

Metal forming processes: Forging

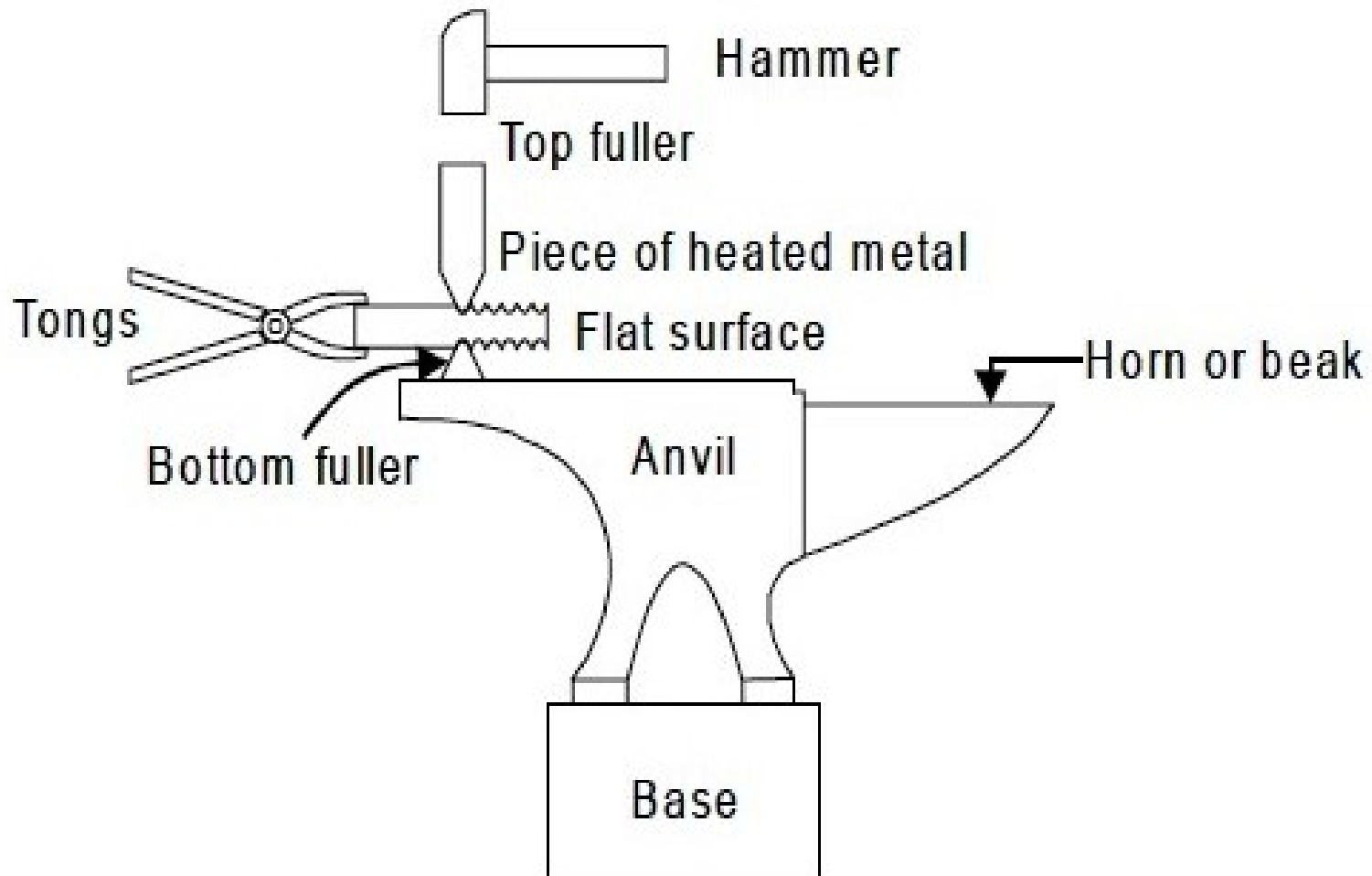
- Forging is the operation where the metal is heated and then a force is applied to manipulate the metal in such a way that the required final shape is obtained.
- Forging is defined as the plastic deformation of metals at elevated temperatures into a predetermined size or shape using compressive forces exerted through some means of hand hammers, small power hammers, die, press or upsetting machine.
- It consists essentially of changing or altering the shape and section of metal by hammering at a temperature of about 980°C, at which the metal is entirely plastic and can be easily deformed or shaped under pressure.

