CHASSIS SUSPENSION • • • SECTION 8

CONTENTS

GENERAL DESCRIPTION

The chassis is suspended at all four wheels in such a manner as to obtain maximum riding comfort and ease of steering with minimum tire wear.

The front end of the chassis is suspended through large coil springs at each front wheel with a shock absorber mounted inside each spring. The rear end is supported by means of strong leaf springs which are connected between the frame and the rear axle. Rear shock absorbers are mounted at an angle toward the center of the vehicle to absorb shocks from the rear wheels and to aid the sway eliminator bar in controlling vehicle sway when rounding curves at high speeds.

MAINTENANCE AND ADJUSTMENT

Careful maintenance of front end alignment is the major item of chassis suspension maintenance. Adjustments should be made when the need for them is indicated by tire wear and/or difficult or unsatisfactory steering. The procedure for adjusting front end alignment is given in detail under "Front End Alignment" in this section.

Lubricate the front suspension parts at regular intervals as described in Section 17, "Lubrication" to assure smooth riding and easy steering and to minimize wear. Lubrication of the rear suspension is also described in Section 17, "Lubrication".

Front and rear shock absorbers should be checked periodically for leaks. Also, check shock absorber mountings to be sure rubber insulators are in good condition. Rear spring rubber bushings must be maintained in good condition. Check tightness of rear spring mountings and front suspension pivot bushings. Check the sway eliminator bar mountings at intervals, giving particular attention to the rubber bushings.

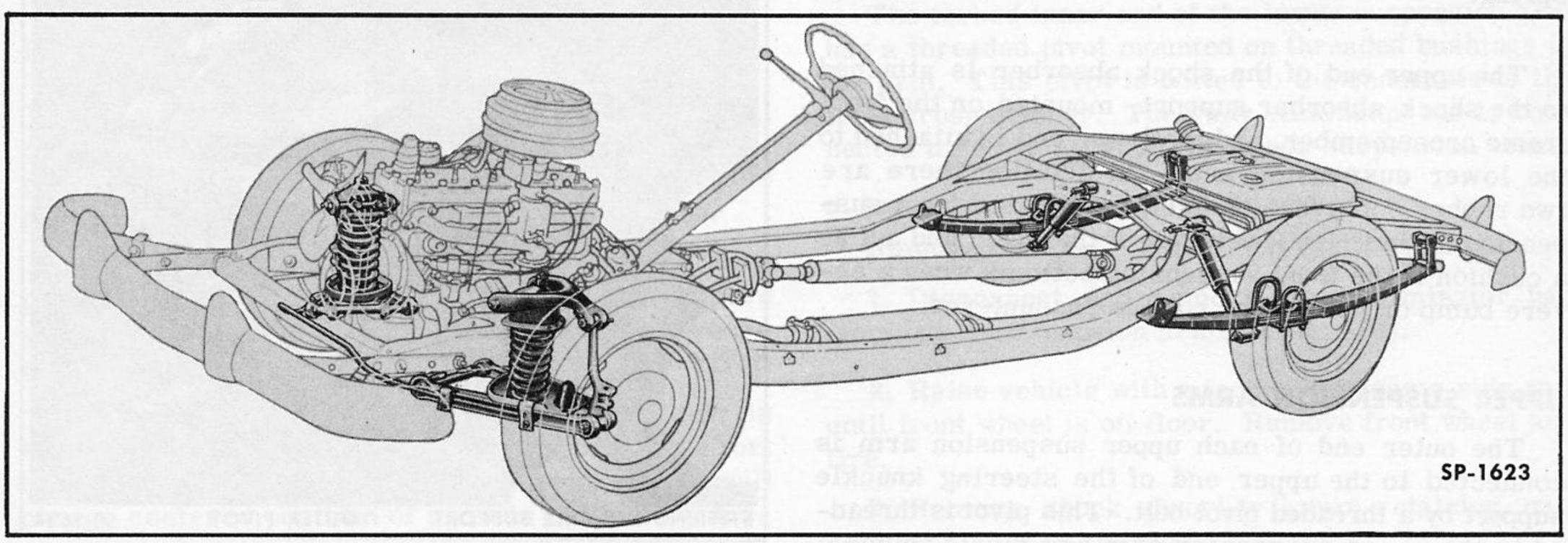

Fig. 157—Chassis Suspension

FRONT SUSPENSION

The front suspension is an independent parallel arm type using a single coil spring for support at each wheel (Fig. 158). The front wheels are mounted through the steering knuckle, steering knuckle support, and upper and lower suspension arms directly to the frame.

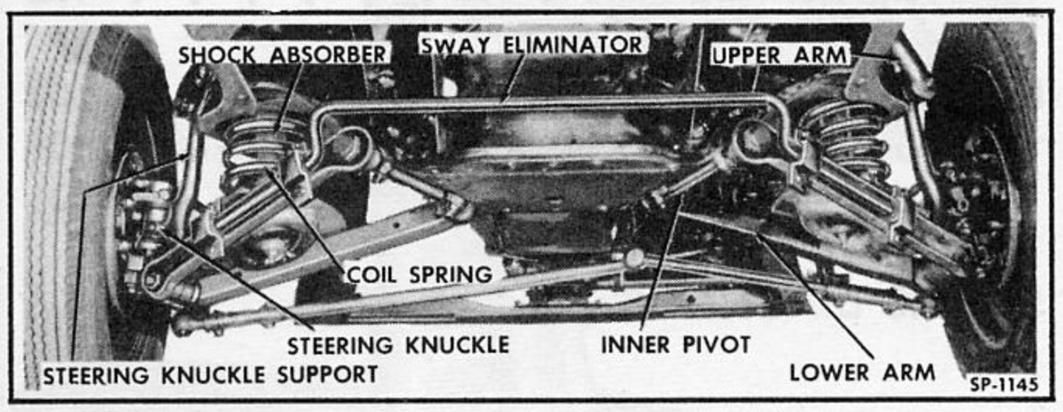

Fig. 158—Front Suspension

Each steering knuckle pivots on a king pin mounted in a forged steering knuckle support. The upper end of this support is attached to the outer end of the upper suspension arm. The lower end of the support is attached to the outer end of the lower suspension arm. Both ends of the support are pivot points.

The inner ends of the upper suspension arm are pivot mounted to the front shock absorber support attached to the top of the frame and front crossmember. The inner end of the lower suspension arm is pivot mounted on the bottom of the front crossmember.

The coil spring is installed with the bottom end supported on a seat in the lower suspension arm. The upper end of the coil spring rests in the upper spring seat which is solidly mounted to the frame. With this construction, the weight of the vehicle is supported on the coil spring. Flexing of the spring at each front wheel is dampened by a double-acting hydraulic "airplane" type shock absorber mounted inside the coil spring.

The upper end of the shock absorber is attached to the shock absorber support, mounted on the front frame crossmember, and the lower end is attached to the lower suspension arm. In addition there are two rubber compression bumpers at each front suspension to limit vertical travel of the wheel and act as a cushion if the front suspension bottoms when a severe bump or hole in the road is encountered.

UPPER SUSPENSION ARMS

The outer end of each upper suspension arm is connected to the upper end of the steering knuckle support by a threaded pivot bolt. This pivot is threaded to the upper suspension arm and pivots inside a bushing located in the steering knuckle support.

The pivot for the inner end of the upper suspension arm is bolted to the front shock absorber support as shown in Fig. 159. The pivot engages threaded bushings in the upper suspension arm. Use of shims between pivot and support will directly affect camber adjustment.

a. Upper Suspension Arm Removal

Remove the upper suspension arm as follows:

1. Raise vehicle with a jack under frame side rail until front wheel is off floor. Remove front wheel and tire. Place another jack (or block) under lower suspension arm to hold arm and coil spring in position while upper arm is being removed. Use of only one jack is permissible if it can be adapted to the underside of lower suspension arm near outer end so that front wheel can be raised off floor safely and without twisting suspension arms.

2. Place a block under brake drum, or fasten steering knuckle support to coil spring with a strong wire, to hold support upright when upper suspension arm is removed.

3. Remove bolts and washers attaching inner pivot to shock absorber support (Fig. 159). If shims are used between pivot and support, set them aside and be sure they are used in the same location when installing suspension arm.

4. Remove nut and pivot bolt from upper end of steering knuckle support, remove seals and lift off upper suspension arm. Do not remove bushing from steering knuckle support unless it is worn or loose.

b. Upper Suspension Arm Repair

Repair operations consist of replacing inner pivot

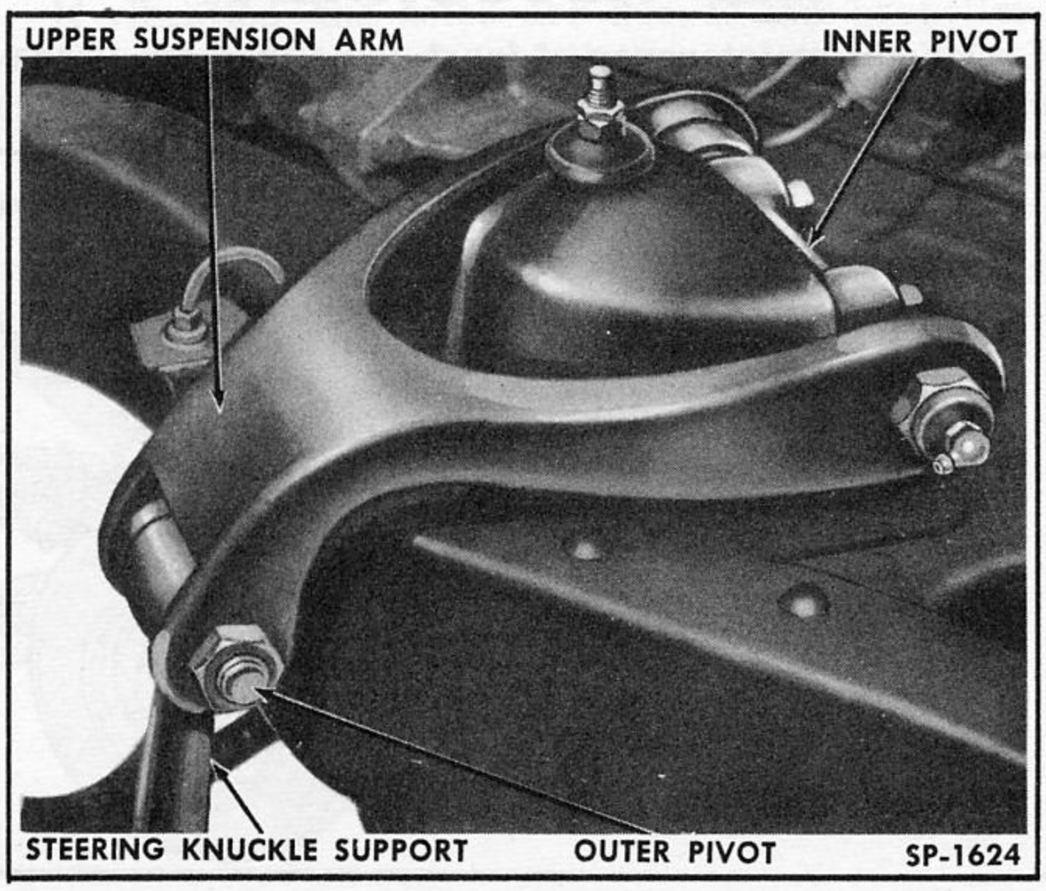

Fig. 159—Upper Suspension Arm

and bushings. However, before this is done, be sure the suspension arm is not distorted or cracked and that new bushings will fit tight in holes in arm.

