

# CHAPTER 20

## THE MUZZLE CAP

**W**ITH THE FORESTOCK SHAPED, IT'S TIME to deal with the muzzle cap. Make sure that you have installed temporary pins or keys to fasten the stock to the barrel.

I know that there are many dealers out there who sell ready-made caps, but anyone who shapes *one* rifle to fit a muzzle cap must be a little touched in the head. It is quite a different business if you plan to make many rifles of the same pattern, as in the old days. However I am talking here about making one rifle of a particular period and style. The easiest method is to make and fit one cap to the stock.

Let's talk about the cap material. Most of the original longrifles used brass. Early Germanic rifles tended to use cow horn and there are one or two early longrifles that used the same material. A few late—and ugly—guns were mounted in German silver (which isn't silver at all), but if you want to make one of those, then the rest of your furniture better be German silver, which enjoyed some popularity in the mid-1800s. To put a German silver cap on an otherwise brass-mounted rifle would be like a cowboy wearing a wristwatch in a John Wayne western.

Speaking of silver, I know of only two silver-mounted rifles with silver muzzle caps, and they are very ornate pieces. But if you intend to make such an ornate gun, then, apart from the cost, your difficulty will be to find butt plate and trigger guard castings of that material.

There were also iron-mounted rifles with iron caps, which today we can reproduce using mild steel sheet. Incidentally, I don't like to use cast steel butt plates and trigger guards because they are hard to file. The same might apply to any kind of cast steel cap.

Your choice of material must conform to the rifle you are recreating. The other lesson is that, with few exceptions, the cap material should be the same as the other mounts.

Depending on the rifle that you are trying to reproduce, you have two choices of the style of cap you need: the rounded cap and the grooved cap. The rounded cap is simply that: rounded. The grooved cap has a groove in the bottom 1/8 inch to 3/16 inch deep that continues the ramrod groove to the muzzle. Photographs will help determine your choice, but there doesn't seem to be much consistency. Besides John Armstrong and other Maryland smiths who always used a grooved cap, most original gunsmiths made at least one grooved cap on a surviving rifle. The grooved cap seems to have been a more sophisticated treatment for the end of the stock. However in all cases the technique is the same: make a mortise and bend sheet metal or horn to fit it.

### MAKING THE MORTISE

**T**HE FIRST STEP IS TO DECIDE THE LENGTH of your cap. Early longrifles tend to have short caps, around one inch or a bit longer, while those made at the end of the Golden Age around 1830 have caps as long as 2-1/2 inches. For some representative lengths, refer to Chapter 16.

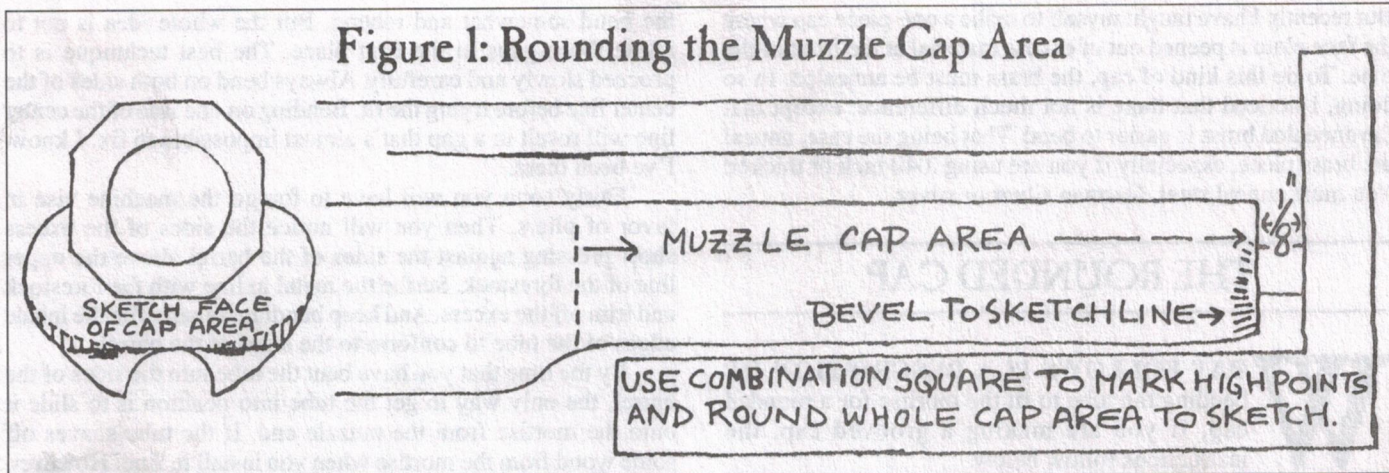
Having decided on the length of the cap, we now proceed to bring this length of the stock, which I'll call the muzzle cap area, to its final shape. The first step is to cut back the front of the stock so that it is 1/8 inch behind the muzzle of the barrel. We do this not only to allow for expansion of the stock in humid weather, but also to allow room for the face plate. Take your combination square and set the long arm to 1/8 inch. Then, resting the short arm on the muzzle, draw right around the stock. Take your jeweler's saw and start cutting off the excess, being sure to leave your pencil line visible. When the saw contacts your barrel, remove the barrel and finish the job. Use fine files and sandpaper backed by a block to bring the front of the stock not only down to your pencil line but also to finish it smooth.

Now you have already rounded the upper one third of the whole upper forestock into the barrel, and you have shaped the bottom two thirds also. The muzzle cap area, however, must round to the bottom of the ramrod groove if you are doing the rounded cap, or you will leave 1/16 inch of rail height above the groove for the grooved cap. What you want to do now is to draw the shape of the muzzle cap area on the front of the stock. Then, as shown in **Figure 1**, use a file to bevel the wood to your line. Replace your barrel and, using your combination square, shape the whole muzzle cap area. Your combination square, with the long arm set to the length of your cap or a bit longer, will aid your shaping, since with a bright light used to best advantage you can see it touching the high points, which you mark with a pencil and remove. Repeat until there are no more gaps. Then sand the area smooth. Finally set your combination square to the exact length of your cap, rest the short arm on the muzzle and draw the rear limit of your cap.

Find a piece of sheet brass for your cap. I have generally used .030-inch-thick brass, but I recently made one out of .040 inch and I suppose you could use 1/16-inch-thick stuff. However keep in mind that the web of wood underneath the barrel is or should be 1/8 inch, so we want as much wood left there after we have cut out the mortise. At any rate, .030-inch or .040-inch-thick brass is about half the thickness of my jeweler's saw



## Figure 1: Rounding the Muzzle Cap Area



blade. So carefully cut down about half the thickness of the blade into the guideline. When the barrel gets in the way, remove it to finish the cut. Then chisel down to the bottom of the cut.

Now we move to the front face again. Having "miked" the thickness of the sheet metal that you intend to use, set one of the points of your vernier calipers on the edge. With the other point, lightly prick the face so that you end up with a series of small holes parallel to the edge of the stock face and exactly the thickness of the metal that you are going to use. Join these holes with a pencil line.

