Hammers

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This document looks at various types of hammers and how to fix them. Hammers come in hundreds of shapes and sizes. I'll only discuss the head shapes I consider the most generally useful:

- ♦ Claw hammer (carpenter's hammer)
- ♦ Ball pein hammer
- ♦ Cross pein hammer

Most people will envision the claw hammer when someone mentions a hammer, as the claw hammer is the most generally useful around the home. Its primary purpose is to drive and pull nails. With the advent of excellent Torx drive wood screws, cordless impact drivers, and nail guns, hammers aren't quite as important as they used to be.

There are two types of claw hammers: the curved claw and the ripping claw. The curved claw style is probably the most common and it is aimed at helping you pull out nails. Most experienced folks probably prefer a ripping hammer because they are more versatile (see *Ripping hammer* below).

My favorite hammer is a 12 ounce cross pein hammer with a square cross section (see Figure 2). The cross pein has a radius on it, letting it be used for metal bending and forming tasks. I have ground and filed the cross pein on other hammers flat to let me flatten things close to a shoulder and for starting tacks and small nails.

I also use 4, 8, and 16 ounce ball pein hammers quite a bit in my shop. The 8 ounce hammer gets the most use, although I use the 16 ounce ball pein hammer to drive cold chisels. The ball on these hammers is used to round over rivets, but this isn't done as much today as a century ago. Thus, I consider a cross pein hammer more useful than a ball pein hammer. However, one place I find the ball useful is in breaking up small amounts of concrete.

Sadly, hammer handles and wedges are expensive today -- sometimes it's nearly as cheap to just buy a new hammer. This is likely because nobody fixes things anymore -- they just throw things away and get a new one. But you can fit and install a new wooden hammer handle when one gets broken and thus return a broken hammer to service. Fiberglass and steel handles are great and last a long time, but my favorite hammers have wooden handles, so I replace them when they break.

Specialty hammers

There are many styles of specialty hammers -- you can learn a lot by a web search using "types of hammers". I'll mention some specialty hammers that can be of interest to the DIY person:

- ♦ Sledge hammers: useful for driving posts into the ground, breaking rocks, etc. A 2 to 4 pound sledge hammer with a short handle is often called a drilling hammer and is used with star drills to make holes in masonry.
- ♦ Replaceable head hammers: these allow you to change heads for a particular task.
- ♦ Dead-blow hammers: These hammers contain sand or lead shot to help transfer more of the swing energy to the thing being struck and reduce rebound. These are made in both soft head and ball pein forms.
- ♦ Soft head hammers made from materials like lead, Babbitt, brass, bronze, or copper. Copper alloys (brass, bronze, beryllium copper) are often used to make non-sparking hammers.
- ♦ Slide hammers: useful to hook onto something and pull it off.

It's worth scouring flea markets, garage sales, antique stores, etc., for hammers you might find useful for special tasks.

Hammer weights

In the US, hammer weights are usually given in ounces or pounds; I'll use ounces.

The most common weight for a claw hammer is 16 ounces (1 pound). This is the best size for the average person. Carpenters will use larger hammers, but these are only needed for the homeowner if you are driving unusually large nails. If you're a woman and find the 16 ounce size a bit large, try a 12 ounce claw hammer.

My two favorite hammers that I use the most are an 8 ball pein hammer and a 12 ounce cross pein hammer.

For tacks and delicate work, I'll use a 4 ounce hammer.

Heavier hammers are specialty items and, if you're young and strong, could be suitable for you. The heaviest hammer I use on a regular basis is a 2 pound cross pein hammer.

Hammer characteristics

You may want to consult http://www.madehow.com/Volume-4/Hammer.html for some details about how hammers are constructed. Details differ, but most commercial hammers will be drop forged and selectively hardened/tempered. Here's a description of a blacksmith making a hammer a century ago: http://lostcrafts.com/Blacksmith-15.html.

A key characteristic of a steel hammer head is its hardness. Commercial hammers are heat treated at the face to higher hardness than the body of the hammer. This gives hardness to resist wear/deformation when driving things made from metal, but toughness in the body to reduce the chance of the metal shattering.

