

The NEMES Gazette

*The Newsletter of the New England Model Engineering Society,
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October, 1997

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Our Next Meeting is at 7:00 PM October 2nd, 1997 at the Museum, 154 Moody Street, Waltham Ma. and don't forget the SHOW Saturday October 4th from 10:00 AM to 4:PM (setup at 8:00 AM)

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

From the Editor's Desk:

Now that we have a charter, I've changed the title of Ron's monthly column to "President's Corner" from "Founder's Corner." Not that I expect him to say much of anything different now, but it does reflect that NEMES is getting a bit more organized.

I made the trip out to Roland Gaucher's shop for the swap meet September 21. There were 30 or 35 people there having a good time and I want to thank Roland for inviting us out.

It's been suggested that a table of contents would be a good addition to the Gazette, and I agree, I just haven't gotten around to it yet. Along those lines, would someone be interested in volunteering to do a cumulative index for the last year and a halfs worth of issues?

See you Thursday night, scl.

President's Corner

by Ron Ginger

Organization: I was quite pleased that we were able to move ahead on the formal organization at the last meeting. I welcome Steven Cushman as our new vice President, and Mike Boucher as the "Officer at Large".

Thanks also to Mike for working through a charter, and the continuing help in the paper work needed to make us an official organization. I think this is an important step in the future of our group.

The Oct 4th Show: I hope everyone is thinking about their exhibit for the next show, Saturday, October 4, 1997. We will be running it just about like the past February show. We originally thought the museum would be hosting a Steam Expo the same day, but for several reasons those plans had to be dropped. Our show will be the only event at the museum that day.

I have not asked for a preregistration this time, I have confidence now that we will have enough interested fellows to make a good show.

As before, we will start setting up at 8:00AM. The tables will be delivered by the rental company on Friday so we just have to set them up and cover them. We have a promise of an air compressor, and John Wasser has the air line and fittings worked out. We should have enough air to run quite a few steam engine models.

We are allowed to bring a SMALL amount of fuel into the building. Please keep this to as small an amount as practical, and bring along a FIRE EXTINGUISHER. We will not have to pay for a Fireman this time, after they saw how well we handled it last time. Lets be sure to maintain our careful safety watch!

I think we will again have the refreshment table. I am very pleased that we have the help of a few wives in that area. I do need 2 or 3 volunteers to run a registration table. I want to register all the exhibitors as they come in and last time I simply couldn't keep up with that alone. If I can get 2 or 3 volunteers we can each just do it for an hour or so.

Rudy Kouhoupt: I think many of you will know the name Rudy Kouhoupt. Rudy has written for HOME SHOP MACHINIST magazine, and for POPULAR MECHANICS for many years. He has published dozens of great projects, and has at least one book published. He also "stars" in a series of very good instructional video tapes.

I spoke to Rudy in April at the NAMES show, and he was very interested in speaking to our club. We hoped he could do it at the October meeting, and then stay over to attend the show. But he has decided to drive to Eugene Oregon for the first Pacific Model Show and he expects to be returning home just about the day of our meeting. Clearly he needs a bit of a rest, so he has agreed to speak at the NOVEMBER meeting.

Mark this on your calendar, and tell anyone else you think might be interested. I am sure this will be one of our best ever meetings.

October Meeting: For some time I have been experimenting with mixing my computer experience with my shop hobby. I have mentioned this to a few fellows at meetings, and there has been some discussion on our club mail list about this, so I decided I would talk a bit about my 'Adventures in Home Brew CNC' at the October meeting. I know a couple others are doing some work as well, if you are please join me in telling the group about your work.

This might be a good lead-in to Kay's suggestion for a group project to build an EDM, since the EDM drive mechanism uses the same kind of step motors we use for CNC. Enough for now, see you all October 2nd, and again October 4th!

-- Ron

Calendar of Events

Thursday October 2, 1997 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Saturday, October 4, 1997 -- Model Engineering Show at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Thursday November 6, 1997 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Thursday December 4, 1997 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Thursday January 1, 1998 -- 7 PM, NEMES MEETING at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

Saturday Feb 21, 1998 -- Second Annual NEW ENGLAND MODEL ENGINEERING SHOW at the Charles River Museum of Industry, 154 Moody Street, Waltham, Ma 02154, telephone 617-893-5410

The Meeting, 4 September, 1997

The meeting got started with some discussion of the show coming up October 4th. There won't be a Steam Expo this year for a variety of reasons, including the fact that the boat ramp is inaccessible because of construction. Also, Chet Petrowski, who had run the boiler for it, passed away a few weeks ago. Ron passed out flyers at the show down at Mystic, so we should have a good attendance. We'll rent tables the same as for the last show. We need a volunteer to help register people as they arrive.

