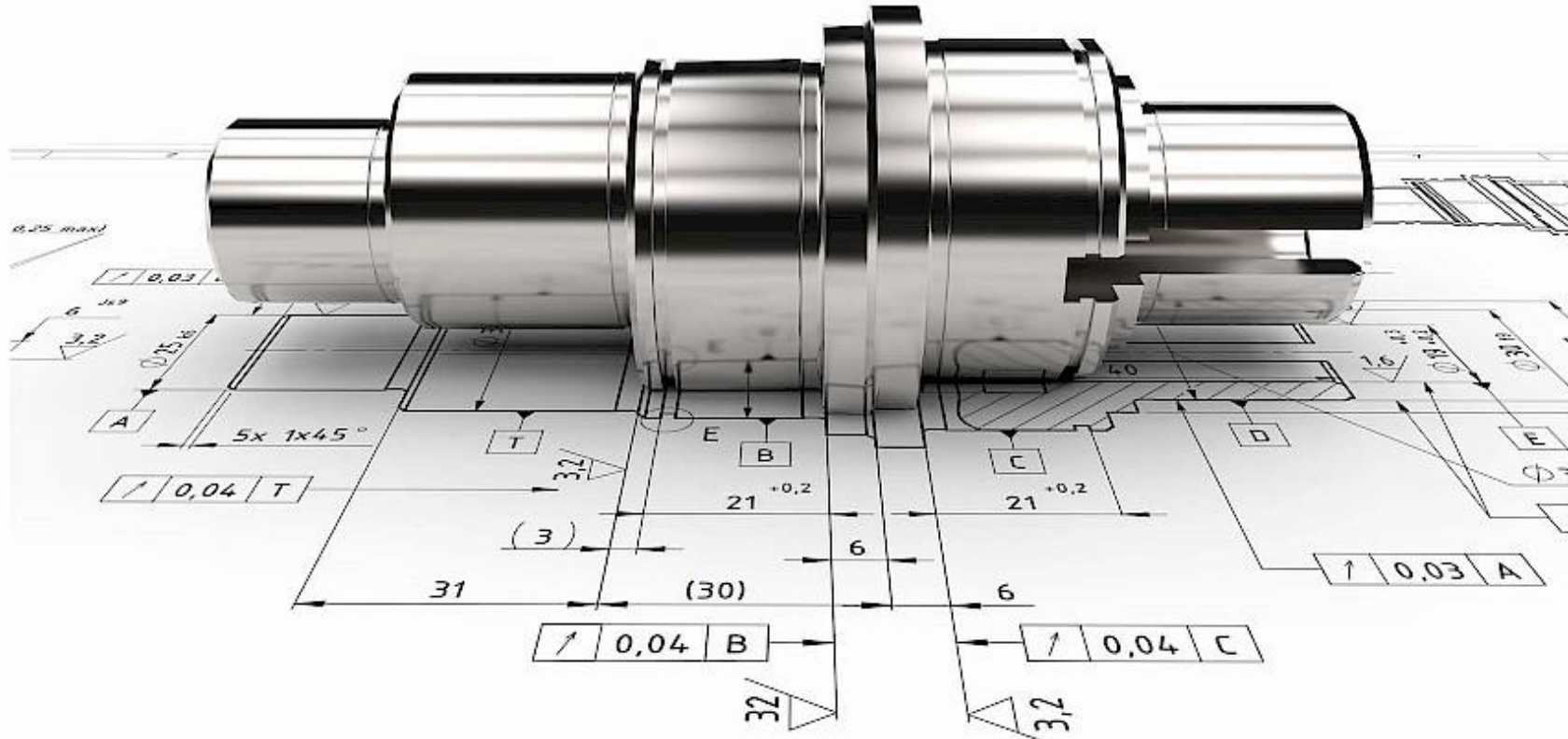
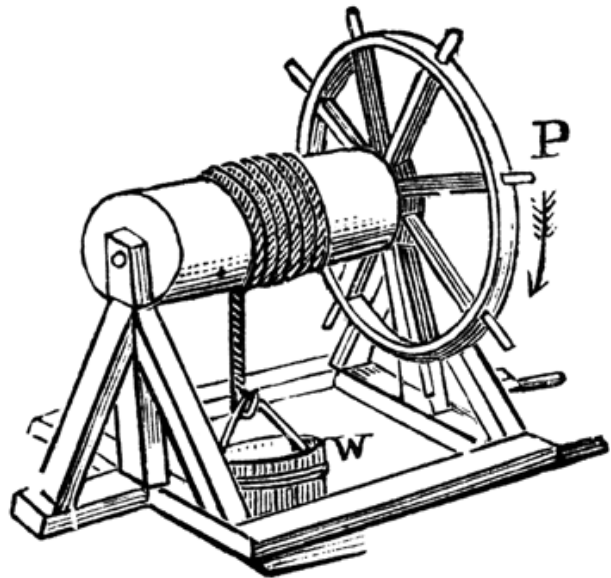


