

# From Gears to Eternity, Part 2

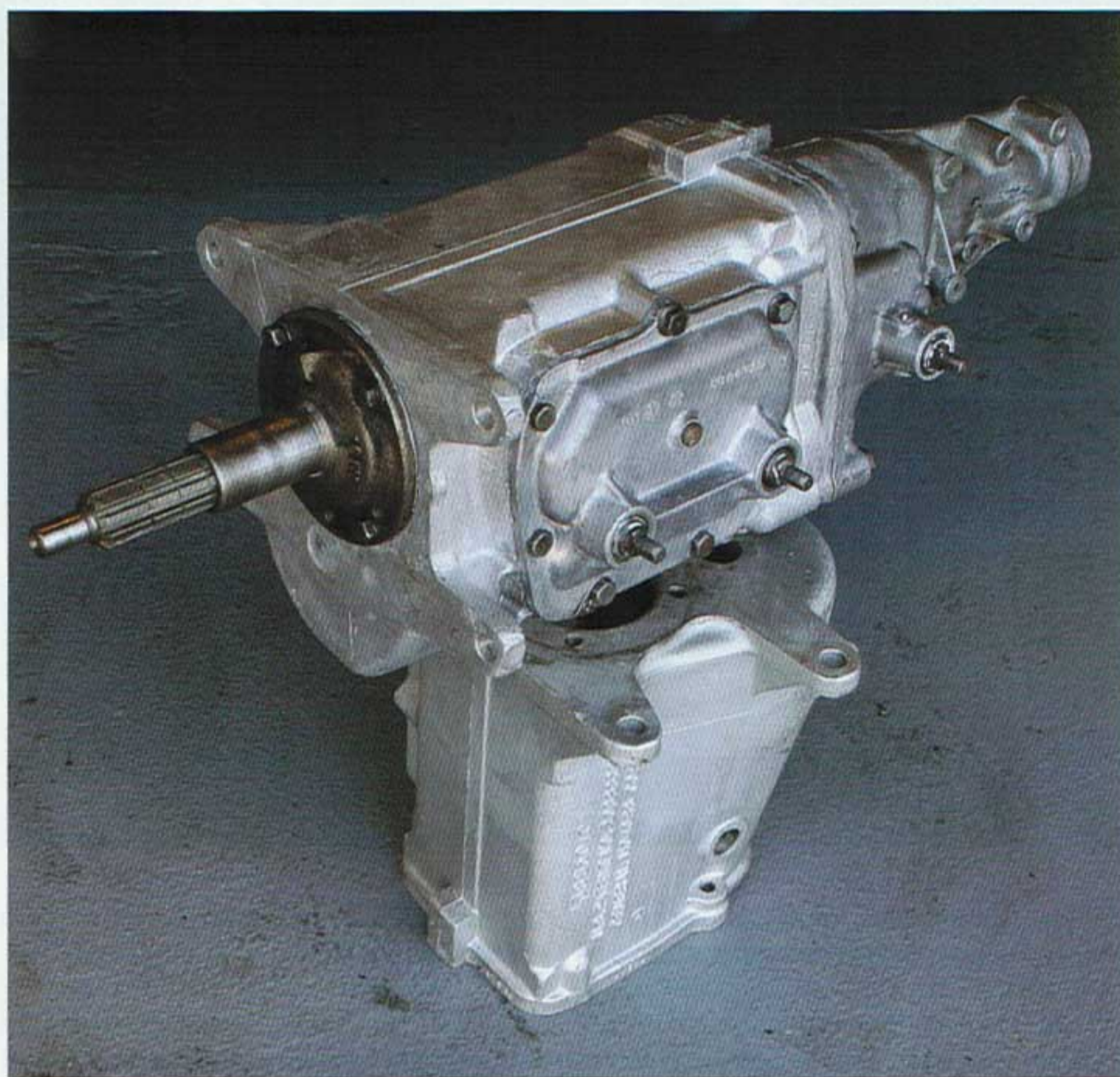
Jeff Glenn finishes the rebuild of a Muncie that got munched. Pix by the author.

In the last issue, we got halfway through the refurbishment of our Muncie four-speed. While all these boxes are more or less the same, remember that our study case—so to speak—is an M20, so some of the internals of M21s and M22s will look a bit different. With that, let's pick up right to where I left off:

**R:** The synchro hub makes a pretty snug fit on the shaft, so tap it firmly into place (*photo 35*). Next, grease the three new keys and stick them into the gaps on the hub. Hold these in place (*photo 36*) while carefully dropping the new synchro slider over the top (*photo 37*), then install the snap-ring spring into the hub. The notches on the spring correspond with two keys (*photo 38*), so that the spring won't twist and break.

