

## Differential Unit

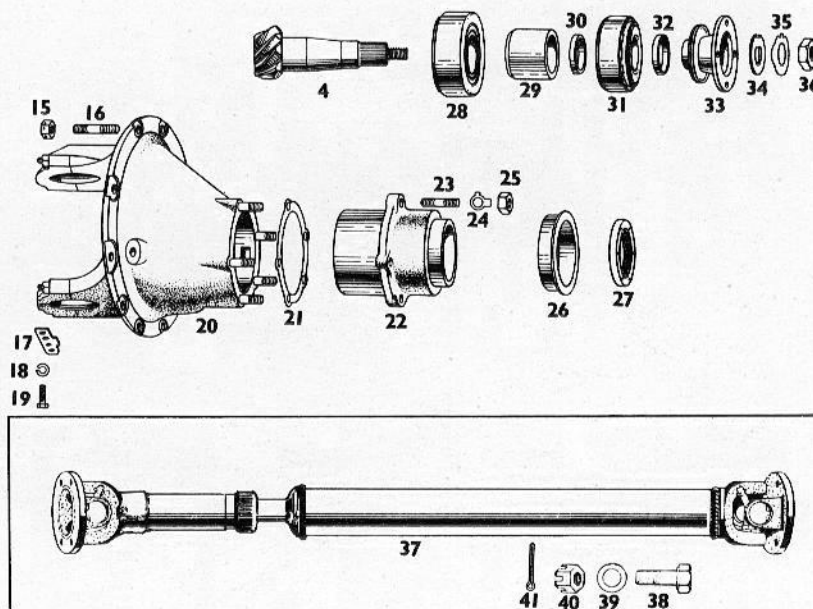
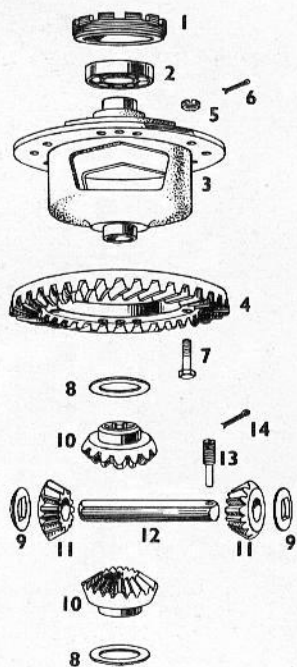
# Differential Unit

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## TYPE 405. DIFFERENTIAL GEAR UNIT. SERIAL 405-1-30003. DETACHABLE BEARING HOUSING AND PROPELLOR SHAFT.

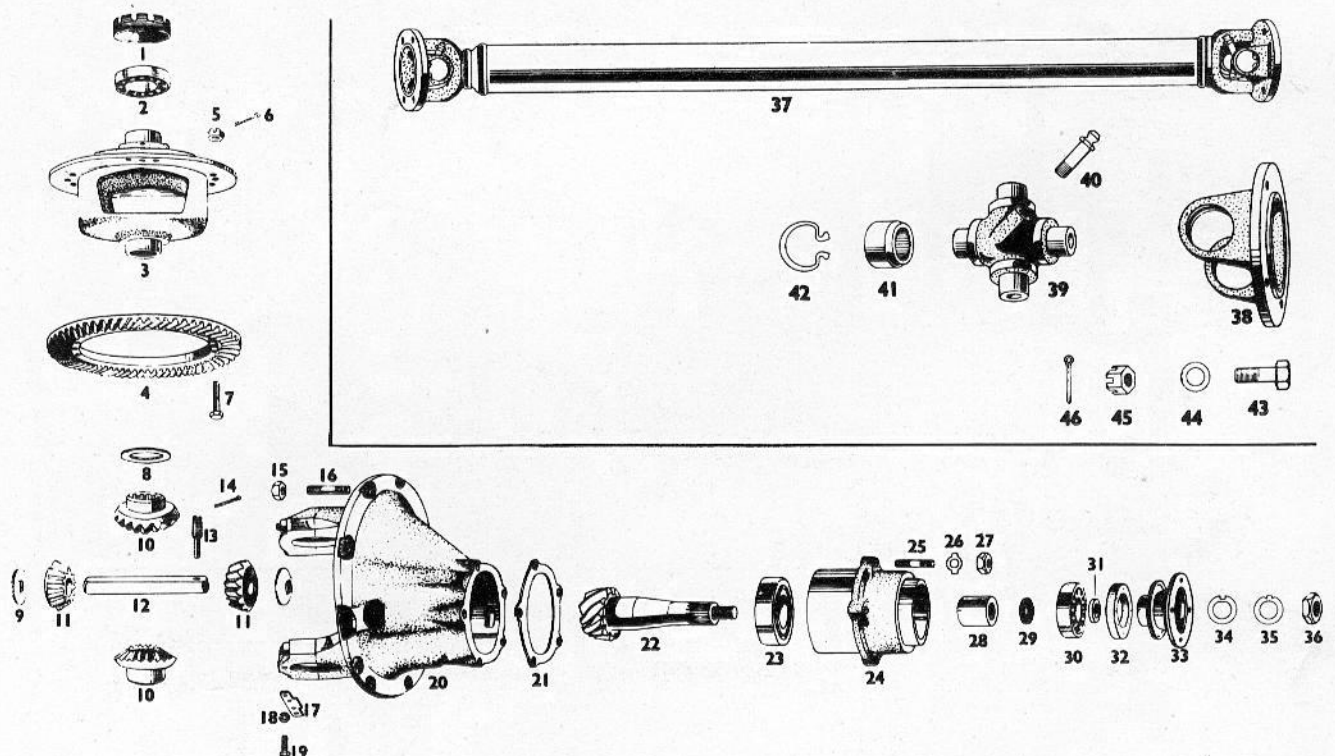
Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2	N.721023-3	21	Shim .005 thickness	selective
N.490361	2	Roller Bearing	2	N.721023-4		Shim .010 thickness	
405-1-30051/1	3	Crown Wheel Mounting	1	N.721923-5		Shim .015 thickness	
405-1-30018/1	4	Driving Pinion ) Paired	1	N.721023-6		Shim .020 thickness	
405-1-30018/2		Crown Wheel )	1	N.721018	22	Bearing Housing	1
FN405/L	5	Slotted Nut	12	N.721006	23	Bearing Housing Retaining Stud	5
N.490291	6	Split Pin 1/16" dia. 3/4" long	12	N.310380	24	Tabwasher	5
N.490141-1	7	Crown Wheel Bolt	12	FN105/L	25	Nut 5/16" BSF	5
N.490141-2		Thrust Washer .102 thickness			26	Not used on 405-1-30003	
N.490141-2A		Thrust Washer .104 thickness		N.721011	27	Oil Seal	1
N.490141-2B		Thrust Washer .107 thickness		N.721022	28	Taper Roller Bearing	1
N.490141-3		Thrust Washer .105 thickness		N.721004-1		Distance Piece 1.423 long	1
N.490141-4		Thrust Washer .110 thickness		N.721004-2	29	Distance Piece 1.443 long	selective
N.490141-5		Thrust Washer .112 thickness		N.721004-3		Distance Piece 1.463 long	
N.490141-6	8	Thrust Washer .114 thickness	2	N.721014-1		Distance Washer .200 thickness	
N.490141-7		Thrust Washer .116 thickness	selective	N.721014-2		Distance Washer .202 thickness	
N.490141-8		Thrust Washer .125 thickness		N.721014-3		Distance Washer .204 thickness	
N.490141-9		Thrust Washer .130 thickness		N.721014-4		Distance Washer .206 thickness	
N.490141-10		Thrust Washer .118 thickness		N.721014-5		Distance Washer .208 thickness	
N.490141-11		Thrust Washer .120 thickness		N.721014-6	30	Distance Washer .210 thickness	
N.490171-1		Thrust Washer .122 thickness		N.721014-7		Distance Washer .212 thickness	1
N.490171-2		Spherical Thrust Washer .219 thickness		N.721014-8		Distance Washer .214 thickness	selective
N.490171-3		Spherical Thrust Washer .221 thickness		N.721014-9		Distance Washer .216 thickness	
N.490171-4	9	Spherical Thrust Washer .228 thickness	2	N.721014-10		Distance Washer .218 thickness	
N.490171-5		Spherical Thrust Washer .231 thickness	selective	N.721014-11		Distance Washer .220 thickness	
N.490051	10	Bevel Gear	2	N.721009	31	Taper Roller Bearing	1
N.490061	11	Bevel Pinion	2	N.721005	32	Distance Washer	1
N.490471	12	Gear Spindle	1	N.721013	33	Companion Flange & Dust Seal	1
N.490161	13	Lock Pin	1	N.490201	34	Special Washer	1
N.490481	14	Split Pin 1/16" dia. 1/2" long	1	N.490251	35	Tabwasher	1
N.490261	15	Special Nut	4	FN212/K	36	Thin Nut 3/4" BSF	1
N.490131	16	Bearing Cap Attachment Stud	4				
N.721017	17	Locking Plate	2			<u>PROPELLOR SHAFT</u>	
N.721023-1	18	Spring Washer 2BA	2	405-1-20132	37	Propellor Shaft	1
N.721023-2	19	Setscrew 2BA Hex Hd 1/2" long	2	N.704117	38	Bolt	8
	20	Differential Gear Housing	1	N.704115	39	Plain Washer	8
		Shim .002 thickness		N.704116	40	Nut-Slotted	8
		Shim .004 thickness			41	Split Pin 3/32 dia. x 1" long	8





