CORVETTE TIPS AND TECHNIQUES

1953-1962 CORVETTE STEERING GEAR OVERHAUL

PART 1

The steering gear assembly on the early Corvette is the source of grief to many a Corvette owner. I can't tell you how many people I know who have major problems with their steering, and have been unable to successfully get them corrected. This is the result of several things. One is the mystique of the steering gear box. If you look in the ST-12 (1953-62 Corvette Servicing Guide) you will see that the steering is covered in great detail. It looks very complicated, with all the tests, adjustments, and special tools needed, it would scare the most capable mechanic.

Another problem is the fact many of the parts are made of that rare material... unobtainium.

Still other problems like the nature of the steering angles, the dirty and rusty conditions under which you will have to work, all join together to make this a particularly undesirable project.

I think we would all agree that the steering is one of the most important aspects of a desirable car. I'd say out of ten early Corvettes I drive, eight of them have deficient steering in one or more ways.

You might think the steering was a poor design. You may assume if the system were a good one, most would not be in the poor shape they are. I believe the design was actually very good considering the time it was done, and the objectives that were achieved.

This steering gear was designed to operate without power assist. The engineers came up with a low friction gearbox that would be very efficient. In order to do this, they used high quality, specially designed gears with very precise fit of very hard materials. The large steering wheel was an important part of the overall design, because its large diameter helped to make the car easy to turn. Additionally, the front wheel geometry was a key factor in the success of the system. When all the parts are in good condition, and adjusted properly, the early Corvette is a surprisingly agile car.

Actually, I believe most of the failures in the steering boxes are caused by a failure of the

owners to check and maintain the proper level of gear oil in the gearbox. The Corvette Servicing Guide says the level should be checked every 1000 miles. While I believe this is unnecessary, it should be checked at least every 20,000 miles, or at least once a year. The gears need a hypoid lubricant commonly called E-P lubricant (Extreme Pressure) or what most of us call 90-weight gear oil.

Another thing, which can cause a failure in the steering gear box, is the use of oversize tires and reversed or otherwise improper wheels. Tires with wide treads have much more adhesion to the road surface, and therefore cause more forces to be transferred to the steering gears. Remember, back when these steering gears were designed, the tires were only four or five inches wide.

One of the most common problems I see is what I call a “catch” in the steering. This is where the steering wheel, as it is being turned, comes to a rough spot, or a “catch” which causes your turn to be interrupted. At this point, you must provide extra force to continue to turn the wheel. Suddenly, the wheel jumps past the hard spot, making the turn uneven, and in some cases dangerous. Many things can cause this type of a problem. It is important to properly diagnose the cause before repairs are started for obvious reasons. I recommend you disconnect the drag link from the pitman arm or the third arm and then turn the steering wheel to see the steering gear box. If the problem ceases with the drag link disconnected, the cause is somewhere in the steering linkage, and it must be located by visual inspection, or by disconnecting other parts until you are able to isolate the problem area.

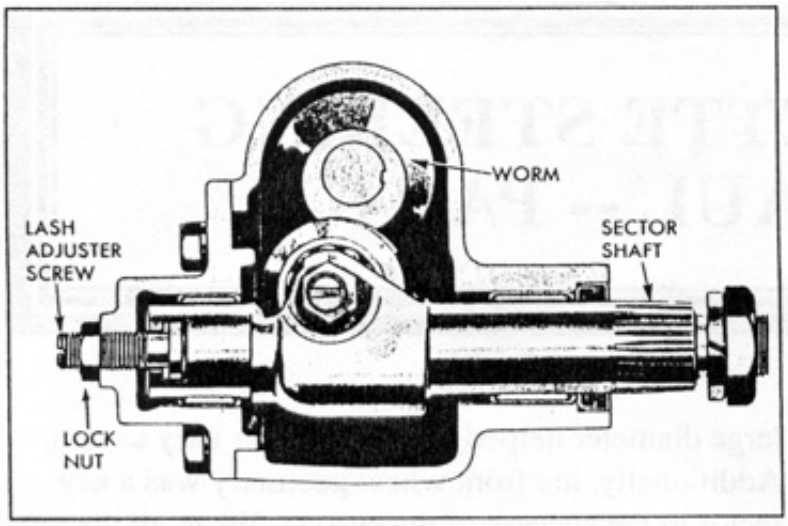


Figure 1

I will concentrate on the problems with the steering box and how you can repair them.

Please take a look at the two cutaway drawings of the steering box. In figure 1 you can see the ball bearings in the sector roller. If you will notice, the sector roller is located just

slightly to the left of the center of the worm gear. Looking to the far left side of the drawing, you will note the “lash adjuster screw”. As you turn this screw, you can move the complete sector shaft closer to or farther from the worm gear. This is how you adjust the lash, or play, in the steering gears. The lash is important. It allows for freedom of movement, without too much play. Note the way the lash adjuster screw fits into the slot in the end of the sector shaft. This fit is critical to the tightness of the steering gears. This little item is often ignored. Later in this article I will show you how to check and adjust this important fit.

