

SECTION G

THE GEARBOX AND TRANSMISSION

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KEY TO THE DIFFERENTIAL AND FINAL DRIVE COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Housing.	17.	Screw.	33.	Axle end cover.
2.	Bush.	18.	Spring washer.	34.	Joint.
3.	Gear.	19.	Nut.	35.	Bolt.
4.	Thrust washer.	20.	Axle casing.	36.	Spring washer.
5.	Pinion.	21.	Drain plug.	37.	Final drive pinion.
6.	Pinion washer.	22.	Axle shaft.	38.	Pinion bearing.
7.	Shaft.	23.	Sleeve.	39.	Washer.
8.	Shaft pin.	24.	Wheel stud.	40.	Bearing circlip.
9.	Crown wheel and mainshaft.	25.	Wheel stud nut.	41.	Oil seal.
10.	Bolt.	26.	Final drive.	42.	Pinion bearing cover.
11.	Nut.	27.	Nut.	43.	Shim.
12.	Bearing housing.	28.	Tab washer.	44.	Dowel screw.
13.	Bearing.	29.	Accommodation washer—.208 to .252 in. in .004 in. steps.	45.	Bolt—long.
14.	Shim—.003, .010, and .025 in.	30.	Inner and outer bearing.	46.	Bolt—short.
15.	Bolt—bearing housing to gearbox.	31.	Oil seal.	47.	Washer—plain.
16.	Oil catcher.	32.	Felt washer.	48.	Washer—spring.

GENERAL DESCRIPTION

The gearbox mainshaft drives directly onto the crown wheel of the rear axle differential, both the gearbox and the differential being housed in the transmission casing. From the differential the drive to the rear wheels is transmitted by 4-18 : 1 spur reduction gears. The drive for the belt pulley is by bevel gears from the primary shaft.

Five forward gears and one reverse gear are provided.

The position of the belt pulley pinion and of the differential housing is controlled by shims fitted beneath the respective bearing housings.

Ring nuts securing a double-row bearing in a detachable housing at the forward end of the mainshaft provide a means of adjusting the mainshaft pinion position.

Each transmission case is stamped with a number on the top of the rear flange beneath the driving seat and this number must always be quoted on orders or correspondence concerning the transmission assembly.

The entire transmission, which includes the gearbox, differential and final drive reduction gears, is lubricated from the one main oil supply. When fitted, the belt pulley power take-off and hydraulic lift are also lubricated from the oil in the transmission casing.

Always use an oil recommended on page P.6.

The oil capacity of the transmission is 12 gallons (54.5 litres). The oil level must never be allowed to fall so low that there is no reading on the dipstick.

Section G.1

REMOVING AND REPLACING THE AXLE ASSEMBLIES

Before commencing these operations it is advisable to position the tractor beneath lifting tackle to enable the axle assemblies to be supported.

Disconnect the forward end of the stabilizers from the hinge pins, remove the front end of the draft links from the link pins and disconnect the lift rod assemblies from the lift arm swivel pins.

Remove the drawbar pin and lift off the drawbar.

Support the weight of the drawbar frame and remove the four bolts securing the forward end to the tractor main frame. Slacken the nuts securing the drawbar frame support links to the main frame, remove the two bottom nuts and bolts from the support links and lower the drawbar frame to the ground.

Drain the transmission oil by removing the plug from the base of each axle casing. Use a clean receptacle if the oil is to be used again and make sure that the oil is passed through a filter before it is returned to the transmission casing.

On tractors fitted with a lighting set, disconnect the sidelamp cables from the switch. To do this, **disconnect**

the battery, remove the screws holding the instrument panel in position, and remove the right-hand-side panel and the screw which secures the rear end of the left-hand-side panel. Disconnect and withdraw the sidelamp cables. The left-hand-side panel should remain in position, otherwise the governor control will be disturbed. Remove the bolts which secure the sidelamp cable clips to the transmission casing top cover.

IMPORTANT.—Place blocks between the main frame side-members and the front axle beam to prevent the tractor swivelling at the trunnion when the rear wheels are raised.

Place blocks at the front and rear of the front wheels to restrict movement of the tractor. Jack up beneath the transmission casing to raise the tractor until the rear tyres are clear of the ground and then place supports beneath the axle casings.

Slacken and remove the eight bolts and withdraw the wheels.

Disconnect the brake rods at the rear end.

Remove the two countersunk-headed screws and the hexagon-headed bolt securing each floor plate. Take care not to lose the packing pieces on the under side.

Unscrew the three bolts which fasten the mudguard to the axle casing and lift off the mudguard assemblies complete with floor plates, sidelamps, and cables.

Raise the tractor slightly by the jack until the axle casings are clear of the supports, and then pack up beneath the rear of the transmission casing. Make sure that the tractor is properly supported.

Secure eyebolts in the axle flange holes next to those used for securing the drawbar side-members in position or place a sling around the axle casing.

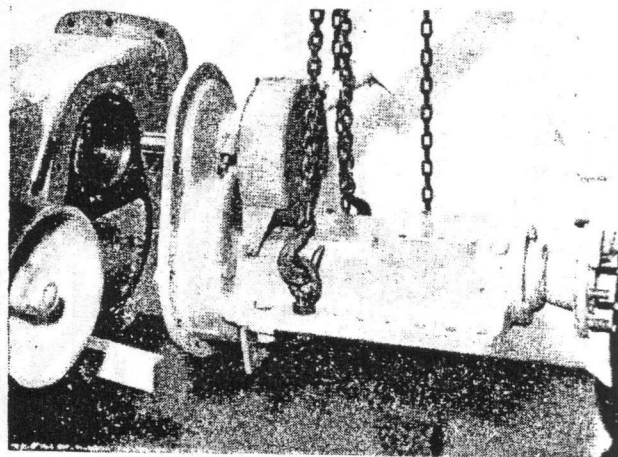


Fig. G.1

A left-hand axle assembly being withdrawn from the main transmission casing. Note the holes in which the eyebolts are secured

Support the weight of the axle assembly and remove the bolts which fasten the axle casing flange to the transmission casing. (Note that the two bolts in each flange which pass through the seat support bracket are slightly longer than the others and they should be replaced in the same position.) The power selector lever gate must be detached from tractors fitted with a power take-off shaft to give access to some of the axle casing bolts. Using two of the bolts, screw them into the tapped holes on either side of the axle casing flange. As soon as the bolts come into contact with the face of the transmission casing, turn each bolt alternately half a turn at a time, until the pressure causes the faces to part. Continue turning the bolts half a turn at a time until the axle casing is clear. Withdraw the unit until the drive pinion is clear of the differential assembly and then lift the axle assembly clear.

The method of replacing the axle assemblies is a reversal of the dismantling procedure. Make sure that the casing faces are clean and free from abrasions. If necessary, carefully smooth the faces with the aid of a flat, fine-cut file. Use a new joint seal, placing it in position on the face of the transmission casing. Use a good-quality jointing compound on both joint faces.

To facilitate locating the unit when refitting, it is of assistance to make up two guide pins, screwing one into each side of the transmission casing face. Suitable pins can be produced from two pieces of $\frac{7}{16}$ in. (11.1 mm.) diameter steel approximately 6 in. (152.4 mm.) long, screwed $\frac{7}{16}$ in. UNF. at one end to suit the tapped holes of the transmission casing face and slightly tapered at the other, with a screwdriver slot in the tapered end of the pin to permit easy withdrawal after the unit is in place. (The same guides may be used when refitting power take-off units and hydraulic power units.)

When re-engaging the drive pinion it may be necessary to turn the axle shaft slightly until the splines of the

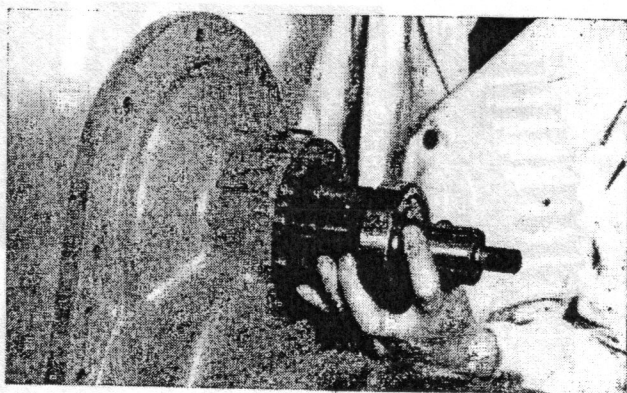


Fig. G.3

Withdrawing the final drive pinion shaft complete with bearing

pinion enter the differential gear before the unit can be pushed right home.

When refitting the mudguard it is essential that the inner centre-bolt which secures the mudguard to the axle casing is smeared with sealing compound before fitting, in order to avoid oil leaks. The tapped hole into which the bolt is threaded passes through to the inside of the casing and oil is liable to leak past the threads of the bolt if this precaution is not observed.

Section G.2

DISMANTLING AND REASSEMBLING THE AXLE ASSEMBLIES

Remove the axle assembly as detailed in Section G.1.

