N.J.B.A. Newsletter

NJBA Volume 7, Issue 3 11/01/02

Editors Soapbox

Well, we made it through another hot, dry summer, the meet and demonstration at the Monmouth County Fair was a big success. We still are looking for some items to be donated or to purchase some items for the NJBA trailer which helps make these events such a success.
Some of us traveled out to Dave Fishers shop in Hamburg, Pa for the Peter Renzetti repousse demonstration. This meet was hosted by PABA and was worth the trip. We will have just finished the meet at Dan Cruzans' with Steve Mankowski from the Williamsburg Smiths by the time you read this. We have our holiday party coming up in December and are in the process of setting up more for other upcoming months. Check the up coming events below and put them on your Calendars. See you soon! Larry Brown, Editor

Upcoming events for 2002

Remember most of our meets have a "Iron in the Hat" drawing, be sure to bring something.
November— To be announced
December 7th, 3PM — Annual Holiday Party at Marshall Bienstocks home, details on this page.
January—To be announced by postcard
February — Possible joint meet at Peters Valley with PABA, Details in the next newsletter.
March — Scheduled post vise stand workshop, details in next newsletter.

NJBA Holiday Party!

The holiday party is to be held on December 7th at Jan and Marshall's house starting at 3PM. Much thanks to Marshal and Jan for opening their home once again to us in the holiday season. Guests are asked to bring a covered dish, salad, desert, etc. and your favorite beverage. NJBA will pick up all of the utensils, plates, cups, and some soda.

Folks can either contact me, David Macauley, to indicate they are coming or contact Marshall or Jan about what specifically to bring. Also there will be a short board meeting at the party. We will also be showing Clifton Ralph's power hammer videos during the party. Despite the emphasis on blacksmithing, members are encouraged to bring their families. I will certainly be bringing my new daughter and wife. Announcement by **David Macauley.**

Directions to Marshalls' Home:

Marshall and Jan's "cabin" is not on Marshall's farm, but about 3 miles east of it on the same road. Casino Drive is just off Rt. 9, about 3.5 miles north of interstate I. 195 (exit 28). and about 4 miles south of Rt. 33. Either of these routes can be easily reached from the major north-south highways including the Garden Sate Parkway, the NJ Turnpike. 1-295, Rt. 18 or Rt. 34. From Rt. 9 northbound. make a right onto Casino Dr.; southbound. take the jug handle to make a left onto Casino Dr. Continue past Marshalls' Farm to #301 Casino Dr., Howell, N.J. (ph# 732-938-6577)

*** * *Remember to send* * ***
in your renewals!!
If you did not get one contact
Nate Pettengill, Membership Chairman
There is a form on the last page of this newsletter
If you have not renewed this will be the last newsletter you receive!

Renewal Time is Here!

If You Have Not Renewed Your Membership Send it in Soon or this may be your last newsletter

Rather than use room in the newsletter,
All correspondence between ABANA and NJBA is now being posted

The NJBA Web Site!

The NJBA Web Site is up and running at:

`http://njba.abana-chapter.com/`

Bruces' links to the ABANA site;

http://www.monmouth.com/~freeman/NJBA/abanawebsite.htm

Official NJBA Address

NJBA, P.O. Box 195
Howell, NJ 07731

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856-697-4144, hotiron1@juno.com

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973-702-8475 wlkngb@yahoo.com

Tim Suter, June, 2004
1112 Ladner Ave., Gibbstown, NJ 08027
856-423-4417

Monmouth County Fair

July 24th through July 28th.

Report by **David Macauley**

NJBA once again provided a fantastic demonstration of blacksmithing at the Monmouth County Fair in East Freehold NJ, July 24th through July 28th. The weather even cooperated at least for the first 3 days. The last two days became quite hot. This year NJBA was positioned directly on one of the roads through the fair. This gave us much more visibility over our previous locations. The number of visitors to our events was up substantially. Two new hot cut hardies and several tongs were made at the fair for the NJBA trailer. Having the tool boxes at the fair made start up and shutdown every day quite easy.

Demonstrators during the week included: David Macauley, Marshall Bienstock, Bruce Freeman, Dan Rice and family, Tom Eden and Jeff Morelli. Many thanks to all those who helped set up and tear down. Here are some suggestions for additions to the trailer:

1. Folding table for displaying work, business cards.
2. More tongs especially general purpose wolf's jaws.
3. 3/8" square and round stock, ¼" x ½" stock, ¼" x 1" stock and ¼ x 2" stock.
4. Another anvil ~100 lbs and stand.
5. A nice small lightweight forge like the square black one already on the trailer.
6. Sharp files all sizes.
7. First Aid kit
8. Rivets 3/16", ¼" , ½"
9. Cross Peen hammers

If you can help with any of these items it would be much appreciated, donations are great but the group is willing to be items also. Contact David Macauley if you can assist with any of these items.

First NJBA Picnic

Report by **John Chobrda**

Saturday, September 7th was a perfect day for the (first annual?) NJBA picnic. The picnic was held in conjunction with Adam Howard's tool swap, at the Red Mill in Clinton, NJ. Many vendors came out with STUFF to sell and one was overheard to say "make me an offer, I don't want to take anything home". Believe me, there was enough to start a small shop, anvils, forges, post drills, leg vices, tongs, hammers, books, etc. I ended up buying some punches and a flatter, and I heard that Josh took home two more Fishers for the museum.

The forge in the shop was going all day and a small portable forge was going outside. The restoration of an old leather bellows was also going on outside, when the leather was removed it was found that the bellows had been rebuilt before, the inner bows were plywood.

Adam Howard provided coffee and doughnuts in the AM, a keg of beer later, and a band "The Collins Brothers". NJBA provided food for the BBQ, and yours truly grilled beef ribs, burgers and dogs (which all disappeared). I wish to thank all the members who brought food, for helping to make this event a success. If you would like to make this an annual event, please let the board members or myself know, and we will try and do it again.

Walnford Day,

October 6th 2002

Report by **Jeff Morelli**

Walnford park is the site of a gristmill that ran on the Crosswicks Creek in Upper Freehold, N.J. through the 18th and 19th century. The mill ceased operations in 1872 and the family closed its doors preserving the mill for over a century. The grounds were acquired by the Monmouth County Parks System, who restored the mill to working condition. It's a must see for all who appreciate good old American know-how in timber frame construction, line shafting and work and huge millstones powered through simple engineering.

NJBA members forged from 11 am to 5 pm across from the mill in weather that couldn't be better. This was the second year in a row that we set up at this event and I think it's safe to say that Walnford Day will become an annual event.

Dave Macauley spent the afternoon forging a pot

rack with matching hooks. Mike Erdie made a new spring swadge with help from Mitch Swirsky. John Chobrda explained a strikers role and demonstrated by using a sledge hammer for fullering and flattening. He also forged leaves which he gave out for folks to hang on their key rings. Mitch amazed the crowds with a forge of blue flames coming off of his personal supply of galvanized half inch round stock that he skillfully forged into many unique forms. I (Jeff Morelli) demonstrated drawing out, upset bending and fullering to make simple vegetable choppers.

Special thanks go to Marshal Bienstock for taking time out of his busy season to deliver the trailer to and from the event.

The Weightless Sledge Hammer is Here!

Levitating a Sledgehammer!

Ever feel you wanted to pick up a really heavy hammer and whale away with it? That could really move some metal! If you've ever tried it, though, reality probably set in pretty quick! Thy arm doest protest!

Some folks got the idea, a couple years back, to hang a sledgehammer from a bungee cord. (They may have even tried it!) Alas, all this really accomplishes is to make your hammer-swinging muscles do the work that your hammer-lifting muscles had to do. And you lose some hammer control in the process.

I turned my attention to this problem late last year. After three (different) prototypes, I knew I was onto something. After six prototypes, I had it.

Elsewhere in this issue are plans you can use to construct your own "Weightless Hammer," a 16-lb sledgehammer you can swing all day with one hand, delivering blows any direction except straight up.

Anyone can build this machine, cheaply and easily, using common tools. It's lightweight and portable, and can be installed most anywhere in a few minutes. I hope you find it useful.

- **Bruce Freeman**

M.R.I. Warning!

Jeff Morelli

This is a serious warning to all of us who may need an M.R.I. (Magnetic Resonance Imaging) scan in the future. NJBA members frequently work with iron or steel. In the process of grinding, filing, sawing, etc. small fragments of metal may get into our eyes, even if we are using eye protection. Most will wash out naturally through blinking and tearing but some could migrate behind our eyeballs creating a dangerous situation if you are placed in an M.R.I. machine

Magnetic strength is measured in units of tesla or gauss; 1 tesla = 10,000 gauss. The earths magnetic pull on us is 0.6 gauss and the typical high-field M.R.I. machine is 1.5 tesla or 15,000 gauss - pretty powerful!

When you are placed in the "tunnel" of the machine you are basically inside a giant electro magnetic coil. The noise you hear is the result of the magnetic field fluctuating with such great frequency and strength that it shakes it's own coils loud enough to need ear plugs or head phones to prevent hearing damage.