Bushings installed in a new arm cut their own threads to make a tight fit. New bushings used in an old arm already threaded must also make a tight fit. Replace worn seals and bushings with new parts.

1. Turn suspension arm inner pivot bushings off end of inner pivot and out of suspension arm. Move seals on pivot away from arm to permit moving pivot endwise enough to clear arm at one end, then free other end.

2. To install inner pivot, place new rubber seals on each end of pivot with cupped side out. Fit pivot into upper suspension arm. Mount arm in a vise as shown in Fig. 160.

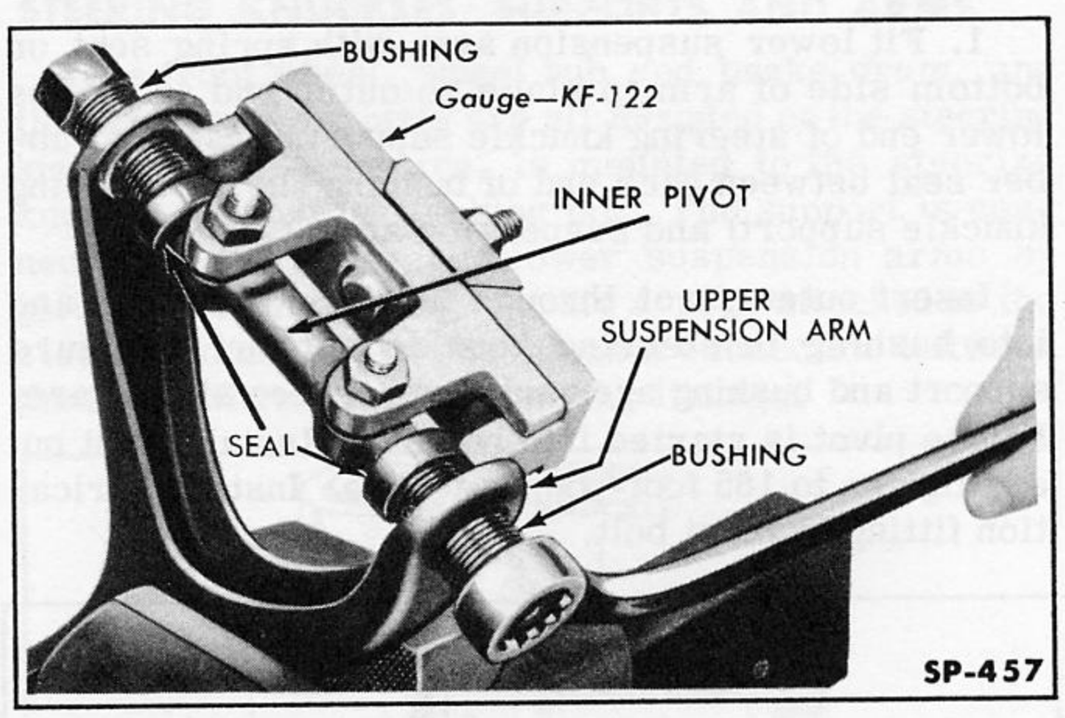

Fig. 160—Installing Upper Suspension Arm Inner Pivot

3. Start threads of bushings into bushing holes in arm. Use a large wrench and turn bushings slowly. NOTE: DO NOT USE CUTTING LUBRICANT.

4. Assemble Upper Suspension Arm Gauge KF-122 on pivot as shown in Fig. 160. This gauge establishes proper spacing between sides of the arm. Tighten wedge plate bolt to expand jaws of gauge until they spread sides of the arm 1/16 inch from normal position. This amount of spreading should provide proper spacing between sides of suspension arm.

5. Turn bushings into suspension arm and onto pivot until hex portion bottoms against arm. Remove gauge KF-122 from inner pivot by loosening wedge plate bolt and removing bolts attaching gauge to pivot.

6. Check pivot to be sure it will move freely in bushings. If correct, it will resist slightly any effort to turn pivot by hand. Do not rotate pivot as this will change centered position of pivot in relation to suspension arm.

7. Move rubber seals on pivot until each seats against arm. Install lubrication fitting in end of each bushing.

c. Upper Suspension Arm Installation

The upper suspension arm is installed to the vehicle as follows:

1. Fit upper suspension arm in place so outer end, curving downward, straddles steering knuckle support while inner end fits against front shock absorber support. Install same shims, if any were removed, between inner pivot and support to make proper camber adjustment possible. Need for extra shims can be positively determined only when adjustment for proper camber is made. Install bolts and lock washers to attach pivot to shock absorber support. Tighten the bolts to 70-80 foot-pounds torque.

2. Fit rubber seal into place between each side of steering knuckle support and suspension arm. Insert outer pivot bolt through the front side of the arm, threading it through steering knuckle support. Install pivot nut and tighten to 165 foot-pounds torque.

3. Install lubrication fitting in head of pivot bolt.

4. Remove block from under brake drum or wire holding steering knuckle support upright (whichever was used when removing arm). Install wheel and tire and remove jack.

5. After upper suspension arm is installed, check and adjust front end as described under "Front End Alignment" in this section.

LOWER SUSPENSION ARMS

Each lower suspension arm is connected at its outer end to the lower end of the steering knuckle support (Fig. 161). The outer pivot threads through both sides of the suspension arm and through a bushing installed in the lower end of the steering knuckle support.

The forked inner end of the lower suspension arm has a threaded pivot mounted on threaded bushings in the arm. This pivot is bolted to the underside of the front crossmember. The sway eliminator bar is connected directly between the lower suspension arms.

a. Lower Suspension Arm Removal

Remove the lower suspension arm as follows:

1. Disconnect and remove sway eliminator bar from lower suspension arms. (Fig. 161).

2. Raise vehicle with a jack under frame side rail until front wheel is off floor. Remove front wheel and tire.

3. Remove shock absorber lower retaining nut, retainer, cushion and cushion seat.

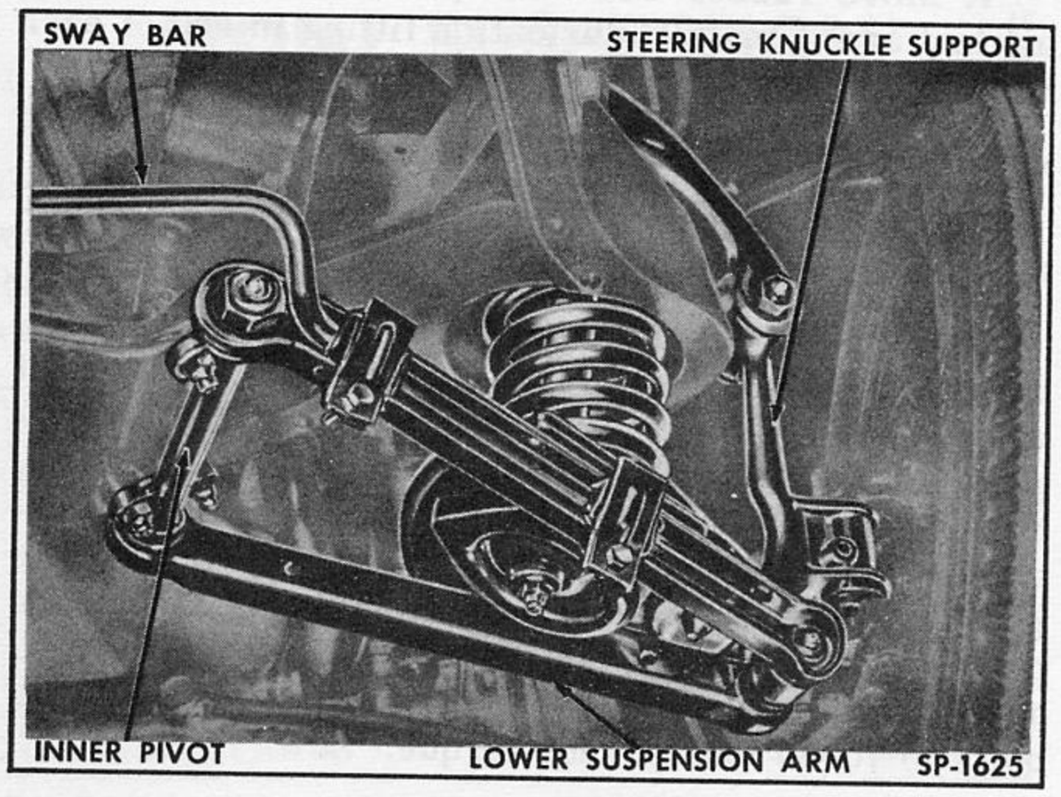

Fig. 161—Lower Suspension Arm

4. Place another jack under spring seat on lower suspension arm. Use a wood block between the jack and the spring seat to prevent slipping. Raise jack to support arm firmly when it is detached from front crossmember.

5. Remove suspension arm inner pivot attaching bolts and reinforcements from front crossmember. If shims are installed under inner pivot, they should be set aside and used in the same location when installing suspension arm. Carefully lower jack to relieve front coil spring compression and remove coil spring.

6. Remove nut and pivot bolt from lower end of steering knuckle support and remove lower suspension arm. Do not remove bushing from steering knuckle support unless it is worn or loose.

b. Lower Suspension Arm Repair

Repair operations on the lower suspension arm consist of replacing the inner pivot and bushings. The procedure for repair is exactly the same as outlined under "Upper Suspension Arm Repair" except Lower Suspension Arm Gauge KF-118 is used to properly space pivot on the lower arm.

c. Lower Suspension Arm Installation

Install the lower suspension arm to the vehicle as follows:

1. Fit lower suspension arm with spring seat on bottom side of arm in place so outer end straddles lower end of steering knuckle support. Insert a rubber seal between each end of bushing (in the steering knuckle support) and suspension arm.

