Section I

TORSION-AIRE FRONT WHEEL SUSPENSION

CONTENTS

DATA AND SPECIFICATIONS

MANUAL STEERING

Caster	Camber	Steering Axis Inclination	Toe-In
$-\frac{3}{4}° \pm \frac{3}{4}°$	$0° \pm \frac{1}{4}°$ (right) $+\frac{1}{4}° \pm \frac{1}{4}°$ (left)	5° to 7° At 0° Camber	$\frac{1}{8}'' \pm \frac{1}{32}''$ ($\frac{1}{8}''$ Preferred)

WITH POWER STEERING

Caster	Camber	Steering Axis Inclination	Toe-In
$+\frac{3}{4}° \pm \frac{3}{4}°$	$0° \pm \frac{1}{4}°$ (right) $+\frac{1}{4}° \pm \frac{1}{4}°$ (left)	5° to 7° At 0° Camber	$\frac{1}{8}'' \pm \frac{1}{32}''$ ($\frac{1}{8}''$ Preferred)

SPECIAL TOOLS

C-3553 ..... Remover and Installer—Shock Absorber Lower Bushing

C-3557 ..... Installer—Lower Control Arm Bushing

C-3558 ..... Remover and Installer—Upper Control Arm Bushing

C-3561 ..... Wrench—Ball Joint Assembly to Upper and Lower Control Arm

C-3564 ..... Remover—Ball Joint Stud

C-3608 ..... Gauge—Front-End Height and Level

TIGHTENING SPECIFICATIONS

	Foot-Pounds
Shock Absorber Upper Mounting Nut	25
Shock Absorber Lower Mounting Nut	40
Sway Eliminator Shaft Link Nuts	15
Sway Eliminator Insulator Retainer Nuts	25
Lower Ball Joint Stud Nut	135
Strut to Lower Control Arm Mounting Bolts	65
Lower Control Arm Strut Bushing Nut	35
Shaft to Lower Control Arm Bushing Retainer Nut (Inner)	125
Upper Ball Joint Stud Nut	135
Lower Control Arm Shaft to Crossmember Mounting Nut	200
Upper Control Arm to Support Bracket Mounting Bolt Nuts	55-65
Control Arm Support Bracket to Frame Bolt (½")	70
Steering Knuckle to Brake Support Bolt	55
Steering Knuckle to Steering Knuckle Arm Nut	50

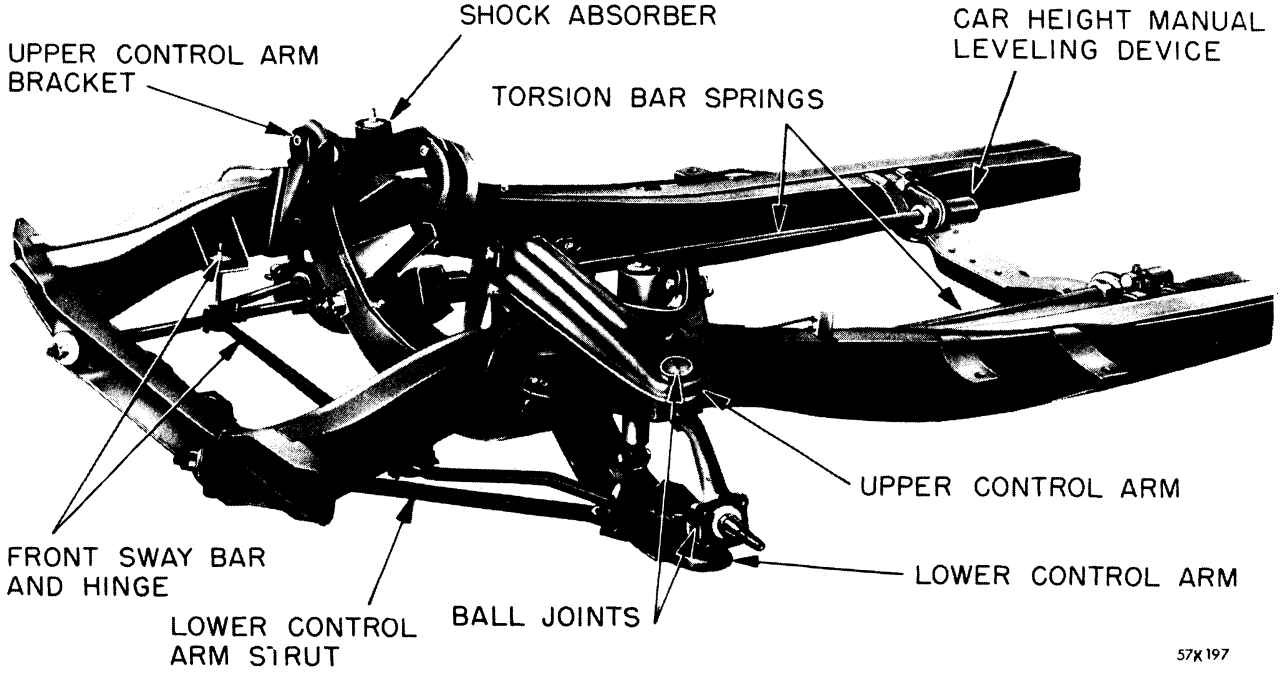

Fig. 1—Frame and Front Suspension

Section I

TORSION-AIRE

FRONT WHEEL SUSPENSION

The Torsion-aire Front Suspension System Figures 1, 2 and 3 is retained on the 1958 cars. This new suspension gives improved steering and directional stability with the anti-brake dip principle built into the design, the tendency of the nose of the car to dip when braking is reduced to a minimum. Torsion bar springs also permit relocating of steering linkage and control arm inner pivot points, so that their steering geometrics are more nearly matched resulting in less wheel fight because the vertical movements of the road wheels have little effect on the steering linkage. The new system also offers a number of other advantages in terms of longer part life and ease of servicing.

1. LUBRICATION

The suspension points requiring lubrication are effectively sealed against entry of dirt, dust, and water, however, the upper and lower ball joints should be carefully lubricated. The following lubricating procedure is recommended:

Raise the front of the car in such a manner that the weight of the car is on both lower control arms as close as possible to the ball joints.

NOTE: When this has been properly executed, the lower ball joint will be unloaded and the upper control arm rebound bumper will be away from the stop bracket on the frame.

Apply grease gun to fitting on lower ball joint and lubricate generously. Trigger the grease gun so that pressure is applied intermittently. Applying the grease in this manner will cause an up and down motion in the ball joint assembly to assist in thoroughly lubricating the joint. It is also advisable to turn the steering gear to left and right to allow the grease to penetrate the whole assembly.

NOTE: The upper ball joint cannot be unloaded, but grease should be applied generously while turning the steering and front wheel assembly from left to right to allow the lubricant to penetrate the joint.

CAUTION

Leaded compounds of more than 10% leaded powder in the lubricant should never be used, also the ball joints should not be heated or reworked. They should be replaced if found not serviceable.

SERVICE PROCEDURES

2. SERVICING THE FRONT SUSPENSION SYSTEM

The upper control arms are mounted on removable brackets which are bolted to the frame sub side-rail. Shim packs are mounted between brackets and frame side-rail to establish caster and camber settings for each front wheel, as shown in Figure 4.

The lower control arms are assembled to pivot shafts and mounted to frame crossmember in replaceable rubber bushings, as shown in Figures 5 and 6. The pivot shafts extend through the crossmember and from the axis of lower control arms. The steering knuckles are connected, as shown in Figures 7 and 8, to upper and lower arms through ball joints, thus eliminating the king pins. This also eliminates the king pin inclination procedures and the term "Steering Axis Inclination" will be used hereafter.

To prevent the possibility of any fore and aft movement of the lower control arms, a strut is attached from frame crossmember to

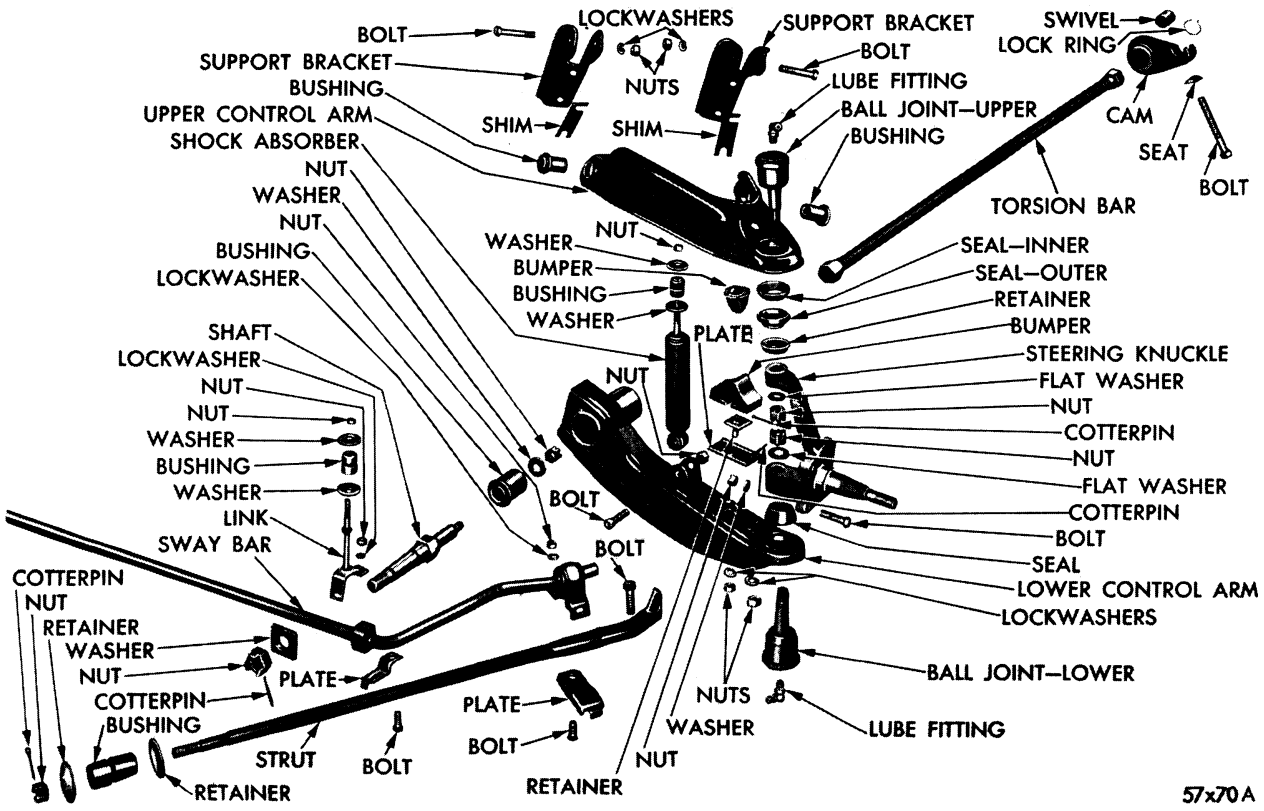

Fig. 2—Front Suspension (Disassembled View)

