

Dec 28, 1991

To: Bill Cannon / Skinned Knuckles Magazine
175 May Ave
Monrovia, CA 91016

Dear Bill,

Here is some more material for SK magazine, as usual, if you decide to use it, just extend my subscription in lieu of payment. By the way, if you would like this material on a disk instead of just on paper, let me know and I'll be pleased to comply with your wishes.

What Went Wrong?

by Bill Noble

The car - a 1959 Cadillac Eldorado Seville (dum-de-dum-dum - ominous music plays in the background) - pink and ostentatious as ever. The situation - well, this here car sits around a lot, and then once every couple of months gets started up to take the family and friends out to dinner. The last couple of times I had driven it had been during the daytime, and I had noticed it was running a bit rough and loud. The loud part was easy - there was a hole in one of the front exhaust pipes, so I just ordered a replacement and installed it (an acetylene torch is really helpful here since even if you don't weld the pipes to each other, the rust will bond them together. With a torch, you can heat the junction and separate the pipes with a modest amount of force and not damage anything. Then just oil the new pipe and slide it into place and clamp it down with muffler clamps.)

Since I had to roll the car down the driveway a bit to get enough room to replace the pipe, I decided that it would be a good time to take the car and go out to dinner - it's my opinion at least that it isn't a good idea to start a car and only let it run for a minute or so, so driving around is the only thing to do when the car needs to be moved under its own power. So, that evening some friends come by and we pile into the car. It cranked over a bit slowly, but started up just fine with the help of a spray of ether, and we were off. Well, no we weren't, the car was belching black smoke. A quick look showed that the rear carburetor was leaking, and tapping on it wouldn't reseal the needle valve - so, off with the top of the carb, wipe the needle, reassemble, restart the car, wash up and we're off.

Well, no, it was almost out of gas, so off to the station for a fill up. I left the car running since the battery was low and I didn't want to risk it not restarting. When I put it into gear to leave, it died dead and wouldn't crank. Fortunately, the gas station was one frequented by tow trucks, so a jump was easy to get and after some flailing about with the tow truck driver the car starts and we're off.

Well, no, we figure out that maybe the reason it stalled was that the generator belt was loose, so back home to tighten the belt, wash up, and we're off. With the belt tightened, the headlights get nice and bright and everything looks rosy. We hop on the freeway, go about 6 miles, and the car starts to miss, the headlights get dim, and the generator light starts to flash. (Flash??? what can that mean??) I spend some time on the shoulder of the freeway trying to convince myself that the voltage regulator is ill, but it isn't. So, we turn around, and head home, driving most of the way with the headlights off to save whatever charge is left in the battery.

Well, then I really tighten the belt, jump the car to get it started, and we're off. Except that the whole scenario repeats itself - The headlights go from bright to dim, the generator light flashes, and we come back home in the dark. We decide to give it one more try before giving up and taking another car (my friends were very patient, and really did want to ride in that car).

So, I open the hood, re-tighten the generator (again??? how much is that belt stretching???). But this time, after tightening it all down, I give one more pull on the generator with the crowbar (oops, excuse me, ..with the factory approved belt tightening tool), and notice that the generator moves. (???? what the ???) Well, now the problem

becomes clear - the generator is not being held in place properly, and so it is moving. A few seconds of investigation and the situation becomes clear.

On this car, the generator upper bracket which has the slot for belt tension adjustment is a fairly short piece of steel which is screwed to the air conditioner lower bracket. The bolt is hidden from view by the air conditioner pump and pulley, and had fallen off sometime before. Thus, when I tightened the belt, nothing really happened because nothing was holding the tension except the friction of the generator to its lower support bracket. The reason the generator light would flash is that the assembly would oscillate causing the belt to slip and then grab about once per second. So, finally, I replace the missing bolt, again tighten everything down, and off we go. This time we make it just fine, and the problem stayed fixed. Not only that, but a rather annoying vibration that had shown up at around 50 to 60 MPH was gone - presumably the vibration was due either to the loose belt or to the oscillating generator (I suspect the belt).

The moral??? You mean these things gotta have morals??? Well, how about either "Col. Murphy was an optimist", or "after tightening a belt, yank on it again to be sure it is actually staying tight"??? This problem had actually been present for many months, but it had not become critical because I was driving the car during the day, and so even with the belt loose the generator got turned enough to put some charge into the battery. Only when I tried to drive it at night did the increased load on the generator cause the belt to slip enough that the problem became obvious.

Fixing Power Steering Gear Leaks

By Bill Noble

After 10 to fifteen years, almost any car with power steering will end up with a slow leak from the steering gear. If the pump leaks, rebuild pumps are cheap and they are easy to change, so that is the most expedient solution, but the gear is another matter - it is neither inexpensive nor easy to change, so if you have to do all that work anyway, why increase your expenses by buying a rebuilt just to fix a leak?

The first step is to make sure you know what is leaking - is it the pump, a hose, a hose fitting, or something on the gear itself. If the pump and hoses are dry, then you can rule them out, if not, clean everything off real well, and start the car and look for where the leak is coming from. Turn the wheel from lock to lock to build up pressure.

Presuming that the leak is not from the pump, hoses, or hose fittings, then it must be from the steering gear. I've worked mostly on GM cars (50s through 80s), but the general approach outlined should apply to almost anything (except rack and pinion). The steering gear is mounted to the frame with three or four large bolts. A splined shaft either extends through a hole in the frame or from the bottom of the gear, and the pitman arm is affixed to the shaft with a large nut and lock washer. The steering column attaches to a smaller shaft extending through the top of the gear. There are rotary seals on the steering gear, one around the pitman arm shaft, and one around the steering column shaft. The seal around the pitman arm holds the full pressure of the power steering fluid, and usually consists of two seals with spacers between them. The upper (steering column) seal is also usually a single seal with an "O" ring and spacers. The pitman shaft seal can be replaced easily with the steering gear on the car, the steering shaft seal cannot be replaced with the gear on the car.