# Shafts, axels



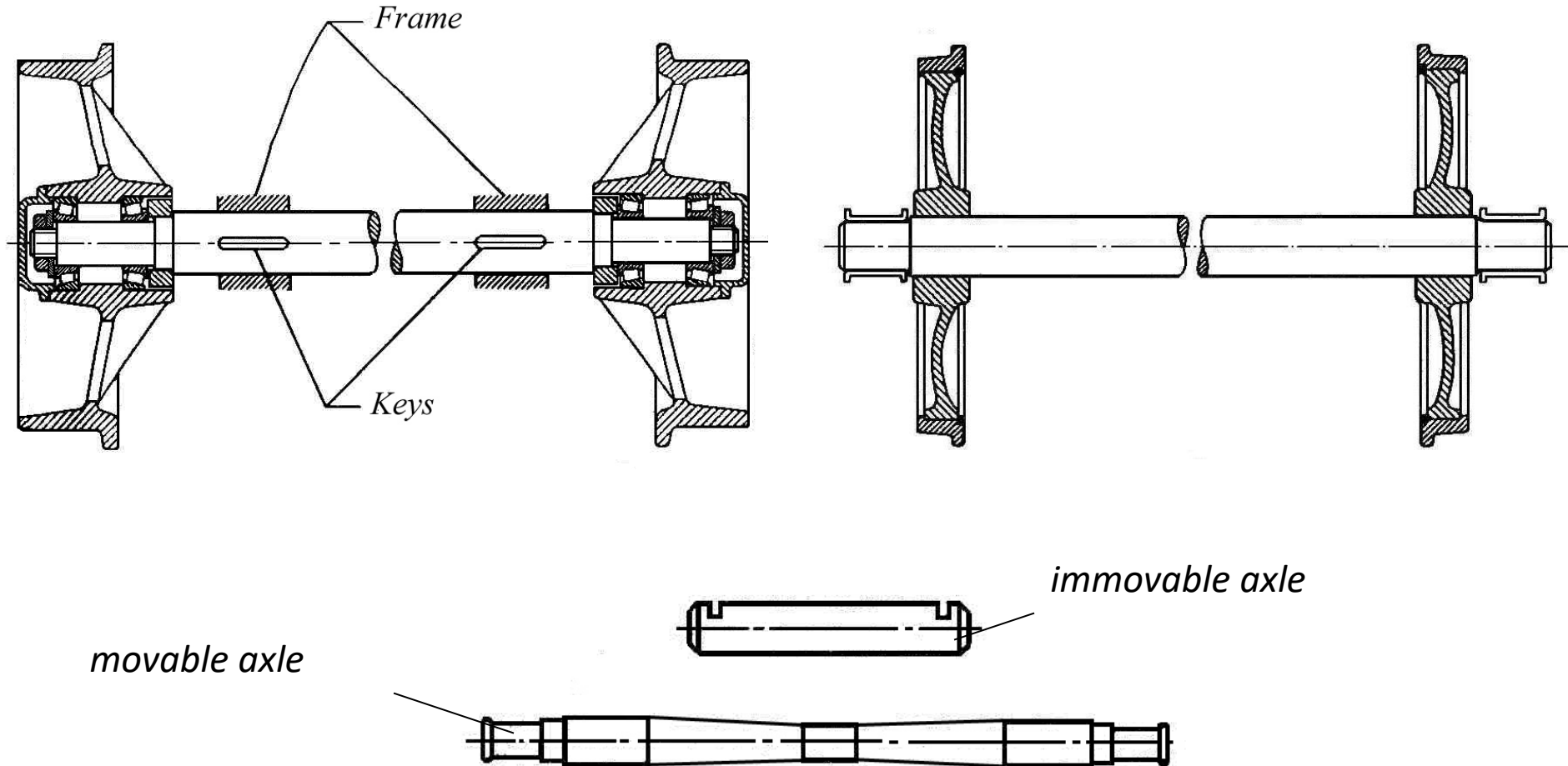
Gears, pulleys, sprockets and other rotating parts of machinery are mounted on shafts or axles