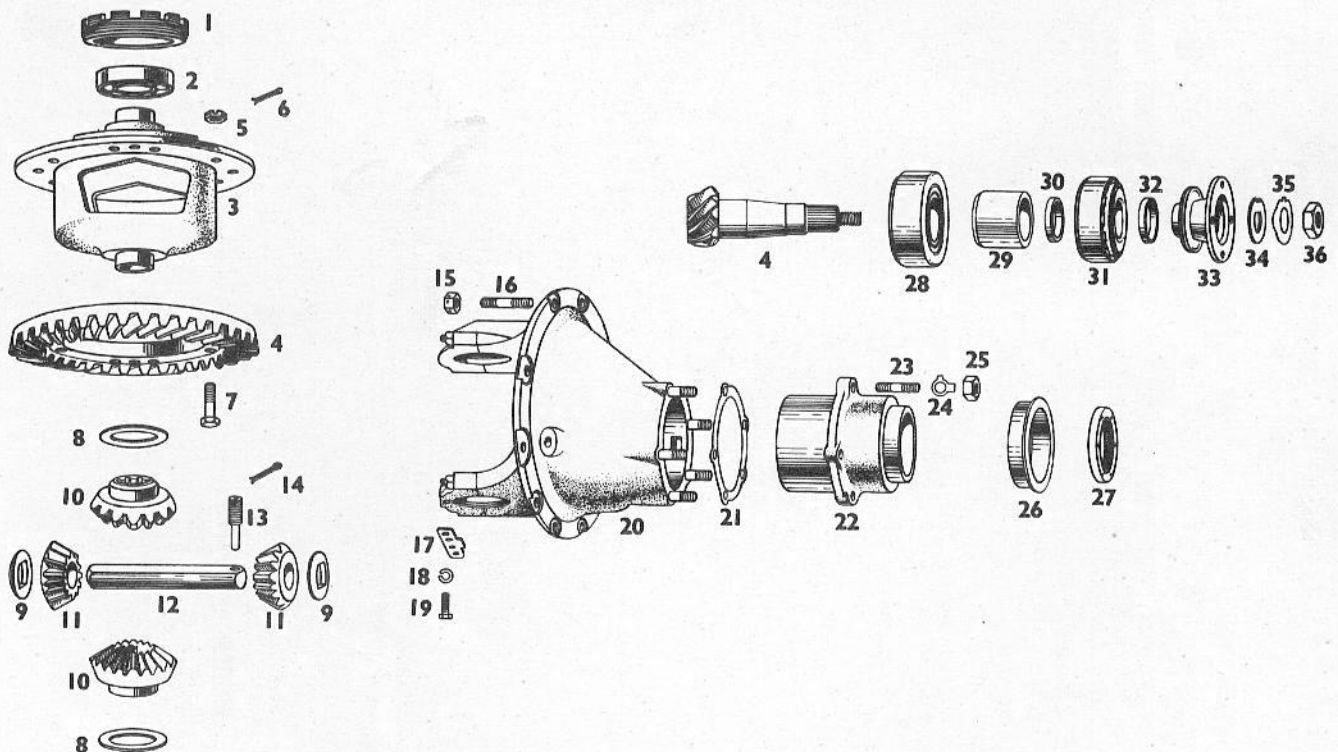
## TYPE 404. DIFFERENTIAL GEAR UNIT AND PROPELLOR SHAFT.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2	N.721017	20	Differential Gear Housing Complete	1
N.490361	2	Bearing	2	N.721007	21	Adjustable Washer	1
N.490031	3	Crown Wheel Mounting (Complete)	1	N.490021	22	Driving Pinion	1
N.490231	4	Crown Wheel	1	N.721010	23	Taper Roller Bearing	1
N.490460	5	Nut Slotted 5/16 BSF	12	N.721018	24	Bearing Housing	1
-	6	Split Pin 1/16 Dia. x ¾	12	N.721006	25	Stud	5
N.490291	7	Bolt	12	AGS195-2	26	Tabwasher	5
N.490141-1	8	Thrust Washer. Thickness) .102 .000 - .001 )	2	FN105/L	27	Nut 5/16 BSF	5
N.490141-2		Thrust Washer. Thickness) .104 .000 - .001 )	2	N.721004-1	28	Distance Piece 1.423 )	1
N.490141-3		Thrust Washer. Thickness) .110 .001 - .000 ) Selective	2	N.721004-2		Distance Piece 1.443 ) Selective	1
N.490141-4		Thrust Washer. Thickness) Assy. .112 .002 - .000 )	2	N.721004-3		Distance Piece 1.463 ) Assy.	1
N.490141-5		Thrust Washer. Thickness) .114 .001 - .000 )	2	N.721014-1	29	Distance Washer. Thickness).200 )	1
N.490141-6		Thrust Washer. Thickness) .116 .001 - .000 )	2	N.721014-2		Distance Washer. Thickness .202 )	1
N.490171-1	9	Spherical Thrust Washer ) Thickness .219 .001 - .000 )	2	N.721014-3		Distance Washer. Thickness .204 )	1
N.490171-2		Spherical Thrust Washer ) Thickness .221 .001 - .000 )	2	N.721014-4		Distance Washer. Thickness .206 )	1
N.490171-3		Spherical Thrust Washer ) Thickness .228 .001 - .000 ) Selective	2	N.721014-5		Distance Washer. Thickness .208 )	1
N.490171-4		Spherical Thrust Washer ) Assy. Thickness .231 .001 - .000 )	2	N.721014-6		Distance Washer. Thickness .210 ) Selective	1
N.490171-5		Spherical Thrust Washer ) Thickness .234 .001 - .000 )	2	N.721014-7		Distance Washer. Thickness).212 ) Assy.	1
N.490051	10	Bevel Gear	2	N.721014-8		Distance Washer. Thickness .214 )	1
N.490061	11	Bevel Pinion	2	N.721014-9		Distance Washer. Thickness .216 )	1
N.490471	12	Gear Spindle	1	N.721014-10		Distance Washer. Thickness .218 )	1
N.490161	13	Lock Pin	1	N.721014-11		Distance Washer. Thickness .220 )	1
-	14	Split Pin 1/16 x ½	1	N.721009	30	Taper Roller Bearing	1
N.490301	15	Special Nut 7/16 BSF	4	N.721005	31	Distance Washer	1
N.490261	16	Bearing Cap Attachment Stud	4	N.721011	32	Oil Seal	1
N.490131	17	Locking Plate	2	N.721013	33	Companion Flange, and Dust Seal	1
-	18	Spring Washer 2 BA	2	N.490201	34	Special Washer	1
-	19	Set Screw 2 BA Hex Head ½ Long	2	N.490251	35	Tabwasher	1
				FN212/K	36	Nut Thin ¾ BSF	1
				404-X-20142	37	Propellor Shaft	1
				N.704145	38	Flange Yoke	2
				N.704146	39	Journal Assy.	2
				N.480161	40	Lubrication Nipple	2
				N.704147	41	Needle Bearing Assy.	8
				N.704148	42	Circlip	8
				N.704117	43	Bolt	8
				-	44	Washer 3/8 Plain	8
				N.704116	45	Nut	8
				-	46	Split Pin	8



