Model Engine Builder™

Newsletter # 4

Welcome to another *Model Engine Builder* Newsletter

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I am honored that Ross Purdy offered me a good article on building a small steam engine from a kit supplied by an New Zealand company.

Yes, this is an article for beginners yet the experienced builder may find a tip or two as well.

On the 18th of this month, I am to have a new heart valve installed. Big surprised as until my new Cardiologist told me in late September that I must have one this year, I had no idea the old pump needed a tune-up. Basically, a bout of Rheumatic Fever when I was young left scar tissue on my Aortic valve and now the hole through the valve when it opens is a wee little thing. No wonder I have no energy and run out of breath so quickly. I thought is was just because I'm getting old.

The good news is the Cardiologist claims I'll feel 10 years younger. Right away I asked if that means I'll feel 59 or my real age. He just laughed.

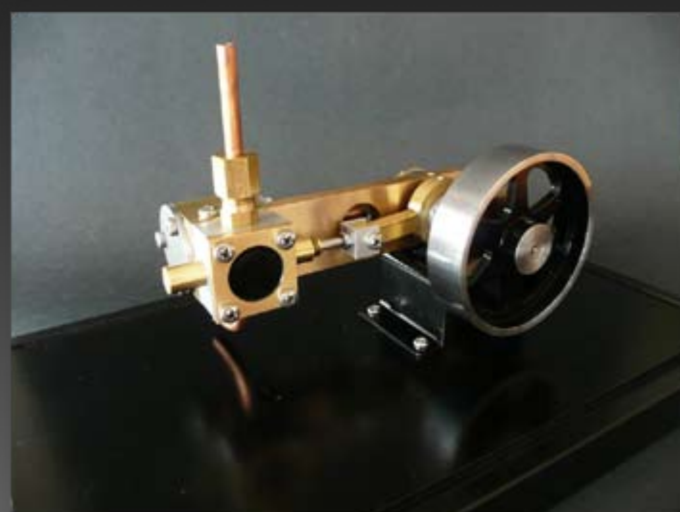
The photography section is a bit smaller than I want but if I wait much longer, this issue will come out next year.

I will probably be able to publish # 5 in December so see you then.

Mike

Space to 3-hole punch

Building a Quayle 16/16H



Make a Quayle 16/16H slide valve steam engine

By Ross Purdy

No other engine is as fascinating as the steam engine. People young and old are mesmerised when they see a steam engine operating, whether it be a steam locomotive or a stationary engine.

The engine I'm about to describe is a double acting, single cylinder, slide valve engine - but what does all that mean?

How does it work?

A steam engine works by applying pressure to a piston in a cylinder, usually this pressure is in the form of steam produced in a pressure vessel or boiler.

In this engine we have only one cylinder doing all the work. The disadvantage of a single cylinder is that it won't self start at top or bottom dead centre on the crankshaft, a twin cylinder engine overcomes this limitation.

So what does double acting mean? Double acing is when the pressure can be applied to either side of the piston to drive it back and forth. Double acting steam engines are much more efficient as power is applied to both directions of the piston stroke. A mechanism is required to switch the pressure to alternate ends of the cylinder at the correct time - this is achieved by a valve. There are various types of valves that can be used, in this engine it is sliding valve driven from an eccentric on the crankshaft. In the photos you will see the valve opens ports to the cylinder at either end of its travel.

Quayle Kits

Quite a few years ago I was attending a Model show and I picked up a flyer from the model engineering display. The flyer had a range of steam engine kits that were home grown and I was keen to give one of them a go. After successfully building the first model I was hooked as they say and have gone on the build almost all of the Quayle kits available.

For this article the obvious choice was the Quayle 16/16H, which has been designed as an easy starter project for the novice engineer. The engine is a horizontal single cylinder, double acting, with a simple slide valve.

This engine makes an ideal hand crafted gift or family heirloom.

The kit comes with all the materials you need to build the engine, a full set of 2D drawings plus exploded view, and comprehensive building instructions (see photo of kit contents) all at a very reasonable price.

Equipment

You will need a lathe, a metric tap & die set, hand tools, metric & imperial drills, marking out equipment, and a good quality vernier calliper.

The first thing you learn about engineering is there are many ways to go about making a component, with some techniques better than others.

You can follow the instructions provided, as I did with my first engine, and end up with a very nice running engine.