Extract the three bolts and spring washers securing the brake-drum cover to the rear axle casing and remove the cover. Slacken the brake adjusting turnbuckle in an anti-clockwise direction as far as it will go. Extract the split pin, remove the nut and washer securing the brake-drum to the final drive, and withdraw the brake-drum.

Extract the bolts securing the brake backplate assembly and remove the assembly complete with brake-shoes and operating mechanism.

Remove the two hexagon-headed dowel bolts from the final drive pinion cover and withdraw the cover complete with oil seal and shims.

Press or drive out (towards the outside) the drive pinion shaft complete with bearing.

The circlip may be removed from the axle casing but is best left in position unless a new one is to be fitted.

Unlock the tab washer locking the final drive gear retaining nut, remove the nut and tab washer and withdraw the final drive gear and the accommodation washer.

Extract the axle end cover bolts and, using the extractor bolt holes provided, break the seal between the cover and the axle casing.

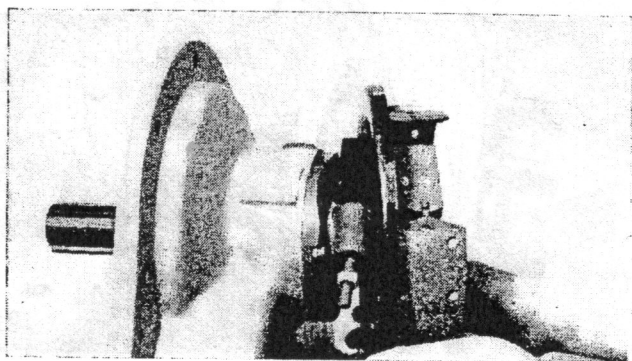


Fig. G.2

The brake backplate complete with shoes can be removed as a unit

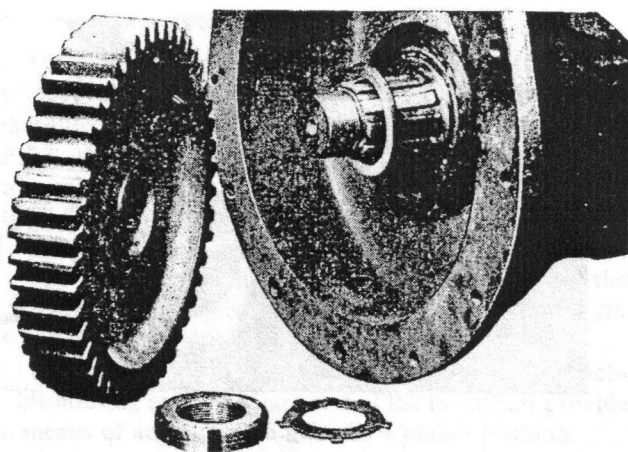


Fig. G.4

The final drive gear removed, showing the accommodation washer fitted to provide the correct end-float

Press out the axle shaft or drive it out with a lead hammer at the splined end, taking care not to damage the retaining nut thread. The inner bearing will remain in the axle casing, as will the outer bearing outer race. The outer bearing inner race and sleeve will come away with the axle shaft.

Withdraw the outer bearing inner race from the shaft, using remover 18G47C with adaptors and long legs 18G47AF (see Fig. G.28).

Remove the axle end cover complete with felt washer and two oil seals. Withdraw also the bearing sleeve and examine it for signs of damage or wear; renew the sleeve if the slightest damage is found as any small imperfection will destroy the effectiveness of the rubber oil seals.

Reassembly is a reversal of the dismantling procedure but some points require special attention.

When refitting the bearing sleeve or fitting a new one warm the sleeve slightly and press it onto the axle shaft until the bevelled edge of the sleeve is against the register on the axle shaft.

Allow the sleeve to cool and then with a feeler gauge check for clearance between the bevelled end of the sleeve and the axle shaft register. If, as a result of contraction of the sleeve during cooling, any clearance exists apply pressure to the sleeve until this clearance is taken up. Warm the outer bearing inner race slightly and press it over the axle shaft until the race is hard against the inner end of the sleeve. When the bearing race is cool check for clearance between the race and the sleeve; if any clearance exists again apply pressure to the race until it is hard against the sleeve.

Both bearings are fitted to the axle with the thrust towards the centre of the shaft. Fit both outer races into the axle casing. Slide the axle end cover over the axle shaft and fit the bearing sleeve and outer bearing inner race and roller cage.

Insert the shaft into the axle casing; onto the splined end of the axle shaft assemble the inner bearing roller cage and inner race.

Accommodation washers are available in 12 sizes, commencing at .208 in. (5.3 mm.) and progressing in .004 in. (.102 mm.) steps to .252 in. (6.4 mm.). Select an accommodation washer and place it in position on the shaft, ensuring that it is located on the larger diameter of the shaft and against the inner bearing inner race. Fit the final drive gear to the shaft and secure it with the retaining nut (do not lock the nut).

NOTE.—The axle end cover must be left loose at this stage.

Chalk a datum-line across the rim of the final drive gear and fit a dial gauge (as shown in Fig. G.6) with the foot of the gauge on the line. Grip the axle shaft, pull outwards, and rotate the shaft a few degrees both sides of the line, still maintaining pressure. Note the gauge reading when the gauge foot aligns with the chalk-mark.

Push the axle shaft inwards and again rotate the shaft a few degrees both sides of the line, maintaining inward pressure. Note the gauge reading at the chalk datum-point.

The difference between the two gauge readings is the end-float, which must be .002 in. (.05 mm.) to .006 in. (.152 mm.), and should the reading obtained on the gauge be outside these limits it will be necessary to fit a thicker washer to decrease the float or a thinner washer to increase it.

Before refitting the pinion shaft refer to Section G.10.

To determine the shims required for the final drive pinion bearing cover, fit the cover with the oil channel at the bottom but without the shims and lightly tighten the two dowel bolts. Measure the gap between the cover and the axle casing and fit shims equal to this thickness. The shims have two large holes to clear the dowel bolts and are provided with an oil drain hole to line up with the drain hole in the axle casing.

See also Section G.15.

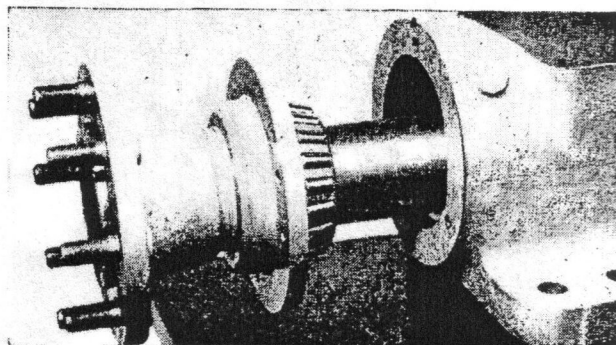


Fig. G.5

The axle shaft partly withdrawn, showing the tapered roller inner race

Section G.3

REMOVING AND REPLACING THE GEARBOX

Remove the axle assemblies as in Section G.1.

If the rear cover only is fitted to the transmission case it is removed by extracting the securing bolts.

To remove a power take-off unit an assistant is required to steady it. Place the selector lever in the disengaged position. Remove the bolts securing the unit housing to the transmission casing and, using two of the bolts, screw them into the tapped holes on either side of the housing. As the bolts contact the transmission casing turn them alternately, half a turn at a time, until the faces are clear of the dowels. Lift the unit clear. Note the position of the bearing bush in the end of the layshaft, which forms a support for the forward end of the power take-off shaft. This sleeve may remain in the layshaft or may be withdrawn with the power take-off shaft.

A hydraulic power unit may be removed, after placing the selector lever in the disengaged position, by supporting it with lifting tackle with a sling round the ends of the cross-shaft. Remove the bolts securing the unit to the transmission casing and use two of them in the tapped holes provided to withdraw the unit clear of the locating dowels. (The magnetic filter on the right-hand side of

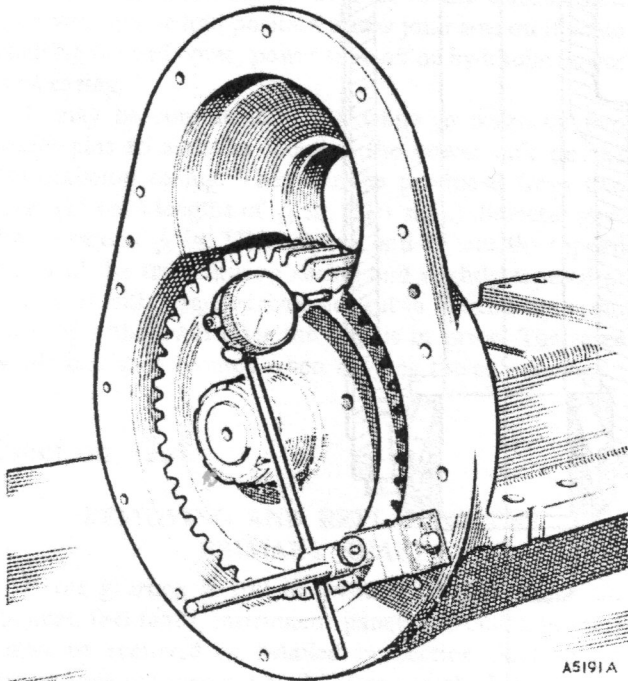


Fig. G.6

Checking with the aid of a dial gauge the permissible .002 to .006 in. (.05 to .152 mm.) end-float of the axle shaft