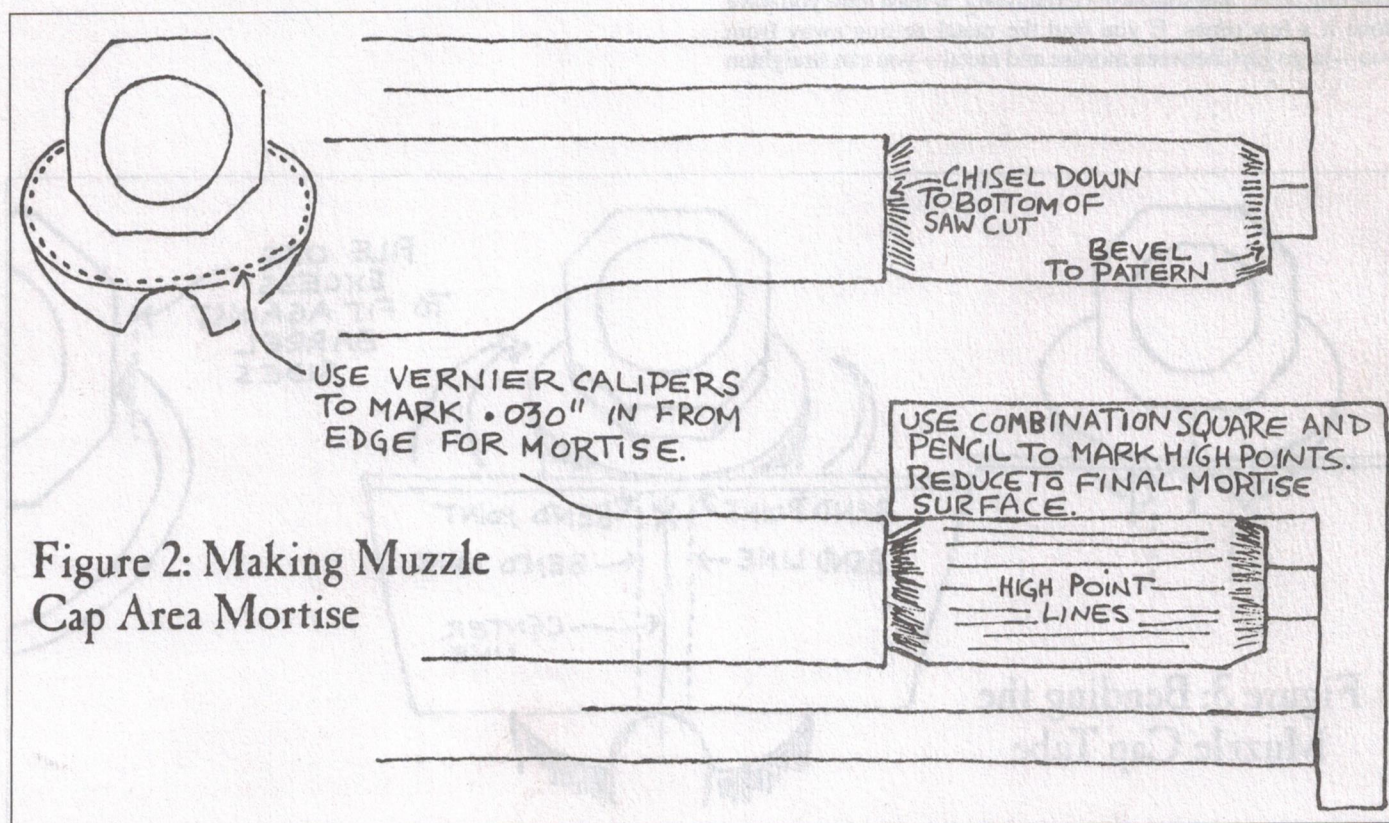
Once again, chamfer the sides down to your new guideline. Again, set your combination square to the length of your tube and, with a strong light set to best advantage, use the long arm as a gauge to show the high spots as you rasp and file wood away to effect your mortise. It may be that your rear saw cut is too shallow, so test its depth with your cap sheet. If necessary, deepen the area. The goal of this job is to cut and file the depth

of this mortise so that the tube is eventually flush with the stock wood behind it. See **Figure 2**.

While the description and figure apply mainly to the rounded cap, it also applies to the grooved cap. For the grooved cap, all you have to do is deepen the ramrod groove in the muzzle cap area by the thickness of your sheet metal. You already marked this on the front of the stock. I find that I can prepare the mortise for either cap within an hour.

Now to prepare the tube. Take a scrap piece of paper and wrap it around the mortise to determine the width of the tube. The length is determined by ruler. Remember that sheet brass has a grain (which you can see) caused by the rolling process. Make sure the grain runs lengthwise along the tube. Next, lay out your dimensions on your sheet, adding 1/4 inch to the width and length, just in case. Cut out the piece and carefully file it to your guidelines.

In the past I never bothered to anneal .030-inch-thick brass.



## Figure 2: Making Muzzle Cap Area Mortise



But recently I have taught myself to make a one-piece cap where the face plate is peened out of excess material at the front of the tube. To do this kind of cap, the brass must be annealed. In so doing, I noticed that there is not much difference, except that the annealed brass is easier to bend. That being the case, anneal the brass piece, especially if you are using .040 inch or thicker. You must anneal steel, German silver or silver.

## THE ROUNDED CAP

**W**HAT FOLLOWS IS A DESCRIPTION OF bending the tube to fit the mortise for a rounded cap. If you are making a grooved cap, the instructions follow below.

The first thing to do is to scribe a center line along the length of your tube piece. Then, at what you decide will be the eventual front end, scribe an X, so that you will replace the tube the same way each time.

On the front of the stock, draw a line from the center of what used to be the ramrod groove to the center of the bottom flat of the barrel. Now lay your brass sheet in position so that the scribed center line is centered on the ramrod groove at the rear end and above your vertical line at the front. As illustrated in **Figure 3**, I hold the rifle in an upright position. With appropriate light I can see where the mortise curves away from the flat sheet on either side of the center line. With a pencil, mark the point of divergence on either side of the center line, and then using each mark draw a line parallel to the center line. These are "bend" lines. Take the piece to the machine vise, clamp it just a bit inboard of a bend line and bend it a bit. Repeat for the other "bend" line. Then check it against the mortise to make sure that you have full wood/metal contact.

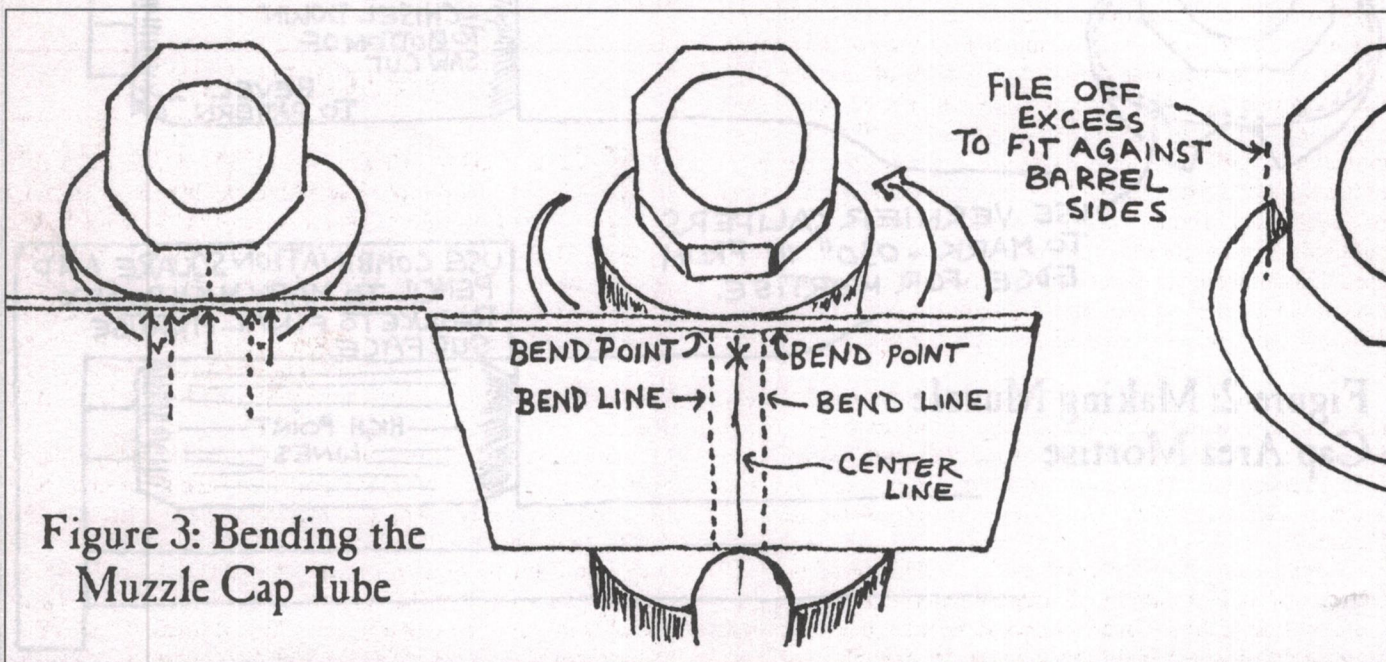
Repeat and repeat and repeat. I guarantee you that this is exacting work, and somewhat exhausting, at least until you have done it a few times. If you find the metal getting away from you—large gaps between mortise and metal—you can straighten

the bend somewhat and rebend. But the whole idea is not to allow those gaps in the first place. The best technique is to proceed slowly and carefully. Always bend on both sides of the center line before trying the fit. Bending on one side of the center line will result in a gap that's almost impossible to fix. I know. I've been there.

