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# The Crank Calls

AUGUST 2006

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NEXT MEETING  
AUGUST 19, 2006 AT  
Robert Schutz's Shop,  
366 40th St. Oakland, CA  
Doors open at 9AM  
Meeting starts at 10 AM

**Events Coordinator Report -Dick Pretel**

Here are show dates that are tentative.  
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.TBD

**MEETING REPORT**  
**7-15-2006**  
**Carl Wilson**

There were two guests present at this meeting: Stan Om and Jerry James.

There will be no events this month at which members of BAEM will be displaying their engines.

Mike Rehmus gave a brief report on the model engineering show at Harrowgate in England. This is now the best show in the country and well worth attending. Mike was surprised to see two other members of BAEM: Tom Hare and Chris Leggo. After the show Mike stayed for a few days and enjoyed a bit of travel. He mentioned riding the Festiniog narrow gauge railroad, driving a 1923 Bentley, and a ride on the footplate (cab) of a

steam locomotive.

Bob Kradjian reported on the display of model engines organized by Paul Knapp and installed at Concourse A in Denver International Airport. This excellent collection fills about 40 cases and includes Lee Root's three engines. There is a possibility that the show will be rotated to the San Francisco International Airport.

Two other events were mentioned, both of them already past: The 2006 Fire Arts Festival sponsored by The Crucible in Oakland. For more information see this website: <http://www.thecrucible.org/>. "The Crucible is the Bay Area's only nonprofit sculpture studio, educational foundry and metal fabrication shop offering classes in fine and industrial arts." (Quoted from their website.) They offer classes in a wide range of art and industrial techniques.



And: August 7-13, 2006 the 13<sup>th</sup> International Symposium of Electronic Arts will be held in San Jose. Also the first Zero One San Jose: A Global Festival of Art on the Edge. For more see: <http://01sj.org/content/blogcategory/13/102/>.

Pat O'Connor (pres of this august organization) asked our Webmaster, Jim Piazza, to create a new section in our web page that will have high-resolution pictures of the work of our members. This will be in addition to the low resolution pictures that are a part of the newsletter.

Cor Langeweis brought his rendition of the St Steam Hammer. It features a 1" bore and 2" stroke piston directly connected to the hammer. This view shows the operator side: the chain controls the "main steam stop valve" which admits steam to the valve chest and the lever behind the chain controls the steam to the cylinder. Quite amazing stories are told of the exquisite control of the hammer achieved by an experienced operator: touching the crystal of a watch without breaking it is not an exaggeration.

Paul Bennet achieved a First Pop when his Wall 4 roared into life. Another modeler built this engine and Paul noted that each piece had some problems, but having applied his machining magic, it now runs well.

While Paul held the floor he talked about some typical carburetion problems, particularly fuel supply. He showed the float chambers that will be part of a model Weber 2 barrel carb and then went on to the problem of controlling the fuel under conditions of low manifold vacuum when insufficient fuel is aspirated into the air-flow. The accelerator pump operates as the throttle is opening and injects extra fuel to prevent "stumbling." Once the throttle is open the accelerator pump has "done its thing" and has no more fuel to inject: another circuit in the carburetor takes over to supply the extra fuel needed during sustained operation at low manifold vacuum. This is the power valve. Paul promised more information as he develops his model.

On the other side of the cylinder are the two cylinder drain cocks that are opened when the cylinder is cold to drain any condensed steam (i.e., water) from the cylinder. Note the anvil dovetailed into the base of the hammer. Cor included a work piece supported at its outboard end by a work support. For more information on this and other Stuart models see: [http://www.stuartmodels.com/inprod\\_det.cfm/section/casting/](http://www.stuartmodels.com/inprod_det.cfm/section/casting/)



Corey Renner is building an engine to the design of Phillip Duclos: Maverick, serialized Home Shop Machinist, Sept/Oct 1995 et seq. The vital statistics are 3/4" bore and 1" stroke hit-n-miss engine with no cooling hopper or fins. Some other common details are missing also: no piston rings and no timing gears. But it makes up for what is missing by what it does have: an indexing mechanism that takes the place of the gears. In his account of an earlier engine Phil wrote that he had heard of such a thing: a four stroke engine with no timing gears, and set out to design a mechanism that would perform the needed functions. He used his design in several engines including this one. The original design is known as the Gearless Olds; it used a special indexing ratchet interposed in the exhaust valve actuating mechanism that allowed the valve to open on every second stroke. Phil's design is very similar.