## TYPE 405. DIFFERENTIAL GEAR UNIT-DETACHABLE BEARING HOUSING. SERIAL 405-1-30052

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2	N.721023-3	21	Shim .005 thickness	selective
N.490361	2	Roller Bearing	2	N.721023-4		Shim .010 thickness	
405-30051/1	3	Crown Wheel Mounting	1	N.721023-5		Shim .015 thickness	
405-1-30049/1	4	Driving Pinion ) Paired	1	N.721023-6		Shim .020 thickness	
405-1-30049/2		Crown Wheel )	1	405-1-30047	22	Bearing Housing	1
FN.405/L	5	Slotted Nut	12	N.721006	23	Bearing Housing Retaining Stud	5
-	6	Split Pin 1/16" dia. 3/4" long	12	N.310380	24	Tabwasher	5
N.490291	7	Croan Wheel Bolt	12	FN.105/L	25	Nut 5/16" BSF	5
N.490141-1		Thrust Washer .102 thickness	selective	405-1-30044	26	Oil Seal Adaptor	1
N.490141-2		Thrust Washer .104 thickness		N.721011	27	Oil Seal	1
N.490141-2A		Thrust Washer .107 thickness		405-1-30032	28	Taper Roller Bearing	1
N.490141-2B		Thrust Washer .105 thickness		405-1-30038-1	29	Distance Piece 1.466 long	1 selective
N.490141-3		Thrust Washer .110 thickness		405-1-30038-2		Distance Piece 1.486 long	
N.490141-4		Thrust Washer .112 thickness		405-1-30038-3		Distance Piece 1.506 long	
N.490141-5		Thrust Washer .114 thickness		405-1-30038-4		Distance Piece 1.526 long	
N.490141-6	8	Thrust Washer .116 thickness		405-1-30045-1	30	Distance Washer .200 thickness	1 selective
N.490141-7		Thrust Washer .125 thickness		405-1-30045-2		Distance Washer .202 thickness	
N.490141-8		Thrust Washer .130 thickness		405-1-30045-3		Distance Washer .204 thickness	
N.490141-9		Thrust Washer .118 thickness		405-1-30045-4		Distance Washer .206 thickness	
N.490141-10		Thrust Washer .120 thickness		405-1-30045-5		Distance Washer .208 thickness	
N.490141-11		Thrust Washer .122 thickness		405-1-30045-6		Distance Washer .210 thickness	
N.490171-1		Spherical Thrust Washer .219 thickness		405-1-30045-7		Distance Washer .212 thickness	
N.490171-2		Spherical Thrust Washer .221 thickness		405-1-30045-8		Distance Washer .214 thickness	
N.490171-3		Spherical Thrust Washer .228 thickness		405-1-30045-9		Distance Washer .216 thickness	
N.490171-4	9	Spherical Thrust Washer .231 thickness		405-1-30045-10		Distance Washer .218 thickness	
N.490171-5		Spherical Thrust Washer .234 thickness	selective	405-1-30045-11		Distance Washer .220 thickness	
N.490051	10	Bevel Gear	2	405-1-30045-12		Distance Washer .209 thickness	11
N.490061	11	Bevel Pinion	2	405-1-30045-13		Distance Washer .211 thickness	
N.490471	12	Gear Spindle	1	405-1-30045-14		Distance Washer .213 thickness	
N.490161	13	Lock Pin	1	405-1-30045-15		Distance Washer .215 thickness	
-	14	Split Pin 1/16" dia. 1/2" long	1	405-1-30045-16		Distance Washer .217 thickness	
N.490481	15	Special Nut	4	405-1-30045-17		Distance Washer .219 thickness	
N.490261	16	Bearing Cap Attachment Stud	4	405-1-30045-18		Distance Washer .221 thickness	
N.490131	17	Locking Plate	2	405-1-30033	31	Taper Roller Bearing	
-	18	Spring Washer 2BA	2	405-1-30041	32	Distance Washer	
-	19	Setscrew 2BA Hex Hd 3/4" long	2	N.721013	33	Companion Flange & Dust Seal	
N.721017	20	Differential Gear Housing	1	N.490201	34	Special Washer	
N.721023-1		Shim .002 thickness	selective	N.490251	35	Tabwasher	1
N.721023-2		Shim .004 thickness		FN.212/K	36	Thin Nut 3/4" BSF	1



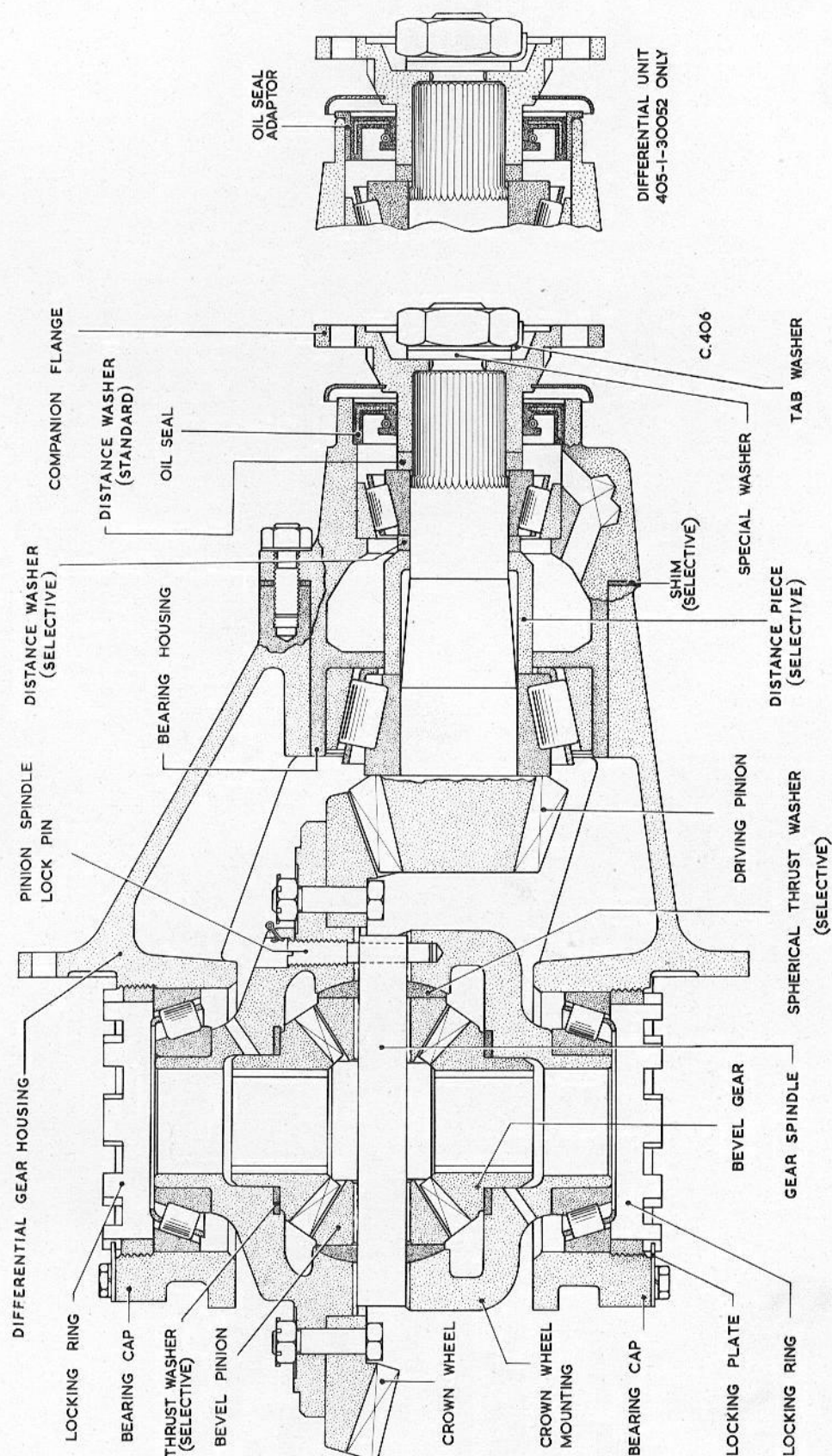


Fig. 156. Assembly of differential unit (Detachable bearing housing)



