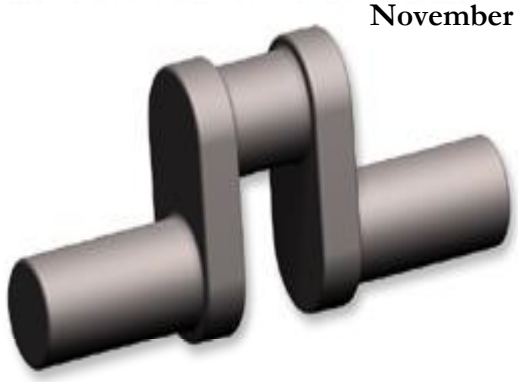
Bay Area Engine Modelers Club
www.baemclub.com

The Crank Calls

November 2022



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pedenham@comcast.net

NEXT MEETING

Saturday, November 19, 2022, at the Golden Gate Live Steamers clubhouse site in Tilden Park, Orinda, CA

Gate opens at 9:00 am
Meeting starts at 10:00 am

Upcoming Events

- Nov 19: BAEM meeting at GGLS
- Dec 10: BAEM meeting at GGLS
- Jan 21: BAEM meeting at GGLS

See below for more details regarding events. Watch Crank Calls, BAEM emails and BAEM web page for updates. BAEM meetings are usually 3rd Saturday of the month except December.

MEETING NOTES

The monthly Bay Area Engine Modelers meeting was held at the Golden Gate Live Steamers clubhouse on Saturday, October 15. Seventeen members were present.

NEW MEMBERS/VISITORS

BAEM members are reminded that visitors are welcome at our club meetings, and we're always looking for new members.

TREASURER'S REPORT

President Paul Denham summarized the club's financial status and mentioned our treasurer might be slow in depositing checks.

2023 dues of $25 are now due. Give your check to Paul Denham at the next club meeting, or mail to Deirdre Denham at 1937 Merchant St, Crockett, CA 94525. Make checks payable to "BAEM".

BAEM's YouTube Channel: https://www.youtube.com/channel/UCZ7VbDw_y0GtNm1n6KWiQkg

CLUB BADGES

If you are a member in need a badge, contact Mike Rehmus (mrehmus@byvideo.com) who has offered to produce them.

UPCOMING SHOWS

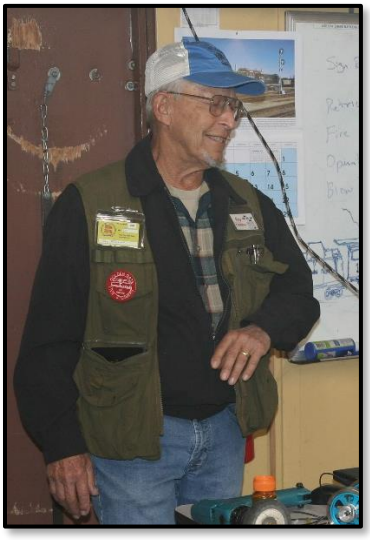
No shows are currently pending.

FIRST POPS

Ray Fontaine brought in a rebuild of a Tochtrop Economy hit and miss. The original builder was apparently associated with the foundry where Joe Tochtrop produced his casting kits. The engine had never been run.

Ray Fontaine's Tochtrop Economy engine

Ray described his rework, including new rings, lapping the piston, new bearings and other items.



