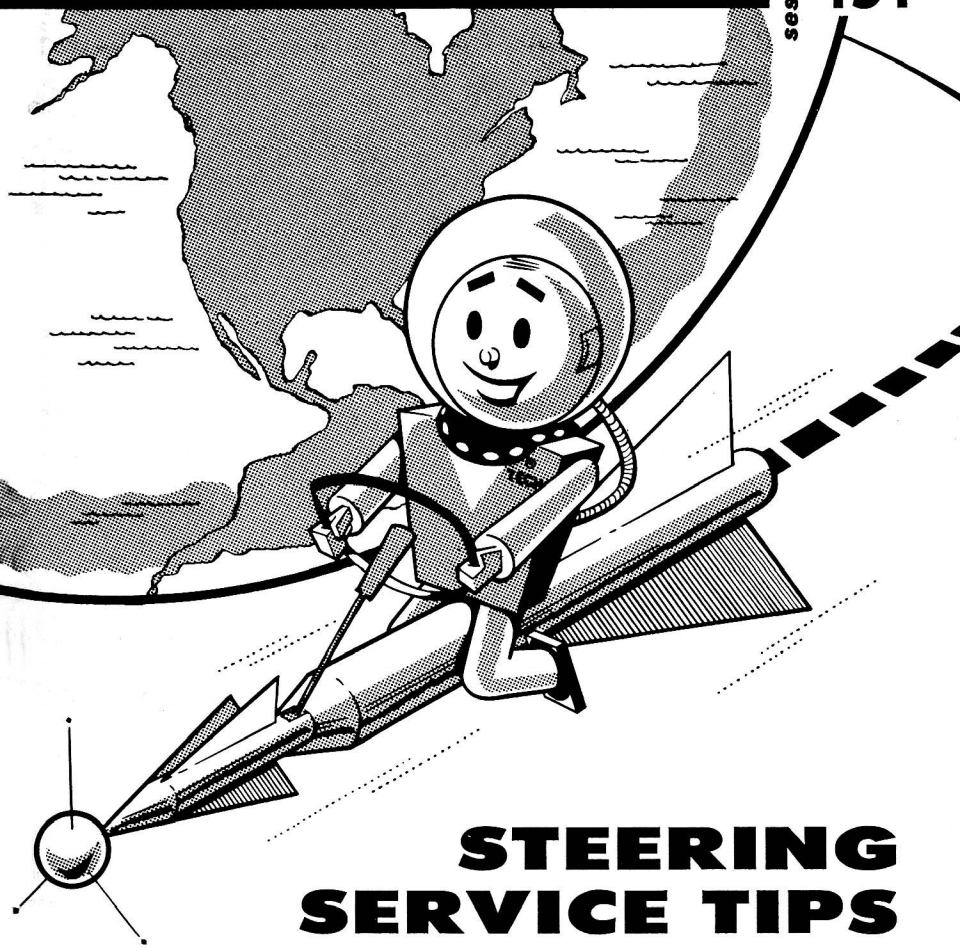
SERVICE REFERENCE BOOK

of the MASTER TECHNICIANS SERVICE CONFERENCE

session no. 151

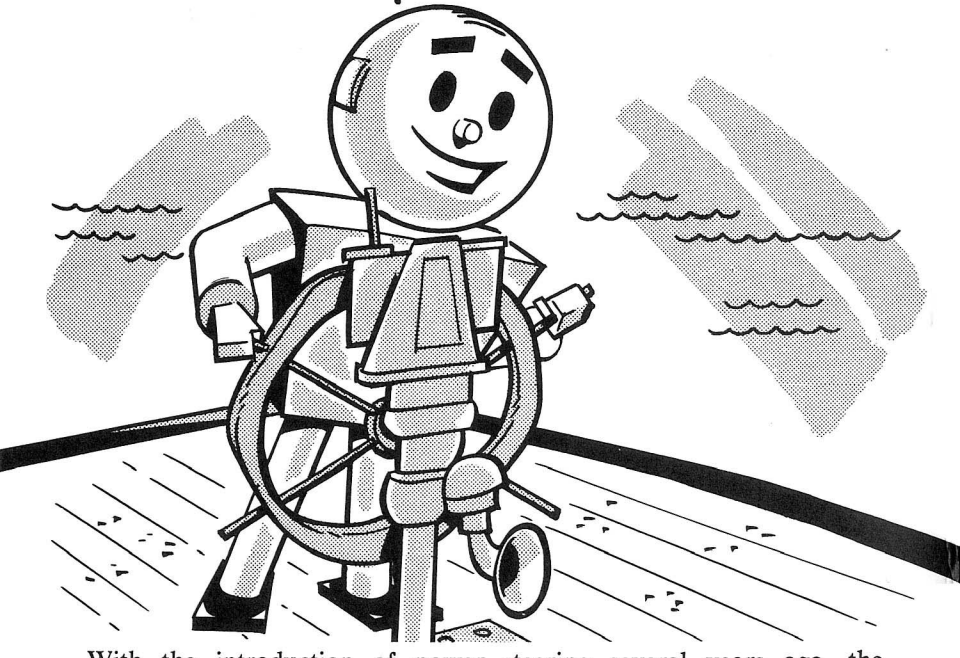


STEERING SERVICE TIPS FOR 1960

PREPARED BY CHRYSLER CORPORATION

Dodge • Plymouth-De Soto-Valiant • Chrysler and Imperial Divisions

TECH SEZ: "Good steering will keep you on course!"



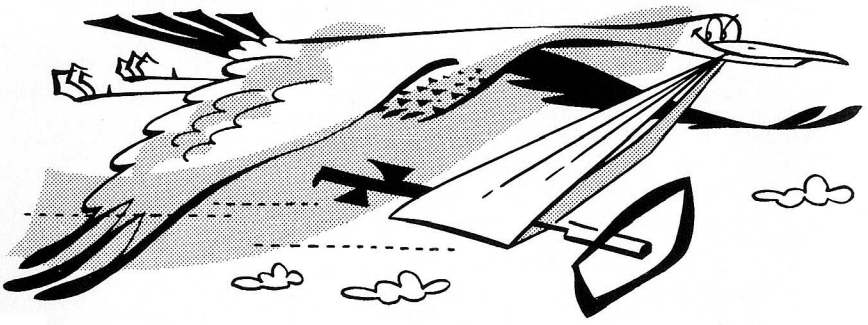
With the introduction of power steering several years ago, the probable impression was that manual steering would die a natural death.

Far be it from that! Improvements have just recently been made in the design of the manual steering gear used on our cars to provide not only easier operation, but easier and more positive alignment and servicing as well.

