FINAL INSPECTION BEFORE THE REBUILD

With the transmission and gearbox stripped and cleaned, there are some vital checks to be made before putting in back together. Don Morley explains how to do it all properly.

WITH our heavyweight Royal Enfield's primary transmission and gearbox stripped right down now, and every last nut or bolt gleaming clean, we are ready to make the final few inspections prior to the rebuild.

The first and undoubtedly most vital check is literally to tick each individual component off against an accurate spares list. This does not imply any carelessness during the stripdown but if the gearbox has been stripped before, some component or other may have been missed out. These gearboxes will often operate minus the occasional thrust washer or spacer.

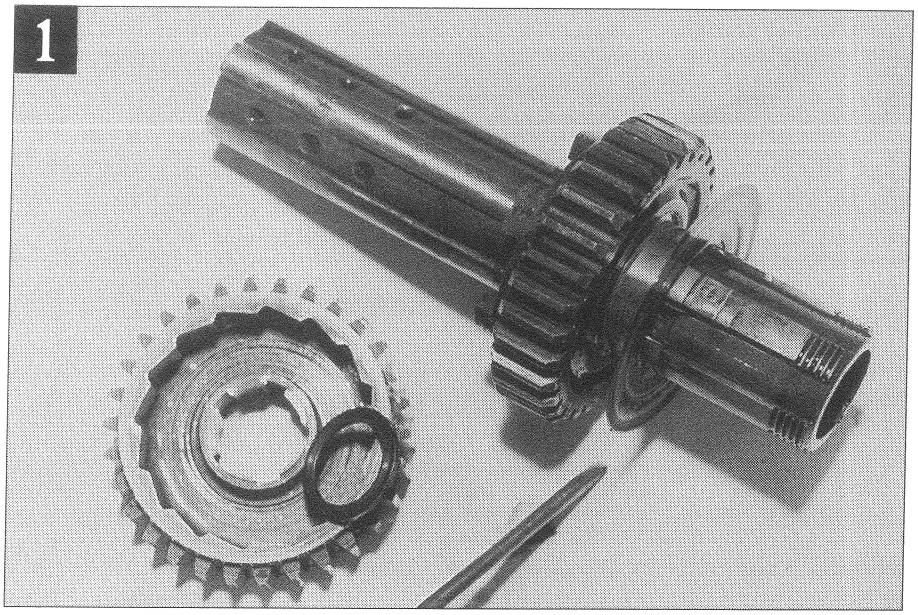
We are therefore primarily concerned at this stage with establishing the expected shims, hardened thrust washer, oil thrower rings and sundry other bits are all there.

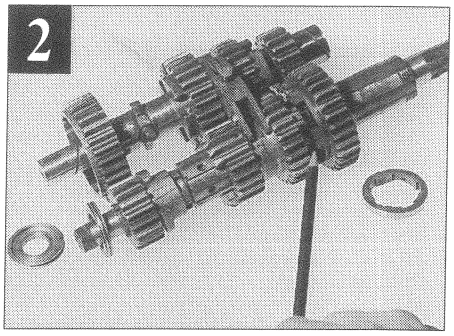
Some of these items and a number of gear pinions can be fitted in the wrong spaces or even back to front, so at this stage we have to make sure they are assembled in the correct order — and that may **not** be in the order they were stripped!

Fortunately, Enfield's spares books or workshop manuals are still available if only in reproduction form. They provide excellent check lists but are less than helpful at illustrating several highly relevant fitting points. No doubt that's why there are many mis-assembled Albion gearboxes around.

That's why our picture strip this month shows how and where the various gearbox components should be assembled.

● **Picture one** shows this very thin, dished and fairly large diameter shim which fits (dish inwards) between the gearbox mainshaft's final drive pinion





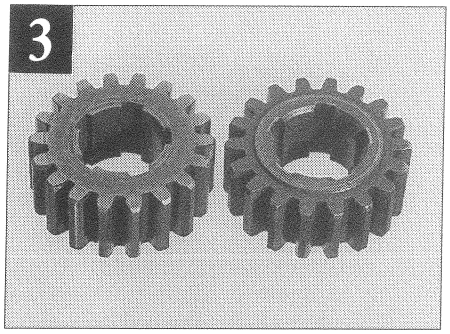
may not) be a similar flat-faced shim fitted to the bearing's offside, i.e. within the housing. And on the left is the thicker hardened thrust washer of smaller diameter which MUST be fitted between the kick starter pinion and kick starter shaft.