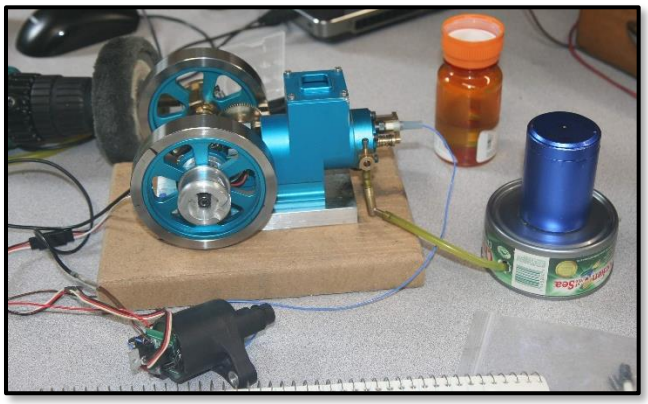
BITS AND PIECES

Dwight Giles brought in two of his new vertical his and miss engine. Its design was largely inspired by Mike Rehmus, derived from Dwight's GEM1. Mike calls it a "GEMini." Interesting features include conventional cooling fins on one cylinder and a "threated" fin on the other engine. Engines were close to running.

Dwight's GEMini

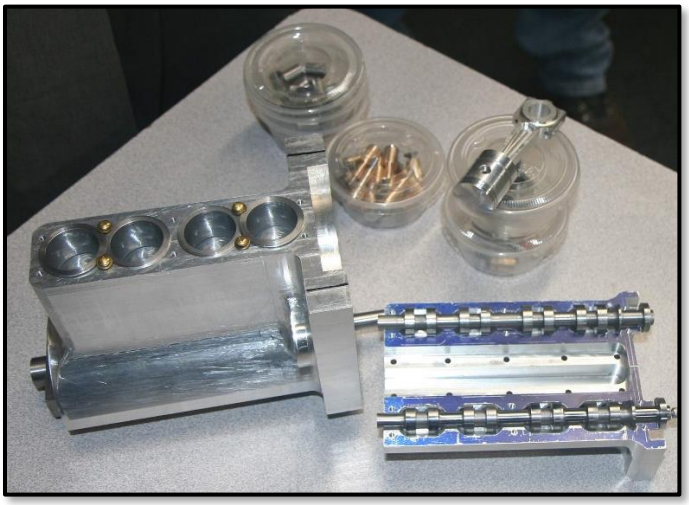
Dwight also described an interesting repair project that involved a split bearing in a co-polymer microphone holder that would unintentionally disassemble in field use. New bearing required some creative fixtures for machining.

Paul Denham ran a Chinese Kerzel that was also a trouble shooting project. After a number of tweaks including timing, new needle valve, fuel tank base, lapping tthe intake valve seat, and alternative ignition circuitry, he discovered the spark plug worked in test but seemed to have a sneak path to ground when installed in the head. After replacing the spark plug, the engine ran well.



The chicken can elevated the fuel tank to an appropriate height for feeding the carb.

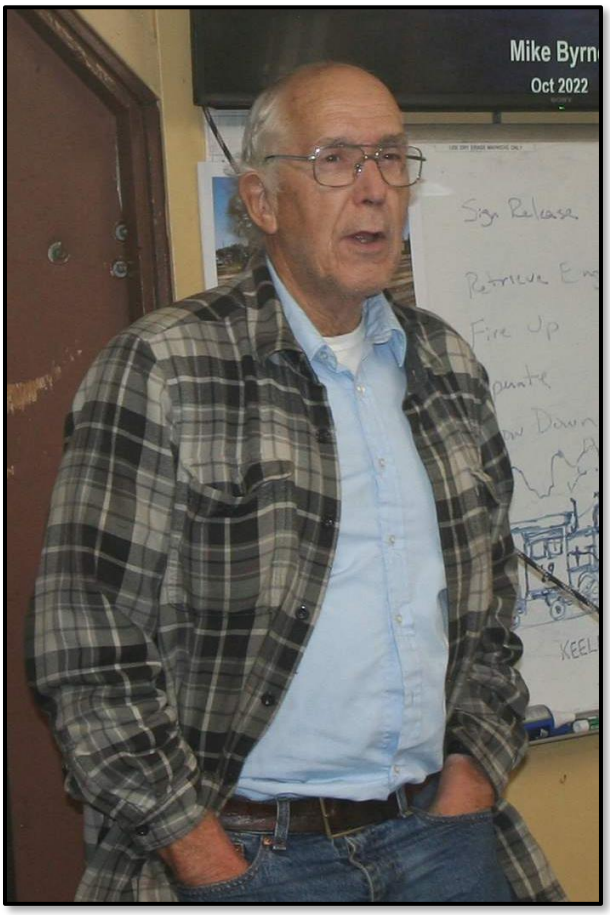
Peter Lawrence reported that his Merlin V12 was on the temporary disabled list, likely due to spark plug issues. He had turned his attention to the Cirrus and Duesenberg 4-cylinder straight block projects. He showed completed piston and rod assemblies, valves with valve cages, and the largely completed block.