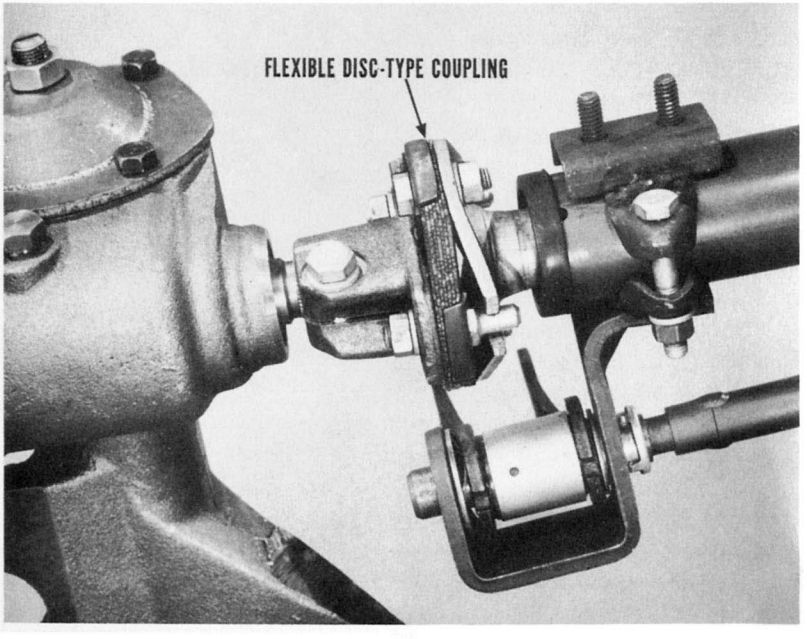
This reference book covers the new features and servicing procedures to follow to get best results.

Here's how the information is arranged for your reference:

NEW MANUAL STEERING GEAR



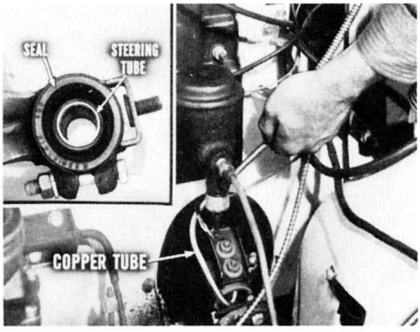
A new manual steering gear is currently being used on all models except Valiant. This new steering gear is easily identified by the flexible disc-type coupling between the worm shaft and the steering tube. These parts replace the single tube formerly used.



You'll notice the coupling, which looks and acts very much like a certain type of universal joint, is located just above the chuck. The coupling is made up of a flexible disc sandwiched between two steel hubs. The lower hub of the coupling is attached to the worm shaft by a serrated connection and clamp bolt. This shaft, which extends from the chuck, has a master serration which lines up with an index mark on the outside of the lower hub.

The upper hub is integral with the steering tube which extends up to the steering wheel in the conventional manner. This arrangement simplifies alignment of the worm shaft and tube.

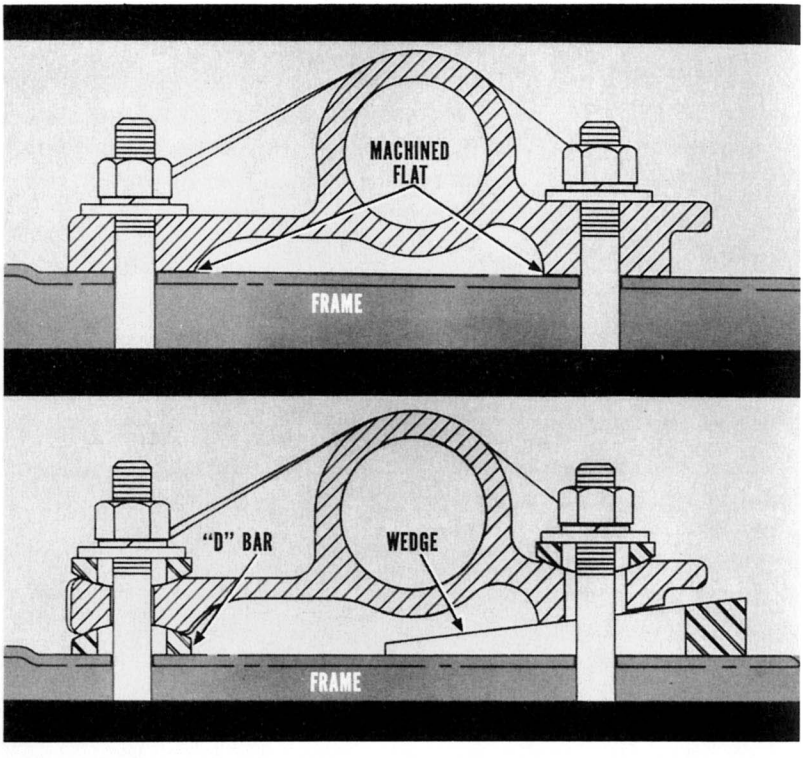
Column Jacket Seal. A new, rubber, lip-type jacket seal is used in the lower end of the jacket to seal around the steering tube.



This seal requires periodic lubrication to prevent it from squeaking. Therefore, at intervals of 5,000 miles, or oftener if a squeak develops, apply a coating of wheel bearing lubricant to the lips of the seal. The lubricant can be applied through a 12-inch length of copper tubing, flattened at one end, and bent at an angle to contact the seal lip area on the steering tube.

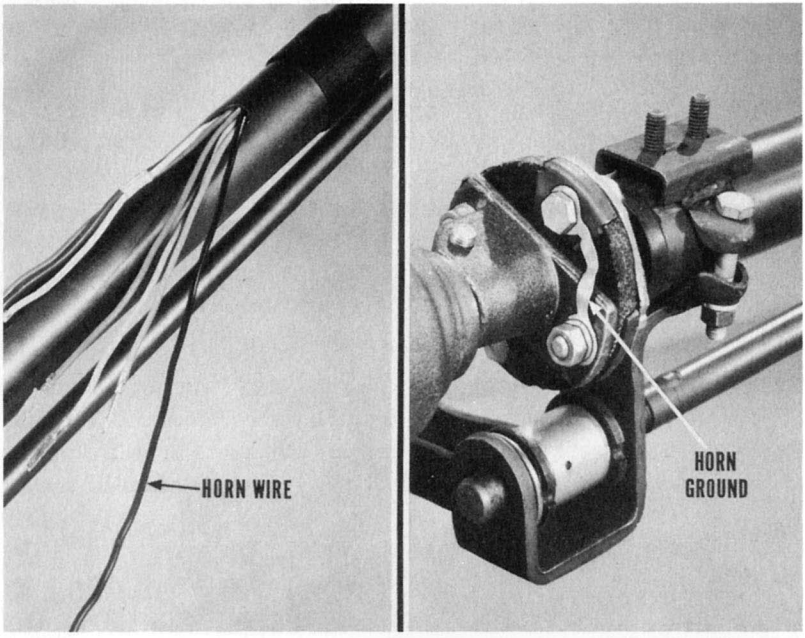
Chuck. Other than using a new, short worm shaft and a new worm shaft oil seal, the internal parts of the chuck remain the same as in the former unit.

Gear Mounting. A simplified method of mounting the new gear is used. The face of the gear housing is now machined flat, instead of at different levels, so it rests flush against the inner face of the frame side rail. It is attached by three bolts, washers and nuts. The "D" bar and the wedge, which were used with the former gear, are not used with this new gear mounting.

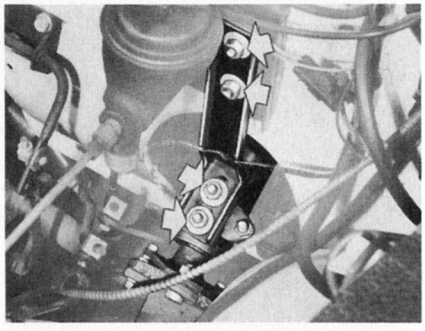


The new steering gear provides several benefits for both the car owner and the service technicians. First, the flexible coupling reduces the transmission of road shock and noises into the car. Service technicians like the new gear because the new mounting and the flexible coupling make the job of aligning the gear and steering column much easier and more positive than with the former unit.

