ARRANGEMENT OF REAR AXLE
Section “M”

REAR AXLE

“M” 1

The fully floating type rear axle is constructed from malleable iron housings which incorporate the flexible beam seatings, nearside and offside housings being coupled by a hollow cast crossmember.

The axle arms are pressed into their two housings with a force fit and located with dowels.

Mounted on the arms are the wheel hubs running on plain roller bearings and positioned by ball thrust locating bearings.

The axle incorporates a two stage reduction gear. The first stage reduction is by a spiral bevel pinion and wheel mounted in the offside axle housing and driving through a conventional four bevel pinion differential unit.

The four bevel pinions revolve on a casehardened “star” member with bronze spherical thrust washers.

The outer differential bevel wheel is provided with a renewable thrust washer, and the inner wheel has a flanged phosphor bronze bush.

The spiral bevel pinion is mounted on two taper roller bearings. The bearings are positioned in a detachable housing bolted to the offside axle casing and are spaced by a distance piece and suitably shimmed.

The second stage reduction is obtained by pairs of spur gears mounted in the nearside and offside axle casings.

The differential is connected to the offside spur pinion by a short splined shaft, this shaft being a combined shaft and bevel wheel, whilst the nearside spur pinion is driven by a long splined shaft which passes through the hollow rectangular sectioned crossmember.

The nearside spur pinion is mounted in its particular housing on parallel roller bearings. The offside pinion is supported by a parallel roller bearing and the differential cage taper roller bearing via a needle roller assembly.

The spur reduction wheels are mounted in their housings also on parallel roller bearings. These spur gears transmit the drive through conventional axle shafts having involute teeth engaging with a driving dog secured to the wheel hub.

Oil return bushes are fitted at the inner end of the axle arms to prevent passage of oil from the axle casings to the hubs.

The oil filler cap incorporating a dipstick is to be found on the offside axle casing. For correct oil specification refer to page (vi).

An axle breather is fitted to the nearside axle housing cover.

Both axle housings are filled with oil from the one filler, the oil being transferred through the hollow crossmember to the nearside.

Note:—Whenever any major service attention is to be given to the rear axle gearing the complete axle unit should be withdrawn from the vehicle. It is, however, possible to examine the spur wheels and their bearings by removing the top inspection covers.

To Remove the Rear Axle

(1) Securely block vehicle at “Level” height, drain air suspension reservoir, disconnect and remove the levelling valves, and disconnect the brake pins from the brake cam levers.

(2) Slacken the road wheel nuts, jack the axle at each gear casing (with suitable type of trolley jack), sufficiently for road wheels to clear the ground, remove the road wheels using spanner 7/8 PZ.

(3) Disconnect the shock absorber eye, remove rebound stop complete with wheel-arch bracket, disconnect air spring securing plates from transverse beam platform, and remove air spring drain taps.

M1.3
(4) Disconnect the propeller shaft at flange coupling attached to the spiral bevel pinion.

(5) Jack the frame rear crossmember, suitably supporting the frame by adding blocks to those, use as in para (1) above, forward of the short tubular crossmember.

Note:—At this stage, it will be sufficient to relieve the suspension of the frame and body weight.

(6) Disconnect and withdraw the stabiliser rod securing pin at the transverse beam link, using tool No. 672 SZ. Secure stabiliser rod to rear crossmember.

(7) Remove the flexible beam front bracket pinch bolts, and drift out beam securing pins.

(8) Lower axle assembly to the minimum ground clearance available for withdrawal, jack rear crossmember and further block frame as in (5) above, to obtain sufficient clearance for the withdrawal sideways of the axle assembly complete with flexible beam from the vehicle.

Re-Fitment to Vehicle

Is carried out by a reversal of all foregoing operations.

Note: Important—Do not admit air to Suspension Reservoir until linkage has been fitted between levelling valve levers and axle casing.

The split bush used at the flexible beam front brackets must be drifted up to the beam eye to prevent any initial side float. This operation to be carried out before final tightening of the pinch bolts.

