REAR SUSPENSION

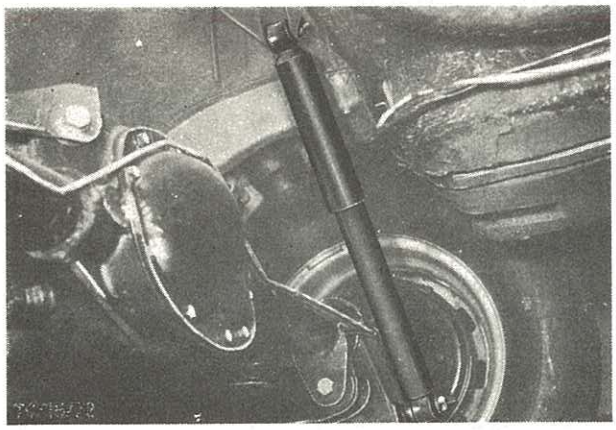

FIG. 28 — Shock Absorber Installation

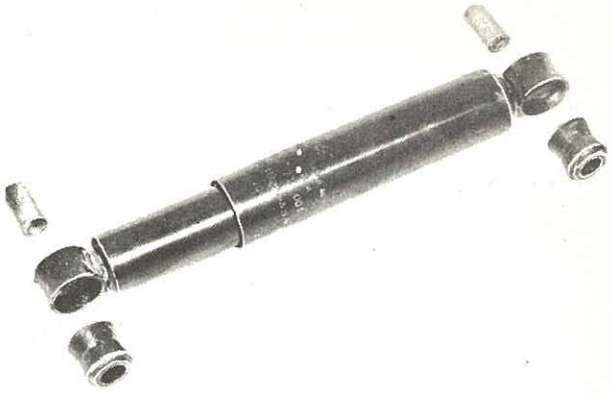

FIG. 29 — Shock Absorber Assembly

REAR SHOCK ABSORBER — REMOVE AND INSTALL

To Remove

1. Drive the car over a pit and detach the shock absorber mountings.

2. Remove the shock absorber.

NOTE — To replace the insulator bushes, press out the spacer sleeves and remove the bushes. To reassemble, first fit the insulator bushes then press in the spacer sleeves.

To Install

3. Position the shock absorber.

4. Insert the bolts and tighten the nuts.

MANUAL STEERING GEAR

STEERING GEAR AND LINKAGE

GENERAL DESCRIPTION

A safety steering column is fitted to this model. It consists of an outer energy-absorbing jacket and an inner torque-transmitting assembly.

The inner assembly has a steel tube which at the upper end sleeves over a solid spindle leading to the steering wheel hub mounting. Unintentional telescoping is prevented by spring steel inserts that connect the spindle to the inner tube. The outer jacket consists of two tubes, the upper tube being sleeved over the lower tube. A friction disc located in the bottom of the upper tube, between it and the lower tube controls the load required to collapse the tube assembly.

The bottom end of the outer jacket which is separated from the inner tube by a bush and the upper end separated from the spindle by a bearing. The steering column assembly is attached to the instrument panel with a special one-way breakaway bracket welded to the plain portion of the outer tube.

In the event of a collision, the bracket breaks away from the instrument panel, the inner spindle telescopes into the inner tube and the outer tube telescopes at a predetermined rate, so absorbing the energy of impact.

Movement of the steering wheel is transmitted by the steering shaft through a flexible coupling to the helically-toothed pinion. Rotation of the pinion causes the rack to move laterally and the tie rods, attached to the ends of the rack, transmit this movement to the steering arms and thus cause the road wheels to turn onto lock.

The rack and pinion steering gear is mounted in rubber insulators on brackets attached to the front cross-member.

The tie rod inner ball joints, attached to the rack, are protected by convoluted rubber bellows and the tie rod outer ball joints, attached to the steering arms, are protected by conventional gaiters.