It is tempting to assume that the pitman seal is the culprit for gear leaks because it is easy to replace and because it is the larger seal with the greater pressure. However, I have found that the upper seal for some reason is more likely to be the culprit. To be sure, first pull the pitman arm off (with a pitman arm puller or a good gear puller). The pitman arm shaft is usually keyed by omitting the notch between one (or more) pair of splines, but be sure of this before you move the steering wheel. If the shaft is not keyed, mark the shaft and the pitman arm with a punch or a scribe so that you can realign everything when you go to put it back together.

Now, using some spray on brake cleaner, really clean the pitman shaft and the oil seal face to get rid of all the dirt and grime. With the shaft and seal face really clean, you will be able to see any leak with ease. Now, start the car and turn the wheel hard to the left and to the right. Usually a full left turn will produce the maximum pressure against the pitman arm seal, but turn it both ways to be super sure. If you see any leaking at the seal, then change it. If you don't see any leaking at the seal then the problem is likely to be with the upper (steering shaft seal). I would change the pitman arm seal too at this time since it is easy, but you will have to pull the gear to change the steering shaft seal.

To change the pitman arm seal on the car, put a container under the steering gear to catch the steering fluid that is going to leak out. Remove the pitman arm (if you haven't already done so), and remove the pitman shaft seal retaining ring (using snap ring pliers). Now, start the car and turn the steering wheel hard to the left and hold it for a second or so. The oil pressure will force the seals out of the bore. If the seal doesn't come out, back the wheel off and turn it hard to the left again. Stop the engine as soon as the seals are forced out to avoid pumping fluid all over the place.

If the pitman arm seal was the culprit, you can replace it on the car. If the upper (steering shaft seal) is the culprit, it is easier to replace the pitman seal on the bench at the same time as you replace the upper seal. To replace the seal on the car, make sure everything is clean so you don't get dirt into the steering gear, wrap one layer of tape around the splined pitman shaft to protect the seal lips. Lubricate the seal lips and the shaft bore (with petrolatum or power steering fluid). Install the single lip seal (with the lip facing into the bore), then the steel washer, then the double lip seal. Finally install the steel washer and snap ring. When you put the single lip seal in, drive it no more than an eighth of an inch below the bore, then drop in the washer. Drive the whole thing in about another half inch, then install the double lip seal and washer. Then drive the whole mess in until the outer steel washer is just below the snap ring groove. Then install the snap ring. Driving the pieces in small steps like this keeps the seals from getting cocked sideways and makes sure that you don't drive anything in too far.

If the upper seal is suspect, you can check it by disconnecting the steering column from the gear, and removing the bolts which hold the gear to the frame (the pitman arm should already be removed). Be sure to note how the column attaches to the shaft from the gear and scribe it for realignment if it is not keyed in some way. Lower the gear away from the car with the hydraulic hoses still connected. Place it on blocks to keep from pulling hard on the hoses. Clean the shaft and seal face carefully (with brake cleaner), and as before start the engine. Turn the shaft back and forth with your fingers, being sure to go all the way to the right and left. If the upper seal is leaking, you will see it. If you feel binding or unevenness, something else is wrong also and a rebuild gear would be the better part of valor. If the only problem is the leak (now you can see exactly what is leaking) then just change the seals. You can remove the pitman arm seal at this time by just removing the snap ring and turning the shaft hard to the left. The seal can come off with some force, so make sure that the pitman shaft is not pointed at you. Also, make sure someone is in the car to stop the engine when the seals come out. Now, disconnect the hoses and take the gear to your workbench.

Buy seal kits and follow the instructions for changing the upper seal. Usually, there is a seal and an "O" ring and some washers in the kit. The seal is mounted into an adjuster plug which is also used to set the end play on the steering gear. You may need a special spanner wrench to take this plug off, but you can make such a wrench by bending some heavy steel wire, or by welding something. The adjuster plug is held from moving by a large lock nut that usually looks like it belongs on a piece of electrical conduit. Mark the adjuster plug and housing with a scribe mark so you can reassemble things to the same position, then remove the adjuster plug lock nut and then the adjuster plug. Remove the clip ring that holds the seal in place, and remove and replace the "O" rings and seals. Then, reinstall the adjuster plug (lining up the scribe marks), reinstall the adjuster plug lock nut, and turn the gear so you can replace the pitman seal. Follow the instructions above for installing the pitman seals, then take the gear back to the car and reinstall it. If you want to be certain that you fixed the leak, you can re-attach the hydraulic hoses, and start the engine and look for leaks before bolting the gear back to the frame.

Bolt the gear to the frame, attach the steering column and the pitman arm (don't tighten anything really tight yet) being sure to line up any scribe marks you made. Now check that the steering wheel is properly oriented when the front wheels are straight forward, and that you can turn the wheels normally from full left to full right (do this

with the engine off). Inspect the flexible coupling between the steering shaft and the steering gear for distortion - it should be in a flat plane with no visible bend or twist - adjust as needed. If all is ok, tighten everything down. The pitman arm nut should be tightened to 100 to 125 foot pounds on big GM cars, the flexible coupling retaining screw should be tightened to 25 to 30 foot pounds - you can get some feel for the proper tightness by remembering how hard it was to get the nut off in the first place.

There are other places the gear could leak, including the hose connector seats, and the end plug. Working on these leaks requires much more disassembly of the gear, so if you have leaks at these places you are probably better off getting a rebuild unit. If you want to tackle the thing yourself, the factory shop manual will give the best guidance - the after market shop manuals are universally useless for this kind of repair.