Fairly soon you will have to forego the machine vise in favor of pliers. Then you will notice the sides of the excess sheet pressing against the sides of the barrel above the upper line of the forestock. Scribe the metal in line with the forestock and trim off the excess. And keep bending. Finally file the inside edges of the tube to conform to the sides of the barrel.

By the time that you have bent the tube into the sides of the barrel, the only way to get the tube into position is to slide it onto the mortise from the muzzle end. If the tube shaves off some wood from the mortise when you install it, fine! However, if you are using a swamped barrel, you may notice gaps between the sides of the barrel and the tube at the rear end. This is because the barrel is flared. In other words the diameter of the barrel is less at the rear end of the tube than at the front. The solution is to install the tube without the barrel in the stock and bend or squeeze the rear portion into place. But this will have to wait until the final steps.

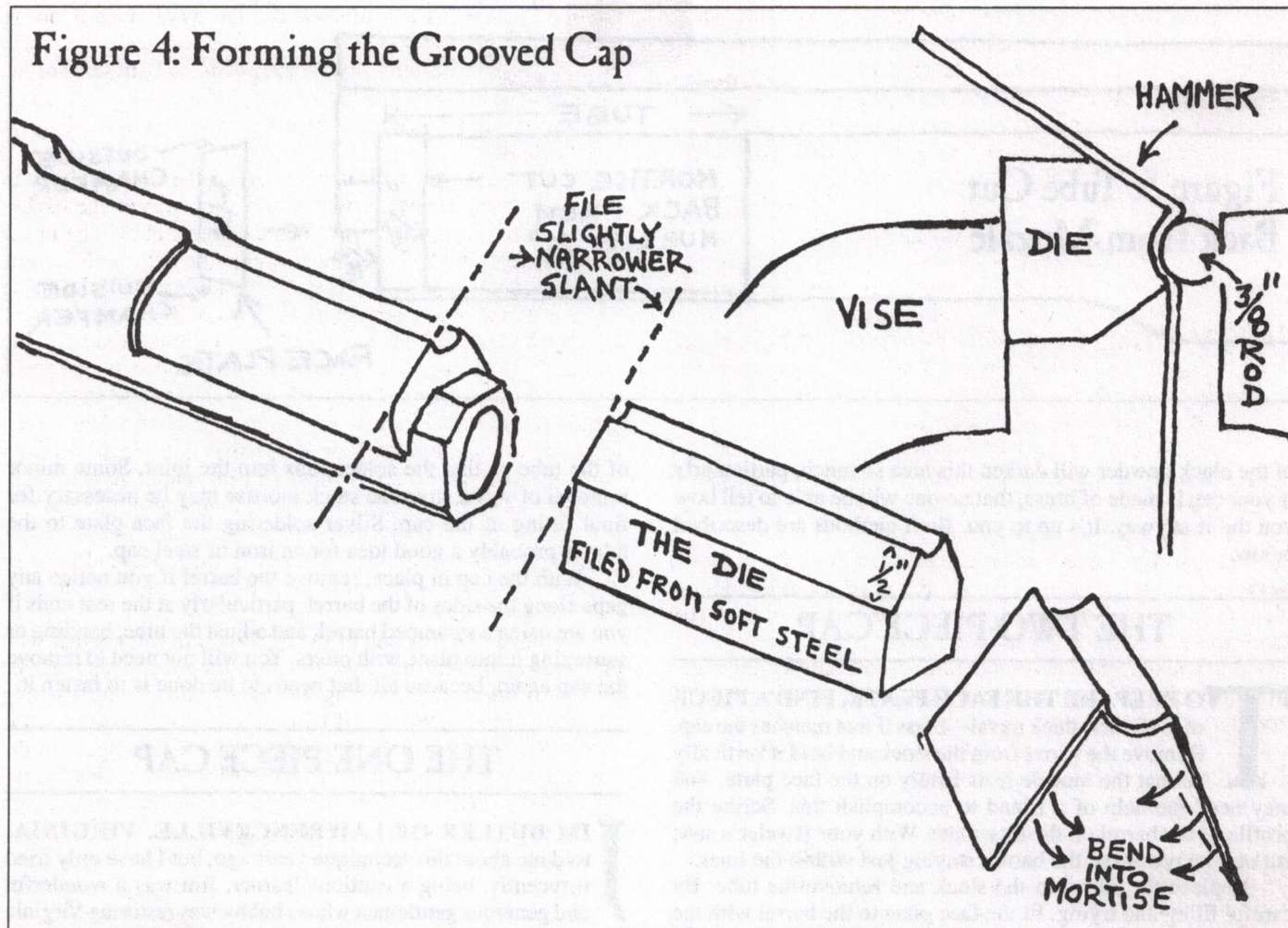
Examine the rear end of the tube. Is it in full contact with the wood behind the mortise? You may have a gap here caused by a bit of inaccurate bending. It's easy to do. Try hammering the front of the tube a bit. If that doesn't work, slide the tube forward about 1/16 inch, then set your vernier calipers to the widest portion of the gap. Scribe around the tube, indicating the excess to be filed off after removing the tube. That's one reason we made the tube longer than necessary.



**Figure 3: Bending the Muzzle Cap Tube**



**Figure 4: Forming the Grooved Cap**



## THE GROOVED CAP

**I**F YOU ARE MAKING THE GROOVED CAP, YOU have already made the mortise for it. The only problem is how to bend the tube to accommodate the top of the ramrod. To do this, I made up a die out of a chunk of mild steel two inches by two inches by three inches. Using a rattail file, I filed a groove in the top to match the mortise and then filed the edges to match the bottom third of the mortise. Then I filed the angle of the sides of the die steeper by a few degrees than the mortise on the general principle that it's much easier to bend the cap outward to fit the mortise than inward. I must say that I have used this same die for over twenty years for whatever longrifle that needs a grooved cap, and it has worked for all of these different guns, which shows that the differences from one cap to another are minimal.

To use the die, place the sheet on the die so that the center line is aligned with the groove. On top of the center line, place a piece of 3/8-inch rod and then clamp the combination in the vise. Squeeze the rod into the groove as far as it will go, then hammer each side of the sheet onto the side of the die. See **Figure 4**.

Apply some transfer color to the underside of the tube section and slide it onto the mortise. What you are looking for is the outside of the grooved section of the tube to be flush with the ramrod groove behind the mortise. It probably won't be.

The transfer color will indicate the wood in the mortise that needs to be removed. With the rear end inletted flush, use your combination square to ensure that the cap groove is properly aligned. The rest of the tube can now be bent into the mortise as described above.