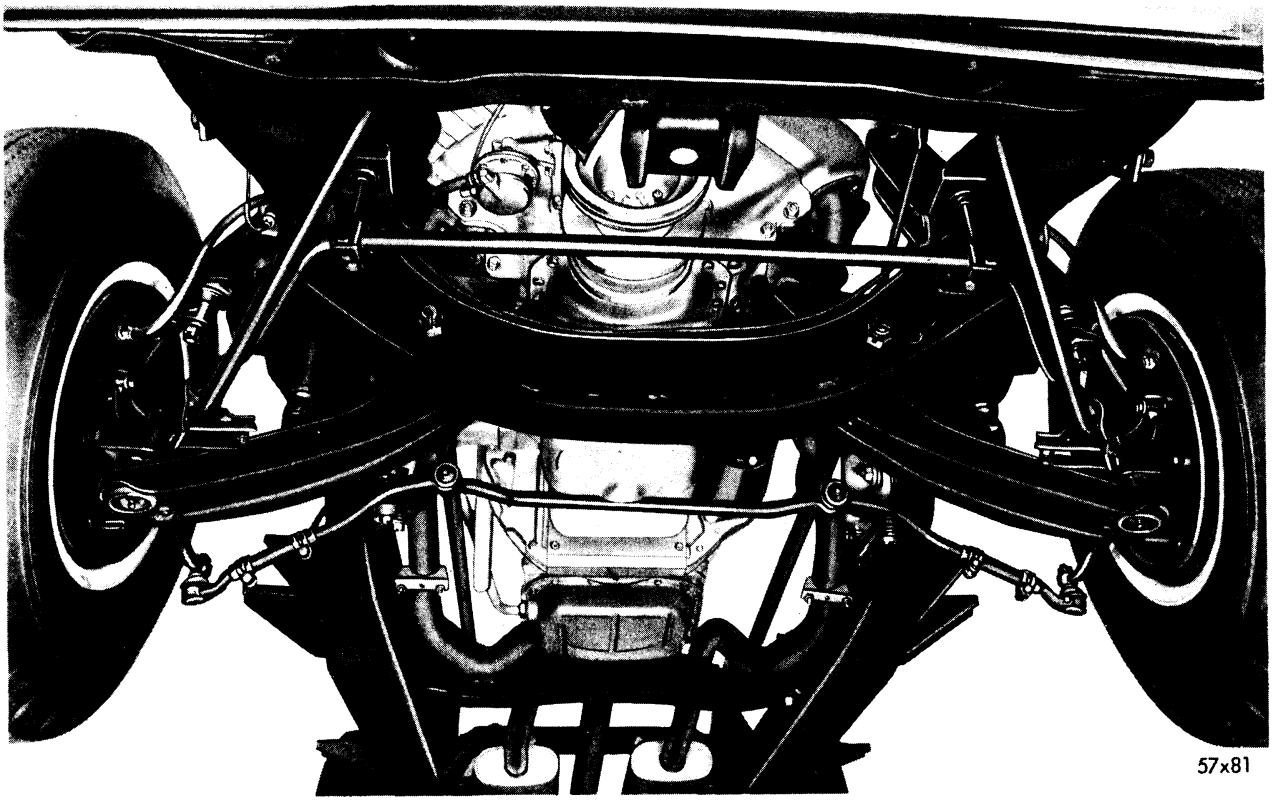

Fig. 3—Lower View Front Suspension Assembly

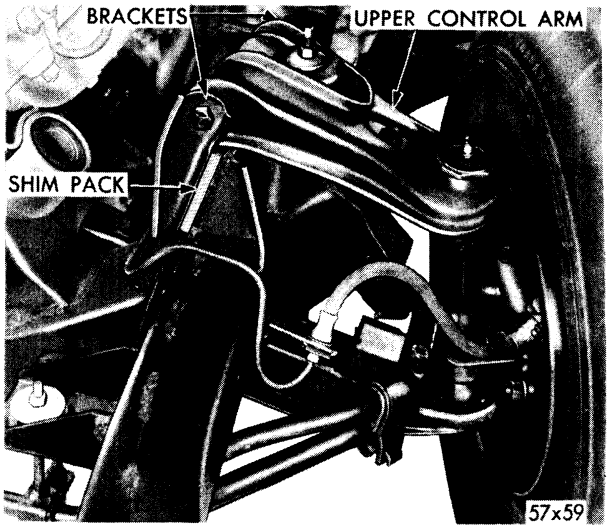

Fig. 4—Upper Control Arm, Shim Pack and Bracket

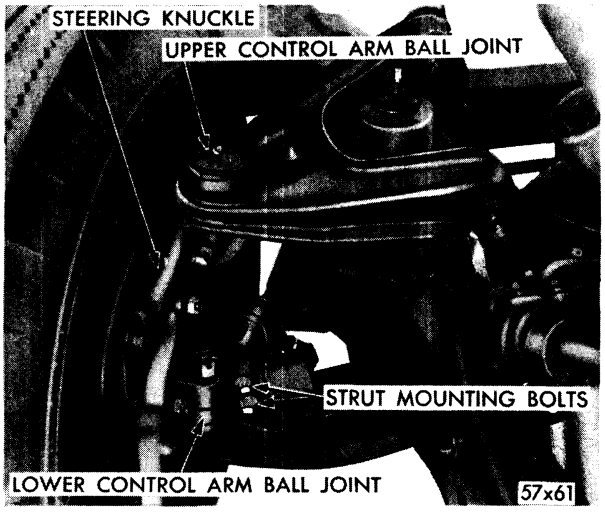

Fig. 7—Steering Knuckle and Ball Joint Assembly

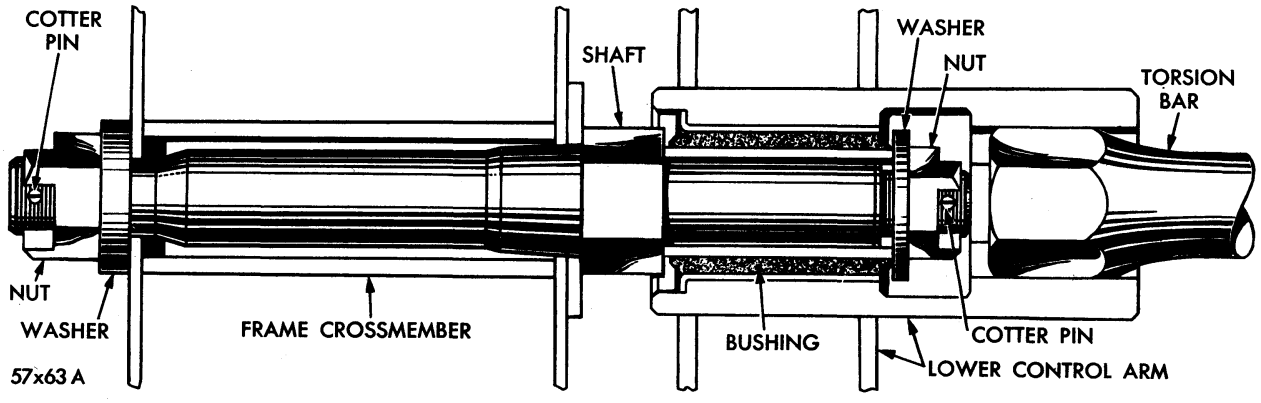

Fig. 5—Lower Control Arm Pivot Shaft and Bushing Assembly

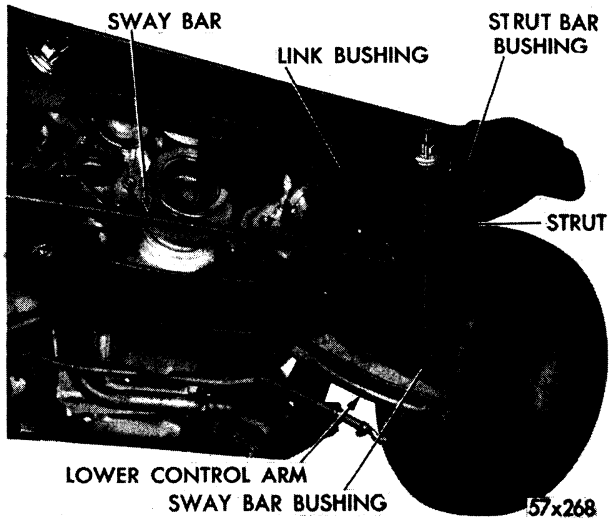

Fig. 6—Lower Control Arm, Strut and Sway Bar Assembly

lower control arm, as shown in Figure 6. The forward end of the struts are mounted in the front crossmember with replaceable rubber bushings, as shown in Figure 9.

The sway bar shaft is insulated and mounted to frame and the lower control arm. (Figs. 6 and 10.)

The front end of the torsion bars are indexed with lower control arms at frame front crossmember pivot points (Figs. 1 and 2). The rear end of torsion bars are indexed in anchors which are supported by brackets welded to frame side-rails and crossmember, as shown in Figure 11. The torsion bar springs (Fig. 12).

