The NEMES Gazette

Vol 3 No 32
December, 1998

The Newsletter of the New England Model Engineering Society,
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Our Next Meeting is at 7:00 PM Dec 3, 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

This Months Contents

From the Editor's Desk:

Well, I messed up last month. Just after I dropped the November issue into the mailbox I noticed I hadn't updated the page headings - so the November issue said it was October and No30, not November and No 31. So, this month the first thing I did was change the headings to December and No 32. (I've also set up for the January issue already and even remembered to change the year!)

Don't forget to park up by the Railroad Tracks again this month. Hopefully the new Garage will be done on schedule and we'll be able to park across the footbridge again soon - but from the info in Ron's column below it doesn't look good..

The Gazette needs material for upcoming issues. Deadline for the January 1999 issue will be early due to my schedule. The deadline will by 14 December, only a week after the December meeting. Even though I'll be doing it early I'll save it till the 29th or 30th of December before I mail them so it should come about the normal time to remind people to come to the meeting.

See you next Thursday night, scl.

President's Corner
by Ron Ginger

DECEMBER MEETING

We will have Ralph Lacerte of Kennametal Corp (the parent company of J&L Industrial) as our speaker. Ralph is an expert on carbide tools, and will talk about the various forms of carbide, how to select them and how to use them. I am anxious to hear this, as I have used some carbide tools with mixed results. I'd like to know more. He will be bringing some handout information. It should be a very usefull meeting.

We will have time for a few short Show and Tell items. We seem to have moved away from that part of the meeting, and Id like to see it resume. I'm sure there are lots of projects going on among our members, let's hear a bit about them. I want to emphasise the SHOW part of these talks, I'd like to keep long technical talks for featured programs, and hold the Show and Tell time to only 4 or 5 minutes each.

Our January meeting is planned for member Dave Stickler to talk about some of his work in the rocket and space world. This should be very interesitng meeting.

I am always looking for meeting suggestions or speaker volunteers- let me know what you would like to hear.

CABIN FEVER BUS TRIP

It looks like we are going to have enough interest to make this trip. I based the $100 bus cost on 21 riders, and we now have 19 signed up, so I have firmed up the reservations for the bus and hotel. Obviously we still need at least a couple more people, and there is room for 49 total, so its not to late if you are still thinking about it. If you get HOME SHOP MACHINIST the last isue had an ad for the show that listed the vendors that were already signed up. There are going to be a lot of interesting models to see, kits and books and used tools to buy, and of course, the fun of a long weekend with a bus load of your friends to talk shop.

If you plan to go, you need to make a hotel reservation before Dec 31. After that they wont guarantee the group rate of $65 per night (note thats per room- so if 2 people share a room you can save half of that.) If you are on the list make your reservation now, just so it doesn't get forgotten before the deadline. Call the Inn at Reading at 800/383-9713.

MUSEUM NOTES.

At the last meeting Karen asked me if we could get some help from club members to reorganize the shop and make it both a workable shop and an exhibit. She would like to see some of the machines setup with samples of the kind of work it makes, and some graphics to explain the machine. There is at least one automatic screw machine that would be great to be able to run, so the kids could carry off a part they saw made right before their eyes!

Ed Mann is working on a plan for the shop, and when we have it we can set a date and see if we can make some progress. I think the most likely time is a Saturday morning. As soon as we can get the details I'll let everyone know.

As it gets to the end of the year and you start thinking about taxes, consider a membership to the

museum- its a tax deduction, helps keep the doors open for our meetings and the public to see some machines they might not otherwise ever see. And for the higher level of support you get INNOVATION AND TECHNOLOGY magazine as part of your membership.

It looks like the parking garage that was supposed to take jsut a couple months has run into a snag- actually it ran into unstable fill, and since its the bank of the Charles River I wold think fill is not too surprising!. Anyway, a few more months of the parking problem, but It doesnt seem to be to bad, I've been able toget a space in the railroad lot both meetings. Just remember, the spaces around the building are reserved for the residents, please don't park there.

TABLETOP MACHINING

The owner of Sherline, Joe Martin has just published a new book called TABLETOP MACHINING. As ou would guess, the subject matter is Sherline machines, but the operations and setups are really universal and would apply to any use. It is also an excellent book of full color photos of a couple dozen very fine models. Our member Roland gaucher has a project in the book.