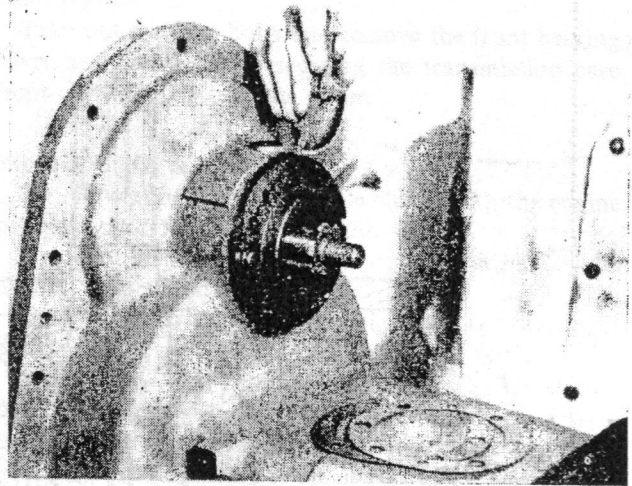


Fig. G.7

Using a feeler gauge to determine the shims required for the final drive pinion bearing cover

the power unit casing must be removed before an extractor bolt can be inserted on that side.) Turn the bolts only half a turn at a time and note the position of the bearing sleeve in the layshaft as detailed above for models fitted with power take-off units only.

Release the belt pulley unit from the side of the transmission casing by unscrewing the four bolts.

Take out the screws securing the instrument panel to the side panels and the screws securing the side panels.

Raise the tractor slightly with the jack and place a

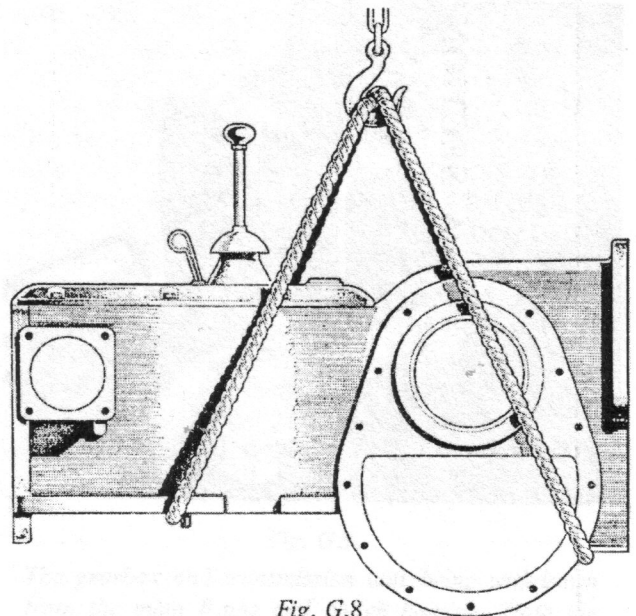
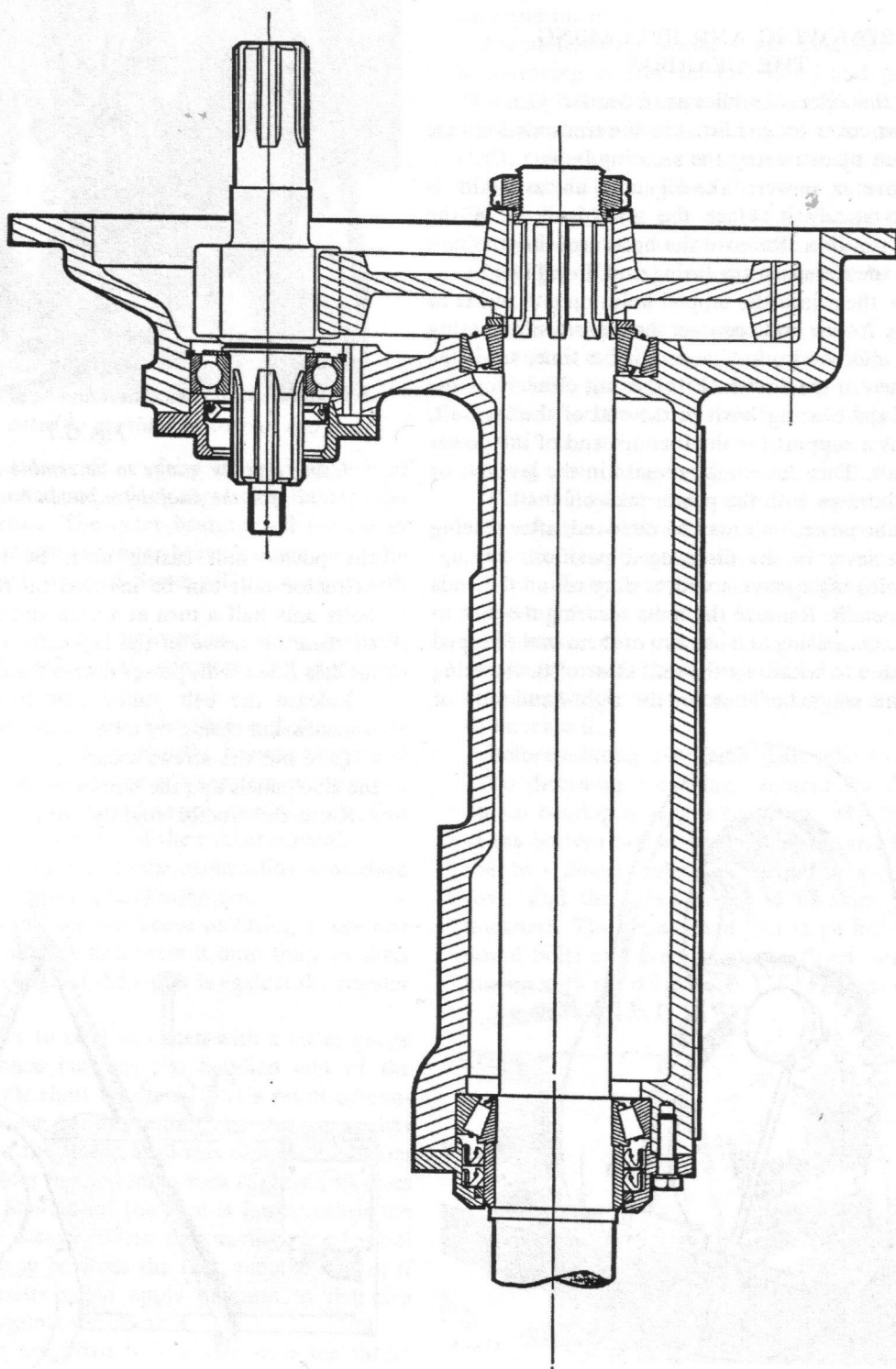


Fig. G.8

By arranging a rope sling as illustrated the gearbox and transmission casing may be evenly slung

A SECTION THROUGH THE FINAL DRIVE



support beneath the main frame, clear of the transmission casing. Lower the jack until the frame is resting on this support.

Take out the bolts securing the brake pedal bracket to the under side of the transmission casing.

On tractors fitted with a hand brake this must be disconnected before the brake pedal assembly can be removed.

Arrange a rope sling as illustrated in Fig. G.8 and raise it until the weight of the gearbox is taken before removing the bolts which secure the transmission casing to the main frame and clutch cover. Note the length of each bolt as it is removed. Two bolts on the right-hand side also secure the hand brake lever when fitted and on the left-hand side one bolt provides the anchorage for the clutch pedal return spring. Note that the fourth bolt down on either side is a **special bolt** which operates as a dowel bolt.

Withdraw the gearbox and transmission assembly to the rear until the transmission shaft is clear of the clutch housing.

When refitting the gearbox make sure that the faces are clean and free from burrs. Remove the clutch inspection cover from the left-hand side of the clutch housing and guide the transmission shaft spigot through the clutch release bearings.

Ensure that the bearing sleeve is in position in the end of the layshaft. Smear the face of the transmission case with grease and position a new joint seal on it when refitting the end cover, power take-off or hydraulic power unit casing.

It may be considered worth while to make up two guide pins to assist in locating the power unit on the transmission casing. They can be produced from two 6 in. (15 cm.) lengths of $\frac{7}{16}$ in. (11.1 mm.) diameter steel bar threaded $\frac{7}{16}$ in. UNF at one end to suit the tapped holes of the transmission casing and slightly tapered at the other with a screwdriver slot cut in the end to permit ease of withdrawal after the unit is in place. The same guide pins may be used when refitting the axle casing.

Section G.4

REMOVING AND REPLACING THE PRIMARY SHAFT

If the gearbox is still in position on the tractor the bonnet, fuel tanks, instrument panel, and clutch housing must be removed as detailed in Section A.21 in the operations numbered 1 to 26. Remove the locking wire and withdraw the two clevis pins from the primary shaft driving sleeve and slide the sleeve forward clear of the primary shaft.