Carpenter's hammers can have faces that are harder than a machinist's ball pein hammer to give longer life when pounding nails. A disadvantage of these harder hammers is that the metal can shatter when hitting other hardened objects, such as punches or chisels. I have never seen a carpenter's hammer shatter when driving a punch or chisel, but I've read of it happening -- and it's the reason all modern hammers tell you to wear safety glasses.

You can make a qualitative hardness check of a hammer by "bumping" it with a file[1] (this is a common machinist's test of a material). When I tested a few carpenter's hammers in my shop, the hammer face was harder than the hammer body. The faces of my ball and cross pein hammers were softer than the carpenter's hammers; however, the bodies of these ball and cross pein hammers were a bit harder than the carpenter's hammers.

Thus, to drive punches and chisels, use a ball pein or cross pein hammer.

The best punches and chisels have their striking ends softer than the cutting/working end (easily verified by the file bump test). My favorite style of pin punch has a hardened/tempered pin permanently inserted into a soft steel body. The soft steel is easily dressed with a file or grinder when it gets deformed.

Another key characteristic of a hammer is its handle. The three common types are wood, fiberglass, and steel. I have all three types on different hammers and I like all of them. Wood works well for hammer handles and has the advantage that you can make or buy new handles. Steel is probably the most robust and long lasting (some hammers are forged from a single piece of steel, including the handle). You can research handle types on the web, but be cautious of all the marketing information out there trying to bias you to buy a particular style or brand. It's best to try each type and form your own opinions.

The length of the handle is another characteristic, although you have little control over this if you buy a commercial hammer. I've used hammers that I've felt had handles that were the wrong length, but this is a personal opinion.

1 There are commercial file sets (look up Tsubosan) that can resolve Rockwell C hardness to the nearest 5 units.

Ripping hammer

I find a 16 ounce ripping claw hammer the most useful tool for general DIY work. Of course, it drives nails, but I use wood screws far more for construction these days, so the ripping hammer gets used for other tasks:

- ♦ Demolition: splitting wood, pulling out nails, bashing in drywall, pounding two nailed boards apart.
- ♦ Prying: the straight claw gets used a lot for this. Use a brass or lead hammer to drive the claw between two things when needed (i.e., don't hit the claw hammer's face with another steel hammer).
- ♦ Digging: the claw makes a good digging tool (I use mine a lot when building concrete forms in the ground).
- ♦ Splitting, cutting: in a pinch, you can use the claw like a hatchet to split a piece of wood. You can also crudely cut thin things off with the claw.
- ♦ Pulling nails: slip a piece of wood under it if you don't have enough leverage. If I have to pull a lot of nails, I'll get a cat's paw or a flat pry bar.
- ♦ Straighten bent nails: put the nail shank in the vee of the claw and you can bend it back to near vertical.

The heavier ripping hammers (called framing hammers) have a cross-hatched face to reduce the slippage on nail heads. They also leave a visible mark in the wood to show a nail has been driven home properly. The average person doesn't need one of these hammers.

Hammer head

For wooden handled hammers, the head has the following exaggerated cross-sectional shape:

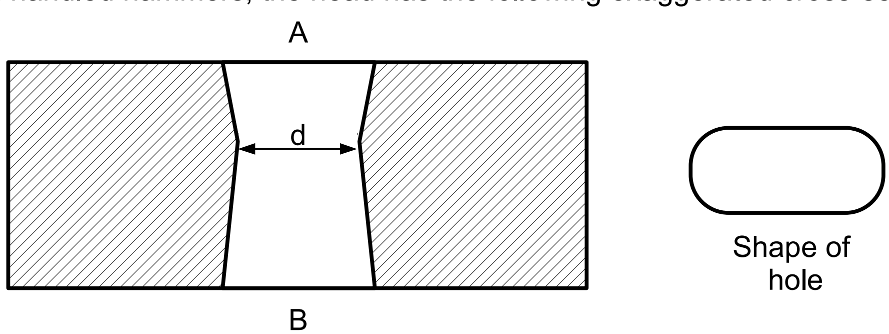


Figure 1

The taper at B is intended to have the hammer head fit the handle tightly without movement. The taper at A is used in conjunction with the wedge to hold the hammer head onto the handle so it cannot come off -- the wedge's purpose is to expand the handle material to tightly fill A's taper. These taper angles aren't very large; they're typically around 1° to 1.5° or so on the handles I've measured.

The key thing for you to note is that **the taper at A is what is used to hold a hammer head on**.