A magnet is attracted to iron and steel. If there's a piece of metal in around or behind your eye it could move around as the field fluctuates or be pulled out altogether. In each case the fragment is like a tiny knife on the move. The damage caused can range from minor to cutting the optic nerve and causing blindness in that eye.

So if your doctor wants to send you for an M.R.I. make sure that you tell them that you are a metal worker. You will need an X-ray or a C.A.T. scan of your orbits (eyes), which safely shows if you have metal in them before you go for the M.R.I. If the Radiologist says that your eyes are clear you may have the M.R.I. If there's metal in them you may have to have it surgically removed or your doctor may have to settle for a C.A.T. scan instead of the M.R.I.

The M.R.I. staff should ask you many times about your personal history(Including metal work) in person or on paper when making your appointment,

filling out paper work and being interviewed before the test. Not all M.R.I. centers ask you, believe it or not. There's only one word for this - Negligence.

I hope this article has informed you and given you greater reason to wear your safety glasses.
Jeff Morelli, Director NJBA

Blacksmithing

Workshops and Classes:

Peters Valley Craft Education Center
19 Kuhn Rd., Layton, NJ 07851 (973)948-5200
pv@warwick.net www.pvcrafts.org
Academy of Traditional Arts
Carrol County Farm Museum
500 South Center St. Westminster, MD 21157
(410)848-7775 (410)876-2667
Touchstone Center for Crafts
R.D.#1, Box 60, Farmington, PA 15437
(724)329-1370 Fax: (724)329-1371
John C Campbell Folk School
One Folk School Rd.
Brasstown, NC 28902
1-800-365-5724 www.folkschool.com
The Blacksmith of Trenton
Alex Parubchenko occasionally gives classes at his shop in Trenton. Please contact Alex or John Chobrda at the shop, Phone # (609) 396-9583.
Red Mill Forge
Contact Adam Howard about workshops and per diem use of the shop (908)735-4573

Open Forge

We want to encourage all to join us at:

Monday Night Open Forge in N.J.

Marshall Bienstock is hosting an open forge in his shop at 7 pm almost every Monday night (Please call ahead on holidays to make sure , (732)780-0871)

Coal

Coal is now available through Alex Parubchenko at his shop in Trenton. Please contact Alex or John Chobrda at the shop, Phone # (609) 396-9583.

Business Members

We would like to thank those who joined with our new Business Membership category
Please show them our support

Ginty's Welding Service, Inc
2 Lee Mack Ave.,Danbury, Conn, 06810

Timothy Miller, Artist Blacksmith,
Bayport, Long Island, NY (631)419-1185

Marshall Bienstock
663 Casino Dr., Howell, NJ 07731
(732) 938– 6577, (732) 780-0871

Lincoln Wolfe
11 Overlook Terrace, Bloomfield, NJ 7003
(973) 338-3913

John Chobrda
Pine Barrens Forge
231 Morrison Ave., Hightstown NJ 08520
609-443-3106 609-396-9583
JChob@earthlink.net

BLACKSMITH TOOLS FOR SALE!

John Chobrda at the
Trenton Blacksmith Shop
Has a large selection of tools for sale.
Anvils – Forges - Leg Vices
Blowers – Tongs – Hammers
Will also repair and/or resurface Anvils
Call John for prices and availability
Daytime (609) 396-9583

Wanted: Donations for the NJBA Trailer

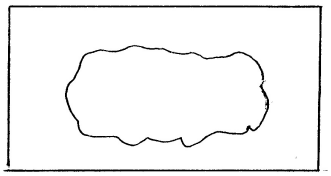
We need hand tools, files,
Tongs (Old, new and repairable),
Safety Glasses and assorted rivets.
Look around and see what you have to donate.
Contact; Dave Macauley, Directors list, Page 2
Also check the Web Site

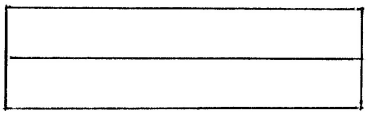
PABA Meet at Dave Fishers

August 10, 2002, with **Peter Renzetti**,

Report by Larry Brown

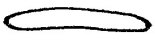
Peter started out showing and original Yellin candle holder and discussed the techniques used to create the piece and how he (Now working for the Yellin shop) was planning on recreating the piece. He also discussed the use of dies to form sheet. He had brought a sample of a railing with repousse animal figures from various metals to show.

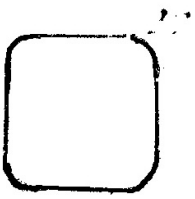


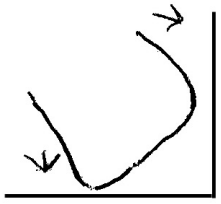


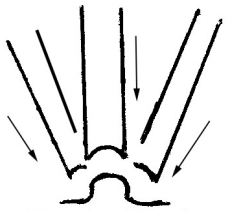
The main part of the demonstration was about repousse. He started with a piece of 16 ga. naval bronze sheet about 6" x 8" that has a strip about 1" wide of the same material TIG welded around the outside forming a frame with the first piece lined up in the center. Pour lead in to the back side to fill to the top, allow to cool. Glue pattern onto front side with spray adhesive. Using a very small chisel form a "Connect the dots" type line on the pattern.

Then remove the pattern carefully making sure you marked all the lines. Melt the lead out of the back with a torch. Melt lead to fill in the front side. Highlight the dot pattern with sandpaper on the backside. Chisel inside the dots pushing the edges forward with a small, slightly curved chisel. Melt a little lead off the lead side to correspond with the areas with the most displacement.









Knocked Tool

Use a chisel with a crowned face to push the main body out being careful not to create cracks and creases. Be careful not to make marks too deep or sharp from the back Pull lead out and flatten the background, then re-melt lead onto back

Refine from the front with a chisel with a slight crown, then redress the edges with a small slightly curved chisel. A slightly crowned chisel is used on the background to give it texture.

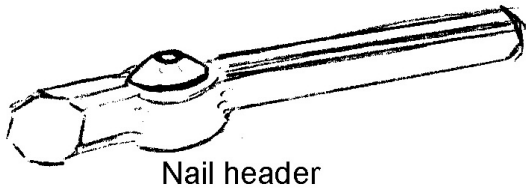
By squaring up an edge it helps keep it from moving. Different tool radiuses used in different directions can give different effects. You can practice with the chisel in lead to see the effect.

For an eye you can use a nocked tool to raise the metal up. The piece is then patinaed and coated with butchers wax.

October Meet

at Dan Cruzans'

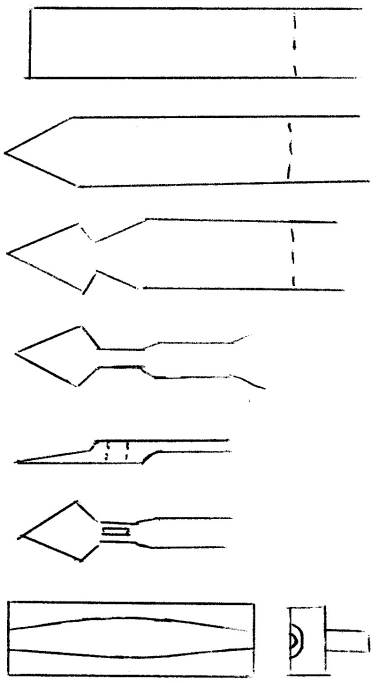
Steve Mankowski from Colonial Williamsburg was the demonstrator. Steve has been with the Williamsburg Blacksmith shop for 14 years and before that worked at the Genesee Village in NY.



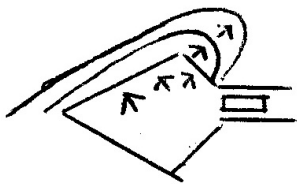
Nail header

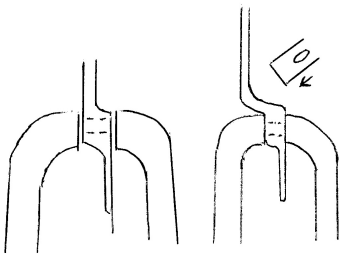
Steve started the demonstration by forging some nails, keeping two rods going and discussing the process and techniques used by blacksmiths and nail makers in colonial times.

Steve made a Suffolk style latch with arrow head ends and a drilled and pinned thumb latch. Steve started by marking out 6" of 1/4"x1" flat stock and then rough forging the upper arrow head point on the end. He said to be sure to leave enough mass of metal to do what you want in each section when rough forging. He then fullered in behind the point using the hammer and anvil edge, forming the part to be punched to pass the thumber through and started to rough the handle out. He then punched the hole for the thumber and drifted the hole and finished forging the area.

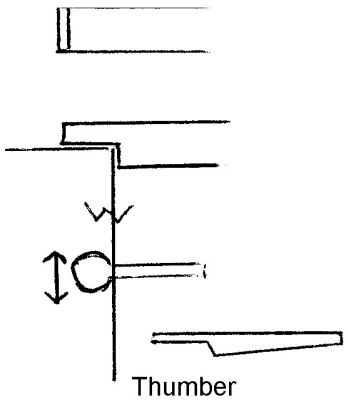


Then he worked on drawing the arrowhead out. Starting from the center and working toward the tip and working some toward the handle to form the arrow head. He worked most of one side, then the other and so on till he had the shape he wanted. He then cut the piece off the bar and pointed and fullered the end the same as before and roughing the other end of the handle also. He then refined the handle to shape and broke the edges before hammering into the swadge he had with him. The handle is curved by putting the top then the bottom in a vise and hammering the curve in from the back. The ends are adjusted on the anvil to keep it even.