0.2 l of oil, SAE 140 Hypoid, is put into the steering gear during manufacture and normally no further lubrication is required. On no account should the gear be completely filled with oil, this will result in a pressure build-up which could burst or blow off the bellows. The design and construction of the steering gear provides for two adjustments:—

(*a*) Rack slipper bearing adjustment.

(*b*) Pinion bearing pre-load adjustment.

Both these adjustments are obtained by varying the thickness of a shim pack under a cover plate. It is necessary to remove the gear assembly from the car to carry out any adjustment.

The tie rods are adjustable for length to permit toe-in setting and to ensure that the wheel lock angles are correct. The king pin inclination angles are set in production and no provision is made for altering them. Also, the lock stops are built in to the steering gear and no adjustment is possible.

WARNING: When the car is jacked up so that the front wheels are clear of the ground do NOT move the road wheels quickly from lock to lock. This will cause hydraulic pressure to build up within the steering gear and may burst or blow off the bellows.

SERVICE AND REPAIR OPERATIONS

Steering Gear

STEERING GEAR – ADJUST

1. Carefully mount the steering gear in a vice (with protected jaws) so that the pinion is horizontal and the rack pre-load cover plate is uppermost.

2. Remove the two bolts securing the rack pre-load cover plate to the casing.

3. Lift off the cover plate, shim pack and gasket. Withdraw the spring and slipper bearing.

4. Remove the two bolts securing the pinion bearing pre-load cover plate to the casing.

5. Lift off the cover plate, gasket, spacer and shims.

Set the pinion bearing preload

6. Remove any oil or grease from the face of the bearing and the shims and thoroughly clean the cover flange area and the cover.

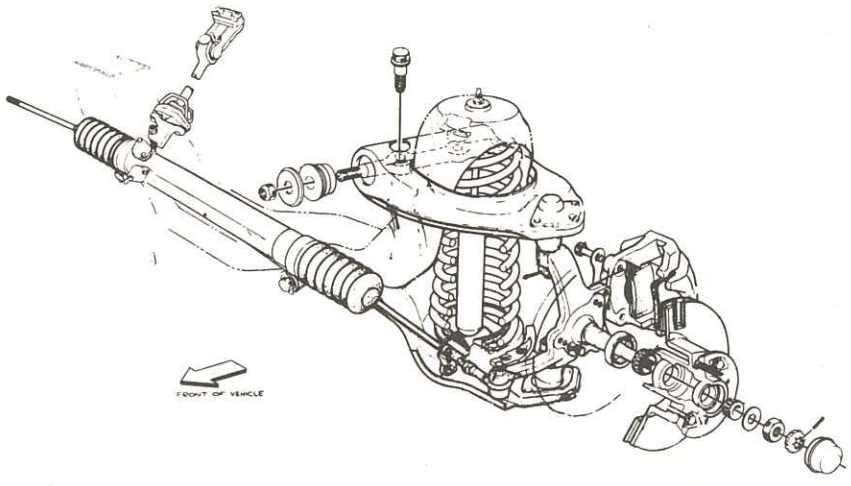

FIG. 1 — Steering Linkage

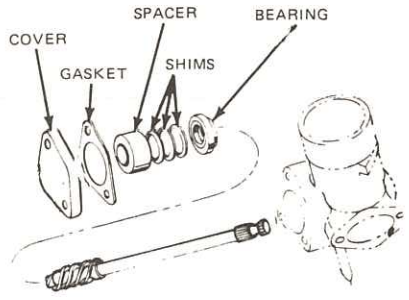

FIG. 2 — Pinion Bearing Cover and Shim Arrangement

7. Install a new gasket and fit shims between the lower bearing and the spacer, until the top of the spacer is flush with the gasket. Check with a straightedge, using light pressure.

8. Add one 0.13 mm shim to the pack in order to preload the bearings. The spacer must be assembled next to the pinion cover.

9. Install the cover and bolts to specification.

Set the rack slipper bearing adjustment

NOTE: For the spring to exert the correct pressure on the slipper, the distance between the underside of the cover plate and the top of the slipper must be set accurately.

