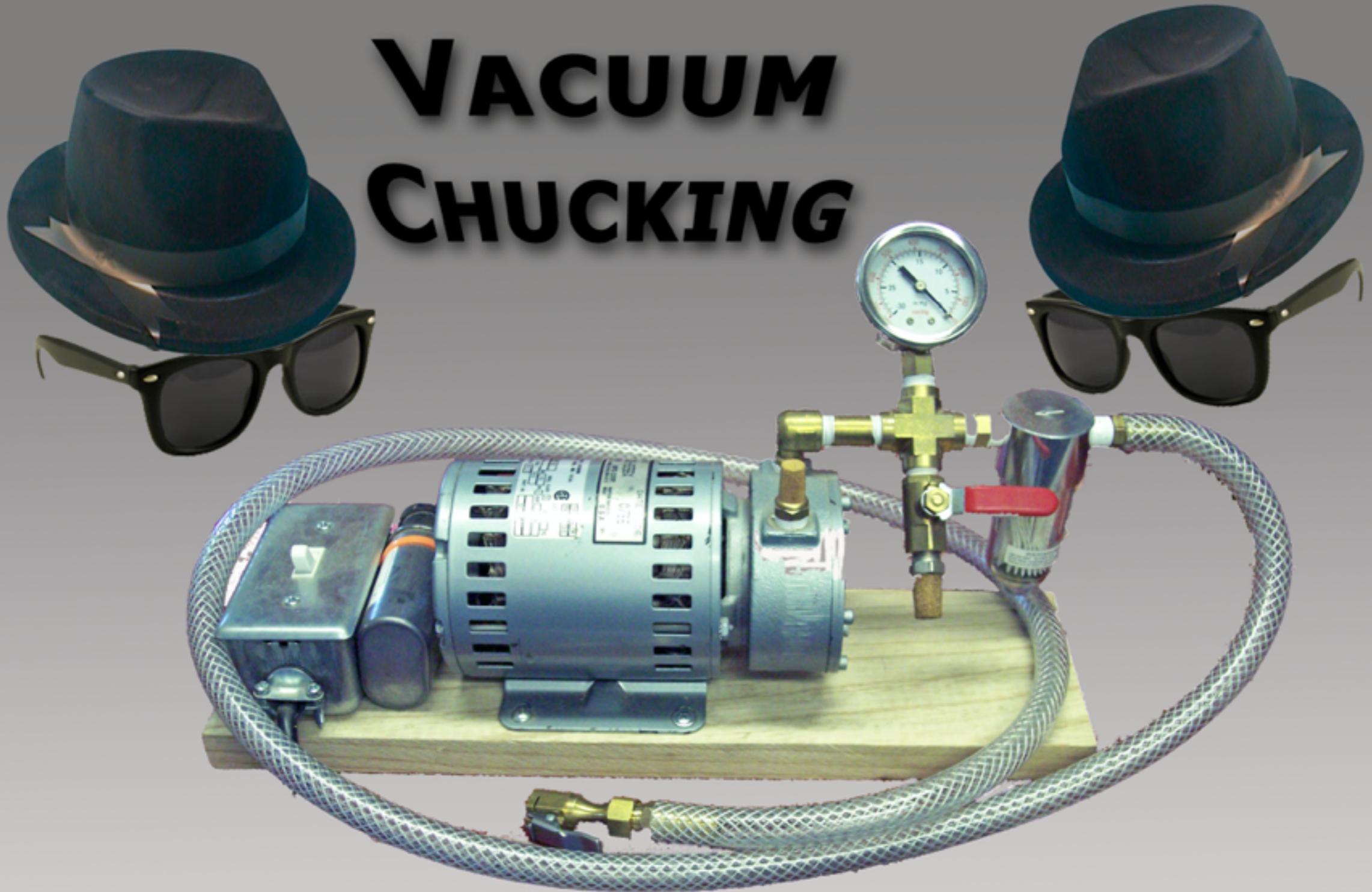


# **VACUUM CHUCKING**



***The Bruised Brothers***

**John Solberg & Peter Tkacs**

# Disclaimers

- We are not experts....We have done the research and put together a few systems and finished many bowl bottoms
- We are open to any suggestions, comments, or questions (write them on the back of a \$20.00 bill and submit them)
- We don't have all the answers: But these systems work for us and are much cheaper!

