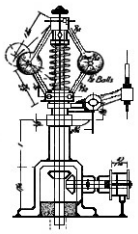

The NEMES Gazette

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

No. 209 September 2013 © 2013 NEMES

President's Corner

Victor Kozakevich

The September speaker will be Gui Cavalcanti, founder of Artisans Asylum in Somerville, and a builder of robots. He appeared on the inaugural season of the series "Big Brain Theory". The topic will be "Stompy", the six-legged robot currently under construction. With an 18 foot span and weighing in at 4000 pounds, this is no tabletop model!

At the August meeting, I brought up a few topics and want to rehash a bit for those not able to attend. If I missed anything, please bring it up at the September meeting.

I spoke about missing the Cabin Fever bus trip, as we were unable to rent the bus. The trip is a major social opportunity for club members to get together for an extended period of time.

I think we need more events like this. Several members though we should try again next year, either with a willingness to pay a bit more if there's low turnout or maybe look into a smaller bus. Some members brought up alternatives like the Rhode Island Steam & Wireless event, or maybe group trip to Owl's Head for the Model Festival.

I offered that I hope we could have more open houses/shops, perhaps by using some treasury money to rent tables, chairs and a tent, possible cater some food via Subway Sandwiches, Boston Chicken or maybe just a stack of pizzas. Pot luck is always welcome.

Someone suggested we get a club laptop for presentations. I know that Microcenter in Cambridge offers late model refurbished ones in the $200 range.

I had requested that we add a "wish-list of speaker topics" column to the Gazette. All members are encouraged to contribute ideas.

Next Meeting

Thursday, Sep 5th, 2013

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 David 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
OCT	SEP 20, 2013
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I brought up the news that we need new Gazette publisher, as Bob would like to retire from the post he's held for the last nine years. It may be possible to share the duties among a couple of members. The discussion is ongoing, still waiting for those volunteer hands to go up.

By the way, the August speaker was John Dunning, who shared his experiences in the recreation of a Boeing P26 "Peashooter" an all-metal fighter plane of the 1930s. John explained that even though Boeing was not willing to provide blueprints, a good bit of documentation was available in the public domain, and the aircraft was completed and flown.

You can see his collection of pictures on his website, www.jrd.org I found several videos on www.youtube.com Search for Mayocraft P26.

Shop Talk

Max ben-Aaron

The Birth of Mass Production

To a sailor, a block is a single or multiple pulley. A block fixed to the end of a line, a spar, or a surface, roves a rope (line) through the sheaves (and, perhaps through one or more matching blocks at some far end) to make up a tackle. The purchase of a tackle refers to its mechanical advantage; in general, the more sheaves in the blocks that make up a tackle the higher its mechanical advantage. Various types of blocks are used in sailing; some blocks are used to increase mechanical advantage, others are used simply to change the direction of a line.

A pulley-block has four components: the shell, the sheave, a pin for locating the sheave in the shell and a coak (a metal bush inserted into the sheave) to minimize wear between it and the pin. Blocks vary in size, and in the number of sheaves in them. Sheaves are enclosed between cheeks (or chocks) in an assembly.

At the beginning of the nineteen hundreds, the Royal Navy required vast numbers of blocks —a typical 'ship of the line' needed about 1000 blocks of different sizes and in the course of the year, the Navy required over 100,000 of them. Blocks were all hand-made by contractors. Because they were made by hand, they were expensive, their quality was inconsistent and the supply chain was uncertain.

Brigadier-General Sir Samuel Bentham was appointed Inspector General of Naval Works by the Admiralty shortly before 1800. During the Napoleonic Wars, the Portsmouth Block Mills has been erected to supply the Royal Navy with pulley blocks. It was in the process of being modernized, with the first stationary steam engines used by the Admiralty being installed. Bentham was tasked with overseeing the modernization and with mechanizing production processes in the dockyard. The innovations he introduced, using all-metal machine-tools, gave birth to the age of mass-production.