Horn Wire Routing. The horn wire formerly extended down through the steering tube and out the lower end of the gear housing. Because of the new flexible coupling construction, the horn wire now leaves the column jacket with the directional indicator wires, above the coupling. In addition, a copper ground strap is attached to the underside of the coupling to complete the horn ground circuit.



Steering Column Bracket. A new steering column bracket is used at the lower end of the jacket to secure the jacket to the dash panel. There are two different types used—one for cars using standard brakes and another for cars using power brakes.

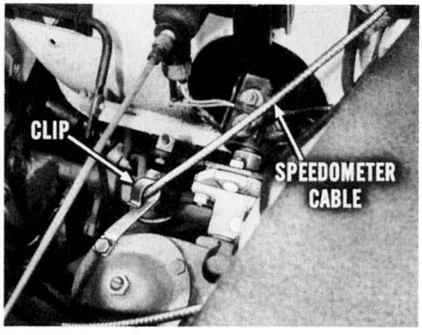


Jacket Clamp. In addition, cars equipped with manual transmission use a new stamped jacket clamp in place of the die casting type formerly used at the lower end of the gearshift tube. This clamp offsets the lower end of the gearshift tube from the jacket, toward the engine. This arrangement provides the necessary clearance between

the lower end of the clamp and the clutch linkage torque shaft to prevent interference between these parts.

Cable Positioning. When you're preparing a new car for delivery, or when installing the gear after servicing it, it's a good idea to see that the speedometer cable and the gearshift cable (on cars equipped with automatic transmission) are kept clear of the steering gear coupling. On some early models, the two cables were routed over the coupling without a support. If not enough clearance was provided, the cables could be damaged by coming in contact with the coupling.

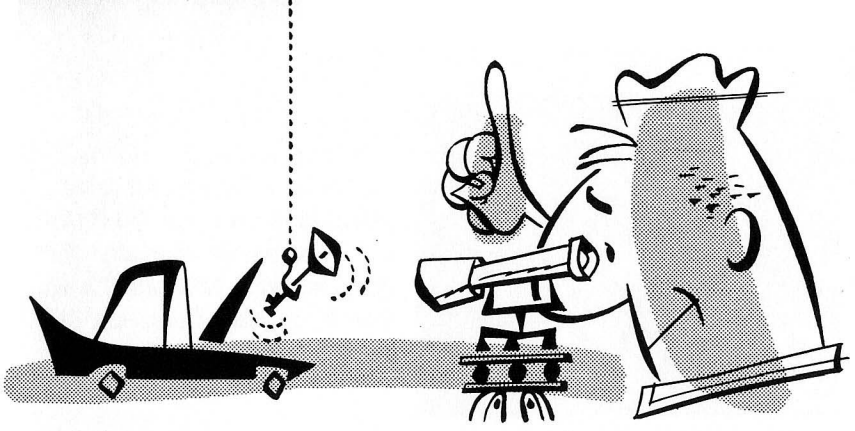
On later models, a rubber-coated clip was installed to route the cables away from the coupling. It is possible, under certain conditions, for the cables to get out of place. So look the car over carefully and see that the end of the clip is properly bent over to secure the cables. On early models without the clip, it might be advisable to install one to assure the proper clearance. You can make a clip that will do the job—just be sure to wrap it with tape so it won't chafe the cables.



INSTALLATION AND ALIGNMENT OF GEAR

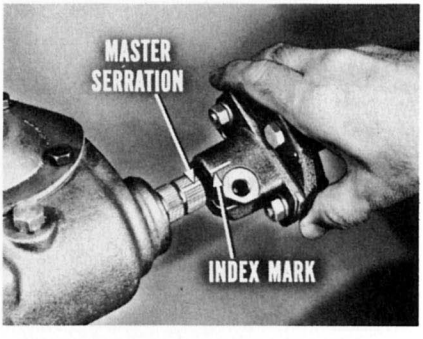
The following procedure should be followed when reinstalling the gear after it has been removed for servicing.

Locate the gear on center by rotating the worm shaft from one limit of its travel to the other, counting the number of turns. Then, turn the worm shaft back *one-half* the number of full turns. This is the exact center of travel, or high point of the gear.

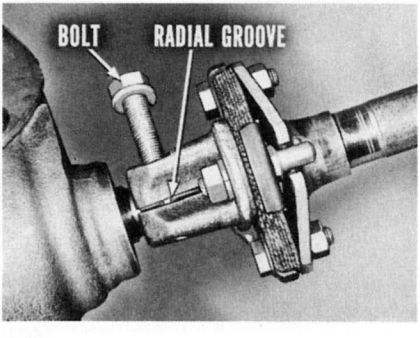


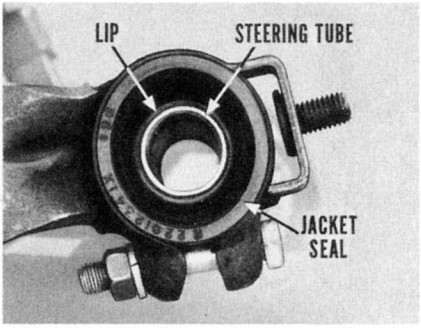
Next, locate the master serration in the outer row of serrations on the worm shaft and mark it for easy identification. Then, position the chuck in the engine compartment.

Align the index mark on the outside of the lower hub with the marked master serration on the worm shaft. Then, slide the coupling on the worm shaft. Next, mount the gear housing to the frame side rail and tighten the attaching bolt nuts to 50 foot-pounds torque.

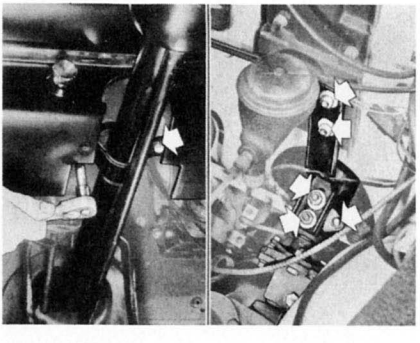


Position the clamp bolt hole in the coupling hub in line with the radial groove on the worm shaft, and install the bolt and lock washer. Tighten the clamp bolt to 30 to 35 foot-pounds.

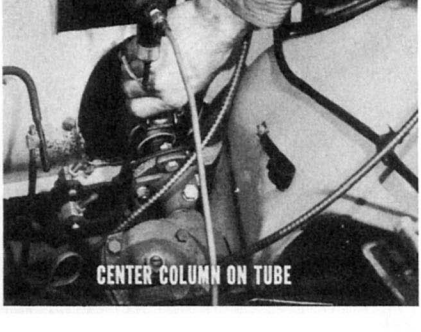




It is important that the steering tube be centered in the jacket seal, and that the lip of the seal which contacts the tube be well lubricated with wheel bearing lubricant to avoid squeaks.