**Shaft** is a rotating member and it provides axis of rotation for gears, pulley, sprockets.



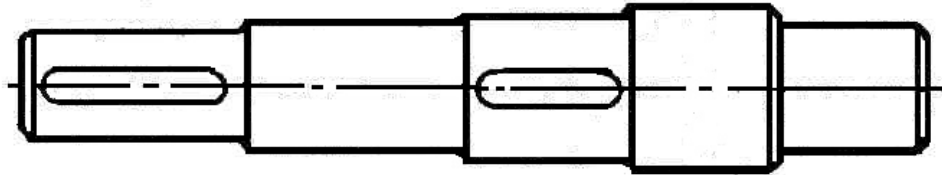
**Axel** is non rotating member, carries no torque and it is used to support rotating wheels.

**Axles** are intended to support rotating parts that do not transmit torques and are subjected to bending only.

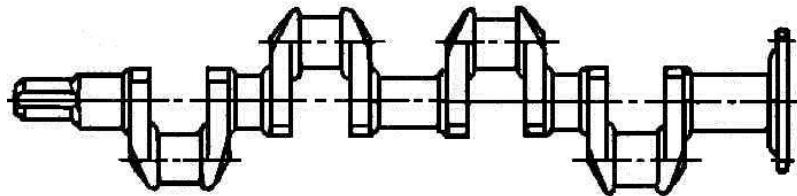


**Shafts** are designed to carry links which transmit torques and experience both bending and torsion.

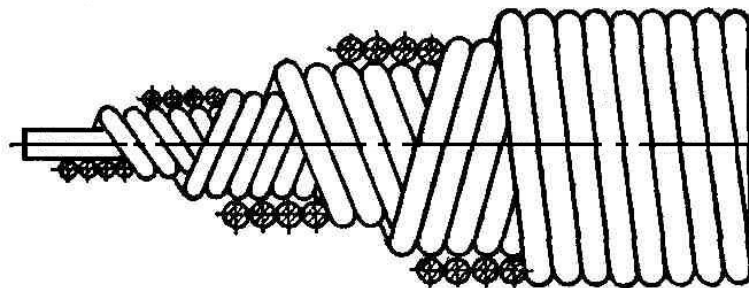
*Straight shafts*

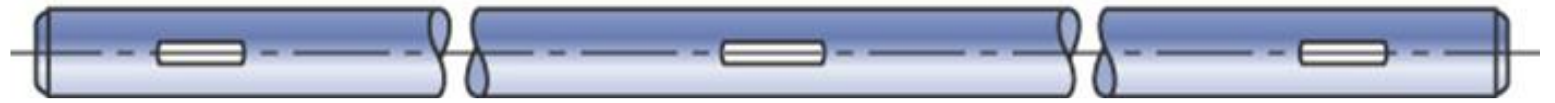


*Cranked shafts*

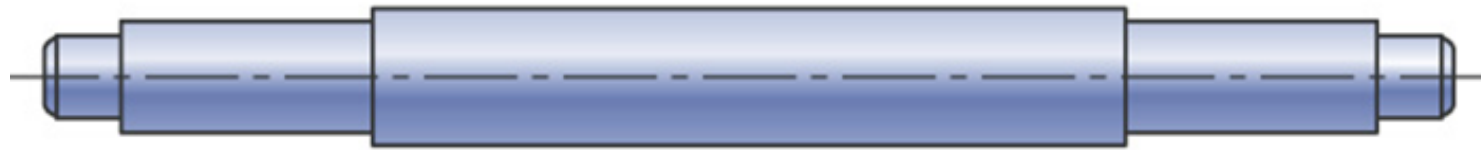


*Flexible shafts*