Remove the gearbox dipstick and the gearbox cover.

Basic tractor

Take out the four bolts and remove the front bearing cover and the six bolts securing the transmission case front cover and remove the cover.

When I.P.T.O. is fitted

To remove the I.P.T.O. double clutch with the engine in the frame refer to Section Q.20.

Remove the circlip and withdraw the rear half of the driving flange from the P.T.O. driving gear.

Take out the 11 bolts securing the transfer gear housing cover and remove the cover.

Remove the self-locking nut and Belleville washer from the I.P.T.O. shaft. It will be necessary to insert a piece of soft metal (copper drift) between the two gears to prevent them rotating as the nut is unscrewed. Remove the driving gear from the gearbox primary shaft and the driven gear from the I.P.T.O. primary shaft.

After removing the H.P.U. as detailed in Section Q.8 withdraw the I.P.T.O. primary shaft rearwards, not forgetting to collect and retain for future use the bearing washer which will fall in the casing below the primary shaft. Extract the 10 bolts and remove the transfer gear housing.

Take out the four bolts and remove the front bearing retainer.

Both models

Rotate the layshaft until the oil flinger plate cut-away is in the uppermost position.

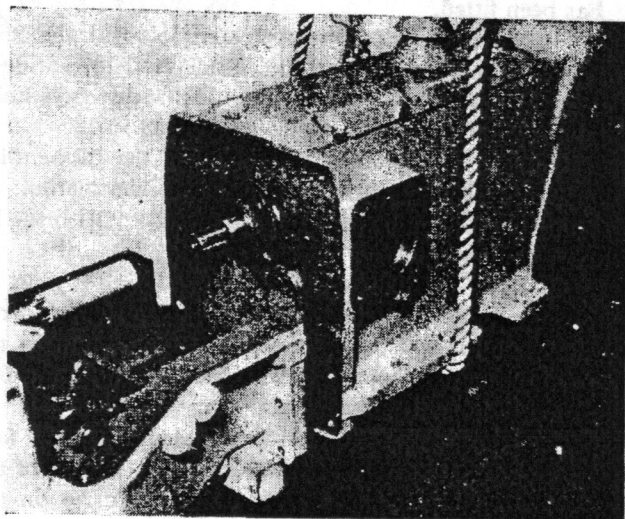


Fig. G.9

The gearbox and transmission unit being withdrawn from the main frame and clutch housing. Note the bolt inserted in the gearbox flange to prevent the rope sliding

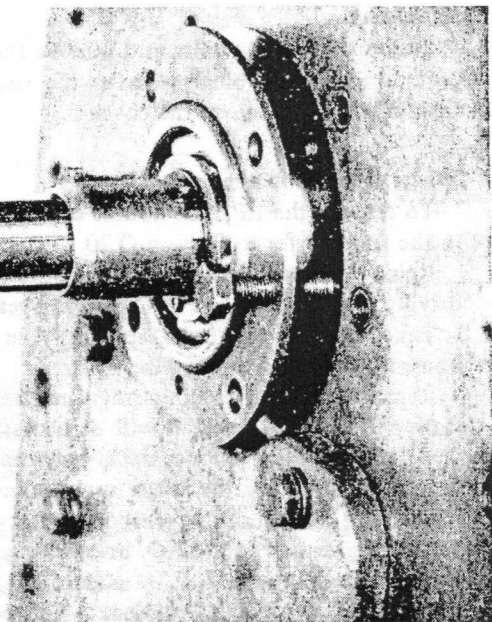


Fig. G.10

Withdrawing, with the aid of two cover bolts, the primary shaft bearing and bearing housing

Use two of the front bearing plate or cover bolts as extractor bolts in the holes provided to remove the primary shaft bearing and bearing housing. Note the number of shims between the housing and the transmission casing and fit the same thickness when re-assembling unless a new bearing, bearing housing, or gear has been fitted.

The primary shaft is removed complete with the bevel pinion and front and rear end bearings. The bearing is located on the shaft by a circlip. Extractor bolt holes are provided in the bearing cover (Fig. G.10).

Reassembly is mainly a reversal of the dismantling procedure, but some points require special attention.

Fit the oil seal in the front bearing cover with the lip towards the bearing.

Since the belt pulley is an optional fitting it must be possible to fix or exchange a pulley drive assembly from stock, and it is essential that the bevel pinion on the primary shaft is accurately positioned to accept any belt pulley unit of the correct type.

The gear is correctly positioned when the inner face lies $1\frac{1}{16}$ in. (1.0625 in. or 26.99 mm.) to the rear of the forward edge of the hole for the pulley drive on the horizontal centre line (Fig. G.11).

The position of the bevel gear is controlled by the thickness of shims between the bearing housing and the transmission casing. To determine the thickness of shims required when a new gear is fitted the bearing and oil seal housings should be bolted in position without shims

and the driving flange fitted with its retaining circlip. Mark off the horizontal centre line of the pulley drive hole in the side of the transmission casing. Place a straight-edge across the face of the bevel gear in line with the centre line marking, and with calipers measure the distance between the straight-edge and the forward edge of the pulley drive hole. The difference between the reading obtained and $1\frac{1}{16}$ in. (26.99 mm.) indicates the thickness of shims to be fitted. Shims are available in .003, .007, and .025 in. (.076, .178, and .635 mm.) thicknesses.

Section G.5

REMOVING AND REPLACING THE DIFFERENTIAL ASSEMBLY

If the gearbox has not been removed from the tractor the axle assemblies must be removed as detailed in Section G.1 and the transmission casing rear cover, power take-off or hydraulic unit as detailed at the commencement of Section G.3.

Cut the locking wire to release the bearing housing bolts and withdraw the bolts. Place a wooden block between the crown wheel and the casing to support the differential assembly. Use two bolts in the tapped holes provided in each bearing housing to extract the housings and shims.

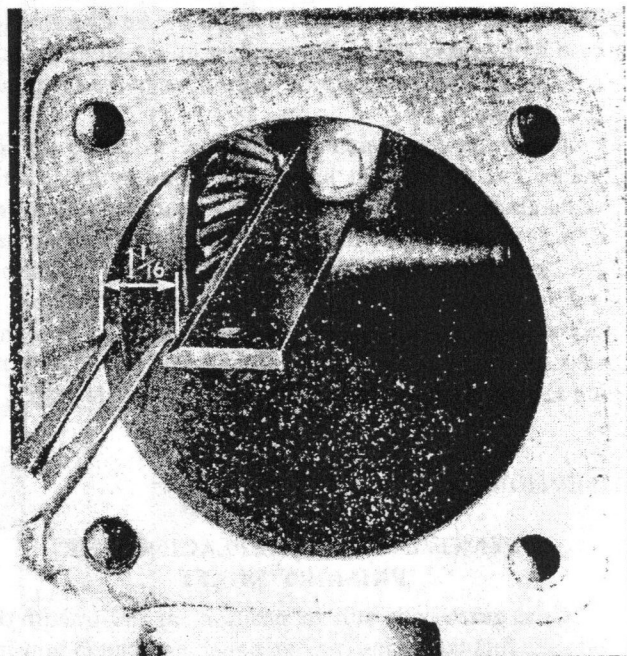


Fig. G.11

The belt pulley drive pinion must be in the position shown and is adjusted by fitting the correct thickness of shims between the primary shaft bearing housing and the gearbox casing

Unless new components are being fitted each bearing housing should be marked 'right hand' or 'left hand' and wired to the shims removed with it to ensure that the crown wheel returns to its original position when replaced.

With the aid of a tapered punch and the two cut-away portions in either side of the differential housing, drive off the two differential bearings. Remove the differential assembly.

Crown wheels and pinions are always supplied and must be fitted in pairs.

When replacing the differential assembly roll it into position with the crown wheel on the right-hand side of

the pinion when seen from the rear. Fit the bearings to the differential housing with their thrust sides away from the housing. Fit the bearing housings and shims removed on dismantling or if new bearings or crown wheel and pinion are fitted proceed as follows.

Tap in the left-hand bearing housing without shims and bolt it up tightly with four bolts equally spaced. Fit the right-hand bearing housing, driving it into position with a mallet until the bearings are against their shoulders, pulling up lightly with four equally spaced bolts.

