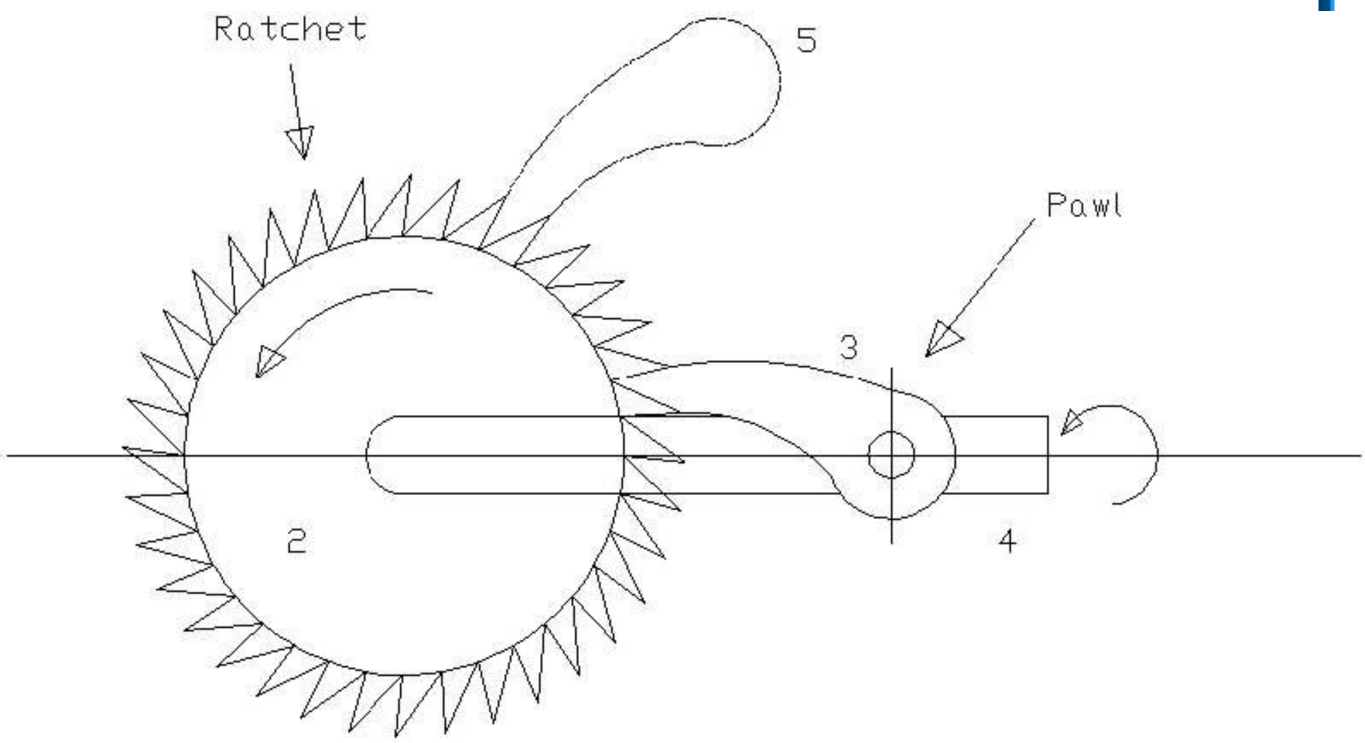
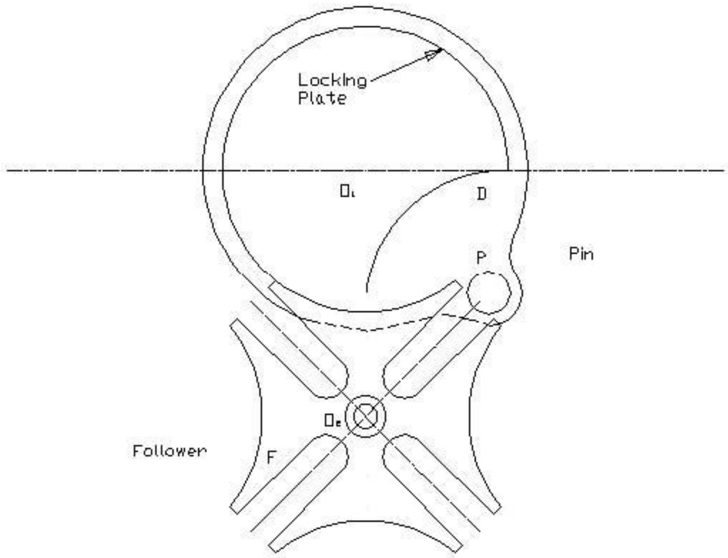
Rocking Mechanism

