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REAR AXLE PROBLEMS; HOW TO OVERCOME THEM BY MIKE ALLISON

The rear axle of a MMM car has a great deal in common with the heel of the Greek hero Achilles. If you own a K-type or an M-type you need read no further, unless it is to mug up on the misfortunes of the greater majority of MMM members and make suitable mirth provoked remarks when passing us parked at the roadside preparing jacks, $\frac{5}{16}$ spanners, 140 oil and the spare diff!

In fact things are not so bad as you may think, and while I would be the last to suggest that you need have no further problems with your rear axle, you can limit failures by a system of regular checks. Also rebuilding a diff is not as difficult as people seem to think, so that perhaps these notes will help you to run into less problems in the future.

First and foremost it must be understood that the rear axle unit is quite highly stressed: it was originally designed to cope with around 20 b.h.p., and while things were improved slightly for the J and Magna models, and then subsequently for the P and N models, critical analysis will lead one to the inevitable conclusion that the Crownwheel and Pinion are on the marginal side for transmitting 50 b.h.p. to move a dead weight of a ton. In case you may think I am being pessimistic, I have chosen figures for the N-type Magnette: my own car goes just over the ton in road trim.

We can now examine the problem in three stages:

- a. Routine maintainance
- b. Stripping and examining the unit for rebuilding
- c. Reassembly of the unit

ROUTINE MAINTAINANCE

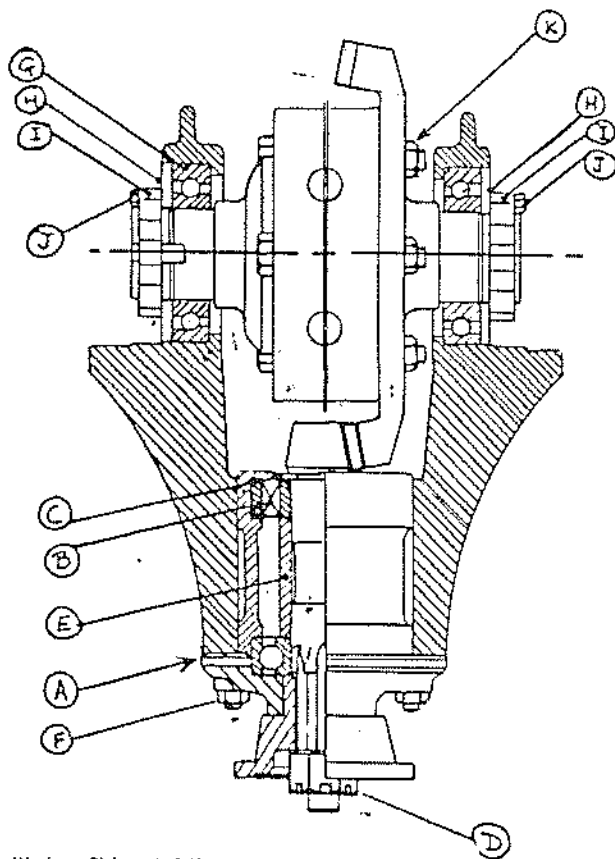
Every time you are about to use the car, check that the oil level is between the two marks on the dipstick, or is just below the filler orifice in the case of the earlier units filled through the back plate of the diff.

One a month remove the wheels, withdraw the half shafts and inspect for signs of twisting of the splines at both ends. Discard any shafts showing such signs. These should be a good press fit into the hub, and under no account should you be able to move them, even with a 4-pound hammer! Your local garage will fit the shaft for you using a suitable press for a nominal charge. If you cannot achieve a press fit, then the hub will have to be replaced . . . I need hardly say that they should not be welded in place, since this renders the heat treatment of the shaft and hub useless!

At the same time check the wheel bearings for slack, and replace faulty units with new ones.

Next check the diff unit. Hold the rear prop-shaft joint firmly and pull and push it along the line of the shaft. There should be NO movement of the drive flange on the pinion shaft, if there is then it is rebuild time. If this is OK, then try rotating the coupling back and forth. You should be able to feel backlash in the gears but no excessive movement. There is a certain amount of knowhow required at this stage, but the safest rule is that if you are not sure, it is time to check things thoroughly.

Apart from this there is little to worry about, and you can drive off with reasonable assurance that your journey will be untroubled. If you indulge in any competition motoring, particularly in grass autotests or trials, you will need to check your axle after each event: I have always found this type of event plays havoc with the diff in particular, while racing and sprints are harder on the wheel bearings and axle shafts.



Pinion Shim at 'A'

Pinion Bearing Spacer at 'C'

(CONTINUED BACK SIDE)

STRIPPING AND EXAMINING THE UNIT

Examination of the halfshafts and hubs has already been described.

