2nd Edition

LatheCity

Working Safely with Benchtop Systems IV

Tabletop Milling

Featuring Sherline & Grizzly Mills

by Uwe Burghaus

www.LatheCity.com

LatheCity
Safely Working with Benchtop Systems IV
Volume 4 – Tabletop Milling
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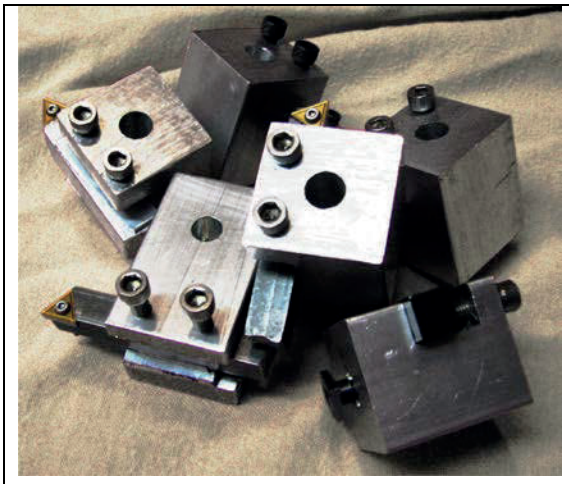
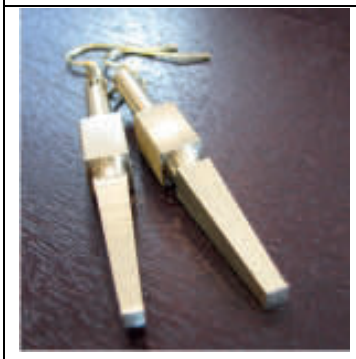
A few project images



