

The NEMES Gazette

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*The Newsletter of the New England Model Engineering Society,
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Our Next Meeting is at 7:00 PM March 5, 1998 at the Museum, 154 Moody Street, Waltham Ma.

Annual dues is \$20.00 - Please make checks payable to "NEMES" and send to the NEMES Treasurer: Kay R. Fisher 80 Fryeville Road Orange, MA 01364

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From the Editor's Desk:

This issue marks the start of the third year for NEMES. I can hardly believe it, but this is the twenty fifth issue of the NEMES Gazette that I have prepared -- the first issue in Volume 3. I'm going to call this issue 25, since it's the twenty fifth issue and Volume 3, #25 seems less confusing to me than having a third issue #1. Besides, #25 seems like more of an accomplishment than #1.

The meeting in May is one that I have been looking forward to. Fred Armbruster, a friend of Don Strang's, will be speaking on Ornamental Turning Lathes.

Steve Cushman wrote a good article on rebuilding his 16" LeBlonde Lathe. Unfortunately it didn't all fit so it'll be continued next month.

See you next Thursday night, scl.

President's Corner by Ron Ginger

EASTEC SHOW -Club Trip, Wed, May 20.

Eastec is a major trade show in the mechanical industry- The brochure claims over 650 exhibitors, in over 180,000 square feet of exhibit. Every major machine tool supplier, distributor- MSC, J&L, Penn Tool, etc, will be there. Lots of the really big CNC stuff, as well as small companies with simple tools. Lots of operating machines, and demos. Even free samples, and LOTS of brochures and catalogs handed out.

The show is May 19,20,21, at the Big E expo in Springfield MA.

If you pre-register for the show, its FREE!. We passed out forms at the April meeting, and if you got

one and sent it in, you will receive your badge before the show, and can walk right in. If you didn't register by April 24, you can still get in free if you bring a copy of the form included in this newsletter. Without the form you will have to pay \$20 at the door.

There seemed to be some interest in this show at the last meeting, so I have called a couple bus companies. We can get a bus to leave from Riverside at 8:30AM, take us directly to the show at the Springfield Big E, and leave the show at 5:00PM, to be back at Riverside by 7:00. The total bus cost is \$600, or \$15 each if we get 40 to go.

I will have a signup sheet at the May meeting- if we get enough names on it before the end of the night, I'll reserve the bus. The club treasury will pay the deposit, and we can collect the \$15 the day we go.

If you want to go on the trip but won't be at the May meeting be sure to call me before the meeting so I can count you in.

If we don't get enough for a bus trip, I encourage you to team up in small groups and share a ride out there- it's not far, and its a GOOD show.

MODEL ENGINEER Centennial Collection

You may be aware that MODEL ENGINEER, the British magazine, was founded 100 years ago. In honor of this, they are publishing a series of 10 special issues this year. Each issue is on a specific topic, and includes a collection of the best of that topic over the 100 years. Issue #1 was on locomotive models, #2 was on tools and shop devices. I don't know what the rest of the topics will be. They are published about 1 per month, for a total of just 10 issues.

You can subscribe to this series for \$65. The simplest way is to call WISE OWL Publications at 310/375-6258 and subscribe by credit card. (This is a California company, so call after 5:00PM here and get the cheaper phone rate. Also tell them you are a NEMES member- I am pushing them for a discount on magazines and books, so letting them know there are lots of us may help.)

If you read the internet mail list, you may have seen some notes about this collection- a couple guys in England seem to have it in for the magazine and cant say anything good about it. I think they are good issues, and have no trouble with the photo quality, but

some people do. I will bring my first 2 issues to the May meeting so you can have a look.

May Meeting.

This month we have Fred Armbruster talking about ornamental turning. This is a topic that has long interested me, I'm looking forward to it.

MUSEUM NEWS.

The museum is looking for a few guys to help them redesign their shop/exhibit. If you have time to help, call Karen and offer to help. I'm also sure they could use other volunteers, so if you have time and want to help a good cause, call Karen!

As I mentioned before, everyone can also help support the museum by joining. Members get free admission, and access to the research library.

September Show.

