

FINAL DRIVES

R.F. 28

RF.28 FINAL DRIVES

WORKSHOP OVERHAUL SCHEDULE

1. This Workshop Overhaul Schedule for the above-mentioned Final Drive replaces forthwith any previously issued.
2. The Classification of Repairs is limited to GENERAL.
3. Periods :-

240/288,000 miles)	For each General Repair *
48/60 months)	
4. Inspection under 'Red Label' procedure is used to ascertain reason for failure before scheduled life is attained, where this is obscure.

* NOTE Power Cars are shopped for a C.3 or C.4 repair at 120/144,000 miles and the appropriate MP.11 examination must be called for to ascertain whether the final drive requires any out of course repair.

R.F. 28 FINAL DRIVE
INDEX TO GENERAL REPAIR SECTION

Axle Assembly	- Sheet 1
Final Drive	- Sheets 2 and 3
Top Shaft Assembly	- Sheets 4 and 5
Input Bevel Pinion Assembly	- Sheet 6
Selector Mechanism	- Sheet 7
Oil Pump Assembly	- Sheet 8

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COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>AXLE ASSEMBLY</u>		
Axle Sleeve	Examine for general condition.	
Axle Gear	Check teeth for wear, pitting and fractures (crack detect), recondition teeth or renew pinion as necessary and crack detect again.	
Bearings	Examine for pitting and tracking and for fit on axle. Renew as	See Data Section Item 1
Oil Pump Driver Gear	Examine teeth for bruising. Repair or renew as necessary.	
Thrust Plate and Oil Thrower	Examine, if oil thrower is scored, renew thrower and thrust plate.	See Data Section Item 2. Oil thrower to be a 'light interference' fit on axle.

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COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>FINAL DRIVE</u>	Clean by appropriate process. Remove final drive from axle and strip completely.	Ensure bottom, intermediate and top portion of casing are stamped with the same serial number.
Direction Indicator Switch	Replace with a switch overhauled in accordance with WOSS 530/6. Check for correct operation when assembled on the final drive.	See Data Section Item 3.
Final Drive Casing	Examine. Examine filler spout and repair as necessary. Remove breather and check condition. repair as necessary. Check casing for internal or external damage, repair as necessary. Check all internal and external oil pipes for leaks, repair or renew as necessary. Check top shaft bearing housing bores for wear, recondition as required. Check axle bearing housing bore for wear, recondition as required. Check input housing assembly bore for wear, recondition as necessary. Check condition of torque arm mounting, repair as necessary. Check bronze bushes locating selector bar for wear or scoring, renew as necessary. Check studs and dowels for condition and security; renew.	See Data Section Item 4. See Data Section Item 5. See Data Section Item 6. See Data Section Item . See Data Section 1.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS.
<u>FINAL DRIVE</u> (Continued)		
Final Drive Casing (Continued)	Paint interior as necessary.	Oil resistant paint.
Torque Arm	Examine for fractures and wear, repair or renew as necessary.	See Data Section Item 9.
Locking Plunger Assembly	Examine, repair or renew as necessary. Check locking plunger guide for fractures.	See Data Section Item 10.
Manual Selector Controller (Where Fitted)	Examine, repair or renew as necessary.	See Appendix A
External Selection Lever Spring (Where Fitted)	Examine spring, anchor eyebolt, and anchor bracket for wear in the anchor pomb for the spring.	See Data Section Item 33.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>TOP SHAFT ASSEMBLY</u>		
Shaft	Check for alignment.	See Data Section Item 11.
	Check splines on top shaft for freedom of sliding dog; recondition or renew shaft as necessary.	See Data Section Item 11.
	Check keyways on top shaft for wear; recondition or renew shaft as necessary.	See Data Section Item 11.
	Examine pinion and bearing seats on top shaft, recondition as necessary.	See Data Section Item 11.
Driving Pinion	Check teeth for wear, pitting and fractures (crack detect); recondition teeth or renew pinion as necessary and crack detect again.	See Data Section Item 12.
	Check bore for scoring after pressing off, recondition as necessary.	See Data Section Item 12.
	Check keyway for wear, recondition or renew as necessary.	See Data Section Item 12.
Reverse and Primary Bevel Gears	Check spiral and internal dog teeth for wear, pitting and fractures. Crack detect, recondition or renew as necessary and crack detect again.	See Data Section Item 13.
Bearings	Check all bearings for condition, renew if pitted or worn.	
Bevel Hubs	Check for wear, recondition or renew as necessary.	See Data Section Item 14. See Appendix B
Sliding Dog	Examine for wear and renew as necessary. Crack detect.	See Data Section Item 15.
Distance Pieces	Check for wear and distortion; recondition or renew as necessary.	See Data Section Item 16.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>TOP SHAFT ASSEMBLY</u> Continued)		
Oil Throwers	Check for wear and distortion; recondition or renew as necessary.	
Bearing Retaining Plate	Check for wear and distortion; recondition or renew as necessary.	See Data Section Item 17
End Covers	Check for wear and distortion; recondition or renew as necessary.	See Data Section Item 18

