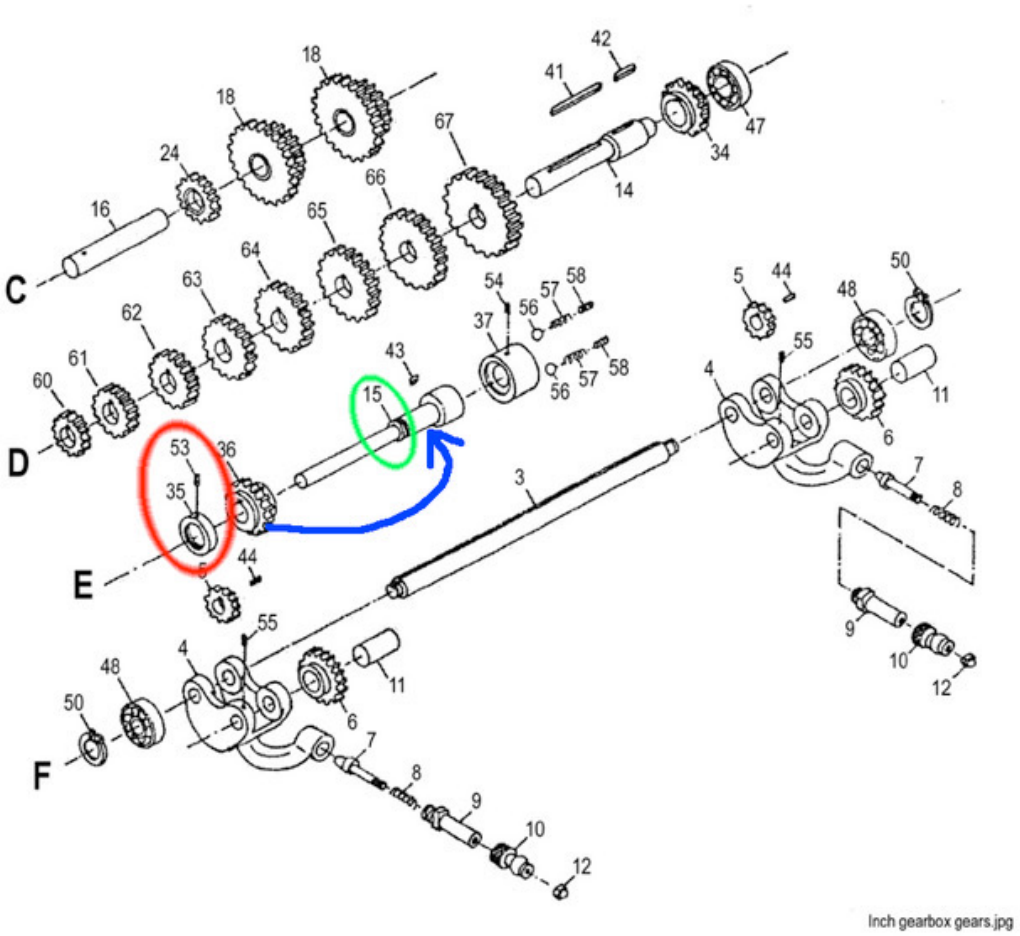
I was having some issues with the carriage feed system on my PM1340 lathe. The carriage feed system would not turn. This caused the change-gears to grind and I ended up with broken change-gear teeth. I was able to pinpoint what I believed was the culprit. Something was bound-up solid in the carriage feed shaft system.

First I removed the block that holds all three of the rods (lead screw, feed rod and forward/reverse rod) on the right end of the machine and pull out the feed shaft that drives the carriage enough to test the friction in the carriage. That seemed fine. Next, I checked the feed shaft coming out of the Norton gear box and discovered is was really bound up and not spinning freely even though the feed mechanism was disengaged. The shaft was difficult to turn even by gripping it with channel-loc pliers. I concluded the shaft coming out of that gearbox was binding on something even though it was well lubed. After looking at it for quite a while, I also concluded that I had to remove the shaft and inspect the bearings to further diagnose the friction.

Here's the parts diagram we - annotated:



Inch gearbox gears.jpg

The shaft in question is "E" in the drawing. Although the drawing shows a collar with set screw (circled in red) holding the shaft in position, that element does not exist. The gear #36 sits further up the shaft as shown with the blue arrow, and a snap ring (circled in green) holds

that gear in position against the bushing in the side of the gearbox casting. The snap ring locking that gear #36 in position at the end of the shaft is what prevents the shaft from lateral movement and removal.

That shaft felt like it had been press fit into the side of the gearbox and was impossible to get out without removing the gear train in front to get access to press the shaft out. That front gear train marked “D” is held in position with a screw/washer on the outside of the gearbox holding the ball bearing #47 in position. That ball bearing is also press fit into the casting and was difficult to remove, but I did get it out. Once that front gear train was out, I had enough access to pound out the shaft that drives the feed rod.

Once disassembled, I found that all the gears and both shafts had been heavily coated with overspray from the factory paint job. I cleaned all that up and polished the shafts:

The shaft is supported with a bronze bushing with oil galleries around the inside of the bushing. That bushing, and the part of the shaft that was in the bushing was gunked up with something that looked like tar. This was the source of the friction that was keeping the shaft from spinning freely, and which got worse as the bearing surfaces got hot. I suspect that tar-

like gunk was either additional paint overspray from the factory, or cosmoline rust inhibitor applied to the machine before packing. I don't know what else it could have been.

The shaft to bushing tolerance is VERY tight - I ended up using a hair dryer to heat the bushing and an ice cube on the shaft and pounding as best I could to get the shaft removed. It took almost 2 hours to get it out. But I did get it cleaned up and polished with ultra-fine Scotch-Brite, and this is how that bushing looked afterward:

By the way, that bronze bushing is lubed by oil coming down from the galleries above via a small copper tube to the back where you see the hole in the bushing.

I also discovered that the shaft that drives the feed rod has no bearing on the left end (just a bored hole in the casting web). This is the hole in the casting web at the opposite end of that shaft - no bushing or bearing here:

As you can see in the photo above, there is lots of factory paint overspray inside that gearbox.

The photo below shows the end of the drive shaft that couples to the feed rod. The end of the feed rod itself has a fitting with two ball bearings backed by springs that tension this clutch mechanism. I was able to get this clutch adjusted so that it now works properly and will drive the carriage under load, but give way and spin if I grab hold of the carriage positioning handwheel and force it to stop.

The outside end of that shaft (with the two V-shaped notches) is the clutch (ball bearings on springs) that will give way if the feed shaft is stalled downstream.

The clutch comprises a pair of spring loaded steel balls bearing on a detent disc driven by the Norton gear-box. Spring pressure is adjusted by two set screws on either side of the feed shaft, arrowed. Setting the spring pressure is a process of aiming for the best compromise between too high and too low, which might mean unexpected stopping for no good reason.

Once I got everything reassembled and lubed again, that drive shaft was spinning freely.

The Norton gearbox was packed with grease, and is also lubed from the oil galleries above via the hole in the side at the base of the headstock casting. I wasn't sure if the gears needed grease in addition to oil from above, but I did repack it was grease just in case. Let me know if that's not proper.