Insert outer pivot through front side of arm, and into bushing in steering knuckle support. Be sure support and bushing are centered between side of arm before pivot is started into bushing. Install pivot nut and tighten to 165 foot-pounds torque. Install lubrication fitting to pivot bolt.

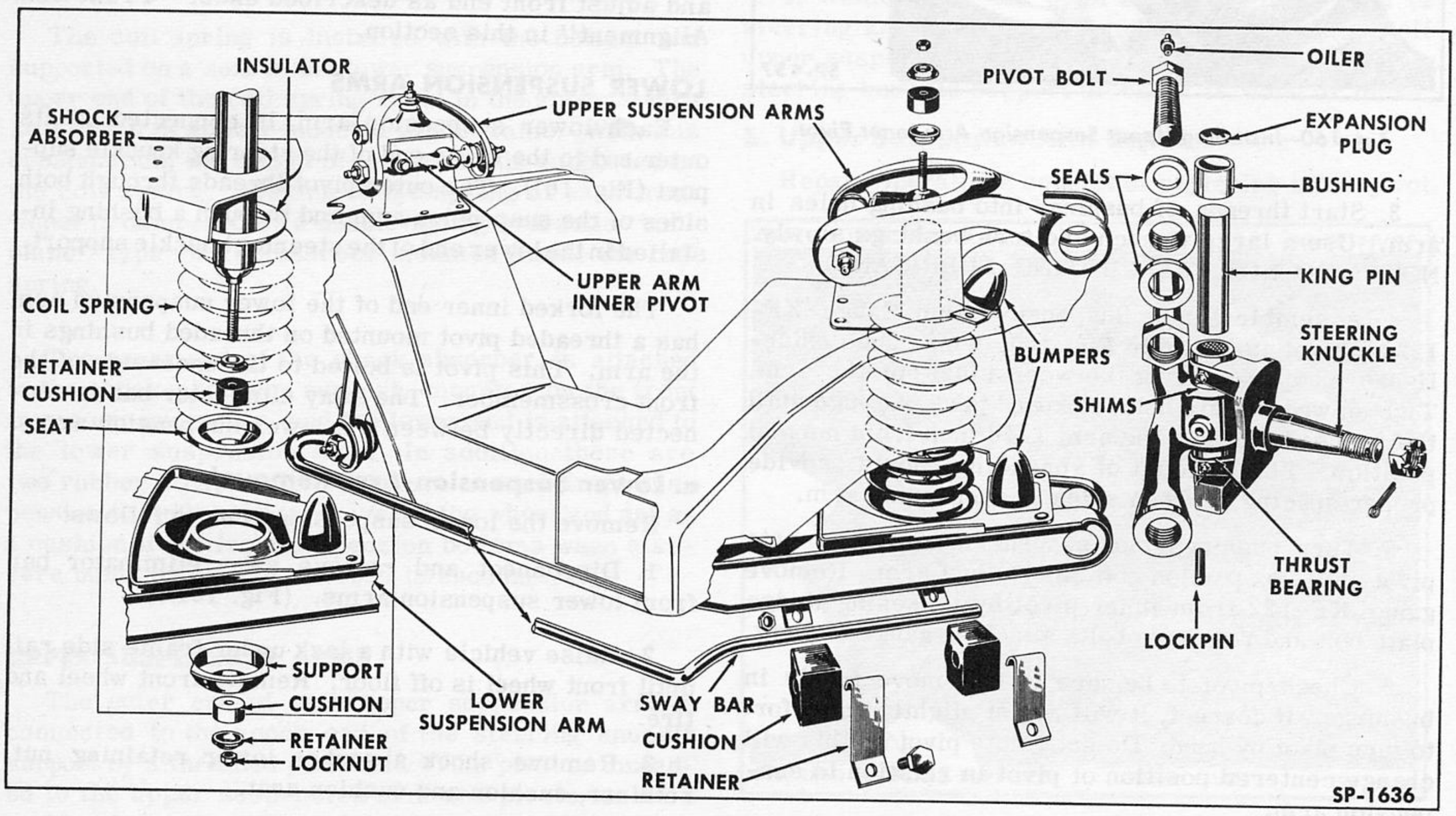

Fig. 162—Front Suspension—Exploded View

2. Install coil spring with spring and shock absorber attaching parts in proper position as shown in Fig. 162.

3. Swing lower suspension arm upward into place on coil spring and shock absorber. Jack up lower suspension arm until inner pivot seats against front crossmember. Install inner pivot reinforcements and attaching bolts and remove jack.

4. Attach lower end of shock absorber to suspension arm, remove jack under frame side rail and connect sway bar to lower suspension arm.

5. After lower suspension arm is installed, check and adjust front end as described under "Front End Alignment" in this section.

STEERING KNUCKLES, SUPPORTS AND ARMS

The front wheel, wheel hub and brake drum, and the brake support plate are all mounted on the steering knuckle which, in turn, is mounted to the steering knuckle support by the king pin. The support is connected to the upper and lower suspension arms by pivot bolts. A steering knuckle arm is attached to the steering knuckle and serves as a connection between the front wheel and the steering linkage.

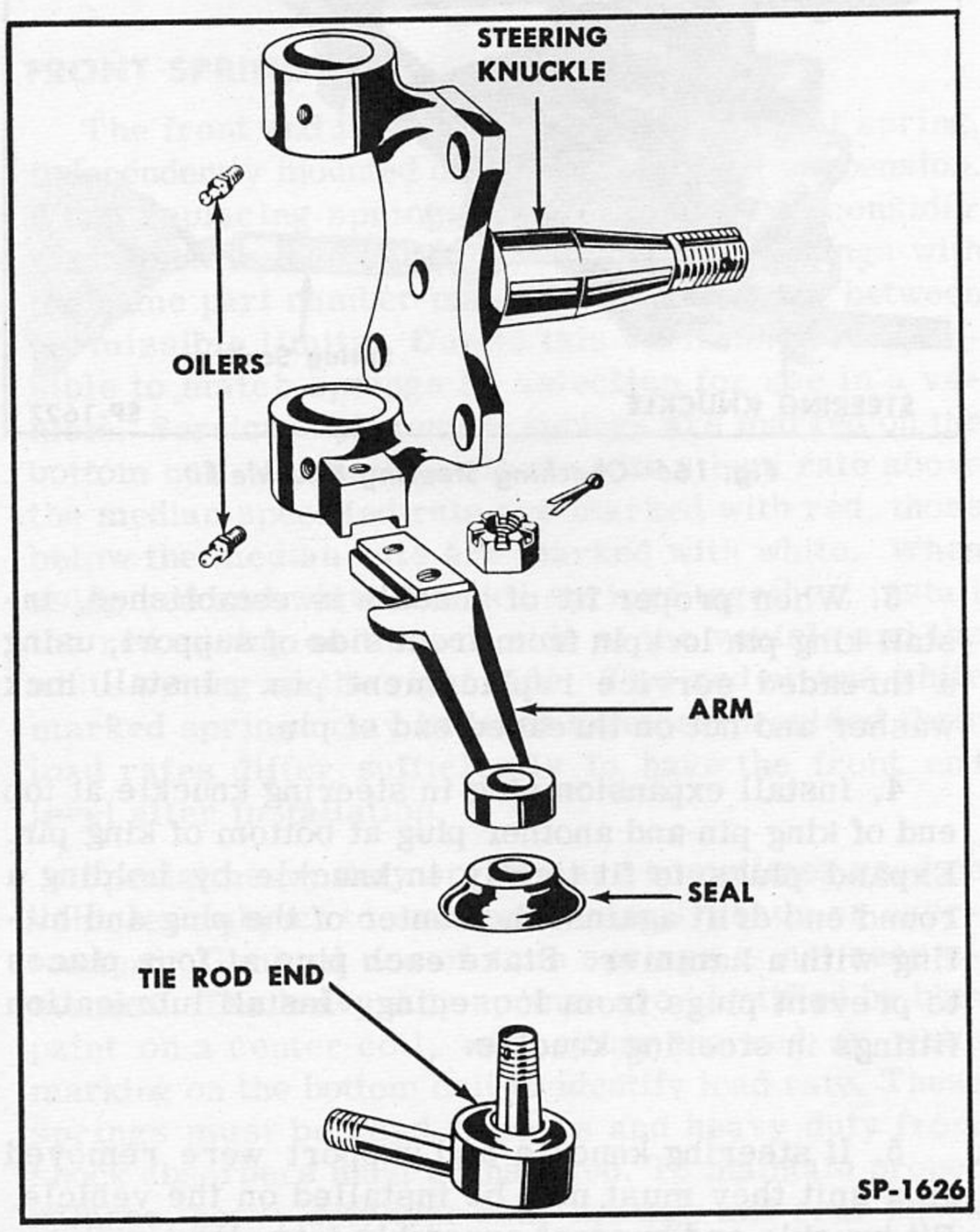

Fig. 163—Steering Knuckle Arm Installation

a. Steering Knuckle and Support Removal

The steering knuckle and support can be removed as a unit, or the steering knuckle can be removed separately. Both conditions are covered in the following procedure:

1. Raise vehicle and remove front wheel and tire. If steering knuckle support is to be removed, support the lower suspension arm with a jack to relieve coil spring pressure.

2. Remove wheel hub and brake drum assembly as outlined in Section 12, "Wheels and Tires."

3. Remove brake support plate assembly from knuckle by removing four bolts. Brake line does not have to be disconnected if support plate is wired or tied to frame.

4. Disconnect tie rod end from steering knuckle arm by removing cotter pin and nut. (Fig. 163).

5. If steering knuckle and support are to be removed as a unit, remove nuts and pivot bolts connecting ends of support to upper and lower suspension arms.

6. If steering knuckle is to be removed separately, or is to be disassembled from steering knuckle support, drive out king pin lockpin (Fig. 162) from rear side of support with suitable punch and hammer.

7. Remove expansion plug from top of steering knuckle by drilling a hole in center of plug and prying plug out with a punch.

8. Remove king pin from knuckle and support by driving it out with a suitable drift against top end. Lower expansion plug will be pushed out ahead of king pin.

9. Remove steering knuckle, thrust bearing and shims. Remove arm from steering knuckle.

b. Steering Knuckle and Support Repair

Steering knuckles are fitted with pressed-in type bushings. Repair operations are as follows:

1. Remove pressed-in type bushings from steering knuckle by pressing out with King Pin Bushing Remover and Installer KF-32 (Fig. 164). Be careful not to spring knuckle when removing bushings.

2. Inspect the steering knuckle and support carefully for twisting, bending and distortion as these conditions will affect front end alignment. Replace either or both parts for damage or if bores are worn excessively. The pivot bushing at each end of support must be threaded tightly into support. Check thrust bearing for wear and roughness and replace as necessary.

