NHIG

National Heritage Ironwork Group

Forged vs Fabricated

How to tell the difference

Proctor Taylor

Originally published for Topp & Co.



Forged vs Fabricated

If you are assessing the heritage value of an example of ironwork, you will need to first look at the methods used in its making.

Before the invention of electric power tools, hydraulic presses, and electric arc welding, the only way a craftsman had of gaining the power to work iron was to get it incandescently hot in a fire and then tool it - either directly with a hammer, or through an intermediary tool driven by the hammer such as a punch or chisel (among many others). This is the process of forging: it is fundamentally different from modern fabrication methods, and gives rise to an incredible variety of possible shapes. One key identifier is the presence of changes in the section of the metal: progressing in cross-sectional thickness and/or shape (see comparison of scrolls, opposite).

Fabricated work is made from stock sections of steel, mostly worked cold, though some heating may have been applied for bending and, rarely, twisting. Joining is pretty much limited to arc welding and bolting. It is quick and cheap compared to forging, and the results contrast sharply with heritage work.

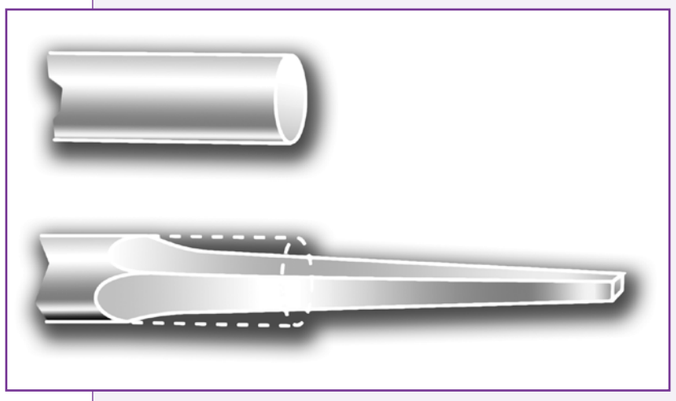
Note that many modern smiths use combinations of forging and fabricating to good effect, and use modern tools and techniques where these do not compromise quality. The use of modern methods does not automatically devalue the work.

Hot forging processes and their fabricated approximations

Smiths use arguably seven different basic processes, and many advanced permutations of these. Below are descriptions of these compared to processes used in fabrication. After you've gained an understanding of the processes of forging, ironwork made in the fire will tell you many of the secrets of its origin.

Drawing down

This is the most fundamental process, whereby the metal is hammered to make the piece longer and thinner. In doing this, the smith may change the section (from round to square, for instance) or work the bar into a taper. This process is key to giving the form being forged dynamics that cannot be achieved cold. There is no fabricated equivalent.

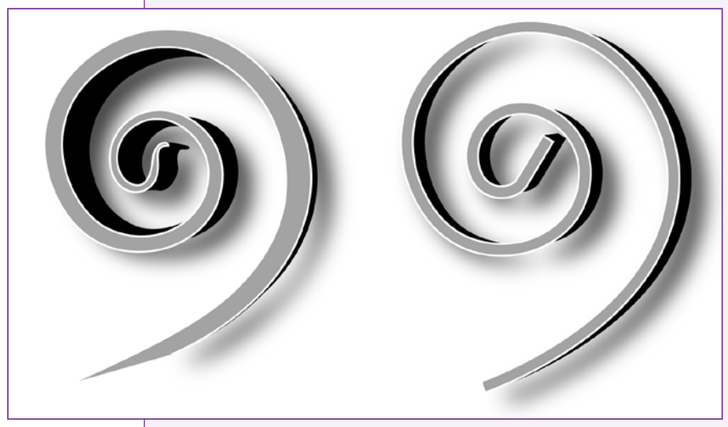


Top, round stock straight from the mill.

Bottom, the same stock, drawn to a square taper.

