

# SECTION 3

## FRONT SUSPENSION

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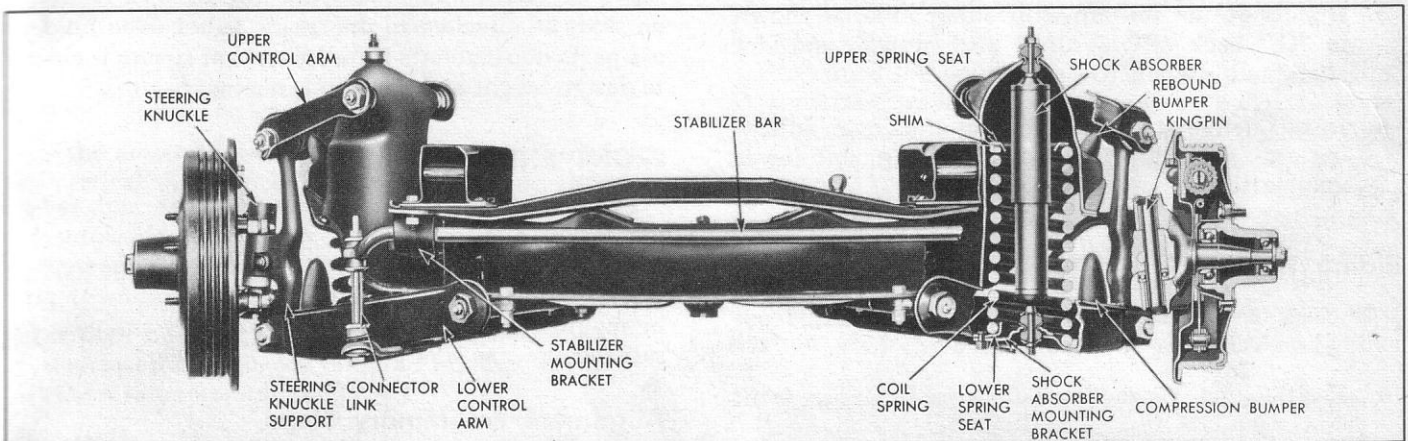


Fig. 1—Corvette Front Suspension—Typical

## GENERAL DESCRIPTION

The 1953-1962 Corvette front suspension is the short and long arm independent type with open coil springs and is assembled to the suspension crossmember as a complete unit (fig. 1). Upper and lower control arms are one-piece steel stampings with threaded steel bushings for the cross-shafts. The lower control arm cross-shaft is bolted to the underside of the crossmember, while the upper arm cross-shaft is bushed to the upper spring housing assembly. The steering knuckle support is pivoted at its upper and lower end to the upper and lower control arms through threaded steel bushings and pivot pins. The upper pivot pin is eccentric and provides for caster and camber adjustments. A conventional reverse Elliott steering knuckle is used, which pivots on the kingpin through split, float-

ing bushings. A ball bearing located between the lower face of the steering knuckle and the support absorbs thrust loads. Steering stability and body roll are controlled through a rubber insulated stabilizer bar which is grounded to the radiator support crossmember and linked at each end to the lower control arms. Front wheel bearings are ball type. Shock absorbers are sealed, direct-acting and are mounted vertically through the center of the springs, attached at the upper housing through a bayonet mount, and to a bracket bolted to the lower control arm. Front end alignment procedure is included in this section. General front suspension specifications are included in the Specifications Section at the rear of this book.

## MAINTENANCE AND ADJUSTMENTS

### Wheel Bearing Adjustment

1. Remove wheel hub cap and bearing dust cap.

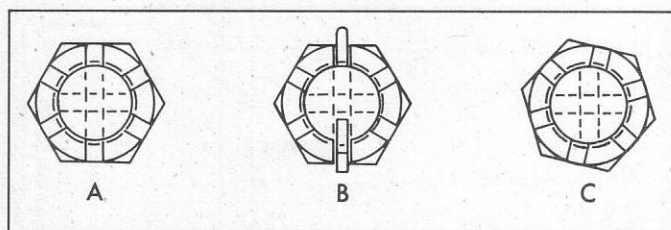


Fig. 2—Adjusting Wheel Bearing

2. Tighten spindle nut to 33 ft. lbs. while rotating wheel.
3. Back off spindle nut until bearings are loose and retorqued to 12 ft. lbs.
4. If slot in nut and cotter pin hole line up either horizontally or vertically as shown in "A," Figure 2, insert cotter pin as shown in "B."
5. If slots do not line up with either hole, as shown in "C," back off nut until nearest hole and slot align, and insert cotter pin.
6. Install new cotter pin and bend ends over adjusting nut. Install grease cap, hub cap and lower vehicle to floor.

### Riding Height—Spring Sag

In cases of unequal riding height or spring sag, front riding height may be checked as follows:

1. Position vehicle on level floor and bounce front end up and down to allow to settle.

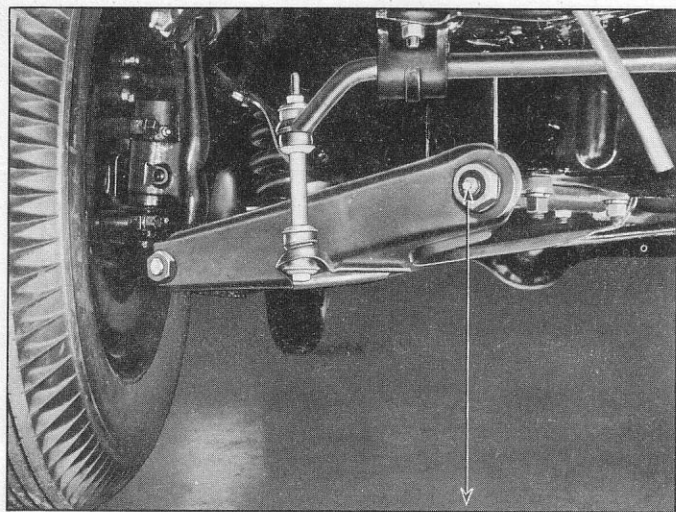


Fig. 3—Measuring Riding Height

2. Measure distance from centerline of lower control arm inner pivot shaft to floor (fig. 3). This distance should be as shown in Specifications, Section 14.

**NOTE:** It is important that tire pressures, front and rear, be as specified in *Wheels and Tires*, Section 10.

3. If distance varies from listed figures a shim may be added to the top of the spring.

More than two shims should not be used because additional shims may cause the spring coils to bottom before the lower control arm movement is stopped by the rubber bumper.

If the addition of shims does not bring the spring height within the limits given above, it will be necessary to install a new front spring to make the correction.

Service replacement springs are checked to designed height before being shipped to parts warehouses and a shim, if necessary, is wired to the spring. Field replacement of springs should be made to include the shim that is attached to the spring. Should no shim be attached to the spring as received by dealers parts departments it indicates that spring is correct to design height and no shim is necessary.

### FRONT END ALIGNMENT

Front end alignment (caster, camber and toe-in) inspection and adjustment consists of checking and adjusting all the inter-related steering components of the front suspension system. Correct alignment must be maintained to assure steering stability and ease and satisfactory tire life.

#### Alignment Preliminary Steps

There are several different types of front end alignment machines, all of which outline proper procedure for checking factors of front end alignment. The instructions furnished with each type of machine should be followed. All checks must be made with the vehicle level and at curb weight. Preliminary inspection of the vehicle before checking front end alignment should include:

1. Steering gear adjustment.
2. Steering gear housing mounting.
3. Excessive wear in pivot bushings or steering shaft coupling.
4. Loose tie rod or steering shaft connections.
5. Improper front spring heights.
6. Tire inflation.
7. Wheel and tire balance.
8. Wheel bearing adjustment.



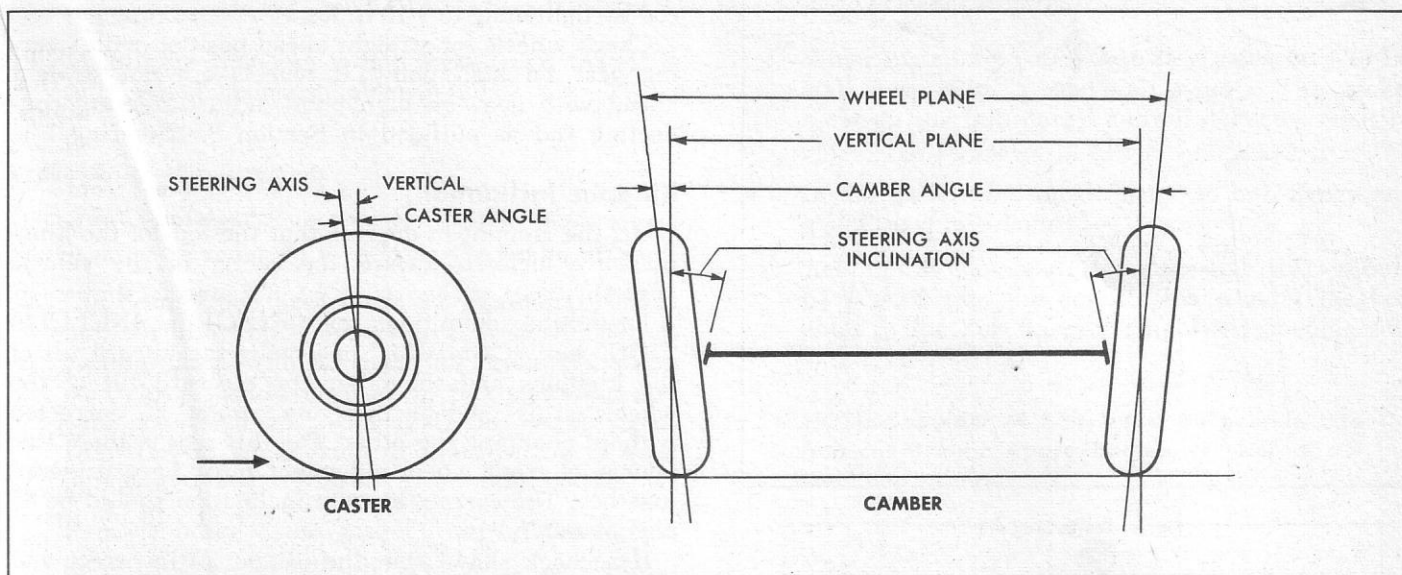


Fig. 4—Caster and Camber Diagram

9. Shock absorber operation.
10. Vehicle at curb weight (no passengers, full gas tank, full radiator, proper engine oil level).