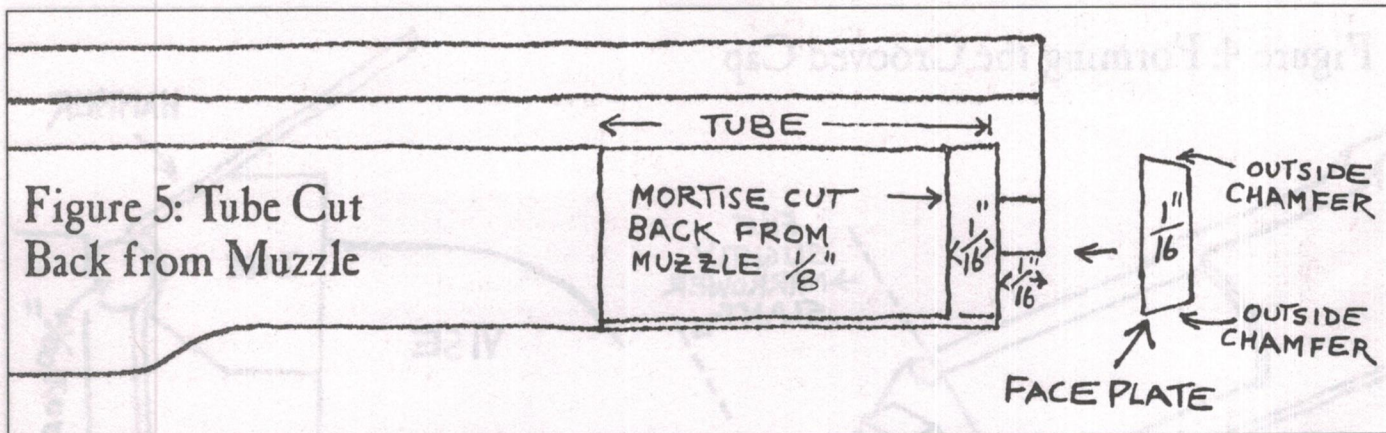
## THE FACE PLATE

**T**HE FRONT END OF MOST MUZZLE CAPS had a metal face. The exception seems to be jaeger rifles (see below), and longrifles made in the Lehigh Valley of southeastern Pennsylvania. If your rifle doesn't have a face plate, ignore this section. Simply file the metal cap flush with the front of the stock. Some minor additional bending may be needed to close any gaps at the front of the cap. After the cap is fastened and the stock is finished and stained, remember to stain, seal and varnish the wood at the front of the cap.

But most muzzle caps had face plates, and there are basically two ways to go about making them. To me the simplest method is to make a separate piece and solder it in place inside the tube. John Armstrong of Emmitsburg, Maryland, made his caps this way, and I'm sure other original gunsmiths did too. However, most caps seem to have been made of one piece, with the excess metal at the front peened upward. This technique I find a little more time-consuming. After the first few shots, the corrosion



**Figure 5: Tube Cut Back from Muzzle**



of the black powder will darken this area so much, particularly if your cap is made of brass, that no one will be able to tell how you did it anyway. It's up to you. Both methods are described below.

## THE TWO-PIECE CAP

**T**O PREPARE THE FACE PLATE, FIND A PIECE of 1/16-inch-thick metal—brass if that matches the cap. Remove the barrel from the stock and hold it vertically so that the muzzle rests firmly on the face plate. You may need the help of a friend to accomplish this. Scribe the profile of the barrel on the face plate. With your jeweler's saw, cut out the profile of the barrel, staying just within the lines.

Replace the barrel in the stock and remove the tube. By careful filing and trying, fit the face plate to the barrel with the plate positioned at the front of the stock. Remove the face plate. Again, remove the barrel and replace the tube. Using a shim of 1/16-inch brass, scribe all around the tube so that your line is exactly 1/16 inch ahead of the front of the stock. Trim the excess off of the front of the tube. Replace the barrel.

Since your tube now ends 1/16 inch behind the muzzle of the barrel, you can engage the mortise of the face plate on the muzzle of the barrel while resting its inside surface on the front of the tube. Take your scribe and mark an X on the outside surface just underneath the muzzle. This will ensure that you replace the face plate the same way each time as you fit it. Then scribe the outside of the tube on the inside surface of the face plate. Remove the face plate, clamp it in your vise and cut away the excess with your jeweler's saw. Carefully file down to the line.

The next job is to file away just enough material from the outside of the face plate that it fits exactly inside the tube. Definitely a file 'n try job. I use my vernier calipers to mike the thickness of the tube material and then scribe a second guideline in from the edge of the face plate. This gauge makes the job go faster.

After the face plate is fitted inside the tube, I file a slight chamfer around the edge, as illustrated in **Figure 5**, and then I apply flux and soft solder the gap. This holds the face plate quite securely.

On the other hand, you may want to silver solder the piece. If so, you reverse the chamfer, because you will solder the piece from the inside. To do this, you must remove the tube from the stock and, having placed the face plate in it, wire the tube so that there is no chance it will expand with the heat of your oxyacetylene torch. Flux the joint and carefully heat the front

of the tube so that the solder runs into the joint. Some minor removal of wood from the stock mortise may be necessary for final fitting of the cap. Silver soldering the face plate to the tube is probably a good idea for an iron or steel cap.

With the cap in place, remove the barrel if you notice any gaps along the sides of the barrel, particularly at the rear ends if you are using a swamped barrel, and adjust the tube, bending or squeezing it into place with pliers. You will not need to remove the cap again, because all that needs to be done is to fasten it.

## THE ONE-PIECE CAP

**J**IM BUTLER OF LAWRENCEVILLE, VIRGINIA, told me about this technique years ago, but I have only tried it recently, being a cautious learner. Jim was a wonderful and generous gentleman whose hobby was restoring Virginia longrifles from basket cases. Thanks to the Civil War, there are far fewer original Virginia longrifles that have survived compared to other states, like Pennsylvania, so Jim's self-taught rescue efforts were well worth it. On a visit to Jim some years ago, he readily shared his collection and knowledge of riflemaking in Virginia with me and taught me some of his techniques. Sadly, Jim has passed away. I miss him.

So as described above, you have fitted the tube to its mortise. At the front end, you have 3/16 inch to 1/4 inch of excess brass or other sheet metal. Remove the barrel and scribe around the inside of the tube in front of the stock. Remove the tube.

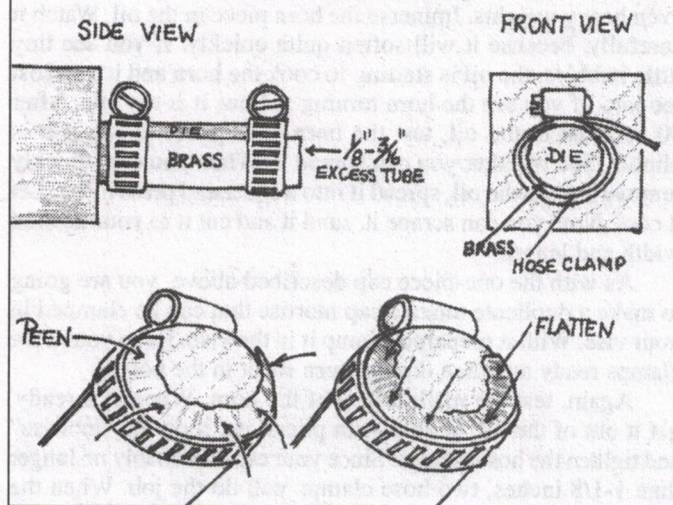
Find a piece of hardwood about two inches by two inches thick and about a foot long. Make sure that the front is at right angles to its length. Then carefully file the front area to a duplicate of your muzzle cap mortise. When you are getting fairly close, try the tube on it for size. As is shown in **Figure 6**, round the top. Of course, you can go much simpler: Jim told me that he used a section of broom handle. Finally, it is advisable to file it a little narrower than your original mortise.

Now clamp the lower end of your wood die in your vise. Slip your tube onto the top end so that your scribe line coincides with the front of the die. Hold your tube in position with two hose clamps, one at the rear end of the tube and the other at the front end, so that its front end coincides with the front of the die.

The rest is simply using your ball peen hammer to peen the excess onto the front of the die. Work from the sides around to the front, which will be underneath the barrel. If you notice the front beginning to distort, remove the tube and file away a bit of the excess. Then anneal the tube again and go back to the



## Figure 6: The Wooden Die & the One-Piece Cap



peening. Finally, use a 1/4-inch diameter punch to make sure that the front face lies flat on the front of the die.