Take a second brass blocking ring and locate it so that the collar faces the synchro hub. After that, grease up first gear and slide it onto the shaft. It'll be loose as it rides on the sleeve. In the meantime, since the sleeve and the center bearing need to be pressed on together, line the sleeve up with first gear and place the bearing on the shaft so it rests on the sleeve. Now drag the whole assembly to the press: Locate the shaft so that the bearing and first gear are held in the lower jaw, then press the components together (*photo 39*) until the sleeve slips under first gear and the bearing is snug.

**S:** Forward of second gear, grease the shaft and slide third into place with the small teeth pointing ahead (*photo 40*). Follow that with a hit of grease on the smooth end and a brass blocking ring with the collar facing forward. Locate the synchro hub and brush a little more grease on the shaft, then tap the hub into place. (Precision Motive uses a shank of appropriate aluminum pipe.) Pat then searches through his stash of spring clips to find the precise thickness that will keep the hub from sliding. The new clips are .093 inch, but he found a .090



that kept everything ideally in place (*photo 41*). Take three new synchro-hub keys (*photo 42* contrasts a new key with a worn key) and hold them in place while the hook slider drops into position (*photo 43*). With that, the main-gear stack is complete.

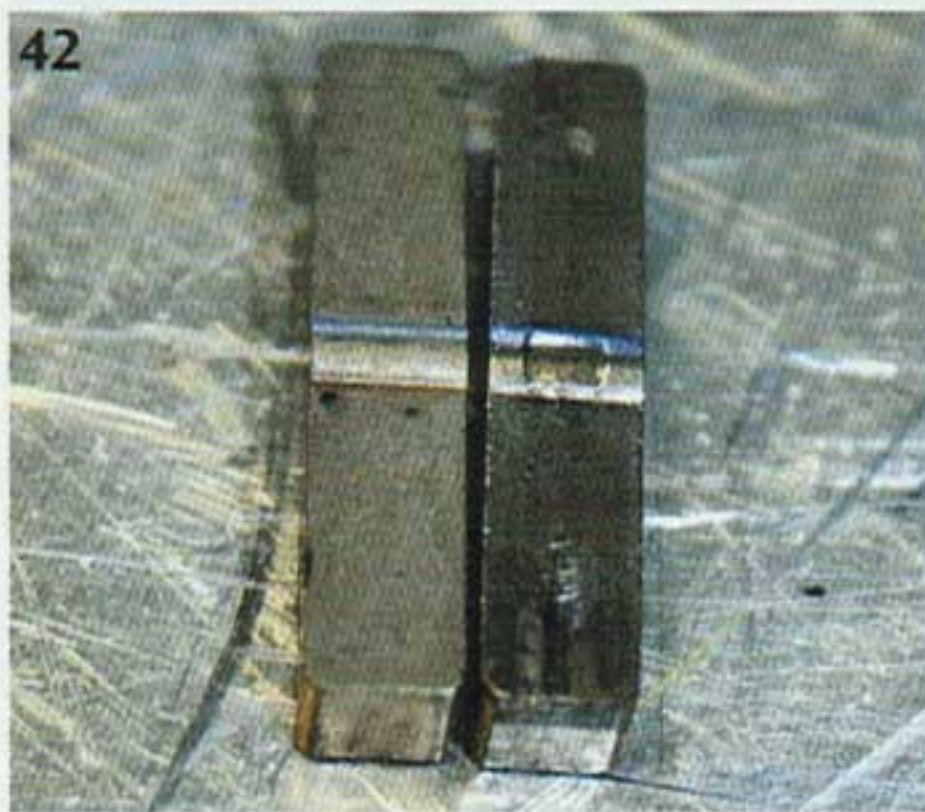
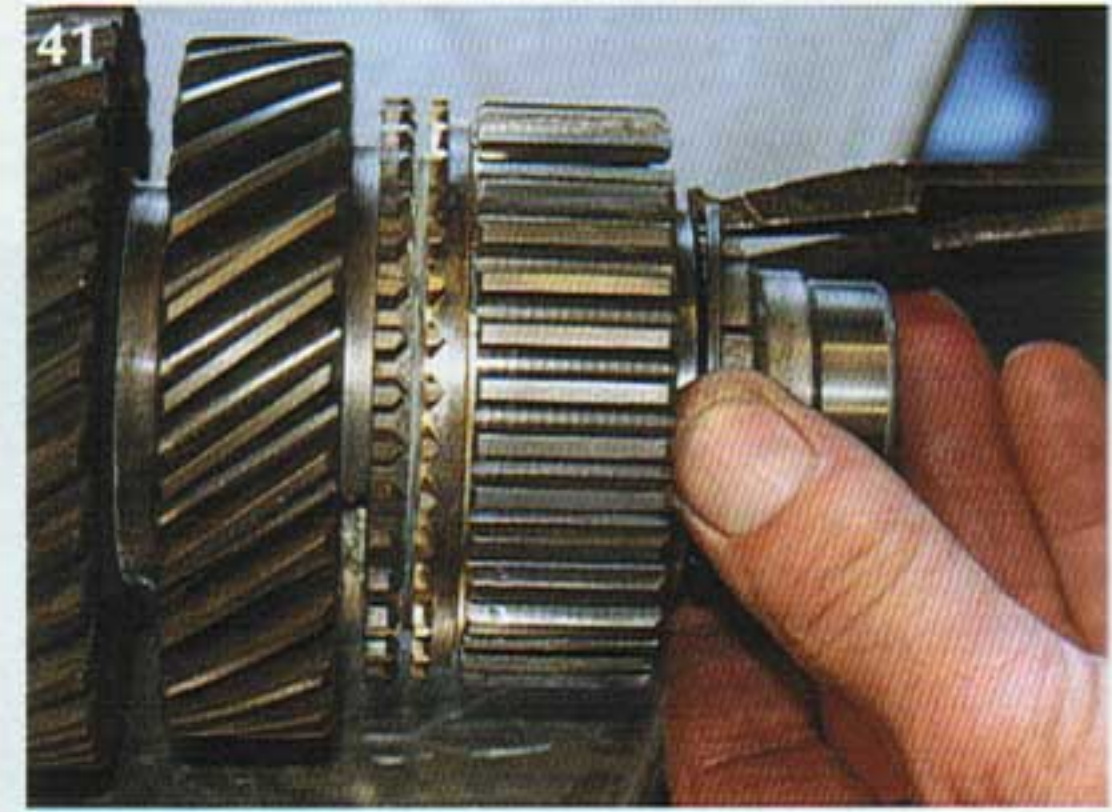
**T:** Now take a good look at the case, the bearing support, and the tailshaft housing. If there is any gasket material still clinging to the mating surfaces clean it off with a razor scraper, being careful not to gall or scratch the metal. Pat likes to sweep the flat surfaces with a file, too, to ensure proper sealing. This is also a