Our member Ed Rogers, is an old car fan and a member of the Northshore old car club. They have a big annual outdoor show on September 13 at the Topsfield Fairgrounds. They would like us to have a model show, and have offered us tables and tents for our use. Ed talked about this at the last meeting, and seemed to get a good deal of interest.

We need to get a fair idea of the interest in this show. We will have a signup sheet for it at the next meeting. I don't want to lead the Old Car Club along if we don't have enough interest to make a presentable show. So, check your calendars, mark the date and sign up next month.

DUES

Remember, we are on a June-June dues base. EVERYONE has dues due at the JUNE meeting. Kay Fisher has asked me to remind everyone of this, and to request you bring a CHECK for the \$20 to the June meeting. Kay can't be at the May meeting- some lame excuse about his daughter getting married! But he will be ready to collect the dues in June.

JUNE MEETING

At the NAMES show I spent a good deal of time talking to the owner of Shooting Star DRO. I examined the unit very carefully, and saw it as a well made device. I have made arrangements for the June meeting to be a discussion of DRO's. Shooting Star will ship their show demo unit to me in time for the meeting. We will set it up, and I'll give a quick demo of it. Then we will call the owner and hook up a phone link to our speaker system, so he can give a brief talk, and answer any questions.

He has also agreed to a very good discount program. Any club member buying a unit after this talk will get a discount- the exact discount will be

dependent on the total number of units members buy, but will basically be the dealer price.

I'll have more details at the May meeting and in the next newsletter. If you were planning to buy a DRO hang in a few more weeks- I think this will be an attractive deal.

NAMES

A few of us made it to NAMES. It was again a good show. This time the crowd was so big I understand they had to turn away a few exhibitors. They had the usual collection of vendors- managed a few good buys! Norm Jones got another casting kit, Roland and I each found a couple good tool bargains. Most outrageous small project was an oscillating steam engine, inside a wooden box that was .140x.140x.230 inches long. He displayed it sitting on the eraser of a wood pencil.

--Ron

April-1998 Treasurers Report

Previous balance -----	\$1459.97
Interest -----	.59
Service Charge -----	-3.00
Speakers Fee (George King)-----	-75.00
News letter postage -----	-85.91
Speakers Fee (Fred Armbruster)----	-50.00
Dues Deposits -----	32.00
Books Deposits -----	193.00
Books Withdrawal -----	-193.00
New balance -----	\$1278.65

I will not be able to attend the next meeting. Dues for our next year will be due the meeting after that. Please bring checks for \$20 made payable to NEMES to the June meeting for your annual dues.

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Respectfully
Kay R. Fisher

Ledloy and Brass

Max ben-Aaron has asked me to let you all know that the group ledloy buy is on hold because Richard Sabol has access to ledloy offcuts and will be in the parking lot starting about 6:15 PM before the May 7th meeting selling them. He will also have some free-machining brass for sale.

Calendar of Events

Thursday May 7, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Saturday May 9, 1998 -- Big Swap Meet at Paul Gauffin's new place in Mason New Hampshire. He's at 443 Rt 31, which is easy to find as it's right at

the intersection of NH Routes 31 and 124 (it's Rt 31 in Mass also)

Thursday June 4, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Thursday July 2, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Thursday August 6, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

The Meeting, 2 April, 1998

Before the meeting there was some interesting activity on the tables in the hall. Larry Keegan had brought in a couple of electric motors that he had made. One was a solenoid motor where the solenoid took the place of a piston and turned the flywheel via a crank arm. The other was a very simple motor with a simple commutator and a loop of wire mounted on a bamboo skewer mounted vertically between a couple of permanent magnets. Two hand held paddles of thin aluminum sheet were the brushes and by holding them up to the commutator just right you could get the skewer spinning quite impressively in either direction. The motor build on the skewer especially impressed me because of it's simplicity, how well it worked, and because by holding the brushes in your hands it involved you directly with the motors operation. It would be a great science fair project.

Ron got the meeting under way at 7:05 PM. Mike Boucher had a copy of the Articles of Incorporation for NEMES with him. Next month is nominations for office, and the plan is to get NEMES incorporated by the Annual Meeting in June. This will be the second step in the quest for Tax Free Status. Mike got a well deserved round of applause for all his hard work to get the club officially organized.

