UNIT - II

TURNING MACHINES

CENTRE LATHE :

A Lathe is a father of all machine tool It is the most Important machine used in any workshop.

The main function of a Lathe is to remove the metal from a piece of work to obtain the required shape and size.

The Parts to be machined Can be held b/w two rigid Supports Called live and dead Centres.

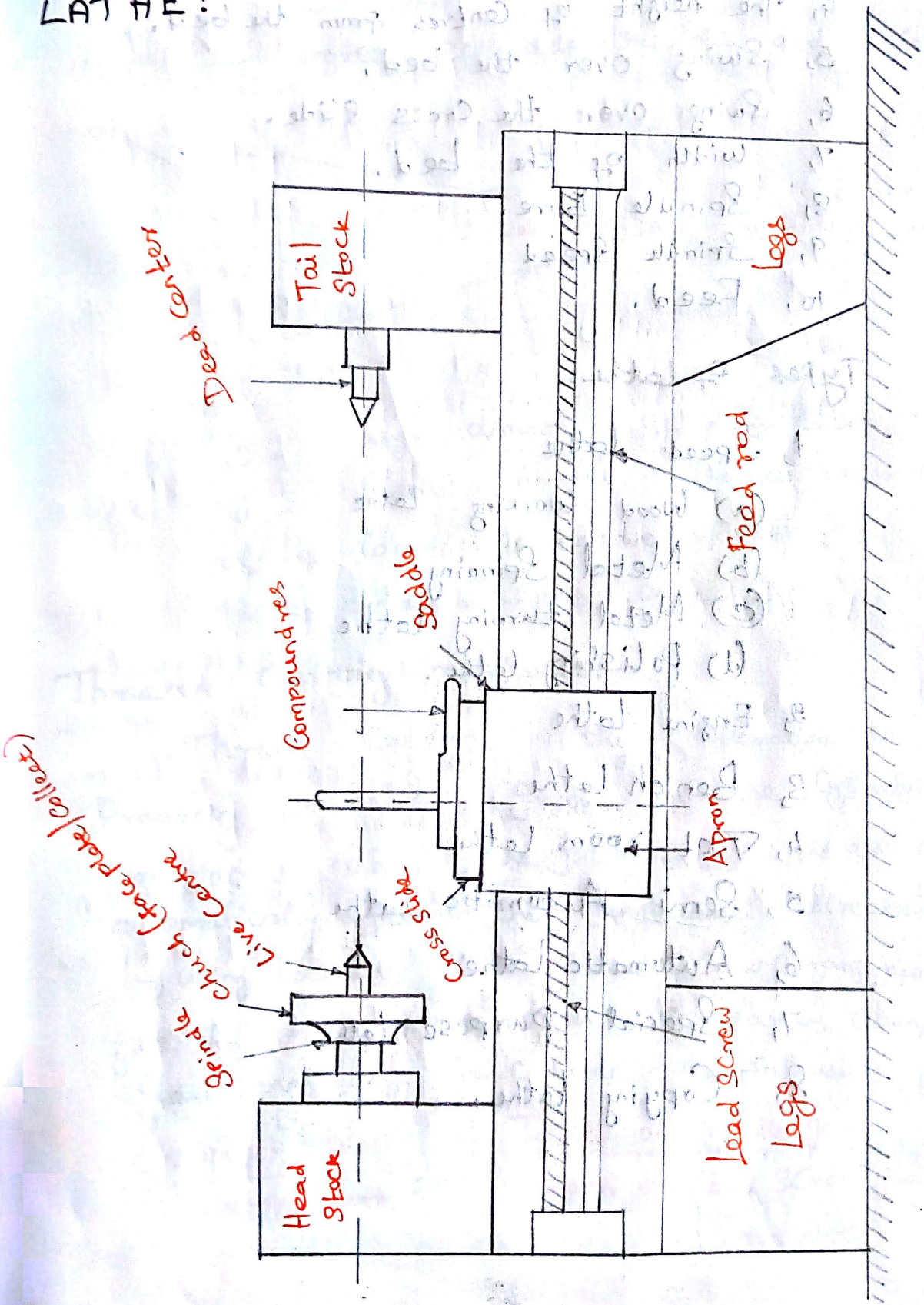
The following operations Can be done by using Lathe.

* 1, Turning
* 2, Taper Turning
* 3, Eccentric turning
* 4, Chamfering
* 5, Facing
* 6, Drilling
* 7, Boring
* 8, Reaming
* 9, tapping
* 10, knurling
* 11, Forming
* 12, Grooving
* 13, Polishing
* 14, Spinning and Thread Cutting.

