter and receiver, and raising the height of his antenna, improved the system, but, even with these improvements he could transmit signals only up to 2 miles.

Eventually, Marconi's experimental apparatus proved to be the first engineering-complete, commercially successful radio transmission system. It is also credited for saving the 700 people that survived the tragic Titanic disaster.

Russians claim that radio was invented byAlexander Stepanovich Popov, because, conducting experiments along the lines of Hertz's research, he built his first radio receiver, which contained a coherer, in 1895.

## *Shop Talk*

George Gallant

I have spent the last two weeks learning about 3D modeling in preparation for getting a 3D printer.

My development systems are/were CENTOS 6.6 Linux. They have served me well. 3D modeling software has been the exception. Most of the modeling software refuses to run due to library inconsistencies. What does work is a free 3D modeling program called openSCAD.

OpenSCAD differs from most other modeling software in that the user writes a program to instantiate the shapes. It comes with a number of primitives (cube, sphere,

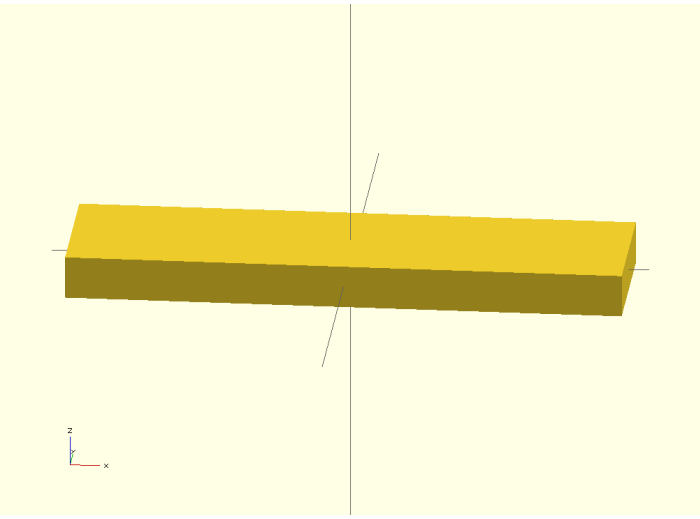
cylinder) and a good selection of manipulators (translate, rotate, scale). You describe the object in a C like program with mathematical parameters and then invoke the compiler to build and display the image.

This is quite different from the traditional drag, stretch, and rotate drawing tools.

There are four aspects of this methodology that are real positives for me:

- Shapes have numerical parameters.
- Making multiple copies of a part is trivial.
- Easy to view individual parts or a whole project
- The language is similar to C which is something I am familiar with.

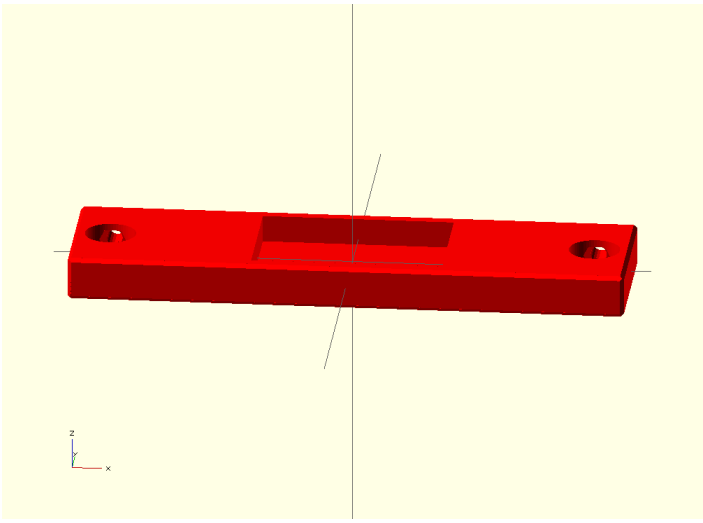
For example, my first part that I want to print is a battery holder for a self-balancing robot. The battery is a 11.1V 2200mah LiPo that measures 2.0 x 1.0 x3.0 inches. The battery will mount on rails that are about 18 inches high and 3 inches apart.



