BLACKSMITHY WORKSHOP

Outline

- ✓Introduction
- ✓Forging – Basic Principles
- ✓Forging – Terminology
- ✓Objectives of the forging lab
- ✓Forging – materials and equipment

Introduction

✓**Forging** is a Bulk Deformation Process in which the work is compressed between two dies.

✓ According to the degree to which the flow of the metal is constrained by the dies.

- ✓A metal is shaped by compressive forces
- ✓Oldest metal working process – 4000BC
- ✓Can be performed with a hammer and anvil

Typical forged products

- ✓Bolts
- ✓Rivets
- ✓Connecting rods

Introduction

FORGING TERMINOLOGIES

- **Hot forging**

  Plastically deforming an alloy at a temperature above its re-crystallization point

- **Open Die Forgings / Hand Forgings**

✓ Made with repeated blows in an open die

✓ The operator manipulates the work piece in the die.

- **Impression Die Forgings / Precision Forgings:**

✓Are further refinements of the *blocker forgings*.

✓The finished part more closely resembles the die impression.

❑ **Cold working** *is metal forming performed at room temperature.*

✓ *Advantages: better accuracy, better surface finish, high strength and hardness of the part, no* heating is required.

✓ *Disadvantages: higher forces and power, limitations to the amount of forming,* some material are not capable of cold working.

❑ **Warm working** *is metal forming at temperatures above the room temperature but below the* recrystallization temperature.

✓*Advantages: lower forces and power, more complex part shapes, no annealing is required.*

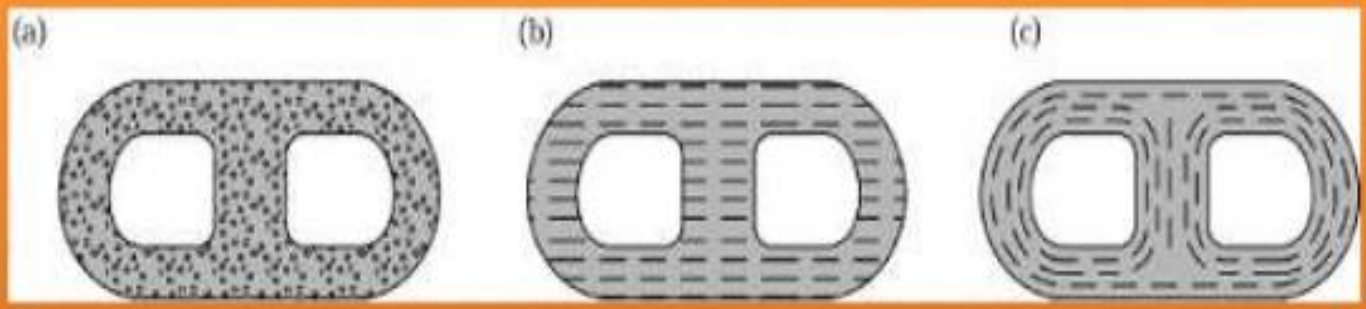
✓*Disadvantages: some investment in furnaces is needed.*

❑ **Hot working** *involves deformation of preheated material at temperatures above the re crystallization* temperature.

✓*Advantages: big amount of forming is possible, lower forces and power are required, forming* of materials with low ductility, no work hardening and therefore, no additional annealing is required.

Grain Structure

- Parts have good strength
- High toughness
- Forgings require additional heat treating



