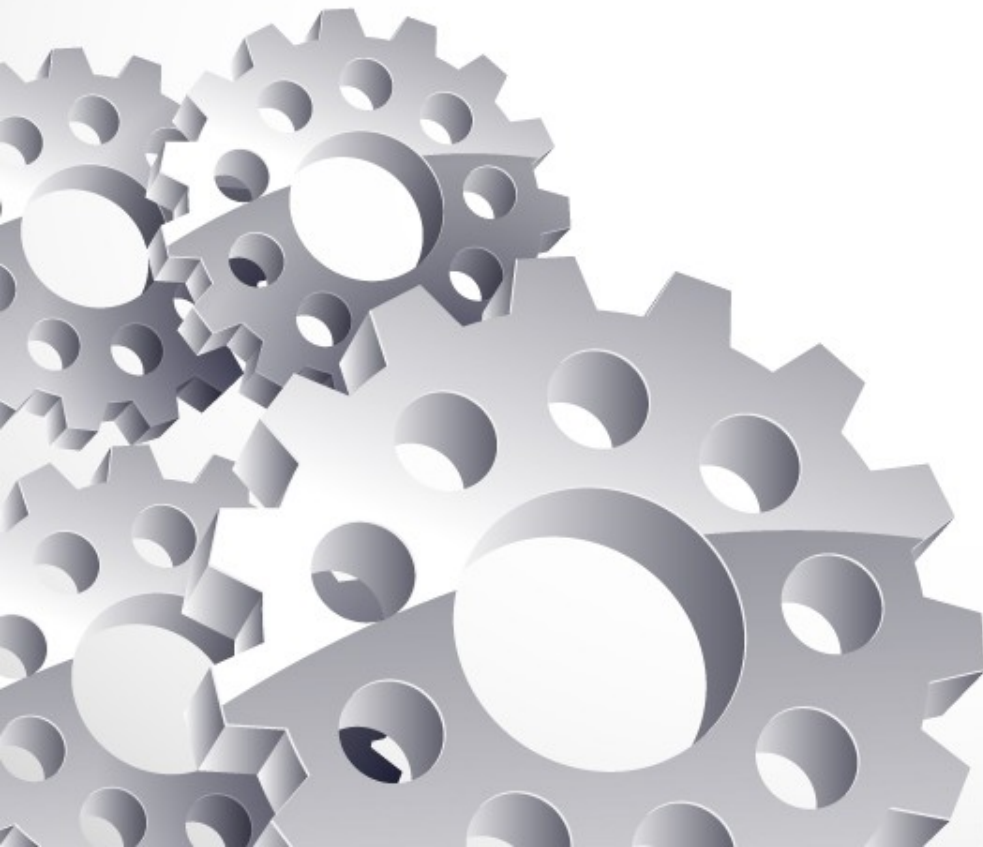


Introduction to Leaf Spring



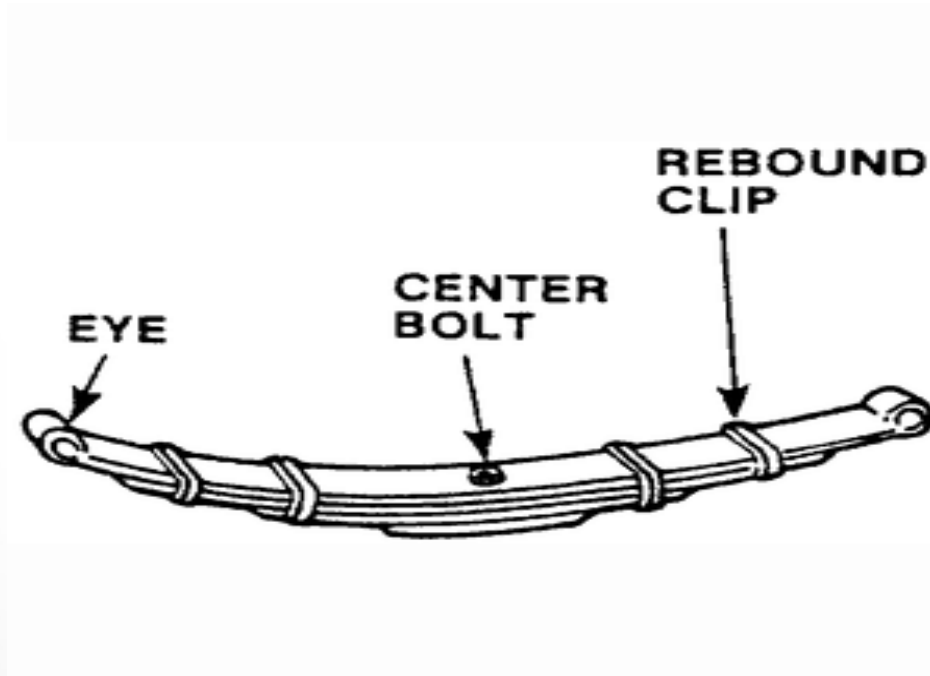
Invention of Leaf Spring



- Leaf spring was invented by Obadiah Elliot of London in 18th century. He simply piled one steel plate on top of another, pinned them together and shackled each end to a carriage, it was the first ever leaf spring used on a vehicle.