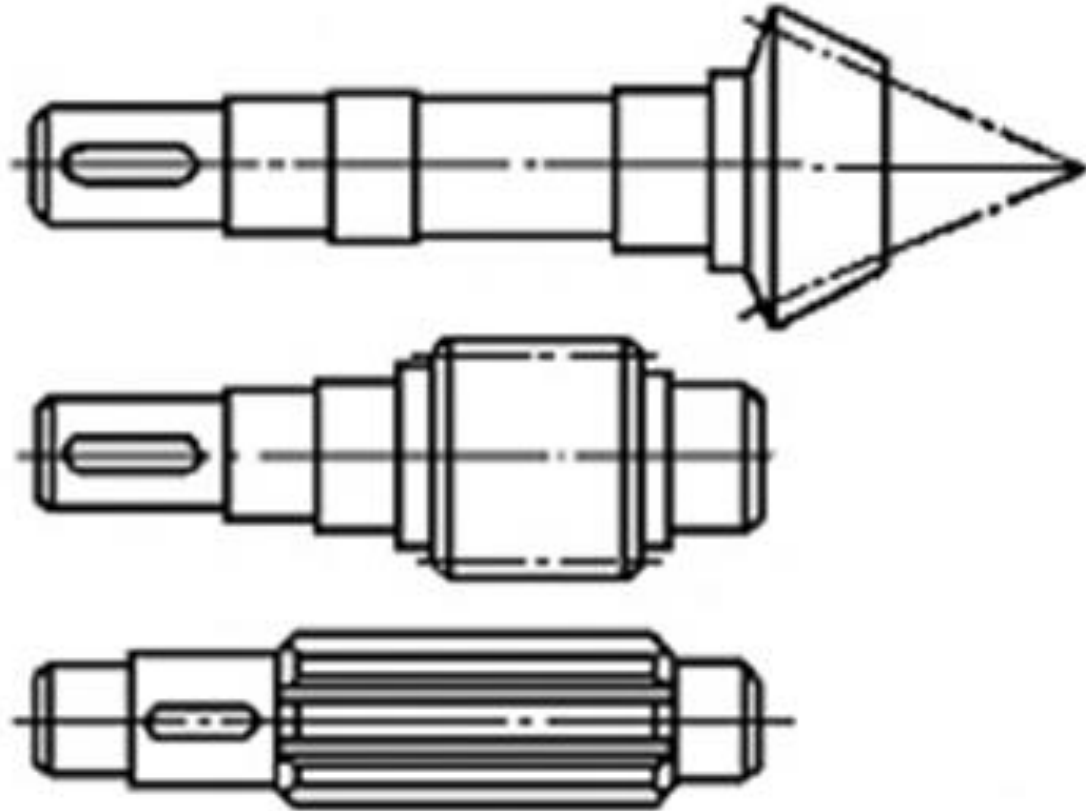
**Plain (not stepped) shaft.** Shafts of constant cross section. Plain shafts are lighter, the cost are lower, simple installation, higher rotational speed, longer fatigue-free service and life of their elements, greater and better shock resistance.



**Stepped shaft.** Shafts of variable cross section. High torsional rigidity (the shaft is subjected to high torsion which can result in severe twisting and ultimately failure of the system. In order to overcome this, the shaft is manufactured with steps on it, so that the major portion of the torsion can be particularly diverted to a particular step). Facilitates installation of parts on the shaft.