Wheel bearings should be free running and quiet, with no side movement. There should be no movement between the bearing and the bearing carrier, while the former should be a light press fit in the latter. If the bearing is slightly slack in its carrier it would be permissible to use Loctite "Bearing Fit", but do not expect it to fill a worn housing. Do not attempt to use an adhesive to make the bearing a tight fit, since not only is it bad practice, to say the least, but inevitably the bearing will be out of line and will result in axle failure of one sort or another.

Drain the oil from the axle unit, remove the halfshafts and then uncouple the propshaft, and remove the diff assembly. Mount the unit in a large vice, using fibre clamps in the jaws to protect the housing.

Check that the large nut is tight and properly split-pinned. Check all other nuts, including those around the differential, all should be tight. Now check the tab washers locating the ring nuts on the differential bearings. If everything is OK you can proceed to the checking of the gear meshing at the end of the next session, but having got this far, it is worth stripping the unit completely.

Carefully open up the tab washers and withdraw all split pins. Loosen all the nuts, but do not remove them at this stage. Having loosened them all, remove firstly the pinion drive flange, which will normally come away with a small puller, and then remove the four nuts at the front of the housing. Next remove the four large nuts which secure the crownwheel and differential assembly, tap the bearing caps off and withdraw the crownwheel complete with the differential and its bearings. Next press out the pinion housing complete . . . again ask your friendly garage to do this for you, rather than belting it out with a hammer, which will wreck just about every component.

Strip the pinion housing by removing the two countersunk screws normally hidden from view, and remove the front plate of the housing. Now remove the large circlip; at the other end, after which it should be possible to remove the pinion complete with the inner part of the roller race, the spacer, and possibly part of the ball race. Drift out the remaining bearing parts from the housing.

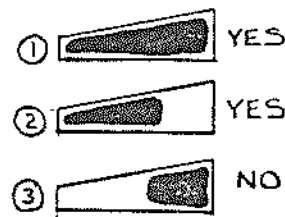
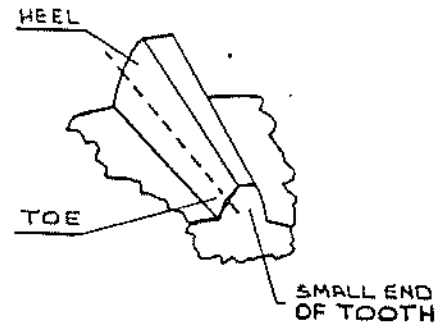
Next strip the crownwheel assembly. Undo the bearing lock rings, and press the bearings off. Undo the diff housing nuts, and drift the bolts out of the housing. The crownwheel will come away, do not open up the diff at this stage.

Check all the bearings. My own rule is to replace them all: I know they are an expensive item, but they are relatively cheap compared with a crownwheel and pinion set. If you are replacing the gears anyway, then always use new bearings. There should be no sign of shake or roughness in the bearings, if you really must use secondhand bearings.

Next check the housings, any sign of the bearings moving in the housing should be remedied by building up the housing and machining to the proper size for the bearing. This is not the job for an amateur!

Now check the crownwheel and pinion gears. Obviously the teeth should be whole: none should be chipped, missing or corroded. Such gears are scrap. The teeth should display even bright marks on both sides in

line with the markings shown for assembly, but any sign of ridging or undue wear renders them scrap. If in doubt ask a motor engineer for an opinion . . . or better still scrap the gears.



Next turn to the differential unit. A sharp tap on the joint should open the unit up, but be very careful not to drop all the parts, as it is important that they are kept together. Carefully remove the gears, and store them together in a safe place. Examine the housing carefully for cracks: I have come across several now which are actually broken here. They can be repaired, so do not despair! If all is well reassemble this unit taking care to ensure that the marks on the outer housing align, and that the gears are kept in the relative positions.

REASSEMBLY OF THE UNIT

There are three basic adjustments when reassembling the unit, and it is absolutely essential to get these all correct. It is therefore important not to start doing this just as your wife suggests that you will need to get ready for a dinner party, or mow the lawn, walk the dog, or any of the other all important jobs which are suddenly listed for you when you announce you will be in the garage for an hour or so!

Joking aside, allow a clear run of at least two hours for this job, because if you cannot get it right in one go, you will have to start again pretty well from the beginning.

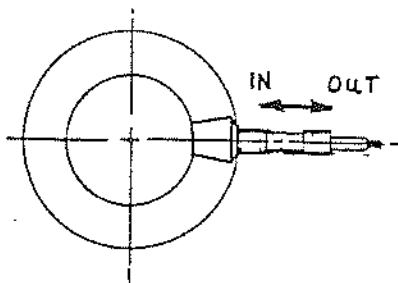
Right: and now you may begin.