Measure the clearance between the right-hand housing flange and the transmission casing with feelers and add

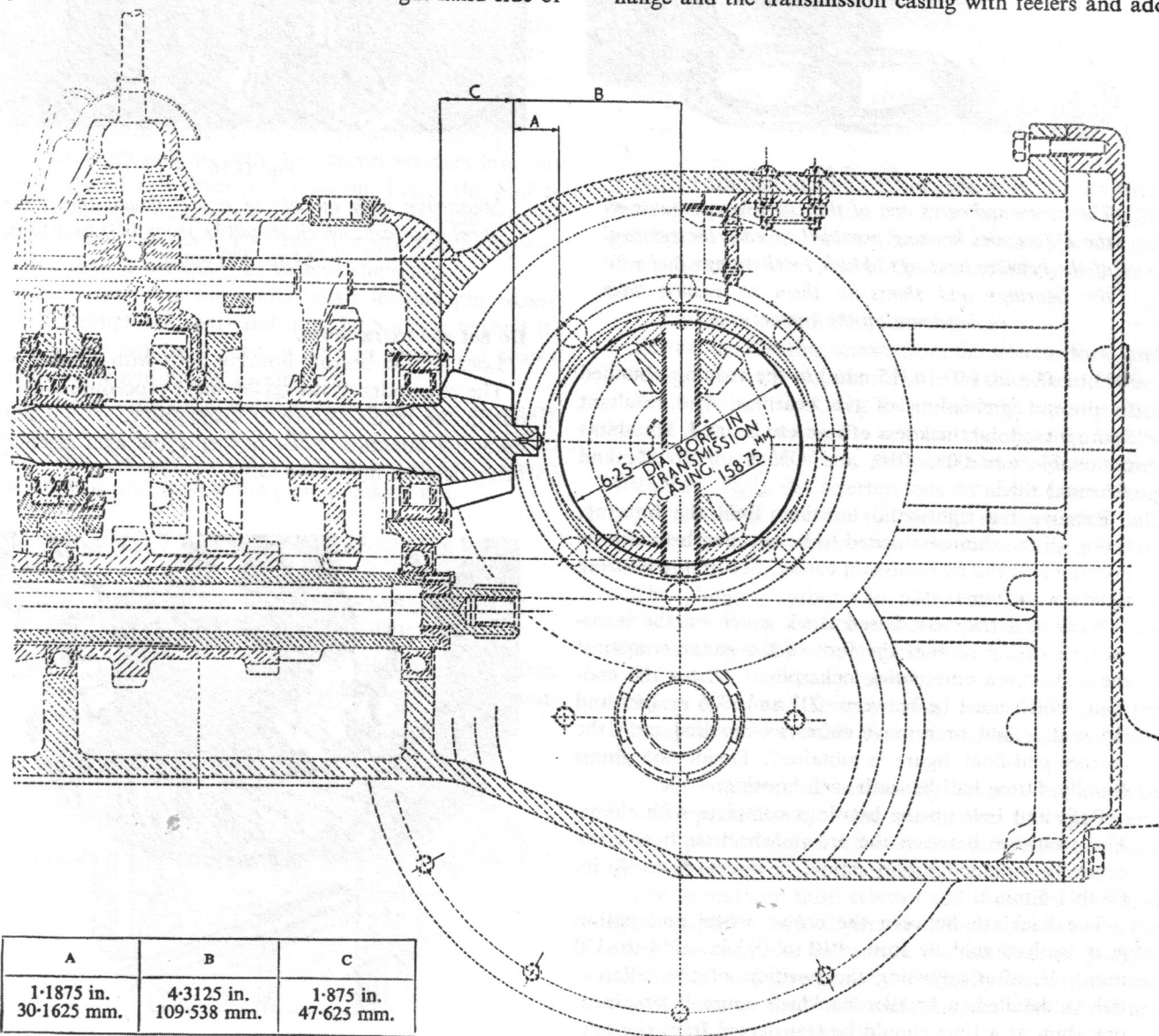


Fig. G.12

The correct location of the mainshaft pinion in relation to the crown wheel bearing housing holes in the transmission casing.

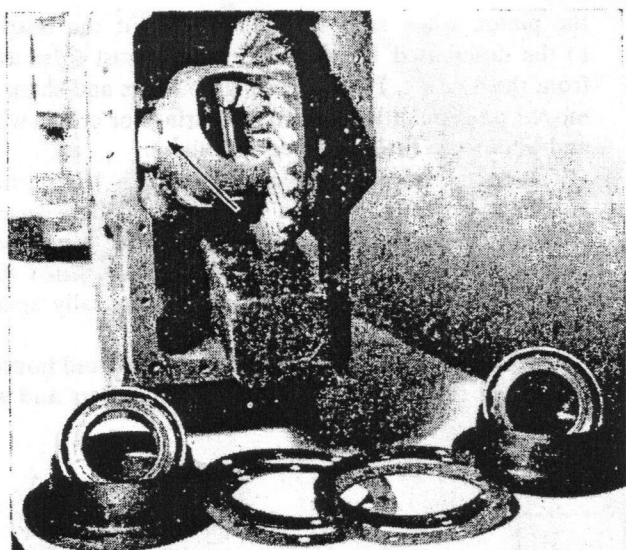


Fig. G.13

The arrow indicates one of the cut-away portions on the differential housing provided to ease the removal of the bearing housings. Mark the housings and wire the bearings and shims to them to ensure their replacement on the correct side

·003 to ·006 in. (·07 to ·15 mm.) to the reading obtained to prevent preloading of the bearings. The resultant figure is the total thickness of shims to be used. The shims obtainable are ·003, ·010, and ·025 in. (·07, ·25, and ·63 mm.) thick.

Remove the right-hand housing. Refit the housing, fitting all the shims estimated to be required between the housing and the transmission casing. Secure the housing tightly with four bolts.

Position a magnetic-based clock gauge on the transmission casing so that the foot of the gauge is against the end of the differential lock splines. Check the end-float, which must be between ·003 and ·006 in. (·07 and ·15 mm.). Add or remove shims as required until the correct end-float figure is obtained. Divide the shims equally, fitting half beneath each housing.

Refit and bolt up the housings complete with shims. The clearance between the crown wheel teeth and the centrally mounted scoop should be from $\frac{1}{32}$ to $\frac{1}{16}$ in. (·8 to 1·6 mm.).

The backlash between the crown wheel and pinion gear teeth should be from ·010 to ·013 in. (·254 to ·330 mm.). If, after adjusting the position of the differential as detailed, a smaller backlash figure is obtained, one shim at a time should be transferred from the left-hand side to the right-hand side, or alternatively, if a larger reading is obtained, it is reduced by transferring shim(s) from the right-hand side to the left-hand side.

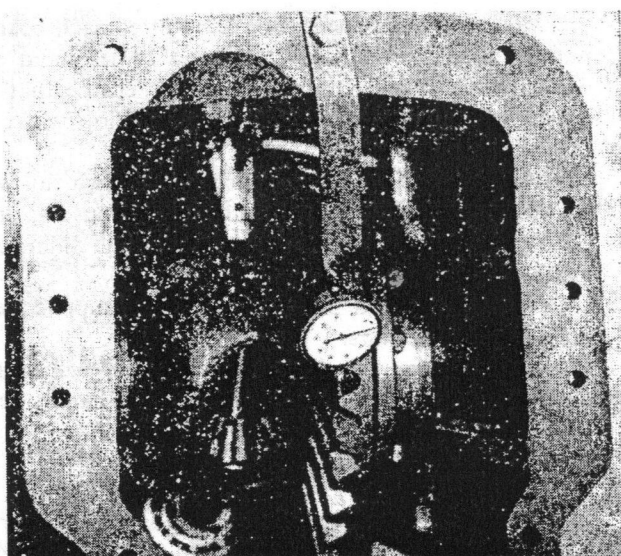


Fig. G.14

Measuring with the aid of a dial gauge the crown wheel backlash, which should be from ·010 to ·013 in. (·254 to ·330 mm.)

Do not add extra shims.

Lock up the bearing housing bolts with locking wire.

The remainder of the replacement procedure is carried out in the reverse order to dismantling, several points requiring attention when replacing the axle assemblies being detailed in Section G.1.

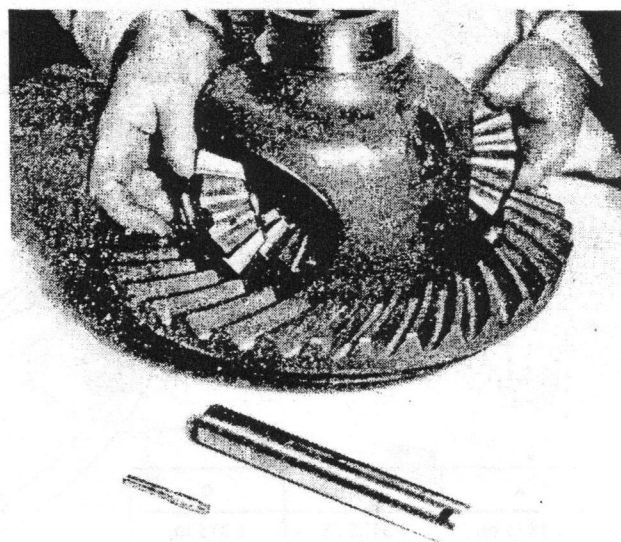


Fig. G.15

Withdrawing the differential gears and thrust washers. The differential shaft and locking pin are also shown

Section G.6

DISMANTLING AND REASSEMBLING THE DIFFERENTIAL ASSEMBLY

Cut and remove the locking wires from the crown wheel bolts and nuts and withdraw the differential pinion shaft and locking pin.

Push out the pinion shaft and rotate the pinions until they can be withdrawn together with their thrust washers.

Remove the differential gears and thrust washers.

To dismantle the differential assembly, take out the crown wheel nuts and bolts and press off the crown wheel.