The objective is to obtain a clearance 0.05 to 0.12 mm between the slipper bearing and the cover at the position of rack travel where clearance is at a minimum.

The gasket thickness is 0.25 ± 0.04 mm which compresses 0.07 mm when assembled.

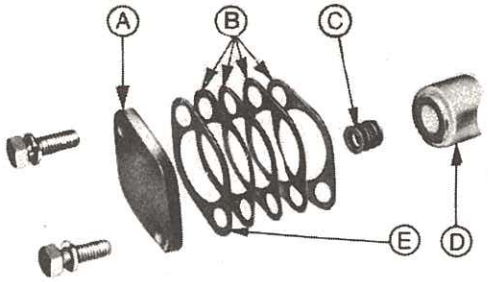

FIG. 3 — Support Yoke Arrangement

A – Cover plate.
B – Shims.
C – Spring.
D – Slipper.
E – Gasket

10. Lubricate the slipper and assemble it to the rear of the rack, pushing it fully home. Using a straight edge and feeler gauges, traverse the assembly from lock to lock and measure the minimum distance between the top of the slipper and the surface of the pinion housing. Note this dimension.

11. Assemble a shim pack (including gasket) the thickness of which is greater than the dimension obtained in sub-operation 9 by 0.15 ± 0.025 mm.

It is most important that this dimension is correctly set. If it is not it may result in 'knocking' from the steering gear or heavy or stiff steering.

12. Fit the spring into the recess in the slipper. Ensure that the correct spring is fitted.

13. Position the shim pack so that the gasket is adjacent to the cover plate and replace the cover plate.

14. Assemble the securing bolts to the cover plate, using sealer on the threads. Torque the bolts to specification.

15. Fit the pre-load gauge adaptor to the splined end of the pinion shaft. Assemble the pre-load gauge to the adaptor and lock in position.

16. Determine the torque required to start the pinion rotating.

This should be 565 to 1700 mNm. If the actual torque is not within the prescribed limits, the adjustment is incorrect (check the shimming) or there is some malfunction within the gear assembly (tight bearings, damaged gear teeth, lack of lubricant, etc.) which is increasing the friction level.

STEERING GEAR – REMOVE AND INSTALL

To Remove

1. Set the steering wheel in the straight-ahead position.

2. Jack up the front of the car and fit wheel stands.

NOTE: Wheel stands should be used, not chassis stands. Alternatively, the operation should be carried out on a lift.

3. Remove the clamp bar securing the flexible joint to the steering column.

4. Remove the split pins and slacken the castellated nuts securing the tie rod outer ball joints to the steering arms.

5. Separate the ball joints from the steering arms.

6. Remove the tie rod ends and the locknuts, noting the number of turns required to unscrew them.

7. Bend back the lock tabs and remove the bolts securing the steering gear to the crossmember. Remove the bolts and locking plates and withdraw the steering gear from the car.

To Install

8. Replace the locknuts and the tie rod ends, screwing them on the same number of turns required to remove them.

9. Check that the steering wheel is in the straight-ahead position.

10. Set the steering gear in the straight-ahead position.

11. Locate the steering gear and

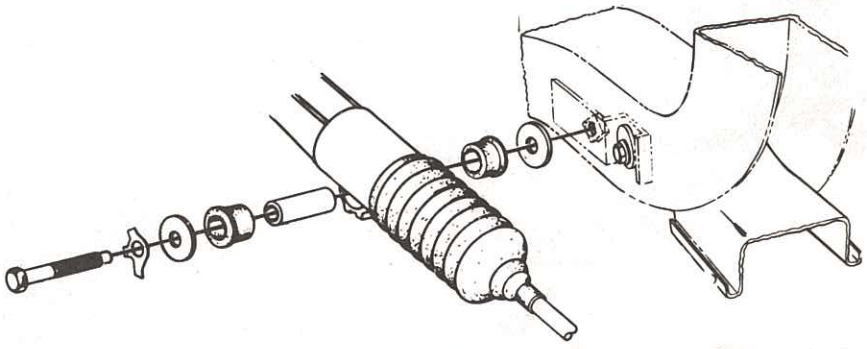

FIG. 4 — Installation Steering Rack to Crossmember.

align the flexible coupling with the steering shaft.