What I have attempted to do here is show how I went about the build using tools and techniques which in some cases better suit my workshop, skills and tools.

Basically don't be afraid to try a different technique that produces the required result!

As you will see there are quite a few components to manufacture, but don't be phased by this, the engine took me approximately 50 hours to complete.

Construction

I started the construction as recommended in the instructions with the base. This

The contents of the kit - metal, plans and fittings.

Drilling holes in the base frame.

Pre-bent frame showing punched out oval, and mounting holes.

Facing off the ends of the end plates in the four jaw chuck.

has been pre-bent to the required shape and the oval hole punched out - which is a nice feature. All that is required to do is drill eight holes to complete the base. The column and the end plates need to be drilled and tapped so they can be screwed to the base. The instructions says to screw these parts to the base then drill the hole for the crankshaft. I didn't do it this way because I wasn't confident I could drill accurately over that distance. I made a small part which allowed me to bolt the two pieces directly together (see photo) then easily clamp this in the vice for drilling. I have found that I end up with the crankshaft aligned with the two holes and running nice a true using this method. Once this is done I finished the end plate by drilling the oil hole.

Column

The column is the long metal section that everything is bolted to so it forms the backbone of the engine. There are lots of holes that need to be accurately marked and drilled in the column, and at the end it starts to look a little like a piece of Swiss cheese. The column can't be finished completely until other components are added to it.

Crankshaft & Crankdisk

The crankshaft is constructed next. This is fabricated from three parts; the shaft, disc, and crankpin. I elected to silver solder the disc to the shaft to give a stronger joint, although soft soldering will work. I also countersunk the disc to give a greater surface area for the solder to flow into. Machining the disc is a straight forward task, the critical operation is making sure the crankpin is absolutely parallel to the shaft. The crankpin hole should be drilled and tapped in the lathe to assure accuracy. My favoured method is to make a fixture from a short length

Using a *"Wobbler"* to find the edge of the end plates in the milling machine.

Tapping end plates in milling machine using simple tapping fixture.

Silver soldering crank disk & crankshaft.

Using a D.T.I to setup offset.

Drilling off-centre hole for crank pin in crank disk using jig.

(same length as the shaft) of 25mm steel rod. I bored a centre hole to clear the M4 tap and the offset hole for the shaft to slide into (see photo). I used my DTI to set up the 8mm offset in the 4 jaw chuck. If you are going to purchase a DTI, I'd suggest one with about 25mm range - I started with a DTI with 10mm range, but this was never enough.

Once the fixture is made, the crankshaft can be fitted and held firm with a grub screw on the flat that will later be used by the flywheel.

The crankpin is easily machined, so don't let the Stainless Steel put you off, just use some cutting fluid while facing off and threading.

Upper and Lower Covers

The next suggested component to make is the lower cover. Again I made a simple fixture to hold the work piece while machining the outside diameter and shoulder. The fixture (see photo) has two 18mm shoulders and clamps the lower cover with a bolt through the middle. This is set to run true in a 4 jaw chuck before clamping the lower cover and subsequent machining. This method allows the centre bore of 18mm to be done at the start rather than the end, as was detailed in the instructions. This makes sure that the inside and outside are perfectly concentric. Note that the upper and lower covers are supplied as 3mm punched steel discs just a little over size.

Flywheel

The flywheel is next on the list for fabrication. I enjoy making flywheels as they are usually the most visible part of the engine. The kit is supplied with the centre web laser cut, which makes it very easy to make and has good visual appeal when completed. Three parts make up the flywheel; the outer rim, web, and centre boss.

I took the rim and skimmed the face, then machined a 54mm diameter rebate - this is where the web will fit into. Next I flipped the rim around and repeated the exercise, but this time I only machined the inside until it was round - leaving the step which locates the web.

Next I made the boss, which is very straight forward. The web was then held in the 3 jaw chuck, and the centre bore opened out to 15mm so the Boss was a nice fit. The boss and the web were then soldered together. I used soft solder but in hindsight I should have silver soldered them, as machining the outside of the web at 54mm diameter makes it easy to break the solder joint (I speak from experience here, as I had to re-solder mine!).

I machined the web down until it fitted nicely in the rim, then

Drilling hole in lower cover.

Holding lower cover in jig to machine outside.

Turning outside of flywheel hub, soldered on shaft.

Flywheel after assembly - turning outside.

