GROUP 6
CHASSIS SUSPENSION

SECTIONS IN GROUP 6

SECTION 6-A
SPECIFICATIONS, DESCRIPTION, SERVICE RECOMMENDATIONS—CHASSIS SUSPENSION

CONTENTS OF SECTION 6-A

SERVICE BULLETIN REFERENCE

Bulletin No.	Page No.	SUBJECT

6-1 CHASSIS SUSPENSION SPECIFICATIONS

a. Tightening Specifications

Use a reliable torque wrench to tighten the parts listed, to insure proper tightness without straining or distorting parts. These specifications are for *clean and lightly lubricated* threads only; dry or dirty threads produce increased friction which prevents accurate measurement of tightness.

Part	Location	Thread Size	Torque Ft. Lbs.
Nut	Lower Control Arm Shaft Bolt	7/16-20	45-50
Nut	Steering Knuckle Support Lower Pivot Pin	7/8-11	65 Min.
Bushing	Steering Knuckle Support	——	120 Min.
Bolt	Steering Knuckle Support Clamp	3/8-24	30-35
Bushing	Knuckle Support Upper Pivot Pin	——	75-80
Nut	Upper Pivot Pin Bushing Clamp Bolt	3/8-24	25-30
Bolts & Nuts	Front Shock Absorber to Frame	1/2-20	60-65
Nut	Brake Assembly and Steering Arm to Steering Knuckle Bolt	7/16-20	45-50
Nut	Steering Tie Rod End Ball Stud	1/2-20	50-60
Nut	Steering Tie Rod End Ball Stud	9/16-18	65-70
Nut	Steering Tie Rod End Clamp Bolt	7/16-20	30-35
Nut	Front Stabilizer Bracket Bolt	3/8-24	20-25
Bolt	Wheel to Front Hub and Rear Axle Shaft	9/16-18	70-75
Nut	Rear Brake Assembly to Axle Housing	7/16-20	35-40

Part	Location	Thread Size	Torque Ft-Lbs.
Bolt	Rear Shock Absorber to Brake Backing Plate	9/16-12	90-105
Nut	Rear Shock Absorber Link to Arm and to Frame	3/8-24	20-25
Nut	Rear Axle Strut Rod to Spring Seat	1/2-20	60-60
Bolt	Rear Chassis Spring to Spring Seat	1/2-20	55-60
Bolt	Rear Chassis Spring to Frame	1/2-20	15-20
Nut	Radius Rod Pin Support to Spring Seat	1/2-20	35-40
Nut	Radius Rod F. & R. Support to Spring Seat	3/8-24	20-25
Nut	Radius Rod Pin Support to Axle	3/8-24	20-25
Nut	Radius Rod Frame Bracket to Side Rail	7/16-20	30-35
Bolt	Radius Rod Frame Bracket Brace to Cross Member	7/16-20	30-35

b. Chassis Springs

Item	Series 40	Series 50	Series 70
Type, Front and Rear	Coil	Coil	Coil
Trim Dimension, Front Springs	←See Paragraph 6-17→		
Trim Dimension, Rear Springs	←See Paragraph 6-20→		

c. Shock Absorbers

Make—Front and Rear	←Delco→		
Type—Front and Rear	←Double-acting→		
Model—Front	←1948-A→		
Model—Rear	←Right, 2105-C—Left, 2105-D→		
Calibration—Front			
Rebound Valve	3-E	3-E	3-F
Compression Valve	3-D	3-D	3-D
Calibration—Rear, Regular			
Rebound Valve (Except Mod. 59 and 79)	.50-J	.50-J	.60-L
Rebound Valve, Mod. 59 and 79	——	.60-L	.70-M
Compression Valve	2-Cd.-5	2-Cd.-5	2-Cd.-5
Calibration—Rear, Export, or Domestic High			
Rebound Valve	.60-L	.60-L	.70-M
Compression Valve	2-Cd.-5	2-Cd.-5	2-Cd.-5

d. Wheels and Tires

Wheel Type	←Demountable Steel Disc→		
Rim Type	←Drop Center→		
Rim Diameter and Width	16"x6.00"L	15"x6.50"L	15"x6.50"L
Tires—Make and Type			
U. S. Royal	Deluxe	←Air Ride→	
Firestone	Deluxe	←Super Baloon→	
Goodrich	Champion Silvertown	←Extra Low Pressure→	
Tire Size (Except 1948 Mod. 79)	6.50"—16"	7.60"—15"	8.20"—15"
Tire Size, 1948 Model 79	——	——	7.00"—15"
Number of Plys	4	4	4
Specified Valve in Tube	←Rubber Stem→		
Maximum Allowable Runout at Side of Tire	1/8"	1/8"	1/8"

e. Dimensional Specifications

NOTE: *Dimensions and limits given in these specifications apply to new parts only. Where limits are given, "T" means tight and "L" means loose.*

Caster, Camber, Toe-In, King Pin Inclination, and Steering Geometry	←See figure 6-36→
Steering Knuckle Spindle	
Large End, Diameter	←1.3735"—1.3740"→
Small End, Diameter	←.8326"—.8431"→
Wheel Bearing Cone on Spindle	
Outer	←.—0004"L—.0014"L→
Inner	←.—0005"L—.0015"L→
Wheel Bearing Cup in Hub	
Outer	←.0005"T—.0025"T→
Inner	←.0005"T—.0025"T→
Wheel Bearing Adjustment	←See paragraph 6-14→
King Pin Diameter	←.861"—.862"→
Knuckle Bushings, Bore	←.8625"—.8635"→
King Pin to Knuckle Bushings, Clearance	←.0005"L—.0025"L→
Knuckle End Clearance	←Shim to .003"→
Knuckle Support Pivot Pins in Bushings, Upper and Lower	←.011"L—.020"L→

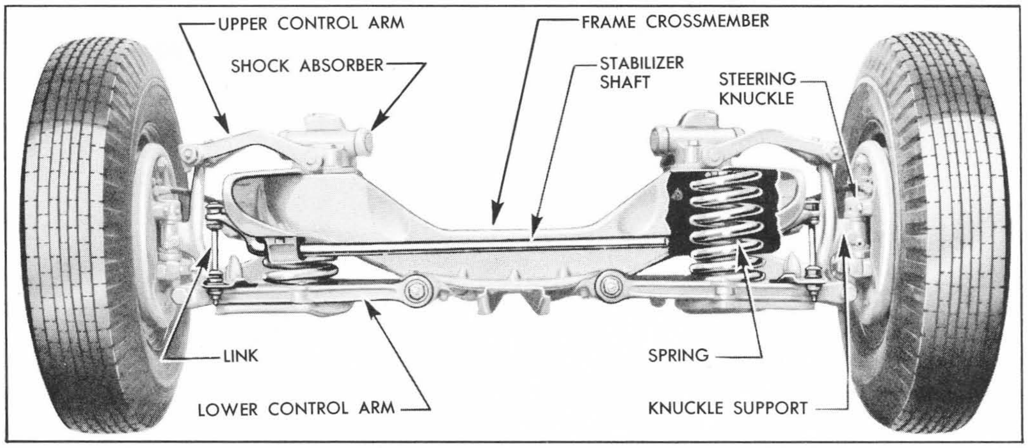


Figure 6-1—Front Wheel Suspension

6-2 FRONT WHEEL SUSPENSION

The front wheel suspension allows each front wheel to rise and fall, due to change in road surface level, without appreciably affecting the opposite wheel.

Each wheel is independently connected to the frame front cross member by a steering knuckle, steering knuckle support, lower control arm assembly, and an upper control arm on the shock absorber. See figure 6-1. The upper and lower control arms are so placed and proportioned in length that they allow each knuckle support, spindle, and wheel to move through a vertical plane only. The front wheels are held in proper relation to each other for steering by means of two tie rods which connect to steering arms on the steering knuckles and to the pitman arm on the steering gear.

A coil type chassis spring is mounted between the frame front cross member and a spring seat in each lower control arm assembly. A large rubber bumper is mounted on the outer end of each lower control arm to limit travel of the arm during compression of chassis spring. A similar rubber bumper is mounted on the frame under each upper control arm to limit travel of arm during rebound of chassis spring.

Side roll of the front end of chassis is controlled by a spring steel stabilizer shaft. The shaft is mounted in rubber bushings supported in brackets attached to lower flange of each frame side rail. The ends of stabilizer shaft are connected to the front sides of lower control arms by links which have rubber grommets at both ends to provide flexibility at the connections and prevent rattle. See figures 6-1 and 6-15.

The lower control arm assembly consists of two drop forged steel arms solidly riveted to a stamped steel spring seat to form a rigid V-shaped unit. A small plate riveted above the spring seat serves as a mounting for a rubber bumper and a point of connection for the stabilizer link. Hardened steel threaded bushings are screwed solidly into the inner ends of the forged arms to provide thread-type bearings on the ends of the control arm shaft which is attached to the frame front cross member. A large threaded pivot pin held by a lock washer and nut connects the steering knuckle support to the lower control arm. See figure 6-2.

A large threaded hardened steel bushing is screwed solidly into the lower end of each steering knuckle support to provide a thread-type bearing on the pivot pin in outer end of lower control arm. The upper end of knuckle support provides for a threaded, clamp type pivot pin which connects upper end of support

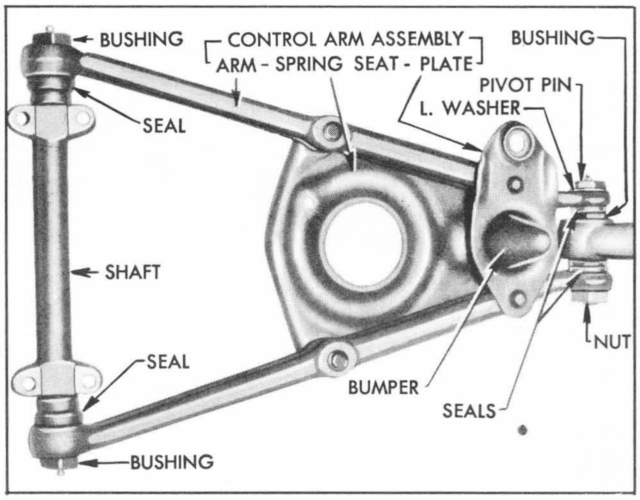


Figure 6-2—Lower Control Arm and Shaft Assembly

to outer end of the upper control arm. The threaded ends of the upper pivot pin seat in internally threaded hardened steel bushings mounted in outer end of upper control arm. See figure 6-3.

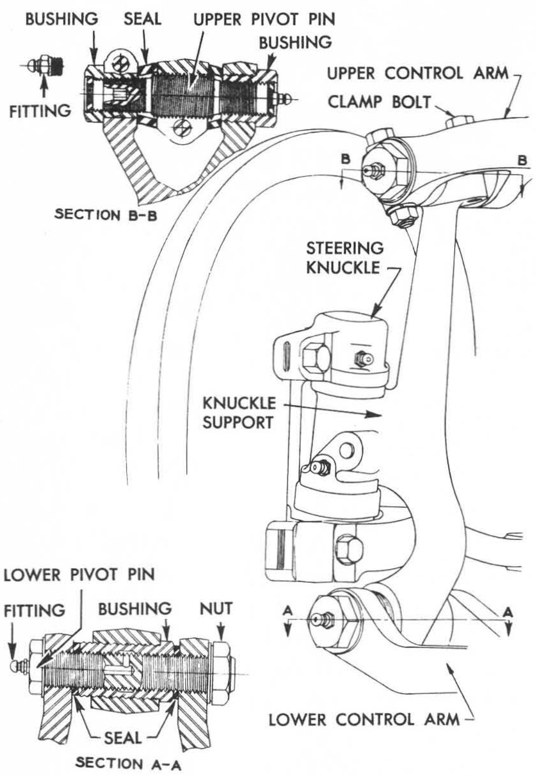


Figure 6-3—Steering Knuckle Support Pivot Pins

The eccentric type steering knuckle support upper pivot pins provide adjustment for both caster and camber. The threaded pin and bushings permit adjustment of caster by turning the pin, which moves the upper end of knuckle support fore or aft, depending on rotation. The large diameter threaded middle section of pin is eccentric to the ends so that camber is also changed by turning the pin. A hex recess is broached in one end of pin for insertion of the adjusting wrench after removal of the lubrication fitting from the clamped type pivot pin bushing. See figure 6-3.

Rubber seals are installed on lower control arm shafts and on lower and upper pivot pins to exclude dirt and water from the threaded bearing surfaces. Lubrication fittings are provided at all bearing locations.

The steering knuckle is attached to knuckle support by a hardened steel king pin which is locked in knuckle support by a tapered pin. Bronze bushings in steering knuckle provide bearings for king pin. Vertical thrust is taken

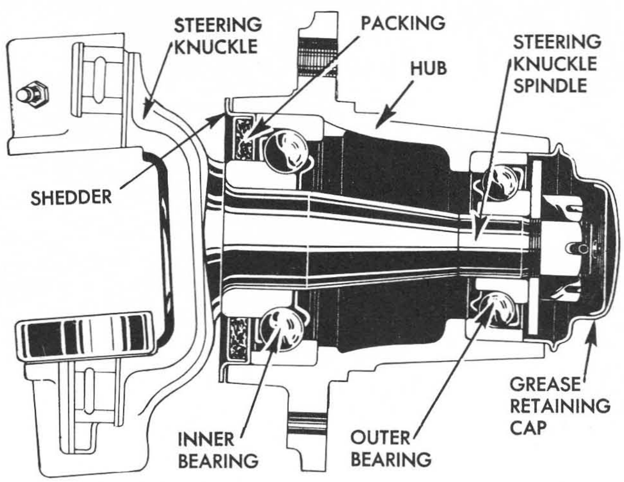


Figure 6-4—Steering Knuckle, Wheel Bearings and Hub

by a ball bearing between the steering knuckle and knuckle support. The steering knuckle spindle supports the wheel hub with two New Departure adjustable cup and cone ball bearings. The outer end of hub is closed by a cap and inner end is sealed with a packing to exclude dirt and water from bearings. See figure 6-4.

6-3 REAR WHEEL SUSPENSION

Rear wheels are not independently sprung since they are mounted on axle shafts incorporated in the rear axle assembly. The rear wheels are held in proper alignment with each other by the rigid construction of the rear axle housing. They are held in alignment with the rest of the chassis by the torque tube and radius rod between car frame and the rear axle assembly.

On Series 40 and *1949 Series 50-70,* two coil type chassis springs are mounted between the

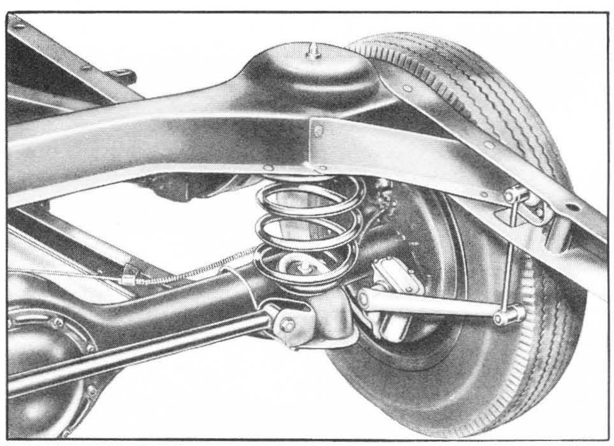


Figure 6-5—Rear Wheel Suspension—Series 40 & 1949 Series 50-70

frame cross member at top of kick-up, and spring seats welded to the axle housing near each end. *On 1948 Series 50-70,* the lower ends of springs are seated on the strut rods just ahead of axle housing. Ride control is provided by a double-acting hydraulic shock absorber mounted on each rear brake backing plate and connected to the frame by a rubber bushed steel link. Side sway of the chassis springs and rear end of frame is prevented by the transverse radius rod. Large rubber bumpers and rubber rear axle stops are bolted to lower flange of frame side rails over axle housing to limit travel of axle housing during compression of the chassis springs. See figure 6-5.