With the barrel removed from the stock, replace the muzzle cap. Now is the time to do any adjustment of the back of the cap for those of you using swamped barrels. The front of the cap is not cut out for the barrel muzzle, and that is the next job. You can use the barrel channel itself as a guide for some preliminary filing. The final fitting of course, is done by trying the barrel in place, filing and trying again.

## THE HORN MUZZLE CAP

**T**HE HORN MUZZLE CAP WAS USED ON SOME jaeger and Germanic rifles in the 18th century and occasionally on some Germanic and English half-stock shotguns and rifles and, as noted above, on a few early American longrifles.

Horn is a wonderful material. You can make a muzzle cap out of either a solid piece of horn or a section of cow horn. If you choose to make it out of solid material, I would buy a buffalo horn with the most solid tip possible. If you want to make it out of a section of cow horn, examine the hollow inside of the horn: the one to pick is the one where the black or other dark color comes as close as possible to the open end.

To make a muzzle cap out of solid horn, measure the width of your cap mortise and then add about 1/4 inch. Find this diameter at the front of the horn, mark it and cut off the excess. Smooth the cut. Now set your combination square to the length of the cap plus the usual extra 1/8 inch and scribe this length around the circumference of the horn using your first cut off to rest the short arm of the square. Now cut off the excess at the back of the horn and smooth this face. Remember that we are not talking about a big piece here; most horn caps on Germanic rifles were little more than one inch long, perhaps as long as 1-1/8 inches.

You should have two faces parallel to each other, which is a help when clamping the piece in the vise. Also examine each face. The rear face might be somewhat hollow, but that's O.K., as long as the hollow is smaller in diameter than your cap

mortise. If the hollow is much larger than your cap mortise, then you might as well throw away the horn, although it might be possible to heat and bend it, as described below. At any rate, it always pays to buy more than one horn.

The next job is to clamp the piece in the vise by placing each face on a jaw and tightening. Naturally the horn tapers from back face to front face. It may even curve a bit. What you want to do now is make the sides parallel or, to put it another way, at right angles to the front face. So get to work with your cabinetmaker's rasp and files. Sand the sides smooth.

Remove the barrel from the stock and lay the back face of the horn on the front of your mortise. Scribe the mortise on the back face. Use your combination square to transfer some key points to the front face of the horn. Such points will be where the sides of the mortise meet the barrel and the bottom of the mortise. Now turn the horn piece around and align your key marks with the front of the cap mortise and again scribe the circumference of the cap mortise on the front face of the horn. Join the top of your mortise profile (where the sides of the mortise meet the barrel) on the back face to the same points on the front face with two longitudinal scribed lines. Check your marks and guidelines.

Now saw the excess off of the top of the horn piece. File it carefully down to the lengthwise guidelines. Smooth this flat surface. Very carefully mike the diameter of the barrel at the rear end of your cap mortise and transfer the measurement to the flat top of the horn. Do the same at the front of the mortise and piece.

All you do now is hollow out the interior. You can start with a hacksaw and then go to your jeweler's saw, finishing up with various rat tail files. Be very careful to stay within your guidelines. Then it's the usual file 'n try until the horn piece slides onto the mortise. I suggest you do the fitting with the barrel out of the stock to take into account the flare of the barrel at the muzzle. See Figure 7.

With the horn tube fitted, it is glued into place. Eighteenth-century artisans had some very fine glues, so today it is not out of line to use epoxy. I tend to tint the epoxy with either burnt umber or black tempera paint powder. When the glue has cured, the outside of the piece can be rasped, filed and sanded to final shape. If you left enough horn on the bottom, you can even file a groove there to continue the ramrod groove.

A section of buffalo horn, the cap mortise prepared, the tube sawn and filed from solid horn, and the face plate.

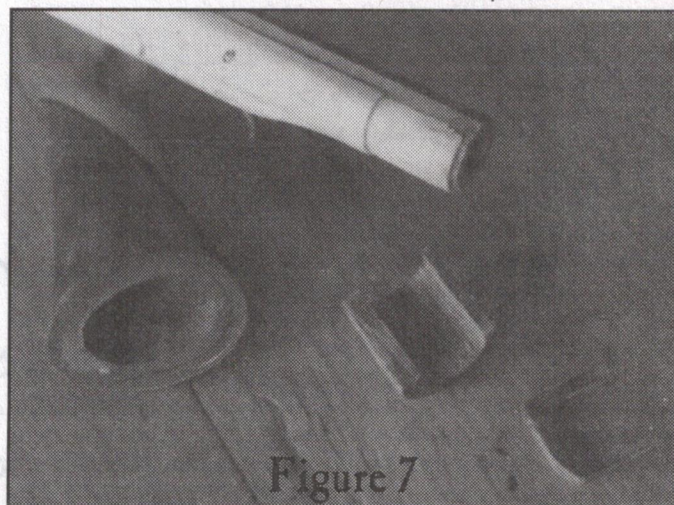


Figure 7



It seems to me that most horn caps didn't have a face plate. I have seen one or two with face plates, and these seem to have been made out of one piece of horn. I have only the vaguest idea of how that might have been done. I make the face plate out of a separate piece of horn—just like the two-piece cap described above—and glue it in place. The final step is to fit the barrel into the cap.

To make a muzzle out of a piece of cow horn, determine the length of your cap and add 1/4 inch, just in case. Mark this length on your horn, checking inside to choose the section with the best color. Cut your section out of the horn by sawing across it. Then cut the section lengthwise so that the piece can be opened up and flattened. The process can be seen in **Figure 8**.

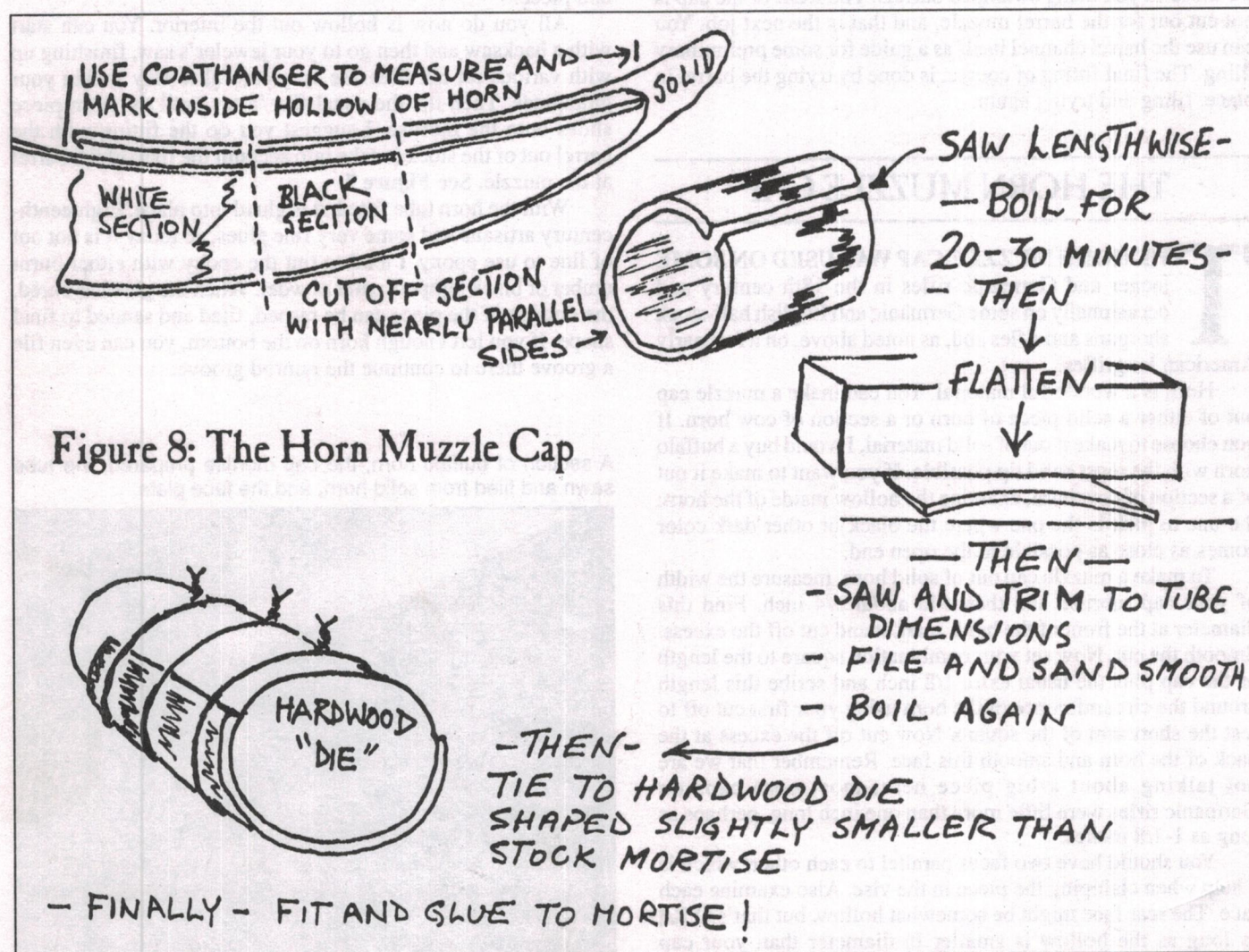
I used to believe that boiling horn in water would soften it sufficiently to bend it anyway I wanted. So it does. The problem is that when the horn cools it still retains its memory of how it used to be and starts to return to its former curvature. I learned from friends Erwin Tschanz and Roland Cadle that the way to soften and work horn is to dip it in hot oil until it softens. The best "oil" is actually melted beef tallow, or rendered fat. However shortening works about as well. Find a pot big enough and deep enough to hold your piece. Melt enough shortening to cover the piece. Make sure that you have a cooking thermometer so you can heat the oil to 300 degrees Fahrenheit and no hotter. When doing this kind of horn work, always take precautions: long

