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TECH TOOLKIT

The Rolling Mill: A Jewelry Studio's "Forever Tool"

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Bench Tricks for Jewelers

TECH TOOLKIT

The Rolling Mill: A Jewelry Studio's "Forever Tool"

BY JEFF GEORGANTES

AT ITS MOST BASIC LEVEL, a rolling mill is like a pasta press for metal. Its primary use is to manipulate sheet and wire into different thicknesses, but it can do much more. The rolling mill can be used as a forging tool, a texturing tool, and, perhaps most importantly, it can be a critical component in recycling silver and gold scraps into usable stock. Most rolling mills are "forever tools," and if properly maintained will last for the rest of your career.

I got my first rolling mill back in the 1980s. It was a used Cavallin square wire/flat combo mill, made in Italy. It's built like a tank and weighs a ton. When I moved into my current studio, I didn't set up the rolling mill up right away, because I couldn't figure out a good spot. Because it is super heavy, I left it on the concrete studio floor. Big, big mistake. At some point, my new studio flooded unexpectedly because of spring snow melt, and the Cavallin rollers rusted. It was tragic. I did my best to repair the damage, which helped the rollers, but it didn't remove all of the pits. I tried to talk myself into the idea that the rust marks added texture to my work, but eventually metalsmith guilt got the best of me.

I decided to explore the question of if the rollers could be refinished. I talked to the folks at Otto Frei and received instructions on how to remove the rollers and ship them to their headquarters in Oakland, California, where a specialized machinist could refinish them. Part of the challenge is that you can only take so much off the surface of the rollers, as the steel rollers are not hardened all the way through to the center, and if you remove too much of the roller surface, the mill won't close entirely. Fortunately, my rollers were salvageable, and they came back looking perfect once again. Now I rub and clean every surface of the rollers regularly with cloth and oil, much the way my dental hygienist lectures me to brush and floss. Five years later, the rollers still look brand new. My Cavallin rolling mill is back to its "forever tool" status.

Jeff Georgantes
Spiral Ring, 2019
Milled recycled silver, rolling mill forged taper sterling silver, 14k gold, ruby
1¾ x 1¾ x 1¾ in.
Photo by Case Hathaway-Zepeda

At the 2019 SNAG Conference in Chicago, I met with Steve Frei, president of Otto Frei. I've known Frei for at least thirty years, and of all the people that I know in our industry, he's the closest I've met to a jewelry tool historian. He knows the history of pretty much every jewelry tool that has come on the market in the past fifty years. I asked Frei how he has seen rolling mills evolve within his career. He said that a lot has changed, and a lot hasn't; the core design of rolling mills is very similar to those from a hundred-plus years ago. What has changed the most are the quality of materials and the efficiency of the manufacturing process.

I talked to Sean Seo, owner of Best Built Jewelry Equipment, at his NYC storefront while attending the Manufacturing Jewelers and Suppliers of America Expo in March 2019. I asked Seo what he hoped

ROLLING MILLS

Clockwise from top left: Durston D4 Combo Rolling Mill; Pepe 130 mm Combo Power Rolling Mill; Otto Frei Blue Economy Rolling Mill; Best Built Combo Rolling Mill.

Work made using a rolling mill

ARTIST: Curtis H. Arima
curtisharima.com
Secondhand 1980s Durston Wire Sheet Combo Mill

My rolling mill allows me to recycle my metals and make different colors of gold (or any alloy) for my fabricated work. It gives me the independence to make any size wire or sheet that I need. I make my own bezel wire, ring stock, cloisonné wire; the list is endless. I often use it to help forge tapers in both jewelry and larger sculpture. I use it every day that I am in my studio.

Curtis H. Arima
Heartfelt: Bleeding Heart, 2018
Torch-fired enamel on copper, sterling silver, gold
4½ x 3¾ x ½ in.
Photo courtesy of the artist

ARTIST: Jim Dailing
jimdailing.com
Secondhand 1980s Cavallin Power Mill

I cast a lot of my own alloys, like 20k rose gold (gold with a little bit of copper). My mill allows me to recycle metal quickly into usable stock for nearly any project.