### Caster

—is the amount in degrees of the backward tilt from the vertical of the knuckle support and kingpin (fig. 4).

**NOTE:** Before adjusting caster and camber angles after complaint of excessive tire wear or poor handling, the front bumper should be depressed and quickly released to allow car to return to its normal height.

### Camber

—is the amount in degrees that the front wheels are tilted outward at the top from a vertical position (fig. 4).

When a wheel is tilted too far out at the top, hard steering or wander will be experienced and tires will show excessive wear on outside shoulders.

Reverse camber or a wheel that is tilted too far in at the top will result in excessive tire wear on the inner shoulders.

Unequal camber may result in unstable steering, wandering or unequal tire wear.

The caster and camber adjustments are both performed by turning the upper control arm pivot pin with an allen wrench placed in allen wrench hole in rear end of pivot pin after lubrication fitting is removed from rear bushing. This pivot pin is threaded into the front and rear bushings in the control arm and the steering knuckle support is held centrally

located on the pivot pin, which is  $\frac{3}{32}$ " eccentric, by a clamp bolt which indexes with a groove in the pivot pin. With this construction, change in caster is slight for a full range of camber adjustment.

Procedure for adjustment is to turn pivot pin (fig. 5) until the travel of pin threads in bushings gives an exact caster setting, then turn pivot pin less than  $\frac{1}{2}$  turn in direction required for camber adjustment. The direction depends upon the position of the eccentric. The maximum amount of thread travel during camber adjustment is about  $\frac{1}{4}$  of the available caster adjustment so that caster and camber can be brought within limits on the first trial. Refer to Specifications, Section 14, for caster and camber settings.

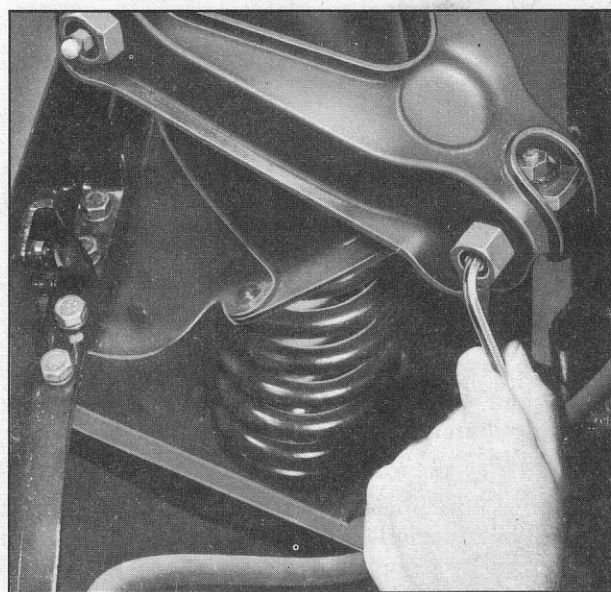


Fig. 5—Adjusting Caster and Camber

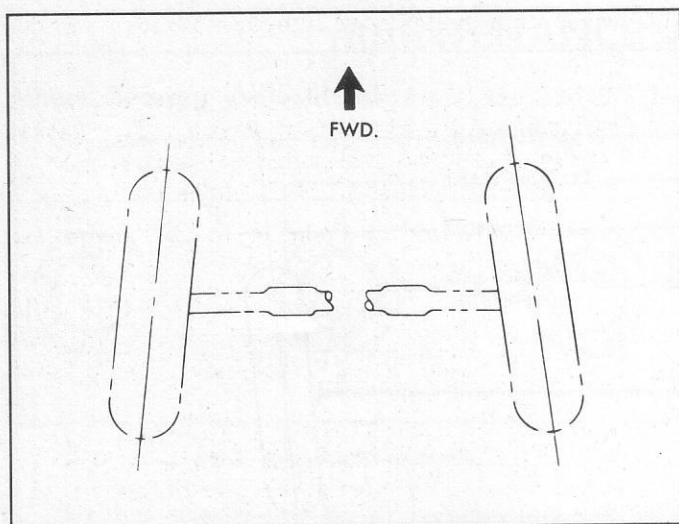


Fig. 6—Toe-in Diagram

### Toe-In

—is the amount in fractions of an inch that the wheels are closer together in front than at the rear. The purpose of toe-in is to insure parallel rolling of the front wheels, to stabilize steering and prevent side slipping and excessive wear of tires. A slight amount of positive toe-in is desirable to offset the small deflections due to rolling resistance and brake application which tends to turn the wheels outward.

Toe-in can be adjusted by loosening the clamp bolts at each end of the left hand tie rod and turning the left hand tie rod to increase or decrease its length as necessary, until proper toe-in is secured. Refer to Specifications, Section 14, for toe-in settings.

Before locking the clamp bolts, make sure that the tie rod ends are in alignment with their ball studs. If the tie rod is not in alignment with the studs, binding

will result. Lock the clamp bolts at each end of the tie rod by tightening to 8-12 ft. lbs.

Check wheels for straight ahead position with steering gear on high point. If wheels are not straight ahead with gear on high point, adjust steering connecting rod as outlined in Section 9, "Steering."

### Kingpin Inclination

—is the amount in degrees that the tops of the kingpins are inclined toward the center of the vehicle (fig. 4).

From the definitions of "KINGPIN INCLINATION" and "CAMBER," one being the inward tilt of the kingpins and the other the outward tilt of the wheels, it is evident that one cannot be corrected without changing the other. For this reason these two factors of front wheel alignment must be considered together. The correct kingpin inclination should be  $4^\circ$  plus or minus  $\frac{1}{2}^\circ$ .

If a check shows that the camber is incorrect and the kingpin inclination is correct it indicates that the steering knuckle is bent and must be replaced. If the kingpin inclination is incorrect the knuckle support must be replaced. If a new knuckle support is installed it is necessary to re-adjust both caster and camber.

### Cornering Wheel Relationship

Cornering wheel relationship or toe-out on turns, is determined by the angle of the steering arm and is not adjustable. If this measurement does not fall within the limits (inner wheel  $20^\circ \pm 1^\circ$ , outer wheel  $24^\circ \pm 1^\circ$ ), it will be necessary to replace the steering arm on the wheel side that does not fall within limits. See this section for steering arm replacement.

It is recommended that major service operations on the front suspension be performed on a hoist which will allow the control arm to swing free.

## SERVICE OPERATIONS

### HUB AND DRUM ASSEMBLY

#### Removal

1. Remove hub caps, loosen wheel to hub bolt nuts, raise vehicle from floor, place on stand jacks and remove wheels.
2. Remove hub grease cap, cotter pin, spindle nut, spindle washer and remove drum and hub assembly.

**NOTE:** In some cases it may be necessary to back off the brake adjustment because of scored drums or badly worn linings holding drum on.

3. Remove outer bearing from hub with fingers. The inner bearing will remain in the hub and may be removed by prying out the inner bearing felt seal assembly.
4. Wash all parts thoroughly in cleaning solvent.

#### Inspection

1. Check all bearings for cracked bearing cages or worn or pitted balls.
2. Check bearing race for cracks or evidence of scoring.
3. Check brake drum for out of round or scored condition.
4. Check bearing outer race for looseness in hub.

#### Repairs

##### Bearing Races—Replacement

1. Insert front wheel bearing cup remover K-224 or drift punch through hub, indexing end of tool with notches in hub shoulder behind bearing cup.
2. Tap lightly on cup through each notch to remove cup from hub.



3. Install new bearing cup in hub using K-463B bearing cup installer (fig. 7).
4. Make sure that cup is not cocked and that it is fully seated against shoulder in hub.

#### Brake Drum—Replacement

The brake drum is held to the hub by three rivets which must be removed to replace the brake drum.

1. Cut heads from three rivets which retain drum to hub. Drilling rolled end of rivet first will permit cutting them without distorting holes. A sharp cold chisel should be used in this operation and care exercised to avoid distorting rivet holes. Drive rivets from drum and hub using tapered punch and remove drum from hub bolts.
2. Remove brake drum gasket from hub and clean gasket surface on hub thoroughly.



Fig. 7—Installing Bearing Cup

3. Install new brake drum gasket and brake drum over hub bolts and insert three new rivets through rivet holes in oil deflector, hub, gasket and drum.
4. Support heads of rivets and peen ends securely.