Lay all the components on the bench, and clean them all in a chemical degreaser, you can use petrol if you are a non-smoker but this is a very-dangerous substance to have lying around in a workshop. Having cleansed everything thoroughly, a light spray over all components with WD40 will do no harm.

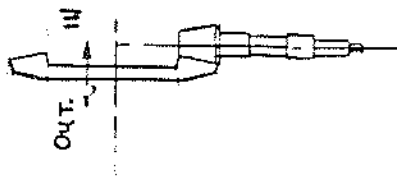
Check the thickness of the pinion head spacer 'C'. It should be 0.125". No more than 0.005" variation either side of this is permissible, but a new one can be bought from various suppliers. An ordinary washer is of no use, the spacer must be hardened and ground to size.

Now assemble the pinion into its housing, the bearings should be a press-fit onto the pinion shaft, and this should be done on a press, NOT with a hammer. As each bearing is fitted, check that it still runs freely. When all the parts are fitted into the pinion housing, refit the roller circlip, and finally fit the flange and its retaining nut. This nut should be tight, 60 lb.ft torque is about right, but tightening should be progressive to ensure that the pinion spins freely. If when this torque is reached there is end-float on the flange, then you will have to strip it all down and find the reason. Assuming everything is right, splitpin the flange nut, pour plenty of oil in the bearings and put the assembled housing in a safe clean place.

Next fit the differential assembly to the crownwheel. Tighten all the nuts: 22/25 lb.ft torque is about right. I normally use self locking nuts here, but if you must use split pins or wire to lock the nuts, do not be tempted to leave them a little slack, or overtighten them to get the split-pin slots to align: the base of the nut must be ground to achieve alignment . . . a job which requires considerable patience. When all is assembled, check that the differential gears rotate freely, and then refit the differential bearings. Run the slotted nuts onto the threads, but **DO NOT TIGHTEN UP**.



Pinion Setting



Crownwheel Setting

Now it is time to fit the pinion housing into the nose-piece. When you stripped the housing, there will have been a number of thin steel washers or shims at 'A'. Check the thickness of these with a micrometer, and fit

new shims to this total thickness. If you are fitting new gears, then there will be an advisory shim thickness, in which case you will use this as a starting point. Press the pinion housing home, and tighten the nuts. Offer up the crownwheel sub-assembly, and check by eye that the head of the pinion is near to the inner diameter of the crownwheel teeth. If all is well you can proceed, but if not, really the job is beyond the amateur, since some sophisticated measuring equipment will be needed to establish the correct datum for the pinion housing setting.

Assuming all is well, fit the bearing caps and tighten the nuts (25/28 lb.ft). The differential carrier bearing nuts 'I' are now adjusted to obtain the correct backlash in the gears. A skilled fitter will be able to get this right by feel, but will check the amount of backlash to 0.004"/0.006" using a dial gauge. When this is achieved, a marking compound, such as "engineers blue" can be applied to check that the mesh of the gears is correct. If it is not, then backlash can be adjusted slightly to improve gear marking. But do bear in mind that any gross error must be located as this cannot be adjusted out. The most likely error is the amount of pinion housing shims, and the correct thickness will have to be found by trial and error.

When the mesh is correct, check that the locking rings are tight against their respective lock-tabs AND their bearing faces, and then lock up the nearside tab. Now locate the tab on the offside nut which lines up, and then turn the lock ring one serration and lock this one.

Clean all the marking compound off the gears, and then pour fresh oil over all the working parts and check the feel of the gears. Everything should run smoothly and quietly, and if all is well you can assemble it back into the car. A worthwhile modification will be to dispense with the original small bolts, and fit long 3/8" bolts right through the banjo casing to secure both front and rear housings, but if you do this you will need to make up spacer tubes of length equal to the internal width of the banjo casing. When fitting these don't forget to check that they clear all the working parts!

LUBRICATION

The lubrication of the rear axle will determine to a large extent the life of the unit. The correct oil for use in all Triple-M axles is a straight gear oil of SAE 140. This should be changed every year, and it will do no harm to fit a magnetic drain plug to catch all the little pieces of metal which seem to congregate in the rear axle! The use of lower viscosity oils is not recommended, and modern EP oils are an unnecessary expense.

OTHE PROBLEMS

There are a number of other problems of which two are common. They both centre on oil leakage.

Leakage from the pinion shafts into the brake drums is far more difficult to cure, if not impossible. In normal road driving, the standard oil seal will do its job very well, but a little bit of press-on stuff will render the nearside rear brake ineffective very quickly. I have tried all the patent remedies over the years, but currently am using the original set-up which is as good as any of the "remedies". If I find a successful cure I will use it as a basis for a future article, but in the meantime I hope you will enjoy driving your M.G. and not have too many of the more serious axle problems.