Karen has agreed to give NEMES some space in the storage room for our books and other things.

We have talked for quite a while about getting NEMES organized and official, and tonight we took steps to do it. Mike Boucher presented the draft of the bylaws. Highlights of the bylaws include the following. Full membership is available for people 18 years and older, Junior membership for people 12 to 17 years old. Dues are payable by June 1st of each year and must be in by November 1st or you are out. There will be a President, Vice President, Secretary, Treasurer, and a Director at Large. Elections take place at the June meeting, for the candidates nominated at the May meeting. A quorum is 30% of the members. An amendment to the bylaws requires a 2/3 vote of the members at a business meeting (the May and the November meetings are the two business meetings of each year.) If the organization is dissolved then any remaining assets of the club will go to a non profit organization (such as the Charles River Museum.)

Max ben-Aaron moved that the bylaws be approved. All approved, and there was no opposition. The next step is to file for incorporation with the state. Mike Boucher will take action on it.

So, we now are organized and hopefully on our way to becoming a permanent organization. Ron Ginger is the new President, Steve Cushman is the new Vice President, Kay Fisher is the Treasurer, and Mike Boucher is the Director at Large. I guess I'm the Secretary.

Kay Fisher had the EDM books that he'd gotten from Village Press in a group buy to pass out to those who had

ordered them. There's a possibility that it will be a group project for those who want to pool their efforts to build a batch of them.

Bob Painter visited us. He has a bunch of equipment and supplies that he has to clear out as he's retired and sold his buildings. I visited him about a year ago and there was a lot of good stuff there. My favorite items were the Optimatic Lensmaker Lathes by Dunham Tool. The head is similar to a Hardinge with dual tapered roller bearings and had a pneumatic collet closer for 5C collets. It's a specialized machine tool for making contact lenses, but it's got a lot of possibilities for adaption and use in the home shop. You can reach Bob at Millen Hardware Div of Beta Labs, 42 Pleasant St, Stoneham, Ma 02180, 781-438-1662

Howard Evers reports that the visit to Union Twist Drill in Athol was a big success. If you're the one who put a couple of drills into his box of goodies there let him know so you can get them from him. As a matter of fact, it was such a success that Paul Gaufin has arranged for us to do it again. Be there at 9:00 AM on October 25. With a little more notice this time hopefully even more people will be able to make it than in the August visit.

Assabet Valley Regional Vocational Technical School is running a milling machine course Wednesdays from 7 to 10 PM. There will be 10 Sessions.

Errol Groff has put another recommendation in for Rainy Day Books in New Hampshire. He says there's another good place for technical books in downtown Derry NH as well.

Jim Chetwynd Sr. had a \$39.50 digital caliper that he bought from Hydraulic. It measures to +/- 0.008 inches. He says it'd be great to hook up to the spindle of a drill press. Don Strang has a catalog and a video of a steel blackening kit for anyone who is interested. He also reports that a recent model engineer had an article on putting fiberglass over styrofoam to make fiberglass shapes the way that Henry Szostek did when he made the air cleaner for his motorcycle. He also brought in a diaphragm chuck he picked up used for \$75 a while back. It's from Sadler, which is now Northfield Industries. It's useful for holding things like bearing races or washers, from either the inside or the outside. He also recommends that you go see Admiral Dewey's flagship from Manila Bay if you're in Philadelphia.

The New England Job Shop Show is at the Royal Plaza Trade Center in Marlboro Oct 14, 15, and 16. 10-4 Tuesday, 9-4 Wed and Thurs. Register on the internet at <http://www.jobshopshows.com/marlborough> It's exit 24B off of Rt 495, 1/4 mile west of 495 on Rt 20. Put on by Job Shop Shows, Inc. 203-758-6663 Register ahead for free admission.

Ray Hasbrouck at 22 was the 2nd engineer on a Liberty Ship, and he gave Ron and Roland a great tour of the one at New London for the Mystic show.