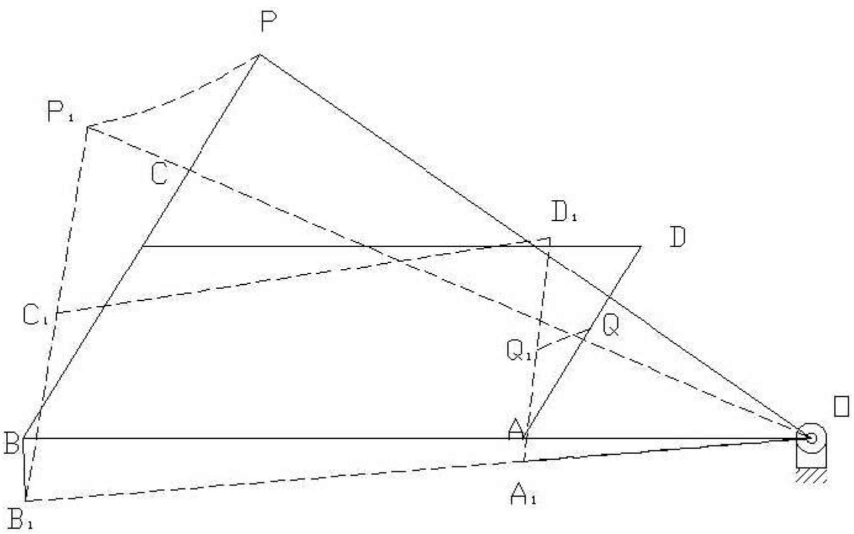
- **1. Ratchet and Pawl mechanism:** This mechanism is used in producing intermittent rotary motion member. A ratchet and Pawl mechanism consists of a ratchet wheel 2 and a pawl 3 as shown in the figure. When the lever 4 carrying pawl is raised, the ratchet wheel rotates in the counter clock wise direction (driven by pawl). As the pawl lever is lowered the pawl slides over the ratchet teeth. One more pawl 5 is used to prevent the ratchet from reversing. Ratchets are used in feed mechanisms, lifting jacks, clocks, watches and counting devices.



- **2. Geneva mechanism:** Geneva mechanism is an intermittent motion mechanism. It consists of a driving wheel D carrying a pin P which engages in a slot of follower F as shown in figure. During one quarter revolution of the driving plate, the Pin and follower remain in contact and hence the follower is turned by one quarter of a turn. During the remaining time of one revolution of the driver, the follower remains in rest locked in position by the circular arc.



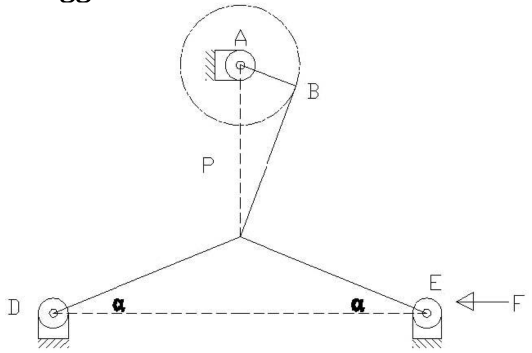
- **3. Pantograph:** Pantograph is used to copy the curves in reduced or enlarged scales. Hence this mechanism finds its use in copying devices such as engraving or profiling machines.