# Shafts made solid with gears or worms

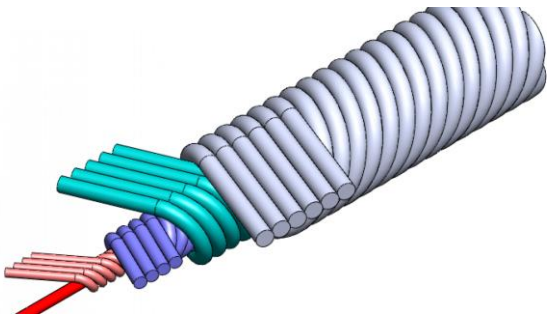




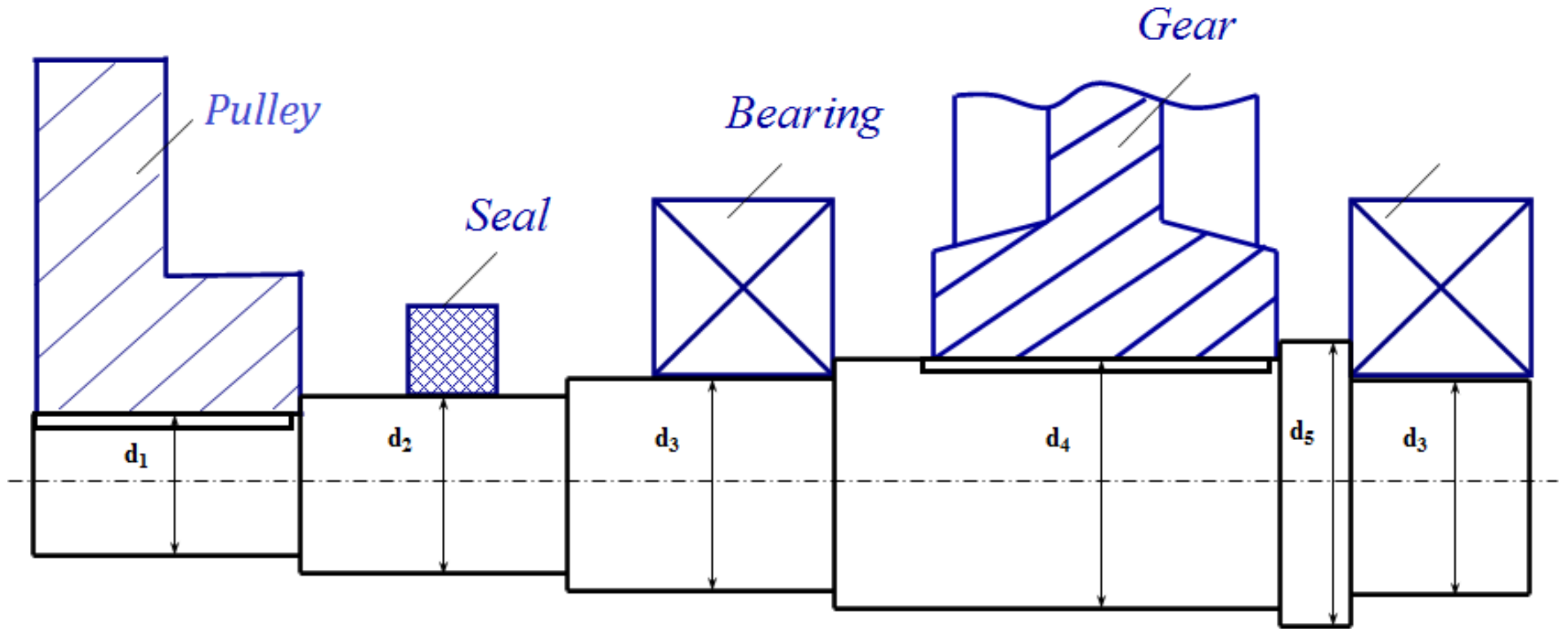
Some shafts do not support the rotating parts