Engineer Marc Isambard Brunel had patented a system of making blocks using machinery. In 1802 he proposed his system to the Admiralty. Bentham appreciated the superiority of Brunel's system and in August 1802 he authorized Brunel to install three series of block-making machines designed to make a range of block sizes. Each series was to be laid out to allow a production line, with each stage of the work progressing to the next in a natural flow.

Brunel's patent specification shows wooden-framed machines but the machines actually installed bear little resemblance to them. The final designs seem to have had considerable input from both Bentham and Brunel, with assistance from Maudslay and Simon Goodrich, (mechanician to the Navy board).

Brunel engaged Henry Maudslay to construct the machines once the Admiralty contract was signed. The machines were almost entirely hand-made. This was before the advent of milling, planing or shaping machines. The only machine tools used were lathes for circular parts and drilling machines for boring small holes. All flat surfaces were made by hand — chipped, filed and scraped — although there is evidence that flats may have been ground to get near-precision finishes. This was before the days of interchangeability, so each nut, (made to fit its matching bolt), was numbered to ensure correct replacement if ever it needed to be removed. Cast and wrought iron, brass and gun metal, the materials used throughout their construction, greatly improved the rigidity and accuracy of the machines. These materials became the standard for later machine-tool manufacture.

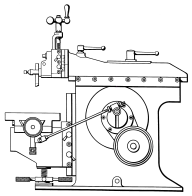
The first set, for medium blocks, was installed in January 1803. The second, for smaller blocks, in May 1803, and the third set, for large blocks, in March 1805. Soon, the plant was able to fulfill all the needs of the Navy. In 1808, 130,000 blocks were produced. There were 45 machines of 22 types, including circular saws, pin-turning machines and mortising machines, all driven by two 22.4 kW (30 hp) steam engines. Ten men, using these machines, could produce as many blocks as 110 skilled craftsmen.

Several features in these machines, used for the first time, have since become commonplace in machine design:

- Detachable tool bits were held in removable tool holders (like those used on general purpose lathes).
- Expanding collet chucks, used during certain operations, held and located the sheaves by gripping the internal bore,
- Two-jaw gripping chucks (the precursors of the three-jaw chucks used on lathes today), were used on some machines.
- The boring operation indented gauging points in the wooden blocks; machines further down the production line used these to locate and clamp the blocks precisely in relation to the tool working on it.
- Several of the machines had cone clutches.
- Automatic stops could be set on the mortising machines to stop them once the operation was done.

- Interchangeability was possible because sheaves and pins were not married to any particular shell
- The entire system was designed to be worked by laborers and not skilled craftsmen. Each man was trained to operate two or more machines and could be moved round the plant as required.

The work flow is perhaps best described as batch production, because a range of block sizes was demanded yet it was basically a production-line system,. This method of working did not become popular in general manufacturing in Britain for many decades. When it did, it was imported from America.