12. Check the condition of the steering gear mounting bushes and renew if necessary.

13. Secure the steering gear assembly to the crossmember. Use new locking plates under the bolt heads. Tighten the bolts and bend up the lock tabs.

14. Assemble the tie rod ends to the steering arms. Fit the castellated nuts, tighten, and fit new split pins.

15. Fit the flexible coupling to steering shaft clamp torque bolts to specification.

16. Jack up, remove wheel stands and lower the car to the ground.

17. Check the front wheel toe-in and lock angles.

18. Check position of steering wheel.

RACK BELLOWS – ONE SIDE – REPLACE

1. Remove the ball joint and locknut from the outer end of the tie rod. Note the number of turns required to remove the tie rod so that it can be replaced in the same location.

2. Slacken the clips securing the bellows to the tie rod and the steering gear casing.

NOTE: In production the inner end of the bellows may be secured with soft iron wire, not a screw clip. The soft wire should not be used more than once, a screw clip should be fitted in its place.

3. Pull off the bellows, taking suitable precautions to avoid spilling lubricant on the ground.

4. Drain the oil into a suitable waste container. To do this, the rack must be held vertical and traversed from lock to lock several times until all the oil is expelled.

To Install

5. Carefully mount the steering gear in a vice (with protected jaws) so that the end from which the bellows has been removed is uppermost.

6. Traverse the rack so that the upper tie rod is in the fully extended position.

7. Pour 0.2 litre of SAE 140 hypoid oil into the steering gear casing underneath the tie rod inner ball joint. Traverse the rack as necessary to assist the flow of oil.

8. Fit the new bellows in position and secure with the clips.

9. Refit the locknut and ball joint to the tie rod screwing them on the same number of turns required to remove them.

TIE ROD – REMOVE AND INSTALL – ONE SIDE
(Steering Gear Assembly removed)

To Remove

1. Drill out the retaining pin that locks the locknut and the ball housing in position. Take care not to drill too deeply. Max. depth 9.5 mm (0.38 in).

2. Screw the ball housing off the end of the rack shaft using both the ball joint spanners.

3. Remove the spring and ball seat from the recess in the end of the rack and discard.

4. Examine the ball housing and the ball formed on the end of the rod and discard if worn or damaged.

To Reassemble

5. Fit a new spring washer and ball seat to the recess in the end of the rack shaft.

6. Smear SAE 140 EP oil on the ball, ball housing and ball seat.

7. Assemble the ball housing to the tie rod. Screw the ball housing onto the rack shaft until the tie rod articulation becomes stiff.

8. Before measuring tie rod articulation effort, the tie rod must be rotated at least seven times to obtain a true reading.

9. Fit a piece of wire to the piston pull scale, and hook the wire round the the threaded area of the tie rod approximately 13 mm (½ in) from the end.

10. With the tie rod in the mid position of its range of articulation (i.e. parallel to the rack shaft) adjust the position of the ball housing on the rack until the effort required to move the tie rod, measured on the pull scale, is 2.26 kg (5 lb).

11. Tighten the locknut against the ball housing using the ball joint spanners. Check that the effort required to move the tie rod is still within specifications.