**Crankshaft**, for converting reciprocating motion into rotary motion or vice versa

**Flexible shaft**, for transmitting rotary motion between two objects which are not fixed relative to one another.

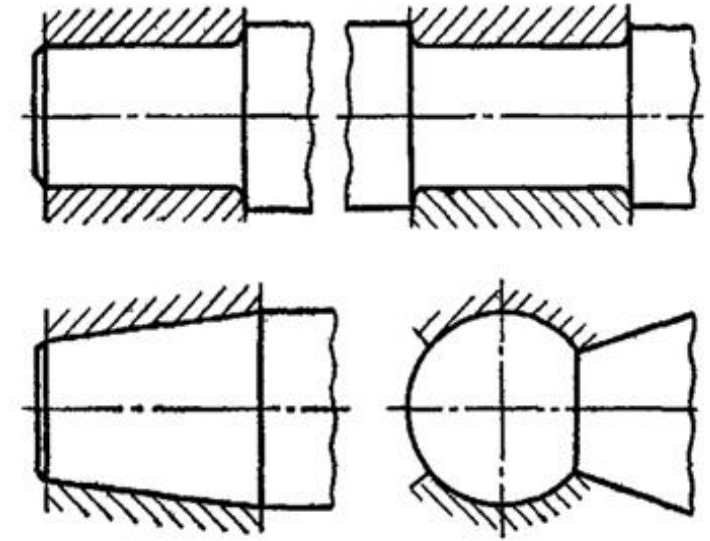
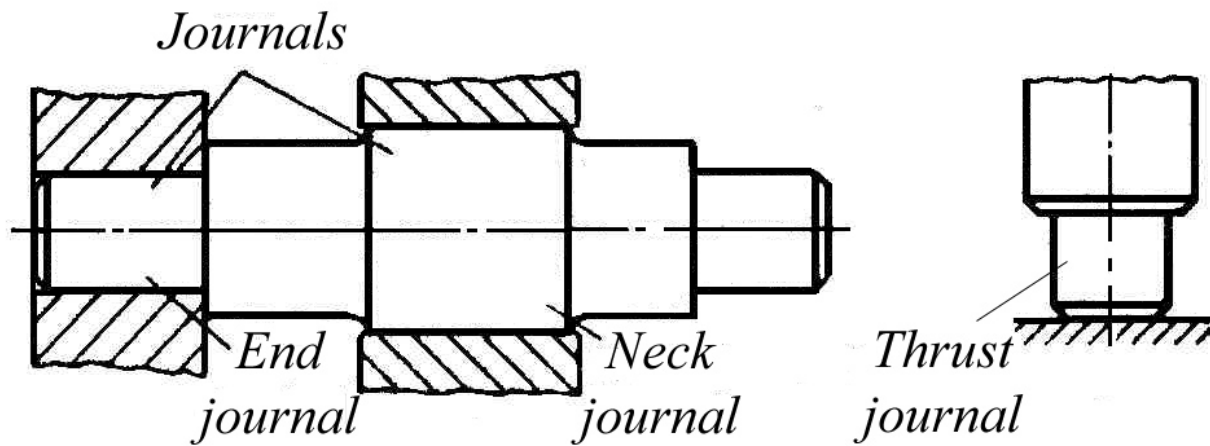