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>INPUT BEVEL PINION ASSEMBLY</u>		
Bevel and Shaft	Check spiral teeth for wear, pitting and fractures (crack detect), renew as necessary. Flaw detect before fitting.	
	Check taper and keyway on input bevel shaft, if worn, renew whole shaft.	See Data Section Item 19.
Input Coupling	Check taper, keyway and bolt holes for wear and flange for distortion.	See Data Section Item 20. See Appendix 'C' for fitting of coupling to shaft.
Housing	Check for fit in casing and for wear between bearings and housing. Repair as necessary.	See Data Section Item 21.
Bearings	Check both bearings for pitting or tracking and fit on shaft, renew as necessary.	See Data Section Item 22.
Distance Piece	Check for wear, renew as necessary.	See Data Section Item 23.
Locking Ring	Check for damage, renew as necessary. Renew washer.	

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>SELECTOR MECHANISM</u>		
Shifting Fork	Check fork for fractures (crack detect) and renew as necessary. Renew brass pads.	
Selector Bar	Check for concentricity, renew if bent. Check for wear in isolating plunger groove, recondition or renew as necessary. Check shifting fork bolt grooves for wear, recondition or renew as necessary.	See Data Section Item 24. See Data Section Item 24. See Drawing DP3/DC326 issued by Derby Loco. Works.
Air Cylinders	Check air cylinders and liners for condition; repair or renew as necessary. Check air cylinder caps for fractures, renew as necessary. Check threads for air union, repair or renew as necessary.	See Data Section Item 25.
Pistons	Check condition of pistons and adjuster screws, renew as necessary. Renew piston seals.	

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>OIL PUMP ASSEMBLY</u>		
Oil Pump Driving Gear	Check teeth for damage, renew gear as necessary.	
Oil Filter	Clean, examine and repair or renew as necessary.	
Mounting Plate	Check for damage, repair or renew as necessary.	
Oil Pump Bracket	Check for fractures, repair or renew as necessary. Ensure oilway is clear.	
Oil Pump	Examine and renew if necessary.	
Oil Pipes and Fittings	Check oil and gallery pipes are clear, renew 'Aeroquip' hose, fit new sealing washers.	
	On reassembly, oil pump to be given functional test.	See Data Section Item 26.

ASSEMBLY

WORK TO BE CARRIED OUT

REMARKS

Top Shaft Assembly

Fit bevel wheels to hubs.

Fit one hub to top shaft by first shrinking the inside bearing onto the shaft, followed by the hub and the correct distance piece. Shrink on the outer bearing. Fit the oil thrower and using a sleeve clamp down to prevent 'creep'.

Fit sliding dog to splined section of top shaft.

Fit the other hub to the opposite end of top shaft following the same procedure, as above.

Check dimension across the backfaces of the bevel gears in 4 positions.
Select required shims and fit between bevels and hubs.

Ensure bevel hub bolts are tightened to the correct torque loading. Data Section Item 32.

Fit driving pinion key ensuring that it is driving fit in the key way.

Shrink on the driving pinion and clamp down to prevent 'creep'.

Check that there is a clearance between the top of key and the pinion keyway.

Shrink support bearing inner races onto ends of the top shaft. Use end caps to hold in position.

ASSEMBLY.

WORK TO BE CARRIED OUT

REMARKS

Fit top shaft into the final drive casing.

Fit the end covers, ensuring that the letters 'SCG' are kept upright.

Check end float in the top shaft and fit shims under the end caps to give correct value.

Date Section Item 27.

Fit the input shaft assembly into casing.

See Appendix 'C'.

Fit the selector gear to the top section of the final drive casing.

Fit top section and tighten the top shaft end covers.

Adjust input shaft assembly to give the required gauge clearance between the sliding dog and the input bevel.

Check the backlash on the bevels by locking each wheel and measuring the clearance with a clock gauge in 4 positions. The three bevels are in a matched set and the backlash required is etched on the back of the bevels.

If the average value obtained on each bevel wheel is not the same as that marked on the bevels it is necessary to adjust the input shaft into or away from the top shaft until the correct value is obtained.

The bevel pinion teeth should then be 'blued' and the gears rotated. The markings should then be checked to ensure that they are in the correct position on the teeth. (See Fig. 1.)

If the markings are low on one side and high on the other, shims should be taken from the appropriate end cover and placed in the other cover so as to move the whole top shaft assembly and centralise the bevel gears on the input bevel.

Re-check the backlas in both bevels.

Check the clearance of the shifting fork in the forward and reverse positions.

Data Section 30.

Carry out an electrical test to cover the action of the shifting fork and position of the sliding dog.

Data Section 31.

Refit breather tube and drain plug.

