

# The NEMES Gazette

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

No. 173

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## Editor's Desk

Frank Hills

### The Sound Barrier Older Than You Think!

Despite what the Russians and the French say, everyone who knows airplanes knows that the first person to break the sound barrier was Chuck Yeager in the Bell X-1 (a bit of American pride). But he wasn't the first one to have to deal with it. In fact, the sound barrier has been a problem for at least 250 years. The first people to have to deal with this aerodynamic phenomenon didn't even know what it was. But intuition told them it had something to do with the nature of air.

The sound barrier isn't really a barrier at all. Though some aviation pioneers began to think so in the 1940s when aircraft came back badly damaged simply trying to approach it. The sound barrier is the speed at which sound waves created by a body traveling through a medium can no longer out-run the body. They build up in front of the body forming a high pressure wave.

-Continued on page 2

## Next Meeting

Thursday, Sept. 2, 2010

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

## Membership Info

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

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

Addresses are in the left column.

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## **Editor's Desk**

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If the body isn't shaped to penetrate the wave, it's like a swimmer doing a belly flop instead of doing a nice piercing dive. In fact, even if the body is nicely shaped, that wave of air pressure can fold back and hit other parts of the structure.

Early supersonic aircraft designers learned the hard way that a nice point on the front wasn't enough. The wave coming off the nose radiated out and clipped the ends of the wings and caused them to flutter. The waves shedding from the leading edges of the wings slowly moved back as the plane traveled faster and, interacting with their own following low pressure zone, cause control surfaces to wave like flags until they were ripped off. Fun times!

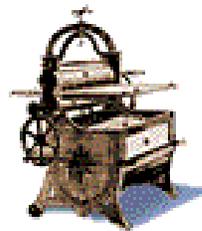
It took a great deal of effort, research, and a few lives to find out what was happening. Aircraft manufacturers late in WWII tried to make their planes sleeker, but what they really needed to do was figure out where the waves were forming, to shape things so the wave from one part of the aircraft didn't crash into another, to control the propagation of the wave, the flow of the wave over the plane, to their advantage. At high speeds the sleek P-51 mustang was a flying barn door. Even the Me-262, wasn't sleek enough. Eventually, however, the problems were identified and answers were found to the combination of issues that are the sound barrier.

But it didn't start or end there either. In fact, the sound barrier, or rather, the speed of sound was identified as a limiting factor in the design of bullets and shells in the late 1800s by a physicist name Ernst Mach. The speed of sound, or Mach one, is named after him. During this time, the makers of high-powered guns of all sizes seemed to be struggling with increasing range and decreasing accuracy. Mach and his son actually photographed the shockwaves propagating from models in a high speed-air flow. By changing the angle of the models in relation to the flow, they discovered that the shockwaves created higher and lower pressure zones around the model that distorted

the forces the air was exerting on its surface. The projectiles of the time would start to wobble. The answer, at least at this early stage, was to machine the outside of the bullet/shells to a sharper point and give them a bright finish. They also needed to be of higher quality, guaranteeing that they were balanced around the centerline. Once the rifling in the barrel started them spinning, the improved balance kept them turning around the axis. The point and bright finish reduced the production of shockwaves and reduced aerodynamic friction. Now we can kill each other at longer ranges. Thank you, Ernst.

But that's still not the beginning of the story. In the early 1700s, the King of England (don't remember his name, he's not the interesting one here), hired a scientist to research cannon fire. How much powder was needed? How far and fast could the shell go at what elevations of the barrel? This gentleman experimented with incrementally larger amounts of black powder and measured the expected increases in distance the ball flew. But eventually he came to a point where the ball didn't travel any farther, no matter how much additional powder was added. He then came to a remarkable conclusion. Air resistance had risen to the point where the air could no longer flow around the ball, but instead, built up in front of it. His deduction was brilliant, and almost hit the nail on the head. Strange it would take another hundred years for someone to think of putting a point on the ball.

Next month..."Cannon Shells to Space!" Why not? I'm in a groove.



