Bay Area Engine Modelers Club, Branch 57 of EDGE&TA

The Crank Calls

November 2013

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NEXT MEETING
November 16, 2013 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 except December

Note from your Editor: We will be going digital on the Crank Calls Newsletter. Why are we doing this? To save the cost of ink, paper, envelopes and postage and the time to print, stuff envelopes, and mail paper newsletters we would like to email BAEM Club members that the current version of the newsletter is available for download from the Club's website. Please make sure that the Editor has your current email address by sending him an email at baem_editor@pacbell.net

MEETING NOTES

October 19, 2013
Bob Kradjian, Secretary

President Don Jones called the meeting to order at 10:00 am

VISITORS: Rob Thompson attended the meeting. His interest is in making clock works. Two guests made a late appearance so there presence can only be acknowledged in the newsletter: John York and D Mayeron. John has retired from a long career as the owner of a jobbing machine shop and has a wide range of hobbies including full size steam yachts. D also has a lot of hobbies including engraving, blacksmithing and woodturning.

FIRST POPS: There were no first pops.

EVENTS:

I reported on the Ironstone Winery Concours showing by your secretary and Ken Hurst. That event was more fully described in the last newsletter. It was a lovely venue and a good showing of our engines. It will be a commitment by our members to make an appearance, as it will require an overnight stay. Perhaps we will be invited back and participate in their 2014 Concours.

John Palmer reports no EDGE & TA activity.

WEME Report: We are still having problems with water in the compressed air supply and Carl feels that an after-cooler may solve the problem.

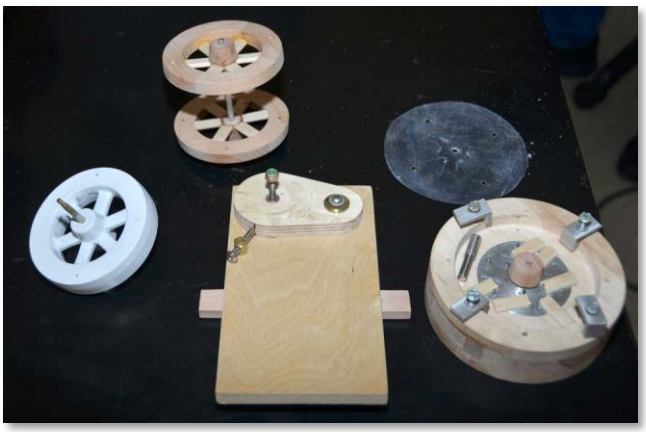
A GEARS report was provided by Dwight Giles. The show was smaller than last year and plagued by rain and the usual problems involved with a new venue.

Pat O'Connor described a trip to England with the aircraft engine historical society. He also visited a steam railroad museum.

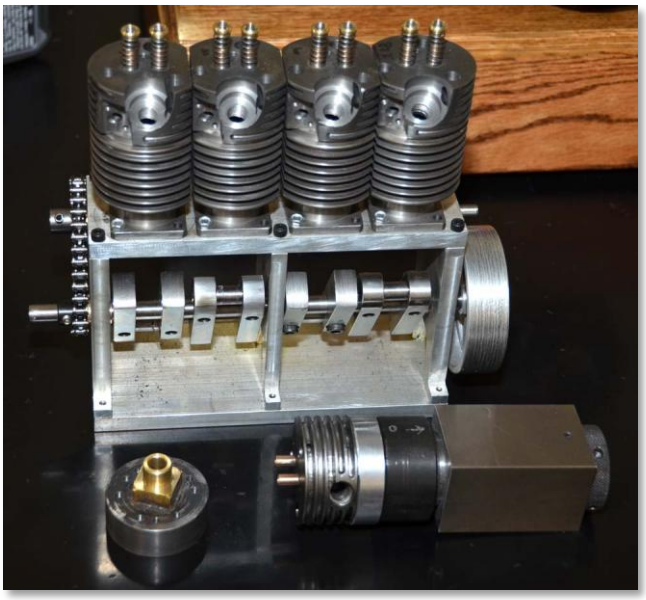
They also visited the steam engine that raises the roadway for the Tower Bridge

TREASURER'S REPORT: John Gilmore reports that we are solvent with no substantial changes.