To Dismantle Rear Axle Assembly

Having removed the rear axle and flexible beam assembly from the vehicle proceed as follows:—

(1) Disconnect the flexible beam “U” bolts and remove the beam assembly from axle.

(2) Drain the axle oil. Drain plugs are to be found, one in either axle casing.

(3) “Break” the axle by removing nuts at the offside end of the rectangular section crossmember when the offside axle casing assembly may be removed.

(4) Withdraw the central cross shaft and remove nuts securing the crossmember to the nearside casing. These two components may now be separated.

Having accomplished operations (1) to (4), work upon the final drives may be carried out as follows:—

To Dismantle the Offside Final Drive and Differential

Note:—Care must be taken to mark and note the position and thickness of all shims such that on re-assembly, the spiral bevel gears are replaced in their original position.

(1) Remove the top inspection covers to reveal the spur wheel and bearings.

(2) Remove the setscrews retaining the hub caps and withdraw the axle shaft.

(3) Remove the spur wheel bearing cap nuts and locking washers and lift bearing caps.

(4) The spur wheel complete with roller bearings may be removed.

(5) Remove the nuts securing the cover plate to which the rectangular crossmember was attached. Remove cover.

(6) The differential unit, bevel wheel and spur pinion assembly may now be withdrawn together with the inner track of the attendant bearings.

(7) Remove the nuts securing the spiral bevel pinion housing to the casing and drift out the assembly complete.

(8) Remove the nut securing the coupling flange to the pinion, using spanner, tool No. 471 SZ. The flange, oil seal housing, distance piece and taper roller bearings may be readily removed from the pinion.

(9) Remove the nuts locking the differential casings and separate them.

M1.4
(10) The differential bevels will now be exposed and may be removed together with the "Star" member and thrust washers.

(11) The spiral bevel wheel may be removed by removing the setscrews and locking wire securing the wheel to the differential casing and disengaging it from its spigot.

Note:—The spiral bevel pinion and wheel are numbered since they are manufactured as a pair and therefore must always be kept married together.

To Re-assemble Offside Final Drive and Differential, including the setting of the spiral bevel pinion and wheel, when new gears are fitted.

Assembly of Spiral Bevel Pinion

(1) Fit taper bearing outer cups to spiral bevel pinion housing.

(2) Fit inner taper bearing cone to pinion and slide distance piece into position together with shims of approximately .040" thickness.

(3) Place the pinion, etc., in the housing and then fit the outer taper bearing cone to the pinion. 
Note:—The oil seal housing should not be fitted at this stage.

(4) Fit to the pinion the coupling flange and nut. Tighten to a torque figure of 400 lbs. ft. rotating the bearing housing whilst the nut is being tightened to ensure correct bedding of rollers.

(5) Check torque required to turn the pinion, this should be 20/25 lbs. ins. This figure being obtained by adjusting the shim thickness (2) above.

(6) Having satisfied the above requirements, remove flange and fit the oil seal housing. Re-assemble the coupling flange and nut up securely to torque figure stated above and lock nut.

Assembly of Differential and Spiral Bevel Wheel

(1) Select the small differential cage and fit bolts.

(2) Fit the taper roller bearing inner cones to the differential casings.

(3) Assemble the bronze bush to the differential casing which carries the spiral bevel wheel. Fit the differential bevel wheel. Press the needle roller races into the other differential case and follow with the thrust washer which is radially located by dowels.

(4) Select the spur pinion, fit the inner track of the plain roller bearing, pass the combined shaft and bevel wheel through the offside differential casing, secure the spur pinion with tab washer and nut.

(5) Place in position the "Star" member and differential bevel pinion and thrust washers. Ensure that the thrust washers are correctly located.

Note:—This operation is assisted by marking each washer radially opposite the locating tab.

(6) Assemble both differential casings taking care that they are in the correct radial position.