The hole in the head usually has the shape of a rounded rectangle or an ellipse to prevent the hammer head from rotating on the handle. If you make a hammer head with a circular hole, the head will be able to rotate on the handle no matter how tightly you drive in a wedge. A circular hole seems to work OK for light-duty hammers, but it's not recommended for hammers above 4 to 6 ounces.

To fit a handle, have the handle match the taper at B, then be straight at the minimum diameter d. The wedge is put in at A to expand the handle end to grip the taper at A.

Handle

Remove a handle

The easiest way to remove a hammer handle is to cut it off flush with the hammer head, then drive it out with a punch or cold chisel. Use the punch on the side opposite the wedge. This should take a matter of seconds.

The web page http://theprepperproject.com/brought-broken-hammer-back-life/ recommended removing the broken handle from a hammer head by burning it out. This is bad advice, for two reasons. First, it's slow -- you can easily drive the old handle out in a few seconds with a punch after cutting it off at the base. Second, you'll destroy the hardness of the hammer head because this will anneal the steel. This will reduce the subsequent life of the hammer. Remember that a hammer head is heat-treated high carbon steel.

Fit a handle

My favorite hammer is a 12 ounce cross pein hammer I bought used. The first time I used it, the head fell off because it was poorly mounted. I had a broken handle from an old 3 pound sledge hammer, so I decided to fit it to this cross pein head.

I used some old-style machinist's 2 inch calipers to gauge the needed size of the handle; it was about 1/2 inch wide and 3/4 inch long. Other suitable calipers for such work are Starrett model 37 or 39 inside lock joint calipers.

I laid out cuts on the handle in pencil using my surface gauge, then cut the handle to the needed rectangular size on the bandsaw. After about 10 minutes of shaping with a shoe rasp, I got the handle to fit the hammer head tightly. I used a 1 pound hammer to pound the new handle onto the head (I put a piece of wood on top of the hammer head being pounded), then drove in the wedge. It's such a nice, tight fit that this handle will never come off. This hammer is the bottom one in the following picture (its cross pein is rounded):

Figure 2

This hammer feels perfect in my hand and I consider it to be the best hammer I have. The head is about 12 ounces.

The hammer is such an important tool in the shop that it's worth your time to fit new handles to old heads. Yes, you can buy new hammers (about $5 to $30) and that's the fastest way to get a usable hammer, but old hammer heads and handles can be purchased at e.g. flea markets inexpensively and you can fit a new handle yourself -- and be confident it's done correctly.

Some hammer handles come with a slot cut in the head for the wedge. I like to have a plastic wedge that runs the long ways of the handle and a steel wedge that orthogonally bisects this plastic wedge. It will take hard pounding to drive these wedges in, but you'll feel when you have pounded them in enough and the wood/wedges are jammed tightly in the head. They can then be filed off flush with the top of the hammer body. Done correctly, the hammer head should never come loose unless it gets abused.

You can make your own hammer handles if you have a suitable wood (ash or hickory are often recommended, as are some fruit woods like apple or cherry). Rough cut things out on a band saw, then use the rasp to shape the handle (a drawknife, spokeshave, and shaving horse are the traditional tools for this). Use existing handles as a guide. I find the most comfortable wooden handles are those that have an asymmetric shape that's nearly elliptical. A common size where the hand fits is a 3/4 inch minor diameter and 7/8 to 1 inch major diameter.

The easiest wooden handles to make are probably the claw hammers, because they just need a tapered rectangular cross section to fit into the head. If you measure things carefully, you can cut the handle out using a bandsaw and have little to no fitting with a rasp.

Wedges

The wedge is used to expand the top of the head of the handle. **This expanded wood is what holds the hammer head on the handle**.

There are three materials typically used for wedges: steel, plastic, and wood.

The steel wedge is most common and is usually a formed piece of low carbon steel. In my opinion, they are overpriced, as their manufacturing cost is probably a few cents in high volume, but they get sold for dollars apiece. Nevertheless, when you need one, you need one.

