

# How to Fix Front Wheel Wobble

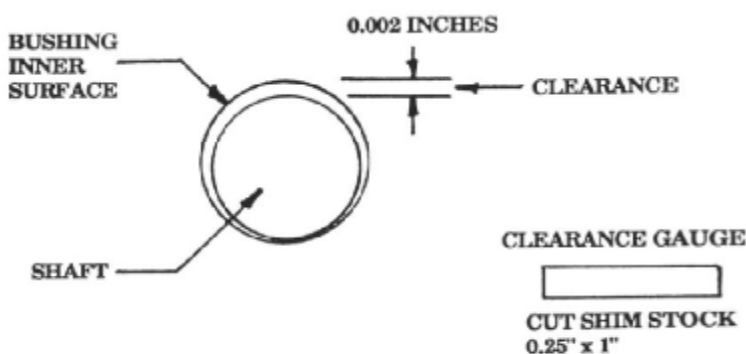
By Milt Webb

As you may have read in Ted Aschman's "Tinkerin' Tips" on front wheel wobble in the November-December 1991 issue of *The Vintage Ford*, front end wobble "is not natural and is curable. This article offers some additional technical information on "how to fix front wheel wobble. Most of the technical information and specifications are extracted and paraphrased from the Model T Ford Service Manual. When the Ford Manual specifications are too broad or imprecise, I have based my comments on experience in fixing Model T wobble (wobble).

## "LOOSENESS CHECKS

### STEERING GEAR BOX

The steering planetary gears "should mesh without unnecessary play. The Ford Manual (paragraphs 758-771) is rather broad and general on steering gear specifications using words like "tight", "badly worn, and "tightly. In my experience the steering gears wear very little if kept well greased. The most wear occurs in the steering gear cover bushing. The steering gear post shaft bushing clearance should not exceed 0.002 inches (see *Illustration 1*). If the clearance is greater than 0.002 inches have a machinist bore out the cover and install a bushing with 0.002 inches clearance.



*Illustration 1*

When checking the clearance on a small bushing, insert a strip of shim stock of the appropriate thickness, cut to 1/4" by 1", between the shaft and the bushing inner surface. A "moderate" drag on the clearance gauge indicates the correct clearance. Note: Various thicknesses of shim stock can be purchased at hobby shops.

### STEERING GEAR BRACKET

The bushing clearance in the steering gear bracket should "fit snugly. The clearance should not exceed 0.002 inches. A new bushing is available through Model T parts houses. Check the steering shaft diameter for wear in the bushing area. It should measure 0.750 inches. If the steering shaft is undersize, ream the newly installed bushing until it will just slip over the end of the steering shaft. A little more than 0.002 inches clearance is okay; however, over 0.005 inches is too much.

### STEERING GEAR CONNECTING ROD

The steering gear connecting rod and caps are very "high wear items, especially on the Pitman (steering gear) arm end. The wear is high usually because of a lack of lubrication. Paragraph 694 in the Manual says, check for being "loose in socket. If there is end play with no grease in socket, grind off ball socket caps until the end play is just zero. A fine bench grinder stone works very well. However, it is tricky to hold the cap. Be careful! Check end play often; don't grind off too much. When the end play is just zero, install wheel bearing grease. After tightening bolts and jam nuts make sure steering does not bind with the wheels off the ground.

### CONNECTING ROD

There should be no "looseness in the spindle connecting rod. Paragraph 691 in the Ford Service Manual specifies a maximum clearance of 0.003 inches. If clearance is more than 0.003 inches, replace with new bolts and bushing kit available through the T parts houses.

### SPINDLE ARM BUSHINGS

The spindle arm ("king pin") bushing clearance should not exceed 0.004 inches. New spindle bolts are 0.500 inches. Paragraph 687 in the Ford Service Manual specifies line reaming the spindle arm bushings to 0.504 inches.

New spindle arm bushing ends should be raced allowing an end clearance of 0.002 inches. During assembly, paragraph 689 states a "slight resistance should be felt when turning the spindle arm in the axle. It is my experience that this adjustment is the most critical area in controlling wobble. If the "resistance is too great the car will steer the driver instead of the driver steering the car! The secret is to tighten the spindle bolt and lock nut until the end play (up and down) is just zero.

1b check the end play, jack up the front axle until one wheel is off the ground about one inch. Use a large flat blade screwdriver to lift the wheel up and down. Place your fingers on the spindle arm bushing edge and lift the wheel up and down using the screwdriver under the tire. Tighten the spindle bolt and lock (jam) nut until the end play just becomes zero. Do not forget, the lock (jam) nut will also take up end play as you align the castellated nut with the cotter pin hole in the spindle bolt. Check the spindle arm end play often. End play wear is high. My thanks to Chuck Kroll (Portland) for setting me straight on this adjustment several years ago.

### FRONT WHEEL BEARINGS

The front wheel bearings should be "installed properly. Paragraph 66 (c) in the Ford Manual specifies "no play between the bearing cup and the cone bearing. The way to check this adjustment is to place your thumbnail between the edge of the wheel hub and the wheel bearing edge. Wiggle the whole wheel in the vertical plane to check

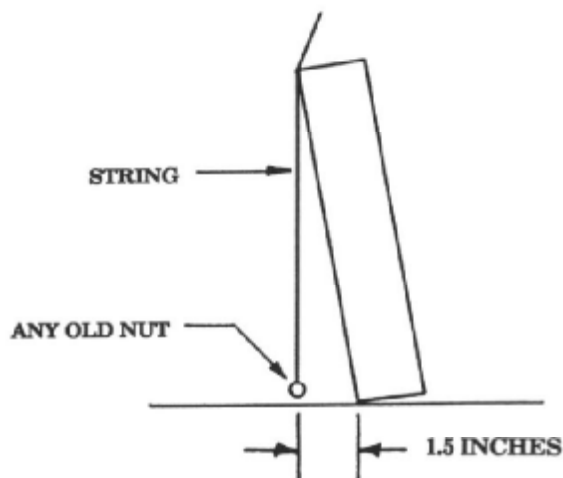


Illustration 2  
Measuring the camber with a "plumb bob."

looseness. Tighten the cone and locknut until "no play exists. Make sure the wheel will rotate freely with a very easy push on the spoke. (what's an "easy push ?)