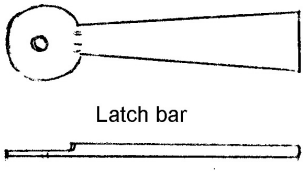




The thumber is made by hammering the metal over the edge of the anvil spreading it out to the sides and then drawing the other end out for the lifting tang. The latch bar is started the same way and then punched for the nail. The keeper is started over the far edge of the anvil and then finished up by drawing



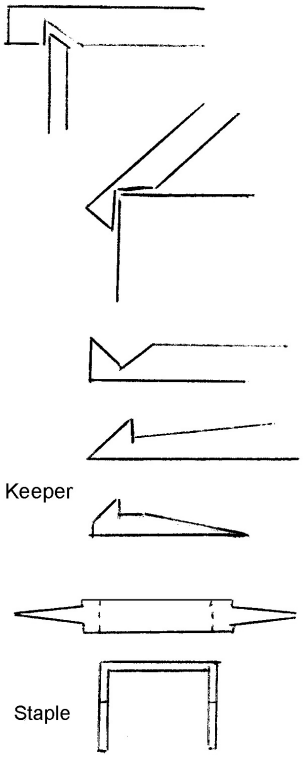
Thumber

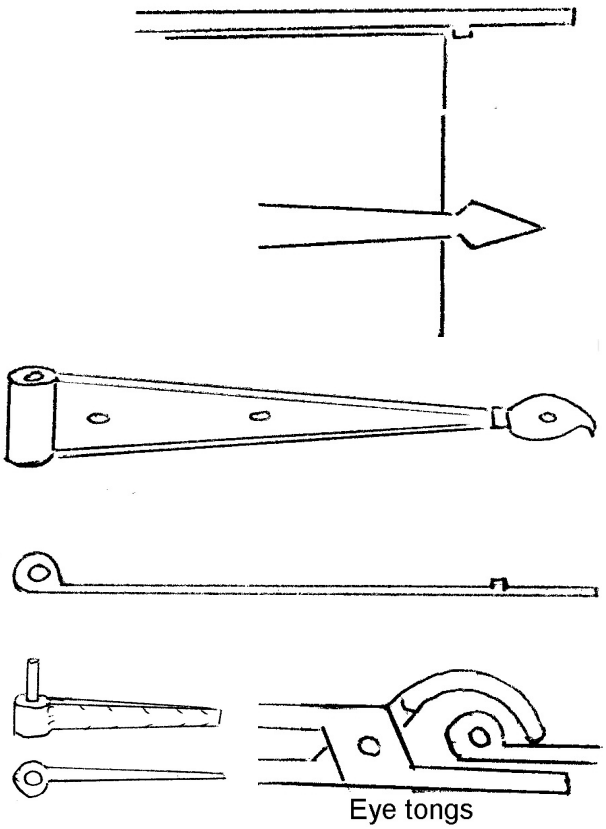


Latch bar

out the part that is hammered into the frame. The staple is a piece of 1/8"x1/2" with the ends shouldered and drawn to nail points and bent over.

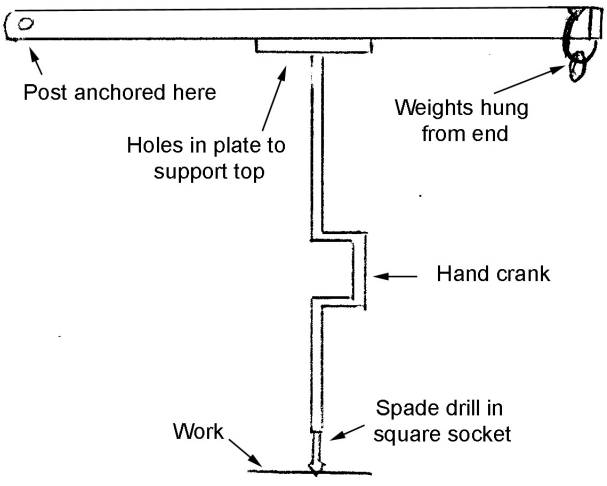
Steve next demonstrated a hinge with a leaf type end. First he drew the end of a piece of 1/4"x 1 1/2" out for a taper about 1 1/2" long. He than folded the stock back by hammering in the vise. The next step was to hammer the stock back up and around to form the eye. As the stock is worked back around the work is moved to the anvil and a drift is inserted to keep the eye sized correctly. The eye is refined and the stock welded. The eye is further refined after welding by working the drift back in a little at a time. (Flux was previously heated and crushed borax and iron filings) Steve worked his way down from the eye refining, champhering the edge and punching the holes as he went working each section till it was finished. The end was finished up leaving a raised boss on the end and forming a leaf type end. The pintle was formed the same way as the hinge eye with slightly thicker stock After the eye is rolled up the pin is then welded in as the piece is shut. the final steps were to refine the hinge surface in a bolster block and put in bards on the edges.





Many thanks to Steve for the demonstration and many thanks to Dan Cruzan for his hospitality and the opening his shop to us.

Old spade drill press as described by Steve



Foundations!

A Resource for Beginners.
by Bud Oggier
the Anvil's Ring/ Spring 1988 Part 9

Bud Oggier Passed away about 4 PM in the afternoon on Oct 25th. He died peacefully in his sleep at Penobscot Bay Medical Center. Many thanks for his permission to print this series. Heaven gets another fine smith. LB

"Hi, Jean, good to see you again! Ready to make a hammer? Good! What kind of hammer do you think you'd like? I get quite a bit of use out of this 2 1/4 lb. crosspeen, particularly for finishing up or working in a tight place. It's too light to move much metal, but it does fine for smoothing up. If you think you'd like one, let's make it.

We can use the same truck axle we made your hardie out of. First thing we need to do is forge it square. The hammer is 1 1/2" square, so let's go. When the piece is hot enough, I'll bring it out and you be the striker. Remember, hit where I hit, and with the same relative force.

OK, the bar is ready. I'm ready, how about you? OK! Hit — again — go stop. Jean, I know I taught you early on that when forging a square section to hit it, turn it a quarter-turn and hit again. Hit, turn — hit, turn. This bar is almost 2" in diameter and quite heavy. We'll need about 4" of 1 1/2" square, so I forged up the bar for about 4", then turned it, and we forged the other side. The bar is too heavy to turn for each and every hit you couldn't control it well and it would be quite tiring.

The piece is almost ready; we should be able to finish the square on this heat. Here we go — hit. Stop and let's check the size. Looks like we need to forge a little more — let's go. OK, stop. I'll check the size again. Looks fine, just a little over 1 1/2" square. Remember, Jean, when measuring a hot piece it will shrink about 1/64" for each inch of section when it cools, so it needs to be just a little over 1 1/2" while hot.

Jean, the end of this bar is going to be the hammer face, so we need to be sure that it is square with the body. It's better to do this now before we cut it off, so let's check. See, it's a little out, so we'll heat it up a bit and you forge the face down square. Remember, when you hit the end you will be upsetting, so you'll have to forge the side where it swell is.

While the piece is heating, take a look at the rule I used to measure with. I made this out of a piece of 1/4" X 3/4" stainless. The end was bent 90° on edge, and the corner forged up square. The short bent leg (about 1 ") was forged and filed so it was 1/4" X 1/2". The long leg is marked with a chisel every 1/4"; one side is measured from the outside of the leg, the other from the inside. The leg acts as a hook to catch the end of the piece. If I need to measure the inside of a piece, the other side of the hook butts into the far side of the hole or shoulder, and I read the scale on the other side. Because it's stainless, it won't rust and the heat won't affect it. I know that 1/4" marking is coarse, but it lets you make a real good estimate of a dimension.

OK, your piece should be ready so go ahead and square it up. Good — now let's check it again; that looks fine. We'll file the piece after it is finished, but not hardened, and you have it close enough for now.

The next step is to cut it off. How do we know when to cut in order to wind up with enough stock to get a 2 1/2 lb. head? Almost every steel supplier has a small catalog that has in it a table of weights and areas for all standard stock sizes. Let's look at mine. Here, see the table says that 1 1/2" square weighs .6380 pounds per inch. So 3 5/8" will weigh 2.312 pounds by the time we punch the eye and dress it up. Also taking into consideration the amount we lose to scale, we ought to be just about right. Let's mark the piece with a chisel, then cut it off.

Ready to strike? OK, go, hit, again — stop. I turn the piece 90°, line up my hot cut and go again, hit, again stop. Turn again and go, hit stop. Turn again and go, hit, turn again. OK — careful now, we're almost through, easy does it — good.

Now we're ready to punch the eye, but where should it go? When we forge the peen it will grow about 1/2 the length of the peen. In this piece that means about 3/4", so the hammer will be about 4 3/8" long. like my hammers to be a little face heavy,

that is, the face wants to hang down. If we put the middle of the eye 2 1/4" from the face, it should be about right. I'll put a good heavy center punch mark in so we can find where to punch the hole. Let's heat it up and punch.