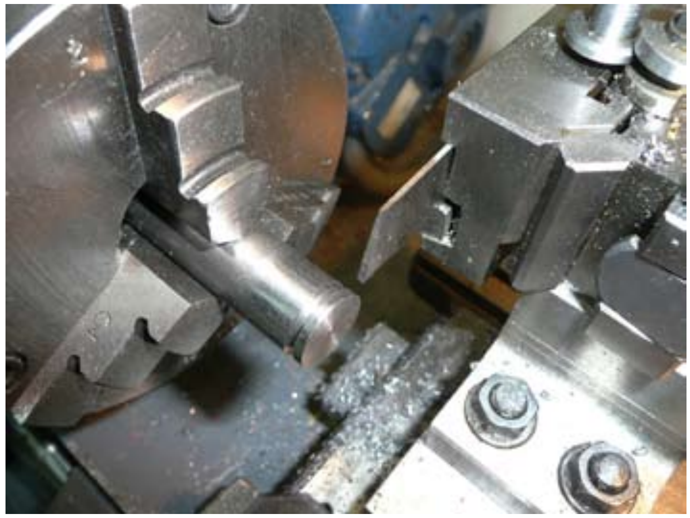
soft soldered the two pieces together. Soft solder is fine for this job, as there is a large surface area between the web and the rim.

In the last operation I turned down a piece of scrap until the boss would just fit onto it, and filed a flat for the grub screw to grip on. I then turned the outside to the specified diameter and polished it up with some fine wet and dry paper.

Eccentric

The eccentric was made next, again this isn't difficult to make using both 3 and 4 jaw chucks as per the instructions. The eccentric Strap looks complicated, but it is very straight forward to make. I started by making the brass flat, supplied, the correct length (24mm). Using the 4 jaw chuck I then drilled and tapped the cross hole, then bored out the

Half of finished eccentric strap.



Using rear-mounted parting off tool to machine slot.

Using D.T.I to setup offset for the eccentric hole.

Finished eccentric.

Facing off yoke in 4 jaw chuck.

Drilling inside of trunk guide using an end mill.

Finished trunk guide.

Turning down stainless steel valve rod.

centre until it was a nice fit for the eccentric. Using the same technique as in the lower cover I used a fixture running true to clamp the work piece. It was then a simple matter of turning it until it was the correct diameter. The eccentric Rod is a simple lathe job and is soldered onto the eccentric strap - thus completing this part.

Connecting Rod & Bushes

The connecting rod is made in a similar way to the eccentric rod, and I did this at the same time.
The holes in these rods have a stainless steel bush inserted into them to minimise wear. To make the bushes I held the rod in a collect chuck, as it must be running true before boring the 3mm hole. Stainless isn't hard to machine as long as the speed is slow and you use some cutting fluid - don't pause while drilling this, as the stainless steel will work harden. All I did was drill the hole and part off the bush to the correct length. As you have to make two, I drilled deep enough for one then cut it off, faced the stock back and drilled it again. You can get the drill wandering if you drill to deep so I thought it would be best to do each piece separately.

Yokes

The yokes are fiddley parts to make as you can't easily grip them. I faced both ends in the 4 jaw chuck using a piece of scrap across the open end (see photo). I then moved the channel to a machine vice and drilled and tapped from each end. I tapped them with my home made tapping attachment in the drill chuck so that they were tapped square to the face. That gave me two pieces made at the same time and a longer piece of metal to work with. To complete them I cut them from the end then carefully faced the ends back to the required length.

Piston & Trunk Guide Valve & Piston Rod

The instructions say make the valve rod and piston rod, then move on to the piston and trunk guide. I swapped the order of these because I think you need the trunk guide to test fit onto the turned shoulder of the piston rod.
The piston, piston rod, and trunk guide are screwed together, and must be a nice sliding fit in the cylinder. The important thing here is that the thread on the piston and trunk guide must be perfectly in line, and in the centre of the cylinder. The trunk guide and piston are made from 16mm rod (the drawings say 5/8" but 16mm is now supplied). The cylinder is 5/8" bore so a tiny amount needs to be removed from the starting material to make a good friction free fit in the bore.