6-4 CHASSIS SPRINGS

a. Regular Chassis Springs

The front chassis springs have a small coil at the top end only, which fits around a center cup attached to the frame by one shock absorber bolt. A rubberized fabric insulator is located between upper end of spring and the frame.

The rear chassis springs have small coils at both ends. The upper end of each spring is attached to the frame by a bolt and clamp. A rubberized fabric insulator is located between upper end of spring and the frame. Another insulator is located between the spring clamp and the flat washer on attaching bolt. *On Series 40* and *1949 Series 50-70,* the lower end of each rear spring is attached to a spring seat on rear axle housing by a spring clamp and bolt. *On 1948 Series 50-70,* the lower end of spring is attached to the strut rod.

b. Optional High or Export Springs

For special requirements, optional high or export front and rear springs are available; these are slightly longer than the regular springs. Optional high or export front springs have the same flexibility rate as the regular front springs. Optional high or export rear springs have a higher rate of flexibility than the regular rear springs. The use of optional high or export springs is explained in paragraphs 6-17 (front) and 6-20 (rear).

c. Overload Rear Springs

Special rear chassis springs are available in 200 pound and 500 pound overload capacities, for use under abnormal load conditions. *It is not recommended that any series rear axle be overloaded in excess of 500 pounds.* Use of overload rear chassis springs is explained in paragraph 6-20.

d. Chassis Spring Identification

All front chassis springs are identical in appearance, and rear springs also. Chassis springs are of different load capacities for different models; therefore springs may not be interchangeable between models. Each spring has the part number stamped on one end coil for identification. The correct spring to use for each model is specified in the Master Parts List.

6-5 FRONT SHOCK ABSORBERS

Delco double acting, opposed piston type hydraulic shock absorbers are used on all models. Front shock absorbers are mounted on top of frame front cross member. Two of the three attaching bolts fit in reamed holes to insure correct alignment of shock absorber with other front suspension members. The arms which are welded to outer ends of shock absorber

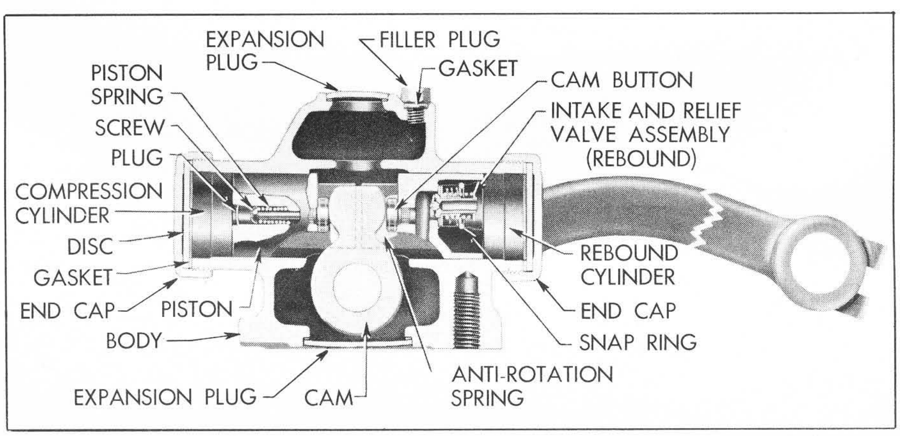


Figure 6-6—Front Shock Absorber—Sectional View

camshaft form the upper control arms of the front wheel suspension system.

Right and left shock absorbers are identical and interchangeable, however, calibrations may differ between car models. Shock absorber calibrations for each model are given under Specifications (par. 6-1) and are also given in the Master Parts List. The manufacturer's model number, coded date of manufacture, and the calibration code numbers are stamped on one end cap of each shock absorber.

The shock absorber body contains a fluid reservoir connected to two cylinders in which rebound and compression pistons operate. Both pistons are fastened together and are simultaneously actuated by a cam located between their inner ends. The cam is mounted on a shaft which extends through both sides of the body and is rotated by the upper control arms serrated to the outer ends. The rebound piston and cylinder are toward the upper arm. See figure 6-6.

Each piston is fitted with a spring loaded valve which operates as a main control valve and also as an inlet valve for return of fluid to outer end of the cylinder. The rebound and compression valves have different calibrations, which govern the rate at which fluid passes through them. The calibration code number is stamped on each valve for proper identification.

Each compression and rebound valve has a bleeder hole in the valve stem. Under normal car operation, when the fluid pressure is applied by the piston, transfer of fluid takes place through the bleeder hole, but for violent road shocks the valve opens against spring pressure, allowing a more rapid transfer of fluid past the valve seat as well as the bleed hole.

As the shock absorber arm moves downward, due to car spring rebound movement, pressure set up in the rebound cylinder forces fluid through the bleeder hole or opens the rebound valve by compressing the valve spring; at the same time, the compression valve moves off its seat in the body, due to the partial vacuum created in the compression cylinder, and the compression cylinder is filled with fluid. As the shock absorber arm moves up, pressure set up in the compression cylinder forces fluid through the bleeder hole or opens the compression valve by compressing the valve spring; at the same time, the rebound valve moves off its seat in the body, due to the partial vacuum created in the rebound cylinder, and the rebound cylinder is filled with fluid. Thus, the action of the fluid is the same in both the rebound and compression cylinders, but the rate of movement of the arm up and down is controlled by the size of the bleeder hole and weight of the spring of the rebound and compression valves.

6-6 REAR SHOCK ABSORBERS

Delco double acting, parallel cylinder type hydraulic shock absorbers are used on all models. Rear shock absorbers are mounted on the brake backing plates and the arms are connected to the frame by non-adjustable rubber bushed steel links. Right and left rear shock absorbers are identical in design but are not interchangeable. Calibrations for each car model are given under Specifications (par. 6-1) and are also given in the Master Parts List. Calibration code numbers are stamped on the valve nuts of each shock absorber.

The shock absorber body contains a fluid reservoir above two parallel cylinders in which compression and rebound pistons operate. Either piston is moved downward by a cam located to bear against the upper end of the piston; while one piston is being moved downward by the cam, the other is moved upward by a heavy coil cap spring. The cam is mounted on a shaft which extends through one side of the body and is rotated by the shock absorber arm attached to the outer end. The compression piston and cylinder are toward the shock absorber arm. See figure 6-7.

While the action of the rear shock absorbers is similar to the front shock absorbers (par. 6-5), they are much faster acting due to the drilled passage from one cylinder to the other. Their construction differs from the front shock absorbers as follows:

1. The oil discharge is from one cylinder to the other by means of drilled passages in the shock absorber body.

2. The compression and rebound valves are located in the ends of the drilled passages rather than in the pistons. The compression and rebound valves act as main control valves only.

3. An intake valve is provided in each piston of the rear shock absorber and its only function is to replenish fluid lost by piston leakage as the cylinders are filled under pressure from valve discharge of opposite cylinder.

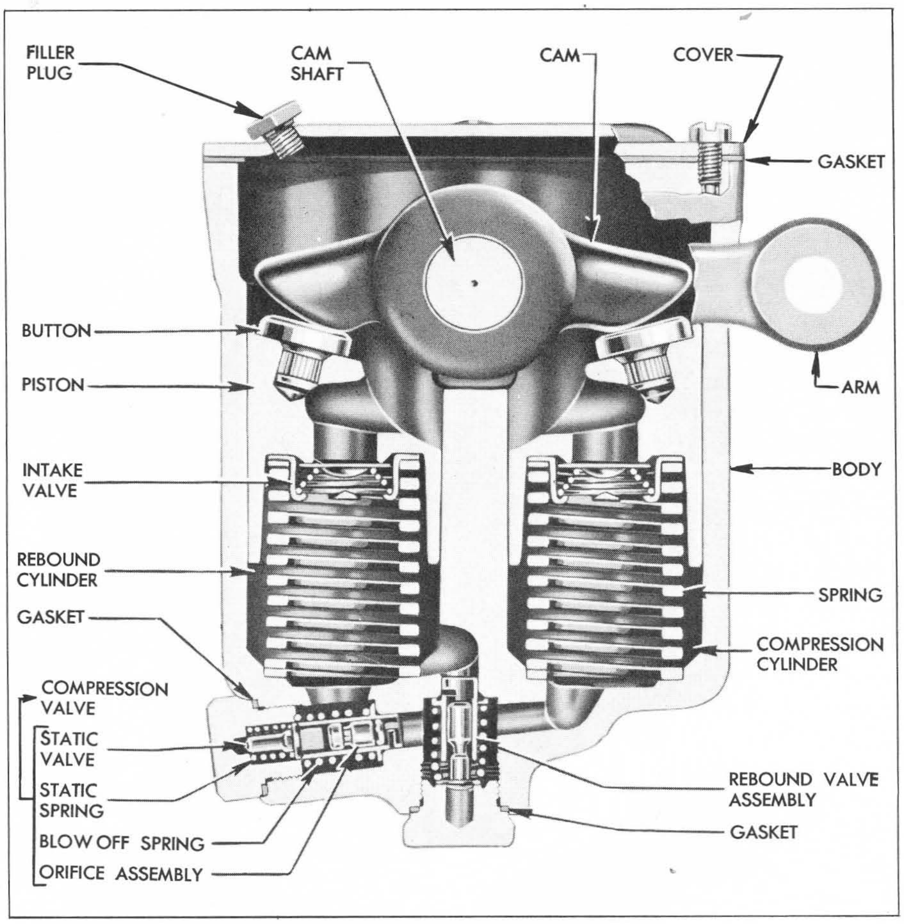


Figure 6-7—Rear Shock Absorber—Sectional View

6-7 WHEELS AND TIRES

a. Wheels

Wheels are demountable disc type with the rim welded to wheel disc to form a unit assembly. The wheels have wide drop center type rims designed to give ample support for the tire sizes used as standard equipment. The rims have tapered tire bead seats which cause tire beads to wedge tightly in place when tires are inflated.

b. Tires and Tubes

Tires on all models are low pressure balloon type, made of a combination of synthetic and natural rubber. Tubes are made of synthetic rubber, which has the advantage of holding air pressure somewhat better than natural rubber. Standard production tire sizes are given in paragraph 6-1 (d).

All tires and tubes used as standard factory equipment have been worked out with the tire manufacturer for stability. *This does not imply that other makes and types of tires and tubes are not suitable for Buick cars, but owing to the large number of tire and tube makes and designs it is impossible for ride and handling calibrations to be worked out for each one.*

Tires other than those used as standard equipment may cause a wander. Larger tires will reduce clearance at fenders and be difficult to mount in spare carriers. Tires with more plys may cause hard riding. Some types of "puncture proof" tubes are difficult to balance and may cause "tramp."

6-8 SERVICE RECOMMENDATIONS—CHASSIS SUSPENSION

Barring accident or rough handling that affects wheel alignment, the chassis suspension requires no attention other than the items specified under Lubricare Instructions (par. 1-1). The following additional services pertaining to tires will insure maximum tire life and bring to attention any out of line condition affecting the tires.

a. Tire Inflation

Maintenance of correct inflation pressure in all tires is one of the most important elements of tire care. Correct tire pressure is also of great importance to ease of handling and riding comfort. Overinflation is detrimental to tire life but not so much as underinflation.

Correct tire inflation pressure is as follows:

Series	*When Tires Are Cold FRONT and REAR*	*When Tires Are Warm FRONT and REAR*
40	26 lbs.	29 lbs.
50	24 lbs.	27 lbs.
70 except 1948 79	22 lbs.	25 lbs.
1948 Model 79	26 lbs.	29 lbs.

In temperatures below freezing inflate tires 2 lbs. higher. WARNING: *It is not possible to inflate tires correctly when hot.*

Driving without tube valve caps contributes to underinflated tires. The valve cap keeps dirt and water out of the valve core and seals the valve against leakage. Whenever tires are inflated be sure to install valve caps on all tubes and tighten firmly by hand. Make sure that rubber washer in cap is not damaged or missing.

If tires are checked at frequent intervals and adjusted to correct inflation pressure, it is often possible to detect punctures and make a correction before a tire goes flat, which may severely damage tire and tube if car is in motion. This is because tubes usually do not go flat for days or even weeks after they are punctured. Slight differences in pressure between tires will always be found, but a tire that is found to be 3 or more pounds below the lowest of its running mates can be suspected of having either a leaking valve or a puncture.

b. Tire Inspection

All tires should be inspected regularly to avoid abnormal deterioration from preventable causes. If tires show abnormal or uneven wear the cause should be determined and correction should be made.

See that no metal or other foreign material is imbedded in the tread. Any such material should be removed to prevent damage to tread and tire carcass.

Cuts in a tire which are deep enough to expose the cords will allow dirt and moisture to work into the carcass and ruin the tire unless promptly repaired. Attention to cuts and cracks in tires containing synthetic rubber is particularly important because cuts spread more rapidly in synthetic than in natural rubber. Shallow cracks or cuts may be arrested by grooving but deep cracks or cuts should be repaired promptly.

Tires which are worn smooth are more likely to skid on wet surfaces than tires with a normal anti-skid design. Water is a lubricant to rubber and there are no sharp edges and gutters in a smooth tire to scrape the water off and allow the tire to make a dry path in which to run. In addition, smooth tires naturally are not as thick as new tires and therefore puncture more easily. It is good practice to replace smooth tires with new tires as insurance against tire accidents.

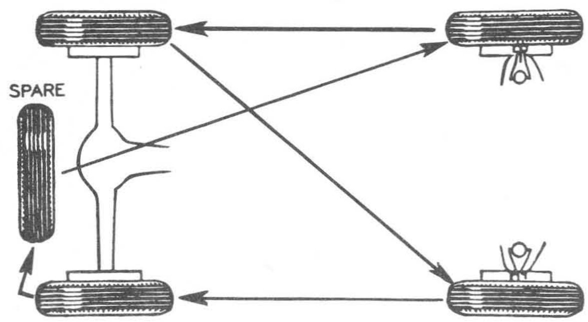


Figure 6-8—Method of Interchanging Tires

c. Interchanging Tires

Tires tend to wear unevenly and become unbalanced as mileage accumulates. Uneven tire wear is frequently the cause of tire noises which are attributed to rear axle gears, bearings, etc., and work is sometimes needlessly done on rear axles in an endeavor to correct the noise.

Tire life will be increased and uneven wear and noise will be less likely to occur if the tires, including the spare, are balanced and interchanged at regular intervals of approximately 5000 miles. The recommended method of interchanging tires is shown in figure 6-8.

d. Use of Tire Chains

Do not use tire chains on the front wheels under any circumstances because they will interfere with the steering mechanism. Any of the conventional full-type non-skid tire chains can be used on the rear wheels.

Tire chains should be loose enough to "creep" but tight enough to avoid striking fenders or other parts. If chains remain in one position the tire side wall will be damaged. Tension springs (either metal coil springs or the rubber band type) must also be used in order to prevent chains contacting frame, etc. The use of tension springs will also reduce ordinary chain noise caused by loose cross links contacting pavement, and prevent damage to rear wheel shields.

On Series 70, due to the larger tires, tire chains may contact the frame side rails or the rear wheel shields if car rolls heavily on a sharp turn. The contact with frame will not cause damage. If chains contact the wheel shields, however, the fenders should be adjusted to provide additional clearance. Loosen fender attaching bolts at fender gravel deflector and pull fender outward to the limit of slotted bolt holes. While holding fender in this position securely tighten attaching bolts.