ASSEMBLY

WORK TO BE CARRIED OUT

REMARKS

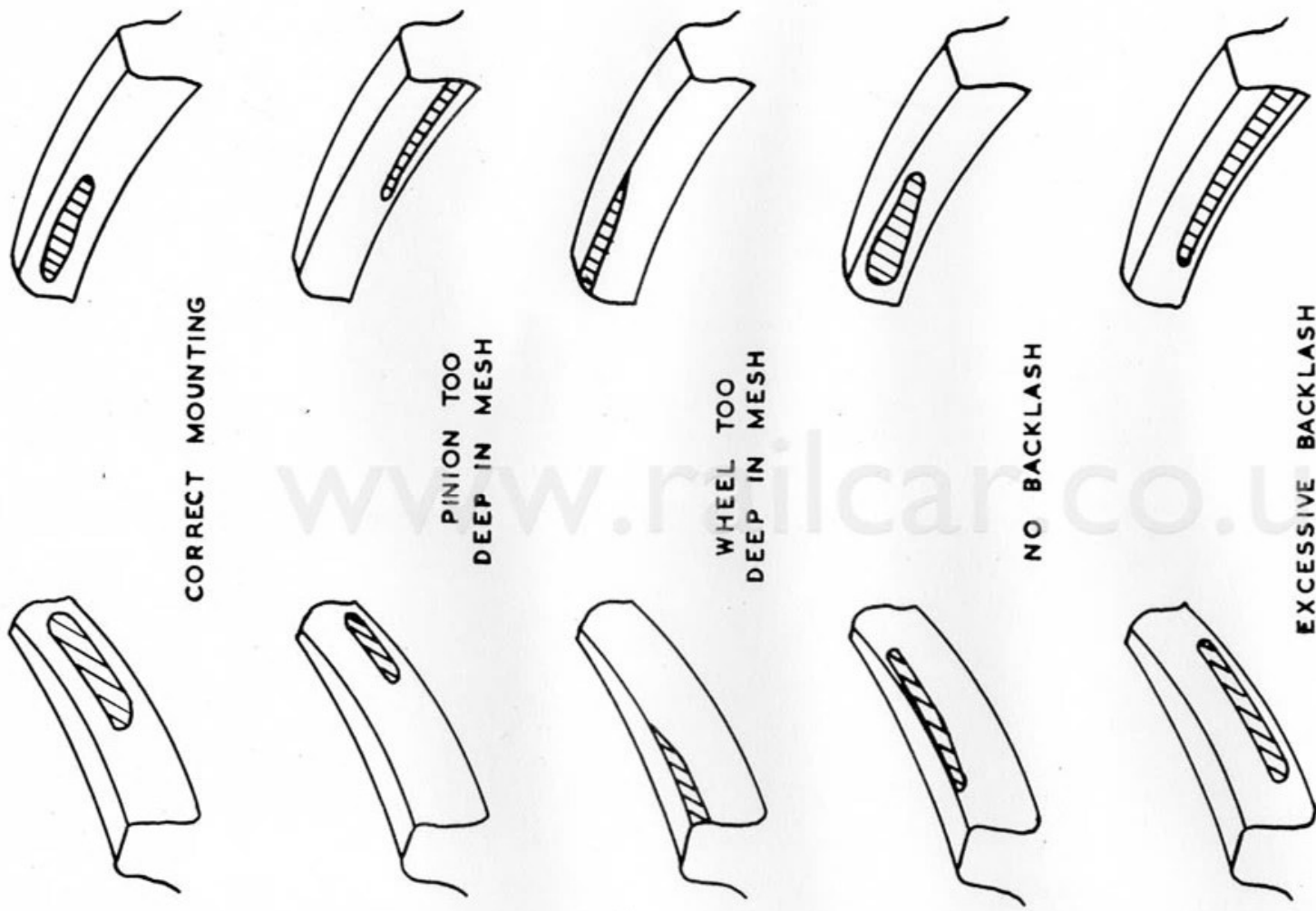
Fit sump and joint.

Final clean and paint.

Fit masking tape and/or covers to prevent ingress of dirt and apply protection to prevent rusting.

FIG. 1.

ASSEMBLY.



CORRECT MOUNTING

PINION TOO DEEP IN MESH

WHEEL TOO DEEP IN MESH

NO BACKLASH

EXCESSIVE BACKLASH

DRIVING SIDE

REVERSE SIDE

SPIRAL BEVEL GEARS - WHEEL CONTACT MARKING.

DAIA

JULY 1972.