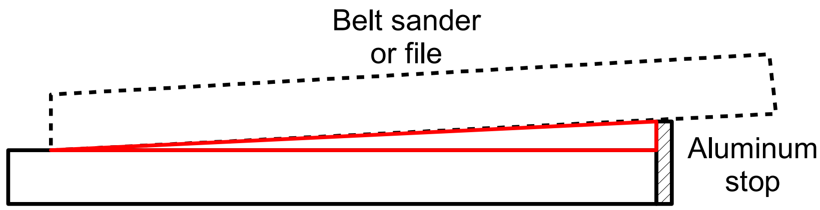
I've purchased general-purpose wedge sets that contain a plastic main wedge with a smaller steel wedge that is driven in at 90° to the plastic wedge, locking things in place. I feel these sets do the best job of attaching a hammer head because they expand the handle's wood in two different directions in the head.

It's not hard to make your own wedges, so let's take a look at that.

Making your own wedge

If you have the time, making your own wedge isn't difficult. You'll probably want an included angle between 5° and 10°. I don't measure the angle, as I just make something that looks good to my eye.

Plastic and wood wedges are straightforward to make. Screw a piece of aluminum sheet to the edge of a board and use it as a stop to file or belt-sand the wedge to shape:



If you have a table saw, wooden wedges are quickly made with a simple fixture[2]. Another tool to quickly make wedges is the bandsaw. The quickest way might be to just use a sharp chisel to split out and form the wedge.

Metal wedges

For smaller hammers, cut masonry nails can be handy for making a wedge:

2 Also see here for some other ideas and an adjustable fixture.

The width of these nails under the head is about 10 mm and the thickness is about 3 mm, and the included angle is about 13°.

These nails are hardened and tempered steel, so you'll first want to heat the metal red hot with a propane torch and let it cool slowly to anneal it. This will let you cut the metal with a hack saw and file it. You can file small serrations into the side to help it hold a bit better, but I usually don't bother. There's no need to reharden it.

Use other scrap steel from the shop. You can heat the steel with a propane torch and pound it to shape (i.e., simple blacksmithing) or just file/grind as needed.

Larger hammers can use tapered round wedges made from e.g. 1/8 or 1/4 inch steel pipe (pg 293, *The American Machinist Shop Notebook*, 1919). These are advantageous because they force the handle wood to expand in all directions.

Hammer tidbits

If you have a hammer with a loose handle, it's almost always better to install a new handle than try to fix the existing one, especially if the area where the wedge is has lots of splitting. I've read that some people soak a loose hammer handle end in antifreeze which will cause swelling of the wood, but I haven't tried this. You can use a pin punch to drive the wedge a bit deeper, but it will almost certainly come loose again, which is why I recommend installing a new handle.

The ball pein was made for rounding over the end of a rivet, something that was done a lot 50 to 100 years ago, but isn't done very much today. I find a cross pein hammer much more useful in the shop. One use is that the cross pein can make it easier to start tacks[3]. I also use the cross pein to drive wedges out in my shop-made fixtures.

For hammers with wood handles, the vulnerable part of the handle is at the base of the head, as it's easy to miss with a strike and hit the handle instead just under the head. Wooden handles often will break immediately; fiberglass and steel handles can be more robust. A good defense against this type of handle damage is to put some kind of protector over this part of the handle; a chunk of rubber hose, vinyl tape, or a lashing with braided nylon twine are some possibilities. Some hammers come with such protectors and I would pay extra for such a thing, especially on sledge hammers. It's easy to add your own.

If you have a lathe, you can turn a nice handle to the major diameter of the elliptical cross section and finish it to the desired cross-sectional shape using a rasp. Use an existing handle you like as a pattern.

If you use cold chisels and punches much, you may want to make or buy a chisel holder. You'll be more confident in your work if you know you won't slip and smash a finger, which can bring a job immediately to a halt and exercise your repertoire of cuss words. Here's one I made for myself, but I have to admit I only use it when I have to do some heavy pounding on a chisel:

3 Warrington pattern hammers are even better, but they are often ridiculously priced.

If you're using a hammer and a punch to knock out a pin, begin with a starting punch if you can. A starting punch has a taper which makes it less likely to bend when breaking loose a tight pin. Once the pin has moved, you can switch to a regular pin punch. If you need to deal with spring pins a lot, you can buy specialty pin punches for removing and installing them.