As a Sherline dealer I can order the books for a good discount, and I'm willing to sell them to members at my direct prices. In this case, the normal discount makes the book $30, but there is an additioanl discount on case lots of 12 books that makes the price just $20 each. I'll have a sign up sheet at the meeting if you are interested in a copy. I will have a copy on hand to look over.

(Not to make this a commercial, but I do sell Sherline equipment at a 20% discount. If you would like to get any of their machines, talk to me)

SNOW EMERGENCY

Since it is that time of year, even though the current weather doesn't seem like it, we should recall our plan around snow days- if the weather is such that Northeastern University cancels class, as announced on WBZ radio (1030 AM) then we are cancelled too. Last year we did have one bad weather day that stopped our speaker, but still about half our stalwart memebrs showed up, and heard a great talk about silversmithing.

FEBRUARY SHOW

Just to keep your dates open, our annual show will be Saturday Feb 20. As we did last year we will try to get some more good raffle prizes for the exhibitors, and I suspect we will do the show just about as we did last time. We will get into more details next month. Get those projects ready so we can have another good show.

--Ron

Calendar of Events

Dec 3, 1998 Thur 7PM
NEMES Monthly club meeting

Waltham, Ma.

Charles River Museum of Industry 617-893-5410

Dec 13, 1998 Sunday 10:00AM
Straw Hollow FrostBite Crankup

Boylston

Norm Jones 978-256-9268

Jan. 7, 1999 Thur 7PM
NEMES Monthly club meeting

Waltham, Ma.

Charles River Museum of Industry 617-893-5410

Jan. 29 1999, Fri noon to Sun noon
Cabin Fever Show

NEMES bus trip to big east coast model show.

Ron Ginger 508-877-8217

Feb 4, 1999 Thur 7PM
NEMES Monthly club meeting

Waltham, Ma.

Charles River Museum of Industry 617-893-5410

Feb 20, 1999 Sat 10AM to 4PM
New England Model Engineering Show

CRMI Waltham Ma.

Ron Ginger 508-877-8217

For a listing, please sent name and brief description of event, time and place and a person to call for further information to:

Bill Brackett at wbracket@ultranet.com or 508-393-6290

Nov-1998 Treasurers Report

Previous balance ---------- $2567.25
Interest ---------- 1.11
Dues Deposit ---------- 40.00
New balance ---------- $2608.36
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Aloha
Kay R. Fisher

The Meeting, 5 November, 1998

Ron brought up the idea of special interest groups within NEMES again. To get them started we need volunteers, both to lead and to follow. Bob Barrett says he's got a welder and could have a welding session at his house. Howard Gorin said he'd be happy to have some folks over in the spring to learn about operating a steam roller.

Mike Boucher had an IRS form SS4 to get NEMES the equivalent of a Social Security number so that we can get a bank account that is actually in NEMES's name.

As part of his search to get all editions of Machinery's Handbook Errol Groff has had all the names and addresses from the 1998 Engine Show book entered into a computer, and has gotten permission from the publisher to let others use them, so check with him if you need them. He's still looking for the 2nd and 3rd editions.

Don Strang's talk on electric motors.

Electrical theory is not something I claim to be an expert at. I've tried to get the facts straight from Don's talk in the following paragraphs, but please let me know if I got something wrong, Don, so I can get it corrected next month.

Edison believed in DC current, and his first systems used 2 wires and were 10KW, good for 400 25W bulbs for lighting houses. The three wire system evolved from the 2 wire, with the common wire being the + for one of the 100V legs and minus for the other leg. This gave 200 volts DC over the combination of the two legs and allowed a smaller conductor in the common wire, saving money. If the two legs had balanced loads then there was no current flowing in the common wire, and as long as each side had at least some load the common wire would have less current flowing in it than the other two. The 3 wire circuit was retained with the conversion to AC current. Typically there is 2300 volt 3 Phase current on the street, converted by single phase 10:1 "pole pig" transformers to 230 volt AC. The center tap of the transformer is the common or neutral line is grounded to earth and there is 115 volt AC between the two legs and the common line and 230 volt AC across both of the legs from the transformer.