sleeves, heavy gloves and glasses. Oil that is 300 degrees Fahrenheit is hot! It can burn very well!

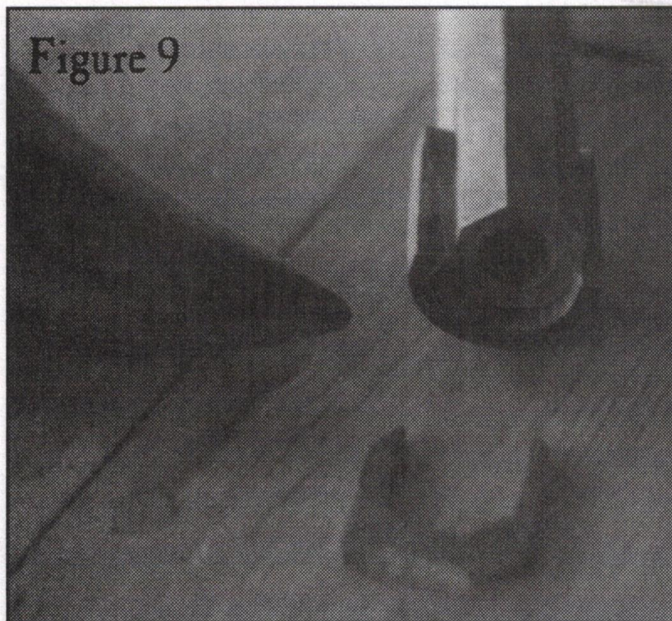
Meanwhile, you have to set up some means to flatten the piece and keep it flat while it cools, such as a vise or press or even heavy weights. Immerse the horn piece in the oil. Watch it carefully, because it will soften quite quickly. If you see tiny little bubbles, the oil is starting to cook the horn and it's almost too late. If you see the horn turning yellow, it is too late. After 30 seconds in the oil, test the horn with pliers to see if it is pliable. See whether you can spread it. When you can, quickly remove it from the oil, spread it into a sheet and press it flat. Let it cool. Now you can scrape it, sand it and cut it to your desired width and length.

As with the one-piece cap described above, you are going to make a duplicate muzzle cap mortise that can be clamped in your vise. With it prepared, clamp it in the vise. Have your hose clamps ready and then dip the horn sheet in the hot oil.

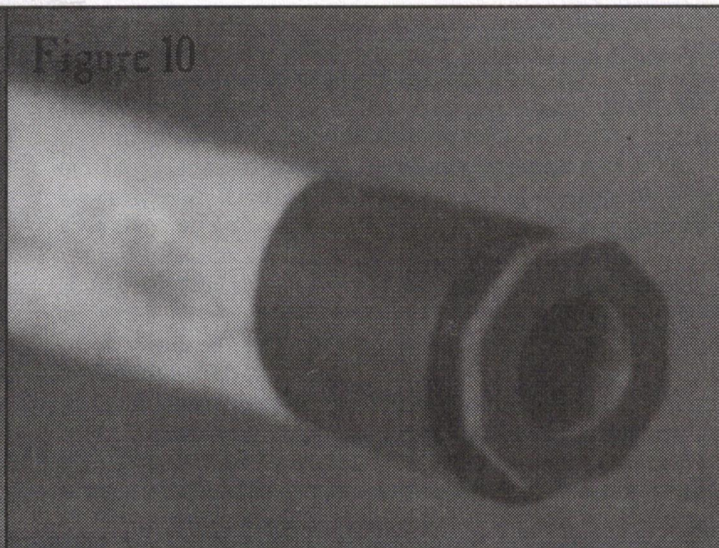
Again, test the malleability of the horn. When it is ready, get it out of the oil, bend it with pliers, get it on the "mortise" and tighten the hose clamps. Since your cap is probably no longer than 1-1/8 inches, two hose clamps will do the job. When the piece has cooled, remove it, sand the inside surface to remove any oil and then fit it to your cap mortise. Glue it in place as described above. And, as described above, if you want a face plate, make it out of a leftover piece of flattened horn. See **Figures 9 and 10**.







The tube installed on the stock.

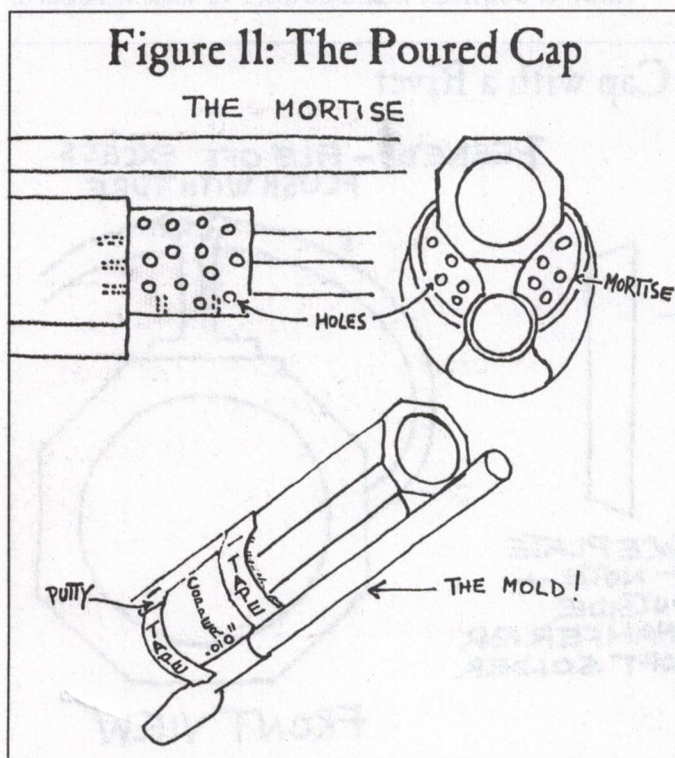


The finished job.

## THE CAST MUZZLE CAP

**C**AST CAPS OF LEAD OR PEWTER WERE generally used on half-stock rifles and shotguns. Lead was used on the lower grade guns. I use pewter, which is readily available from any hobby shop.