Metal Shapers

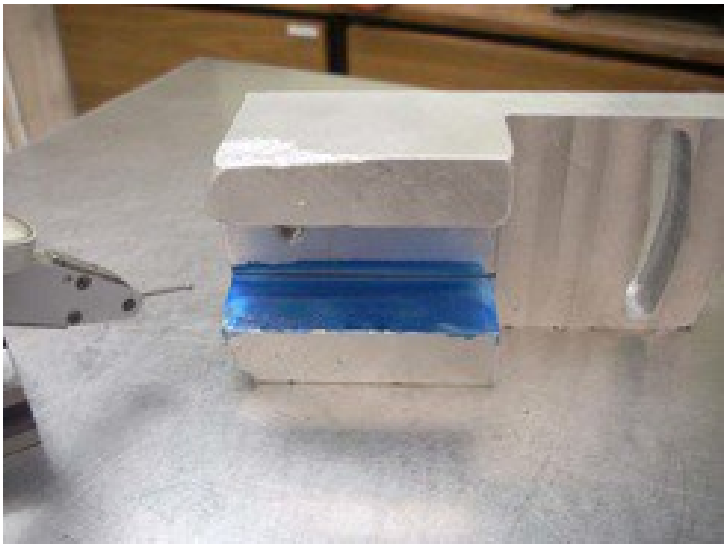
Kay Fisher

R. G. Sparber's Gingery Shaper - Part 40

Fitting the Clapper To The Clapper Box

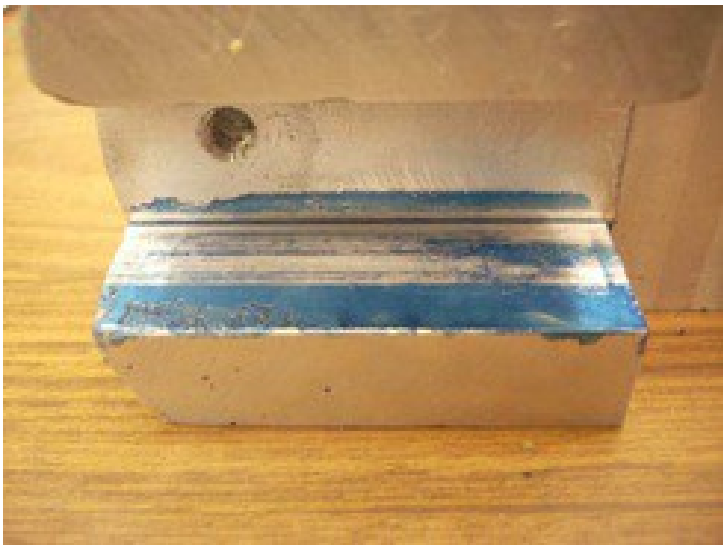
The quality of the cut made by my shaper will depend heavily on how well I fit the clapper to the clapper box. If it is a sloppy fit, the clapper will not be solidly supported, so the cutter will chatter as it cuts. In the last article I discovered that my box sides were sloped, so I asking around for advice dealing with a 0.001 5" taper between the top and bottom of the box.

The approach I chose is simple and worked well. The surface to be cut is first blued.



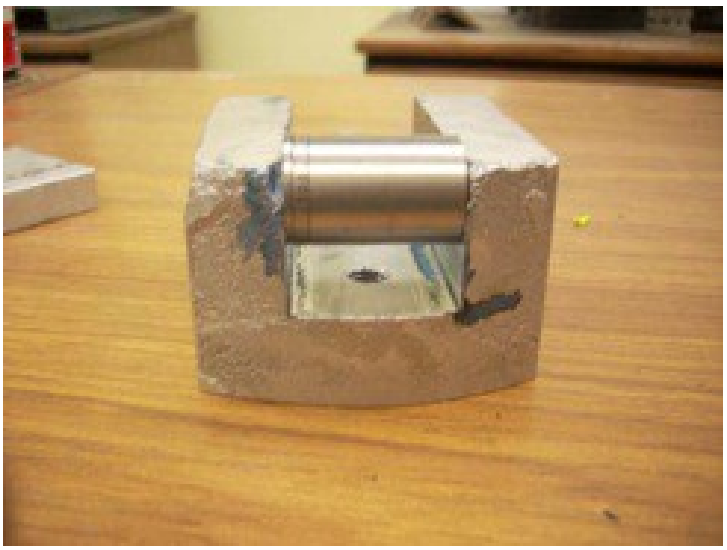
Bluing and Measuring Photo by R. G. Sparber

I use my DTI to find where metal must be removed. As expected, the bottom of the box is narrower than the top.



Filing Photo by R. G. Sparber

Using the bluing as a guide, I gently used a clean file to remove most of the bluing in the area I want to reduce. The process removes 0.0005" of metal as it takes the bluing.