DATA SECTION

SHEET 1

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
	<u>AXLE ASSEMBLY</u>				
1	Bearing - Standard Axle Diameters at Bearing	7.0015"	7.0025"		1
	- Bearing Sizes (relative to axle diameter) - New	-	7.000"		
	- Clearance - Worn Condition		0.005"		
2	Gear box end float.	0.003"	0.007"	Adjust with shim as necessary.	
	Thrust Plate and Oil Thrower - Oil Thrower - Outside Diameter	7.610"	0 - 007"		
	- Thrust Plate- Labyrinth Bore	7.632"	-		
	<u>FINAL DRIVE</u>				
3	Direction Indicator Switch - Test Details			24V supply. Manually obtain 3/4 engagement of dog clutch and pinion and check that directional indicator light operates. (See Swindon Drawing W.3393 for details of test rig.)	3
	Final Drive Casing				
4	Top Shaft Bearing Housing - Bore	5.3755 in	5.377"		4
5	Axle Bearing Housing - Bore	11.375"	11.377"		5
6	Input Housing Assembly - Bore		7.500"		6
7	Torque Arm Mounting Point - Fixing Hole Diameter		0.625"	Holes to be reamed for fitted bolts.	7
8	Locating Selector Bar Bushes- Inside Diameter	1.502"	1.507"		8

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
	<u>FINAL DRIVE</u> (Continued)				
9	Torque Arm - Fixing Bolt Hole Diameter - Fulcrum Pin Hole Diameter - Rolls Royce Engined Cars - Other than Rolls Royce Engined Cars	- 1.000"	0.625" 1.750" 1.0015"	Holes to be reamed for fitted bolts. Metalastik bush No. 13/27	9
10	Locking Plunger - Guide Spring Length	1.125"	1.250"		10
	<u>TOP SHAFT ASSEMBLY</u>				
11	Shaft - Runout - Male Spline Width - Keyway Width - Key Size - Pinion Seat Diameter: Standard 0.010" O/S 0.020" O/S 0.030" O/S	1.053" 0.6865" 0.6875"	0.003" 1.062" 0.6885" <u>NOMINAL SIZE</u> 2.6900" 2.7000" 2.7100" 2.7200"	Pinion & Shaft to be selectively assembled to give an interference fit of 0.002" - 0.003" (20-30 tons pressing on load)	11
12	Driving Pinion - Pinion Bore: Standard 0.010" O/S 0.020" O/S 0.030" O/S - Pressing on Load - Keyway Width	20 tons 0.6895"	2.6880" 2.6980" 2.7080" 2.7180" 30 tons 0.6915"	Where pinions and shafts are serviceable, security of pinion on shaft should be checked by applying a press load of 20 tons. If movement takes place, pinion must be removed.	12
13	Reverse & Primary Bevel Gears - Setting on Hubs for correct clearance - Shim sizes	9.8750"	9.8770" 0.002" 0.005" 0.020" 0.044"		13

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
	<u>TOP SHAFT ASSEMBLY (Continued)</u>				
13 (Cont)	Reverse and Primary Bevel Gears (Continued) - Gear Teeth Wear			Surface contact of bevel teeth 50% in mesh ⁺ 10% to be obtained on assembly. Related to backlash of gears and position of hubs on shaft.	13 (Cont)
14	Bevel Hubs - Inside Diameter	5.748"	5.750"		14
15	Sliding Dog - Shifting Fork Groove Width	1.008"	1.028"		15
16	Distance Piece - Length		1.750" Std. Size	Distance piece machined as required to give an end float of .001" to .003" in the bevel wheel and hub assembly.	16
17	Bearing Retaining Plate - Distortion		0.025"		17
18	End Covers - Distortion		0.025"		18
	<u>INPUT BEVEL PINION ASSEMBLY</u>				
19	Bevel and Shaft - Taper	75% bed) In accordance with) Standing Order) T.&.R.S./DUB/W/1))))	19
	- Keyway Width	0.5615"	0.5635"		20
20	Input Coupling - Taper	75% bed			
	- Key Width	0.5625"	0.5645"		
	- Bolt Hole Diameter	0.4375"	0.4525"		
	- Flange Runout		0.010"		

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
	<u>INPUT BEVEL PINION ASSEMBLY</u> (Continued)				
21	Housing - Outside Diameter - Inside Diameter at Bearing Positions - Inner - Outer	6.626"	7.497" 6.627" 5.377"		21
22	Bearings - Inside Diameter - Inner - Outer	6.625" 5.375"	6.626" 5.376"		22
23	Distance Piece - Standard Length		0.4375"	Machine to obtain 0.0025" to 0.003" end float in Input Bevel Assembly.	23
	<u>SELECTOR MECHANISM</u>				
24	Selector Bar - Runout - Isolating Plunger Groove Width		0.003" 0.6975"		24
25	Air Cylinders - Bore Diameter	2.505" <u>2.500</u>	2.510" <u>2.505</u>		25
	<u>OIL PUMP ASSEMBLY</u>				
26	Oil Pump - Test Details			Submerge in oil and drive in both forward and reverse directions and check that flow of oil is obtained.	26

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DATA SECTION.

SHEET 5.