Parts of the Lathe:

(i) Bed
(ii) Head Stock
(iii) Tail Stock
(iv) Carriage
(v) Feed Mechanism.

LATHE:



Specification of a Lathe:

1, The length of bed.
2, Maximum distance b/w dead live Centres.
3, Type of bed, i.e. Straight, Semi gap or gap type
4, The height of Centres from the bed.
5, Swing over the bed.
6, Swing over the Cross Slide.
7, Width of the bed.
8, Spindle bore.
9, Spindle Speed
10, Feed.

Types of Lathe:

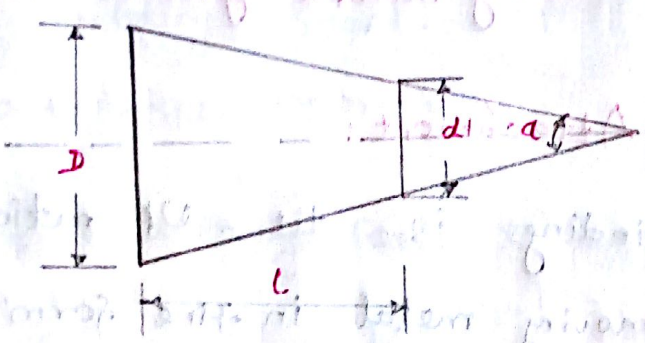
1, Speed lathe
   (a) Wood working lathe
   (b) Metal Spinning
   (c) Metal turning lathe
   (d) Polishing lathe.
2, Engine lathe
3, Bench lathe
4, Tool room lathe
5, Semi Automatic Lathe
6, Automatic Lathe
7, Special Purpose lathe
8, Copying lathe.

Taper Turning:

A taper is defined as the uniform change in the diameter of a workpiece measured along its length. Taper may be expressed in two ways.

(i) The ratio of difference in diameter to the length

(ii) In degrees of half the included angle.



D – Large diameter of the taper.
d – Small diameter of the taper
L – Length of tapered part
α – Half taper angle.

Thread Cutting methods:

Thread Cutting is the operation of producing a helical groove on the cylindrical workpiece. When the job rotates, the tool is automatically fed in the longitudinal direction by using Lockmut and Lead Screw arrangements.

The number of teeth on various change gears may be calculated as follows.

$$\frac{\text{Driver teeth}}{\text{Driven teeth}} = \frac{\text{Teeth on Spindle gear}}{\text{Teeth on Lead Screw gear}}$$

Special Attachments:

Milling Attachment:

Milling is the process of removing metal by moving the work against a rotating cutter is mounted on the tool holder called arbor. Milling Cutters have multipoint cutting edges

1) For Cutting grooves on keyways.
2) For Cutting multiple grooves and gear wheel

Grinding Attachment:

* Grinding is the Operation of removing metal in fine form of chips. It is done by moving the work against a rotating abrasive wheel.
* This abrasive wheel is known as grinding wheel. Both external and internal grinding can be cut by using special attachments on a lathe.
* The work is held b/w centres or on a chuck and rotated for grinding external surfaces.

Power Estimation:

Power is the product of cutting force and velocity. In machining process, the force component is the force in the direction of cutting speed.

Force Involved in orthogonal Cutting is the force component in the direction of cutting speed. Ex: Turning, facing, Parting-off operations.

W_c = Cutting force x Velocity of Cutting or Cutting Speed.

$$W_c = F_c \times V$$

W_c = Force in the direction of Cutting Speed.

F_c = Cutting force.

V = Velocity or Cutting Speed.

Due to Shear and friction,

* 1) Power due to Shear
* 2) Power due to friction.

Total power = Power due to Shear + Power due to friction

$$W_c = W_s + W_f$$

$$F_c \cdot V = F_s \times V_s + F_f \times V_f$$

Capstan and Turret Lathes:

The main parts of Capstan and turret lathes are as follows.

1) bed
2) Head Stock
3) Turret head and Saddle
4) Cross Slide.

1) Bed:

Bed is the base part of the lathe. It is a box type which is made of Cast iron.

2) Cross Slide

1) Reach over type
2) Side hung type.

3) Head stock:

Headstock of Capstan and turret Lathe is similar to a head in ordinary Centes lathes but larger and behavier in Construction to house the Spindle and driving mechanism.

Pre-Selective head stock

4) Saddle
5) Turret head.

Automatic Lathes:

* Automatic lathes or simply automats are machines tools in which all operations required to finish off the workpiece are automatically done without the attention of an operator.

* These m/c are meant for producing idential parts without the participation of an operator.