As illustrated in **Figure 11**, make your mortise as usual, but make sure that it is about  $3/32$  inch deeper than the stock behind it. Then, to secure the pewter, drill a series of holes in the sides and face of the mortise with a  $3/32$  inch drill. Next



remove the barrel and apply petroleum jelly on it in the cap area, even though I don't believe the pewter would stick to the barrel. Then, with the barrel replaced, make a mold. I use some thin copper sheet that I found somewhere, although I suppose that thick cardboard would probably do. I apply some Silly Putty on the barrel sides to prevent the pewter from flowing down the sides of the barrel. Jam a dowel in the rear ramrod pipe to prevent the pewter from getting in there and finally tape the mold to the stock with masking tape.

Pewter is easily melted in a pot on the stove. Its melting point is well below the burning point of wood, so there are no worries there. However, use thick gloves, long sleeves and glasses, just in case. Pour the pewter into the mold and let it cool.

Remove the mold and file off any excess pewter. If you find the odd hole or so in the casting, heat up your soldering iron and melt a little excess pewter into place by holding the pewter wire against the tip of the iron at the same time pushing the tip into the hole. I believe this technique is called "puddling."

## FASTENING THE CAP

**A** PART FROM GLUING THE HORN CAP OR using holes in the mortise to trap molten pewter, there are a number of ways that can be used to fasten the metal cap. Most of those described below are traditional.

The most elaborate method for fastening the cap that I have ever seen on an original longrifle was on the famous "George Nunnamacker 1797" rifle, which you can see in Kindig's book, *Thoughts on the Kentucky Rifle in Its Golden Age* (337-339). I've held the rifle in my hands and can attest that it's a magnificent work of art from one end to the other. On this rifle Nunnamacker not only keyed the stock to the barrel, but he also keyed the ramrod pipes and . . . the muzzle cap. Unless you're planning an elaborate gun, I'd steer clear of this method.

**THE EARLY SCREW METHOD** was used to fasten iron caps on some jaeger rifles and on some early American rifles, as you can see in Shumway's *Rifles of Colonial America*. Here the cap was fastened with a machine screw into a tapped hole in the barrel, the head of the screw being countersunk, then filed



flush with the outside of the cap. There is no problem with this method on a short-barreled jaeger rifle, but with a longrifle, one must be aware of the longitudinal expansion and contraction of the stock. I have seen my stocks lengthen and contract as much as 1/8 inch over the year. Another drawback to this method is that you can't remove the barrel without unscrewing it from the muzzle cap. And the screw won't be much more than 1/8 inch long—very easily lost—which may or may not be why this technique was abandoned.

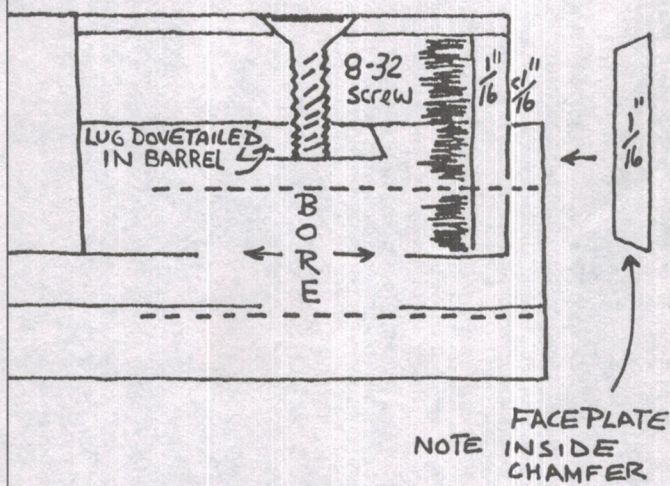
However if you would like to try it, here's how I would do it. Very carefully mark the location of the fastening screw on the outside of the cap directly underneath and centered on the bottom flat of the barrel. Equally carefully, drill through the cap with a 1/8-inch drill until the drill tip marks the barrel.

Having removed the barrel, scribe a longitudinal line on the bottom flat that passes through the drill mark and extends beyond the mark fore and aft by about one inch. Another scribe line at right angles to it and continuing down to one of the side flats will also help to relocate your drill hole. Then I would cut out a dovetail mortise for a lug, just like the other barrel lugs that you made and installed for your barrel pins. However you want your lug as thick as possible. With a heavily swamped barrel with quite a flare at the muzzle, you should be able to make your mortise as deep as 1/8 inch, if not deeper, without endangering the bore. Check this very carefully.

Having cut out your dovetail mortise, fit to it a piece of mild steel and file it flush with the bottom flat of the barrel. Make it longer than the bottom flat of the barrel so that it overhangs the bottom oblique flats by a good 1/4 inch on either side. Using your combination square, you can relocate your drill hole on your new lug. Centerpunch the lug, remove it and, using your drill press, drill with a No. 29 drill for an 8-32 screw. Reinstall the lug, punch the sides to hold it firmly and file the ends flush with the oblique flats of the barrel. Now open up the hole through the cap with a No. 19 drill and countersink to accept the head of the screw. All you have to do is fit an 8-32 screw into position. See Figure 12.

**THE RIVET FASTENING** was the most common method

**Figure 12: Fastening Cap with a Screw**

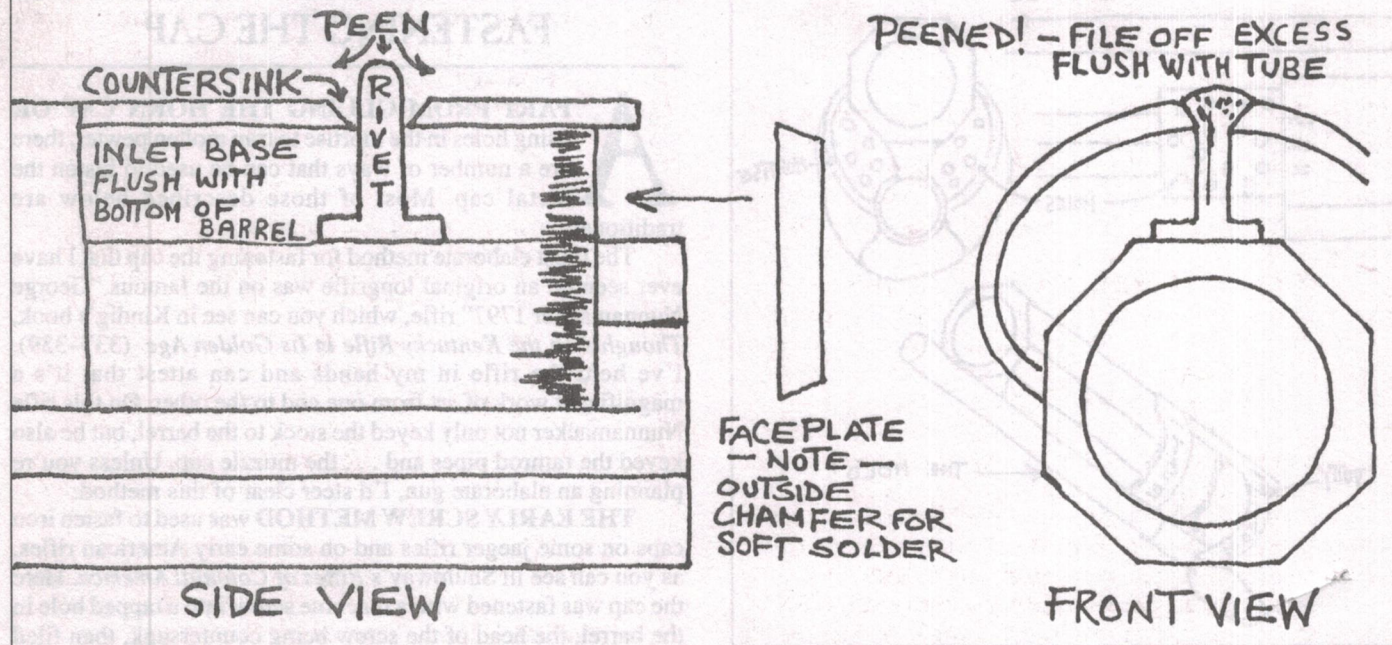


of fastening the cap. Most gunsmiths used one rivet directly underneath the bottom flat of the barrel and about halfway along the length of the cap. Some Virginia gunsmiths used two rivets centered on the bottom oblique flats and quite near the back end of the cap. They may have used a third rivet near the front but under the bottom flat, like J. P. Beck of Lebanon, Pennsylvania, but only Beck did this as far as I know and that information is thanks to Rudi Bahr, who drew my attention to it. To make sure how an original gunsmith riveted his cap, you need to examine photographs carefully.