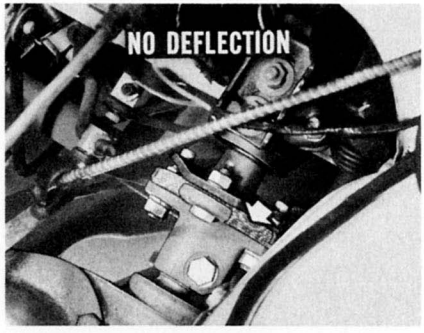


If the tube is not centered, loosen the steering column bracket bolts at the instrument panel. Then, loosen the column clamp bolt nut and the steering column bracket stud nuts at the dash panel and at the clamp.



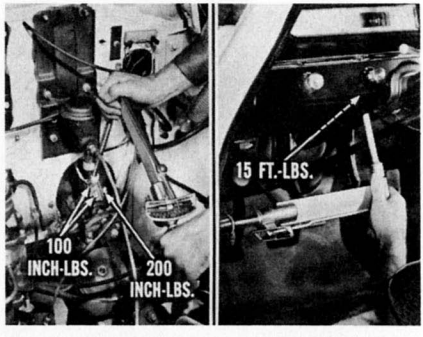
Hold the steering column so it is centered on the tube, and at the same time align the steering column bracket and the column clamp.

Carefully examine the coupling disc to be sure there is no distortion or deflection. If there is any visible deflection, move the jacket up or down, as required, to correct the condition.



While holding the jacket in position, tighten the column bracket stud nuts at the dash panel and the column clamp to 100 inch-pounds torque.

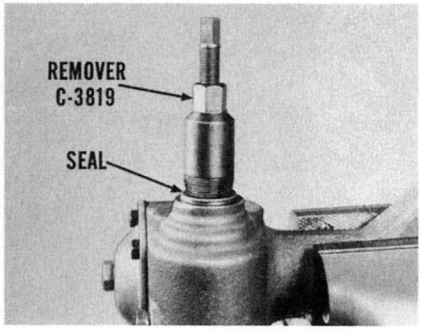
Then, tighten the steering column clamp bolt nut to 200 inch-pounds.



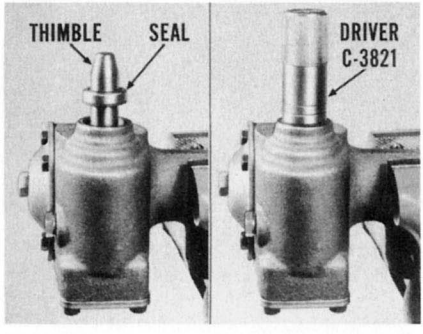
Finally, tighten the instrument panel steering column bracket bolts to 15 foot-pounds. Then, re-examine the coupling disc for deflection.

SERVICING THE CHUCK

Servicing the chuck follows much the same procedure as that prescribed for the former unit, with two important exceptions. The chuck can be removed by disconnecting the flexible coupling, so it is not necessary to remove the steering column. And, the worm shaft seal can be replaced without removing the shaft. Two new tools are required to replace the seal. The seal is removed by using Remover C-3819, and installed by using Seal Driver and Thimble C-3821. The procedure for replacing the seal is as follows:



Thread the Seal Remover into the seal until it engages the metal portion of the seal. Then, turn the puller center screw to withdraw the seal from the housing.



To install the seal, first place the Thimble over the serrations on the worm shaft to protect the lip of the seal. Then, carefully drive the seal into the housing until it stops against the counterbore.

DIAGNOSIS

Hard Steering

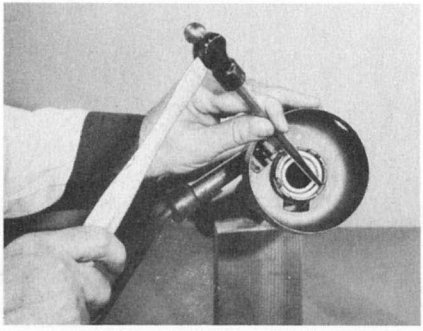
When servicing a manual steering gear because of hard steering or wander, first be sure that the factors of wheel alignment are correct, that the gear is properly adjusted, that parts are properly lubricated, and that tires are properly inflated. If the trouble still exists, inspect the column jacket upper bearing. If the bearing is damaged or rough, because of improper installation, it will develop considerable friction and cause hard steering. In the case of power-steering-equipped cars, poor returnability will be experienced.

Jacket Upper Bearing Installation. This bearing seats on three supporting lugs formed by depressions in the upper end of the jacket. It is then held in place by crimping down three tabs on the upper end of the jacket. It is important that the bearing be seated completely before the crimping operation is performed. It is also important that the jacket be perfectly round so it does not pinch the bearing. If either of these precautions is not observed, brinneling could occur, which would result in the hard steering condition.

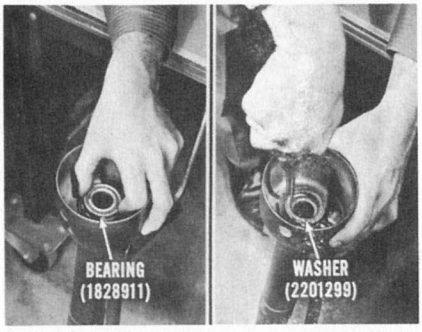
To inspect the bearing, it is necessary to remove the steering wheel and column jacket. Before removing the jacket, remove the upper snap ring from the upper end of the tube, using Pliers C-3229.

Then, slide the jacket off the tube.

Next, carefully bend back the three tabs which retain the bearing, being careful not to break them off. When you remove the bearing, note its position in the jacket. If the clearance around the bearing is uneven, the trouble probably is due to an out-of-round condition of the jacket. It can be reshaped if it is not too badly distorted. If the distortion is too great, the jacket should be replaced.



Install the new bearing, part number 1828911, with the nylon ball separator, in the jacket with the radius on the inside diameter of the bearing facing downward. See that the bearing seats squarely on the three supporting lugs in the jacket. Then, press it firmly into place. Next, place the washer, part number 2201299, on top of the bearing.



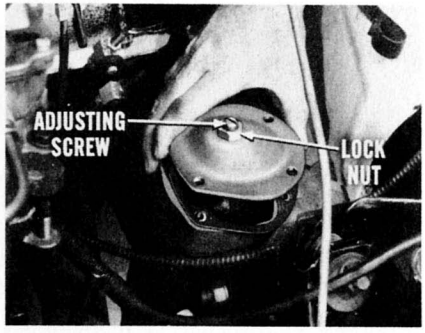
Complete the installation of the bearing by crimping the three tabs to retain the washer and bearing. Bend the tabs down to an angle of about forty-five degrees instead of ninety degrees, so the bearing will be free to turn.

Before installing the jacket on the steering tube, carefully examine the snap ring just below the spacer spring on the tube to see that it

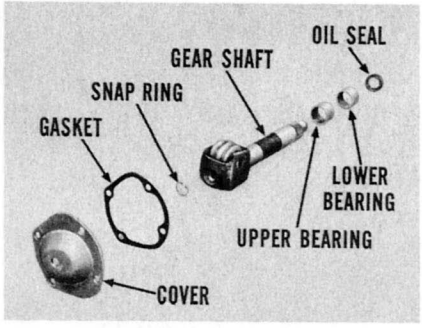
is fully seated in its groove. If it is not, or if it is distorted, install a new ring. Then, install the jacket on the steering tube, and install the washer and snap ring.