Reassembly of the components is a reversal of the dismantling procedure. The flats on the heads of the crown wheel bolts must be fitted towards the crown wheel teeth and the differential housing bearings are fitted with their thrust sides away from the housing.

Insert both pinions with their thrust washers into the housing and roll them into position. Insert the pinion shaft with the locking pin hole in line with the hole in the housing; use the screwdriver slot provided in the end of the shaft if necessary to achieve alignment.

Make sure that the pinion shaft locking pin passes right through the shaft and into the housing beyond it. Use a new length of locking wire to relock the crown wheel bolts and pinion locking pin.

If a new differential case has been fitted it is necessary to drill a $\frac{3}{32}$ in. (2.38 mm.) hole for the pinion locking pin wire. The hole should be drilled in the small flange adjacent to the head of the pinion locking pin.

Section G.7

DISMANTLING AND REASSEMBLING THE GEARBOX TOP COVER

Make sure that the battery is disconnected before removing the instrument panel side covers from a completely assembled tractor.

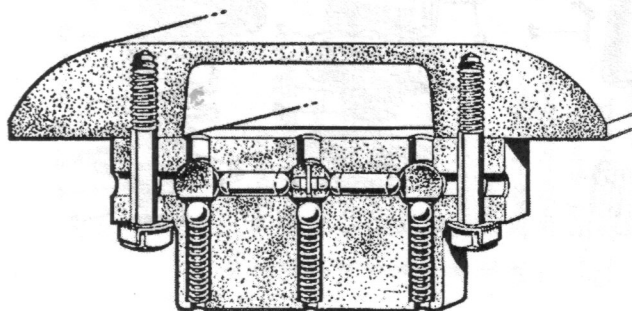


Fig. G.16

A section through the interlocking housing in the gearbox top cover

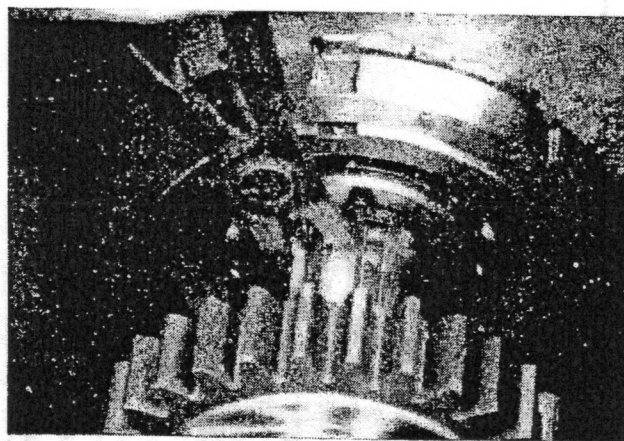


Fig. G.17

Removing the mainshaft circlip with the aid of a pair of circlip pliers

Before dismantling the selector gear, note that the interlocking housing is at the front, or square end, of the gearbox cover and that the first and reverse selector rod is on the right-hand side of the tractor when seen from above.

Cut and remove all the lock wires.

Extract the locating screws from the selector forks and jaws and slide the outside forks from the selector rods.

Bend back the locking tabs and take out the four special bolts securing the selector rod bearing blocks. Slide off the rear block, the jaws and distance tubes. Withdraw singly the selector rods from the interlocking housing, taking care not to lose the spring-loaded balls and the plungers which are released as the rods are withdrawn.

The plunger, spring and abutment washer may be withdrawn from the first and reverse gear selector jaw after extracting the retaining circlip.

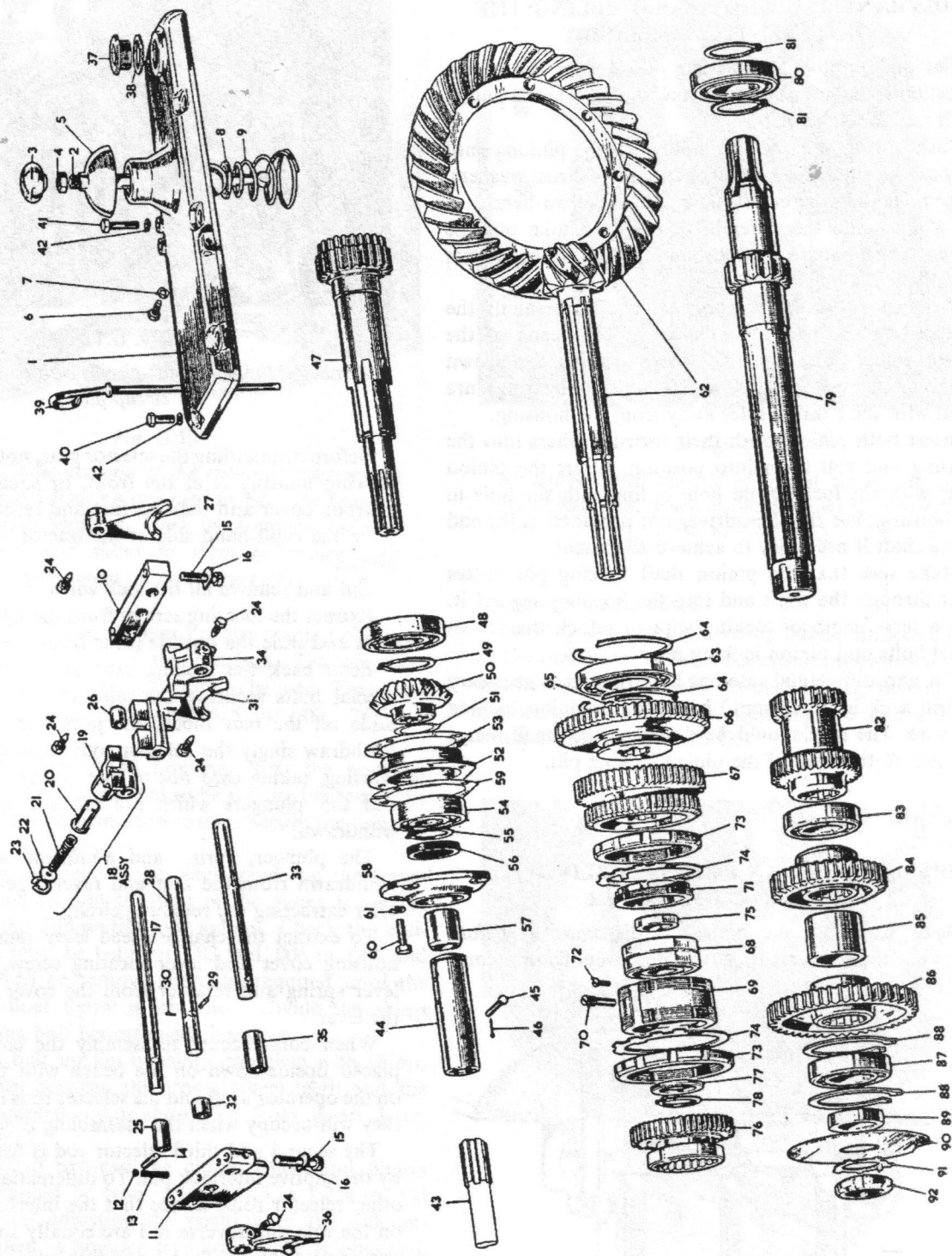
To extract the change speed lever remove the knob, housing cover and lever locating screw. Prise out the lever spring and retainer from the cover and withdraw the lever.

When commencing reassembly the cover should be placed upside-down on the bench with the square end on the operator's left and the selector rods in the positions they will occupy when the assembling is completed.

The second and third selector rod is readily identified by the captive interlock pin. To differentiate between the other selector rods, notice that the interlocking grooves on the first and reverse rod are equally spaced, whereas two of those on the fourth and fifth gear selector rod are comparatively close together.

Position one locking spring and ball in one side of the interlock housing and, remembering that the housing is fitted plain side towards the cover, insert the appro-

