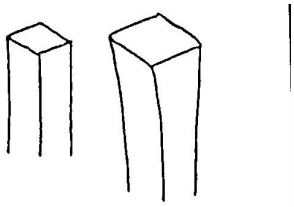
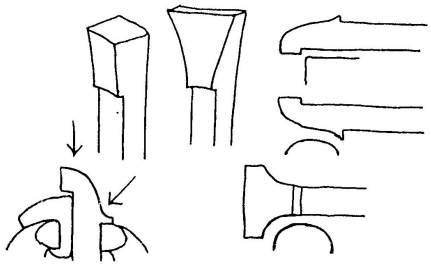
Bench Vise by Tom Latané

Complex Hand Forging Bench Vise By Tom Latané

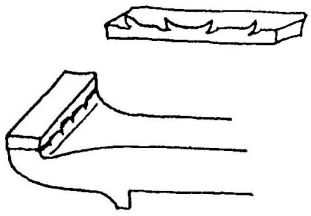
Identical forging procedure for front and rear jaws.



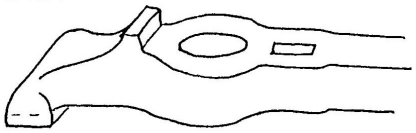
I. A. Upper Vise Jaw
Upset end of a 10" and a 12" piece of 1" square until the ends are 1 1/2" square.
2" below the end should measure 1 " x 1 3/16" —1 1/4".
With 1 ¾" -2" over edge of anvil shoulder down to 1".
Spread end over horn and anvil face hammering first on back, then inside.
Reduce end to ¾" thick.
Dress curves with round faced hammer over horn.
Bend ¾" of end down over anvil edge.
Upset and dress over anvil edge and in vise with back-up jig*
Reduce the thickness of the back of the jaw above the shoulder
with cross pein. Place in vise with jig and draw out lip with fuller.
Dress shape of jaw in jig and over horn.
Forge bar below lip to 1" square.



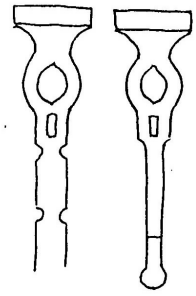
B. Steel face on jaw
Forge some 1045 or water hardening steel to length and width of vise jaw face and 3/16-1/4" thick.
Chisel barbs into one edge of steel.
Heat vise jaw and pound cold barbs into it. (Barbs on lower side.)
Bring to welding heat with steel up in fire.
Weld into place.
Dress edges and top of jaw.



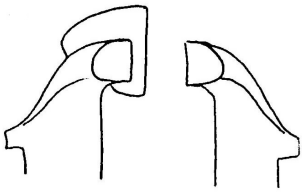
C. Eye for screw
Begin a slit 1 1/2" long 3/8" below the lip through jaw back to front.
Open and drift to a little over 1" round.



II. Rear Vise Jaw Components.
A. Mortise
Punch a mortise 3/8" below eye with a 3/16" x 1/2" punch. - -
Dress with mild steel drift to 1/4" x 3/4" maximum.
B. Lower bracket
Forge leg below lip to 7/8" deep or to smallest dimension resulting from punching.
Make a punch mark on side of leg ½" below mortise and another 2" below that.
Fuller on both these marks.
Draw material between fullers to a taper from over 1/2" to under.
Cut off over hardie leaving mass below fuller shoulder for screw clamp.
Shoulder bar on side of jaw face 2/3 of distance down from shoulder below mortise to lower shoulder.
Reduce from 7/8" to 5/8".
Forge end into cylindrical shape.
Bend end of leg away from face of jaw to right angle at shoulder.



*Back up jig
Shoulder 1 ¼" x 1" and draw down to 3/8".
Forge a right angle.
Cut off bar and taper back of 1" end.
Forge to fit your leg vise jaw.