grain flow (a) casting (b) machining (c) forging

ADVANTAGES AND DISADVANTAGES OF FORGING

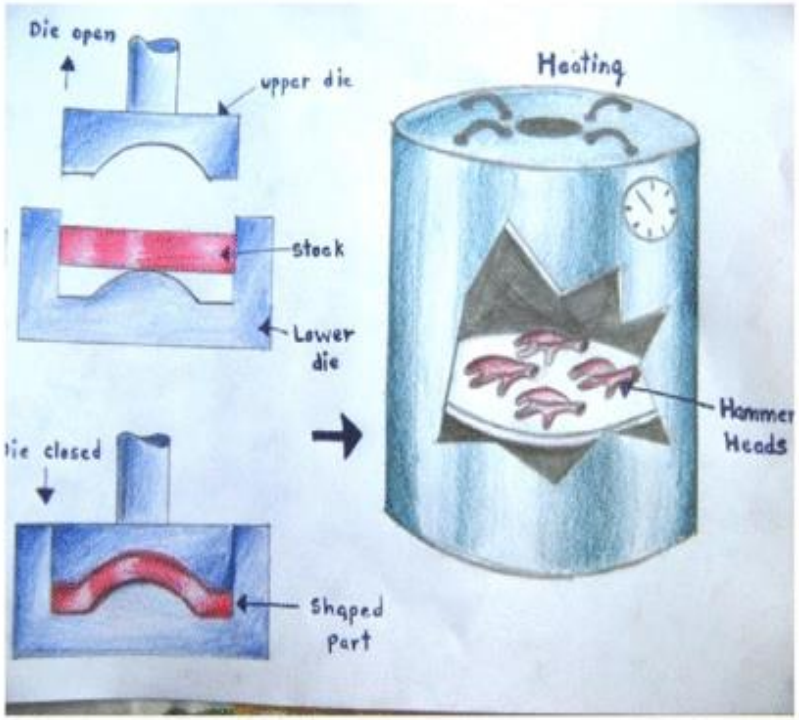
ADVANTAGES

- ✓ Uniformity of qualities for parts subject to high stress and loads.
- ✓ No weight loss.
- ✓ Close tolerance.
- ✓ Less machining or no machining in some cases.
- ✓ Smooth surface.
- ✓ High speed of production.
- ✓ Incorporation in welded structures, i.e., what can be welded easily.

DISADVANTAGES

- ✓ High tool cost.
- ✓ High tool maintenance.
- ✓ Limitation in size and shape.