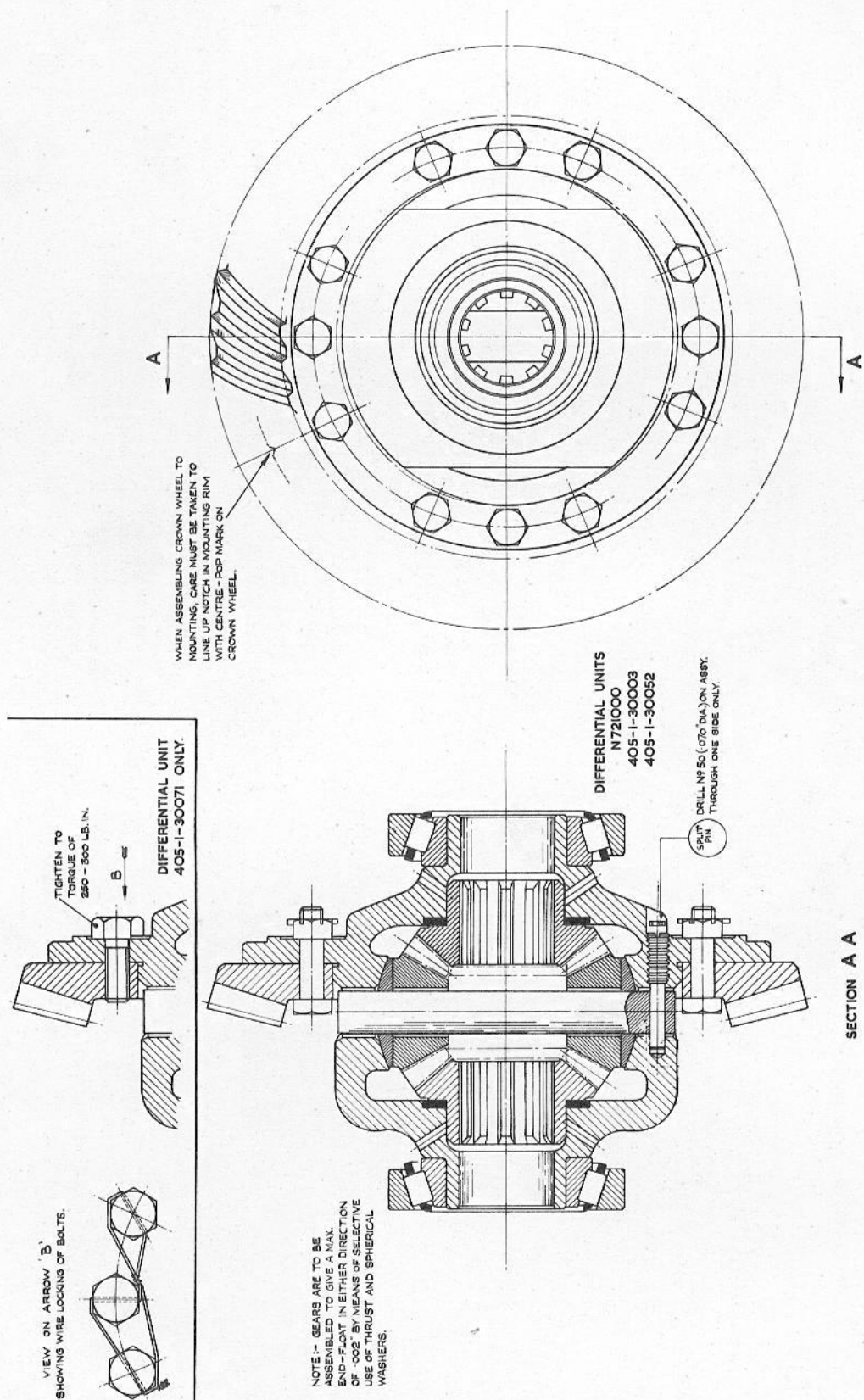


Fig. 157. Assembly of crown wheel mounting

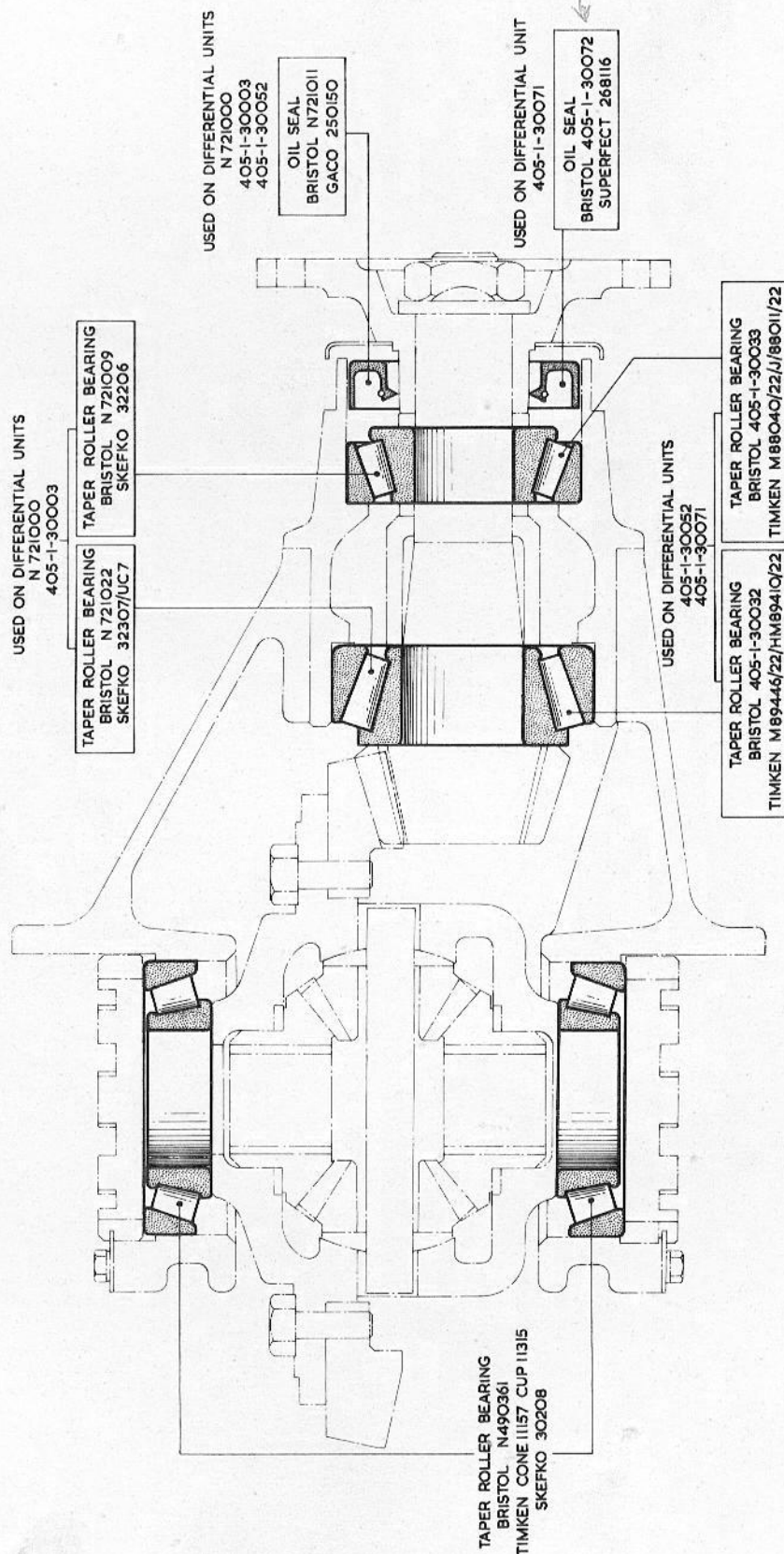


Fig. 158. Roller race and oil seal diagram



## Differential Unit

The differential unit used on the Type 404 Car is 3.9 Ratio and identical with the differential used on the previous Type 401 and Type 403 Cars. The part number of this unit is N.721000.

The differential used on early Type 405 Cars is identical with N.721000 except that the ratio changed to 4.22. The part number of this unit is 405-1-30003.

On intermediate Type 405 Cars the taper roller races in the pinion bearing housing were changed. This changed the diameter of the pinion and consequently the crown wheel and pinion are non-interchangeable with previous differentials. The part number of this unit is 405-1-30052.

On later Type 405 Cars numerous changes were made, the bearing housing being shrunk into the casing and is not detachable. The crown wheel and pinion are changed and are not interchangeable with previous types. The part number of this unit is 405-1-30071.

In all instances the differential units are completely interchangeable in the 'Bristol' Cars as units. Only the component parts have been subject to alteration.

### Removing and Refitting to the Car

Type 404 and 405.

Drain the rear axle, jack up the car and support the rear on chassis stands. Referring to the Rear Suspension for the procedure withdraw the half shafts from the splines on the differential. Detach the attachment unit from the top of the differential.

Disconnect the propellor shaft from the differential companion flange and push the propellor shaft forward towards the gearbox.

Release the tabwashers, remove the nuts and lift it forward clear of the axle casing.

To refit, clean the joint faces of the axle casing and the differential and fit a new gasket over the studs.

Fit the assembly to the axle casing, replace the tabwashers and nuts and tighten evenly and lock.

Reconnect the propellor shaft, attachment unit and refit the half shafts. Fill with approved oil.

### Replacing the Driving Pinion Oil Seal

From below the car disconnect the propellor shaft rear companion flange and push the shaft forward.

Remove the nut, lockwasher and special washer and using extractor TPN8450 remove the companion flange from the splines of the driving pinion.

Prise out the oil seal and fit a new seal lip inwards and with the face flush with the face of the bearing housing.

Check the running surface of the companion flange for condition where it fits the seal and polish or replace if necessary. Lubricate and fit the companion flange with its special washer, lockwasher and nut and tighten and lock. Refit the propellor shaft.

### Dismantling the Unit

This procedure applies only to differential units stamped with the following Part Numbers.

N.721000.....3.9 Ratio. Fitted to Type 404 cars.

405-1-30003.....4.22 Ratio. Fitted to early Type 405 cars.

405-1-30052.....4.22 Ratio. Fitted to intermediate Type 405 Cars.

For dismantling 405-1-30071 refer to a separate procedure.

With the unit removed from the car refer to Fig.156 and proceed to dismantle as follows:-

Locate and bolt the complete assembly on to Vice Plate TPN5053.

Unlock the tabwasher and remove the nut, tabwasher and special washer from the companion flange.

Remove the locking plates from both bearing caps and remove the locking wire from the bearing cap nuts. Remove the nuts, bearing caps and the locking rings and lift out the crown wheel mounting complete.

Unlock and remove the five nuts securing the pinion bearing housing and withdraw this assembly which is a good slide fit. The joint on the five studs is a laminated adjustable washer or separate thin shims which control the penetration of the pinion to the crown wheel. In most instances they should be carefully retained.

Proceed to dismantle the Crown Wheel Mounting:-

If the taper roller bearings are unserviceable, remove them from the crown wheel mounting spigot with extractor tool TPN5057 see Fig.159

Remove the split pins, nuts and bolts and remove the

crown wheel. Remove the split pin retaining the pinion spindle lock pin and unscrew the pin. Drift out the bevel pinion spindle.

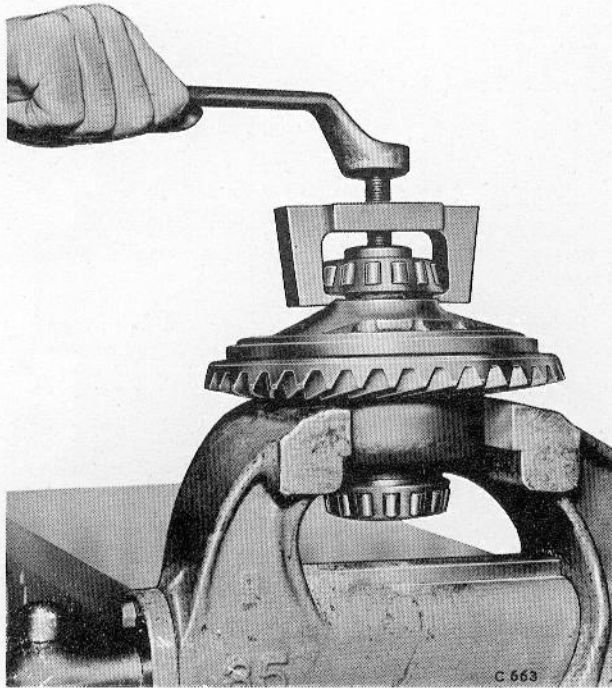


Fig. 159. Removing roller races from crown wheel mounting

Remove each pinion together with its spherical thrust washer and keep them together noting the location. Remove the bevel gears.