SECTION 6-B

TROUBLE DIAGNOSIS—CHASSIS SUSPENSION

CONTENTS OF SECTION 6-B

SERVICE BULLETIN REFERENCE

Bulletin No.	Page No.	SUBJECT

6-9 ABNORMAL TIRE WEAR

a. General Operating Conditions

Assuming that there is no misalignment condition to cause unnatural wear, the life of tires depends largely upon car operating conditions and driving habits.

Tires wear at a much faster rate in some localities than in others because of road and operating conditions. Some types of roads are much more abrasive than others. Tire wear is also dependent upon the number of hills and mountains which the car must go up and down, the severity of grades, the number of starts and stops, driving speeds, the amount of rain and snow, and prevailing temperatures. *Tire wear increases rapidly with both speed and temperature.* Tires used at low speeds or in cool climates will have longer life than tires used for high speed driving in hot climates.

Driving habits have a very important bearing on tire life. A careful driver may obtain much greater mileage from a set of tires than would be obtained by a severe or careless driver. Rapid acceleration and deceleration, severe application of brakes, taking turns at excessive speed, high speed driving, and striking curbs or other obstructions which lead to misalignment are driving habits which will shorten the life of any tire.

Maintenance of proper inflation pressure and periodic interchanging of tires to equalize wear are within the control of the driver. Underinflation raises the internal temperature of a tire greatly, due to the continual friction caused by the flexing of the side walls. Tires squealing on turns is an indication of underinflation or of excessive speed on the turns. A combination of underinflation, high road temperatures, and high speed driving will quickly ruin the best tire made.

High speed on straight highways causes more rapid wear on the rear than on the front tires, and driving turns and curves at too high a rate of speed causes the front tires to wear much faster than the rear tires.

An inspection of the tires, together with information as to locality in which the car has been operated will usually indicate whether abnormal wear is due to the operating conditions described above, or to mechanical faults which should be corrected.

The various types of abnormal tire wear and their causes are described in the following subparagraphs.

b. Shoulder or Underinflation Tread Wear

When a tire is underinflated, the side walls and shoulders of the tread carry the load while the center of tread folds in or compresses due to the low internal air pressure. This action causes the shoulders to take all of the driving and braking load, resulting in much faster wear of shoulders than of the center of tread.

See figure 6-9. For maximum results in handling, riding and tire life, tire inflation pressures should never be allowed to go below the specified minimum pressure (par. 6-8.)

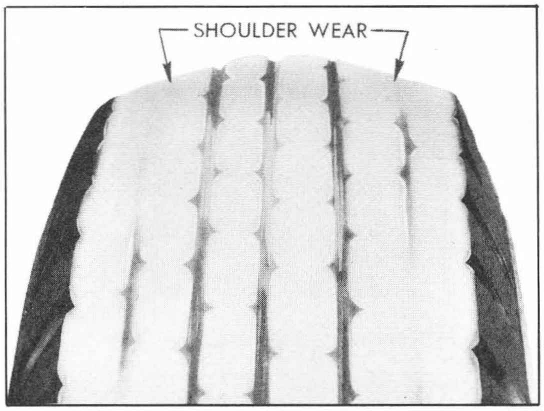


Figure 6-9—Underinflation Tread Wear

Continuous high speed driving on curves, right and left, may produce tread wear very similar to underinflation wear and might very easily be mistaken for such. Side thrust when rounding turns causes wear on the sides of tire tread. In making a turn to the left, especially at high speeds, the outside shoulder of the right tire and the inside shoulder of the left tire take the side thrust and naturally receive the most wear. The only possible correction is to advise slower speeds on curves. Do not increase tire inflation pressures beyond specified limits as this will cause center or overinflation wear (subpar. c, below).

6. Center or Overinflation Tread Wear

On a tire that is overinflated the center of the tread receives much more driving and braking strain than the sides or shoulders. The center of tread therefore wears away much faster than the shoulders and, if tire is continuously overinflated, may be worn thin while the shoulders have plenty of tread material left. See figure 6-10.

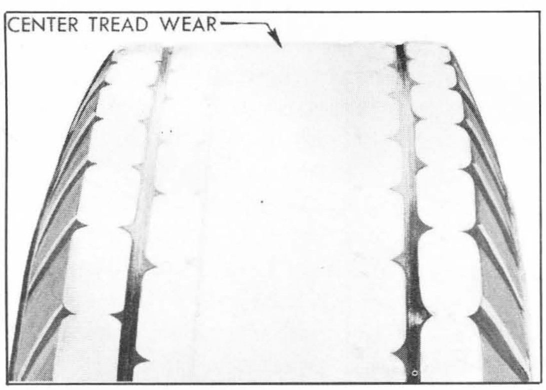


Figure 6-10—Overinflation Tread Wear

When tire inflation pressures are maintained within the specified limits (par. 6-8) the tire will make a full contact across the entire width of tread, thereby distributing the wear evenly over the total surface of the entire tread area.

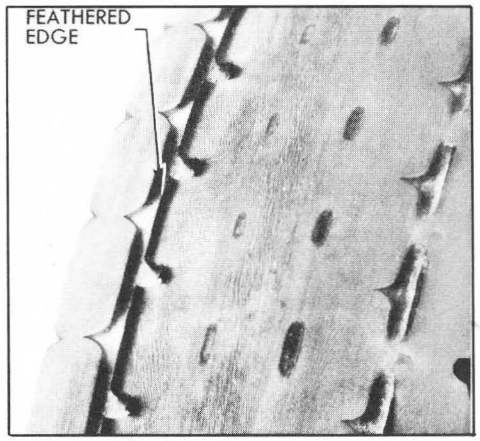


Figure 6-11—Toe-in or Toe-out Tread Wear

d. Cross or Toe Tread Wear

When the front wheels have an excessive amount of either toe-in or toe-out, the tires are actually dragged sideways when they travel straight down the road, and a cross wear or scraping action takes place, rapidly wearing away the tread of tires. This cross wear condition will usually produce a tapered or feathered edge on the ribs of the tire tread. See figure 6-11. In most cases this can be detected by rubbing the hand across the tire tread.

If the tapered or feathered edges are on the inner sides of the ribs on one or both sides, it indicates that one or both tires have excessive toe-in, while the same condition in the outer sides of ribs indicate excessive toe-out. See paragraph 6-30 for toe-in correction.

Cases may be encountered where one front tire definitely indicates toe-in wear while the opposite tire indicates toe-out wear. Whenever this condition is indicated always check the steering geometry or turning angles of both front wheels as described in paragraph 6-30. It may be found that the turning angles are not according to specifications, so that the inside wheel on both turns either toes-in or toes-out too much, resulting in cross wear on turns only. Incorrect turning angles are caused by bent steering arms.

Cornering wear caused by high speed driving on curves (subpar. f, below) sometimes has the appearance of toe wear. Care must be used to distinguish between these two types of wear so that the proper corrective measures will be used.

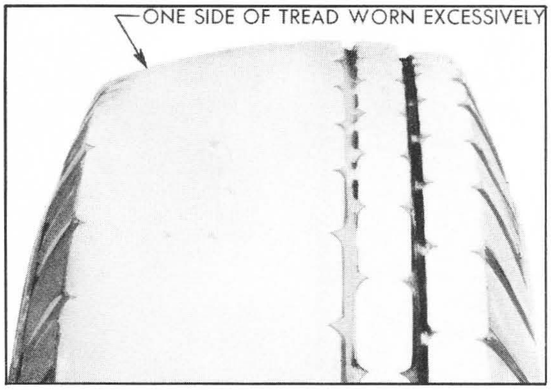


Figure 6-12—Side or Camber Tread Wear

e. Side or Camber Wear

Excessive wheel camber, either positive or negative, causes the tire to run at such an angle to the road surface that one side of the tread wears much more than the other. See figure 6-12.

The amount or angle of the camber wear will be governed by the amount of positive or negative camber in relation to the perpendicular, and by the shape of the road surface. With any given camber angle, tires driven on modern flat concrete highways will show greater camber wear than when driven on the earlier type crowned highways. Camber wear may or may not be smooth or uniform, depending largely on the tire tread design.

Tire tread wear very similar in appearance to camber wear may be caused by driving on turns at excessive speeds. This "cornering" tread wear (subpar. f, below) cannot be corrected by change of camber angle.

Adjustment for specified camber is covered in paragraph 6-30.

f. Cornering Tread Wear

The modern independently sprung automobile allows the driver to negotiate turns at a much higher rate of speed with the same feeling of safety that he had with the older type cars. This fact is responsible for a comparatively new type of tread wear that can easily be mistaken for toe or camber wear.

When a car is making a turn, the tires are supposed to be rolling in a circle. When the turn is made at high speed, however, centrifugal force acting on the car causes the tires to be distorted sideways and to slip or skid on the road surface. This produces a diagonal cross type of wear, which in severe cases will result in a fin or sharp edge on each rib of the tire treads.

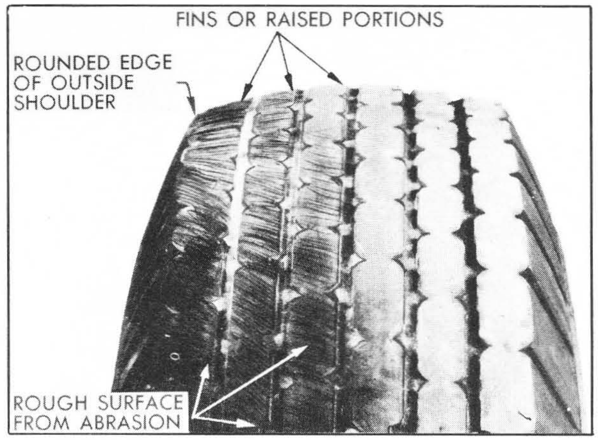


Figure 6-13—Cornering Tread Wear

Cornering wear can be distinguished from toe or camber wear by the rounding of the outside shoulder of the tire, and by the roughening of the tread surface in this section denoting severe abrasion. See figure 6-13.

No alignment or tire pressure change can be made that will relieve cornering wear. Only the driver can effect a cure, and that by slowing down on the curves.

g. Heel and Toe Tread Wear

Heel and toe wear is a saw-tooth effect with one end of each tread block worn more than the other. The end which wears is that which first grips the road when the brakes are applied. High speed driving and excessive use of the brakes will cause this type of irregular tire wear. This type of wear will occur on any type of block tread design. See figure 6-14.

Heel and toe wear is not so prevalent on the rear tires because of the propelling action which creates a counteracting force which wears the opposite end of the tread block. These two stresses on the rear tires wear the tread blocks in opposite directions and result in more even wear, while on the front tires the braking stress is the only one which is effective. This may be counteracted by interchanging tires (par. 6-8).

A small amount of irregular wear, slightly saw-toothed in appearance, at the outer segments of tires is a normal condition and is due to the difference in circumference between the

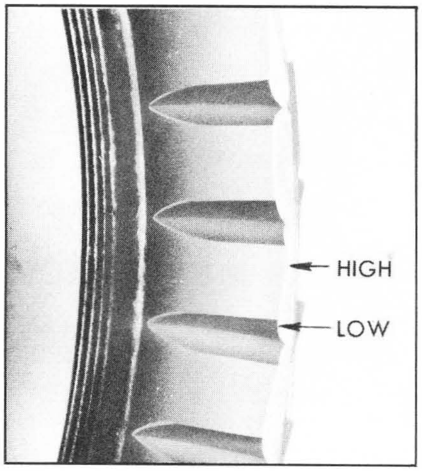


Figure 6-14—Tread Block Heel and Toe Wear

center and the outer edges of the tire tread. This saw-toothed appearance, however, will be exaggerated by underinflation, improper toe-in, or both.

h. Wavy Tread Wear, Flat Spots, and Cupping

Many combinations of factors may cause the types of tread wear listed here; therefore it is never possible to say definitely that any one condition is the cause.

As stated above (subpar. g) a small amount of irregular wear at the outer segments of tires is a normal condition; however, irregular wear extending toward center of tread is due to wheel misalignment conditions which should be corrected. Careful checking and adjustment of all wheel alignment factors (par. 6-29 and 6-30) will reduce such wear.

An overinflated tire tends to bounce instead of keeping in contact with the road surface. On turns this bouncing produces scuffing and may cause flat spots to develop.

A tire that is statically unbalanced bounces or hops on the road, causing rapid and uneven tread wear.

Uneven brake adjustment or grabbing brakes will cause rapid and uneven tread wear. Out of round brake drums will cause flat spots to develop on tire treads.

Wabble or runout of a tire, either front or rear, due to bent wheel or to tire being improperly mounted will cause uneven wear. The runout of wheel and tire when rotated should not exceed 1/8" at side of tire.

Looseness of parts in the suspension system such as worn king pins or steering knuckle bushings, loose wheel bearings, worn knuckle support pivot pins or bushings, inoperative shock absorbers, and any excessive looseness throughout the steering system all tend to allow the front wheels to kick around, and if any of the wheel alignment factors are incorrect, irregular spotty tire tread wear of one type or another may result.

Regardless of the original cause of spotty tread wear on either front tire, no alignment or balance job, however perfect, can prevent future excessive wear of the spots. Once a front tire acquires flat or cupped spots extra rapid wear will continue, caused by the braking and steering strains on the thinner and weaker sections of the tread.

A thorough mechanical and alignment inspection, plus a check for wheel and tire unbalance, should uncover the cause or causes of the irregular wear. At the time of correction, however, the cupped tire should be interchanged with a rear tire on which the tread runs true. The cupped tire will, to a certain degree, true itself up on a rear wheel because being rigidly mounted to the axle shaft it can only revolve, absorbing first the driving and then the braking strain.

6-10 FAULTY SPRINGS OR SHOCK ABSORBERS

a. Weak Springs

Measurement of the trim dimension with springs installed is the only practical method of checking chassis springs that are reported to be weak. See paragraph 6-17 for checking trim dimension of front springs and paragraph 6-20 for rear springs. The strength of chassis springs cannot be determined by measurement of the free length when removed from car, because springs of equal strength under rated load may vary considerably in length when not loaded.

b. Weak or Inoperative Shock Absorbers

Many shock absorbers have been replaced and returned to the factory with the report that they were weak. When tested with special factory equipment very few of these replaced units have been found weak or otherwise below standard in operation. This indicates that these shock absorbers were needlessly replaced in an attempt to improve riding conditions that were actually standard, or that erroneous methods were used in judging the operating condition of the units.

Before attempting to test shock absorbers make sure that all attaching bolts are tight and that the units are filled with specified fluid (par. 6-23). Tires should be uniformly inflated to specified pressure (par. 6-8). The chassis should be well lubricated to make sure that suspension parts are free moving.

Test each front and rear shock absorber in turn by quickly pushing down and then lifting up on the end of car bumper adjacent to the unit being checked. Use the same force as near as possible on each test, and note the amount of resistance provided by the shock absorber on compression and rebound. A little practice on another car of the same model which has satisfactory ride control will aid in judging the amount of resistance that should exist.

Both front shock absorbers should provide the same feeling of resistance and both rear shock absorbers should do likewise. Any noticeable variation between right and left shock absorbers indicates that one unit is not operating normally. Little or no resistance on compression or rebound indicates air in shock absorbers, internal leakage due to wear, or that the valve is held open by dirt. Excessive resistance indicates that bleeder hole in valve is plugged with dirt.

If there is any doubt about the action of a shock absorber after testing as described above, disconnect shock absorber arm at the outer end. Quickly move the arm up and down through complete range. There should be no free movement in the arm, and the force required to move arm up and down should be almost equal but with slightly greater resistance on the upward movement. On the front shock absorbers the upward movement is compression and on the rear absorbers it is rebound.