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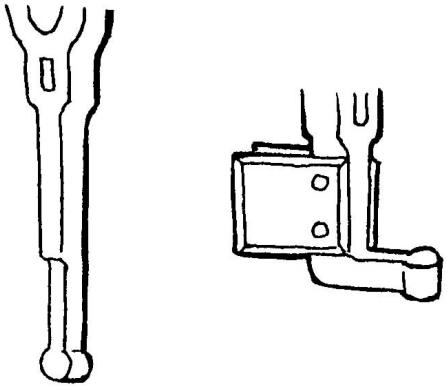
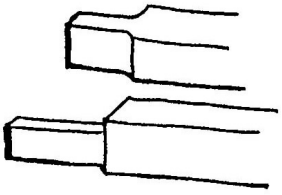
Part 2

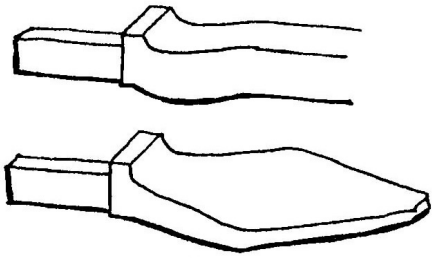
C. Cheeks
Cut 2 pieces of 1/4" x 2" x 2 1/2".
Bevel top and bottom edges.
Drill and rivet to vise leg ¾" above
or even with bottom bend depending
on space available.
Pickle in vinegar.

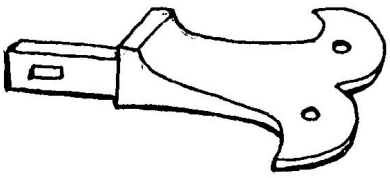


D. Bottom bracket screw
Weld ¼" x ¾" collar on 7/16" round shaft.
Forge ball end.
OR
Forge 3"- 4" of 7/16" round on end of ¾" round bar.
Cut off and forge ball end. Pickle in vinegar.
File or turn ball end.
Bore for 3/8" round toggle.
Make toggle like main screw toggle.
Hold in upsetting jig or wood vise chaps to thread with die.



E. Upper bracket
Fuller end of ¾" square, or use set hammer on anvil edge.
Shoulder third side over anvil edge.
Draw tenon to ¼ x ¾ x 1 ½" long.
Shoulder behind single shoulder. Cut off bar.
Spread and forge or cut desired shape.
Punch mortise with 1/8 x 3/8" punch.
Bore 1/8" holes for teeth.
Counter bore or drift.
Forge tenons on 3/16" square rod.
File to fit holes.Cut 1/4" long and brad tenons in holes.
Sharpen teeth with file
.





III. Front Jaw Hinge
A. Front Leg
Dress depth to match rear leg
Fuller below eye to match rear jaw.
Draw leg width to taper same as rear, allowing it to spread in depth.
Cut off even with bottom of rear jaw cheeks.
Shoulder and upset pivot area. (Shoulder will need to be
higher than finished position.)
Forge leg to even depth from eye to shoulder.
Match length to rear jaw.
Heat cheeks and dress together with front leg.
Bore for 7/16" bolt.

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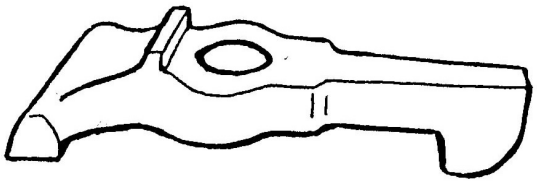
Part 3

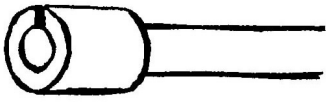
B. Pivot Bolt

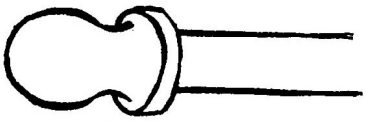


Neck down end of 5/8" square bar to 7/16".
Forge to 7/16" round.
Nick and head partially in 7/16" round hole.
Finish head in 7/16" square hole,
File hole in one cheek to accept square portion of bolt.
OR
File notch in plate with 7/16" round hole..
Form bolt head in this.
File corresponding notch in one cheek.
Make nut and thread bolt or punch mortise in bolt over swage and fit with wedge.

C. Spring
From scrap spring forge a leaf spring no wider than the width of the vise leg where the upper bracket is mortised, tapering from about 1/8", long enough to reach from below the box to just above the shoulder above the pivot hole in front jaw.
Punch a mortise for the upper bracket tenon.
Make a wedge to secure both bracket and spring.
Harden and temper spring.