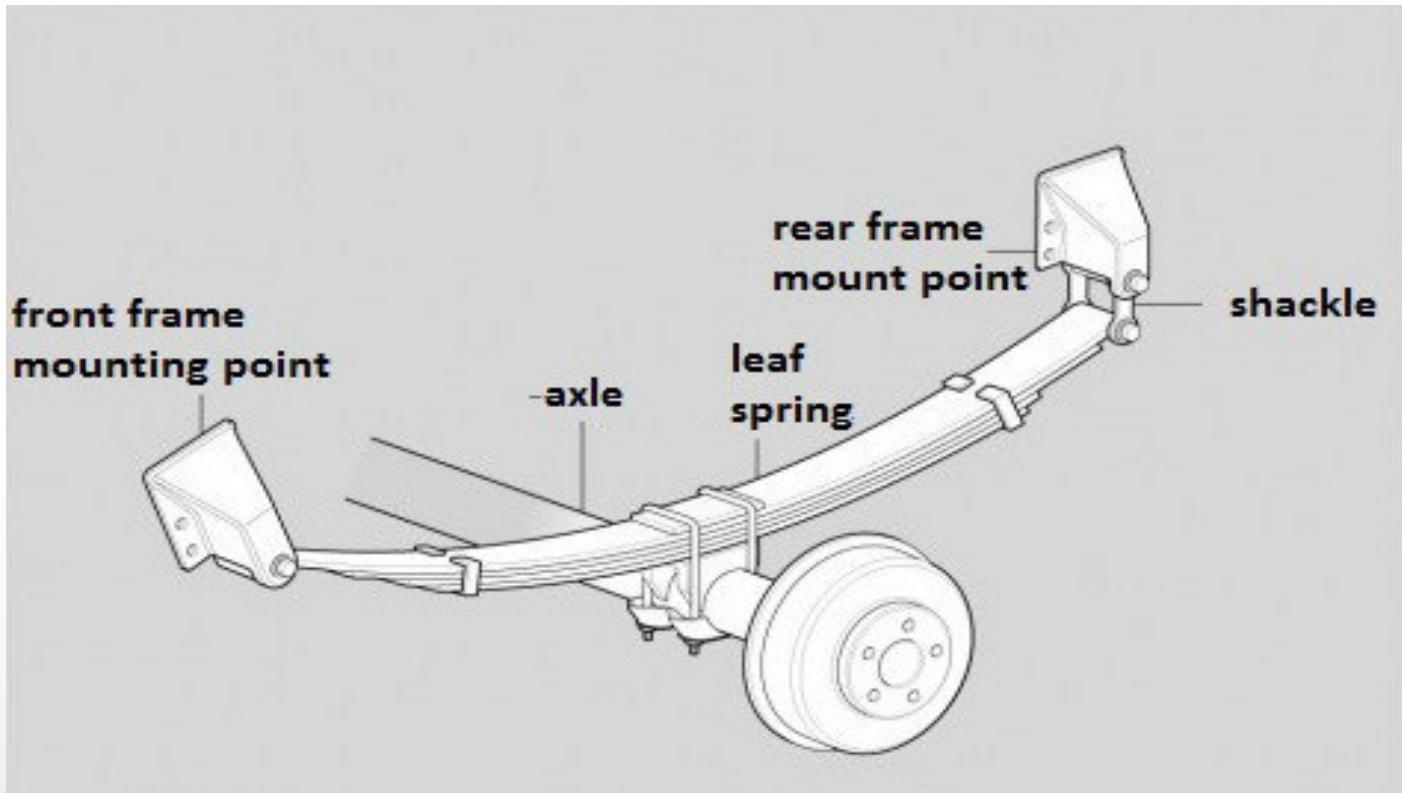
Leaf Spring

- It is originally called as a laminated or carriage spring, and sometimes referred to as a semi-elliptical spring or cart spring.



Principle of Leaf Spring

