

OVERHAULING A FOUR CYLINDER TRACTION GEARBOX

Hell! The Traction gearbox is making weirder noises than usual and its only 160,000km since the oil was last changed. Hmm, must be time for an overhaul.

If you live with a Traction then fear not the above situation is going to happen to you, sooner or later.

A gearbox overhaul is well within the scope of the moderately skilled, but attempting it without a workshop manual is something akin to Russian roulette. Finding the gearbox section is easy: it's the fingermarked pages at which the book falls open.

The following notes were prepared to help fill in the gaps in the official workshop manual.

Required tools:

With one exception none of the special Citroën tools listed in the manual are absolutely necessary they just make the job easier.

[a] Mainshaft end cap and layshaft nut [500965 and 500375]:- 35 mm across flats suitable metric spanners not available, use 13/16 Whitworth or 36 mm ring spanner. Note: socket spanner won't fit over mainshaft end cap, but tube spanner will.

[b] Output flanges [508012] don't require extractor - they just slide off.

[c] A normal two-legged puller can be used to remove Timken bearing cones [408451] from differential casing and crown wheel.

[d] If Synchromesh hub [500809] is disassembled, then tool MR 3025 is essential for re-assembly - paranoia is the inevitable result if not available.

[e] Without stop tool MR3139 to allow the layshaft nut to be tightened, it will be necessary to temporarily fit the mainshaft assembly and bearings into the casing and select two gears to lock the layshaft, in order to tighten the layshaft nut.

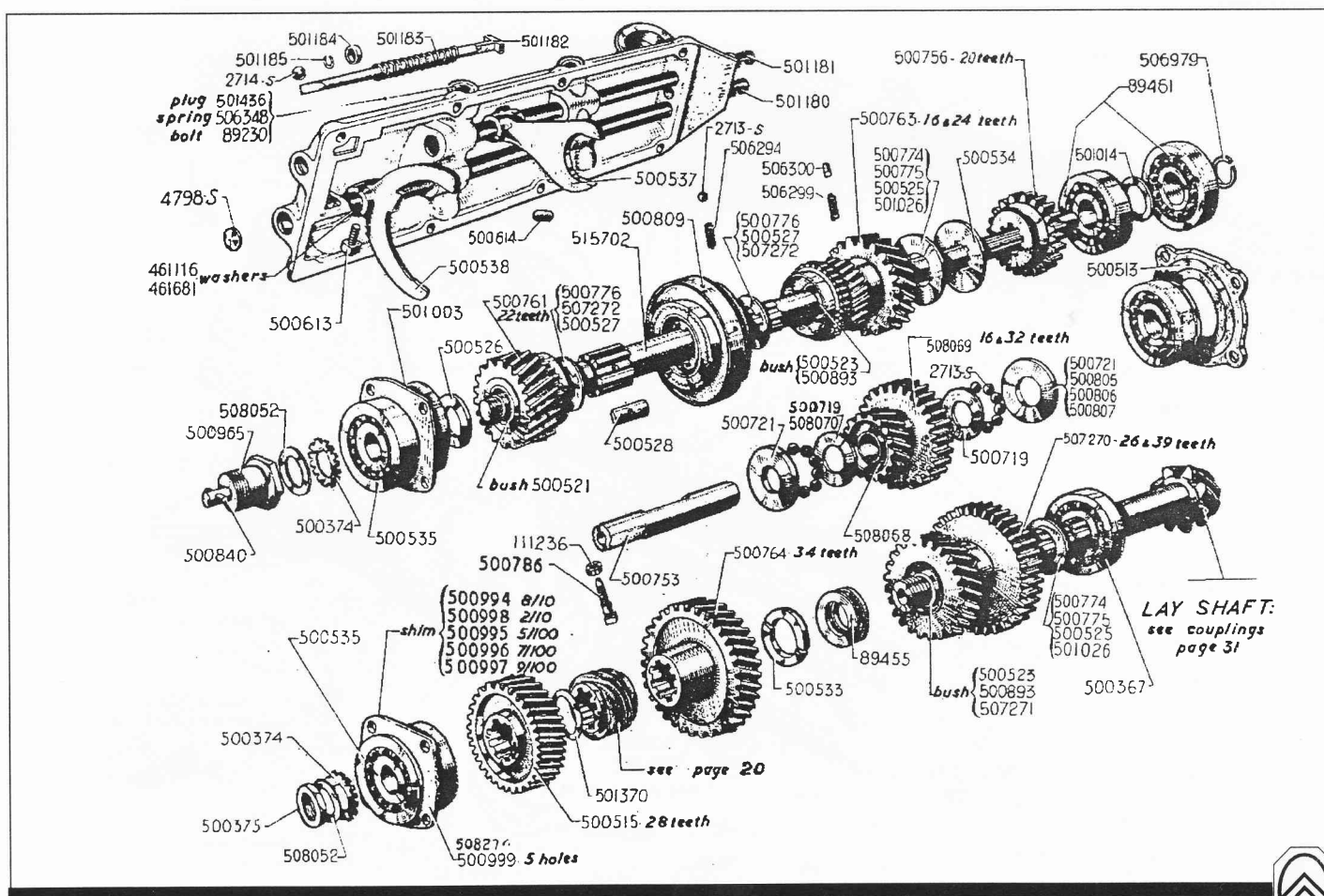
[f] It is highly unlikely that apparatus