# Cautions!!

## While turning under vacuum

- Don't turn through your work
- A severe catch while turning can cause a serious problem
- Soft or punque wood may not hold vacuum pressure
- Thin walls can collapse under vacuum pressure
- Porous wood grain can allow air to be drawn in (Oak) reducing the amount of vacuum
- A power disruption of the vacuum pump while lathe is running is dangerous - or turning the pump off before stopping the lathe (For additional info ask Peter!)
- Turn at a lower than normal speed

# Vacuum Chuck Systems Built

- Jet Mini
- Jet 1642
- Delta Midi
- Powermatic 3520A
- Powermatic 3520B
- Powermatic 4224

# Vacuum Systems Currently Available From Retail Outlets

Gast Vacuum Pump	\$375.00 to \$445.00
Vacuum Rotary Adapter	\$55.00 to \$100.00
Gauge Kit	\$85.00 to \$100.00
3 1/2" Vacuum Cylinders (Aluminum)	\$70.00 to \$75.00
<b>Total</b>	<b><u>\$580.00</u> to <u>\$720.00</u></b>

Plus the addition of hoses, fittings and filters

# The Bruised Brothers System

• Vacuum Pump (Used Estimate)	\$75	to	\$125
• Lamp Rod	\$5	to	\$10
• Bearing x 2	\$10	to	\$15
• Vacuum Gauge	\$15	to	\$20
• Vacuum Valves (2 ea)	\$10	to	\$20
• Filter	\$15	to	\$20
• Vacuum Hose	\$5	to	\$10
• Miscellaneous Hardware	\$25	to	\$40
<b>Total</b>	<b><u>\$160</u></b>	<b>to</b>	<b><u>\$260</u></b>

# Types of Vacuum Pumps

- Diaphragm Pumps
- Piston Pumps
- Rotary Vane pumps
- Oil bath Pumps
- Refrigerant Pumps
- Venturi pumps
- Vacuum Cleaners

# Diaphragm Pumps

- Ideal for Some Vacuum Systems
- Often used in Vacuum Clamping
- Fairly low CFM Rating - 1 to 3 CFM Typical
- Very Reliable
- Can be purchased used and are relatively inexpensive



