Workshop Technology
[Forging Practice]

Forging Practice

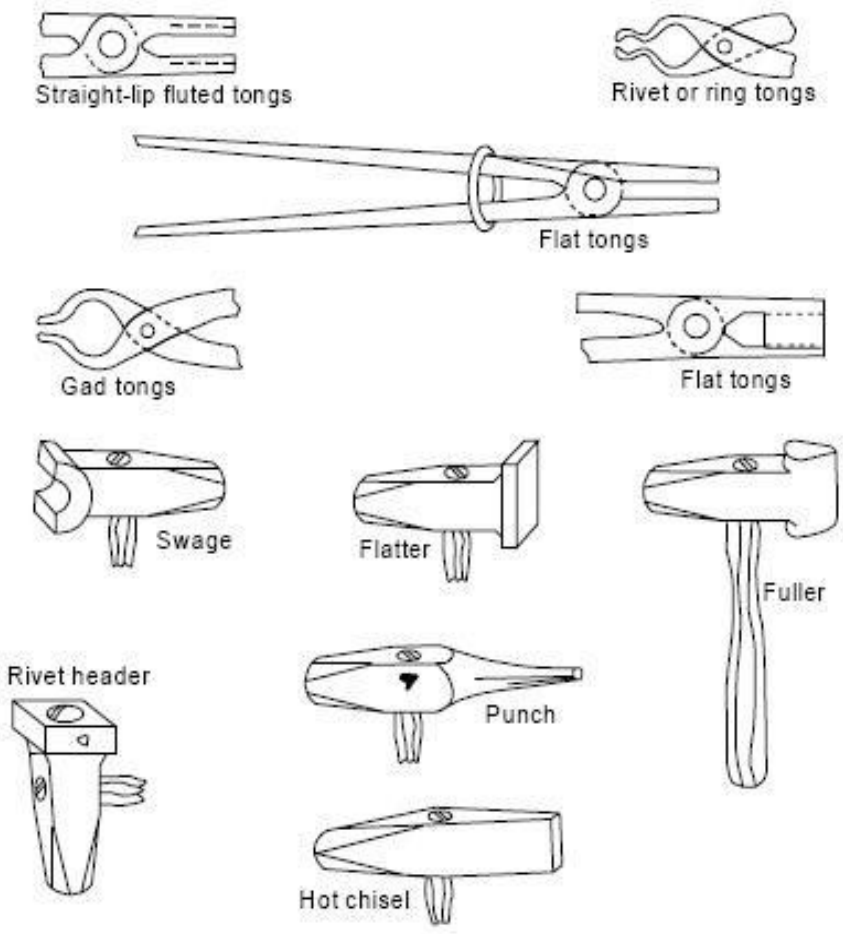
Forging Practice

Introduction

Forging is the process of shaping heated metal by the application of sudden blows (i.e., hammer forging) or steady pressure (i.e., press forging) and make use of the characteristic of plasticity of the material.
It is one of the oldest metalworking arts (primitive blacksmith).
Forging machines are now capable of making parts ranging in size of bolt to a turbine rotor.

Forging Tools

- **Tongs:** Tongs are mainly used for holding work of many section.
- **Flatter:** Flatter is used to give smoothness and accuracy to articles which have already been shaped.
- **Swage:** Swage is used to reduce/finish to round, square/hexagonal form. It consists of two parts- top part having handle and bottom part having square shank.
- **Fuller:** Fullers are used for necking down/to form depressions.



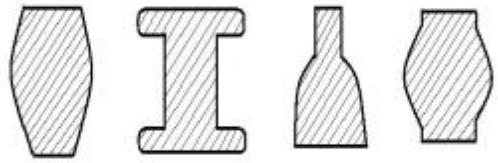
Forging Tools

- **Anvil:** Anvil is used for supporting hot job while hammering is done for shaping it into various shapes. It is made of cast steel.
- **Swage block:** It is used for holding hot bars during bending, support for punching holes in a job.
- **Hammer:** Used for hand forging.

