

# The NEMES Gazette

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

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## Editor's Desk

Frank Hills

### What We Know We Don't Know.

Isn't science funny? It gives us the confidence to say "we can", or "we are sure of thus and such" only to find out later that we were wrong. At one time, the world was flat, with no doubt. Not more than 35 years ago, the T-rex stood upright and was a cold blooded, slow mover. Not now. Of course science has evolved and we can be more confident in things than we used to be. In fact, there is now a standard caveat used in science when we start stretching beyond what we might call "engineering sciences", or the use of well understood knowledge and technologies. It's "We think so, but we should look closer". I would add to that – many people now feel perfectly comfortable saying "we simply don't know".

Note that I am making a distinction here. For the purposes of this article I'm saying that engineering is the science of using well-understood knowledge and technology. Mind you, I work in an environment where we stretch that as a matter of course.

Continues next page.

## Next Meeting

Thursday, Nov. 3th, 2011

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**

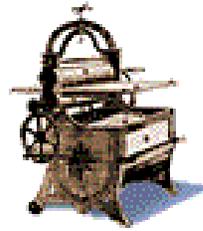
-continued from page 1

I'm also calling scientists "engineers" of their field whose expertise is to research and understand how to push beyond those limits and/or better define our knowledge and create new technologies. There must be a willingness to do that to expand our intellectual horizons. Back when the world was flat, religion dictated science. I'm a religious man, but even I can see the foolishness of that! When T-rex stood upright, scientist simply took what they knew about reptiles and adapted it to this new pile of bones! The problem wasn't that they were wrong, and they were, it was that they were hesitant for so long to admit that their conclusion had holes. Have you been to the Boston Museum of Science lately? Old T is out in the rain and snow, new T is in where it's nice and warm. But like I said, that way of thinking has changed.

In defense of the scientists (and the engineers who stretch), I must say that they've got a tough job. They have to start somewhere and that has to be with what they know. To make their job even harder, they must continue to make those assumptions until they have information to either prove them wrong or give them another path of investigation. If they don't, they're doing nothing more than stumbling around in the dark. That's tough! I personally believe that where modern science has gained the most is in the willingness to say "we need to know more" or "we don't know". Sometimes knowing that you don't know has to be applied even to the things we do know. Again, I see it all the time. We try to apply knowledge and technologies that should work and sometimes just don't. Then starts the search to understand why.

There is a benefit to knowing what you don't know; you waste less time chasing your tail. The best scientists are those who truly love to explore the limits of their field. Though their search may end with more questions than answers; there is always something to be gained. As for me, I just want to know why

guinea pigs only have three toes on their back feet. Next month, "Microscopes".



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

<u>Issue</u>	<u>closing date for contributions</u>
December 2011	November 18, 2011
January 2012	December 23, 2011
February 2012	January 20, 2012
March 2012	February 17, 2012
April 2012	March 23, 2012
May 2012	April 20, 2012

## ***2012 NEMES Membership***

Please send a check for \$25.00 made out to NEMES to:

Richard Koolish  
212 Park Ave.  
Arlington MA 02476

PLEASE PRINT NEATLY!

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ ZIP \_\_\_\_\_

Home Phone \_\_\_\_\_

Work Phone \_\_\_\_\_

Email \_\_\_\_\_



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

Dick Boucher

### ***The Meeting***

This month our speaker will be Gary Phillips. Gary will speak on the design and building of a rather large and extremely precise vacuum table. He built this from some left over materials, mostly. It is extremely well built. He will discuss the various operations required to obtain precision. Why certain materials and construction methods were chosen and how it all worked out in the end; was it a success, a failure, or something in between?"

Normally I prefer our membership to hold their questions until the end of a speaker's presentation but in Gary's own words: "My "style" is to have interaction with the various people in attendance. I know how I am, I have a spark in the mind and by the time I wait for questions and answers, it's gone...you know at my advanced age of 52. :~) So, it would be great for those who want to contribute, to do so."

### ***Miscellaneous Ramblings***

Well, other than taking Bea for a date to the dance hall where we met 50 years ago this summer and a quiet ride up the Maine coast checking out the light houses and the surfers on the ocean for our 46 anniversary, I haven't done much rambling.