# THE SHAFT CONSTRUCTION





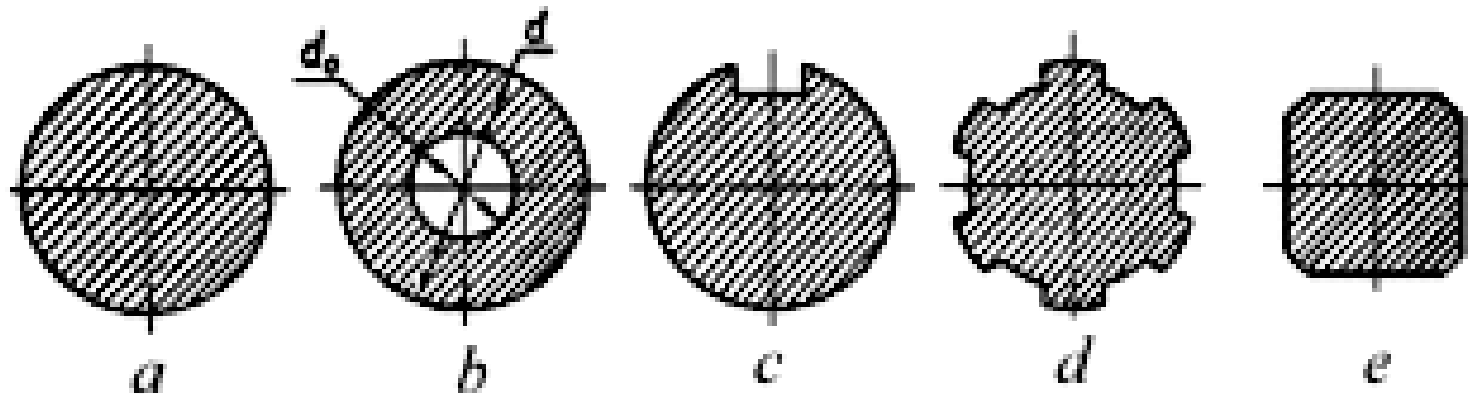
Portion of the shaft which is in contact with a bearing is called **journal**. We will distinguish between **end journal**, **neck journal** and **thrust journal**.

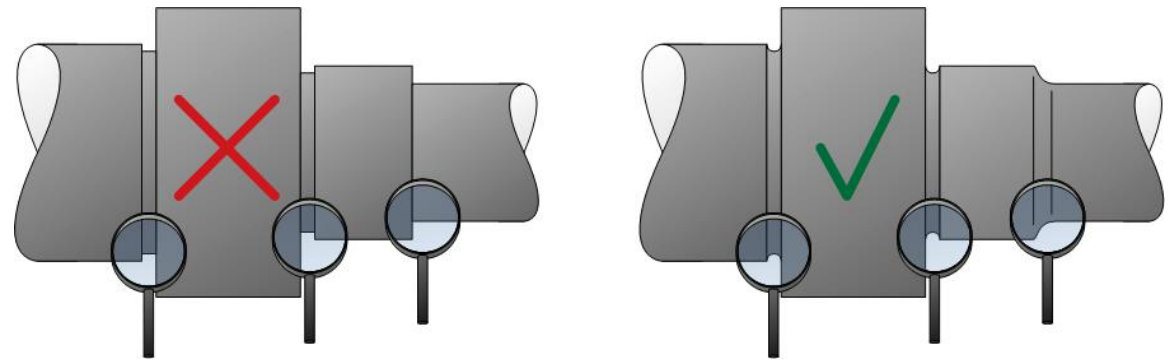
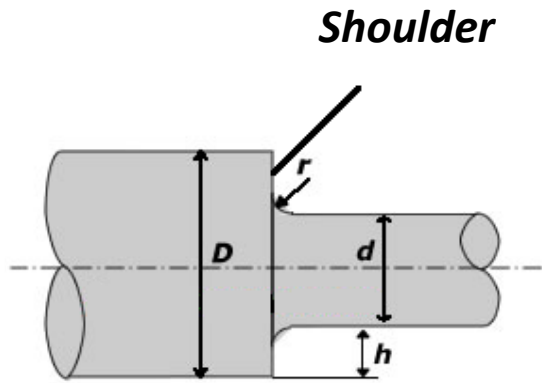


**Shaft journals** can be in the form of various bodies of revolution: cylindrical, conical or spherical. End journal and neck journal are most often made in the form of a cylinder