- A leaf spring is a simple type of suspension spring which is commonly used in heavy duty vehicles.



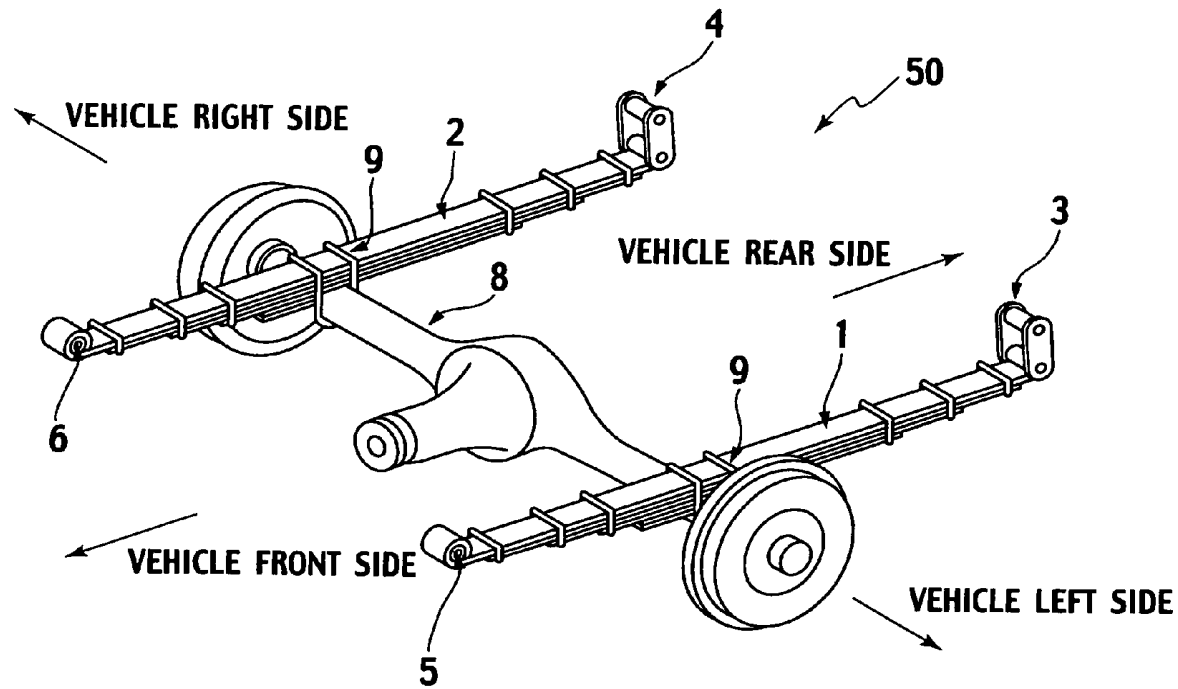
Use of leaf spring in suspension of vehicles