Here are the hammers I use most frequently:

From left to right are:

- 2 pound cross-pein hammer. Note the rubber protector for the fiberglass handle under the head -- this is definitely wanted on a heavy hammer or sledge hammer for long handle life.
- Old 1 pound ball pein hammer with fiberglass handle. Note the rubber tip (similar to a crutch tip) over the ball pein, turning it into a soft hammer. I bought this hammer used decades ago and it was already well-used; it has given excellent service.
- Cross pein hammer discussed above with new handle; this is my favorite general-purpose hammer in the shop. The handle is a little large for this hammer head, but it fits my hand nicely and it allowed me to salvage a broken handle. I use this hammer so much it always is sitting on my workbench; the head weighs around 12 ounces.
- Small soft-face hammer with brass and nylon tips. The steel body is 1 inch in diameter and has a 7/16" round hole for the handle.
- Steel-handle carpenter's hammer. I've used this hammer for many decades, but I prefer a ripping hammer for most work.

The hammer I use the most is a Starrett 815 toolmaker's hammer, as I use it every time I drill a hole (and I drill thousands of holes). This hammer is useful because of a magnifier in the head that allows you to align a prick punch with scribe marks. It's a surprisingly expensive hammer, nearly $100 in March 2018. I bought mind in 2002 when I retired, but I've seen how much I've used mine and I'd replace it with another if I lost it.

I spent most of my life without a cross pein hammer, but now that I have a few, I've learned how useful they are. They're handy to bend a piece of sheet metal to follow a curve, but you'll want the cross pein to have a radius on the end rather than be ground flat. A flat cross pein can be useful for starting small tacks or peening metal flat close to a shoulder. I cut shallow notches in wooden wedges for holding things in fixtures and use the cross pein to drive them out when I'm finished using them.

Here are some measurements of some commercial hammer handles. The measurement A is the diameter for the largest portion of the end of the handle (i.e., the major diameter). B is the minimum major diameter where you typically grip the handle. C is the diameter where the handle starts to taper. D is the minimum diameter near the head. The value in brackets is the diameter in the orthogonal direction to the major diameter (i.e., the minor diameter). The hammers were:

1. Two light-duty ball pein and cross pein hammers with wood handles
2. 1 lb cross pein hammer with wood handle
3. 1 lb carpenter's hammer with fiberglass handle
4. 2 lb cross pein hammer with fiberglass handle

Measurements in inches

Handle	A	B	C	D
1	0.9 [0.8]	0.9 [0.8]	0.8 [0.7]	0.43 [0.3]
2	1.6 [1.3]	1.3 [1.04]	1.36 [1.02]	1.08 [0.8]
3	1.5 [1.15]	1.26 [0.83]	1.25 [0.9]	0.9 [0.57]
4	1.7 [1.1]	1.5 [1.08]	1.35 [0.9]	1.25 [0.8]

For my hands, I like a major diameter of 1 inch for 8 ounce or lighter hammers, 1.25" for hammers up to about 16 ounces, and 1.5" for heavy hammers, sledge hammers, and axes.

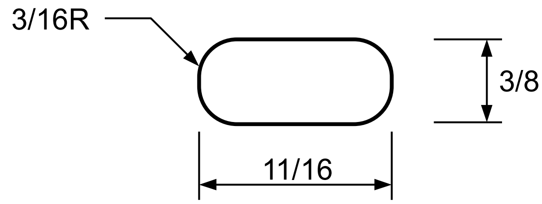
Make a hammer handle

Making a handle is a useful skill, as it can put back into service a favorite hammer with a broken handle. Since few people fix things today, this can also let you buy a hammer head at a flea market and get it back into service for less cost than a new one. This is cost effective for those unusual or obsolete hammer heads. Besides, you'll probably find that it's not too difficult to make a handle and it will be satisfying to use that hammer in the future, as you'll remember making the handle every time you use it.

http://www.cornishworkshop.co.uk/hammerhandle.html

I had some scrap wood in my shop that came from a crate that our snow blower came in. It's obviously a cheap wood, but it was pretty tough when I cut it with a saw. I thought it would be a good exercise to make a hammer handle using it, as a few weeks before I had broken the wooden handle of a favorite 8 ounce ball pein hammer (I'd used that hammer for nearly 50 years before breaking the handle by hitting the handle on a piece of steel just below the head).

