Bay Area Engine Modelers Club

The Crank Calls

September 2015

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MEMBERSHIP $25.00 US

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NEXT MEETING

September 19, 2015 at
Chabot College, building 1500
25555 Hesperian Blvd, Hayward 94545
Doors open at 9:00 AM
Meeting starts at 10:00 AM

Upcoming Events

BAEM meetings: 3rd Saturday of the month

Pacific Coast Machine Tool Expo - September 22-24, Santa Clara Convention Center

MEETING NOTES

August 15, 2015
Bob Kradjian

President Don Jones called the meeting to attention promptly at 10:00 am. Don gave us a report on the adventures his summer students had with heat-treating their project hammers. They were dealing with a carburizing furnace at 1751 degrees for 8 hours. A discussion of heat-treating followed.

VISITORS: None

FIRST POPS: None reported.

MEETINGS: Our annual WEME Show: August 21-23, Pleasanton.

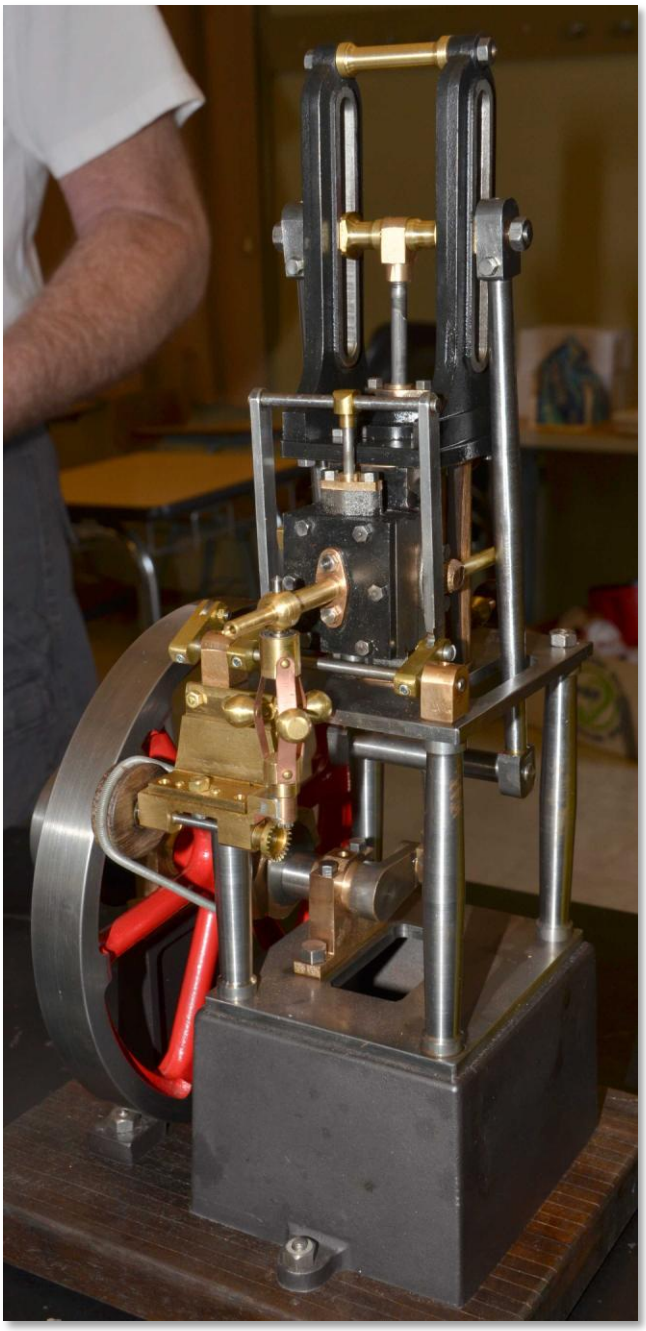
SECRETARY'S REPORT: The Pacific Coast Machine Tool Expo will be held September 22 to 24 at the Santa Clara Convention Center. For sign-up and details, see machinetoolexpo.com. There is no charge to attend.

TREASURER'S REPORT: John Gilmore tells us that we are still solvent.

CLUB BADGES: If you need a badge, contact Mike Rehmus (mrehmus@byvideo.com) who has offered to produce them.