2044T will be available for positioning the bevel pinion, use simplified method described in the workshop manual, but check that the differential housing diameter being used as a measuring face is true and free from burrs and flats.

[g] A clock gauge [similar to apparatus 2041T] ideally should be used to set-up crown wheel and pinion meshing clearance as described in the manual. It is possible, however, to use a strip of medium weight brown paper run through the gears, setting the clearance so that the paper is just not cut on the way through. Fiddly and subject to error, unless extreme care is taken.

[h] Spanner 1751T is not necessary to adjust differential bearing ring nuts [408452] - back off bearing cap nuts [2669-S] temporarily and adjust ring nuts by hand.

[i] The various ball and roller bearings can be removed/refitted with mild steel drifters instead of the mandrels recommended. Don't use bronze drifters as



these can chip, leaving bits in the bearings. Mild steel will not harm the hardened steel bearing sleeves.

DISASSEMBLY

In general the procedure in the workshop manual should be followed. However, when removing second gear idler gear [500763] from the mainshaft, care should be taken that plunger [506300] doesn't fly to the darkest regions of the garage and ensure in any case, that this plunger is removed before it is attempted to slide the gear off the shaft. If removal of the gear is attempted with the plunger in place, it will trap itself in the lubrication groove halfway along the gear bronze bushes, making removal without damage to the bushes impossible.

Dismantling of the synchromesh hub must only be done when wrapped in a cloth or plastic bag - the six balls fly everywhere, otherwise.

Clean all the parts thoroughly [not in petrol, please!] so that they can be examined carefully for wear, cracks and other catastrophes.

Incidentally, because a good, clean, well lit area is required to lay out parts for examination, it is not recommended to do this on the lounge room carpet - kitchen table is OK, though.

EXAMINATION

Missing gear teeth should be obvious to even the most incompetent. After all, there must have been some reason for all that drama when out-dragging the 2CV at the lights. However, all sound teeth should be examined for pitting, scoring and cracks. The latter applies particularly to the second gear mainshaft pinion [500763] teeth adjacent to the synchro dog teeth and bevel pinion [508460]. Cracks originate at the junction of the base

[root fillet] of the tooth and the gear side face and run in a curved line to around the midpoint of the tooth tip. If cracks can be seen with the naked eye, the part should be scrapped.

Apart from cracking of the second gear mainshaft pinion teeth, the helical gears don't seem to wear too much. The straight-cut first/reverse mainshaft pinion [500756] teeth however, can show surface pitting due to metal fatigue at high milages. This pinion also suffers from burring of the ends of the teeth due to shifting into first or reverse before the gears are stationary, so check for either condition.

The crown wheel and pinion teeth should be evenly polished over the tooth contact areas and should be

free from ripple or score marks. Such signs of abnormal wear will mean that they will be impossible to setup correctly and will be noisy in use.