Forging Operations

Upsetting

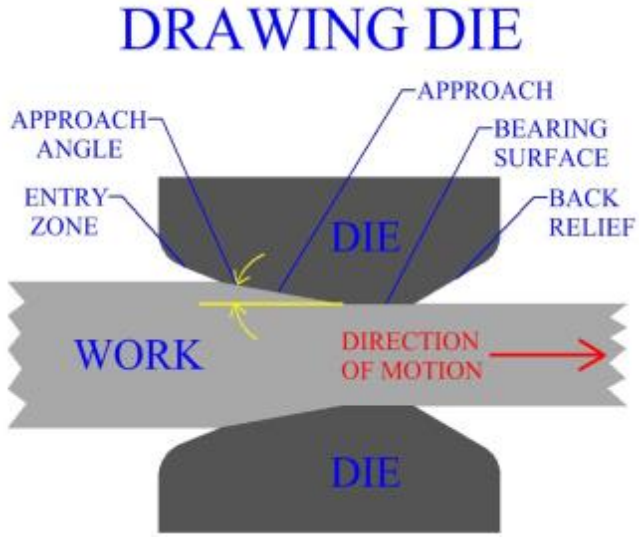
It is the operation by which the thickness/ cross-sectional area of the work piece is increased at the expense of its length.
To achieve the length upsetting, force is applied in direction parallel to the length of job.
Forming of bolt head.



Up Setting

Drawing down

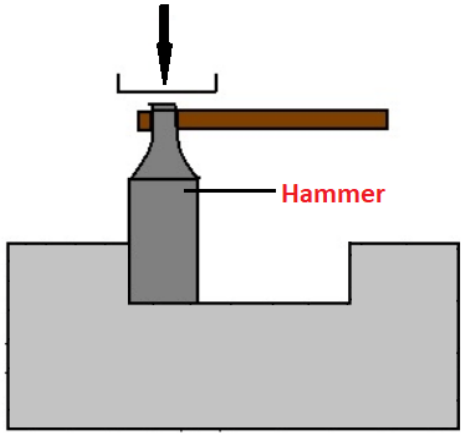
It is the operation by which the thickness/ cross-sectional area of the work piece is reduced by increasing length.
Force is applied in a direction perpendicular to the length of job.
Making metal bar.



Forging Operations

Setting down

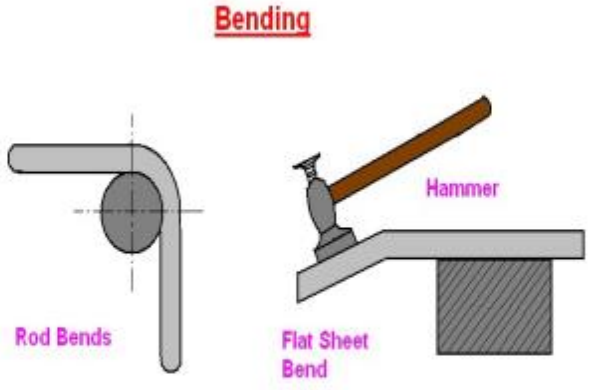
It is the local thinning operation performed by the set hammer.



Setting Down

Bending

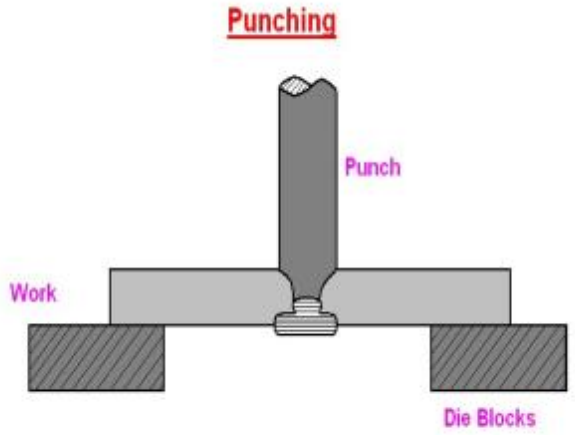
It is the operation by which the bend either curve or sharp corner is produced.
Bending can be done using beak of anvil.
This is required for those which have bends shapes.