The valve rod is again made from stainless steel. As the rod supplied is 1/8", I had to turn the threaded ends down to 3mm before threading. It might not seem a lot, but it can't threaded when it is over size. I did modify the design slightly at this point. The drawing calls for the end to be turned down to 2.5mm. My M3x0.5 die won't clear 2.5mm, and leaves the surface with a spiral groove down it. The turned down section has to run nicely in a brass bush, and the last thing I wanted is for it to be marked, so I turned mine down to 2.2mm, and also drilled the bbush that it runs in 2.3mm instead of 2.6mm.

The piston rod is basically the same procedure above, just a different size. When I turned the partial threaded end, I tried the trunk guide onto the shoulder until I got a nice fit.

Gland Nuts

There are a collection of special Nuts and Sleeves which are all quite easy to make. The only parts I have difficulty with are making the Gland Nuts which are made from M6 and M8 threaded brass rod. The problem with these is two fold; first they are difficult to hold without damaging the thread, and secondly the thread is a little smaller than M6 and M8 respectfully, so they are a sloppy fit when threaded into there mating part. The sloppy fit can be a problem for the piece that is later soldered in, because it may solder slightly off centre. I had problems here and fixed it by the method detailed below.

Because of the spiral of the thread you get an optical illusion - looking at it end on it looks like the hole is badly offset. It is absolutely critical that the holes in these pieces are in the middle otherwise you can't assemble the engine. A better option, if you have some brass rod, is to turn it to the correct diameter, thread it, centre drill it, and part it off all in one operation in the lathe. This way you will get a perfect part every time. The drawings show these parts cross drilled so that they can be adjusted with a tommy bar. This works for the 8mm piece but I think it is a bit difficult on the 6mm piece. Instead of the cross drilling I have milled a hex shape so a tiny spanner can be used.

Valve

The valve slides back and forth on the column driven by the motion of the eccentric. It is floating free in a drive ring and relies on a film of oil, and the input pressure to keep it flat on the column face. I had no problems making these parts as detailed in the instructions.

The valve chest is made from square aluminium but you need to accurately mark and drill the hole positions. The centre hole is best drilled on the lathe holding it in a 4 jaw chuck and then use a boring bar to open out to the correct diameter.

Cylinder

The cylinder is my least favourite part to make, especially drilling the 12mm hole in the side. I made a close fitting plug for the bore - this was inserted while I was holding it in the chuck and vice. This method prevents the walls from being crushed. First I had to get the supplied bush running true using the 4 jaw chuck, I protected the work piece with some old drink can (I use this a lot to stop the jaws marking the work). I needed the other end of the bush held by the live centre and the DTI to get it running true.

I machined the step in the

Drilling gland nut, held in a collet chuck.

Finished gland nut - note the optical illusion.

Turning the outside of the cylinder/trunk guide .

Drilling holes in the cylinder/ trunk guide, starting with small holes.

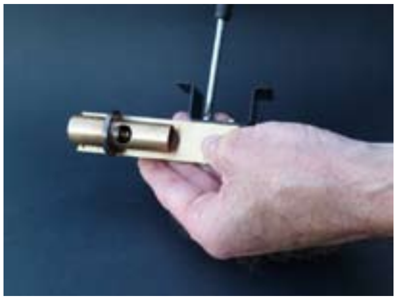
Armature wire securing frame and cylinder, ready for soldering.

lathe, and the flat where it mates onto the column in the mill. When the flat was milled I also drilled the inlets and screw hole. The last operation is the most nerve racking, drilling that big hole in the side. I used a Vee block in my machine vice to hold it while I drilled through. I elected to start with about 4mm and work my way through my drill set up to 12mm! Yes it takes a bit of time but big drills grab at this material, and it is all too easy to wreck all your hard work.

Soldering

The next thing to do is solder the column, cylinder, lower cover, piston gland bush & nut, and exhaust plug together. I started by soldering the exhaust plug into the cylinder, then carefully drilling through it once soldered. I also soldered the piston gland nut & bush as a separate unit. I used my LPG torch to do the soldering as you need a fair amount of heat. I then assembled all these parts together and used some wire to hold everything in place (see photo). I use resin cored electrical solder because you don't need or want to much solder around the place. I started by heating the piston gland bush with the torch through the 12mm hole. Once hot enough I applied the solder wire without the torch. If it is hot enough it will flow nicely around the cylinder and bush. Next I moved to the flat between the column and cylinder, feeding the solder along the outside face. The solder will flow through to the other side so the main thing is not to add too much solder. To complete I added a bit of solder around the lower cover and cylinder.