ITEM NO.	COMPONENT.	MINIMUM	MAXIMUM	REMARKS.	ITEM NO.
	<u>ASSEMBLY SECTION</u>				
27	Top Shaft - End Float	0.004 in.	0.005 in.		27
28	Input Bevel Wheel and Primary and Reverse Pinions - Permissible Backlash - Shim Sizes	0.010 in.	0.015 in. 0.002 in. 0.005 in. 0.020 in.		28
29	Input Bevel Pinion - Clearance between Face of Pinion and Outside Diameter of Sliding Dog.	0.887 in.			29
30	Shifting Fork - Clearance in Forward and Reverse Positions.	0.025 in.	0.125 in.		30
31	Electrical Test covering action of shifting fork and position of sliding dog.			Air pressure 75 lb./in. ² Check correct operation of directional indicator and air/axle lights.	31
32	Bevel Hub Bolts. - Torque Loading		70 lb.ft.		32
33	External Selection Lever Spring.			Free Length 5 in. 22 coils. Spring to carry 73 lbs for 1 in. extension. On initial fitting spring to be adjusted to give an extension of 1.3/8 in. by adjusting the nuts on the spring anchor eyebolt. This is to be done with a direction selected.	33

DATA SECTION

APPENDIX A.

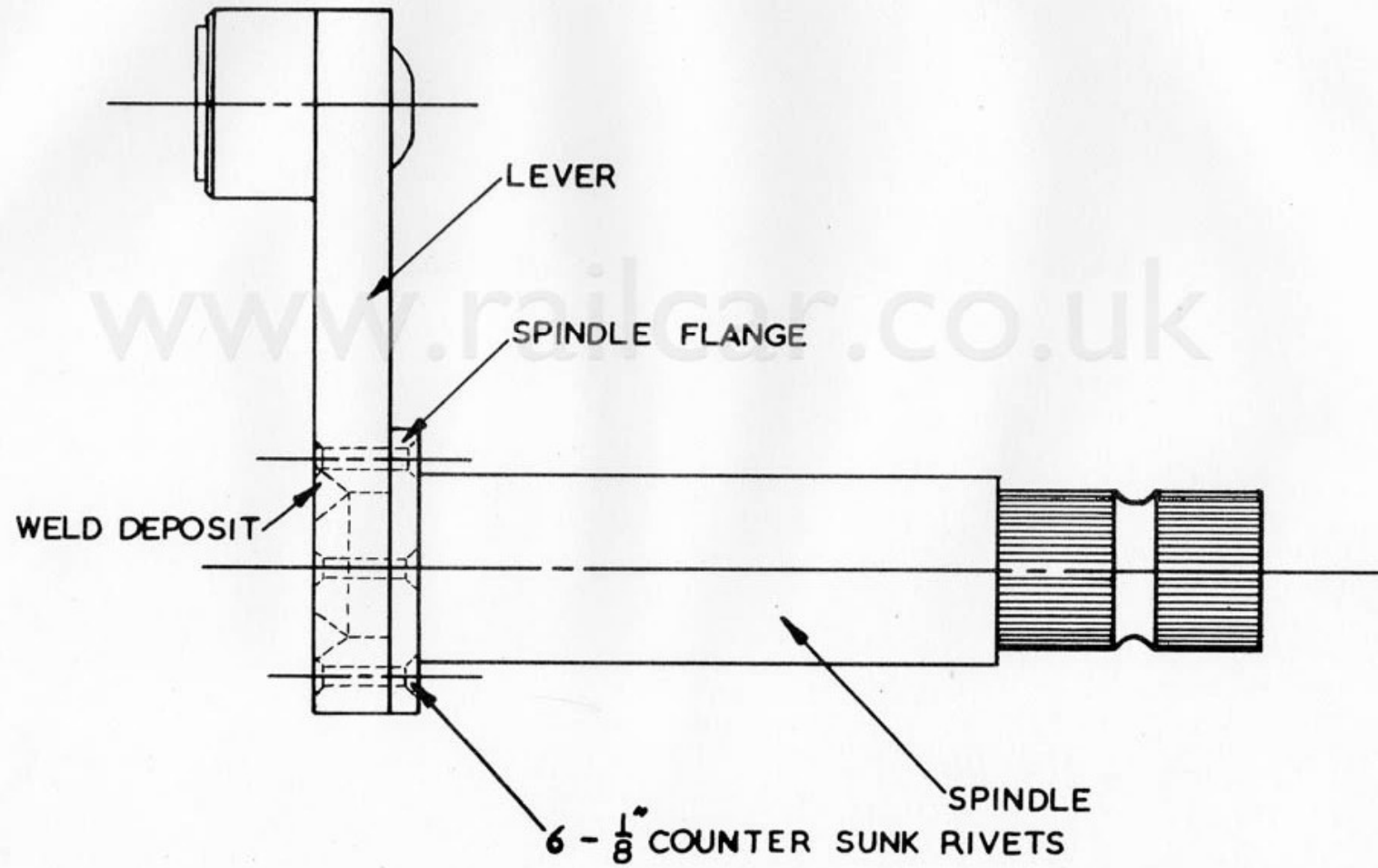
R.F. 28 Final Drives - Direction Selection Levers.