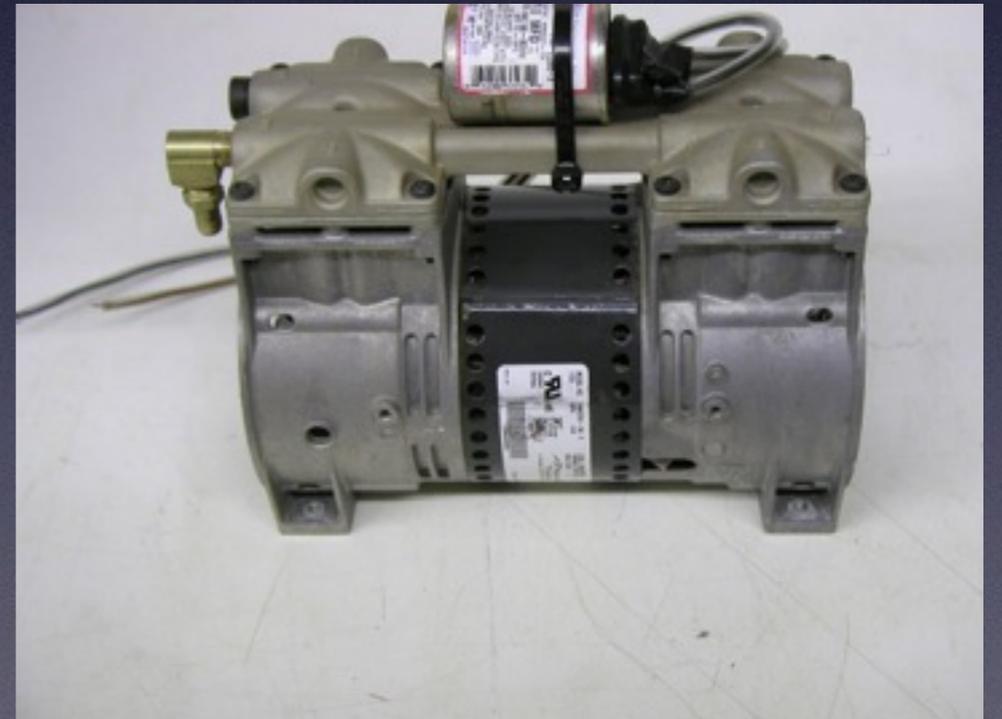
# Diaphragm Pump

1.9 CFM



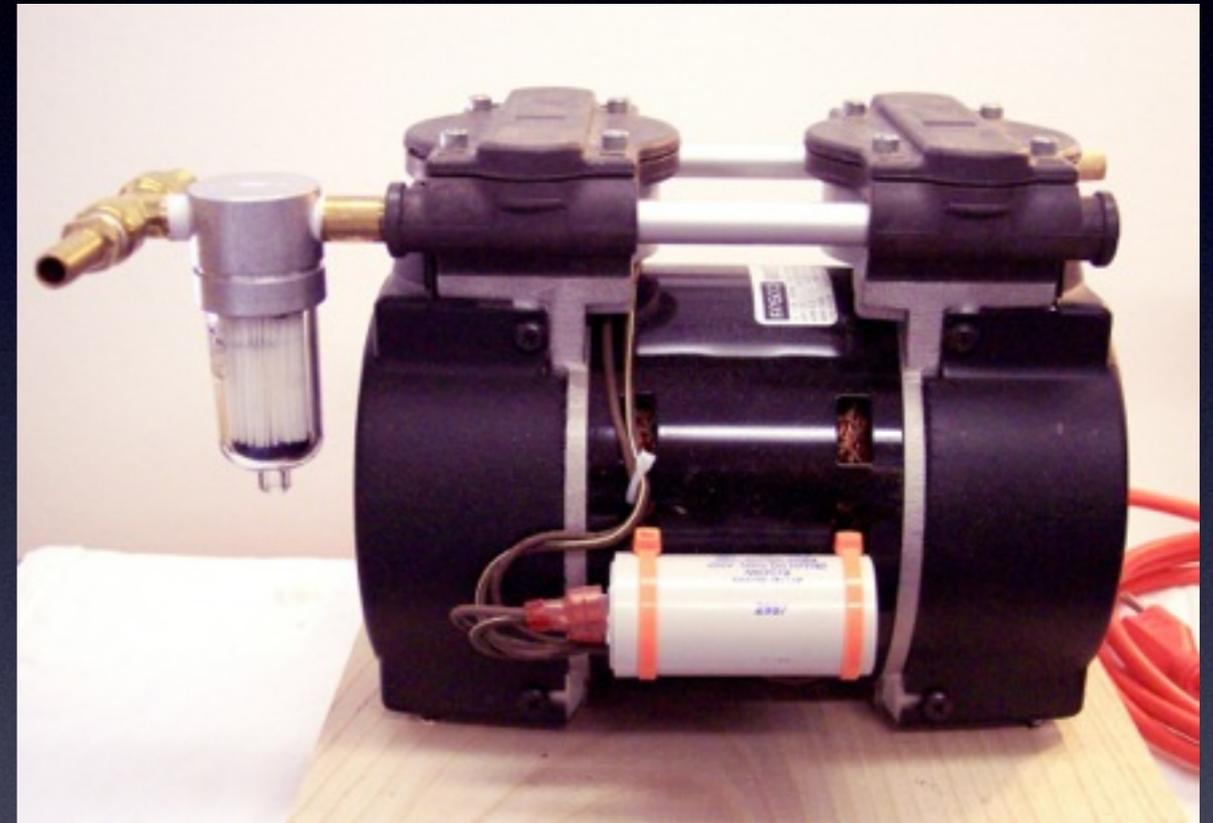
# Piston Pump

- Not as quiet as a Diaphragm Pump
- Common in Vacuum Clamping
- Higher CFM output - 2 to 5 CFM Typical
- Higher CFM good for woodturning



# Piston Pumps

5.5 CFM @ 25" Hg



1.75 CFM @ 29" Hg

# Rotary Vane Pumps

- Very Common - Found in most woodturning catalogs
- Generally maintenance free
- Good CFM Rating - 2 to 10 Typical
- Long life
- Tend to get hot with extended usage
- Very often used in woodturning



# Rotary Vane pumps

2.6 CFM @ 25" Hg



4.5 CFM @ 25" Hg  
220 Volt

# Oil Bath Pumps

- Used by the air conditioning industry
- Good CFM range - 2 to 6 CFM Typical
- Designed to pull moisture out of AC units
- Need to keep lubricated with fresh oil



# Refrigerator Pumps

- Very Quiet