THE GEARBOX, GEARS, SHAFTS, AND SELECTORS



KEY TO THE GEARBOX, GEARS, SHAFTS, AND SELECTORS

No.	Description	No.	Description	No.	Description
1.	Top cover.	24.	Pin—fork locating.	61.	Spring washer.
2.	Change speed lever.	32.	Distance tube—short.	62.	Mainshaft and crown wheel (pair).
3.	Knob for lever.	33.	Selector rod—fourth and top.	63.	Rear bearing.
4.	Locknut—knob.	34.	Selector jaw—fourth and top.	64.	Internal circlip.
5.	Cover—lever.	24.	Pin—jaw retaining.	65.	External circlip.
6.	Pin.	35.	Distance tube—long.	66.	Gear—first speed.
7.	Spring washer.	36.	Selector fork—fourth and top.	67.	Gear—second and third.
8.	Lever retainer.	24.	Pin—fork locating.	68.	Bearing—centre.
9.	Spring.	37.	Filler plug.	69.	Housing—bearing.
10.	Block—bearing.	38.	Washer—plug.	70.	Pin—anti-rotation.
11.	Block—interlock.	39.	Dipstick.	71.	Bearing nut.
12.	Ball—selector.	40.	Bolt—short.	72.	Screw—locking.
13.	Spring for ball.	41.	Bolt—long.	73.	Locknut—housing.
14.	Plunger—interlock.	42.	Spring washer.	74.	Lock washer.
15.	Bolt.	43.	Transmission shaft.	75.	Thrust collar.
16.	Tab washer.	44.	Sleeve—driving.	76.	Gear—fourth and direct.
17.	Selector rod—first and reverse.	45.	Clevis pin.	77.	Washer—spacing.
18.	Jaw and plunger assembly—first and reverse.	46.	Split pin.	78.	Circlip.
19.	Selector jaw—first and reverse.	47.	Primary shaft.	79.	Layshaft.
20.	Plunger.	48.	Rear bearing.	80.	Bearing—rear.
21.	Spring.	49.	Bearing circlip.	81.	Bearing circlip.
22.	Abutment washer.	50.	Bevel pinion.	82.	Gear—second and third.
23.	Circlip.	51.	Shim.	83.	Bearing centre.
24.	Pin—jaw retaining.	52.	Housing—front bearing.	84.	Gear—fourth speed.
25.	Distance tube—intermediate.	53.	Shim.	85.	Distance piece.
26.	Distance tube—short.	54.	Front bearing.	86.	Gear—constant mesh.
27.	Fork—first and reverse selector.	55.	Bearing circlip.	87.	Bearing—front.
24.	Pin—fork retaining.	56.	Oil seal.	88.	Bearing circlip.
28.	Selector rod—second and third.	57.	Sleeve.	89.	Packing piece.
29.	Interlock pin.	58.	Cover—front bearing.	90.	Oil flinger.
30.	Locking pin.	59.	Shim.	91.	Lock washer.
31.	Selector fork—second and third.	60.	Bolt.	92.	Locknut.

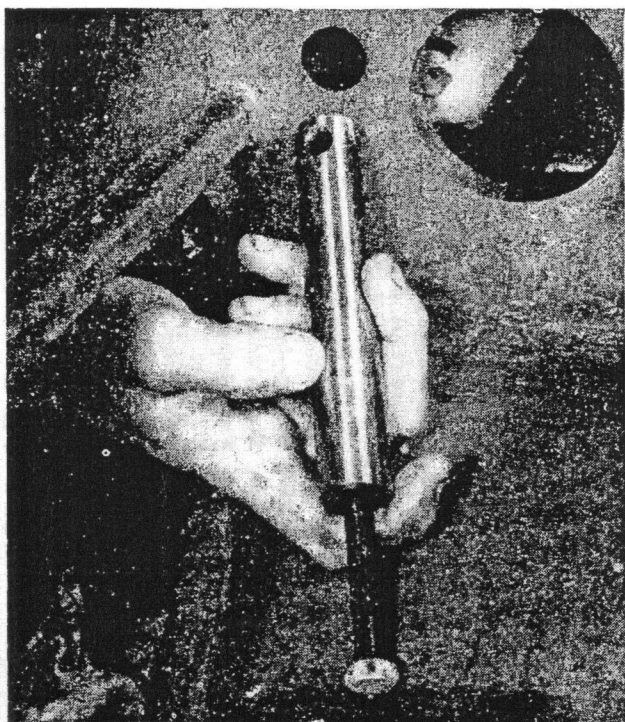


Fig. G.18

Withdrawing the reverse gear shaft after using the shaft locating bolt as an extractor

appropriate selector rod. Insert an interlock plunger through the opposite end of the housing and a spring and ball in the centre guide channel. Engage the second and third speed selector rod. Insert the second interlock plunger through the same side of the housing and fit the remaining spring and ball and the selector rod.

With the selector rods positioned in the interlock block, hold the assembly with the block on the left and the flat side uppermost. Assemble the distance tubes and selector forks onto the shafts in the order illustrated on page G.14. Tighten and re-wire the locating screws.

When replacing the change speed lever the retaining spring should be positioned with the end of the large coil to the rear. Compress the spring and engage the front half beneath the two forward lugs on the gearbox cover and finally spring the rear half into position under the rear lug.

Section G.8

DISMANTLING THE GEARBOX

Remove the axle assemblies as detailed in Section G.1 and remove the gearbox as detailed in Section G.3. Take out the primary shaft as detailed in Section G.4 and the differential assembly as in Section G.5. Remove the gearbox top cover.

Unless a new crown wheel and pinion is to be fitted do not disturb the setting of the mainshaft front bearing housing.

Expand the mainshaft circlip and move it forward onto the smaller diameter of the shaft (Fig. G.17).

Drive the mainshaft and inner race of the rear end roller bearing through the rear end of the gearbox and lift out the gears, thrust collar, distance washer and circlip.

Slacken and remove the layshaft locknut, lock washer, oil flinger and packing piece. Support the second and third speed gear cluster and drive the layshaft to the rear, complete with the rear bearing and circlip.

Lift out the second and third speed layshaft gear cluster, the fourth speed gear, the distance piece, and the constant mesh gear.

Take out the reverse gear shaft locating bolt and, using the same bolt as an extractor screwed into the rear end, withdraw the shaft.

Remove the mainshaft rear bearing outer race and the layshaft front end bearing after extracting the circlips.

To remove the mainshaft centre bearing housing lift up the locking tags and slacken the two bearing housing locking rings with special spanner 18G474. Remove the rear locking ring and slacken the grub screw locating the bearing housing through the web of the gearbox casing.

With a mallet, tap the housing towards the front of the gearbox until it is free.

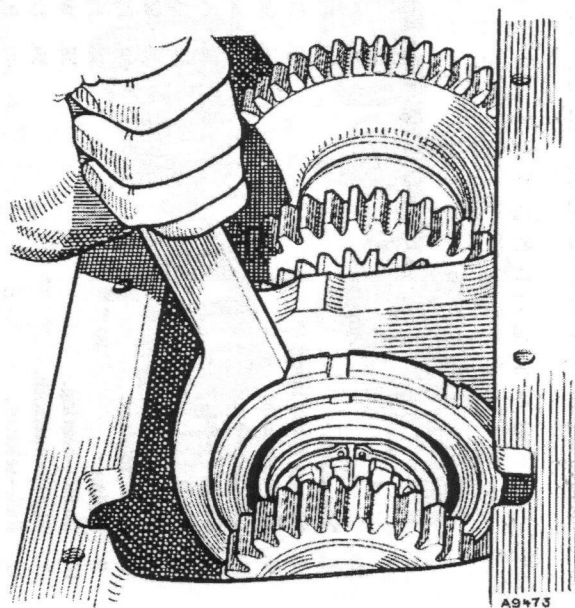


Fig. G.19

Using spanner 18G474 to tighten a mainshaft bearing housing locking ring

To remove the double-row bearing from its housing take out the locking nut countersunk screw, unscrew the nut, and press out the bearing.

Section G.9

REASSEMBLING THE GEARBOX

It is an advantage to fit the mainshaft centre bearing housing assembly as the first operation, although it can be fitted later with little difficulty. If a new bearing has been fitted to the housing the locking screw may not line up with the tapped hole in the bearing retaining nut, and in such case a new hole must be drilled and tapped unless the nut tightens to within half a hole, when the nut can be refaced and the same hole used.

When replacing the assembly in the gearbox ensure that the floating outer race is at the front end and the locking nut is to the rear. Tap the housing into its approximate position with the keyway to the top and engaged by the anti-rotation screw through the top of the casing web, taking care not to damage the locking ring threads. Replace the lock washers, or fit new ones if necessary, and screw up the locking rings.

Position the reverse gear cluster, largest gear to the rear, insert the shaft and secure it with the locating bolt engaging the tapped hole in the shaft.

Fit the layshaft front end bearing and locate it with the two circlips. Press the rear end bearing onto the layshaft and refit the two circlips.

Enter the layshaft through the rear end of the gearbox and thread it into the small end of the second and third cluster, keeping the gears from engaging with the reverse gear. Thread on the centre bearing before passing the layshaft through the web in the gearbox and, as the shaft emerges beyond the web, pass it through the fourth speed gear with the boss to the rear. Next thread on the distance piece and the constant mesh gear with the boss to the rear.

Line up the second and third gear cluster with the splines and continue entering the shaft until the rear end bearing enters the housing and is in position. Thread the bearing packing piece over the front end of the layshaft and follow this with the oil flinger, lock washer and nut.