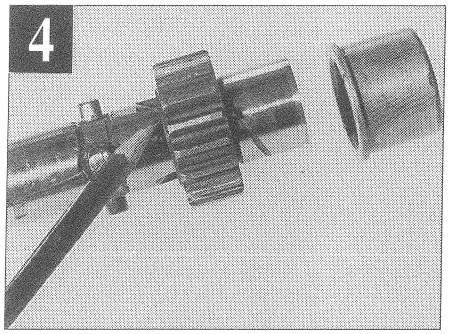
● The entire gearbox cluster with shafts in correct order of assembly is shown in **picture two** but the previously mentioned shims and thrust washer cannot be seen from this angle. The two identical stepped oil thrower rings (lower left) fit each side of the inner cover's main roller bearing. The one fitted inside the gearbox must have its step facing inwards and the outside washer have its step facing outwards.

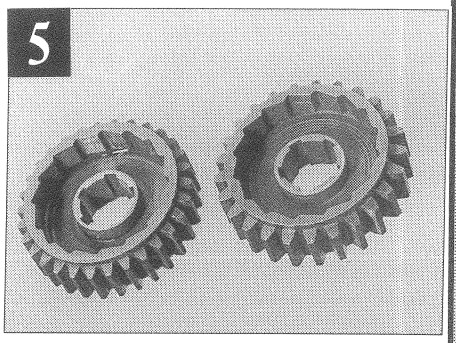
● Also check the condition of the various sliding gear locating dogs indicated by the pencil. Ideally these should be nicely square and unmarked. Don't overlook the separate, hardened, splined ring (lower right). This has to be fitted between the bearing and final drive sprocket, outside the gearbox but inside the oil seal

● Assuming it is in good condition it keeps the gearbox's oil inside by its outer or upper face mating very closely with the git seal. (Quite an unusual arrangement this, not least in that most other manufacturers ran their equivalent seal directly on to the gearbox's sprocket.)

● These **(picture three)** are the smallest pair of pinions out of the four







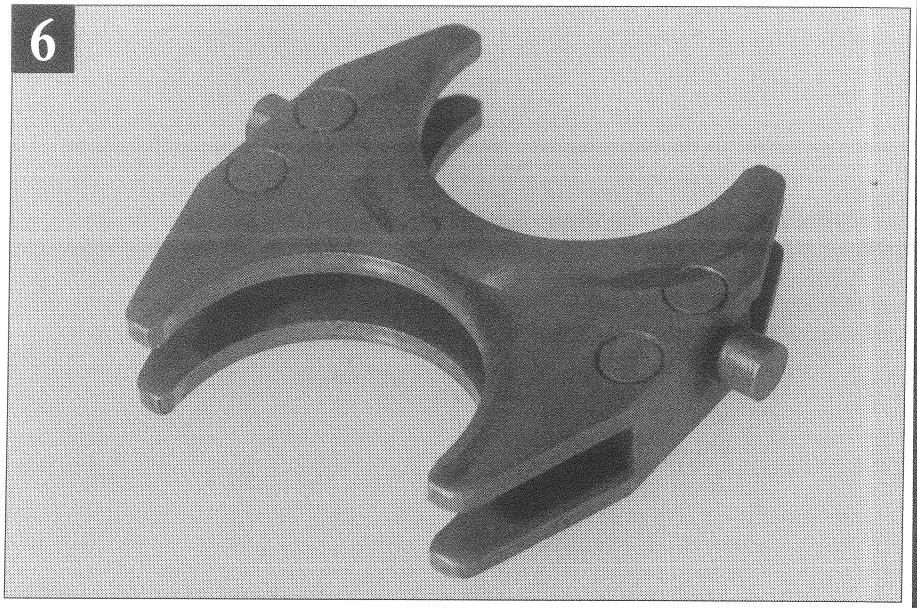
making up first gear. Note one of them is 'stepped'. Although this duo should be quite tightly fitted to their respective shafts they often seem to be transposed and/or fitted back to front.

