

Newsletter # 2

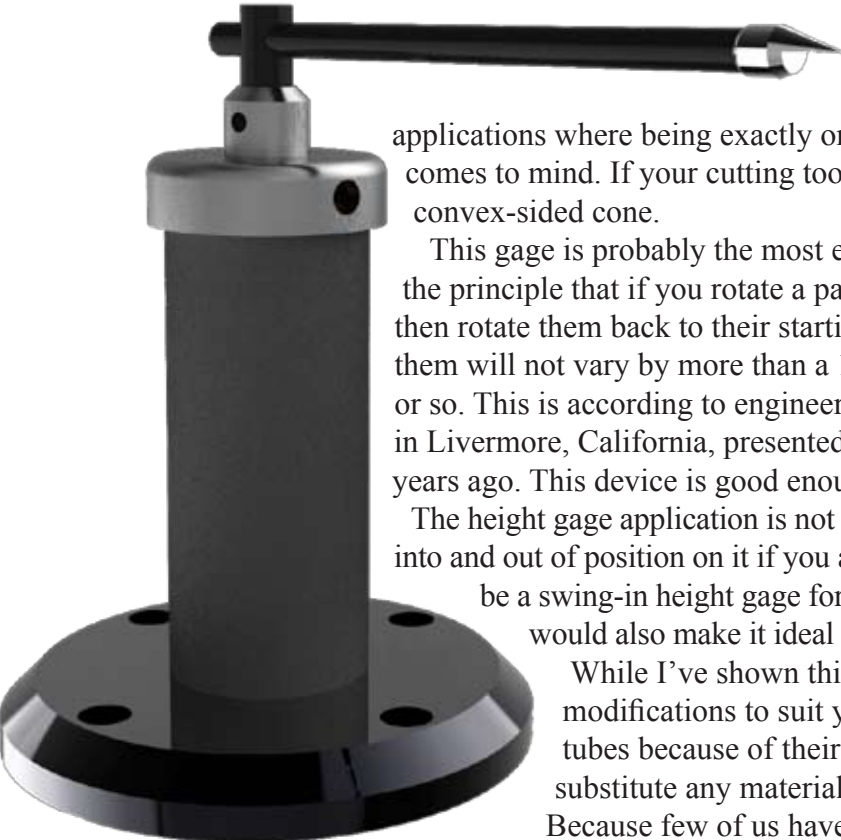
Welcome to another *Model Engine Builder* Newsletter

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- **Tips or Mini-Articles** — Quick (usually) and easy (usually) ways to solve Model Engineering problems.
- **Events** — Send us your Event information and we'll add it to the list. Click on the Contact MEB link on page 4
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Lathe Center Height Gage

Article & Drawings by Mike Rehmus



Most of us can judge the height of a lathe cutting tool reasonably well. But there are times and applications where being exactly on center is important. Forming male and female tapers comes to mind. If your cutting tool is not exactly on center, you will form a concave- or convex-sided cone.

This gage is probably the most exacting device you can build for your lathe. It works on the principle that if you rotate a pair of pre-loaded ball bearings less than a full circle and then rotate them back to their starting location, the vertical position of a shaft attached to them will not vary by more than a 10 millionths of an inch (0.0000001") (0.00000254mm) or so. This is according to engineers at the Lawrence Livermore U.S. National Laboratory in Livermore, California, presented in a machinist training satellite broadcast about 20 years ago. This device is good enough for almost any purpose.

The height gage application is not the only use for this device. A dial indicator can be swung into and out of position on it if you are measuring position on a lathe or mill, etc. It can also be a swing-in height gage for CNC milling cutters—just flip the tip 180 degrees which would also make it ideal for trammig a mill with an arm in the spindle.

While I've shown this in the height gage application, you can make modifications to suit your use. Where possible, I've made use of carbon fiber tubes because of their almost unbelievable stiffness and light weight. You can substitute any material you wish.

Because few of us have exactly the same layout for our lathes, you may find yourself needing to alter dimensions and even the design to make the gage fit your application. Change anything you wish as long as you retain the dual ball bearings under a slight preload. Do not place them in a high preload as their lifetime may be shortened and it is always easy to Brinnel them (fancy word for making dents in the bearing races).

It is relatively easy to set this gage to height. Obviously the base has to mount on a surface that will maintain its exact relationship with the lathe or it will be rendered useless. You could mount it on the lathe or just set it on the lathe bed if you wish. Clearly, it has to be consistently placed in exactly the same position in order to function properly.