Although the differential planet gears [408632] generally last well, the satellite gears [408355] almost

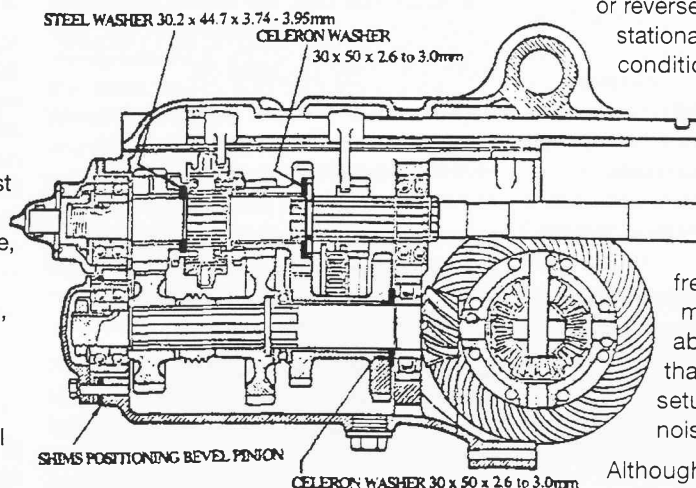
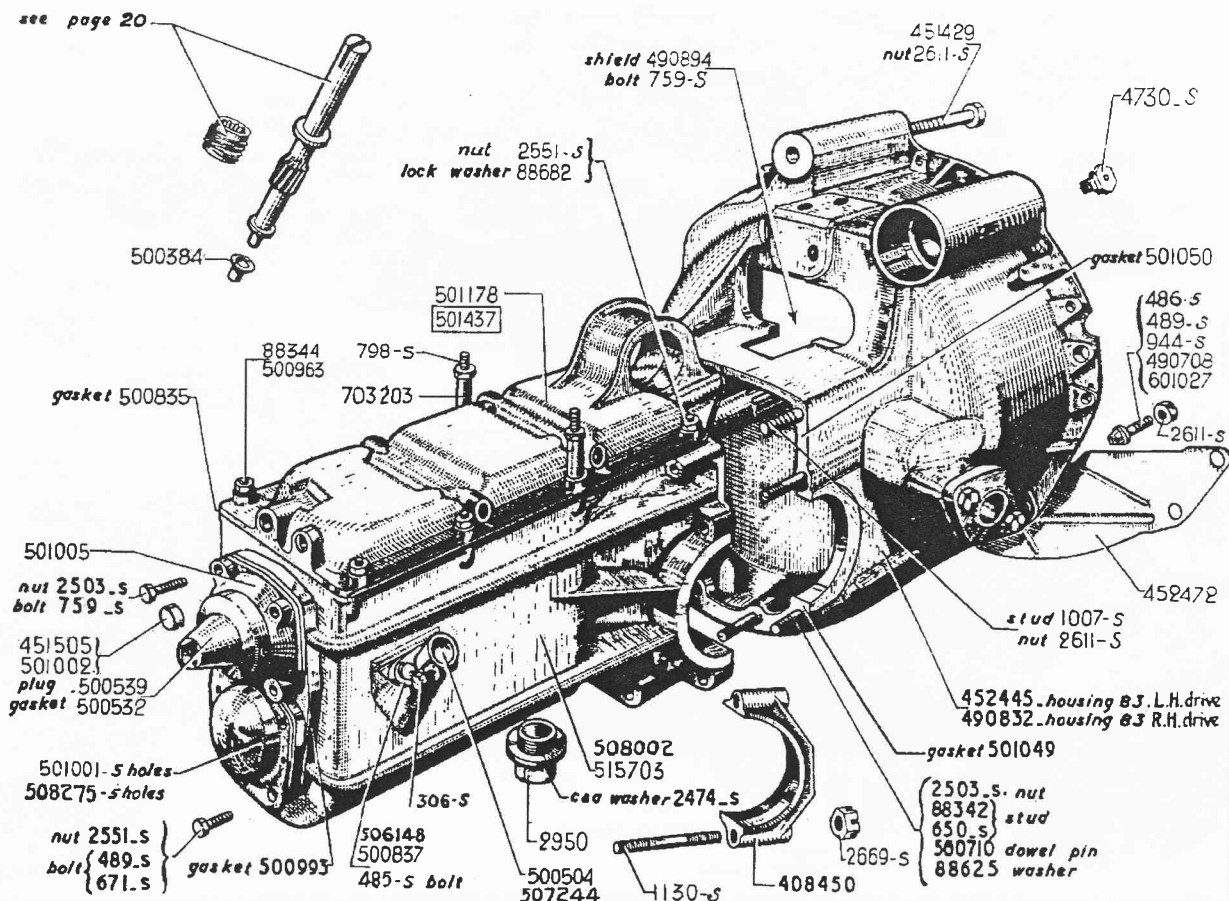


FIG. 1. CROSS-SECTION ON LONGITUDINAL CENTRE LINE SHOWING WASHERS CONTROLLING END PLAY AND POSITIONING.