Layout

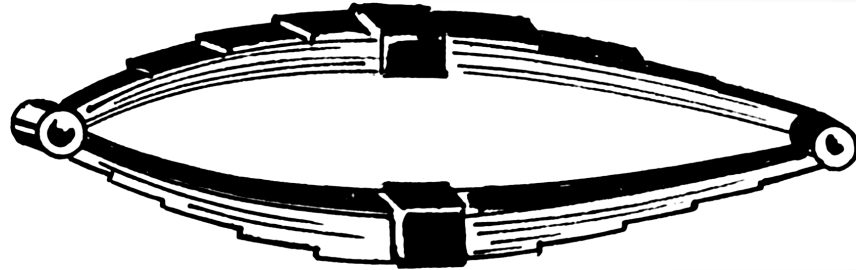


FIG. 1

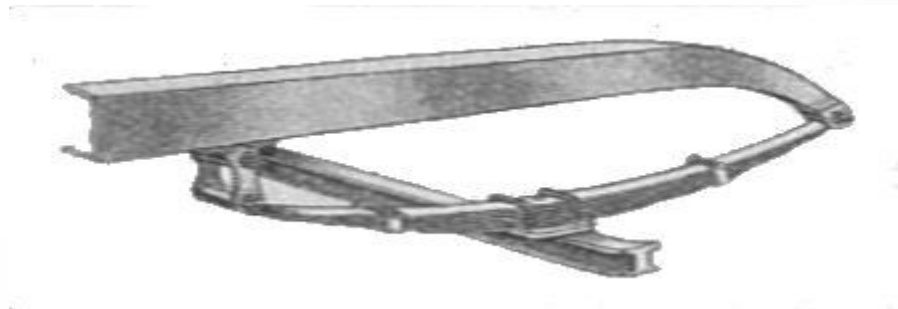


Types of Leaf Spring

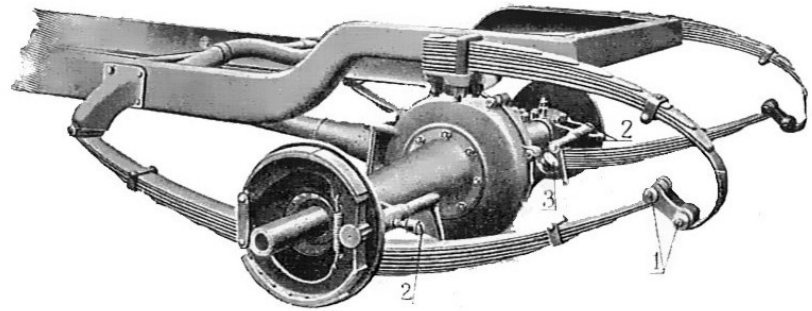
- Elliptic



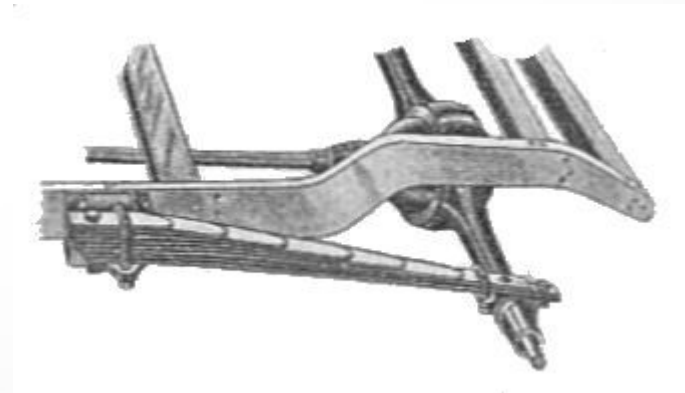