#### Wheel Hub—Replacement

1. Remove inner and outer bearing cups.
2. Remove three rivets retaining brake drum to wheel hub and remove brake drum.

3. Drive hub bolts from hub and remove oil deflector.
4. When installing a new hub it is necessary to install new bolts, rivets and gaskets. The gasket between the hub flange and oil deflector must be covered with sealer to prevent oil leaks.
5. Install gasket and oil deflector to hub flange and install new hub bolts.
6. The end of the shoulder on the hub bolts should be peened into the countersink around the bolt holes in the hub flange, using J-554 peening tool and anvil (fig. 8).

**NOTE:** Shoulder of bolts must be peened into hub countersink approximately  $\frac{1}{16}$ " before assembling drum.

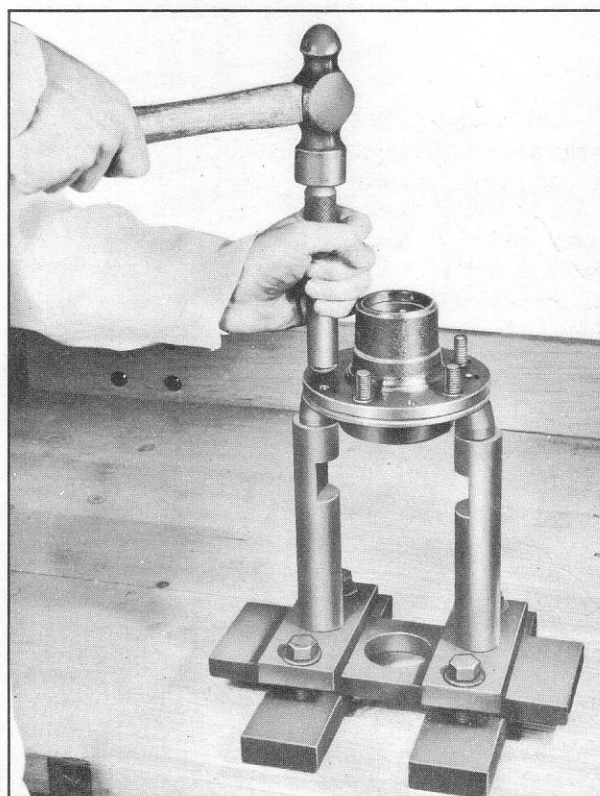


Fig. 8—Peening Front Hub Bolts

7. Install new brake drum gasket and brake drum over hub bolts.
8. Install three new rivets through rivet holes in oil deflector, hub flange and drum and supporting rivet heads, peen ends securely.
9. Install inner and outer bearing cups into hub using K-463B, Bearing Cup Inserter Set.

#### Installation

1. Hand pack both inner and outer bearings, using a short fibre "High Melting Point Lubricant."

2. Place inner bearing in hub, then install a new inner bearing felt seal assembly.
3. Using a piece of fine sandpaper, lightly sand the inside braking surface of brake drum to insure a clean surface and proper brake operation.
4. Carefully position hub on spindle making sure the inner oil deflector is in proper position between inner bearing and inner race and shoulder on spindle.
5. Install outer bearing, pressing it firmly into the hub by hand.
6. Install spindle washer and spindle nut. Draw spindle nut up snug and adjust bearings.

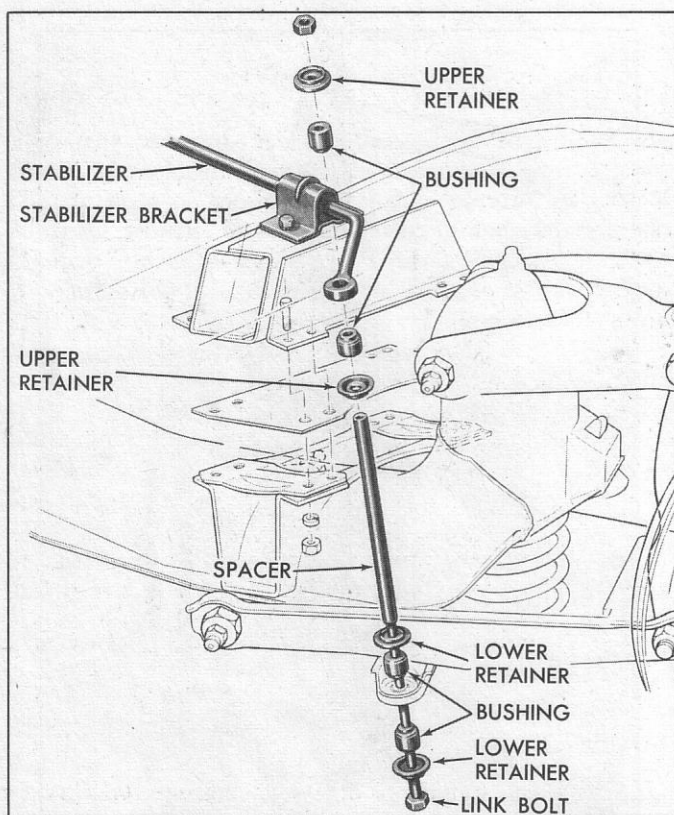


Fig. 9—Stabilizer—Exploded View

## STABILIZER—FIGURE 9

A ride stabilizer is used to provide steering stability and control of body roll. This bar is rubber mounted to brackets attached to radiator support cross member.

### Removal

1. Disconnect the stabilizer links by removing the nut from the top of the link bolt and pulling the bolt out from the lower bracket attached to the lower control arm.

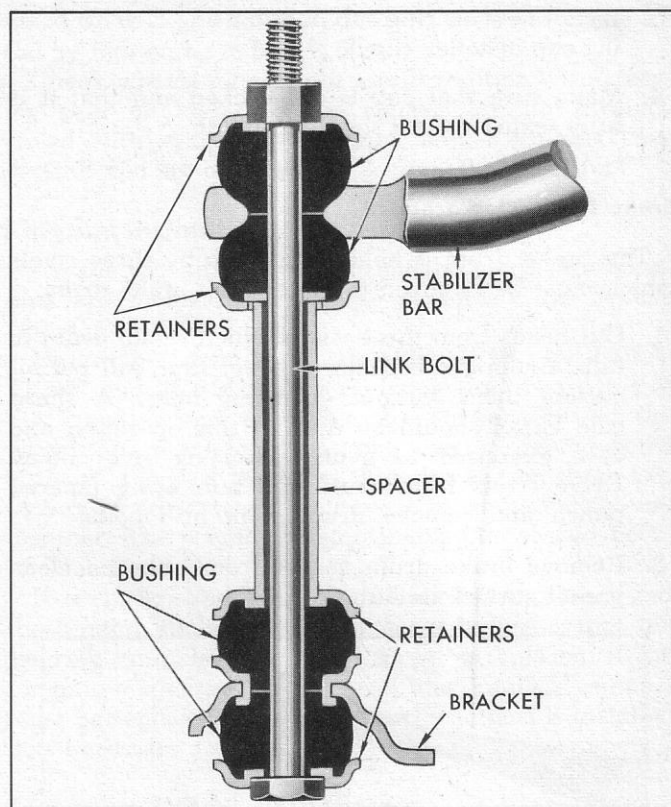


Fig. 10—Stabilizer Link Attachment—Typical

2. Remove the bolts and nuts that attach the stabilizer brackets to the radiator support cross member and remove bar and brackets.

### Installation

1. Place rubber bushings on stabilizer bar and install support brackets over bushings, then bolt brackets loosely to radiator support cross member.
2. The stabilizer link bolt, bushings and retainers may be assembled by placing one steel retainer and one rubber bushing on the link bolt and threading the bolt up through the bracket on the lower control arm.
3. Assemble rubber bushing, retainer, steel spacer, retainer and rubber bushing over bolt and thread bolt through eye on stabilizer bar.
4. Install rubber bushing and retainer over bolt and install nut tightening it to LIMIT of bolt threads.
5. With wheels of car on floor and supporting the car weight, bounce front end up and down several times to align stabilizer.
6. Tighten bracket mounting bolts securely, torquing to 17-22 ft. lbs.