I used the following four steps to design the bracket:

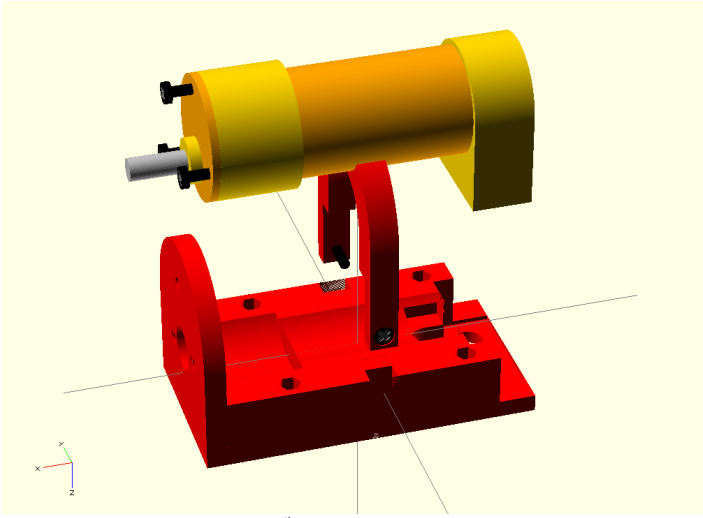
1. Design models for the parts that external to the 3D printing process such as screws, nuts, rails, plate plate, motors, batteries etc.
2. Create a cube of the approximate size. In this case the span between the vertical rails determines the x, the battery depth determines the y, and the packet depth determines the z.
3. Use the difference function to remove material.
   - 2.1 Subtract the cylinders for the rails
   - 2.2 Battery case
   - 2.3 Rail clamp screws
   - 2.4 Cubes to bevel the edges.
4. Compile and view the results.

Note: The previous steps also applied to modeling the screws and motors, etc.



This is when openSCAD starts to become addictive. I initially had 3/8 x 1/2 u-chanel rails. Changed to solid 3/8 round stock. Tool did all the work. As I became more comfortable with the tool I started to build more primitive parts and to use the “union”, “hub” and “difference” operators. I also realized that the model for the motor needed more detail than the model for the wheel.

The following picture shows the motor mount assembly with the motor and clamp being displayed at an offset.



This is about the 8th revision and I suspect it is something that would be sturdier and easier to make in metal but will attempt to print as an experiment.

Another technique used was made dummy modules that had the screws or alignment pins placed on the model. That way I could use the difference operator to generate matching mounting holes in the mating parts.

OpenSCAD is under active development and does have some flaws, weaknesses, and omissions:

- Typographic mistakes are not always errors or even warnings. It just supplies a default value.
- Warning messages (when presented) refer to line numbers which are impossible to locate.
- Some user mistakes just fail. Fatal. No help.

- The export to DFX is weak
- There is no apparent ability to add dimensions to the drawings.

When doing the subtract operation the quality of the model is critical. This was very evident in making the cradle style motor mount.

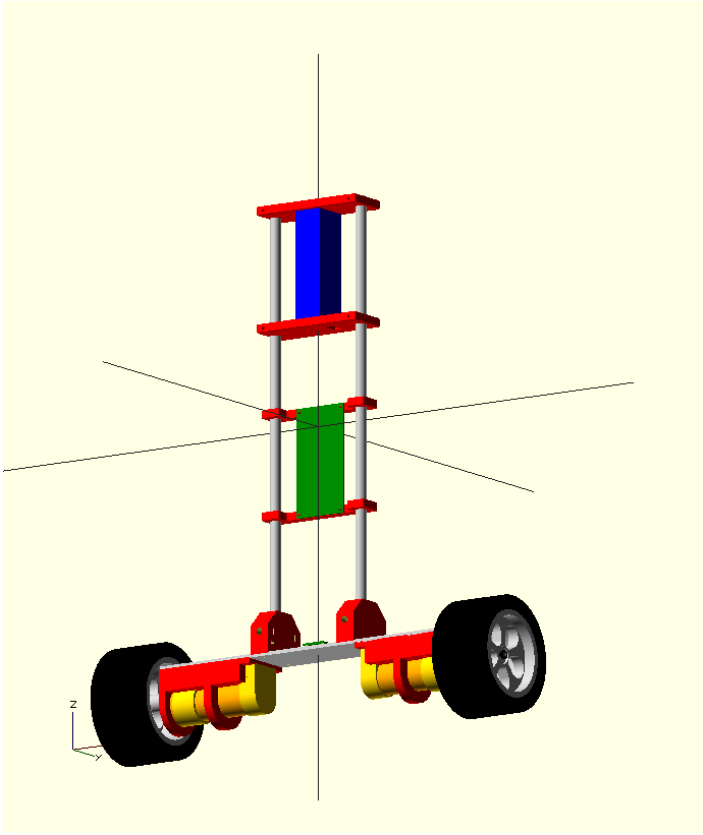
Modeling allows one to play “what if” without actually expending material resources. This is just one tool in the toolbox, it just happened to exceed my expectations.