- Semi-Elliptic



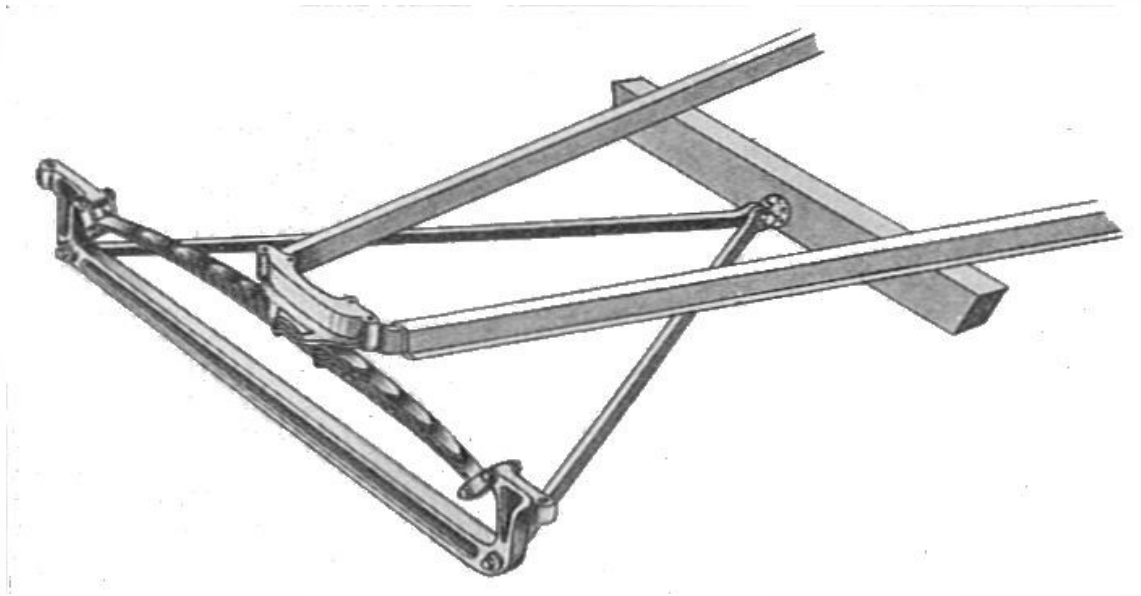
- Three-quarter elliptic



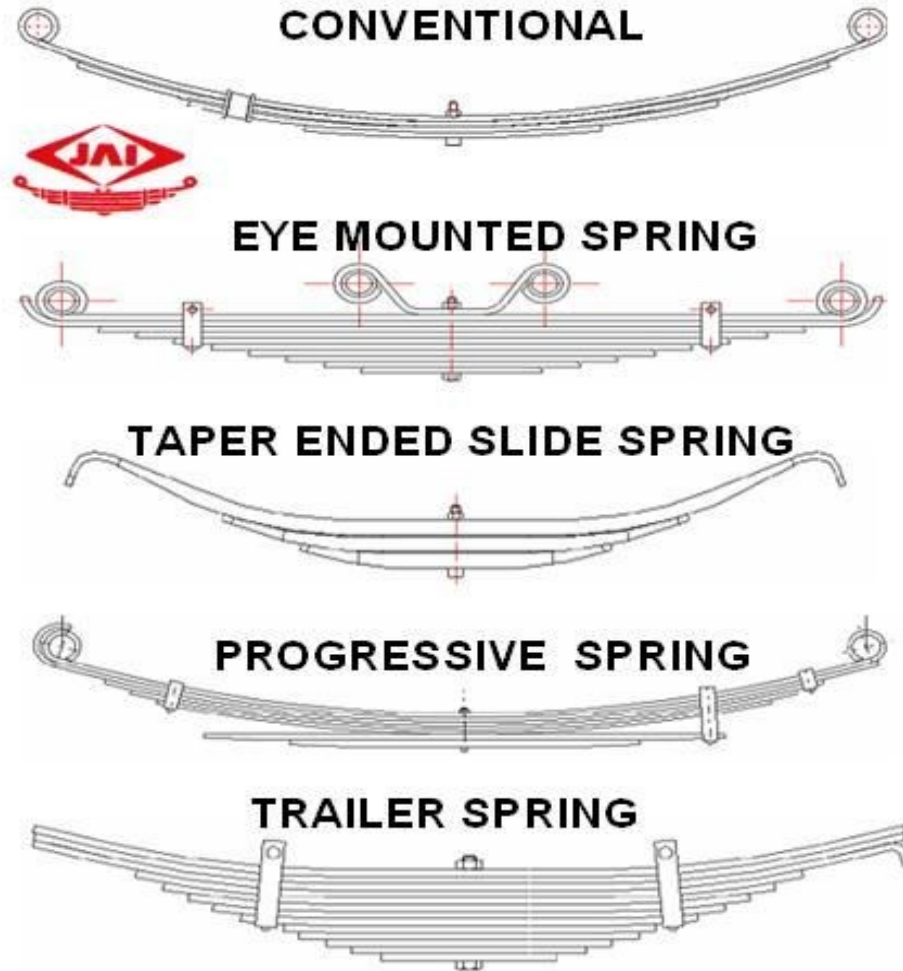
- Quarter elliptic

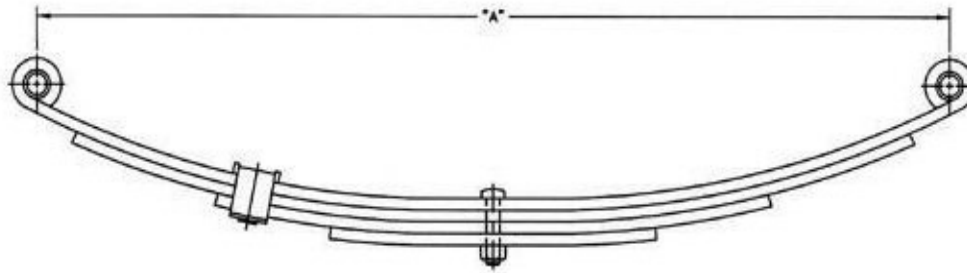