Loose Snap Ring In Gear Shaft. Another source of hard steering on some early models can be traced to the snap ring, which secures the adjusting screw in the steering gear shaft, becoming unseated.

In order to inspect for this condition, the steering gear cover must be removed from the gear housing. First, remove the four cover screws. If the cover can be lifted off with the adjusting screw and lock nut intact, the snap ring is out of its groove in the gear shaft.



If the snap ring is out of place, it is because the snap ring groove is too shallow. The chuck should then be removed from the car and placed on the bench for disassembly and repairs. The gear shaft, snap ring, oil seal and cover gasket should be discarded and replaced with new parts. The two housing bearings and housing cover should be thoroughly cleaned and carefully inspected for damage, and replaced if not serviceable.

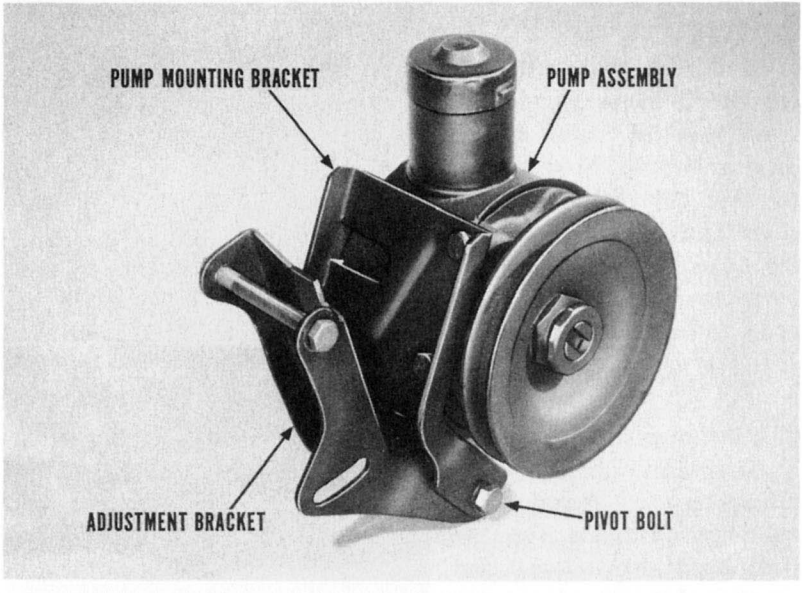


After the unit has been reassembled, install it in the car and align it as instructed under Installation and Alignment of Gear.

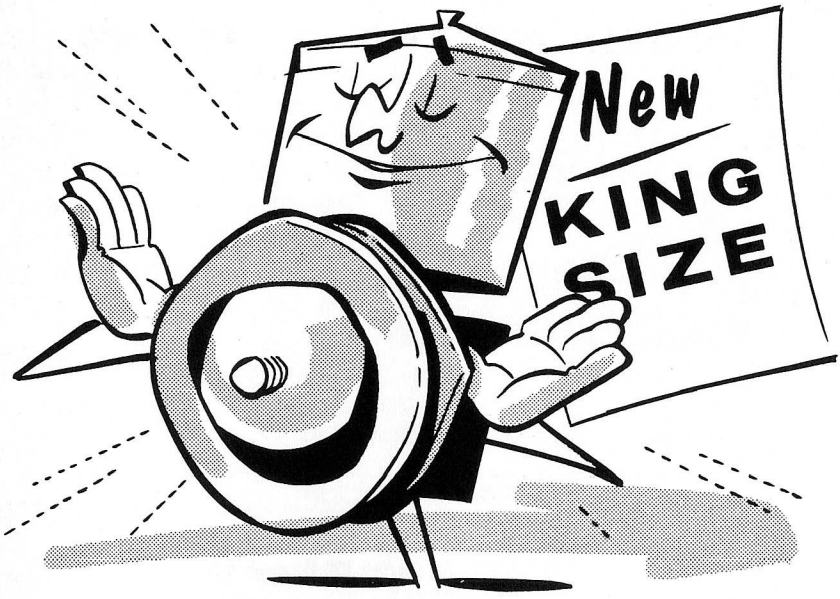
POWER STEERING PUMP AND LOAD REACTION BELT TENSIONER

Power Steering Pump

A new slipper-type power steering pump which incorporates a new reaction mounting bracket is now being used on all V-8 engines with displacement of 361 cubic inches or more.

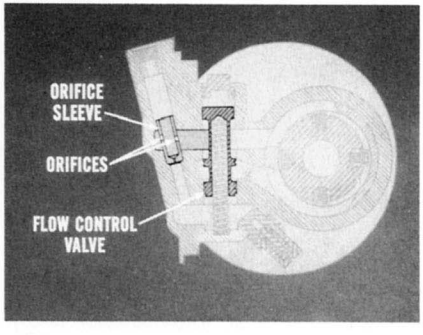


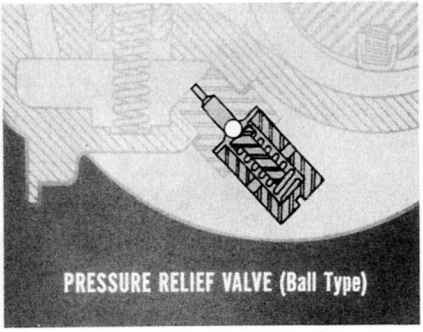
While the new pump is the same basic slipper-design as used formerly, the pump is of larger capacity and the individual parts are not interchangeable with the former pump. For example, the diameters of the reservoir and the mounting flange are increased from 4⅝″ to 5⅛″.



In addition, the diameter of the pump shaft and shaft seal have been increased. As a result, this larger pump has a twenty-five percent greater capacity than the former one. That lets the pump move a larger volume of fluid at the same speed, so both pump and belt life are lengthened. Along with the larger capacity, there are new flow control valve and pressure relief valve characteristics.

Flow Control Valve. The flow control valve does not have the orifices such as were used in the former valve. Instead, it is a new solid, spring-loaded flow control valve. There's a separate orifice sleeve pressed in the pump outlet passage in the pump body. Two orifices in the sleeve line up with the flow of fluid from the control valve.



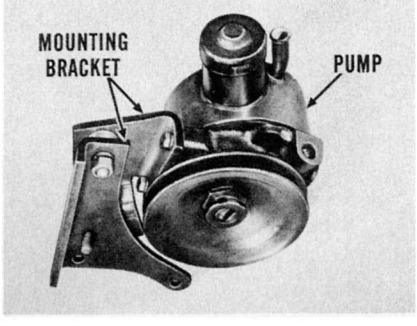


Pressure Relief Valve. The new pressure relief valve is a ball-type valve instead of the disc-type valve formerly used, and is serviced as an assembly. The valve is supplied in three different capacities, and each valve is marked on the hexagon section for easy identification.

The following chart lists the different capacities, passenger car and truck models on which they are used, and the individual identifying marks stamped on the hexagon section of the valve body.

CAPACITY P.S.I.	MODEL APPLICATIONS		IDENTIFICATION MARK
	CARS	TRUCKS	
900–1000	–	Series 100 through 600	□
1000–1100	All except Imperial	Series 700 through 1000	△
1150–1300	Imperial	–	○

CAUTION: When installing the relief valve assembly, it is important that the valve specified for the particular car or truck model being worked on be used. If the wrong valve is used, incorrect pressure gauge readings will be obtained when taking pump pressure readings.