Forging Operations

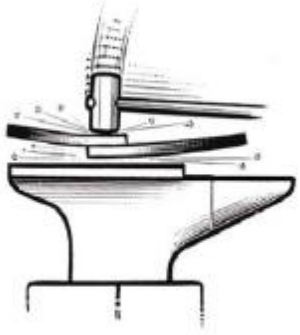
Punching

It is the process of producing holes in metal plate, which is placed over the hollow cylindrical die.
By pressing the punch over the plate the hole is made.



Welding

It is the process of joining two surfaces of metal under pressure after they are heated to welding temperature.
Welding possible above 30mm thickness.
Parts are heated to state of plastic and placed end to end and hammered manually or by power hammer.

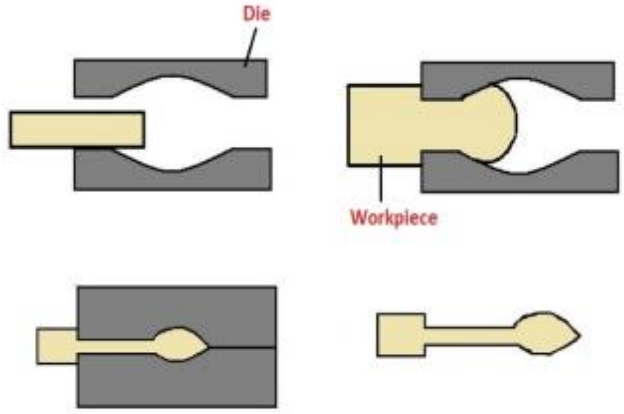


Forge welding

Forging Operations

Edging

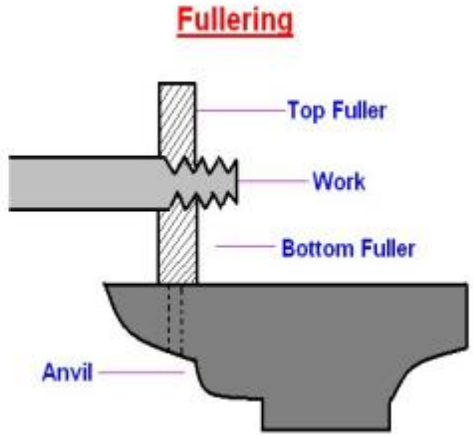
Edging is used to shape the ends of the bars and to gather metal.
The metal piece is displaced to the desired shape by striking between two dies.



Edging Operation

Fullering

Fullering is used to reduce the cross-sectional area of a portion of the stock.
The metal flow is outward and away from the center of fullller.



Classification of Forging

Based on the heat treatment applied

Hot forging : Temperature above re-crystallization point
Cold forging : Temperature below re-crystallization point.

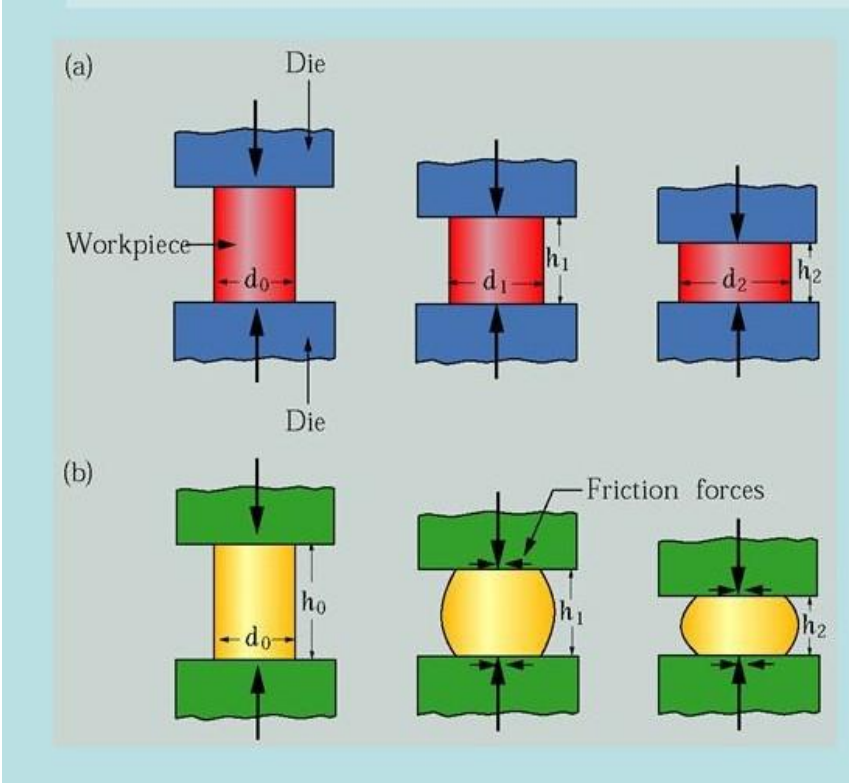
By degree to which the flow of material is constrained