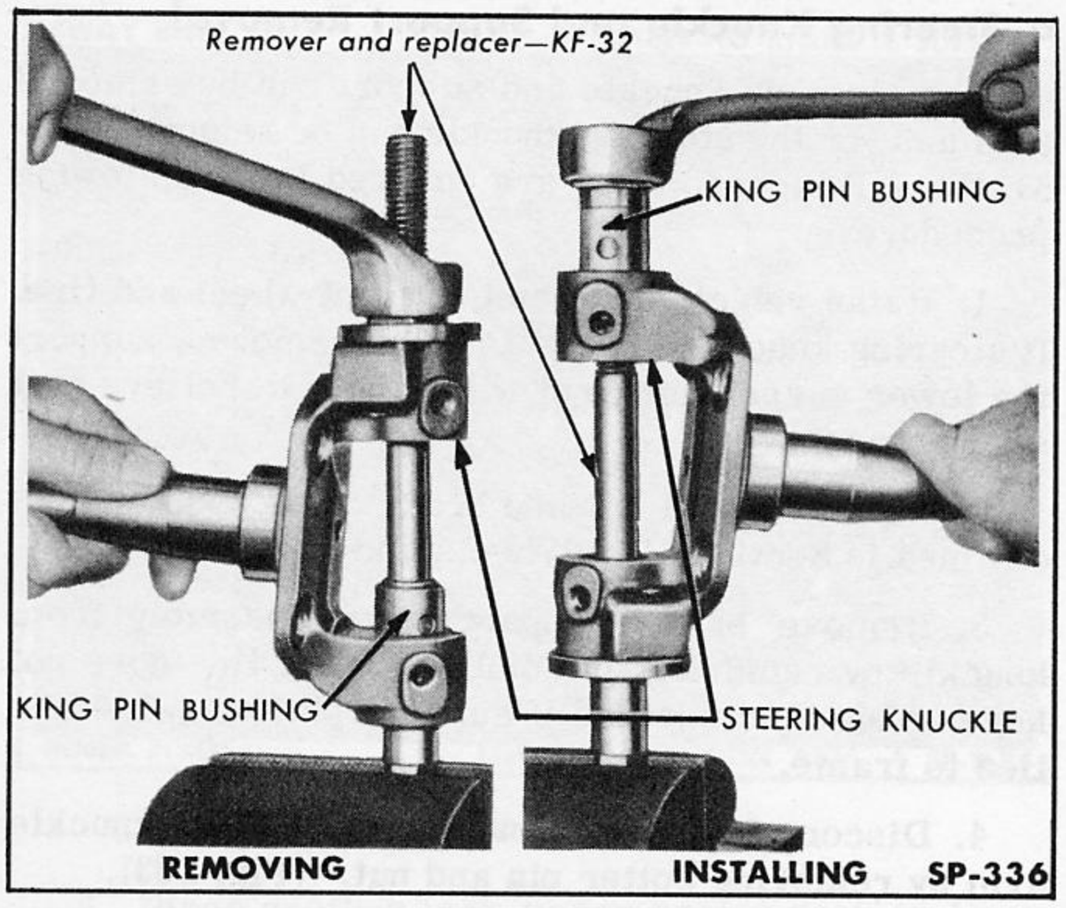

Fig. 164—Removing and Installing Steering Knuckle Bushings

3. Install bushings in steering knuckle, using King Pin Bushing Remover and Installer KF-32. Bushings should be flush with inner faces of knuckle which is toward support. NOTE: Oil hole in bushing must align with hole in knuckle. Line ream bushings to .796 - .797 inch inside diameter using King Pin Bushing Reamer C-369 (Fig. 165).

c. Steering Knuckle and Support Installation

If the steering knuckle and support were both removed they should be assembled prior to installation on the vehicle. If only the steering knuckle was removed, install or assemble the knuckle on the support. The following procedure applies to both conditions:

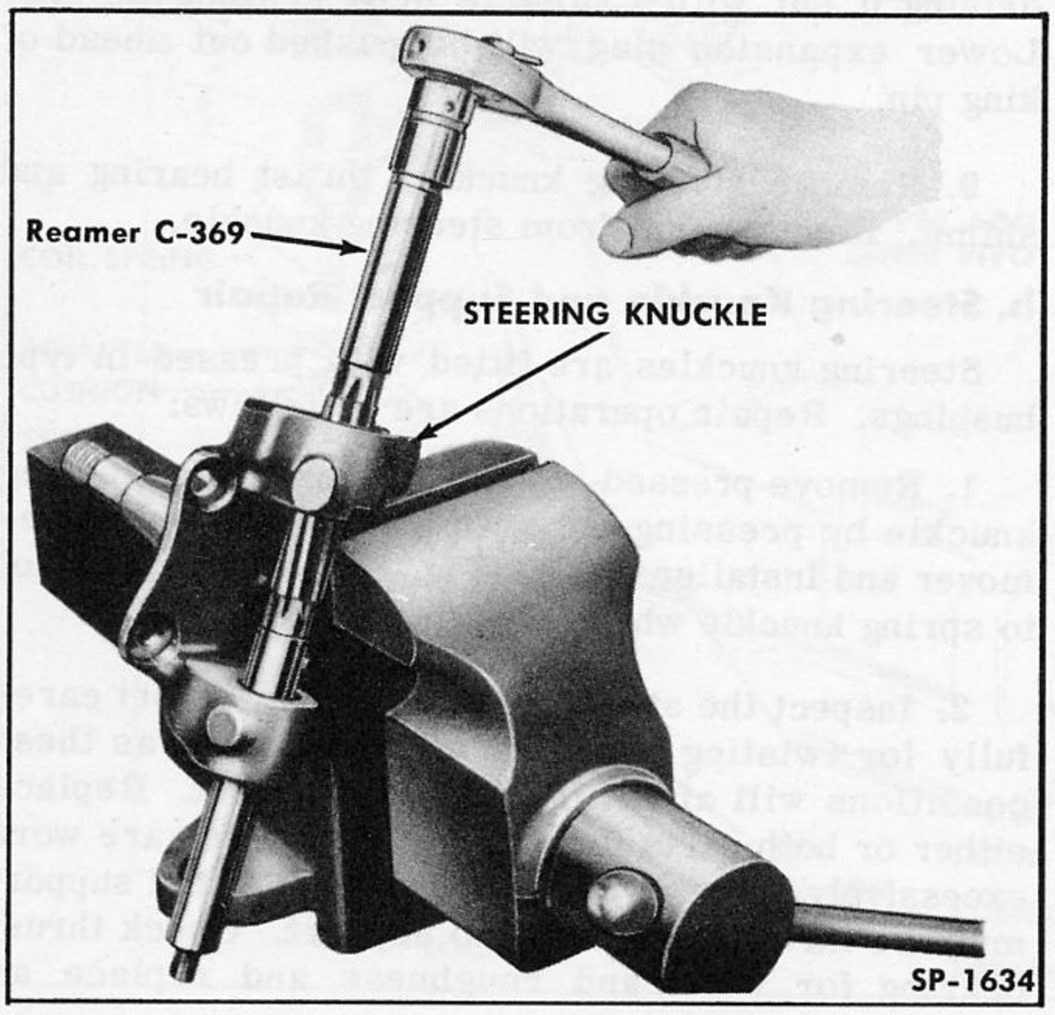

Fig. 165—Reaming Steering Knuckle Bushings

1. Hold steering knuckle on support. Insert thrust bearing between the lower face of support and steering knuckle with open side down. Carefully align bores in knuckle, support, shims and bearing, then drive king pin into place using a suitable soft drift and hammer. The groove on side of king pin must align with lockpin hole in support when king pin is installed.

2. Check fit of steering knuckle on king pin. A spring scale attached to the cotter pin hole (Fig. 166) should measure not more than 5 pounds pull to swing knuckle. The knuckle should not have more than .002 inch vertical movement on the king pin. Add or remove shims (available in various thicknesses) between top face of support and steering knuckles as required.

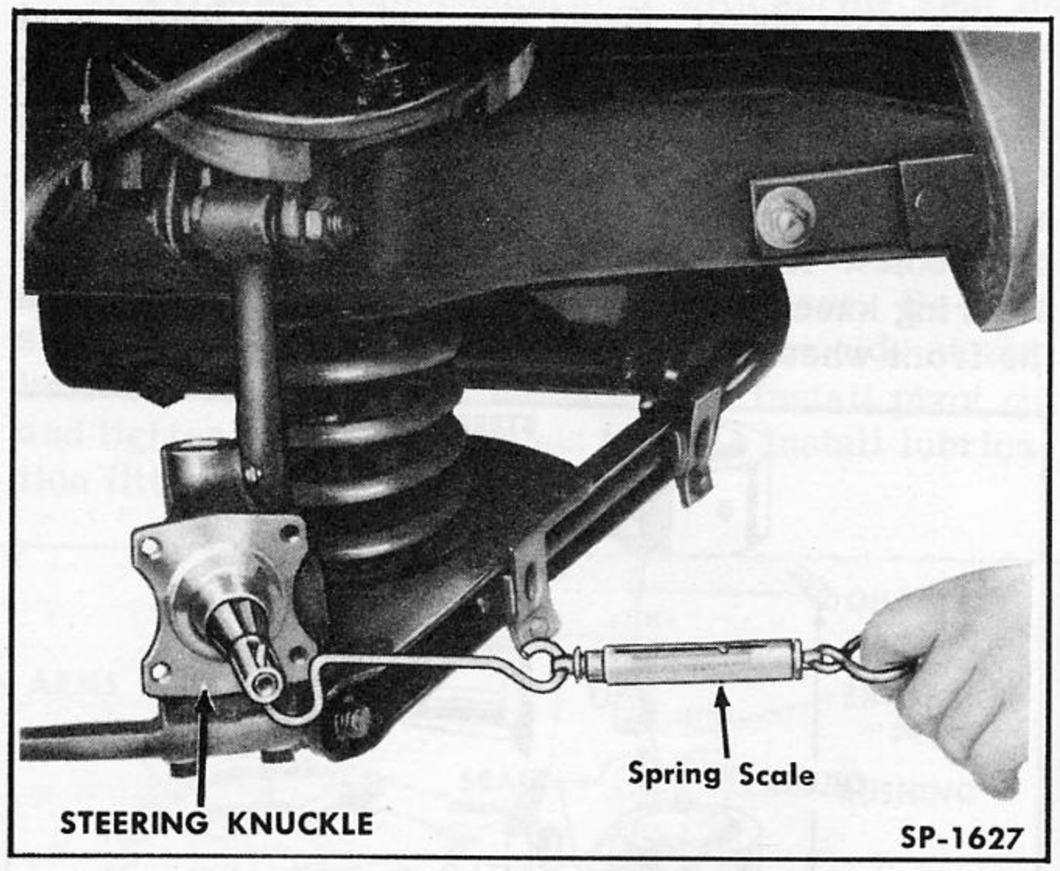

Fig. 166—Checking Steering Knuckle Fit

3. When proper fit of knuckle is established, install king pin lockpin from front side of support, using a threaded service replacement pin. Install lock washer and nut on threaded end of pin.