Bending

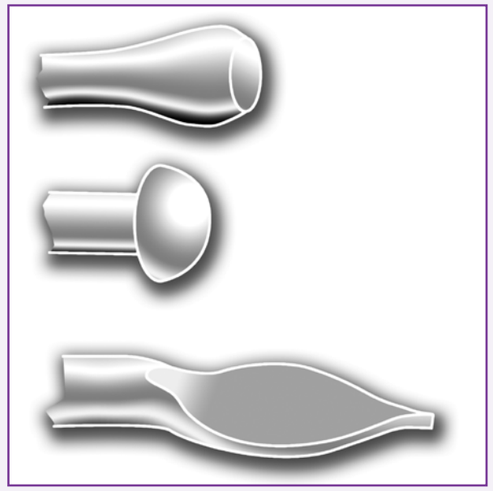
Although this needs no definition, smiths use a surprisingly large number of methods of getting the bend they want, depending on the nature of the work. This process is also available to the fabricator, and is sometimes done hot.



The scroll on the far left is made of stock that has been drawn to a taper and bent hot, free-hand. On the right is a scroll made of stock section, bent cold, with a typically straight centre where it was clamped to a scroll-forming jig.

Upsetting

Upsetting is the opposite of drawing, and involves thickening the metal by hammering it against its length. It is used most often to gain mass for rivet heads or decorative finials and to set tenons after they've been inserted into mortises. One more specialist use is to increase the mass at a sharp bend to make a squared corner. There is no fabricated equivalent to upsetting.



Top, bar-end, thickened by upsetting.

Middle, bar-end, upset and formed into rivet head.

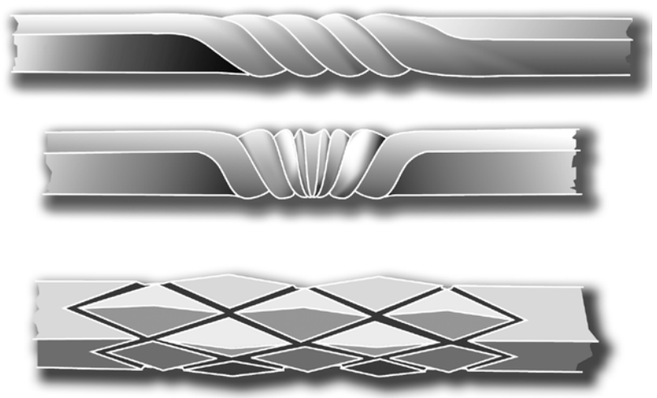
Bottom, bar-end, upset and formed into finial.

Cutting

Yes, this can be a forging process. The metal is heated and either laid on the anvil and pierced with a chisel or driven downward into a static chisel held upright in a hole in the anvil. This can be done cold for smaller sections. Usually other work is done after cutting, but in sheet metal elements, the beveled edge left by the chisel may be visible. Fabricators (and modern smiths) obviously have recourse to many different methods of cutting that would have made their ancestors green with envy!

Twisting

Again, an obvious process, there is a profound difference in the methods and results used by the two schools. Smiths may work the bar in many varieties of ways before and after twisting, may make extreme numbers of turns that vary along the bar, and may twist multiple pieces together. Cold twists are simple and without variation.



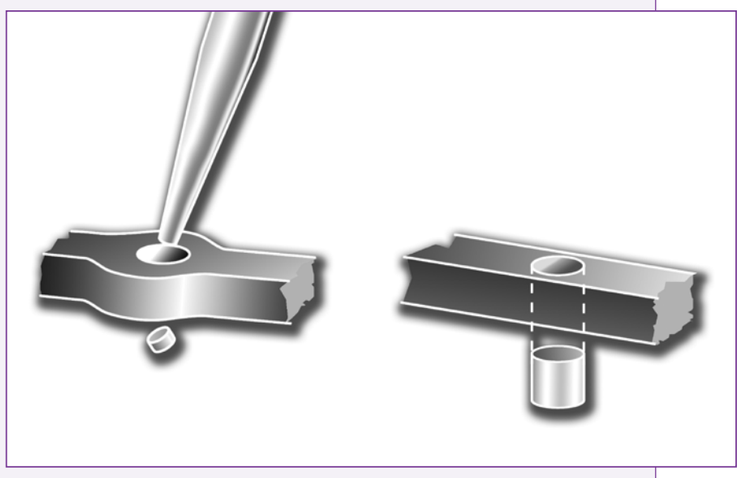
Top, simple cold twist.

Middle, progressive reverse twist, made hot.

Bottom, pineapple twist, made by twisting, hammering and untwisting, all at an incandescent heat.