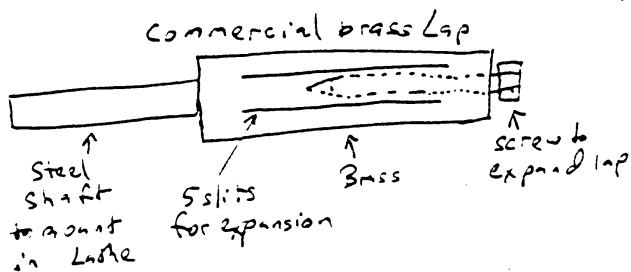
Dave Piper brought in some castings for the marine engine he is making. He paid \$75 each for two engine sets he had

cast by Peter Lyons at the Nashua Foundry in New Hampshire. He made the patterns and mounted them on a match plate. The foundry added the gating and poured him the two sets. He used standard round cores, which the foundry has available in 1/8" increments from 3/4" to about 4".

The main speaker for the night was Roland Gaucher, who talked about lapping. He likes it because it's cheap – all it takes is patience to get remarkable fits. One of the first lapping jobs he did was the cylinders for his Bently BR2.

He recommends lapping in the lathe with plenty of newspapers put down to keep the lapping compound off the ways.

Clover Compound is what he uses (on sale in September from MSC) and he has one grade, 280 grit, which he says is good for lapping out a bored hole.



Move the cylinder back and forth on the lap going 300 RPM or so to get a 45° to 60° angle on the pattern the lap makes in the bore. Try to use a standard diameter bore so you can use standard laps.

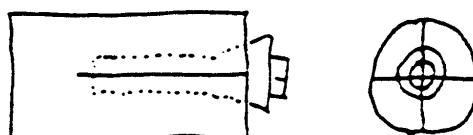
New laps don't work as well as older ones. A new lap will only cut on a 1/16" band or so at the center (where it's expanded the most) while an older one will cut over a wider band.

Move the cylinder from no resistance on one end to no resistance on the other end as you arelapping. The lap cuts at its middle and you need to go all the way through the cylinder with the cutting action or it won't be lapped straight. At first the lap will cut fast. As you lap the compound will move away from the center of the lap where it does the work as you continue, so wipe it back to the middle of the lap where it can do some work and the lap will start to cut again. Lapping will straighten out a taper in a cylinder.

The big question is where to start. Leave 0.010" oversize as you start. If it cleans up at 0.005 you can still hit your target, but if you go too close and it cleans up undersize, you can't put metal back. As you learn about the individual work you are doing, you will learn how much to leave for lapping. At first, the cutting action will be fast, but as the surface becomes more even, the action will be slower as more metal has to come off to remove the same thickness. Hold the cylinder in your hand. If it grabs (and it will, so be sure you don't have sharp fins on it if you're holding it in your hand – be safe!!) shut down and loosen the lap, then continue. As the piece gets smoother, wipe off the compound. So that you will finish up with the lap dry and squeaking. That will leave the part with a burnished surface.

If you start lapping a bored hole any imperfections in the hole will show up. Roly had a "perfect" hole that he had bored on his LeBlond gearhead lathe. When he started to lap, a pattern showed up. It was probably due to a vibration from one of the gears in the train driving the spindle, with the number of lines down the length of the hole matching the number of teeth in the gear.

Don suggests putting the lapping compound onto the lap with your finger. He uses 280 grit for the whole job – it breaks down as you go along and gives a good finish. If you add fresh 280 grit after you've been lapping on the part for a while, the fresh compound will put scratches into the work.



Cylinder with +
cut in end and
a screw thread for
a tapered bolt

Laps get better with use, the more the use, the better they get. To avoid bell-mouthing, change ends often, so the cylinder doesn't go the same way over the lap all the time. Also, use a lap that is a lot longer than the cylinder, as that will tend to keep everything lined up.

A cylinder hone just roughens the surface. A cylinder and a lap that aren't round will vibrate as you start lapping, but as metal is cut away, both the lap and the cylinder will get rounder. A cylinder hone will follow the shape of the cylinder but won't make it rounder.

When lapping, you can feel a difference of tenths on the diameter. That lets you control the size of a shaft so that you can get a thumb press fit of a bearing onto the shaft, where the difference between a thumb press fit and a falling off fit is only maybe 10 millionths of an inch.

A lap for cleaning up a lawn mower crank after somebody started it up new before adding the oil:

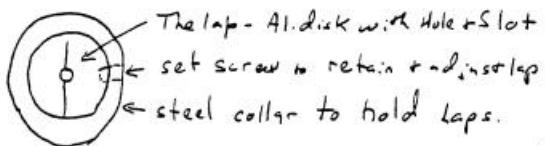


When the fit on the shaft gets loose and needs to be tightened, take the cap off and rub it on 320 paper, then put it back together. The removable cap lets you lap the crank journal where you couldn't get to it with a lap with only one split.