BITS AND PIECES

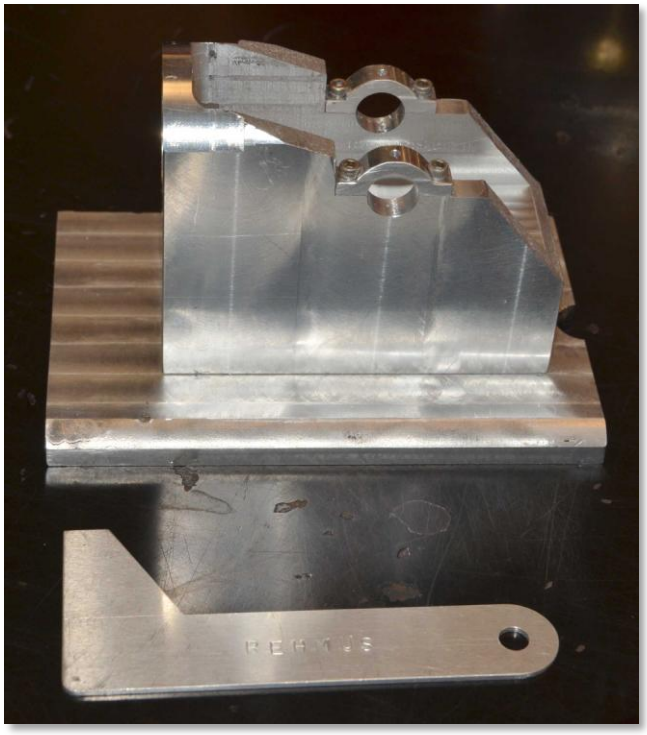
Stirling engine report: Your secretary showed two Stirling engines available from Amazon for from forty dollars to around one hundred. They operate nicely and we will show them at the WEME show. John Gilmore commented that power sources for satellites use Stirling engines! He explained that they use plutonium for heat on one side, and the coldness of space on the other to operate the devices.



Jim Bove did a nice job on a Stuart-Turner steam engine. This was a James Coombs design. The old castings, Jim found, were of excellent quality in contrast to more recent offerings.

John Palmer delved into a seemingly endless store of his machinist's lore and showed us a very old ribbed lock washer. John found it listed in a Waterhouse-Lester catalog of 1921. An irreverent member asked John what the web site for Waterhouse was in 1921. Scott Overstreet also asked about John's Wright engines. He made three of these vertical fours, one is to be seen at the Hiller Aircraft Museum in San Carlos. If you haven't been to the Hiller, make a trip! Our club regularly met there for several months some years ago.

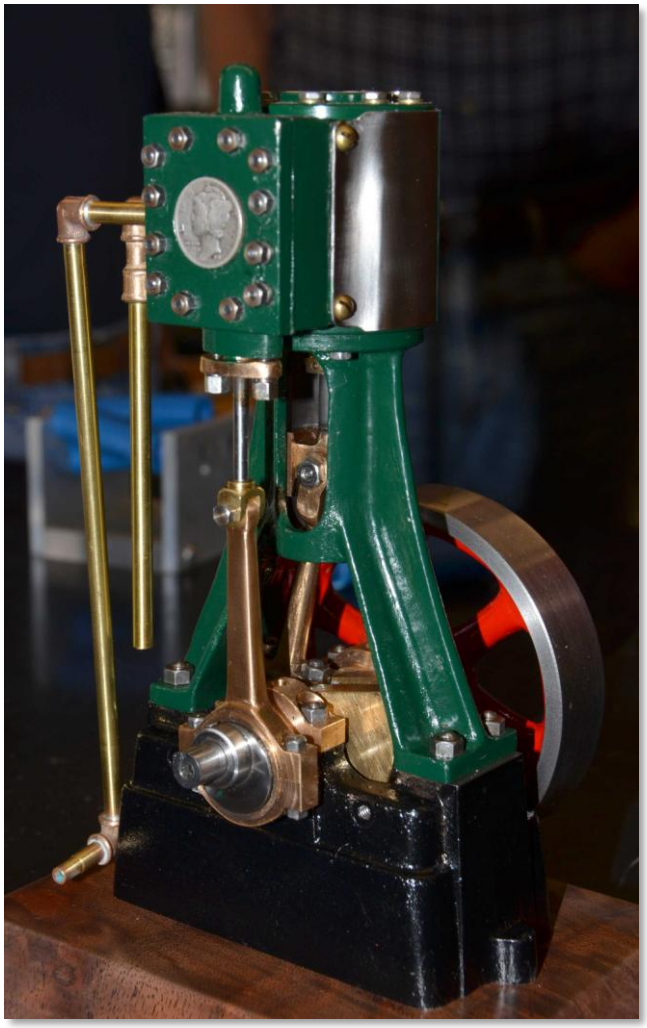
A discussion of the old art of hand scraping, filing, and chiseling to extreme degrees of accuracy followed. We were reminded that the original large lathes, shapers and mills were necessarily made by hand. Many of our older members related the strict disciplines they were subjected to as apprentices and students.