For some reason most of the original rivets were made out of copper. Perhaps they were readily available from the harness trade. That's where I got my supply. They were too big, so I chucked them in my electric drill and filed the shank to 1/8-inch diameter and reduced the head to 1/4-inch diameter and a thickness of about 1/16 inch. If you can find a 1/4-inch diameter copper rod, you can easily make your own rivet.

However iron rivets were used too. I've made some out of

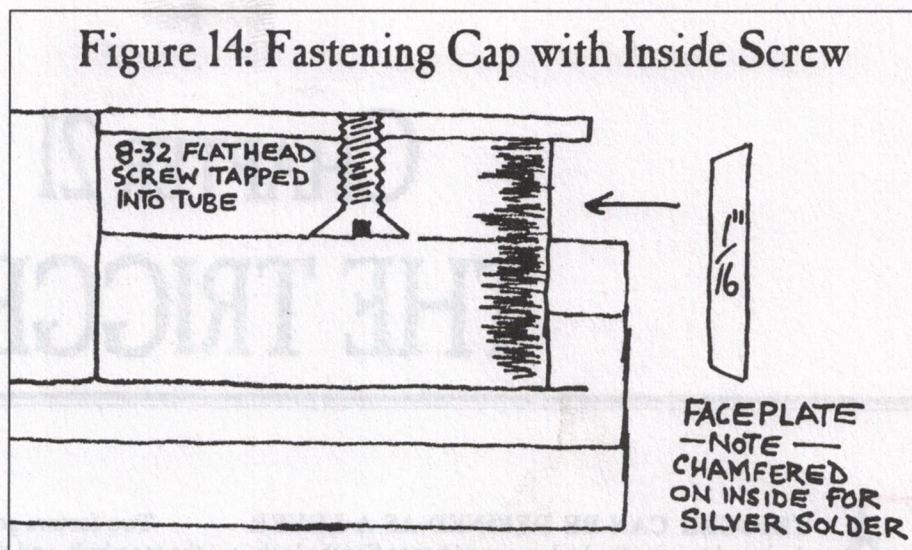
**Figure 13: Fastening Cap with a Rivet**



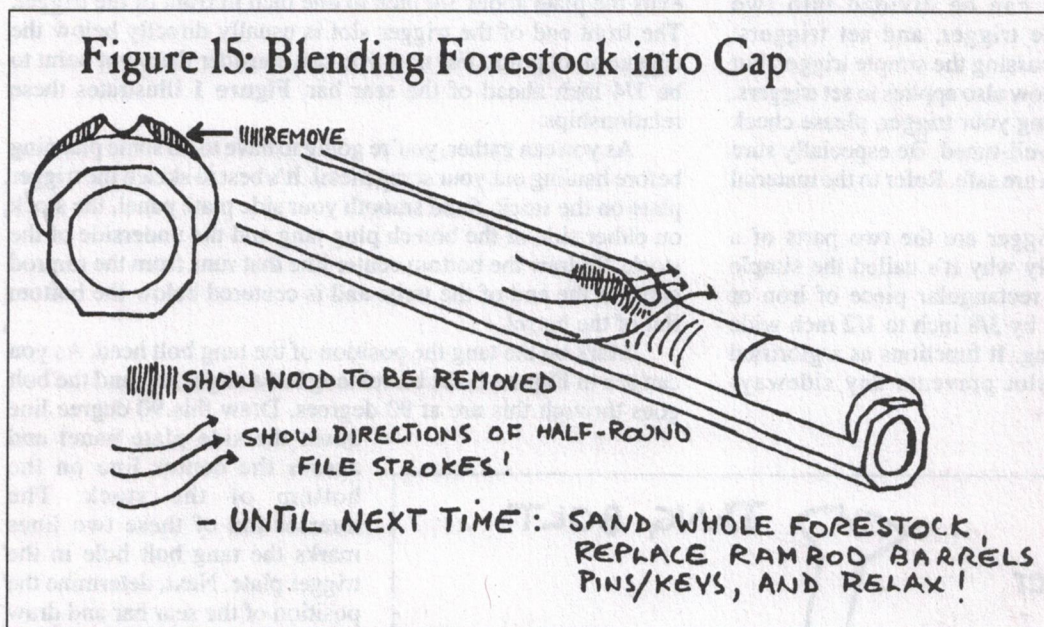


roofing nails using the technique described above. If you want to hide your rivet completely in a brass cap, why not make a brass rivet?

Having made the rivet(s), locate your rivet hole or holes and drill with a 1/8-inch drill until the tip marks the barrel. Countersink the hole or holes in the cap. Remove the barrel and finish drilling the hole. Then install the rivet with the head inside the channel and outline the head with your X-Acto knife. Remove the rivet and very carefully cut out a mortise for the head so that the head is exactly flush with the bottom of the barrel channel. Make certain of this—if the head sinks below the surface of the channel, you will have a



**Figure 15: Blending Forestock into Cap**



loose rivet when you peen the outer end into the cap. Repeat for any other rivets.

Having installed the rivet(s), you replace the barrel. Find some method to clamp the stock so that the barrel flat opposite the rivet is resting firmly on the workbench or on a padded vise. Peen the outer end into the countersunk hole in the cap. Avoid hitting the cap as you may distort it. Light taps with the peen of a heavy ball peen hammer will do the job well, as is illustrated in **Figure 13**.

**THE INSIDE SCREW** was a fastening method used on some later half-stock rifles with iron caps. Here the head is on the inside flush with the bottom of the ramrod channel, and the hole through the cap is threaded, as illustrated in **Figure 14**. The advantage here is that the cap can be easily removed for browning or bluing after the stock has been finished. Drill the cap with a tap drill until the drill tip marks the barrel. Remove the barrel and finish-drill the hole. Run a tap through from the inside to thread the cap. Install the screw and scribe the outline of the head on the barrel channel. Remove the screw and employ the countersink to open up the hole just to within the scribe lines. Several tries may be necessary until the head is flush with the channel. Finally, trim the excess shank of the screw from

the outside of the cap and file the remains flush with the cap.

In the illustration I recommend an 8-32 screw, which I think would be acceptable for a steel cap 1/16 inch thick. However, having used this technique recently to fasten a brass cap, I find that a 4-40 screw works just as well if not better.

I got the idea to use the inside screw method on a J. P. Beck re-creation from my old friend and mentor Rudi Bahr, who has not only restored some fine original longrifles, but also made some equally fine ones over the years. Rudi told me that he used this technique because it was so convenient. I tried it and, as

usual, he was right. It took me far less time, and I didn't have to worry about distorting the cap with a poorly aimed hammer blow. An added advantage is that if I ever need to remove the cap it is easy to do, unlike the riveted cap. If I ever get really picky, I can always make 4-40 screws out of copper.

## FINISHING THE FORESTOCK

**H**AVING INSTALLED THE CAP, ALL WE HAVE to do now is deal with the sides of the ramrod groove (the rails) where they slope down to the bottom of the groove. When we shaped the muzzle cap area, we left this termination pretty thick. A little judicious filing will continue the knife edge of the rails down to the bottom of the groove, as illustrated in **Figure 15**.

Now all you need to do is to file the muzzle cap smooth and sand the whole forestock and cap down to 300-grit paper. Except for decoration, we have finished the whole forestock. Install your ramrod and take a break.