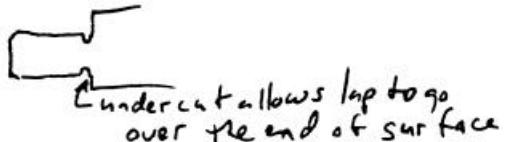
You can use almost anything as the base for a lap. Wood, plastic, whatever – as long as it's softer than the work. Lead is a traditional material for making laps.

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Here's a convenient device for lapping shafts:



It's important to lap off both ends of a part to keep it straight and free of tapers. So, when you are fitting a bearing up to a shoulder, do it like this:



Soap and hot water is the best way to get lapping compound off of cast iron – but watch out for rust.

Treasurer's Reports

Aug-1997

Previous balance -----	\$1776.61
Dues Deposits -----	40.00
Service Charge (Jun) -----	-2.66
Interest -----	0.02
Service Charge (July)-----	-3.00
Newsletter postage (2 months)	125.72
Dues Deposits -----	380.00
New Balance -----	2065.25
Sep-1997	
Previous balance -----	2065.25
Interest Adjust-----	3.36
Advise of Credit -----	0.09
Interest -----	0.74
Service Charge -----	3.00
Newsletter postage -----	74.79
Dues Deposit -----	100.00
New balance -----	2091.65

Respectfully, Kay R. Fisher

Tips And Techniques

By Ed Kingsley

Some recent progress, a bit of insight (aha!) and still more amazement at the past.

PROGRESS – Drill Press

After trying every way I could think of to position and immobilize pieces of work to be drilled, counterbored, tapped, etc., I finally got around to mounting the drill press vise I bought at least 10 years ago. I've used the cantilevered, column mounted, cam type hold-down for 15 years, but it can exert so much force that it's difficult not to tilt the table or distort the workpiece enough to misalign the spindle with the hole. I've tried the Vise-Grip type, toggle clamps and various and sundry other hold-downs that fasten through the table slots. These kind don't tend to cause as much misalignment, but are often too short, too low or just impossible to position in the slots of the table.

The genuine drill press vise I now use is a "Float-Lock – Standard". It looks like a large bicycle (or basin or monkey)

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wrench, with 5" long jaws, 1 1/2" thick. The "handle" is a 1" diameter tube, 18" long, that runs through a small, lever operated clamp that is fastened to the edge of the drill press table. The jaws have a 1/4" deep x 1/8" wide groove on the "up" side, and a "built-in" parallel that holds the work 1 1/4" above the table. One jaw also has a vertical and a horizontal "V" groove for round work. The vise "tube" slides through, and pivots around the clamp, permitting the jaws to be moved, quickly and easily, anywhere on the table.

The jaw furthest from the clamp is fixed. A folding crank handle extends from it which opens/closes the other jaw, which moves along a keyed slot running the length of the tube. Maximum opening is just over 10". The jaws lie on the table, which on my machine is too wide to permit the crank to hang over an edge, so moving the jaws is tedious. A smaller table or longer tube would eliminate this problem. I had neither, so I cut out a 5" x 5 1/2" x 1/2", Aluminum plate, bolted my Atlas Shaper Vise to it, and mounted IT in the "Float-Lock" vise.

It's the best of both possible worlds. The Atlas Shaper Vise is 4" wide and opens about 4 1/2", so it has a reasonable capacity for a drill press vise. I've replaced the iron crank with a 2" diameter knob with a revolving handle, which makes for rapid adjustment, and I left 1/2" of the square end of the shaft exposed to slip a wrench on.

Now, I lay out the work and punch the hole centerline, fasten the piece in the Atlas Shaper Vise, and move the "Float-Lock" around the table until the punch mark is under the center drill. I let the center drill "find" its way into the punch mark (the "Float-Lock" slides on the table surface) and then tighten the clamp on the tube of the "Float-Lock". The vertically moving clamp does not induce any lateral displacement of the tube, nor flex the table in any way, so the work just "freezes" in place and is prevented from moving in any direction. This setup is a quantum leap in accuracy, convenience and user satisfaction.