Measuring Progress Photo by R. G. Sparber

I used spacer blocks to monitor progress as I removed small amounts of aluminum from both sides of the box.

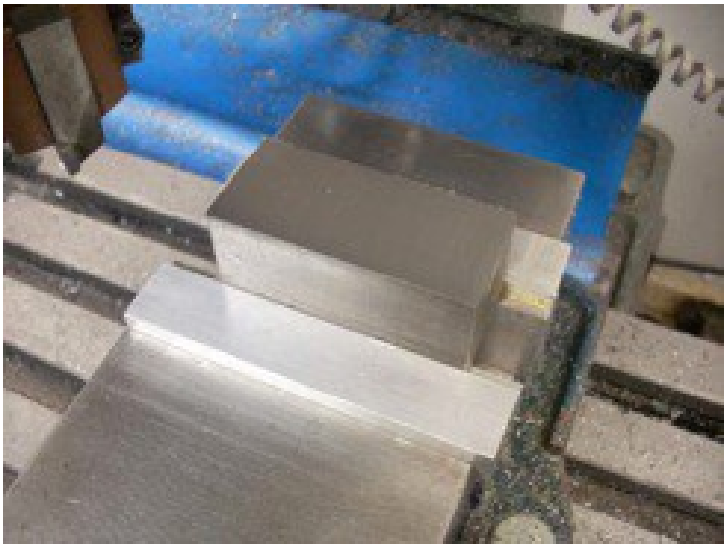
In the end I was able to remove most of the taper. The final fit must wait until I have made the clapper.

I chose to make my clapper out of steel rather than cast aluminum. This will make it more difficult to cut the tapered pivot pin but should provide more support to the shaper's cutter.

Recutting Soft Jaws Photo by R. G. Sparber

After sawing a block of 12L14 steel, it was time to cut fresh surfaces on my soft jaws. The jaws are clamped to packing such that the jaws are about as far apart as they will be with the block in place. This step minimizes any error along the vise ways.

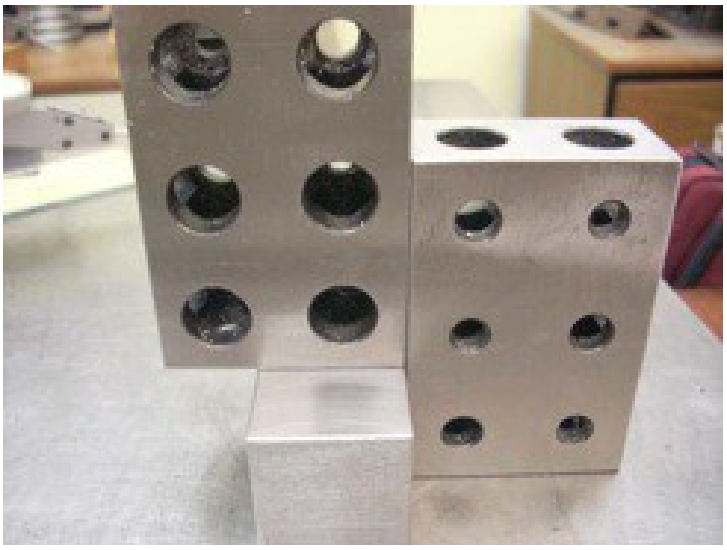
I then took a light cut across the sides and bottom of the steps and did my best to remove every tiny bit of swarf.