AC current flows in a 60 Hertz sine wave. That means that it goes from 0 voltage to the maximum positive voltage, then through 0 volts to the maximum negative voltage and back to 0 volts 60 times every second. The voltage that we refer to with AC current it the RMS voltage (root mean squared) and works out to .707 times the peak voltage. The current also flows in a sine wave. If you look at a sine wave there are obvious places that you can put a marker, such as where it crosses 0 volts with the voltage going up. When looking at two sine waves these marking points can be used to compare the phase of one wave to the other. The phase that is ahead is leading, the one that is behind is lagging. For a resistor the voltage and the current are in phase with each other. For a capacitor the current leads the voltage, and for an inductor the current lags the voltage.

Michael Faraday produced Faraday's law, change of magnetic flux causes current to flow. Biot-Savart showed that the voltage times the current was the electric power and that force times velocity, the mechanical power, was equal to the electrical power. Faraday's law says that a wire moving in a magnetic field produces a voltage. So, combining the two, we can moving the wire in the magnetic field and produce a voltage (a generator) or we can put voltage into the wire and get movement out (a motor.)

Induction motors work because of a rotating magnetic field that the rotor tries to keep up with. Polyphase induction motors are selfstarting because the magnetic field rotates as a result of the multiple phases. Single phase induction motors need to be started.

A squirrel cage rotor has a current flowing in it as a result of the magnetic field from the stator. It always turns slower than the rotating magnetic field from the stator because if it catches up the wires in the rotor are not moving in the rotating magnetic field of the stator so there is no force. The more that the motor slips below the synchronous speed the greater the torque, up to the maximum torque. If the motor is loaded to the point were it slips below the maximum torque speed it will stall as further slowing will reduce the available torque until it is producing the starting torque and not moving.

In a single phase motor the magnetic fields swap direction ever 1/120 of a second. To start the motor there is a set of start windings at 90 degrees from the run windings. To start the motor a current 90 degrees out of phase with the run current is needed. To get the starting current typically a capacitor is used to shift the phase until the motor reaches a certain speed, at which point the starting current is cut off. Once the motor is rotating a voltage is induced within the rotor at 90 degrees from the run winding. The magnetic field that results from the current in the run coils and the induced current in the rotor continues to rotate as the rotor current takes the place of the start current in the start coils to keep the motor running.

A 2 pole single phase motor turns at about 3450 rpm at it's rated load. At no load they run about 120 rpm below the 3600 rpm synchronous speed and then slow down slightly more for the loaded condition.

Three phase motors are more complicated - there are three phases at 120 degrees from each other to produce the rotating fields. When one phase fails you are back to one phase.

Life in A Watch Factory

The main speaker for the night was Par Caruso, who went to work in the watch factory in 1927 as a 17 year old Newton High School Sophomore looking for a summer job and liked it so much he stayed.

He started out as an errand boy in a 200 foot long room full of people assembling watches. That was in the finishing department where Charles Freedman was his first foreman. Boxes with the parts

for ten watches in each went to the assemblers. In his first week he dropped a box, but despite his fears he didn't get fired. After four months he was made an assembler. Women did the assembly, then men put in the balance. In another four months he was moved to balance adjustment as he'd done well. It took about 3 years to go through the entire course of watchmaking at the plant when he started in 1927.

In 1929 the crash came, and there were only 30 people working in the factory. Pat sold ice and did very well, but then the refrigerator started to come in and the ice business slowed. He went back to the factory in 1934, and by 1938 business was getting better.

Things were still piecework, but you were part of a 10 or 12 person team assembling watches (depending on the model watch.) It could be fine, or if one of the people wasn't up to speed it could keep the whole team from making a decent wage. So, a union got organized in Pat's cellar with about 300 people from the finishing department. Pat was the #2 man after the president of the Union. They promoted the president into management, and he quit the union so Pat was the president. In a few months they made Pat management too, but he stayed in the union. So they told him he was going to be let go just before vacation.

He built his brother a house, and then decided that he should start a watch repair shop. At that time the company credit union was in the personell office. So, when he went to get out his money to set up his shop they wanted to know why he wasn't working at the plant, and he took one jobbing - repairing the watches that failed on the line. It was a good job because many of them had nothing wrong but stuck hands.