FORGING

- Forging is a process in which material is shaped by the application of localized compressive forces exerted manually or with power hammers, presses or special forging machines.
- The process may be carried out on materials in either hot or cold state.
- Typical forged parts include rivets, bolts, crane hooks, connecting rods, gears, turbine shafts, hand tools, railroads, and a variety of structural components used to manufacture machinery.
- The forged parts have good strength and toughness; they can be used reliably for highly stressed and critical applications.

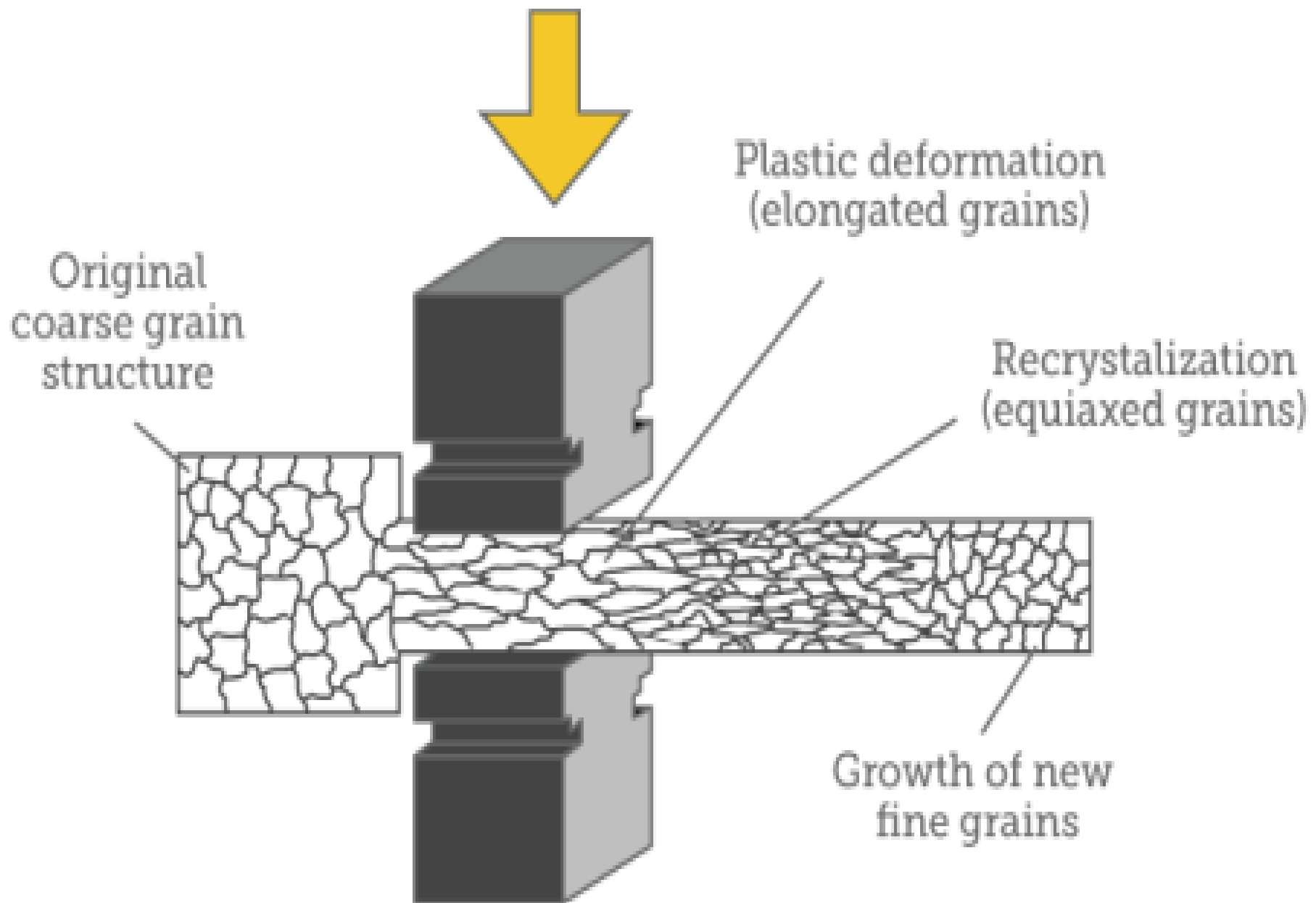
Forging Types

1. Hand Forging or Blacksmith's forging







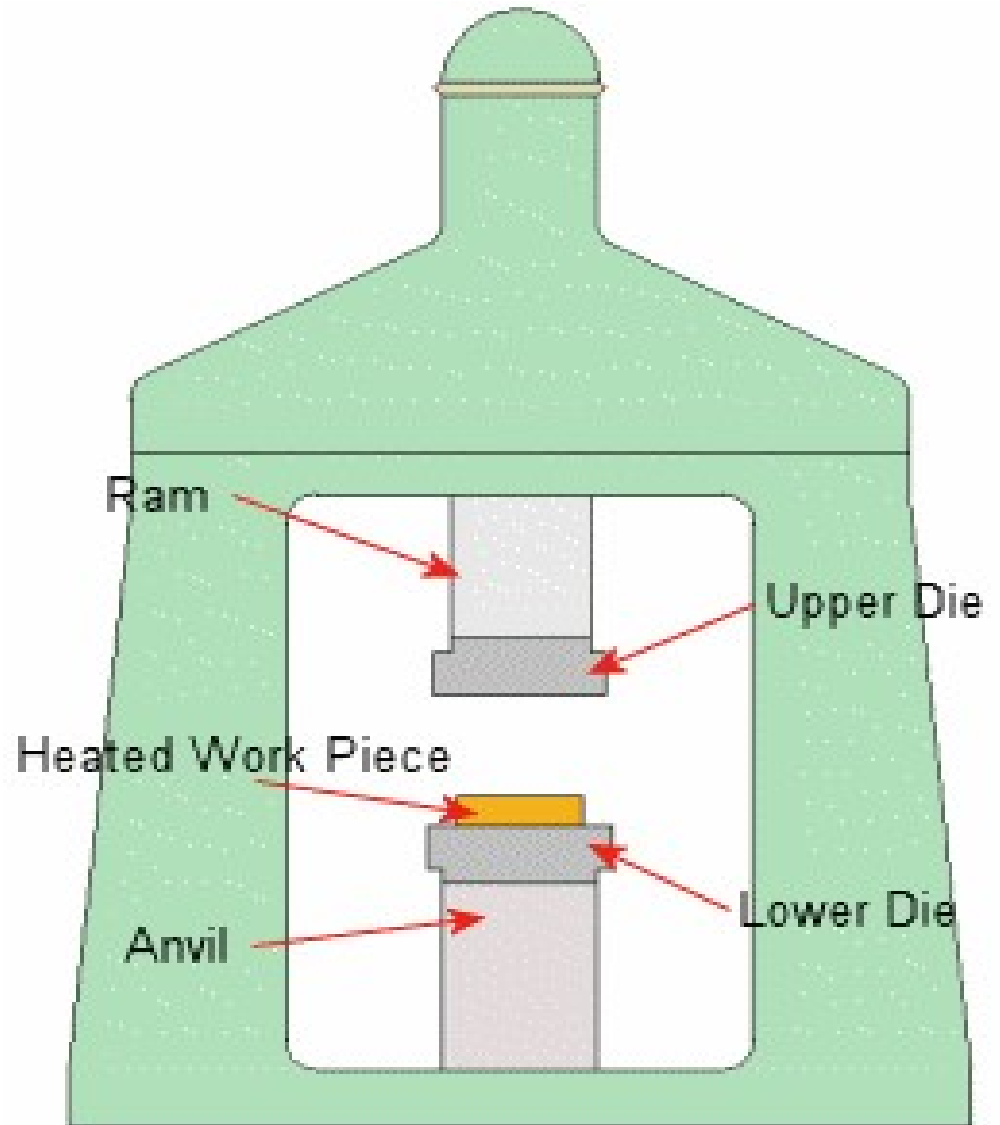


How the open die forging process affects the crystal structure.