When direction selection levers are broken or show signs of fracture at the spindle weld, the following procedure should be carried out:-

1. Clean out welded hole in lever.
2. Drill both lever and spindle flange with six equally spaced counter sunk holes (both sides of assembly) for 1/8" counter sunk head rivets.
3. Rivet assembly together - rivets to be put through holes from the spindle flange side.
4. Deposit fresh weld at head of spindle to fill recess in lever.

For further details, see accompanying sketch.

DIRECTION SELECTION LEVER ASSEMBLY



DATA SECTION

APPENDIX 'B'

METHOD OF OBTAINING CORRECT DISTANCE PIECE

FOR THE BEVEL HUB BEARING ASSEMBLY

A jig, as shown on Figs. 1 & 2 , should be used. Distance pieces of known lengths and circular shims are to be used with this jig.

Assemble the hub and bearings with a selected distance piece to the jig.

Place the 'C' washers in place and clamp down the assembly.

With the lifting levers swivelled out of the way rotate the hub about 4 turns.

Place the clock gauge in the position shown. The clock gauge base should be securely fixed to the base plate of the jig.

Bring the lifting levers under the rim of the hub as shown in the drawing.

Lift the hub up with the levers and note the reading on the clock gauge.

(Data Section 16).

If the reading is not correct, dismantle the assembly and adjust the distance piece until the correct reading is obtained (Data Section 16).

Once the correct and float has been achieved, dismantle the assembly, keeping the distance piece and any shims used together.

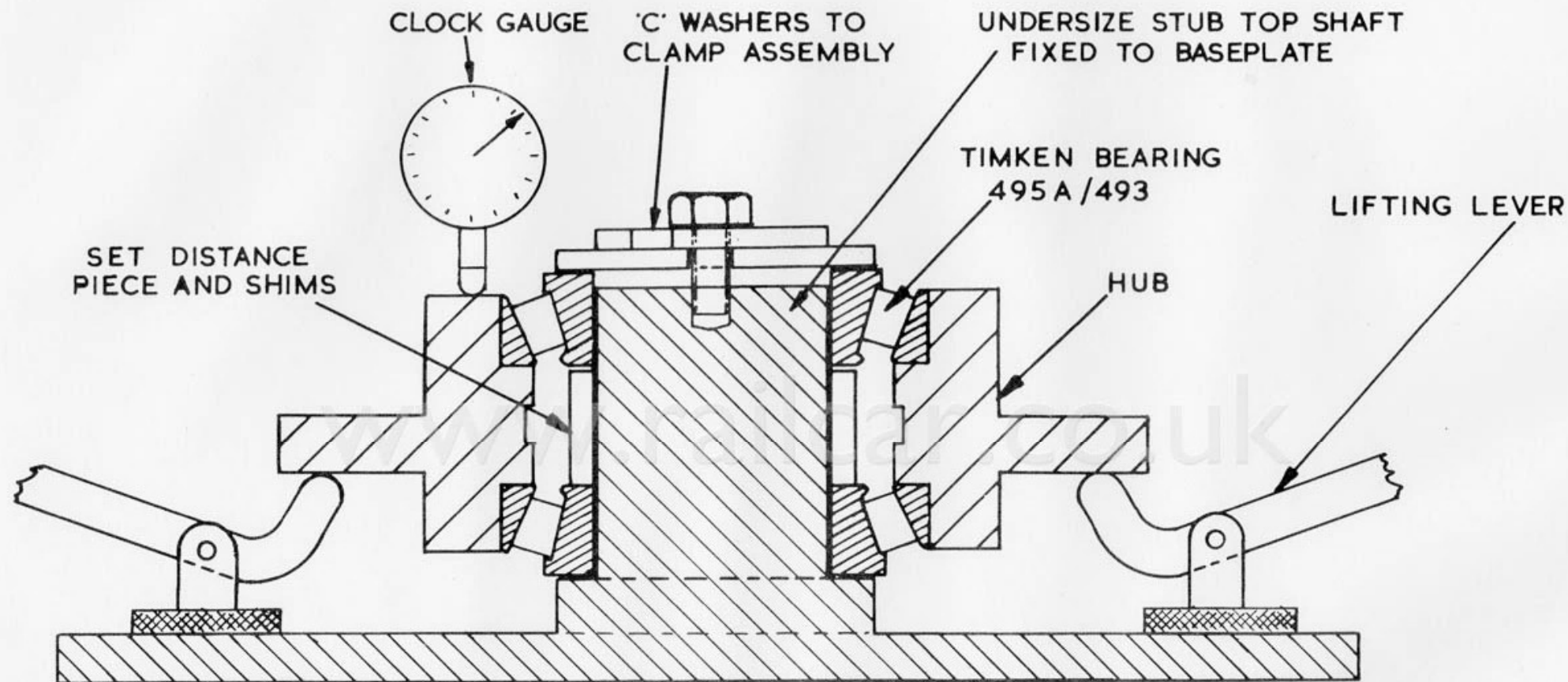
Measure the overall length of the distance piece and shims with a micrometer and have a Standard Distance Piece (Length 1.75") ground to the length measured.

