

Thought I'd do a bit of a tutorial for replacing the bearings in a PG1 gearbox. It's a bit daunting when reading through the Sticky's and seeing all those bearing codes without knowing where they go or what they do, I've been there myself. However once you've had a 'box apart and seen them for yourself it all seems to fall into place and you realise all the info you needed was here in the first place! So this is more for those who are thinking about doing a rebuild to familiarise themselves before getting the tools out. Talking of tools, you will need:

8, 10 & 19mm spanners

12, 14 & 32mm (1 ¼" will do for 32mm) sockets, extension bar and ratchet

14mm allen key

Long thin flat screwdriver

2 medium sized flat screwdrivers

Large flat screwdriver for levering with

Bearing puller

Hammer

Obviously the gearbox needs to be off the car, drained of oil and have the inner CV's removed from the diff. The 'box I'm rebuilding here is a bit of a hybrid of K-Series & "U" spec turbo parts to fit on my Mini. Perhaps it's not the best example as it's probably the only one of this spec in existence! However I have shown pics of how a normal box would look to help matters.

If you're rebuilding your existing 'box and it's still on the car, it is worth undoing the big plug on the end of the gearbox with the 14mm allen key if you have access through the wheel arch. It is quite tight, but once it's cracked it unwinds quite easily. With the engine still mounted, it holds the gearbox nice and still, don't take it out completely, just crack it for now. If your gearbox is already off or you're building a spare, it's best to have it on the floor and use a hammer on the allen key to crack it then have it on a decent height workbench to take off.

Anyway here is said plug:



I have sawn off the allen key and used a 14mm socket & ratchet to make thing easier. Remove the plug and you will see this:



We'll come back to that in a minute. Use an 8mm spanner to remove the speedo drive:



A 19mm spanner to remove reverse light switch:



A 14mm socket/ratchet to remove the reverse gear idler shaft bolt on the top face of the gearbox:



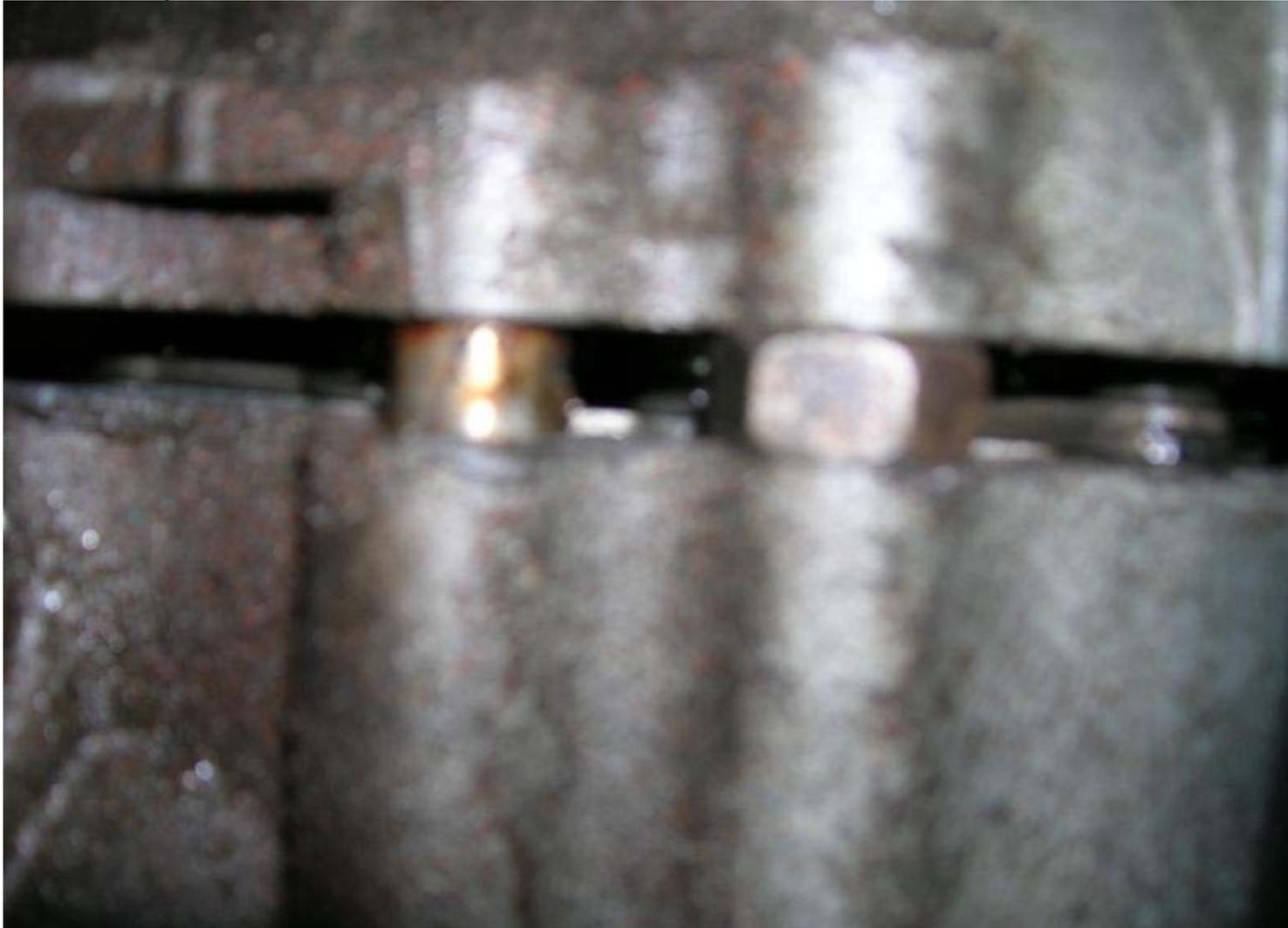
And finally use a 12mm socket, ratchet & extension bar where necessary to undo the 14 bolts holding the two halves of the casing together:



Use a hammer on the piece of casting that the clutch cable mount/engine mount (depending on car) bolts up to to break the seal between the two halves:



Now use a couple of screwdrivers to lever the two halves apart progressively all the way round. At this stage it is not possible to separate them completely. Just lever them apart enough to allow room to get some sort of wedge between the cases. I use two M12 nuts, one next to each dowel, to hold them apart:



The reason for this is that the circlip, which you saw under the end plug, is now holding the weight of the main shaft up. Now use the 2 medium sized screwdrivers to lever the two prongs of the circlip away from each other to release it from the bearing:



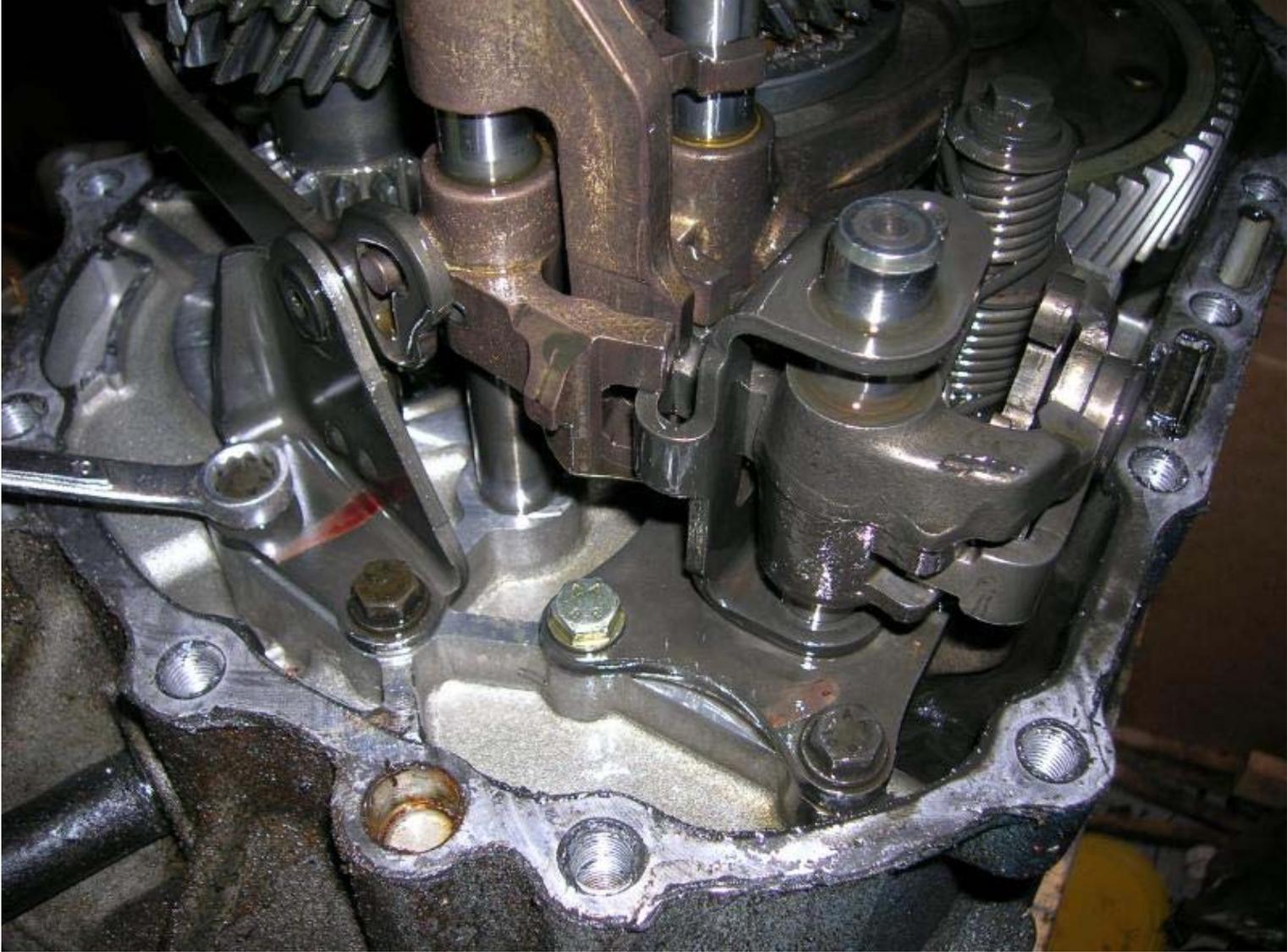
With gravity on your side, the main shaft should now drop back down into the other half of the casing. Use a screwdriver on the outer race of the bearing to help it if need be. It will then look like this:



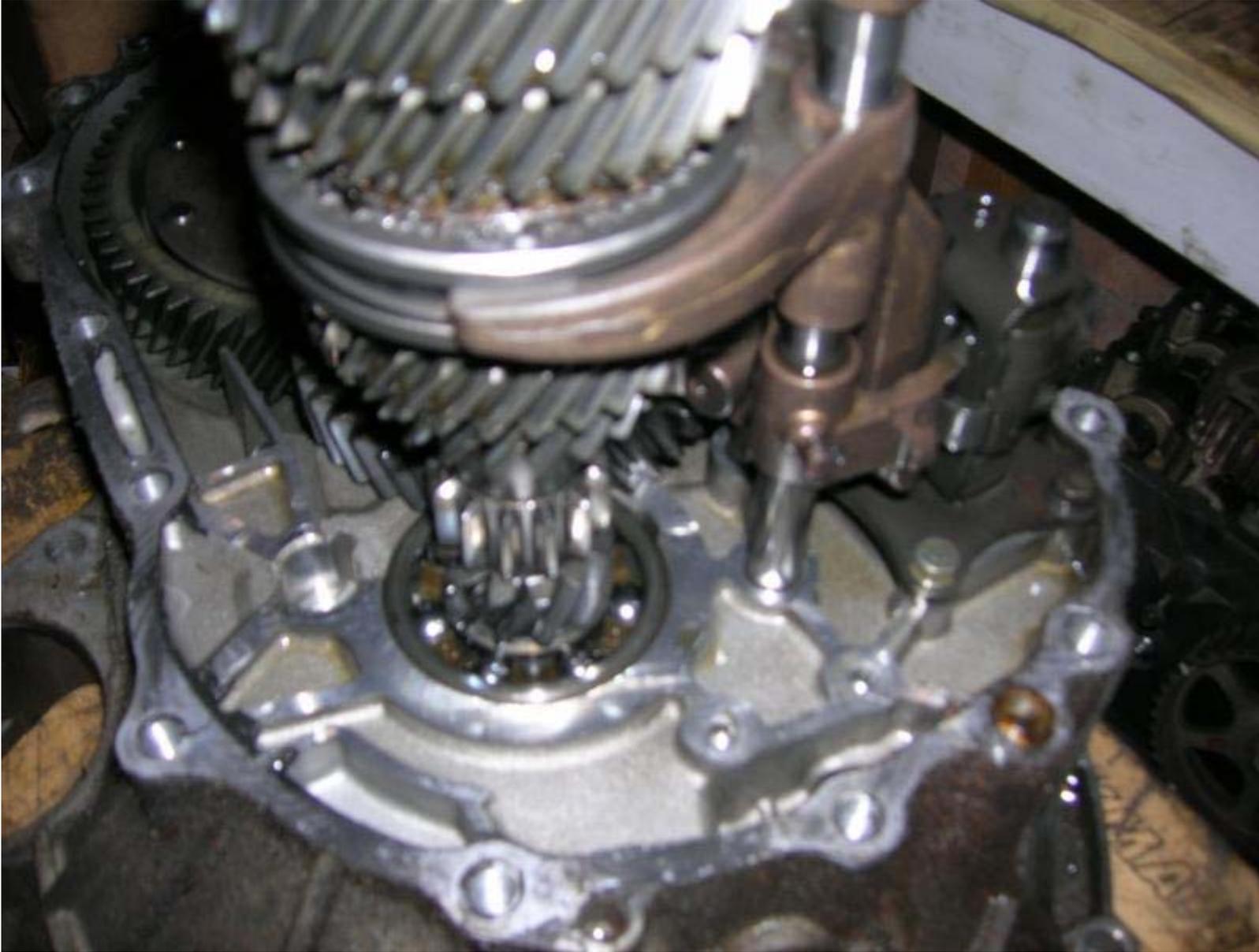
You can now lift the gear casing from the diff housing, and retrieve your two wedges. Now you can see the gears:



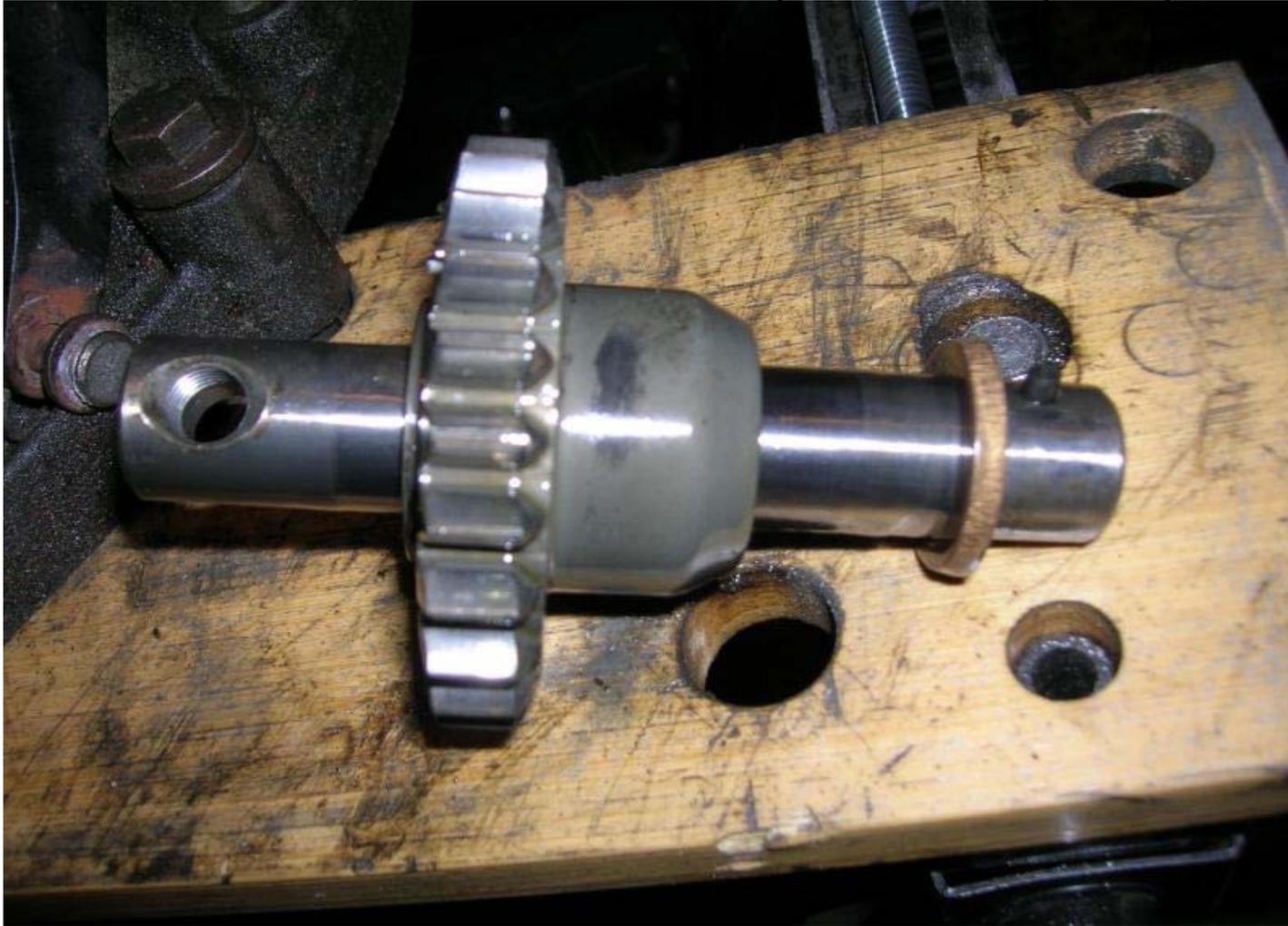
Use a 10mm spanner to remove the two bolts securing the reverse gear selector to the casing. Support the reverse gear idler as you do so as otherwise the weight of the gear tips the plate over and makes undoing the bolts awkward:



Remove the selector and the reverse gear idler with its shaft:



Note that the shaft has a locating pin at the end of it, which engages with a slot in the casing to ensure the threaded hole ends up in the right place for the bolt. Also the brass ring is free to move on the shaft, it's to give the idler something to bear against when reverse is selected.



For those that didn't know, the reason that reverse whines at speed is because the teeth are "straight cut" as opposed to the forward gears that are "helical" (diagonal looking). Straight cut is stronger, as it only tries to rotate the next shaft rather than rotate and lift it that helical gears tend to do due to the nature of the cut of the teeth. Race/rally cars have straight cut teeth on all the forward gears too, but for road going cars where noise levels need to be kept down, helical gears are used.

Anyway, back to the gearbox, next thing to do is remove the three bolts securing the selector mechanism to the case with a 10mm spanner:



Note the position of the silver bolt, which is shorter than the 3 black ones (1 on this mechanism, 2 on the reverse selector). Obviously the black one that runs through the springs is much longer, but it's hard to put that back in the wrong place! Now you can remove the mechanism:



You can now withdraw the input shaft, main shaft and selector forks together as an assembly. Be aware that a good percentage of the gearbox weight is in these shafts, so careful not to drop them!

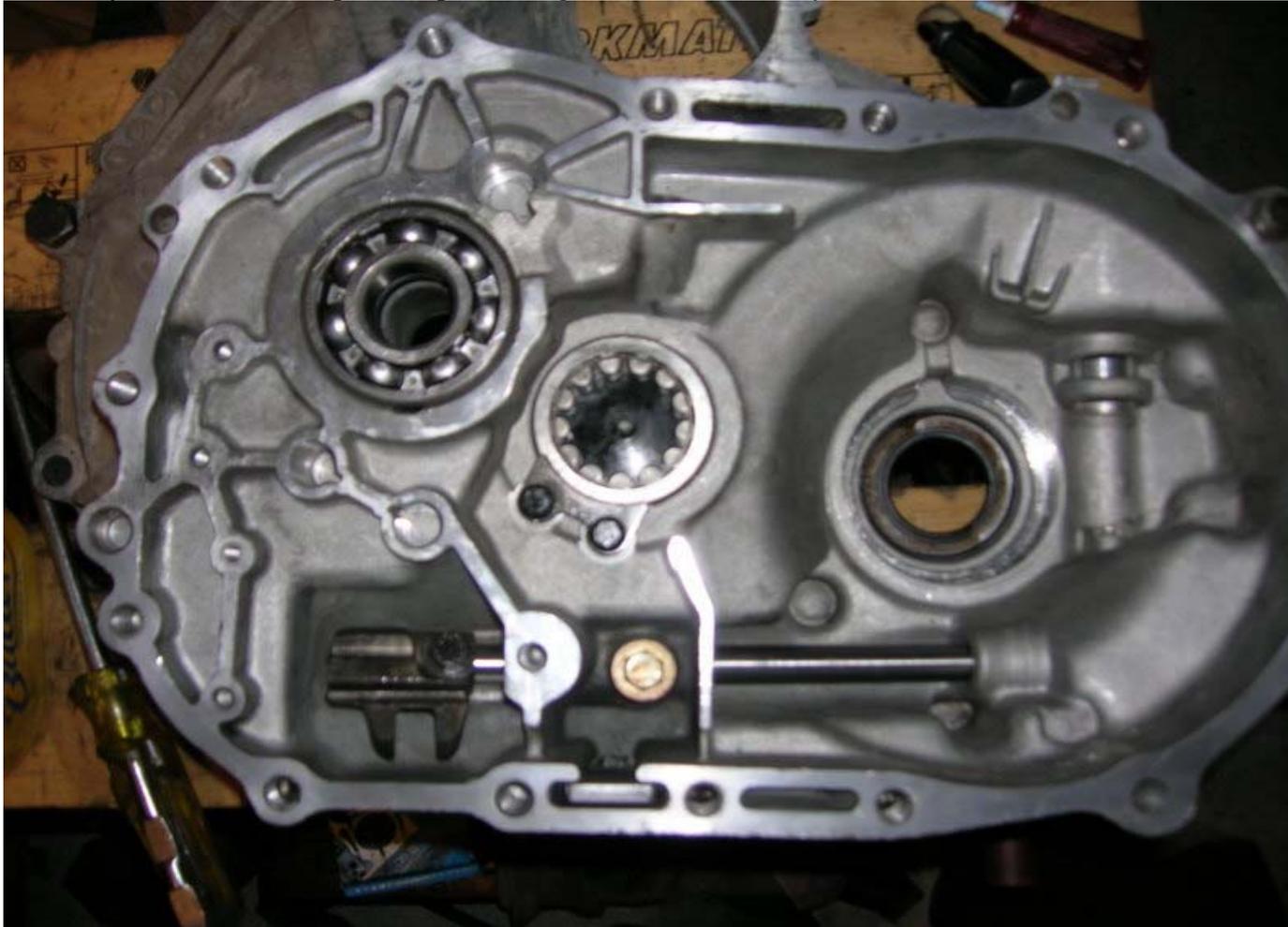
Lay this assembly down on a clean surface:



And lift off the selector forks and shafts:

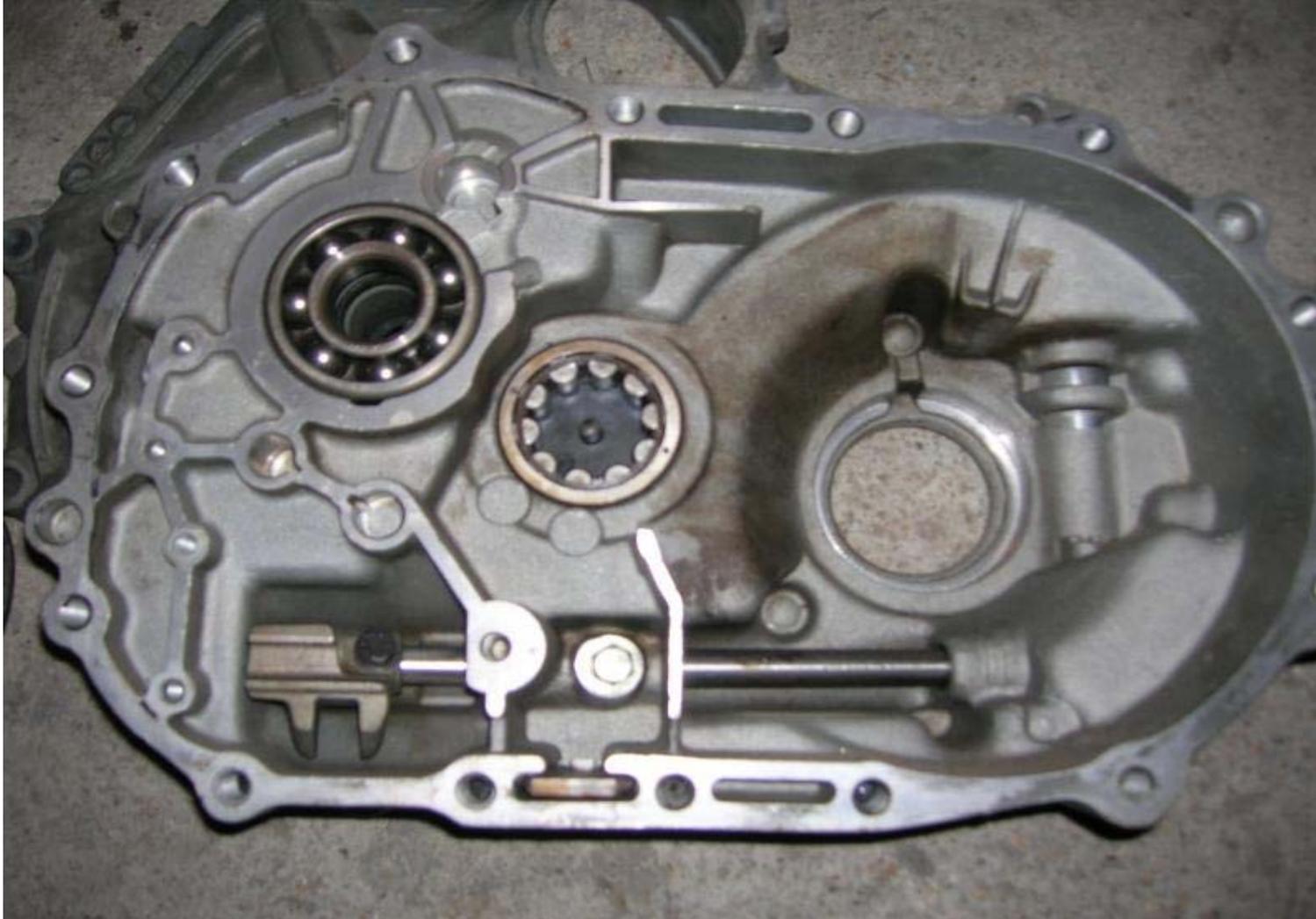


And place them to one side. Back to the gearbox, lift the diff out of the casing. May need a bit of wiggling to free it, there's nothing physically holding it in, just the bearing being a tight fit in the casing. This is where different specs of gearbox come into it, with different bearings being fitted. If you have a "U" (Uprated) spec turbo gearbox, this is what you will find:



The left hand bearing is for the input shaft, RHP part number 3/MJ28. The one on the right is for the main shaft, RHP part number RJ2024. Note this bearing has 13 small diameter rollers to accommodate the larger 35mm journal on the shaft. There is a small retaining plate to help hold this bearing in place. I should also point out that this pic shows a steel cage version of the 3/MJ28, normally this is plastic caged but this was the only pic I had of a "U" spec box.

If you have a K-Series, T-Series NASP or “X” spec turbo box you will have this:



The left hand input shaft bearing is the same, 3/MJ28. This pic shows the Rover issue plastic caged version, which would have been found in the above pic, had I not already replaced it. The main shaft bearing has 10 larger diameter rollers to take the smaller 33mm journal on the shaft. RHP part number is 2/LLRJ33. Note also there is no retaining plate fitted to these ‘boxes.

As I mentioned, mine is a bit of a hybrid. It’s a K-Series case (the clutch housing half anyway, to mate up to a K-Series engine) so there’s no retaining plate. But, it is running “U” spec gears so has the RJ2024 main shaft bearing. To date the lack of retaining plate has not been a problem.

Here's how mine looks:



Before removing the bearings, drop the shafts back in without the selector forks so you can undo the nut at the end of the main shaft:



Rave states to engage 1st & 4th gear to lock the shafts. However I have found that gravity pulls the selector off of 4th gear, just as the nut is about to undo, and I end up flying across the garage! So instead I engage 1st & 3rd gear so if anything, gravity will pull the selector onto the gear:



Use a screwdriver and hammer to release the locking tab on the nut out of the shaft. Loosen the nut with a 32mm (or 1 1/4") socket and ratchet. **NOTE THIS NUT HAS LEFT HAND THREAD!**



Undo the nut about halfway for now, just so that the locking tab is no longer interfering with the thread and the nut is free to turn. Once again withdraw the shafts from the gearbox case. If you have taken the nut off, chances are the main shaft will stay put and you'll lift all the gears off it. Standard procedure is for them to then fall on the floor! Leaving the nut halfway lets them move a bit, but they stay on the shaft. Stand the main shaft up on a clean surface and now completely remove the nut and washer. You can now withdraw the bearing(s) from the shaft.

Here is another variation between 'boxes. K-Series & T-Series NASP will have a single, deep bearing fitted:



RHP part number is 3LDJK25

T-Series Turbo, whether "X" or "U" spec, will have 2 separate bearings. Top one has the circlip groove and RHP part number is 43/LJ25.

With that one removed you can see the lower one, part number 3/LRJA25:



This one is in two halves, so don't be alarmed if only the outer race lifts off and leaves this behind:



This can be lifted off afterwards to leave just the shaft:



You can now place your new bearing(s) on the shaft:





Followed by the washer and nut, just screw the nut on loosely for now:



At time of writing there are not steel caged versions of these bearings available but I thought it better to have new plastic caged ones rather than used ones.

Back to the casing again, turn it over and stand it on a couple of wooden blocks and heat up the area around the input shaft bearing. Boiling water will do, I've used a blow lamp:



Place another block of wood over the hole, and give it a couple of good smacks with the hammer. The bearing should drop out of the casing. Here's the standard item next to a steel caged version:



Turn the casing back over. To remove the main shaft bearing, use a long thin screwdriver to get behind the plastic cage and flick the rollers out:



Remove all the rollers:



And then gently lift the cage out to leave just the outer race:

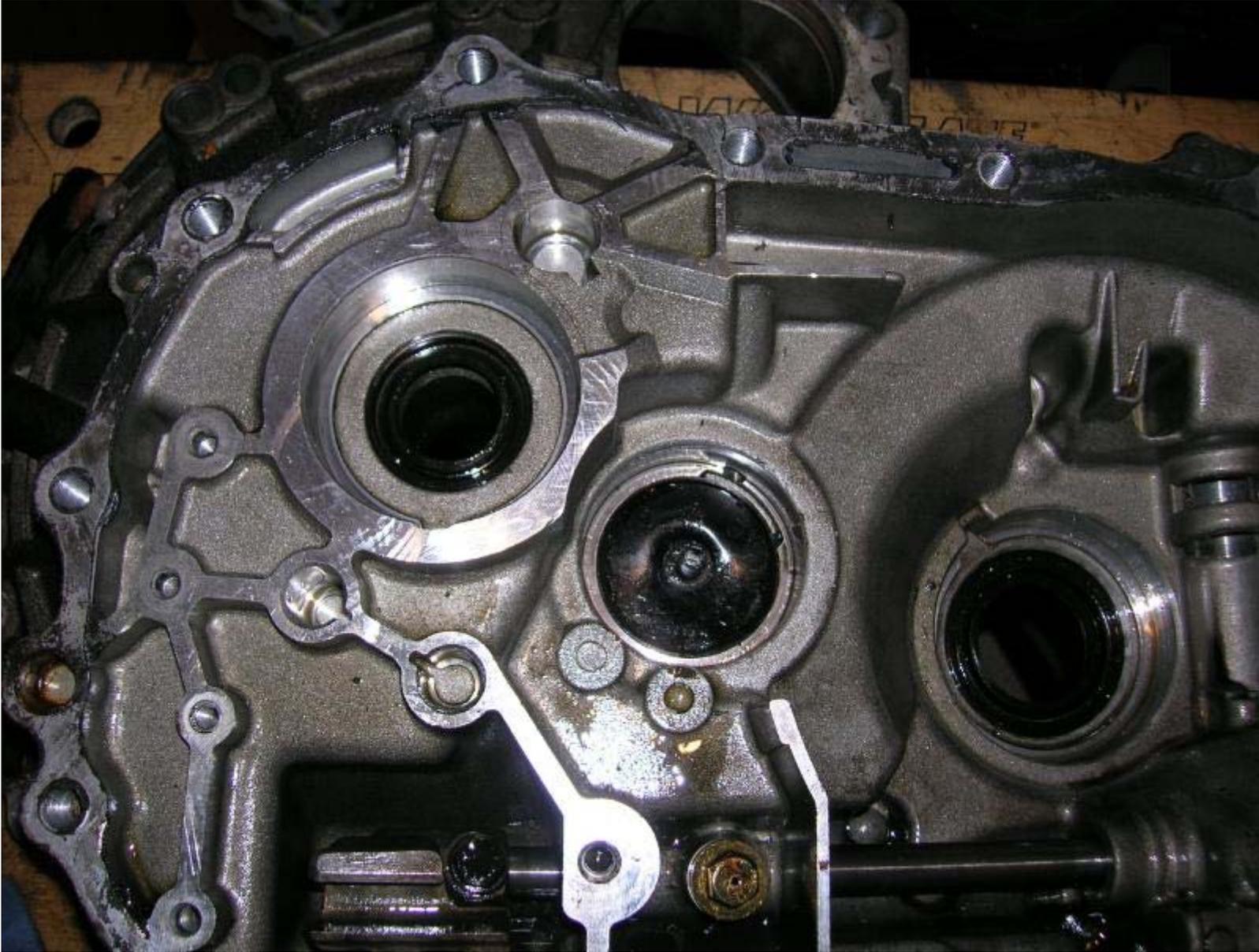


If fitted, take off the retaining plate by undoing the two bolts. Now position your bearing puller so the feet are underneath the top lip of the bearing. Obviously that black plastic disc is going to get crushed if you wind the centre bolt onto it. I've used a 10mm socket to give the bolt something solid to work against:

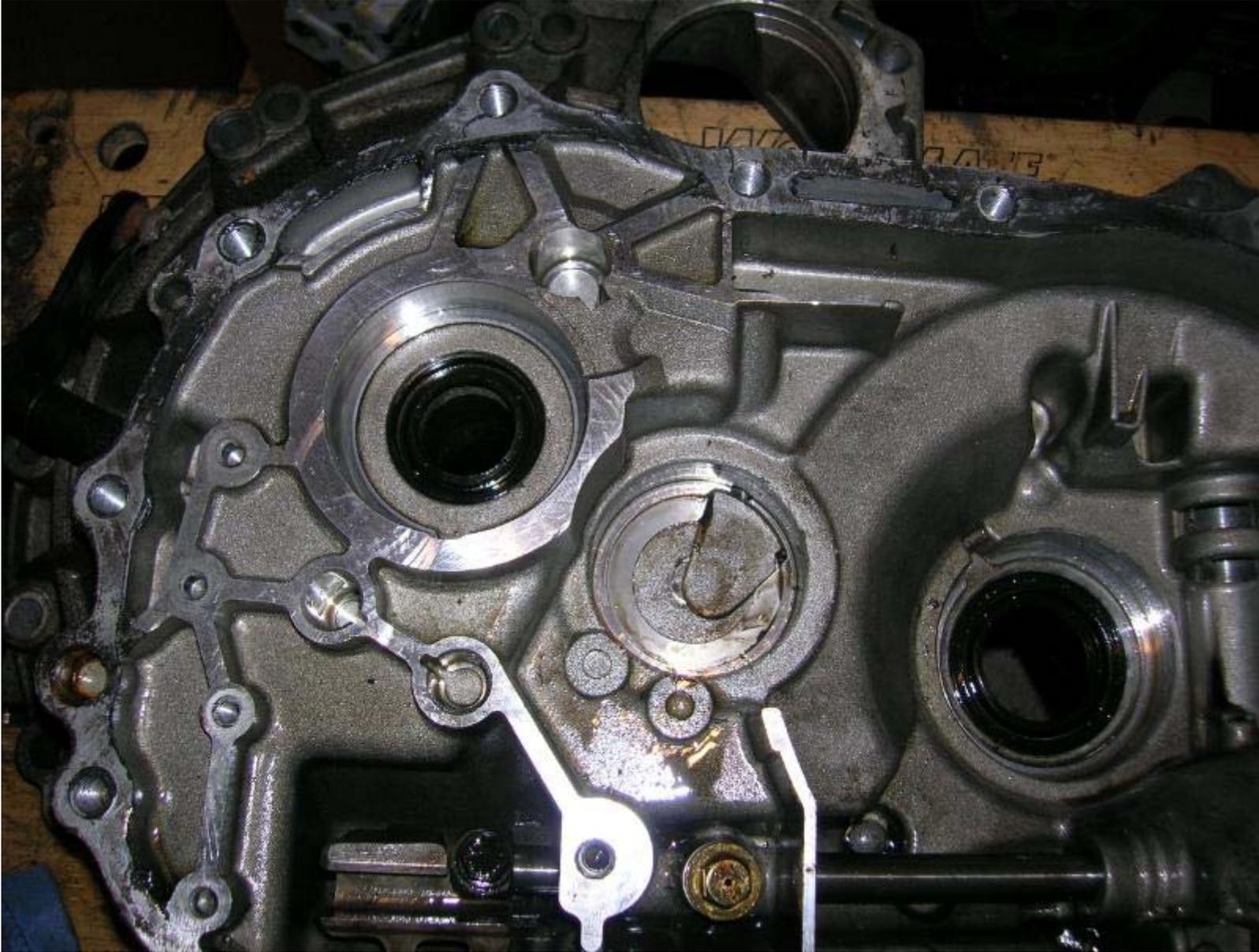


Tighten the puller's bolt just enough to get some pressure against the bearing. There's only a thin wall of aluminium behind that plastic disc and it doesn't take too much effort to burst through it making the casing scrap. Apply some heat to the area around the bearing and on the other side of the case as before. It's now a case of winding the bolt in a bit more, then applying some more heat and so on. It may also need some persuasion with a hammer and block of wood. If using a blow lamp, be careful not to melt the plastic disc, as this provides oil to the shaft and gears. Once it's about halfway out, it seems to come out easier and can be removed with the puller alone.

Now you'll have this:



Remove the plastic disc and clean up behind it with some rag:



Refit the disc. You won't have a better opportunity to renew the input shaft oil seal. Lever the old one out with a screwdriver:



Again clean up behind it, place the new seal in the hole, stack the old one on top of it and find a suitable size drift to knock it in with, this socket is 1 13/16" and fits perfectly:



Fit your new input shaft bearing, again I've used the old one on top:



Followed by the main shaft bearing. This goes in complete, you don't need to put the outer race in first, then the cage and rollers afterwards!
Similarly, you don't need to re-assemble the old one, just use the outer race of it:



Refit the retaining plate if fitted, with TOP facing you and tighten bolts.