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Materials

Construction is simple. Except for the carbon fiber tubes, everything can be found in your scrap bin or reasonably obtainable from a metal supply company. You can freely substitute metals although I picked what I think is the most appropriate choices for a long and trouble-free life. The bearings should be sealed because dirt would cause them to not repeat their positioning with the accuracies we wish.

There are many suppliers of bearings, metal and carbon fiber tubing. I had a suggestion from one reviewer that archery clubs may be a source of used but still useful carbon fiber shafts.

Construction

Body

I would make the body of the gage from similar steel alloys and press fit, weld or bond the Body Tube and Body Base to each other. Then place the tube in your lathe and face the bottom of the Body Base to insure it is at right angles to the axis of the Body Tube.

Note that this assumes you are using a tube for the Body Tube with an internal bore that is parallel to the outside diameter. They don't need to be concentric although that is a real plus. But if their axis are not at least parallel if not in perfect alignment as well, you may have some problems in assembling the parts with accuracy.

Axle

The Axle can be made from two parts as long as you face the top rim of the bottom disk. The top rim needs to be at right angles to the longitudinal axis of the Axle in order to properly preload the bearing. The rim diameter should not extend beyond the inner race (ring) of the bearing so you should change the given dimension to match the Bearings you will use.

Height Adjust Tube

You may want to make this tube from aluminum if you are wary of cutting a hole in carbon fibre tubing. However sharp tools (which will dull a bit on this cut) will allow you to do an OK job. An alternate to boring a hole in the carbon fiber would be to make an aluminum cap for this tube with a hole in it for the Cross Tube.

Cross Tube

Until you test it yourself you may not believe how stiff a 1/4" carbon fiber tube can be. I have a 36" length of this material that I cannot deflect by grabbing the ends with my hands and trying to bend it.

Use whatever length you needed to bridge between the location of the gage and the center of the lathe. Bond the Cross Tube to the Height Adjust Tube with an epoxy so that the tube with the Tip in place, is exactly where you want it to be.

Cutting Carbon Fiber Tubing

An Internet search will give you plenty of suggestions for cutting carbon fiber tubing. The best suggestion seems to be using the diamond cut-off wheel that can be purchased from rotary tool suppliers. I suspect for the occasional user, any abrasive cut-off wheel would work. You might want to wrap a bit of tape around the circumference of the tube where you will cut it. This allows you to make a more visible cutting mark and might prevent any slight splintering at the tube surface.

Carbon Fiber Safety

The Material Safety Data Sheets I've read (finding them through an Internet search) suggests that there are no real safety hazards in working with Carbon Fiber. However, reasonable precautions would be to wear a breathing dust mask while cutting this material and perhaps vacuuming the resultant dust away just to avoid the spread of carbon dust. Or cut it outside with a breeze blowing any possible dust away from you (and the house/shop). As always, you are solely responsible for your own safety



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Bearings

The Bearings should be of reasonably good quality and have a very smooth feel as you rotate the inner race (ring). If you feel any roughness, this disqualifies the bearing from this application. The Bearing should also be free from rust or any coating or other 'stuff.' Metric bearings work too, just make the appropriate adjustments.

Height Adjust Collar

This collar is used to hold the vertical position of the gage to match the true spindle centerline of the lathe. Once the collar's set screws are tightened (not too tight, they are bearing on carbon fiber), I suggest the Inner Vertical Tube be permanently epoxied into the Axle. However, you may want to make the gage into a more adaptable tool and not permanently bond the Height Adjust Tube to the Axle. In this case, I recommend altering the Height Adjust Collar into a split clamp so you don't have set screws constantly be bearing on the carbon fiber tube.

Bearing Spacer

The Bearing Spacer ends must be parallel so the Bearings are properly supported, allowing a good preload around their circumference.

Cap

The cap has multiple functions, the major use is to create the preload for the two bearings. Secondly it provides some protection from swarf and dirt falling onto the top of a bearing. When you adjust it to create the Bearing preload, use the setscrew to prevent it from moving on the Axle and changing the preload.

Tip

If you are going to use the Tip where it will contact hard cutting tools, it should be made from a hard material. Hardened Drill Rod seems appropriate for this task. You may wish to change the shape or even the function to fit your application. You could even mount the Tip to the Cross Tube using a small set of pre loaded ball bearings so that you could flip it upside down and use it to set tools that are cutting from the backside of the work.

