

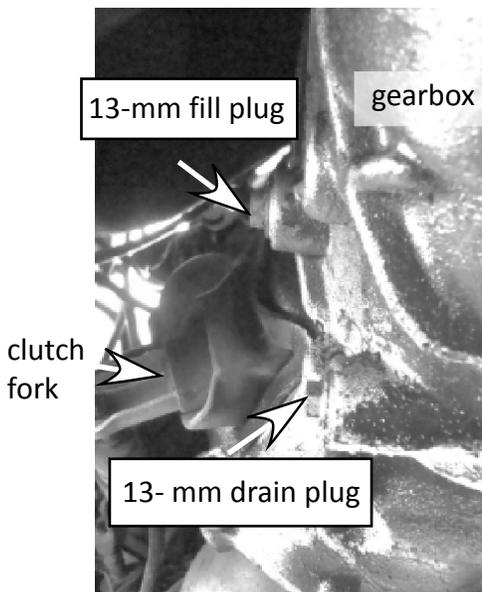
# How to Avoid the Brass Gearbox Fill Plug from Hell Fiasco (Or the best way to change the gearbox oil)

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**Caution: Put your car up on ramps, chock wheels, put transmission in first, set handbrake.**

The shifting in my M46 manual transmission was acting up, a combination of clutch and gearbox. I decided to change out the gearbox oil first. It had been over five years and almost 14 thousand miles since I had checked that oil level. Well, previously, I had rounded the upper brass gearbox fill plug, but I continued to reuse it. **Big mistake 1!**

I tried to remove the brass fill plug using a 12-point 13-mm box end wrench. I could not loosen the plug because the head had become rounded and the wrench was slipping. "No problem," I thought. "I'll just use the Craftsman vise-grip tool I have." **Big Mistake 2! What was normally a 45-minute job became a 23-day task.**



**Figure 1.** The fill and drain brass plugs of the gearbox, M46 transmission, looking towards front of engine.



**Figure 2.** Note the rounding of the 13-mm brass fill plug from using a 12-point box end wrench. This was before attacking it with the vise-grips.



**Figure 3.** The brass fill plug after unsuccessful attempts to loosen it with the vise-grips. The steel of the vise-grips would cut through the brass and slip off the head. It also wore away the head.

Based on my observations and tribulations, I have some recommendations, in deteriorating order, for folks replacing the gearbox oil in the M46 (or M47) manual transmission. (More advice: **If you don't have the proper tool, go out and buy it rather than jumping steps.** Sure, it's a headache to stop what you're doing to make a special trip to the tool store. But, believe me, it's less of a headache than escalating the deterioration.) These steps show a progression to the worse-case scenario.

**1) Loosen the fill plug first.** Why? This will ensure that you have an easy way to get new oil into the gearbox. If you can't loosen the fill plug, you still have the old oil in the gearbox and you can still use your car. If you did it the way I did, you would have drained all the old oil out first. But, since I couldn't budge the fill plug, I had no easy way to refill the gearbox and I could not use my car. **(Do not start engine with no oil in gearbox, as the input shaft of the transmission spins!)**



**Figure 4. 6-point box end wrench.**

**2) (a) Use a 6-point 13-mm box end wrench (Figure 4) to loosen the *fill* plug.** The 6-point grabs the flats of the hex head, offering a more secure grip on the plug head than a 12-point wrench.

**(b) If you had already used a 12-point box end wrench and had already rounded off the brass plug head (Figure 2), then file down the protrusions from the rounded corners so as to get the hex sides as flat as possible. Then, use the 6-point box end wrench.**

If this fails, then . . .



**Figure 5. The Craftsman Bolt-Out.**

**3) Use something like a Craftsman Bolt-Out (Figure 5).** This socket grabs the bolt head and bites deeper into the head while you attempt to loosen it.

If this fails, then . . .



**Figure 6. Hex gripper Vise-Grips.**

**4) Try using the hex-gripper Vise-Grips (Figure 6).** It grips hex heads better than traditional vise-grips. (This tool actually saved my bacon when I rounded off a brass plug on another job.)

If this fails, then . . .



**Figure 7. Traditional vise-grips with straight jaws.**

**5) Try a traditional straight-jawed vise grips (Figure 7) if all of the above have failed.** You've got nothing to lose at this point. (I'm pretty sure, though, that you will be cutting brass from the head while the tool slips.)

If this fails, then . . .

6) Either have the car towed to a professional mechanic who can weld something to the plug head for a better grip so as to loosen, or



Figure 8a. J-B Weld, a steel epoxy. Follow directions on label. I found it to be runny when first mixed. You can wait a few minutes before applying. Clean surfaces with acetone or paint thinner.