- Transverse



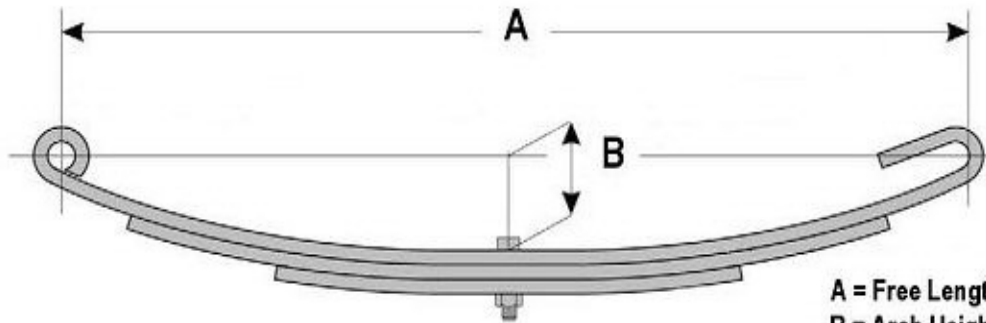
Another Types of Leaf Spring





DOUBLE EYE LEAF SPRINGS

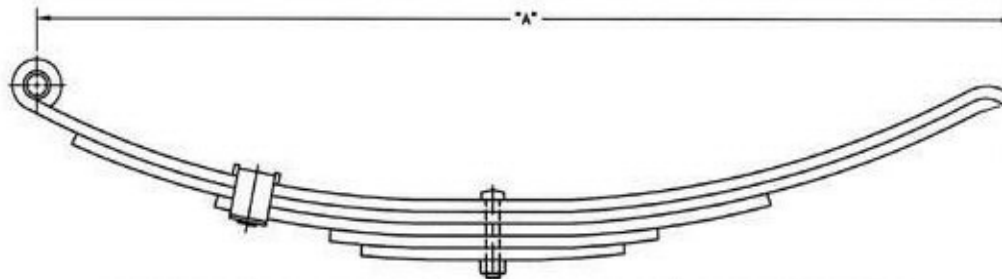
Measure Mounting Point To Mounting Point Center