Max ben-Aaron had proposed another metal buy for some Ledloy, but Mike Sabol said that he had access to 12L14 offcuts at work. He'll bring about 300 pounds or so of it with him to the meeting and will be selling it in the parking lot before the meeting for 39 cents a pound.

J. Walter Castrow spoke to us about the formation of an International Engineering Model Museum in the Metropolitan Boston area. He has been working on it for about four or five years now and has had a fantastic response from Industry, Private Builders, NASA, the Navy, the Air Force, and other government groups. The goal is to see the ful-

fillment of the Museum in the Boston area and the elevation of fine models to the status of fine art worthy of being appreciated for it's own merit. Too many times great collections are abused or destroyed when someone dies, with the formation of the International Engineering Model Museum there will be a place for them.

For more information about the International Engineering Model Museum, or EMMA, the Enigneering Model Museum (Friends) Association contact J. Walter Castrow, 136 Boylston St, Newton, Ma 02167. Telephone - Home: 617-965-5893 / Library: 617-332-8679 / Telefax - 617-731-1336.

Ron Ginger had half of a cast iron propshaft coupling he made. It's for a tugboat that belongs to a friend of his up in Maine. It weighs 18 pounds and started out as a 44 pound piece of Durabar.

Dave Piper was down at Mystic Seaport a couple of months ago helping to work on a steam winch with bad valve rods made from 3/4" square stock. He said sure he could make new ones, but when they came out of the winch they were a lot longer than he'd suspected. They barely fit in his lathe, and since they were so long and skinny he made a follow rest that he used to turn the part quite successfully. He also had a lap that he had made for his steam engine project.

John Wasser is still working on his lathe rebuilding project. He had 10 copies of the SB lathe parts list that he passed out to people who could use it. He has also recently acquired another 9" SB lathe, this one a model A which he also plans to restore. When the model A is ready to go the model C he has now will be redundant

Ed Rogers reminded us again about the big outdoor show September 13th at the Topsfield Fair Grounds. We need a list of people who are committed to going to it so that the amount of space and tables we will need can be planned for.

Don Strang had model C of his drill grinder with him. Model A, the original handled #60 to 1/4" drills. Model B, which he had at the show, handled 1 / 4 to 1 / 2" drills. This latest version, the Model C can sharpen drills from #60 to 1/2". He made a new holder from Ledloy for the small collets. He used a surface grinder to get the holder finished to size and says that the Ledloy sparked on the surface grinder. He bought a Norton wheel for it, in 120 grit which is a little fine for the larger drills but needed for the #60 drills to get a good finish. Norton has good, better, and best grade wheels and he got a better. The half inch size collet will hold a diamond to dress the wheel. He's been working on drill sharpening now for

about 18 months, but says that drilling with a sharp four facet drill makes all the effort he's put into drill sharpening worthwhile. Don also has a new book recommendation for us that Leo Klos discovered on the internet, *The Design and Use of Instruments and Accurate Mechanism* by T. N. Whitehead.

After a short break we got back to our main speaker for the evening, George King, Chief Engineer of the Sabino at Mystic Seaport. Bob Barrett got him wired up for sound and we could all hear him quite nicely. George was born in Newton Wellesley Hospital and lived for a while in Newton. He came from a family with roots in Steam - some of his relatives worked for the Stanley brothers making Stanley Steamers. His father was interested in Marine Steam, and that is what George decided to pursue for his career. He spent 22 years in the Coast Guard.

In 1899 the Damiriscotta Steamboat Company was formed, and by 1908 they needed a third boat, so they built Tourist. Sometimes Tourist was listed as 45 feet, and sometimes as 57 feet - which probably had something to do with the way that boats were regulated and taxed back when it was built.

In 1917 the original company was dissolved and Deforest Etheredge took it over. Tourist ended up in a class where no license was required to operate it. One of the landings it served was only 140 feet from a bridge. On August 26, 1918 Tourist went under the bridge when the unlicensed engineer, rushing back to the engine room to control the engine, tripped and fell into the engine cutting his arm. Tourist rolled under the bridge. There was only one fatality, the engineer with the cut arm who came running out of the engine room and said he was abandoning ship even though he couldn't swim. He drowned. The Tourist was back in service again in three weeks, although it was not put into regularly scheduled service again.