Then the AFofL sent in an organizer and by a 1500 to 300 vote they became a closed shop. At that time the Swiss were becoming tough competition and when the union came in the piecework kitties that everyone had went out to improve productivity.

In World War II they worked 100% making aviators watches and artillery fuses. During the same time the Swiss saturated the US market with civilian watches so that after the war the Swiss had the marked locked up and the US government did nothing to help the watch industry.

Watches and Clocks were a cottage industry in Switzerland, with government subsidies. In 1945 Waltham Watch could make a movement for $5 which would sell for $15 at retail. Swiss movements were retailing for $10.

After World War II the watch company was up and down - mostly down. In 1959 when Kennedy was running for President he'd help the watch company as President. After he was elected Pat wrote him a letter and as a result the co. got a contract for 12000 clocks.

The Swiss kept underbidding them, Pat retired in 1975, and even today the US government buys airplane clocks from the Swiss.

"Jewels" in a watch are mostly used as bearings. There are two flat pallets and one jewel pin in the balance. 15 or 17 jewels is enough for most watches, although the Vanguard Rail Road watch had 23. In WWII Hamilton designed a ships chronometer with 14 jewels in it and put them into production. Diamond, ruby, and amethyst are typical jewel materials.

Waltham Watch was at the 1876 Philadelphia Exhibition to demonstrate machine made watches. The Swiss bought 10, tested them, and went into production.

Dennison in Boston was the first to make watches by machine for interchangable parts. In Waltham they had a machine for doing watch plates in the 1860s and 70s. It made the entire plate. As time went on they replaced it with a series of simpler machines which each do one part of the work to make a plate. In the long run that proved less expensive. All of the decorations engraved on the watch plate were done by a series of machines, each doing a simple part of the job to produce the overall damascene on the watch plate.

Assembly and adjustment were the hard part of the job of making a watch.

In the 1930s the factory made about 2000 watches a day.

Did it take special aptitude to work in the watch factory? Yes, only about one in ten people worked out. You had to be willing to sit all day at a bench, you had to be willing to use a magnifying glass to do your work, and you had to be mechanically inclined. At one point they got a contract from Kierford to make gyroscopes. Kierford said that they did not want the girls who had been working on watches to work on the gyros. The gyro engineers said they weren't qualified. Pat insisted that they try them - He knew they were mechanically inclined and would sit all day working through a magnifying glass. After a bit of training in soldering they worked out fine and Kierford changed it's position to asking for watch girls to work on the gyros.

The balance and spring work together to vibrate five and one half times each second. When a wheel is in balance it means that they will work together this way in all positions. There are six positions. Dial down and dial up. With the watch on edge there are four more, stem up, stem left, stem down, and stem right. For a Rail Road watch to be in balance and adjusted properly it means that it will be correct within two seconds over a 24 hour period in all six positions (some RR only required 4 seconds.)

A wristwatch needed to be within 30 seconds in 2 positions. The various RRs all had their own watch inspectors. They would check the watches every six months and they had to be cleaned every eighteen months. The check would usually only be in one position.

The standard against which the 2 seconds a day was measured changed over the years. At first they had their own observatory to measure solar and siderial days, later they switched to government standards. There were four Master Clocks in the plant that ran electric tickers throught the plant. They clicked every 2 seconds and skipped 58 so that the workers could know the time without having to look up at a clock.

A balance is brass outside and steel inside, which compensates the watch for hot and cold.

A man can regulate about 40 watches a day. (He would actually work on more, the 40 was the amount that were finished and within spec for the required number of positions.) Pat could do 50 -60 a day back when he was doing a lot of them. Today he figures an hour to do one.

During the War Bell and Howell wanted a clock to within 2 seconds a day at 40000 feet altitude. They tested them in altitude chambers and cold, but B&H kept sending them back as not passing. When a troubleshooter went to B&H to see why they were failing he discovered they were using an electric clock as there standard. As the power company says, they sell power, not time. With a proper standard in place B&H was happy with the clocks they were getting.

It took about 10 days from a box of parts to a shipped wristwatch.

In 1927 when Pat started the plant had steam engines generating it's own power and electric motors running lineshafts to power the bays in the plant.