FOLLOWING IS A LIST OF THE BEARINGS:

	Citroën Part No	SKF Part No
Main shaft, front	500535	3305/C3, available as 3305
Main shaft, rear [2 of]	89461 [30x 62x11mm]	98206 and 99206, or 4206 [30x62x20mm]
Pinion shaft, front	500535	3305/C3, as for front mainshaft
Pinion shaft, centre [thrust]	89455	No longer available, but rarely needs replacing
Pinion shaft, rear	500367	F-UC 1306TM, available as 5F-UC 1306TM
Differential, side [right & left]	408367	30208
Reverse idler, thrust	2713-S	1/4" balls, 26 required
Clutch throwout	89971 [35x72x17/14mm]	306629, no longer available but can use 7207C or 7207B [35x72x17] and modify shroud to fit over wider outer sleeve

always show tooth surface pitting after considerable use. Replacement with less worn gears is the only cure.

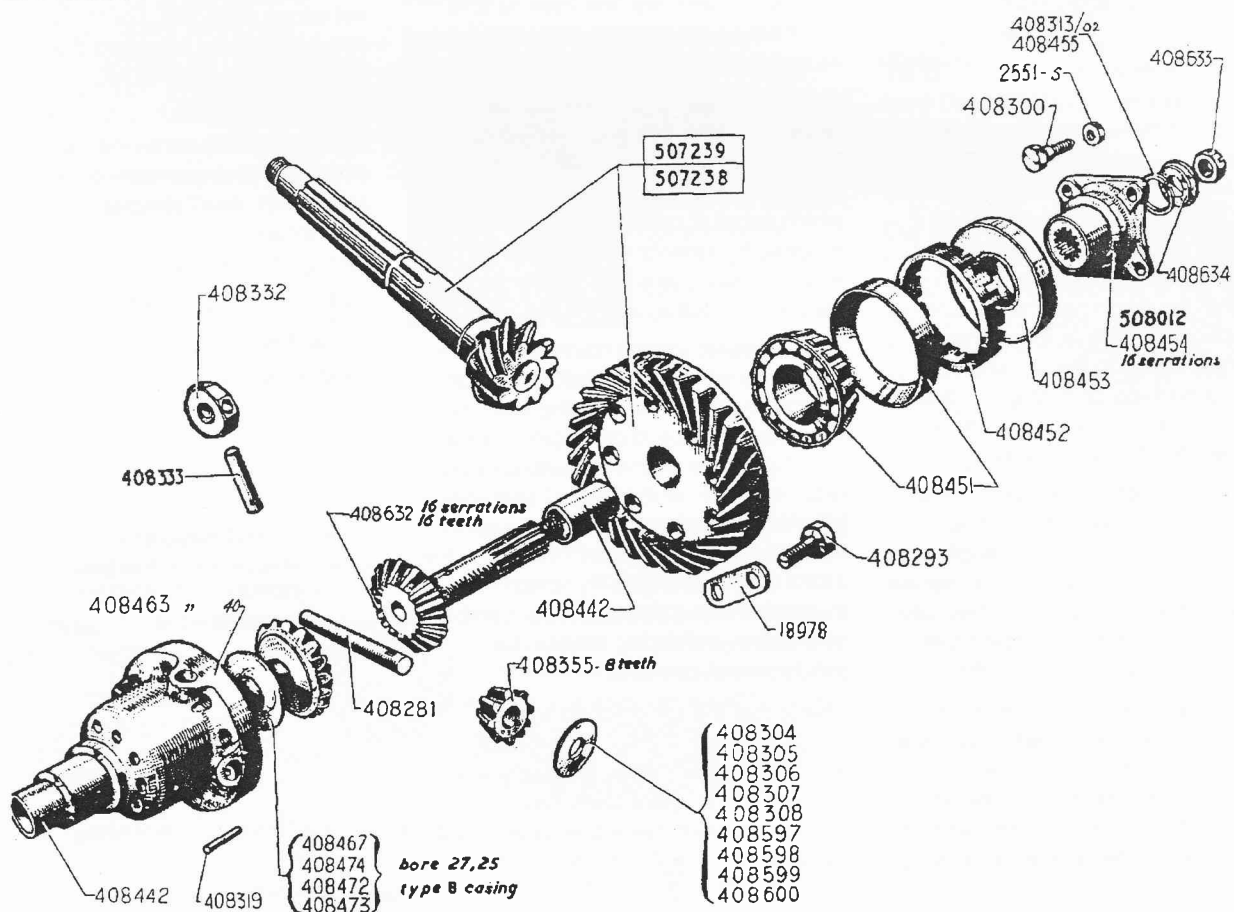
All the ball and roller bearings are quite reliable, but check all ball and roller tracks for excessive wear, pitting and corrosion. If the box has done a lot of work, it is worth replacing all the available bearings while it is apart. This particularly applies to the pinion shaft roller bearing [500367] and differential taper