3. SERVICING THE SWAY BAR (FIGS. 6 and 10)

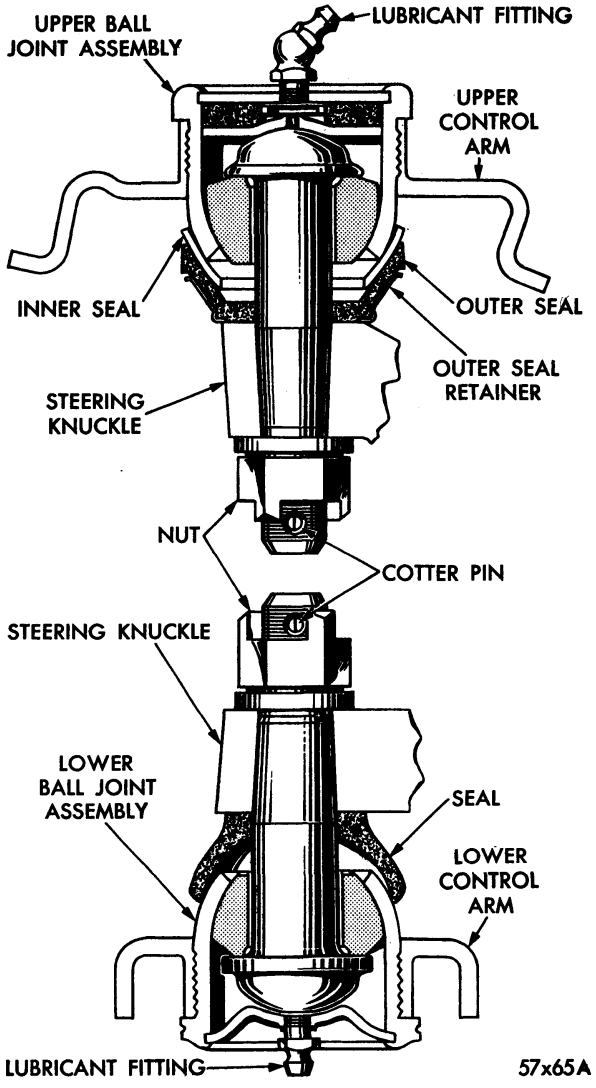

Fig. 8—Upper and Lower Steering Knuckle Ball Joint Assembly

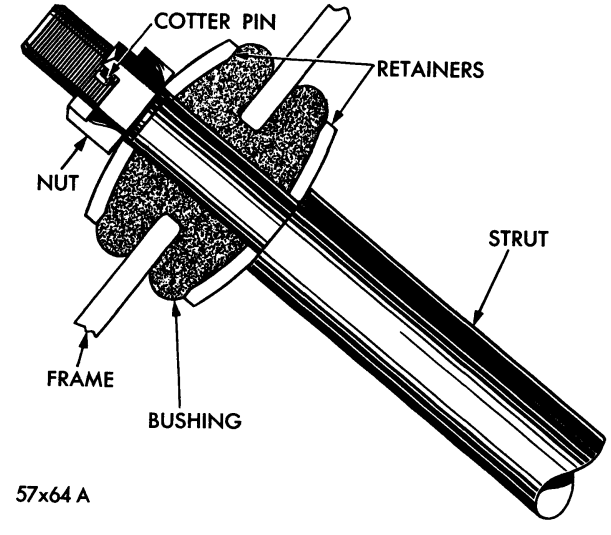

Fig. 9—Front Strut Bar Bushing Assembly

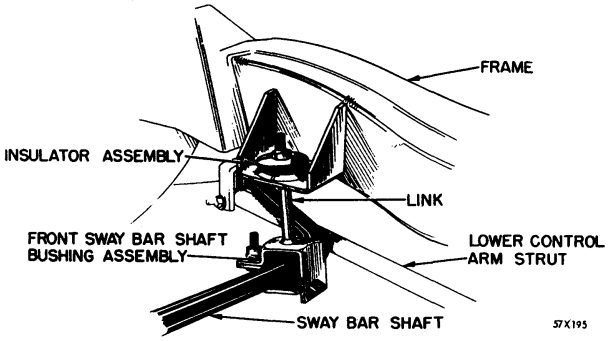

Fig. 10—Front Sway Bar to Frame Attachment

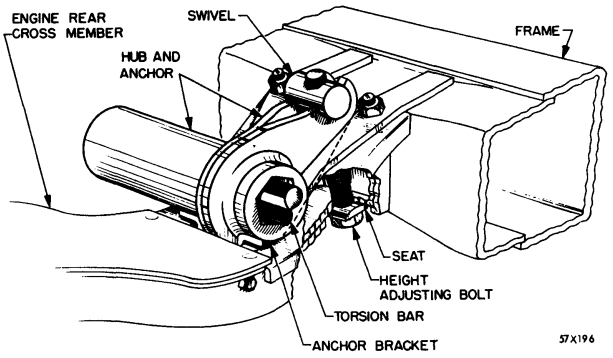

Fig. 11—Torsion Bar Spring Cam and Height Adjustment Bolt Assembly

a. Removal

The front sway bar is attached to frame and strut bars through insulated rubber mounting brackets. To remove the sway bar proceed as follows:

Remove two sway bar link retaining nuts and concave washers. Remove two sway bar cushion retaining nuts, lockwashers and bolts, (one on each strut). Slide sway bar out through control arm struts and away from vehicle. **The sway bar cushions are not serviced separately. If replacement is necessary, install new sway bar assembly.**

Remove lower concave washers. Remove sway bar link insulating bushings from frame bracket by forcing out of position. If bushings are worn or deteriorated, install new ones as required.

b. Installation

Dip new sway bar link bushing in water, install in opening in frame bracket, using a twisting motion. When installed properly, the groove

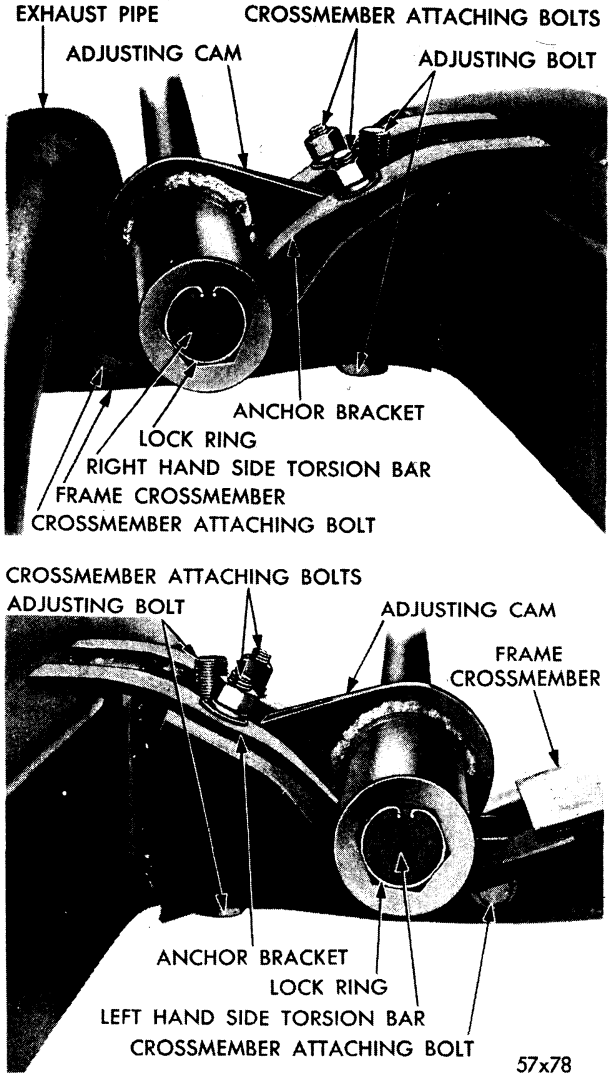

Fig. 12—Torsion Bar Spring (Rear Mounting)

in bushing will index with opening in frame bracket.

Thread sway bar into position over top of lower control arm struts. Engage sway bar cushion housings with struts and install lockplates. Insert bolts, lockwashers and nuts. Tighten to 25 foot-pounds torque. Install washers over ends of links (concave side up), then slide links up through bushings. Install washers (concave side down), over ends of links and down on bushings. Install nuts and tighten to 15 foot-pounds torque.

4. SERVICING THE UPPER CONTROL ARM

a. Removal (FIG. 2)

Place a jack under frame crossmember and lift front wheel off floor. Remove wheel and tire

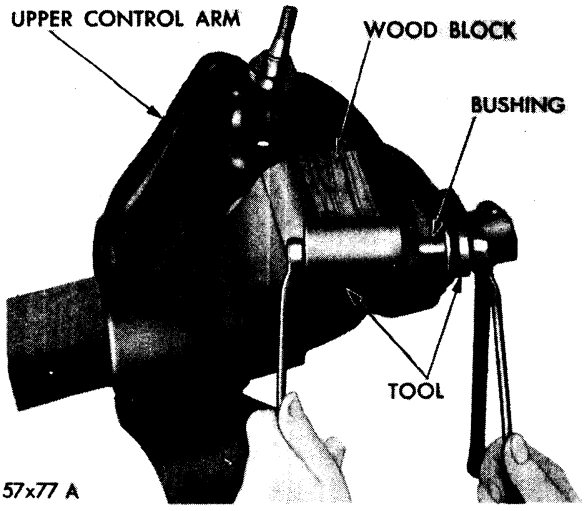

Fig. 13—Removing Upper Control Arm Bushing

assembly. Remove cotter pin, nut, and washer from upper ball joint stud. Install tool and load studs. Using a hammer, remove ball joint stud from steering knuckle by striking the ball joint boss on knuckle sharply. Do not hammer on threaded section of stud.

Remove upper control arm front and rear pivot bolt. Remove control arm from support mountings. Do not remove brackets from frame.

b. Installation

Position upper control arm in support mounting bracket and install front and rear mounting bolts, washers, and nuts. With control arm in **normal position** tighten nuts to 60 to 70 foot-pounds torque. Place upper ball joint stud in steering knuckle and install washer and nut. Tighten nut to 135 foot-pounds torque and secure with cotterpin.

5. UPPER CONTROL ARM BUSHING—REPLACEMENT

Remove upper control arm. Refer to "Upper Control Arm—Removal", Paragraph 4.

Remove bushings by either pressing them out with Tool C-3558 (Fig. 13) or using a hammer and suitable drift.

NOTE: Make definitely sure control arm is properly supported when removing bushings. If hammer and drift are used, extreme care must be exercised to avoid damaging bushing surface in the control arm.

When installing new bushings, always make sure control arm is supported squarely at the point bushing is being pressed in. Position flange end of new bushing in Tool C-3558 (Fig. 14), and support control arm squarely. Using an arbor press, install bushings (flange out) into control arm until the flanged portion of bushings seat on arm.

Install upper control arm. Refer to "Control Arm—Installation", Paragraph 4.

6. UPPER CONTROL ARM SUPPORT MOUNTING BRACKETS

The upper control arm support mounting brackets are bolted to the frame side-rails and should not be removed unless they have been damaged due to accident, etc. When removing the mounting brackets, extreme care should be taken so not to lose the alignment shim pack located between the bracket and frame side-rail. In event a shim pack is lost, a selection of shims $\frac{5}{16}$ inch thick **may be used as a starting point** when reassembling.

7. SERVICING THE LOWER CONTROL ARM (FIGS. 5 and 6)

a. Removal

Raise car by placing jack under frame crossmember. Remove wheel and tire assembly. Remove torsion bar spring from lower control arm to be removed. Refer to "Servicing Torsion Bar —Removal", Paragraph 17. Remove shock absorber lower eye attachment nut and bolt from mounting bracket. Push lower portion of shock absorber up into frame opening. Remove the two struts to lower control arm mounting bolts and nuts. Remove cotter pin, nut, and washer from lower ball joint stud. Remove lower ball joint stud from knuckle (Refer to Paragraph 16 (a). Remove cotter pin, nut and washer from lower control arm shaft assembly. With washer removed, reinstall nut (to protect threads) until it is flush with end of shaft. The lower control arm shaft is a tapered fit in front crossmember. Use a hammer and brass drift for loosening, then remove nut from shaft. Slide lower control arm and shaft assembly from rear of crossmember.

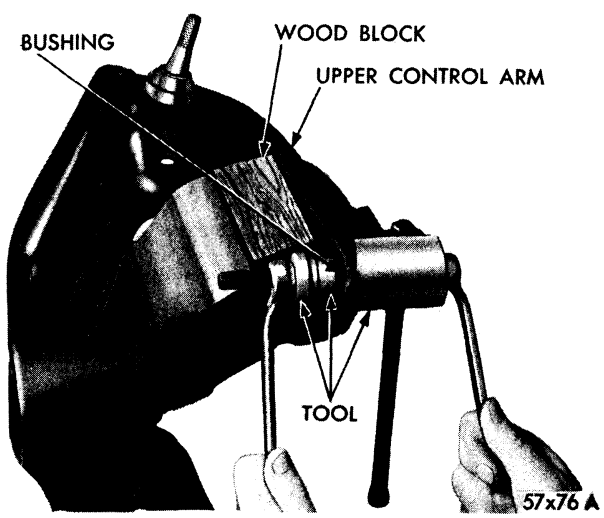

Fig. 14—Installing Upper Control Arm Bushing

b. Installation

Position shaft and lower arm assembly in crossmember in **normal position**; and install washer and nut. Tighten 175 to 200 foot-pounds torque and secure with cotter pin. Position lower ball joint stud in steering knuckle and install washer and nut. Tighten nut 135 foot-pounds torque and secure with cotter pin. Place shock absorber in position in lower mounting bracket and install bolt and nut. Tighten to 40 foot-pounds torque. Install wheel and tire assembly. **Do not lower front of vehicle at this time.** Install torsion bar spring. Refer to "Servicing Torsion Bar Installation", Paragraph 17.