The new MSC Catalog shows a "Heinrich" vice on page 2111 that is similar, and has the added advantage of a lever operated closer (instead of a crank) - \$149. I should mention that the "Float-Lock" can be rotated off of the table or removed from the table clamp in a few seconds.

PROGRESS – Band Saw

I cut a fair amount of rod, tube, and square and rectangular bar stock in my vertical band saw. Holding tube and round stock and preventing it from rotating, can be a challenge. I obtained a clamped-out 2 1/2", cast iron, drill press vise recently (cheap) and since it's too beat up to use for precision holding, I've been using it to hold the stock I'm cutting on the band saw. It has a horizontal "V" groove and holds bars very well, but pushing it along with the miter gage was frustrating.

A while back, I made a sliding plate to hold a square, 5C Collet Block in the groove of the table of the band saw. The idea was to use collets to hold the round stock and tube. It worked very well, but the diameters were often outside the collapse-range of the collets that I had, and the amount of work involved with using collets finally outweighed the advantages, but the idea that stuck was the 1/4" x 3/4" bar that rode in the table groove and kept the work perpendicular to the blade.

I put the old vise next to the blade and measured the distance from the outside of the vise to the outside of the groove. Then I looked through the assortment of aluminum angle I've collected from many visits to Admiral Metal's Thursday afternoon "Tent Sales" (ask me if you don't know about this...) and found an unequal legged piece, needing a minor amount of adjusting, and cut off a 5" length. I drilled

two holes in the side of the cast iron vise and two holes in the short leg of the angle to match. I drilled two more in the ends of the long leg, through which I fastened a 6" length of 1/4" x 3/4" steel bar with two tapped holes.

I drilled the second set of holes in the angle oversize, and used a dial gage to adjust the bar so that the vise jaws are perpendicular to the groove. Picture a canoe with an outrigger mounted low to the water. The only other thing I had to do was to remove the sliding "T" handle, which caught on the edge of the table, and replace it with a 'knob' shaped handle. It now takes only seconds to place the vise on the table, clamp the work and push it through the blade - making a straight cut. The vise is limited to work 3 1/2" wide, but if it's large diameter round stock or tube, I cut it with the power hacksaw and, if it's plate, well I've already started making a sliding platform that will hold fairly large pieces of flat stock.

I've also been sketching up some ideas for a gravity powered, hanging weight, "come-along", with a limit switch, to make bandsawing larger stock a pretty much "hands-off" operation, similar to the power hacksaw. I truly believe it is actually laziness, and not necessity, that is the real mother of invention.

INSIGHT - Lathe

After many laborious attempts at turning "push fits" that resulted (on taking that "last" thou) in something that only a machinist's mother could love, I decided that I needed to fit my cross slide with a dial gage to see where I was going astray. When I installed it and started turning the crossfeed handle, the light shone down upon me. My lathe is a venerable 10" Atlas that's seen more than its fair share of work over the years. When I first got it, I replaced the half-nuts (what I think I am, most of the time ...) and the crossfeed leadscrew nut. I never considered that the leadscrew itself was badly worn - isn't that what the brass nut is supposed to take care of (?).

In the movement of 1" (10 turns of the handle) I saw variations between the dial gage and the handle dial from zero to .004". The reading at "0" on the crossfeed dial was always within .0005" of the dial gage, but at "50" on the crossfeed dial, on all 10 turns, the discrepancy was never less than .002"! Obviously, if I'd zeroed the dial gage at a different point in the rotation of the lead screw, the discrepancies would have occurred at different dial numbers, but the runout was fairly uniform at the same position of the handle. The greater amount of runout occurred in the middle position of the crosslide, which was to be expected, and there was almost none at either end of the travel.

Even .001" or .002" is a very large mistake, since it's doubled in relation to the diameter of the finished piece. My dial gage is now a permanent part of the crosslide and will remain there. The first press-fit I attempted to turn, after installing the dial gage, was exactly that, proving I guess that good work can be done with an imperfect tool, but only if the workman is aware of its limitations and knows how to make the necessary compensation. Too often, I take the accuracy of my tools and equipment for granted, when I should take the time (and effort) to carefully check them out BEFORE the mistake is made and the damage is irreversible.

MORE AMAZEMENT AT THE PAST

The American Precision Museum, Windsor VT

I had the opportunity, and pleasure, to visit this great museum again. Last year I got there about and hour and a half before closing time and was just overwhelmed. This year, I gave myself almost four hours (since I'd already

seen most of the stuff already ...) and managed to be overwhelmed all over again.

