

# SMITHY WORKSHOP WRITE-UP

**By ANEESH PANCHAL (2K20/A6/56)**

## **INTRODUCTION:**

The process of heating the material up to its plastic state and then applying external pressure to give the desired shape and size to material is known as Smithy or, Forging. It reduces any cavities or voids present in the material and thus make it dense.

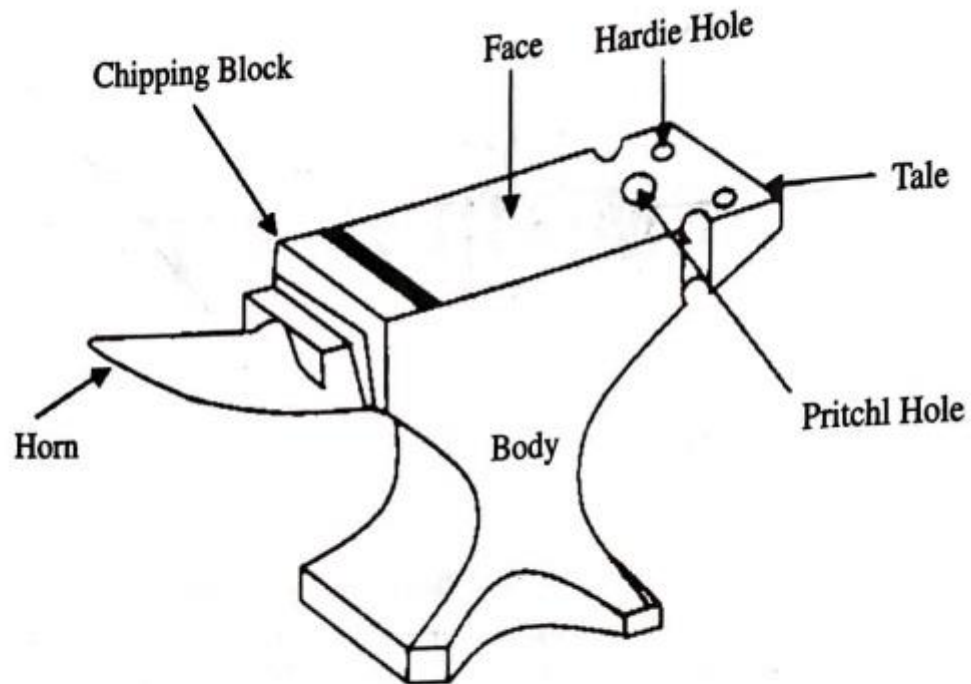


## **FORGING MATERIALS:**

Carbon steels, alloy steels, wrought iron, copper-based alloys, nickel-based alloys, aluminium alloys and magnesium alloys, etc. are forged easily. The low and medium carbon steels are forged easily, but the high carbon and alloy steels are more difficult and require greater care to forge.

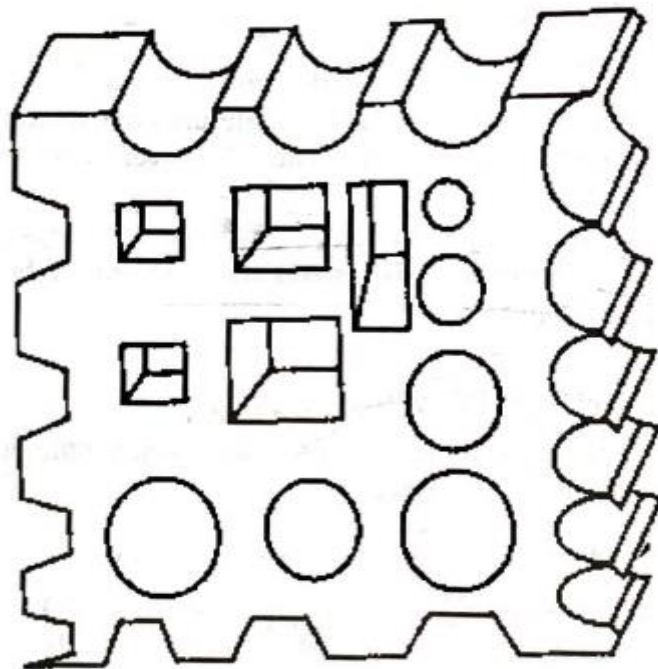
## TOOLS AND EQUIPMENT USED IN FORGING:

**a) Anvil:** Used as a supporting device for blacksmiths work when hammering. The body of the Anvil made of mild steel or wrought iron. Anvil weight is varying from 100 to 150 kg and height should stand about 0.75 m from the floor.