Assembly

Assemble the Bearings, Axle and Bearing Spacer and slide them into the Body Tube to check that everything fits. If it does, slide the assembly partially out of the Body Tube and apply epoxy or Loctite® to the Bearing Space, and slide the assembly back into the Body Tube. The top of the top Bearings should be flush with the upper end of the Body Tube. When the bonding agent is cured, you can screw the Cap onto the Axle and run it down until it just touches the top of the upper Bearing. Now turn it a bit further to preload the bearings. I would think that a turn of less than 5 degrees beyond just touching will set the preload appropriately. The Axle should turn with no vertical or side-to-side play. You may want to use a dial indicator to check the vertical motion (or hopefully the lack thereof). Assuming it has no detectable movement, the most delicate part of the assembly process is finished.

Now tighten the set screw against the Axle. If you are concerned about distorting the threads on the Axle with the setscrew, slide a bit of brass or copper in the setscrew bore before you insert and tighten the setscrew.

Slide the Height Adjust Tube into the Axle, slide the Collar over it, insert the Cross Tube into the Height Adjust Tube. Bond the Tip to the Cross Tube with your favorite compound. *Note that we have not yet bonded the Cross Tube to the Height Adjust Tube.*

Calibration

First the area where you are going to mount the gage must be selected, prepared and end up flat and clean. Drill and deburr the mounting holes and bolt the Gage to the surface. Then adjust the height tube until the Tip can make contact with a clean section of the lathe bed. Then you can bond the Cross Tube to the Height Adjust Tube as this will assure that the Tip's flat underside is parallel to the lathe's ways.

When that bonding agent is cured, you can now set the gage height by sliding the Height Adjust Tube up until the flat bottom of the Tip is exactly aligned with a center in the lathe spindle. Use a magnifying glass to insure this is correct. The clamp the Collar to the Height Adjust Tube and you are finished with adjusting the gage. The final step is to slide the Height Adjust Tube up until you can spread epoxy on its OD and slide it back down into the Axle. Double check the Tip's alignment with the center in the spindle. If it is still OK, relax until the epoxy is cured.

Modifications

There are a number of changes you could make to the gage:

- The Cross Tube could be clamped to the Height Adjust Tube instead of using a bonding agent.
- If you clamp the tubes instead of bonding them you might consider split-clamps to minimize part movement as you tighten the clamps.
- The Tip could be made replaceable
- You could devise a magnetic base or adapt the magnetic base from a dial indicator stand.
- A three-point leveling arrangement using screws threaded into the base
- Dual-ended Cross Tube for many uses including height indication from cutting tools used in front of the workpiece in the lathe and cutting tools used behind the workpiece in the lathe (rear cutoff tool for example).
- Rotational stops to exactly position it at the same point every time.
- Spacer under the gage to modify it for use on multiple machines.

You can no doubt think of many other modifications. Go ahead, it is your tool.



Drawings are on pages 5 & 6

Material Safety Data Sheets

There are MSDS for almost any chemical or material you can think of readily available on the Internet. Just perform a search with your favorite search engine for the subject, e.g., Carbon Fiber Material Safety Data Sheets will bring you a large number of selections from which to choose.