Advantages of Automatic Lathes:

1, Mass production of identical parts is highly achieved.
2, High accuracy is maintained.
3, Time of production is minimized.
4, less floor space is required
5, Constant flow of production occurs.

Classification of Automatic Lathes:

1, Classification according to the type of work material used:
   a, Bar stock mechanism
   b, Chucking machines.
2, Classification according to the number of spindles:
   a, Single spindle automates
   b, Multi spindle automates
3, Classification according to the arrangement of spindles:
   a, Horizontal spindle type
   b, Vertical spindle type.

Single Spindle Automatic lathes:

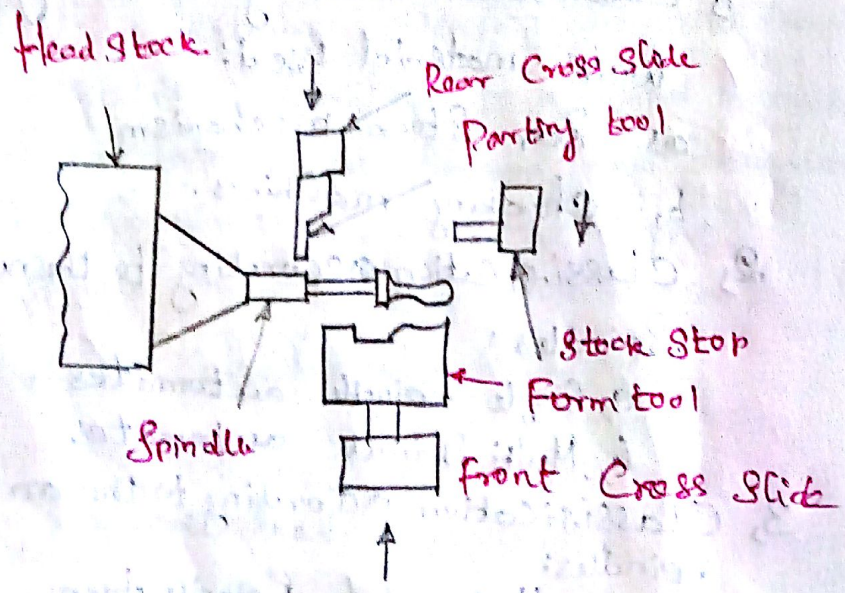
A Single Spindle automatic lathe is a modified form of turret lathe. These machines have an addition to a 6 - Station or 8 - Station turret, a maximum of 4 Cross Slides.

The following types of Single Spindle automatic lathe are mostly used

1. Automatic Cutting off M/c
2. Automatic Screw cutting M/c
3. Swiss type automatic Screw M/c.

1. Automatic Cutting off Machine:

These machines are simple in design and they are used for Producing large quantities of parts of Smaller diameter and shorter lengths.



Swiss Type Automatic Lathes:

This type of automatic Lathe is suitable for small parts but they should be long and slender parts such as parts of Wriswatches.

There is a distinct difference b/w Conventional automatic lathes and Swiss type Automatic lathes.

Parts:

1. Sliding Head Stock
2. Tool bracket
3. Feed Base
4. Cam Shaft

Advantages of Swiss type screw machine:

1. It is used to manufacture precision turning of small parts.
2. It has five tool slides
3. wide range of speeds is available
4. It is rigid in construction
5. Micrometer tool setting is possible
6. Simple design of cams is enough
7. Tolerance of 0.005 to 0.0125mm is obtained.

Single Spindle Automatic Screw Cutting M/c

* These machines are essentially automatic bar type turret lathes.
* They are widely used for production of all sorts of small turned parts
* It mainly consists of a cross slide and turret.
* Two cross slides, one front cross slide and another rear cross slide are provided for cross feeding tools.
* The turret slide is placed at the right end of the bed.
* It carries the turret having six tool holes.
* The various tools used in the machine are mounted arround the turret in a vertical plane in line with the spindle.

Applications:

1) Producing small jobs.
2) Screws
3) Stepped pins
4) Tapper bins
5) bolts.

Multiple Spindle Automatic Lathes

Multiple Spindle automatic lathes are machines which can produce larger workpieces than single spindle automats.

The principle advantages of Multi Spindle automat is that it has a tool slide working simultaneously on the jobs on all spindles and hence, the time for producing a piece is the time for the longest cut.

Classification of Multispindle Automatic Lathes:

1) According to the type of workpiece (stock) used:
   a) Bar type machine
   b) Chucking type m/c
2) According to the type of arrangement Spindle
   a) Horizontal Spindle type
   b) Vertical Spindle type.
3) According to the Principle of operation.
   a) Parallel action type
   b) Progressive action type.