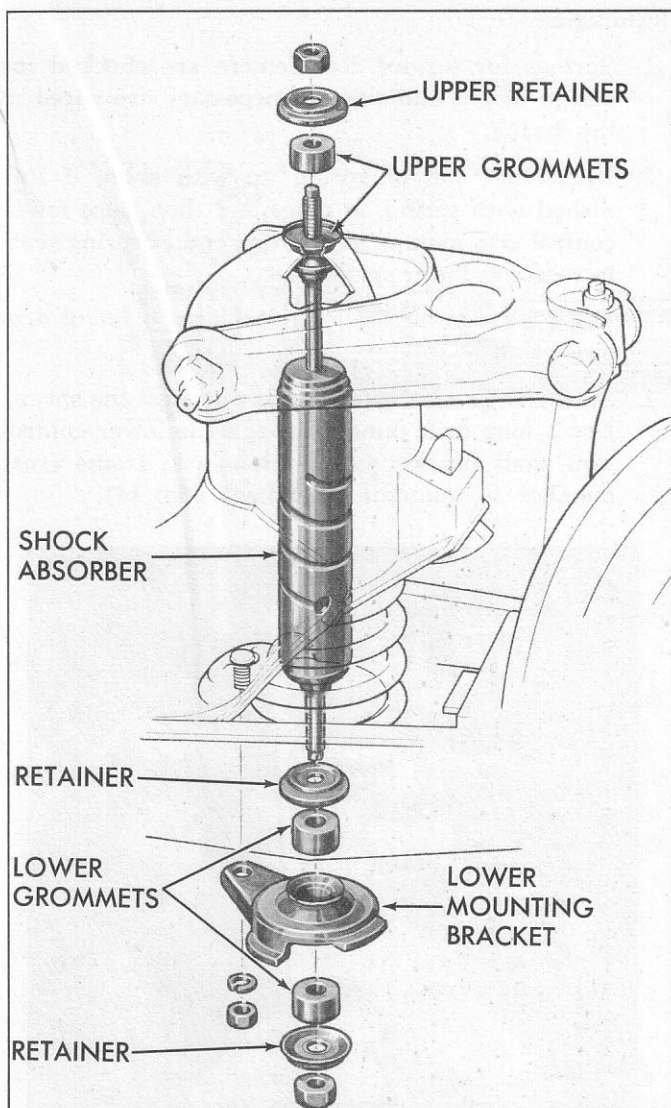


Fig. 11—Shock Absorber—Exploded View

## SHOCK ABSORBER—FIGURE 11

### Removal

1. With a  $\frac{1}{4}$ " open end wrench, hold upper stem from turning and remove upper stem retaining nut, grommet retainer and grommet.
2. Remove nut and lockwasher from special bolt, retaining shock absorber lower mounting bracket to lower control arm, and pull shock absorber assembly and mounting bracket out bottom of spring housing (fig. 13).
3. Place mounting bracket in vise and remove lower stem retaining nut, grommet retainer and grommet and remove shock absorber from mounting bracket.
4. Inspect rubber grommets and if necessary replace with new grommets.

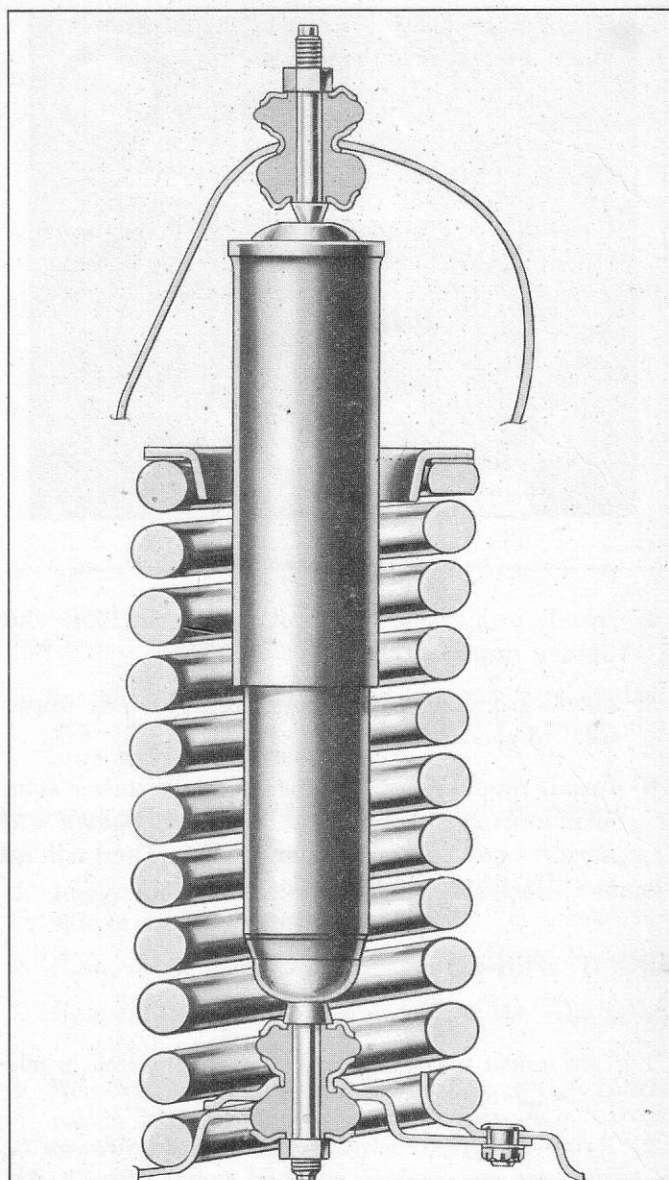


Fig. 12—Shock Absorber Mounting

### Installation

1. Install grommet retainer, upper grommet, retainer bracket assembly, lower grommet and grommet retainer on bottom stem of shock absorber and install grommet retainer nut and tighten until it bottoms on shoulder of stem. Then, tighten to 4-6 ft. lb. torque and stake in place.
2. Install grommet retainer and grommet on upper stem of shock absorber and install shock absorber up through lower control arm and spring housing.
3. Index upper stud through mounting hole in top of spring housing and index mounting hole in shock absorber retainer bracket over special bolt in lower control arm.

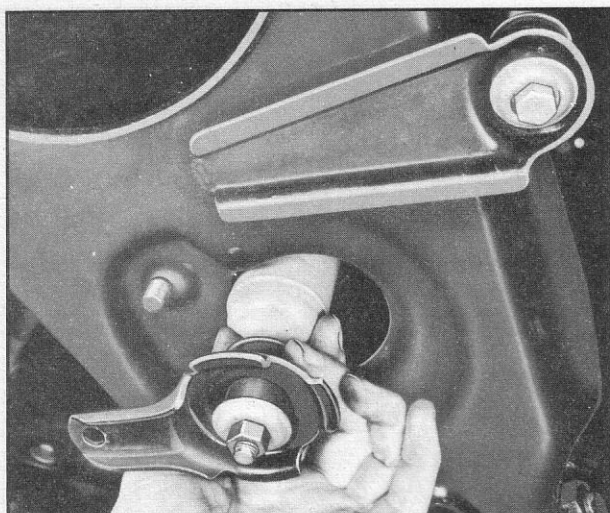


Fig. 13—Removing Shock Absorber

4. Install lockwasher and nut on special bolt and tighten nut securely.
5. Install grommet and grommet-retainer over upper stem of shock absorber.
6. Install retainer nut to upper shock absorber stem and, holding stem with  $\frac{1}{4}$ " wrench, tighten nut until it bottoms on shoulder of stem. Then tighten to 4-6 ft. lb. torque and stake in place.

## FRONT SPRINGS

### Removal

1. Disconnect the stabilizer link from the link bracket on the lower control arm.
2. Remove front shock absorber on the side spring is to be replaced as outlined under "Shock Absorber—Removal."
3. Raise the front end of car off the floor and place stand jacks beneath frame side rails. Lower car until weight is carried on stand jacks.
4. Place a hydraulic jack under the lower control arm inner shaft on side from which the spring is to be removed.
5. Remove nuts and lockwashers from the lower control arm shaft bracket bolts and drive out the bolts.
6. Lower the jack slowly to remove the spring pressure; then, remove the hydraulic jack. This allows the lower control arm to drop down, releasing the spring.

**NOTE:** If shim is used, make sure it is removed from upper spring seat.

### Installation

1. Springs for service replacement are checked for design height and shims if necessary are wired to the spring.
2. Install flat end of spring up with shim, if furnished with spring, in place and then raise lower control arm making sure lower end of spring seats in recess in lower spring seat.
3. Place a hydraulic jack under lower control arm inner shaft.
4. Slowly raise arm with jack to compress the spring. Use a long drift punch through the lower control arm shaft bracket hole and hole in frame cross member to maintain alignment (fig. 14).

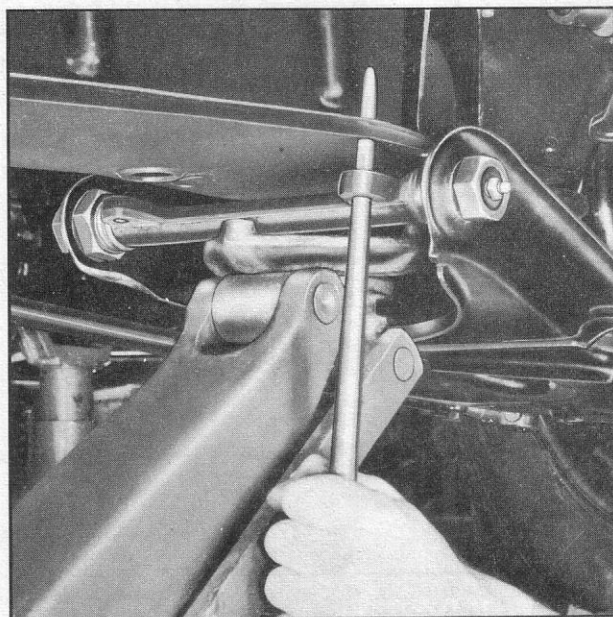


Fig. 14—Aligning Lower Control Arm Shaft Bracket

5. Install bolts through cross member and control arm shaft bracket bolt holes and install lockwashers and nuts and torque.
6. Remove the hydraulic jack, then raise front end of car and remove stand jacks.
7. Lower car to floor and connect the stabilizer link to the bracket on the lower control arm.
8. Replace front shock absorber as outlined under "Shock Absorber—Installation."