8. SERVICING THE LOWER CONTROL ARM STRUT (FIGS. 6 and 9)

a. Removal

Remove the nuts, lockwashers, and bolts that attach the sway bar bushing housing to struts. Disconnect sway bar from struts. Remove the strut to lower control arm mounting bolts and nuts. Remove the cotter pin, nut and bushing retainer from forward end of strut at front crossmember. Slide strut and inner bushing retainer from bushing in frame, as shown in Figure 9. Using a knife, cut bushing out front of frame.

b. Installation

Dip new bushing in water and with tapered portion toward rear of vehicle, install in opening in frame using a twisting motion until groove in bushing indexes properly with frame. With cupped side out, slide washer over threaded end of strut. Push strut through bushing in frame (Fig. 9). Slide outer washer

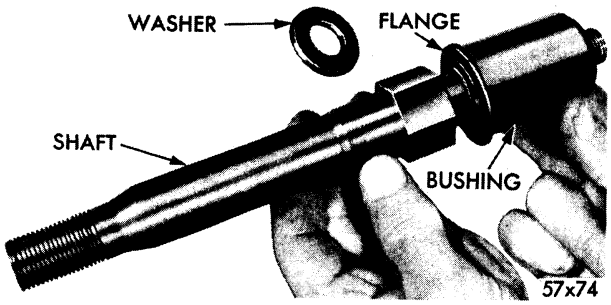

Fig. 15—Removing or Installing Lower Control Arm Pivot Shaft Bushing

over end of strut (cupped side in). Install nut. Tighten nut sufficiently to install strut to lower control arm mounting bolts. Install bolts, lockwashers and nuts, and tighten to 65 foot-pounds torque. Tighten strut nut to 30 foot-pounds torque and install cotter pin. Check caster and camber.

9. LOWER CONTROL ARM PIVOT SHAFT BUSHING—REPLACEMENT (FIGS. 15 and 16)

Remove lower control arm assembly. Refer to "Lower Control Arm—Removal", Paragraph 7. Remove torsion bar spring cushion (small disc) from end of shaft assembly.

a. Disassembly

Support lower control arm assembly in an arbor press; and using a brass drift, press shaft and bushing assembly from control arm. Remove cotter pin, nut, and washer; and slide bushing assembly from shaft.

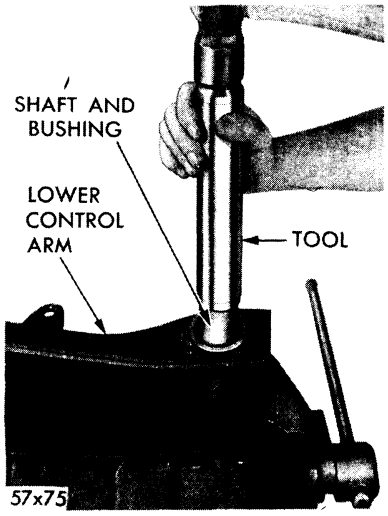

Fig. 16—Installing Lower Control Arm Pivot Bushing

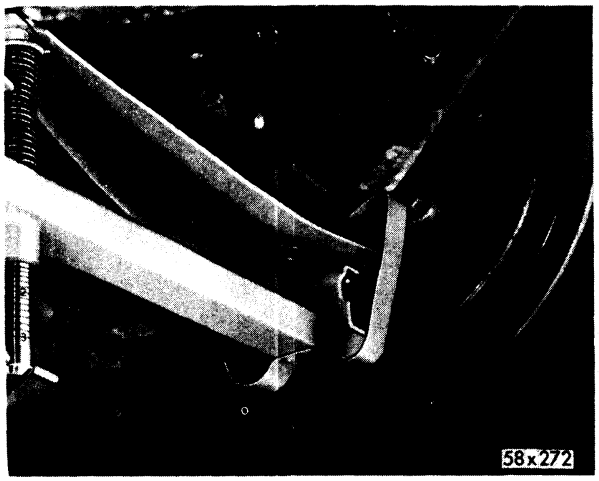

Fig. 17—Front Suspension Height and Level Gauge Installed

b. Assembly

Position new bushing (flanged end of bushing first) on shaft and install washer and nut. Tighten nut 100 to 150 foot-pounds torque and install cotter pin.

With lower control arm supported, install shaft and bushing assembly by using Tool C-3557 and pressing bushing into the lower control arm until flanged portion of bushing is seated all the way into control arm. Install lower control arm. Refer to "Lower Control Arm —Installation", Paragraph 7.

10. CHECKING FRONT SUSPENSION HEIGHT

Front suspension height should be checked when front wheels are aligned or whenever any service work is performed on the torsion bars. If the suspension height is not up to specifications the height should be checked and reset. The suspension height can be checked with or without Tool C-3608. To check the height with Tool C-3608 proceed as follows: Place vehicle on alignment equipment or on a

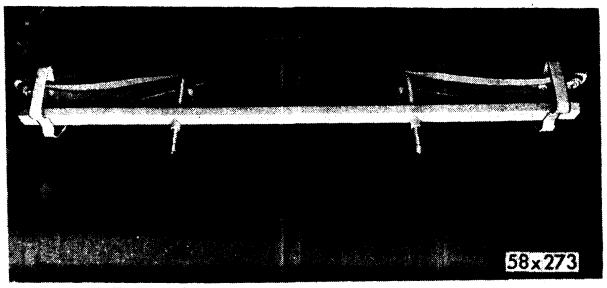

Fig. 18—Front Suspension Height and Level Gauge Measuring Pins and Clips

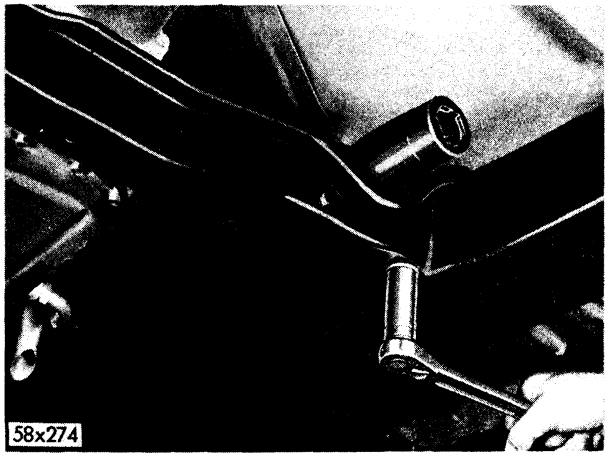

Fig. 19—Adjusting Torsion Bar Cam Bolt

level floor. Inflate tires to recommended pressures, with only the vehicle weight on the torsion bar springs (no passenger or unusual weight in vehicle). Grasp front bumper and jounce car up and down several times to settle the suspension system. When the vehicle is settled, refer to Figures 17 and 18 and install leveling tool as follows:

For accurate gauge reading make sure the lower control arm ball joints at the steering knuckle and control arm bushing housings are clean, free from grit and dirt. Before assembling tool to control arm, retract the tool measuring pin and while under tension lock tool securely in this position. With measuring pin retracted, assemble tool to control arms, as shown in Figure 18 making sure the stops on the ends of tool are up against the control arm ball joints.

Latch the tool retaining springs securely to the flange of the control arm and release the measuring pins so that they contact the lower surface of control arm bushing housing.

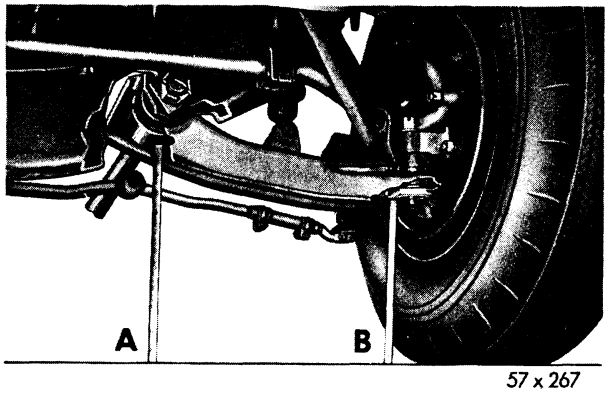

Fig. 20—Measuring Front Suspension Height

NOTE: The measuring pins are spring loaded and scaled in ⅛ inch increments. These readings are direct measurements and indicate the difference in height between the low point of the control arm ball joints and the lower surface of the control arm housing.

These readings can be equalized or adjusted by raising or lowering of the torsion bar anchor adjusting bolt (Fig. 19) to the specified height. See Table 1 for height specification.

NOTE: These reading are direct measurements and indicate the difference in height between the low point of the control arm ball joints and the lower surface of the control arm housing.

If Tool C-3608 is not available, car height can be set in the following manner:

Compare the differences of the two measurements between "A" and point "B" (Fig. 20). The difference between these two measurements should be ¼ + ⅛ inch, on the Passenger Car, 2¾ on the Town and Country Wagon and 1¾ inch on the C-300D models. If the difference between the two sides of the vehicle are within ⅛ inch of each other and are with-

TABLE I

CAR HEIGHT SPECIFICATION

Standard Passenger Cars	2¼ ± ⅛ inch
Town and Country Wagon	2¾ ± ⅛ inch
C-300D	1¾ ± ⅛ ihcn

in the limits specified, they may be considered acceptable. If these values differ more than 1/8 inch or if one or both of them are outside of the specified limits, the front suspension height on both sides must be reset by tightening or loosening the adjusting bolt at the torsion bar (Fig. 19). See Table 1 for Height Specifications.

11. FRONT WHEEL ALIGNMENT (CASTER AND CAMBER)

Correct front wheel alignment produces easy, positive steering with a minimum of scuffing action between tire and load. Normally, when checking front wheel alignment, car should be empty (all luggage or load should be removed). If a constant load is carried, such as when a car is used by salesman for carrying samples, etc., car should be loaded with its normal amount of weight before checking front wheel alignment.

All factors of front wheel alignment are interrelated, but each angle has specific purpose. Four different angles are used in positioning front wheels for proper steering under varying conditions of weight and speed.

When making adjustments or installing new suspension parts, the alignment angles in both front wheels should be checked in the following order: Caster, (Fig. 21), Camber, (Fig. 22), Steering Axis Inclination and Toe.