Onto the diff, use whatever you find easier to remove the bearings. Couple of large screwdrivers or pry bars should do the job. I've used a bolster to start them off:



Then a bearing puller to finish the job:



Here's the standard plastic caged bearing, part number 6208, next to the M208 steel caged version which seems to be the most popular upgrade:



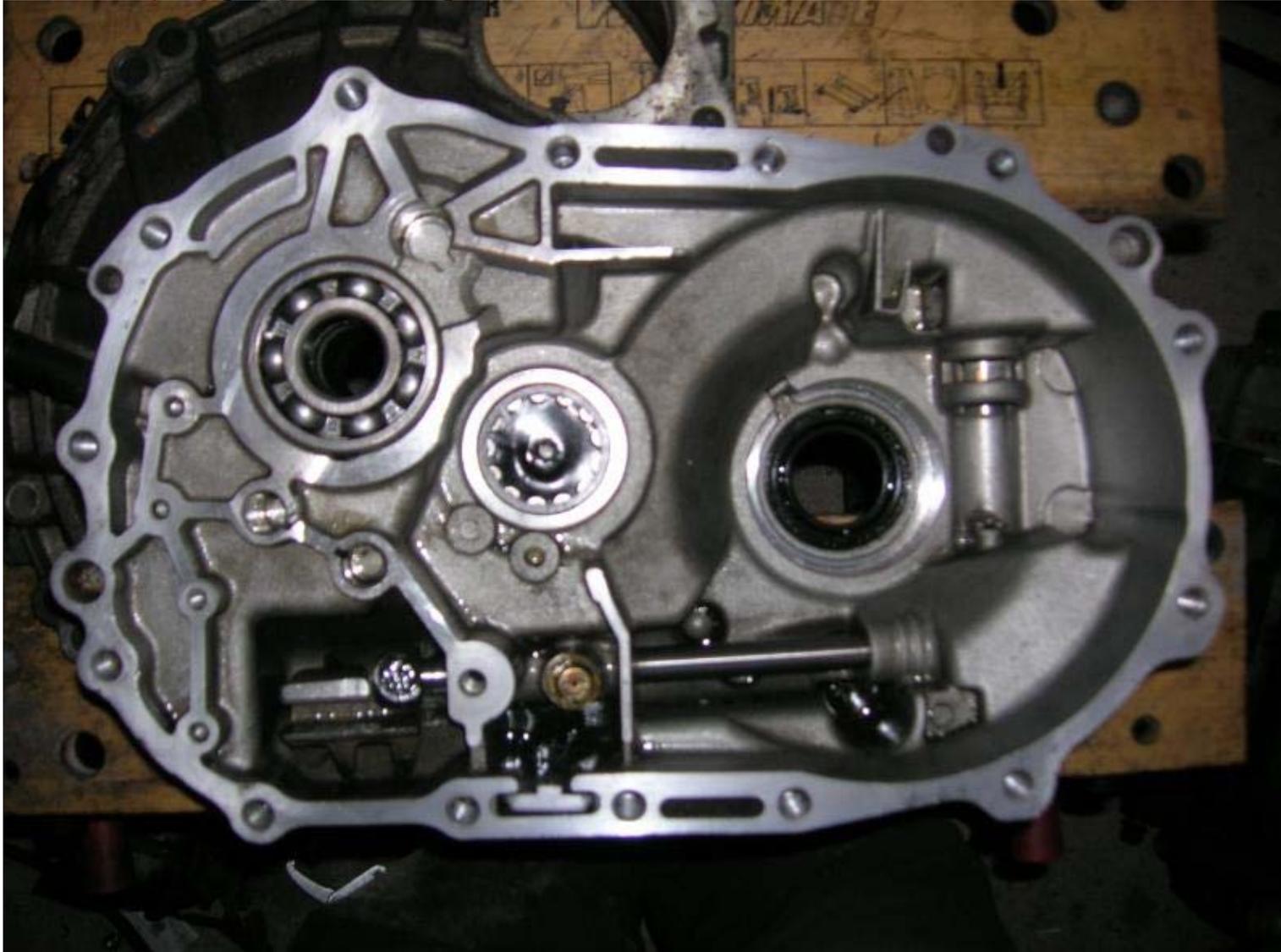
Again, use an old bearing to assist fitting the new one:



Keep going around the inner race of the old one to make sure it goes down evenly. You'll know when it's fully home as the note of the tapping will change as it goes solid. The journal on the diff will protrude slightly out of the bearing.

The eagle eyed amongst you may have spotted I removed bearings from a Type A torsen and fitted new ones to a Type B. Taking the opportunity to upgrade!

The gears & diff are now ready to be re-fitted to the casing. Before doing this though, clean up the mating face of the casing. I use a Scotchbrite pad which does a pretty good job of removing the old sealant:



Also give the inside of the casing a general clean up with some rag. It is also worth removing the magnet on the bottom edge with a screwdriver:



Give it a good clean up and refit it.

Refit the diff:



And the two shafts, without the selectors:



Engage 1st and 3rd gear as before and tighten the nut, and use a hammer and screwdriver to knock the lip of the nut into the cut-out of the shaft to lock it. Disengage the gears so you're back in neutral and remove the shafts. Fit the selector forks back onto the shafts and once again lift the assembly back into the casing.

Now then, see this slot in the near selector shaft:

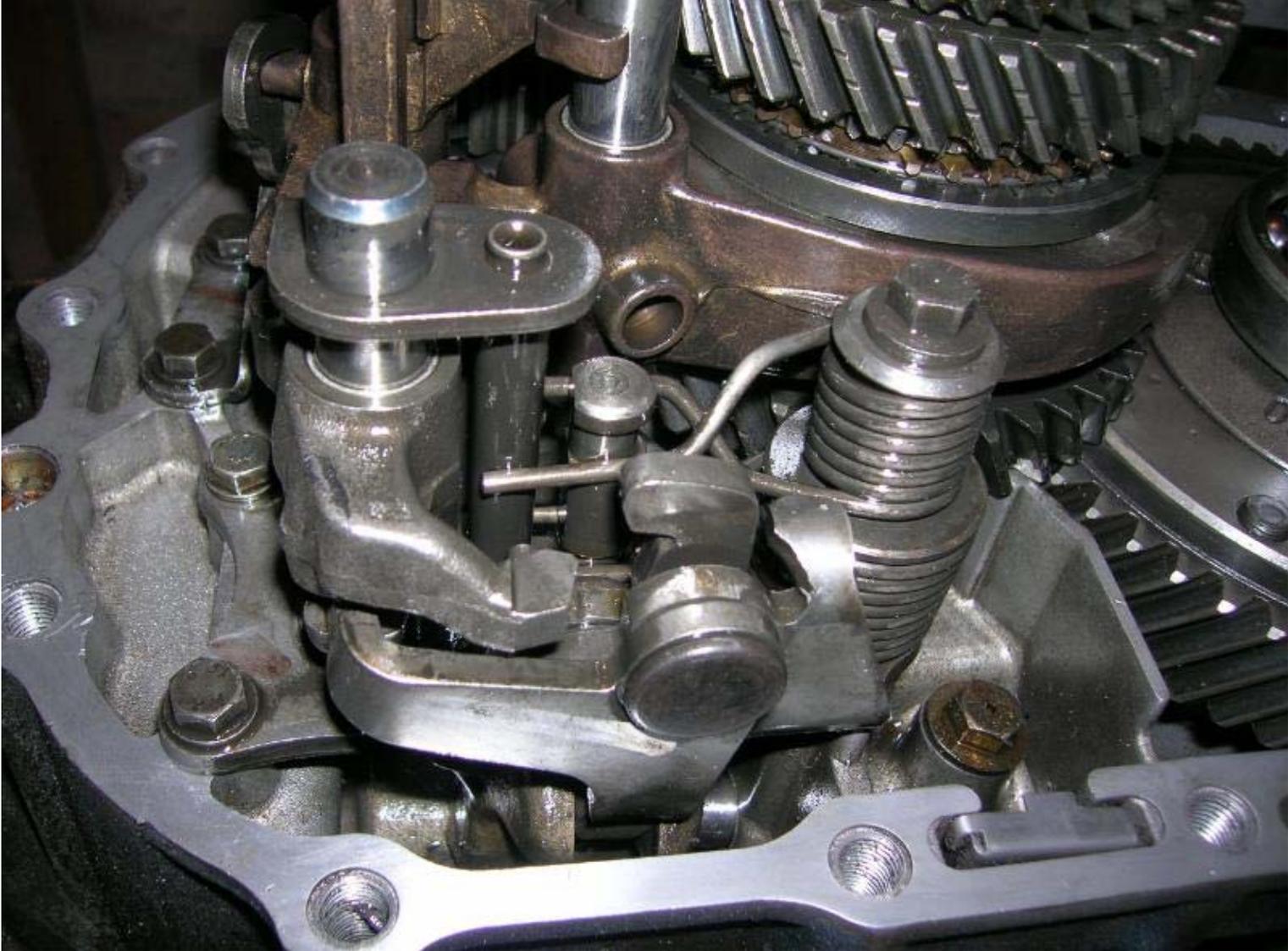


That allows the base plate of the selector mechanism to slide into it:



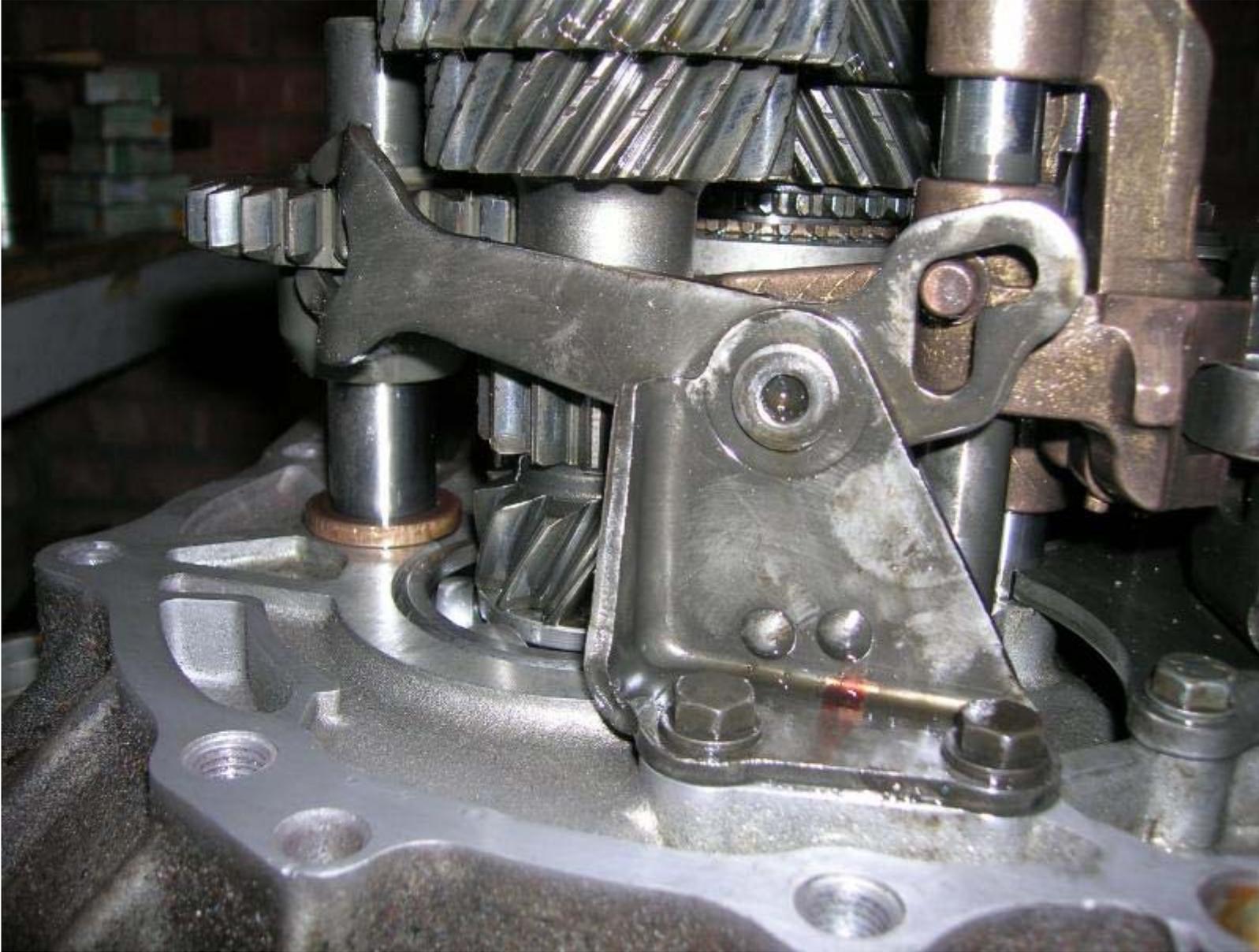
You can just make out a small semi-circle on the edge of the plate, in the centre of the pic where the shaft locates.

With this in mind, refit the selector mechanism and tighten the bolts:



Remember where that silver one goes!

Refit the reverse gear idler and selector fork. Ensure the 3-pointed slot locates over the peg on the lower selector fork:



There's now one more bearing to replace, but where's it gone?! Nine times out of ten, the top input shaft bearing stays inside the gear case but it may get left on the shaft. Again, which 'box you have determines which bearing. "X" and "U" spec turbo 'boxes will have a 3/LJ28 which has an O.D of 78mm:



K-Series and T-Series NASP have a 4/MJ28, which has an O.D of 75mm:



If it has remained on the shaft (as Rave assumes it has!) lever it off. If it's stayed in the casing, you'll need to heat it up with your preferred method:

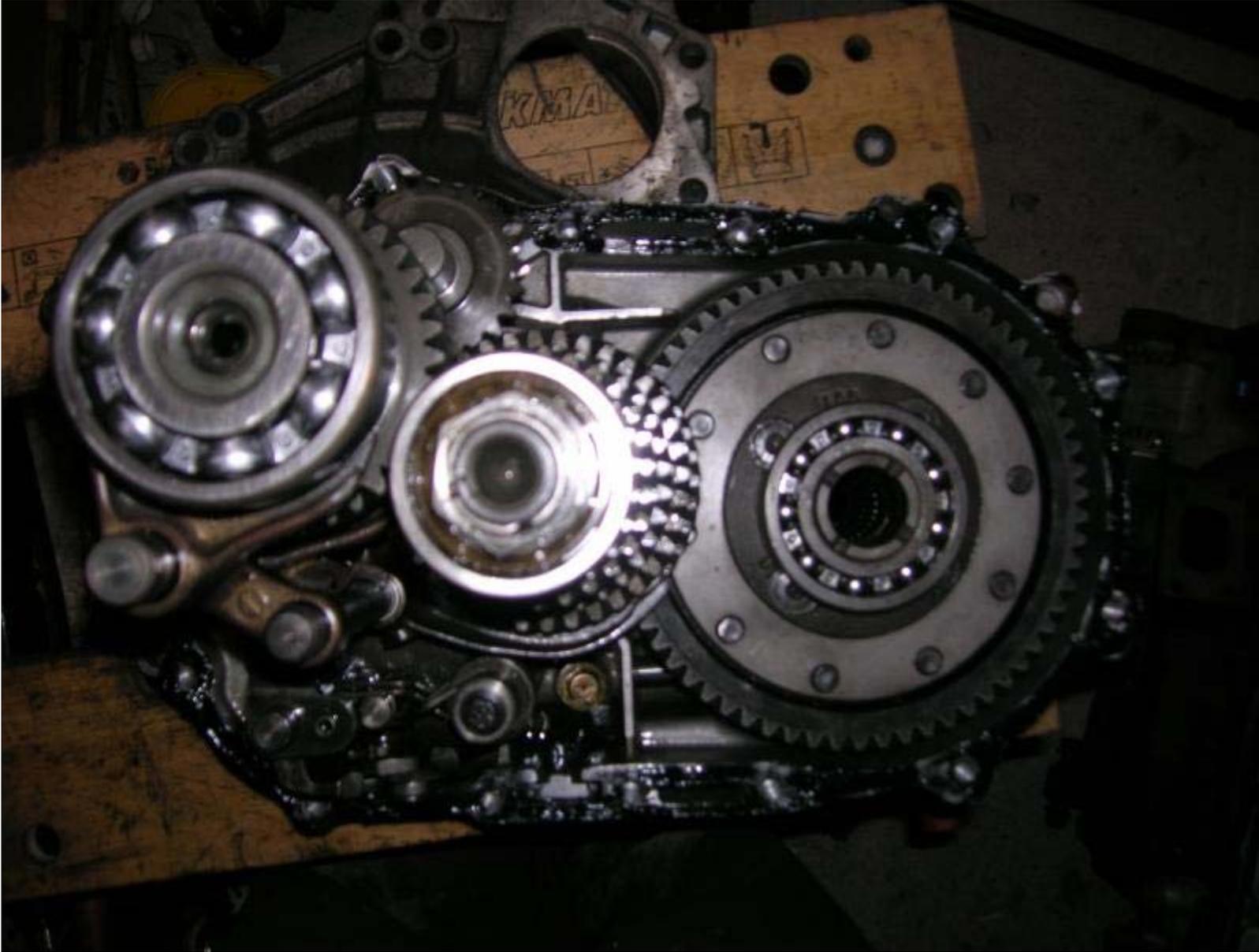


Sometimes the casing “pops” and jumps a bit as the bearing is released just from the heat. This one needed some persuasion with my variable pressure applicator! Don't hit the casing directly with the hammer, use some wood to absorb the impact and spread it over the area.

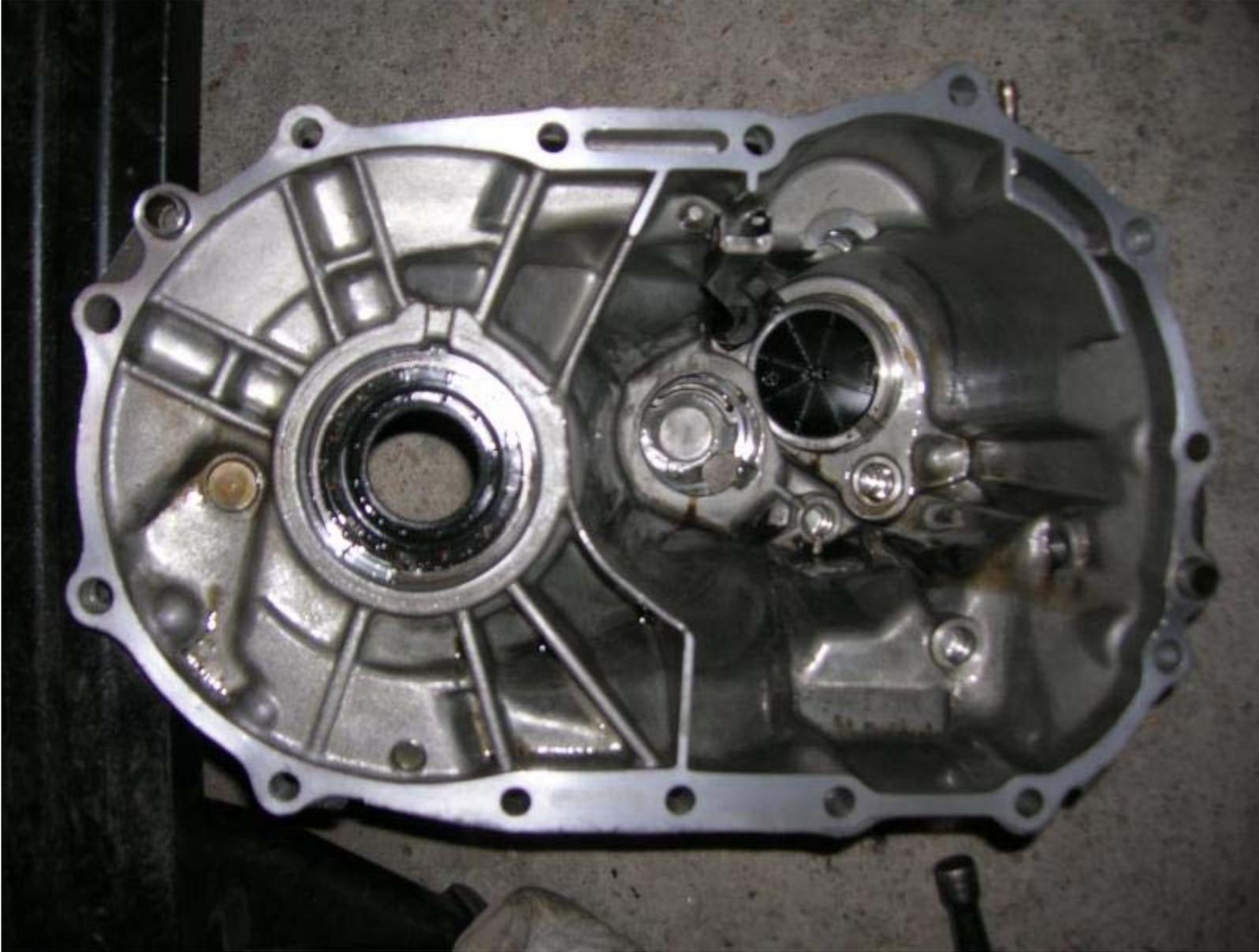
Here's a pic of the old one next to the new steel caged one:



Whether the old one was on the shaft or in the case, it's easier to fit the new one to the shaft:



Before lowering the gear case over the gears, clean up the mating face:



And apply some sealant around the diff housing half. I use this:



As it sets quite “rubbery” like the original sealant. Carefully lower the gear case over the gears and onto the bearings. You should be able to get the dowels lined up if not started with hand pressure alone. Now use 4 or 5 bolts around the edge of the case to gently and evenly pull it down to the other half.

Wind the bolts down far enough so the circlip has a little pressure applied to it by the bearing:



Use 2 screwdrivers to lever the prongs apart enough so the circlip sits on the taper at the edge of the bearing:



If it keeps springing back, you don't have enough pressure on it so wind the bolts in a touch more. Once you're happy it's started on the bearing, keep winding the bolts down evenly to bring the two halves fully together.

The circlip will now look like this:



Use a large flat screwdriver under the nut at the end of the shaft and lever the shaft up so that the circlip clips into the groove of the bearing:





You can now refit the remaining bolts and tighten them before the sealant goes off. I normally start on one of the long ones on the bottom edge,

work my way around the short ones, and then finish on the other long one. That way you know you've done them all. Clean the threads of the plug with a rag and wire brush if necessary. Apply some sealant to it, refit it, and tighten it up. Refit your speedo drive and reverse light switch. You may need a phillips screwdriver or similar to line up the reverse gear idler shaft with the hole in the top of the gear case. If only the thread of the bolt will go in, it isn't lined up properly. Keep playing and eventually about half of the shoulder of the bolt will also go through then the bolt can be tightened.

And that's about it! There's nothing here really that the Rave manual doesn't tell you but does go to show you don't need any of the "Rover Special Tools" which it frequently mentions! I know I haven't mentioned shimming of the diff or input shaft but remember this post is titled "bearing replacement guide". Much like Ronseal doing exactly what it says on the tin!

I've never shimmed a gearbox that I've stripped and it's never given me a problem (well, not one that shimming would solve anyway!) There are people on here with much more experience of these 'boxes and I feel they would be better qualified to comment than myself. I may have a crack at it one day, it doesn't seem to difficult looking at the manual.

It is also wise to replace the diff oil seals whilst the gearbox is out. I haven't included that here because, unlike the input shaft seal, you don't need the box apart to do it, although it's easier to knock the old ones out from inside.

As I said at the beginning, this is intended as more of a guide for those who haven't had a gearbox apart to see exactly what is what. I've covered the replacement of every bearing, but the ones that seem to be the most trouble are the two diff ones, and the input shaft bearing at the clutch end of the gearbox. Conveniently, these are the only bearings that remain the same regardless of gearbox spec!

Hope this is of some help (perhaps even worthy of a Sticky?!) and if anyone wants to add anything I've missed please feel free!