A = Free Length
B = Arch Height

OPEN EYE LEAF SPRINGS

Measure Mounting Point to Furthest Inside Point

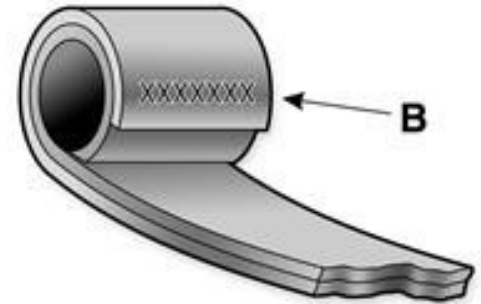
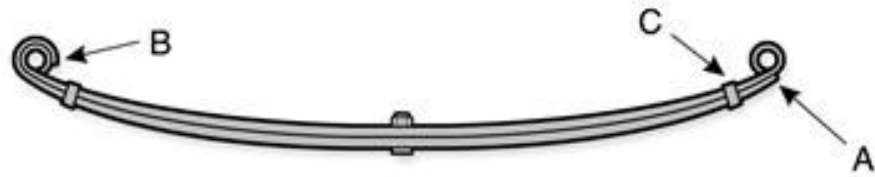


HOOK END, FLAT END & RADIUS END SPRINGS

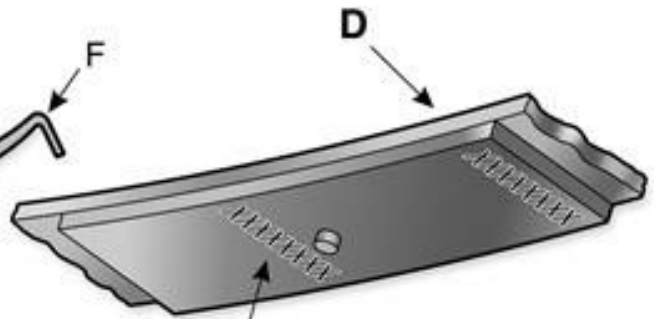
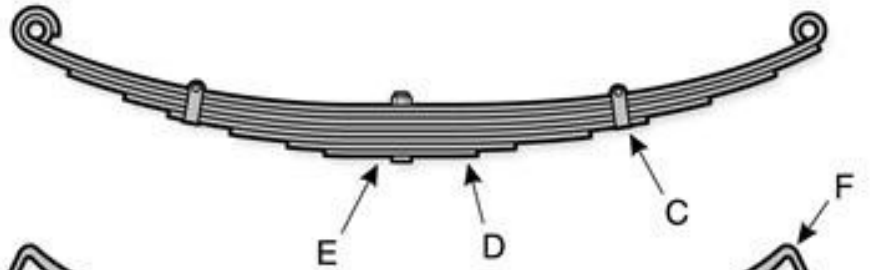
Measure Front Bolt To End Of Spring



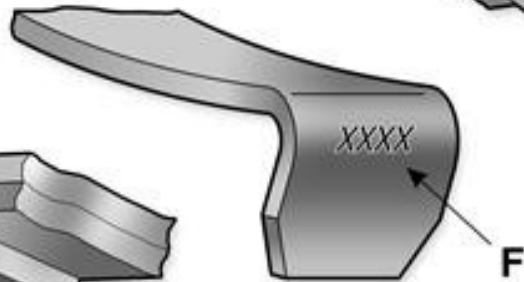
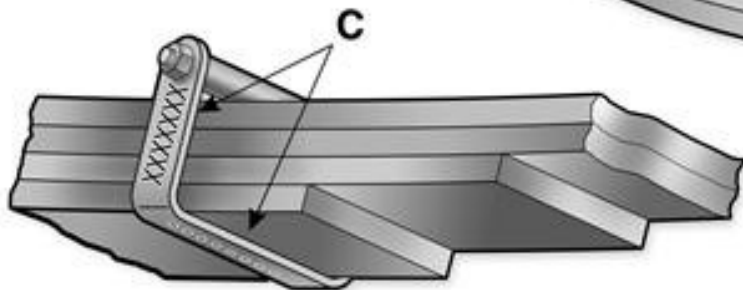
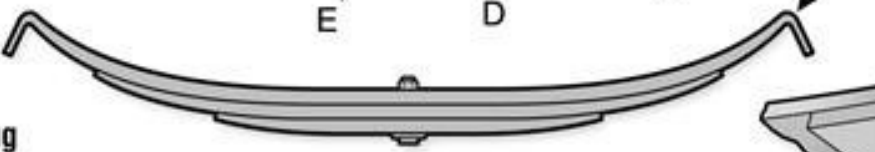
Full Taper Spring