Note:—Casings are marked to facilitate this.

(7) Check the differential assembly for freedom, lock the nuts by split pins.

(8) Assemble spiral bevel wheel to differential casing and wire up setscrews securely.

Assembly of Offside Final Drive Unit

(1) Fit the spiral bevel pinion assembly to the main drive casing with 0.060" thickness of shims between the pinion housing and drive casing.

(2) The spiral bevel pinion has stamped on the end face of the teeth a figure, this figure is a setting dimension in thousandths of an inch for use with the setting tool, Part No. 506SZ.

(3) Place in position this tool and with feeler gauges check the gap between the end face of the pinion and the tool. This gap should agree with the figure marked on the end face of the pinion if the shimming is correct. When a correction is required, alter the shim thickness as mentioned in (1) above. For details of Tool set-up see drawing No. 19 LDM.
ARRANGEMENT OF REAR AXLE

40 LDM

SHEET 3 OF 4 SHEETS
(4) Remove pinion assembly from casing, noting the shimming which has been found necessary at (3) above.

(5) Fit the differential casing taper roller bearing cup to the cover plate without shimming.

(6) Fit the spur pinion roller bearing outer track to the main drive casing, also the differential casing taper roller bearing cup to the main drive casing placing 0-060" of shims between the cup and casing in the case of the latter. Use tool No. 508 SZ.

(7) Slide into position the differential and spiral bevel wheel assembly. Fit the cover plate, securing it temporarily.

(8) With tool No. 479 SZ pre-load the differential casing taper roller bearings to such a degree that a torque of 5 to 10 lbs./ins. is required to rotate the assembly. To achieve accuracy, the differential should be locked during this operation.

(9) When the torque figure is achieved, check the gap between the taper roller bearing and its abutment shoulder on the cover plate and note this figure.

(If the spiral bevel wheel is in the correct position shims are required to fill this gap).

(10) Refit the spiral bevel pinion assembly and check the backlash between the spiral gears in the manner shown in drawing No. 130 LDM. The correct backlash is 0-010"/0-008".

Note:—If this backlash is not correct then the spiral bevel wheel must be adjusted. This is achieved by increasing or decreasing the shimming behind the differential casing taper roller bearing cup (see (6) above).

Additions to this shimming must be subtracted from the gap figure measured at (9) above and vice versa.

Tool No. 507 SZ may be used for extracting the taper roller bearing cup from the drive casing.

As a rough guide 0-001" of shim thickness is approximately equal to 0-003" backlash.

(11) Remove the pinion assembly taking care with the shims.

(12) Remove the cover plate, drift out the taper roller bearing cup and add the necessary shims, equal in thickness to the gap measured at (9) and modified at (10).

(13) Refit the bearing cup and refit the cover plate to the casing. Recheck the bearing pre-load to ensure that the torque figure has been achieved.

(14) Fit the pinion assembly to the casing and re-check the backlash. Should the backlash be incorrect, repeat the previous operations.

(15) Finally check the tooth contact, by "blueing" the pinion and marking the wheel. The correct marking is shown on Drawing No. P.204.

(16) Secure the cover plate and pinion assembly, making sure that any differential locking arrangement (8) above is removed.

(17) The spur wheel may now be fitted together with its bearings and bearing caps. Backlash between spur pinion and spur wheel should be 0-009"/0-002".

(18) Fit and secure all inspection cover plates, etc.

To Dismantle the Nearside Final Drive

(1) Remove the top inspection cover.

(2) Remove bearing cap securing nuts and locking washers. Remove caps.

(3) Withdraw spur wheel complete with roller bearings which can then be removed.

(4) Remove cross shaft buttress cap.

(5) Drift out spur pinion assembly complete with the inner roller bearing and the inner roller track and cage of the outer bearing.

(6) The outer bearing, outer track may then be removed.