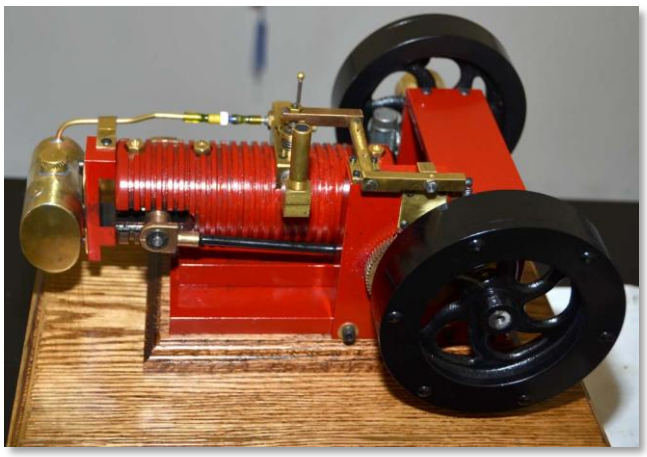
BITS AND PIECES:



Dwight Giles has ventured into the wonderful world of patterns and bronze casting for small flywheels. He gave a detailed recipe for making the wooden patterns. The issues of locating pins, incorporating a five-degree draft, parting agents, how to paint the wood, and where to position locating gates for the metal pour were discussed.



Ray Fontaine showed us his progress on his version of Randall Cox's open six-cylinder engine, but in a smaller four-cylinder format. He described the tricky machining necessary for the valve guides and seats in the four detachable heads. The seats are rotated and offset. He devised a 5C square fixture collet to be used with a four-inch rotary table. He is making excellent progress on this engine, including some ingenious modifications. Building of the cams is planned for the near future. Paul Denham mentioned a free Cam Calc II program described on the Internet that gives the X and Y calculations for a cam lobe. The HTML file can be converted to a note pad file before use. Before starting on the cams, Ray will make the rocker arms as the first project for his new CNC machine purchased from the "Little Machine Shop" at the WEME show.

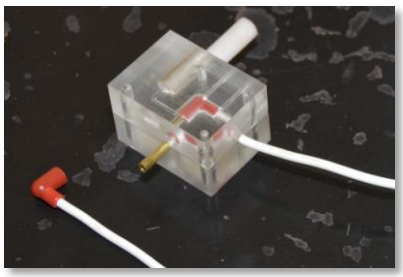


George Gravatt not only showed his original opposed-piston engine, but he also ran it to the great enjoyment of the group. After a brief warm-up it settled into a lovely, slow idle. George described problems with the wrist pin size and skirt clearance on the "downhill", long piston that required sorting out. It should be noted that George had only a tiny photo of a similar engine to start this creation. He generously offered this "set of plans" to all considering a similar effort.

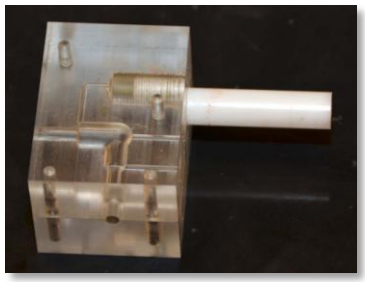
Dick Pretel showed his highly modified Challenger block augmented by overhead cams. He is using the standard one-inch bore and stroke format. Not satisfied with two overhead cams, Dick went for four such! We have a considerable number of pushrod-operated overhead valve V-8's about, but almost never an overhead cam arrangement. The venerable Schillings is an example of a factory-made version, but it has the deficiencies of glow plug operation and pinned on cam lobes. Roger Slocum ground the cams from 810 tool steel. The

crankshaft is also from Roger Slocum. The pistons and rods are Dick's own manufacture. A unique feature of this build is the Roots compressor from a 1966 Porsche 911. Dick had to make new seals out of Delrin AS that gave up a little of the tight grip of the original seals. He has opted for a single carburetor arrangement. A 3/8th inch center loaded timing belt set was obtained from Stock Drive to drive the cams. Two bearings are supporting the flywheel end and a split bearing is used for the notorious weak center crankshaft arrangement on the Challenger.