Here's the punch I use for this size eye it is 7/8" X 7/16" at the end and oval shaped. The punch is tapered so that the deeper it goes the larger the eye gets. I'll start the punch and you strike. It's important that the punch is over the punch mark and lined up with the sides. Here we go~ The punch is lined up — go, hit, again, again. OK, stop. Cool the punch and go on, hit again, go stop. Cool the punch; we're about halfway through so I'll mark the hole on the other side and you punch it through. OK. This piece needs more heat. When the piece is heated, be sure to put it on the anvil with the hole down and be careful about lining up the punch. As soon as the punch breaks through, have me stop.

Here we go sure you are right with the punch? OK, stop and let's take a look. It looks good; we matched up the punched holes pretty well. Now drive this drift in about 1/3 of the way and forge down the bulge we got on the sides. OK, now drive the drift all the way through. Good.

Now we have to forge the peen. To hold on to the piece we'll use a pair of hammer-eye tongs. They look like a conventional pair of flat jaw tongs except there is a projection on the end of the jaw that fits down in the eye. Because of these projections you can really hold on to the piece and don't have to put up with it moving in the jaws.

When the piece is hot, I'll bring it out, hold it up at an angle and forge out the peen. Because it will be at an awkward angle, you'll be better off to stand to the side and tilt the sledge at the right angle.

Ready? Here we go! Easy now, we're close to done — there, that should do it. To finish off the radius on the peen, we'll use a 3/8" swage. Before swaging, let's be sure that we won't get an inclusion on the end. See how there is a hollow in the middle of the peen where the outside stretched more than the middle? If we don't get rid of that there's a good chance it will fold over in the swage and leave us with an inclusion that could break out in use. Just put the hammer in the vise and trim them off with a hot chisel. OK, that looks much better; now we can swage it. This time when we heat I'll be heating only the peen. Ready? OK, hit, again, again, stop — that looks pretty good'

I think it is good to chamfer the four sides of the face; it reduces the chances of chipping off the corners and besides, I think it looks better. After you chamfer the corners, we'll take a general heat, finish it all over with a flatter, and re-drift the eye.

While the piece is heating, take a look at this flatter. Notice two opposite sides have about a 1/8 radius; these prevent putting marks on the piece with the edge of the flatter. The other two sides are quite sharp, with just a small radius, so you can work right up to a shoulder.

Jean, first I'll put the peen in a bottom swage and flatten the face, then on the anvil to get all four sides and lastly the peen. The piece just has to be a good red, and the hits on the flatter not too hard. It is important to wire brush the piece free of scale before flatting, or else you'll get heavy pits from scale.

OK, here we go, in the swage — hit, again, once more, harder — stop. Now the sides — hit, again, again — enough. Quickly now, drive the drift through; good. Let's bring it back up to a good orange, put it in the wood ashes to normalize it, then finish and heat treat it tomorrow.

Good morning, Jean. Ready to finish up your hammer? If you feel the piece you'll see that it's still a little warm. It should be a uniform softness and free of any stress. First you should clean this off on the wire wheel and file it all over — make it a nice finished piece.

How are you getting along with that file, Jean? You know, wire brushing this piece with the wire wheel before filing not only cleaned it up, but it removed any scale we got in the annealing process. This scale is harder than the steel and can eat up files pretty quickly. When you file the face, put a little crown in it and a good heavy chamfer all the way around, to again prevent chipping. Be sure to break the edges all the way around the piece, including the eye; I hate a tool with sharp edges.

Well, let's look it over now and see if there is any-

thing left to do. Looks pretty good to me, Jean, what do you think?

There's still one thing to do before we harden. Everything I make gets my stamp on it before it goes out the door. If it's not good enough for me to sign, it's on the way to the dump. Why don't you sign this with your initials and the year. I also put the weight on the heads.

Say, that looks very professional, Jean. Once this is hardened and handled, you can use it with pride; you'll know every lick that went into it.

Take a look at the eye. It is hourglass shaped, with a straight section and a taper on each end. That's because the drift is purposely smaller than the large end of the punch. These tapers lock the handle in when you drive in the wedge.

We're ready to heat treat this, so let's get at it. Into the fire with the peen, but not in quite as far because since it is thinner, it will heat faster. Not too much blower either; we want to heat this slowly so that the heat soaks all the way through the piece. Jean, this hammer is a little long in relation to its thickness — this was done purposely to provide a little more hang so you can hit beyond an obstruction more easily. I had you put the extra crown on the face because it will be used mostly for finishing and this helps reduce hammer marks. Many people think hand forged work always shows a lot of hammer marks, but if you look at the work of the most historically well-known smiths, you'll see that they spent a good bit of time finishing the piece to remove them. The only time they left hammer marks was to produce a textured surface for effect.

How's that piece doing? Almost ready? Remember that when we made the hardie we established this as an oil hardening steel, so open up the tank and set the fusible link. We're just about ready.

Here we go — put the piece into the oil and move it back and forth. See how the oil bubbles more than it did with the hardie? That's because the heated steel mass is greater and it takes longer to cool, a few more puffs of smoke, but still not much. There, the noise from the bubbling has stopped, so it won't be long now. Jean, there is a lump of cast iron about 1" thick and 3" X 5" lying on the floor next to the vise. Put that in the fire to heat while this finishes quenching. Now we're ready to clean this up and polish it a little so we can temper it. There, that looks pretty nice. Is that cast iron hot yet? OK, now set the hammer on top of the hot iron piece and let it heat up — keep turning it so that the heat gets evened out, and watch carefully for the colors to appear.

Do you see this stock formed into a square ring? I use this to get a little extra tempering around the face edges. I'll stick it under the cast iron plate to heat it while we finish tempering the heat. Once we've reached the proper blue color, we'll drive the hot ring over the head. This will heat the edges more and help reduce the chance of chipping in the future. That hammer now looks about the right color of blue, so hold it face-up on the anvil. I'll polish the face now and put on the ring; see the blue get darker? Just a little more — O.K. — knock off the ring and re-quench the head.

Well, let's look at what we've got. That looks pretty good; let me try a file on it. Good, the file almost sticks on the hammer face, but takes a good hold on the edges. Now, once we use the torch on the two ends of the peen to soften them a little more, we'll be finished. Set that head over here with the peen up and I'll give the corners an extra draw. In heating this we have to be careful not to get the edge overheated, so we'll take it a little slow. Watch now, the color is beginning to show; a little more deep blue, almost gray. There, that should do it.

Well, Jean, there is your hammer. It looks like a good one to me. I hope you get to wear out many of them. Now that you know the steps used to make one, you can produce any size or shape you want. Jean, the process we used to make this hammer is basically the same for all handled tools. You may have to modify it some to suit the shapes, but it is mostly the same.

See you next time!"

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The Weightless Hammer

Description

The Weightless Hammer is a ~16-lb sledge-hammer, with a short handle for one-handed use, suspended from a dynamic tool-balancer that is an integral part of a light-weight jib crane. A specially designed bale allows the hammer to strike in virtually any direction except straight up. Being weight-less, the hammer can be lifted repeatedly with little effort for multiple blows. The user must accelerate the hammer for the blow, but this requires no unusual strength. If con-structed with a straight-pein sledge, the user may alternate between flat and pien faces between subsequent blows.

This machine is designed to be easily con-structed at moderate cost from commonly available hardware using a minimum of hand power tools. The machine is not free-standing, but is designed to pivot on the floor and at a rafter or joist. The machine is trans-portable, weighing only 60 lbs, including the 16-lb sledge, and may be easily carried on a car roof rack.

General Considerations

Relieve all corners and edges after cutting or drilling. The approximate scale, e.g., "(1/4)", is given for all drawings. Major hardware is illustrated. Much small hardware is not illus-trated and is left to the judgment of the builder. Most bolts should be held in place with a nut and split washer. Flat washers are used as needed, and fender washers are used against wood or sheet-metal parts. Where tightening a nut would interfere with function, jam nuts or a lock nut may be used.

Recommended Tools

4 1/2" angle grinder with cut-off wheel; vari-able speed reversible 3/8" drill; drill bits; files; cold chisel; cross-cut saw; pop-riveter; screwdrivers; wrenches; hammer; anvil (or metal block); C-clamps; vise; 3/4" tubing bender; 3/8" mandrel; needle-nosed pliers; propane torch (or a forge); 5/16" transfer punch; center punch; tape measure; plumb bob; spirit level; square; marking pen; com-pass; protractor.