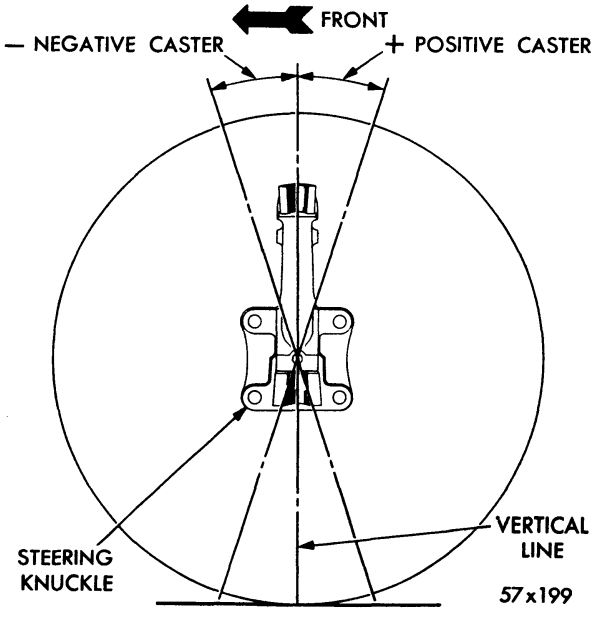

Fig. 21—Caster Angle

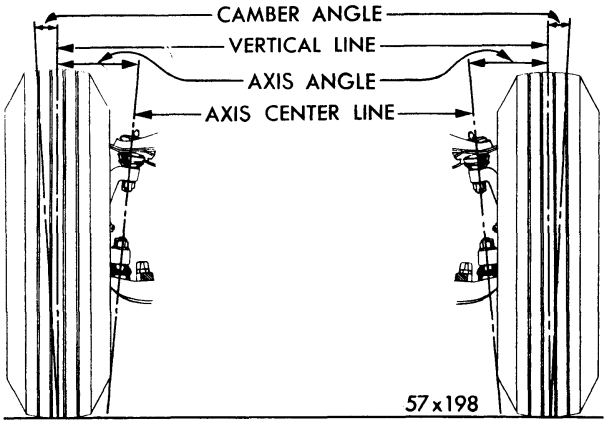

Fig. 22—Camber Angle Axis Inclination

NOTE: Front suspension parts are heat treated, if they are damaged or bent, they should be replaced. Under no circumstances should these parts be heated in order to straighten.

The method of checking front wheel alignment settings on the subject models, which incorporate Torsion-Aire front suspension, remains the same as the method used on previous models. However, the procedures for adjusting camber and caster settings and front spring heights differ.

After alignment is once checked and adjusted, it should only be necessary to check the alignment once a year, under normal operating conditions. However, new cars or cars which have had the front suspension reconditioned and new suspension bushings installed, may require realigning after a short period of operation. This is due to the relatively stiff operation of new bushings, which will take a normal set after a short period of driving.

Inspection

When checking front wheel alignment, the following inspection should be made to determine the necessity for repairs or replacement of suspension or steering parts and the necessary repairs made before proceeding further:

1. Check type of tire wear.
2. Check adjustment of front wheel bearings as follows:

a. Remove any burrs or nicks on the spindle thread.

b. Tighten wheel bearing adjusting nut to 90 inch-pounds while rotating the wheel.

c. Selectively position the nut lock over the adjusting nut so that one set of slots in the nut lock is in line with the cotter pin hole in the spindle.

d. Without removing the nut lock, back off the nut until the next set of slots in the nut lock is lined up with the cotter pin hole.

e. Insert and bend the cotter pin to secure the nut lock. Check all suspension and steering linkage pivot points for excessive looseness.

3. Check rear springs for "U" bolt tightness and proper positioning on axle spring seat.
4. Check for bent frame or suspension parts by measuring wheel base (both sides) from center to center of axles with front wheels in straight ahead position.

When the above points have been checked and the necessary repairs made, check and correct front wheel alignment as follows:

Inflate all tires to recommended pressure. (Should have tires with equal wear on front wheels). Position the car on a level floor with only the weight of the vehicle on the springs.

Grasp the front bumper at the center and jounce the front of the car up and down several times to place the front springs and shock absorbers in their normal position.

NOTE: The car must remain in this normal position while checking all alignment settings.

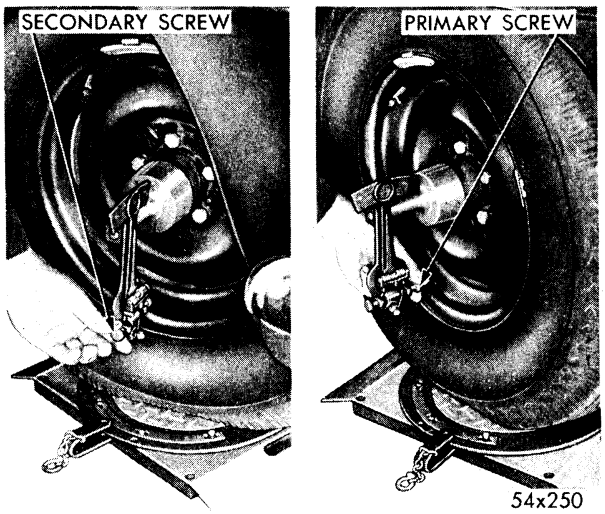

Fig. 23—Checking Caster—Right Wheel

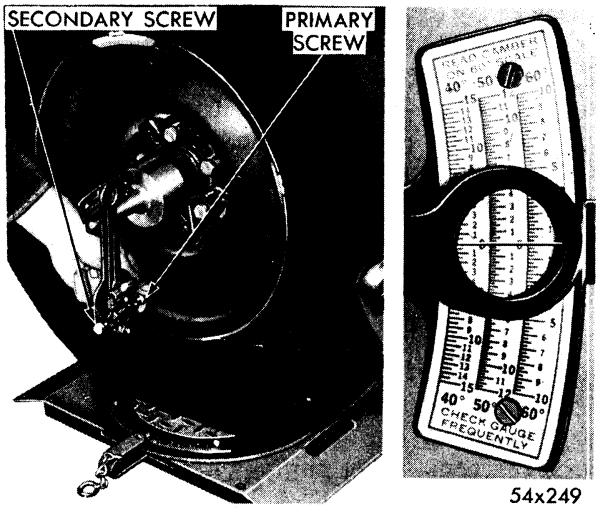

Fig. 24—Checking Camber (Tool C-3409)

Check front suspension height by finding the difference in height between the floor and the two measuring points on each lower control arm. The measuring point at the inner end is from the underside of the lower control arm bushing housing (located between the flanges of the control arm) to the floor, ("A" Fig. 20). This measuring point at the outer end is from the lowest point of the lower ball joint housing to the floor, ("B" Fig. 20). The difference in the two should be 2¼ ± ⅛ inch, on the Passenger car, 2¾ Town and Country Wagon and 1¾ on the C-300D models. If the difference between the two sides of the vehicle are within ⅛ inch of each other and are within the limits specified, they may be considered acceptable. If these values differ more than ⅛ inch or if one or both of them are outside of

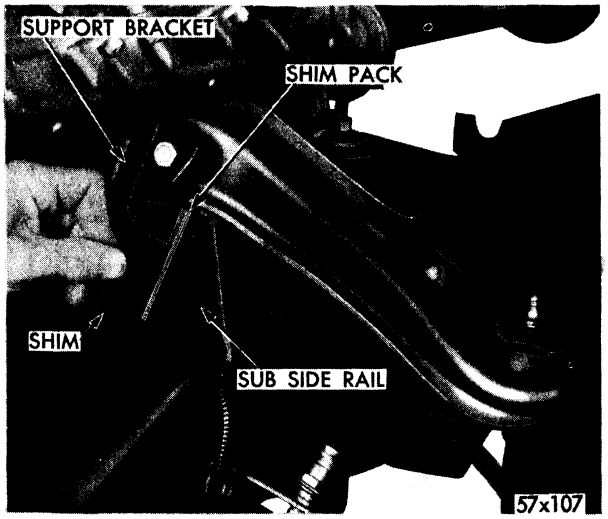

Fig. 25—Removing Shims to Adjust Camber or Caster

the specified limits, the front suspension height on both sides must be reset by tightening or loosening the adjusting bolt at the torsion bar (Fig. 19).

Compare the measurements that have been taken on both the right and left sides of the car. The two results should be within 1/8 inch of each other.

If the spring heights are not within the specified measurements, or if the right and left measurements differ by more than 1/8 inch, correct by tightening or loosening the height adjusting bolts at the torsion bar spring rear anchors. Tightening a spring height adjusting bolt, (one located at each end of the engine rear crossmember) will increase spring height; loosening the bolt will decrease height.

NOTE: Always check front wheel alignment and aiming of headlights after adjusting spring heights.

Caster and camber angles and king-pin inclination can be checked with Gauge Tool C-3409, Turntable Tool DD-435 and Gauge Tool DD-428 with new leg attachment for small wheels (Figs. 21, 22, 23 and 24).

Negative Caster is the tilting of the top of the steering knuckle toward the front of car.

Positive Caster is the tilting of the top of the steering knuckle toward the rear of the car.

Camber is amount that front wheels lean outward or inward from the vertical, when viewed from front of car. With positive camber, wheels are farther apart at top than at bottom. With negative camber, this condition is reversed.

NOTE: Caster and camber are adjusted by removing or adding shims (Fig. 25) between the upper control arm support brackets and frame sub-side rails.

Adding shims at the rear bracket or removing shims at the front bracket will increase positive caster. One shim 1/16 inch thick will change caster approximately 3/8°.

Removing shims equally at both front and rear brackets will increase positive camber. One shim 1/16 inch thick at each bracket will change camber approximately 5/16°. The total thickness of each shim pack should not exceed 9/16 inch.

NOTE: Should any front suspension parts become bent, they should be replaced. Under no circumstances should these parts be heated to straighten or bend.

12. ADJUSTING CASTER AND CAMBER WITH TORSION-AIRE SHIM CHANGE CHART (FIG. 26)

Both caster and camber can be adjusted at the same time by the use of the attached chart on pages 14 and 15.

The shim chart is designed to operate much in the same manner as the mileage charts found on most road maps. The chart may be used for either left or right wheels, as well as for cars equipped with manual or power steering. The camber figures for the right wheel will be found across the top of the chart and the figures for the camber reading for the left will be found across the bottom of the chart. Figures for the caster on a power steering equipped car will be found along the left side. The figures for the manual steering car will be found along the right side.

To use the shim chart, the following procedures should be followed:

The car should be jounced so as to allow it to assume its normal setting. The car height should be checked and adjusted if it's not within the specifications. THE FRONT SUSPENSION MUST ALWAYS BE SET AT THE PROPER HEIGHT BEFORE ALIGNMENT CHECKS OR WORK ARE PERFORMED.

A wheel alignment reading should be taken to determine the present caster and camber settings for each wheel. These settings should be recorded so they will not be forgotten.

Locate on the chart, the camber reading for the right wheel using the camber figures across the top of the chart. Also locate the caster reading for the right wheel using either the caster figures at the left side if the car is equipped with power steering or right side of the chart, if the car is equipped with manual steering. Follow the caster column across until it intersects with the camber vertical column indicating the shim change necessary to bring the right wheel within preferred setting range.