4. Install expansion plug in steering knuckle at top end of king pin and another plug at bottom of king pin. Expand plugs to fit tightly in knuckle by holding a round end drift against the center of the plug and hitting with a hammer. Stake each plug at four places to prevent plugs from loosening. Install lubrication fittings in steering knuckle.

5. If steering knuckle and support were removed as a unit they must now be installed on the vehicle. Fit knuckle and support assembly into place on outer ends of suspension arms. Insert rubber seal between

each end of suspension arm bushings and suspension arms and install pivot bolt through front side of arm and into bushing in support. Install pivot nut and tighten to 165 foot-pounds torque.

6. Remove jack from under lower suspension arm. Then install steering arm to bottom of steering knuckle. Connect tie rod end to steering arm and install nut and cotter pin.

7. Install brake support plate assembly to steering knuckle.

8. Install wheel hub and brake drum assembly as described in Section 12, "Wheels and Tires", making sure bearings are properly adjusted.

9. Install front wheel and tire, remove jack and check and align front end as described under "Front End Alignment" in this section.

d. Steering Arms

The steering arms connect the steering linkage (tie rod end) to the steering knuckle as shown in Fig. 163. Inspect arms carefully after removal and replace them if they are bent or twisted as this will affect front end alignment and steering. When installing arms to steering knuckle, always use correct size bolts and tighten to 35-40 foot-pounds torque.

FRONT SPRINGS

The front end is amply cushioned by a coil spring, independently mounted on each front wheel suspension. When replacing springs, it is important to consider variations in load rates of the springs. Springs with the same part number may differ in load rate between permissible limits. Due to this variation, it is possible to match springs by selection for use in a vehicle. Service replacement springs are marked on the bottom coil with paint — those with a load rate above the median specified rate are marked with red, those below the median rate are marked with white. When using red and white marked springs together, install the red spring on the left side of the vehicle and the white spring on the right side. Two red or two white marked springs may be used together provided their load rates differ sufficiently to have the front end level after installation.

Special heavy duty springs are sometimes used on vehicles subject to extremely rough roads or overloading. General use of such springs is not recommended. The heavy duty springs are identified by blue paint on a center coil, with either the red or white marking on the bottom coil to identify load rate. These springs must be used in pairs and heavy duty front shock absorbers must be installed. To maintain proper balance, heavy duty type rear springs and rear shock absorbers should also be installed.

a. Checking Front Spring Deflection

Spring deflection should be checked on a level floor to determine if front springs are properly matched. Before checking be sure the front suspension is thoroughly lubricated as described in Section 17, "Lubrication". Then bounce the front end up and down several times to be sure the suspension operates freely. Measure at each lower suspension arm from top of arm near outer end, upward to top face of frame side rail. Be careful to measure between identical points on both sides of the vehicle to obtain comparable dimensions. The two measurements must be the same within 3/8 of an inch. A difference greater than this indicates uneven spring deflection probably caused by improperly matched springs. If rear springs are matched, replacement or switching of front springs is required to correct the condition.

Weak springs are indicated when the outer ends of both control arms are slightly above horizontal with respect to the inner ends when the vehicle is at curb weight (no one inside). If this condition exists, replace both springs.

b. Front Spring Replacement

When it is necessary to remove or replace a front spring, follow the procedure for "Lower Suspension Arm Removal" up to the point where the spring is removed. Replace the spring according to the procedure for "Lower Suspension Arm Installation."

FRONT SUSPENSION ARM BUMPERS

Two rubber bumpers (Fig. 162) are provided to limit vertical movement of the front wheels. One bumper is installed in a bracket on the frame side rail and the other is installed in the lower suspension arm. These bumpers cushion the shock when the front wheels strike a severe bump and cause the suspension arms to bottom against the frame. The rubber bumpers are retained by rubber buttons on the ends which are inserted through a hole in the frame side rail or lower suspension arm. When installing new bumpers, the rubber button should be coated with a soap solution or Lubriplate and the button pressed into the mounting hole.

FRONT SHOCK ABSORBERS

The two double-acting hydraulic "airplane" type shock absorbers are mounted inside the front coil springs. The upper end of each extends upward through a flanged hole in the front crossmember to the front shock absorber support which is riveted to the top surface of the frame side rail. The stud attached to the shock absorber, together with cushions, retainers and a self-locking nut attach the upper end of the shock absorber to the support.

A similar stud in the lower end of the shock absorber, together with cushions, retainers, support, seat, and self-locking nut, attaches the lower end to the lower suspension arm (see Fig. 162).

Special heavy duty shock absorbers must be used whenever heavy duty front and rear springs are installed. The standard and heavy duty shock absorbers are alike in outward appearance and can only be identified by part number.

The shock absorbers are not adjustable and do not require the addition of fluid. If a leak should occur the shock absorber assembly must be replaced. The mounting cushions should also be replaced whenever inspection indicates deterioration of the rubber.

Front shock absorbers, although mounted inside the front coil springs, can be removed and installed without removing the springs. The procedure is as follows:

1. Raise front end of vehicle with a jack under either frame side rail or center of front crossmember to extend the front coil spring.

2. Remove nut, retainer, cushion, and cushion seat from lower end of the shock absorber (Fig. 162). Prevent turning of the lower end of the shock absorber during this operation by holding with suitable pliers between the coils of the front spring.

3. Compress shock absorber until stud in lower end clears lower suspension arm. Remove lower shock absorber seat by pulling it out between coils of the spring. This will permit withdrawal of shock absorber through opening in lower suspension arm when retaining nut is removed from top end of shock absorber.

4. To install the shock absorber, reverse the above procedure.

SWAY ELIMINATOR BAR

A front torsional type sway eliminator bar is used on Henry J models to offset body and frame sway, which would otherwise occur when rounding curves at high speeds. The sway eliminator bar is attached to the two lower suspension arms and requires no adjustment.

The bar is easily removed by removing the bolts, nuts, retainers and cushions from the front suspension lower arms (Fig. 162).

FRONT END ALIGNMENT

Front end alignment is the adjustment of the related factors of caster, camber, king pin inclination, toe-in and toe-out on turns to provide proper steering and to assure long life from tires by preventing improper wear. If the front end is not correctly aligned, hard steering, vehicle wander, front wheel shimmy and abnormal tire wear can be expected.

Alignment specifications given in this section apply to an unloaded vehicle without passengers (normal curb weight). After adjustment, the alignment will vary depending on loading and operating conditions but will be within limits for satisfactory performance.

FRONT END ALIGNMENT SPECIFICATIONS

Caster	$+1^{\circ}$ to -1°, 0° preferred
Camber	$+1/4^{\circ}$ to $+1^{\circ}$, $+1/2^{\circ}$ preferred
Toe-in	3/16" to 1/4", 1/4" preferred
King Pin Inclination	4° to $4\text{-}3/4^{\circ}$, $4\text{-}1/2^{\circ}$ preferred
Toe-out on Turns	Inside Wheel 20° Outside Wheel $17\text{-}1/2^{\circ}$

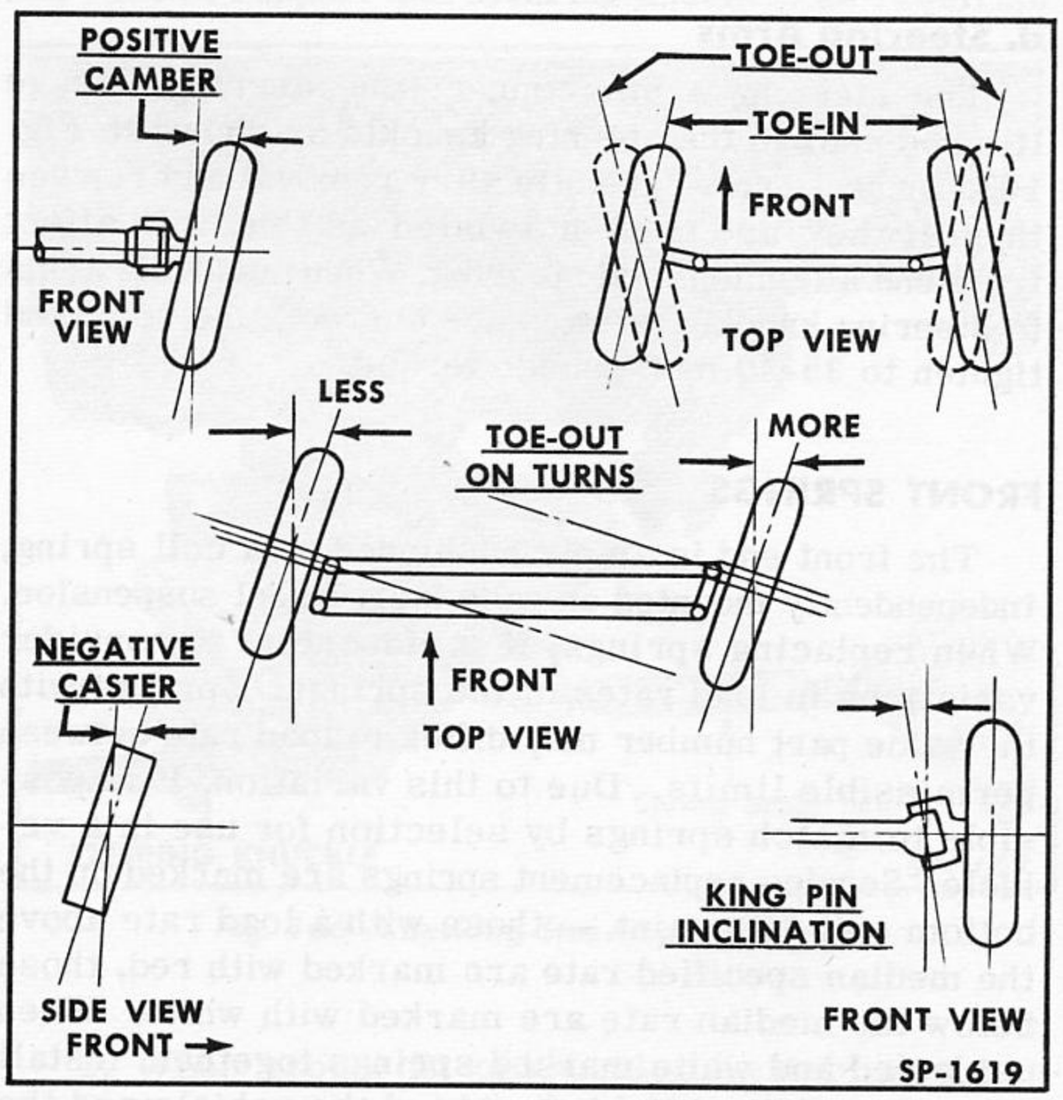

Fig. 167—Wheel Alignment

a. Preparation for Alignment

Checking and adjusting front end alignment will not correct steering difficulties or unusual tire wear if other conditions or parts of the vehicle are at fault. Therefore, it is necessary to check and adjust, or otherwise correct, each of the following items before making front end alignment adjustments. Driving habits of the operator should not be overlooked as a possible source of unusual tire wear.