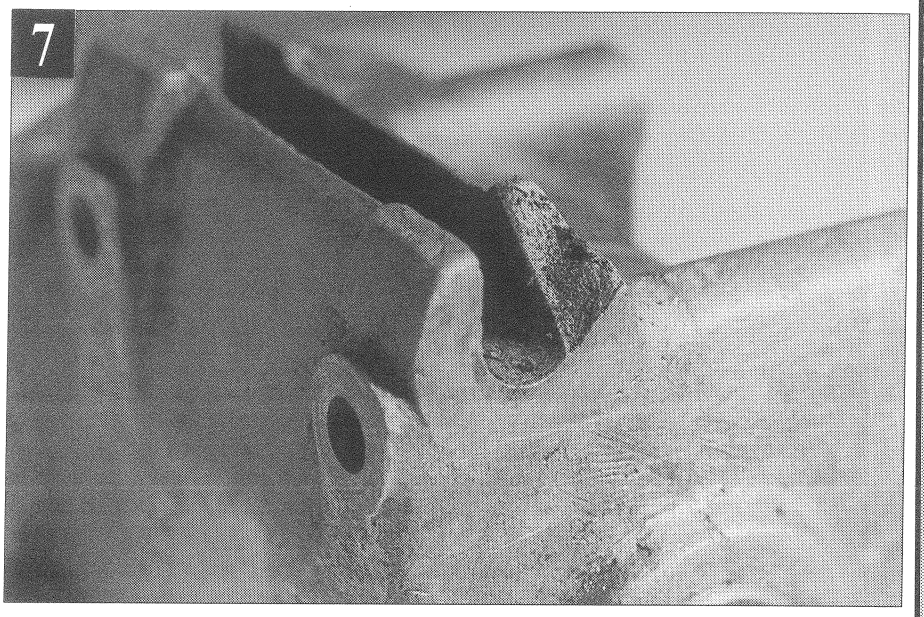
● The unstepped version of these two gears may be positioned either way round — PROVIDED IT IS ONLY FITTED TO THE GEARBOX MAINSHAFT (the longer shaft of the two which passes through the gearbox to eventually hold the clutch). The stepped pinion goes on the layshaft with the step facing inwards **(picture four).**

● It is then held in position by a hardened sleeve. This also can be fitted back to front but is correctly shown here with the chamfered end pushing up against the pinion. Also shown on the right is the phosphor bronze bush this latter sleeve runs in. This, likewise, is a wearing surface so either or both will need replacing if the shaft shows any noticeable amount of rock or side play on assembly.

● The more powerful 700cc Constellation employed a stronger and coarser gear tooth profile **(picture five)** as demonstrated by the kick starter pinion on the right compared to its pre-1960 predecessor on the left. Different numbers of teeth did not necessarily mean any change to the overall gear ratios provided each pinion's outer diameters did not change. Matching pairs of late or early pinions can be interchanged, but not single items.

● The gear selector inner sliding plate **(picture six)** is often fitted back to front — and it doesn't seem to make any difference to the gearbox. Luckily, it can't be fitted upside down due to the half moon shaped radiuses being slightly different.





HAVING corrected or counteracted any possibility of misassembly, we can now move on and begin making a detailed inspection of any damage.

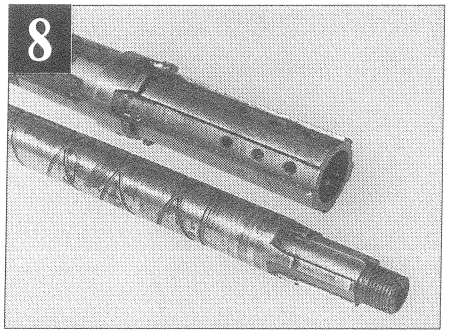
● Are any of the gearbox's main castings cracked, chipped or broken? Are any of the internal pinions damaged? Have the engaging dogs become ground away or rounded? Have they, or the gearshafts, ever been allowed to run dry and become overheated? If so the case hardening of the steel may have suffered.