Phosphor bronze thrust washers are pressed into a recess in the bevel gear location. These are a selective assembly and should only be removed if replacements are necessary. Small holes are provided to enable them to be tapped out but the holes are only accessible when the roller bearings have been removed.

To dismantle the bearing housing use the following procedure:-

Having previously removed the nut, use extractor TFN8450 and withdraw the companion flange from its splines on the pinion.

With the rear face of the bearing housing suitably supported press out the driving pinion. The bearing inner race and rollers and the selective distance piece and distance washer will remain on the pinion. Take out the standard distance piece between the roller race and the oil seal.

Reverse the bearing housing and press out the oil seal together with the inner race and rollers of the front bearing. Discard the oil seal.

If the roller bearings are to be replaced it will be necessary to remove both the outer races from the bearing housing and the inner race from the driving pinion by the following method.

Using the tools TFN5058 and TFN5059 remove the roller race as shown in Fig.160.

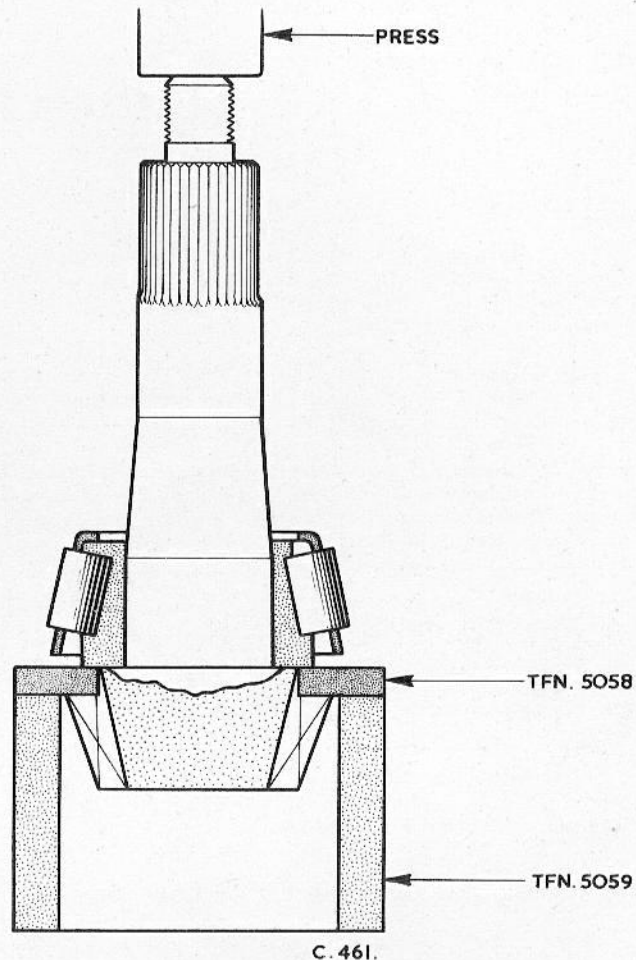


Fig. 160. Removing roller race from pinion

Using the spigots TFN5060 and TFN5061 and the rings TFN5062 and TFN5071, press out the bearing outer races (larger race first) as shown in Fig.161.

### Re-assembling the Bearing Housing

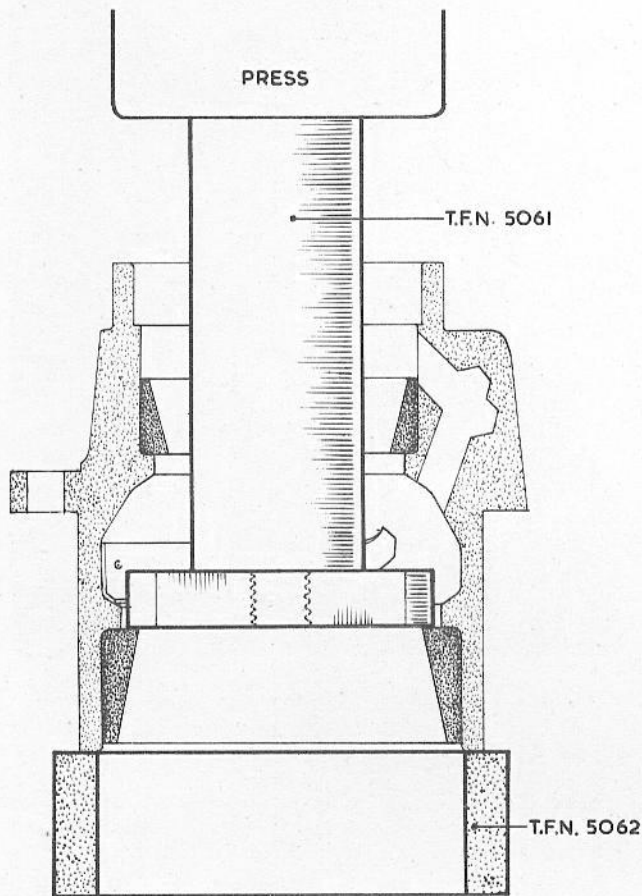
It is assumed that this assembly would not have been disturbed except for replacement of the pinion, roller races or the housing itself. This means that the removed distance piece and distance washer would not now be suitable to produce the pre-load of 8-10 lbs. which is necessary to turn the pinion before meshing with the crown wheel.

To obtain this figure in manufacture a dummy pinion is used but failing the availability of this tool then it means 'trial and error' by pressing on and off the taper roller bearing and adding or subtracting from the distance pieces until the desired torque is obtained.

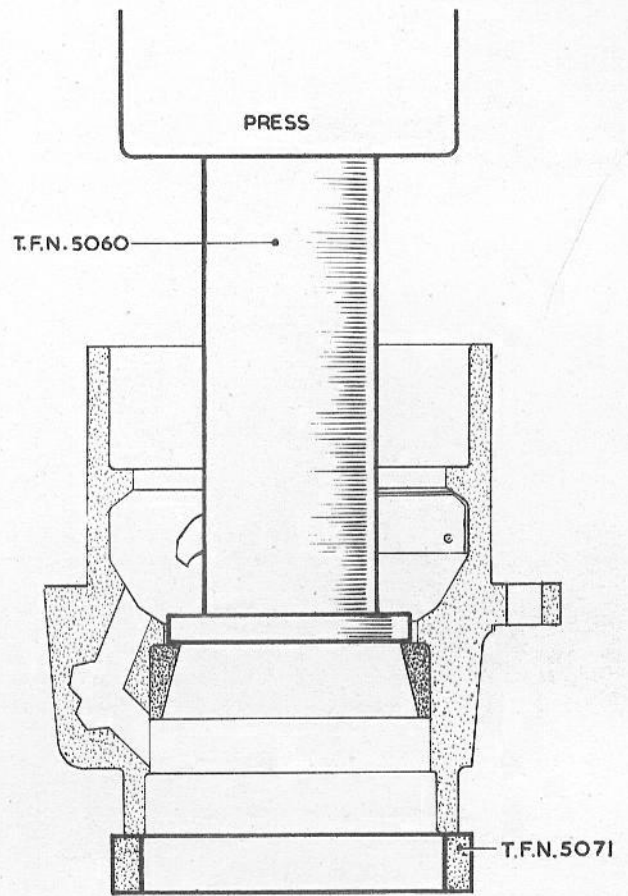
For general instruction the process using the dummy pinion is given herewith:-

Press into position the two roller bearing outer races,

with the large diameters of the taper facing outwards, until they are hard on their respective shoulders.



distance washer then fit the oil seal, followed by the companion flange, special washer, tabwasher and nut.



C479/A

Fig. 161. Removing outer races from the bearing housing

Using the dummy driving pinion TFN5063 completely assemble the bearing housing, less oil seal, and tighten the nut securely with spanners TFN5054 and TFN5055 see Fig.162.

If the assembly locks solid during this process the distance piece and/or distance washer is too short. Conversely, should the housing revolve freely after tightening check the end float to determine the reduction to make to the distance piece or washer.

When the correct pre-load of 8-10 lbs/ins has been determined, using a torque spanner or spring balance, the parts should all be dismantled from the dummy pinion and assembled to the driving pinion in the following manner:-

Referring to Fig.156 press the larger roller inner race on the pinion until it is hard against the pinion head. Then fit the distance piece and distance washer and insert this assembly into the bearing housing.

Resting on the pinion face press the outer bearing fully home in the pinion shaft. Fit the standard size

Holding the bearing housing in Vice Plate TFN5052 and using spanners TFN5054 and TFN5055 tighten the nut. Test the pre-load figure and if correct lock the nut with the tabwasher.

### Re-assembling the Crown Wheel Mounting

Make sure that all components are clean and that all oil passages are clear. For assembly use the following procedure referring to Fig.157.