Once the correct distance piece has been obtained, the hub, both bearings and the distance piece must be kept together.

Repeat this operation for the other hub assembly,

DATA SECTION.APPENDIX 'B'

FIG. 1.

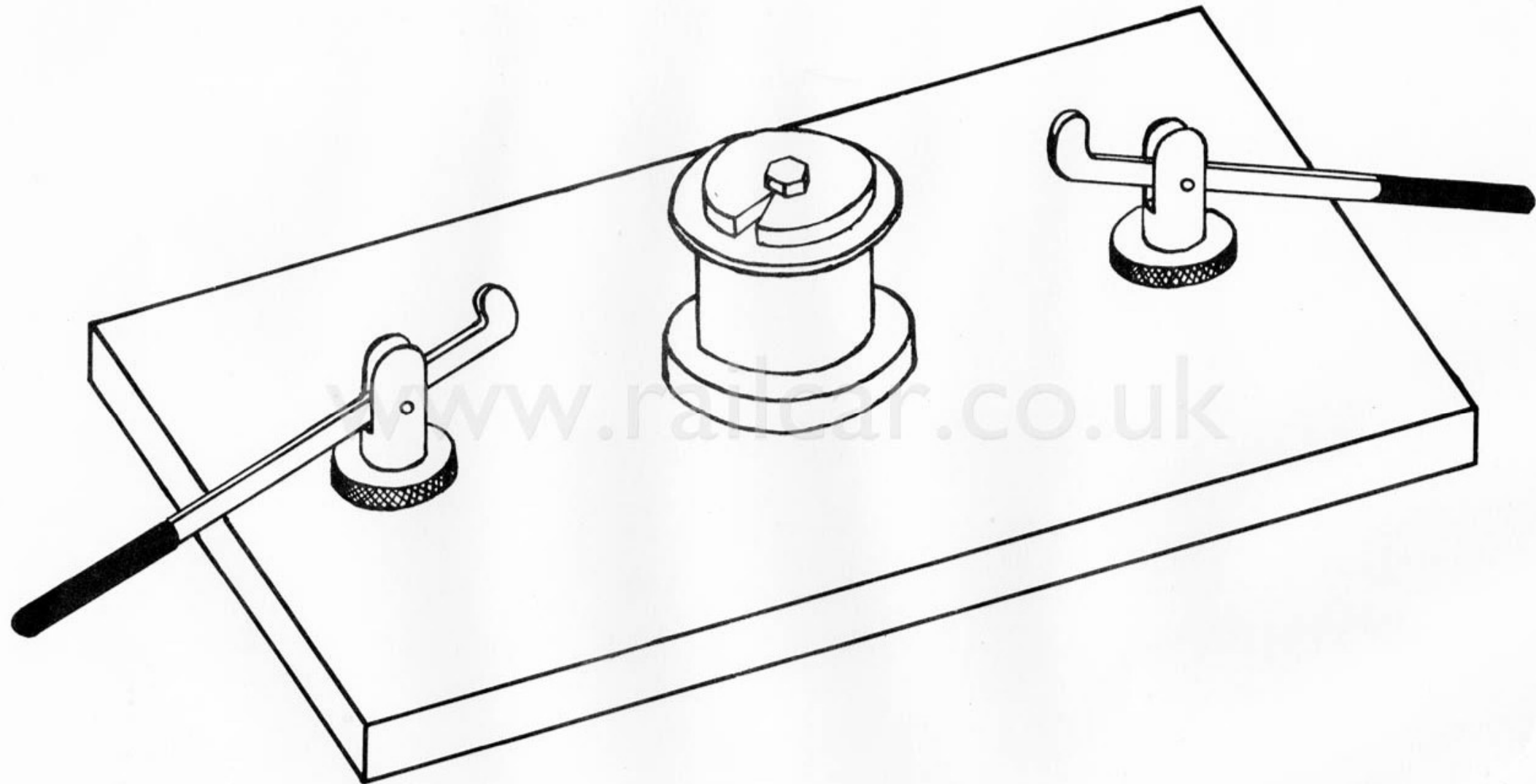


JIG TO BE USED TO FIND THE CORRECT
DISTANCE PIECE TO BE FITTED TO THE HUB ASSEMBLY
TO GIVE THE CORRECT END FLOAT.

DATA SECTION.

APPENDIX 'B'.

FIG.2



FIXTURE USED TO DETERMINE END FLOAT IN
HUB BEARINGS OF RF 28 FINAL DRIVES

APPENDIX 'C'

FITTING OF INPUT COUPLING TO SHAFT
AT OVERHAUL IN MAIN WORKS.

In all cases it is most essential that the input coupling and shaft should be 'blued' and hand lapped to ensure correct mating. This operation must be carried out with the key omitted and the minimum blueing area must not be less than 75%.

When fitting the key a clearance of 0.010" must be obtained between the top of the key and keyway in the coupling hub. The key must be a "drive fit" in the input shaft keyway and a "push fit" in the coupling hub.