The starter motor was made for a snowmobile. He was able to reduce the weight by about half, from the original nine pounds. It requires a good bit of power to spin, definitely a task for an automobile battery. This has been a long-term project for Dick and a very ambitious undertaking.

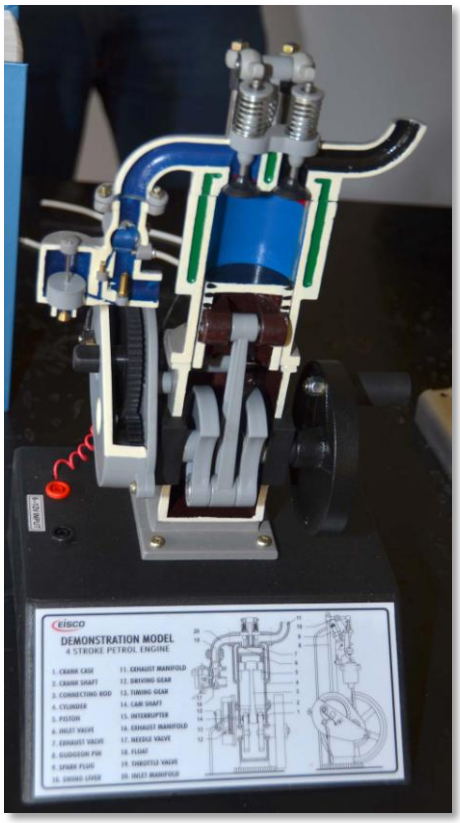


Jim Piazza reported on his third version of an injection mold for his spark plug boots. He's achieved a fine result and has experimented with the hardness of the mold material to get an ideal blend. He uses a Teflon piston to inject the charge. It's twelve hours to de-mold and then an additional curing time is needed to avoid taking an unwanted gravitational "set".



Anthony Rhodes showed and described a gear hob-shaping cutter. It will cut any number of teeth at 20 dp

Anthony also had a shaping cutter to show that is different from the Brown and Sharpe system. Martin Models in Oregon will sell a set of castings if you wish to make your own hobbing machine. Dwight commented on his experiences with herring-bone gear cutters at the old Mare Island facility.



I reported on a hand-cranked Four-cycle demonstrator to take to our engine shows. It comes from Eisco in Rochester, New York and was ordered from eBay. The price is $125.00 and $12.00 for shipping. Young visitors love to crank these devices. We've had subsequent reports from dads that their youngsters actually absorbed and retained

the principles of internal combustion based on that exposure.

One of our guests, John York, brought his recently completed patternmaking tools. The height gage is shown with the pencil scriber attached to the knife edge scriber with a wood clamp. There are no graduations on the column so the scriber is set to a rule. The base of the height gage is brass. The large try square is a carpenter's square with a stock made from two pieces of ipe wood (used for decks in wood boats.) The short arm of the square is set into rabbets in the stock with epoxy. John also made the brass screws which present a flat countersunk appearance from both sides.

Mike shared a video from Alan Suttie on a method for cutting helical gears on a lathe. Alan cut the bevel and skew gears for his locomotive using the method.

Our excellent Tech Topic on cams was continued by Carl Wilson and was videotaped by Mike Rehmus.