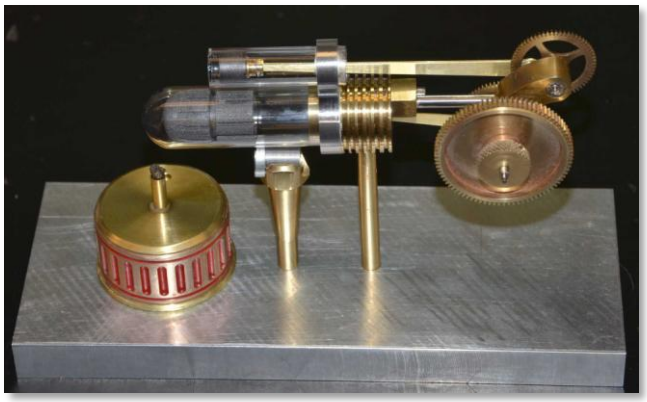
Mike Rehmus brought us to date on his CNC adventures. He is using a Dynamite 2000 mill converting DXF to G Code. He is making good progress on his hit and miss frame project.

Peter Lawrence told us of his adventures with lapping and honing cylinders for his four-cylinder test engine. He bought an inexpensive three-inch expanding mandrel-type with indifferent results. It seems that he is destined to buy additional and more expensive gear. The virtues of laps versus hones were discussed.

Dwight Giles told of his adventure with a very small keyway for a water pump. He made his own device that will be best shown in the future article in MEB that will have proper plans. Dwight told of his new milling machine head from Acer to fit his Bridgeport. He likes it a great deal, but says that it so quiet he can't hear it running.

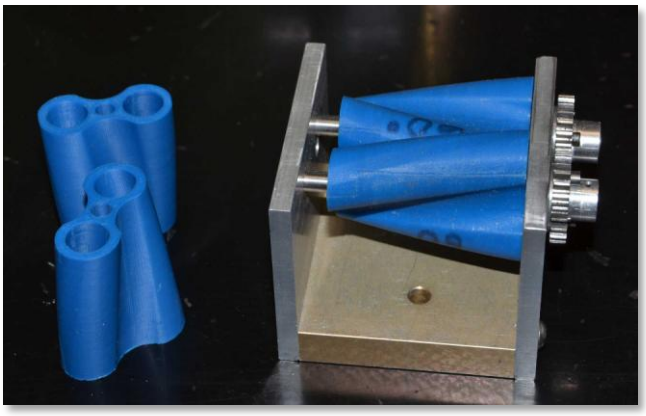


Paul Denham showed us a steam engine built from the Stuart line. He added a counterweight to the crankshaft which otherwise would have been quite out of balance.



Paul also made a Jan Ridders Stirling engine that uses a magnet to couple displacer and actuator pistons. He's had this engine running at an estimated thousand rpm. If the unlikely event that

you haven't checked out his work, just proceed to You Tube and type in Jan Ridders for a treat. This man cranks out engines!



Jim Piazza printed a pair of proof-of-concept twisted rotors on a Zortrax M200 3D Printer. This was of material that would not be practicable in an internal combustion, but it shows that the printer technology is very capable. We are going to contact the Zortrax dealer in Campbell, California to see if they want to join us at our WEME Show. The printer sells for just less than $2000 and can be reviewed at: www.octave.com/zortrax-m200. This ready-to-use-out-of-the-box printer is clearly a very capable unit.