Peter builds engines two at a time

Peter also reported that he had found a British source for the skew gears he needs for his vertical diesel project and was no longer looking for home shop machining solutions.

Mike Byrne gave a Tech Topic briefing on spur gear mechanical drawing and attempted to demystify using involute profiles and involute angles in spur gear construction. Some thought that the detailed derivation of these parameters over-engineered the presentation.



Mike Byrne talks tech

RAMBLINGS

Interesting note: Dwight Giles reached an agreement with Martin Models who are marketing Black Widow V8 casting kits made from Dwight's patterns.

https://www.martinmodel.com/collections/model-engine-casting-sets/products/v8-black-widow-engine

Working on an interesting project? Got a great BAEM story? Share it with us here. Send us pics and project details, and your hard work will be shared with the entire club.

FOR SALE

Dwight Giles is offering all the essentials for a complete home workshop foundry for sand metal-casting. This includes a Speedy Melt furnace (pictured), blower, sand/clay mix, cope and drag, match plate, and other stuff. Needs a new burner and the refractory may need replacing. Price: Free to a BAEM member willing to pick it up!

Contact Dwight at jig313@aol.com or ph: 707-648-1481

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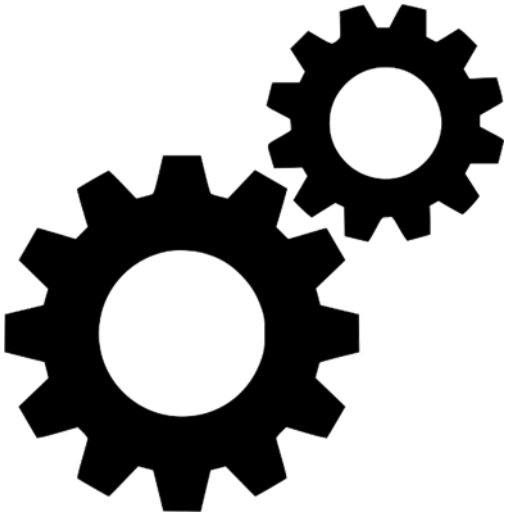
Got something you'd like to sell? Your ad is free and will be seen by likely customers.

NEWSLETTER CONTRIBUTIONS

Your contributions to this newsletter are appreciated: workshop reports, tech articles, reviews, historical pieces, whatever. You contribute, we'll figure out how to post it. Send your contributions to either or both of us. Thanks!

-Mike Byrne at mgbyrne3@comcast.net

-Wes Wagnon at weswag@ix.netcom.cm



Spur Gear Construction
or
Involutes Demystified

BAEM Tech Topic

Mike Byrne

Oct 2022

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Find (x,y) cords of P as function of θ