This is the ignition side view of the Maverick. Corey used his CNC mill to machine the side plates of the engine frame. He is trying to make it look less like a "bar-stock special."

Dick Remington brought his example of a (lathe) center height gage built to a design in Model Engineer's Workshop. It is a block of acrylic plastic with sharp lines scribed at center height on each side. The mirror mounted in the sheet metal clip allows viewing of both lines and the cutting tip of the tool at the same time. This facility makes it easier to adjust the tool to the correct height.

Chris Leggo's small parting tool was, unfortunately, not photographed, but that doesn't mean it received little interest. He was given this tool while he was in England. The section holding the cutting tool is connected to the clamping shank by a curved piece that can flex slightly during the cut. The effect of this spring is to reduce the problem of "digging-in" that is common in light lathes. With this design, the tool moves away from the cut as the load increases, rather than into the cut, digging-in and stalling the work.



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What does all this mean to you as a user: 1. you can do some impressive work with a design package that will not fold up shop in 30 days; it is yours permanently. 2. much of the nitty-gritty math and other odd design details are handled automatically by Xpress. 3. 2-D drawings are a result of the part modeling, not the other way round as with traditional CAD software.

So what are the benefits of working with a 3D mechanical design software program rather than a 2D drafting program. Actually, that just said it all. A 3D mechanical design program allows you to design complex or simple mechanisms on a screen rather than trying first to build an actual prototype (or attempting to keep everything in your head while sketching bits out on paper). A 2D drafting program is just that, a tool to document an existing design. As a designer, I'm very interested in looking at and evaluating a machine from all angles and determining if parts are going to fit where they should. And that they won't interfere with other parts. To do that, we need to be able to assemble the parts of a machine and check them either on our workbench or on-screen. On-screen is faster and frequently more accurate.

In addition to its 3D design capabilities, ADX is also has Parametric in its description. Parametric is a fancy way of saying it works from user accessible and changeable parameters. Parameters are not limited to length, width, circumference, etc., they can be any equation or ratio (of another dimension) that you can think of. In fact, ADX can work from an Excel spreadsheet if you wish as I do to generate reasonable approximations of gears.

When you first start with Xpress, take the time to work through the tutorials in detail. These will get you started and you will be drawing parts in the correct manner. Skipping the tutorials may mean you may never get ADX to work well for you.

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So what you want is to install and register Alibre Design Xpress. At some point during the entire installation process, you will get the opportunity to select (or register ADX). You will also have the option to install the full software for a 30 day evaluation but at the end of that time, it will cease working.

The version of ADX that is on the CD is 8.2. If you wish, when you install version 8.2, you will have the opportunity to upgrade to version 9.0 at no cost. No cost except it is a 60+ megabyte file to download (or you can order a CD for about \$10).

Normally ADX works on-line so that when you ask for a Help topic, it will download the most current version of Help. If you would prefer to work off-line, you make that selection when you start the ADX program. If you want a local Help capability, you can install it from the CD. It is located in the AD folder.

How do we 'make' a Part in ADX? Simple parts are easy and quick as we can see:

First we start by opening a Part window. With that open, we can sketch any 2-dimensional shape we wish by using the drawing shapes either alone or in combination to create the outline of the part we want to draw. We sketch the most central shape if we are modeling a complex part. We can add other bits and blobs on to the model as we go as you can see. For the first part, let's make a center punch.

First we Sketch a circle. Then we Dimension it to 3/8". Now we Extrude the circle to, say, 5" which gives us a rod of 3/8" diameter and 5 inches long. Not too difficult is it? But wait, there's more-we need to sharpen the punch. For this we select the 3D Chamfer tool and select from it, the Angle-distance dimension choice. 20° will do for a tip angle. Let's try 1 inch for the distance. Hmm. I've made a Nail Set. So I'll Edit that distance value. 1.5"? Nope, just made it for a smaller nail. 2"? yes, that works OK. Sorry, I can't harden it for you on-screen.