Clapper on Mill Photo by R. G. Sparber

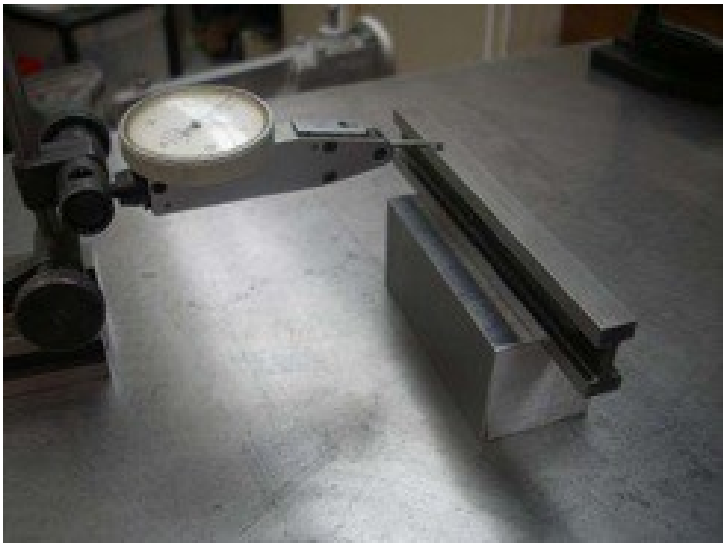
The block is now clamped and ready to be squared up. The top face is shell milled using plenty of cutting oil. The 12L14 contains lead which is a nice lubricant but I figure a little bit of oil can't hurt.

The procedure for squaring up the block starts with cutting the top face to a depth of 0.015”. The block is deburred and the soft jaws cleaned. Then the cut face is set vertically up against the fixed soft jaw and clamped by the vise. The second face is then machined. Again the block is removed, deburred, and the fresh cut surface placed vertically against the clean fixed soft jaw. When all four faces have been cut, it is time to test the block for accuracy. By taking the same amount from each face, I hope to minimize warping.



Square Check Photo by R. G. Sparber

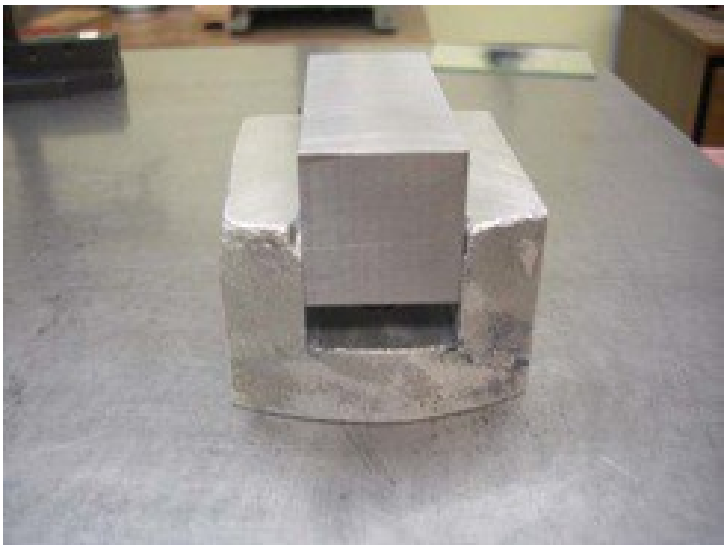
To test for squareness, I used two precision 1-2-3 blocks and looked for light between the 3 blocks. All was nice and tight so my block is reasonably square between the top face and the right face. The block was rotated 180° and the diagonally opposite corner was tested. It looked just as good.



Parallel Check Photo by R. G. Sparber

Next I wanted to verify that opposite faces are parallel. The DTI is run on the parallel so I don't get a bumpy ride on the relatively rough finish of the block. I saw less than 0.0005” of variation from one end of the block to the other. The block was rotated 90° and the test repeated. Again variation was less than 0.0005”.