Anvil

**b) Swage Block:** It is also supporting device which have a number of slots and holes of different shapes and sizes along its four side faces.

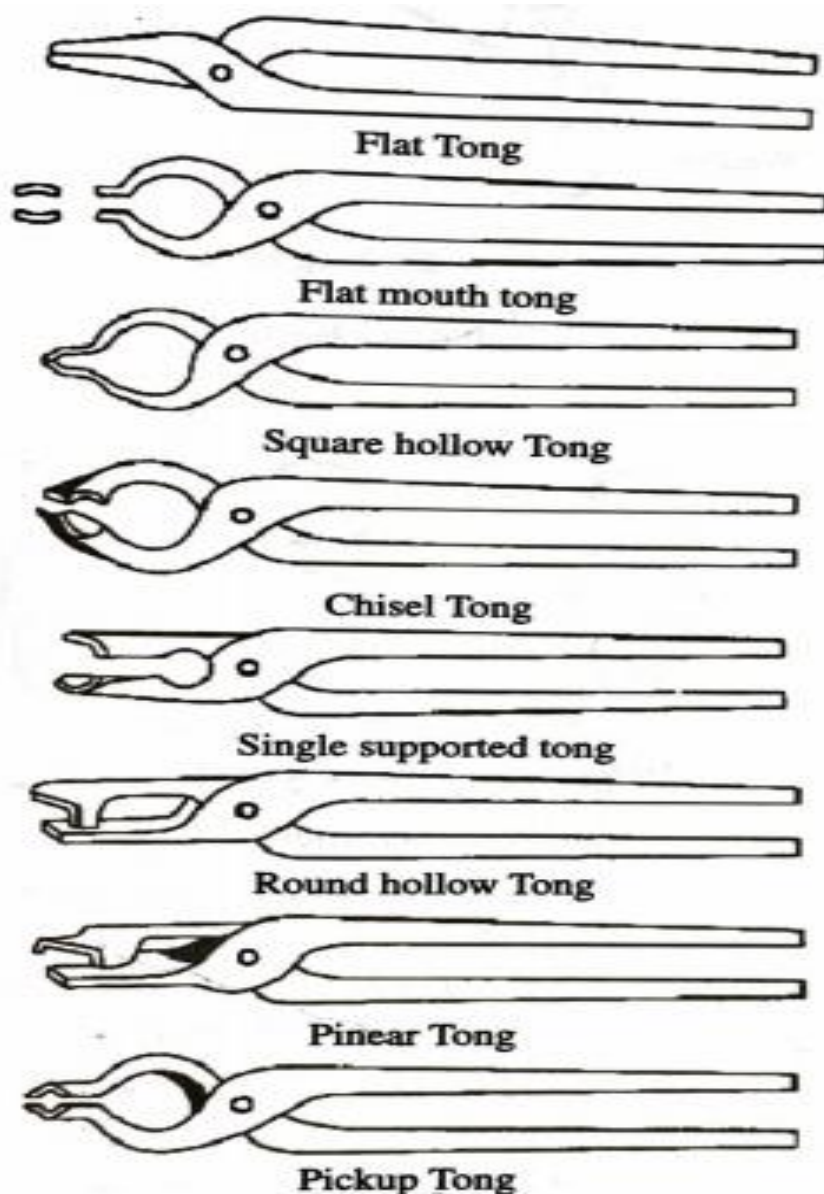


Swage Block

**c) Tongs:** It is a holding device used to support and grip the job while some operation is carried out. It is made of mild steel in 2 pieces, and are riveted together to form a hinge.

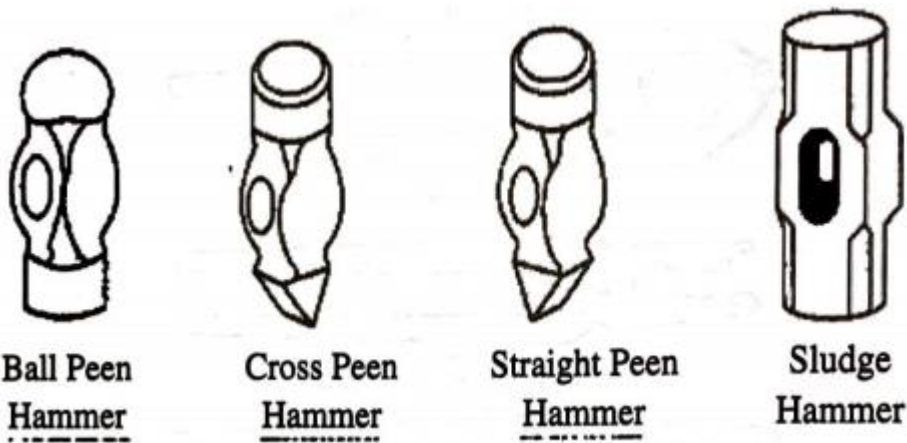
On the basis of applications, it may be classified as:

1. Flat Tong: Used for supporting and gripping of small flat objects.
2. Flat Mouth Tong: Used for supporting comparatively longer flat jobs.
3. Square Hollow Tong: Used for supporting and gripping of triangular and square jobs.
4. Chisel Tong: Used for unsymmetrical jobs and also known as belt tong.
5. Single Supported Tong: Used for supporting flat piece having more width.
6. Round Hollow Tong: Used for supporting and gripping of round objects in parallel direction.
7. Pinear Tong: Used for supporting and gripping of round objects in perpendicular directions.
8. Pickup Tong: Used for supporting and gripping of very small jobs.



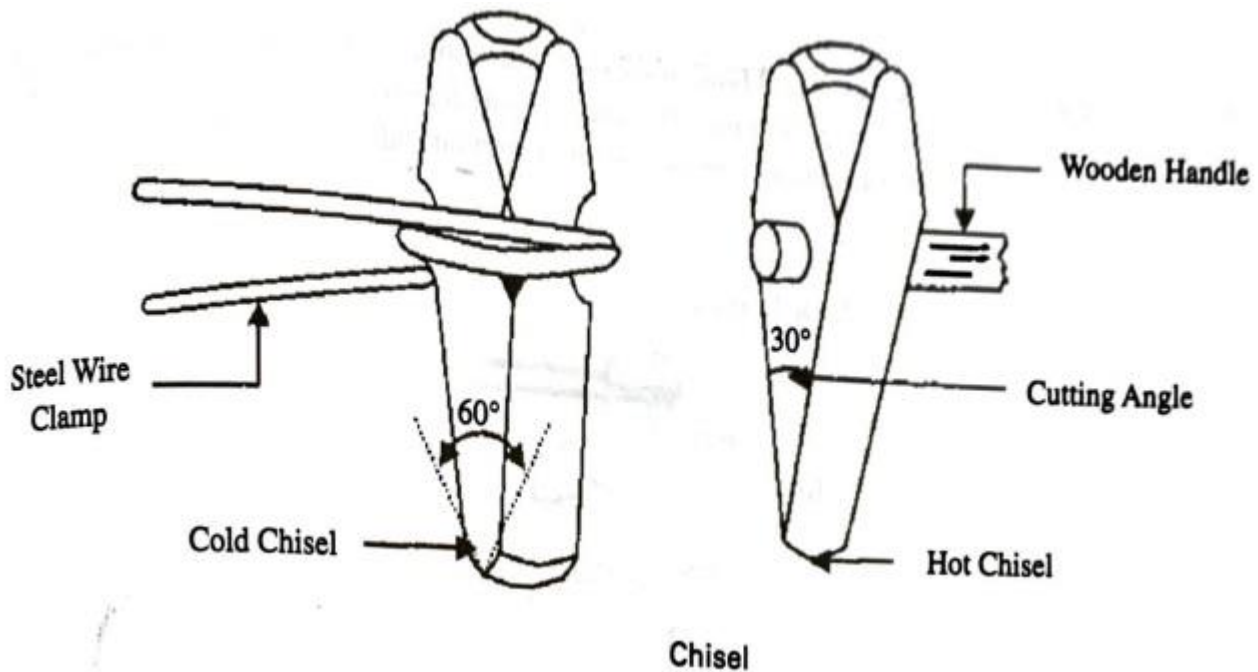
**d) Hammers:** Used to strike a tool or a job. Generally high carbon steel and alloy steel are used after hardening and tempering for hard face hammer.

1. **Ball Peen Hammer:** Used for riveting and chipping, etc. These are available from 100 to 900 g.
2. **Cross Peen Hammer:** Used for hammering, stretching and bending etc. These are available from 200 to 900 g.
3. **Straight Peen Hammer:** Used for stretching and peening etc. These are available from 100 to 900 g.
4. **Sledge Hammer:** It has double striking faces at both ends. It is generally used for heavy work in black smithy. Generally it is available from 2 to 10 kg.
5. **Power Hammers:** Some heavy hammers are operated by power other than manual power, are come under this category. These are used for heavy blows.