Figure 8b. A sacrificial 13-mm box end wrench was “welded” to the, by now, extremely rounded brass plug head. Unfortunately, I had not masked the threads and ended up “welding” the threads of the plug to the threads of the gearbox. *What was I thinking?* Also, after the epoxy cured, there was a depression in the box end. So, I mixed more J-B Weld, filled the depression, and once again, waited for it to cure.

7) Use J-B Weld (Figure 8a) to fill a sacrificial 13-mm or larger box end to the problem plug head (Figure 8b). Score the plug head and wrench with a Dremel tool cutting disk (Figures 9a, b) before applying the J-B Weld.



Figure 9a. The scored brass fill plug.



Figure 9b. The scored back side of the sacrificial 13-mm box end.



**Figure 10. Tape off the thread boundary of the brass plug with the gearbox. Discerning readers will notice that this is not the *fill* plug of Figure 9a. Remember, I had failed to tape that boundary. This is a photo of the *drain* plug and is used for illustration.**



**Figure 11. While the J-B Weld is setting up, you need to support the wrench. I jammed a cardboard strawberry box as a wedge against the undercarriage and wrench at the top end; for the bottom end, I built up a support using a box and blocks of wood.**

**8) Be sure to tape off the boundary of the plug threads with that of the gearbox (Figure 10).** Support the wrench as in **Figure 11**. In the end, the J-B welded wrench seemed to be able to offer the torque to loosen the rounded plug.

As I said, I did not tape the thread boundary, thus inadvertently J-B welding the threads together. Thinking I could salvage the project, I spent many, many hours scribing and scraping the weld steel away with various wood carving knives. In the end, I couldn't tell how much weld steel was between the threads, and I didn't want to strip the threads out of the gearbox. **So I left well enough alone. After piling one bad decision on top of another in this summer of auto discontent, leaving well enough alone was a decision I could live with.**

If you did tape the threads, once the J-B Weld has cured, make sure that the thread boundary is clean. You may have to peel and cut away as much tape as possible and use a mirror to see the whole circumference. You may also wish to use a wood carving knife or small pen knife to score and scrape at the boundary for any weld steel that may have accumulated there. Once you're sure the boundary is clean and clear, then try torquing the wrench to see if the plug breaks free. Hope it works!

**Caution! If you did get J-B Weld on the threads, then I highly recommend that you go to Step 9 rather than risk ripping out the gearbox threads, thereby killing your transmission and putting you in a world of hurt---timewise and moneywise.**

If this fails, then . . .

9) Fill the gearbox by going through the overdrive switch plug (Figure 12) on top of the gearbox, passenger side. An IPD Tech gave me this hint. He said I would have to drop the transmission a bit to get to the 22-mm plug because space is so confined in there. But, I got around that by using a 22-mm crowsfoot wrench from ZD-Mak (Figure 13). The wrench combination I used is shown in Figure 14.



Figure 12. The overdrive switch plug and connector atop gearbox, passenger side. Easily felt, hard to see. Use a pick to pry off the connector. A mirror helps.



Figure 13. The 22-mm ZD Mak tool, which also fits the oxygen sensor plug.

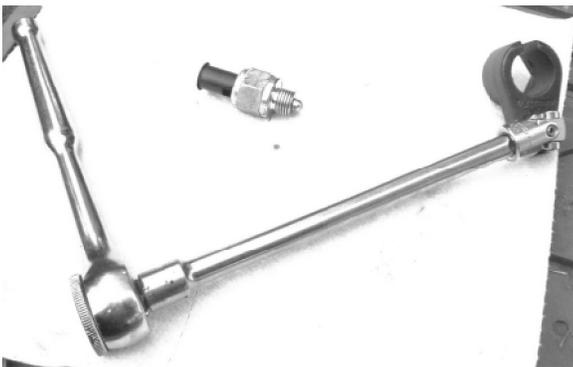


Figure 14. This is the wrench combination I used: 3/8" socket wrench with 8" extension and a 3/8" universal joint.

**10. Insert a hose (7-mm works) into the overdrive switch hole (Figure 15) and work it around the partial obstruction. Hook up the other end to a squirt can (Figure 16). IPD recommends that for old cars, rather than filling with gear oil or ATF fluid (type F or G), that the gearbox be filled 10W-30 synthetic oil. Use 2.4 quarts. Put overdrive plug back in and tighten (not too tight). Hook up electrical connector. Now, you can start your engine.**



**Figure 15. A 7-mm hose is inserted into the overdrive switch hole. You need to work it around a partial obstruction.**



**Figure 16. The other end of the hose was connected to a squirt can filled with 10W-30 synthetic oil.**

**11. And finally,** if you have that J-B Welded wrench hanging around beneath the car, it's time to cut it short (Figure 17). I left a short handle, so I can slip a piece of pipe over it if I ever decide to try torquing it loose---perhaps just before the car goes to clunkerville.



**Figure 17. The J-B Welded wrench, cut short. It will remain as a reminder of my stupidity.**