### LOWER CONTROL ARM CROSS-SHAFT AND/OR BUSHING—PIVOT BOLT AND BUSHING—ON THE VEHICLE

Replacement of lower control arm shaft or lower control arm shaft bushings may be accomplished without removal of lower control arm from vehicle.



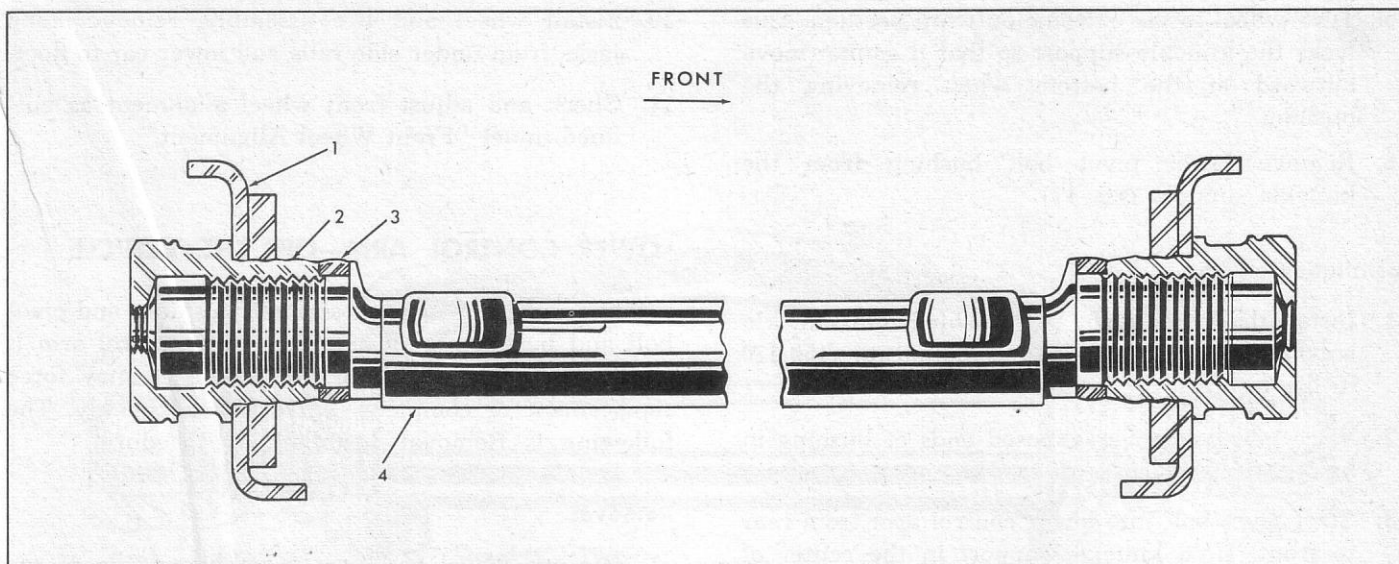


Fig. 15—Lower Control Arm Shaft

1. Control Arm 2. Bushing 3. Bushing Seal 4. Control Arm Shaft

1. Support inner end of control arm securely on jack and remove one bushing.
2. Ascertain that control arm shaft is centered in control arm bushing hole. Then, thread new bushing onto shaft and into control arm and tighten to 85-100 ft. lb. torque.
3. Remove other bushing and replace.

**NOTE: When replacing both bushings replace one at a time to assure alignment of control arm and shaft.**

4. When replacing control arm shaft, place shaft in control arm and position by scale measurement. Start bushings into control arm making sure threads index and enter arm properly. Tighten bushings to 85-100 ft. lb. torque.

5. Install both through cross member and control arm shaft bracket holes, install lock washer and nuts and tighten securely.

#### Lower Control Arm Pivot Bolt and Bushing Removal

1. Raise the car and place stand jack under the inner side of the lower spring seat.
2. Remove the wheel and tire assembly.
3. Remove tie rod end as outlined under "Tie Rod—Removal"—Section 9.
4. Remove pivot bolt lock nut and then remove lubrication fitting from pivot bolt and remove bolt from lower control arm and knuckle support.

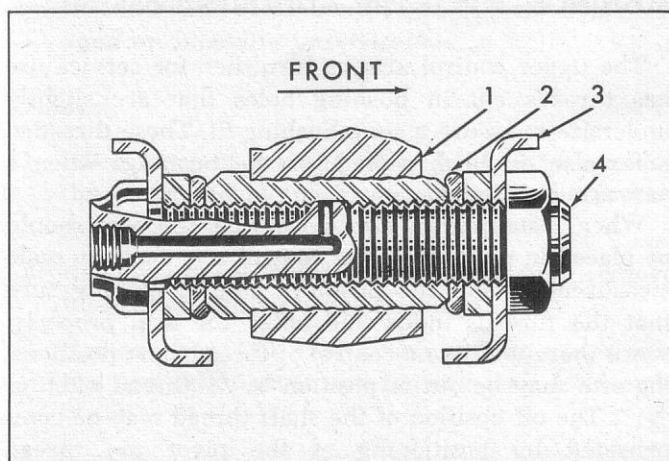


Fig. 16—Lower Control Arm Pivot Bolt Cross-Section

1. Steering Knuckle Support 2. Bushing 3. Control Arm 4. Pivot Bolt

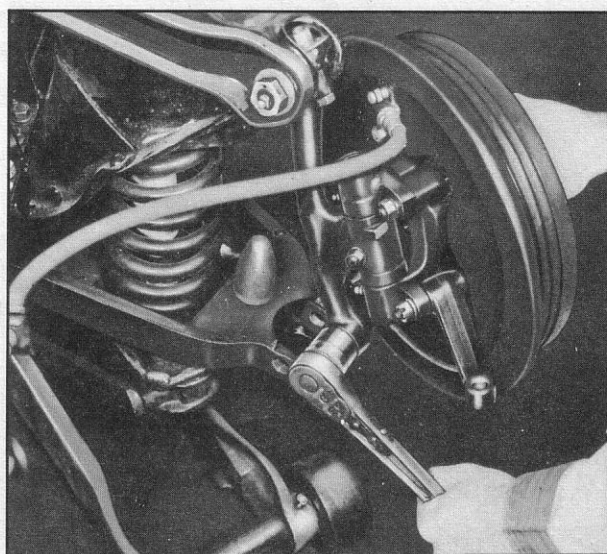


Fig. 17—Removing Lower Pivot Bolt Bushing

5. Turn wheel to the extreme outward position. This locks the knuckle support so that it cannot move outward at the bottom when removing the bushing.
6. Remove lower pivot bolt bushing from the knuckle support (fig. 17).

#### Installation

1. Install the lower pivot bolt bushing into knuckle support from rear to front and tighten it to 150-170 ft. lbs. torque.
2. Place new seals over exposed ends of bushing in knuckle support.
3. Start pivot bolt into lower control arm from rear to front. Hold knuckle support in the center of the yoke formed by the lower control arm and thread pivot bolt into bushing in the knuckle support being very careful to keep it centered in the yoke.
4. Continue to screw pivot bolt in until it contacts the front face of the control arm. If the threads on the bolt and in the control arm index properly, continue to screw bolt into control arm until its head seats firmly against the rear face of the lower control arm.
5. If the threads do not index properly, place a "C" clamp over ends of control arm and compress the ends slightly trying the threads as you proceed (fig. 18). It will be found that very little compression will allow the threads to index properly.
6. Tighten pivot bolt to 100-200 ft. lbs., install lock nut and tighten nut to 90-120 ft. lbs.
7. With a hook made of stiff wire, slip seals off ends of knuckle support bushing and into their seats.
8. Install tie rod to steering arm as outlined under "Tie Rod Installation"—Section 9.
9. Install lubrication fittings and lubricate.

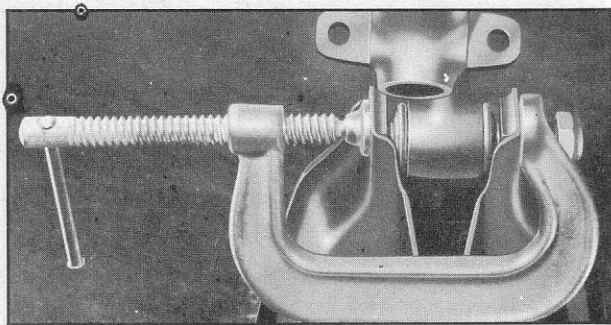


Fig. 18—Indexing Threads of Pivot and Lower Control Arm

10. Install wheel and tire assembly, remove stand jacks from under side rails and lower car to floor.
11. Check and adjust front wheel alignment as outlined under "Front Wheel Alignment."

#### LOWER CONTROL ARM—OFF THE VEHICLE

While replacement of cross-shaft, bushings and pivot bolt and bushings may be done while control arm is on the vehicle, accident or other damage may force replacement of complete control arm assembly. The following is Removal—Installation Procedure.

##### Removal

1. Remove wheel and tire assembly on side of car from which control arm is to be replaced.
2. Remove front spring as outlined under "Front Spring—Removal."
3. Remove tie rod end from steering arm as outlined under "Tie Rod—Removal"—Section 9.
4. Remove lower control arm pivot bolt nut and bolt and remove lower control arm assembly from beneath vehicle.