12. Drill a 3.2 mm diameter pilot hole and then drill out to

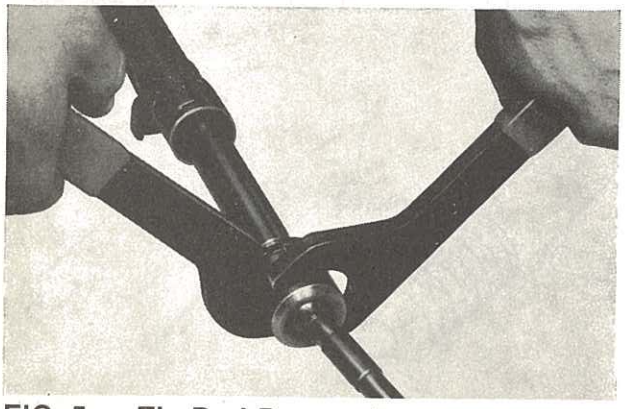

FIG. 5 — Tie Rod Removal

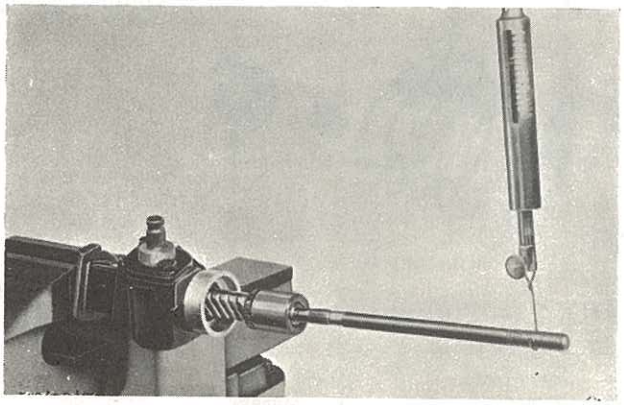

FIG. 6 — Tie Rod Pre-Load Check

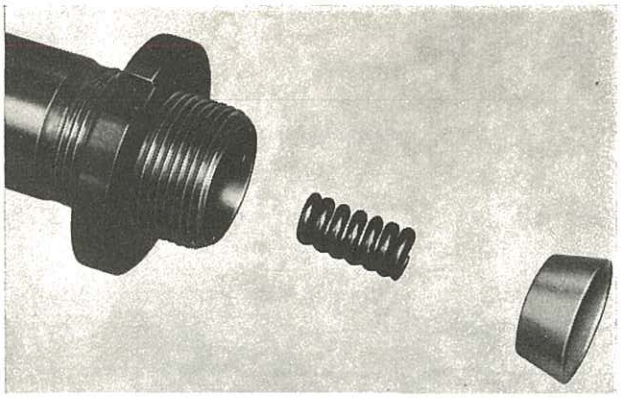

FIG. 7 — Fitting Spring and Ball Seat

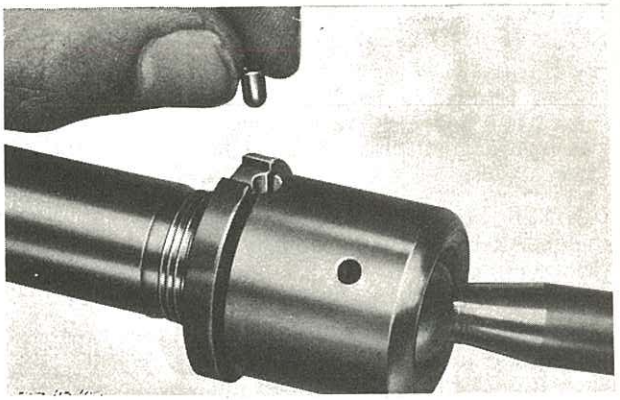

FIG. 8 — Fitting Retaining Pin

4.0 mm diameter, maximum depth 9.50 mm (refer sketch for location) to obtain a neat fit on the 4.0 mm diameter lock pin. The hole is located on the line of contact of the locknut and the ball housing, i.e. half the drilled hole will be in the locknut and half in the ball housing.

NOTE: A new hole must be drilled even if the halves of the existing hole align. If necessary file a flat or keyway to facilitate drilling a hole.

13. Insert the retaining pin and tap it into position. Peen the end of the hole to secure the adjustment. (Fig. 9.)

Note: No more than two holes may be drilled in either end of the rack.