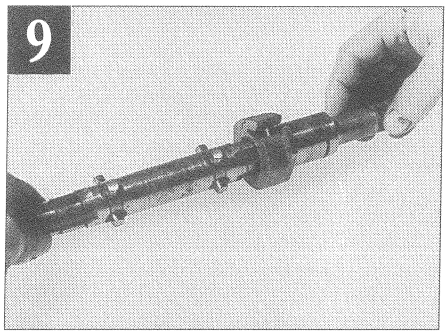
● Similarly, we haven't yet mentioned servicing those numerous lesser items including gear selector or kick start return springs, phosphor bronze bushes, ball bearing and main bearing oil seal, etc. Nor shall we! It is safest and best to replace each and every one as a matter of course. Who wants to strip the 'box again to replace a tuppeny halfpenny spring?

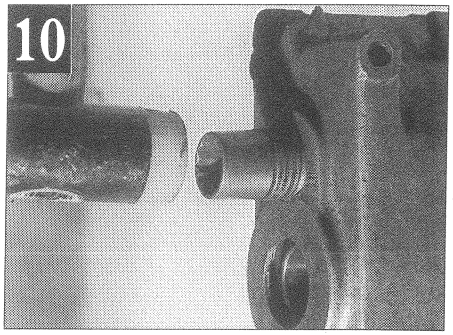
● Another all-too-common bodge you may encounter is the failure by a previous owner to replace the spacers between the engine plates to the frame in the correct order or tighten the various spacer's bolts fully.

● This almost guarantees lug wasting or breakage as shown in **picture seven.** This one really needs to be built up again with alloy weld even though it is just about serviceable.

● Any chipped or broken internal pinions must be thrown away. This is fairly rare on these gearboxes but replacements, new or used, can be found at fairly cheap prices. If such damage is found, it is likely the gearbox has suffered from a shortage of oil.







● Shortage of oil soon results in main bearing failure followed by the gears meshing too deeply together, followed by a wrecked gearbox!

● No gearbox should be allowed to run low on oil but the Albion/Enfield is unusual in that the ultra hard steel mainshaft actually runs inside a separate and even harder gear pinion-carrying sleeve **(picture eight).** It does so without the aid of any additional or separate, softer, metal bearings to keep those hardened surfaces apart. This is unique — any engineer will tell you that for minimum wear it is best to run hard metals against soft.

● Albion's topsy turvy arrangement was undoubtedly successful however, principally because of the vast amount of side clearance between the shaft and its sleeve to allow in copious amounts of the gearbox's heavy SAE grade cushioning oil. As soon as the shafts start turning the oil is allowed in by the triple holes seen in the outer sleeves splines.

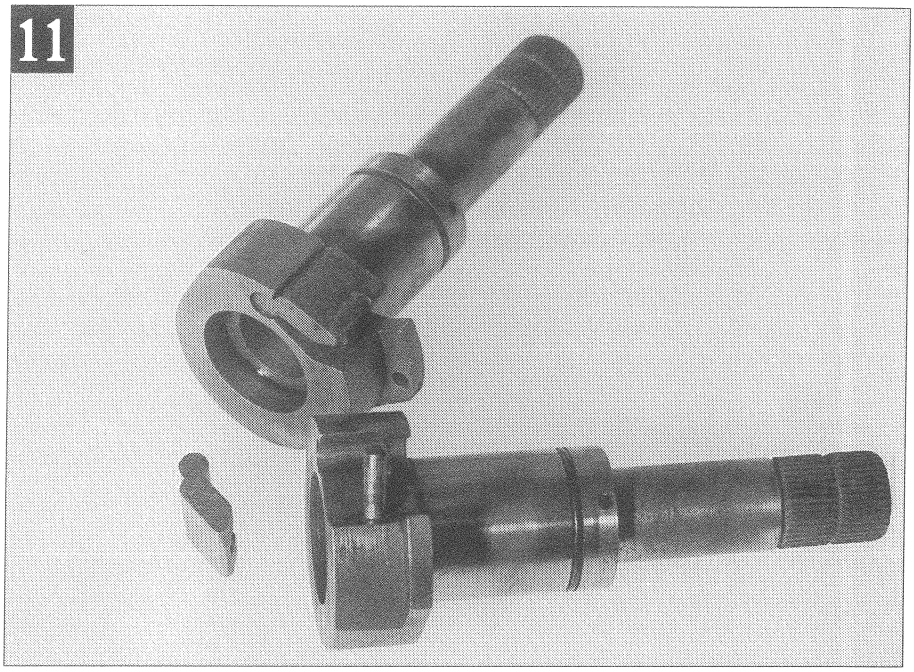
● Allowing the oil level to fall beyond the correct mark removes the cushion and increases wear as shown on the inner shaft in the picture. Eventually, it could break. However, Albion's component steel quality was sufficiently good for us to allow this shaft to continue in service if necessary.