Open die forging
Impression die forging

Classification of forging

Open die forging

This process is also known as smiths die forging or flat die forging.
The operation is carried out between two flat dies of very simple shape.
The workpiece reduces height/plastically deform by compressing it.
The process is used for mostly large objects or number of parts produced is small.
Tooling is simple, inexpensive and allows the production of a large variety of shapes.



Classification of forging

Impression die forging

This process is also called closed die forging.
In this, metal is deformed under high pressure between two dies (called tooling) or in a closed cavity that contain profile of the desired part.
Closed die forging is commonly used where mass production of identical and more complex shapes of greater accuracy are required.
Closed dies are expensive.

Classification of forging

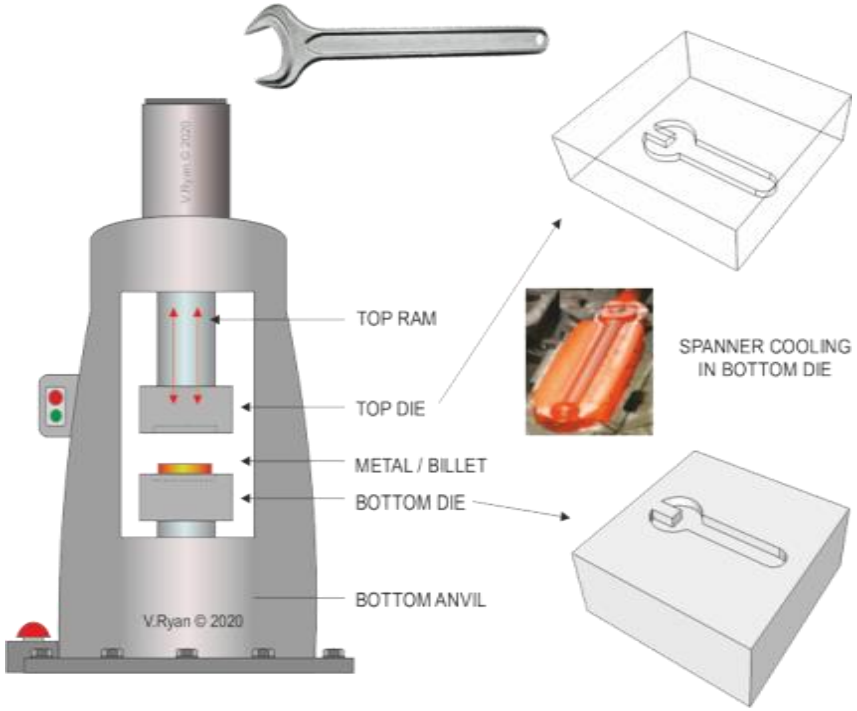


Figure: Drop forging

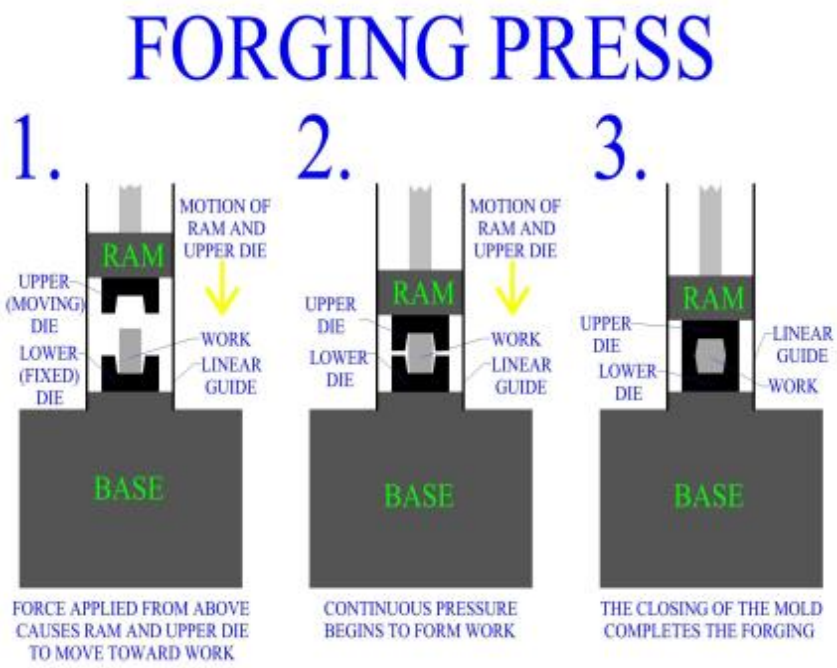


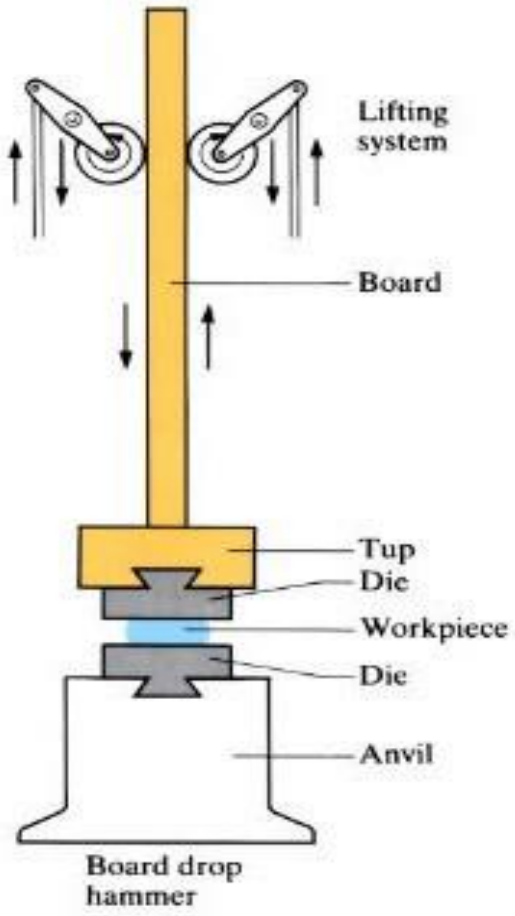
Figure: Press forging

Forging hammers and presses

Hammers

Board hammer

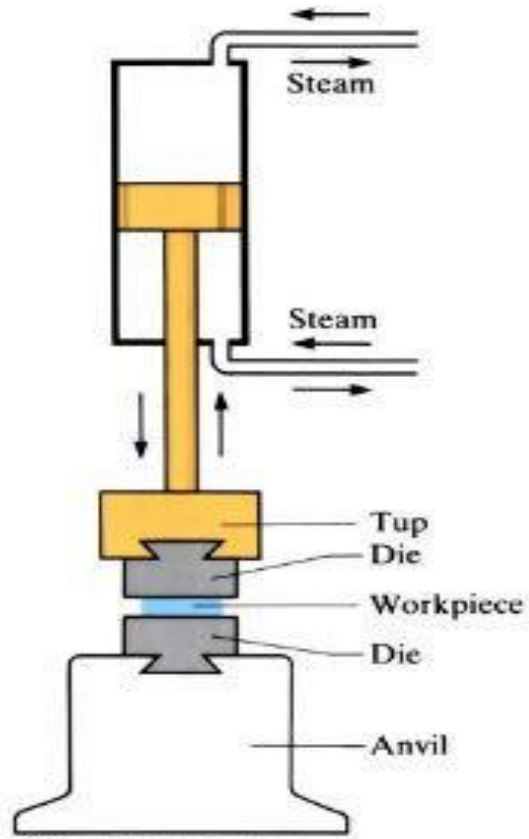
The upper die and ram are raised by friction rolls gripping the board.
After releasing the board, the ram falls under gravity to produce the blow.
Hammer can strike between 60-150 blows per minute depending on size and capacity.
The blow energy will be delivered to the metal work piece to produce plastic deformation.