Lack of resistance to movement of the arm indicates air in shock absorber, internal leakage due to wear, or that the valve is held open by dirt. Excessive resistance indicates that bleeder hole in valve is plugged with dirt. Air may be worked out of a shock absorber by removing filler cap and moving the arm up and down through full range and adding fluid as described in paragraph 6-23. If a valve is plugged or held open by dirt, or internal leakage due to wear exists, the shock absorber must be removed for replacement of valve or shock absorber assembly (par. 6-24).

In either of the tests given above, the amount of force that can be applied is not sufficient to open a valve against its spring pressure; therefore these tests only check the flow of fluid through the valve bleeder hole as well as any leakage due to a valve being held open or due to internal wear of piston and cylinder. Since it is unlikely that the valve springs will weaken in service, it may be assumed that the shock absorber action is normal if it operates satisfactorily in the tests given above.

6-11 IMPROPER STEERING ACTION

Steering action is dependent upon the chassis suspension members as well as the steering gear assembly and tie rods. Improper steering actions which are most likely to be caused by chassis suspension are covered in this paragraph, while conditions most likely to be caused by the steering gear assembly or tie rods are covered in paragraph 7-4.

a. Car Pulls or Leads to One Side

(1) High crowned roads.

(2) Low or uneven tire pressure (par. 6-8).

(3) Front tires of unequal diameter due to wear.

(4) Brakes dragging on one side (par. 8-15).

(5) Shock absorbers low in fluid or inoperative (par. 6-23 and 6-10).

(6) Incorrect caster, camber, or toe of front wheels (par. 6-30).

(7) Frame bent or broken (par. 9-2).

b. Steering Affected by Application of Brakes

(1) Low or uneven tire pressure (par. 6-8).

(2) Front tires of unequal diameter due to wear.

(3) Brakes incorrectly or unevenly adjusted. Dirt or grease on lining (par. 8-15).

(4) Incorrect or uneven caster or bent steering knuckle (par. 6-30).

c. Car Wander or Lack of Steering Stability

(1) Heavy cross wind.

(2) Type of road surface.

(3) Low or uneven tire pressure (par. 6-8).

(4) Wheels toe out in straight ahead position (par. 6-30).

(5) Incorrect or uneven caster or camber (par. 6-30).

(6) Steering gear or tie rods adjusted too loose or worn, or adjusted too tight (par. 7-4).

(7) Steering knuckle bushings or king pins worn (par. 6-15).

d. Road Shocks Transmitted to Steering Wheel

(1) Low or high tire pressure (par. 6-8).

(2) Wrong type or size of tires used (par. 6-7).

(3) Steering gear or tie rods incorrectly adjusted. Broken tie rod spring (par. 7-4).

(4) Shock absorbers inoperative or leaking (par. 6-10). Wrong valving (par. 6-1).

(5) Improper caster or bent steering knuckle (par. 6-30).

(6) Steering knuckle bushings or king pins worn (par. 6-15).

e. Front Wheel Shimmy (low speed)

Low speed shimmy is a rapid series of oscillations of the front wheel and tire assembly as the wheels attempt to point alternately to the right and left. This movement is often transmitted through the steering linkage to the steering gear. Low speed shimmy usually occurs below 30 MPH.

(1) Uneven or low tire pressure (par. 6-8).

(2) One or both wheel and tire assemblies out of balance (par. 6-28).

(3) Front wheel bearings loose or worn (par. 6-14).

(4) Incorrect caster, camber, or toe of front wheels (par. 6-30).

(5) Steering knuckle bushings or king pins worn (par. 6-15).

(6) Steering gear or tie rods incorrectly adjusted or worn (par. 7-4).

f. Wheel Tramp, Front or Rear

Wheel tramp, sometimes called high speed shimmy, is a rapid up and down movement of a wheel and tire assembly, as though the tire was decidedly eccentric. In severe cases the tire actually hops clear of the road surface. Wheel tramp may develop in either front or rear wheels, and occurs at speeds above 35 MPH.

(1) Wheel tire or brake drum out of balance (par. 6-28).

(2) Shock absorber inoperative (par. 6-10).

(3) Item 1 or 2 in combination with one or more items listed under Front Wheel Shimmy (subpar. e, above).

6-12 CAR ROUGHNESS OR VIBRATION

Car roughness or vibration may be caused by road surface conditions as some types of road set up unusual vibrations in cars at various speeds. Testing the car on a different type of road will show whether the road is causing the vibration.

Some types of tire treads, as well as tires having more than four plies of fabric may cause abnormal vibration or roughness. If car is equipped with tires other than those which have been selected for production equipment (par. 6-7) it is advisable to test the car with standard tire equipment before deciding that a mechanical condition is the cause of roughness.

The following procedure should be used to determine cause of roughness or vibration in car operation at various speeds, which may be due to an unbalanced condition of wheels, tires, brake drums, propeller shaft, or engine.

1. Jack up all wheels, having jack support rear end of car at center of rear axle housing.
2. Check runout of front and rear wheels and tires. Runout should not exceed 1/8" at side of tire.
3. With transmission in third speed, run engine at various car speeds to note speeds at which vibration or roughness occurs.
4. Remove rear wheels and run engine again at the critical speeds noted in step 3. If roughness is gone the condition is caused by unbalanced wheel and tire assemblies (par. 6-28).
5. If roughness still exists with rear wheels removed, remove rear brake drums and repeat the running test. Elimination of the roughness indicates out of balance brake drums (par. 8-17).
6. If roughness still exists with brake drums removed, run engine with transmission in neutral. Elimination of the roughness indicates that propeller shaft is out of balance. Continued roughness with engine running alone indicates an out of balance condition of engine.

SECTION 6-C

REPAIR OPERATIONS—CHASSIS SUSPENSION

CONTENTS OF SECTION 6-C

SERVICE BULLETIN REFERENCE

Bulletin No.	Page No.	SUBJECT

6-13 REPLACE AND ADJUST STABILIZER LINK GROMMETS

The construction of the stabilizer links is clearly shown in figure 6-15. To disassemble, remove nut from lower end of the link rod, then remove rod, spacer, retainers, and grommets. When new, the link grommets are ⅞" free length. When assembling, install rubber grommets dry and use care to center the grommets in the seats on stabilizer shaft and lower control arm plate, also center the retainers on grommets before tightening rod nut. Tighten rod nut to the limit of thread on rod.

When the rod nut is tightened to limit of threads on rod, the overall dimension between sides of grommet retainers as shown at "A" in figure 6-15 should be 1¹¹⁄₁₆". If dimension "A" is not 1¹¹⁄₁₆" when nut is tight, adjust the nut to obtain this dimension. *This is important to insure proper riding qualities and stabilization.*

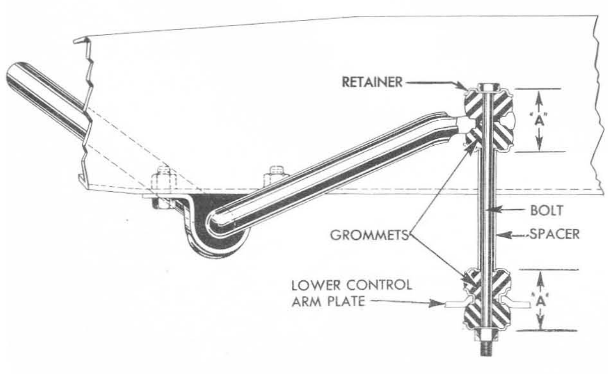


Figure 6-15—Front Stabilizer Link—Sectional View

6-14 REPLACE AND ADJUST FRONT WHEEL BEARINGS

a. Replacement of Bearings

1. Remove wheel with hub and drum assembly. Remove oil seal packing from hub so that inner bearing can be properly cleaned and inspected.

2. Wipe old grease out of hub and from steering knuckle spindle. Clean and inspect all bearing parts as described under Bearing Service (par. 1-13 and 1-14), and replace any that are faulty.

3. If a bearing cup has to be replaced, drive

the old cup out with a punch. Use care when installing the new cup to start it squarely into hub, to avoid distortion and possible cracking. Install a new oil seal packing, driving it squarely into the hub with a suitable flat tool to avoid distortion.

4. When inspecting or replacing bearing cones (inner races) make sure that cones are free to creep on spindle of steering knuckle. The cones are designed to creep on the spindle in order to afford a constantly changing load contact between the cones and the ball bearings. Polishing the spindle and applying bearing lubricant before cones are installed will permit creeping and prevent rust forming between cone and spindle.

b. Installation of Wheel and Adjustment of Bearings

1. Work approximately one tablespoon of wheel bearing lubricant into each ball bearing assembly and *push the inner bearing cone into place in the oil seal packing*. If this cone is placed separately on the spindle there is danger of damaging the oil seal packing when wheel is installed on spindle.

2. After wheel, outer bearing and cone, safety washer, and nut are installed, take up spindle nut with 10" wrench until bearings are preloaded at least one (1) hex, then rotate wheel one (1) revolution to make sure bearings are seated.

3. Back off spindle nut until bearings are slightly loose. Tighten nut until all bearing looseness is just removed, then line up nut to nearest cotter hole and install cotter pin. Do not mistake loose king pin bushings, etc., for wheel bearing looseness. CAUTION: *Bearing preload must not exceed $1/12$ turn of spindle nut.*

4. Before installation of grease cap in hub, make sure that end of spindle and inside of cap is free of grease so that radio static collector makes a good clean contact. Make sure that static collector is properly shaped to provide good contact between end of spindle and the grease cap.

6-15 REPLACE OR REBUSH STEERING KNUCKLE

a. Removal of Steering Knuckle

1. Remove front wheel with hub and drum assembly.

2. Remove brake backing plate and steering arm from steering knuckle. Do not disconnect brake hose but support backing plate out of way to avoid strain on hose.

3. Drive out king pin lock pin.

4. Remove upper welsh plug from knuckle by piercing with a sharp pointed punch and prying out.

5. Drive king pin down and out, which will drive lower welsh plug from knuckle. Remove thrust bearing and shims.

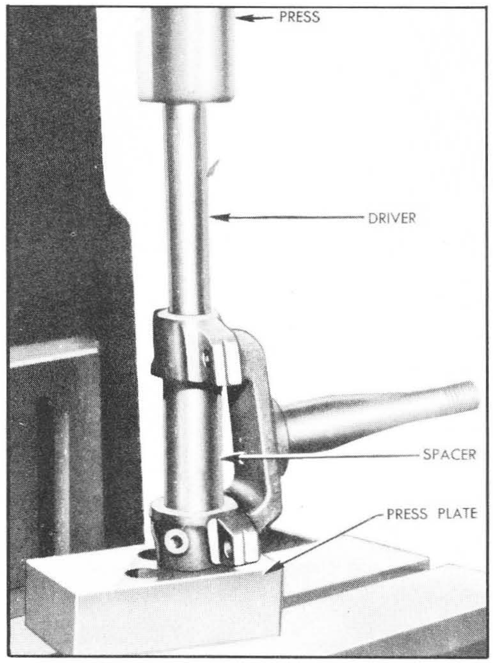


Figure 6-16—Installing Steering Knuckle Bushing

b. Rebush Steering Knuckle

New steering knuckles have bushings installed and reamed to size. Bushings are also furnished separately for installation as follows:

1. Remove grease fittings and press old bushings from steering knuckle, using Driver J 1382-3 and Press Plate J 1649. If bushings are so tight that pressure springs yoke ends of knuckle, place Spacer J 722-2 between yoke ends to one side of bushing.

2. With oil hole in bushing in line with hole for grease fittings, and with the short groove on inside of bushing leading toward the expansion plug seat, press new bushing into each arm of steering knuckle, using Driver J 1382-3, Spacer J 722-2, and Press Plate J 1649. See figure 6-16.

3. Burnish bushings, using Burnisher J 722-1, Spacer J 722-2, and Press Plate J 1649. See figure 6-17. The burnisher expands the bushings tightly in place and sizes the holes for reaming.

4. Use Reamer HM 592 to line ream bush-

ings to provide .0005" to .0025" clearance on king pin.

5. Install grease fittings.

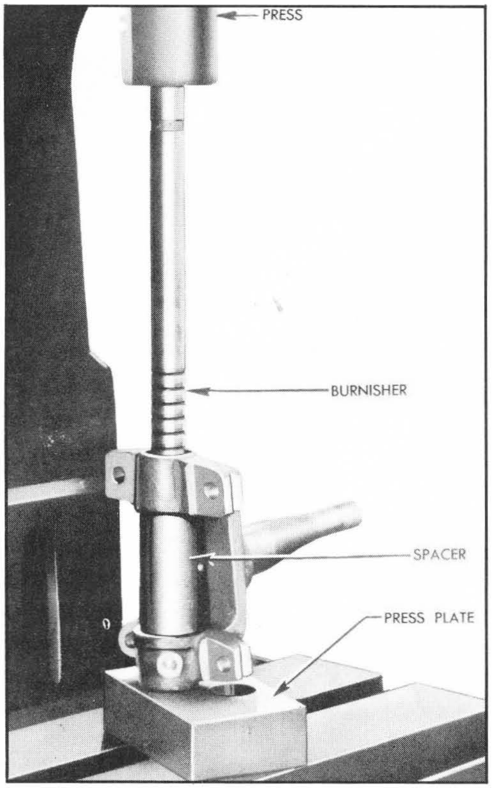


Figure 6-17—Burnishing Steering Knuckle Bushings

c. Installation of Steering Knuckle

1. Install steering knuckle by reversing the removal procedure. Use shims as required between lower boss of knuckle and the thrust bearing to provide .003" end play of knuckle on knuckle support. Use new expansion plugs at both ends of king pin.

2. Lubricate and adjust front wheel bearings as described in paragraph 6-14.

3. Check and adjust caster, camber, and toe-in (par. 6-30). Be sure to install grease fitting in pivot pin bushing.

6-16 REPLACE UPPER PIVOT PIN AND BUSHINGS

a. Removal of Bushings and Pivot Pin

1. Place jack under lower control arm, raise wheel off floor, and remove wheel and tire assembly.

2. Remove pivot pin bushing clamp bolt in upper control arm, then remove both pivot pin bushings from upper control arm, and remove rubber seals.

3. Loosen clamp bolt in knuckle support and remove pivot pin, using 1/4" hex Allen wrench. NOTE: *Tie steering knuckle support to upper control arm to prevent damage to brake hose.*

b. Installation of Pivot Pin and Bushings

NOTE: *The 1949 model upper pivot pins are more eccentric than prior model pins, to provide a 50% greater range of camber adjustment. The bushings are also different, therefore neither of these parts can be used separately with prior model pins or bushings. Complete sets of 1949 model pivot pins and bushings may be installed in 1937 through 1948 Series 40-50-70.*

1. Hold knuckle support in line with hole through control arm and screw pivot pin into knuckle support, with adjusting wrench hole in pin toward the split side of control arm.

2. Turn pivot pin until the large diameter section is centralized in knuckle support and tighten the clamp bolt. Install rubber seals on both ends of pivot pin.

3. Centralize knuckle support boss in upper control arm yoke and start the externally threaded bushing on threads of pivot pin and into threads of control arm.

4. Start the plain (grooved) bushing on threads of pivot pin, then turn the opposite bushing up tight. Turn the plain bushing up until hex is just clear of control arm, then install and tighten clamp bolts.

5. Check and adjust caster, camber, and toe-in (par. 6-30). Be sure to install grease fitting in upper pivot pin bushing.

6-17 FRONT CHASSIS SPRING TRIM DIMENSION

a. Checking Trim Dimension

Before measuring front spring trim dimension, bounce front end of car up and down several times to make sure there is no bind in front suspension and to let springs take a natural position.