good time to do any Helicoil repairs and re-tap any damaged threads.

**U:** In back at the tailshaft cover, grease up the new bronze bushing and its receiving surface. Tap the bushing into place from the rear with a suitable drift (*photo 44*). Test-fit the yoke to be sure it works, then pull it back out. Hit the sealing surface with silicone RTV, then gently tap the new rear seal home.

Returning to the inside of the case, grease the reverse-detent spring and drop it in its hole (*photo 45*). Next, go outside again and tap in the new seal for the reverse-shift shaft.





V: Take a dab of heavy wheel-bearing grease and smear the top of the reverse-detent spring. Next, after placing the steel detent ball on top (photo 46), grab the reverse-shift shaft and feed it through the appropriate hole while pressing the ball down onto the spring (photo 47). Once that's set, put the reverse-selector fork over the inside end of the reverse-shift shaft (photo 48), smoothing the way with still more lithium grease.

W: What, *more* gears?! Okay, fine. The cluster gear and pin should come next. Pat uses a short 'dummy' cluster pin to assemble the new needle bearings and spacer; he'll tap the actual pin into place after the cluster gear is positioned inside the gearbox.

Grease up the dummy pin and drop it into the cluster-gear assembly. Then press additional wheel-bearing grease all around the pin

and install the first of your six thin thrust washers (photo 49).