I made a fixture to hold this completed assembly in the lathe. The end of the column was then turned back to the cylinder and the recess for the cylinder head machined.



Screwing base & frame together.

Assembling eccentric.

Attaching connecting rod to yoke.

Inserting trunk guide subassembly.

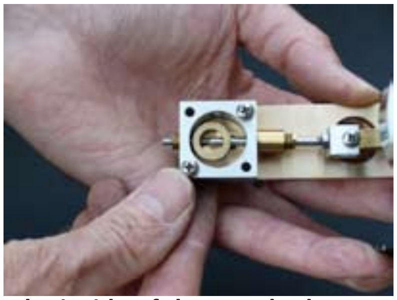
Attaching flywheel to crankshaft.


Attaching piston to shaft.


Screwing crankpin in.


Assembling valve chest.


Attaching valve chest to eccentric strap.


The inside of the attached valve chest.

Valve Chest Assembly

Now that the column was at its' final length, I could mark, drill, and tap the four holes for the valve chest. I used double side tape to stick the valve chest onto the column and then used a drill to just mark the surface of the column. The chest and tape was then removed, and the marked holes drilled and tapped as required.

Assembly

At last the moment of truth has arrived - where it could be assembled as a complete engine, and I could see if everything was correct.

I started from the valve side and assembled all the parts required. A small amount of Teflon yarn is stuffed and packed down by the gland nut - this provides a gas tight seal around the valve rod (the same is done around the piston rod). By temporary locking the eccentric grub screw, the flywheel can be turned to see if everything is moving freely. For a start I don't fit the valve cover, so I could see the valve operating. The valve should move equally around the exhaust hole - this can be judged by viewing how much of the inlet ports are visible at the top and bottom of the valve throw. The valve shaft length can be adjust on the yoke, and the valve ring moved up and down as required. Actual timing can wait until the piston assembly is installed.

To fit the piston assembly to the engine, I begin by assembling all the pieces except the piston. With the crankpin unscrewed from the crankshaft, the assembly can be inserted into the cylinder. The Teflon packing, and piston gland nut are adjusted through the 12mm hole in the cylinder. Now the crankpin is screwed through the connecting rod and into the crank disc.

Lastly I insert the piston and, screwed it onto the piston rod. The engine was then turned by hand to make sure everything is running smoothly.

Everything was fine on my engine, so on went the cylinder head.

The last thing to do is set the timing. There are detailed instructions for this supplied with the kit, but I find the best and easiest method is to turn the engine anticlockwise until it is at bottom dead centre, then move just a few degrees more (you want the piston to go just past the bottom and start going back up the cylinder). I hold that position, then move the eccentric around on the crankshaft until the bottom ports are just starting to open. The grub screw can be accessed from above with this method. I used the hex key to move the eccentric back and forward until the timing looks right then nip up the screw. Turning the engine over by hand should have the other port just opening when the piston is just passed top dead centre. You can adjust the eccentric until you get this right if required. If the timing is to far advanced the engine with knock when running indicating the pressure is being applied before the piston has travelled completely to the top or bottom. The valve cover was then attached and the engine connected to an air compressor set to low pressure (Less than 20psi). After some light oil was added to the moving parts, the air was turned on and the engine ran superbly.

Cylinder Cladding

Now that the engine was running, I made the cylinder cladding - which only required 5 holes to be drilled, and a couple of folds at each end, as the piece supplied was exactly the right length and width.

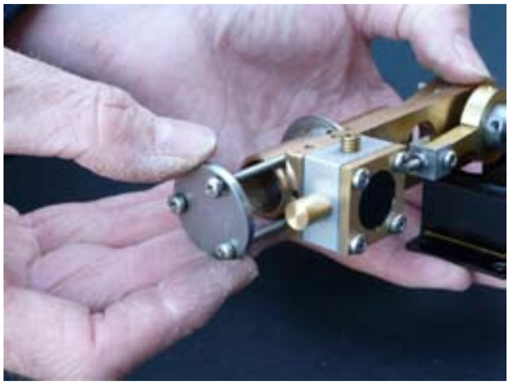
Painting

To complete the engine, the flywheel, base, and the recess in the valve cover were primed and painted black. To protect the engine from moisture and dust, I put mine in locally made glass display case.