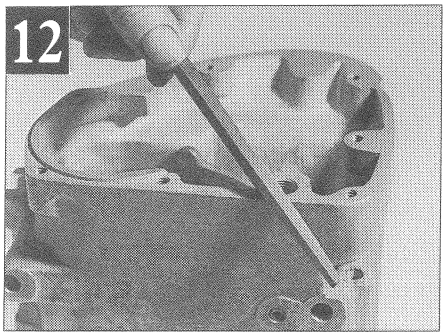
● For the same reason there is no need to worry too greatly about slightly worn gear pinions, layshaft or (even severely) worn dogs — providing all burrs are stoned away or very gently ground off before refitting.

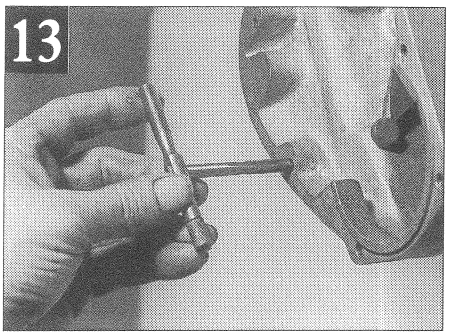
● Next we need to check how well the layshaft fits into the gearbox's plain bearing and into the kickstart shaft's blind bush **(picture nine).** If sloppy, the latter will need drilling out for replacement, whereas whereas the gearbox's main housing bush is accessible enough for it to be tapped with a suitable drift like a socket **(picture ten).**

● **Picture 11.** To avoid kickstart slippage and grazed shins it is almost always best to replace the kickstart pawl given ANY wear on its leading or locating edge.

● The pawl's plunger spring should also replaced, or at least re-tensioned by simply holding the tiny plunger down with a tiny screwdriver whilst sliding the pawl out. Gently does it though, preferably working with the kickstart shaft held inside a plastic bag in readiness to catch that important little plunger seen in the picture.







● Now check the outer and inner cover mating surfaces. Neither Enfield or Albion ever fitted gearbox cover gaskets so the faces have to be perfect matches to retain the oil. Damage inevitably occurs when they are needlessly prized apart, so run a finger very gently round each and every edge to detect any imperfections.

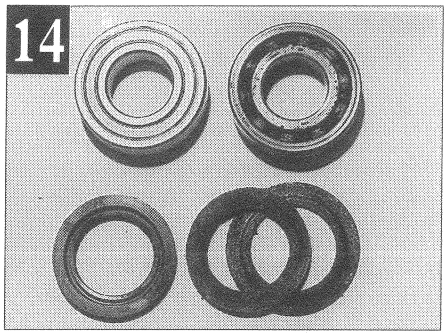
● Burrs and raised edges will almost certainly be found but all that's usually necessary is to run a fine-tooth file gently around each inside and outside edge at approximately 45 degrees as shown in **picture 12.** But remember the box will need washing out or cleaning again and be extremely careful not to remove too much metal — it can't be put back.