TORSION-AIRE SHIM CHANGE CHART

CAMBER—RIGHT WHEEL +¼ TO −¼ DEGREES, 0° PREFERRED

+1½ TO 0 DEGREES (Set right and left sides the same)

CASTER—MANUAL STEERING

RT. ➤	−3.00	−2.75	−2.50	−2.25	−2.00	−1.75	−1.50	−1.25	−1.00	−.75	−.50	−.25	0"	+.25	+.50	+.75	+1.00	+1.25	+1.50	+1.75	+2.00	+2.25	+2.50	+2.75	+3.00	
+8.00													+18−18													+6.50
+7.75													+17−17													+6.25
+7.50												−15+18	+16−16	+18−15												+6.00
+7.25												+14−17	+16−16	+17−14												+5.75
+7.00												+14−17	+15−15	+17−14												+5.50
+6.75											+12−18	+13−16	+15−15	+16−13	+18−12											+5.25
+6.50											+11−17	+13−16	+14−14	+16−13	+17−11											+5.00
+6.25										+ 9−18	+11−17	+12−15	+13−13	+15−12	+17−11	+18− 9										+4.75
+6.00										+ 9−18	+10−16	+11−14	+13−13	+14−11	+16−10	+18− 9										+4.50
+5.75										+ 8−17	+ 9−15	+11−14	+12−12	+14−11	+15− 9	+17− 8										+4.25
+5.50									+ 6−18	+ 7−16	+ 9−15	+10−13	+11−11	+13−10	+15− 9	+16− 7	+18− 6									+4.00
+5.25									+ 5−17	+ 7−16	+ 8−14	+ 9−12	+11−11	+12− 9	+14− 8	+16− 7	+17− 5									+3.75
+5.00								+ 3−18	+ 5−17	+ 6−15	+ 7−13	+ 9−12	+10−10	+12− 9	+13− 7	+15− 6	+17− 5	+18− 3								+3.50
+4.75								+ 2−17	+ 4−16	+ 5−14	+ 7−13	+ 8−11	+10−10	+11− 8	+13− 7	+14− 5	+16− 4	+17− 2								+3.25
+4.50								+ 2−17	+ 3−15	+ 5−14	+ 6−12	+ 8−11	+ 9− 9	+11− 8	+12− 6	+14− 5	+15− 3	+17− 2								+3.00
+4.25							0−18	+ 1−16	+ 3−15	+ 4−13	+ 6−12	+ 7−10	+ 9− 9	+10− 7	+12− 6	+13− 4	+15− 3	+16− 1	+18 0							+2.75
+4.00							− 1−17	+ 1−16	+ 2−14	+ 4−13	+ 5−11	+ 7−10	+ 8− 8	+10− 7	+11− 5	+13− 4	+14− 2	+16− 1	+17+ 1							+2.50
+3.75						− 3−18	− 1−17	0−15	+ 1−13	+ 3−12	+ 4−10	+ 6− 9	+ 7− 7	+ 9− 6	+10− 4	+12− 3	+13− 1	+15 0	+17+ 1	+18+ 3						+2.25
+3.50						− 4−17	− 2−16	− 1−14	+ 1−13	+ 2−11	+ 4−10	+ 5− 8	+ 7− 7	+ 8− 5	+10− 4	+11− 2	+13− 1	+14+ 1	+16+ 2	+17+ 4						+2.00
+3.25					− 6−18	− 4−17	− 3−15	− 1−14	0−12	+ 2−11	+ 3− 9	+ 5− 8	+ 6− 6	+ 8− 5	+ 9− 3	+11− 2	+12 0	+14+ 1	+15+ 3	+17+ 4	+18+ 6					+1.75
+3.00					− 6−18	− 5−16	− 3−15	− 2−13	0−12	+ 1−10	+ 3− 9	+ 4− 7	+ 5− 5	+ 7− 4	+ 9− 3	+10− 1	+12 0	+13+ 2	+15+ 3	+16+ 5	+18+ 6					+1.50
+2.75					− 7−17	− 5−16	− 4−14	− 2−13	− 1−11	0− 9	+ 2− 8	+ 3− 6	+ 5− 5	+ 6− 3	+ 8− 2	+ 9 0	+11+ 1	+13+ 2	+14+ 4	+16+ 5	+17+ 7					+1.25
+2.50				− 9−18	− 8−16	− 6−15	− 5−13	− 3−12	− 2−10	0− 9	+ 1− 7	+ 3− 6	+ 4− 4	+ 6− 3	+ 7− 1	+ 9 0	+10+ 2	+12+ 3	+13+ 5	+15+ 6	+16+ 8	+18+ 9				+1.00
+2.25				−10−17	− 8−16	− 7−14	− 5−13	− 4−11	− 2−10	− 1− 8	+ 1− 7	+ 2− 5	+ 4− 4	+ 5− 2	+ 7− 1	+ 8+ 1	+10+ 2	+11+ 4	+13+ 5	+14+ 7	+16+ 8	+17+10				+ .75
+2.00			−12−18	−10−17	− 9−15	− 7−14	− 6−12	− 4−11	− 3− 9	− 1− 8	0− 6	+ 2− 5	+ 3− 3	+ 5− 2	+ 6 0	+ 8+ 1	+ 9+ 3	+11+ 4	+12+ 6	+14+ 7	+15+ 9	+17+10	+18+12			+ .50
+1.75			−12−18	−11−16	−10−14	− 8−13	− 6−12	− 5−10	− 3− 9	− 2− 7	− 1− 5	+ 1− 4	+ 2− 2	+ 4− 1	+ 5+ 1	+ 7+ 2	+ 9+ 3	+10+ 5	+12+ 6	+13+ 8	+14+10	+16+11	+18+12			+ .25
+1.50			−13−17	−12−15	−10−14	− 9−12	− 7−11	− 6− 9	− 4− 8	− 3− 6	− 1− 5	0− 3	+ 2− 2	+ 3 0	+ 5+ 1	+ 6+ 3	+ 8+ 4	+ 9+ 6	+11+ 7	+12+ 9	+14+10	+15+12	+17+13			0°
+1.25		−15−18	−14−16	−12−15	−11−13	− 9−12	− 8−10	− 6− 9	− 5− 7	− 3− 6	− 2− 4	0− 3	+ 1− 1	+ 3 0	+ 4+ 2	+ 6+ 3	+ 7+ 5	+ 9+ 6	+10+ 8	+12+ 9	+13+11	+15+12	+16+14	+18+15		− .25
+1.00		−16−17	−14−16	−13−14	−11−13	−10−11	− 8−10	− 7− 8	− 5− 7	− 4− 5	− 2− 4	− 1− 2	+ 1− 1	+ 2+ 1	+ 4+ 2	+ 5+ 4	+ 7+ 5	+ 8+ 7	+10+ 8	+11+10	+13+11	+14+13	+16+14	+17+16		− .50

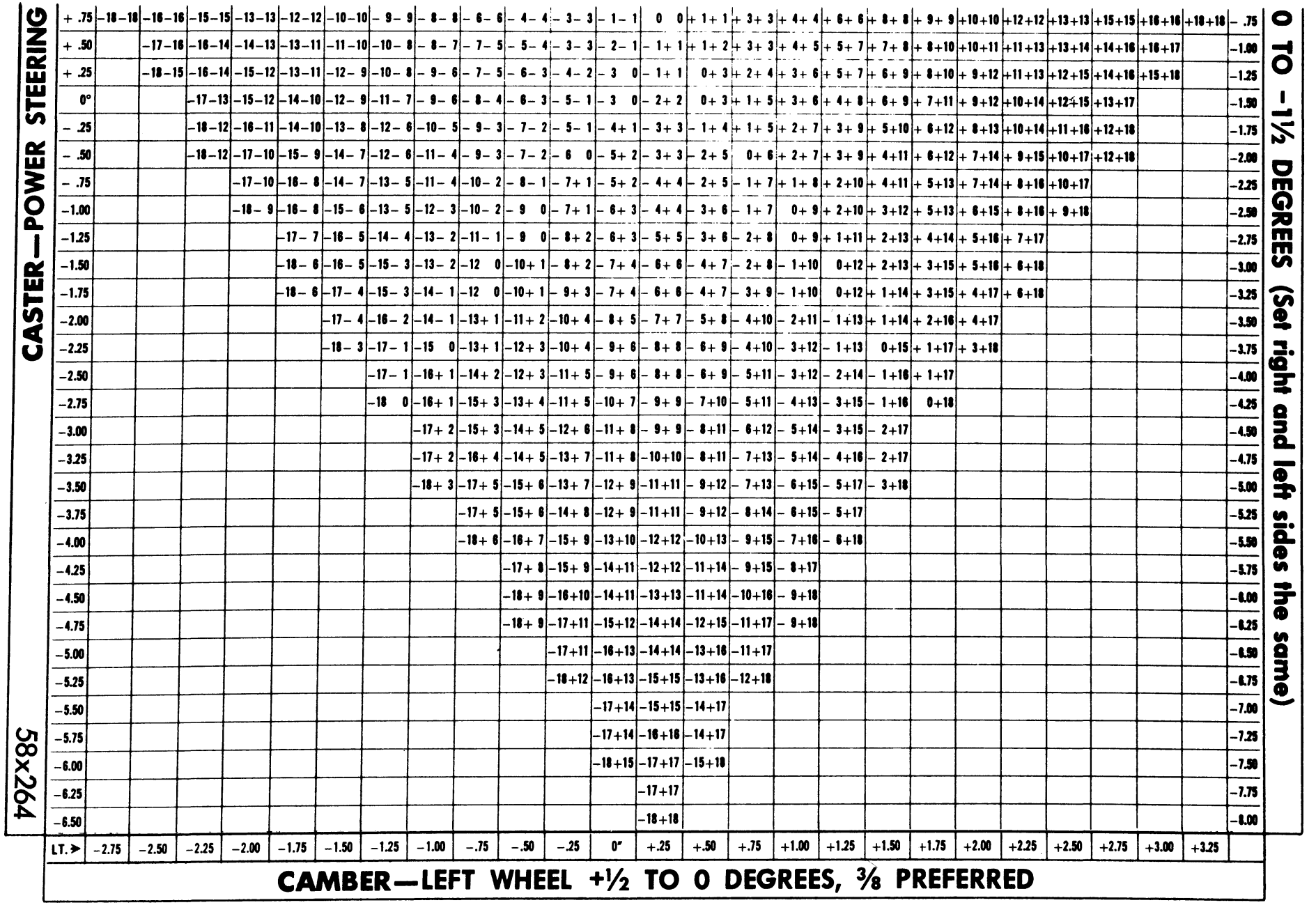

Fig. 26—Torsion-Aire Shim Change Chart

SHIM TABLE II

	Direction	Front Bracket	Rear Bracket
Camber	**Increase**	**Remove Shims**	**Remove Shims**
	Decrease	Add Shims	Add Shims
Caster	**Increase**	**Remove Shims**	**or Add Shims**
(Positive)	Decrease	Add Shims or	Remove Shims

The first figure in the square indicates the shim change necessary at the front bracket. The second figure indicates the shim change necessary at the rear bracket. A plus mark (+) indicates the addition of shims, a minus mark (—) indicates the removal of shims.