1. Inflate tires, balance front wheels and adjust wheel bearings as necessary in accordance with instructions in Section 12, "Wheels and Tires."

2. Check frame alignment as described in Section 13, "Frame." Straighten frame if necessary.

3. Check tires for wear and rotate as necessary to have tires of same diameter (equal wear) on front wheels.

4. Check front wheel run-out at rim and tire. To do this, jack up front end, spin wheel and hold a piece of chalk near rim and tire so chalk mark will appear at point of greatest run-out. Run-out should not exceed 1/8 of an inch. If it is excessive, check for improper wheel mounting or bent wheel.

5. Check steering gear worm bearing and roller shaft adjustments and check steering gear mounting and linkage for looseness or bind. Refer to Section 10, "Steering."

6. Check front spring deflection as described under "Checking Front Spring Deflection" above. Also check for sagging of rear springs. Make necessary corrections.

7. Inspect all front suspension parts for looseness, excessive wear, binding, distortion or other damage. Particular attention should be given to suspension arm pivots and steering knuckle king pin and bushings. Adjust or replace parts as required.

8. After vehicle has been checked and conditioned as itemized above, locate a perfectly level floor area and set up the required special equipment. Then proceed as described in the following paragraphs.

b. Caster Checking and Adjustment

Caster is the backward or forward tilt of the king pin from a true vertical. If caster is "positive", the top of the king pin tilts to the rear, if it is "negative", the top of king pin tilts forward. Limited adjustment of caster is possible by adding a shim to either the front or rear end of the lower suspension arm inner pivot mounting on the front crossmember. This moves the lower end of the support forward or rearward, tilting the support and the king pin.

1. Move vehicle in position on level floor area and adjust front wheels to straight ahead position on Front Wheel Turntable DD-435. Wheel turntables must be perfectly level and locked and wheels should be centered on them. The wheel should be turned until the point of greatest run-out, indicated by the chalk mark, is at the rear.

2. Mount Universal Camber and Caster Gauge DD-428 on left front wheel, as shown in Fig. 168, with quadrant at a right angle to wheel and with gauge supported on edge of wheel rim. The hairline should be on "zero" with indicator aligned on scratch line.

3. Pull lock pin from both Turntables and turn front wheels to the right 20 degrees as registered by indicator on Turntable under left wheel.

4. Turn secondary screw until level bubble indicates level (centered between marks).

5. Turn front wheels to the left 20 degrees. This will move bubble from level position.

6. Turn primary screw which moves hairline and bubble until bubble levels. The reading under hairline on the 40 degree scale on quadrant is amount of caster. If reading is on side of scale toward wheel, caster is "positive" — reading on side away from wheel is "negative" caster. DESIRED READING IS ZERO WITH PLUS OR MINUS 1 DEGREE PERMISSIBLE.

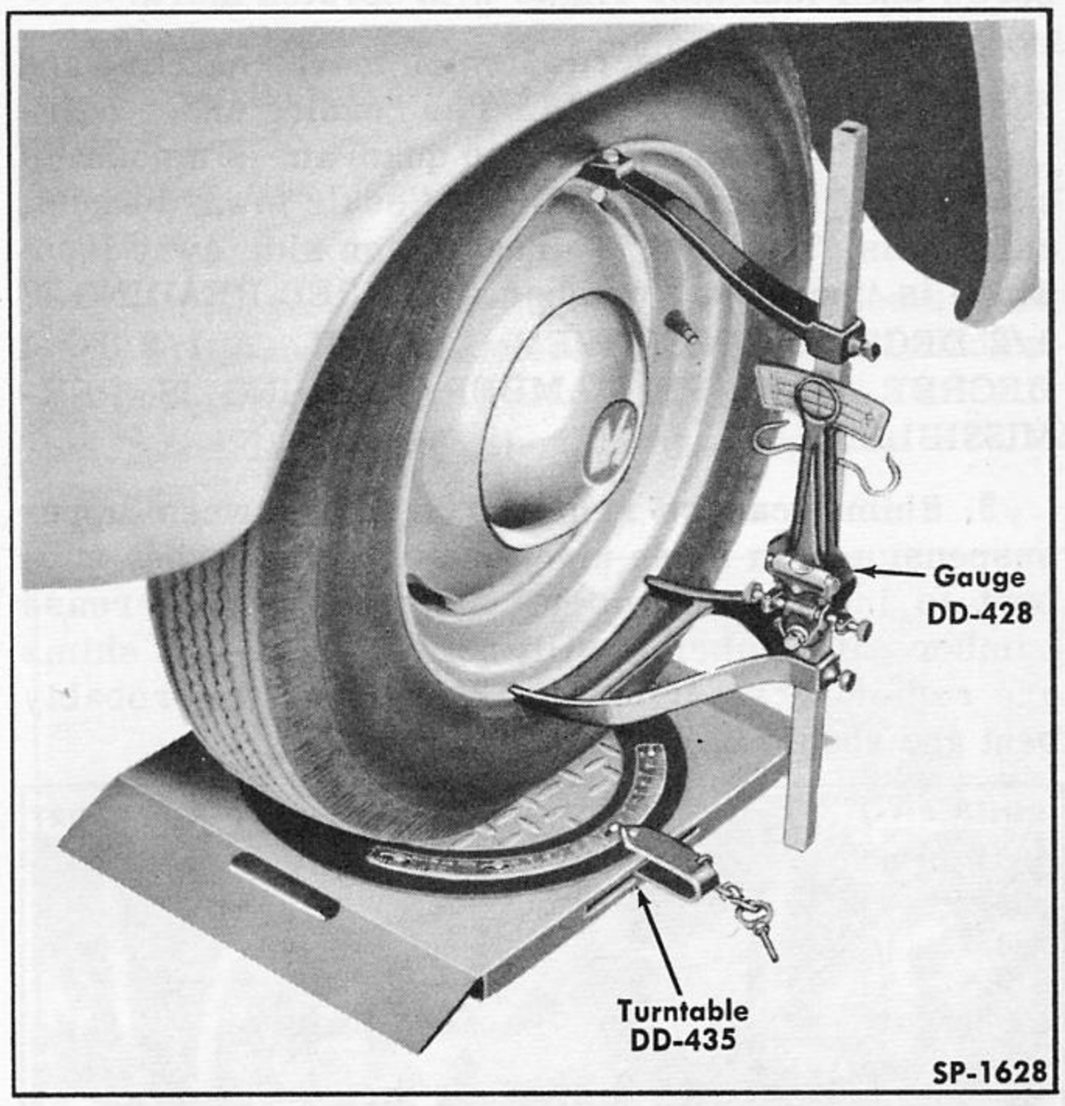

Fig. 168—Checking Front End Caster and Camber

7. To adjust for correct caster, 1/16 or 1/8 inch thick shims are installed between front suspension lower arm inner pivot and frame at either the rear or front portion of the inner pivot. Excessive negative caster is corrected by placing a shim under the rear end of inner pivot. Excessive positive caster is corrected by shimming under forward end.

8. Adjust caster of right wheel in a similar manner except wheels are first turned to the left 20 degrees and then 20 degrees to the right. Caster should be as near as possible the same for both wheels.

c. Camber Checking and Adjustment

Camber is the inward or outward tilt of the wheel

at the top from a true vertical. If camber is "positive", the wheel tilts outward at the top, if it is "negative", the top of the wheel tilts inward.

The camber angle is adjustable by installing or removing shims between the upper suspension arm inner pivot and the shock absorber support. Installing a shim will tilt the wheel inward at the top. Removing a shim will tilt the wheel outward. Point of greatest wheel run-out should still be at rear of wheel for camber adjustment.

1. With vehicle still in position on Front Wheel Turntables DD-435, turn wheels to straight ahead position and install turntable lock pins. Mount Universal Camber and Caster Gauge DD-428 on wheel as it was for checking caster (Fig. 168). Adjust secondary screw until indicator aligns with scratch mark.

2. Turn primary screw, which moves hairline and bubble, until bubble levels. The reading under hairline on the 60 degree scale on quadrant is amount of camber. If reading is on side of scale toward wheel, camber is "positive" — reading on side away from wheel is "negative" camber. DESIRED READING IS 1/2 DEGREE "POSITIVE" CAMBER. A 1/2 TO 1 DEGREE POSITIVE CAMBER READING IS PERMISSIBLE.

3. Shims can be removed from between upper suspension arm inner pivot and shock absorber support to increase camber. Add shims to decrease camber. If camber is still negative after all shims are removed, steering knuckle support is probably bent and should be replaced.