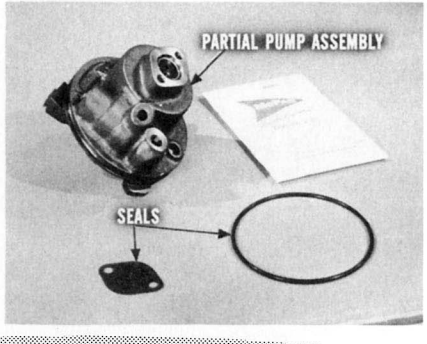
Truck Model Pump

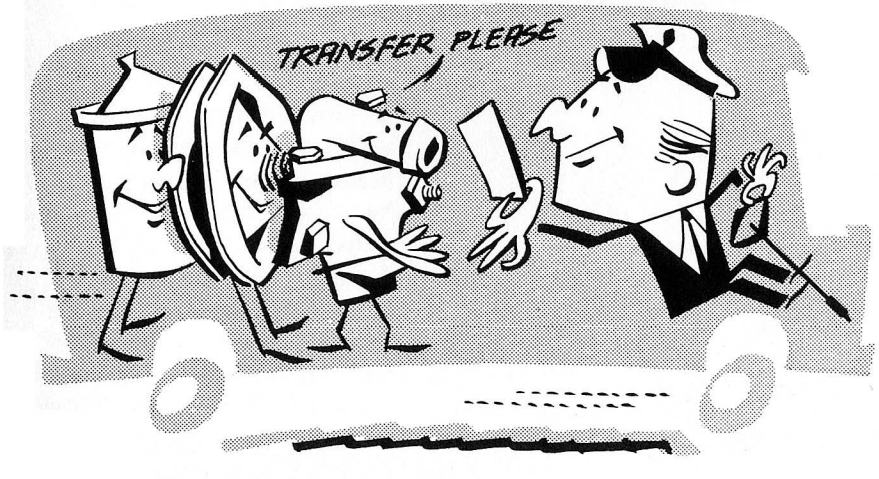
The same basic pump, but with some internal differences in flow control and pressure relief characteristics, is used on V-8 truck models.

Flow Control Valve. The flow control valve is the same as in the other pump. However, the two orifices in the orifice sleeve are larger diameter than those in the passenger car pump, to allow for greater volume of fluid to flow through the system. The truck pump flow is three and three-quarters gallons per minute as compared with two gallons per minute in passenger car pumps.

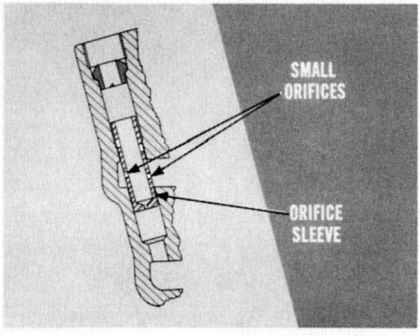
Service Parts

An arrangement has been set up to service parts for this new pump for both passenger car and truck models. Servicing this pump has been simplified by making the same replacement parts package available for all models. This pump parts package, part number 2196082, consists of a partial pump assembly, with seals. You transfer the reservoir, pulley and relief valve from the used pump to the new pump if they're serviceable. If not, replace them with new parts.



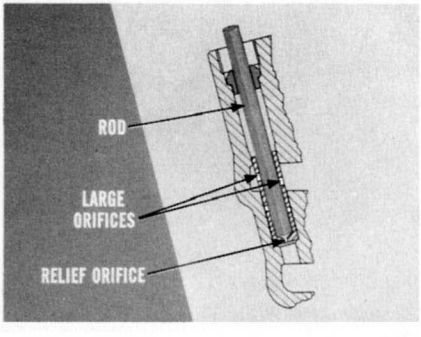


The outlet passage in the service pump is counterbored deeper than in the production pumps. The orifice sleeve is provided with two sets of orifices, one set of small orifices near the lower end for passenger car models and another set of larger orifices near the top for truck models. The replacement pump is furnished with the orifice sleeve positioned so the *small* orifices are in line with the flow of fluid from the rotor —as required for passenger car installation. The upper set of orifices is blocked off because of the position of the sleeve.



When the pump is installed on a truck, the orifice sleeve must be positioned with the *large* orifices in line with the flow of fluid from the rotor to provide the greater volume of fluid required for truck operation.

CAUTION: Under no circumstances should the truck pump, or the service pump with the orifice sleeve in position for truck service, be used in a passenger car because it will cause overheating of the pump fluid.



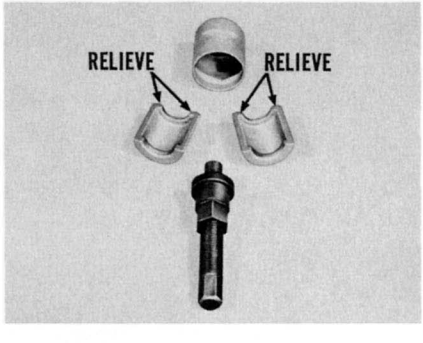
The sleeve may be positioned deeper in the passage by using a length of ¼-inch round steel rod to drive it down to the bottom of the counterbore. Be sure there is a slight chamfer on the end of the rod so you don't damage the relief orifice in the lower end of the sleeve.

Because there should be no interchanging of passenger car and truck pumps, and there are no identifying marks on the pump regarding the position of orifice sleeve, you can be sure of using the correct pump by measuring the depth of the sleeve in the outlet passage. On passenger car pumps the measurement from the top of the outlet passage to the bottom of the sleeve is $2\frac{17}{32}$ inches. On truck models, the dimension is 3 inches. A rod inserted into the outlet passage is a convenient method of making this measurement.

When reassembling the pump, carefully examine the identification on the pressure relief valve and check it against the chart to be sure it is the correct valve for the car you are working on. Use a new gasket under the valve.

Pump Maintenance Procedure

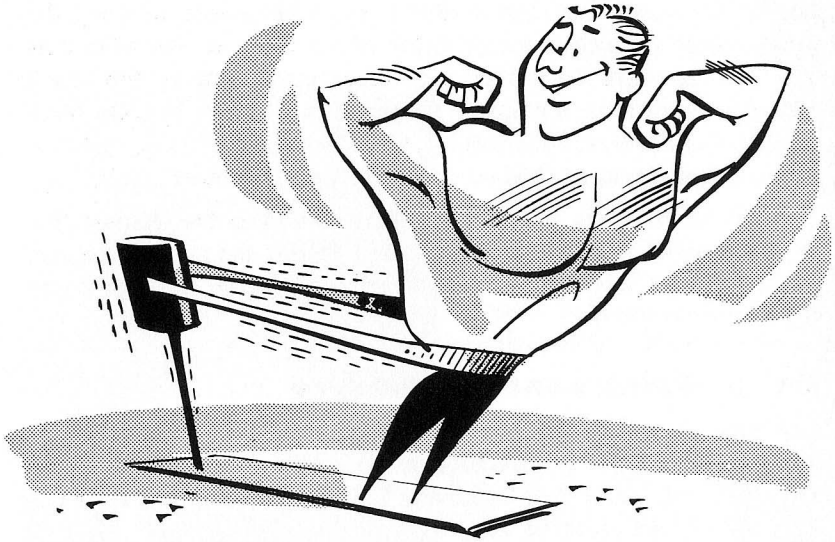
The procedure for servicing this new pump is the same as for the former pump. However, because of the larger diameter pump shaft and shaft seal, a new Seal Removing Tool C-3783 and Seal Installing Tool C-3782 are required. Although the hub on the pulley is slightly larger than the former hub, Puller C-3615 can be used by reworking the two self-locking jaws. The jaws may be reworked by just slightly relieving the inside diameter at the ends until they fit over the hub flange.



