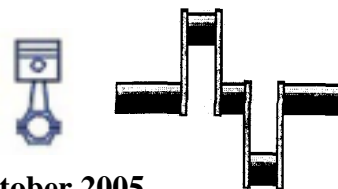


# The Crank Calls



October 2005

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**NEXT MEETING October 15, 2005 At  
Robert Schutz's Shop, 366 40th St. Oakland, CA  
Doors open at 9AM  
Close at noon**

**TO JOIN THIS CLUB OR  
RENEW YOUR MEMBERSHIP**

Contact Lewis Throop at  
27272 Byrne Park Ln.  
Los Altos Hills 94022-4324  
Phone 650-941-8223  
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**Club members can obtain a badge by contacting  
Mike Rehmus at michael.rehmus@byvideo.com  
707-643-6396 or at the club meeting.**

**Meeting Notes**

September 17, 2005

Bob Kradjian, Secretary

Carl Wilson called the meeting to order at 10:00 am. (Carl assumed moderator duties as President Ken Hurst and George Gravatt were putting on a two-man engine show in the North Bay). There were 48 attendees, not bad for the tail of the vacation season.

Guests: Ken Coe, a friend of John Meridith was our lone guest. Ken describes himself as a mechanic who loves engines. We hope you return, and maybe even catch the miniature engine-building bug.

Treasurer's Report: Lew Throop is away on one of his many interesting trips.

**First Pops:** None this month.

**Special Events Coordinator Report:** Dick Pretel reminded us that there is only one public event scheduled for the remainder of the year. That is the Visalia Show on October 22 and 23. Call for reservations at the Radisson (539) 636-111 and mention the show for the special rate. Be warned, though, that the rate has increased since last year and some members are staying at the nearby Comfort Inn. Mike Rehmus informed us that the NAMES show,

always held in the Detroit Area, will be moved to Toledo, Ohio on April 22 and 23, 2006.

Holy Toledo!

I took a look at the map, and this is not a huge problem. It appears to me that Toledo is only about 40 miles southwest of Detroit on Highway 75. The Seagate Convention Centre is on 401 Jefferson Ave. in the heart of downtown Toledo.

A separate report in this newsletter from Karen Palmer will give you details of the GEARS show in Portland, Oregon, which followed our last meeting.

Pat O'Connor gave a report on an unusual engine seen in Merced at the "Ag Museum." This large opposed piston engine (a four stroker) was made sometime in the years between 1900-1910. It has two flywheels and two drive shafts. The Museum, which is bundled with a fruit stand, is on 4498 E. Hwy. 140 (five miles east of Hwy. 99). This might be a logical stop on the Visalia trip. Charlie Parrish runs this spot, which includes a giant (20 foot) "Muffler Man." You may recall these giant fiberglass fellows that graced muffler shops in the 1960's in the Los Angeles area. They have now spread out to most of the states and have been morphed into Indians, Paul Bunyans, etc. A look under "Muffler Man" on Google will tell you much more than you wanted to know.

**Bits and Pieces:**

Cor Langewis dipped into his seemingly inexhaustible supply of fine steam devices and came up with a steam hammer mode. Made from a Stuart casting set, it works just fine.



Dwight Giles shared his extensive cylinder lapping experience with us. As Dwight often has done, he has fashioned an ingenious device employing a slotted brass lap (2.850") keyed to the shaft.



Two to four thousandths of cast iron can be removed with great accuracy using a diamond compound and spindle oil. The "coarse" or "heavy" is Dwight's choice, which he feels is in the 600 numerical range. The lathe furnishes the power, and about 400 rpm is a good speed.

Dick Pretel showed a Ken Brennerman single that was used in tether boats. It has a hemi-head with push rods and overhead rockers. This was a rather advanced engine for the mid 30's. The bore and stroke were an inch and a quarter. Dick believes that there were only five casting sets for this rare engine.



John Vlavianos showed us the classic old Bantam Midget car from 1936. He has cast a num-

ber of these, and they sell well. The Original plans were in Model Craftsman magazine.



Don Catalano has set up the foundry he recently purchased to produce these nice little cars. The wire wheels are by Roger Garcia, a former BAEM member. John and Don have plans for producing a '27T-Bucket, a B.B. Korn tether car, A Dooling car, a Glover car, and a single cylinder glow engine for these cars. Some of these projects are ready for casting. I'm sure that we will be seeing many fine products from these two gifted people.