Front springs are considered too high or too

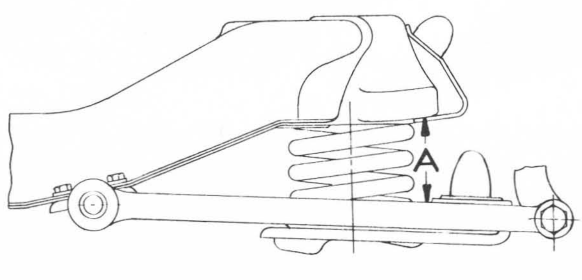


Figure 6-18—Front Spring Trim Dimension

low when the trim dimension shown at "A" in figure 6-18 is not within the following limits, *with car at curb weight.*

Year and Series	Regular Springs	Opt. High or Export Springs
1948 All Series	3½"—4"	3⅞"—4⅜"
1949 Series 50-70 (Except Mod. 56-C and 76-C)	3¾"—4¼"	4" —4½"
1949 Models 56-C and 76-C	3½"—4"	3¾"—4¼"

b. Correction of Trim

When the trim dimension is found to be too low, correction may be made by installing special shims (group 7.425), ⅛" thick, between upper end of spring and the frame. If more than three shims are required, replace the spring.

c. Use of Optional High or Export Springs

For special requirements where excessive bottoming occurs on regular springs with normal loads, it is advisable to install optional high or export springs, which are slightly longer than the regular springs. Front shock absorber calibrations need not be changed upon installation of optional high or export front springs.

6-18 REPLACEMENT OF CHASSIS FRONT SPRING

a. Removal of Front Spring

1. Place jack under lower control arm, raise wheel off floor, and remove wheel and tire assembly.

2. Disconnect stabilizer link from lower control arm and disconnect outer end of tie rod from steering arm.

3. Remove lower pivot pin nut, pivot pin, lockwasher, and dirt seals.

4. Support car frame by another jack, then slowly lower the jack under lower control arm. This will allow lower control arm to drop low enough to remove chassis spring.

b. Installation of Front Spring

Before installation of front spring, check the part number which is stamped on one end coil to make sure that spring is correct for the car model, as specified in group 7.412 of Master Parts List.

1. Make sure that the rubberized fabric spring insulator is in place around the spring center cup on frame, and is in good condition.

2. Place small end coil of spring over the center cup and as lower control arm is raised, position lower end of spring so that the end coil seats in the recess provided in spring seat. Support lower control arm on a jack.

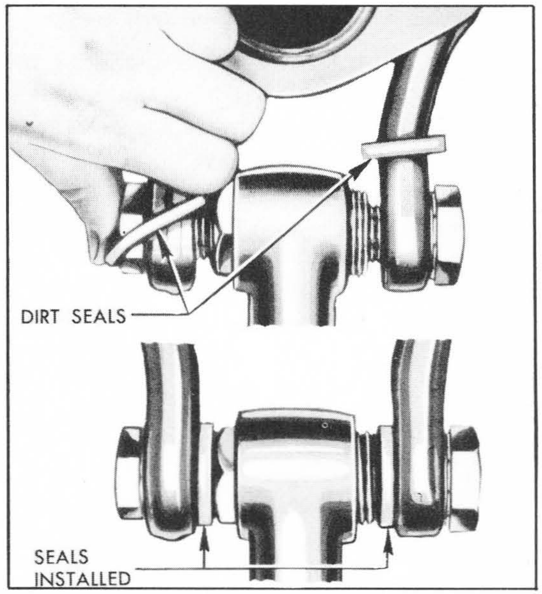


Figure 6-19—Installing Dirt Seals

3. Slip the lower pivot pin dirt seals over outer ends of lower control arm. Centralize lower end of knuckle support between outer ends of lower control arm, then install lower pivot pin and lockwasher from front side and tighten securely. Install and tighten nut. Snap dirt seals into place over pivot pin. See figure 6-19.

4. Connect tie rod outer end to steering arm, and connect stabilizer link to lower control arm. Adjust stabilizer link grommets as described in paragraph 6-13.

5. Install wheel and tire assembly, then check and adjust caster, camber, and toe-in (par. 6-30).

6-19 REPLACE OR REBUSH LOWER CONTROL ARM ASSEMBLY

If a lower control arm is bent or broken it should be replaced with a new assembly which includes the shaft, bushings, and dirt seals. The riveted parts of the assembly are not furnished separately. If only the shaft and bushings require replacement these can be obtained separately or in a package (group 6.170) containing the parts shown in figure 6-20.

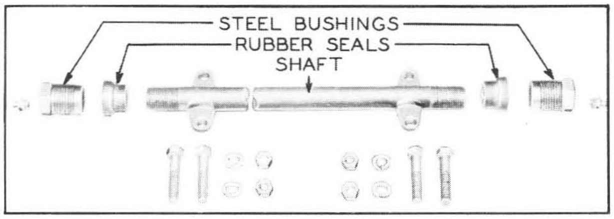


Figure 6-20—Lower Control Arm Shaft Package

Use the following steps 1, 10, and 11 for installation of control arm and shaft assembly. Use steps 1 through 11 for replacement of control arm shaft and bushings.

1. Remove front chassis spring (par. 6-18) then remove lower control arm assembly from frame front cross member.

2. Unscrew bushings and remove shaft from control arm.

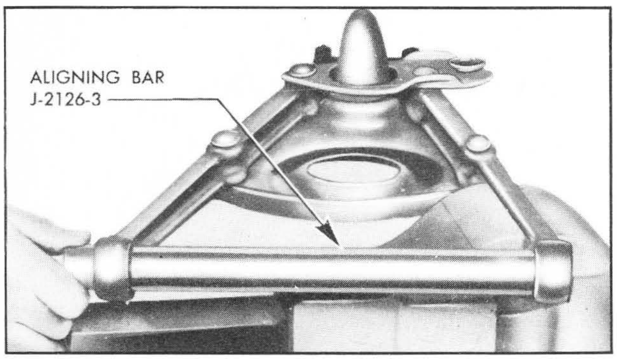


Figure 6-21—Checking Alignment of Control Arm Inner Ends

3. Use Aligning Bar J 2126-3 to check alignment of inner ends of control arm. See figure 6-21. If the ends are not in alignment use a piece of pipe over the bar to obtain more leverage and bend arms until aligning bar enters both ends freely. Distance between inner ends of arm should be 11¼" plus or minus 1/32", from inside to inside. See figure 6-22.

4. Install a rubber seal over each threaded end of new control arm shaft, with the large or bell ends of seals outward toward ends of shafts. See figure 6-23.

5. Insert one end of shaft with the seal in place in one control arm end and force opposite end of shaft into the other control arm end. A piece of wood approximately 1¼" x 2½" x 24" long can be used as a pry. See figure 6-23.

6. Fasten control arm securely in vise close to one end to prevent springing or distortion. NOTE: *Apply a liberal amount of white lead or Lubriplate to both bushings before installing in arms.* Place one bushing in position in end of arm and screw the end of shaft into this bushing. This will help to align the bushing while screwing it into place with socket and ratchet handle wrench. See figure 6-24. The

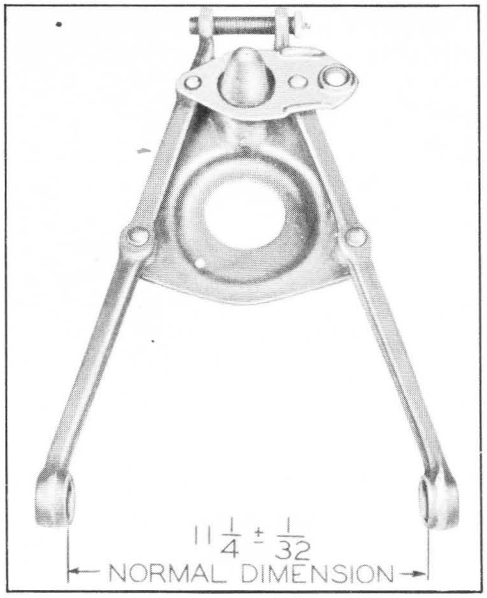


Figure 6-22—Correct Spacing of Control Arm Inner Ends

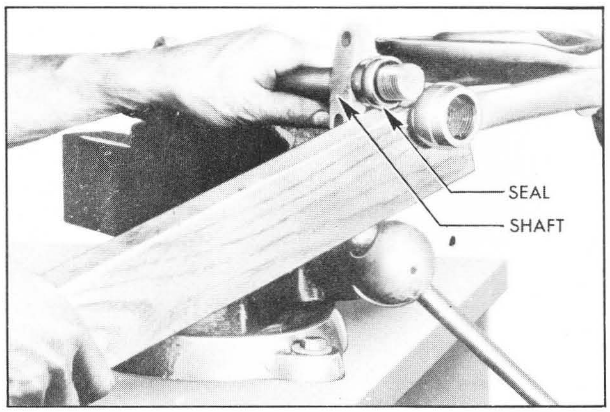


Figure 6-23—Springing Arm Over End of Shaft

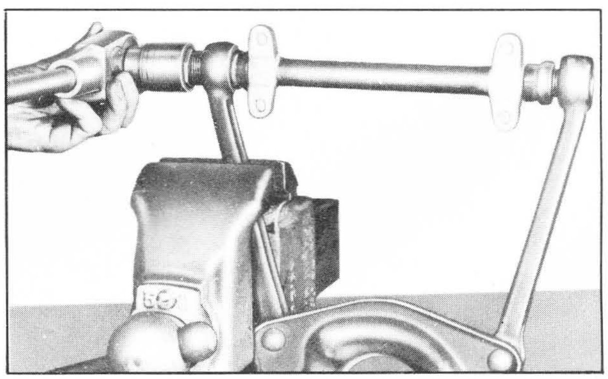


Figure 6-24—Installing First Bushing

holes in end of arms are not threaded; therefore, the outside threads on the bushings must cut their own threads in the arms. To insure the bushings being a proper fit, a torque of 100 foot pounds minimum must be used in checking for tightness.

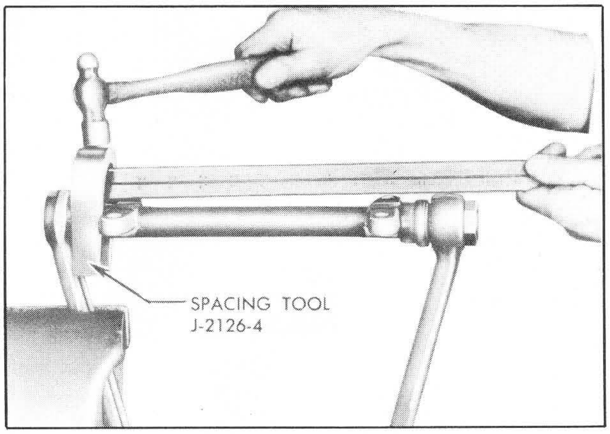


Figure 6-25—Spreading Arms for Installation of Second Bushing

7. After the first bushing has been installed, revolve the shaft in threaded bushing until the shaft is in the approximate center between the two arms. Spread the arms $\frac{1}{64}''$ to $\frac{1}{32}''$ more than the normal dimension by using Spacing Tool J 2126-4. See figure 6-25.

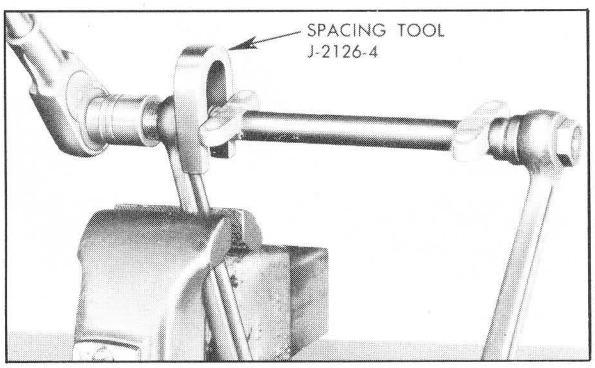


Figure 6-26—Installing Second Bushing

8. Screw the second bushing into place using socket wrench and ratchet. See figure 6-26. Shaft must be held to prevent turning while installing this second bushing; then check bushing with torque wrench tightening to a minimmum 100 foot pounds. NOTE: *Both bushings must have the hexagon heads tight against the arm bosses.*

9. Install lubrication fittings in each bushing and paint the assembly.

10. Before installing lower control arm and shaft assembly, turn shaft to locate the bolt holes at both ends so they are equally distant from the inside surface of the arms, then bolt shaft to frame front cross member.

11. Install front chassis spring and other parts (par. 6-18). Check and adjust caster, camber, and toe-in (par. 6-30).

6-20 CHASSIS REAR SPRING TRIM DIMENSION

a. Checking Trim Dimension

Before measuring the rear spring trim dimension, bounce rear end of car up and down several times to make sure there is no bind in rear suspension and to let springs take a natural position.

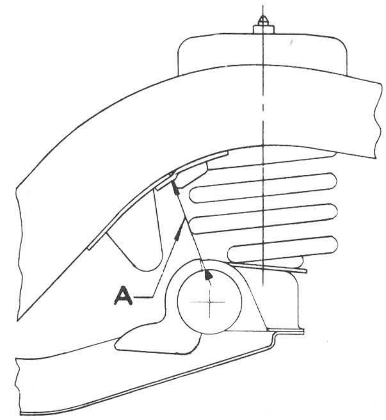


Figure 6-27—Rear Spring Trim Dimension—Series 40 & 1949 Series 50-70

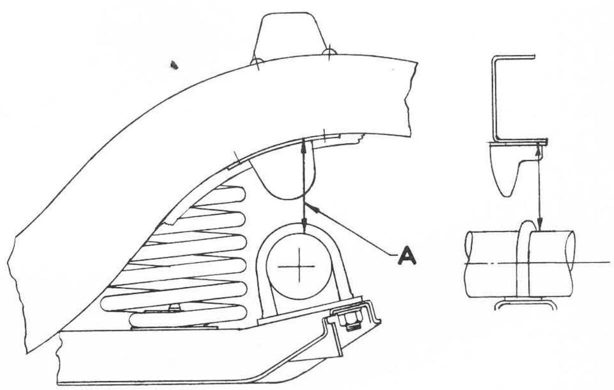


Figure 6-28—Rear Spring Trim Dimension—1948 Series 50-70

The rear spring trim dimension shown at "A" in figure 6-27 or figure 6-28 should be within the following limits, *with car at curb weight.*

Year and Series	Regular, Opt. High, or Export Springs
1948 Series 40	$5\frac{1}{2}''$—$6\frac{1}{4}''$
1948 Series 50-70	$6\frac{1}{2}''$—$7\frac{1}{4}''$
1949 Series 50-70 (Except Mod. 56-C and 76-C)	$5\frac{13}{16}''$—$6\frac{9}{16}''$
1949 Models 56-C and 76-C	$5\frac{9}{16}''$—$6\frac{5}{16}''$

b. Correction of Trim

If trim dimension "A" is not within specified limits the weak spring should be replaced. In each case new spring installation should not increase spring dimension "A" more than 1" over limits given above.

c. Use of Optional High or Export Rear Springs

For special requirements, when excessive bottoming occurs on regular springs with normal loads, it is advisable to install optional high or export springs, which have a higher rate than the regular springs. Shock absorber calibrations need not be changed upon installation of optional high springs; however, the ride and handling will be improved by using the rear shock absorber calibrations specified for optional high or export springs (par. 6-1).

d. Use of Special Overload Rear Springs

Special rear springs are available in 200 pound and 500 pound overload capacities, for use with heavy trailers or for heavy loads in the rear compartment. In estimating rear spring overloads, place rear wheels of car on scale, with car at curb weight and no load in rear compartment other than spare wheel and tire. After obtaining weight, hook trailer to car, or place desired load in rear compartment, and read scale again. The additional weight is the amount of overload on springs and rear axle.