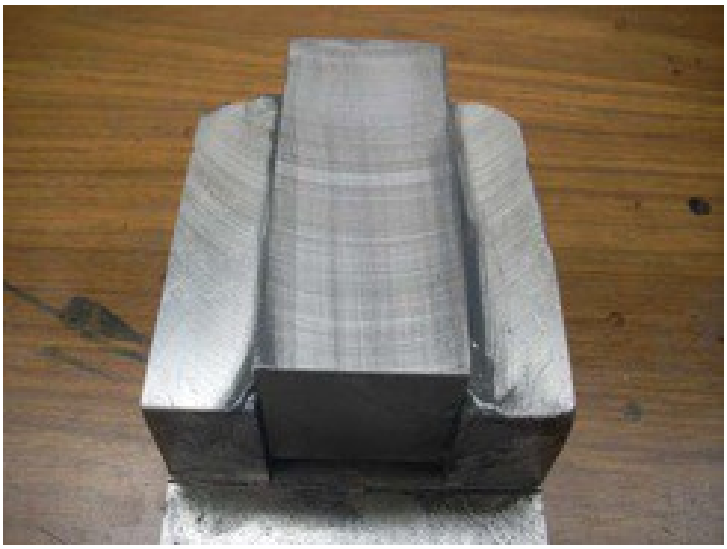
The block went back into the vise. This time I cut the width to match the box. I really don't care what the width of the block is but do care that it fits. To this end, I zeroed my digital caliper to the width of the box at the top of the slot. As I machined the block's width, I could tell when I arrived at a good fit to the box.



Close Photo by R. G. Sparber

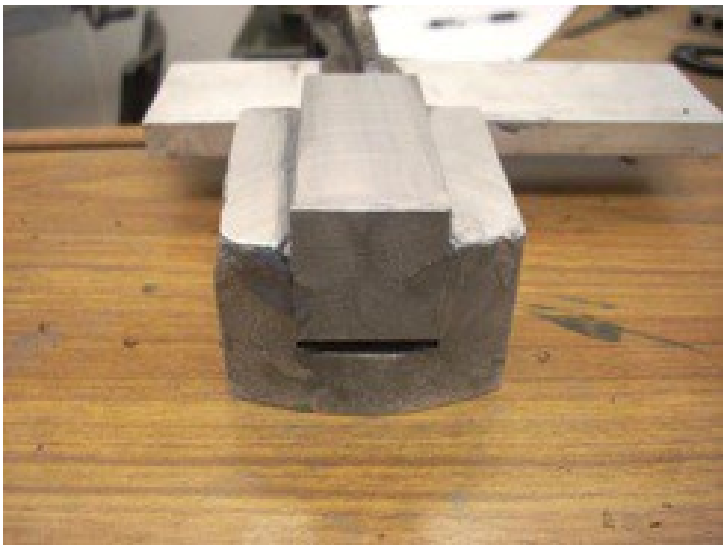
It doesn't take much taper in the box to prevent the clapper from dropping all the way down. If I had cut the clapper to match the top width of the box, it would have been much higher in the slot. At least I can get a great fit for the bottom half of the box.

To remove this last tiny bit of aluminum and get exactly the right width, I put 600 grit lapping compound on the steel block and used it to remove some of the aluminum box.



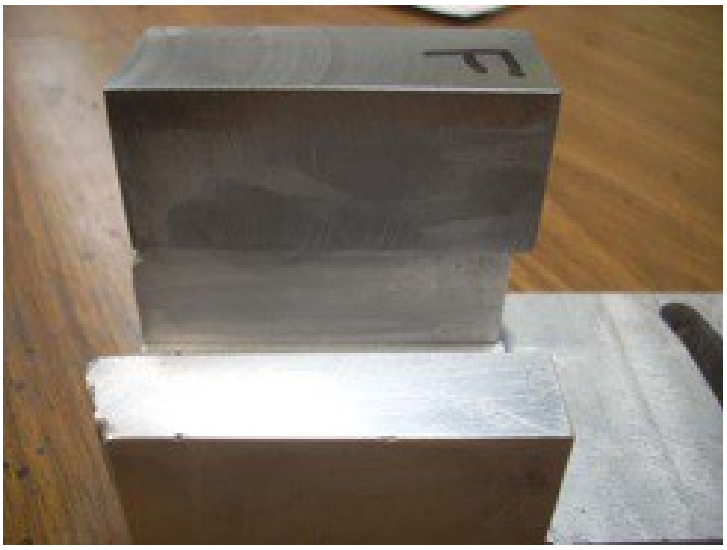
After Some Lapping Photo by R. G. Sparber

It took some time moving the clapper back and forth, but it slowly removed aluminum and the block sank into the box.