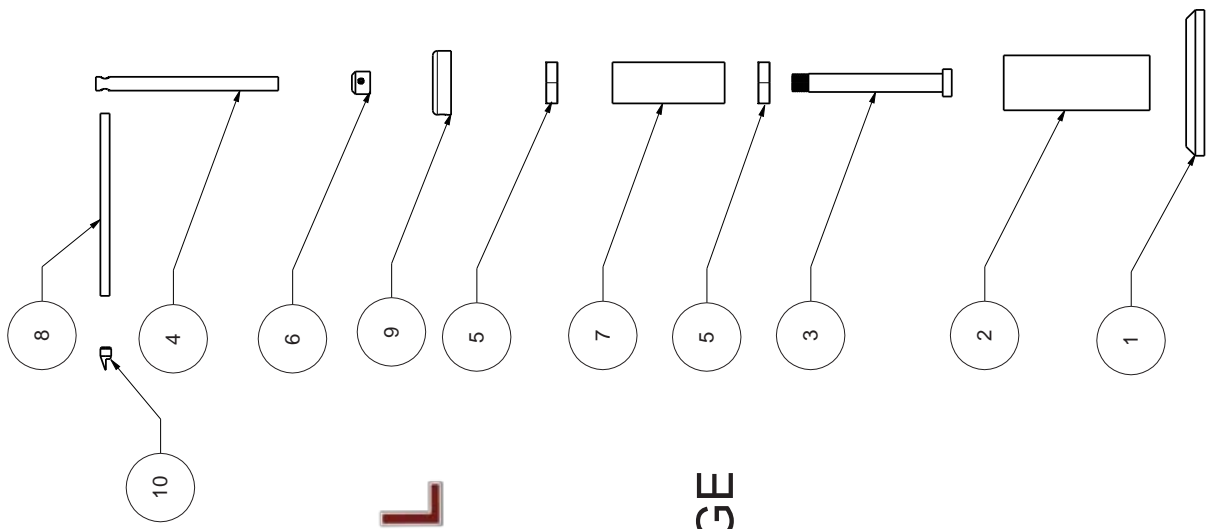
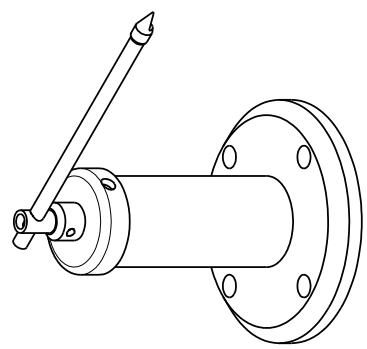
Editor's Note: We intend to evolve this newsletter to fit your expectations. So your feedback is of primary importance. You can do so by clicking on www.modelenginebuilder.com/contactus.htm to send us your message. Clicking on the above link will take you to a Contact MEB page on our Web site where you can type and send your message.

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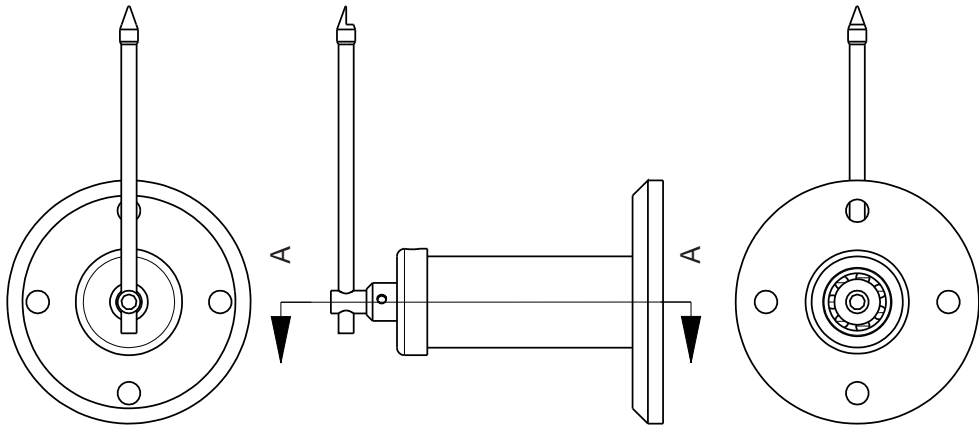
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Section A-A

LATHE CENTER HEIGHT TOOL GAGE



PART NUMBER	QUANTITY	PART NAME	MATERIAL
1	1	BODY FOOT	STEEL
2	1	BODY TUBE	STEEL
3	1	AXLE	STEEL
4	1	HEIGHT ADJUST TUBE	CARBON FIBER
5	2	BEARING 1.125 X .5 X .3125	STEEL
6	1	HEIGHT ADJUST COLLAR	ALUMINUM
7	1	BEARING SPACER	STEEL
8	1	CROSS TUBE	CARBON FIBER
9	1	CAP	ALUMINUM
10	1	TIP	DRILL ROD

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED
 METRIC 1 PLACE = ±0.3 2 PLACE = ±0.03 3 PLACE = ±0.005 4 PLACE = ±0.0005
 IMPERIAL 1 PLACE = ±0.01 2 PLACE = ±0.001 3 PLACE = ±0.0001 4 PLACE = ±0.00005