Introduction



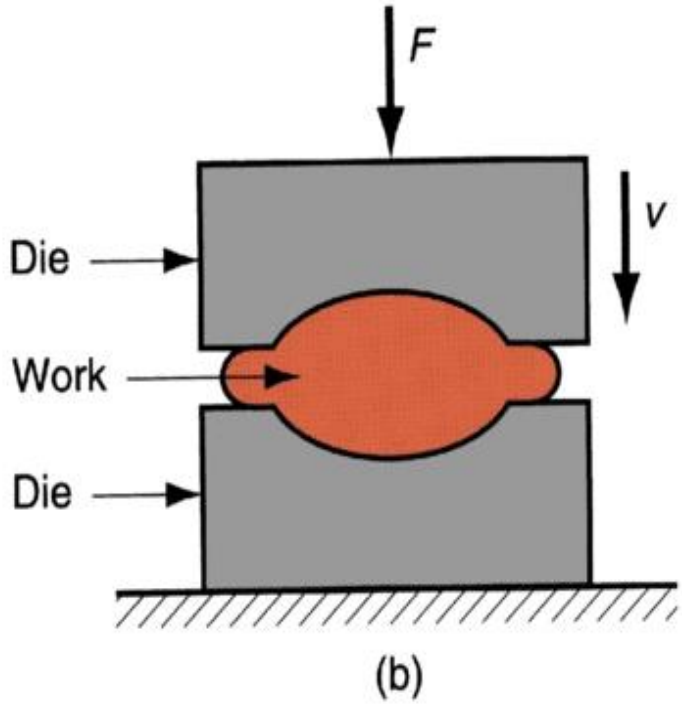


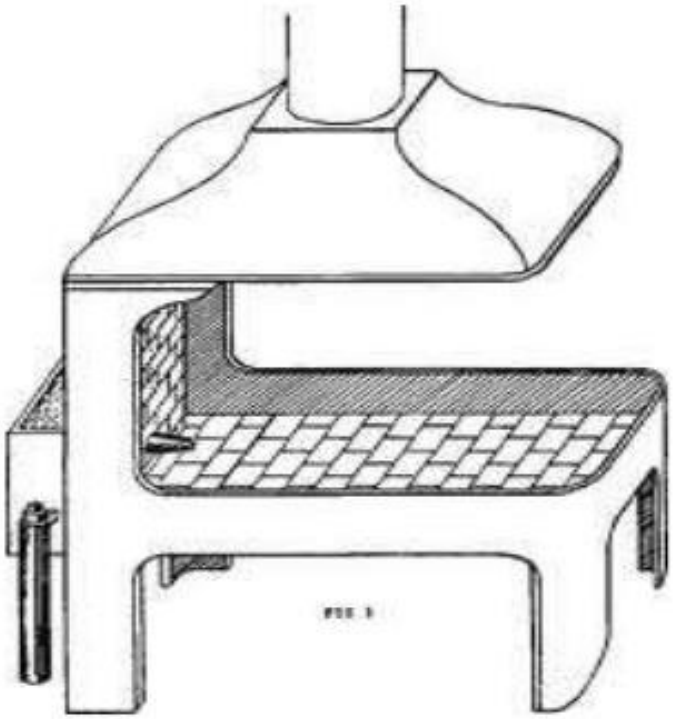
Illustration of Simple forging Operation

Tools and Equipments required for Hand Forging

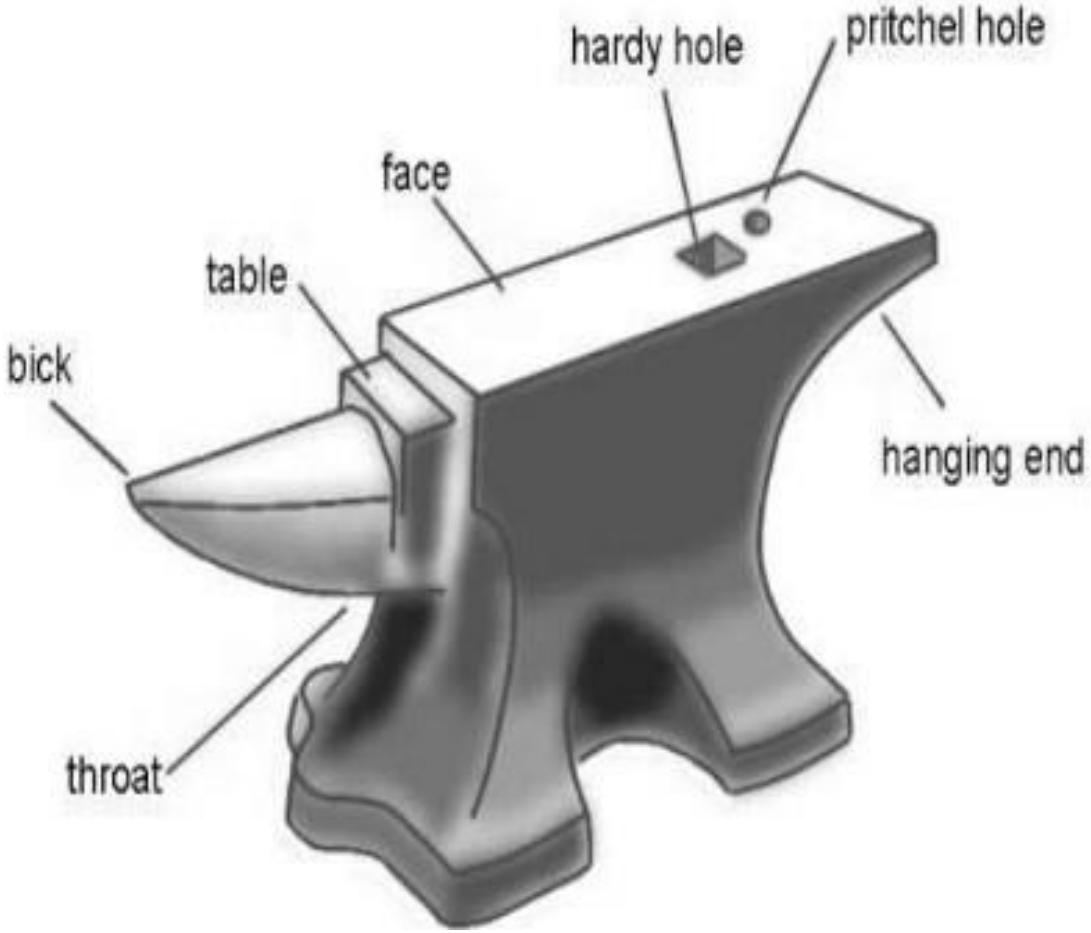
- ***Black Smith Forge Hearth***
- ***Anvil***
- ***Swage Block***
- ***Hammers***
- ***Tongs***
- ***Chisels***
- ***Punches***
- ***Drifts***
- ***Fullers***
- ***Swages***
- ***Flatters***
- ***Set Hammers***