This is a simple figure of a Pantograph. The links are pin jointed at A, B, C and D. AB is parallel to DC and AD is parallel to BC. Link BA is extended to fixed pin O. Q is a point on the link AD. If the motion of Q is to be enlarged then the link BC is extended to P such that O, Q and P are in a straight line. Then it can be shown that the points P and Q always move parallel and similar to each other over any path straight or curved. Their motions will be proportional to their distance from the fixed point. Let ABCD be the initial position. Suppose if point Q moves to Q1 , then all the links and the joints will move to the new positions (such as A moves to A1 , B moves to

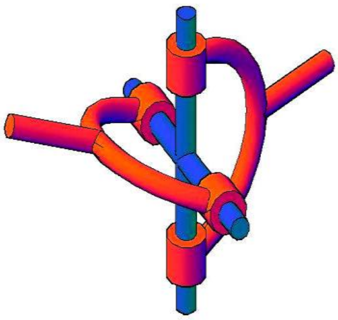
Q1, C moves to Q1 , D moves to D1 and P to P1) and the new configuration of the mechanism is shown by dotted lines. The movement of Q (Q Q1) will be enlarged to PP1 in a definite ratio.

- **4. Toggle Mechanism:**



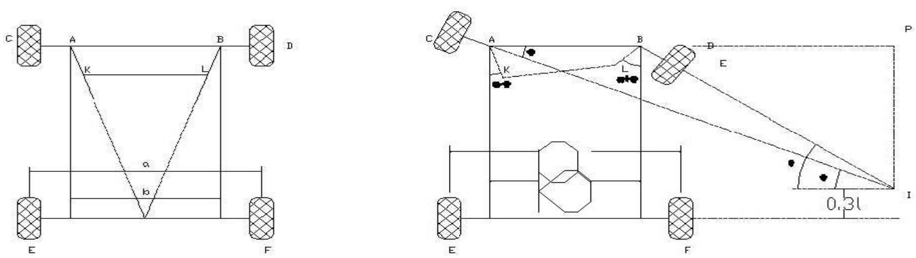
In slider crank mechanism as the crank approaches one of its dead centre position, the slider approaches zero. The ratio of the crank movement to the slider movement approaching infinity is proportional to the mechanical advantage. This is the principle used in toggle mechanism. A toggle mechanism is used when large forces act through a short distance is required. The figure below shows a toggle mechanism. Links CD and CE are of same length. Resolving the forces at C vertically **F Sin α =P Cos α 2** Therefore, F = P . (because Sin α/Cos α = Tan α) 2 tan α Thus for the given value of P, as the links CD and CE approaches collinear position (αO), the force F rises rapidly.

- **5. Hooke's joint:**



Hooke's joint used to connect two parallel intersecting shafts as shown in figure. This can also be used for shaft with angular misalignment where flexible coupling does not serve the purpose. Hence Hooke's joint is a means of connecting two rotating shafts whose axes lie in the same plane and their directions making a small angle with each other. It is commonly known as Universal joint. In Europe it is called as Cardan joint.

- **5. Ackermann steering gear mechanism:**



This mechanism is made of only turning pairs and is made of only turning pairs wear and tear of the parts is less and cheaper in manufacturing. The cross link KL connects

two short axles AC and BD of the front wheels through the short links AK and BL which forms bell crank levers CAK and DBL respectively as shown in fig, the longer links AB and KL are parallel and the shorter links AK and BL are inclined at an angle α. When the vehicles steer to the right as shown in the figure, the short link BL is turned so as to increase α, where as the link LK causes the other short link AK to turn so as to reduce α. The fundamental equation for correct steering is, **$\cot\Phi - \cos\theta = b / l$**
In the above arrangement it is clear that the angle Φ through which AK turns is less than the angle θ through which the BL turns and therefore the left front axle turns through a smaller angle than the right front axle. For different angle of turn θ, the corresponding value of Φ and (Cot Φ – Cos θ) are noted. This is done by actually drawing the mechanism to a scale or by calculations. Therefore for different value of the corresponding value of and are tabulated. Approximate value of b/l for correct steering should be between 0.4 and 0.5. In an Ackermann steering gear mechanism, the instantaneous centre I does not lie on the axis of the rear axle but on a line parallel to the rear axle axis at an approximate distance of 0.3l above it.

Three correct steering positions will be:

1) When moving straight. 2) When moving one correct angle to the right corresponding to the link ratio AK/AB and angle α. 3) Similar position when moving to the left. **In all other positions pure rolling is not obtainable.**