Here is another Internet spot that I believe merits a look if you're interested in the large V-8's in the Black Widow category. Go to You Tube and type in: Keith 5700. The builder (? German) is nearing completion on a very sophisticated and finely finished V-8. He clearly is using CNC and has even fashioned 10-degree offsets on his crankshaft journal throws to even out the firing. That folks, is some very advanced machining for a model engine!

Jerry Franklin has done additional work on his mock-up of a double crankshaft engine using a single piston and pin. He feels that the design will provide a better power stroke. He is working on a revived, ancient 12 inch Craftsman lathe. Jerry's father is credited as the designer of the very narrow angle Vee engines in the mid 1970's. Jerry has a background in heavy equipment maintenance, and later in electronics; but he is just getting started in machining. Welcome to the group, Jerry.

Don Jones showed us the latest information on the Gary Conley Stinger 6.09 cu. in. V-8. This is a very advanced engine being produced in volume by Gary in Glen Ellyn, Illinois. Unlike the earlier Conley engines, this features spark ignition and uses a 90-degree crankshaft. For details on this $8,000 plus engine see: www.conleyprecision.com. Gary knows about our club and would have liked to come to our first Pleasanton Show, but could not make time in his schedule.

On the topic of crankshafts, several visitors have commented on the distinctive exhaust note of our Challenger V-8's. They were surprised to learn that these very old designs used the flat, or 180 degree, crankshaft. The 2015 350R Ford Mustang features the "new" flat plane crankshaft to produce 526 horsepower.

Nearly all of the early V8 engines used flat-plane cranks, chiefly because it's a simpler, more straightforward design. A flat-plane crank V8 is really like a pair of mated in-line fours, and there are issues with them; the largest issue being balance and vibration.

A flat-plane V8 can generate a significant amount of vibration, especially on large displacement engines.

To correct this, the cross-plane crank was developed (way back in the 1920s) primarily to make everything smooth. To achieve this, a cross-plane crank sets things up so that there are unevenly-spaced firings in each cylinder bank, but even cylinder firing over both banks, which keeps things balanced and gives cross-plane V8s the burbling exhaust note we associate with the modern V-8. But, remember that Ferrari has been making lovely exhaust music for many years using flat crankshafts. The price of cross-plane balance and smoothness is weight and size. A cross-plane crank is inherently larger, since it has crankpins on two axes, it's much more heavily counterweighted and balanced, all of which requires a larger, heavier crankcase to hold it all. This necessitates increased weight and raises the center of gravity.

WEME SHOW REPORT: It was another successful and large show in our own exhibit hall at the Pleasanton Fairgrounds during the Good Guys West Coast Nationals, August 21-23. The occasion was marred by the passing of John Gilmore, our show leader for the past three years.

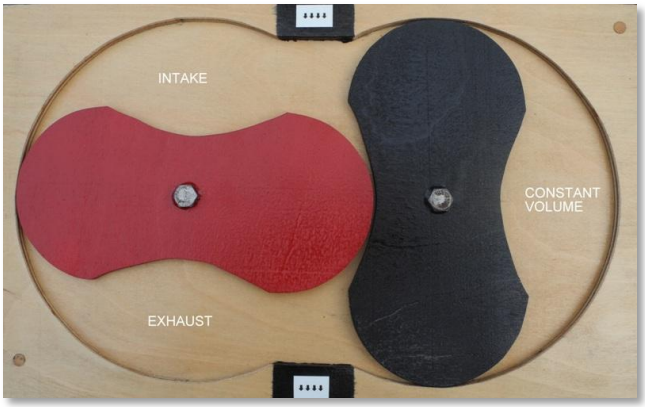
John's strong leadership, wonderful craftsmanship, and his positive attitude created an essential part in our group's history over the past years. He took over the difficult task of running our large WEME show at Pleasanton and coordinating our efforts with the Good Guys management. It was his background in top-level hot-rod building, his managerial skills, and his strong personality that were the foundations of his success. When the club needed support at the key position of Treasurer, John again stepped up and handled the job brilliantly. We will all treasure our grateful and fond memories of John, each in our own way.
From Carl Wilson: "I build hot rods." With those words, John Gilmore introduced himself to me. In a massive under-estimation I thought that lots of guys had project cars in their garages but were hot rod builders. John was the real deal, a builder of hot rods and more. There is his hit-n-miss engine, the locomotive, the V8. Sadly, there will be no more. His talents will be remembered. On behalf of Bay Area Engine Modelers, I commend his stewardship of responsibilities for our club. Thank you, John.