Black Smith Forge Hearth

- Hearth
- Tuyere (nozzle)
- Hood
- Water Tank
- Blower
- Chimney



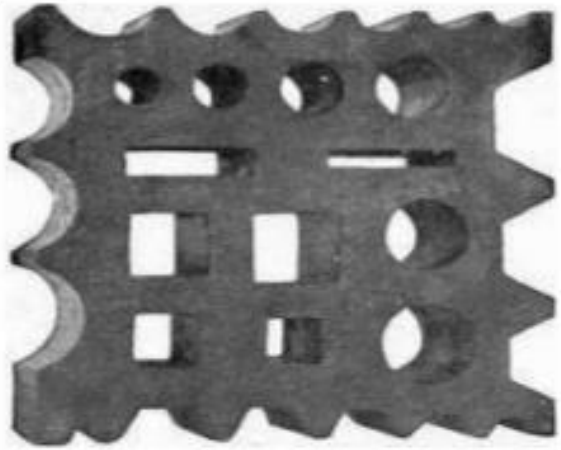
ANVIL


hardy hole
pritchel hole
face
table
bick
hanging end
throat

Swage Block

(made of cast iron or cast Steel)

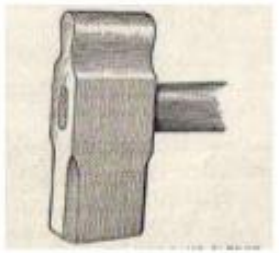
- It carrying a number of slots of different shapes and sizes along its four side faces. The job is to be given a desired shape is kept similar shaped slot.



Hammers

- Ball Peen Hammer

- Sledge Hammer



(i) straight peen sledge Hammer

(ii)Cross peen sledge Hammer

(iii)Double Faced Sledge Hammer

Tongs

Tongs are used for holding and turning hot metal pieces. Depending upon their use tongs are classified as below

- Square Hollow tong

- Pincer tong

- Close flat tong

- Chisel tong

- Pick up tong

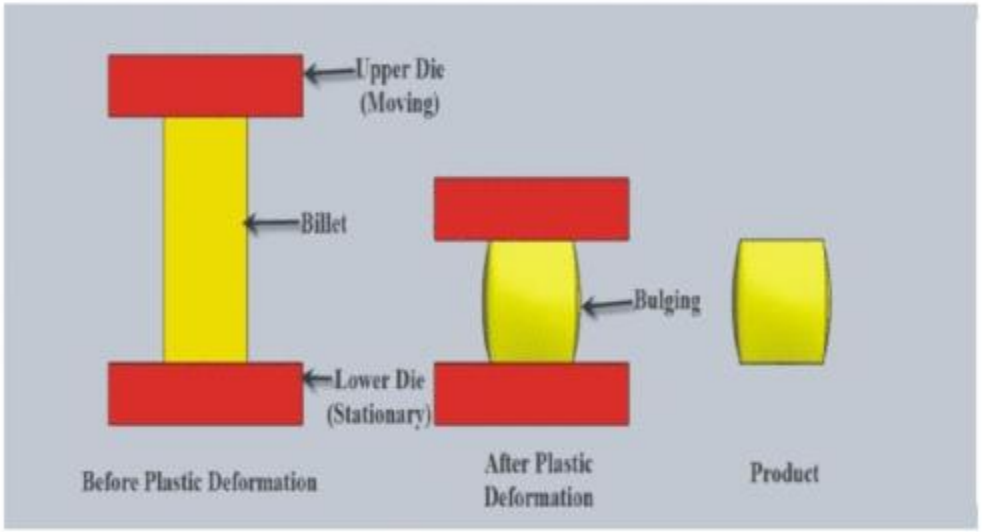
- Round hollow tong

Forging Operations

❑ Upsetting forging

✓Upset forging increases the diameter of the work piece by compressing its length.