If the two phosphor bronze thrust washers in the crown wheel mounting have not been discarded leave them in position pending the end float check. If they are to be discarded, fit two new washers slightly thicker than those taken out. Refer to the Spares illustrations and lists for sizes available.

Preferably support the crown wheel mounting using Vice Plate TFN5056 and then insert the bevel gears.

If the phosphor bronze spherical thrust washers have not been discarded, fit them, together with the bevel pinions. Refer to the Spares illustrations and lists for



the sizes of spherical thrust washers available. With the bevel pinions fitted, insert the spindle, aligning the hole with the locking pin position.

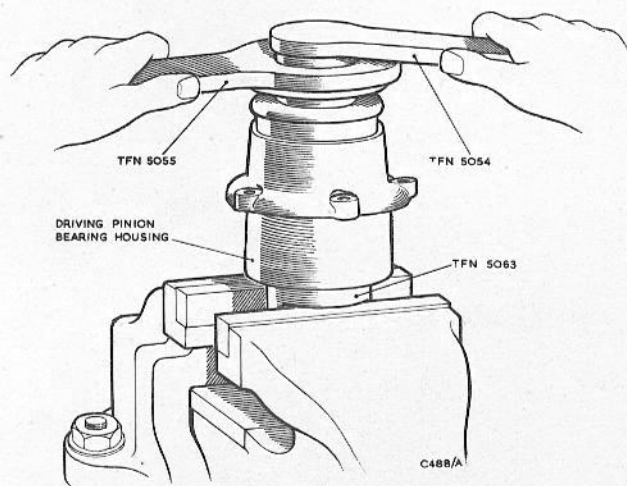


Fig. 162. Tightening bearing housing on dummy driving pinion

Using the key TFN5064 as shown in Fig.163 make sure that the pinions and gears are free to rotate, then check that each pinion and gear is free but without end float. Fig.164. If necessary correct by selecting suitable thrust washers. When this is satisfactory, fit the locking pin and lock with the split pin.

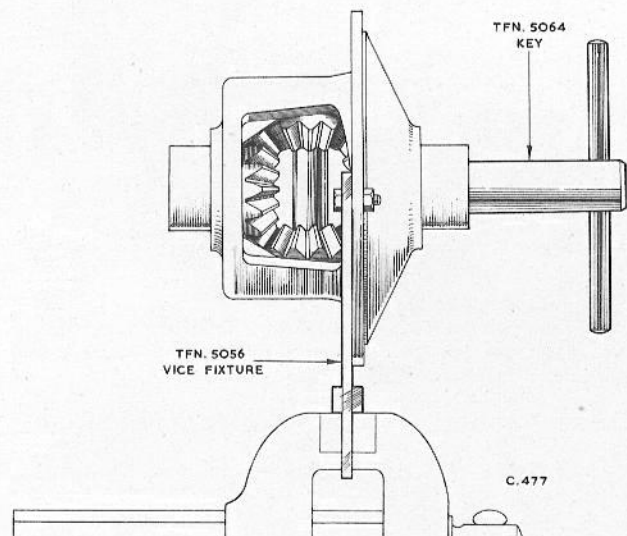


Fig. 163. Checking bevel pinions and bevel gears

Remove the assembly from the Vice Plate and fit the crown wheel, with the bolt heads on the inside of the gear. The centre punch mark on the crown wheel must line up with the notch on the rim of the mounting. Tighten the nuts evenly and securely but do not fit the split pins at this stage.

If the taper roller races have been rejected and removed, press the inner races of the new bearings on to the mounting spigots with the smaller diameter outwards.



Fig. 164. Checking bevel pinion and bevel gear end float

### Final Assembly of the Differential Unit

The rear ball joint must be fitted to the differential casing, see Rear Suspension, before fitting the crown wheel mounting.

Support the differential casing using Vice Plate TFN5053. Fit the outer races to the roller bearings and fit the crown wheel mounting assembly to the differential casing. Temporarily fit the assembled driving pinion in order to position the crown wheel and fit the threaded locking rings to retain this position. Remove the driving pinion.

Fit the bearings caps, making sure that the locking rings can be moved freely in the threads then screw up the bearing caps to a torque figure of 28 lb./ft.

Fit the existing adjustable washer (now superseded by separate shims) over the five studs. Smear the pinion carefully with marking compound then fit the pinion bearing housing assembly into the casing. One stud is offset to provide the correct location. See that the crown wheel is free to revolve with the bearing housing fully in position and fit and tighten the nuts.

The correct marking Fig.165 should now be carried out using the adjustments provided i.e. The shims at the joint of the bearing housing and the locknuts on the crown wheel mounting. Keep all locations tight during this operation so that final tightening and locking would not alter the marking.

When the correct marking is obtained and using spanner TFN5065 check that the locking rings have a pre-load figure of 4 lb/inch. The backlash, crown wheel to pinion should not exceed .005 to .007 inch. See Fig.166.

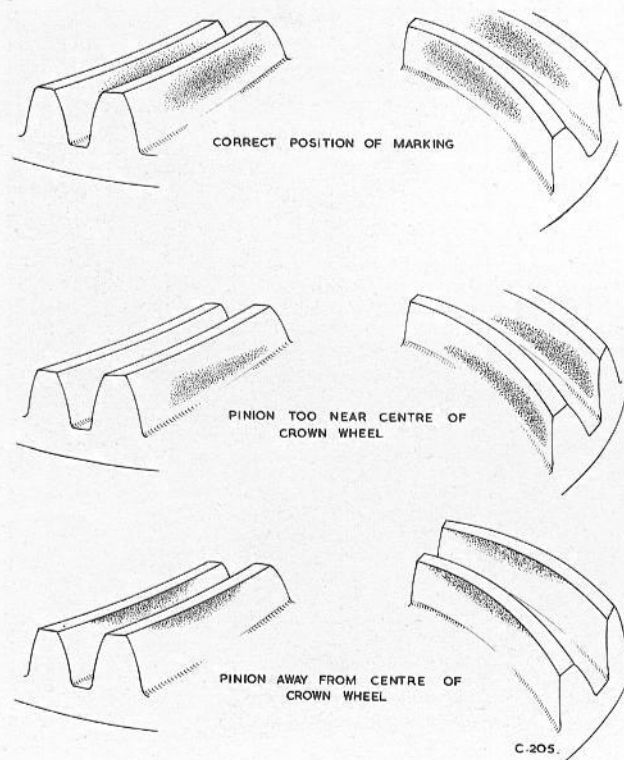


Fig. 165. Diagram of tooth contact

Fit the lockplates to the locking rings, wire lock the bearings cap nuts and fit split pins to the crown wheel mounting bolts. One at a time fit tabwashers to the five nuts of the bearing housing and lock.

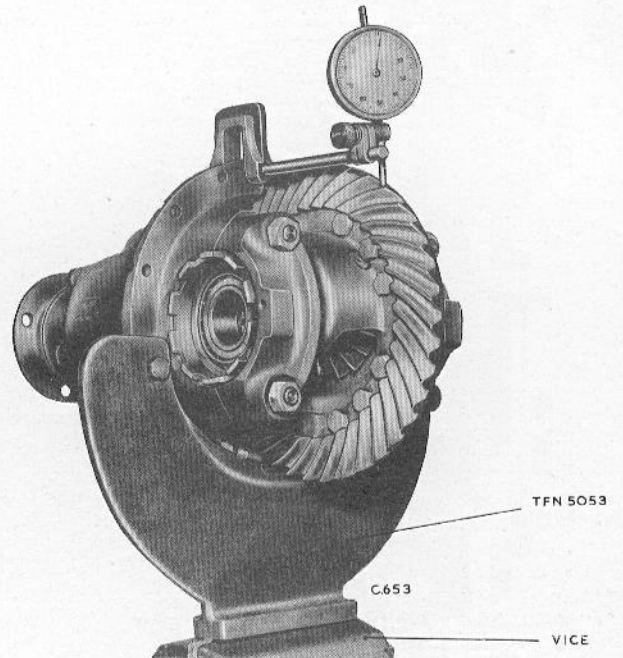
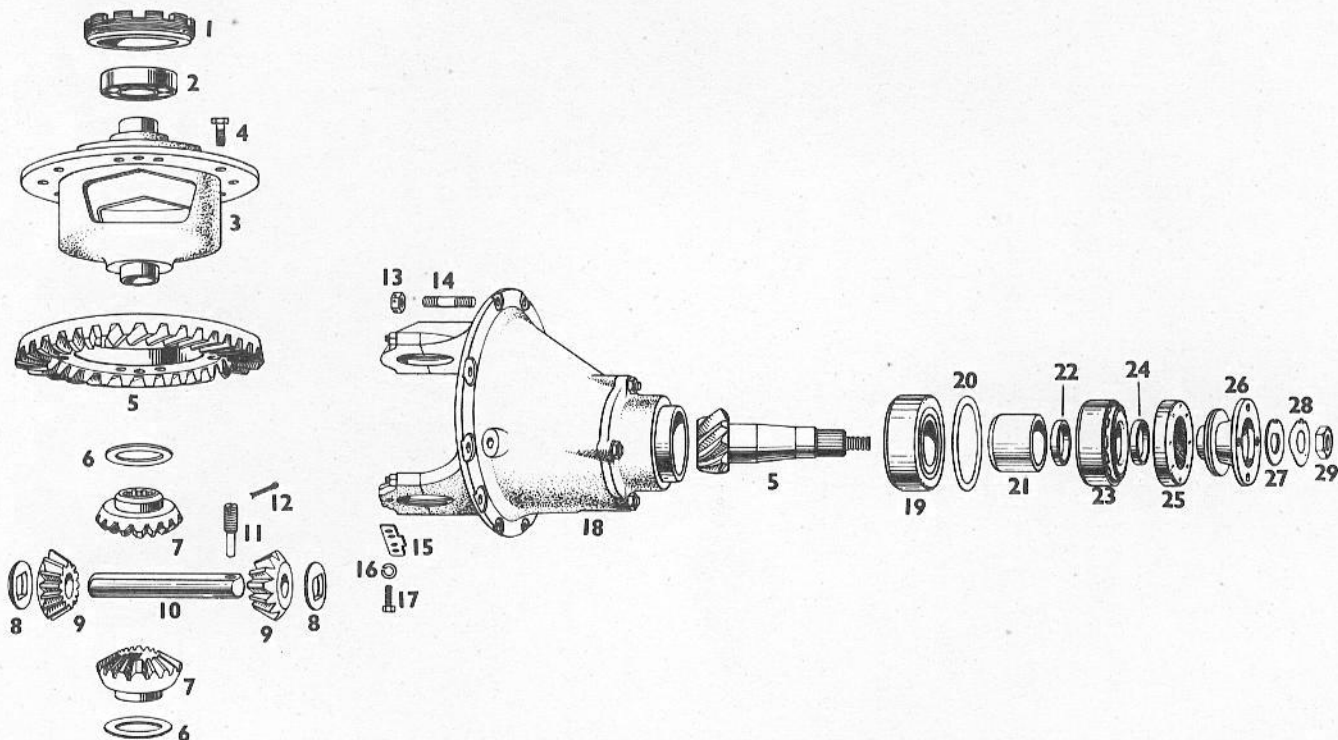