- Very low CFM - Typically less than 1 CFM
- Large and Bulky
- Hard to make connections
- Watch for Freon in the system
- Not recommended for woodturning



# Venturi Pumps

- Some are very low cost
- Needs a large compressor to operate
- Compressor must supply 4.5 CFM @ 90 psi
- Not portable because of the compressor
- Reliability relies on the compressor



# Vacuum Cleaner as a Pump

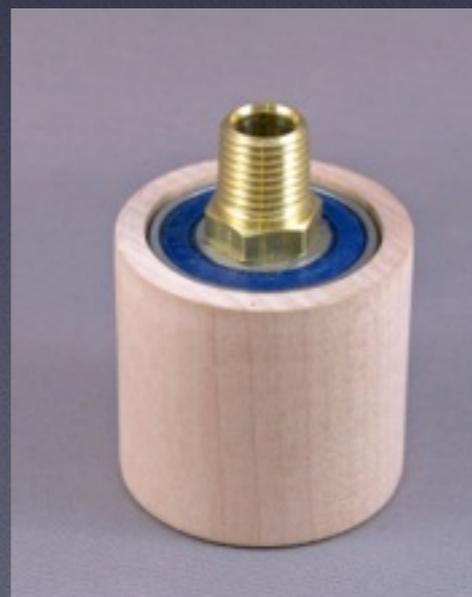
- Not Recommended
- Designed to run with air flow through them
- Expensive to replace
- High CFM but low Vacuum Hg
- Only able to get 6 - 7 Hg
- Hard to adapt to the lathe



# Build a Rotary Adapter

## Parts list

- Block of wood 2 1/2 x 2 1/2 x 4 approximately (or appropriate material)
- Two Bearings 1621-DS ( 2 bearings better than 1 )
- Brass Hose Barb - 1/2" Barb x 1/4"NPT
- Lamp Rod ( Length determined by lathe )