## ***NEMES Gazette*** ***Editorial*** ***Schedule***

<u>Issue</u>	<u>closing date for contributions</u>
Oct. '10	September 24, 2010
Nov. '10	October 22, 2010
Dec. '10	November 19, 2010



## ***Past President's Corner***

Dick Boucher

### **ATTENTION!!**

Access to the Jackson Room where we hold our meeting will be through a different route this month. Ellen will be there to direct you. The roof repair work is ongoing and the museum floor is full of staging and is off limits to everyone. You will not be able to enter through the rear glass doors to the museum. However, the door to the stairs in the Jackson Room will be available after it is opened.

### ***The Meeting***

This month we will continue with the automobile theme. Joe Monty has been roaming around the North Shore and regularly commuting to the Lynn plant of the General Electric Plant in a car containing an internal combustion engine powered by wood scraps or wood pellet fuel. The technology of running an internal combustion engine this way isn't new. Many folks ran engines in this manner during World War Two in England. Joe has resurrected this out of curiosity and has found it kind of fun to drive. He has ventured as far as Portland Maine from his home on the North Shore.

When we first set up the speaking engagement, Joe was planning to drive the car to the museum for a hands-on demonstration, but the ravages of New England winters caught up with the old Ford and rust in the suspension has

made the car undriveable. He is looking for a good used Ford Escort to set the system up in again. If he can't find a car he is considering setting up the engine as a generator in his shop for generating electricity and providing heat to the space.

## ***Miscellaneous Ramblings***

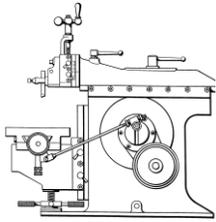
Gentleman: We must do something about the vacancy of the presidency of our organization. The term of the president is only a year and if more of you would be willing to take a year it would make the job easier and more of you could have the honor, and it is an honor, of being president of our esteemed organization.

There is also some discussion about forming a Speaker Committee to help the president locate speakers. This action would help the next president greatly and would also add a greater dimension to the type speakers we would have at our meetings. Bill Bracket and Norm Jones will be talking about this at the next meeting.

Unfortunately I will not be at the next meeting. Bea and I have been asked to help out at Clarks Trading Post that week. This is the second year I have done it as it is one of the problems with the current policy of colleges starting classes in late August rather than the long standing opening after Labor Day. All seasonal business that use college students for their summer help are caught short the week between the beginning of classes and the Labor day weekend are scrambling for help that week. My rather simple solution would be to open school after Labor Day and have a three-week Christmas Vacation rather than the four-week vacation now enjoyed.

At the August meeting someone approached me about giving a talk to the group. Now as I am want to do more and more lately, I have forgotten who it was. Would the person please e-mail me with a short note about the talk so I can set up the speaking engagement?

Dick B.



# ***Metal Shapers***

By Kay Fisher

## ***R. G. Sparber's Gingery Shaper - Part 6***

### **Machining the Ram and Ram Cap**

I got to use all of my new techniques and they worked very well.

The casting is now placed onto the blocks with the bottom reference plane squarely on the horizontal faces of the blocks and the crank side vertical reference plane squarely on the vertical lip of the block. It is then a simple matter to clamp it down, taking care not to over-tighten the clamps and distort the casting.



**Milling Back Photo by R. G. Sparber**



**Soft Blocks Photo by R. G. Sparber**

I start by placing my soft blocks. They are clamped to the table roughly where they will best support the ram casting. The end mill is then used to take a light cut on the horizontal and vertical surfaces. This insures that the casting will be parallel to the table and parallel to the X axis. It is essential that all surfaces are free of swarf.

I then side milled the back end of the ram just to clean it up.



**Ram Cap Pocket Photo by R. G. Sparber**

The ram cap pocket is done next. I would prefer to not side mill the vertical part of the pocket but don't see any choice. By making repeated passes without advancing the table, I will be able to remove essentially all cutter flexure.



**Ram on Soft Blocks Photo by R. G. Sparber**



**Finished Vertical of Pocket**  
**Photo by R. G. Sparber**

The cap was a very simple casting presented in an earlier diary entry. To jazz it up a little, I used a rubber bumper to form the land where the pivot screw will go.

After sawing off the sprue, I constructed this fixture to hold the cap with full access to the cap's bottom surface.