IV. Vise screw and Box
A. Screw





Upset 2" of end of 5/8" round.
Make collar of 1/4" x 1 ¼" bar.
Weld to end of rod using swage.
OR
Draw 4" of 11/16" round on end of 1" round bar.
Cut off with 1 ½" of 1" round on end.
Upset shoulder with shaft through 11/16" hole in plate.
(For beveled shoulder and washer, forge dished washer first, then upset in washer)
Fuller neck.
Forge ball on end.
Pickle in vinegar- Ball end will be filed or lathe turned. Screw wilt be turned down to 5/8" round and threaded on lathe.

B. Flat washer

Scarf ends of 3 ½" of 3/8" square.
Roll in swage.
Weld.
Drift open.

C. Dished Washer
Cut 1/2" of 1" round.
Punch and drift 5/8" hole.
Upset outer edges.
Dish center with large ball pein.

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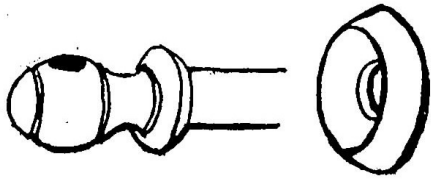
Part 4

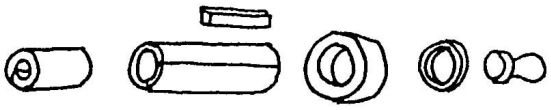
V. Box

A. Outer tube



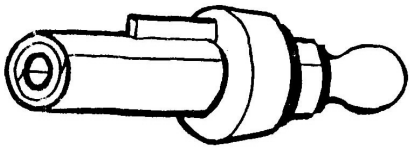
2-7/8" of 1/8" x 3"
Scarf the two 3" sides
Roll a 3" long tube in a swage.
Dress to close ends around ¾" round bar.

B. Inner Tube



1 ¾" of 1 ½" x ¼" bar.
Chisel cut both ends same side.
Roll in swage with chisel beveled side inwards.
Close ends using ¼" mandrel or drift if necessary.
Size to fit snugly inside outer tube.
Braze together in fire.
Pickle in vinegar- threads will be cut in inner tube on lathe.

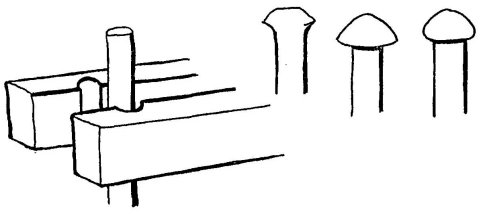
C. Restraining ring



Weld 4" of 3/8" square or upset and punch 1" of 1" round.
Drift to fit tightly around tube.

D. End plug
Fuller end of ¾" round.
Forge ball finial.
Cut off and fit to end of tube.
These will be brazed around and into the end of the tube along with a spline to prevent rotation after the threads have been cut.

E. Toggle
Upset end of 7/16" in vise jig.
Forge button end.
Pass through hole bored in ball end of screw.
Upset and forge second button end.



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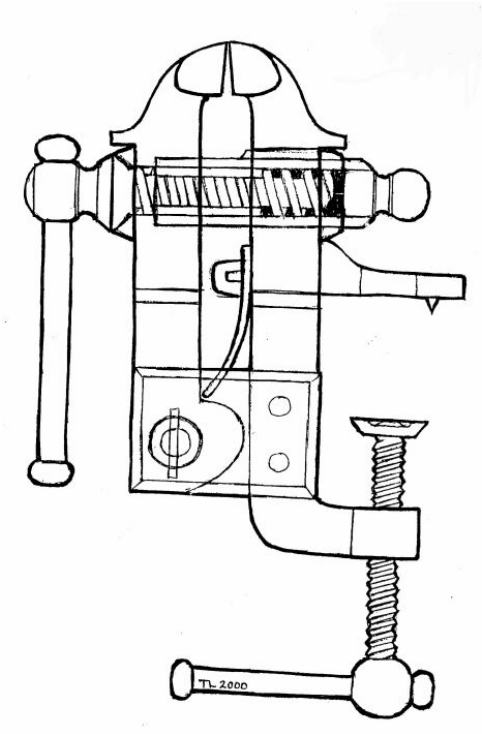


The Scrap Corner

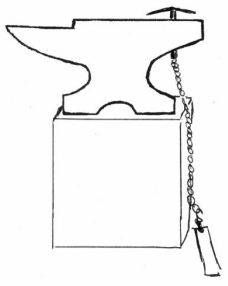
Of long tradition, blacksmith shops have always had a scrap pile or corner. There reposed unused bits and pieces, broken and discarded tools and implements, This pile was not regarded as waste, but rather, as a valuable resource, for a small piece of material, useful odd shape or a piece of desired special material. In olden times and remote areas, when iron stock was at a premium, scrap would be forge welded together into a billet then fashioned in to a desired product.