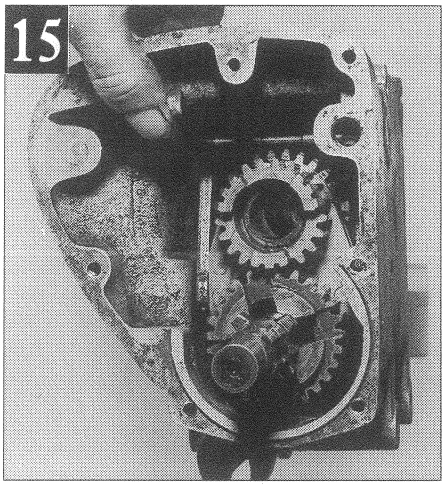
● Our final pre-assembly check is on the screw threads within the gearbox casting's fixing holes which ideally should be run through with the right size tap **(picture 13).**

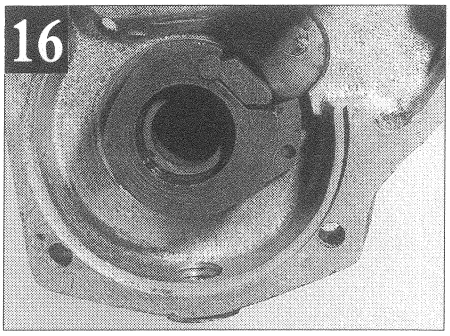
● Now it is time to fit the new main bearing and oil seal along with new (or previously fitted) shims. At this point replace the standard, cheaper, open cage roller bearing for a sealed type. Both versions are shown in **picture 14.** Many years of Trials riding have proved to me the sealed bearing's superior ability to withstand the grinding paste-like effects of grit and gravel deposited by the rear chain towards the gearbox.

● Indeed, to forestall problems it is a good idea to still fit the separate external oil seal as well. A bib and braces job!

● The gearbox shell and inner cover will, of course, require considerable heating prior to fitting this or any other bear-







ing. Do this by putting them in the oven, heating with a blow torch or using rags soaked in boiling hot water. Also put the bearings in the freezer for half an hour and they should fit easily.

● Working quickly is the secret here and I'd also recommend using a drop or two of Loctite's bearing fit. Most important of all, it is vital to press the bearing in squarely using (as when dismantling) the gearbox's own relevant sleeves or shafts as perfectly sized drifts but do remember that they are hardened, so only tap them with lead, hide, plastic alloy or copper headed mallets.

● Next assemble the layshaft, gear cluster, selector plate and mainshaft sleeve loosely into the main casing. Leave the kick starter (bottom gear) pair of pinions and the mainshaft itself out at this stage. This will ease the job of jiggling the selector's sliding plate into correct location with the selector fork as seen in **picture 15.** Now we merely need to slide the mainshaft and remaining pinions gently into position in readiness for fitting the gearbox's inner or intermediate cover.

● The latter should likewise have had a new roller bearing fitted and also be ready coated on the inner mating surface with 'Hylomar' or any other good quality liquid gasket solution.

The inexperienced would be advised to try a 'dry run' or two of the following before applying the gasket solution.

● Add the kick start shaft to the inner cover *whilst making quite sure* it is rotated as far as it will go clockwise to hold down the kick starter pawl as shown in **picture 16.**

● Everything else should then line up for the inner cover to slide gently over the unsupported mainshaft and layshaft without unduly disturbing either (though it may be necessary to lift one or the other very slightly). Be careful not to knock the selector slider and fork out of register with each other. If so, start again. It sound complicated but is actually quite straightforward.

● Importantly, just pause a moment or two for a last look inside before mating up the inner cover with the main castings. At this point, as the cover is pushed home **(picture 17)** the spoon-ended internal gearchange lever inside the inner cover needs to be precisely lined up to engage with the selector fork prong inside the gearbox.

● Without this occurring the gearbox will not change gear due to there being no direct linkage between the bike's external gear lever and internal gears!

● Once engagement is definitely established we can tighten the fitting screws and begin adding the various other components which live between the inner and outer covers. Again, remember that the gear selector striker plate **(picture 18)** can easily be fitted upside down and/or the wrong way round. If so, it won't work.

● This is the correct position, though it should have an equal gap either side of its teeth and the main plate when the gearbox is in neutral. This can be positionally fine-tuned by slackening off each of the backplate pillar bolts, then rotating the plate fractionally in the required direction.

● Remember also that the selector locating tensioner spring plunger **must** have its adjustment screw slot running horizontally (across the gearbox), and that it should be tensioned no more than necessary for a light action gearchange but enough to make sure it doesn't jump out of gear.

● ***This, of course, implies that some more adjustments might be required after a road test on the gearbox. More on this next month along with modifying the clutch rod mechanism and overhauling and re-fitting the primary transmission.***