Brian Lamb of the Valleymetal Club suggested this scheme and it worked great! Thanks Brian. A full description of how to make this fixture is presented in the machining section of this article. I'll just give you the high points here



**Horizontal of Pocket** Photo by R. G. Sparber



**Cap on Fixture** Photo by R. G. Sparber

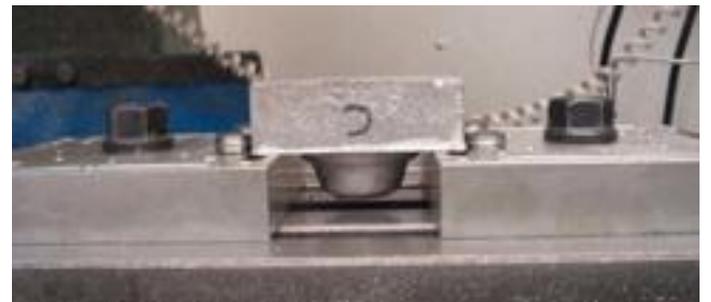
This fixture consists of two scrap blocks of 1" thick aluminum. Each has a 1/2" diameter hole in the center to accept a hold down stud and nut. But the interesting part relates to those 4 small screws and washers.

The vertical surface is now done. I could switch to my shell mill for the horizontal surface but it is so small, I will just do it with the end mill. It only took a few minutes to finish the job.

Each screw is a 1/4-20 x 1" button head. They have been turned on my lathe with an offset of about 0.050" so the head is an eccentric. The washer is actually a cup. The outside has been turned to form a sharp edge in the middle. The through hole is about 0.060" over a normal clearance hole.



**Ram Cap** Photo by R. G. Sparber



**Cap on Fixture Side View** Photo by R. G. Sparber

You can better see these screws with their funky shaped washers in the above picture. To clamp the casting, I start by tightening the left hold down bolt. The casting was then checked for flatness and found to be rather square so I did not bother with a 3 point support. The screws on the left are turned so their washers are retracted as much as possible from the casting. This means that the lobes point to the left. I then turned the two screws on the right block so their lobes pointed to the right. The right block was then pushed against the casting. Since the casting is not perfectly square, the right block ended up being slightly out of square with respect to the X axis. I then turned the screws on the left and right blocks.

Two forces come into play here. The eccentric action of each screw forces the cutting edge of its washer into the casting while the screw's threads pull the washer down. Even though the contact area is very small, the holding power is amazingly good.



**After 0.005" Cut Photo by R. G. Sparber**

Since I never used this fixture before, I took only a 0.005" cut with my shell mill and I stood as far away from the action as possible. It turned out that 0.005" was enough to fully cut the surface so I'm done. Nothing shifted. It took me about 3 hours to build the fixture including the screws and funky washers. The actual cut of the casting took about one minute. Such is machining.



**Cap on Side Photo by R. G. Sparber**

With the bottom surface cut, I am ready to use another technique from Brian Lamb. A 1-2-3 block is clamped to the table and the casting bottom is clamped to it. I set the top face roughly parallel with the table using a level. Two C-clamps secure the casting. A quick pass with the shell mill and I'm done.



**Cap in Pocket Photo by R. G. Sparber**

The last machining step was to put the cap down on the table and clean up the top in preparation for the pivot screw and the 4 bolts.

The front will be squared up on the lathe and the sides are not critical. Cap and its pocket are a very nice fit. I see no light between the surfaces. Stay Tuned for part 7 from R. G. Sparber next month.

Keep sending me email with questions and interesting shaper stories.

My email address is: [KayPatFisher@gmail.com](mailto:KayPatFisher@gmail.com)

Kay

## NEMES Shop Apron



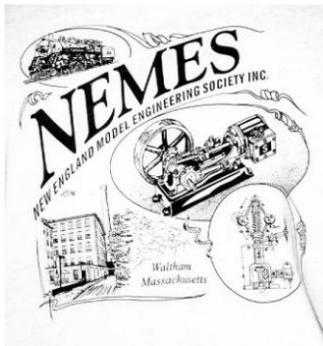
Look your best in the shop! The NEMES shop apron keeps clothes clean while holding essential measuring tools in the front pockets. The custom strap design keeps weight off your neck and easily ties at the side. The apron is washable blue denim with an embroidered NEMES logo on top pocket.