The Watch business was a very shaky business to invest in. You'd sell some at graduation, but most of the years business was for Christmas. If you sold poorly at Christmas you had problems with excess inventory and would have to lay people off. Then later when you needed to make watches you probably wouldn't get all your experienced help back.

Pat was wearing a Waltham Watch made in 1927, the year he started. He had gotten it as a movement - the original case having been sold for scrap gold. It was in a case with a clear back and looked and sounded very nice - it's a long time since I've held a watch that actually ticked.

TIps and Techniques
by Ed Kingsley

A COMMON CENTS APPROACH TO FILE MANAGEMENT

Leo Klos kindly passes on this file cleaning tip he learned from a former colleague, Marie Neuner (a female engineer).

Hold a penny at right angles to the wide face of the file. Press down and pull the penny across the file in a direction parallel to the teeth. The penny is cut by the teeth into a sort of "form tool" able to reach deep into the clogged gullets and dislodge the wedged detritus stubbornly lodged therein.

Thanks Leo and Marie.

LESS IS MORE (?)

After admiring it for many months, and corresponding briefly with a proud owner, I too purchased one of those great looking, albeit lillipudlian, precision vises recently on sale at MSC. That's the one that's 63 mm long, 25 mm wide and opens a whopping 13/16". Definitely not very big -- and I really didn't want a vise with a capacity less than 1". But, it has a 'step' in the jaws that made me curious . When my correspondent confirmed that the capacity across the steps was actually about 1 3/32", it was a done deal!

He described it as a "jewel", and I agree with that. At 2 1/2" long, by 7/8" wide, it's meant to be used as a "vise_within_a_vise", and it performs that job admirably. It also looks great just sitting on my desk. The fellow I spoke with bought it to use for a workholding vise on his Sherline Mill. Unfortunately, it's not designed to attach to a mill table, but he's so taken by it he doesn't seem to care. Me neither, but I don't have a Sherline Mill.

I've been a fan of Kant Twist Clamps for years, and I have a dozen of them in sizes from 1" to 4 1/2". Last month I bought one with a modest 3/4" capacity, and I had a most similar reaction to it that I had had to the vise. It's, can I say it, adorable .... It has a knurled, disk shaped "handle", as opposed to the "T" style handle found on the more common variety, a style I find is often more convenient on the smaller sizes than the larger "T". Small doesn't mean cheap, however. On sale, the vise is $39 and the clamp is $7.30, but who's crass enough to count the cost when you're acquiring works of art? OK, I mean other than your wife? (unless maybe she's an engineer?.....)

"IF IT STARTS RAINING BANANA PEELS, I'LL COME SLIDING HOME TO YOU"

I've got one of those Shim Punching sets that enables you to punch great looking holes in all manner of thinish stuff, and if you're lucky, find the equally great looking circles that go flying somewhere out the other end.

I had a project that needed some low friction washers of specific thinknesses, but I couldn't find ready-made in either the diameters or the thickness I needed in "slippery stuff", like Teflon. So, on a hunch, I let my fingers climb the foothills of the MSC catalog, and discovered that they sold not only 12" x 12" Teflon sheets as thin as a mere .002", but also MDS 6/6, Nylon impregnated with ol' slick himself, Molybdenum Disulfide, in strips 1" wide, and 5' long, in thicknesses from .020" on up. Bingo! I 'stocked up'. They also sell a Teflon that's processed on one side so that it can be epoxied to another material. It's not cheap, but if you have the want .... they have the way.

The Shim Punches can produce washers with OD's from 3/16" to 3/4", and ID's from 1/8" to 5/8", in thicknesses (in plastic) up to .030". It's a right handy combination when you need that 'special' shim or washer. The punch set sells for around $80, steep unless you need it when, of course, cost is no object, and anyway, the client is paying for it, right?

HAVE I MENTIONED GAGE PINS RECENTLY?

I had to mill a radius on the end of a 1/8" x 1/2" bar of aluminum, concentric with a hole for a #10 screw. I needed a pin that fit snugly in the hole to rotate the bar around - against the endmill - without permitting any vertical or lateral play. What to use?

A Gage Pin? Remember, they come in sets by .001". I selected one that was a snug push fit, put it into a drill chuck, put the drill chuck into a 5C Collet, put the 5C into a Collet block, put the Collet block into a milling vise and pressed the bar over the pin. That was pretty much it. A spacer between the work and the chuck can often be useful if you wish to avoid milling the chuck to the same radius.