INPUT SHAFT SEAL
REMOVE AND INSTALL

1. Clean the input shaft and seal area thoroughly. Do not scratch or damage the pinion shaft. Pry the pinion seal from its bore and discard.

2. Lubricate a new pinion seal with MIC-75-B lubricant or equivalent and install the seal over the shaft.

3. Use a piece of tubing to engage the outer flange of the seal, and press or tap the seal into its bore until flange is flush with the shoulder of the bore. **If the outer edge of the seal is not engaged when assembling, the seal will be damaged.**

STEERING GEAR OVERHAUL
(TIE RODS REMOVED)

To Dismantle

1. Remove the two bolts securing the rack pre-load cover plate to the housing.

2. Lift off the cover plate, shim pack and gasket. Withdraw the spring and the slipper bearing.

3. Remove the two bolts securing the pinion bearing pre-load cover plate to the housing.

4. Lift off the cover plate gasket, spacer and shims.

5. Lift the rack away from the pinion and push the pinion and lower bearing from the housing.

6. Withdraw the rack from the pinion end of the housing to avoid passing the rack teeth over the rack support bush.

7. Remove the upper pinion bearing spacer and the bearing.

8. Prise the pinion oil seal from the housing.

9. Check all parts for wear or damage. If the rack or the pinion teeth are damaged a complete new steering gear must be fitted. Examine the rack support bush and replace if necessary.

To Reassemble

10. Assemble the rack into the housing and locate it so that the teeth are adjacent to the pinion location. Position the rack shaft in the centre of its travel (i.e. the straight-ahead position) by measuring the rack protrusion at each end.

11. Hold the rack away from the pinion, locate the small spacer on the upper bearing and install the pinion.

The single pinion spline, with the four blocked serrations either side, must be on a centreline parallel with the rack centreline, and must face toward the right hand side.

12. Install the lower bearing on the pinion with the inner race protrusion toward the rack. Check and adjust the pinion bearing pre-load as described under Steering Gear Adjust.

13. Check and adjust the rack slipper bearing as described under Steering Gear Adjust.

14. Install a new pinion oil seal as previously described.

TRACK ROD END – ONE – REMOVE AND INSTALL

To Remove

1. With the handbrake applied, jack up the front of the car and fit wheel stands.

NOTE: Wheel stands, not chassis stands. Alternatively, the job may be carried out on a lift.

2. Slacken the locknut on the outer end of the tie rod adjacent to the ball joint.

3. Remove the split pin and nut securing the tie rod to steering

4. Detach the tie rod end from the steering arm.

5. Remove the tie rod end from the tie rod, noting the number of turns required to free it from he rod.

To Install

6. Screw the new end onto the rod using the same number of turns required to remove the old tie rod end.

7. Assemble the tie rod to the steering arm. Tighten the caselated nut and fit a new split pin.

8. Jack up, remove the wheel stands and lower the car to the ground.

9. Check the toe-in and wheel lock angles.

10. Tighten the locknut on the tie rod outer end to the specified torque, using a torque wrench with an open ended adaptor.

STEERING CONTROL

STEERING WHEEL – CENTRALISE

To Remove

1. Align the wheels in the straight ahead position.

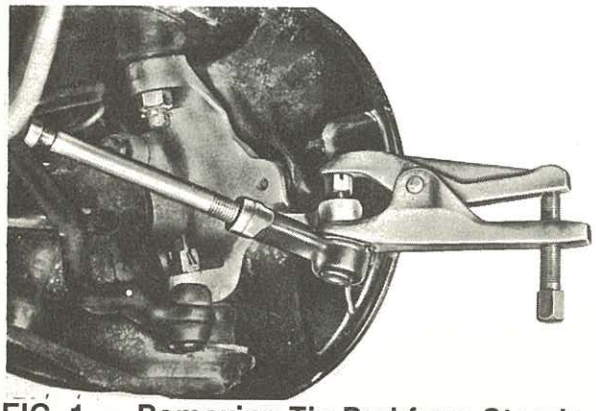

FIG. 1 — Removing Tie Rod from Steering Arm (Typical)