M1.8
ARRANGEMENT OF SET UP FOR CHECKING BACKLASH IN SPIRAL BEVEL GEARS
130.LDM
MI.9
ARRANGEMENT OF SET UP FOR CHECKING SPIRAL BEVEL GEARs.

PINION FLANGE

REAR AXLE CASING
DIAL TEST INDICATOR NOT SUPPLIED WITH TOOL.

RATIO OF INDICATED FIGURE TO ACTUAL = 2.5:1.
FOR CORRECT BACKLASH DIAL INDICATOR
SHOULD READ 0.20 - 0.25".

FOR CHECKING BACKLASH OF ARS. 130 LDM
ASSEMBLY OF TOOL FOR SETTING SPIRAL BEVEL PINION
19.LDM
M1.10
PRELOAD TO 20 TO 25 INCH LBS.
BY ADJUSTMENT OF SHIM THICKNESS.

TIGHTEN NUT TO
400 LBS. FT. TORQUE.
PRE-ASSEMBLE WITH .040" THICK SHIMS. TAKE THE FEELER CLEARANCE AT 'X'. SUBTRACT THE FEELER CLEARANCE FROM THE CLEARANCE MARKED ON THE FACE OF BEVEL PINION (& GIVEN IN \( \frac{\text{inches}}{1000} \)) & THEN ADJUST SHIM THICKNESS IN ACCORDANCE.

\[ X = \text{FEELER CLEARANCE} \]

\[ \text{CLEARANCE IN } \frac{\text{inches}}{1000} \text{ OF AN INCH MARKED ON FACE OF PINION. THIS CLEARANCE MUST BE MAINTAINED USING GAUGE No. 506 SZ.} \]

EXAMPLE: WITH FEELER CLEARANCE .020" & MARKING OF 15 (\( \frac{\text{inches}}{1000} \))

.015" MINUS .020" = .005".

PK4-ASSY SHIM THICKNESS = .040" -.005" DIFFERENCE

= .035" SHIMS REQUIRED.

SETTING SPIRAL BEVEL PINION.
Re-assembly
Is carried out by a reversal of the foregoing operations, ensuring that the inner roller bearing outer track is fitted only in the final stage.
The backlash between the spur wheel should be checked prior to finally securing the top cover. This should be +0.009"/+0.002".

Re-assembly of Axle Complete
(1) Assemble nearside casing assembly to crossmember and nut up securely.
(2) Add the cross shaft and make sure that this shaft slides easily in spur pinion. Assemble offside casing assembly to crossmember. Nut up securely.

Removal of Rear Wheel Hubs
(1) Slacken road wheel nuts and jack up vehicle until wheels clear ground.
(2) Remove road wheel nuts and road wheels.
(3) Remove axle shaft cap.
(4) Withdraw axle shaft.
(5) Remove the driving dog from the hub.
(6) Remove bearing locking nut locking ring and dowel. Remove the nut with the aid of Spanner No. 98 SZ.
(7) Withdraw hub complete with brake drum and hub outer bearings, distance piece and inner oil seal housing complete with oil seal. This operation can be simply accomplished by using withdrawal tool No. 97 SZ.

Re-assembly of Rear Hubs
Note:—No bearing adjustment is necessary, the bearings being positioned by a distance piece, the hub being positioned as previously mentioned by the ball location bearing.
The bearing distance piece has been precision ground to provide parallelism of end faces which are also square with the bore. It is therefore, imperative that the length must not, under any circumstances, be altered.
(1) Re-assemble hub and brake drum together with the inner oil seal and housing and inner bearing.
(2) Place in position the bearing distance piece and at this stage thoroughly pack with grease of the correct specification.
(3) Assemble the outer bearings, location bearing against the distance piece.
(4) Add the locking nut and tighten securely. Fit the locking ring entering the dowel into one of the holes provided in the axle tube for this purpose.
Note:—Ensure, when assembling the hub, that the outer bearing when in its correct position is standing proud of the hub face by 0.005". This will enable a "nip" on the bearing outer tracks to be obtained when the driving dog is fitted.