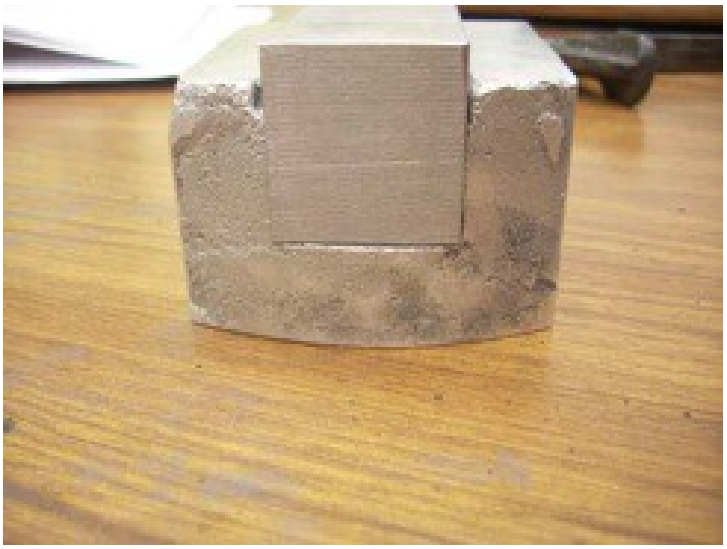
Almost Done Photo by R. G. Sparber

Just a little bit more and I'm done.



Lapping Visable Photo by R. G. Sparber

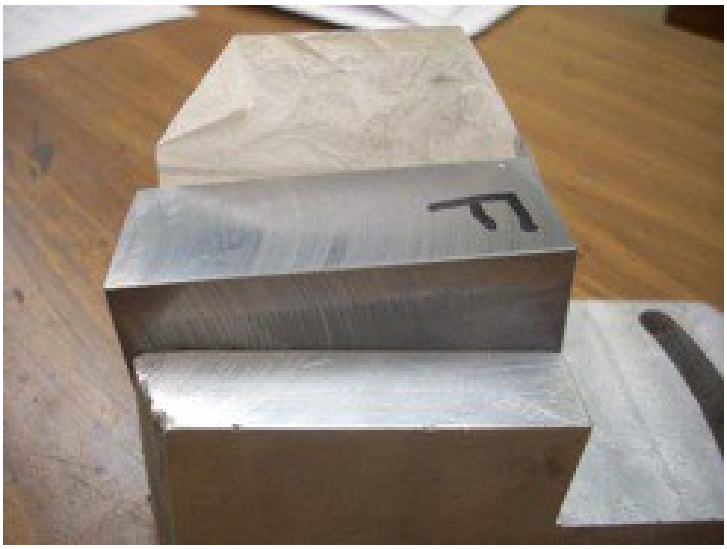
Here you can see the lapped aluminum inside the box. The 12L14 also looks a bit smoother.