John Palmer told of "Big Lizzie" a huge single cylinder oil engine with a bore around twelve inches. Not surprisingly, it required an air-start.

Carmin Adams showed two igniters, both for Fairbanks-Morse engines he is constructing. He reminded us that standard car ignition in the 30's required a primary and a secondary winding for coils (as well as a condenser). The igniters require only a simple transformer and no condenser. The igniter contacts close before the piston reaches TDC on the compression stroke, and then opens quickly at TDC plus or minus a few degrees. These engines would operate happily in a driving rain; it made no difference whatever to the igniter points, as they were tucked away inside the combustion chamber or a pocket nearby.



Mike Rehms has heard from our first president, Gordon French, who is now living in Oregon. Gordon has his shop built, but says that there are few builders in that part of the country.

Mike also had a nice visit with the Bob and Frances Washburn following the GEARS get-together.

BAEM Members

Here is a picture of my four cylinder opposed engine that I have completed. it has a .625 bore & stroke made from Dale Detrich's plans. Point ignition twelve volt. Thanks Ken Reynolds



Tech Topic  
Carl Wilson

Carl Wilson found a pattern for a connecting rod that was made many years ago by Ed DeGear. Seeing as our Tech Topic for August was connecting rods, he thought it would be nice to make two castings from this pattern. One is buried in the sand held inside the round flask seen in this photo. During his talk he broke the mold open and extracted the casting that he then passed around. The pattern is a very nice job of carving out of solid wood and it molded very well.



## TECH TOPIC

9-17-05

Carl Wilson

### Paul Bennet: Design of Pistons

Paul opened a plastic sandwich bag, took out 5 pistons, and passed them around. The first was from a commercial engine. It had a flat top, short skirt, and one ring. The next three were increasingly more detailed pistons machined in aluminum and the last was Gene Corl's highly detailed casting of a Chevy small block piston in 1/3<sup>rd</sup> scale.

At first glance few parts in an engine are simpler than a piston: a closed (one end), hollow, cylindrical shape with one or more grooves and two holes. But the devil is in the details, and Paul emphasized there are a lot of factors to consider in designing a piston. He had a phrase for it: "The engine starts to design the piston." His talk explained the meaning of this statement.

Paul started at the top, of the piston that is. The crown is the top surface and all of the 5 examples that he passed around had flat crowns. This is used in two-stroke engines and many 4-strokers: flat-head side valve engines and wedge combustion chamber overhead valve engines. These are rugged designs widely used in automotive applications requiring moderate performance. Power output is limited by several factors, among them small valves and combustion problems. There may be dead spaces or tight corners in the combustion chamber in which high pressure can cause premature combustion, i. e., detonation. The secondary flame wall thus created can collide with the primary flame and cause knock. This tendency can be reduced by careful design of the combustion space to provide a "squish area" that promotes turbulence, and thus better mixing and burning of the air-fuel charge.

Flat-head and wedge combustion overhead valve engines place the valves side by side, and together the valves and seats must fit into the diameter of the combustion chamber. This makes it easy to actuate the valves but limits their size. Larger valves can be used in hemispherical heads at the cost of more complex valve actuation. The piston in a "hemi-head" cannot have a flat crown. It must be domed. A flat crown piston would result in a low compression ratio. A choice of the valve layout dictates a portion of the piston design.

A domed piston is harder to make than a flat-top. There is, of course, the additional work to make the dome itself, but the problems are really in the interior. The weight of the piston is always a factor in high-speed engines and to keep the weight down, the interior may have an "inverse dome." This is very much more difficult. This shape is usually not machined, but it may be cast or forged. Both of these processes require additional tooling and processes. There is always a compromise between design, cost, number of pistons to be manufactured, and the equipment available.

Rings are next. Some engines are able to sufficiently seal the combustion gases without losing lubrication and so have no rings. These are usually small 2 stroke engines that pass fuel and lubricant through the crankcase. Most other engines use rings for the seal. Rings require a significant amount of pressure against the cylinder wall to seal and it is this pressure that causes wear. The ring thickness must be proportioned so that they develop enough wall pressure, but have sufficient area to distribute the load so as to not wear rapidly. There are two sources of the force against the wall: first the rings are larger than the bore and must be compressed to fit. This initial pressure seals the ring to the cylinder wall until the second source begins to operate. During the high-pressure phase of the combustion cycle, the hot gases pass down the cylinder wall until they encounter the rings. The gases enter the small space between the ring and the top of its groove and press the ring down against the bottom of the groove, sealing this area. Most important, the gases press outward against the inside of the ring and increase the pressure against the cylinder wall.

