

# TROUBLESHOOTING THE FRONT SUSPENSION & STEERING SYSTEM

## TOO MUCH PLAY IN STEERING SYSTEM

To provide ease of steering a small amount of backlash of the steering wheel is necessary and the entire steering system must not be adjusted so as to cause a binding action in any part. A free movement of the rim of the steering wheel in excess of 2" without moving the front wheels is generally considered excessive and is objectionable to many drives.



1. Excess end play in steering gear worn.
2. Improper mesh of roller teeth and worm.
3. End play in steering gear arm shaft from worn bearings.
4. Steering gear connections adjusted too loosely or worn.
5. Steering knuckle bearings worn.
6. Camshaft lever bushings oversize or badly worn.
7. Cam lever follower worn, chipped or brinnelled.
8. Steering gear cam worn, chipped, brinnelled, distorted or adjusted off center.
9. Steering gear cam bearings worn, broken or incorrectly adjusted.
10. Steering wheel loose on post.
11. Loose or worn tie rod connections.
12. Loose or worn drag link connections.
13. Broken ball seat springs at tie rod or drag link.
14. Steering cross tube ends loose on cross tube.
15. Front wheel bearings incorrectly adjusted or worn.
16. Loose or worn steering knuckle bushings or pins.
17. Steering knuckle arms loose at steering knuckles.
18. Steering knuckle arm balls loose in arms.
19. Steering drop arm loose on cam lever shaft.
20. Steering gear case loose on chassis frame.
21. Steering post clamp loose on cowl bracket.
22. Excessive clearance of steering post in upper jacket bushing.

## CAR STEERS HARD

1. Tires under inflated or unequal inflation.
2. Tires oversize or abnormally worn.
3. Lack of lubrication or improper type of lubricant at the rod or drag link joints.
4. Dirt accumulated at tie rod or drag link joints.
5. Tie rod or drag link ball seat or ball scored, rough or galded.
6. Drop arm ball worn out of round.
7. Steering gear connections adjusted too tight.
8. Lack of lubrication or improper type of lubricant in steering gear.
9. Steering camshaft follower meshed too deeply with steering gear cam.
10. Steering gear cam bearings adjusted too tight.

11. Steering gear cam lever shaft bearings rough, scored, or otherwise damaged.
12. Insufficient clearance of cam lever shaft in bushings.
13. Cam lever shaft bushings not in proper alignment.
14. Steering gear cam thrust bearings broken, galded, rough or chipped.
15. Insufficient clearance of steering post upper bushing on post.
16. Steering gear cam or tube sprung or distorted.
17. Worn steering gear parts.
18. Misalignment of steering gear assembly due to method of mounting at chassis frame and cowl bracket.
19. Lack of lubrication of steering knuckle upper and lower bushings and thrust bearings.
20. Galded, rough, or scored kingpins.
21. Insufficient clearance between steering knuckle bushings and kingpins.
22. Insufficient end play in steering knuckles.
23. Steering knuckle thrust bearing races galded, brinnelled, rough, scored or full of dirt.
24. Bent steering knuckle.
25. Insufficient kingpin inclination.
26. Reverse or excessive front wheel camber.
27. Incorrect front wheel toe-in.
28. Excessive caster.
29. Front axle shifted.
30. Frame bent or broken.
31. Suspension arms bent or twisted.
5. Wheels, tires or brake drums out of balance.
6. Front wheel bearing incorrectly adjusted or worn.
7. Front wheel bearings too loose resulting in incorrect or uneven camber.
8. Incorrect caster.
9. Incorrect or uneven camber adjustment.
10. Insufficient front wheel toe-in.
11. 1Loose front spring "U" bolts.
12. Weak front springs.
13. Front springs over lubricated.
14. Insufficient or incorrect type of fluid in shock absorbers resulting in inadequate control.
15. Improper adjustment of shock absorber resulting in inadequate control.
16. Abnormal internal clearances of shock absorbers resulting in inadequate control.
17. Shock absorber inoperative or leaking.
18. Worn or loose steering gear parts.
19. Steering gear incorrectly adjusted.
20. Steering connections incorrectly adjusted or worn.
21. Incorrect adjustment of steering cross tube.
22. Bent or sprung steering cross tube.
23. Steering cross tube end loose on threads.
24. Steering cross tube end parts worn or loose.
25. Worn or loose steering linkage parts.
26. Tie rod loose.
27. Drag link adjustment loose.
28. Steering knuckle bearings worn.
29. Steering knuckle bent.
30. Excessive freedom or looseness of kingpin thrust bearings.
31. Recess cut on underneath side of steering knuckle spindle by rotation of outer bearing cone resulting in incorrect or uneven camber.
32. Kingpin or bushings worn or loose resulting in incorrect or uneven camber.
33. Bent steering knuckle yoke or spindle resulting in incorrect or uneven camber.
34. Front axle shifted.
35. Improper load distribution on truck.

### ***LOW SPEED SHIMMY OR FRONT WHEEL WOBBLE***

High and low speed shimmy are many times confused by the service man. Although many of the causes of high and low speed shimmy are identical, the two conditions have absolutely different characteristics.

Many times a vibration or movement in the steering wheel only is termed a shimmy. However, this is an incorrect term and should be avoided. Front wheel shimmy often causes steering movement but originates at the front wheels and is transferred to the steering wheel.