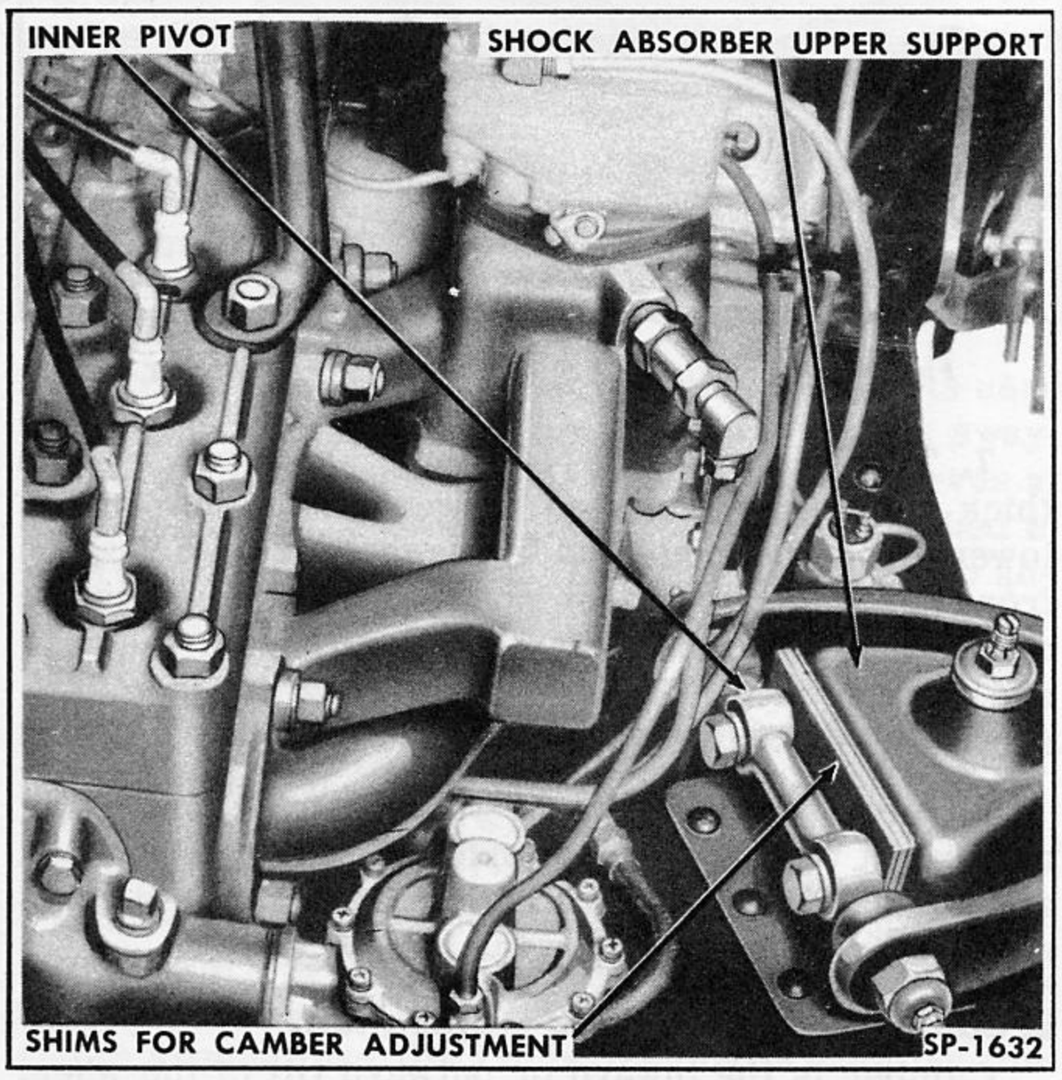

Fig. 169—Adjusting Camber

4. Adjust camber on opposite wheel to obtain same camber angle for both wheels, as near as possible.

d. King Pin Inclination

King pin inclination is the amount in degrees that the top of the king pin is tilted inward toward the center of the vehicle from a true vertical. This inclination imparts to the front wheels a tendency to return to the straight-ahead position after they have been turned. It also causes the wheels to resist turning enough to afford good directional stability.

Camber and king pin inclination are closely related; camber adjustment will change king pin inclination but within permissible limits. If camber is within specified limits and king pin inclination is not, the steering knuckle spindle, or possibly the knuckle support, has been bent and should be replaced. Check king pin inclination as follows:

1. Carefully center front wheels on Front Wheel Turntables DD-435 located on level floor. With turntables locked, turn wheels to straight ahead position. Lock front wheel brakes so wheels cannot roll.

2. Mount Universal Camber and Caster Gauge DD-428 on left front wheel, as shown in Fig. 170, with quadrant parallel to wheel and gauge supported on edge of wheel rim. The gauge must be mounted on the wheel so that the level bubble indicates level with hairline on "zero" and indicator aligned on scratch line.

3. Pull lock pin from both turntables and turn wheels to the right until left wheel has turned 20 degrees as registered by indicator on turntable.

4. Turn secondary screw until level bubble indicates level. This changes position of indicator but not the hairline.

5. Turn wheels to the left until left wheel has turned 20 degrees past straight ahead, as registered by indicator on turntable.

6. Turn primary screw which moves hairline and bubble until bubble levels. The reading under hairline on 40 degree scale is the amount of king pin inclination. THE DESIRED READING IS 4-1/2 DEGREES, WITH 4 TO 4-3/4 DEGREES PERMISSIBLE.

7. Check king pin inclination on right front wheel in same manner, turning right wheel 20 degrees to left, and then 20 degrees past straight ahead to the right. If king pin inclination at either wheel is not within limits, and camber was correct, the steering knuckle or steering knuckle support is bent and must be replaced.

e. Toe-In Checking and Adjustment

Toe-in is the difference in distance between the extreme front and rear of front tires at spindle height.

If the rear of the tires is farther apart than the front, the wheels toe-in — if the front of the tires is farther apart than the rear, the wheels toe-out. A slight toe-in will help prevent steering wander. Check and adjust as follows:

1. Place Toe-In Checking Board DD-398 on a level floor, about three feet ahead of front wheel. With steering gear in center of its travel (steering wheel spokes should be horizontal), pull vehicle slowly from center of front bumper to keep from exerting side pressure on front wheels.

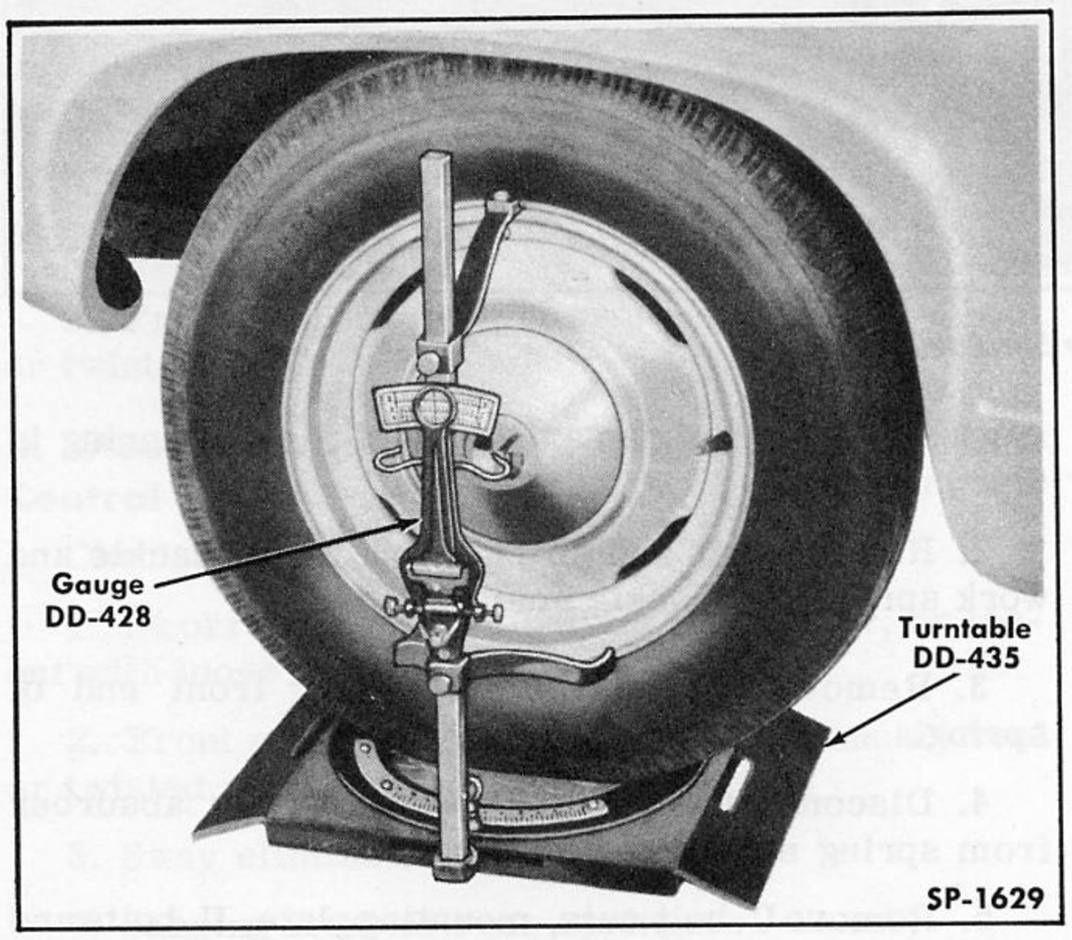

Fig. 170—Checking King Pin Inclination

2. As front wheel passes over center of board (Fig. 171), observe indicator on board. Movement of indicator outward shows toe-in, while indicator movement inward shows toe-out. TOE-IN OF 1/4 INCH IS DESIRED BUT 3/16 TO 1/4 INCH TOE-IN IS PERMISSIBLE.

3. Check opposite front wheel in same manner. If the two readings differ, a variation in caster or camber is indicated. This should be corrected before toe-in is adjusted.

4. To adjust toe-in, shorten or lengthen steering tie rods. Loosen the two clamps on the tie rod adjusting link and turn link to adjust rod length as required. Tighten clamps to lock the adjustment.

5. After tie rod adjustment, the toe-in should be rechecked to be sure it is correct.

f. Toe-Out on Turns—Checking

When making a turn the front wheels must actually toe-out so each wheel can be at a right angle to the radius on which it is turning. The inside wheel must turn at a greater angle than the outside wheel. This condition of toe-out on turns is obtained automatically by the angle or amount that the steering arms are positioned inward at the tie rod end. This characteristic is a design factor and is not adjustable. However, the arms may be bent or damaged, thus changing the toe-out on turns. In such a case, the arm should be replaced or straightened. Check for toe-out on turns as follows:

1. Carefully center front wheels of vehicle on Front Wheel Turntables DD-435 on level floor. With turntables locked, turn wheels to straight ahead position.

2. Pull lock pin from both turntables and turn front wheels to the left 20 degrees as registered by turntable indicator under left wheel. The turntable indicator under the right wheel should register 17-1/2 degrees.

3. Reverse the procedure by turning wheels to the right 20 degrees as registered by the turntable indicator under the right wheel. The turntable indicator under the left wheel should then register 17-1/2 degrees.