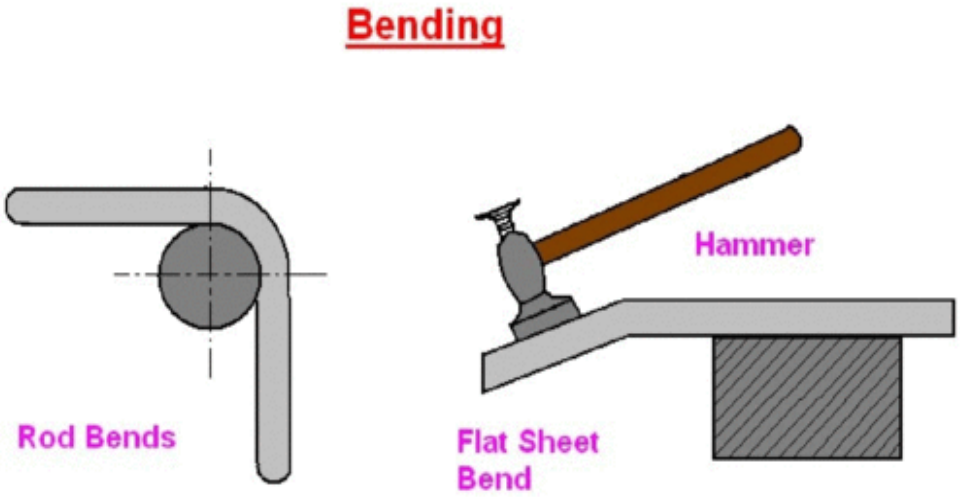
✓A few examples of common parts produced using the upset forging process are **engine valves, couplings, bolts, screws,** and other **fasteners.**



Up Setting

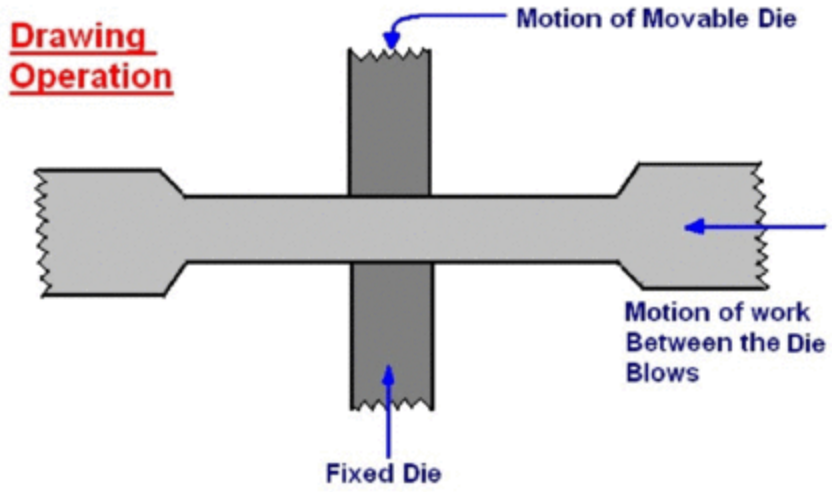
Bending Operations

Bending is very common forging operation. It is an operation to give a turn to metal rod or plate. This is required for those which have bends shapes.



❑ Drawing

This is the operation in which metal gets elongated with a reduction in the cross sedation area. For this, a force is to be applied in a direction perpendicular to the length axis.