Major Parts

1 sledgehammer head, ~16-lb, preferably straight-pein, in good condition.
2 hammer handle, ~ 14" to 16"
3 2 ea. 8 ft 2x4 sheet-metal studs,
4 1 ea 4-wheeled in-line skate
5 bicycle parts, preferably: boy's-style steel bike frame, lightweight (aluminum) rear wheel with 5-sprocket cluster, bike chain, underslung "gooseneck" (handlebar stem).
6 8 ft x 2 3/8" pipe (chain-link fence post)
7 2 caps for 2 3/8" pipe
8 garage-door spring, ~160-lb, with safety cable
9 ~20 ft of 1/4" braided nylon rope

I. Materials and Hardware

1 4 ft of 1/8" wire rope with 4 cable clamps
2 quick links: 1 ea 1/8", 2 ea, 5/16" or 3/8"
3 turnbuckle with ~4" travel
4 8 ft of 3/4" electrical conduit
5 2 ea. 4" ball-bearing garage-door pulleys, with bales
6 bungee cords, 2-ft and (optional) 1-ft
7 small spring link (optional)
8 small pulley block with ~3/4" pulley for 1/4" rope
9 light chain, ~36", with two S-hooks
10 round stock, ~18" of 3/8", ~36" of 1/4"
11 ~14" of 1 1/2" x 1 1/2" 16-ga angle iron
12 hex bolts: 2 ea 4 1/2" x 5/16", 2 ea 5"x3/8"
13 carriage bolts: 2 1/2" x 1/4", ~1 1/2" x 3/8"
14 pop rivets, steel, short
15 pan-head sheet-metal screws, 1" #8
16 3"x3/8" threaded rod
17 eyebolts: 4"x1/4", 6"x1/4", 4"x3/8", 6"x3/8"
18 3"x3/8" lag bolt
19 eyelets, wire coat hanger, 2x4 lumber scrap, and misc. other scroungeable sup-plies

II. Definitions

"Vertical", "high", "above", "below", and simi-lar terms, are used with reference to the final installation of the machine, without regard to the position of the machine during fabrica-tion. "Upper" and "lower" are used with re-spect to the arm to mean closer to and far-ther from the bike frame, respectively. "Front" (and "forward") and "back" are de-fined with the jib pointing toward the viewer.

A. The Jib

1. Cut two 2x4 25-ga sheet-metal wall studs to ~7 feet long. (Keep the scrap.) Fold in the small flanges, top and bottom, at the end of one of the two studs for a length of two feet. (Figure 1).

2. Clamp the studs together back-to-back and drill 1/8" holes through the backs of the two studs, near the top and bottom edges, at approximately one-foot intervals. Pop-rivet the two studs together.

3. Drill a 3/8" hole perpendicularly through in the center of the broad side of a two-foot piece of 2x4 lumber. Mount this board in the end of the stud, where the flange was folded over, using round- or pan-headed screws inserted from back, top and bottom. (Punch holes through the steel with a nail).

4. Extend (i.e., drill) the 3/8" hole in the wooden 2x4 through the sheet-metal 2 x 4's as well. Also drill a 1/4" hole, through wood and steel, two inches from end of the jib and centered vertically.

5. Drill a 3/8" hole about 1" from the other end of the jib, centered vertically. Cut a 3" piece of 3/8" threaded rod, and center it in this hole with a nut and fender washer on one side, and a fender washer, split washer and nut on the other. Do not tighten yet.

6. Make a loop on the end of a 4-foot piece of 1/8" wire rope using two cable clamps. At the level of the 1/4" hole in the wood, spread the two metal studs enough to insert the loop of the wire rope between them. Secure the wire rope to the jib using a 2 1/2" x 1/4" car-riage bolt. Attach a turnbuckle to the other end of the cable with two clamps. Attach a quick-link to the turnbuckle. (Figure 21)

B. The Truck

1. Enlarge the center hole of a 4x4 deck post tie (Figure 2) to 5/16".

2. Cut two pieces of light-weight (~16-ga) angle iron to about 7" long. Drill a 5/16" hole at the center of one face of each angle iron to mount the deck post tie. Drill 5/16" holes about 1" from each end of the other face of each angle iron for mounting the skate wheels.

3. Drill a 5/16" hole in the center of the arc of the pulley bale.
4. **4.** Dismount the four wheels from a roller blade, retaining all hardware.

5. Assemble the truck as shown in Figure 2 using 5/16" washers or 3/8" nuts as spacers between the wheels and the angle irons.

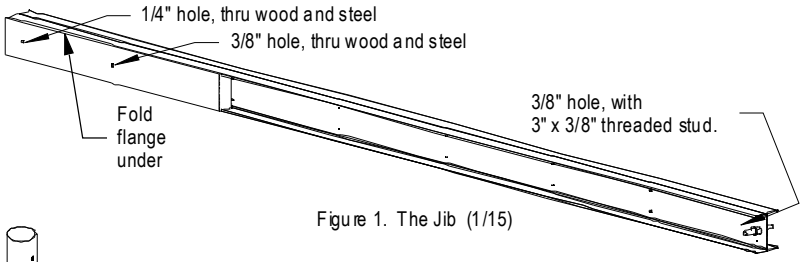

Figure 1. The Jib (1/15)

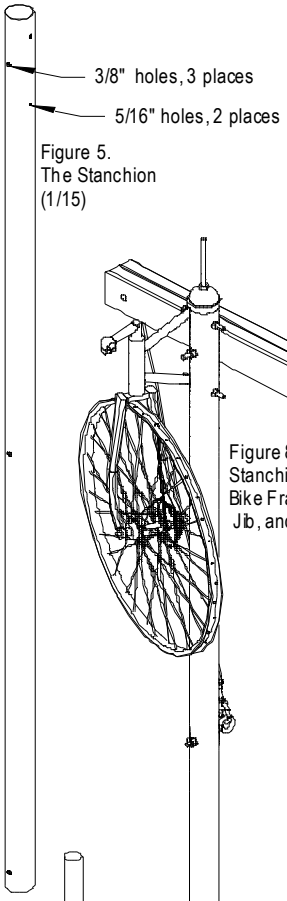

Figure 5.
The Stanchion
(1/15)

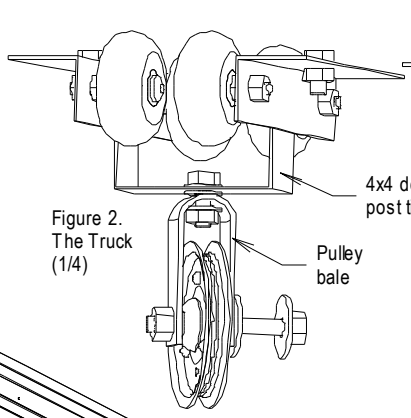

Figure 2.
The Truck
(1/4)

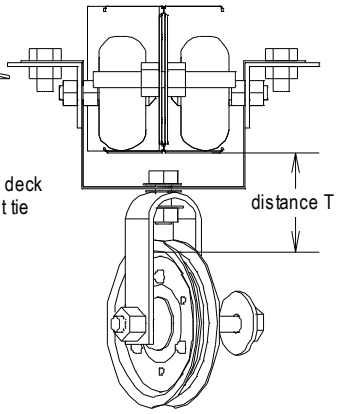

Figure 3.
The Truck on the Jib
(1/4)

Figure 8 (1/15)
Stanchion with Caps,
Bike Frame, Eyebolts,
Jib, and Truck.

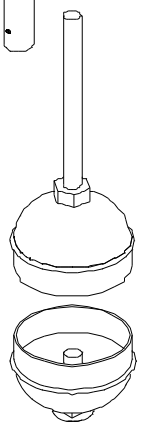

Figure 7. (1/4)
Stanchion Caps
with Pivot Bolts

Figure 4. (1/8)
Bike Frame and Stanchion

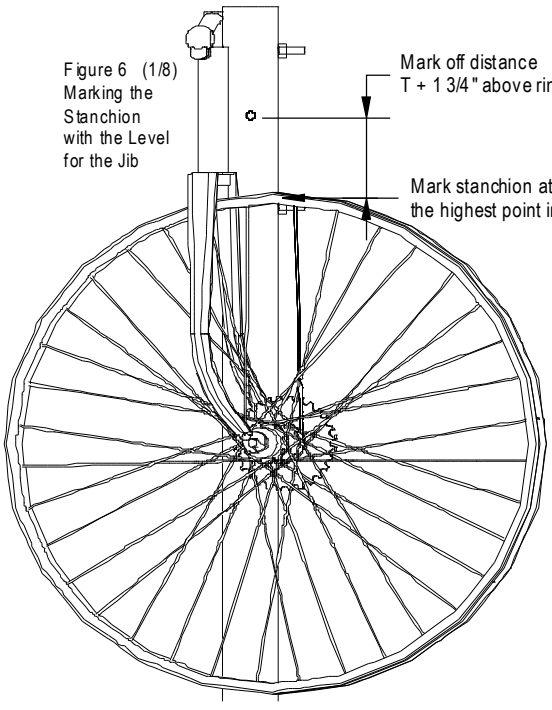

Figure 6 (1/8)
Marking the
Stanchion
with the Level
for the Jib

6. Check that the truck properly fits the jib, and measure the distance T on the truck between the top of the pulley and the bottom of the wheels, Figure 3, for use in step IV.3.

C. The Bicycle Frame

1. Cut the bike chain at one of the narrower (side-to-side) links. Service and lubricate the chain, if necessary, so that it is fully flexible.

2. Remove the wheels from the bike, retaining the mounting nuts. Remove tire, tube and rim strip from the rear wheel.

3. Cut the bicycle frame tubes just in front of the seat and in front of the pedals.

4. From the front frame remove the handlebars and all hardware except the headset (fork, fork bearings and gooseneck). Service the bearings if necessary. Lower the gooseneck as far as possible and turn it 90° to the right. Spread the front fork to accommodate the rear wheel. (A 3/8" threaded rod with two nuts and washers works well as a tool.)