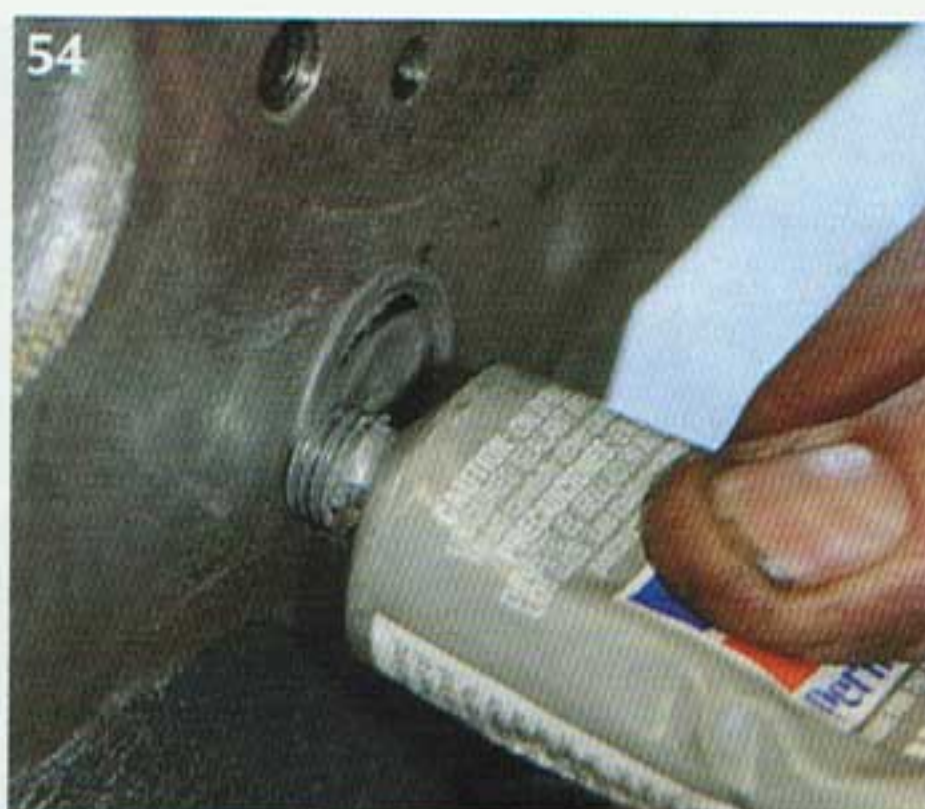
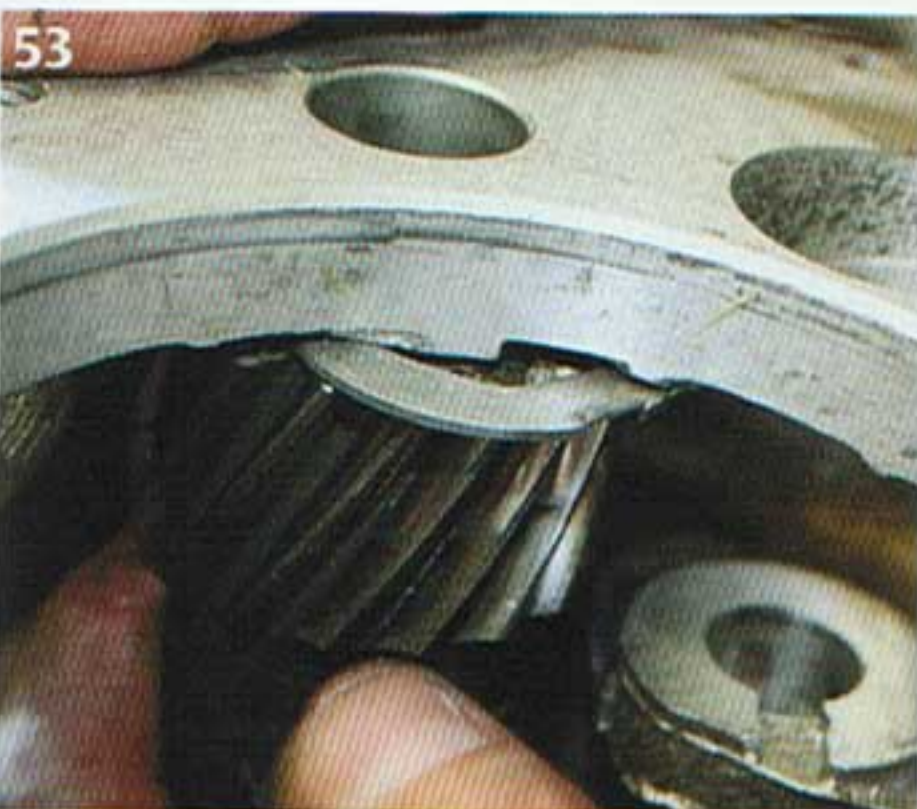
X: Check one of your new needle bearings against an old one. They should be exactly the same length. If they aren't, the wrong ones were put in the kit, which for some reason isn't uncommon. Anyway, also be aware that most kits come with extra needle bearings; as long as you're careful during reassembly, don't worry if you have some left over.

Push the needle bearings into the grease all around the pin until every last space has been filled (photo 50), then press them down with more grease and install the next thrust washer. Repeat the process again until you have two rows of bearings and washers. Next, flip the cluster over, drop the large spacer (photo 51) in, and pack two more rows of bearings on top of that.

Y: To prep the case for the cluster, place the unit front-face-down on the bench and fit a new thrust washer so that its tab is locked into the gap (photo 52). Slide the loaded cluster gear with the temporary pin into the case, largest gear facing forward. Once it's in place, slip a second thrust washer between the cluster and the back of the case (photo 53). Finally, slide the case over the edge of the bench and drive the real cluster pin in to replace the short dummy, making sure that the tapered end with the half-moon is located on top. As the pin reaches the front of the case, take a second to apply more RTV to prevent leaks (photo 54). After that, drive the pin home until its bottom is flush with the back of the case (photo 55).