Punching

Hot punching to make a hole differs dramatically from cold punching or drilling in that there is much less loss of material, and the metal displaced by the punch swells the bar on either side. This swelling is very often an obvious clue to the method of manufacture.

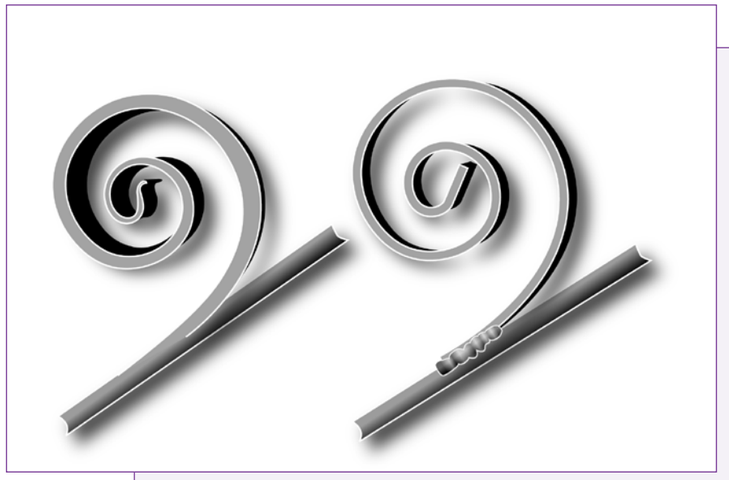


Right, the amount of material removed by hot punching is the diameter of the punch-tip, and much shorter than the depth of the hole. Most of the material moves aside. The final diameter is determined by the punch body, or by using a separate drift.

Far right, the amount of material removed by drilling is obviously equal to the size of the hole, with a corresponding weakening of the structure.

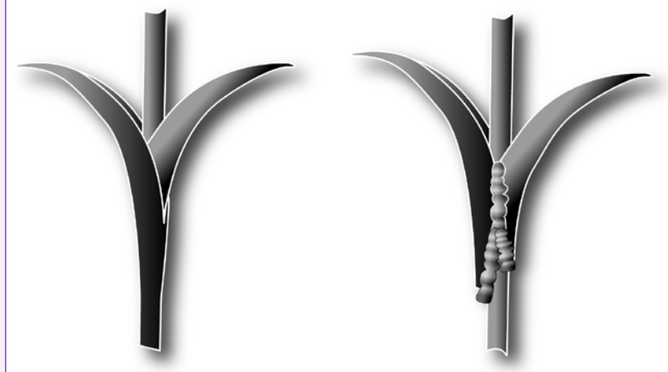
Fire (or forge) welding:

This is a joining method, but it is also the prince of processes, in which it is possible to achieve sculptural excellence rarely rivaled by modern methods. The pieces are heated to fusion temperatures and hammered together while hot. It requires preparation, timing, skill and a clean fire. There is often no sign of the weld in the finished product other than the evidential impossibility that the shape could not have been forged in one piece. Fabricators weld by adding metal to the joint, and this is usually quite visible.



Far left, forged scroll fire-welded to a round bar.

Right, cold-bent scroll arc welded to a round bar.

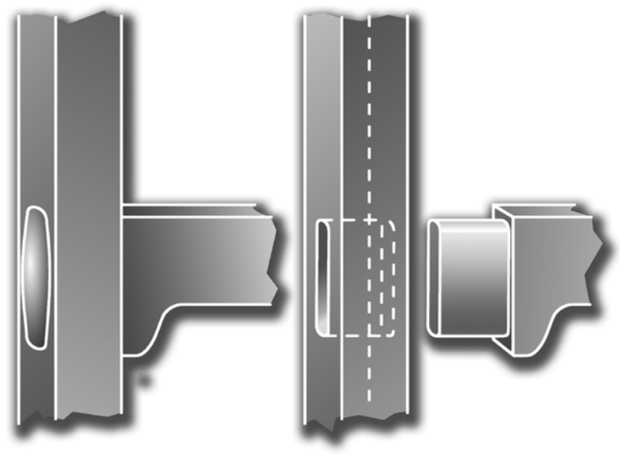


Right, leaf detail fire-welded to a round bar.