roller bearings [2 x 408451], especially if a new crown wheel and pinion is being fitted. The bronze bush in reverse gear idler pinion [508069] and the floating bush in the first/second pinion shaft gear [507270] are not prone to excessive wear. Those in the top gear mainshaft pinion are however, but this does not seem to cause problems other than an increase in the noise level. Replacement is tricky, as the bushes have to be line-

bored in place using the imaginary pitch line diameter as the concentricity datum. In practice, the worn bush inside diameter is used as the setting-up datum on the assumption that it was right in the first place and that the subsequent wear has been evenly distributed. The other complicating factor is that the mainshaft journals wear and should be ground true and the bushes bored to suit. This is OK for top gear, but the second gear journal diameter is the same as the splined section of the shaft where the ball-races sit and grinding the journal and splined section undersize will allow the shaft to flop about on the bearing bores. The correct method would be to build-up the journal by short arc-welding, hard chrome plating or metal spraying and grinding back to the original size - probably not worth the effort!

If bush replacement is attempted, allow a minimum diametrical clearance of 0.04mm, otherwise the bush will seize, and don't forget to machine the oil grooves and drill oil holes.

Other wear prone points are synchro mesh splines, dog teeth and synchro mesh bronze rings. These synchro rings are also prone to becoming loose. Check that they are solidly located and note the depth of the oil breaker grooves to gauge the



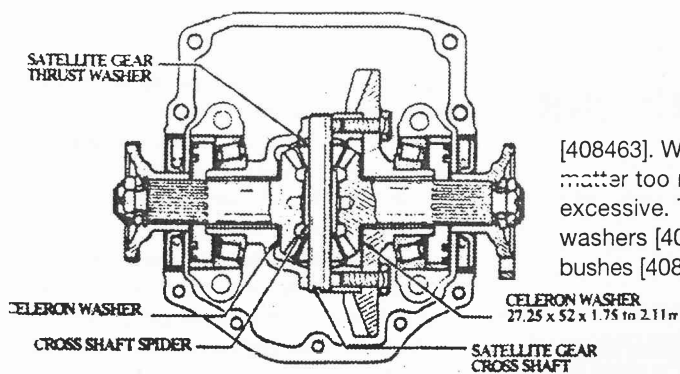


FIG. 2. CROSS SECTION OF DIFFERENTIAL

amount of wear. If the grooves are almost non-existent and the synchro cones have been chewing away at the rear face of the recess, it explains why the gears crunched at every change and means you will have to hunt around for some bits that aren't so worn. The dog teeth can even wear down to half their thickness without seriously affecting their function, but this degree of wear adds to the "sloppiness" and noise of a well used gearbox.

With the synchromesh hub dismantled, check that springs [506294] are not broken and that the six balls [2713-S] have not worn excessive tracks in the hub face. Both conditions can cause poor synchromesh action.

The selectors do not seem to wear much, but again check for broken springs and ball-tracking. The interlocking rod [501182] wears on the contacting surfaces.

End play of the first/second pinion shaft and main shaft gears [507570 and 500763] is controlled by non-metallic [Celeron] thrust washers. There DO wear and on occasion can break-up due to old age. Tractionists seem to collect a selection of washers out of boxes that have expired, but there is no reason why they cannot be machined from a similar cloth re-inforced resin or even bronze and finally finished to the thickness required by rubbing on a sheet of fine emery laid on a surface plate or sheet of plate glass. Don't forget the oil grooves.