Hammers

Power hammer

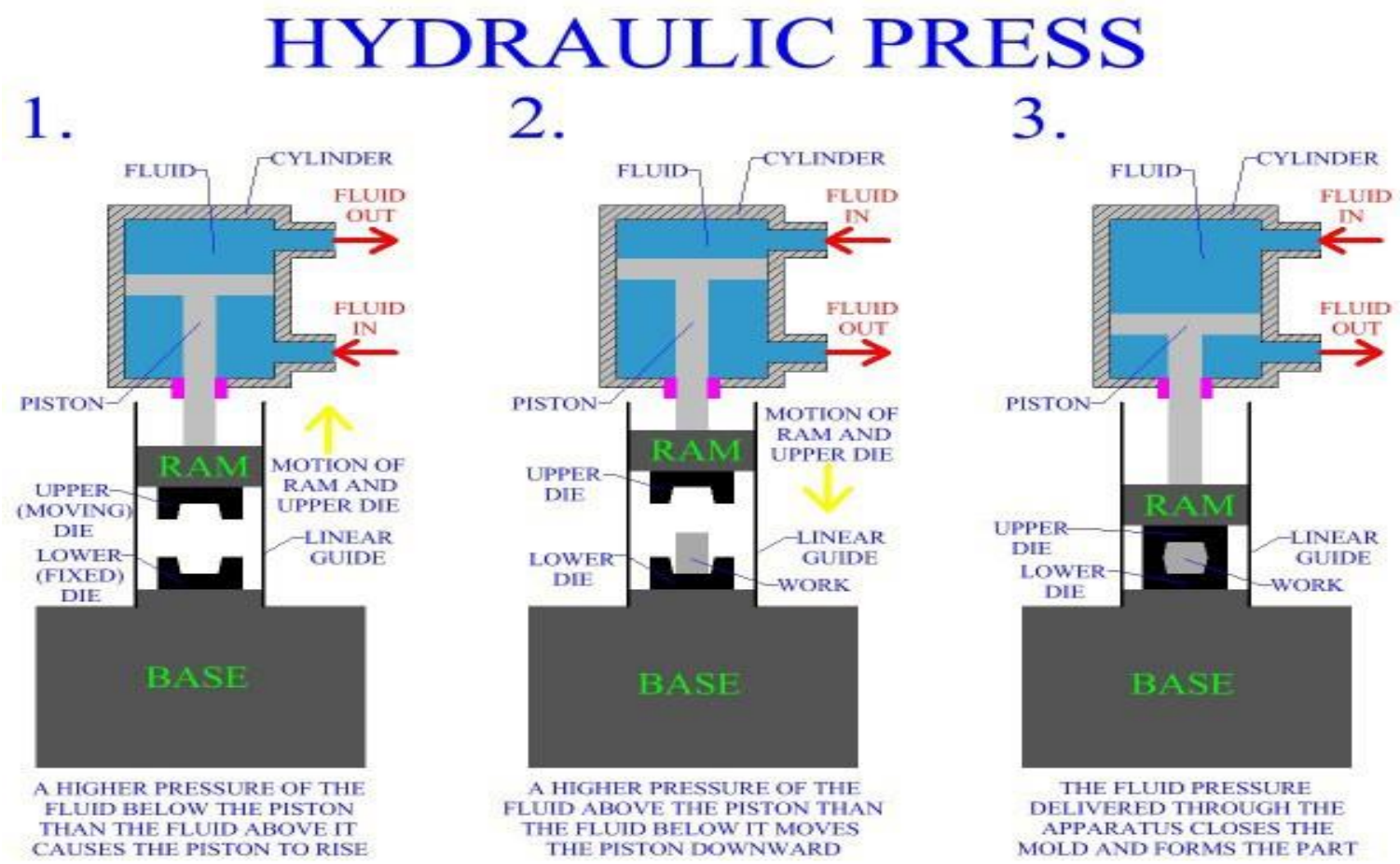
Power hammer provides greater capacity, in which the ram is accelerated on the down stroke by steam or air pressure in addition to gravity.
Steam or air pressure is also used to raise the ram on the upstroke.