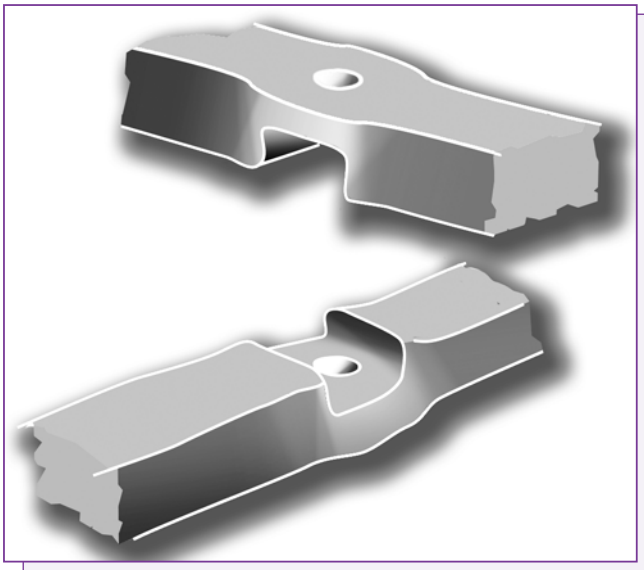
Far right, leaf detail arc welded to a round bar.

Other joining methods:

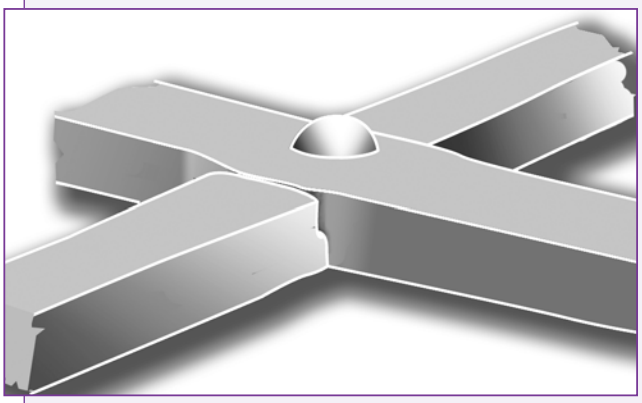
Only one of the above processes joins elements together, but there are a host of ways to securely fasten pieces - in fact nearly as many ways as there are smiths. This is one of the unique aspects of blacksmithing.



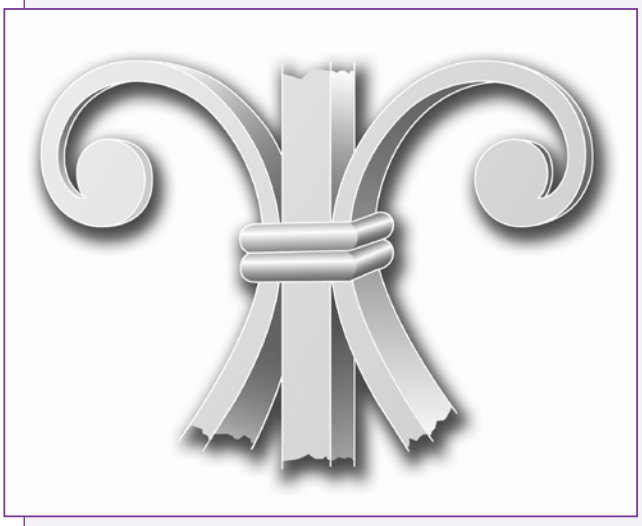
Mortises and tenons resemble their wooden counterparts. In this example, the tenon is made longer than the mortise, and peined or headed like a rivet to draw the joint tight and secure it. Sometimes captive wedges are used.



Halving is used where bars are lapped over each other, or where two pieces are joined for a run longer than the stock. These joints can be secured by rivets, which may be countersunk and difficult to see under layers of paint.



The joint above riveted. Rivets are often used where nuts and bolts would be used in modern work.



Collars are shaped sections of bar which are wrapped while hot around bundled elements.

Other forging processes

- Often closed dies are used under power-hammers to get consistent repeating shapes.
- Rolling is used to make bars with constant sections.
- Sheet metal is formed from the back (repoussé) or the front (chasing) using shaped punches to make ornamental elements, and this can be done either cold (usually) or hot.