Do Not Scale
 Break or deburr edges unless otherwise specified

Drawn By
 Mike Rehmus

Designed by
 Mike Rehmus

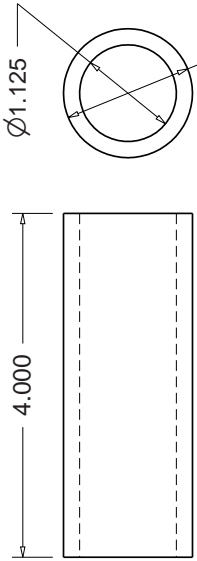
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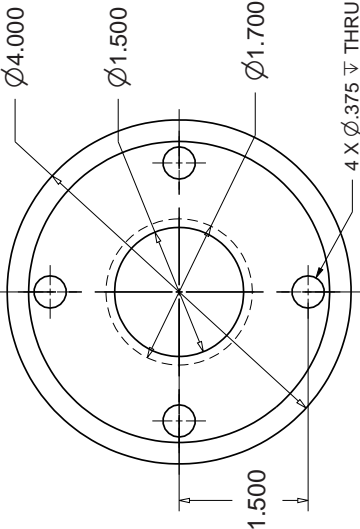
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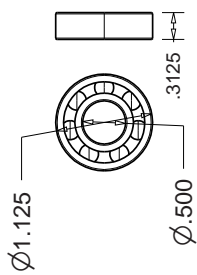
1-BODY TUBE
MILD STEEL, 1 REQ'D
1/2-SCALE



2-BODY FOOT
MILD STEEL, 1 REQ'D
1/2-SCALE

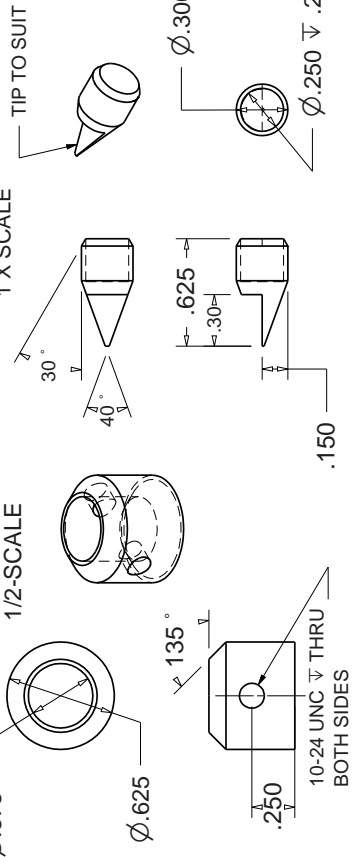


5-BEARING
SHIELDED, 2 REQ'D
1/2-SCALE

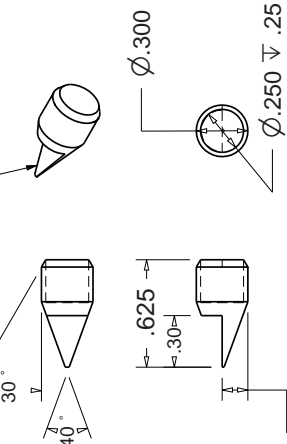


FREELY SUBSTITUTE METRIC BEARINGS IN THIS APPLICATION

6-HEIGHT ADJUST COLLAR
ALUMINUM, 1 REQ'D
1/2-SCALE



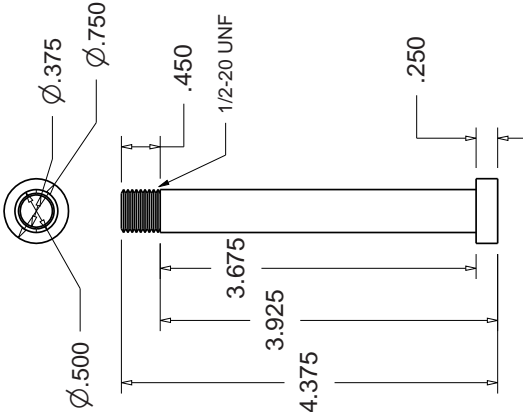
10-TIP
DRILL ROD, 1 REQ'D
1 X SCALE



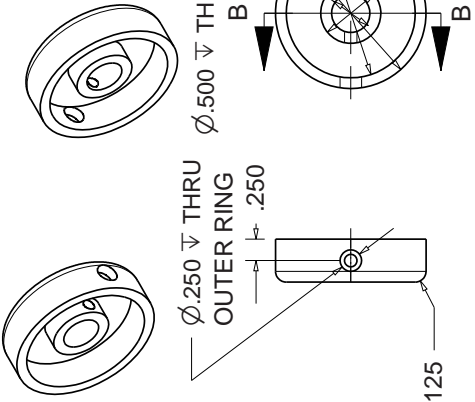
CHAMFER .1 TO ALLOW A SINGLE-BEVEL WELD BEAD BETWEEN FOOT AND BODY TUBE. NOT REQUIRED IF BRAZING JOINT