Z: Installing the thrust washer for the reverse-idler gear is similar to doing the one for the cluster. Once it's in, the idler gear should ride





right up against it. The rest of the reverse-gear stack follows it in, this being a good way to temporarily hold the parts in until the mainshaft returns to the case. Pat saw some wear on the thrust side of the idler gear, so he lightly ground the chamfered side before installing it.

**AA:** Moving to the forward gears, take the input shaft with fourth gear and find the needle-bearing cage among your cleaned parts. Grease up the cage and stuff the new needle bearings in its slots, then use pliers to drop the cage onto the rear of the shaft below fourth. Hide it with heavy grease (photo 56), then brush a little white grease onto the smooth collar behind fourth gear and put the brass blocking ring over the end of the shaft (photo 57).

**BB:** Cruising right along, tap the main-case bearing support over the bearing near first

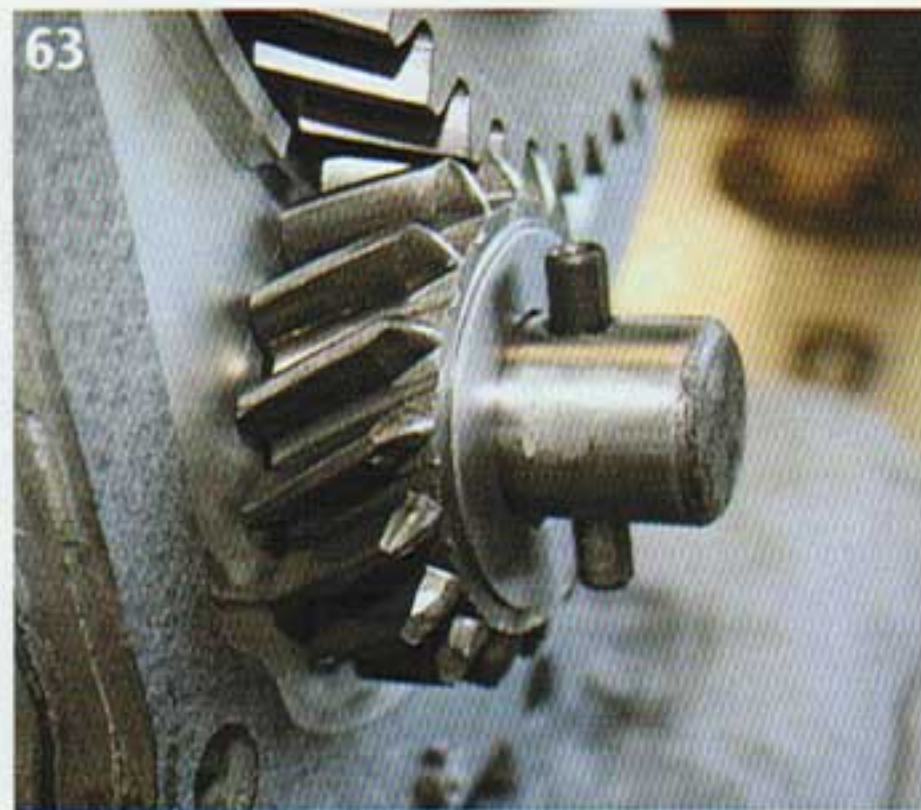
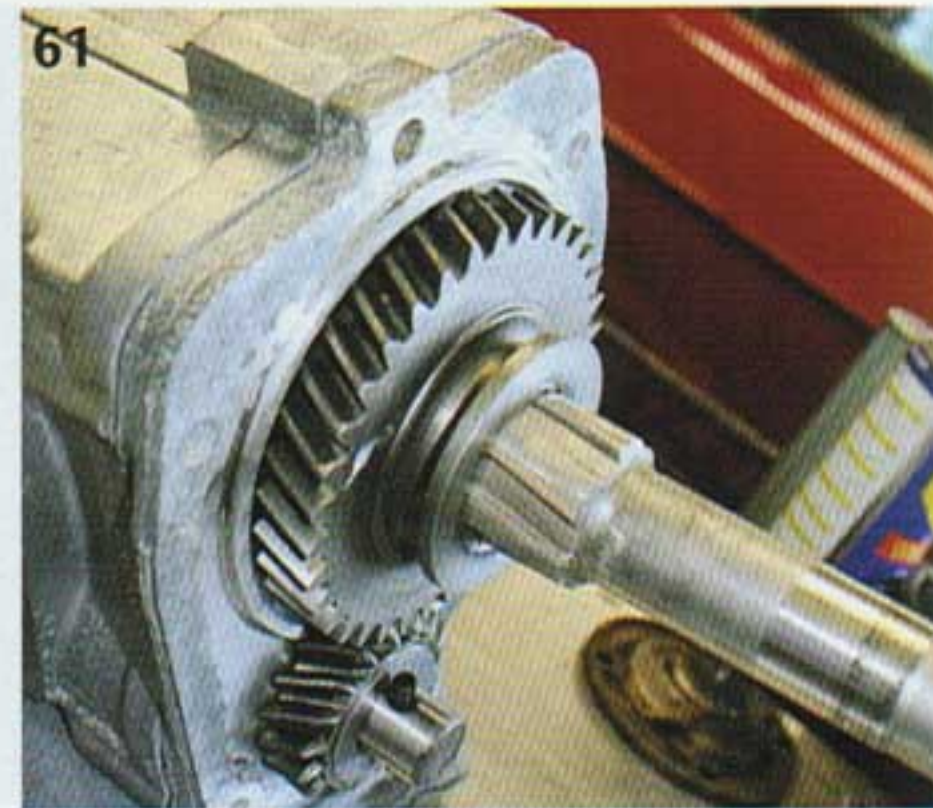
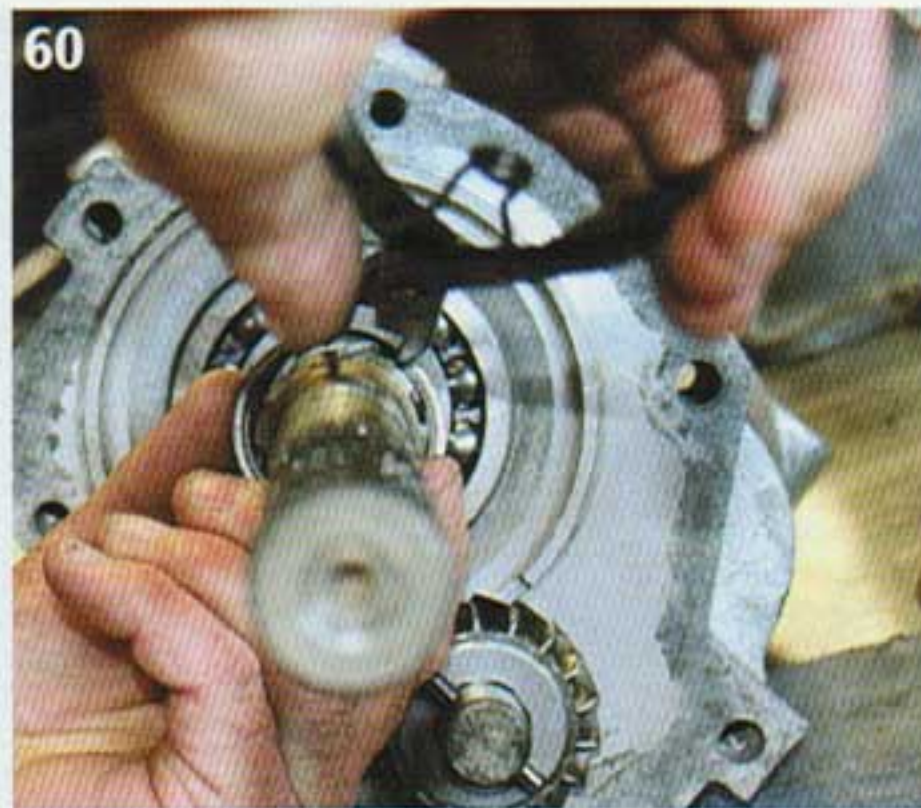
gear on the mainshaft. Keep driving it forward with the snap ring in place (photo 58) until you hear the ring expand with a "clack," signifying that it's home. Smear the gasket surface with gray RTV and line up the new gasket on the pins in the bearing support.

**CC:** Now take reverse gear back out, leaving the idler rolling around near the cluster gear. You're finally ready to put the mainshaft back in. Smear more gray RTV onto the back of the case, drop the input shaft with fourth gear into place, and carefully feed the resulting assembly into the case. You can avoid tangling it up with the cluster gears by pushing the synchro-hook slider into fourth gear and tilting the shaft up (photo 59); that gives you just enough room to sneak the assembly in, drop it down into place, and push it out through the front of the case.

**DD:** Once that's done, reach into the case and line up the reverse idler while you feed the gear through the bearing support. The pin should follow. Fit a snap ring to the back of the support bearing (photo 60), then locate the large reverse gear. Check its inner surface for burrs, gently filing down any small imperfections you might find. Once you're satisfied, grease up the shaft and slide reverse gear into place (photo 61). The speedo gear follows; Pat uses a pipe as a press and carefully taps the speedo gear into place until it lines up with the marks left by the original (photo 62).