Multi Leaf Spring

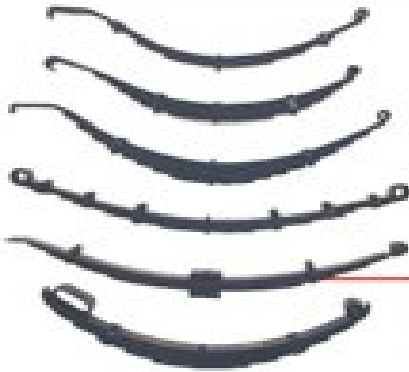


Three Leaf Trailer Spring



Different LF used in different vehicles

Heavy truck springs for Mercedes,
Isuzu, Scania, Man, Mack, Bedford, etc



Small trailer springs for box type trailers,
boat trailers, agricultural trailers, horse floats
and classic cars.

4WD springs for Jeep, Toyota Land Cruiser,
Ford, GM, Chevy, of different lifts



Semi-trailer springs for BPW, Rubery Owen,
Fruehauf, Frighter Hendirckson, etc.

Construction of Leaf Spring

- Leaf springs used in automobiles is of semi-elliptical type.
- It is built up of number of plates (known as leaf), which are reducing in lengths.
- The longest leaf is called as main leaf or master leaf & other leaves are called as graduated leaves.
- The spring is clamped to the axle by means of U-bolts.
- Rebound clips are used to hold the leaves together.



- Central clamp is used to fix the position of leaf spring to the wheel axle.



Characteristics of Leaf Spring



- Leaf spring acts as a linkage for holding the axle in position and thus separate linkage are not necessary. It makes the construction of the suspension simple and strong.
- As the positioning of the axle is carried out by the leaf springs so it makes it disadvantageous to use soft springs i.e. a spring with low spring constant.
- Therefore, this type of suspension does not provide good riding comfort. The inter-leaf friction between the leaf springs affects the riding comfort.
- Acceleration and braking torque cause wind-up and vibration. Also wind-up causes rear-end squat and nose-diving.

Manufacturing Process



1. Shearing of flat bar
2. Center hole punching / Drilling
3. End heating process forming
 - Eye Forming / Wrapper Forming
 - Diamond cutting / end trimming / width cutting / end tapering
 - End punching / end grooving / end bending / end forging / eye grinding
 - Center hole punching / Drilling / nibbing



4. Heat Treatment

- Heating
- Chamber forming
- Hardening
- Quenching
- Tempering

5. Surface preparation

- Shot peening / Stress peening
- Primary painting



6. Eye bush preparation process

- Eye reaming / eye boring
- Bush insertion
- Bush reaming

7. Assemble

- Presetting & load testing
- Finish painting
- Marking & packing

Standard size of Leaf Spring




- Width (mm) : 25-80 mm in steps of 5 mm.
- Thickness (mm) : 2-8 mm in steps of 1 mm, 10-16 mm in steps of 2 mm.

Material used for Leaf Spring



- The material used for leaf springs is usually a plain carbon steel having 0.90 to 1.0 % carbon.
- According to indian standards the recommended materials are :
 - For automobiles : 50 Cr1 , 50 Cr1 V23 , 55 Si2 Mn90 used in hardened & tempered state.

- 
- For rail road springs : C55 (Water hardened) , C75 (Oil hardened) , 40Si 2Mn 90 (Water hardened) & 55Si Mn90 (Oil hardened)