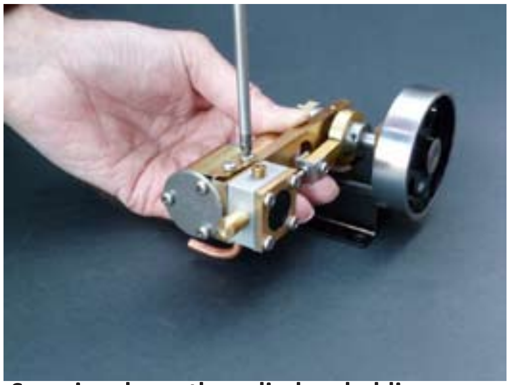
These engines run beautifully with an extremely low speed, and tick over very nicely.

The engine kits are available from:

Graham Quayle in New Zealand
Phone +64-9-416-7600 or email
gray.quayle@xtra.co.nz



Attaching the top cover.



Securing down the cylinder cladding.

Attaching air fitting.

Securing Finished engine to the base.

THE END

Photographing Shiny Objects

By Mike Rehmus

Of *Model Engine Builder* magazine and Bay Area Engine Modelers

I've been asked a number of times to talk about taking good pictures of model engines and other hard-to-photograph objects. I've given a seminar or two but I've not put words to paper in the magazine because it is all about building engines, not photography. But this newsletter has no restrictions and I am much more free to spend digital bits on all sorts of subjects.

Light Tents

What is a light tent? In this case it is an enclosure, made of white translucent material that encloses the subject and is illuminated from many directions. Its purpose is to establish a light environment that illuminates all parts of the object to be photographed with the light reflected from the object back to the camera fitting within the dynamic range of the recording technology. Got that? What does it mean?

I need to place the correct amount of light on the model engine to center the reflected light (that is the light that forms the image) to the camera in the dynamic range of the film or digital receptor. Why worry?

Walk outside on a sunny day and measure the range of light reflected from various objects. The range of light reflected from deep shadows to the highlights off your automobile's windshield or chrome will be more than 1,000,000:1. Silver-based film has a dynamic range of about 10:1 which means it cannot record the deepest shadow and the brightest object at one exposure setting. Unfortunately, digital receptors (CCDs or other sensors) have even less range.

How do we fix this? We cannot turn the sun down. Wouldn't matter anyway because the range of reflected light just gets reduced but the range stays the same. Hmm. We can add light with electronic flash and subtract light with anything from a sheet of opaque material to sheet of milk plastic to a sheet of white nylon or cotton. This is essentially the types of tools you see in a picture of a photographic or TV studio. As you can tell, the cost of controlling light in a commercial studio can be high.

Could we just even out the light? Fortunately for our needs, the answer is yes. What we need is a tool that will intercept the incoming light and tend to uniformly redistribute it over our subject. A photographic tent. Fortunately, tents are very simple. A white sheet hung over a clothesline makes a great tent (or at least as long as the weather cooperates). My first tents were made with plastic sprinkler tubing and a white bed sheet. This worked just as well as the factory-made pop-up nylon tents I now carry to photo sessions. It is not as convenient as the pop-ups, but I can make it any size I need where the factory tents are of a fixed size.

So, what does one look like? Just like the one on the next page. OK, I didn't take a picture of the tent, I took a picture of an engine in the tent. If you subscribe to my magazine, *Model Engine Builder*, you will recognize the new Black Widow V-8 as the Centerfold subject in Issue # 26 which is being mailed as I type this. This tent, a Photek, is 3 feet wide and 2 feet deep by 2 feet high. The light is sunlight and the tent is sitting on top of a garbage can in the middle of a patio. The sun is so bright that I've draped 2 thicknesses of spare translucent nylon panels that come with the tent over the back and top. See the diagram on the next page

The camera is placed about 10 feet away on a tripod and a white piece of Foamcore, a sandwich of Polystyrene foam and white card stock is just to the right of the tent and angled towards the camera. This is to avoid a reflection of a brick wall that is about 3 feet to the right of the light tent. I should mention that this is the second photo session as I did not pay attention to the brick wall reflecting in the side of the radiator and the carburetor enclosure the first time so I had to reshoot the engine.