Along one side of the head tube (between gooseneck and fork) mark a line parallel to the axis of this tube. Lay a square along this axis line and mark the point on each frame tube six inches (*minimum*) perpendicular from this axis line. At these marks drill 5/16" holes through each tube, perpendicular to the plane of the bicycle frame. Cut each bike frame tube off **1.** square 1 3/16" (i.e., half the diameter of the stanchion pipe) beyond the center of these holes. (Figure 4)

D. The Stanchion

An eight-foot stanchion pipe will result in a machine ~8′ 8″ tall, and will require ~8′ 2″ under the joists to clear the gooseneck. If less clearance or ceiling height is available, mount the bike frame lower on the stanchion pipe, or shorten the stanchion pipe.

1. Lay the bicycle frame across the 2 3/8" stanchion pipe with the two holes drilled in step 5 along the axis of the pipe and as high up the pipe as possible without the gooseneck exceeding the height of the pipe. (Figure 4) Transfer-punch the position of these holes onto the pipe. Drill 5/16" holes at each of these marks, through both sides of the pipe and perpendicular to it. (Figure 5) Test-mount the bike frame to the stanchion pipe with 4.5" bolts.

2. Mount the rear wheel backwards (i.e., with the cluster on the left) in the front fork. (Figure 4) With the aid of a square, mark the stanchion at the highest point on the rim. (Figure 6) Dismount the bike frame from the stanchion pipe.

3. On the stanchion, mark off distance {T+1 3/4"} *above* the mark from step 2. (See step II.6, Figures 3 and 6.) At this mark drill a 3/8" hole through the stanchion pipe, perpendicular to the holes for mounting the bike frame to the stanchion pipe. Drill two more 3/8" holes directly below this, one at the middle of the pipe, the other 2" from the bottom. (Figure 5)

4. Drill 3/8" holes through the centers of two hemispherical caps for 2 3/8" pipe. In the "bottom" cap, mount a short carriage bolt from the outside. In the "top" cap securely mount a 5" hex bolt from the outside, then cut off the head of the bolt so there is a rod projecting up from this cap. (Figure 7) Mount the end caps on the stanchion pipe. (Figure 8)

III. Preliminary Assembly

1. Remount the bike frame to the stanchion pipe as before. (Figure 4)

2. Mount a 4"x3/8" eyebolt in the bottom 3/8" hole from step IV.3, with the eye under the bike wheel. (Figure 8)

3. Place a nut on a 6"x3/8" eyebolt, and insert the eyebolt into the middle 3/8" hole from step IV.3, with the eye on the opposite side from that in step 2, and the center of the eye held 1.5" from the stanchion. (Figures 9 and 21)

4. Mount the jib on the stanchion using a 5"x3/8" bolt. Connect the quick link on the turnbuckle to the eyebolt in the middle of the stanchion, and adjust the turnbuckle until the jib is perpendicular to the stanchion.

5. Remove the 3" threaded rod from the end of the jib, mount the truck on the jib. Measure the vertical distance V from the center of the truck pulley to the center of the handlebar-mounting hole in the gooseneck. (Figure 9)

6. Remove the truck from the jib and replace the threaded rod. Disconnect the quick link from the eyebolt and bring the jib down to the stanchion.

IV. Arm

1. From an 8- or 10-foot length of 3/4" electrical conduit, cut a 45" piece for use as the lower arm. Drill 3/8" holes 2" from the upper end and 3" from the "lower" end, *offsetting the two holes exactly 90° from each other.* (Figure 10)

2. The remaining piece of conduit is used to make the upper arm. Put an S-bend into this piece (not centered but nearer one end) so that the two ends of the conduit are parallel and the center-to-center offset is *2″ less* than the distance V from step IV.5. The overall length of the S-bent portion should be about 18". Cut off the shorter end of the upper about 6" from the S-bend, such that the overall length is at least 42". (Note: The actual measurement should be about 36", but the upper arm should not be cut to size until the action of the fork is checked, in step IX.3.) Drill a 3/8" hole through the shorter end of this conduit in the plane of the bend, 2" from the end. (Figure 11)

3. Drill two 3/32" holes through the conduit for mounting *each* rope guide *at 90° to the nearest 3/8″ hole.* Drill these holes 4" and 5" from the lower end of the upper arm, 4" and 5" from the upper end of the lower arm, and 5" and 6" from the lower end of the lower arm. (Figures 10 and 11)

4. Drill a 1/4" hole through the lower arm, 1" from the lower end, and at an angle of 25° from the vertical. (Figure 10) Make the terminal rope guide by bending the eye of a 4"x1/4" eyebolt 115° from the shaft. Mount a nut on this eyebolt about 2" from the eye, and install it on the lower arm as shown in Figure 14 with a lock washer and nut.

5. Assemble the arm as shown in Figures 12 to 14. Mount a 4" pulley between (or optionally atop) the lower end of the upper arm and the upper end of the lower arm using a 4"x3/8" bolt. (Do not yet mount the lower arm on the pulley bolt on the truck.)

6. Fabricate rope guides, two at a time, by wrapping the middle of a ~16" piece of ~3/32" dia. (hanger) wire 3 times around a 3/8" mandrel, spacing the wraps at least 1/4" apart, then cutting the coil in the center to make two pigtails of 1.5 rotations. (Only three of these will be used). (See Figures 13 and 14.)

7. To mount each rope guide, insert the straight end into the 3/32" hole nearer the respective pulley, making sure the pigtail is on the correct side of the conduit. With the pigtail end extending about 2.5" from the conduit, bend the straight end on the opposite side of the conduit sharply 90° toward the other nearby hole, against the conduit. Using a needle-nose pliers, bend a small eye loop (~3/16" I. D.) in this end of the wire, centering

the loop over the hole, then cut off any excess wire. Insert a self-drilling screw through the eye and into the hole, and tighten it down to lock the rope guide in place. (Figures 13 and 14)

8. Adjust each pigtail rope guide by inserting a 3/8" mandrel in the pigtail and bending the wire until the pigtail is as close as possible to the pulley and the mandrel feeds directly onto the pulley. Similarly align the eyebolt rope guide (from step 4).

V. The Hammer and Bale

1. Determine the center of mass of the hammer head and mark this point on the side of the hammer head. Measure the distance, R, from the center of mass to the farthest point on any face or corner of the hammer head. Also measure the distance, H, from the center of mass to the top of the hammer. (Figure 15)

2. Measure the distance, P, from the top of the pulley to the bottom of the pulley block. (Figure 16)

3. On a suitable surface, draw a semicircle of radius {R+P+1/8"}. Draw a line through the center and both ends of the semicircle, and sketch the shape of the bale, as in Figure 17.

4. Heat the end of a roughly 3-foot length of 1/4" round stock to a red heat and bend it around a 3/8" mandrel to form an eye, then allow it to air cool (normalize). Make the bale by cold-bending this rod as shown in Figure 17. Make the loop (on the end opposite the eye) to fit the handle 3/4" back from the head. Check that the center of the loop is in line with the center of the eye.

5. Saw-cut the end of the hammer handle to receive a wooden wedge. Drive the handle into the head and drive a *wooden* wedge into the handle slot. Drill a ~5/16" hole, about 3" deep, straight down the handle directly toward the center of mass of the head..

6. Slide the pulley onto the bale, and slide the loop of the bale onto the hammer handle. Use a 2 1/2" x 3/8" lag bolt and a flat washer to mount the eye of the bale to the hole in the handle. The bale should move freely around the hammer, (Figure 18)

VI. Setting up the Machine

Choose an area of the shop for mounting the machine to a joist or rafter, where the rotating machine (jib and arm especially) will not hit light fixtures etc. The upper bearing is an eyebolt installed in a joist or rafter. If there is no joist or rafter at the right position, install a 2x4 where needed and work from that. (Virtually any 1/2" dia. hole, whether in wood or metal, is suitable as the upper pivot, so modify these instructions to suit the location.) This pivot point must be stable, however, not subject to motion.

1. Measure the height of the stanchion from the bottom of the lower cap up to but not including the top pivot bolt. Install a screw eye with a 1/2" hole at a height about 2" higher than this measurement.

2. Use a plumb bob to locate the point on the floor directly beneath the upper pivot hole, and mark this point with an X. If a lower bearing is to be used, affix it to this point. If the floor is solid and would not be damaged by the rotation of the stanchion against it, then there is no need for a lower bearing. However, the machine will eventually wear a dimple into even a concrete floor, so if that would be unacceptable, then install a brick, board, or dimpled metal plate of some sort to act as the lower bearing.

3. Set the stanchion vertical, with the upper bolt inserted into the eyebolt (i.e., the upper pivot bearing) and center the bottom of the stanchion on the X..

VII. Final Assembly of the Jib Crane

1. Lift the jib horizontal and reconnect the quick link on the turnbuckle to the eyebolt. If the jib swivels of its own accord, the stanchion is not vertical. Use a plumb bob or spirit level to aid adjusting it to vertical.