But it is that time again. Norm, Rich Baker and I are starting to plan the Cabin Fever trip to York Pennsylvania. Mark, our driver, has made a suggestion for picking up the folks from Central Massachusetts at Exit 6 so they will not have to travel all the way to Boston to get the bus and then have the long drive home facing them when we return. Rich is scouting the area of the *Round the Clock Diner* for a different motel for us to stay at this year. No more Motel 6 even if they promise to leave the lights on for us. If you have gone on the bus trip in the past Norm will be contacting you. If this will be your first time, get in touch with Norm or myself and

we will put you on the list. You can contact Norm at 978-256-9268 or [nejhome@yahoo.com](mailto:nejhome@yahoo.com) Contact me at 978-352-6724 or [rlucienb@juno.com](mailto:rlucienb@juno.com)

The next thing worth mentioning is our own Model Engineering Show in February. It will be held on February 18<sup>th</sup>, the third Saturday of the month. So start dusting off your projects to show and mark that date on your calendar.

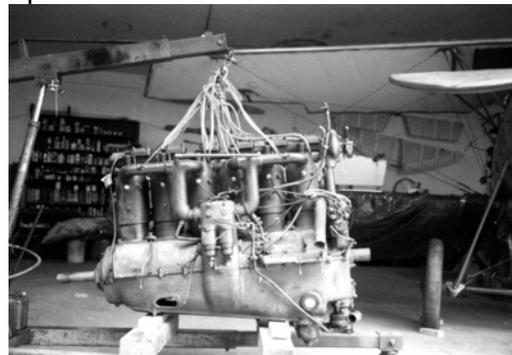
Dick B.

### ***Aircraft Engines***

By Jim Johnson

Germany's aircraft manufacturers could use any engine they wanted, as long as it was a straight six (other the rotary) Other features were direct-drive with high-torque at low RPM, overhead alloy steel valves, water cooling, dry-sump lubrication, continuous carburetor de-icing, versions suitable for high altitude with long duration operations, and finally, weight was not good. There is a marvelous old film available about the Albatross factory, showing production with such 6-cylinder engines. Daimler-Mercedes, Daimler-Austria, Benz, Bavarian Motor Works (BMW), and others were already onto this at the beginning of the war with smaller in-line fours, heavy but useful. Such early aircraft were less agile but a bit more stable and very capable in diving!!!

The engine in the photo below is a Mercedes, traceable back to Paul Manz, who used this engine extensively in movies for aerobatics. Cole Palin of Old Rhinebeck traded a Snipe with a Bentley engine to the Smithsonian for it. It was installed without full overhaul and was recently operating in a reproduction DR-VIII. The writer was very impressed with idling; there was nearly no mechanical noise except the solid click of valves and the boom of the exhaust at something near 100 RPM. It produces 200 SHP at 1600 RPM.



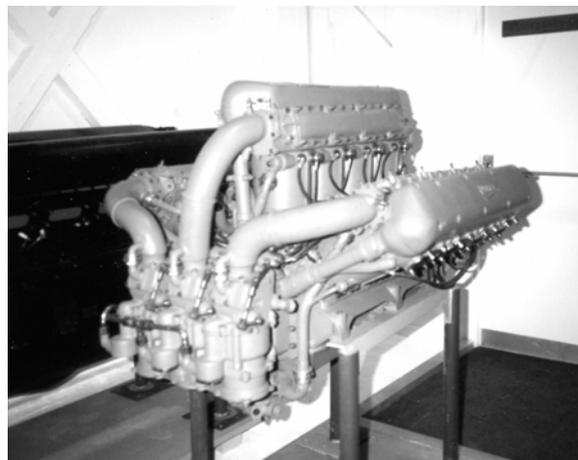
It uses a steel cylinder, welded water jacket and flange, and an array of items welded to the top of each cylinder, including camshaft bearing supports!. The cylinder top was initially created as an integral curved dome and later as a flat top. Mercedes employed an external camshaft, and BMW internal with pushrods and rocker arms. Both BMW, used in the DRVII, and Mercedes, in the Albatross and DRVIII, weighed about 200 pounds more than the French Hisso. The oval hole visible in the Mercedes crankcase is a port for carburetor air traveling through the crankcase. The Mercedes high-altitude versions relied on higher compression and strict pilot limitations during takeoff and climb. BMW relied on only one compression ratio with two separate throttle controls with associated fuel mixtures for the different altitude regimes. Bombers eventually tried a third engine to drive a supercharger, but the war ended without any further development.