I used some 2 inch toolmaker's calipers to measure the hole for the handle. This involved carefully feeling for size and taper. The handle's cross section needed to be as follows to fit the hole in the hammer head:



I grabbed a similar hammer and traced the handle on the piece of stock -- nothing fancy, just a sharp pencil that I tried to keep at a constant angle with respect to the handle's edge.

I then used hermaphrodite calipers to find the centerlines of the wide and narrow portions of the top of the handle where the hammer head goes. I set the desired half-width on some dividers and marked the relevant distances off the centerline. The dots were connected with a pencil and rule to show me where to cut. I used the bandsaw to cut just to the outside of the pencil lines, leaving a little extra to rasp off so I could get a tight fit.

I used an 8 inch shoe rasp to fit the handle to the hammer head until it slipped on to the handle with about 1/2" exposed and had 0.4 inches farther to bottom out (I had slightly tapered things so there would be a tight fit at the bottom of the head). I also shaped the handle to fit my hand a little better, but I didn't bother to try to turn it into a perfect handle. I left some of the flat sides of the board as they were, yet the handle fit my hand just fine.

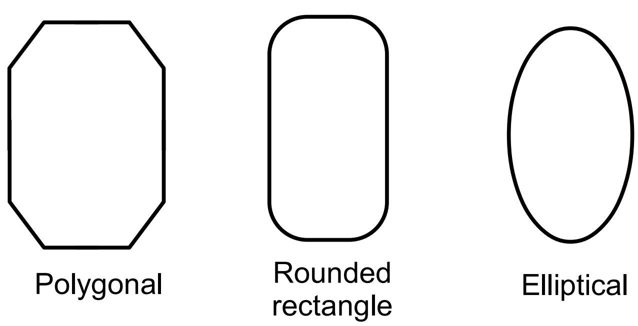
I then knocked the hammer head onto the handle by banging the bottom of the handle on the back of my bench vise. It was a tight fit and the hammer head sheared off a few wood fibers because of the slight taper I had given the bottom part of the handle. I cut the excess handle off and drove in a steel wedge to lock the handle in place. Some filing smoothed things off, I put a golden oak stain on the handle, and I gave it two coats of a polyurethane finish

Making a hammer handle from scrap wood is an excellent exercise because only simple tools are needed (a saw, rasp, and vise) and you'll learn some useful techniques in rasping something to shape. Calipers are useful for assessing the needed sizes and seeing how close you're getting to the final size, although you'll find the final fitting only needs the hammer handle because you'll push it onto the handle, see where the interference is, then rasp that off and repeat.

The general consensus is that ash and hickory are the best woods for hammer handles; avoid woods like oak. Fruitwoods like apple and cherry are also recommended by some folks (I made a handle for the hammer in the next section from black cherry).

I recommend you first fit the handle to the hammer head before shaping the area where your hand will grab.

I've seen three basic handle shapes for hammers where your hand grips the handle:



I find all three shapes to be comfortable for average hammer use.

Making other hammers

Blacksmiths are capable of making their own hammers and you can look that topic up on the web. Most of us won't have the tools and skills, so we either buy new hammers or buy used stuff and fix it.

There are many web sites that cover making wooden hammers (also called mallets). Others salvage polyethylene and form it to make plastic hammers.

There are companies that sell materials and tools to make your own hammers from lead or Babbitt, but these kits are pretty expensive and only make sense if you go through lots of hammers. If you're interested in doing such a thing, you can make your own mold if you have a lathe or mill (look up Frank Ford's site, as he discusses making hammers). Also search the web, as there are a number of sites that have discussed casting lead hammers.

Turning a handle in the lathe

If you have a wood lathe, you'll probably have no issues holding and turning a hammer handle. However, things may be a little more challenging with a metal lathe, as you have to grab the stock somehow to turn it.

A 4-jaw chuck is the most general choice and works well, though you may want to have excess stock to cut off so you don't need to worry about the marks from the chuck jaws.

If you have a spur center, that's a tool that will get you up and running quickly. These aren't hard to make if you have a milling machine.

I find the easiest technique is to drive a small nail into the end of the stock and grip it in a chuck or collet. Drive in an off-center nail to bear against a chuck jaw or collet slot to drive the wood piece. It's simple, fast, and provides enough torque for turning. Small nails can be used and you can cut them off to perhaps a 10 mm exposed length or so. I usually have to pound the small drive nail flat to get it to fit in the slot of a collet; a cross pein hammer with the cross pein ground flat is the tool of choice for this.