It is not recommended that any series rear axle be overloaded in excess of 500 pounds.

Trailer design and distance trailer coupling is located to rear of rear axle center line, are the major factors governing effective trailer overload. Instructions for attaching trailers to Buick cars may be obtained from Buick Motor Division Factory Service Department.

6-21 REPLACEMENT OF CHASSIS REAR SPRINGS

1. Disconnect links from rear shock absorber arms.
2. Hoist rear end of car until all load is off rear springs and place floor stands under frame for safety.
3. Remove bolts and clamps at lower and upper ends of spring and remove spring. The lower bolts have left hand threads.
4. Before installation of new spring, check the part number stamped on one end coil to make sure that spring is correct for the car model as specified in group 7.503 of Master Parts List.
5. Attach upper end of spring to frame with insulator between end of spring and frame, and insulator between spring clamp and flat washer on attaching bolt. Attach lower end of spring to spring seat with spring clamp and bolt. Lockwashers are used on both attaching bolts.
6. Lower rear end of car and attach links to shock absorber arms.

6-22 REPLACE OR REBUSH RADIUS ROD

1. Support rear end of car on jacks placed under rear axle housing so that weight of car will be on rear springs.
2. Remove nuts and lockwashers from radius rod pins at both ends, then remove radius rod pin support on right end and remove radius rod frame bracket brace on left end of rod. Remove rod and bushings from pins.

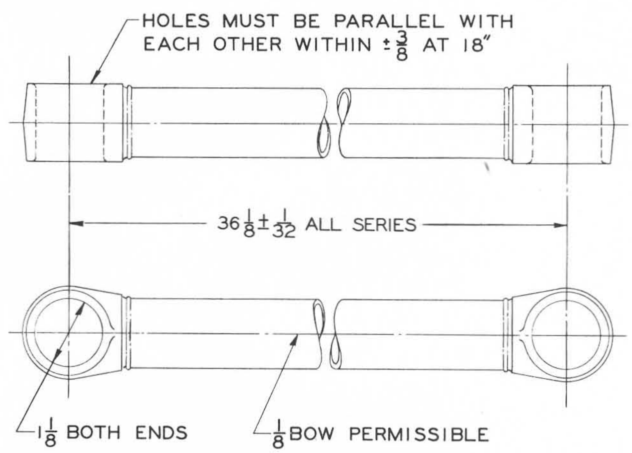


Figure 6-29—Radius Rod Dimensions

3. Check radius rod for twist and bow, which should be within limits shown in figure 6-29. If rod is twisted or bowed it must be straightened *without heating;* otherwise, replace with a new part.
4. Install rod with new rubber bushings, reversing procedure for removal. When radius rod pin nuts are tightened, normal weight of car must be on rear springs so that rubber bushings in rod will be clamped in neutral position.

6-23 CHECKING AND FILLING SHOCK ABSORBERS

CAUTION: *Thoroughly clean off all dirt from top of shock absorbers, front and rear, to avoid getting dirt into absorbers when filler* *plugs are removed. Blow off all loose dirt from the surrounding area of chassis so that dirt will not be brushed off into filler opening while filling shock absorbers. A few grains of dirt can readily plug a shock absorber valve and seriously affect performance of the unit.*

a. Filling Front Shock Absorbers

Remove filler plugs and add fluid until it overflows, using only G. M. or Delco Shock Absorber Fluid. Install plugs loosely to exclude dirt and bounce front of car up and down by front bumper to force out any air in cylinders. Repeat addition of fluid and bouncing of car until no more fluid can be added, then install filler plugs securely. An air space is built into the front shock absorber body above the filler opening to provide for expansion of the fluid when hot.

b. Filling Rear Shock Absorbers

Remove filler plugs and add G. M. or Delco Shock Absorber Fluid until level is ½" to 23/32" below filler openings. Install plugs loosely to exclude dirt and bounce car up and down by rear bumper to force out any air in cylinders. Add additional fluid, if necessary, until fluid level is ½" to 23/32" below filler openings, then install filler plugs securely.

Shock absorbers require some air space for expansion of fluid when hot, otherwise fluid may be forced out. This air space must be provided in rear absorbers by leaving fluid level ½" to 23/32" below filler opening. Correct level in rear absorbers may be conveniently obtained by use of Shock Absorber Gun KMO 1026 and Adapter J 1611. Use gun to fill absorber and place the adapter on gun nozzle to suck out surplus fluid.

c. Checking for Fluid Leaks in Shock Absorbers

An empty or almost empty shock absorber indicates leakage which should be located and corrected.

To check for leaks, clean off the entire body with an air hose, then fill shock absorber as described above. Drive car over a rough road for a few blocks, then inspect the unit with a good light. A slight leak at the seal around cam shaft is of little consequence and is due to initial expansion after filling. Leakage at end caps of front shock absorber will require removal of unit for installation of new gaskets. Leakage at gaskets of rear shock absorbers may be corrected by installation of new gaskets without removal of the unit.

6-24 REPLACE SHOCK ABSORBERS OR VALVES

In front shock absorbers, the end cap gaskets may be replaced to correct fluid leaks, and the valves may be replaced, if the proper special tools are available in the shop.

In rear shock absorbers, the cover or gasket, rebound and compression valves, valve nuts and gaskets may be replaced with ordinary hand tools. The intake valves in pistons cannot be replaced.

If any other parts replacements or repairs are required in either a front or rear shock absorber, a complete replacement unit is required. Replacement shock absorbers are available through Buick Parts Warehouses on an exchange basis.

Shock absorber calibrations as furnished in production, and as given in Chassis Suspension Specifications (par. 6.1) have been carefully engineered to provide the best ride control over a wide range of driving conditions. Substitution of other calibrations should not be attempted under any circumstances, unless authorized by Buick Motor Division.

a. Removal and Installation

A front shock absorber can be removed by removing the knuckle support upper pivot pin (par. 6-16) and the three shock absorber attaching bolts. The outer bolt (located at upper end of chassis spring) may be removed with a socket wrench and extension through the opening in lower control arm spring seat. When shock absorber is installed by reversing removal procedure, caster, camber, and toe-in must be checked and adjusted (par. 6-30).

A rear shock absorber can be removed by disconnecting link from shock absorber arm, and removing shock absorber from brake backing plate after removal of brake drum.

b. Removal of Front Shock Absorber Valves

1. Thoroughly clean outside of shock absorber, then mount it on Holding Fixture J 895. *Do not hold shock absorber in a vise.*

2. Remove end cap, using End Cap Wrench J 766. See figure 6-30. *Do not use a pipe wrench as this will ruin the cap.*

3. Remove fluid. With a screwdriver, remove retainer ring that holds the valve in place. Lift out the valve assembly, return spring, and the

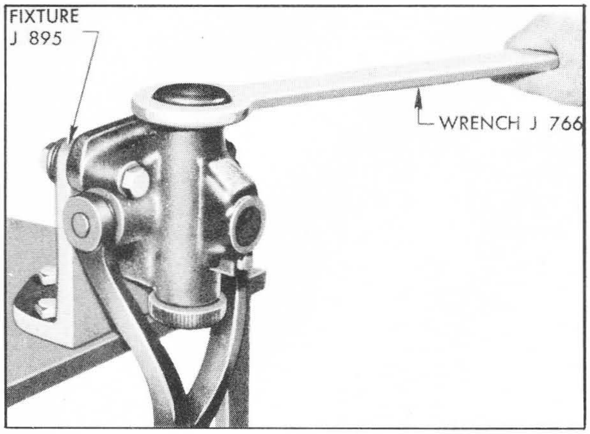


Figure 6-30—Removing Front Shock Absorber End Cap

two thin steel discs located under the valve seat.

4. Remove valve assembly from opposite piston in the same manner.

5. Inspect the valves. If air cannot be blown through bleed hole, valve is plugged and should be replaced with new valve assembly.

6. Thoroughly clean inside of shock absorber with gasoline or kerosene, working shock absorber arm through complete travel while cleaning. Drain cleaning solution and blow out absorber with air.

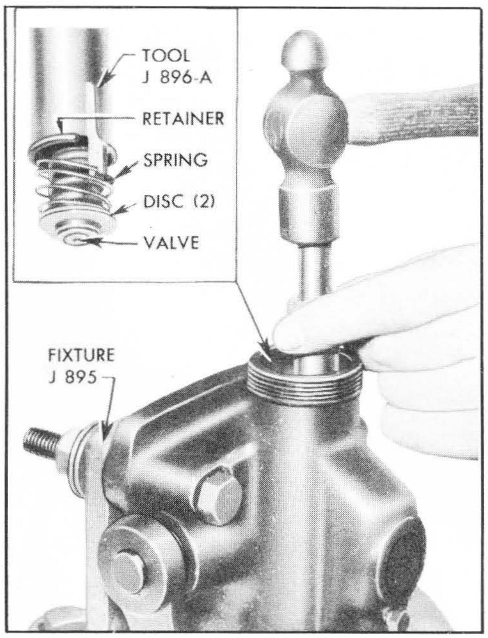


Figure 6-31—Installing Front Shock Absorber Valve Retainer

c. Installation of Valve in Front Shock Absorber

1. Mount shock absorber on Holding Fixture J 895. Install compression and rebound valve discs, valves and retainers, using Valve Installing Tool J 896-A to install the retainers. The blade of tool is placed in the gap in retainer and it holds valve spring down while retainer snaps into notches in piston. See figure 6-31.

2. Install one end cap, using new end cap gasket and tighten securely with Wrench J 766. CAUTION: *A small amount of Lubriplate or soft soap should be placed between the end cap and the end plate and between the end plate and gasket before installation to prevent the gasket tearing when tightening end cap.* Tap end cap with hammer after tightening and then re-tighten. End cap must be tight.

3. Turn shock absorber over on holding fixture and fill open end with fluid, holding the valve off its seat while filling. Move shock absorber arm through complete travel while filling to remove any air trapped in closed end.

4. When completely filled, install end cap securely, using new gasket and being careful not to tear gasket, as mentioned in step 2 above.

5. Place shock absorber flat on bench, remove filler plug, and add fluid to completely fill shock absorber, move arm up and down several times and recheck for complete filling, then install filler plug and gasket.

d. Replacement of Rear Shock Absorber Valves

After thoroughly cleaning outside of shock absorber, remove rebound or compression valve as required by removing value nut and gasket. The rebound valve consists of one assembly. The compression valve consists of an orifice assembly, blow off spring, static valve, and static spring, which must be installed in the order given. See figure 6-7.

6-25 REMOVAL AND INSTALLATION OF TIRE AND TUBE

With the synthetic tubes and drop center rims, care must be taken in removal and installation to avoid injury which would result in early failure of tube in service. The following instructions must be carefully followed.

1. Deflate tube completely. Loosen both beads from rim ledges, using tool if necessary. Insert two tire tools about 8 inches apart between bead and rim flange near valve stem and pry short lengths of bead over flange. See figure 6-32, view A. Then, leaving one tool in position, follow around rim with the other tool, taking small bites, to remove remainder of bead.

2. Remove inner tube. See figure 6-32, view B. Stand wheel in upright position with bead

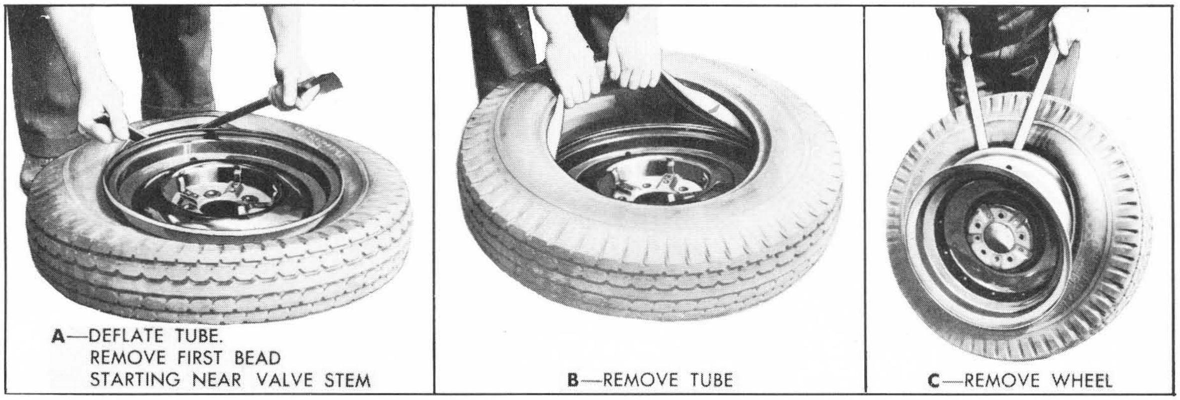


Figure 6-32—Removing Tire and Tube

in well of rim at bottom. Insert tool between bead and rim flange at top side of wheel and pry wheel out of tire. See figure 6-32, view C.

3. Inspect inside of tire and remove any dirt or other foreign materials. Inspect for cracks in casing which would pinch the tube.

4. Insert the deflated tube in tire and inflate just enough to round it out, placing valve at red balance mark.

5. Make solution using water with tube mounting compound or prepared liquid tire soap, and work it into a heavy suds. With a cloth or sponge, swab thoroughly all around the base of the tube, between the tube and beads of tire and on the face of the beads. See figure 6-33, view A. *Do not use oil or grease.*

6. The soap acts as a lubricant and reduces the friction as the tube passes over the beads down into the well of the rim when inflated. If tube and tire are not properly lubricated, friction will prevent tube from sliding into the well of rim, consequently the tube will be stretched thin in this area when inflated. See figure 6-33, views B and C.

7. Lay wheel flat with valve hole up. Start to mount tire with valve pointing toward valve hole. Apply the first bead by pushing a portion of it into the well and then working the remaining part over the flange with a tire tool. Spread the tire and place valve stem through the hole in rim. The use of a valve fishing tool or valve extension will aid in pulling the valve into position.

8. Force the portion opposite the valve down into the well of the rim and with tire tools work the remainder of the bead over the flange, alternating from right to left to prevent the tire from creeping on the rim. Make certain that the beads are out of the well and in position to seat properly against the flange, then pull the valve out so as to hold the base snugly against the rim. While holding the valve in this position, inflate the tire until both beads are seated, with the centering ribs (when marked on the tire) showing evenly above the rim flange.

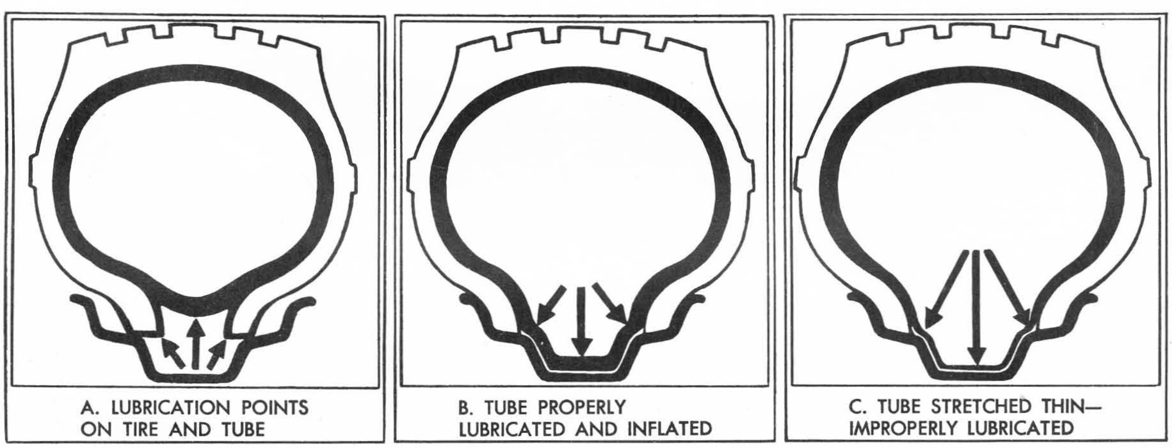


Figure 6-33—Lubrication and Inflation of Tube

9. The tube then should be deflated completely to allow for adjustment of position and insure against pinching of tube under beads. Re-inflate to recommended pressure for use (par. 6-8).