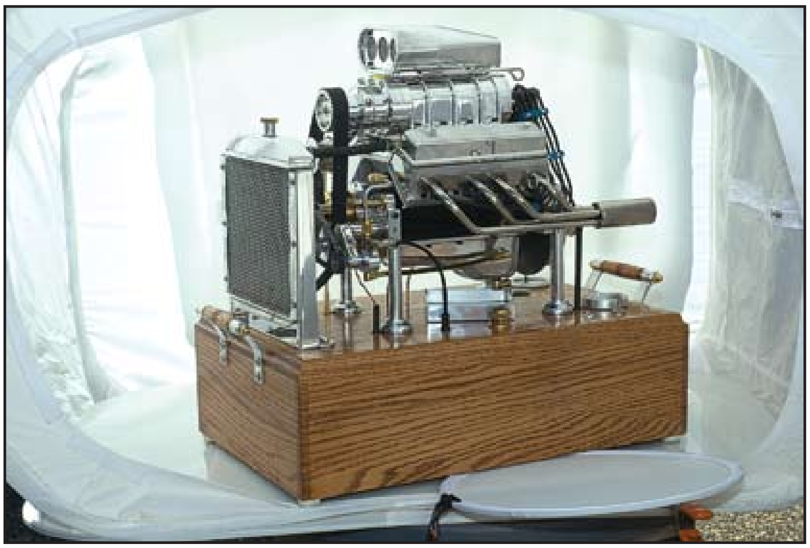
Notice the round disk of white just under the base of the engine? That is because the orange handle of the spring clamp you see just below it on the right would otherwise reflect off the engine.

Now contrast this with the final picture on the bottom of the next page . . . as you can see, there has been a bit of Photoshop work to obtain the final result.

Actually, if you look close enough, you might discover that the final picture is the combination of 2 images. This is to insure that there is some detail in the bright and the dark areas of the picture. The dynamic range of any one digital picture was too great to be used by itself. The easiest way to do this is to adjust your shutter speed while holding the aperture fixed. We'll talk about that in a later installment.

Now what else do we have to worry about on the journey from model to the printed page? The major problems are color accuracy and dynamic range (again).

First, nothing made by man has yet been able to accurately capture all the color nature has to offer. The range of our imaging tools is not as large as nature and the accuracy isn't all that great either. Then we move from the captured image to the printed page and we do that by mixing 4 inks onto an opaque piece of paper. We use Cyan, Yellow, Magenta and Black inks to try and reproduce the colors properly. Well, we get sort of close but unless we are printing Art Books, we only get sort of close. Art Books can afford specially formulated inks to get closer to what the artist had in mind when they created their work. But magazine publishers cannot afford that accuracy unless they want to really raise their prices. So we make do with 'close.'

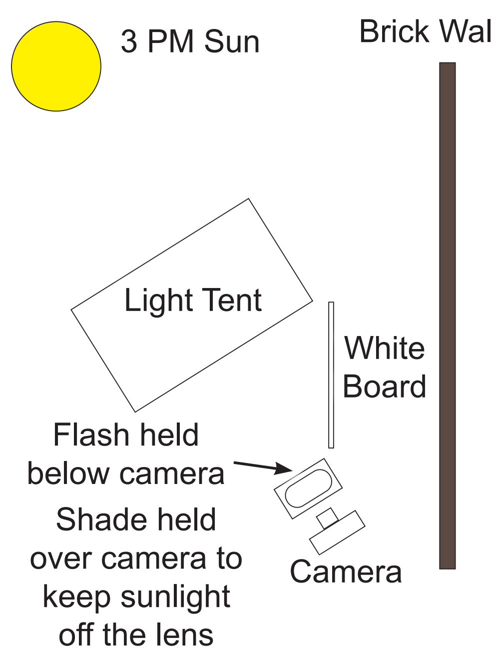


The other restriction is that the printed page is viewed with light reflected off of a relatively dull piece of paper, not viewed from a light source like your computer screen which can deliver double the dynamic range of light that you get from a paper image.

Make yourself a temporary tent and take some pictures. You'll see an immediate improvement, especially in the printed pictures.

The Photo shoot setup is shown below. The location was a protected patio so we had little wind to deal with. It took a good lens with a shade over the lens to avoid contrast problems because we were shooting into the sun. The camera was a Nikon D-80 DSLR with a 60mm Micro-Nikor lens on a tripod. I used a Nikon SM-800 electronic flash held low to illuminate the black crankcase. The flash was triggered by the D-80's on-board flash. F/18 @ 1/100 second, ISO 200 sensor speed.