Jim Dailing
Galileo's Daughter—Neckpiece
Rolling mill forged taper
Continuum silver, diamonds, Tahitian pearls
Photo courtesy of the artist

ARTIST: Jeff Georgantes
jeffgeorgantes.com
Secondhand 1980s Cavallin Wire/Sheet Combination Mill; Pepe Flat Mill; Otto Frei Blue Economy Mill

My three mills all have different purposes. The Cavallin mill fits on my bench and is there for small pieces of sheet and wire. The Pepe flat mill is for wider sheet metal and the Otto Frei Economy Mill is for my hand-carved texture rollers.

Jeff Georgantes
River Rock Ring, 2019
Metal textured with hand-carved steel mill rollers
Sterling silver, 14k gold, found rock, carnelian, garnet
1¾ x 1¾ x 1¾ in.
Photo by Case Hathaway-Zepeda

to bring to the jewelry industry with his line of rolling mills. He said that one of the features he hoped jewelers would appreciate about his products was, as Steve Frei had said, the quality of materials and construction. For example, Best Built's rolling mills feature rollers that are plated with industrial rhodium to protect against rust and create an enduring shine. The rollers on a Best Built mill really are a thing of beauty.

What Best Built has done with their rollers highlights the importance of maintaining your mill. So how do you keep your mill a forever tool, and looking brand new? At JCK 2019, I asked Tony Aizenman, Founder and President of Pepe Tools in Oklahoma City, how he recommends maintaining a rolling mill. Aizenman said that the most important thing a person can do is to keep the rollers clean and to never let them get damaged in the first place. He recommends cleaning your rollers after each day of use with a cloth soaked in a light lubricating oil. I've definitely found that to be helpful. If I don't use my mill for days or weeks, I also make sure that the rollers are well coated in oil. Making sure that the rollers are separated is also crucial, because when the heavy steel rollers touch, it can create condensation and rust.

Covering the mill with either a cloth or plastic cover will also help protect it. I've heard both sides of the debate when it comes to cloth versus plastic covers. Cloth allows for moisture to escape. Many say that plastic covers are bad because they can entrap moisture. Where I live in New Hampshire, it's very humid in the summer. For me, I've found that the combination of a plastic rolling mill cover and regularly coating the rollers liberally in lubricating

The core design of rolling mills is very similar to those from a hundred-plus years ago. What has changed the most are the quality of materials and the efficiency of the manufacturing process.

ROLLING MILL TIPS AND TRICKS

BY JEFF GEORGANTES

Turning scrap metal into usable metal stock

NOTE: Some metals recycle better than others. Brass, copper, bronze, and white gold are harder to recycle into usable stock. Sterling silver, argentium, and yellow gold work well.

1. Melt your scrap into an ingot mold of some kind. Make sure that the scrap is free from any solder.

2. Let the ingot air cool, then pickle, rinse, and dry.

3. File away any flanges, pits, or imperfections, then sand to a 400-grit finish.

There are many different concepts of how to mill the ingot. Some people say you're supposed to reduce the thickness by 20 percent through forging before milling. I find that confusing. Here's what works for me: five courses of lightly forging or planishing, annealing, and then pickling before any milling at all. It accomplishes about the same thing, which is to strengthen the outer layer of the ingot.

Why do you need to forge, anneal, and pickle first? The best explanation I've ever heard is to think of the metal as water in the ocean. The wave on the water's surface moves at a different pace than the water near the ocean floor.

As the metal at the surface of the rolling mill moves more than the metal in the center of the ingot, this inconsistency can lead to surface cracks.

4. After you finish five hammering courses, it's time to roll. You need to roll very conservatively at first. Only reduce the thickness a little bit at a time, and anneal frequently.

