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Smithy and Forging

1) Introduction:

A black smith's work involves heating of a metal stock to a desired temperature enable it to acquire sufficient plasticity, followed by the operations like hammering, bending, pressing, etc. to give it the desired shape. This is known as forging. Hand forging is the term used for the process when it is done by means of hand tools. Similarly, forging done with the help of power hammers is known as power forging. When carried out by means of drop hammers or drop stamps as drop forging, and when carried out by means forging machine as machine forging..

2) Tool and Equipment used in Hand Forging:

i) Open hearth furnace:

It has a robust cast iron or steel structure consisting of four legs supports, an iron bottom known as hearth, a hood at the top and tyere opening into the hearth either from the rare or from the bottom. The hearth carries the coal, therefore provides with fire bricks lining to withstand the extensive heat produced due to combination of coal. Air, under pressure is supplied by blower, the chimney provided at the top enables easy escape of smoke and gasses produced due to burning of coal. A water tank is provided in front of forge, which carries water for the purpose of quenching.

ii) Anvil:

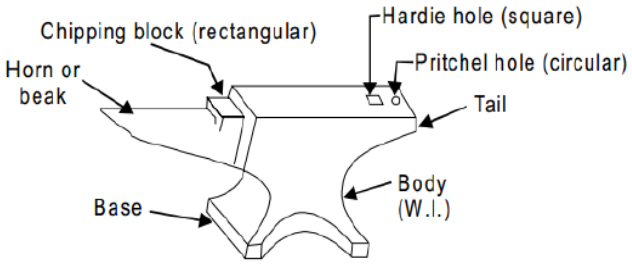

Fig.1. Anvil

It is evident that, in order to carry out forging operations successfully, a proper supporting device is needed which should be capable of withstanding heavy blows rendered to the job. Apart from supporting the work, during hammering, its construction helps in doing other forging operations successfully. As shown in fig.1 anvil body is generally made of steel, wrought iron or mild steel provided with a hardened top, about 20 to 25 mm thick. The horn or beak is used in bending the metal or forming curved shapes. The flat step provided, between the top and the horn, is used to support the jobs during cutting and is known as chipping block.

iii) Swage Block:

It is usually a block of cast steel or cast iron carrying a number of slots of different shapes and sizes along its four side faces and through holes, from its top face to bottom face, which also vary in shapes and sizes. This is used as a support in punching holes and forming different shapes.

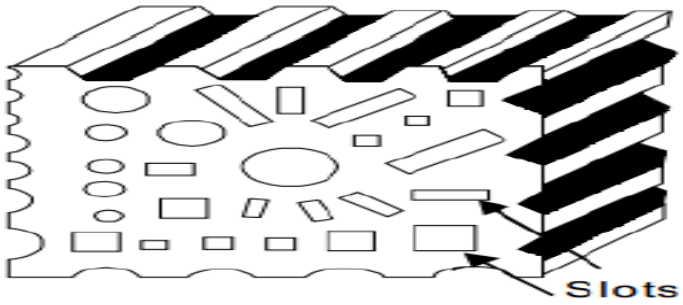

Fig. 2 Swage Block

iv) Hammers:

These are the principal striking tools, made of forged steel, used in forging work. A smith's hand hammer is small sized hammer used by smith himself and the sledge hammer is comparatively larger in size, heavier in weight. The weight of hand hammer varies from about 0.5 to 2 kg while the weight of sledge hammer varies from 4 kg to 10 kg.

v) Tongs: The work to be forged is generally held with tongs. The tongs (as shown in fig. 4) generally used for holding work are i) the gad tong used for general pick up work, either straight or tapered. ii) The straight- Lip fluted tong used for square, circular and hexagonal bar stock.

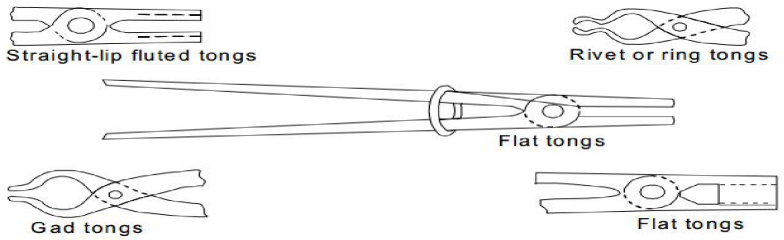

Fig.4 Types of Tongs

iii) The ring tong used for bolt, rivets and other work of circular section. Iv) The flat tong used for holding work of rectangular section

vi) Chisels:

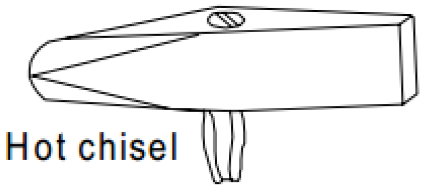

Fig.5 Hot Chisel

Chisels are used for cutting metals and for nicking prior to breaking. They may be hot or cold depending on whether the metal to be cut is hot or cold. The main difference between the two is in the edge. The edge of a cold chisel is hardened and tempered with an angle of about 60˚, whilst the edge of a hot chisel is 30˚and the hardening is not necessary. The edge is made slightly rounded for better cutting action.

vii) Swages:

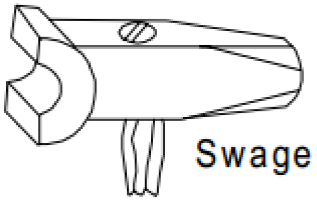

Fig. 6 Swages

Swages are used for work which has to be reduced and finished to round, square or hexagonal form. These are made with half grooves of dimensions to suit the work being reduced.

Swages consist of two parts the top part having the handle and the bottom part having a square shank which fits the hardie hole in the anvil face.

viii) Fullers:

Fullers are used for necking down a piece of work. They are made in top and bottom tools as in the case of the sewage. Fullers are made in various shapes and sizes according to the needs, the size denoting the width of the fuller edge.

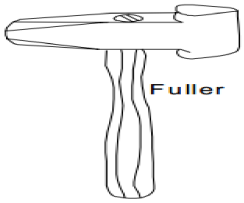

Fig. 7 Fuller

ix) Flatters:

Flatters are used to give smoothness and accuracy to the articles which ready been shaped by fullers and sewages.

x) Punch and Drift:

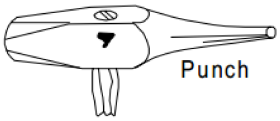

Fig. 8 Punch

A punch is used for making holes in metal part when it is at forging heat, and holes are opened out by driving through a larger tapered punch called a drift.

3) Advantages:

1) It refines the structure of the metal

2) It renders the metal stronger by setting the direction of the grains.

3) It effects considerable saving in time, labor and material as compared to the production of similar items by cutting from a solid stock and then shaping it.

4) Since, the production of articles with reasonable degree of dimensional accuracy is possible the machining operations can be avoided in most of the cases. This also results in considerable saving of time and labor.

4) Limitations:

1) The cost of initial setup is high.

2) The close tolerance under forging operations are difficult to maintain.

3) The metal get cracked or distorted if worked below a specified temperature.