##### Disassembly—Assembly—Installation

After removal, control arm may be serviced and reinstalled using same procedures as outlined above for *Lower Control Arm Cross-Shaft and/or Bushings—Pivot Bolt and Bushing—On the Vehicle.*

#### UPPER CONTROL ARM CROSS-SHAFT AND/OR BUSHINGS—PIVOT PIN AND BUSHINGS

The upper control arm as furnished for service use has threads cut in bushing holes that are slightly undersize to assure a snug bushing fit. These threaded holes also establish a lead for the bushings when a new arm is installed.

When installing an arm in service, the arm should be placed in position on the control arm shaft by scale measurement and the bushings started making sure that the threads index and enter the arm properly. Since there will be no control of thread start positions, the arm may be out of position by  $\frac{1}{2}$  thread pitch or  $\frac{3}{64}$ ". The off position of the shaft thread may be compensated by positioning of the pivot pin thread although there will always remain the possibility of the assembly being  $\frac{1}{2}$  thread pitch out of position. This may be corrected by means of a caster adjustment.



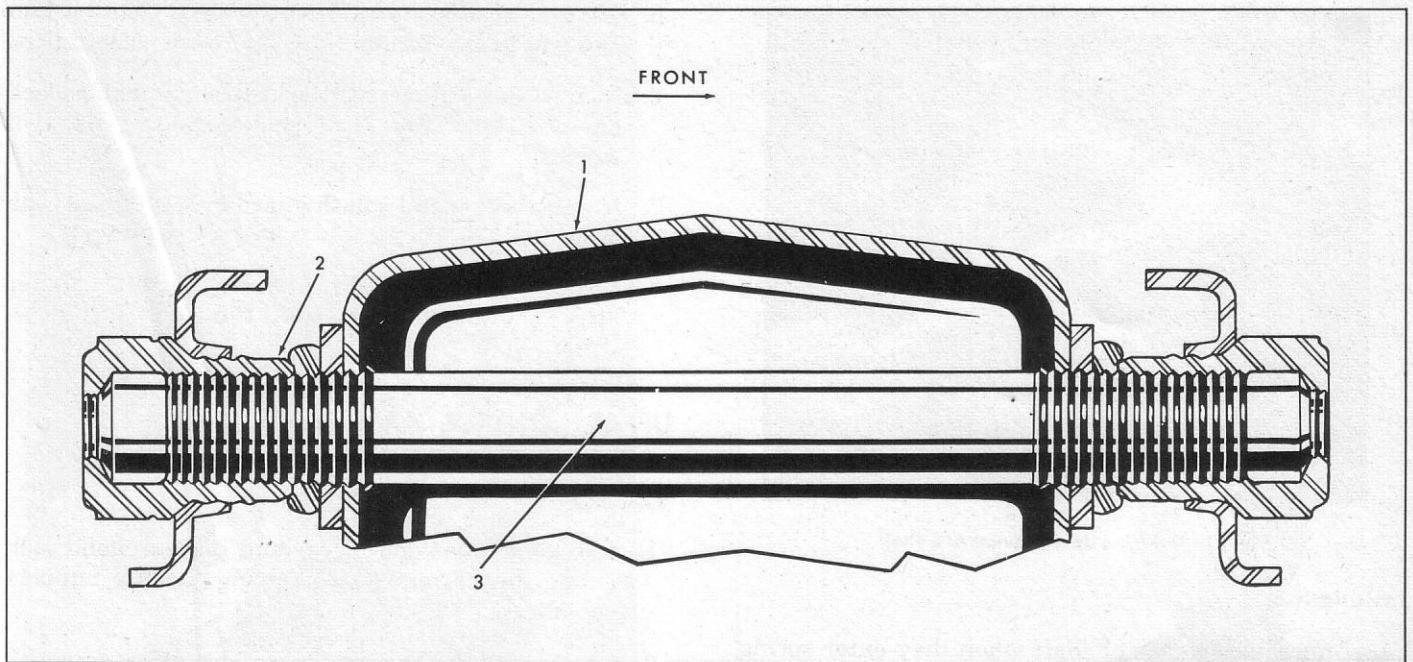


Fig. 19—Upper Control Arm Shaft

1. Control Arm      2. Control Arm Shaft Bushing      3. Control Arm Shaft

After completion of assembly, the bushings should be finally tightened to 30-40 ft. lbs. torque. The arm should be assembled at the shaft end first, the lubricators assembled in the bushings, and moved up and down through the full range of normal movement with rubber bumper removed to insure that there is no interference between shaft and bushings.

Service replacement shafts are oversize on the thread diameters which thread into the spring housing. The large end of the shaft is installed to the front of the housing which allows the small end or rear of shaft which carries an identification indentation to slide through the front hole in spring housing.

**NOTE: Do not remove cross-shaft unless damaged or otherwise unserviceable.**

#### Removal

1. Raise front of car and place a stand jack under the outer end of the lower control arm allowing jack to support vehicle.
2. Remove wheel and tire assembly and remove lubrication fittings from bushings.
3. Remove front and rear bushings from upper control arm outer pivot and remove seals from ends of pin.
4. Remove pivot pin clamp bolt from knuckle support and slide the pivot pin out of the knuckle support using a  $\frac{1}{4}$ " Allen set screw wrench to assist removal.

5. Swing knuckle support and hub and drum assembly away from upper control arm.
6. Remove upper control arm shaft front and rear bushings and remove control arm from control arm shaft.
7. Remove seals from ends of upper control arm shaft and using Upper Control Arm Shaft Remover and Replacer J-2958 (fig. 20) remove upper control arm shaft from spring housing from rear to front.

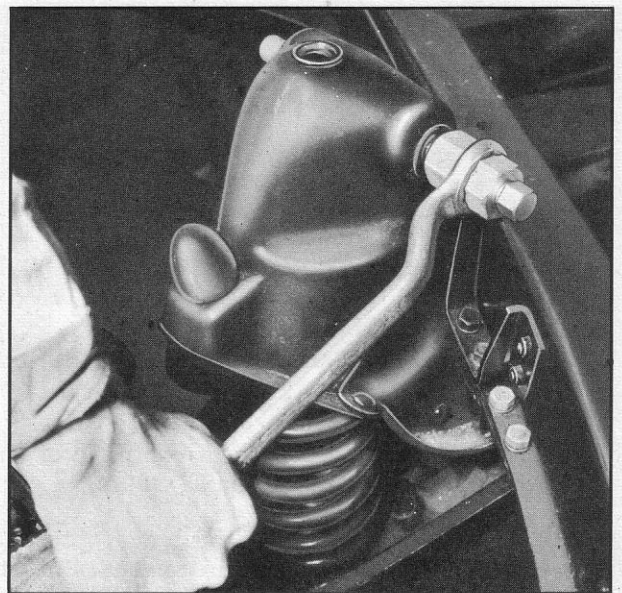


Fig. 20—Removing Upper Control Arm Shaft

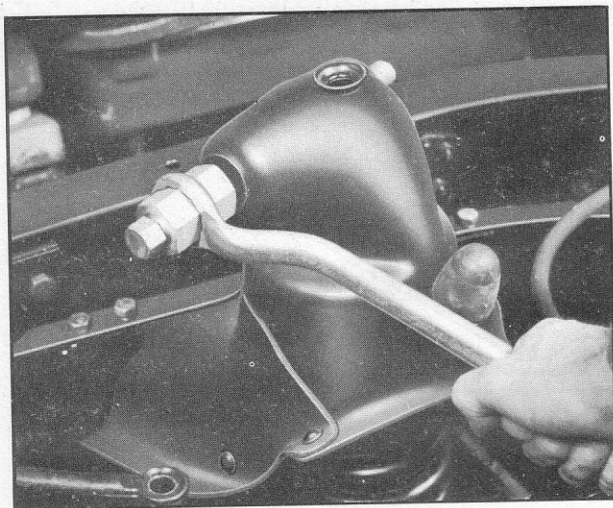


Fig. 21—Installing Upper Control Arm Shaft

### Installation

1. Lubricate threads of shaft when they enter spring housing to prevent tearing threads during installation.
2. Install new upper control arm shaft into spring housing from front to rear using Upper Control Arm Shaft Remover and Replacer J-2958 (fig. 21). Drive shaft into housing until end projects out back of spring housing  $1\frac{1}{8}$ " (fig. 22). Remove tool.

**CAUTION:** Rear end or smaller threaded end of shaft which carries an identification indentation has tapered threads and extreme care must be exercised when installing shaft so that it is not driven in too far since backing off will leave it loose in the spring housing.

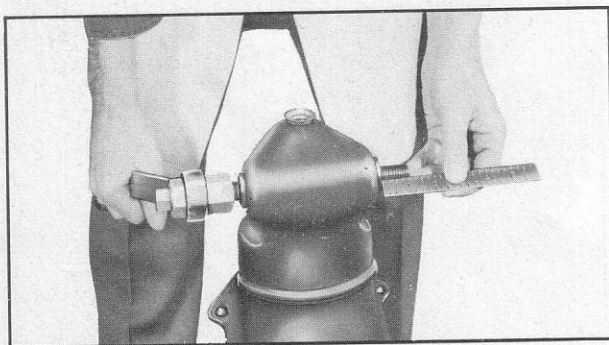


Fig. 22—Locating Shaft in Spring Housing

3. Install new seals over ends of control arm shaft and install control arm on shaft.
4. Start both front and rear bushings onto shaft, position arm by scale measurement and start bushings into arm making sure threads index properly.