Our membership is encouraged to toss something into OUR scrap corner. A technique hint, shopping hint, product or tool testimony (pos. or neg.) ,a novel tool idea, finishes and coatings, quenching and tempering solutions and techniques, patina formulas, etc. Your tidbit could be of welcome use or help to another. By Tim Suter

Tim's Hold-down

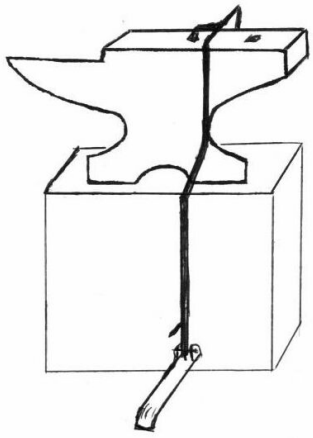
Problem; to hold a piece on the anvil with a tool in one hand and a hammer in the other. I have tried spring dogs, spring loaded mechanical devises, modified vise grips, and chasing loose pieces around the anvil.

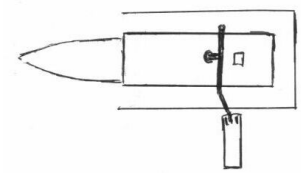
This is the best solution I have come across so far. Use a piece of pipe about eight inches long that fits loosly in the hardie hole. To that weld a piece about 3/8 X 1/2 and slightly longer than the width of your anvil to one end to form a “T". Bend the arms down slightly. If your work piece wants to move it can only move to the center and no further than the pipe. Now weld a length of 1/4” log chain to the bottom of the “T”, long enough to just clear the floor. Make a pedal of wood about 3/4” X 4” X 14” with an eye bolt on one end with three links of chain and a chain hook. With the chain and “T” through the hardie hole adjust the hook so the pedal just clears the floor with the work piece under an arm of the “T”. By shifting your weight to the pedal the holding force will be 2/3 of your body weight or more and won’t shake loose. The pedal can be kicked to the most advantagious place under the anvil. Try this, it’ll make you happy and you will quickly learn to pick it up from under the anvil. Tim Suter



Larry’s Hold-down

My hold-down uses the same foot pedal idea as Tim's except I use a 5/8 rod that hooks over the top of the anvil and comes down almost to the floor. The part that hooks over the anvil, the rod should be longer than the size stock you usually work, mine is about 2” with no stock under it. The rod has a piece that sticks out and down from the side of the rod over the anvil. There is also a small bar sticking out from the rod near the pedal to help lift it onto the work or off the work with your toe. I have been using this for about 15 years and although I can think of ways to spice it up or improve it, It's the same as when I spent a half an hour or less to make it. It fits both anvils I have set up and when I set up another anvil that is a different size I will try out some modifications on the next one, But it works good now!





One-Man Swage

Jr. Strasil

1. Cut 2 pieces of cold rolled 1 1/4" to 1 1/2" square stock with good square edges, 3" long.
2. Cut 1 piece of 1 1/4" heavy walled square tubing, 1 1/4" long. Cut 2 sides off so a 1/4" flat will easily slide inside. See Fig. A. Weld to bottom swage block.
3. Cut 2 pieces of 1/4" x 1" flat, 1/4" shorter than both blanks together. Make sure they slide in tubing. Fig. B. Weld to top swage block on top and sides.
4. Clamp blocks together in drill press and drill holes on the center line. Slightly camfer holes. Break corners with file. Fig. C.
5. Weld on stub to fit hardy hole, it can be round or square.
6. To use - Lift top swage and insert part to be swaged. Use light to medium blows directly over the part to be swaged and rotate the part slightly with each blow. If you do not break the corners on the holes, the swaged part will have many little nicks.
7. Happy swaging!