Photo shoot setup



Issue # 26 Centerfold Picture

TO BE CONTINUED IN NEXT ISSUE

Model Engine Builder™

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Essentially this is the message we sent to our magazine subscribers:

Dear Magazine Subscriber,

Unfortunately for the October issue of *Model Engine Builder*, because of my medical condition, the issue is about 3/5ths the size of a normal issue. This issue, therefore, does not contain several articles that I have not been able to complete in time to meet the schedule. These articles will appear in issue #27, which I hope to be healthy enough to publish in January 2012, the next scheduled publishing date.

I did, however, want our subscribers to have the Valve Timing and battery-powered EDM articles and the conclusion of Don Grimm's excellent Igniter series with the miniature low voltage magneto, a look at the new Black Widow V 8 featured in the Centerfold article, and the completion of Todd Snouffer's excellent Pip engine build instructions.

Toni and I are sorry that this issue does not contain the variety and number of articles which we expected to include, but hope you will enjoy these articles and also that you will understand the health problems we are dealing with right now.

Mike Rehmus, Editor

Model Engineering Clubs

- Bay Area Engine Modelers
  U.S.A., San Francisco www.baemclub.com
- Bournemouth & District Society of Model Engineers
  U.K., www.littledownrailway.co.uk
- Chicago Model Engineers Association
  U.S.A., e–mail: edsmerz@webtv.net
- Colorado Model Engineering Society
  U.S.A., e–mail: jbeall303@juno.com
- Florida Association of Model Engineers
  U.S.A., www.floridaame.org
- Hamilton Model Engineering Club
  Canada, www.hamiltonmodelengineeringclub.com
- Kansas Association of Model Engineers
  U.S.A., www.geocities.com/steammodel/index.html
- Model Engine Collectors Association (M.E.C.A)
  U.S.A., www.modelengine.org
- New England Model Engineering Society
  U.S.A., www.neme-s.org
- Northwest Model Engineers Association (Chicago)
  U.S.A., dyoung1228@aol.com
- Portland Model Engineers
  U.S.A, tomten@easystreet.net.
- The Society of Model & Experimental Engineers
  U.K., www.sm-ee.co.uk/
- Southern California Home Shop Machinists
  U.S.A., www.schsm.org
- Toronto Society of Model Engineers
  Canada www.tsme.ca

To add your club to this list, please send contact information by clicking on: www.modelenginebuilder.com/contactus.htm

Model Engineering Internet Resources

Click on these to explore the Web sites:

http://www.homemodelenginemachinist.com/
http://modelenginenews.org/
http://www.floridaame.org/
http://groups.yahoo.com/group/Min_Int_Comb_Eng
http://groups.yahoo.com/group/R_and_R_engines
http://www.practicalmachinist.com/
http://bbs.homeshopmachinist.net/
http://www.cnczone.com/
http://forums.americanmachinist.com/
http://www.machinistweb.com/forum/
http://www.chaski.com/homemachinist/
http://www.machinetools.com/us/forums
http://www.modeleng.org/
http://sites.google.com/site/kiwimodel engineering/home

Do you have more links? Send them to us via this link www.modelenginebuilder.com/contactus.htm.

Events

See Us At:

CABIN FEVER EXPO 2012

Model Engineering Show
& Auctions
SHOW: January 14th & 15th, 2012
Saturday: 9:00 AM - 5:00 PM
Sunday: 9:00 AM - 3:00 PM
Toyota Arena
York Fairgrounds & Expo Center
334 Carlisle Avenue
York, Pennsylvania 17404

NORTH AMERICAN MODEL ENGINEERING SOCIETY

23rd Annual Exposition
April 21 - 22, 2012
Yack Arena, Wyandotte, MI

Other Exhibitions

MODEL ENGINEERING EXHIBITION

9, 10 and 11 December 2011
Sandown Park Racecourse, UK

LONDON MODEL ENGINEERING EXHIBITION

Friday 20 January 2012 to Sunday 22 January 2012
Great Hall, Alexandra Palace, Alexandra Palace Way, London, N22 7AY
Opening Times
10.00am - 5.30pm Friday and Saturday
10.00am - 4.00pm Sunday

NATIONAL MODEL ENGINEERING AND MODELLING

13, 14 & 15 May, 2012
Great Yorkshire Showground, Harrogate, UK

Do you have an upcoming event? Send information to us at this link:
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