On the raw stock, I pencil in where I want portions of the handle. I'll put my hand around the end of the handle as I was holding the hammer and mark the extent of my hand grip. Then I mark where the head goes and the reduced cross-section area between the hand grip and the head. These sections then get turned quickly with a skew chisel and I just eyeball the sizes. Since I start with stock with a rectangular cross section, I can turn the wood to the desired major diameter, then finish shaping the handle with a rasp. After you've made a few, it becomes pretty routine.

Assessing hardness

Hammers are made from high carbon steel so that they can be selectively hardened. Chisels and punches also benefit from being hardened. Unfortunately, you can't tell whether a chunk of steel is hardened or not just by looking at it.

Materials testing labs will use hardness testers to quantify the hardness of a material. These force an object of known geometry into a material and gauge the hardness by the size of an indentation. Other tools use the elastic properties of the materials. Regardless of the method, these tools are out of scope because of cost and complexity.

The most practical tool in the shop to help assess hardness is a steel file. The one I use for this task is an 8 inch mill file made by Nicholson. A quick "bump" with a file gives you a clue to the hardness of a material. Something near the hardness of the file itself will cause the file to "skate" on the surface without cutting. Something softer will still feel hard, but will show evidence of a little material removed. Soft steel will easily cut with a file.

Use a file to bump various portions of a modern hammer handle and you'll be able to feel the different levels of hardness. The hammer face (the portion that strikes the nail) will likely be hard enough that it won't file (or files with difficulty). Perhaps 10 mm behind the face you'll find that the material files more easily.

A good "standard" for soft steel (often called mild or low-carbon steel) is a common nail. You can keep a few concrete nails on hand for a reference hardened steel. You'll see that a file mostly skates on such hardened nails (the file may shave a little material off the nail). You can heat the concrete nail red hot and let it cool. Then it will be nearly annealed and you'll find you can file it more easily (but it will still be tougher than the low carbon nail). Punches and chisels are made from hardened steel; you can verify they are selectively hardened by filing them near their tips versus the back where the hammer strikes. Experimentation with the file will let you find other materials that are hardened.

It's also handy to have samples of other materials like brass, aluminum, copper, and lead. These are soft materials and file easily.

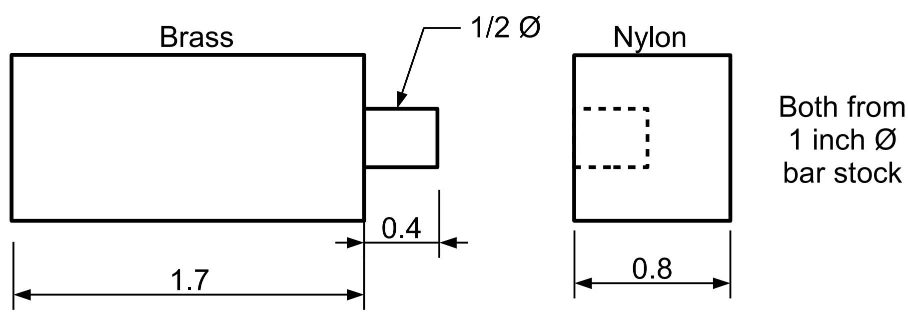
If you want to be a bit more quantitative, you can buy hardness file sets that are heat treated to cut at a specific hardness. Such files have roughly 5 units of hardness resolution on the Rockwell C hardness scale. Look up "Tsubosan hardness files" on the web for examples.

When encountering an unknown material[4], the first thing a machinist will do will be to bump it with a steel file. This can be refined by trying to machine it with a high speed steel, carbide, ceramic, or diamond tool. The material's behavior and appearance give pretty good clues as to what the general type of material it is.

Make a hammer

Brass hammer

I decided to make a brass hammer with one nylon face, as I wanted this specialty hammer to live at my lathe for various tasks (removing sticky ER32 collets is one common use). I used some 1 inch diameter brass and nylon bar stock:



I machined the 1/2 inch spud to be 2 mils larger than the corresponding bored hole in the nylon piece. This let me drive the pieces together for an interference fit (a typical metalworking fit would indicate about a 0.5 to 1 mil interference, but this wouldn't be tight enough with the plastic).