Belt Tensioner

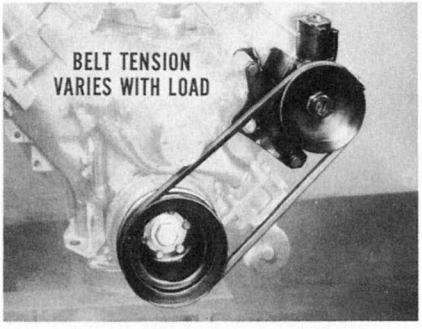
The reaction mounting bracket is an automatic belt tension controlling feature called Load Reaction Belt Tensioner. This new mounting is a combination mounting bracket and adjustment bracket. The two brackets and a pivot bolt operate together to provide a flexible pivot-type mounting. This does not mean, however, that it is no longer nec-

essary to adjust the pump belt. On the contrary, the belt must still be adjusted to provide its basic tension.



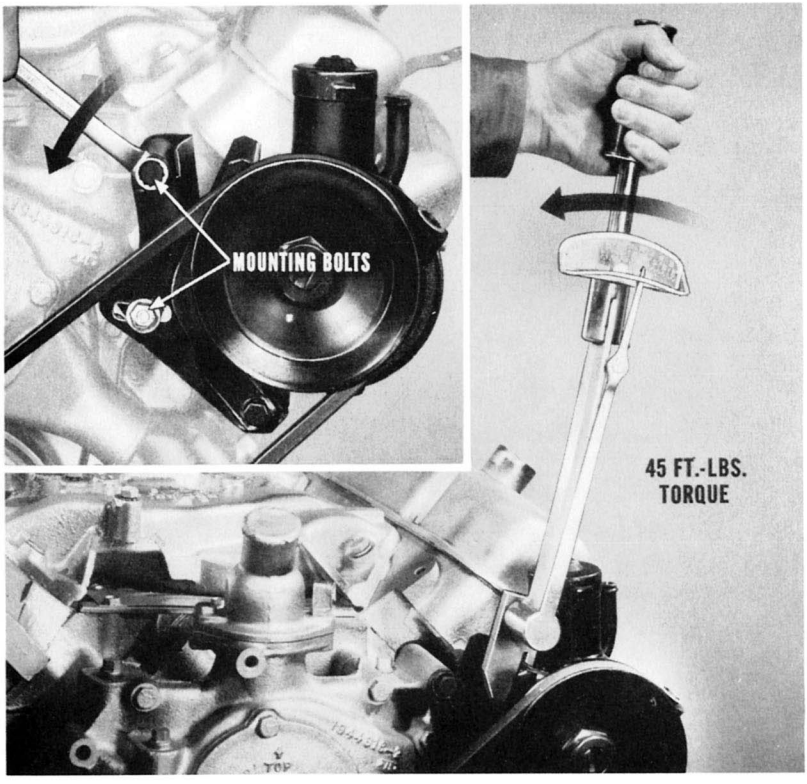
The purpose of this new mounting bracket is to take advantage of the torque reaction of the pump to automatically vary the belt tension when higher pump loads are imposed, such as when parking the car at a curb or in other close quarters, when greater steering effort is required.

In other words, as the pump load increases, the belt tension is increased automatically to prevent belt slippage. Since most belt slippage and consequent wear takes place when the pump is under heavy load, the automatic tension take-up reduces the slippage, thus increasing belt life and resulting in fewer belt adjustments.

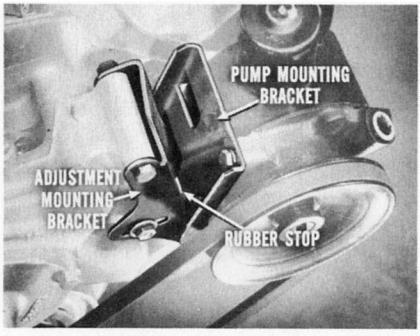


Basic Belt Adjustment. For normal operation, the belt must operate with its basic tension adjustment.

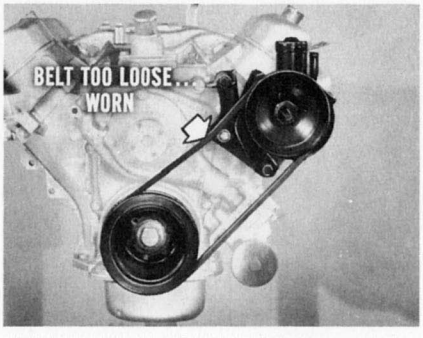
The basic tension is adjusted with a new Belt Tension Adapter Tool C-3832, and a torque wrench. To adjust the belt, first loosen the two adjustment bracket-to-engine mounting bolt nuts. Then, with the tool mounted on the drive of the torque wrench, fit the tool over the edge



of the pump mounting bracket as close as possible to the outer edge of the bracket. Next, tighten the belt until you obtain a reading of forty-five foot-pounds on the torque wrench. Hold that tension while you tighten the bracket mounting bolt nuts to hold the adjustment.



Then, use a torque wrench to tighten the nuts to thirty foot-pounds. When the belt is properly adjusted and normal pump pressures are developed, the pump mounting bracket will be resting against the rubber stop in the adjusting bracket.

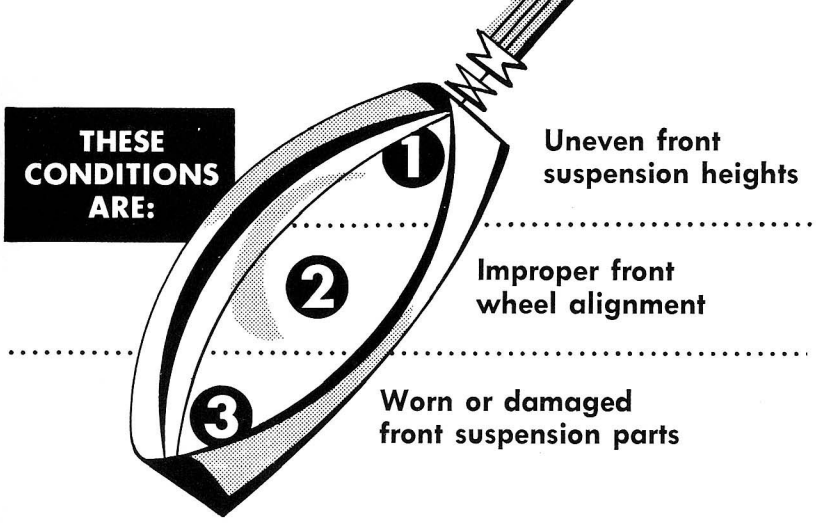


If the belt tension was originally adjusted too loosely, or the belt was stretched after a lot of service, there may be a squealing noise from the belt, or a slight knocking noise caused by the bracket vibrating against the rubber stop.