**EE:** To prepare the tailshaft cover, test-fit it onto the back of the box. The pin drive for reverse is supposed to reside in a depression inside the tailshaft, so make sure that's still lining up. With a flashlight, also check to make sure that the speedo gear is lined up and cen-





tered over the shiny dimple in the side of the case near the gear drive. If it all looks good, pull the cover back off, goop the back of the bearing support with RTV, and stick on the new gasket. With the reverse-shift gear clicked forward, line the reverse-gear pin (photo 63) up with the back of the cover (photo 64) and mate the two halves (photo 65). It may take a little wiggling of the reverse arm to get everything happily in place.

**FF:** Once that all pops together, the box will be engaged in reverse. Since you also left the mainshaft engaged in fourth, you're effectively in two gears at once now. Pull the box out of reverse by twisting the reverse-shift shaft. This last step unlocks the transmission—and if you forget it, you're gonna be sorry.

**GG:** Torque the tailshaft-cover bolts to 35 lbs-

ft each and drop the pin loosely into the hole in the shift cam (photo 66). Don't drive it all the way home yet.

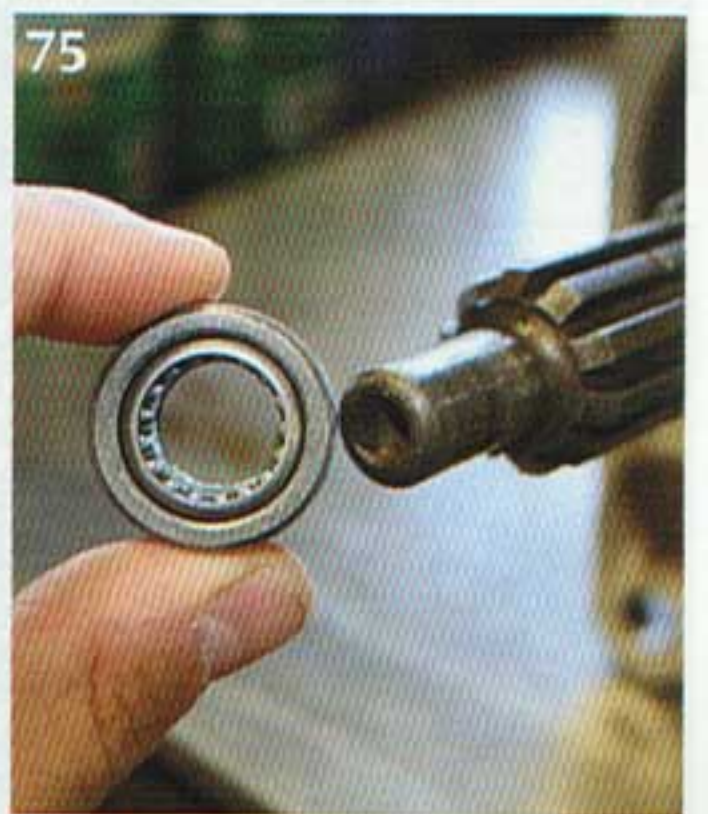
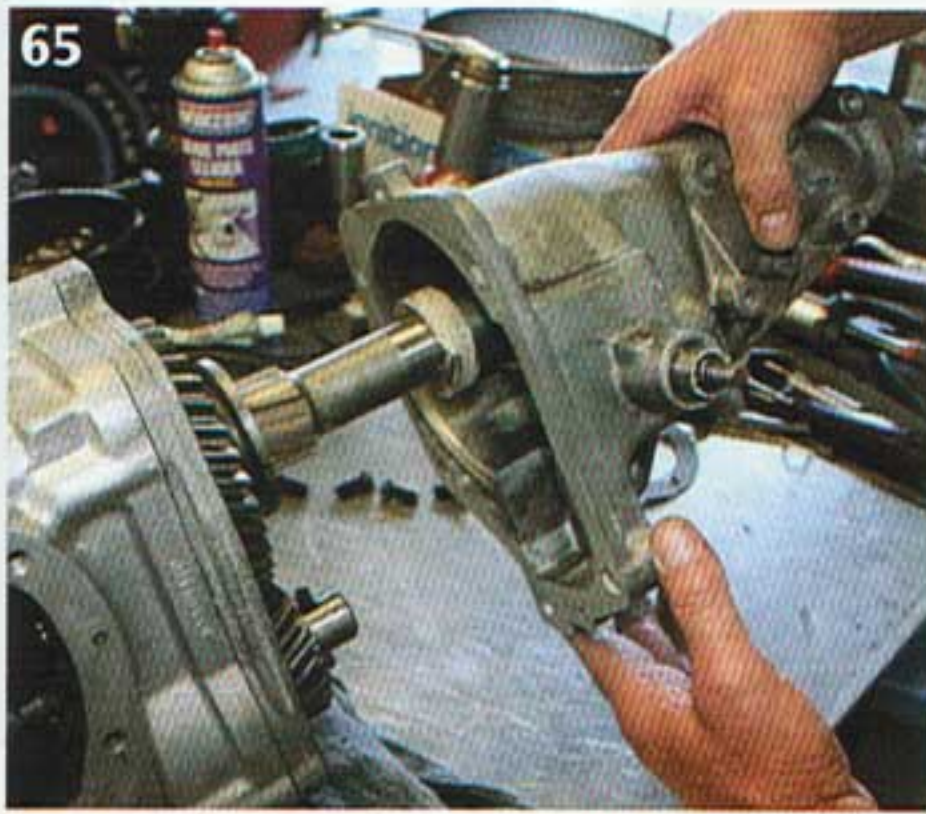
In order to re-tighten the reverse-threaded input-shaft nut you still need to lock the shaft. Do that by pushing another hook slider back and engaging first or second gear along with fourth. Before the nut goes on, however, you need to install the front bearing. Use a suitable driver and hammer until the snap ring gets close to the case (photo 67), then tighten the reverse-threaded nut with your thin-headed wrench to compress the bearing, exposing the oiling hole in the shaft. For a little extra insurance, Pat likes to stake the nut into the hole with a punch (photo 68) to keep it from backing itself off.

