Design & Manufacture

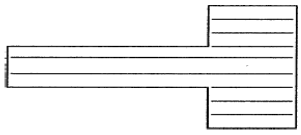
Homework 33

Forging

Hand forging is one of the oldest methods of shaping metal and is associated with the work of a blacksmith. Today there are many computer controlled processes.

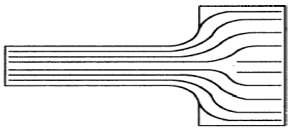
One reason for forging metal is to improve its strength. When it is hit it is squashed and becomes more dense. Also, a shaped product will have the 'grain' (layers of crystals) flow around the shape.

A machine cut shape with sharp internal corners



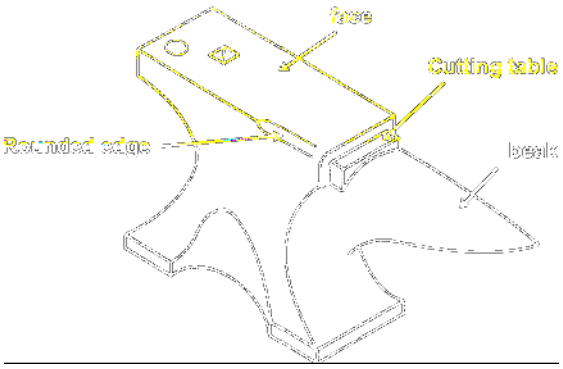
Straight grain lines that can be the source of a crack at the internal corner

A forged shape with curved (filleted) corners



Grain lines are closer together and follow the corner shape, giving extra strength.

The heated metal is shaped on an anvil by hitting it with a heavy hammer.

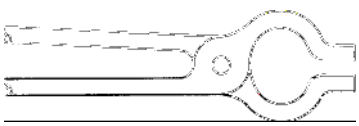


Holding the metal

Tongs are used to hold the metal being forged, they come in large variety of styles and sizes, to hold different shapes of metal bar.

Open-mouth tongs

For gripping thick flat material

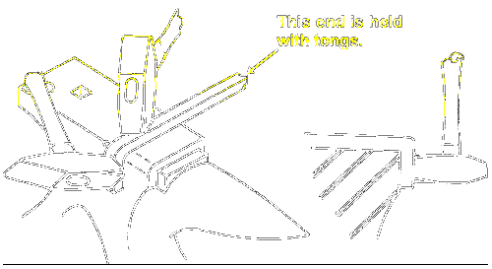


Pickup tongs

For gripping awkward shapes including round bars.

Bending

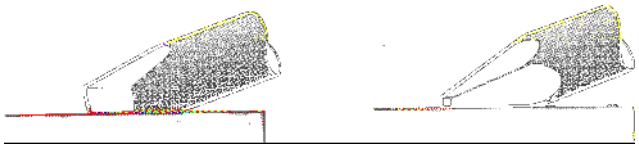
Bending a bar on the anvil, using the rounded edge of the face.



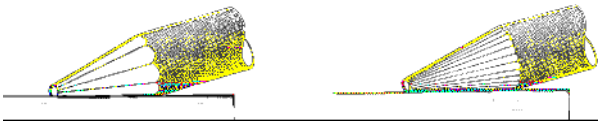
Drawing Down

To make a round bar pointed it has to be **drawn down**. Drawing down requires four stages to avoid the tip splitting.

1. Hold the bar at a slight angle to the anvil face and hit on one side, the anvil face flattens the other side at the same time.
2. Turn the bar 90° and hit again to make the point square in shape.

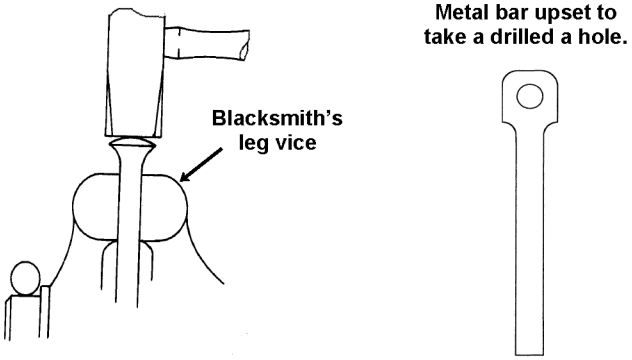


3. Hit each corner of the square shape to turn it into an octagonal shape
4. Continue turning the bar and hitting the corners until the point is round in shape.



Upsetting

Upsetting is the term given to the process of thickening the metal. This is useful for maintaining strength when drilling a hole.



Questions

1. Explain how forging a component can make it stronger than sawing and filing it to shape.

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2. Draw a blacksmith's anvil and label its parts.

3. Show how the anvil can be used to bend the end of a bar of mild steel.

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4. Illustrate how a point can be forged on a piece of round bar so that it does not split.

5. Explain the process of upsetting and why it is done.

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