Upsetting

By Jr. Strasil

Upsetting can be a time consuming and frustrating task to perform. With a simple bolster or upsetting bar it can be quick and easy.

Start with a piece of 2" square hot rolled bar about 5" long and drill 6 holes in it as per drawing. Hole sizes are 7/8" - 3/4" - 5/8" - 1/2" - 3/8". All holes should be 1/64 to 1/32" oversize and very lightly camphered on both sides. Remove burrs from the cut ends and weld on a square shank to fit your hardy hole at the end with the 1" hole.

To use, take a yellow heat on 1 1/2 to 2" of the end of the piece to be upset and taper slightly as in figure 3. Stick the end in the upsetting bar, using a hole about 1/8" larger the material, Hammer the end of the material. Remove from the block and realign the upset end of the rod with light blows, so you don't undo the upsetting. If a longer or larger upset is needed, taper the end before heating and repeat the procedure.

Upset only 1/8" at a time to control cold shuts and bending of the end. If it sticks in the hole, wait a little while and it will cool and shrink and then slip out easily.

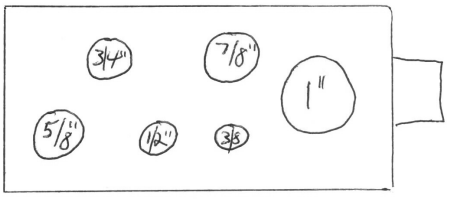
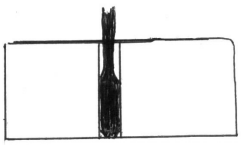


FIG.1



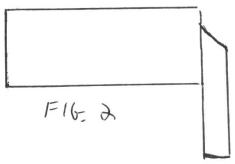


FIG. 2


FIG. 3

Foundations;

A Resource for Beginners. . .
by Bud Oggier
the Anvil's Ring/Fall 1986
Part 3

"Hello, Jean. Back for more? I hear you bought an anvil at the farm auction last week."

"Yes, I got one that's not beaten up too much."

"Did you get started putting your forge together yet?"

"Yes, Bud. Things really have been going along well. Dad offered to let me use the old shed and helped me put up the masonry. I used the dimensions from the Anvil's Ring (Volume 7, #1, March 1979) and when the dimensions didn't suit the block sizes, I went larger, like you suggested, to make them come out even. We used 8" blocks for the base with a brick top and laid up the chimney with 4" blocks around a 12" x 12" liner. Came out fine. I could hardly wait for a week until the mortar was set before starting a fire. When it was finally time, I built a fire and it draws as well as yours. I'm really pleased."

"Good, Jean. Sounds as if you're well on your way. We'll start making some tools pretty soon so you can start to make all the tools you need for your shop. But, first we need to have a discussion of the different types of hammers. Other than your anvil, the tool you are going to use more than any other is the hand hammer. When you look in my tool rack you can see I have about 25-30 different ones. That's not because I'm a collector, but because each one has a specific use. The one I use most is this one; it weighs about 3 lbs. and has a cross pien. I used to use a 4 lb. hammer for all general forging, but at my age it gets a little heavy by the end of the day.

"The pien, or end opposite the face, has a purpose and comes in many shapes. When you hit a piece of stock with the square face of the hammer, the stock moves equally in all directions. It gets as much longer as wider. If you need to make the stock move much more in one direction than another, you use the pien. When you hit a piece with the pien, it acts as a wedge and drives the metal at right angles to the pien and consequently, it moves more in one direction than the other.

"Cross pien means the pien is at a right angle to the handle; straight pien means the pien is parallel to the handle. The same effect can be achieved by forging on the horn instead of the face of the anvil, but in that case, the effect is much less pronounced.

"Notice the pien on my hammer is about ½" wide and has a rather large radius. In my opinion, factory made hammers have a pien that's much too sharp. You can correct this easily with a grinder. I also like to relieve the side edges with a radius. It helps to prevent chipping.

"Let's heat up a bar of iron and see if it really works this way. Now that this bar is hot, I'm going to forge it just the way we did on the very first piece we ever worked except I'll hit it with the cross pien. If what I told you is right, the steel should get much longer than wider. Here goes! See how much it stretches in length compared to width? Now a few hits to flatten out the ridges the pien put in. Just turn the hammer around and hit with the face. There, that should do it. If I wanted to make it wider instead of longer, I could use a straight pien or turn the piece 90 degrees, but that's a little awkward.