NOTE: The chart is based on a 1/32 inch shim to enable more accurate settings to the preferred specifications. It is advisable to use 1/16 inch shims where possible to reduce the number of shims that have to be handled. The shim pack should NOT exceed 9/16 inch. (Eighteen 1/32 inch shims or nine 1/16 inch shims.)

The same procedure should be repeated using the appropriate figures for the left wheel. After the shims have been changed as indicated by the chart, the alignment should be rechecked with the gauges, to complete the operation.

13. ADJUSTING FRONT WHEEL TOE-IN

Toe-In means that wheels are closer together at front than they are at rear. To measure, spin front wheels and scribe a thin line in center of tread of each tire (Fig. 27). Jounce front end up and down several times and position wheels in straight-ahead position. Gauge and scriber

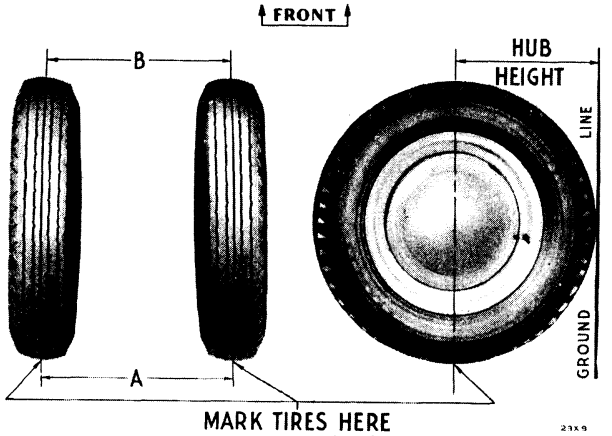

Fig. 27—Front Wheel Toe-In

Tool C-695 can be used for scribing tire treads and measuring toe.

Measure distance at hub height between points A and B, Fig. 27. The distance between point B should be ⅛ inch less than distance between point A. To adjust toe, lengthen or shorten the tie rods an equal amount until the wheels toe-in ⅛ inch, plus or minus 1/32 inch (⅛ inch preferred) and recheck measurements at points A and B. Make sure the rods are centered and U-clamps are down before the tie rod clamp bolts are tightened.

NOTE: The steering wheel hub, steering gear arm, steering tube and steering gear roller shaft are machined with master serrations to place front wheels straight-ahead when steering

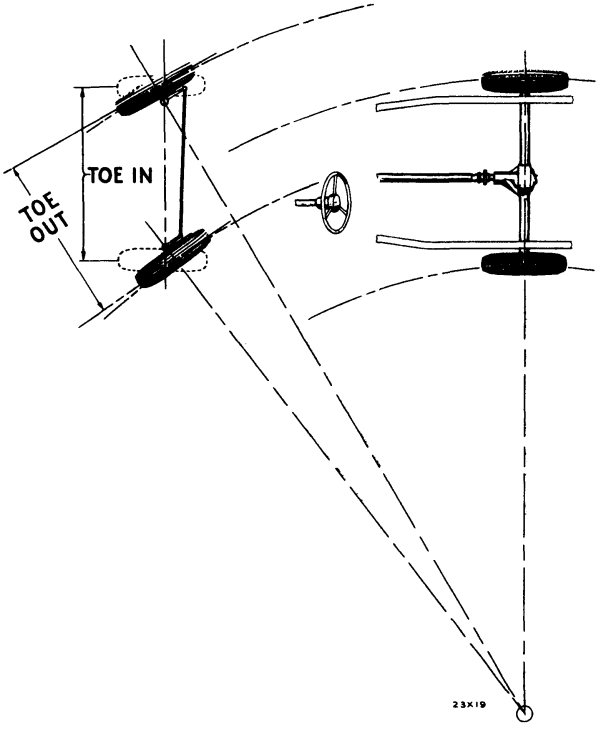

Fig. 28—Steering Geometry on Turns

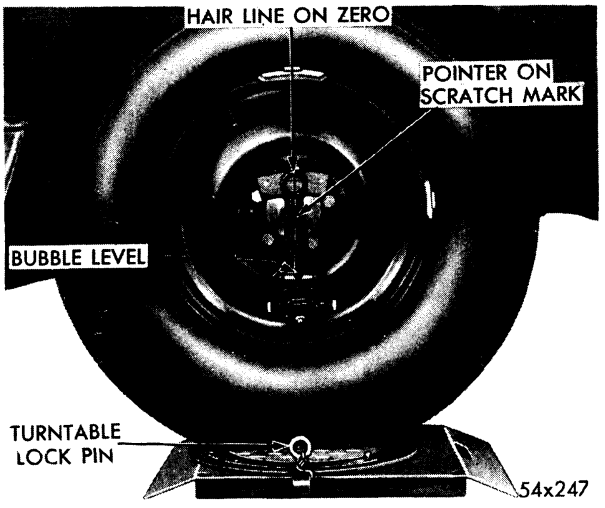

Fig. 29—Gauge C-3409 and Turntable DD 435 on Right Wheel

wheel is in center position. Do not alter these serrations to change position of these parts. Improper position of steering wheel must be corrected by adjusting tie rod lengths.

Toe-out turns.

When car makes a turn, front wheels travel in circles which have a common center (Fig. 28). The arc of circle traveled by the inside front wheel is smaller than arc of circle traveled by outside front wheel. Consequently, when turned to right or left, the wheels will be farther apart at front than at rear. The amount that front wheels toe-out depends upon how far they are turned.

With front wheels on turntables, set right wheel to 20 degrees. The turntable under left wheel should indicate 21½ degrees, plus or minus 1 degree. If reading is not within these limits, the steering knuckle arm or steering gear arm may be bent. Before above check is made, make sure that camber, caster, steering axis inclination and toe-in are within limits.

14. CHECKING STEERING AXIS INCLINATION

Steering axis inclination is amount in degrees that axis of the ball joints lean away from vertical toward center of car (Fig. 21). If camber can be adjusted within the recommended limits, it is unnecessary to check steering axis inclination.

To check axis inclination refer to Figs. 21 and 22 and proceed as follows:

Inflate tires to recommended pressure, place front wheels in straight-ahead position on turntables and set foot brakes. Grasp front bumper at center and move front end of car up and down several times to permit front suspension parts to settle in "normal" unloaded position.

Assemble gauge to right wheel (Fig. 29) and pull out turntable lock pins. Turn front wheels to left until right wheel has turned more than 20 degrees then return to 20 degrees. Adjust secondary screw (Fig. 30), which controls the short pointer until bubble is centered in spirit level. **Do not disturb gauge setting or release brakes.**

Turn front wheels to right until right wheel is turned to an angle of more than 20 degrees mark. Allow wheel to back off to exactly 20 degrees. Adjust primary screw (Fig. 30) until bubble centers in spirit level. The reading on 40-degree scale of gauge will be steering axis inclination for right wheel.

To check angle of left front wheel, place gauge on left wheel, turn front wheels to right and repeat procedure outlined above.

NOTE: If the steering axis inclination does not conform with limits listed in Specifications, check for bent frame, steering knuckle or control arms or damaged ball joints.

15. SERVICING THE STEERING KNUCKLES (FIG. 31)

a. Removal

Remove wheel, tire and drum. Cover brakes

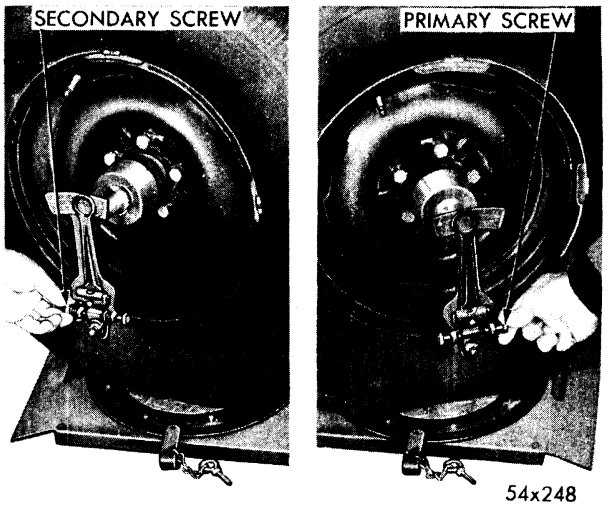

Fig. 30—Checking Steering Axis Inclination (Gauge C-3409)

with clean cloth to protect lining from being covered with grease. Remove the cotter pins, nuts and lockwashers attaching the steering arm and brake dust shield to steering knuckle. Remove steering arm, and brake assembly from steering knuckle but leaving the brake hose attached. Do not allow assembly to hang by the brake hose. Remove ball joint studs from steering knuckles as described in "Servicing the Upper and Lower Ball Joints," Paragraph 16, using Tool C-3564. Lift steering knuckle out and away from vehicle.

b. Installation

To install steering knuckle, refer to Fig. 31, and slide upper and lower ball joint studs into steering knuckle and install lockwashers and nuts. Tighten the ball joint stud nut to 135 foot-pounds torque. Install cotter pins.

Slide brake assembly over knuckle and into position. Install lockwashers and nuts on upper rear and lower front bolts. Install upper front and lower rear bolts through dust shield and steering knuckle, then slide steering arm over bolts. Install lockwashers and nuts. Tighten nuts evenly to 55 foot-pounds torque. Install cotter pins. Remove covering from brake shoes, replace wheel, tire and drum assembly. Adjust front wheel bearings as per "Front Wheel Bearing End Play Adjustment", Paragraph 18. Refer to "Front Wheel Alignment (Caster and Camber)", Paragraph 11.