## FRONT END ALIGNMENT

### CAMBER

The camber on each wheel should be 1-1/2 inches (see paragraph 153 in the Ford Service Manual). The camber can be measured by holding a plumb bob from the top of the outer tire surface to just above the floor. Then measure the distance from the plumb bob to the outer surface at the bottom of the tire (see Illustration 2). The camber should be the same on both wheels. Using trigonometry the camber calculates to 5° positive.

### CASTER

Additional caster will make the Model T steer easier through "cross-winds or over minor "road defects. You can gain about 1.5 degree additional caster by lowering the ball cap at the back of the wishbone 1.5 inches downward from the original position.

Obtain a second radius rod ball cap. Install 6 lock washers on each stud. Then, install the ball cap on top of the greased radius rod ball. Ask your partner to hold the lock washers as you push wishbone and the ball cap up onto the studs. Install the bottom ball cap. Run up the castellated nuts until the ball caps touch and lock washers are compressed. If there is any play in the ball and cap, grind off the bottom cap until the play is just zero. Be sure to safety-wire the studs to each other.

### TOE-IN or GATHER

The toe-in should measure 3/16 to 1/4 inch (paragraph 150 in the Ford Manual). This can be measured by measuring length between the front and back of wheel rims using a 6 foot steel rule or a retracting measure tape. Paragraph 151 in the Ford Manual shows how to measure and adjust for gather or toe-in.

## Summary

Model Ts will not wobble at low speeds if all components are set up and adjusted as outlined in the Ford Service Manual, Ted Aschman's Tinkerin Tips, or in this article. Camber, toe-in and caster are very important to keep the T going straight on the road. Excess play in the steering gear box, steering gear bracket, connecting rod, steering gear connecting rod, spindle arm bushings and/or front wheel bearings can all contribute to "wobble at low speed.0

## DEFINITION OF TERMS — a brief tutorial

### CAMBER

Camber of the front wheels means that the wheels are closer together at the bottom due to the spindle being placed at an angle instead of being perfectly vertical. (See Figure 1.) Thus, the wheel is inclined and the length of "D" is less than "C."

The idea of this incline, or cambering is to make the center line of the spindle bolt coincide, as near as practical, with the center of contact with the ground.

The purpose is to bring the point of contact of the tires with the road more nearly under the king pins, thus permitting the car to be steered more easily.

### TOE-IN or GATHER

To offset the wearing action on the tires by the camber, and to produce more even wear on them, the wheels are slightly "toed-in" at the front. (See Figure 2.) Therefore, the length of "B" is less than the length of "A."

### CASTER

Caster refers to the pitch or angle of the front axle. The front axle is actually tilted rearward so that if a straight line is drawn through the king pins, this line is not vertical, but angled toward the rear of the car at the top of the line with the lower end of the straight line hitting the ground in front of the axle.

To demonstrate this principle, we have used a bicycle in Figure 3. The steering axis meets the ground in advance of the point of contact of the wheel. This is termed "caster action." As shown, the straight line of the steering axis meets the ground in advance of the vertical line that passes through the wheel's center.

On a car, the turning of the wheels left or right actually raises the body of the car slightly, thus the weight of the vehicle tends to bring the wheels back to the center position.

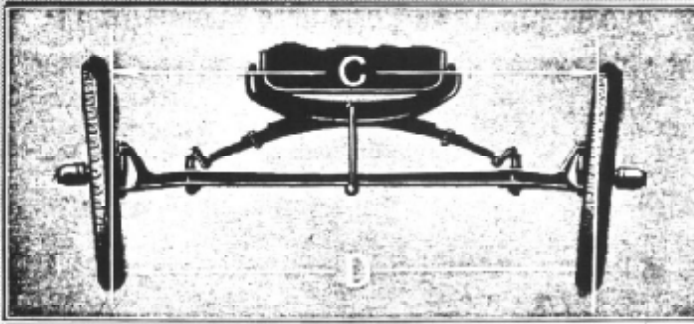


Figure 1

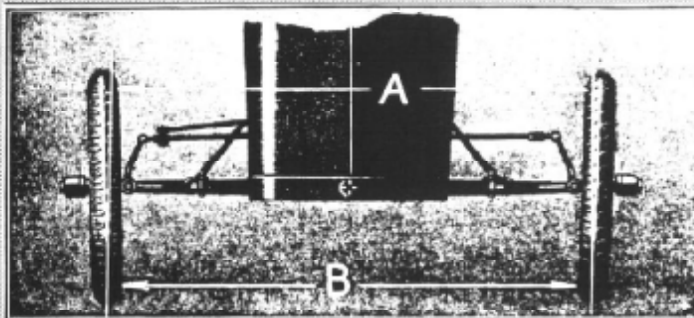


Figure 2

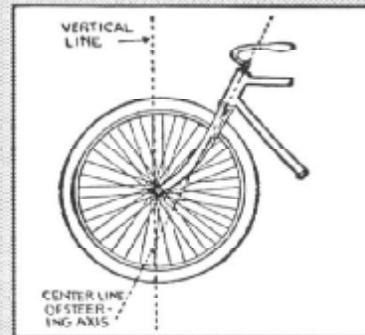


Figure 3