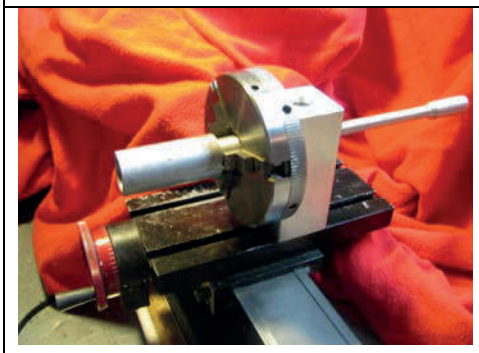
Tool posts

Lathe cutting tools

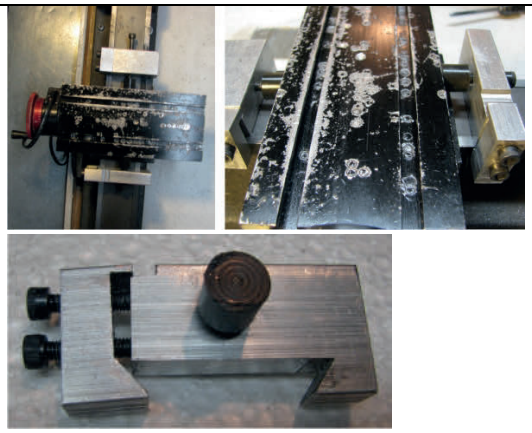


Artwork projects – earrings

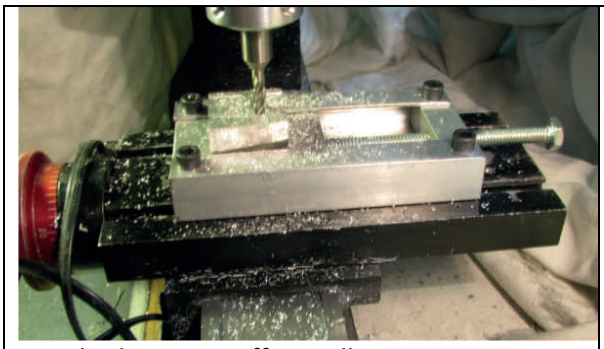
Drill stops



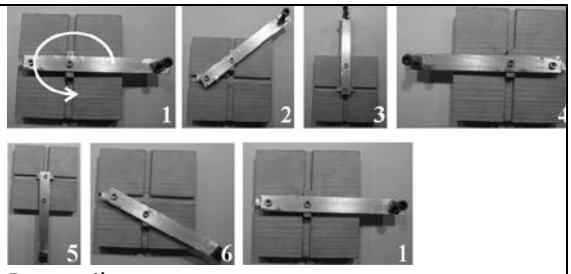
Indexing tools



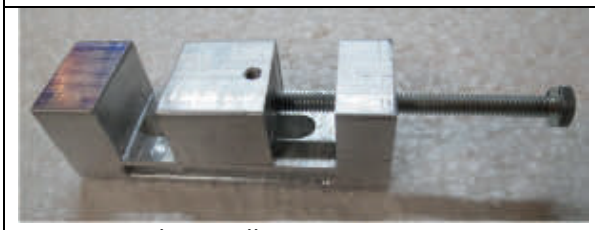
Dovetail lathe stop / mill lock



Zero budget, zero effort mill vise

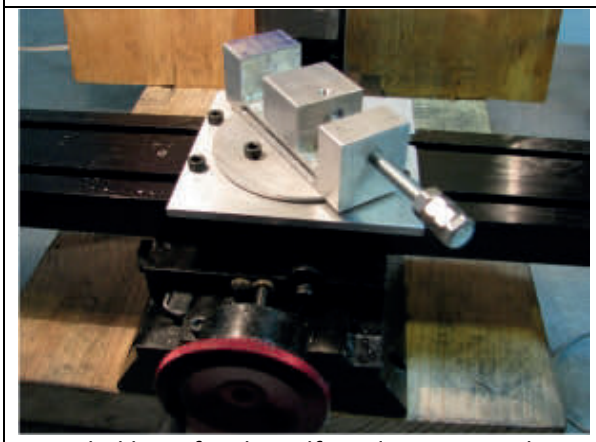


Dovetail toy

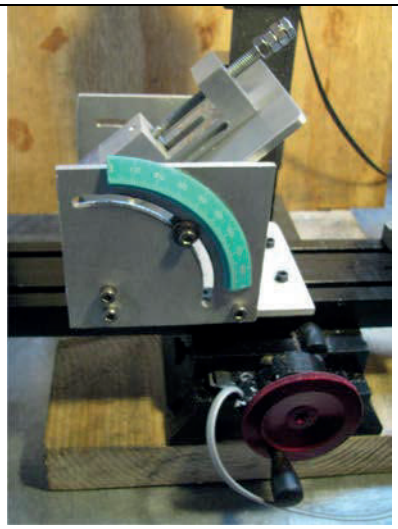


Miniature plane mill vise

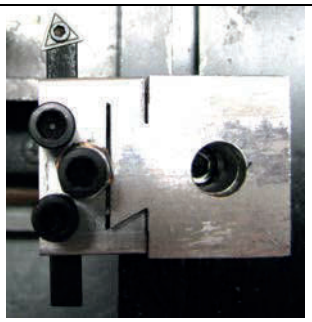
Playing with a rotary table



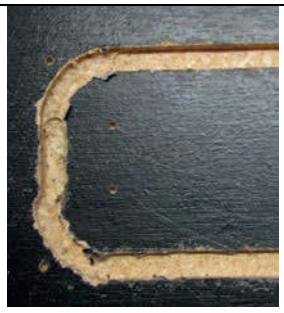
Swiveled base for the self-made vise – working with a rotary table



Machining a tilt table



Fast tool change system



Keyways with rounded corners – flanges

Project list

	page	level, time (min)	required tools						
			swiveled vise	end mill	fly cutter	dovetail / T-slot cutter	boring drilling	rotary table	tilt table
turning tools	121	++, 30	X	X					
chuck storage rack	118	+, 30		X					
low budget mill vise	132	+, 30					X		
hole punch	170	++, 60					X		
lathe lock	55	+, 60					X		
drill stops	119	+, 15		X			X		
adjustable gibs plate	138	+, 10				X			
machinist jack	82	+, 10		X			X		
lathe tool posts	115	++, 20		X			X		
kids (?) toy	149	+, 60		X		/x	X		
angle plate	199			X			X		
dovetail lathe stop / mill lock	157	+++, 90		X	X	(X)	X		(X)
indexing chuck holder	167,130	++, 60					X		
plane mill vise	134,161	+++, 120		X	X		X		
tilt table	182	++, 120		X			X	X	
fast tool change system	143	++, 120		X		X	X		(x)
swiveled base	178	++, 60		X			X	X	
handwheel (lathe work)	207	+, 10					X		
monster mill vise	134	+++, 60			X		X		
flange	186	++, 20		X				X	

The "++" indicate the difficulty level (from + simple to ++++ difficult) which is certainly a matter of taste and depends also on the tooling at hand. The time estimates may be somewhat optimistic and assume advanced machining skills. (x) indicates that options exist in regard of the required tooling.