Double-acting steam hammer

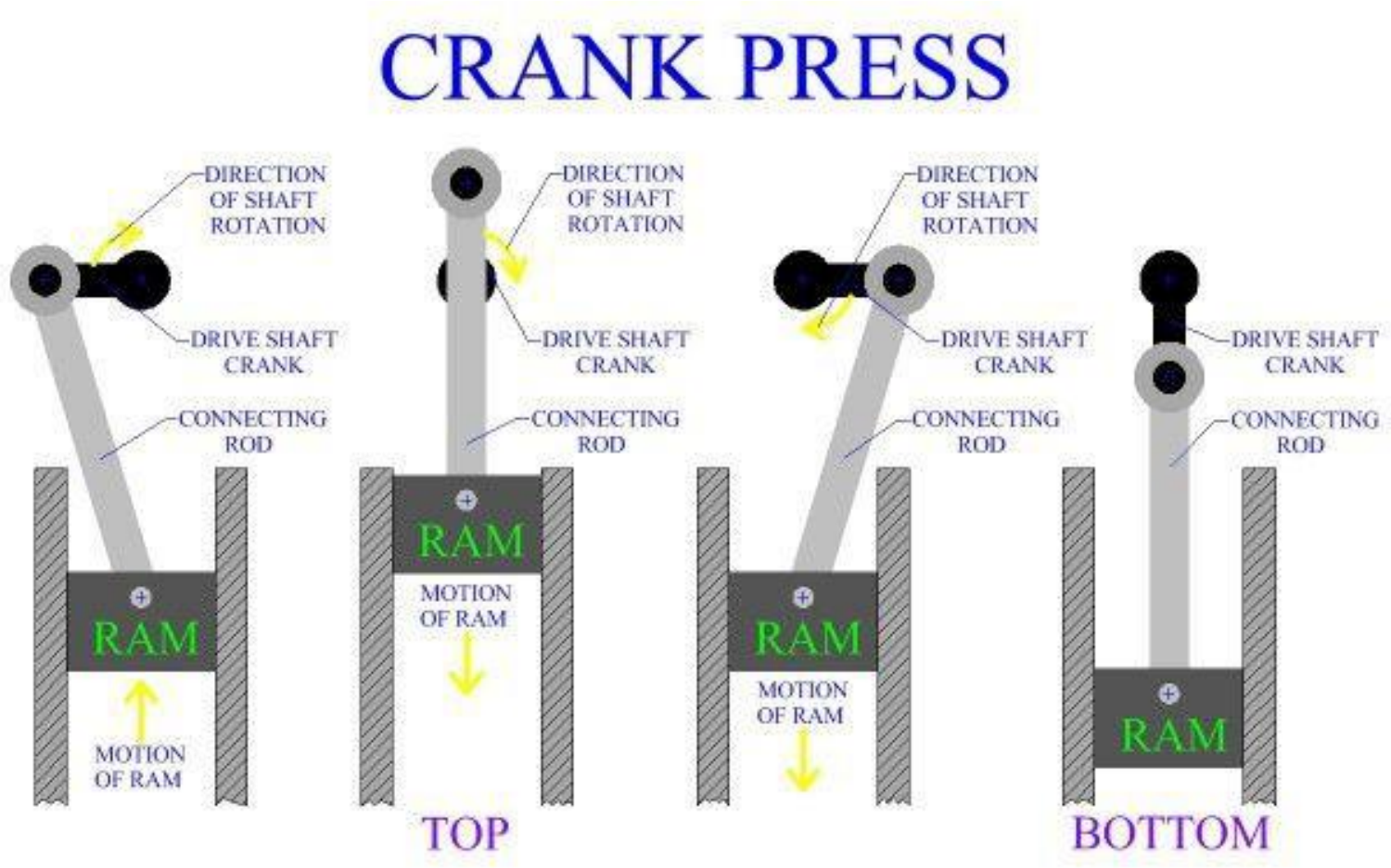
Forging hammers and presses

Presses



Forging hammers and presses

Presses



Forging hammers and presses

THANK YOU !!!