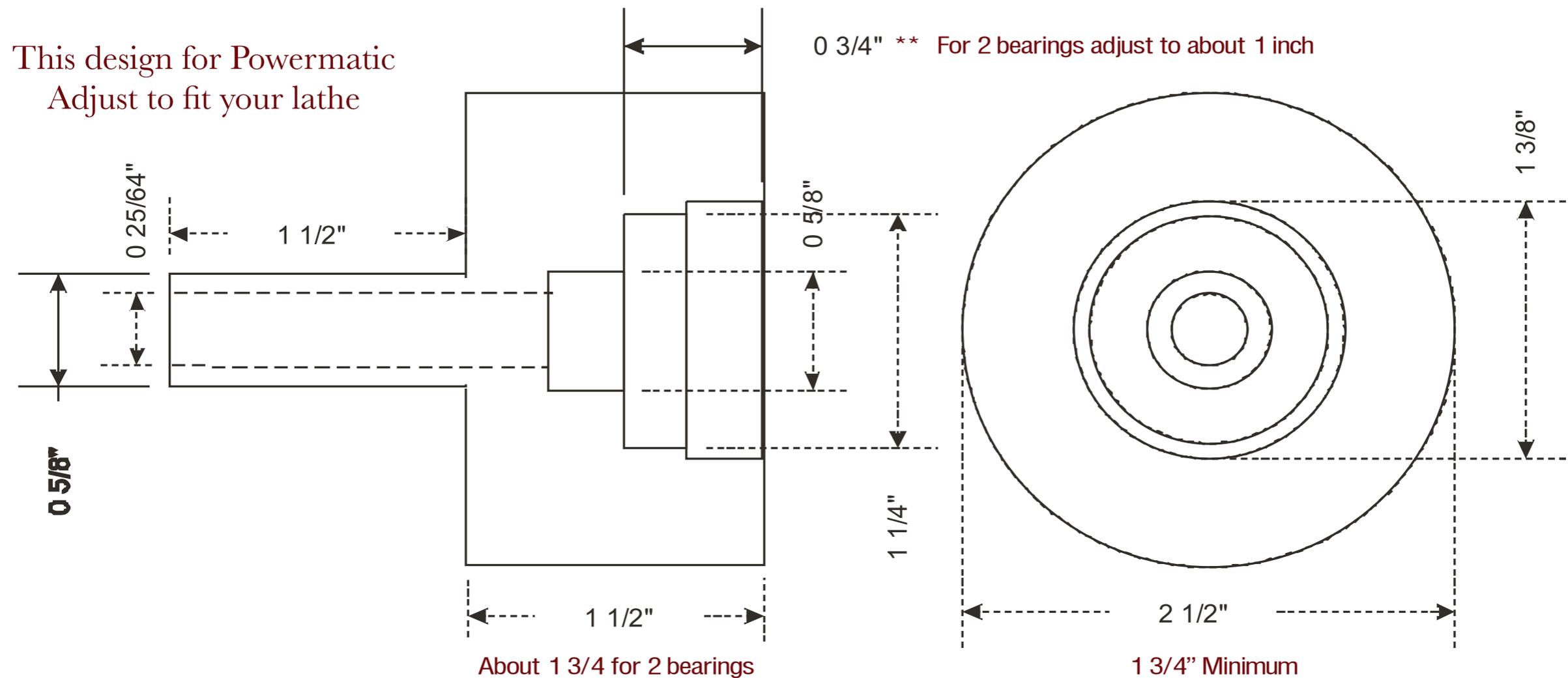


# Building a bearing adaptor

For a vacuum Chuck system

by

The Bruised Brothers



Material: Use good tight grain hard wood - (Maple)