Last year the Special Exhibit was "Maxfield Parrish, Artist and Machinist". This year it is "The History of Pedal Power". A dozen or so treadle operated machines are presented, but the bulk of the exhibit is devoted to the history of the bicycle, from the first pedal powered model in 1865 to the silver medal winning sprint machine at last Summer's Olympics in Atlanta. A video of the pedal powered planes, Gossamer Albatross, and its successors caps, the presentation. They have a high wheeler set up on a stand that you can sit on, and pedal, without fear of falling. My first bicycle had 10" wheels and it looked pretty scary from way up there. The wheel on this bike is taller than I was, then, and you sit on top of it!

The BBC returned this summer, for the second time, to film a documentary about arms making in America. I saw a clip of the first film, while I was there, in which several of the museums collection of machine tools were run. They included a rifle stock, pattern-replicating lathe, a dedicated mill that cut the outside shape of interchangeable lock mechanisms and a barrel rifling machine that was made in 1853, used in the building now housing the museum (originally the Robbins and Lawrence Armory and Machine Shop) through the Civil War and then by Smith and Wesson through the end of WW II!

A few things I learned this trip were that ball wheel bearings, pneumatic tires, shaft drives, case hardening, electric welding and swaging, stamping and pressing techniques were originally developed for the manufacture of bicycles. A shaft drive bicycle (a la BMW motorcycles) was made in 1898, for women primarily, to keep their skirts from getting caught in the chain. A Tricycle (also designed for women) on display, built in the late 1880's, had a steering tiller and greatly resembled the earliest automobiles, which look like they simply added a motor.

I hadn't realized before the extent of the debt the automobile owes the bicycle. I had always assumed that the horse drawn carriage had directly evolved into the automobile and that the bicycle was a spin-off or parallel development. Not so. "... excepting the internal combustion engine, almost every technological breakthrough required for the car had previously been either adapted to, or specifically developed for the bicycle. (Henry) Ford used many bicycle parts in his first car ... named the quadricycle". Prof. Glen Norcliffe, York University.

There's so much, much more at the museum and, rather than bore you with inadequate descriptions, I'll just recommend, in the strongest possible terms, that you visit for yourself. The American Precision Museum is located in Windsor VT, (take 91N or 89 toward Lebanon NH) and is open until November 1st. The foliage is magnificent in early to mid October, so you have the perfect excuse to get the spouse to come along. Give them a call @ (802) 674-5781. Be sure to check out the circa 1825, 13" by 14', chain driven metal lathe with the 6" x 13" x 14' granite bed. It's 'way' cool.

-- Ed Kingsley

Letters

Ron Ginger sent me the following mail: I have Rudy Khoupt lined up to be speaker at the Nov meeting. Could you see if we can get his book from village press/ maybe we could take orders in Oct, and have them on hand in Nov when he speaks and maybe get them autographed? Well - I called Village Press to set up a more permanent arrange-

ment with NEMES and from now on I can order books for NEMES at 40% off plus we pay shipping. There is a huge saving in shipping costs by getting all books sent in one box to one address. So having learned my lesson in the last EDM order I will take orders at the next meeting based on cash in advance. The Rudy books are normally \$36.00 plus individual shipping would run another \$5.00 for a total of \$41.00 each. I will take orders for \$23.00 each at the next meeting.

I plan to bring my Rudy books in to the next meeting so you can inspect incase you have never seen the Rudy books.

Summary - If you want to order the Village Press Rudy books (Volume 1 and/or Volume 2) then you need to bring a check for \$23.00 or \$46.00 to the next meeting. Make checks out to NEMES but if you must use cash - please bring the exact amount.

Respectfully
Kay R. Fisher

Warning

I recently got word from Don Strang that he has seen warnings in two different magazines about power strips made in the far east. They have been reported with counterfeit UL labels and with faulty grounding. Weak spring clips to do

the grounding, and even cases where the green wire from the plug wasn't connected to anything. If you are counting on your power strip to be properly grounded or want to use it with a ground fault protection plug be sure to open it up and check that it is properly grounded.

Classified Section

Worthington Duplex Steam Pump. 3x2x3 \$125 Leo Klos,
508-465-1960

Al Wade has a 9" South Bend Model A for sale and a Bridgeport DRO for sale. If you're interested see Don Strang or Norm Jones.

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c/o Stephen C. Lovely
Post Office Box 277
Milford, Ma. 01757-0277
newsletter of The New England Model Engineering Society