WHAT'S THE POINT?

If you have to drill a hole to a specific dimension, and the depth has to take into account the extra length of the hole created by the point of the drill, here's a way to quickly calculate that factor.

For a 118 degree drill point, the length of the cone of the point is:

Diameter of the Drill (times) .3

For example, a 1/4" drill would have a point length of .250 X .3 = .075".

RIDDLE

Q. Why is it nearly impossible to electrocute a RR Engineer?

A. Because he's not a Conductor.

OK, I'll try to try harder next year. A most Happy Holiday Season to one and all, and may all of your presents be hard to lift.

-- Ed

My Experiences with a Coffee-Can Foundry
by John A. Wasser

In it's simplest form a coffee-can foundry is a large steel can with the top removed and the bottom perforated. The can is raised off the ground so that a fan or blower can blow air in through the perforated bottom. Common barbeque charcoal is ignited in the can and aluminum (or possibly some other metal) is melted in a steel container in the middle of the burning charcoal. The inner container is called the "crucible".

Equipment you will need:

The Coffee-Can Foundry
An air source
Charcoal fuel
Means to light the charcoal
A crucible
Welding gloves
Aluminum to melt (narrow enough to fit into the crucible)
A mold in which to pour the metal
Pliers to tilt the crucible for pouring

The Foundry Can

The ideal size for the main can is about three inches taller and three inches larger in diameter than the crucible to allow a layer of charcoal to complely surround the crucible. The cans I use contained about 2-pounds of coffee. A 1-pound can might not have enough room for a reasonable crucible but it can't hurt to try!

The Perforations

The quantity of perforations does not appear to be critical. I have about a 1" grid of 1/4" holes and used a can-opener to make holes around the rim about every couple of inches.

Air Feed

To feed air into the bottom perforations you have to raise the foundry can off the ground. One method of raising the foundry can is to put it on bricks. The method I chose was to make an air plenum out of a second can. Split the plenum can about 1/3 down the side in several places and spread the opening a little to allow the foundry can to be firmly jammed into the plenum can. A hole in the side of the plenum can allows air in.

For an air feed I used a vacuum-cleaner. The vacuum-cleaner provides far too much air at full speed so I ran it off a light dimmer so I could adjust the speed. I get my best results running the vacuum-cleaner at nearly dead slow (maybe 10% of full speed) and more air just seems to use charcoal faster without producing more heat. A small fan blowing into a larger hole should produce enough air flow.

An old-fashoned hood-style hair dryer should produce plenty of air flow. Modern hand-held hair dryers are probably not designed to run for an hour (although they might if they have a “cold” setting).

For my first short burn I used a plastic pipe to get air from the vacuum-cleaner hose into the air plenum. The end of the plastic pipe melted a bit from the radiant heat of the foundry can bottom so I replaced the plastic tube with a rolled-up piece of aluminum flashing. The outside of the plenum can remains quite cool and plastic parts can probably be used within a few inches of the plenum without danger of melting.

The Fuel

Common barbeque charcoal will melt aluminum at quite a good rate (I would say about three minutes a pound for mine once the crucible is hot and a small puddle of liquid metal is available to conduct the heat). The “Match-Light” type is easy to start but causes quite a roar when you go to add more fuel. The foundry acts as a blowtorch until the starter fluid is used up an the flames are about a foot high. I intend to switch to the cheaper non-pre-startered type.

To start the charcoal I leave the air supply off and hit the charcoal with a propane torch flame. You’ll quickly get a feel for how long the coals must burn before turing on the air feed will just blow them out.

In my foundry it takes about 2.5 pounds of charcoal to melt about 1.5 pounds of aluminum. Start with the foundry can filled about 1/3 with charcoal. After it is started and before turning on the air, put in the crucible and put charcoal around it to hold it upright.

The Crucible

Just about any steel container can be used as a crucible as long as it is deep-drawn or has a crimped or welded bottom. A soldered bottom will almost certainly melt off and possibly even a brazed one.