TECH TOPIC: Cams and Followers

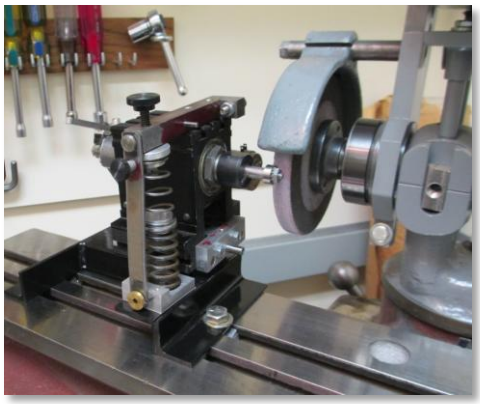
Carl Wilson

Last month the Tech Topic looked at the shape of cam lobes and how they transform motion from one form to another. The cam rotates, the follower does something different.

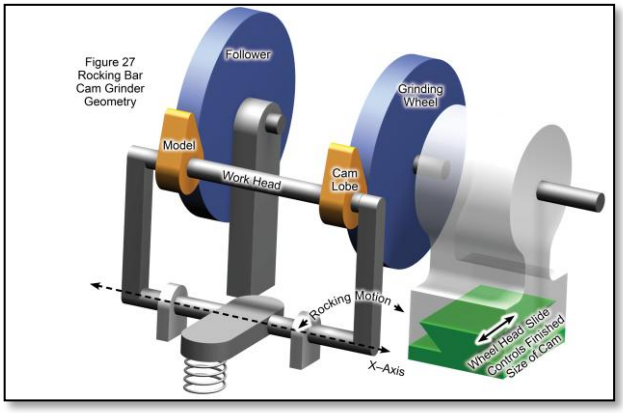
This month the Tech Topic is about cam grinding: how to make the working profile of the cam lobe. We will see that cam grinding is a copying process wherein the shape of an original, called the model lobe, is transformed into oscillation of the grinder workhead and simultaneously that motion is converted into the shape of the cam lobe as the workpiece oscillates toward and away from the grinding wheel.

I used the aphorism "It's all about geometry" to sum up the interaction of the cam and follower and we will see that cam grinding is also about geometry. An accurate cam grinder must be designed and built to specific geometrical requirements.

The cam blank is positioned just in front of the grinding wheel and it is rotated by an electric motor behind the Taig lathe headstock. Oscillation of the workhead is generated by the model lobe and its follower which is almost visible at the left end of the spindle. The center of oscillation is the dowel pin in the aluminum block below the spindle. This is the basic Rocking Bar Cam Grinder.



There are two main geometrical requirements. First, the model lobe and the cam lobe are mounted on the same shaft and both rotate and oscillate together. Second, the radius of the follower is the same as the grinding wheel and their centers coincide.

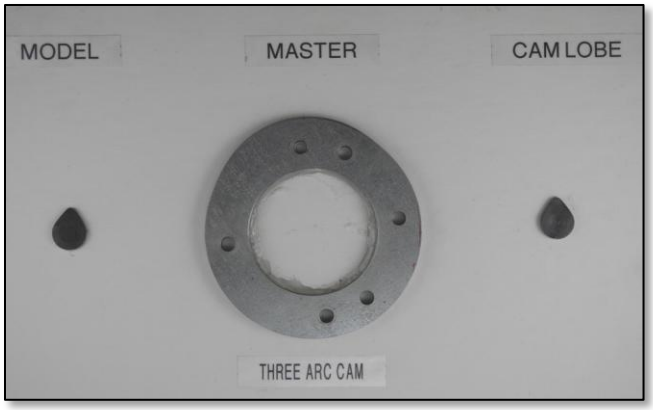


This schematic drawing by Mike Rehmus shows the basic geometry of the Rocking Bar Cam Grinder. Both the photo and the drawing show only the workhead of a grinder. A complete cam grinder would include a longer rocking bar carrying a tailstock to support the right end of a multi-lobe

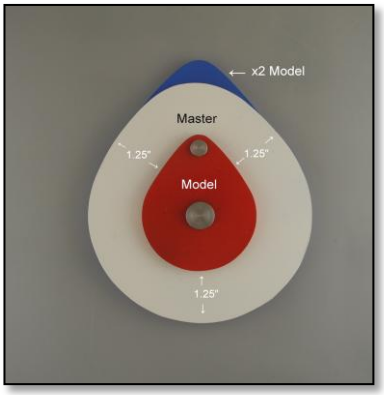
camshaft and the spindle would have other features such as indexing for lobe center angle and multiple cylinders.