Lock 2 nuts together on  
lamp rod and epoxy into  
adapter



Complete Bearing adapter  
with one bearing



#2 Morse Taper to fit  
head stock

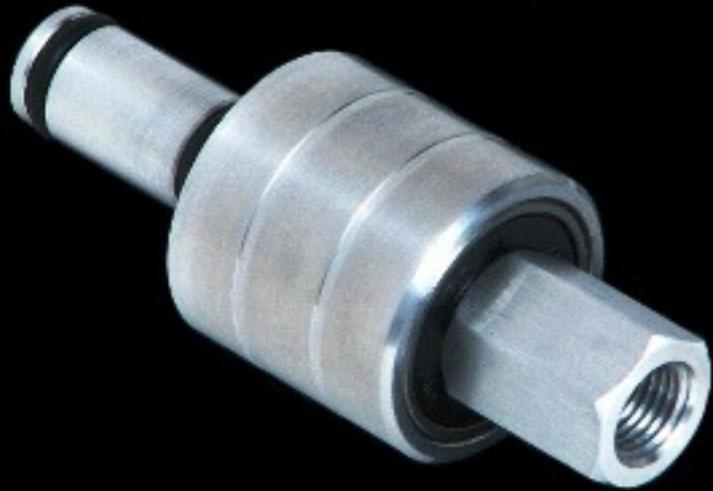


Headstock assembly with  
on/off valve





# Commercial Vacuum Adapter



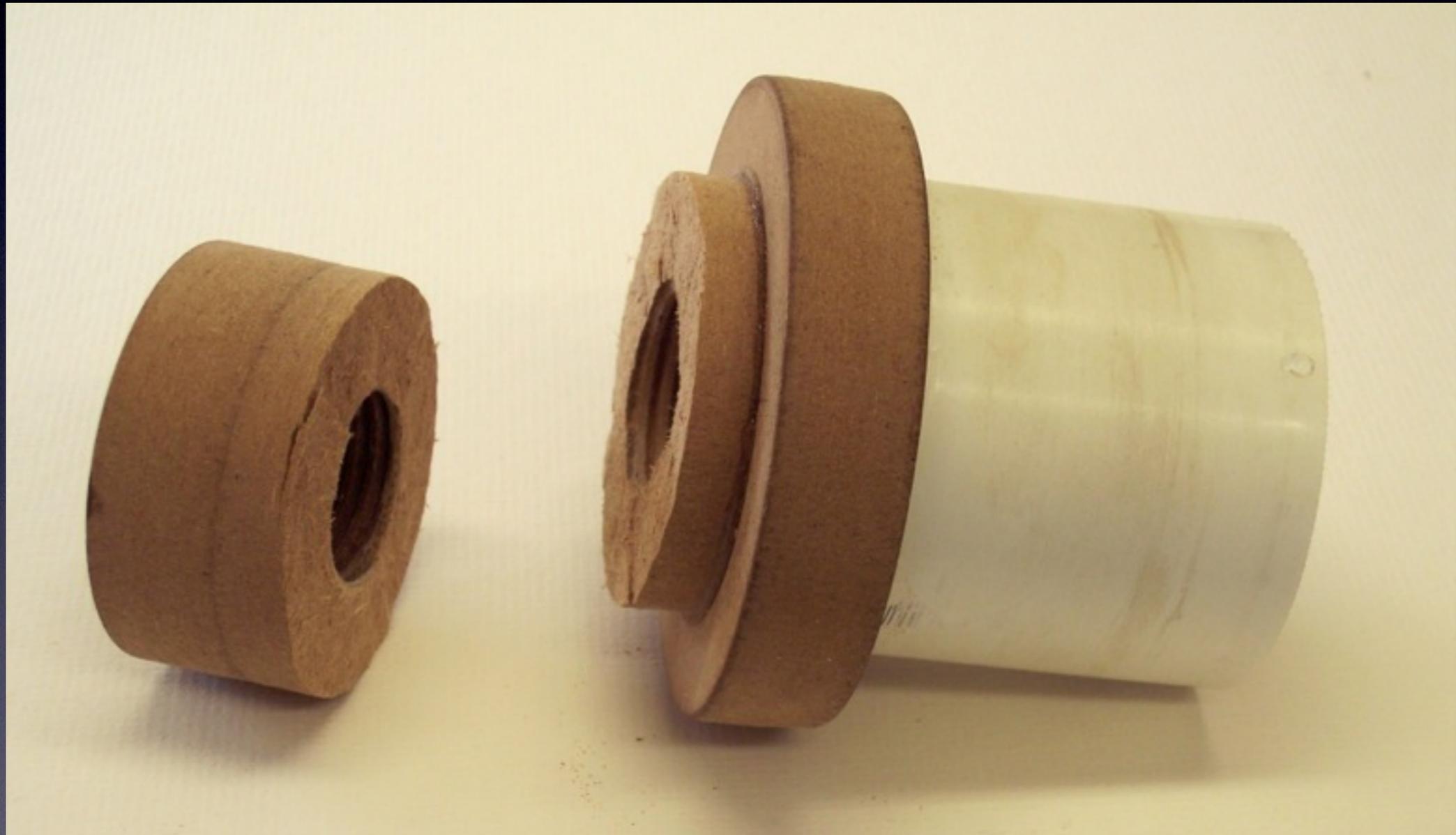
<http://www.jtturningtools.com>

# Easy to make PVC Chucks



# One thing we learned

Don't use MDF



## Vacuum Pressure Guide

Contact Diameter in inches	4	5	6	7	8	9	10	11	12	13	14	15	16
Vacuum HG	Pounds of Pressure												
2.5	15	24	35	47	62	78	96	117	139	163	189	217	247
5	31	48	69	94	123	156	193	233	278	326	378	434	494
7.5	46	72	104	142	185	234	289	350	416	489	567	651	740
10	62	96	139	189	247	312	386	467	555	652	756	868	987
12.5	77	121	174	236	309	390	482	583	694	815	945	1085	1234
15	93	145	208	283	370	469	578	700	833	978	1134	1302	1481
17.5	108	169	243	331	432	547	675	817	972	1141	1323	1518	1728
20	123	193	278	378	494	625	771	933	1111	1303	1512	1735	1974
22.5	139	217	312	425	555	703	868	1050	1249	1466	1701	1952	2221
25	154	241	347	472	617	781	964	1167	1388	1629	1890	2169	2468

## Vacuum Chuck Resources

- **American Woodturner** - Winter 1998; Page 32 to 35 - *Vacuum Chucks – A turning gizmo you can't afford to ignore.* Ken Keougham
- **American Woodturner** - Spring 1999; Page 28 to 31 - *Vacuum Chucks – An efficient tool without sucking up big bucks.* Ernie Showalter
- **American Woodturner** – Summer 1999; Page 26 to 27 – *Sealing the System – O-ring materials improve the vacuum.* John Hill