**HH:** Clean the bearing retainer and the end of the input shaft with an emery cloth. Test-

fit the bearing-retainer gasket to the case, as it occasionally requires some trimming to clear the oil-relief hole. Take care of that if you have to. Once it's all set, dab some RTV on the respective mating surfaces and the upper portions of the bolts (photo 69) to fight leaks and then bolt down the cover. Pat prefers headed lockwashers to old-style French locks, but originality nuts can stick with the latter.

**II:** One of the last areas needing attention is the side-plate cover and shift forks. Depending on vintage, Corvette shift levers will be attached with a 5/16ths nut ('65 and earlier), or a 3/8ths ('66-'69), or shaft threads ('70 and on). Regardless, pop the shift shafts out by unbolting them and check closely for goofed-up threads. There's rarely much wear on these pieces, but just to be safe it's smart to stick them back into their holes to test them for end





play and side play. Once those check out okay, inspect the spring in the back of the cover (*photo 70*) for looseness.

With the shafts out, remove the old seals with a screwdriver, clean the holes, and tap new seals in place. Next, drop the shift shafts back in their holes from inside the cover. Moving along to the shift forks, check for excessive wear on the center shafts and the surfaces where the forks grab the sliders (*photo 71*). If the forks show a little normal wear on one side, just flip them upside-down and re-use them (*photo 72*).

JJ: There are locator pins on the cover, so this piece only goes on in one orientation. Once you've got that arranged properly, line up the forks with the hook sliders and cinch the cover bolts to 20 lbs-ft each, using a little antiseize before spinning them in.

KK: Now we're just down to the fiddly stuff. Replace the outer O-ring on the speedo-drive gear (*photo 73*). (Hopefully the inner O-ring isn't cooked, because most kits don't include new ones.) Grease the nylon gear, slide it into the drive, and grease up the outside housing. Slip that into place next (*photo 74*), then bolt it down with the keeper tab. On the tailshaft, drive the reverse-shift-shaft pin in from top to bottom and slide the drive yoke back into the end of the shaft cover.

LL: That's about it; the gearbox is ready for oil. Fill it with your preferred lubricant and tighten the fill plug.

MM: One trick to consider before putting the rebuilt box back in the car is to replace the OE bronze bushing on the end of the input shaft with a non-original bearing (*photo 75*). The

bronze bushing works fine, but these tend to make "quacking" noises in some cars. A good replacement bearing is GM Part #1406-1685, a piece made for diesel truck engines.

Assuming you've got a decent press, a thin-headed wrench, and a dummy cluster pin, rebuilding a Muncie four-speed is pretty straightforward. There's a whole lot of *stuff* in there, and it does take a little experience to know which bits are worn out and which are just broken in—if you've never rebuilt a gearbox before, it's best to hook up with someone who has and let them help you as you go. But all in all the job is a lot of fun, kind of like a big, heavy, 3D jigsaw puzzle that can break your toe if you accidentally drop it. My only tip? Just don't start digging around in there if you want to be driving the car again soon. ○