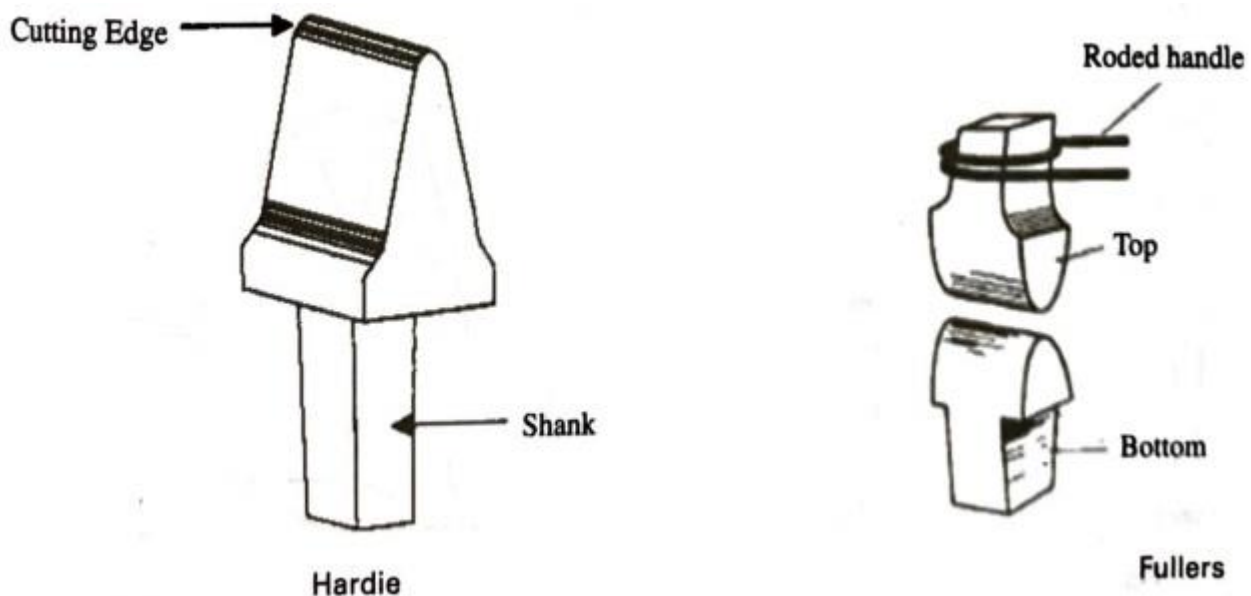
**e) Chisels:** Most widely used for cutting purpose.

1. **Hot Chisel:** This chisel is used to cut the metal in plastic stage, there is no need of hardening it. It is made of medium carbon steel or high carbon steel and its cutting angle is kept about 30 degrees. Hot chisel is used to cut the metal in plastic stage, there is no need of hardening it. Generally wooden handle is fitted in it.
2. **Cold Chisel:** It is similar to hot chisel but its length is generally kept more than hot chisel. It is made of high carbon steel and its cutting angle is usually kept about 60 degrees. It is used to cut the metal in cold stage, therefore it should be well hardened and tempered. It is specified by its cutting width and length. It is available with and without handle in market.



**f) Hardie:** It is provided a square shank, which help it to fix into hardie hole in anvil. It is made by high carbon steel and its cutting angle is kept about 45 degrees.

**g) Fullers:** Used for necking down or reducing the cross section of job. Fullers are available in various shapes and size according to needs. The size of fuller is specified by the width of fuller edge. These are made of high carbon steel.



**h) Swages:** After forging, finishing circular shape of job or for increasing the length of circular rod in circular shape, types of operation are performed by using swage. They are made by high carbon steel.



**i) Flatters:** Used for making surface more smooth and flat, which we have already been shaped by fullers and swages. It is made of high carbon steel with well hardened.

**j) Punch and Drift:** Punch is a tool used for making holes in a job which is at red hot condition. It is available in various size and shape i.e. round, elliptical, square and rectangular etc. Drift is also a large sized punch. These tools are made of high carbon steel.

**k) Set Hammer:** It is similar to flatter and is used for finishing corners and should work where the use of flatter is inconvenient. It is made of high carbon steel.