Done Lapping Photo by R. G. Sparber

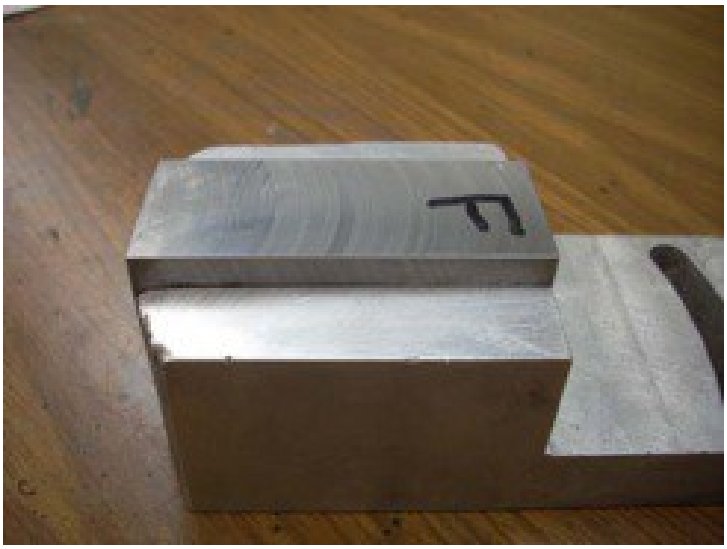
You may recall that before lapping the block went in half way.

This tells me that the top half of the box is slightly wider than the block. The bottom half of the box is now a snug sliding fit to the box.



Paper Measure Photo by R. G. Sparber

I took a piece of 0.001" cigarette paper and placed it between the clapper and the box. As expected, the clapper only went in about half way on the right. The fact that the clapper went into the box a bit more on the left says that that end is a little wider.



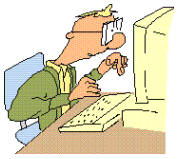
Clapper Seated Photo by R. G. Sparber

When the clapper is in the bottom of the box, I can't see any light between the two and it sure does feel snug. The clapper is not perfectly square because if I put it in the box upside down, it does not fit. This out-of-square condition is less than 0.0005".

Stay Tuned for part 41 from R. G. Sparber next month.

Keep sending me email with questions and interesting shaper stories.

My email address is:
KayPatFisher@gmail.com



Editors Desk

George Gallant

I received an email from John Dunning regarding further info on the P26project.

> "The URL for all the pictures of the P26 project and other things we do at Nate's is http://www.jrd.org/nate/
>
> The address of our shop is Nate's house at 72 Hudson Rd, Bolton MA. We're always looking for volunteers, and happy to show folks what we're working on. We had a couple of people from the Thursday meeting show up yesterday :-) Please let me know if you'd like any more info. Thanks"

Myself, my wife and some grandsons got to visit a neighbors amazing "train set". Their climate-controlled building is twice the size of my house. From now on, my wife can never ever complain about my obsessive habits.

The following pictures do NOT in any way convey the massive nature of the layout. I expect Brian to be the presenter at our October meeting.

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 or 508-393-6290.

Sept 5 Thursday 7PM
NEMES Monthly club meeting
Charles River Museum of Industry
Waltham, MA
781-893-5410 http://www.neme-s.org

Sept 6-8 Dublin Show
RT 101, Dublin, NH

Sept 6 – 15 Annual Lee's Mills Steamboat meet
Moultonburough, NH
http://www.steamboating.org

Sept 15 9AM The Flea at MIT
Albany Street Garage at the corner of Albany and Main Streets in Cambridge http://www.mitflea.com

Sept 21 8AM-4PM The Original Yankee Steam-Up
The New England Wireless and Steam Museum, Inc.
1300 Frenchtown Road East Greenwich, RI
www.newsm.org/index.html

Sept 21 4th Annual Human Powered Vehicle Festival
Morning bike ride through Ayer, MA and surrounding towns followed by a parade through town center and an afternoon exhibit of unusual human powered vehicles
Ayer Nashua River Rail Trail Parking Lot
Ayer, MA
http://fnrrt.org/hpvf

Sept 22 Noon-5PM
Roland's Shop visit
90 S. Spencer Rd. Spencer MA
508-887-2277

Sept 27-29 10AM-4PM
Connecticut Antique Machinery Museum Fall Festival
31 Kent-Cornwall Rd (Route 7) Kent, CT
http://www.ctamachinery.com

Fred Jaggi presenting on Solar System models at the North American Sundial Society meeting in August 2013
Photo by Dick Koolish