5. Hopefully you won't get any surface cracking, but if you do, file and sand out the cracks when they are small. Don't assume that they'll go away; they won't. They'll only get bigger.

Soon your metal will have the same consistency as metal purchased from a professional refinery, and you'll be able to mill it normally.

File the rough ingot to remove any flanges, pits or imperfections.

Sand the ingot to at least 400 grit.

Lightly forge the ingot to harden the surface. Do five courses of forge, anneal, pickle.

Anneal

Pickle

Work made using a rolling mill

ARTIST: **Steve Midgett**
mokume.com
Multiple mills—both electric and hand crank—some with customized rollers

It would be impossible for me to make the mokume that I make without good rolling mills. Square wire rolls are essential for reducing billets into wire for ring making. Because the rollers support the metal on all four sides, there is much less chance of the billet delaminating while rolling.

Steve Midgett
Conch Pearl Brooch, 2002
18K mokume
1⅝ x 1⅝ x ¼ in.
Photo courtesy of the artist

ARTIST: **Kris Patzlaff**
arcataartisans.com/artists/kris_patzlaff/
1988 Durston Wire/Sheet Combo Mill

My rolling mill is probably the most important piece of equipment in my studio. All of my work utilizes it in some way. I use my rolling mill primarily for rollerprinting. Rollerprinting provides me a rich embossed surface texture that utilizes my personal vocabulary of mark making.

Kris Patzlaff
Brooch, 2009
Roller-printed
Silver, 24k gold, opal
1¾ x 1¾ in.
Photo courtesy of the artist

ARTIST: **Paulette Werger**
pjwerger.com
1980s Durston Wire/Sheet Combo Mill

I use my rolling mill daily side-by-side with my torch and it's my favorite tool! I predominately use it for embossing, creating patterns to be combined with Keumboo, fusion or fabrication in jewelry pieces.

Paulette Werger
Condiment set
22k gold, keumboo, roll painted, fabricated argentium silver
6 x 3 x 1½ in.
Photo courtesy of the artist

oil works best. In my humid environment, a plastic cover shields against humidity more than it entraps it. Any moisture that gets inside the cover is overpowered by the liberal coating of oil. Whatever you choose, plastic or cloth, it's important to keep the mill covered when not in use and the rollers well-coated with a light oil.

As I said, my Cavallin mill, which was state-of-the-art in the early '80s, is so heavy that it requires most of my strength to pick it up; yet by today's standards the rollers aren't very wide. Aizenman told me that lowering the overall weight of the steel frame in his Pepe mills, but also increasing the frame's strength, was a big goal for him. I also own a Pepe flat mill for wider sheet metal. The design looks similar to the Cavillin, but the frame is much thinner and lighter. Durston did something comparable with its Agile line of mills, redesigning the frame for strength instead of weight, so the frame doesn't have to be as massive. Both the Pepe mills and Durston's Agile mills retain high quality, yet offer a lower cost, which is a big win for metalsmiths.

How the tool steel rollers are heat-treated will reflect in the mill's overall strength. Aizenman explained that the outer part of the roller is much harder than the interior, allowing for microscopic flexing under pressure and acting like a shock absorber when the metal is milled.

In my opinion, one of the biggest recent innovations in rolling mill technology comes from low-cost, imported rolling mills from India. The baseline price of these mills is currently around $250. That is unbelievably inexpensive! While these mills do have a reduction gear, there are big limitations. With a conventional rolling mill, you can open the rollers to about 5 or 6 mm. With these low-cost imported mills, you can only open the rollers to about 2 mm or 14 ga, which is a big limitation. They also don't have a lot of torque. You could never mill out an ingot, for instance, without doing a lot of forging first.