A common steel soup can may be used as a crucible but they tend to burn through quickly and are typically good for only a single pour. A heavier can, such as the body of an oil filter, will last longer. For larger foundries you could buy a stainless-steel food storage canister at the local department store for about $8.

The crucible I use is the bottom half of a Bernz-O-Matic 1.4oz oxygen cylinder (as used with the little Bernz-O-Matic oxy-propane torch). It has lasted through about 6 pounds of casting (with no end in site) and holds about 1.5 pounds of aluminum. The propane cylinders are reportedly made of thinner metal but shoud still be much stronger than a soup can.

A Handle for the Crucible

Even with welding gloves you don’t want to handle the crucible directly. A long wire handle will allow you to position and lift the crucible using only the welding gloves.

To add a handle, drill or punch two holes near the top of the crucible and insert the ends of a long piece of coathanger wire in each hole. A simple hook through the holes will hold the crucible for a while but the wire will soften in the heat and the hooks will come loose. Beter to run the wire in through the hole and then up and hook it around itself.

The Metal

I have been melting some old triple-track aluminum storm windows. The frames are screwed together and come apart fairly easily. The frame members are extrusions that fit nicely into the 2-3/4” opening of my crucible. Once the crucible is hot the frames melt at about 10 inches per minute (6 seconds per inch). A frame piece of about 30 inches will be about a pound of metal.

Don’t Do Screens

I tried melting the aluminum screen material but ended up with more dross and less aluminum than the effort was worth.

The Melt

It is best to fill the crucible will some small pieces before starting the fire. Don’t pack them tightly or they might just wedge in the crucible rathen than sit on the bottom where they get the most heat. Once the metal starts melting you should put on your welding gloves (if they are not on already) and not take them off till you are leaving the area... 1000-degree hot aluminum looks just like cold aluminum.

Once the small pieces have melted you will have a nice puddle in which to melt longer pieces. The puddle provides much better heat transfer than air and will allow you to melt pieces that are sticking out into the cool air and acting as heat sinks.

The Mold

I have been pouring mostly “aluminum muffins” in a non-stick steel muffin pan. Be sure the pan is steel! The NEMES editor mentioned that he tried a plain steel pan and ended up with the aluminum welded to the pan! Even though the non-stick surface burns off the first time you pour liquid aluminum on it the stuff it leaves behind seems to protect against welding. I would guess that if a steel pan was lightly oiled it would be protected from welding.

I have built a wooden flask and I’m experimenting with “play sand” and pulverized kitty-litter (acting as “fire clay”) to try make my own casting sand. If I get anything that works I will write more on that subject.

Making the Pour

If you are using a metal-pan mold make sure it is sitting on something that can take the heat. An asphalt driveway does not work, believe me. Sit the pan on a steel cooling rack or in a bed of dry sand.

After the metal is good and liquid, scrape any crud off the top with a long steel implement. Turn off the air, lift the crucible out of the fire by the handle, grab the edge of the crucible with the pliers and pour the liquid metal into the mold.

CAUTION! THE METAL IS EXTREAMLY HOT LONG AFTER IT HAS SOLIDIFIED!

In about 10 minutes you can dump the solid metal object out of the mold but even with welding gloves you will not be able to touch the freshly solidified metal for more than a second. In about 20 minutes you will be able to pick up the metal with your welding gloves but you won't be able to hold it for long. If you let it air-cool it will be at least an hour for a muffin-sized object to cool down enough to touch (but not hold) without welding gloves. After two hours the metal might be cool enough to hold.

If you are in a hurry you can cool the object in water. I think it is probably better to wait several hours or overnight to allow for a gentle cool-down.

Network Resources

The recent origin of the Coffee-Can Foundry was an article titled "A Miniature Foundry" written by Gordon Lawson for the Journal of the Home Metal Shop Club of Houston, Texas (Volume 2, Number 5 - May 1997): <http://web.wt.net/~hmsc/may97/may97.htm>

The news post that brought the article to my attention was written by James J Wygralak and he also wrote up his experiences for the Web: <http://www.visi.com/~darus/foundry/>

You can find this article on the World Wide Web at <http://www.John-Wasser.com/NEMES/CCF.html>

To read more ideas about the Coffe-can Foundry go to DejaNews "Power Search": <http://www.DejaNews.com/home_ps.shtml> and search for "coffee can foundry".

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