In 1921 Tourist was sold to the Pompam Beach Company and ran on the Kennebec River. At this time she was also renamed Sabino. Sabino was an all weather boat and ran on the river from March until the end of December. Sabino served on the Kennebec until 1927 when she was sold to Harry P Williams for use in Casco Bay. Williams added sponsors to Sabino to help deal with the seas in the bay in 1928. 1957 was the last year for regularly scheduled service for the Sabino. In 1961 she was sold again and worked out of Haverhill Mass for a while.

Sabino arrived in 1973 at Mystic Seaport as an experiment to see how she'd do. Since she was steam powered and built in the 20th century there was a lot of resistance to her coming and she was given a year to see what would happen. She was

very successful at Mystic. Over the next four years \$175000 worth of work was done on her.

Sabino got her third boiler in 1940, and by 1991 it still had the original mud drums and was getting pretty tired. They hauled the boiler out in sections. Connecticut Boiler repair made new mud drums out of schedule 120 pipe. There was no record of the engine ever having been rebuilt, so when one year the Coast Guard inspector asked about the wood under the engine it was time for the engine to come out. George very carefully put a lot of reference marks where they could be used later to insure that the engine went back in the right place, but the wood guys didn't use them. They do a lot of wood boat repair at the Mystic Seaport, even though not usually on steam boats. They used a string down the middle as a reference and an adze to fit things to size. When George put the rebuilt engine back in he needed 0.060" copper shims under the engine, the rest was all perfect to within 0.001". The shipwrights at Mystic Seaport obviously know what they are doing when it comes to repairing wooden boats.

James H. Paine & Co. started making steam engines in 1873 at Boston Ma. In 1903 they moved to Noank Conn. Sabino has a Paine "Class E" engine marked "JH Paine & Son Noank Conn". The Paine Class E is a two cylinder compound engine with the HP cylinder forward. Stephenson Piston Valves are located between the cylinders, which allows the aft cylinder to fit up against the bulkhead. The low pressure piston was 0.032" in a 14" bore. The HP piston was out 0.074". As a result the engine needed to be bored and new pistons made.

The engine was taken to Reno Machine in Newington Conn. where the cylinders were bored and the babbit bearings for the crank were repoured. The crank had been replaced in 1979 with a new one that had been welded up including pieces cut from 3" plate. After the machine work was done the engine was carefully reassembled at the Seaport. He showed us a nice slide of the restored engine about to go back into the boat, complete with tail rods on the top of the pistons that don't show in the catalog picture of the Class E engine. These were probably added sometime later and help keep the pistons centered during the 4 million revs that the engine makes every year (and remember, the engine is 90 years old!) During all the work they had to walk a fine line between keeping things historically correct while still maintaining 1990's standards. What they have is a 90 year old wooden boat licensed by the Coast Guard to carry passengers. The operation must have been a success because after all the work was completed Sabino burned a third less coal than previously and

could steam at 8 knots - enough faster that they were told to slow down on the river.

The engine has a 12" stroke, with a 7" HP cylinder and a 14" LP cylinder. It turns 200 RPM, although George says he's had it to 218, and swings a 48" diameter 54" pitch bronze screw with four blades. For years the feedwater pump had be inoperable and the boat had made do with it's injectors. During the rebuild the pump was repaired and a new feedwater heater was built to replace the old one.

Before the rebuild the engine had sheet metal lagging, now it is butternut wood over ceramic insulation. A volunteer is working on a set of dimensioned CAD drawings of the engine, and eventually George is hoping to have a set of model castings available along with the drawings for people who would like to build a model of the engine. If you have a preference for what size the castings should be, let George know so when the time comes he can make an informed decision.

If you go to Mystic to ride on the Sabino, George recommends the 5 or 7 PM downriver trips as the most enjoyable ones to take.

George has written a book about the Sabino. Originally it was hoped that it would be available for the June 6th 90th birthday celebration, but unfortunately it won't be ready in time. If the book is half as good as the talk he gave to us it should be a very good read, and you can bet that the names and places will be spelled a lot more correctly than they are here!