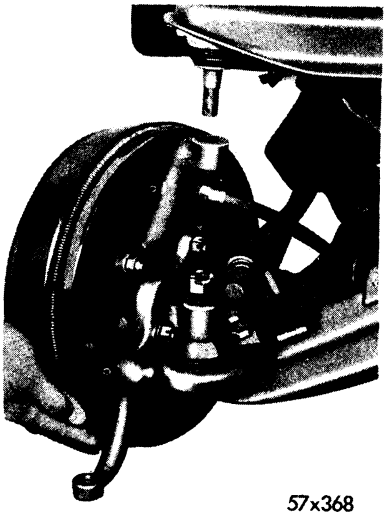

Fig. 31—Removing or Installing Steering Knuckle

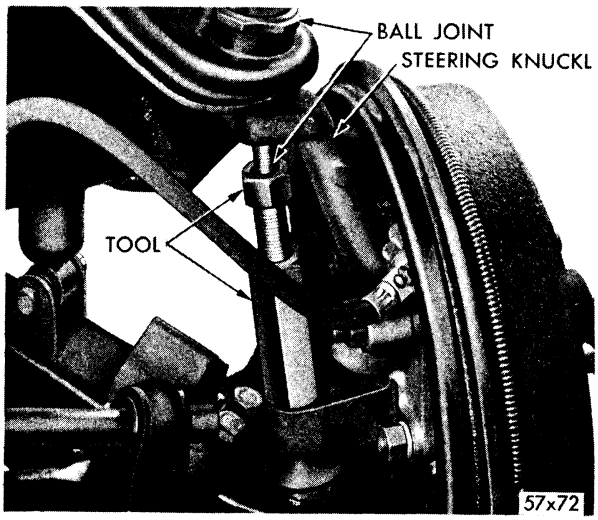

Fig. 32—Removing Upper Ball Joint—(Removal Tool C-3564)

16. SERVICING THE BALL JOINTS—(UPPER AND LOWER) (FIGS. 32 and 33)

a. Removal of Upper Ball Joint

CAUTION

Upper and lower ball joints are not interchangeable. The upper ball joint is a preloaded joint and can not be used in the lower control arm. Remove wheel and tire assembly. With support under the lower control arm, remove upper and lower ball joint stud nuts. Install Tool C-3561 (Fig. 32). Apply load to studs and rap knuckles at ball joint boss sharply with a hammer to loosen stud. **To avoid damaging stud do not attempt to hammer stud out of knuckle.**

Remove tool, and disengage ball joint from

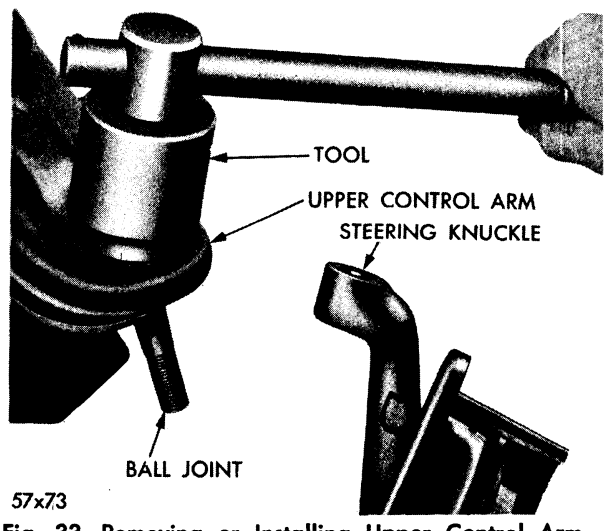

Fig. 33—Removing or Installing Upper Control Arm Ball Joints

knuckle. Remove ball joint dust cover and grease seal. Remove lubrication fitting from top of ball joint, using Tool C-3561, as shown in Figure 33, unscrew ball joint from upper control arm.

b. Installation of Upper Ball Joint

NOTE: When installing new ball joint, it is very important that the ball joint threads engage those of the control arm squarely.

With the lubrication fitting removed, screw ball joint into control arm as far as possible by hand. Using Tool C-3561, tighten until ball joint housing is seated on control arm. Slide seal and dust cover up into position, over stud and position stud in steering knuckle. Install washer and nut. Tighten 135 foot-pounds torque. Install cotter pin and lubrication fitting. Lubricate ball joint with a good grade of chassis lubricant, as specified in Lubrication, Paragraph 1.

c. Removal of Lower Ball Joint

Raise wheel off floor supporting weight under the lower control arm, allowing enough clearance to remove lower ball joint, and remove wheel and tire assembly. Remove upper and lower ball joint stud nuts, install Tool C-3564 (Fig. 34) as described in "Upper Ball Joint Removal" Paragraph 16 procedure. Rap knuckle at stud boss sharply with a hammer to loosen stud. **To avoid damaging stud do not attempt to hammer stud out of knuckle.** Remove grease fitting using Tool C-3561, screw out ball joint.

NOTE: When installing new ball joint, it is very important that the ball joint threads engage those of the control arm squarely.

d. Installation of Lower Ball Joint

To reinstall, screw ball joint into control arm as far as possible by hand. Using Tool C-3561, tighten until ball joint housing is seated on control arm. Slide seal and dust cover down into position, over stud then position stud in steering knuckle. Install washer and nut. Tighten 135 foot-pounds torque. Install cotter pin; lubricate fitting and lubricate ball joint, using a good grade of chassis lubricant and reinstall wheel and tire assembly.

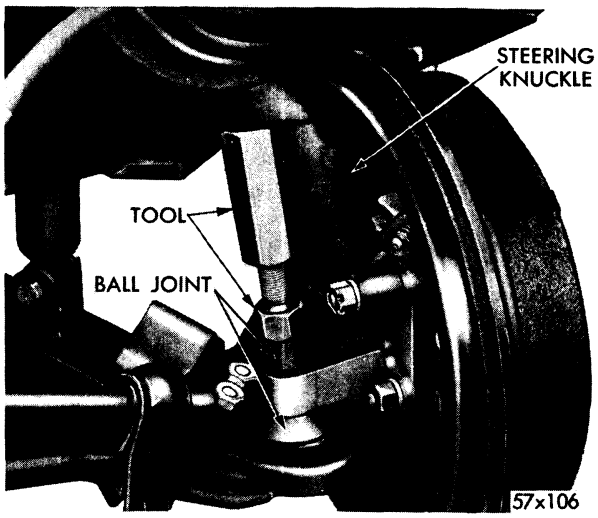

Fig. 34—Removing Lower Ball Joint

17. SERVICING THE TORSION BARS

The torsion bars are not interchangeable, side for side. The left hand bar cannot be used on the right side and vice versa. The bars will be marked left or right by (L) or (R) stamped on the end of the rod, as shown in Figure 12. The bars should always be installed with letters toward the rear of car.

a. Removal of Torsion Bar, Anchor Swivel and Bolt

To replace torsion bar anchor, refer to Fig. 2 and proceed as follows: Raise vehicle off floor by jacking under frame crossmember. Release load from torsion bar by unscrewing the anchor adjusting bolt partly out of swivel.

CAUTION

To prevent swivel from falling into frame bracket, do not loosen the swivel bolt all the way out until torsion bar is removed.

Remove the lock ring from rear of anchor (Fig. 12). Slide torsion bar rearward enough to disengage forward end of bar from lower control arm, then forward to disengage torsion bar from anchor. Remove bar, bolt, swivel and cam from frame bracket anchor.

b. Installation

With car raised off the floor, assemble anchor, swivel, bolt-seat (oval side up) and bolt in frame anchor bracket. Check for torsion bar cushion in lower control arm housing, with

cam bolt barely entered in cam swivel, slide torsion bar into rear cam. Rotate anchor and torsion bar assembly until anchor is positioned as close as possible to floor pan. Engage front of torsion bar in lower control arm shaft assembly as far as bar will go.

CAUTION

Unless anchor blade is in the position just described when installing torsion bar, it will be impossible to adjust front suspension to the proper suspension height.

Center and install lock ring in rear of anchor housing. Pressure may have to be applied to torsion bar to enable lock ring to be installed in housing. After installation of lock ring, tighten cam bolt until approximately 1 inch of threads are showing above the anchor bolt swivel.

NOTE: This is an approximate setting and is to be used merely as a starting point when adjusting suspension height. This setting is also necessary to place load on the torsion bar spring before lowering vehicle to the floor.

Check and adjust suspension height. Refer to "Checking Front Suspension Height", Paragraph 10.

CAUTION

Caster and camber and front suspension height should always be checked whenever the torsion bars are replaced.

18. ADJUSTMENT OF FRONT WHEEL BEARINGS (FIGS. 35, 36 and 29)

Remove hub cap and grease cap, then jack up front of car. Remove cotter pin that retains nut lock. Remove nut lock. Using an inch-pound torque wrench, tighten adjusting nut to 90 inch-pounds, while rotating wheel. Remove torque wrench.

Selectively position the nut lock over adjusting nut so that the spindle cotter pin hole is in approximate alignment with one set of slots in nut lock, as shown in Figures 35 and 36, then back off (to next slot) adjustment (without removing nut lock) until the slots are aligned with cotter pin hole). Install cotter pin, grease cap and hub cap. Remove jack.

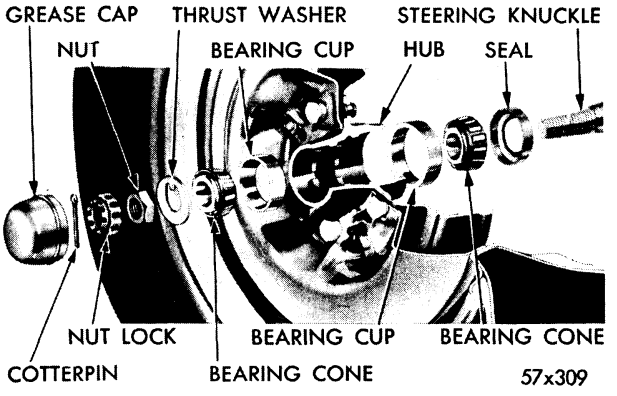

Fig. 35—Front Wheel Bearing Adjustment

Removing and Installing Front Wheel Bearing Races

Should it become necessary to remove the front wheel bearing races, remove drum then drive race out of drum as follows:

Remove inner oil seal and bearing. Invert drum, then using a suitable drift, drive the outer bearing race from the drum. (Driving slots are machined in drum for this operation.)

Again invert the drum and drive out the inner bearing race. Clean the drum and bearings, using a suitable solvent then blow dry with compressed air. (Do not spin bearings with air pressure.) Check bearings for pits or brinelling. Install new bearings as required.

Fig. 36—Installing Nut Lock

When installing new bearing races, be sure and start race evenly in drum. Drive down into position alternately, using (if possible) the old race. Be sure race is seated evenly.

Pack inner bearing with short fibre grease, then install in drum. Install new grease seal. Slide drum over spindle. Pack outer bearing with grease and slide over spindle and into drum. Install thrustwasher and nut, then adjust bearing as described above.

SERVICE DIAGNOSIS

19. FRONT END NOISY—POSSIBLE CAUSES AND CORRECTIONS

Lack of lubrication in ball joints or tie rod ends.

Worn upper or lower control arm pivot bushings (rubber) or loose mounting brackets—Tighten brackets or replace bushings.

Loose or worn strut mounting bushings (rubber)—Tighten mounting nut to proper torque or replace bushing.

Worn ball joints or tie rod ends—Replace as necessary.

Front shock absorber noisy—Tighten mounting nuts or replace bushing or shock absorber as required.

Sway eliminator noisy—Check attaching bolts for tightness and rubber bushings for wear. If rubber bushings are worn, replace sway eliminator assembly.

Worn or loose front wheel bearings—Adjust or replace as required.

20. BODY HAS TENDENCY TO PITCH AND ROLL

Low or uneven tire pressures—Inflate tires to proper pressure.

Shock absorber inoperative—Replace as required.

Loose sway eliminator—Tighten mounting bolts to proper torque.

Improper front suspension height—Adjust torsion bar springs as required.

21. TIRE WEAR

The same items which caused excessive tire wear in the previous suspension will also apply to the 1958 series suspension.

22. STEERING

The following is a list of steering problems which may be checked after it has definitely been established that difficulty is caused by the front suspension system.

23. WHEEL BOUNCE

Unequal tire pressure—Inflate tires to recommended pressure.

Unbalanced wheels, tires or brake drums—A wheel and tire assembly that is out of static balance can cause an up and down action which will affect steering ability and control.