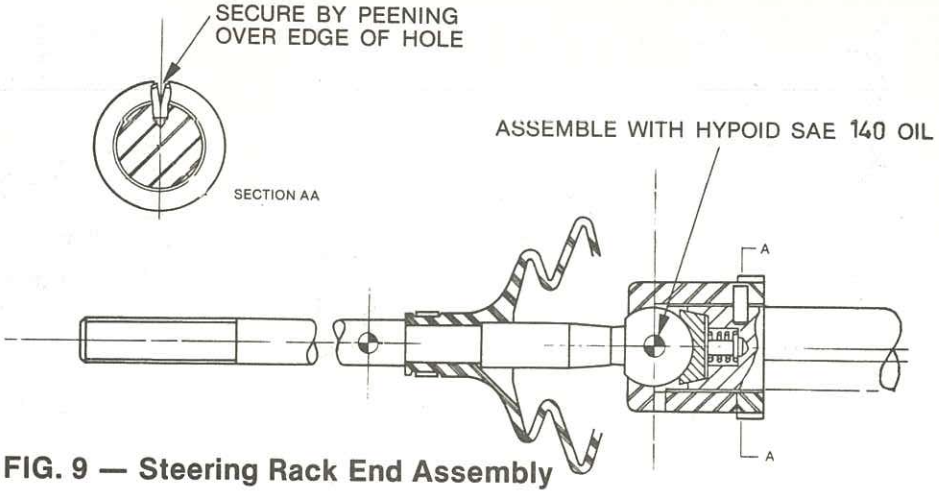

FIG. 9 — Steering Rack End Assembly

2. Disconnect the battery.

3. Working from the underside of the steering wheel spoke, remove the crash pad attaching screws. Lift the crash pad from the wheel.

4. Remove the steering wheel nut and then remove the wheel using a tool made up to the dimensions in Fig. 2 or using Litchfield tool No. E201.

Do not use a knock off type steering wheel puller or strike the end of the steering shaft with a hammer. Striking the puller or shaft will damage the collapsible column or bearing.

To Install

5. Align the steering wheel in the correct position and push onto the steering shaft. Secure with centre lock nut.

6. Refit the steering wheel crash pad.

7. Check steering wheel alignment.

STEERING COLUMN ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Disconnect the battery.

2. Remove the clamp bar securing the universal joint to the steering column.

3. Prise off the upper half of the column shroud and remove the three screws, take off the lower half of the shroud.

4. Disconnect the ignition switch wiring loom.

5. Disconnect the direction indicator and the windscreen wiper switch wiring looms.

6. Remove the column mounting bolts, and withdraw the assembly into the car.

To Install

7. Replace the column assembly, ensuring that the grommet at the bottom of the assembly locates in the dash panel, and the triangular shaft located in the universal joint clamp. Loosely assemble the clamp.

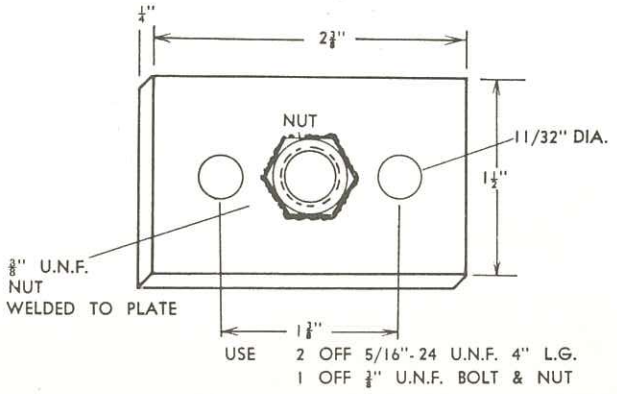

FIG. 2 — Steering Wheel Puller Dimensions