"Now, let's see what happens if we hit the piece with a round or ball pien. I'm going to hit this piece I just forged out close to the end so we can see if the metal really moves in all directions. I'm getting the piece real yellow hot so it will move freely. There, it's ready. See, I only hit in exactly the same place twice. If I really had to I could use a round ended punch. Let's cool it off and take a good look. Notice the end and the sides show about the same swelling and the swelling is radiused. So, the stock really does move in all directions at the same time. The same happens when you hit with a flat hammer but it's not as pronounced because you can't displace enough metal. "Let's try it again using a straight pien. I'll get the piece hot and then spread the end to make it wider. Notice that the piece gets a little longer, but mostly wider. We're ready to go. See how the piece spreads? Notice my blows are coming down first in the middle, then on either side in order to move the stock throughout its entire width.

"Let's try another piece using the cross pien, but over the horn. The closer to the small end of the horn you work, the more pronounced the stretching is because the small diameter of the horn can sink in more than the large end. My piece is ready; let's go. While I hit this piece, I have to move it on the horn closer to me. Now to flatten out the pien marks. See, it stretched more than when I worked on the anvil face. This same principal can be used when you get far enough along to work with a striker using a top and bottom fuller. We'll do that when you're a little more experienced.

"Jean, look at these two hammers. They are almost the same size and weight, but have a major difference. The face of one is quite flat with only the edges radiused, The other has the edges radiused but also has considerable crown. The center is almost 1/8 inch higher than the edges. This is not a flat taper, but a large radius. I use this hammer for final finishing where I don't want any hammer marks. In using it, I don't hit very hard, since all the forging is done, but only hard enough to take out the old hammer marks. This leaves the piece not dead flat, but with a series of large radius dents that blend together so it looks flat. Even though it looks smooth, if you were to file it, you would see high places where the hammer strokes met.

"Jean, why don't you heat up a piece and try the cross pien and draw a piece out? Remember, your hammer blows need to progress over the length you are trying to draw out. Don't hit in the same place twice. It will take a little practice before you can judge when to stop using the pien and go to the face so your piece is not too thin by the time you get the pien marks out. You're doing well, Jean; keep your hammer blows progressing toward the end. Fine; now flatten it, now a few blows on the edges to true them up. Great! See how much easier and faster it was to draw that piece out than the ones we did earlier?

"Jean I make quite a few floral pieces so I use this tool called a leaf hammer. It's not very heavy, maybe a pound and a quarter, and has a cross pien on one end and a straight pien on the other. While folding or shaping a forged leaf, I only have to change ends to get a different pien. You may notice I also have a similar hammer, about the same weight as my forging hammer. I use it when I'm shaping a piece on which I will have to move part of the piece in different directions. It's faster and easier than changing hammers. In looking around my hammer rack, you can see many of my hammers look the same, but are different sizes.

"On one of your first visits, I told you to hit the piece hard enough to move the steel throughout its entire section. This holds true for almost all forging. It is much easier to use a hammer of the proper weight for the piece being worked than to use one too light and try to hit that much harder. I think hammer control is almost impossible when you are trying to hit as hard as you can. Let the hammer do the work. Conversely, you wouldn't try to drive a tack with a sledge, so use the right size tool.

"Now I'd like to show you how to punch holes in steel. Punches can be divided generally into two classes: backing out punches and punches for making holes. They can be hand-held or hand-led. Here are two 1/2" punches. This one is ½" at the end and is slightly tapered so it gets larger going away from the end. Its for putting in holes. This one is slightly smaller than ½" (by about l/64") and has a straight diameter for about 3 inches. It's used for driving pins or parts out of a 1/2" hole. Punches come in all kinds of shapes round, square, for making slots, or decorative shapes. Let's just deal with this ½" round punch for now and see if we can make it work.

"This may seem a little strange, but when you drive a punch into a piece of hot steel you are forging it. Almost all the stock that was was in the hole is forged into the surrounding material. Sometimes this is a big advantage over drilling, where all the stock is lost in chips.