10. If tube or tire was repaired by patching, the wheel and tire assembly should be statically and dynamically balanced before use, as described in paragraph 6-28.

SECTION 6-D

WHEEL BALANCE AND ALIGNMENT

CONTENTS OF SECTION 6-D

SERVICE BULLETIN REFERENCE

Bulletin No.	Page No.	SUBJECT

6-26 WHEEL AND TIRE BALANCE

Wheel and tire balance is the equal distribution of the weight of the wheel and tire assembly around the axis of rotation. Wheel unbalance is the principal cause of tramp and general car shake and roughness, and contributes somewhat to steering troubles.

All wheel and tire assemblies are balanced when assembled at the factory. Tire casings and tubes are assembled with the valve stem located in line with a red mark on the sidewall of the casing, so that the weight of the valve is placed on the light side of the tire. When assembled in this manner the off-balance of the tube tends to counter-balance any off-balance of the tire. After installation of tube and tire on the wheel, the assembly is further corrected for balance, if necessary, by installing balance weights on the rim of the wheel.

The original balance of the tire and tube assembly may change as the tire wears. Severe acceleration, severe brake applications, fast cornering and side slip wear the tires out in spots and often upset the original balance condition and make it desirable to rebalance the tire, tube and wheel as an assembly. Tire and wheel assemblies should be rebalanced after punctures are repaired.

It is recommended that wheel and tire assemblies be checked for balance every 5000 miles.

6-27 STATIC AND DYNAMIC BALANCE

a. Static Balance

Static balance (sometimes called still balance) is the equal distribution of the weight of the wheel and tire assembly about the axis of rotation in such a manner that the assembly has no tendency to rotate by itself, regardless of its position.

For example: A wheel with a chunk of dirt on the rim will always rotate by itself until the heavy side is at the bottom. Any wheel with a heavy side like this is statically out of balance. Static unbalance of a wheel causes a hopping or pounding action, commonly known as wheel tramp, which will also develop into wheel shimmy.

b. Dynamic Balance

Dynamic balance (sometimes called running balance) means that the wheel must be in static balance and also run smoothly at all speeds on an axis which runs through the center line of the wheel and tire, and is perpendicular to the axis of rotation.

To explain the principle of dynamic balance, let us first consider what happens when we swing a weight attached to a string. If we start to swing this weight slowly, it is apparent that the weight swings in a sharp angle with reference to the axis of rotation (the hand). But if the speed is increased, the weight climbs until the weight mass is at right angles to the axis of rotation. Now, let us apply this principle to a spinning wheel.

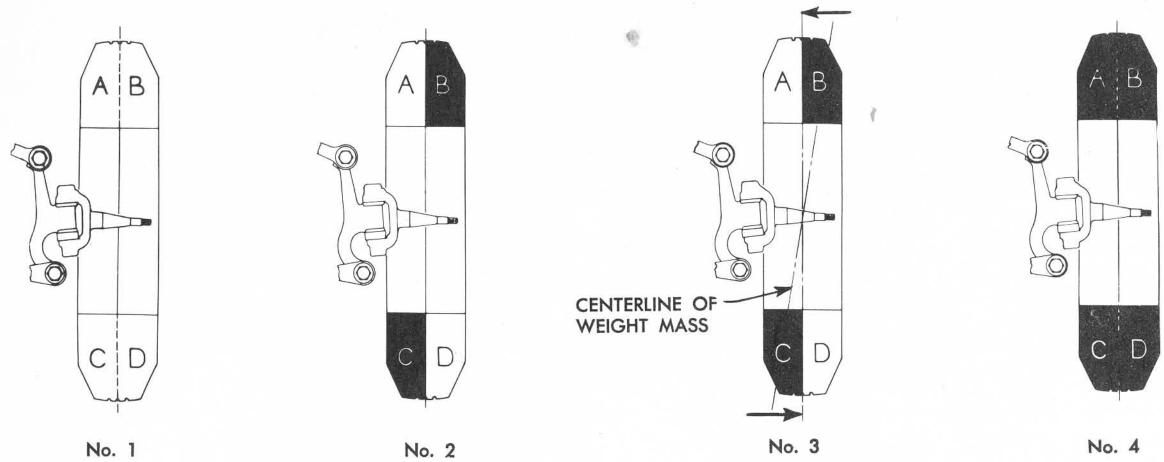


Figure 6-34—Static and Dynamic Balance

By referring to figure 6-34, view No. 1, it can be seen that when a wheel and tire assembly is in static balance, the sum of the weights of sections "A" and "B" is equal to the sum of the weights of sections "C" and "D"; or, in other words, the weight is equally distributed about the axis of rotation. View No. 2 is a drawing of a wheel that is in static balance because the shaded heavy point "B" is balanced by the shaded heavy point "C." However, it can be seen that with reference to the center line, section "A" is lighter in weight than section "B," and that section "D" is lighter in weight than section "C."

When we start to spin this wheel, as in view No. 3, the center line of the weight masses "B" and "C" tries to get at right angles to the axis, just as the weight on the string tried to get at right angles to its axis of rotation (the hand). This tendency to get at right angles exerts a force on the wheel, as shown by the arrows. This force, in turn, tends to move the center line of the wheel and, in so doing, distorts the axis of rotation.

When the wheel has turned 180°, the forces exerted by the heavier sections "B" and "C" now tend to move the center line of the wheel in the opposite direction. In other words, the wheel tries to rock first in one direction, then in the other. The result of the movement of these unbalanced forces causes the wheel to wobble or shimmy, and the condition becomes more violent with increased speeds.

To correct this condition we must add weight to sections "A" and "D," so they will be equal to the weight of sections "B" and "C." Notice that this addition of weight now distributes the total weight evenly about both the axis of rotation and the center line of the wheel as seen in view No. 4. Therefore, this wheel is now both statically and dynamically balanced.

6-28 WHEEL AND TIRE BALANCING PROCEDURE

a. Static Balancing

Static balancing is a simple procedure and can be done on any good balancing equipment of either the vertical or horizontal type.

If such equipment is not available, a simple static balancing fixture may be made from a used steering knuckle, hub, and bearings. Mount the steering knuckle solidly on edge of bench by means of suitable steel straps. Remove the felt packing from hub, wash bearing free of lubricant and adjust bearings so that a very slight looseness may be felt. When a wheel and tire assembly is mounted in a vertical position on the fixture, the heavy side will go to the bottom.

With any type of static balancing equipment the first step is to locate the light spot on the wheel and tire assembly. Mark this spot with chalk and add sufficient weight at this point to exactly balance the assembly statically. Wheel balance weights having metal clips for attachment to the flange of wheel rim are listed in ½, 1, 2, and 3 ounce sizes under group 6.367 of the Master Parts List.

If a single weight will balance the wheel, one weight may be used. If more than one weight is used, the weights should be distributed equally from the light point on the same flange. See figure 6-35, views A, B, C.

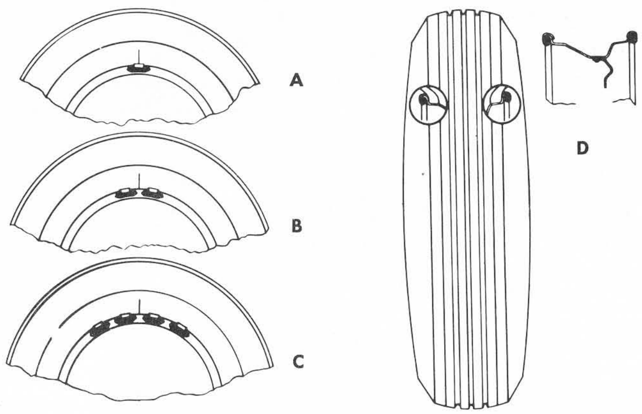


Figure 6-35—Location of Static Balancing Weights

Where weights are assembled to only one flange of wheel rim they should always be assembled to inside flange. When more than 3 ounces of weight is used, divide the weight equally between inside and outside flanges in order to maintain dynamic balance. See figure 6-35, view D.

In some cases wheel and tire balance does not always overcome wheel balance complaints because the brake drums themselves are out of balance. Balancing drums with wheels and tires as an assembly is not always satisfactory because the balance is destroyed when wheels and tires are removed or interchanged. On cars where trouble is experienced in maintaining proper wheel balance, it is suggested that all drums be individually checked for static balance and corrected, if necessary, as described under Brake Drum Balance (par. 8-17).

Nearly all cases of off-balance can be corrected by balancing statically. If the trouble still persists after the complete rotating assembly has been balanced statically (balance when the wheel assembly is at rest), then the assembly must be checked for dynamic balance.

b. Dynamic Balancing

Dynamic balancing of a wheel and tire assembly must be done on a machine designed to indicate out of balance conditions while the wheel is rotating. Since procedures differ with different machines, the instructions of the equipment manufacturer must be carefully followed.

6-29 FRONT WHEEL ALIGNMENT FACTORS

Wheel alignment is the mechanics of properly adjusting all the factors affecting the position of front wheels so as to cause the car to steer with the least effort and to reduce tire wear to a minimum.

Correct alignment of the frame is essential to proper alignment of front and rear wheels. Briefly, the essentials are that the frame must be square in plain view within specified limits, that the top and bottom surfaces of front cross member must be parallel fore and aft, and the bolt holes for front shock absorbers and lower control arm shafts must be of correct size and location. Checking frame alignment is covered in paragraph 9-2.

It should also be understood that wheel and tire balance has an important effect on steering and tire wear. If wheels and tires are out of balance, "shimmy" or "tramp" may develop or tires may wear unevenly, and give the erroneous impression that the wheels are not in proper alignment. For this reason, the wheel and tire assemblies should be known to be in proper balance before assuming that wheels are out of alignment.

Six factors must be considered in determining correct alignment of front and rear wheels. These are as follows:

a. Front Wheel Caster

Caster is the fore and aft angle or tilt of the king pin with reference to a line at right angle to road. See figure 6-36. When top end of king pin tilts rearward the caster is positive; when top end of king pin tilts forward the caster is negative.

b. Front Wheel Camber

Camber is the outward or inward angle or tilt of the wheels from centerline of car, with reference to a line at right angle to road. See figure 6-36. When top of wheel tilts outward the camber is positive; when top of wheel tilts inward the camber is negative or reverse.

c. King Pin Inclination

King pin inclination is the inward angle or tilt of the king pin towards centerline of car, with reference to a line at right angle to road. See figure 6-36.

d. Front Wheel Toe-In

Toe-in is the setting of the front wheels so that the distance between them is less at the front than at the rear, *when wheels are in sraight ahead position.* See figure 6-36.

e. Steering Geometry (Turning Angles)

Steering geometry is the mechanics of keeping the front wheels in proper relation to each other when making right or left turns. As the wheels are turned sideways, the inside wheel must turn through a greater angle than the outside wheel in order to compensate for the difference in turning radius of these two wheels. This is necessary to avoid sidewise scuffing of front tires on a turn. See figure 6-36.

6-30 FRONT WHEEL ALIGNMENT PROCEDURE

Close limits on caster, front wheel camber, and king pin inclination are beneficial to ease of steering but require only reasonable accuracy to provide normal tire life. With the type of front suspension used, the toe-in adjustment is much more important than caster and camber in so far as tire wear is concerned. Caster and camber adjustments need not be considered unless visual inspection shows these settings to be out, or unless the car gives poor handling on the road.

In the majority of cases, services consisting of inflating tires to specified pressure and interchanging tires at recommended intervals (par. 6-8), balancing all wheels and tires (par. 6-28), adjusting steering gear (par. 7-4), and setting toe-in correctly (subpar. e, below) will provide more improvement in car handling and tire wear than will front end alignment adjustments as usually made on front end alignment equipment.

The use of accurate front end alignment is essential to determine whether front suspension parts have been damaged by shock or accident, and to obtain correct alignment settings after new parts have been installed.

a. Inspection Before Checking Front Wheel Alignment

Before any attempt is made to check or make any adjustment affecting caster, camber, toe-in, king pin inclination, or steering geometry, the

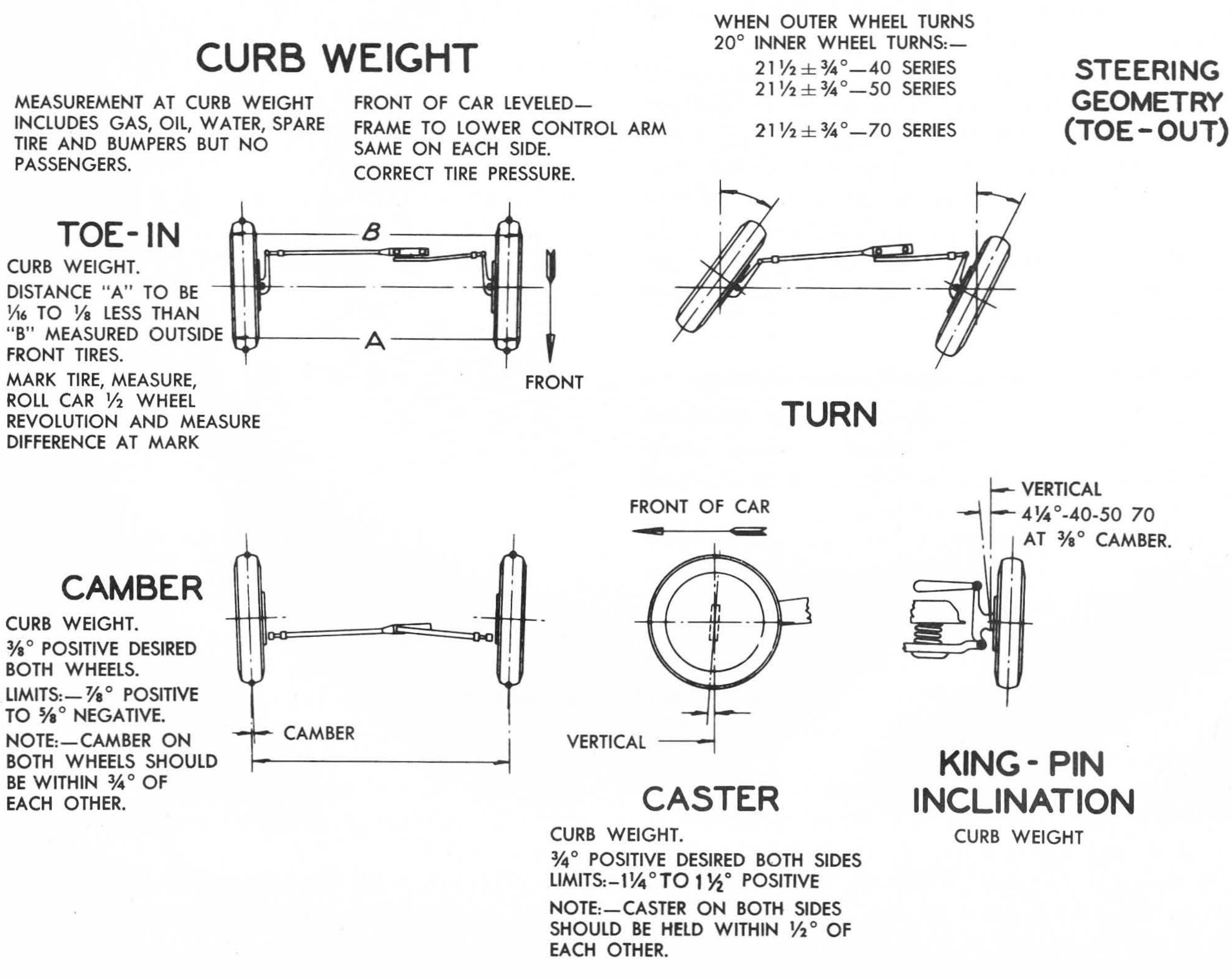


Figure 6-36—Front Wheel Alignment Specification Chart—All Series

following checks and inspections must be made to insure correctness of alignment equipment readings and alignment adjustments.