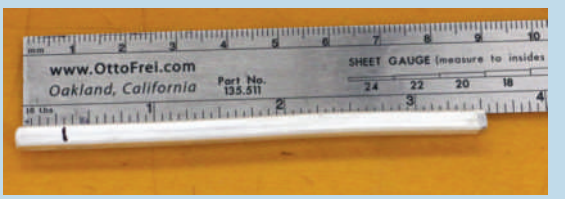
Where these low-cost imported mills really shine though are as texture mills. The Indian mills have a large number of choices for easily replaceable texturizing rollers that cost approximately $30 to $130 each. Texturing doesn't require as much pressure as shaping, so these low-cost mills work well for that. The fact that you can texture entire sheets of silver or gold or bracelet and ring shank stock over and over again is unprecedented. If you're a metal texture junkie like me, this is a game changer. I even bought a $29 plain flat replaceable roller for my imported Indian mill and carved my own texture pattern into it with diamond burs and cut-off wheels. My mind was blown with the possibilities!

For many years, Durston Tools from England has had a reputation of quality, especially with their line of rolling mills. At JCK 2019, I spoke with Matthew Durston. He talked about how important it is for him to honor his father, its founder, and his original goals. Durston said, "For me, I'd rather have a customer have one of our rolling mills for thirty years.... When someone tells me that they've had a Durston rolling mill since 1970, I love it!" Durston reinforces the idea that buying a rolling mill isn't like many other shop

Most rolling mills are "forever tools," and if properly maintained will last for the rest of your career.

Forging with a rolling mill

Forging a taper, especially with thin gauge rod or wire, is really easy with a rolling mill. You still have to do a little bit of hammering, but all the hard work is done by the rolling mill.



This is easiest with square stock and square rollers. Measure and mark.

Using the square wire/rod section of a rolling mill, create a series of decreasing steps. The angle of the taper will depend on how drastically smaller the steps are and the length between them.

Shrink the stock in a square roller to your mark. Mark and roll to a new mark.

In the example, I took a piece of 5 x 5 x 90 mm (3½") sterling silver. I made steps roughly every 10 to 20 mm (½ to 1 in.). By the time I was finished, the silver rod went from 90 to 267 mm (3½ to 10½").

Repeat, creating a series of steps that decrease in width until you get your desired taper and length.

I smoothed out the steps with light planishing. (For the finished example, check out the spiral ring on page 18, made from this piece of silver.)

Smooth out the steps with light forging.

investments. If you take care of it, your rolling mill will be a forever tool that you'll potentially have for the rest of your career and then be able to pass on after you retire.

There are many different models of high-quality rolling mills these days at prices that are comparatively the lowest in decades. That can make the choice of which one to purchase difficult. Virtually all current hand-crank mills now include a reduction gear, which is a huge improvement from the past. There still is the decision of whether to get flat rollers, combo rollers, or side rollers. Electric or hand-crank is another decision. Just think: right now you can get a high-quality electric mill for what you would have had to pay for a decent hand-crank mill not that long ago! Again, what Frei and I talked about summed it up: international competition has driven rolling mill manufacturers to innovate, improve quality, and lower costs. It's time to get it rolling and keep it rolling!

Jeff Georgantes has an MFA in Jewelry/Metals from CSU–Fullerton as well as a BA in Art and a MA in Sculpture, both from CSU–Humboldt. He taught art at College of the Redwoods in Eureka, CA, for fifteen years and has taught numerous visiting artist workshops across the US. He helped develop and coordinate the Jewelry/Metals program at the Mendocino Art Center from the early 1990s until 2005 when he started his position as head of the Jewelry/Metals program at Dartmouth College, Hanover, NH. He has served on the Mendocino Art Center Board of Directors, the Metalwerx Board and currently is a SNAG Board member. www.jeffgeorgantes.com

Further Resources:
Each of these companies has lots of instructional information and videos on their websites and social media channels:

Pepe Tools: www.pepetools.com

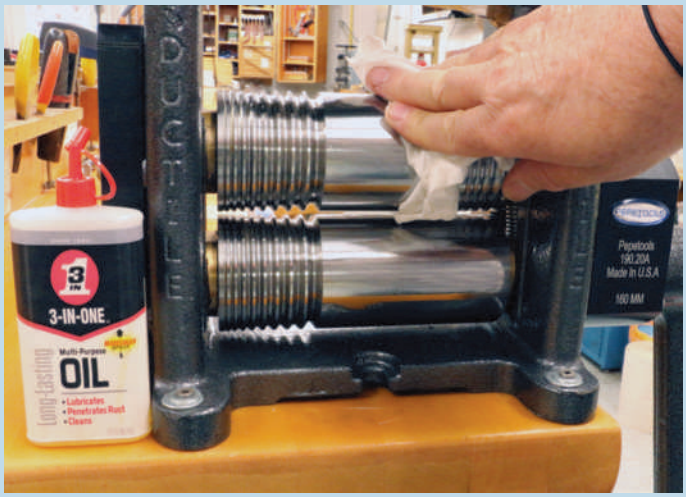
Durston Tools: www.durston.com

Best Built Jewelry Equipment: www.jdsincbb.com

Otto Frei Jewelry Tools: www.ottofrei.com

Rio Grande Jewelry Tools: www.riogrande.com

Rolling Mill Resources: www.rollingmillresources.com
Hundreds of roller printing acid-free paper patterns. They will also laser-cut your own designs onto acid-free paper.



After every day of mill use, wipe the rollers down with a light lubricating oil, such as 3-In-One Oil, and a soft cloth.

Keeping your rolling mill like new

Keep your mill covered to protect from dust and debris collecting on the rollers.

Don't roll anything that might hurt the mill. Ideally, only roll soft metals. When roller printing, it's safest to sandwich your texture material between two sheets of soft metal (like copper or brass sheet). If you use cut paper to texture, remember that many papers are made with acid and formaldehyde. Sandwich your paper unless you know that it's acid-free. (Rolling Mill Resources sells acid-free texture paper sheets: www.rollingmillresources.com.)

Matthew Durston from Durston Tools told me that light staining on steel rollers isn't a problem, but rust is.

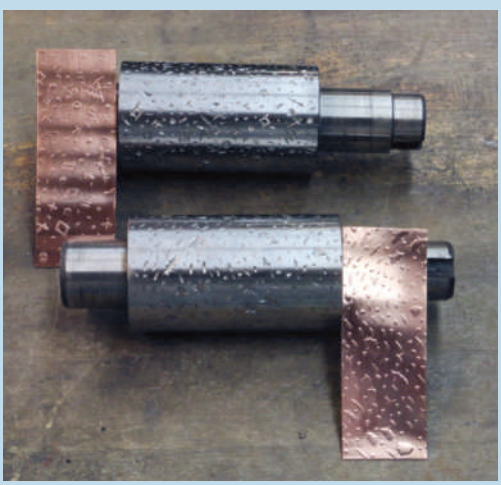
There are lots of YouTube videos out there about rolling mill maintenance. One of my favorites is by Ronda Coryell. You can do a version of Coryell's dowel trick with fine sandpaper to remove light rust.

If the worst happens and your mill gets more rust than you can remove yourself, all mills can be taken apart and the rollers refinished by a professional machinist, ideally one who specializes in roller refinishing. Contact the mill manufacturer or the jewelry tool company from which you bought the mill for specifics about how to remove the rollers, and how best to get the rollers professionally refinished.

Creating your own texture rollers

One of my favorite new tools is the low-cost Otto Frei Blue Economy Rolling Mill (currently about $250). Steve Frei told me that at least the top rollers are interchangeable with mills made in India of a similar design, even though they are made by different manufacturers.

There is a huge selection of premade texture rollers to choose from, but making your own is extremely easy with diamond burs and cut off wheels. A polished, flat roller for one of these mills is currently just $29. What is especially great is that unlike most other kinds of roller-printing textures, these texture makers will never wear out.



Blank rollers hand-carved with print pattern with diamond cut-off wheels and burs.