So you see, we've just made a tool and by interacting with the choices we made, we designed it the way we wanted it. Oh, and by the way, did you want a 6" long punch? No problem, we just Edit the Extrusion and change the value to 6" like this.

Now let's make a Drawing that the Tool Room can use to make the Punch.

First we start the Drawing window and select the Design from which we want to make our drawing. Then select the views we want. For now, let's chose all of them. We can delete what we don't want later. Notice that the main view can be changed by positioning the Model to best advantage. When we click on the OK button, we get blue rectangles representing the views that follow the mouse pointer. Position them to best advantage on the drawing space and click the mouse again. The detailed drawings are now drawn on the screen and we can detail them if we wish. We'll select the dimension tool again and clicking on appropriate points on the drawings, dimension the drawings. Notice that if we want to move a dimension, we can by using the arrow tool.

But wait, we should have chamfered the top of the Punch to prevent mushrooming.

Close the Drawing and open the Model. We'll 3D Chamfer the top just a little and save the Model. Re-opening the Drawing, we see that the chamfer is now displayed and some of our Dimensions may now be shown in red.

That means we need to fix them so we delete and dimension them again.

We now need to build a more complex Model so you can see how we go about that. How about a model of a front engine cover that we want to design for our new V-8 engine. What does it need to do? Cover the chain drive to the camshaft and allow the crankshaft nose to poke through to drive pulleys. So the first thing to do is to sketch in two reference circles for the chain sprockets. Now we'll sketch in the cover circumference and the two tangent lines that connect them. Put a few Restraints in to tell it what the relationship is between the sketch elements. A Tangent restraint will set the straight lines correctly in their relationship with the top circle. The lines were locked into a tangential arrangement with the bottom circle when we drew them. Now we remove the extraneous lines (it all has to be continuous with no breaks or extra lines). Extruding the cover shape we now have to carve (Extrude Cut) the space out for the chain sprockets and the chain. So we insert a new Plane on the surface we want to modify. Remember we can only sketch on a Plane or a Surface. Now sketch two circles that will respectively clear the chain drive, making the two circles concentric with the top and bottom radiuses and draw in the two lines that tangentially connect them.

Repeat the constraining and the line removal until we have the same shape we used to extrude the cover. Now we will Extrude Cut this new shape into the cover model, leaving about a 0.2" front wall.

Now we'll punch in the hole for the crankshaft. Insert a Plane and draw a circle close to the center of the bottom radius. Make it concentric with the bottom radius and of the correct diameter. Extrude Cut that hole in the case and we are just about done.

We need a recess for an oil seal. So insert a Plane and draw a concentric circle to the crankshaft hole of the proper size. Extrude Cut it into the cover and you are done except for the detailing.

Let's round off the rough edges and bevel the edge of the hole so the oil seal will have an easy start.

Select the 3D Fillet tool, click on the front cover, size the fillet to something reasonable and the smoothing is finished. Now flip the part over and select the 3D Edge Chamfer tool and click on the edge of the oil seal bore. About 0.01" should do it and click on OK.

What's left? Well, we might have hogged the hollow out with a ball-end mill. So we should show it. Drag out the 3D Fillet tool again and click on the line between the inside walls of the cover. Select 0.125" and the fillet is completed.

But the engine isn't finished until we Assemble the parts.

Start an Assembly window and select the Cover and the Punch. Using the move tools, move the parts so they look about right. Now we can exactly orient them by using a different set of Constraint tools. First we'll align the axis of the Punch with the center of the crankshaft hole. Then we'll position the Punch in the hole at the correct depth.

Done.

Alibre Design Xpress

(c) 2006 by Mike Rehmus

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Engine Front Cover and Prick Punch designed during the tutorial session.

If you want to know more about Alibre Design Xpress (or any other 3D CAD program, go to their web site and download their demo software.

The correct URL for Alibre Design Xpress is [www.alibre.com/xpress](http://www.alibre.com/xpress)