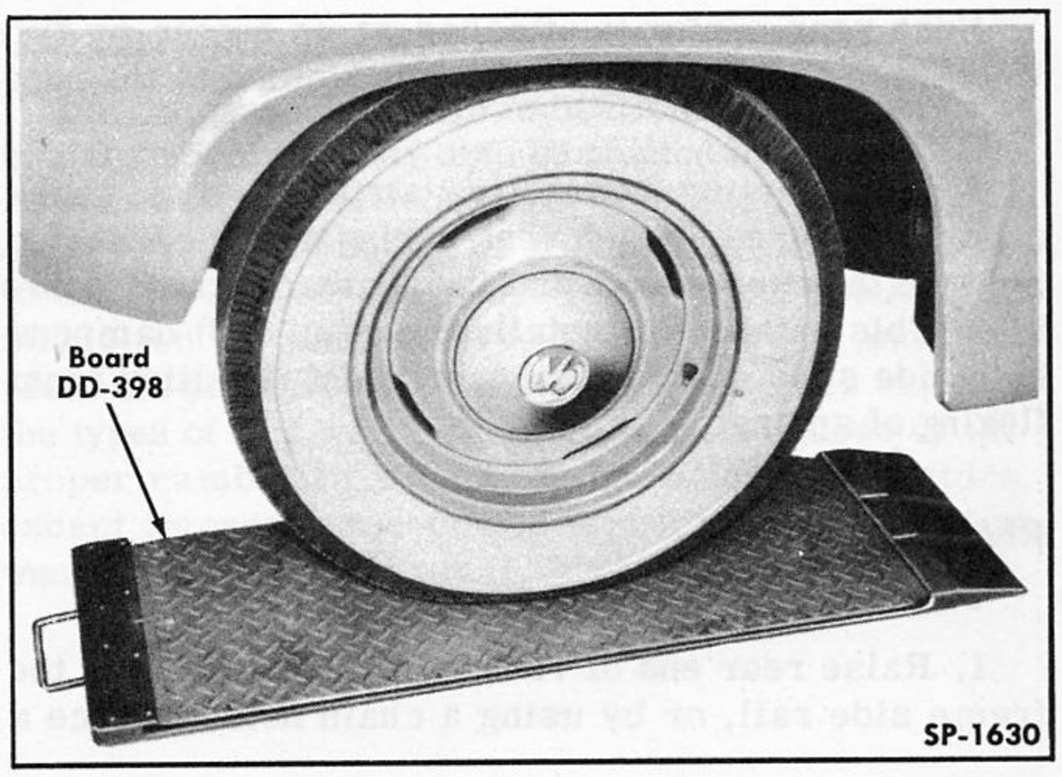

Fig. 171—Checking Toe-In

4. If correct readings are not obtained, one or both of the steering arms are bent and must be replaced.

REAR SUSPENSION

Two semi-elliptic, leaf-type rear springs are hung longitudinally from the frame side rails in rubber

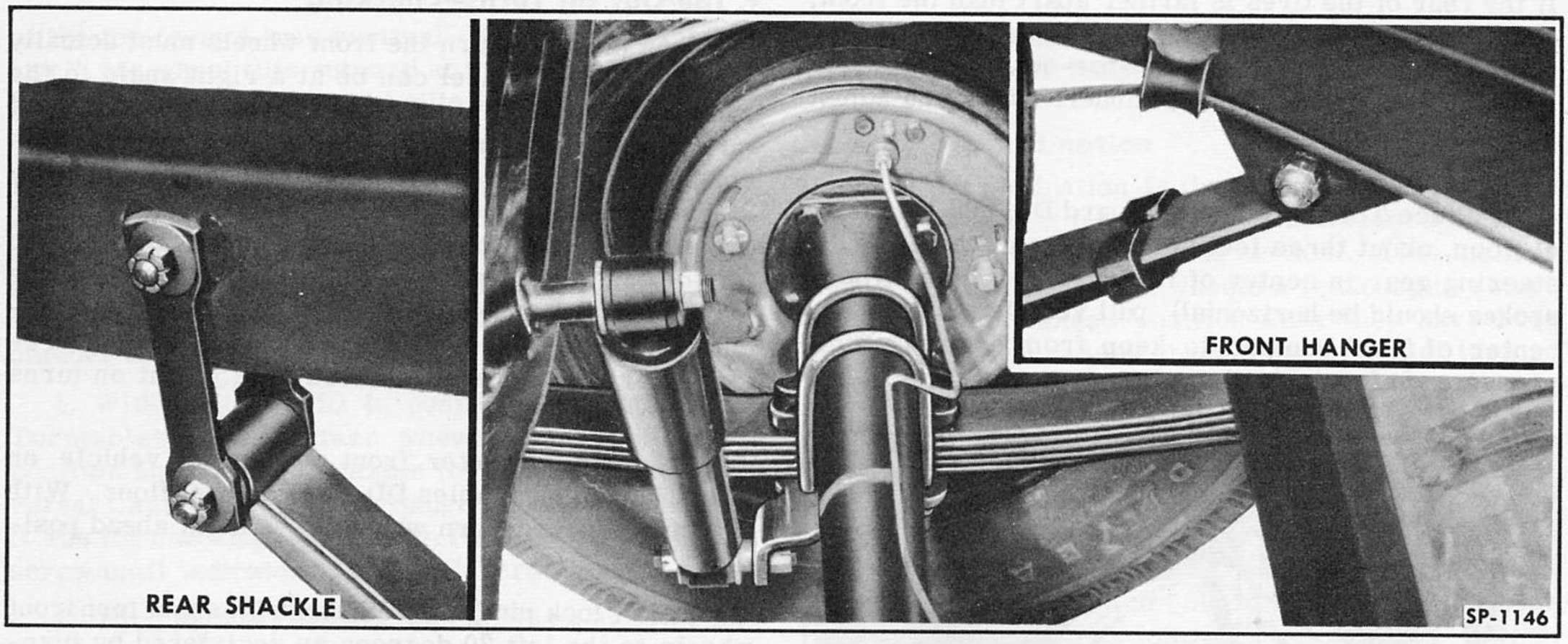

Fig. 172—Rear Suspension

bushed mountings. The rear axle is attached to each spring with U-bolts and a spring plate (Fig. 172).

The front of each rear spring is connected directly to the spring hanger which is riveted to the frame. The rear end of each spring is connected to the frame by a shackle and link assembly.

Each rear spring is attached at its center by two U-bolts to the spring pad which is welded to the axle housing.

A double-acting hydraulic "airplane" type shock absorber is used at each rear spring and is connected between the spring plate and the number 3 crossmember. This manner of installation (Fig. 173) dampens both side sway and vertical movement resulting from flexing of springs.

REAR SPRINGS

The rear springs can be replaced as follows:

1. Raise rear end of vehicle with a jack under the frame side rail, or by using a chain hoist. Place a support under the rear axle to hold it after spring is disconnected.

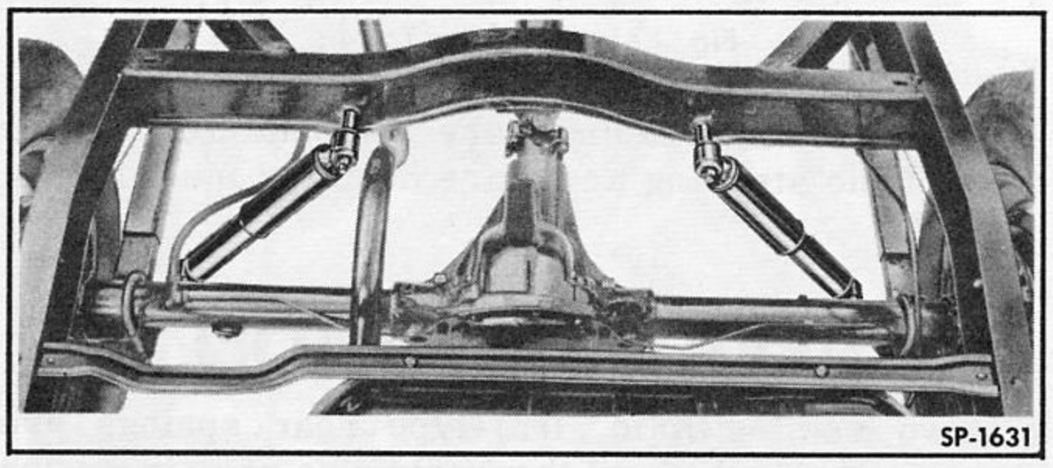

Fig. 173—Rear Shock Absorber Installation

2. Remove nuts and shackle link from shackle and work spring off shackle stud.

3. Remove nut and bolt attaching front end of spring.

4. Disconnect lower end of rear shock absorber from spring mounting plate.

5. Remove U-bolt nuts, mounting plate, U-bolts and remove spring.

6. To install, reverse the above procedure. Apply a soap and water solution to rubber bushings to aid installation.

REAR SHOCK ABSORBERS

The upper and lower ends of the rear shock absorbers fit over studs on the crossmember and the spring plate, with rubber cushions, flat washers and self-locking nuts used to insulate the mounting and hold the shock absorber securely. The shock absorbers are not adjustable and do not require the addition of fluid. If a leak should occur, the shock absorber assembly should be replaced.

The shock absorbers are easily removed after the nut, washer and rubber bushing are removed from the attaching studs.

SERVICE DIAGNOSIS

Whenever the front end is believed in need of alignment, check tire wear and the way the vehicle steers. This will usually provide information to cor-

rectly diagnose improper front end alignment. However, other possible causes of the symptoms which indicate improper front end alignment are listed in Section 10, ''Steering'', and should be considered at the same time. Positive determination of improper front end alignment is assured only by checking with suitable gauges or aligning equipment.

IMPROPER FRONT END ALIGNMENT

The following symptoms may be caused by misalignment or other related front or rear suspension conditions as listed. Refer to Section 10, ''Steering'', for other possible causes.

a. Hard Steering

Check for:

1. Incorrect caster.
2. Front suspension arm or steering knuckle bent or twisted.

b. Steering Wander, Road Weave or Lack of Control

Check for:

1. Incorrect or unequal caster or camber, or toe-out with loose steering linkage.
2. Front suspension arm or steering knuckle bent or twisted.
3. Sway eliminator bar defective.
4. Sagging front or rear springs.
5. Worn steering knuckle bushings.

c. Road Shock or Steering Kick-Back to Steering Wheel

Check for:

1. Steering knuckle bent.
2. Steering knuckle bushings worn.

d. Vehicle Pulls to One Side

Check for:

1. Incorrect or uneven caster or camber.
2. Suspension arm bent or twisted.
3. Sagging or broken front or rear spring.
4. Rear wheels not aligned with front wheels.

e. Front Wheel Shimmy or Tramp

Check for:

1. Incorrect toe-in, caster or camber.
2. Weak or sagging front springs.
3. Shock absorbers not functioning.
4. Worn king pin bushings.
5. Improper tire balance.

f. Poor Control on Turns

Check for:

1. Defective sway eliminator bar.
2. Bent steering arm.
3. Shock absorbers not functioning.
4. Weak front spring.
5. Caster adjustment.

UNEVEN TIRE WEAR

Uneven tire wear is an indication of improper front end alignment but may also be caused by other factors such as mechanical looseness, improper tire balance, excessive wheel run-out or poor driving habits. Refer to Section 12, ''Wheels and Tires'', for detailed information on various types of tire wear and their probable causes. Information in Section 12 explains the types of tire wear which are usually caused by improper camber or toe-in. Other alignment factors, except improper toe-out on turns, do not affect tire wear to any great extent.

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