To correct a condition such as this, readjust the belt using the Adapter Tool C-3832 and a torque wrench. If this does not correct the condition, or the pump still vibrates, the belt should be replaced with a new one.

DIAGNOSIS OF STEERING CONDITIONS

Aside from the normal adjustment of the steering gear chuck, and alignment of the chuck and steering column, there are a number of related conditions that affect steering and ease of handling. These conditions should be investigated, and corrections made as necessary, when handling a steering complaint.



Front Suspension Heights. Incorrect front suspension heights, due to improper torsion-bar adjustment, can impose an extra load on one side of the front suspension. This would have a definite effect on steering control, and might lead the technician to blame the steering gear adjustment.

Front suspension heights vary slightly on the different models, and care must be exercised to adjust the height to that specified for the car being worked on.

For dependability, and accuracy, height gauges should be used when adjusting front suspension heights. A different gauge is used on Valiant models than on other models.

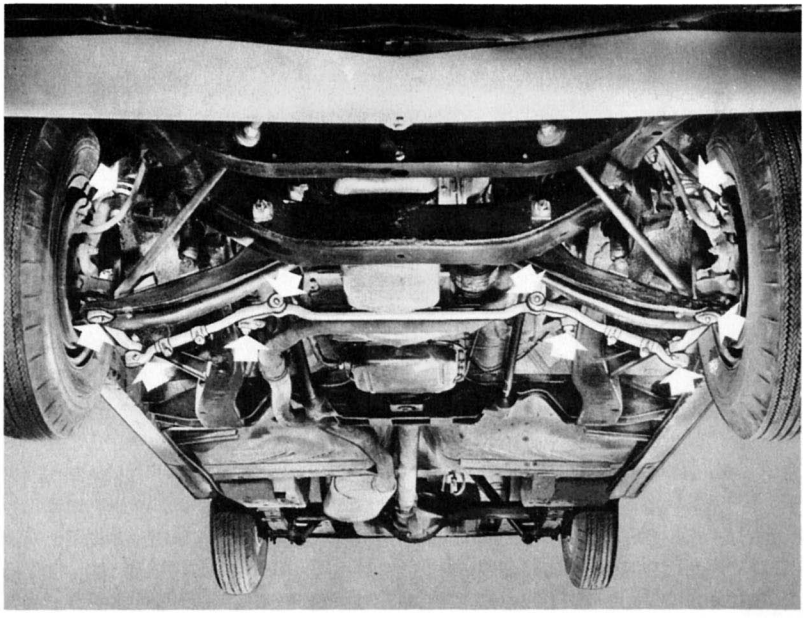
Torsion bars on Valiant models are adjusted at the anchors located at the front ends of the bars. On all other models, the anchor adjustment is made at the rear ends of the bars.

If an excessive amount of torque is required to turn the anchor adjusting bolts, an application of penetrating lubricant (part number 1879318) on the threads will prove helpful. On Valiant models, the maximum torque that should be applied to the bolts is 150 foot-pounds. On all other models, the maximum torque is 200 foot-pounds.

Be sure the anchors and ends of the torsion bars are adequately lubricated with multi-purpose lubricant to prevent formation of rust and corrosion.

Front Wheel Alignment. Proper performance of the front suspension system is not only necessary to ease of steering, but is equally important in obtaining maximum tire life. Taking readings of caster, camber, wheel toe-in and wheel balance will sometimes disclose the cause of steering difficulties.

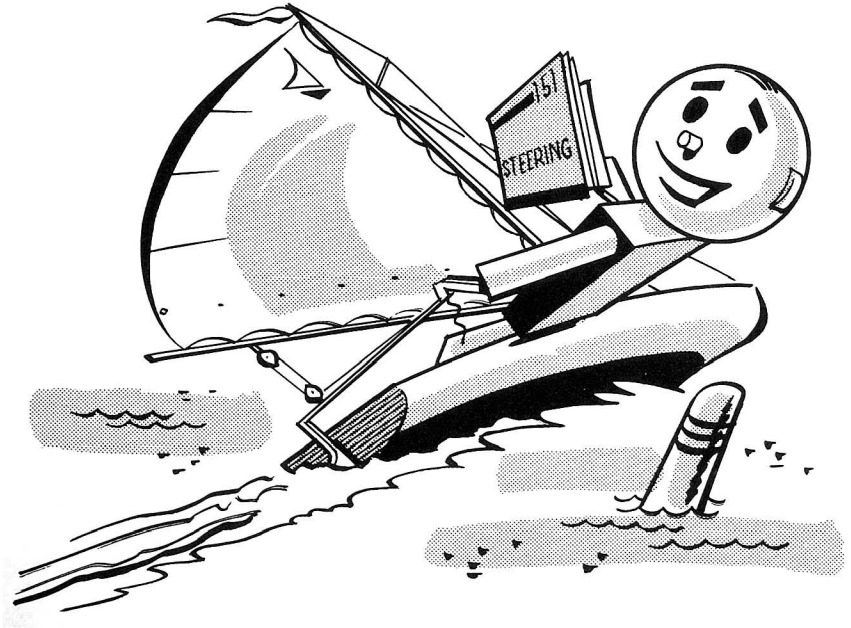
Worn Front Suspension Parts. If an examination of all adjustment points fails to disclose a possible cause for the steering difficulty, carefully look for worn, loose or rough operation of front suspension and steering control parts. The looseness or wear in individual parts may not seem enough to justify replacement of the parts, but the total wear in all related parts may add up to enough to cause the objectionable steering or handling condition. Therefore, careful inspection of all steering connections is necessary for complete diagnosis.



SUMMARY

Now that the warmer weather has spread over the entire country, and cars are being driven longer distances at higher speeds, the job of maintaining the car's steering system in tip-top shape for your owners is most important.

In this reference book you have all the information you need to properly diagnose and correct any reports of hard steering your owners might report. Owners realize their safety, and that of their passengers, depends on how well you do your job. This will give you a fine opportunity to build owner confidence in your service work.



RECORD YOUR ANSWERS TO THESE QUESTIONS ON QUESTIONNAIRE NO. 151

A new flexible disc-type coupling steering gear is now used on all manual steering models. RIGHT 1 WRONG

The master serration on the worm shaft lines up with a master serration on the lower hub. RIGHT 2 WRONG

The "D" bar and wedge are used to align the new steering gear chuck. RIGHT 3 WRONG

The worm shaft seal can be replaced without removing the shaft from the housing. RIGHT 4 WRONG

When installing a new jacket upper bearing, the radius on the inside of the bearing must be at the top. RIGHT 5 WRONG

The new and larger capacity power steering pump is now used on all V-8 engines with displacement of 361 cu. in. or more. RIGHT 6 WRONG

Relief valves of three different capacities are used in the new, larger power steering pump. RIGHT 7 WRONG

One partial pump package is used to service both passenger car and truck power steering pumps. RIGHT 8 WRONG

The new pump reaction mounting bracket eliminates the need for periodic pump belt adjustment. RIGHT 9 WRONG

If the power steering pump vibrates against the rubber bumper it means the belt is too tight. RIGHT 10 WRONG

Litho in U.S.A.