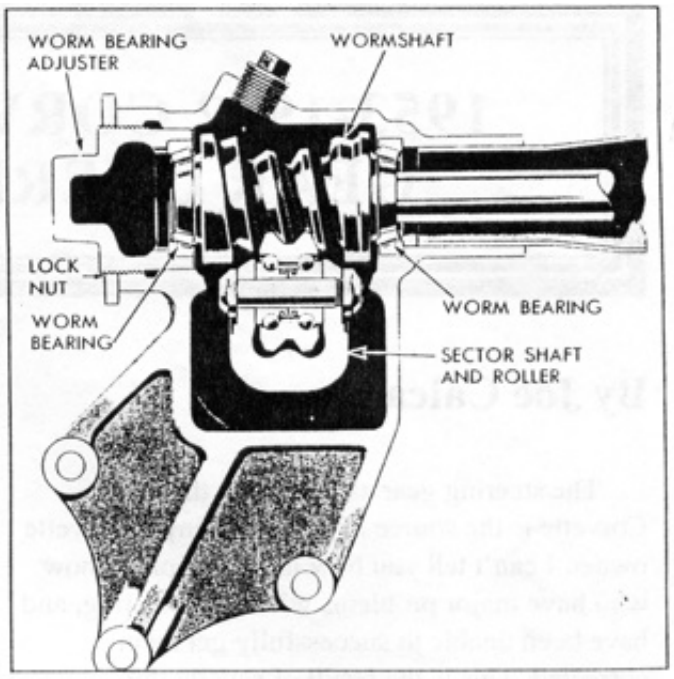


Figure 2

In figure 2 we are looking at the same assembly, but we have turned the gearbox 90-degrees and we’re looking at the end of the sector shaft. You can imagine how the sector roller will follow the screw shape of the worm gear as the worm gear is turned right and left. The sector roller is a precision hardened roller, and it never loses contact with the worm gear as it operates.

Note the worm bearings on the right and left of the worm gear. They are precision bearings. They must hold the worm gear firmly, only allowing it to turn, never allowing it to move away from the sector roller. It is the bearings in this gear box which hold the parts in proper alignment, and provide for long life. If any of these bearings fail, it will lead to the failure of the whole assembly.

Now please look at figure 3. This shows how the whole gearbox is put together. This is a

blow up view and should show all of the parts. It fails to show some items.

Part No. 2, the worm bearing adjuster cap, has a race, exactly like part No. 6, pressed into it. I think this is important because that race needs to be changed when you overhaul the steering box.

Part No. 11, the sector shaft and roller assembly, has several parts installed in it. There are 22 ball bearings, each measuring .050-inches in diameter, two inner races, a retaining clip to hold the inner races together, and a hardened and ground shaft and lock nut to hold it all in the sector shaft. Parts No. 8 and 9, are actually one part, the sector shaft seal.

This gearbox uses four different types of bearings. It uses the 22 ball bearings in the sector roller, the two caged roller bearings on the worm gear, two different size caged needle bearings and a (rubber mounted ball bearing assembly on the upper end of the steering shaft just below the steering wheel.