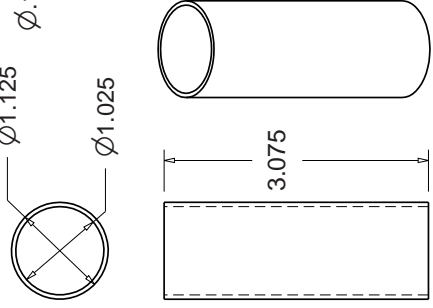
3-AXLE
MILD STEEL, 1 REQ'D
1/2-SCALE



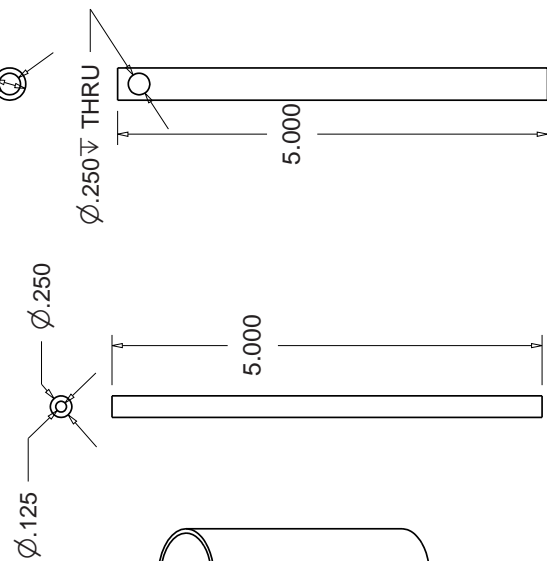
9-CAP
MILD STEEL OR ALUMINUM, 1 REQ'D
1/2-SCALE



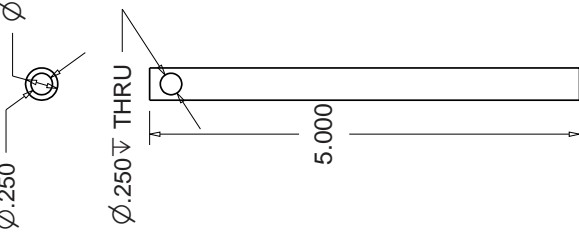
7-BEARING SPACER
MILD STEEL, 1 REQ'D
1/2-SCALE



8-CROSS TUBE
CARBON FIBER, 1 REQ'D
1/2-SCALE



4-HEIGHT ADJUST TUBE
CARBON FIBER, 1 REQ'D
1/2-SCALE



DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED

METRIC	IMPERIAL
1 PLACE ±0.3	2 PLACE ±0.01
2 PLACE ±0.03	3 PLACE ±0.001
3 PLACE ±0.005	4 PLACE ±0.0005

Do Not Scale
Break or de-burr edges unless otherwise specified

Drawn By
Mike Rehms

Designed by
Mike Rehms

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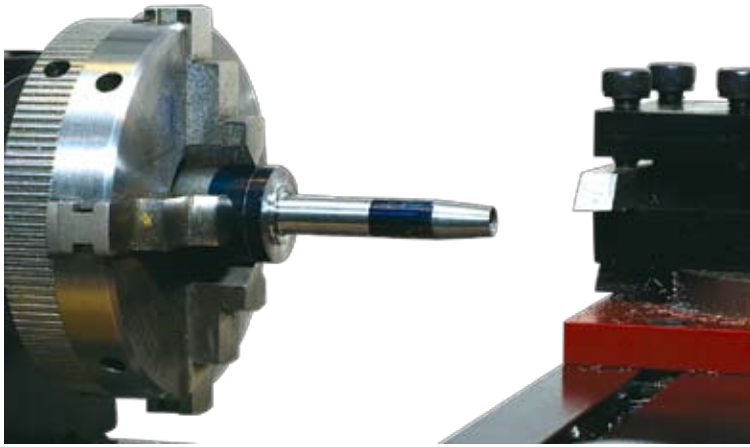
Section B-B



ANGLE PROJ.

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Judging the length of a taper



How long do you make an external (male) taper to fit into a corresponding internal taper like a tailstock ram? And once you know how long you want it to be, how do you know how to stop cutting when you should?

Dykem® is one answer. Paint your workpiece with Dykem from its outboard end (end towards the tailstock) and further up the workpiece than the point the taper should stop. Another method is to run a line down the work with a Magic Marker permanent marking felt pen

Now lightly scribe a line around the workpiece at the point where the taper should end.