5. Tighten bushings until they seat and then tighten to 30-40 ft. lbs. torque.
6. Install lubrication fittings, lubricate and check operation of arm. Arm should fall of its own weight.
7. Install sheet metal splash guard over steering gear housing.
8. Install pivot pin and bushings as outlined under "Upper Control Arm Pivot Pin and Bushings—Installation."

### UPPER CONTROL ARM PIVOT PIN AND BUSHINGS—FIGURE 23

#### Removal

1. Raise the front end of car and place a stand jack under the spring seat, allowing jack to support vehicle.
2. Remove wheel and tire assembly and remove lubrication fitting from rear bushing.
3. Remove pivot pin front and rear threaded bushings from upper control arm. The upper control arm and pivot pin in cross section is shown in Figure 22.
4. Remove seals from ends of pivot pin.
5. Remove clamp bolt from upper end of knuckle support and slide the upper pivot pin out of the knuckle support using a  $\frac{1}{4}$ " Allen set screw wrench to assist removal.

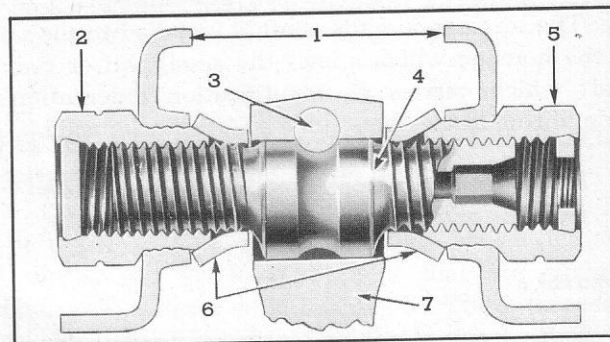


Fig. 23—Upper Control Arm Pivot Pin and Bushings

- |                      |                    |
|----------------------|--------------------|
| 1. Upper Control Arm | 5. Rear Bushing    |
| 2. Front Bushing     | 6. Seal            |
| 3. Clamp Bolt        | 7. Knuckle Support |
| 4. Pivot Pin         |                    |

#### Installation

1. Assemble upper pivot pin through control arm and into knuckle support with Allen wrench hole in pin to the rear of car. Center pivot pin in knuckle support and install lock bolt, lockwasher and nut and tighten to 30-35 ft. lbs. Place new seals over ends of pivot pin.





Fig. 24—Centering Knuckle Support

2. Start front bushing onto pivot pin and then, keeping knuckle support centered (fig. 24) carefully index bushing threads into control arm.
3. Start rear bushing onto pivot pin and then carefully index bushing threads into control arm.
4. Thread bushings into control arm until heads seat and then tighten to 30-40 foot lbs. torque.
5. Install wheel and tire assembly, raise vehicle to remove stand jack and lower vehicle to floor.
6. Install lubrication fittings and lubricate.
7. Check and adjust caster and camber as outlined under "Front Wheel Alignment."

## STEERING ARM

1. Place jack under lower spring seat, raise the vehicle off the floor and remove wheel and tire.
2. Remove hub dust cap, cotter pin and wheel bearing adjusting nut.
3. Remove wheel hub and brake drum assembly from steering knuckle spindle.
4. Disengage brake shoe return springs and allow shoes to hang free.
5. Remove brake anchor pin.
6. Remove three nuts and bolts securing brake backing plate and steering arm to steering knuckle.
7. Drop steering arm free of steering knuckle and hang backing plate with wire to convenient frame or body bracket to protect brake hose.

8. Disconnect steering arm from tie rod end as outlined in "Steering"—Section 4.
9. To install, reverse above procedure and adjust wheel bearings and front end alignment as outlined earlier in this section.

## KINGPIN AND/OR BUSHINGS—FIGURE 25

### Removal.

1. Follow Steps 1 through 7 under "Steering Arm Removal."

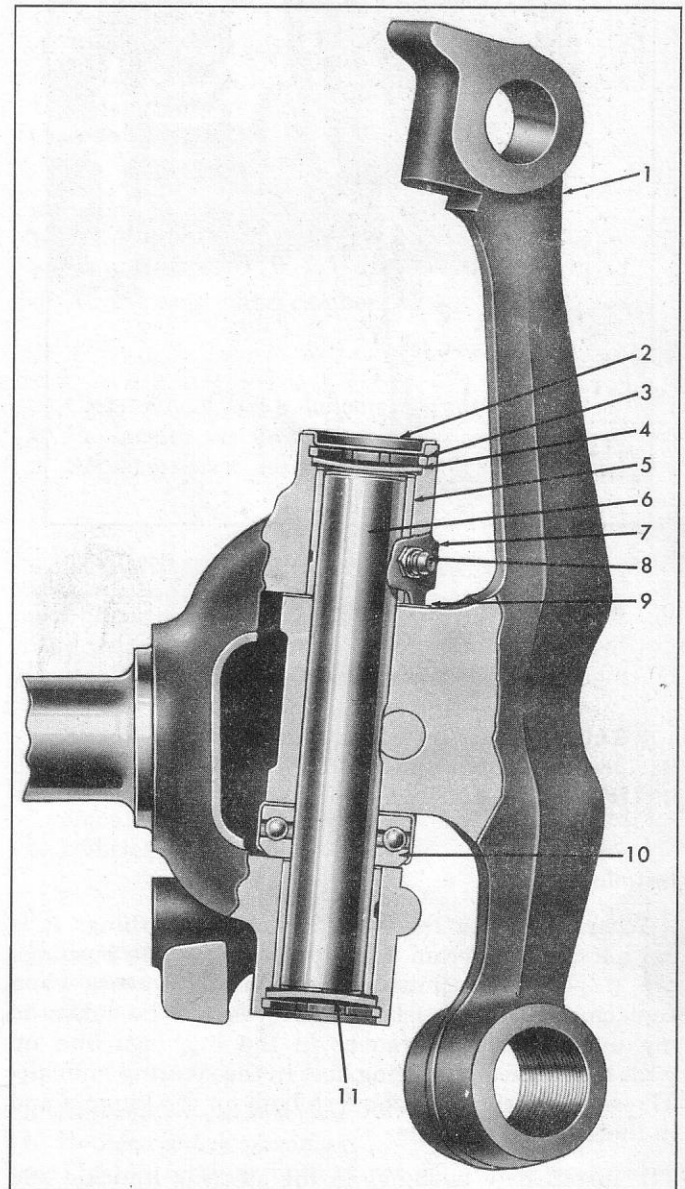


Fig. 25—Kingpin and Bushings—Cross-Section

- |                             |                      |
|-----------------------------|----------------------|
| 1. Steering Knuckle Support | 7. Steering Knuckle  |
| 2. Upper Bearing Cover      | 8. Grease Fitting    |
| 3. Lock Ring                | 9. Shim              |
| 4. Welch Plug               | 10. Thrust Bearing   |
| 5. Kingpin Bushing          | 11. Lower Welch Plug |
| 6. Kingpin                  |                      |

2. Remove the kingpin lock pin, then remove the upper kingpin bearing plug cover and the upper and lower lock rings.
3. Remove lubrication fittings.
4. Remove the kingpin bearing plugs. This can be done with a sharp drift punch by driving through the lower plug and forcing the kingpin upward until the upper plug is removed (fig. 26). The kingpin may then be removed by driving it out the bottom using a soft steel drift.

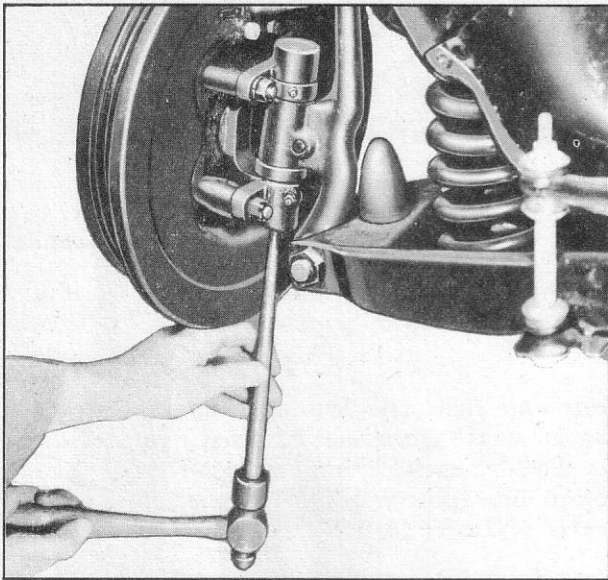


Fig. 26—Removing Kingpin Upper Bearing Plug

5. Remove steering knuckle and thrust bearing from the knuckle support and remove the floating bushings from the knuckle.

**CAUTION:** Extreme care must be exercised to prevent damage to hydraulic brake hose during this operation.

#### Installation

When replacing the kingpin floating bushings it is not necessary to ream them to size as service bushings are machined to finish dimensions. However, when replacing floating bushings, care should be taken to make sure the oil grooves in the bushings line up with the lubrication fitting hole in the steering knuckle. These bushings should be free both on the kingpin and in the steering knuckle.

1. Install new bushings in the steering knuckle and place the knuckle on the knuckle support. Then install the thrust bearing between the lower yoke

of the steering knuckle and knuckle support making sure that the shield on the bearing is toward the top.