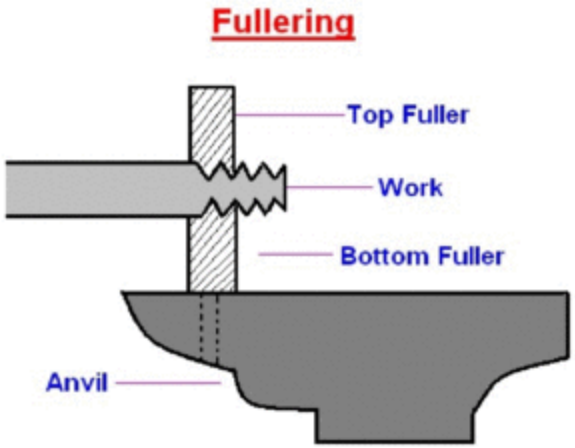


❑ Fullering

It a similar to material cross-section is decreased and length increased.

✓ To do this; the bottom fuller is kept in angle hole with the heated stock over the fuller .

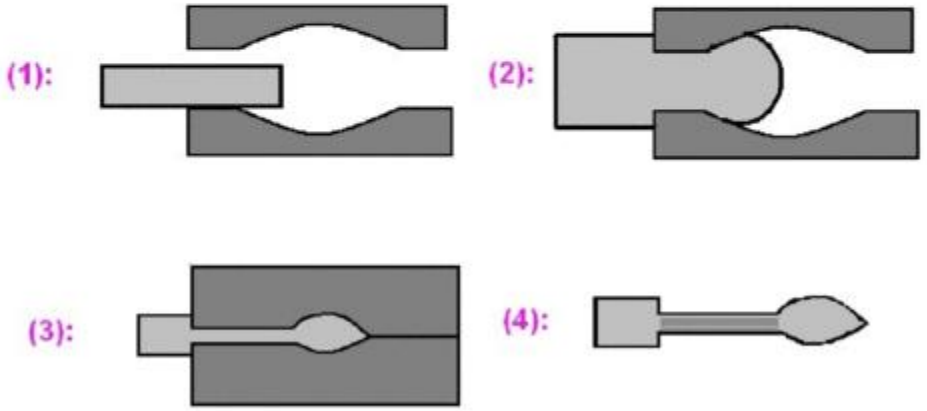
✓The top fuller is then kept above the stock and then with the sledge hammer, and the force is applied on the top fuller



Edging

- ✓It is a process in which the metal piece is displaced to the desired shape by striking between two dies
- ✓Edging is frequently as primary drop forging operation.

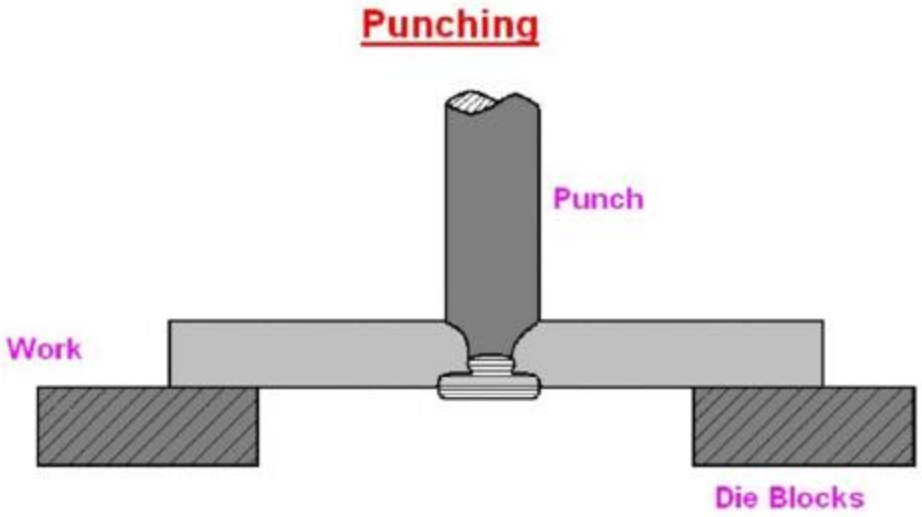
Edging



Punching

✓It is a process of producing holes in motel plate is placed over the hollow cylindrical die.

✓By pressing the punch over the plate the hole is made.



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