$P_x = Q_x + AQ = a\cos(\theta) + AQ$
$P_y = Q_y + AP = a\ \sin(\theta)\ + AP$

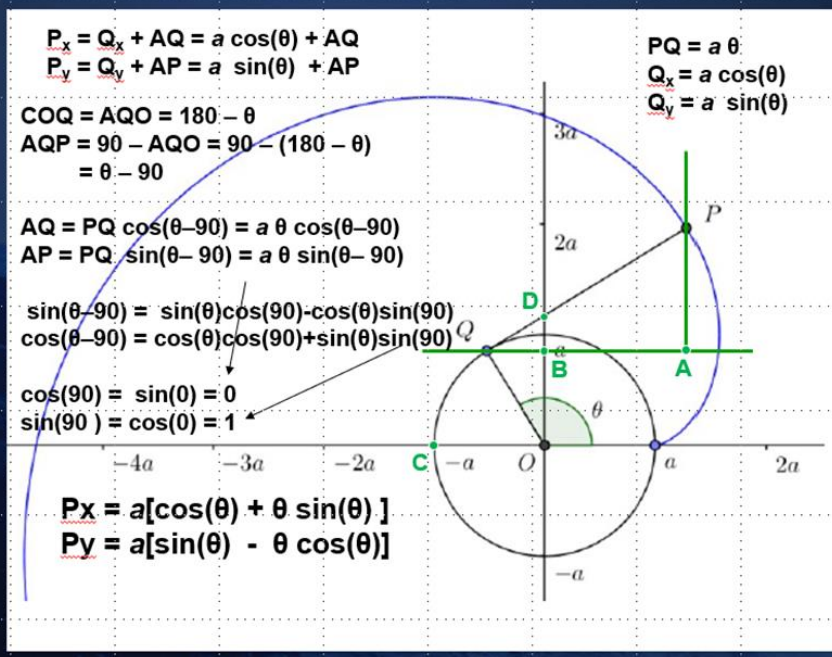
$PQ = a\,\theta$
$Q_x = a\cos(\theta)$
$Q_y = a\ \sin(\theta)$

$COQ = AQO = 180 - \theta$
$AQP = 90 - AQO = 90 - (180 - \theta)$
$= \theta - 90$

$AQ = PQ\cos(\theta - 90) = a\,\theta\cos(\theta - 90)$
$AP = PQ\ \sin(\theta - 90) = a\,\theta\sin(\theta - 90)$

$\sin(\theta - 90) = \sin(\theta)\cos(90) - \cos(\theta)\sin(90)$
$\cos(\theta - 90) = \cos(\theta)\cos(90) + \sin(\theta)\sin(90)$

$\cos(90) = \sin(0) = 0$
$\sin(90) = \cos(0) = 1$



$Px = a[\cos(\theta) + \theta\sin(\theta)]$
$Py = a[\sin(\theta) - \theta\cos(\theta)]$

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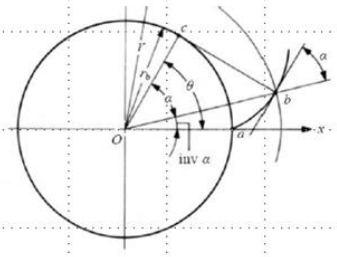
Involute Angle: angle between profile "start" and involute profile



Proof	
Line bc = arc r_b * θ	by construction
Angle θ = α + inv α	by construction
Inv α = θ – α	algebra
θ = bc / r_b	algebra
bc = sqrt(r_p^2 –r_{b2})	Pythagoras' theorem
bc / rb = tan (α)	trigonometry
Inv α = tan (α) – α	QED

Fig. 3.3 The Involute Curve

In Fig.3.3, invα stands for Involute Angle (Involute α). The units for inv α is radians. θ is called involute rolling angle.

inv α = tan α - α (rad) (3.2)

With the center of the base circle O at the origin of a coordinate system, the involute curve can be expressed by values of x and y as follows :

$$\left.\begin{aligned} \alpha &= \cos^{-1}\frac{r_b}{r} \\ x &= r\cos(\text{inv}\,\alpha) \\ y &= r\sin(\text{inv}\,\alpha) \end{aligned}\right\} \quad (3.3)$$

Tooth width = gap width = π / N teeth
Involute start offset from gap center line by π / (2*N) - inv α

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Summary

- Involute angle and involute profile needed to construct theoretically accurate gear tooth drawing
  - But approximations may often be good enough
- Gearotic is quicker but not quite as flexible as CAD
- CAD may not for everyone, (let alone derivation & proofs)
- Understanding of inv angle and parametric equations use in gear construction helps demystify spur gear involutes

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