Contact Rollie Gaucher 508-885-2277

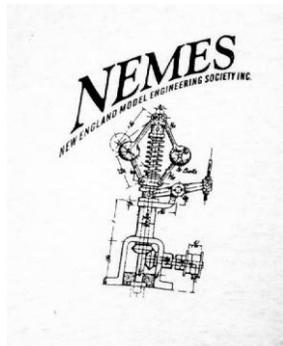
## NEMES Tee Shirts

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](mailto:mdbouch@hotmail.com)



## 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 [thebracketts@verizon.net](mailto:thebracketts@verizon.net) or (508) 393-6290.

*Bill*

Sept 2<sup>nd</sup> Thursday 7PM  
NEMES Monthly club meeting  
Charles River Museum of Industry  
Waltham, MA 781-893-5410  
<http://www.neme-s.org>

Sept 4<sup>th</sup> & 5<sup>th</sup>  
Vermont Gas & Seam Engine Association Show  
Intersection Rtes 100 and 107 Stockbridge VT  
Gail Norman 802-485-8224  
[gailnorman@trans-video.net](mailto:gailnorman@trans-video.net)

Sept 4<sup>th</sup> & 5<sup>th</sup> Vintage Motorcycle Meet & Antique  
Aeroplane Show  
Owls Head Transportation Museum Owls ME  
<http://www.ohtm.org/>

Sept 11<sup>th</sup>-12<sup>th</sup> Dublin Show  
RT 101, Dublin, NH 603-863-4696

Sept 10<sup>th</sup>-19<sup>th</sup>  
Annual Lee's Mills Steamboat Meet  
Lake Winnepesaukee Lees Mills NH  
<http://www.steamboating.org/>

Sept 18<sup>th</sup>-19<sup>th</sup> Earth Movers & Shakers &  
Antique Aeroplane Show  
Owls Head Transportation Museum Owls ME  
<http://www.ohtm.org/>

Sept 19<sup>th</sup> 9AM The Flea at MIT  
Albany Street Garage at the corner of Albany  
and Main Streets in Cambridge MA  
<http://www.mitflea.com/>

Sept 23<sup>th</sup>-27<sup>th</sup>  
The Liberty Ship *SS John W Brown* will be  
visiting the port of Providence Sept 23-27.  
<http://www.liberty-ship.com/>

Sept 24<sup>th</sup>-26<sup>th</sup> Connecticut Antique Machinery  
Museum Fall Festival  
\$8.00 entry  
<http://www.ctamachinery.com/>

Sept 25<sup>th</sup> Vermont Gas & Seam Engine Assoc  
Fall Festival  
East Burke, VT  
Gail Norman 802-485-8224  
[gailnorman@trans-video.net](mailto:gailnorman@trans-video.net)

Oct 2nd 8AM-4PM  
The Original Yankee Steam-Up  
The New England Wireless and Steam Museum  
1300 Frenchtown Road East Greenwich, RI  
<http://www.newsm.org/index.html>

Oct 3rd 12:00-5:00  
Roland's Shop visit  
90 S. Spencer Rd. Spencer MA  
508-887-2277

Oct 7<sup>th</sup> Thursday 7PM  
NEMES Monthly club meeting  
Charles River Museum of Industry  
Waltham, MA 781-893-5410  
<http://www.neme-s.org>

Oct 9<sup>th</sup> CMSG&MA Swap Meet  
Orange Airport Orange MA  
Grover Ballou at 413-253-9574

Oct 9<sup>th</sup>-10<sup>th</sup> Foreign Auto Festival & Antique  
Aeroplane Show  
Owls Head Transportation Museum Owls ME  
<http://www.ohtm.org/>

Oct 17<sup>th</sup> 9AM The Flea at MIT  
Albany Street Garage at the corner of Albany and  
Main Streets in Cambridge MA  
<http://www.mitflea.com/>

Oct 30<sup>th</sup> 9AM-5PM American Precision Museum  
10th Annual Model Engineering Show  
Windsor Community Center, Windsor VT  
[www.americanprecision.org](http://www.americanprecision.org) 802-674-5781.

Oct 30<sup>th</sup>-31<sup>st</sup> The Great Fall Auction  
Owls Head Transportation Museum Owls ME  
<http://www.ohtm.org/>