According to the shape of the cross section

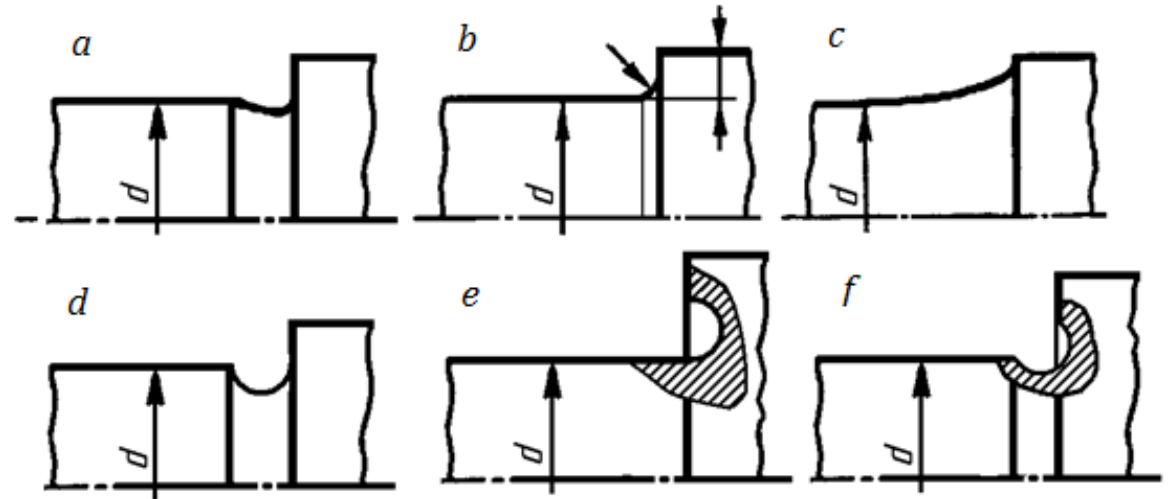
- a. Shafts with ***solid circular*** cross section;
- b. Shafts with ***hollow circular*** cross section;
- c. Shafts with ***keyways***;
- d. Shafts with ***splines***;
- e. Shafts with ***special form*** cross section.





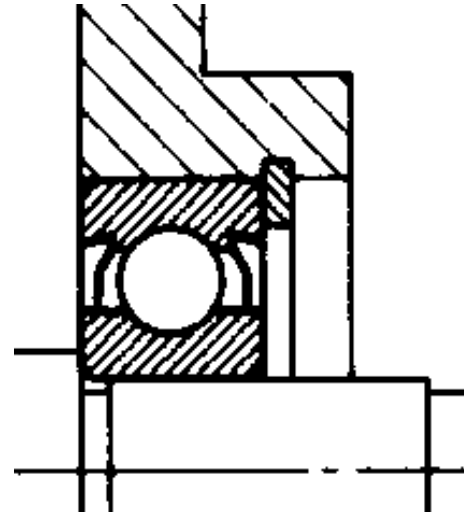
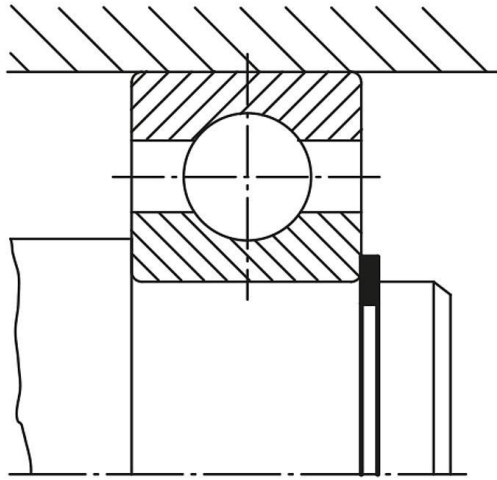
**Fillet** - transition surface from the cylindrical part of the shaft to the shoulder (b, c, e)

**Groove** - small deepening on the cylindrical surface of the shaft (a, d, f)



Small radius , large radius, undercut

***Retaining rings*** are often used instead of a shoulder to provide axial positioning



Retaining ring must seat well in bottom of groove to support axial loads against the sides of the groove.

**Seals** are divided into:

- Commercial seals (Lip-type seals);
- Labyrinth seals;
- Groove seals;
- Combined seals.