The US adopted an analogous role in creating the "Liberty" engine shown in the next photo. The analogy being one design that was supposed to serve a series of engines, 4, 6, 8 and 12 cylinder, each based on the same cylinder and overhead production and only different cranks and cases. Each cylinder is similar to those of the European welded designs, with a small forest of devices welded, brazed, bolted or clamped to the cylinder top. Hall-Scott's basic design was quite successful for their series of engines, straight 4s and small V8s. Incidentally, it used coil spark ignition, not magnetos. Development really was unique: from concept to first engine testing in just over one month. Design was accomplished in 6 days starting end of May 1917, by Jesse G. Vincent of Packard and E.J. Hall of Hall-Scott Engine Co. These men had already been there with crankshafts, crank cases, valves, cams, ignition, carburetion and every other problem area. Production began just a few weeks later by Hall-Scott, Packard, Lincoln, Ford, Lorraine-Cadillac and General Motors. The Liberty was designated for the US DH4 fighter aircraft, later the plane used by the US Postal Service. Production under contract totaled 21,000 by November of 1918. McCook division of the Army Signal Corps., later moved to Wright Field, appears to have been the government agency that set it up and did the contracting. There is a marvelous short film available about

high altitude testing of the Liberty with turbochargers on Pike's Peak available courtesy of General Electric.



Curtis also engaged in their own engine development, which will be discussed in a future paper as it is much too important to just fit in here. Suffice for now to say that their very important efforts also produced a bomb, the very unreliable OX5 shown below, which was produced by contract in the thousands. Between the surplus OX5 at 60 SHP and the Liberty at 400 SHP, further US aviation developments had little choice except to utilize these engines for the next 5 to 10 years as they were sold inexpensively by the Government. The Liberty was also very popular for Sport power boats, with its high torque at low RPM, but subject to terminal corrosion.



According to Bill Gunston in his book "Aero Engines", in Great Britain, Beardmore-Halford-Pullinger, BHP, was producing Daimler-Austro engines. These were being used in the RAF FE series. In 1916, Captain Frank Halford was assigned

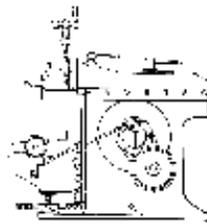
to develop a bigger engine. He chose threaded-steel cylinders with 5.7 diameter by 7.5 stroke, screwed into a big aluminum casting, like the Hisso. The head was not made up of a "forest" of parts but a massive cast iron unit. The engine tested out at 236 Brake Horsepower at 1600 RPM with a bare engine weight of 690 pounds. It was being produced by both Galloway Engineering and Siddeley. However a Major Green took over and the upshot was that the engine was totally redesigned into an all-aluminum in-line 6 called the Puma. It is in essence an in-line version of the Hisso. The Puma was a disaster. Production of several thousand units was well along when it was found that the exhaust valves burned out and the aluminum castings were very porous. It could not be used as planned in the US DH4 fighters shipped to Britain, and then the war was over.

Meanwhile, D. Napier and Son were building cars and one of the Sunbeam engines was being used by the RAF. Then, in 1916, Napier set out to design and develop the W-12 Lion engine with 3 banks of 4 steel cylinders with welded steel water jackets and valve ports in the flat top. Overhead valves, camshafts and both intake and exhaust ports were then contained in monobloc aluminum head castings for each row of 4. These cylinders were bolted into a massive aluminum crankcase casting. The engines were thoroughly tested and alterations made. The completed Lion engines gave 450 SHP at 2000 and the geared version 570 at 2350. According to W. Gunston, there were racing versions running up to 3900 RPM and producing 1400 SHP. Unfortunately, the war was over by the time the engine was perfected, but it became *the* engine to use for the next 12 years. The Lion engine in the above photo was at the Paul Garber center of the Smithsonian. Companies like Rolls Royce were then catching up with them. Rolls Royce produced the Eagle, a welded steel V-12 engine with cylinder construction similar to the Mercedes, but with extra magnetos and multiple carburetors. It was used extensively by the Royal Aircraft Factory and served as the basis for Rolls Royce developments for the next few years after WW1.

## ***Join Our Mailing List!***

There is a NEMES mailing list that is also a Yahoo Group. Joining NEMES does not automatically add you to the list. You must do this on your own. To join the group, visit this web page and follow the instructions. The list is marked as being private, so it does not show up in search results if you ask Yahoo to find the group by name.

<http://groups.yahoo.com/group/nemes/>



## ***Metal Shapers***

By Kay Fisher

### ***R. G. Sparber's Gingery Shaper - Part 18B***



**Inside View of Boss Photo by R. G. Sparber**

I wish there was some way to hide my awful welds but it is the only way you can see how the screws have run through the pivot support.

Note the large change in thickness of the support plate. The bottom of the plate and bore of the boss are all that matter here...within reason.