Check the split locking collars [500533] on the pinion shaft, and the mating groove in the pinion shaft of chipping and other signs of distress. It is essential that these faces are sound, as they take the load of tightening the pinion shaft nut to the specified torque. [110ft/lb].

Turning to the differential, apart from the satellite gears mentioned earlier, the wear points are the cross shafts [40828 and 408333], the satellite gear thrust washers [408304] and the thrust washer mating surfaces in the differential housing

[408463]. Wear of the shafts doesn't matter too much unless obviously excessive. The Celeron thrust washers [408467] and output shaft bushes [408442] show little wear.

The output shaft seals [408453] have a habit of weeping oil and wearing grooves in output flanges [508012]. These seals are spring loaded leather lip seals [Type A1] 83 x 38 x 12mm, and the Super Seals [Repco] part number is P3074. If the output shaft seal surface is grooved, it should be built up to standard size using the methods previously described for the second gear journal.

REASSEMBLY

In general the workshop manual should be faithfully followed. Reprints of the workshop manual are available from CCOCASHOP, for \$20.

All locking tab washers should never be reused. These are fitted to the mainshaft and cap nut, pinion shaft nut, crown wheel retaining screws and diff. bearing saddle nuts. In all cases these can be dispensed with entirely, as long as Loctite 242 is used on assembly. When using Loctite ensure surfaces are free from oil and grease by cleaning with a solvent such as trichloroethylene or lacquer thinners.

Similarly all paper gaskets can be dispensed with by using Dow Corning Silastic RTV 732 as a sealing medium. This is a viscous liquid rubber in a tube which cures at room temperature when exposed to humidity. Incidentally, although RTV 732 is not attacked by oil, petrol causes it to soften and loosen.

When assembling the mainshaft don't forget the locking key [500528] which spaces the washers retaining the synchromesh hub and ensure that the key engages in both washers. End play, 0.05 - 0.10mm, of the second gear idler [500763] is controlled by the thickness of the Celeron washer [500774 etc., 30.2 x 44.7 x 3.75 - 3.95mm]. Try to achieve these clearances by selective assembly, as excessive end play affects the synchromesh operation.

Check that the synchrohub travel doesn't exceed 4.2mm - it probably will if the synchro rings are badly worn, so back to the spare parts box for a hub that is less worn. Selective assembly at its best!

Without Stop Tool MR3139, it will be necessary to alter the official assembly sequence and fit the main shaft assembly and select two gears to enable the pinion shaft nut to be tightened during the pinion shaft positioning procedure. It is still possible to insert feeler gauges to check the pinion position with the mainshaft in position.

End play of the first/reverse pinion shaft gear [507270] is controlled by yet another Celeron washer which is identical with the second gear idler washer. If there is appreciable wear in the pinion shaft front bearing it will be impossible to accurately set the position of the pinion shaft.

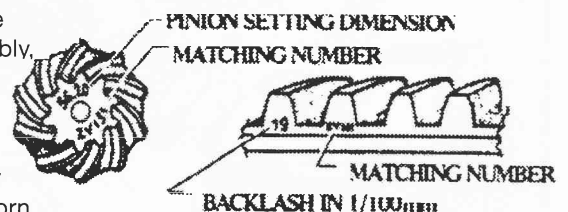
Regarding the crown wheel backlash, it's useful to note that with a 9 x 31 crown wheel and pinion there are 270-odd meshing positions. Obviously, it is impractical to check the backlash of all, but select a few at random. With a well used CWP it is surprising what variation can be observed.

For those who decide to adopt the use of Loctite, use the 242 grade for the mainshaft end cap nut, pinion shaft nut, differential retaining set screws, differential bearing saddle nuts, output shaft nuts [408633] and reverse idler shaft retaining set screw [500786]. Loctite grade 601 can be used for retaining the differential bearing inner sleeves [408451] where the journals have worn.

If, after all this care and selective assembly your gearbox crunches, rattles and howls, don't despair *c'est la vie* [et Traction]!

Please contact CCOCA Spares as most parts are now available new.

Roger Brundle



NOTE: FIGURES ON CROWN WHEEL MAY BE ON BACK FACE

FIG. 3. CROWN WHEEL AND PINION SETTINGS