TIPS AND TECHNIQUES

by Ed Kingsley

SPRING

April showers will bring May floods,
So, don't come over to my house,
My house will come over to you. ... (anon)

BEND THY ROD, AND THY STAFF SHALL BE AMAZED

To bend an aluminum rod:

Heat it good and hot, quench in cold water, and bend immediately. It will bend like a rubberband.

This tip was posted on the Internet. I have not tried it, but it sounds logical, and probably poses no great risk to your workpiece, as long as you don't overdo the "good and hot" part, and melt it. The collective wisdom suggests a temperature of 800 degrees F, which can be determined by "sooting" the bar and watching until the soot burns off, touching the bar with a piece of wood until it begins to char

(the wood) or using the appropriate heat crayon. The aluminum will re-temper itself, at least partially, in a few weeks, without intervention. Don't forget the quench part.

ROLL ON, BON TAPS, ROLL ON

(Some sort of French/Cajun saying, I think ...)

I mentioned, earlier, that I had good luck using roll form taps in plastic, using a drill sized for the regular, cutting-type tap, e.g., a #7 drill for a 1/4" x 20 tap. The threads produced by this process are undersized, and the effect, in Delrin, was of a "locking thread". Here are a few more thoughts on the roll forming method of threading.

The roll-forming process does not cut (remove) material. Instead, it forms the thread in a process (similar to knurling) wherein the helical depression of the thread is shaped by the compression and plastic flow of the material. Think of a wood screw making its way into a nice piece of wood. The material "flow" is a bit different, but the concept is similar. (Roll form taps can be used, with good results, in some types of hardwoods, too).

As the tap forms the thread, the crest of the tap pushes outward into the hole. Material is displaced laterally from the crest area (the Major Diameter), inward, into the root area (the Minor Diameter), which reduces the Hole Diameter. Therefore, to end up with the minimum necessary Minor Diameter, you must start with a Minor Diameter (hole) that is larger than the size you hope to end with. Translation: use a bigger drill than normal.

OK, for example, if we wanted to roll form a 3/8-16 thread, we would (hopefully) consult Machinery's Handbook (Tapping, cold form) and discover that the proper (65%) cold-form, tap drill diameter may be derived using this simple formula:

Size of Tap Drill = (Basic Thread OD) - (.0068 x Desired Percent of Thread) / Threads Per Inch.

Or, .375 - (.0068 x .65) / 16 = .3474".

The drill for a standard 3/8" x 16 tap is .3125". So, the drill for the roll form tap is .035" larger.

The major advantages of roll forming taps are:

- 1) There are no chips produced to foul the tap. Good for blind holes and stringy materials.
- 2) The roll formed thread is usually stronger than a cut thread. Good for softer materials.
- 3) The roll formed tap is stronger than a cutting tap and is less prone to breakage. Good for thin work pieces and interrupted holes.

Expect to pay a premium for Roll Forming Taps, and using a good cutting fluid is important.

They are long "lived", however, and almost never break off in your hole.

I'M DYSLEXIC, AND I'M *MAD*, "D" - "A" - "M"

The next time you're twirling a screw, - or the end of a rod, against a grinding wheel, belt or disk sander, notice which direction you're turning the piece, relative to the abrasive. If you're like me and all of the people I've observed, your normal inclination may be to rotate it in the same direction as the abrasive is moving. However, it may be to your benefit to turn it in the opposite direction. I've found that I have more control over the amount of material removed and the finish of the workpiece when I move it *against* the pressure of the abrasive, rather than along with it.

On the other hand, I may just be really desperate for something to write about. But hey, if you happen to remember, give it a try and let me know what you think. I've heard tell that 40% of people in the US put their paper towels and toilet paper on the holders with the free end hanging down *in front* of the roll and 60% have it on, down *in back*. Nature or nurture? I do not believe that the coriolis effect can be implicated here, but I do believe that the truth - is out there (?)

"IRON WAS DISCOVERED BECAUSE SOMEONE SMELT IT" ... anon (and on)

SPECIAL HANDLING

I had a project recently that required some kind of knob or a handle, but I couldn't decide exactly what I wanted it to be. It had to look, work and feel "special", and add some allure to the piece, which was not looking as expensive as I needed it to. I dug out my Reid Catalog and browsed. I selected 5 different knobs and handles that looked like they might fit the part, swallowed hard and sent the money. (some of these designer models can be real pricey) When they arrived, I liked all of them, and found that four of them were suitable for the job at hand.