As you cut the taper, just keep an eye on that scribed line and when a cut just removes the last of the Dykem or marked line up to that scribed line, quit cutting. This is a fairly simple method and accurate enough for most purposes. This example picture happens to be a crankshaft which I am machining on a Sherline lathe. This is for *Humbug*, a model airplane engine I am

Model Engineering Clubs

- Bay Area Engine Modelers
U.S.A., San Francisco www.baemclub.com
- Bournemouth & District Society of Model Engineers
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

building for a series of beginner's Build Articles in *Model Engine Builder* magazine. The taper is on the nose of the crankshaft and engages the Propeller Driver.

Humbug

Designed
by Ron Chernich
Build Article
by Mike Rehmus

Part 1



The Sherline compound slide is operated from the rear of the workpiece and the cutting tool is held upside down. This makes cutting a taper very easy as there is no tendency to chatter or otherwise misbehave when cutting metal.

Thanks to Dwight Giles for this tip.



Auction of Garland Jobe's Model Engines

Visit <http://www.rogersauction.com/Estate-of-the-Late-Garland-Jobe-a161218.php>
Date is October 1, 2011, on-line bidding
Greensborough, North Carolina

If you are interested in
Model Engine Builder magazine,
Please visit our Web site
www.modelenginebuilder.com
Great articles, big drawings on separate
sheets of 11 x 17 inch paper
All back issues are available

Model Engine Builder™

Model Engineering Internet Resources

Click on these to explore the Web sites:

<http://www.homemodelenginemachinist.com/>
<http://modelengineneeds.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/>

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

Events

See Us At:

WEME

Has moved to the Agricultural Pavilion at the GoodGuys 25th West Coast Nationals
NEW DATE-Aug. 26 - Aug. 28, 2011
Alameda County Fairgrounds
Pleasanton, CA
www.wemeshow.com

GEARS

September 24 & 25, 2011
Kliever Armory
10000 N.E 33rd Drive
Portland, Oregon
www.oregongears.org

Other Events

Western Minnesota Stream Threshers Reunion

September 2-5, 2011
<http://www.rollag.com/index.php>

Blackhills Model Engineering Show

September 17 & 18, 2011
Rapid City, South Dakota
<http://www.blackhillsmodeleengineeringshow.net/>

Estevan Model Engineering Show

October 15 & 16, 2011
Wylie Mitchell Building
Estevan Fairgrounds.
Estevan, Saskatchewan, Canada
<http://www.estevanmodeleengineeringshow.com/>

MidEast Model Engineering Expo

October 21 & 22, 2011
Muskingum County Fairgrounds
1300 Pershing Road
Zanesville, OH 43701
<http://deboltmachine.com/id13.html>

Alberta Metal Enthusiast Network

Humpty's Family Restaurant
4503 Gateway Blvd.
Edmonton, Alberta, Canada
Sept. 17, 2011 1 to about 4:00 pm
hbjacob@telus.net



Machinist's hand tools do not come with operating instructions. This video will provide that training.

Learn to set up and operate the Sherline Lathe

By Mike Rehmus, Editor of *Model Engine Builder* magazine

A ByVideo Production

Purchase them directly from:

LittleMachineShop 396 W. Washington Blvd. #500 Pasadena, CA 91103 USA 1 - 800 - 981-9863 1 - 626 - 797-7850 www.littlemachineshop.com	Sherline Products, Inc. 3235 Executive Ridge Vista, California 92081-8527, USA 1-760-727-5857 1-800-541-0735 www.SherlineDirect.com
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Model Engine Builder™

WEME

5th Annual
Exhibition

Lou
& June
Chenot

Hear it
Run



Lou Chenot's
1932 SJ Duesenberg in 1/6th scale

At the
25th
GOODGUYS
West Coast
Nationals
in
Pleasanton,
CA
August 26-28

Jim Moyer's
1/6th scale
Corvette Small-Block



Clen Tomlinson's
1/8th scale Napier Dellic
Photograph courtesy of Sherline Products

The Western Engine and Model Exhibition (WEME)
is brought to you by the Bay Area Engine Modelers
For more information go to www.wemeshow.com

11TH Annual

Black Hills Model Engineering Show

September 17 & 18th

Pennington County Fairgrounds

Fine Arts Building

Rapid City, South Dakota

Open 9AM to 5PM Saturday

&

9AM to 3:30 PM Sunday

Contact: Clif Roemmich

P.O. Box 45

Piedmont, SD 57769

Phone: 605 716-4647

E-mail: modelbuff@rushmore.com



Model Engine Builder™



MODEL SHOW

**EMMANUEL EPISCOPAL CHURCH &
CHICAGO MODEL ENGINEERS ASSOCIATION**
cordially invite you, your children, and your friends
to a showing of operating scale models

See the fine workmanship of Association members who derive pleasure from building working models of prime movers from early industrial development to the present day. Chicago Model Engineers Association members are dedicated to mentoring and encouraging people in model building and design.