Fig. 166. Checking crown wheel backlash

## DIFFERENTIAL GEAR UNIT - FIXED BEARING HOUSING. SERIAL 405-1-30071.

Part No.	Item	Description	No. off per car	Part No.	Item	Description	No. off per car
N.490271	1	Locking Ring	2	405-1-30032	19	Taper Roller Bearing	1
N.490361	2	Roller Bearing	2	405-1-30040-1		Shim .002 thickness	1
405-1-30073-1	3	Crown Wheel Mounting	1	405-1-30040-2		Shim .004 thickness	selective
405-1-30078	4	Attachment Bolt	12	405-1-30040-3	20	Shim .008 thickness	
405-1-30075-1	5	Driving Pinion )	1	405-1-30040-4		Shim .012 thickness	selective
405-1-30075-2		Crown Wheel ) Paired	1	405-1-30040-5		Shim .015 thickness	1
N.490141-1		Thrust Washer .102 thickness		405-1-30038-1		Distance Piece 1.466 long	selective
N.490141-2		Thrust Washer .104 thickness		405-1-30038-2	21	Distance Piece 1.486 long	1
N.490141-2A		Thrust Washer .107 thickness		405-1-30038-3		Distance Piece 1.506 long	selective
N.490141-2B		Thrust Washer .105 thickness		405-1-30038-4		Distance Piece 1/526 long	
N.490141-3		Thrust Washer .110 thickness		405-1-30045-1		Distance Washer .200 thickness	
N.490141-4		Thrust Washer .112 thickness		405-1-30045-2		Distance Washer .202 thickness	
N.490141-5	6	Thrust Washer .114 thickness	2	405-1-30045-3		Distance Washer .204 thickness	
N.490141-6		Thrust Washer .116 thickness	selective	405-1-30045-4	22	Distance Washer .206 thickness	
N.490141-7		Thrust Washer .125 thickness		405-1-30045-5		Distance Washer .208 thickness	
N.490141-8		Thrust Washer .130 thickness		405-1-30045-6		Distance Washer .210 thickness	
N.490141-9		Thrust Washer .118 thickness		405-1-30045-7		Distance Washer .212 thickness	
N.490141-10		Thrust Washer .120 thickness		405-1-30045-8		Distance Washer .214 thickness	
N.490141-11		Thrust Washer .122 thickness		405-1-30045-9		Distance Washer .216 thickness	
N.490051	7	Bevel Gear	2	405-1-30045-10		Distance Washer .218 thickness	1
N.490171-1		Spherical Thrust Washer .219 thickness		405-1-30045-11		Distance Washer .220 thickness	selective
N.490171-2		Spherical Thrust Washer .221 thickness	2	405-1-30045-12		Distance Washer .209 thickness	
N.490171-3		Spherical Thrust Washer .228 thickness	selective	405-1-30045-13		Distance Washer .211 thickness	
N.490171-4		Spherical Thrust Washer .213 thickness		405-1-30045-14		Distance Washer .213 thickness	
N.490171-5		Spherical Thrust Washer .234 thickness		405-1-30045-15		Distance Washer .215 thickness	
N.490061	9	Bevel Pinion	2	405-1-30045-16		Distance Washer .217 thickness	
N.490471	10	Gear Spindle	1	405-1-30045-17		Distance Washer .219 thickness	
N.490161	11	Lock Pin	1	405-1-30045-18		Distance Washer .221 thickness	
-	12	Split Pin 1/16" dia. 1/2" long	1	405-1-30033	23	Taper Roller Bearing	1
N.490481	13	Special Nut	4	405-1-30041	24	Distance Washer	1
N.490261	14	Bearing Cap Attachment Stud	4	405-1-30072	25	Oil Seal	1
N.490131	15	Locking Plate	2	N.721013	26	Companion Flange & Dust Seal	1
-	16	Spring Washer 2BA	2	N.490201	27	Special Washer	1
-	17	Setscrew 2BA Hex. Hd. 1/2" long	2	N.490251	28	Tabwasher	1
405-1-30068	18	Differential Gear Housing	1	FN.212/K	29	Thin Nut 3/4" BSF	1





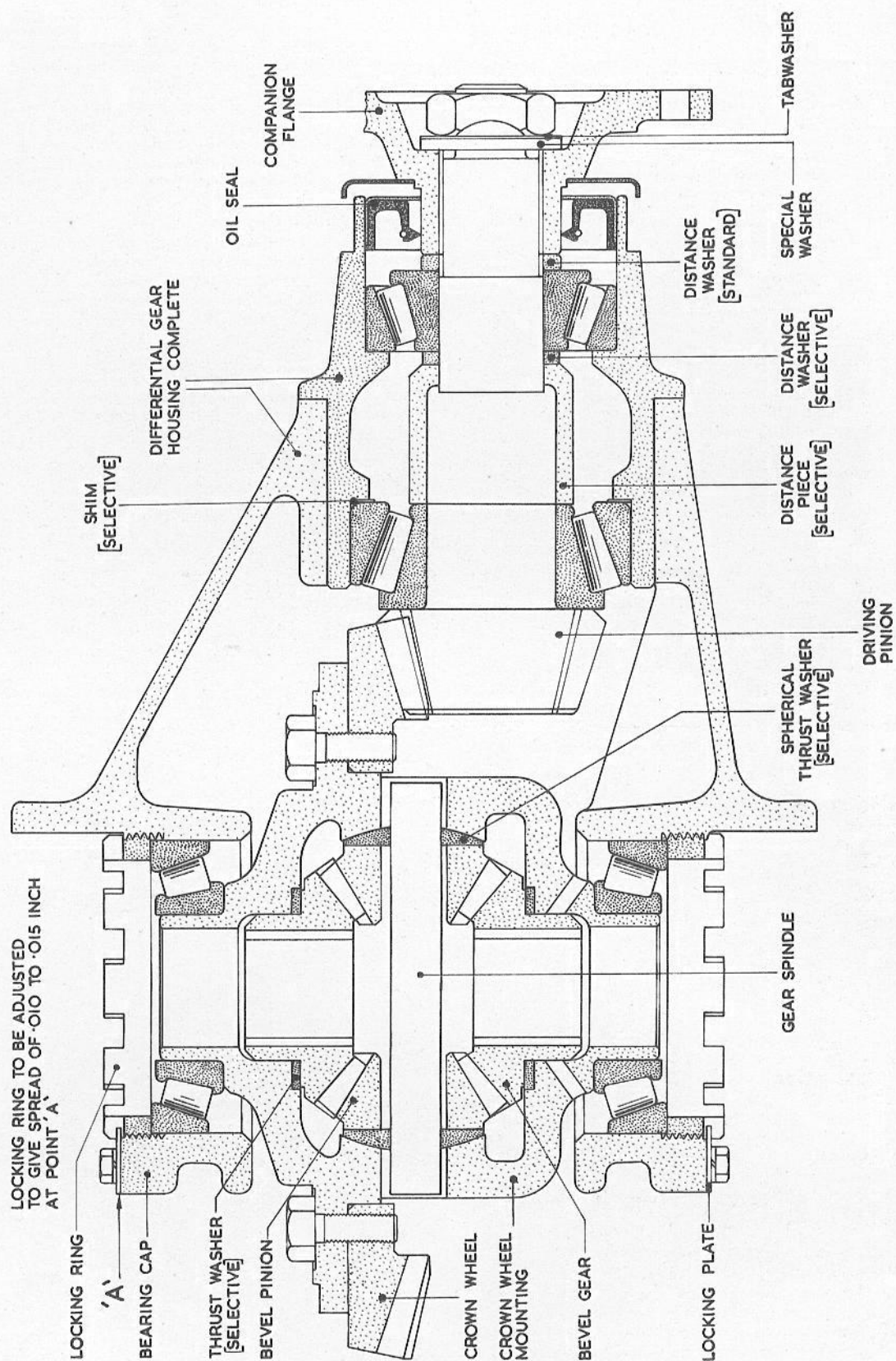


Fig. 167. Assembly of differential unit (Fixed bearing housing)

## Dismantling the Unit (Fixed Bearing Housing)

This procedure applies only to Differentials marked with the Part number 405-1-30071. The pinion bearing housing of this unit is shrunk into the differential casing and is not removable.