2. Reinstall the truck on the jib and tighten down the nuts on the retaining stud. If the truck runs along the jib of its own accord, the jib is not level. Use a spirit level and adjust the turnbuckle to level the jib.

3. Install the lower arm on the truck and the upper arm into the gooseneck (in which it will fit loosely). Run the truck forward and back along the jib and observe the motion while adjusting the position of the upper arm in the gooseneck. When properly adjusted: (a) the gooseneck should rotate continuously clockwise as the truck moves back, and not reverse direction; (b) the bike wheel should not touch the stanchion when the truck is all the way back; and (c) the arm should remain bent at the "elbow" when the truck is all the way forward. Move the upper arm in the gooseneck until the arm motion is proper, then mark the upper arm at the gooseneck. Cut off the excess length of the upper arm an inch or two beyond the gooseneck. (Figure 21)

4. Two ~25-ga shims will be needed to make the upper arm snugly fit the gooseneck. (Figure 12) Cut a roughly 8"x1.5" strip from the scrap (25-ga) steel from the sheet metal studs. Flatten the strip, then bend it around a 3/4" mandrel and cut it off so it wraps most of the way around the conduit. Insert the shims, one at a time, into the gooseneck, then insert the conduit within the shims.

5. Fabricate a brake to prevent rotary oscillation of the jib while hammer ing. Any device that applies adequate drag to the stanchion will do. A simple such brake is a "garrote" rope around the top of the stanchion pipe, just below the upper cap. This garrot may be tensioned with a strong spring or, as illustrated in Figure 19, by means of a lever mechanism and a bungee cord or light extension spring. Position the brake mechanism (especially the lever) such that it is clear of the bike frame and the gooseneck, throughout the rotation of the machine. (Note: Figure 19 may be interpreted either to be a joist or a 2' length of 2x6 lumber which is mounted to a joist or rafter, whichever is more suitable for the installation.)

III. Installing the Hammer

1. Tie a 1/4" dia. nylon rope (~20 feet long) to the eye of the pulley on the hammer bale. (A small spring link may be used if desired to facilitate installation and removal of the hammer,) Run the rope through the rope guides and over the pulleys, then through the tube-stem hole in the rim. Tie the end of the rope over a 3/8" flat washer to keep it from pulling back through the tube-stem hole. Crank the bike wheel to take up the slack in the rope. Recheck that the rope guides are in line with the pulleys. Adjust the angle between the wheel and the upper arm such that the rope feeds straight from the middle pulley to the wheel rim, then tighten the gooseneck bolt. (Figure 23)

2. Run an ~8' safety cable through the garage-door spring. Using a quick link, mount the spring and cable to the eyebolt at the base of the stanchion. (Figure 21)

3. Using a pliers, force a 1/8" quick link through the end link of the bicycle chain. Lay the bicycle chain over the largest sprocket of the wheel, with the quick-link at the rear of the

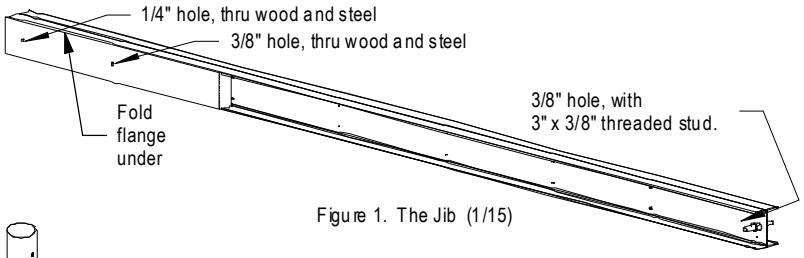

Figure 1. The Jib (1/15)

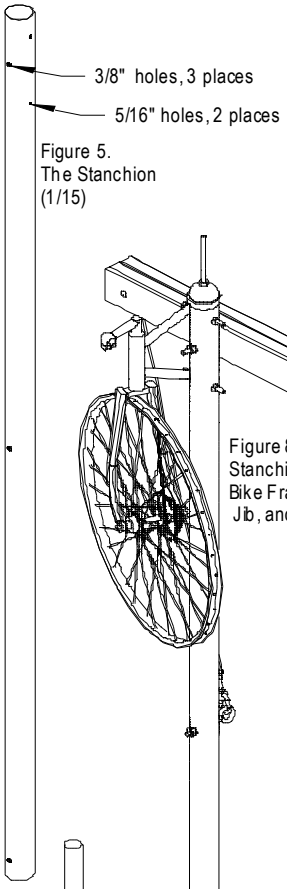

Figure 5.
The Stanchion
(1/15)

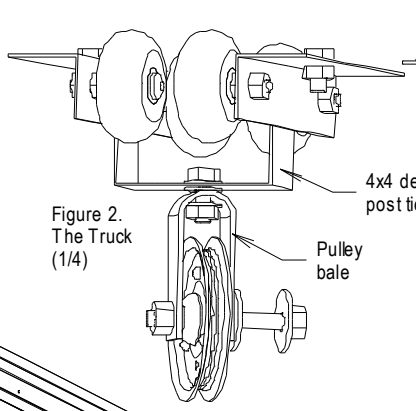

Figure 2.
The Truck
(1/4)

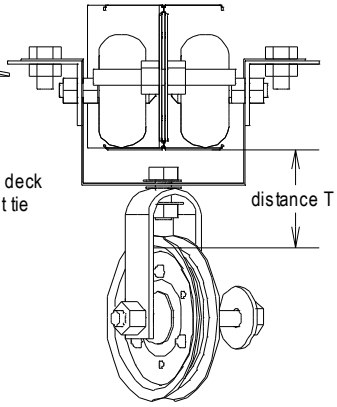

Figure 3.
The Truck on the Jib
(1/4)

Figure 8 (1/15)
Stanchion with Caps,
Bike Frame, Eyebolts,
Jib, and Truck.