In summary:

- Make accurate scale models of the parts that were purchased or made external to the 3D printing process.
- Made dummy models where 2 independent surfaces mate.
- Parameterize just about everything so that the tool does the grunt work of making sure everything meshes perfectly.
- Every now and then stop and view the entire project to insure it looks right.

I did eventually export the base plate to DFX format and email file to Ron Ginger to see if it was importable by his CAD tools.

Hope to be able to add wires, leds, and switches. Current version, parts in red (online version) to be printed.



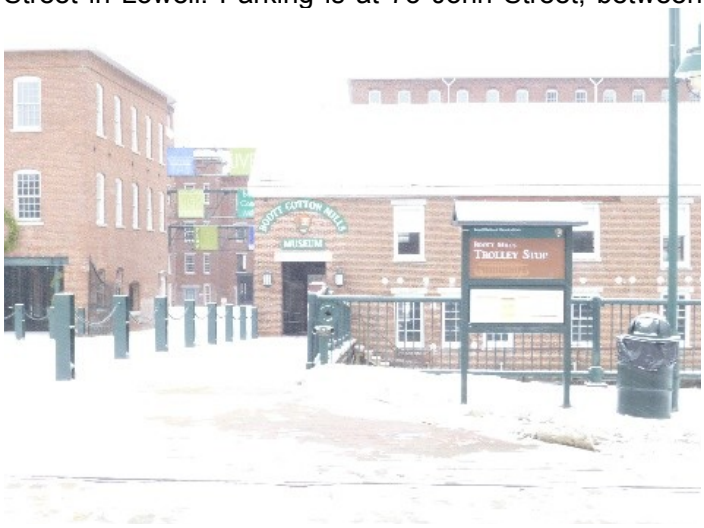
## Club Business

Rich Baker

**NEMES Model Engineering Show.** While the show is still tentative, everything appears in order for a Saturday, February 28th show at the Boot Mill, Lowell National Park in Lowell Massachusetts. We are waiting for the official approval from the Park Service, but they are indicating that everything looks very good. The show will run from 10-4, and we hope to begin setting up at 8 AM. Please bring your latest models and displays.

The Lowell National Park in the Boot Mill and is focused on the mills and mill machinery, with some very nice displays of mill equipment. There is a trolley barn underneath the room we will be using to display, but that area is not open to the public. There should be a good synergy between the Model Engineering Show and the National Park exhibits.

The actual location of the show will be at 115 John Street in Lowell. Parking is at 75 John Street, between



French St and Page Street. When you leave the parking garage, turn right towards French Street. Walk down John Street past the guard shack and over the bridge. Turn right in the mill courtyard, and walk to the end, 115 John Street. Enter the doors and take the elevator to the 4th floor. We will be exhibiting in the room to the left of the elevator and perhaps in the lobby.

If you are exhibiting, drive past the parking garage on John Street through the intersection with French St, and continue to the guard shack. Tell him that you are dropping off your exhibits, and continue over the bridge to the mill, turn right, and drive to the end. The tower is labeled 115 John Street. Enter those doors and take the elevator to the 4th floor. The door has a ramp and is handicap accessible. There are two elevators, so moving equipment to the show area should be easier than the Jackson Room. Be sure to move your car to the

parking garage once you have unloaded.

There is electricity in the room. We are negotiating with the Park Service and the City of Lowell to place an air compressor on the street and to run the air hose up to the 4th floor. Norm has the air manifold to distribute air to the models. Our application also included alcohol flames. We did not request permission to run Internal Combustion engines this year.

The National Park Service does not allow any money to change hands, so there will not be any Shirt nor Membership sales. We are hoping to provide food for exhibitors only, but this is still under discussion.

The National Park Service is open to helping us with publicity, but we could use your help getting the word out. With a new location and date, please help to get both exhibitors and the public to our show.

**Dues.** Dues are now due. If you have not done so already, please send your $25 check to:

Richard Baker
288 Middle Street
West Newbury, MA 01985.

**Non-profit status.** It's official. NEMES is now a 501(c)(3) Not For Profit organization. If you have donated to the club, you may be able to deduct your donation from your taxes. The IRS Letter is posted on the NEMES web site in the Legal Documents area.


## *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:

events@neme-s.org or 207-865-1347

Feb 5th Thursday 7PM
NEMES Monthly club meeting
Waltham Library
735 Main Street
Waltham, Massachusetts

Feb 28th 10:00-4:00
19th Annual NEMES Model Engineering Show

March 5th Thursday 7PM
NEMES Monthly club meeting
Waltham Library
735 Main Street
Waltham, Massachusetts

March 28-29th Midcoast Model Festival
Owls Head Transportation Museum Owls ME
http://www.ohtm.org/events_2000.html