With the unit removed from the car refer to Fig.167 and proceed to dismantle as follows:-

Locate and bolt the complete assembly on to Vice Plate TFN5053.

Unlock the tabwasher and remove the nut tabwasher and special washer from the companion flange.

Remove the locking plates from both bearing caps and remove the locking wire from the bearing cap nuts. Remove the nuts, bearing caps and the locking rings and lift out the crown wheel mounting complete.

Supporting the casing press out the driving pinion. The bearing inner race and rollers and the selective distance piece and distance washer will remain on the pinion. Take out the standard distance piece between the roller race and the oil seal. Remove the oil seal and take away the inner race and rollers of the front bearing.

If the roller bearings are to be replaced it will be necessary to remove both the outer races from the differential casing and the inner race from the pinion using the following method.

Support the differential casing and press out the larger outer race using spigot TFN5061. Carefully retain the shim or shims between the face of the outer race and its locating shoulder in the housing, this is the basis of the pinion setting. Reverse the casing and press out the smaller outer race using spigot TFN5060.

Proceed to dismantle the crown wheel mounting:-

If the taper rollers are unserviceable, remove them from the crown wheel mounting spigot with extractor tool TFN5057 see Fig.159.

Remove the locking tabs or alternatively the wire locking from the crown wheel bolts and remove the crown wheel. Remove the split pin retaining the pinion spindle lock pin and unscrew the pin. Drift out the bevel pinion spindle.

Remove each pinion together with its spherical thrust washer and keep them together noting the location. Remove the bevel gears.

Phosphor bronze thrust washers are pressed into a recess in the bevel gear location. These are a selective assembly and should only be removed if replacements are necessary. Small holes are provided to enable them to be tapped out but the holes are only accessible when the roller bearings have been removed.

## Re-assembling the Unit

Assuming that the roller races and or crown wheel and pinion have to be replaced it will mean that the thickness of shims behind the large bearing outer cone have to be determined and also the distance piece and washer to provide the correct pre-load on the pinion. Proceed to assemble as follows using Fig.167.

If the same pinion is being re-assembled, press into position the larger bearing outer cone with its removed shim or shims. If the pinion is being replaced press in the bearing outer cone without any shims. Press into position the smaller bearing outer cone.

Measure with a micrometer the width across the tooth portion of the pinion (which is 1.125 or 1.300 inch nominal) and make a recording of the actual dimension.

Next press the inner cage of the larger roller bearing into position on the pinion ensuring that it is hard against the back face of the pinion. Read the figures on the face of the pinion which, for example, could read +5 which means +.005 inch on the nominal setting figure of 4.080 see Fig.168. With the differential casing supported vertically locate the pinion into position on the inner roller bearing. With an accurate bar located against the inner diameter of the crown wheel mounting roller race diameters measure accurately the distance between the face of the pinion and the face of the bar. This dimension will now give the thickness of shims required behind the inner roller race.

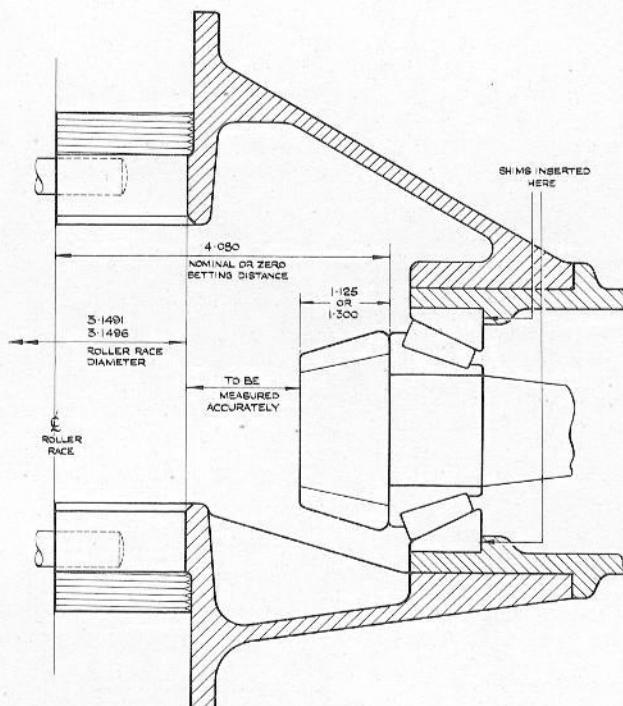


Fig. 168. Pinion setting diagram

Example.

Pinion thickness.....	1.300
Roller Race diameter = $\frac{3.150}{2}$ .....	$\frac{1.575}{2}$
Dimension between bar and face of pinion.....	1.217
Total	4.092
Zero or Nominal Setting.....	Subtract 4.080
Thickness of Shims .....	0.012



From this stage remove the pinion and press out the larger bearing cone. Select a shim or shims from the five selective thicknesses (Example .012 inch), locate the shim or shims against the shoulder of the bearing housing and press the bearing outer cone again into position.

Fit the distance piece and distance washer to the pinion and position this assembly into the housing. Supporting the face of the pinion press the inner race of the roller bearing into position. Fit the standard distance washer, the companion flange and washer and fit the nut and tighten. If the assembly locks solid the distance piece and/or distance washer is too short. Conversely should the pinion revolve freely check the end float to determine the reduction to make to the distance piece or washer.

By trial and error and the process of pressing the pinion on and off the roller bearing select the correct distance pieces until a torque load of 8-10 lbs/ins has been determined, using a torque spanner or spring balance.

Remove the companion flange and fit the oil seal, lip inwards, with the face of the seal level with the face of the bearing housing. Refit the companion flange, special washer, tabwasher and nut and tighten and lock.

### Re-assembling the Crown Wheel Mounting

Make sure that all components are clean and that all oil passages are clear. For assembly use the following procedure referring to Fig.157.

If the two phosphor bronze washers in the crown wheel mounting have not been discarded leave them in position pending the end float check. If they are to be discarded fit two new washers slightly thicker than those taken out. Refer to the Spares illustrations and lists for sizes available.

Preferably support the crown wheel mounting using Vice Plate TFN5056 and then insert the bevel gears.

If the phosphor bronze spherical thrust washers have not been discarded, fit them, together with the bevel pinions. Refer to the Spares Illustrations and lists for the sizes of spherical thrust washers available. With the bevel pinion fitted, insert the spindle, aligning the hole with the locking pin position.

Using the key TFN5064 as shown in Fig.163 make sure that the pinions and gears are free to rotate, then check

that each pinion and gear is free to rotate but without end float. Fig.164. If necessary correct by selecting suitable thrust washers. When this is satisfactory, fit the locking pin and lock with the split pin.

Remove the assembly from the Vice Plate and fit the Crown Wheel. The centre punch mark on the crown wheel must line up with the notch on the rim of the mounting.

On certain differentials fit the bolts and nuts and tighten evenly then fit the split pins.

On later differentials the crown wheel has threaded holes and setscrews are inserted from the rear. Tighten these setscrews to a torque loading of 250-300 lb./in. Should lockwashers be fitted to the head of the setscrews discard them and use wire locking as shown in Fig.157. Undrilled setscrew heads should be drilled 3/32 dia.

If the taper roller races have been rejected and removed, press the inner races of the new bearings on to the mounting spigots with the smaller diameter outwards.

### Final Assembly Stage of the Differential Unit

The rear ball joint must be fitted to the differential casing, see Rear Suspension, before fitting the crown wheel mounting.

Support the differential casing using Vice Plate TFN5053. Fit the outer races to the roller bearings and fit the crown wheel mounting assembly to the differential casing. Fit the threaded locking rings, fit the bearing caps and making sure that the locking rings can be moved freely in the threads screw up the bearing cap nuts to a torque figure of 28 lb.ft.

Measure the differential casing across point 'A' Fig.167 while the locking rings are free and record this dimension. Using a dial indicator set the locking rings to give a backlash on the crown wheel, as shown on Fig.166, if not more than .004 to .006 inch. When this is satisfactory further tighten each locking ring until a 'spread' of .010 to .015 inch is obtained across point 'A'. Again check the backlash and if correct within the limits fit the locking plates to the serrations in the locking rings.

A final marking check can be taken, see Fig.165, but providing the correct setting of the pinion has been carefully carried out and the correct backlash adjusted then the positions of the gears should be correct and the unit should be satisfactory when fitted to the car.