Below the rings is the wrist pin: the connection between the piston and the connecting rod. The hole for the wrist pin should be above the center of the length of the piston to minimize the tendency of the piston to rock back and forth around the pin and slap against the cylinder wall. The oil control ring is sometimes placed below the wrist pin to gain enough room.

The total length of the piston must be sufficient to control its motion within the cylinder, but the bottom of its skirt must clear the crankshaft. A short rod imposes larger side thrust on the piston and requires a larger surface area in the skirt as a bearing. Paul noted that the ratio of rod length to stroke is frequently 2:1. **Continued on page 5**

**TECH TOPIC**

**9-17-05**

**Carl Wilson**

**Paul Bennet: Design of Pistons Continued From Page 4**

There are more factors influencing the design of the piston. High-speed operation requires that the piston be as light as possible, but there must be sufficient material, especially at the wrist pin, to resist the mechanical stresses of being accelerated and decelerated by the connecting rod. The crown and ring belt must be strong enough to withstand the pressure of the combustion gases and be able to conduct the heat away from the crown through the skirt and into the cylinder walls. Some of the heat is removed by oil circulation through the interior of the piston.

Pistons look like round cylinders, but many of them are ground or turned with a more complex cross-section. Modern computer controlled equipment can profile the exterior to compensate for the expansion of various parts of the piston due to heat.

There are three materials that can be used to make a piston: cast iron, brass or bronze, and aluminum. Cast iron is three times heavier than aluminum and is used mostly on older slow speed engines. It has the advantage of being heat resistant and wearing very well against cast iron or steel cylinders. Aluminum is the lightest material and most widely used. It can be forged, cast, or machined from billet (solid) stock.



**TECH TOPIC for OCTOBER MEETING**

Open Format Discussion

**GEARS show in Portland, by Karen Palmer.**

First of all, the weather was sunny & perfect; no fog at all this trip, although the evenings & mornings were a little chilly. The show was great & they were so organized & are so pleasant up there to work with. All the tables were covered in heavy brown paper & the air hooked up & ready under the tables so the table tops unencumbered & are free for models. When we first arrived, we were given a brown envelope with name badges, exhibitor information, registration form for next year, & a GEARS Certificate of Appreciation that looks very nice & is suitable for framing. Then you are taken to the tables where your name is printed on a piece of paper so you know exactly where your spot is. Oh, yes, every model there is photographed separately during the show & you are given copies of those photos. Because the National Guard was on duty, the north parking lot was full of cars. At all times during the two show days, there were volunteers out in front directing the parking. We exhibitors were escorted to a dirt lot behind the armory to allow room for visitors in the front of the building. The crowd on Sat. was tremendous. Sun. was slow, but apparently they did very well & still made money.

Awards were a little different this year. They chose only 5 models & put them on a separate table labeled "Nominees". Dario's Corliss was one of them. Then a few judges were picked randomly, & Dave was one of them since he won last year. The Best of Show this year was a Fairbanks Morse engine that was absolutely beautiful. It was really difficult as all the models were top quality. They did this early on Sat. morning, so the award could be displayed with the winning model on the table. They also have a trophy where the name of each "Best of Show" winner will be engraved. Of course, Dave's name is the first one engraved on it. His "Best of Show 2004" Palmer Rectilinear Engine was also on the round badge they were selling as souvenirs of the show. We didn't realize it until someone told Dave it was his engine. It really was a fabulous show.

Down the hall from the main exhibits was a quilt show which was so much larger this year with some very beautiful quilts. There were also other items on display & for sale this year such as fabric bowls & baskets, crocheted items, quilted placemats, potholders, & an exquisite handmade wedding gown. There was a lot of talent displayed in that room.