- **Woodturning Magazine** – No. 170 January 2007 Page 36 to 40 – *Vacuum Chuck on a budget.* Adrian Jacobs
- **Woodturning Magazine** – No. 171 February 2007 Page 36 to 40 – *Vacuum Chuck on a budget – wwwPart two.* Adrian Jacobs
- **Woodturning Design Magazine** – No. 7 Fall 2005 Page 29 to 35 – *Vacuum Chucking is the Way to Go... How to Create Your Own System at Low Cost.* King Heiple
- **A Guide to Work-Holding on the Lathe** – Fred Holder Page 90 to 97.
- [www.woodturners.org](http://www.woodturners.org) – *Building a Vacuum Chuck System for Woodturning.* William Nobel – March 2002
- [www.woodturningonline.com](http://www.woodturningonline.com) – *Making a Vacuum Chucking System on a Shoestring Budget – an Adventure.* Sy Plonski
- [www.woodturningonline.com](http://www.woodturningonline.com) – *Basics of Vacuum Chucks / Pumps* - Bill Hrnjak 1996
- [www.woodturns.com](http://www.woodturns.com) – *Setting up a Vacuum Chuck* – Rex Haslip
- [www.beaverpondstudio.com](http://www.beaverpondstudio.com) – *Vacuum Chuck* – Richard J. Pagano
- [www.wnywoodturners.com](http://www.wnywoodturners.com) - *Making a vacuum chuck – Part 1 & 2* – Kurt Hertzog
- [www.ovwg.org](http://www.ovwg.org) – *Vacuum Chucking – Part I & II – February 2004* - Bruce Gibson and Ralph Tedeschi
- [www.joewoodworker.com](http://www.joewoodworker.com) – *Vacuum Chucking – Lathe Projects with a Vacuum Press.*
- [www.gastmfg.com](http://www.gastmfg.com) – **Gast Manufacturing, Inc** – *Vacuum Pressure Systems Handbook*