2. Drop Forging

➤ Components obtained in drop forging are crank, crankshaft, connecting rod, crank hooks etc.

➤ The final shape desired in drop forging cannot be obtained directly from the stock in a single pass. The various passes used are:



Fullering->Edging->Bending->blocking->Finishing->Trimming

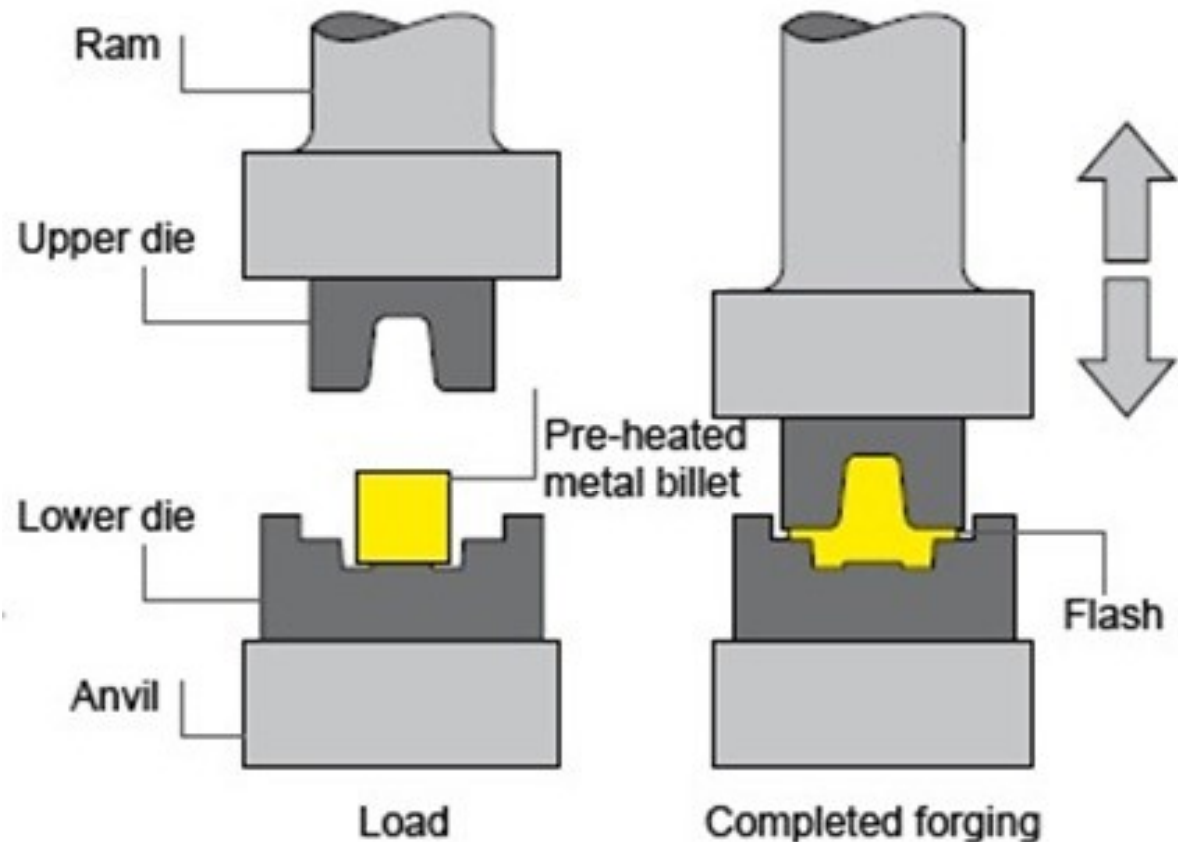
3. Press Forging

➤ In Press forging, the metal is shaped by means of a single continuous squeezing action. This squeezing is obtained by means of hydraulic presses.

Because of the continuous action of the hydraulic presses, material gets uniformly deformed throughout its entire depth.