Saturday, September 24, 2011

10:00 am – 4:00 pm

Emmanuel Episcopal Church

203 S. Kensington Ave.

La Grange, IL 60525

(Entrance on Catherine St., 4 blocks S. of Metra tracks and 3 blocks W. of La Grange Rd.)

- Steam engines and tractors
- Internal combustion engines
- Electro-magnetic engines
- Hot air (Stirling) engines
- Elliptical (Coomber) engines
- Atmospheric engines
- CO₂ powered engines
- Machinery
- Carousels
- Airplanes & aircraft engines
- Helicopters
- Boats

DOOR PRIZE

A drawing for a radio-controlled gyrocopter will be held near the end of the show. Winner need not be present, but will need to pick up the prize at the church office sometime after the show.

For safety reasons, steam engines will be operated on compressed air.

Children are welcome; however, those under 12 years of age must be accompanied by a responsible adult. During this showing, docents from Emmanuel Episcopal Church will be available to conduct tours of the church to view the magnificent stained glass windows and wood carvings.

FREE ADMISSION & REFRESHMENTS

We look forward to seeing and welcoming you at our show!

Model Engine Builder™

8th Annual:

September 24 and 25, 2011

GEARS Model Engineering Show



- ▶ Exhibition of old world craftsmanship from Home Machine Shops
- ▶ Working models of **aircraft**, **automotive**, **steam**, and **hot-air** engines
- ▶ Tools, machinery, farm equipment, locomotives, and more.
- ▶ Foundry metal casting demo
- ▶ New and used tools, books and equipment sales

Quilt Display

Daily Admission: \$9 adults, 12 and under FREE! (With adult)



Times: Saturday: 9 - 5 Sunday: 9 - 3 Ticket sales stop 1 hour before closing.

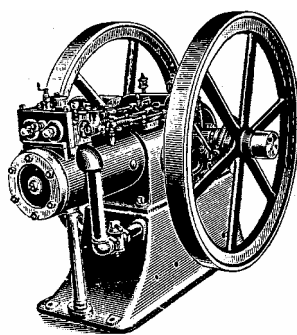
Location: Kliever Armory 10000 NE 33rd Drive, Portland, OR

Mailing Address: GEARs PO Box 1212 Tualatin, OR 97062

WWW.OREGONGEARS.ORG

** 24th Annual **

ESTEVAN MODEL ENGINEERING SHOW



October 15 & 16, 2011

Saturday 9-4 & Sunday 11-4

Wylie Mitchell Building, Estevan Fairgrounds
Estevan, Saskatchewan

Contact Kelly @ (306) 634-3214 or E-mail emes@sasktel.net
www.estevanmodelengineeringshow.com



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"If it wasn't for us, the fast lane would rust"



Fourth Annual Mid-East Ohio Model Engineering Expo!

Saturday, October 22, 2011 • 9 a.m. to 6 p.m.

**Muskingum County Fairgrounds
1300 Pershing Road • Zanesville, Ohio**

**Fully
operational
Models!**



Aircraft Engines
Automobile Engines
Farm Machinery
Miniature Guns
Motorcycles
Stationary Engines



Vendors/Exhibitors

- ◆ Set-up Friday, October 21, 9 a.m.-7 p.m. (No exhibitor/vendor will be admitted prior to 9 a.m.) Electric included with booth fee.
- ◆ Register (check-in) first, then coordinate unloading. You will receive a registration packet along with admission pins for each person in your party.
- ◆ All exhibitors, vendors, and visitors must be members of the Mid-East Model Engineering Expo Association. Insurance requires this membership, which is included in the \$8.00 per person admission fee.
- ◆ No compressed air will be available.
- ◆ Vendors contact us for vendor contracts and pricing.

Model Enthusiasts/Vendors/Exhibitors

- ◆ General admission \$8.00 per person (children 11 and under free).
- ◆ **Free Parking**, RV parking **Free** without hookup
- ◆ Convenient location to local hotels and restaurants
- ◆ Precision machined gasoline and sterling cycle engines
- ◆ Fully operational models, miniature machine tools and supplies

For further information contact:

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