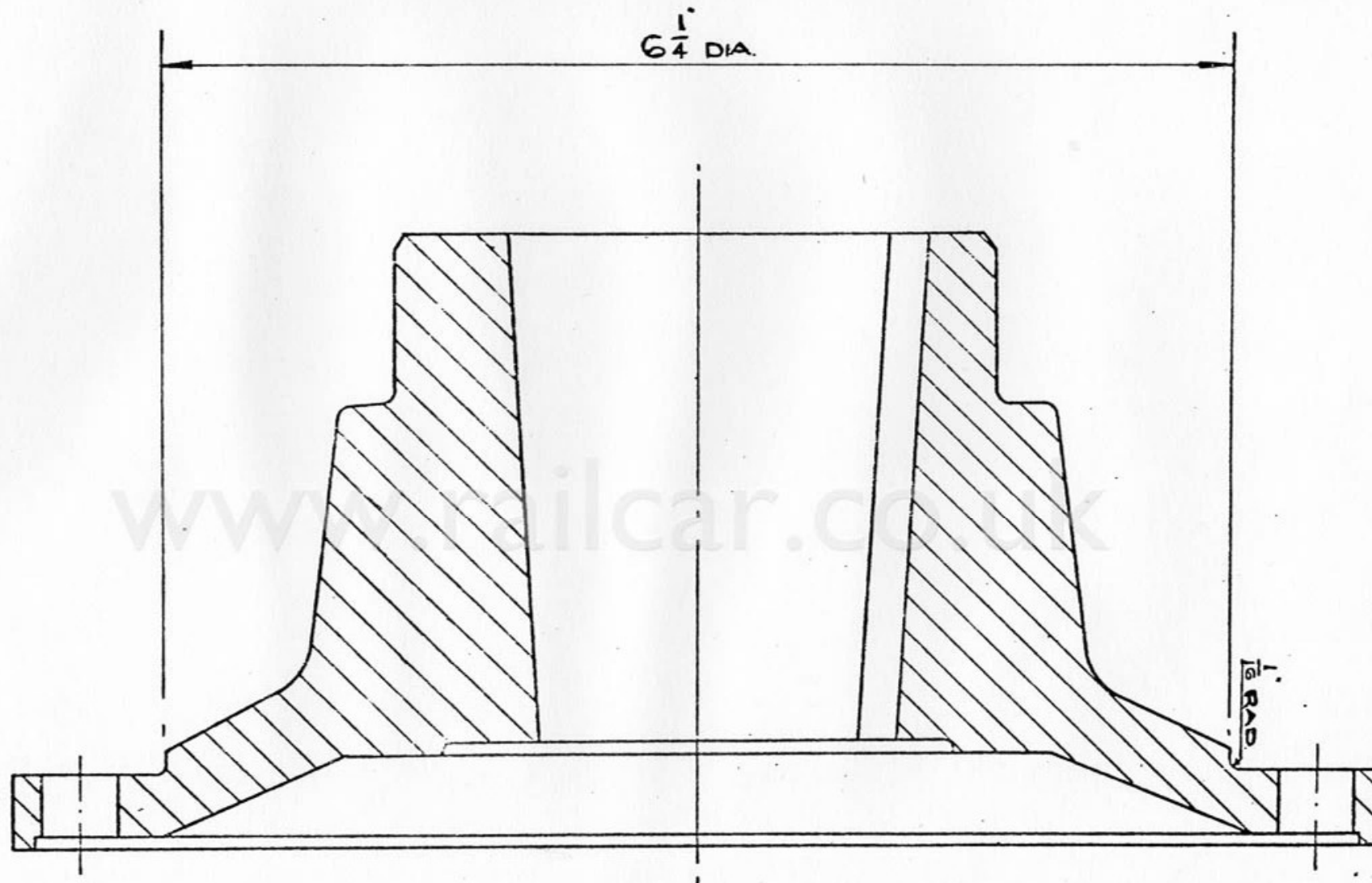
The aforementioned conditions must also apply should it be found necessary to fit an "oversize" key, but the maximum key width must not exceed 11/16". On NO ACCOUNT should a stepped key be used.

To ensure that the coupling is tight on the shaft the coupling hub face MUST project beyond the end of the tapered shaft to the extent of 3/32" minimum on assembly.

A washer MUST always be fitted between the coupling hub face and castellated nut. When fitting the castellated nut it MUST be tightened down to a minimum torque loading of 900 lbs. ft. and on no account must the nut be slacked back in order to insert the split pin. Should adjustment be necessary the nut must be faced accordingly.

Each input coupling and shaft must be stamped with the serial number of the final drive in order that these components can be kept as assemblies and if removed for any purpose, they will not be fitted to another tapered shaft or input coupling.

To ensure correct bedding of the bolt heads when coupling up the input coupling lunge to the cardan shaft universal flange, the back face of the input coupling must be re-machined to the attached sketch.



RE-MACHINED BACK FACE OF INPUT COUPLING.