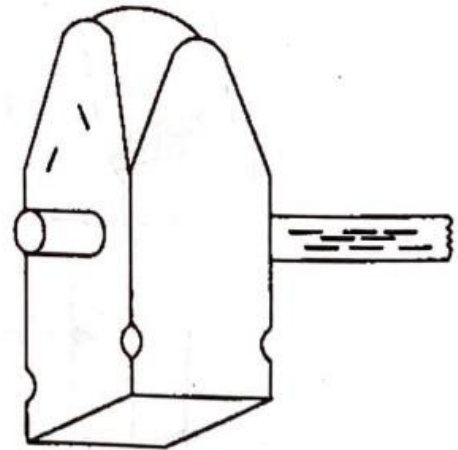


Punch



Drift

Set Hammer



Punch and Drift

## **FORGING TEMPERATURE OF DIFFERENT MATERIALS**

Forging temperature of mainly used materials are as:

1. Wrought Iron (850-1300 degree celcius)
2. Mild Steel (750-1300 degree celcius)
3. Medium Carbon Steel (750-1250 degree celcius)
4. High Carbon Steel (750-1150 degree celcius)
5. Stainless Steel (950-1200 degree celcius)
6. Brass, Copper, Bronze (550-900 degree celcius)
7. Aluminium, Magnesium (300-850 degree celcius)

## **FORGING OPERATIONS:**

1. **Upsetting:** It is the process of increasing the thickness of the job and reduce the length by the application of hammering operation.
2. **Drawing down:** It is the operation of increasing the length of the bar or job by reducing the thickness.
3. **Setting down:** It is the process of local thinning down the work-piece by hammering.
4. **Punching and Drifting:** It is the process of making holes on the work-piece. After punching, hole can be enlarged by hammering a tapered drift into the hole until the required bore size is reached.
5. **Bending:** It is one of the main operations to bend the work pieces as we required. It is carried out on the anvil by hammering.
6. **Forge Welding:** It is one of the method of joining the metals or bars by heating and hammering.
7. **Cutting Off:** Cutting off is a form of chiselling operation where by a long piece of stock is cut into several specified lengths.
8. **Fullering:** It is one of the process of spreading the metal along the length of the bar of work piece by hammering and in which the job is kept between fullers.

## **ADVANTAGES OF SMITH FORGING:**

1. The smith forging components have high strength and give great resistance to impact and fatigue loads.
2. It improves the grain structure of the metal so that its mechanical properties are also improved.
3. Better surface finishing can be easily achieved.
4. Raw material loss is almost nil.

## **DISADVANTAGES OF SMITH FORGING:**

1. It is very difficult to achieve the accurate dimensions.
2. Some metals may break while forging.
3. There are some limitations to achieve the shape and size of the job.

## WRITE UP / EXPERIMENT-IV

### AIM:

To make a chisel from a square heated rod using Smithy Forging.

### MATERIAL REQUIRED:

Square heated rod.

### TOOLS REQUIRED:

Blacksmith furnace, Tongs, Anvil, Hammers, Finishing Tools (Flatter etc.)

### SEQUENCE OF OPERATIONS:

1. Heating
2. Hammering
3. Forming octagonal shape
4. Tapering one end
5. Finishing
6. Checking and Cooling



Chisel (flat on one end) and  
chisel (point) on other end



## PROCEDURE(IN OWN WORDS):

1. First, half length of the bar stock was heated.
2. The heated end is put on the anvil (for the support), by holding the other end by the tongs with due care.
3. Hammering was carried out converting the square head to an circular headed bolt.
4. This operation can be done by hammering at a small angle and then constantly rotating the bar stock with tongs.
5. Now the remaining half of the bar length was heated with constant hammering on each edge, so as to form an octagonal shape.
6. Now, the end of octagonal bar was heated.
7. Forging to flat taper was done by hammering any 2 opposite faces.
8. The chisel was turned a quarter turn, and the narrow sides were hammered to make them parallel.
9. The blows were altered, four or five on the wider surface, then four or five on the narrow surface, until the chisel is in desired shape.
10. The chisel was then held in vertical and hammered on one end for finishing.
11. After the chisel was formed, heat treatment involving annealing and hardening was performed.
12. Finishing the top part of the chisel and cooling it.
13. The required chisel was then ready.

## RESULT:

The desired chisel is obtained through Smithy Forging Process.

**THANKS FOR READING !!!!!**