**Both Pivot Bosses Done Photo by R. G. Sparber**

All four screws have been installed and the crank yoke is securely in position.



**Yoke Middle Photo by R. G. Sparber**

In the photo above, the yoke is vertical with the crank pin at the top of its stroke.



**Yoke Forward Photo by R. G. Sparber**

The crank yoke is in the maximum forward position. You can see the scotch yoke through the hole along with the bull wheel.



**Yoke Aft Photo by R. G. Sparber**

In this photo, the crank yoke is at its maximum rear position. It looks a lot cooler in real life.



**Top Rear View Photo by R. G. Sparber**

This is a top end view. The top of the crank yoke is about  $\frac{1}{8}$ " away from the rear cross brace.



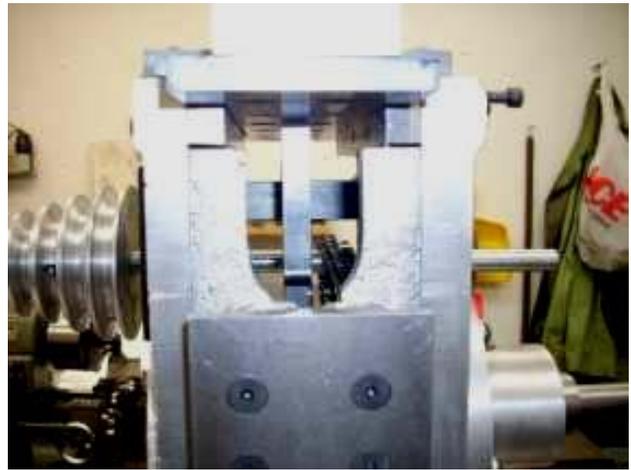
**Front Side View Photo by R. G. Sparber**

This is a side view of the crank yoke peeking out the front. It passes through the front casting.



**Yoke with Ram Above Photo by R. G. Sparber**

I have reinstalled the ram and you can see the  $\frac{1}{8}$ " clearance between the bottom of the ram and the top of the crank yoke.



**Front View Photo by R. G. Sparber**

This is the same position but viewed from the front. The top of the crank yoke has been milled to provide clearance in the front. The plans called for a 2" wide crank yoke but I had 2½" wide stock. Rather than throw away the extra steel, I reduced the width.

I thinned the crank yoke on my mill/drill with a  $\frac{1}{2}$ " diameter end mill. It should have been a routine task but at a critical instant my mind wandered. The end mill snatched the yoke out of the vise and proceeded to dance along the yokes face. I was up-milling as I cut the back of edge of the yoke but this became down-milling as I began to cut the front edge. The increase in cutting force was more than my soft jaws could handle. Fortunately I was not hurt and the dings in the yoke are superficial.

The next step is to make the ram clamp and links. This will permit me to attach the ram to the crank yoke. The design will be modified so the clamping action will be via a nut on the top of the ram like on commercial shapers.

Stay Tuned for part 19 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

## ***Tools for Sale***

**ITEM 1** I have a Geometric Die head for sale if you know anyone that might be interested. It comes with 2 good sets of dies 5/16-24 & 10-32. It is a 9/16 D style head with a 3/4 dia shank. I would like to get \$225.00 for it. See photo below. Contact Dave at: [dmachinellc@comcast.net](mailto:dmachinellc@comcast.net)



**ITEM 2:** Delta floor model 15" drill press. Must be seen. \$125; Newburyport MA. Contact Leo Klos: [leo.klos@vsea.com](mailto:leo.klos@vsea.com) 978.465.1960 H or 978.282.2628 W

### ***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 the front and back:

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*

Nov 2&3<sup>rd</sup> Design-2-Part Show  
Royal Plaza Trade Center  
Marlboro Ma.  
<http://www.d2p.com/MA>  
Free admission if you register on line

Nov 3<sup>rd</sup> Thursday 7PM  
NEMES Monthly club meeting  
Charles River Museum of Industry  
Waltham, MA 781-893-5410  
<http://www.neme-s.org>

Nov 4<sup>th</sup>-6<sup>th</sup>  
World Championship Punkin Chunkin  
East of Bridgeville, Delaware  
<http://www.worldchampionhipunkinchunkin.com/>

Dec 1st Thursday 7PM  
NEMES Monthly club meeting  
Charles River Museum of Industry  
Waltham, MA 781-893-5410  
<http://www.neme-s.org>

Jan 1<sup>st</sup> New Years day run  
Waushakum Live Steamers  
Holliston MA  
<http://www.waushakumlivesteamers.org/>