At the WEME show, Steve Hazelton stepped in and did a masterful and smooth job of managing the show; he has plans to continue in 2016. We owe him gratitude for his splendid efforts. It would not be possible to list all the other members who worked smoothly to set up, run, and finally dismantle the show. John and Diane's fine trailer housed the show equipment for the next showing. We enjoyed the friendship of our fellow enthusiasts from the fine Southern California Home Shop Machinists group., Paul Chretien and Ken Rector. John Vietti came all the way from Wyoming with a fine running vertical twin engine featuring his very own magneto ignition. Paul Knapp's world-class engine display was, as usual, a key to our showing. He and Mike will be taking over Bob Shore's fine line of plans and castings. Finally, at the WEME show, Paul Denham was elected Treasurer of BAEM. Thanks for accepting this important job, Paul.

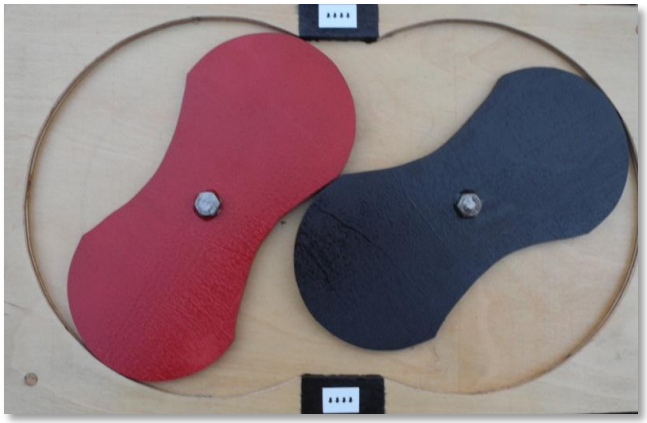
TECH TOPIC

I was looking over Jim Piazza's shoulder, so to speak, admiring his helical Roots blower rotors and got to thinking that I could do some solid modeling myself. Well, sorta solid models. Not the CAD modeled and CNC printed beauts that Jim does, but crude cross-sections of the rotors hacked out of plywood with a scroll saw. Jim is making a real Roots blower; my goal was more modest: to illustrate two basic principles of its operation and design.

This type of supercharger is described as a blower because it simply moves air from the intake to the discharge. It is not a compressor: the volume of the air does not change as it moves through the blower casing.



The model shows three volumes of air within the blower casing. BTW, the red rotor is turning CCW and the black CW. At the top left is intake air, at the bottom left is exhaust air. As the red rotor turns CCW it draws air into the intake area at the same time it expels the same volume into the discharge port.



When the rotor has turned about 45 degrees air intake is cut off and the discharge of air is complete. Note that the volume of air to the left of the red rotor in the second photo is the same as to the right of the black rotor in the first photo. Constant volume = no compression within the casing of the blower.

Compression of the air occurs at the exhaust port and beyond if the flow capacity of that area is less than the delivery of air from the blower. The pressure in the exhaust port will rise until it can flow all the air delivered to it by the rotors. This is the principle of positive displacement pumps of all kinds. The discharge pressure is controlled by the discharge flow capacity. This is the reason that no valves are installed in the discharge of positive displacement liquid pumps: if the valve is closed the pressure at the valve rises until something stalls, leaks or breaks.

The basic principle of the design of Roots blower rotors is *conjugate shape*: the rotors roll against each other without slipping. If we divide the shape of the rotor into four parts – two tips and two waists – the requirement of rolling without slipping implies that the length of a tip of a rotor is equal to length of the waist of its mating rotor. There are many ways of achieving this. The model uses a circular arc tip and a mating waist that looks like a circular arc but is a special curve. The other simple rotor design uses circular arc waists and modified arc tips.

Beyond that there are numerous other rotor geometries. Jim Piazza's rotors are a design using a set of short tangent arcs. This is an approximation to the ideal geometry but is satisfactory. It has the advantage that circular arcs are easy to draw in CAD and make with CNC milling machines.