Disclaimer

This book has been written carefully, and all projects and procedures have been tested thoroughly. However, as always, the author cannot guarantee that the procedures are perfect and without any mistakes. In addition, it is impossible to predict and prevent all of the possible problems someone may possibly run into when working with power tools. **Using a motor tool can be dangerous, and the proper use is the responsibility of the person using the tool.** If you are not perfectly comfortable with working with motor tools, then don't do it! In this case, take a metal working class rather than following a do-it-yourself outline, or find a different hobby. No one else can jump in if you may make a mistake that results in harming yourself or damaging the tools you use. Do not use half broken or banged up tools, possibly purchased on the cheap at a secondhand store or who-knows-where. These will be overwhelming to handle in the beginning. Also note that metal work is a rather expensive hobby. Thoughtful work will be your responsibility.

The author makes no representations or warranties with respect to the accuracy or completeness of the content.

The author is not a professional machinist or engineer. In fact, the author has a PhD in physics and teaches physical chemistry at a college. Therefore, no information provided herein represents professional advice or best practices in machining. All information is provided to help hobbyists and other non-professionals gain a better understanding of using a tabletop milling machine for hobby type work.

The statements and procedures may not coincide with Sherline's Inc. or Grizzly's Inc. opinion or interests.

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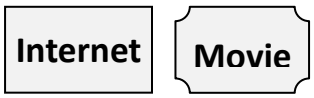
You may perform all of the operations herein described at your own risk. To the fullest extent permitted by law, LatheCity disclaims responsibility for injuries or damage to equipment related to your work. In no event shall the liability exceel the purchase price of the product. Legal action against LatheCity may be tried in Fargo, North Dakota, USA.

Pictograms used in this book

Object of a given Chapter/brief introduction. Start of a project. The Chapter numbers are given in the content list.



Internet addresses of potentially useful sites. However, web sites may be infected by computer viruses. Use them at your own risk.

Safety notes. It is not my intention to bother you, and this book is meant for adults with advanced machining skills, not for children. Therefore, whether you read the safety notes or not is your decision. However, don't blame me if you do not take the few minutes to do this and end up in the hospital. All procedures are performed at your own risk.

E

Engineering terms or topics are described here. You may skip these if you are only interested in the operation of the tool. Remember, though, that knowledge also always provides protection (safety). If you know what you're doing... right.

P_E P_A

Projects: engineering/artwork projects

L/M

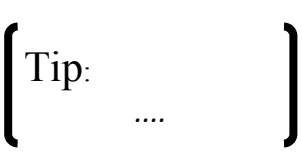
Comparison of lathe and mill operations. Most of us started with lathe work, that is, these comparisons can help gaining a deeper understanding (even of lathe work).

Σ

Summary of the Chapters. See content list for Chapter numbers.

G

Note specifically related to the Grizzly mill. This book focuses on the Sherline mill, but does include some comments related to larger milling machines such as Grizzly and Bridgeport systems.



Tips and tricks

The idea of using pictograms is to allow for fast browsing as well as making the book more appealing to read. Straight text is hard to digest and boring after a while.