1. The front tires should have approximately the same wear and all tires must be inflated to specified pressures (par. 6-8).

2. Check front wheel bearings for looseness and adjust, if necessary (par. 6-14).

3. Check for run-out of wheels and tires and correct to within limit of 1/8" run-out at side of tires, if necessary.

4. Check wheels and tires for balance and correct if out of balance (par. 6-28).

5. Check for looseness at king pins and tie rod ends; if found excessive it must be corrected before alignment readings will have any value.

6. Check shock absorber action and correct, if necessary (par. 6-10).

7. *Car must be on a level surface and at curb weight (no passengers, no load in car, spare tires in place, and full of water, oil, and gasoline).*

8. Bounce car at front and rear ends several times to allow frame to come to its normal level. Check spring trim dimensions and make any correction indicated (par. 6-17 and 6-20).

9. *It is also advisable to check the condition and accuracy of any equipment being used to check front end alignment, and to make certain that instructions of the manufacturer are thoroughly understood.*

b. Checking Caster and Camber Settings

Since caster and camber are both adjusted by turning the eccentric knuckle support upper pivot pin, both of these settings must be checked before changing either setting.

CAUTION: *Regardless of equipment used to check caster and camber, car must be on level surface both transversely and fore and aft, and must be at curb weight. Since camber varies in proportion to the height of the front springs, it is very important that the correct spring trim dimension is maintained while checking camber (par. 6-17).*

When equipment is used which bears against the tire or wheel rim to obtain readings, it is very essential that the tires or wheels be checked for run-out. Readings must be taken at points which have no run-out or which lie in the same plane.

Caster and camber should be within the limits shown in figure 6-36. Note that the caster angles at both front wheels need not be exactly the same but must be within 1/2 degree of each other. Likewise, the camber angles on both sides must be within 3/4 degrees of each other. If caster and camber are not within the specified limits, adjust as described below.

c. Adjustment of Caster and Camber

Caster and camber must be adjusted together to obtain the best average setting of each within the specified limits given in figure 6-36.

1. Loosen pivot pin clamp bolt on upper end of knuckle support. Remove grease fitting from the clamped type upper pivot pin bushing. This bushing is on front end of the right pivot pin and on rear end of left pivot pin. See figure 6-37.

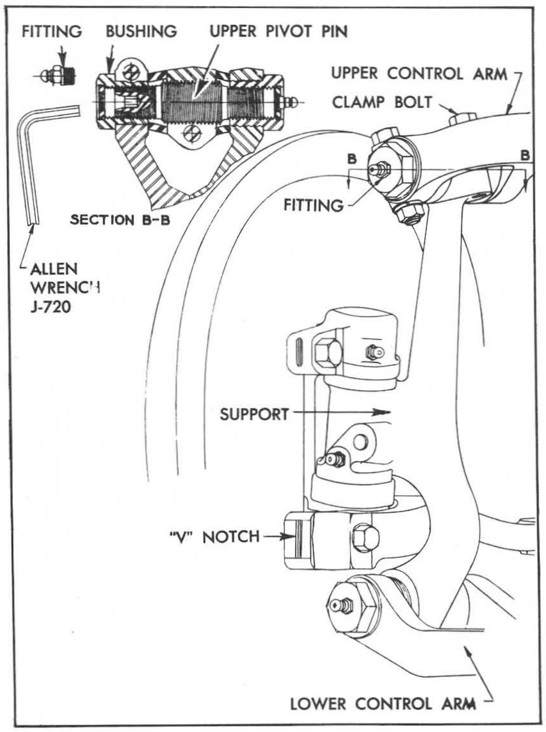


Figure 6-37—Steering Knuckle Support and Pivot Pins

2. Insert 1/4" Allen wrench into hex socket in end of upper pivot pin, then turn pivot pin as required to bring the caster and camber settings within the limits specified in figure 6-36. One-quarter turn of pivot pin changes caster angle 1/4 degree. One-half turn of pivot pin gives the maximum available range of camber adjustment.

3. Tighten pivot pin clamp bolt and recheck caster and camber settings. Install grease fittings.

4. Any change greater than 1/4 degree in caster will require checking of toe-in (subpar. e, below), since a change in caster will change

toe-in to some extent.

5. If camber is incorrect and cannot be adjusted to proper limits, adjust camber as close to specifications as possible and then check king pin inclination (subpar. d, below) before attempting further correction.

d. Checking King Pin Inclination

CAUTION: *When checking king pin inclination, car must be on a level surface, both transversely and fore and aft. It must be at curb weight and must be maintained at specified spring trim height while checking (par. 6-17).*

With camber known to be within specified limits, king pin inclination should check within specified limits given in figure 6-36.

If camber is correct and king pin inclination is not correct, a bent steering knuckle support is indicated.

If camber is incorrect beyond limits of adjustment and king pin inclination is correct, or nearly so, a bent steering knuckle is indicated.

If camber and king pin inclination are both incorrect by approximately the same amounts, a bent upper or lower control arm is indicated.

There is no adjustment for king pin inclination as this factor depends upon the accuracy of the front suspension parts. Distorted parts should be replaced with new parts. *The practice of heating and bending front suspension parts to correct errors is not recommended as this may produce soft spots in the metal in which fatigue and breakage may develop in service.*

e. Checking and Adjusting Toe-In

CAUTION: *Car must be at curb weight and specified trim height, with steering gear and front wheel bearings properly adjusted and no looseness at tie rod ends. See subparagraph a, above. The car should be moved forward one complete revolution of the wheels before the toe-in check and adjustment is started and the car should never be moved backward while making the check and adjustment.*

1. Turn steering wheel until lower spoke is vertical, with front wheels in straight ahead position.

2. Measure the horizontal distance from the near edge of front boss of lower control arm shaft to the front edge of brake backing plate, on each side. Adjust tie rods, if necessary, to make measurements equal on both sides. See figure 6-38 dimensions "X."

3. Using a suitable toe-in gauge, measure the distance between outside walls of tires at the front at approximately 10" from the floor. See figure 6-38 dimension "A." Mark points where gauge contacts tires. NOTE: *An accurate check also can be made by raising and rotating front wheels to scribe a fine line near the center of each tire, then, with tires on the floor and front spring trim height correct, measure between scribed lines with a suitable trammel. See figure 6-38, dimension "C."*

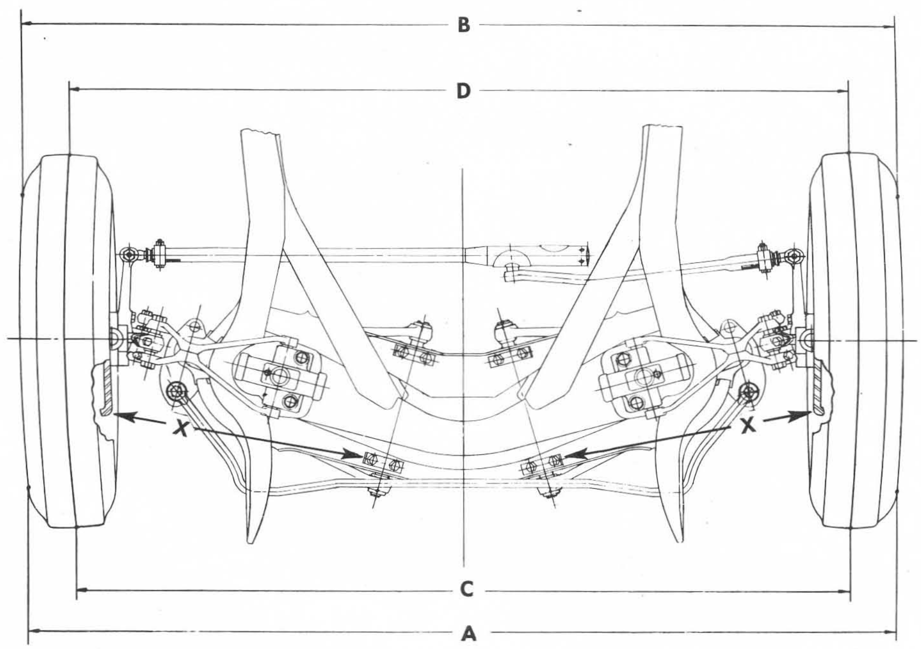


Figure 6-38—Front Wheel Toe-in

4. Roll the car forward until measuring points on tires are approximately 10" from the floor at the rear, and measure the distance between points used in Step 3 above. The measurement at the front (dimension "A" or "C") should be 1/16" to 1/8" less than the measurement at the rear (dimension "B" or "D"). See figure 6-38.

5. If toe-in is incorrect, loosen clamp bolts and turn adjusting sleeves at tie rod ends as required. To increase toe-in, lengthen tie rods by turning adjusting sleeves in same direction as wheels rotate moving forward; to decrease toe-in turn sleeve in opposite direction. CAUTION: *Both adjusting sleeves must be turned exactly the same amount in the same direction when changing toe-in, in order to maintain front wheel in straight ahead position with steering wheel lower spoke properly centered.*

1/8 turn on adjusting sleeve on each side changes toe 1/32".

1/4 turn on adjusting sleeve on each side changes toe 5/64".

3/8 turn on adjusting sleeve on each side changes toe 1/8".

1/2 turn on adjusting sleeve on each side changes toe 5/32".

6. After correct toe-in is secured make sure that tie rod clamps are within 1/8" of end rods and that ear of clamp overlaps slot in tube not less than 1/16", then tighten the clamp screws securely. See figure 6-39.

f. Checking Steering Geometry (Turning Angles)

CAUTION: *Be sure that caster, camber, and toe-in have all been properly corrected before checking steering geometry. Steering geometry must be checked with the weight of the car on the wheels.*

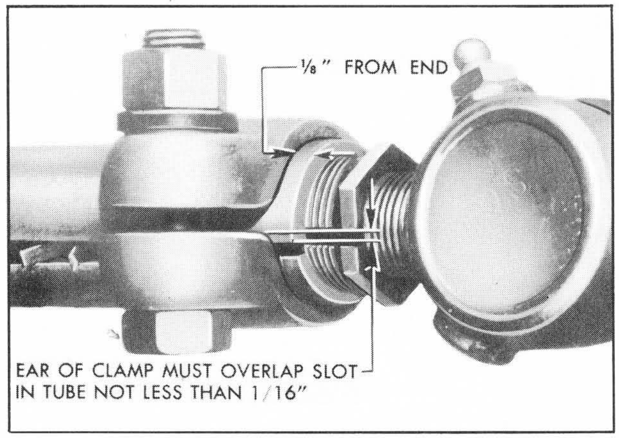
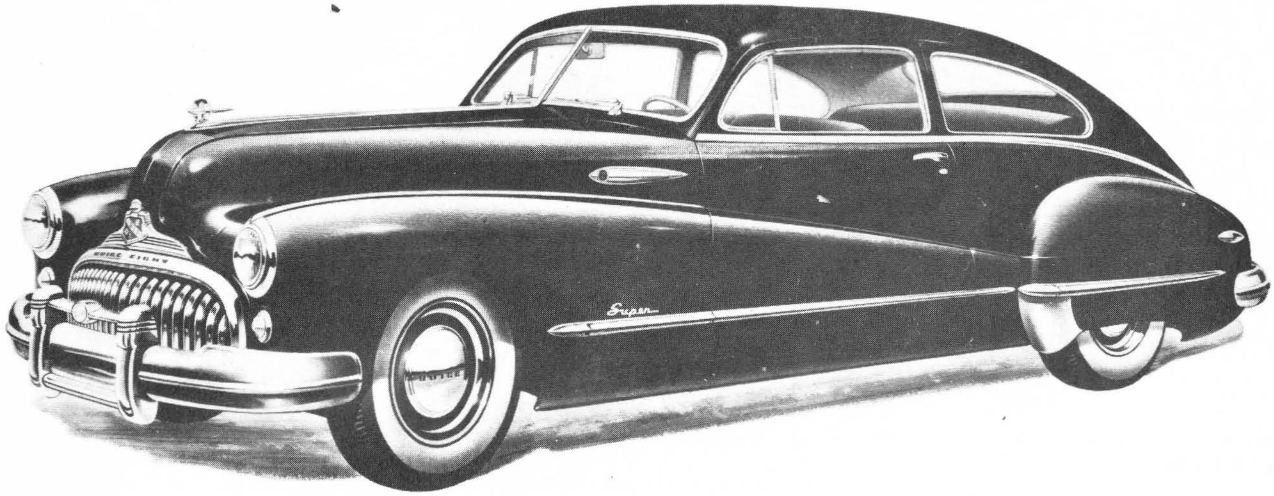


Figure 6-39—Correct Position of Tie Rod Clamp

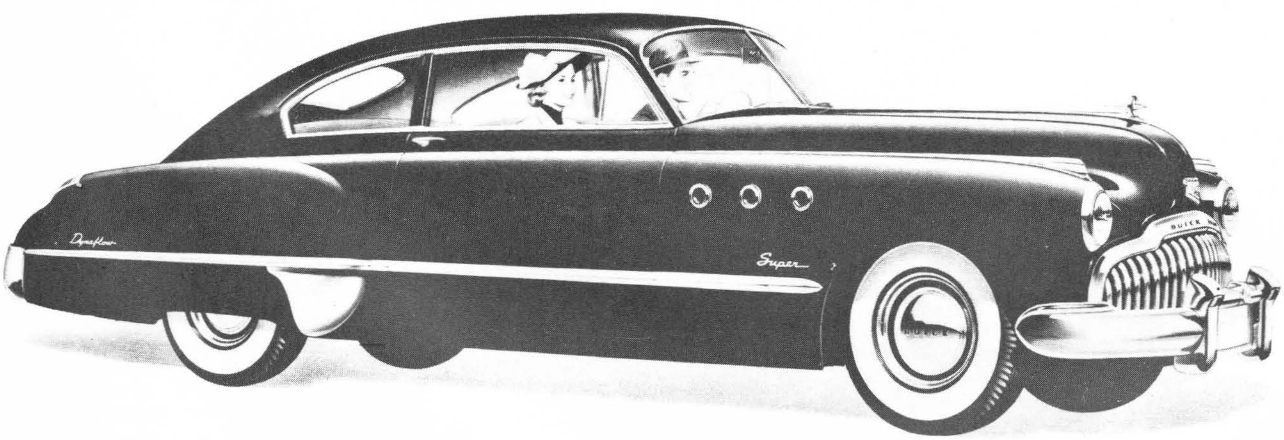
1. With the front wheels resting on full floating turn tables, turn wheels to the right until the outside (left) wheel is set at 20 degrees. The inside (right) wheel should then set at angle specified in figure 6-36.

2. Repeat this test by turning front wheels to the left until the outside (right) wheel sets at 20 degrees; the inside (left) wheel should then set at angle specified in figure 6-36.

3. Errors in steering geometry generally indicate bent steering arms, but may also be caused by other incorrect front end factors. If the error is caused by a bent steering arm it should be replaced. Replacement of such parts must be followed by a complete front end check as described above.



1948 Model 56-S



1949 Model 56-S