➤ Presses capacity ranges from 5MN to 50 MN for normal application

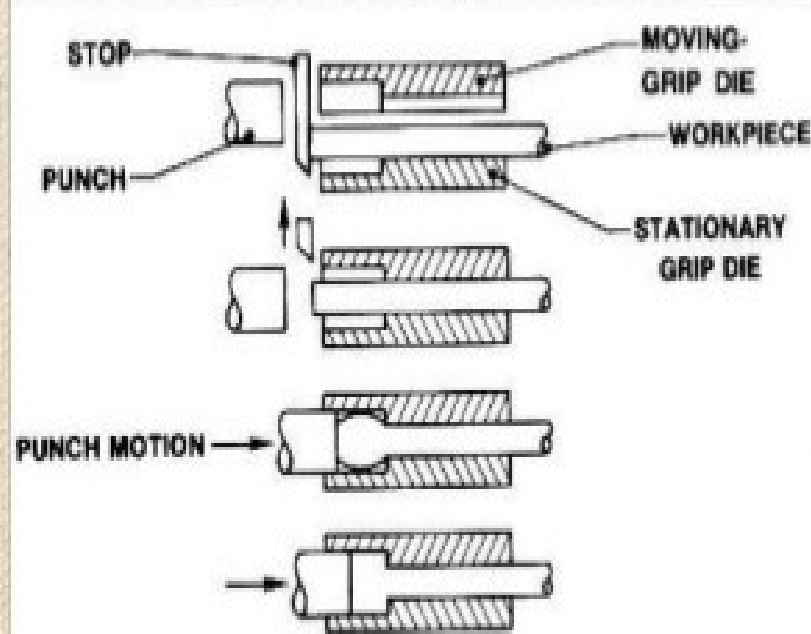
For high capacity 150 MN



PRESS FORGING

4. Machine Forging

MACHINE FORGING

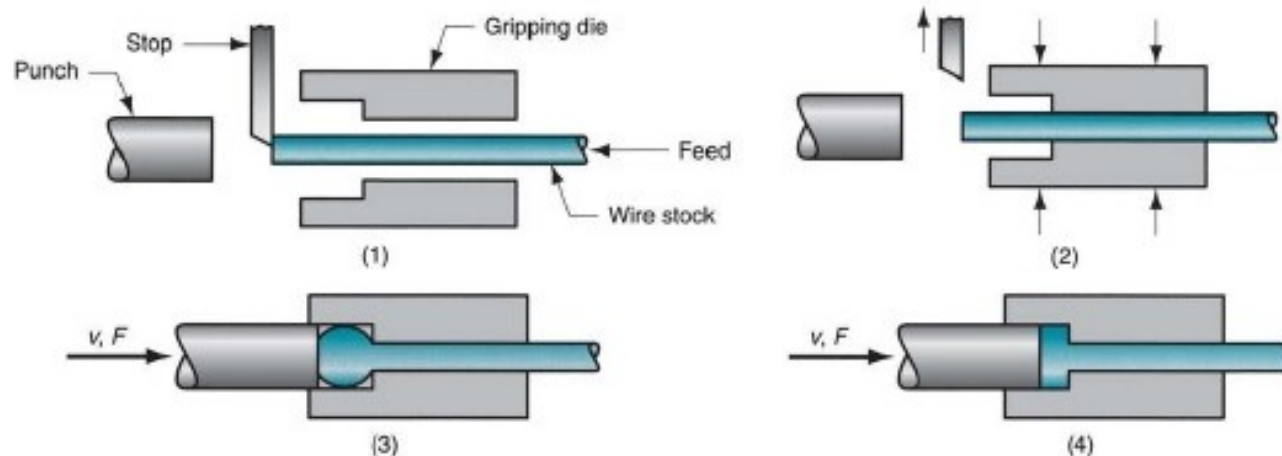


- In machine forging the material is only upset to get the desired shape.
- The die consists of two parts, one called the stationary gripper die which is fixed to the machine frame and the other movable gripper die which moves along with the die slide of the upsetter. The stock is held then between these two gripper dies.
- It is used for making gears, blanks, shafts, axles, and similar parts.



Upset Forging

- Upset forging to form a head on a bolt or similar hardware item: (1) wire stock is fed to stop, (2) gripping dies close on stock and stop retracts, (3) punch moves forward, (4) bottoms to form the head



Forging Defects & Remedies

- Unfilled Sections
- Cold Shut
- Scale Pits
- Die Shift
- Flakes
- Improper grain flow