Contents at a Glance

Featured Milling Machines:

P/N 3050/3053 – Sherline's mill column attached to their lathes, Fig. 2.1

P/N 5000/5100 – typical mill table from Sherline, Fig. 2.3

G0720R – Grizzly heavy-duty bench top mill, Fig. 2.4

Bridgeport mill – a few notes and images of full size mills, Fig. 2.2

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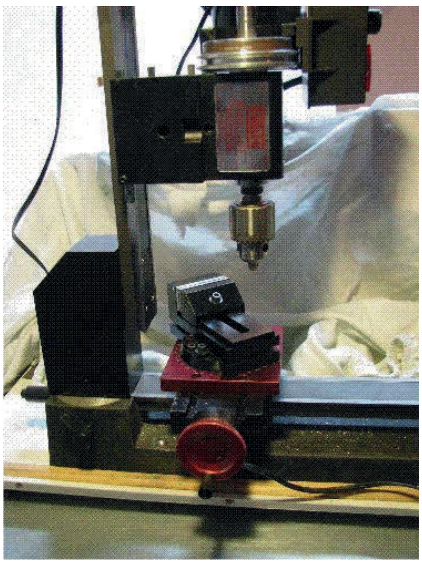
Book 4

Part A: First steps



Sherline's mill attachment to their lathe and accessories are shown

1. **How is this book structured - introduction**
2. **What is a milling machine? - how to decide which one to purchase ?**
3. **What hardware will I need to get started with milling?**
4. **First things first - required safety notes – how to work safely?**
5. **The very first project on the mill - how can I get started?**
6. **Simple cross-slide lock - how to reduce vibrations?**

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Acknowledgement

Some Chapters of this book were proofread by Scribendi (Canada), a commercial proof reading service, which did cost me a fortune, but hopefully reduced the number of typos.

Commercial proof readers are typically located at English departments rather than engineering departments. Therefore, I am glad that William D. Gardner (CA) was so kind to run a 2nd proof reading loop. I met Bill as a customer and got to know him somewhat via e-mail. He is also a hobby machinist and owns a small part-time business. His suggestions are highly appreciated, and the number of typos was further reduced thanks to him.

2nd edition

I did fix up some smaller issues that in the meanwhile came up and smoothened out some sections. When working longer with a larger mill the perspective of some operations changes, perhaps to the better end. A few more figures and subchapters were added.

The biggest change perhaps, in the meantime, I do offer the book with a professional paperback binding.

Uwe Burghaus, born in West Berlin, Germany, obtained his education in Physics and Physical Chemistry at the Free University of Berlin. He obtained a PhD in 1995, after conducting his graduate studies in surface science at the Fritz-Haber Inst. of the Max Planck Society in Berlin. After postdoctoral positions in Genoa (Italy) and Santa Barbara (USA) he went back to Germany to complete a habilitation (German tenure) in Physical Chemistry. Now at North Dakota State University, he started to establish a surface chemistry group in 2003 and obtained tenure in 2009. His group is currently focusing on studies about the adsorption dynamics and kinetics of small molecules on nanostructured catalysts. He is not a professional machinist by training. However, in 2012 his hobby developed into a small part-time business. LatheCity sells currently books about metal working including software tools as well as accessories for mills and lathes: everything that's fun to make and may find customers. The strength of the business is custom designed/customized pieces.

Other LatheCity books are available:
Vol. 1: Basic Lathe Operations (2nd edition) [S, U]
Vol. 2: Working with Lathe Accessories [S]
Vol. 3: Poor Man's CNC Lathe [*]
Vol. 4: Tabletop Milling (2nd edition) [S, G]

Booklet 1: Thread Cutting on a Lathe (3rd edition) [S, U, *]
Booklet 2: Working with Exotic Materials on a Lathe and Mill (3rd edition) [*]
Booklet 3: Summary of Basic Metal Lathe Operations [*]
Booklet 4: Artwork Projects on Benchtop Lathes and Mills [*]

Volumes in preparation:
Vol. 5: Tabletop lathes [*]
Vol. 6: The CNC Benchtop Lathe [S]

[S]: Featuring Sherline systems
[U]: UNIMAT
[G]: Featuring Grizzly systems
[*]: Model independent

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s

Tabletop Milling

Most of us started our hobby with work on a lathe. However, the shapes than can be cut are limited. For example, basic accessories are simple to machine if a mill is at hand. Even a hobby machine shop is incomplete without a milling machine. Fortunately, quite sturdy tabletop mills are available at acceptable costs. However, none of these come with an extended manual. Mill work, on the other hand, is trickier to learn than turning. Thus, a book that describes not only the simplest operations would be useful.

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