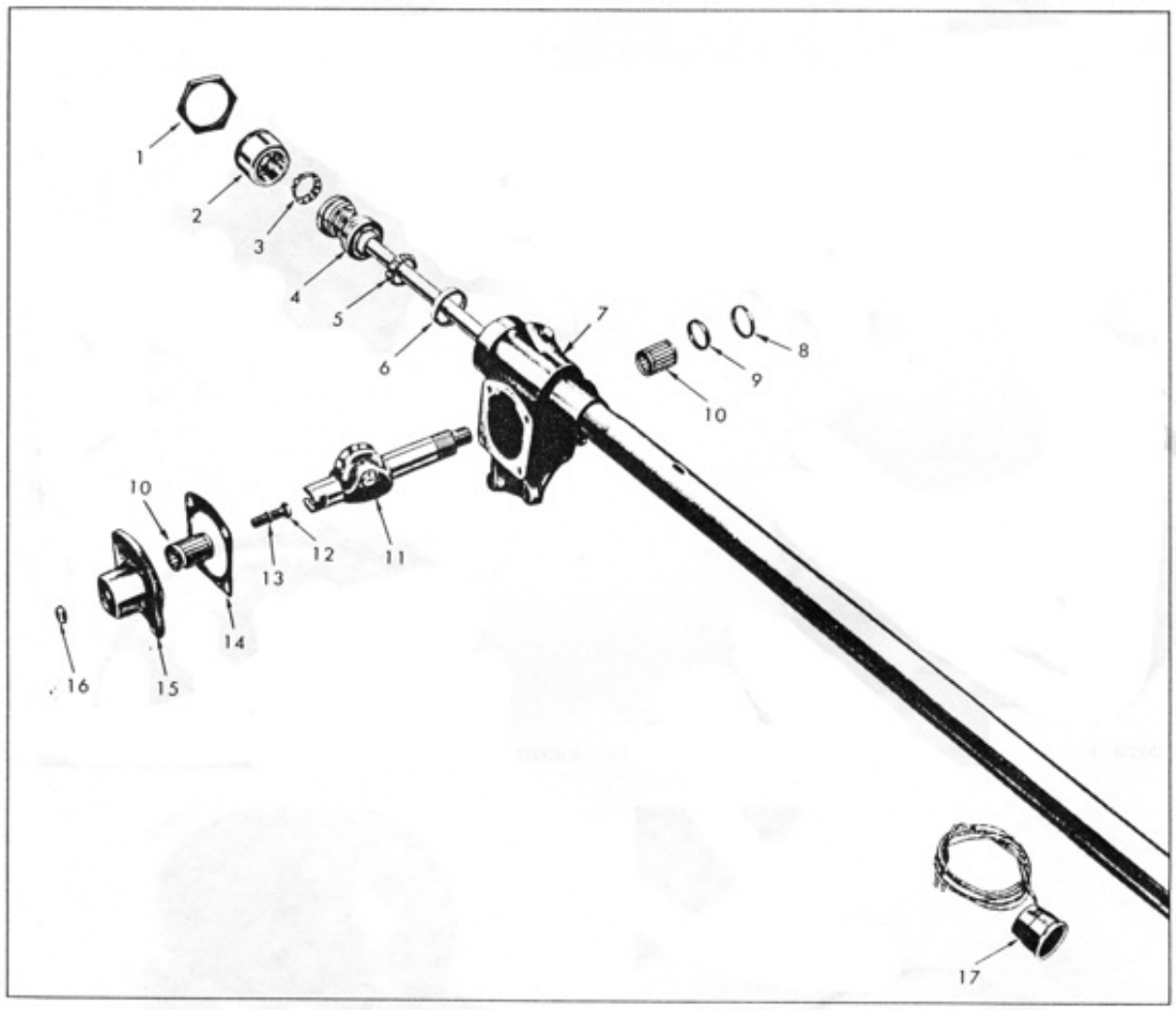
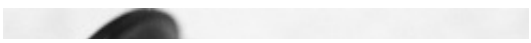


Fig. 12—Layout of Steering Gear Parts

1. Worm Bearing Adjuster Lock Nut
2. Worm Bearing Adjuster Cup
3. Lower Worm Shaft Roller Bearing
4. Worm Shaft Assembly
5. Upper Worm Shaft Roller Bearing
6. Upper Worm Shaft Roller Bearing Race
7. Housing and Mast Jacket Assembly
8. Sector Shaft Packing Retainer
9. Sector Shaft Packing
10. Sector Shaft Needle Bearing
11. Sector Shaft and Roller Assembly
12. Lash Adjuster
13. Lash Adjuster Shim
14. Housing Side Cover Gasket
15. Housing Side Cover
16. Check Nut
17. Mast Jacket Bearing Assembly

There is no need to rewrite the ST-12 Servicing Guide, so I will conclude with some photos of some of the wear and damage that I have found inside these boxes. In the follow up article, I will attempt to show how to remove and replace the bearings and races that the ST-12 shows being changed by means of special tools. If you don't have an ST-12, you should get one before attempting any work on the steering assembly.



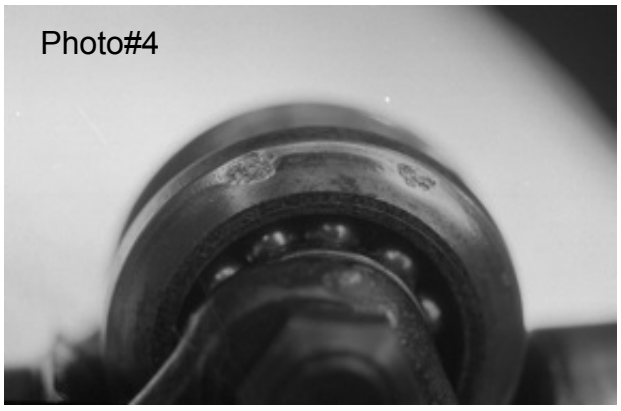


Photo 1 shows a worm gear removed from the steering shaft. Note the galling of the bearing surface on the right-hand end of the gear.

Photos 2 and 3 show severe galling on the cut portion of the gear where the sector roller rolls. It is easy to see how this type of damage will cause the steering to catch as the roller moves through this condition, lubricated properly, and with the front area.

Photos 4, 5 and 6 show damage to sector precise steering rollers. Once again, these parts are precision manufactured to extremely close tolerances, and must be in good condition to maintain contact through the range of the turn. At any point, where there is roughness, you will be able to feel it in the steering wheel. When the system is in optimal condition, lubricated properly, and with the front suspension aligned correctly, you can expect very precise steering, with surprisingly little effort.