Low speed shimmy or front wheel wobble as the name implies can be simply described as a rapid series of oscillations of the wheel and tire assembly about the kingpins. In other words, the front wheels attempt to alternately point to the right and the left.

High speed shimmy or front wheel tramp can be simply described as a gallop. In other words, the condition encountered is very similar to a condition that would be evident if the front wheels were decidedly "egg shaped." In cases of severe high speed shimmy, the front tires actually leave the pavement, while in mild cases the condition is the same as if the front tires were very rapidly deflated and then inflated. In high speed shimmy, one front tire appears deflated while the other is inflated. This condition alternates between the front wheels.

1. Tires under inflated or unequally inflated.
2. Irregularities in front wheel tire tread.
3. Eccentric or bulged tires.
4. Wheels or tires out of true.

### ***HIGH SPEED SHIMMY OR WHEEL TRAMP***

1. All items listed under "Low Speed Shimmy or Front Wheel Wobble" may cause this trouble too.
2. Front wheel, hub, brake drum and tire assembly out of balance.
3. Front tires and wheels wobble or do not run true.
4. Front wheel tire tread eccentric or runs-out more than 1/16".
5. Rear wheel and tire assemblies out of balance.
6. Rear wheel wobble or run-out.
7. Dragging front brakes.

### **STEERING WANDER OR ROAD WEAVE**

1. Front wheel bearings out of adjustment.
2. Front and rear tires under inflated or unequally inflated.
3. Incorrect or unequal front wheel camber.
4. Wheels toe-out in straight ahead position.
5. Incorrect or uneven caster.
6. Front wheels toe-in too much.
7. Steering gear or linkage connections too loosely adjusted or worn.
8. Steering gear or linkage connections adjusted too tight.
9. Worn steering gear bearings.
10. Steering gear adjusted too tight resulting in driver over-steering.
11. Tight tie rod ends.
12. Worn or loose kingpins and bushings.
13. Kingpins too tight in bushings.
14. Steering knuckle bent.
15. Steering knuckle bearings worn.
16. Bent axle parts.
17. Axle shifted.
18. Rear axle shifted on springs.
19. Cross wind.
20. Type of road surface.

### **STEERING KICK BACKS**

Note — Steering kick back is registered on the steering wheel as a very rapid movement of the steering wheel and is the result of the front wheels having encountered a bump or obstruction in the road surface and the subsequent transfer of this shock to the steering wheel. A small amount of steering wheel movement must be expected and is normal when the car is driven over an excessively rough road or when the front wheels strike an unusual obstruction.

1. Tires inflated too high or too low.
2. Wrong type or size of tires used.
3. Improper caster.
4. Worn, loose or improperly adjusted steering gear parts.
5. Worn, loose or improperly adjusted steering linkage parts.
6. Steering gear or connection incorrectly adjusted.
7. Steering knuckle bent.
8. Chassis springs sagged.
9. Shock absorbers inoperative, leaking or fitted with incorrect valves.

### **STEERING GEAR RATTLES**

1. Insufficient lubricant in steering gear.
2. Incorrect grade of lubricant used in steering gear assembly.
3. Excessive lash between cam lever follower and cam.
4. Steering gear cam bearings broken, damaged or incorrectly adjusted.
5. Excessive radial clearance of cam lever shaft in case bushings.
6. Abnormal clearance at steering connections.
7. Steering post jacket clamp loose on jacket or cowl.
8. Steering post jacket loose at lower end.
9. Steering gear loose on chassis frame.
10. Steering drop arm loose on cam lever shaft.
11. Excessive looseness in steering linkage.

### **CAR PULLS TO ONE SIDE**

1. Low or uneven tire pressure.
2. Rear wheel not tracking with front wheels.
3. Brakes incorrectly or unevenly adjusted.
4. Toe-in incorrect.
5. Incorrect or uneven caster.
6. Incorrect or uneven camber.
7. Rear axle shifted.
8. Frame or X member bent or broken.

### **STEERING GEAR BACKLASH**

Sometimes backlash is caused by lost motion in parts other than the steering gear. To make a quick check for backlash in the steering gear, remove the steering gear arm with the two tie rods assembled and install another arm. By rocking the arm, the amount of backlash can be determined.

1. Excessive end-play in steering gear worm.
2. Improper mesh of roller tooth and worm.
3. Endplay in steering gear arm shaft.
4. Worn bearings on steering gear arm shaft.

### **ERRATIC STEERING**

1. Low or uneven tire pressure.
2. Brakes incorrectly adjusted.
3. Dirt or grease on brake linings.

## **SPRINGS & SHOCK ABSORBERS**

### ***SPRINGS SAG OR BOTTOM***

1. Unusually severe operation or excessive overloading.
2. Improperly functioning shock absorbers.
3. Spring leaves broken.

### ***SPRING NOISES***

1. Loose U-Bolts permitting abnormal side movement of leaves and interference with metal covers.
2. Spring covers damaged loose or improperly installed.
3. Axle to frame bumper not correct.
4. Sprung frame or bent horn causing misalignment of springs.
5. Worn bolts or bushings in shackle or bracket.
6. Loose spring clip nuts causing misalignment of axle and spring.
7. Rear spring seat bearings not tight on six-wheel models causing end-play of seat on cross bar.

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