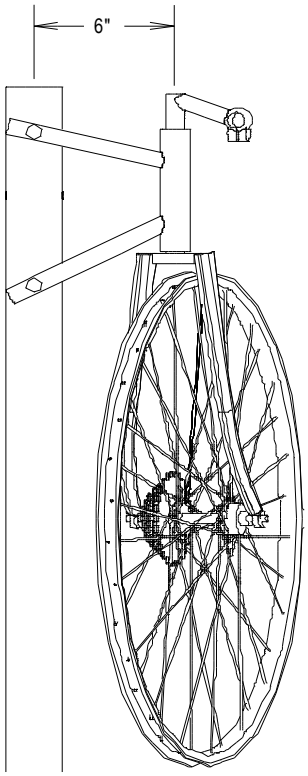

Figure 4. (1/8)
Bike Frame and Stanchion

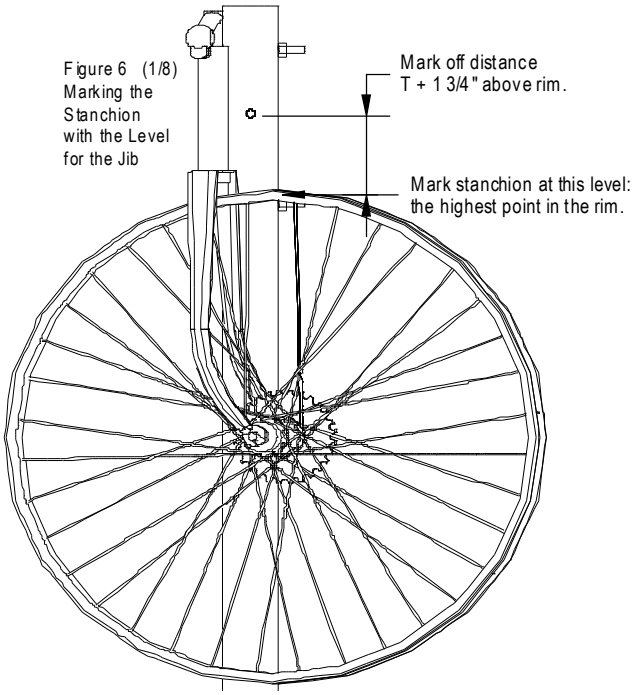

Figure 6 (1/8)
Marking the
Stanchion
with the Level
for the Jib

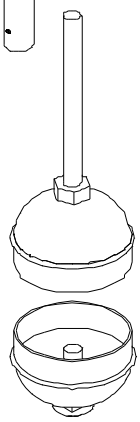

Figure 7. (1/4)
Stanchion Caps
with Pivot Bolts

Figure 22 (1/15)
The Finished Machine

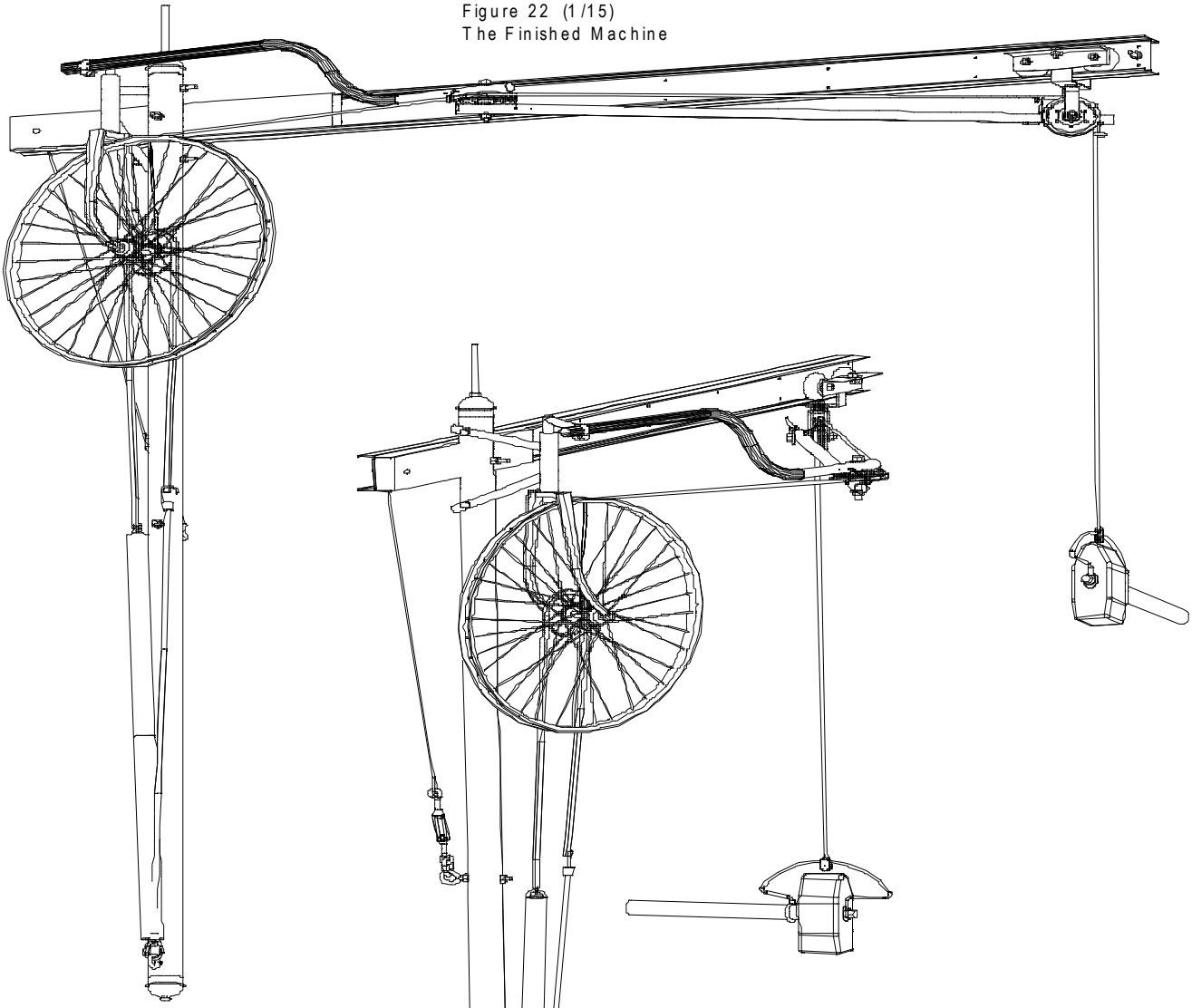

Figure 21 (1/15)
Rear View of
Finished Machine

machine. Insert the terminal loop of the spring into the quick link and close the quick link. Hook one end of a ~2-foot bungee cord onto the opposite end of the bicycle chain. Hook the other end to the bottom eyebolt on the stanchion.

4. Run the free end of the safety cable over the bike frame near the pivot tube, wrap it around the bike frame tubes a couple time to take up slack, and secure the end loop to one of the 5/16" bolts mounting the bike frame to the stanchion. There should be enough slack in the cable that the fork can rotate unhindered, but no more. (Figure 21)

IV. Adjusting the Hammer Motion

1. Crank the bike wheel to lift the hammer up to the truck, then crank it the other way to let the hammer back down to the floor. The spring will stretch.

2. Use a light 3-foot chain with S-hooks on each end to secure the top end of the spring to one of the bolts through the stanchion. Crank the bike wheel to lift the hammer again, all the way up to the truck or some lesser distance. Then crank it the other way to let the hammer back down. Re-secure the spring and repeat this step until the hammer "floats" at the desired level and the "feel" of the hammer is as desired.

3. A J-shaped tool is needed to safely release spring tension in small amounts. (Figure 20) This tool may be fabricated from about 18" of 3/8" round stock. Bend the round stock into a U, with a bend diameter of 5" to 6". Clamp the U in the vise and bend the left branch down and back by hammering. Cut off the bent end 3/4" long to make a stub end.

4. To use the J-tool, hold it upside-down. Lower the hammer to the floor, then insert the stub end into the sprocket near the bungee cord. Rotate the wheel, such that the J-tool lifts a few links of the chain off the sprocket. When the stub reaches the other side of the axle, the spring will suddenly take up the slack, so perform this adjustment cautiously, as it poses some danger to the unwary. Repeat as necessary to release spring tension.

5. When the swing of the hammer is not directly under the jib, the jib will follow the hammer motion. If the jib follows too slowly or drags on the hammer, the brake is too tight. If the jib overshoots and oscillates excessively during hammering, the brake is too loose. Adjust or modify the brake appropriately.

V. Breaking down the Machine

1. Lower the hammer to the floor and chain up the spring (step XI.2). Detach the hammer (with bale and pulley) from the rope. Unwind the rope from the rope guides and remove it from the pulleys.

2. Crank the wheel to slack the chain securing the spring; remove the chain while holding the wheel, then revolve the wheel, hand over hand to release the tension on the spring. Remove and bundle the bungee cord, chain, spring and safety cable.

3. Loosen the clamp on the gooseneck and remove the arm. Tape the shims to the upper arm. Remove the threaded rod from the end of the jib and remove the truck. Remount the threaded rod. Fold up the arm and truck assembly.

4. Release the quick link on the jib cable from the eyebolt on the stanchion and lower the jib to the stanchion. Remove the stanchion assembly from its mounting.

5. If permanently moving the machine, dismount the upper bearing and brake assembly from the joist, and any lower bearing block from the floor.

Tips on Constructing the Weightless Hammer

The first tool on the list is the angle grinder with cut-off wheel. A cheap Chinese version does fine and cuts anything: bolts, sheet metal, steel cables, bicycles, you name it!

Although I recommend a 16# hammer, you may want something else. Just remember, the heavier it is, the slower it will accelerate.

If you don't have a perfect sledgehammer head, go with what you've got. It's easy to change out the hammer later, and the machine will work with any hammer you attach.

You want a boy's bike because the top tube and the down tube spread at a much greater angle than in a girl's bike. This gives you more strength in the attachment of bike to stanchion.

The wheel should be as light as possible. A narrow aluminum rim is best. Heavy is bad.

An underslung handlebar stem is best for reasons of clearance. Although I specify metal tubing for the stanchion and arm, you could use lumber, if you really want to.

You could even use a 2x3 stud for the jib, but you'd have to redesign the truck. (Hint: Use plastic roller skate wheel, instead of roller-blade wheels.) This whole design could be redone many different ways and still work fine. "Quick links" and "spring links" may be brand names. They're chain links that can be opened and reclosed. Anything that will do that will serve. Bungee cords are rubber shock cords, very stretchy. Long, lightweight springs will do. Specified bolt diameters are often more a matter of convenience than an absolute necessity. Use your judgment. You can get a little more work area for the hammer by using an 18", rather than a 24", 2x4 in the jib.

Look at the picture of the truck and construct the upper portion to do the job, from whatever you have handy. The parts specified are available at Home Depot, and have nothing else to recommend them. The top and down tubes of the bike are drilled 6" minimum from the head tube. For a 26" wheel, you might want to make that 7". This may keep the wheel from interfering with the jib cable, but if that should happen, just reposition the jib cable. It's pretty important to drill the 3/8" holes in the lower arm at exactly 90° from each other. That may be the only angle on the whole machine that does matter.

The lightweight wire pigtails work well for 2 of three rope guides. The last rope guide has to be stronger, though, because it pulls the whole machine around as you swing the hammer. If the rope jumps off the 4" pulleys, the rope guides are misaligned. In sketching the bale, the center of the circle is the center of mass of the hammer. Then, as long as you have clearance for the pulley to pass the hammer face and corners, anything goes. The longer the arc of the bale, the more natural the hammer will swing.

Pictured is what I consider to be the practical limit for a useful hammer. This may not be the last word in bale design. I haven't exhausted my ideas. Stay tuned.

If your sledgehammer head is already mounted on a handle, you can live with it, but you'll probably have to drill into a metal wedge and sink a bolt into that. Get the bale eye pivoting correctly, and all else will be forgiven.

__NJBA__ would like to thank Bruce for debuting these plans in our newsletter. Bruce is also the designer of the "Grasshopper Treadle Hammer". Larry Brown, Editor

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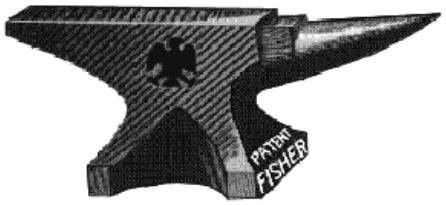

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