The one that didn't suit the project turned out to be the one I've become quite fond of. It is an on-its-side, "L" shaped, black plastic handle, slightly offset, at about 110 degrees. The shank of the handle is a threaded stud which is attached to a spring loaded, spline. This feature permits the handle to be tightened and then adjusted to 20-45 different positions (depending on size), axially around the shank, to wherever it's the most convenient to use.

I have now bought and installed these handles on the lathe's, tailstock ram-lock and way-lock, and on the carriage way-lock. A forth one positions the

dial gage that verifies the cross feed position. On the mill, they are now on the quill lock, the motor lock and the belt guard lock. On my drill press, one secures the downfeed stop and another one locks the "floating" vise.

These delightful appendages are known as "Adjustable Handles" and come in sizes from 10-32 through 5/8" x 11, with female threads, studs of different lengths, a reamed hole or just "blank". They are also available in a zinc alloy and/or with SS components. Prices vary, from about \$4 for a 10-32, plastic handle, to \$24 for a 5/8" x 11, zinc handle with SS innards. Great stuff! MSC has them as well as Reid, and I've seen them in other catalogs, as well. If in doubt, buy one with the *female theads* you need, and fit your own length stud, with Loctite.

STATING THE OBVIOUS

A sign in a Maine, plumbing store window, "Cast Iron Sinks". Aye, yup, it sure does.

--Ed

Lathe Rebuilding (Part 1) by Steven S. Cushman

Most of the machine tools in my shop have arrived in a less than ideal condition, ranging from "needing a few repairs" to basket cases.

Probably, the tool which was in the worst shape on arrival was the 16" LeBlond engine lathe. If you happen to have a copy of Lindsay's reprint of LATHE DESIGN, CONSTRUCTION AND OPERATION, there is a 24" LeBlond lathe shown on pages 310-313. My lathe is the 16" variant of this machine and differs only in not having the crank advance for the tailstock.

When I got the lathe, it had not been used for a number of years. Many parts had been removed including the handles, micrometer collars and most of the thread dial drive. There was a lot of grime, grease and some rust. The apron would not move. The rear headstock bearing was broken. The lathe had been run from an overhead lineshaft and the overhead drive cluster was not with the lathe. Other problems were less obvious.

The lathe is now in fine operational condition (possibly better than factory in some aspects), although this has been a project which stretched out over twenty years.

I'm not sure I would recommend an equivalent reconstruction to anyone, due to the effort involved and the long period of time before any usable results could be seen.

Many of the aspects of reconstruction were typical (scraping, testing alignment, making handles, cleaning, repainting, etc.). There are many articles

written on these subjects, and I am not going to rehash this material, especially since I'm sure that the professional writers have covered it better than I would. Rather, I am going to describe how I went about some of the tasks less frequently described.

One of the first problems observed was that one cap screw was missing from a headstock bearing cap. That seemed like it should be straight forward to deal with -- buy a 1/2-13 cap screw of the correct length. Wrong. The screws are 1/2-12 60 degree V form. If you happen to have a catalog from the 1920's, you can find listings for this form easily, but they are fairly rare today and this thread was used throughout the lathe. So, one unexpected task was to make up replacements for missing (or worn) 1/2-12 screws going into tapped holes and replace 1/2-12 bolts with 1/2-13 bolts. I did locate a 1/2-12 tap which was used to chase the tapped holes. Interestingly enough, a friend of mine has a 15" Champion lathe which also uses 1/2-12 screws.

The bearings in this lathe are split Babbit type bearings. The rear headstock bearing was broken when I got the lathe and probably what had led to it's no longer being used. I let the various cleaning and painting tasks take precedence over dealing with more major problems, especially as I was not quite sure exactly how I wanted to handle some of the issues.

I thought that the front headstock bearing was probably usable as it did not show too much wear and measured reasonably. I also believed it to be a factory bearing. My reason for this belief was that it was a machined split Babbit bearing with part numbers stamped into both halves. I knew of a source for Babbit and did not have a reasonable source for bronze.