I decided to use a round hole for the handle and taper it using a taper reamer; the desire was to produce a hole as shown in Figure 1.

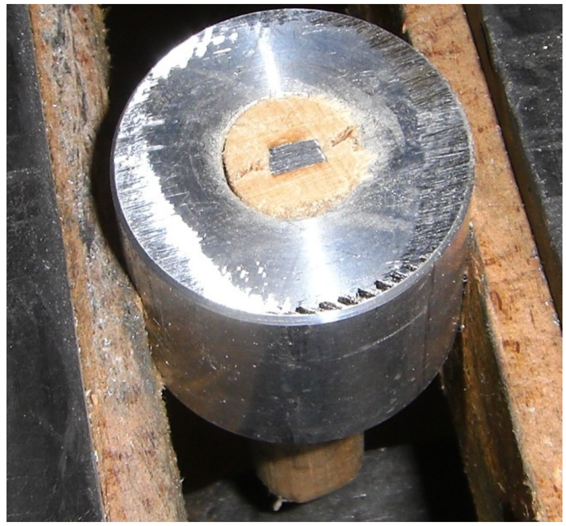
These reamers are typically called repairman's reamers. They have a tee handle and an included angle of taper of around 6°. A common size is about 1/8" diameter on the small end and 1/2" on the large end. They are handy for enlarging holes in sheet metal and for alignment tasks. For around $15, you can get a set of two of these reamers, one from 1/8 to 1/2 and the other from 5/32 to 7/8. General Tools makes the model 130 with a tee handle and the model 131 with a plastic screwdriver handle. Harbor Freight sells the 66936 model for $3.

A handy shop tool can be made by cutting off the tee handle and welding on an old 3/8 square drive socket, letting you drive the reamer with socket handles. Or, cut the handle off flush and turn it smooth,

4 I'm excluding specialized materials that might be toxic, pyrophoric, explosive, etc.

giving you a tapered reamer for chucking in the lathe tailstock.

Before using this tapered reamer, I prototyped the hole and handle to make sure a wedge would adequately expand the wooden handle in the head and not be loose. I used a chunk of 1/2 inch dowel and turned it for a snug fit in an existing hole in a piece of aluminum scrap:

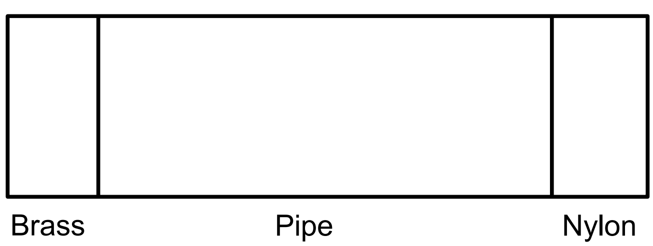


I used the reamer to cut a tapered section about 1/2 inch deep[5], then made a wedge from a tapered flat "cut" masonry nail. I heated the nail red hot with a propane torch to anneal it, then cut and filed it to the desired shape. After pounding the wedge in, I cut off the excess and filed things flush. I grabbed the exposed dowel in the vise and was able to turn the bar stock with a pipe wrench, but I couldn't get things to wiggle or come loose. I made a handle for this hammer from some black cherry.

This hammer is for light duty. For heavier hammers, I would not be happy with the round hole for the handle. For hammers I make in the future, I will put in a hole with a rounded rectangle form (straightforward to do on a vertical milling machine) to ensure the hammer head can't rotate on the handle. I keep this little hammer at my lathe and if the head starts to rotate annoyingly, I'll drill a small cross-hole through the head and handle and drive in a nail as a pin and file it flush.

Hammer with no handle

This hammer is made from a length of scrap pipe:



I've left off the dimensions, as you can decide on those yourself (I used 1¼ inch pipe for mine).

I used a 1/8" diameter spring pin to hold each hammer end in place. I bored out the pipe on the lathe so the hammer ends would be a tight fit, The pipe will have an internal weld seam because it's made from flat sheet. You'll need to turn or grind this seam out to get a head to fit snugly.

This hammer is surprisingly useful for nudging things and it can get into places where you can't swing a hammer.

I used brass an nylon for the ends, but if I had to do it over again, I'd probably use brass and mild

5 Mark a line in the bore with a felt pen and you can easily see how much metal you've removed.

steel.