2. Install the kingpin from the bottom, making sure to line up the lock pin slot with the lock pin hole in the knuckle support.
3. After the kingpin is installed, check the clearance between the steering knuckle and knuckle support with a feeler gauge (fig. 27). If this clearance is more than .006", install a steel shim between the steering knuckle and top of the steering knuckle support.

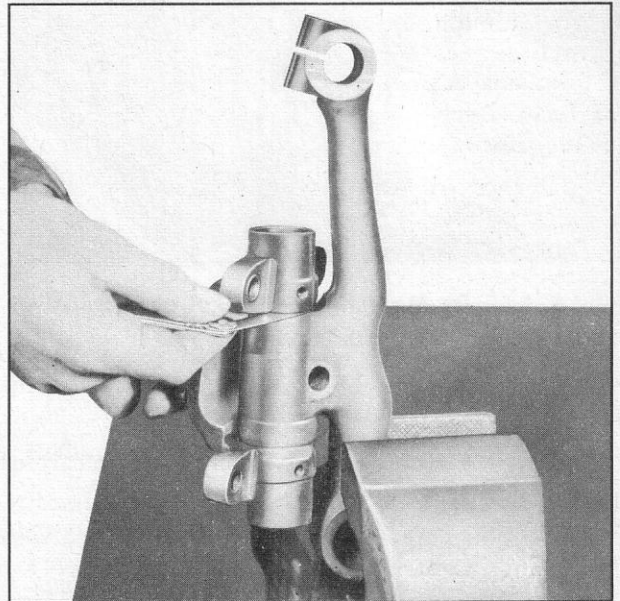


Fig. 27—Checking Steering Knuckle Clearance

**NOTE:** To prevent damaging the steel shim when installing kingpin, a pilot approximately 1 1/2" long can be made from an old kingpin. Use of this pilot will keep steel shim aligned and prevent damage to it during kingpin installation.

4. Install the kingpin lock pin, bearing plugs, lock rings and then install upper kingpin bearing plug cover.
5. Install lubrication fittings and lubricate.
6. Install front wheel and tire assembly and lower vehicle to floor.
7. Check and adjust front wheel toe-in as outlined under "Front End Alignment—Toe-In Adjustment."



## TROUBLES AND REMEDIES

## Symptom and Probable Cause

## Probable Remedy

**Hard Steering**

- a. Lack of lubrication.
- b. Tight kingpin bushings.
- c. Underinflated tires.
- d. Improper toe-in.

- a. Lubricate chassis and steering gear.
- b. If not corrected by lubrication, replace bushings.
- c. Inflate tires to recommended pressure.
- d. Adjust toe-in.

**Front Wheel Shimmy**

- a. Underinflated tires.
- b. Broken or loose wheel bearings.
- c. Improper toe-in.
- d. Worn kingpin bushings.
- e. Improper caster.
- f. Unbalanced wheels.

- a. Inflate tires to recommended pressure.
- b. Replace or adjust wheel bearings.
- c. Adjust toe-in.
- d. Replace worn parts.
- e. Adjust caster.
- f. Balance wheel and tire assemblies.

**Road Wander**

- a. Underinflated tires.
- b. Lack of lubrication.
- c. Improper toe-in.
- d. Improper caster and camber.

- a. Inflate tires to recommended pressure.
- b. Lubricate chassis and steering gear.
- c. Adjust toe-in.
- d. Adjust caster and camber.

**Wheel Tramp**

- a. Wheel assembly out of balance.
- b. Blister or bump on tire.
- c. Improper shock absorber action.

- a. Clean wheel and balance assembly.
- b. Replace or repair tire.
- c. Replace shock absorber.

**Excessive or Uneven Tire Wear**

- a. Underinflated tires.
- b. Improper camber.
- c. Improper caster.
- d. Improper toe-in.
- e. Wheels out of balance.

- a. Inflate tires to recommended pressure.
- b. Adjust camber.
- c. Adjust caster.
- d. Adjust toe-in.
- e. Balance wheels.

**Hard Riding**

- a. Shock absorber broken.
- b. Vehicle springs improperly lubricated.

- a. Disconnect shock absorber and test action; replace inoperative shock.
- b. Lubricate springs.

**Vehicle Bounce**

- a. Lack of fluid in shock absorber.
- b. Dirt in relief valve.
- c. Shock absorber broken.

- a. Replace shock absorber.
- b. Replace shock absorber.
- c. Replace shock absorber.

**Shock Absorber Noisy**

- a. Insufficient fluid.
- b. Dirt in relief valve.
- c. Grommets at upper or lower stems not compressed sufficiently or nut on rear shock lower eye not tight.
- d. Shock absorber broken internally.

- a. Replace shock absorber.
- b. Replace shock absorber.
- c. Tighten retainer nuts as specified or tighten rear shock eye retainer bolt nut.
- d. Replace shock absorber.

**Leaks Fluid**

- a. Sealing welds broken loose.
- b. Packing gland worn.

- a. Replace shock absorber.
- b. Replace shock absorber.

## SPECIAL TOOLS

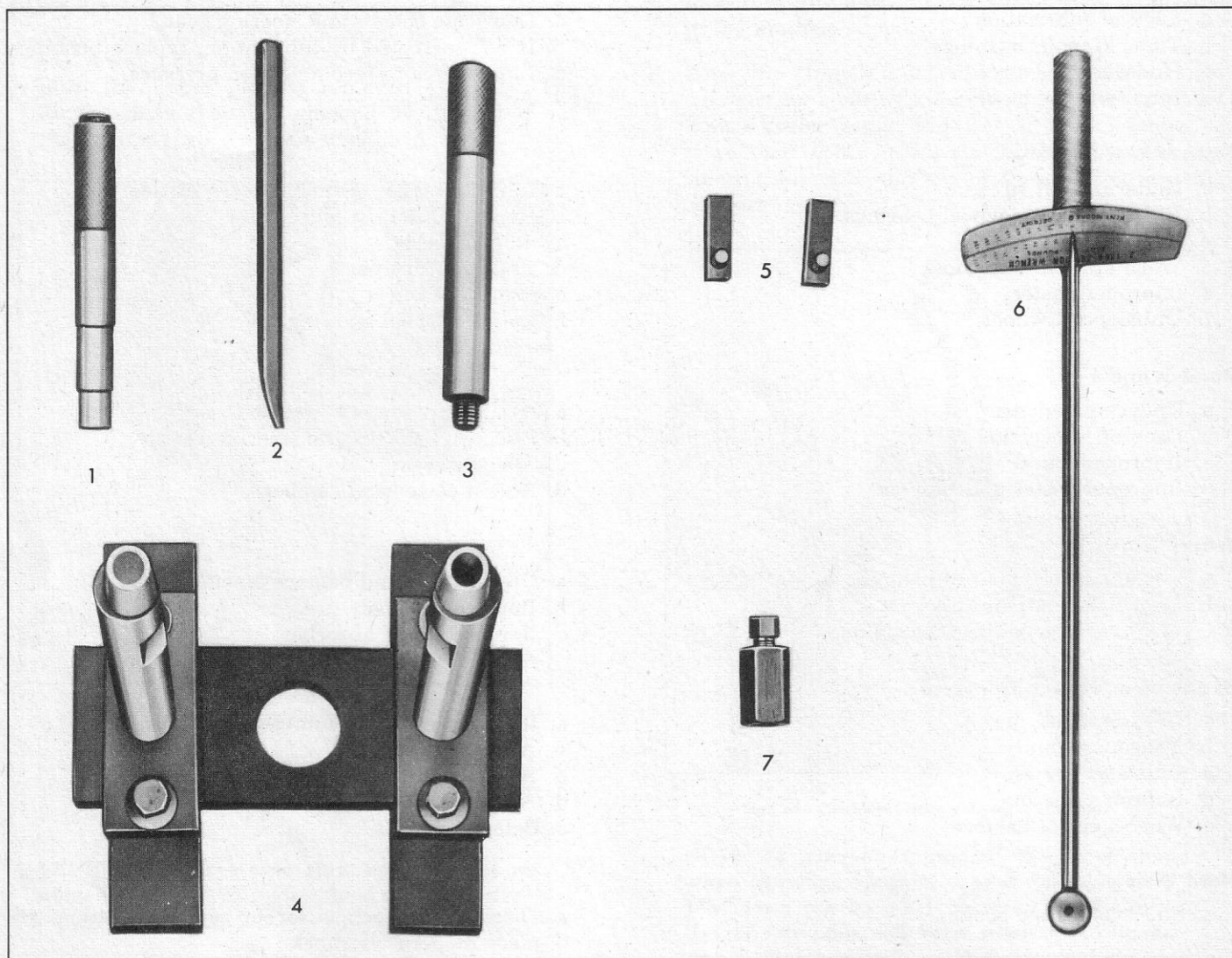


Fig. 28—Front Suspension Special Tools

- |                                           |                                                        |
|-------------------------------------------|--------------------------------------------------------|
| 1. Steering Knuckle Bushing Driver—J-8113 | 5. Lower Control Arm Assembly Gauge—J-3184             |
| 2. Wheel Bearing Cup Remover—K-224        | 6. Torque Wrench—J-1264                                |
| 3. Wheel Bearing Cup Inserter—K-463B      | 7. Upper Control Arm Shaft Remover and Replacer—J-2958 |
| 4. Hub Bolt Peening Tool and Anvil—J-554  |                                                        |