For all these reasons, I decided to replace the rear headstock bearing with another machined split Babbit bearing. I made a rough mold from wood, a melting pot from a length of 4" pipe and poured the rough bearing. This was machined to size on the 10" Sheldon lathe, hand scraped to fit and split (the technique I have used for these bearings is to split them and then separate the halves with shims of the same thickness as the slitting saw).

Before the bearing was scraped, I put the headstock in the 10" Sheldon lathe and carefully polished the rear bearing journal.

After a lot of fiddling, minor shimming and adjusting the shaft seemed to run true in the bottom bearing halves. It also ran fine with the rear bearing cap on and torqued. However, every time the front bearing cap was installed (even with the screws fin-

ger tight), the shaft would bind. For a long time, I was not sure what was going on or how to resolve the issue.

Eventually, very close examination showed that the front (believed to be factory) bearing cap did not fit well with the thrust portion of the bearing and was squeezing it down on the shaft. Scraping the Babbit away from the shell led to the discovery that the Babbit in this old bearing was riddled with air pockets. I decided that the bearing needed to be replaced, and again put the project on hold for a while.

Before I got around to replacing the bearing, I ran across some sintered bronze blanks of approximately the correct size and purchased one. This was used to make a front bearing using the same machining techniques as had been used for the Babbit rear bearing. Again, a lot of fiddling, minor shimming and adjusting, but this time the shaft turns freely with all the caps torqued.

I found the sintered bronze to be easier to machine than the Babbit and believe the results to be a superior bearing. One related change I made was to replace the existing tiny oil cups with larger ones and to (wherever possible) install oil cups in the multitude of drill holes present for oil.

The problem of the missing pulley stack from the overhead drive needed to be solved. I certainly was not planning a ceiling mounted drive, but a pulley stack was required. The lathe uses a 2.5" wide 5 step stack. I looked for many years for either a proper stack or individual pulleys, without finding either.

Eventually, I happened across a four step stack having the same approximate diameters as the larger of the original five steps, but 3.25" wide. I decided that this was as close as I was likely to come and determined to modify it as required.

The modifications began by making up a shaft. The required diameter was 2" and this was turned down from a length of rather rough 2.25" diameter stock. A keyway compatible with the keyway in the stack was machined the stack was mounted on the shaft. This shaft was then mounted between centers on my friends 15" lathe. The large end was then turned back from the 3.25" width to the required 2.5" width. The casting was sufficiently thick that this still left a flange nearly .25" thick.

I then looked carefully at the small end and decided that I was going to make the additional required step out of a section of 4" thickwall tubing. I welded a disk into a length of 4" tubing and then finish bored one side and cut it off at the required length. This let me turn down .75 inches on the out-

side end of the smallest of the four steps on the casting to a good press fit on the ID of the finished 4" tubing section.

The next step was to cut the stack in half (part it) between the two center sections. Completing this operation left the two larger diameter steps free as the amount of the center bore remaining with these two steps was insufficient for secure mounting. The two smaller steps were still securely mounted to the shaft. The larger of these two smaller steps was then faced off to the proper 2.5" width.

I then decided that it was more appropriate to deal with the width of large section before dealing with remounting it to the shaft. It was of too large a diameter to conveniently mount it to the largest faceplate available for the 15" lathe, so I decided to face it off on the milling machine. This worked, but the size of my milling machine required multiple setups and could not be described as convenient. If I were faced with this problem again, I would probably elect an alternate solution.

At this juncture, two modifications were made to the internal structure of the larger stack section, and one to the smaller section.

For the larger stack section a length of stock was rough bored as an extension to the small section of center bore remaining in the large section. A keyway was machined through the wall of one end and devised such that a screw clamp would hold the key in place. This was welded to the remaining center bore. Then, the three spider arms in the large section were slightly extended and welded to the bore extension. This work extended the bore towards the large end. At the small diameter end, a disk with a center hole larger than the shaft diameter was welded to the spider arms. Back at the milling machine, things were lined up as best as possible and the center bore extension was bored to the finish diameter. Proving that it is always possible to devise an order of operations requiring duplication of prior setups, the disk was then faced parallel and even with the inner face of the smaller step.

(continued next month)

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