"Well, let's take a piece of 1½" X ½" bar and punch a ½" hole in it. I'm going to put a heavy center punch mark where I want the hole and chalk it well so I can see it when it's hot.

"Here we go in the lire. While that's heating I'll put this bucket of water close to the anvil. While the punch is being driven into the bar I'll have to take out the punch after every few hits, dip it in the bucket to cool it, and then go back in the hole again. If I don't keep the punch cooled off, it will get hot enough to soften. This causes trouble, If it gets hot enough, the end of the punch upsets in the hole and you can't get it out.

"My piece is ready now, so let's go. Notice it's

quite yellow. In mild steel you can work at this temperature and not harm the steel, and it will punch easier. See the black dot where the punch mark is? I put the punch over the mark and strike quite hard, hitting five or six times. Now I cool the punch tip in the bucket, put it back in the hole, hit five or six more licks and cool again. Hear the difference in the sound the punch makes now? That means we're just about through; just a few more licks there, cool the punch and turn the piece over. See the black spot where the hole is coming through? I'll put the punch right over the black spot and hit hard. There, its broken through. Now I slide over the hardie hole and drive the punch all the way through the hole, then put the punch in the bucket so it gets cool again. I'm looking for the little slug I punched out. Here it is. Let me cool it. There, see, it's only about 1/16" thick; all the rest of the stock from the hole is in the piece.

"Try your piece, Jean. Don't forget to get it good and hot, and cool the punch every few hits. Sometimes when punching a deeper hole, the punch wants to stick. If you put a pinch of coal dust or a small piece of coal in the hole before you put the punch back in, it helps eliminate this. If your punch does stick, turn the piece on its side and strike at the hole. The taper on the punch should loosen it up so you can get it out. Also, while punching a deeper hole, the piece will want to curl up, so you will have to turn it over and flatten it. If you don't, when you flatten the finished piece you'll find the hole quite a bit too large at the entry side. If you don't drive the punch far enough in from the first side, when you turn it over to punch out the slug it won't cool fast enough at the hole so you can see it. You can set your hammer where you think the hole is for a few seconds and that should cool it enough so you can see the dark spot.

"I think your piece should be ready now. Go for it. Don't be afraid to hit the punch hard, Jean. Drive it down in the steel. Cool your punch; it's getting hot. Now go again. Hold it, Jean. Your piece has cooled too much, so take another heat and go again. Once you have started your punch in about an eighth of an inch, hit the punch hard, real hard. If it doesn't go in fast enough, you need a heavier hammer. You want to get the punch through the hole before the piece cools off. Don't forget to cool.

"Okay, go again. Hit it hard. Good. Don't forget to cool. Hear that solid sound? It sounds almost as if it's hitting the anvil. That means you've gone far enough. Turn it over. See the dark spot? Hit it. Good. Now drive the punch in far enough to knock out the slug. Great. I don't think you'll have any trouble the next time. Just remember that while the steel is rather soft at this heat, it's still not like butter. You've got to hit hard.

"Now I'd like you to try a thicker piece. Let's use this 1" x 1" bar. I'm going to let you do this one without me showing you first. No sense working the old man too hard!

"This time the piece has more mass, so it won't lose its heat so quickly. You may have to cool the punch more often, but otherwise everything should be the same. You're ready now. Act like a hole puncher. That's it. Hit hard. Don't forget to cool. Go! Hold it, Jean. Look at your piece. See the ends curled up? If you don't flatten, the hole will be too large. Great. You're ready to turn over. Good. Knock out the slug. Now a few hits to flatten the piece. Good. I was pleased to see you remembered to put a little coal in the hole the last time you went in from the front side. You feel any sign of sticking? Some smiths put a little beeswax or hoof salve on their punch to help prevent sticking, but a little coal dust seems to work okay for me.

"Just remember to keep cooling your punch because it not only will lose its hardness, but if it gets hot enough, it will upset in the hole and will be very hard to get out.

"In punching holes at the forge it is important to do your punching at a high heat. Start at yellow, cool the punch frequently, flatten the piece if it starts to curl up, punch until the punch sounds and feels as if its punching right on the anvil face. In punching a hole rather than drilling, all the stock except the thin slug remains in the piece and most times, this is an advantage.

"Next time, Jean, we'll make a hole a different way and use a different tool to size the hole with."

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