I call this process Direct Copying because the profile of the model lobe is copied directly from the model to the cam. I recommend this system for model engineers for its simplicity.

Professional cam grinders use modification of this method which I call Indirect Copying. This is a two stage process – an intermediate copy, called a master, is first ground from the model lobe and subsequently the cam lobe is ground from the master.



The master is larger than the model and cam lobes and somewhat different shape.



The change in shape is accomplished by adding a fixed amount to the radius of the model at all points. This is done in the rocking bar cam grinder by simply retracting the wheelhead the desired amount. A master is not a scaled up copy of the model.

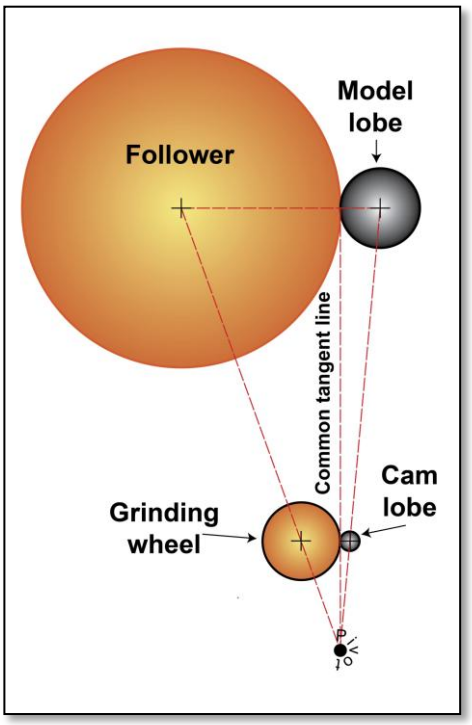
The cam lobe is then ground from the master by removing the model lobe and installing the master in its place. The follower is retracted by the additional radius and the grinding wheel is advanced by that radius. In this setup that radius added to the master is subtracted and the cam lobe has the same profile and size as the original model.

Professional cam grinders use this system for two major reasons. First, the model lobe may be quickly made from soft materials on conventional machine tools. However the small radius, especially the nose, gives a small contact patch at the follower and that together with the soft material would allow excessive wear in production use. These problems are overcome by increasing the radius of the master and grinding it from hardened steel. Second, professional cam grinding machines are designed with a different geometry. The follower usually has a much smaller radius than the grinding wheel and its center may not coincide with that of the wheel. In the direct copying system this change in geometry would yield excessive cam lobe profile errors. The indirect copying system allows these errors in grinding the master and then removes them when grinding the cam lobe. This can only be done accurately by reversing or mirroring the machine geometry in all respects including which face of the master is toward the center of the workhead.

This demonstration model shows the basic geometry of the Indirect Copying Process. This is a more complex system than Direct Copying and as it does not offer corresponding advantages I do not recommend it for the model engineer.

Model engineers, not unexpectedly, are attracted to the idea of geometrically reducing a full-size

camshaft or an over-scale model lobe. Again, geometrical constraints must be observed.



The model lobe and cam lobe are mounted on separate parallel shafts which are connected together and rotate at a 1:1 ratio. The follower and grinding wheel are also on separate parallel shafts and their diameters have the same ratio as that of the model to the cam. All of the distances between the various elements likewise have the same ratio. In addition, the center of the shafts must be located such that a common tangent line originating at the center of oscillation, the pivot, passes through the point of contact between the grinding wheel and the cam lobe, and the follower and the model lobe.

It's all about geometry.

WANTED:

Looking to purchase a miniature model Ford Model A engine in operating condition similar to the one pictured in the January 2012 Crank Calls newsletter. Please contact Ron at rludford@pacbell.net or call 530-885-0171 or my cell at 530-906-6183