Service Data
Axle Shaft Splines to Spur Wheels
Initial Radial Clearance: +0.0035"/+0.0015".
Initial Diametral Clearance: +0.0065"/+0.0038".

Differential Bevel Wheel in Differential Casing Bush
Initial Diametral Clearance: +0.0075" (Inner Wheel only).
Service Data—(Continued)

Differential Bevel Pinion to Star Member
   Initial Diametral Clearance: +0.043"/+0.002".

Axle Shaft Involute Teeth to Driving Dog
   Initial Radial Clearance: +0.024"/+0.015".

Axle Shaft to Oil Return Bushes
   Initial Diametral Clearance: +0.044"/+0.032".

Central Cross Shaft to Spur Pinions
   Initial Radial Clearance: +0.006"/+0.003".
   Initial Diametral Clearance: +0.005"/+0.003".
(B) SPIRAL BEVEL AND HYPOID GEAR CONTACT MARKINGS ON WHEEL TEETH
FOR LIGHT LOAD CONDITIONS

SPIRAL BEVEL AND HYPOID GEARS ARE USUALLY CUT SO THAT WHEN THE CORRECT LIGHT LOAD MARKING AS SHOWN BELOW IS OBTAINED, THE CONTACT MARKING EXTENDS UNDER LOAD TO APPROXIMATELY THREE QUARTERS THE LENGTH OF THE TOOTH IF THE CASE AND MOUNTING ARE OF NORMAL RIGIDITY.

CONCAVE SIDE
(ODERIVE)

CORRECT MOUNTING

PINION TOO CLOSE TO CONE CENTRE.
PINION SHOULD BE WITHDRAWN AND WHEEL CLOSED IN TO MAINTAIN CORRECT BACKLASH.

PINION TOO FAR FROM CONE CENTRE.
WHEEL SHOULD BE WITHDRAWN SLIGHTLY TO ALLOW PINION TO BE CLOSED IN.

ALIGNMENT ERROR IN GEAR CASE.
SPIRAL BEVELS: SHAFTS DO NOT INTERSECT
HYPOIDS: SHAFTS NOT SPACED AT CORRECT OFFSET
A GIVEN ERROR PRODUCES A DIFFERENT EFFECT ON CONTACT MARKING ACCORDING TO HAND OF GEAR

ANGULAR DISTORTION OF GEAR CASE.
SHAFT ANGLE TOO LARGE

ANGULAR DISTORTION OF GEAR CASE.
SHAFT ANGLE TOO SMALL

TO CORRECT THE BACKLASH WITHOUT CHANGING SATISFACTORY TOOTH MARKINGS THE WHEEL AND PINION SHOULD BE ADJUSTED IN THE SAME DIRECTIONS RELATIVE TO THE CONE CENTRE BY AMOUNTS PROPORTIONAL TO THE NUMBERS OF TEETH.

SPIRAL BEVEL & HYPOID GEAR CONTACT MARKINGS
P.204
M1.13

PART NO.

P204

MACHINING SYMBOLS TO BE INDICATED IN

SHEETS:

GRAPHICAL ARTIST:

DRAWING NOT TO BE SCALEDFOR PARTS TO BE MANUFACTURED IN

MATERIALS:

SHARP CORNERS TO BE REMOVED (MINIMUM 0.10 MAXIMUM 0.007)
ASSEMBLY OF TOOL FOR ADJUSTING DIFFERENTIAL UNIT TAPER ROLLER BEARINGS
20.LDM
M1.14
PRELOAD TO 5 TO 10 INCH/LBS TAKE MICROMETER.
SUBTRACT DIMENSION ENGRAVED ON FACE FROM
THEN FIT SHIMS OF THICKNESS EQUAL TO THIS

ASSEMBLY OF TOOL FOR ADJUSTING DIFFERENT
TAKE MICROMETER READING.

FACED ON FACE FROM READING.

NESS OF THE DIFFERENCE.