Here is a list of those BAEM members that I wrote down:

Toni & Mike Rehmus  
Dario & Angela Mecchi  
Dick & Bess Remington  
David & Karen Palmer  
Tom & Eunice Armstrong  
Ray Monahan  
Eugene & Bernita Corl  
John Vietti  
Jim Moyer  
Randall Cox



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# Screw Torques

Suggested Maximum Torque for Screws

Screw Size	Low Carbon Steel		18-18 Stainless		Brass		Silicon Bronze		Aluminum 2024-T4		316 Stainless		Monel	
	in-lb	Nm	in-lb	Nm	in-lb	Nm	in-lb	Nm	in-lb	Nm	in-lb	Nm	in-lb	Nm
2-56	2.2	.25	2.5	.28	2.0	.23	2.3	.26	1.4	.16	2.6	.29	2.5	.28
2-64	2.7	.31	3.0	.34	2.5	.28	2.8	.32	1.7	.19	3.2	.36	3.1	.35
3-48	3.5	.40	3.9	.44	3.2	.36	3.6	.41	2.1	.24	4.0	.45	4.0	.45
3-56	4.0	.45	4.4	.5	3.6	.41	4.1	.46	2.4	.27	4.6	.52	4.5	.51
4-40	4.7	.53	5.2	.59	4.3	.49	4.8	.54	2.9	.33	5.5	.62	5.3	.60
4-48	5.9	.67	6.6	.75	5.4	.61	6.1	.69	3.6	.41	6.9	.78	6.7	.76
5-40	6.9	.78	7.7	.87	6.3	.71	7.1	.8	4.2	.48	8.1	.92	7.8	.88
5-44	8.5	.96	9.4	1.06	7.7	.87	8.7	.98	5.1	.58	9.8	1.11	9.6	1.09
6-32	8.7	.98	9.6	1.09	7.9	.89	8.9	1.01	5.3	.60	10.1	1.14	9.8	1.11
6-40	10.9	1.23	12.1	1.37	9.9	1.12	11.2	1.27	6.6	.75	12.7	1.44	12.3	1.39
8-32	17.8	2.01	19.8	2.24	16.2	1.83	18.4	2.08	10.8	1.22	20.7	2.34	20.2	2.28
8-36	19.8	2.24	22.0	2.49	18.2	2.01	20.4	2.31	12.0	1.36	23.0	2.60	22.4	2.53
10-24	20.8	2.35	22.8	2.58	18.6	2.10	21.2	2.40	13.8	1.59	23.8	2.69	25.9	2.93
10-32	29.7	3.36	31.7	3.58	25.9	2.93	29.3	3.31	19.2	2.17	33.1	3.74	34.9	3.94
1/4-20	65.0	7.35	75.2	8.5	61.5	6.95	68.8	7.77	45.6	5.15	78.8	8.90	82.3	9.64
1/4-28	90.0	10.2	90.0	10.2	77.0	8.7	87.0	9.83	57.0	6.44	99.0	11.2	106.0	12.0
5/16-18	129.0	14.6	132.0	14.9	107.0	12.1	123.0	13.9	80.0	9.04	138.0	15.6	149.0	16.8
3/16-24	139.0	15.7	142.0	16.1	116.0	13.1	131.0	14.8	86.0	9.72	147.0	16.6	160.0	18.1

\* These torque values are approximate and should not be accepted as accurate limits. Indeterminate factors in specific applications preclude the publication of accurate limits for universal use. Torquing values for screws made of various materials, and in sizes pertinent to this catalog, are offered as a guide. Test were conducted on dry, or near dry product. Mating parts were wiped clean of chips. Fastener tension is held at a factor somewhat less than yield point.

**Upcoming 2005 Events**

By Dick Pretel,  
Events Coordinator

**West Coast Engine Exhibitions For 2005**

3<sup>rd</sup> Annual Men, Metal, & Machines!  
Visalia Conventions Center. Visalia, CA  
October 22 & 23, 2005. Phone: 1-800-789-5068.  
Web Site: [www.cabinfeverexpo.com/MMM](http://www.cabinfeverexpo.com/MMM)

**Model Crankshafts and Camshafts**

**By Roger Slocum**

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Web Master Jim Piazza.  
Phone: 408-446-4825  
Email: [jdanpiazza@comcast.net](mailto:jdanpiazza@comcast.net)

**FOR SALE**

"Model Engineer" magazines, 1898 through  
2004, many bound, some hardback, 3 issues  
missing, plus 2 indexes. \$2750 Chris Leggo,  
(510)247-0961. [oinck1@aol.com](mailto:oinck1@aol.com)

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DynaPath - Delta 10M Control  
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manuals  
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