

## Types of forging II

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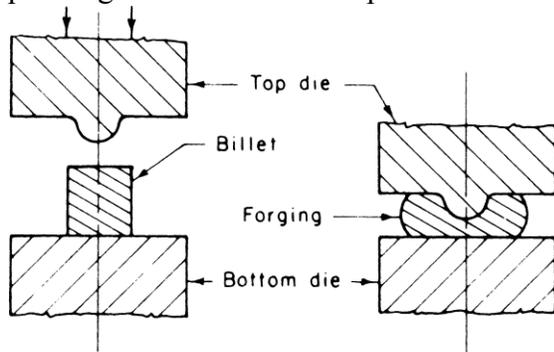
- Closed/impression die forging
- Electro-upsetting
- Forward extrusion
- Backward extrusion
- Radial forging
- Hobbing
- Isothermal forging
- Open-die forgig
- Upsetting
- Nosing

Commonly used materials include

- Ferrous materials: low carbon steels
- Nonferrous materials: copper, aluminum and their alloys

### Open-Die Forging

Open-die forging is a hot forging process in which metal is shaped by hammering or pressing between flat or simple contoured dies.



**Equipment.** Hydraulic presses, hammers.

**Materials.** Carbon and alloy steels, aluminum alloys, copper alloys, titanium alloys, all forgeable materials.

**Process Variations.** Slab forging, shaft forging, mandrel forging, ring forging, upsetting between flat or curved dies, drawing out.

**Application.** Forging ingots, large and bulky forgings, preforms for finished forgings.

### Closed Die Forging

In this process, a billet is formed (hot) in dies (usually with two halves) such that the flow of metal from the die cavity is restricted. The excess material is extruded through a restrictive narrow gap and appears as flash around the forging at the die parting line.

**Equipment.** Anvil and counterblow hammers, hydraulic, mechanical, and screw presses.

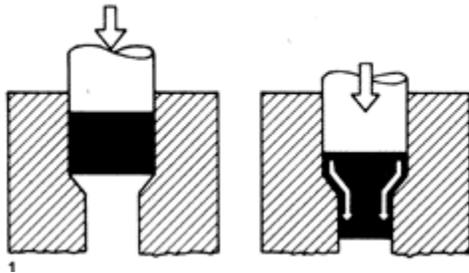
**Materials.** Carbon and alloy steels, aluminum alloys, copper alloys, magnesium alloys, beryllium, stainless steels, nickel alloys, titanium and titanium alloys, iron and nickel and cobalt super alloys.

**Process Variations.** Closed-die forging with lateral flash, closed-die forging with longitudinal flash, closed-die forging without flash.

**Application.** Production of forgings for automobiles, trucks, tractors, off-highway equipment, aircraft, railroad and mining equipment, general mechanical industry, and energy-related engineering production.

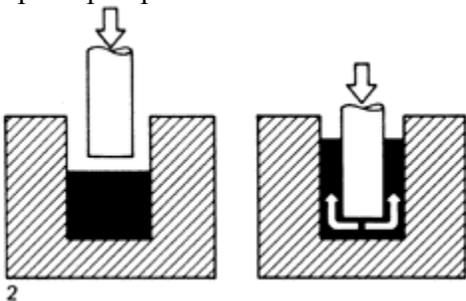
### Forward extrusion

Forward extrusion reduces slug diameter and increases its length to produce parts such as stepped shafts and cylinders.



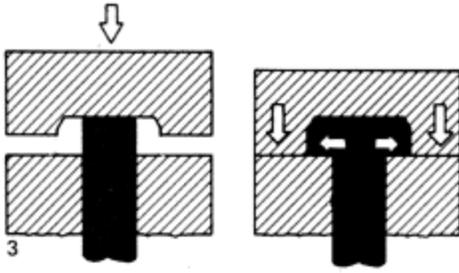
### backward extrusion

In backward extrusion, the steel flows back and around the descending punch to form cup-shaped pieces.



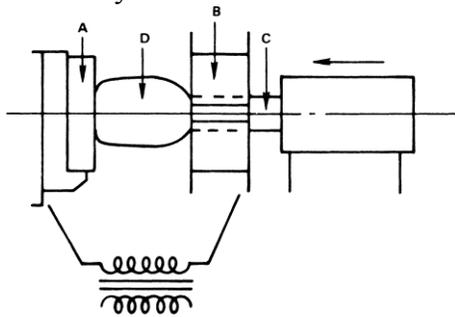
### Upsetting, or heading

Upsetting, or heading, a common technique for making fasteners, gathers steel in the head and other sections along the length of the part.



### Electro-Upsetting (Fig. 2.4)

Electro-upsetting is the hot forging process of gathering a large amount of material at one end of a round bar by heating the bar end electrically and pushing it against a flat anvil or shaped die cavity.



A, anvil electrode; B, gripping electrode; C, workpiece; D, upset end of workpiece

**Equipment.** Electric upsetters.

**Materials.** Carbon and alloy steels, titanium.

**Application.** Preforms for finished forgings.

### Hobbing

Hobbing is the process of indenting or coining an impression into a cold or hot die block by pressing with a punch.

**Equipment.** Hydraulic presses, hammers.

**Materials.** Carbon and alloy steels.

**Process Variations.** Die hobbing, die typing.

**Application.** Manufacture of dies and molds with relatively shallow impressions.

### Nosing

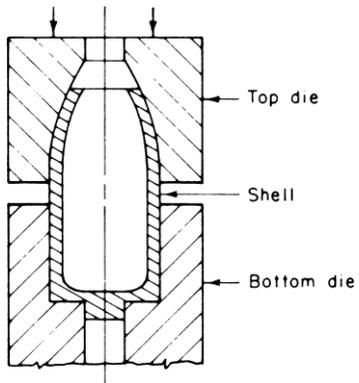
Nosing is a hot or cold forging process in which the open end of a shell or tubular component is closed by axial pressing with a shaped die.

**Equipment.** Mechanical and hydraulic presses, hammers.

**Materials.** Carbon and alloy steels, aluminum alloys, titanium alloys.

**Process Variations.** Tube sinking, tube expanding.

**Applications.** Forging of open ends of ammunition shells; forging of gas pressure containers.



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