If a new mainshaft and crown wheel or double-row mainshaft bearing is to be fitted the thrust collar should be threaded onto the mainshaft before it is fitted into the gearbox, and the double-row mainshaft bearing then pressed onto the shaft until it is hard against the thrust collar. Ensure that the circlip slot is clean, fit the circlip and then select the largest distance washer that will fit between the circlip and the bearing inner race. The distance washers are available in five sizes, increasing in

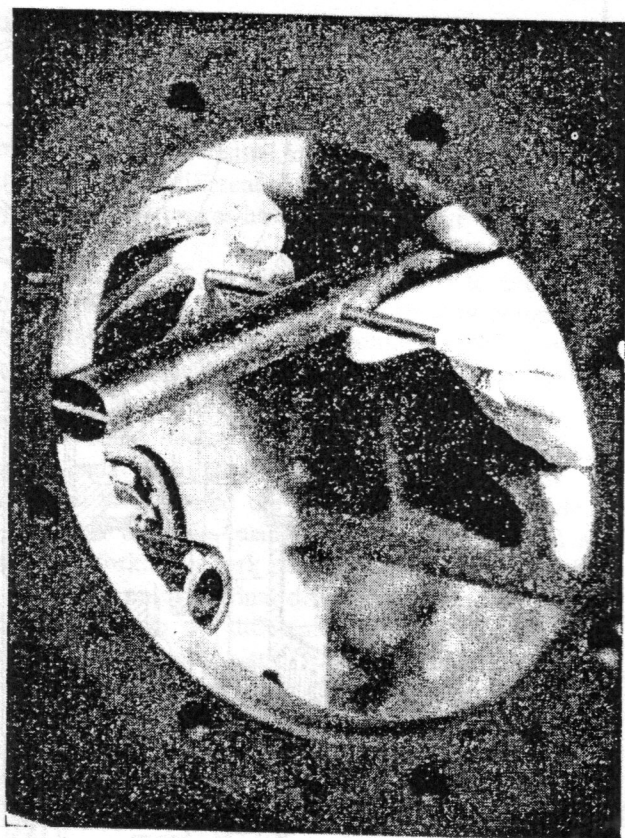


Fig. G.20

Using the mainshaft setting gauge 18G477 to check the pinion position

.003 in. (.076 mm.) steps from the minimum thickness of .169 in. (4.29 mm.). After selecting the correct washer remove the circlip and press the bearing and thrust collar from the mainshaft.

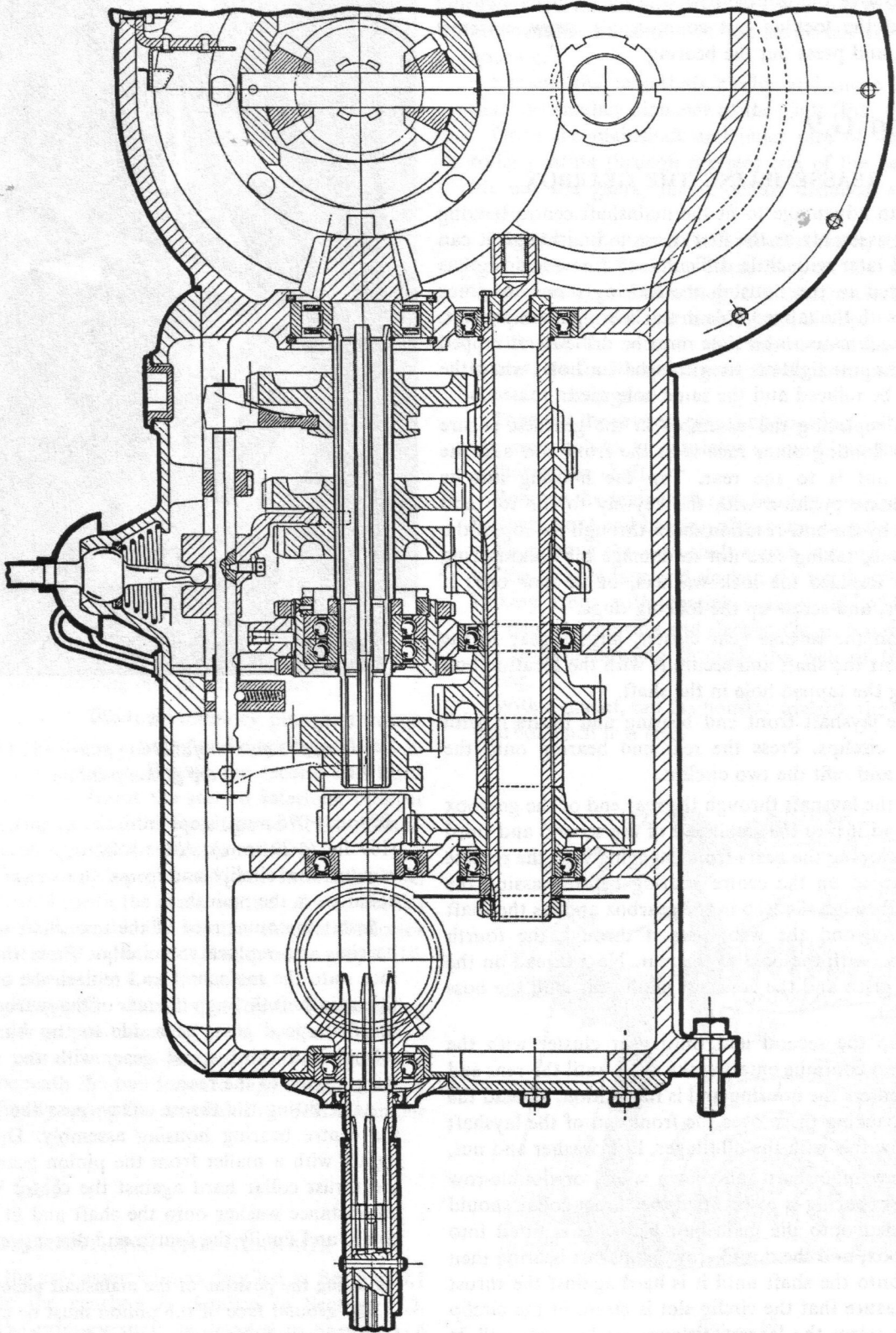
Insert the outer race of the mainshaft rear end roller bearing and replace the circlips. Press the inner roller race onto the mainshaft and replace the circlip. Thread the mainshaft through the rear of the gearbox and engage the first speed gear, gear side to the rear. Engage the second and third speed gear, with the second speed (larger gear) to the rear.

After fitting the thrust collar, pass the shaft through the centre bearing housing assembly. Drive the shaft lightly with a mallet from the pinion gear end to push the thrust collar hard against the centre bearing. Slide the distance washer onto the shaft and fit the retaining circlip and finally the fourth and direct gear.

Adjusting the position of the mainshaft pinion

The ground face of the pinion must be exactly $4\frac{5}{16}$ in. (109.538 mm.) from the centre line of the axis of the crown wheel. As the diameter of the holes for taking the crown wheel bearing housings is $6\frac{1}{4}$ in. (158.7 mm.) the

THE GEARBOX IN SECTION



face of the pinion must lie $1\frac{3}{16}$ in. (30.16 mm.) forward of the forward edge of the holes when measured on the horizontal centre line (see Fig. G.12).

Using the mainshaft setting gauge 18G477 as illustrated in Fig. G.20, check the pinion position. Alternatively, if the setting gauge is not available place a straight-edge across the forward edge of the holes level with the centre-line of the mainshaft pinion and, with a depth gauge or accurately set pair of inside callipers, check the position of the pinion.

If the pinion position is incorrect, slacken the bearing housing locating pin and tighten up the appropriate locking ring, keeping the opposite one slackened until the pinion is in the correct position. Tighten the rings and, after re-checking the pinion setting, lock the ring nuts with the locking washer tags and tighten the locating pin.

Section G.10

MODIFIED FINAL DRIVE PINION SHAFT

When refitting the pinion shaft on tractors prior to Nos. 787/80005, 787/30035, 792/30019, 787/2342, 792/1159, 771/1902, and 772/703 the bearing washer (Part No. NT1190) (Fig. G.21) should be replaced by a distance piece (Part No. ATJ7164). The pinion shaft on these tractors has an annular groove machined on the boss against which the pinion bearing abuts.

On later tractors (commencing numbers above) a modified pinion is fitted and the distance piece is deleted. This pinion may be identified by the absence of the machined groove in the boss.

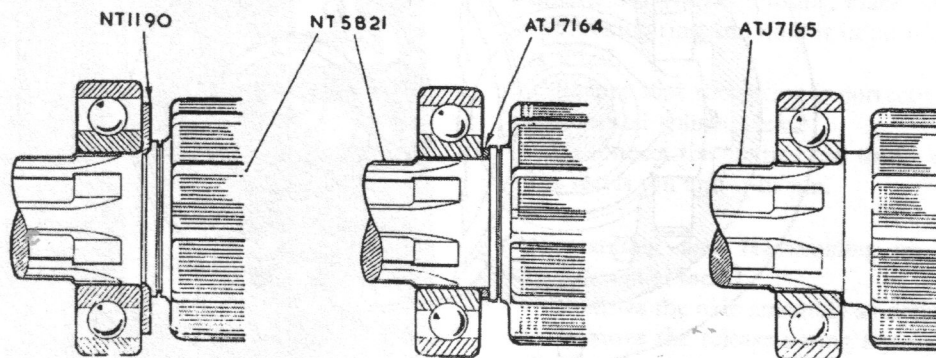


Fig. G.21

Illustrated on the right is the modified pinion requiring no washer or distance piece and fitted to all later tractors (commencing numbers in Section G.10). Illustrated on the left and centre is the earlier-type pinion shaft, which may be identified by the machined groove round the bearing boss. Always fit distance piece ATJ7164 to such pinions in place of washer NT1190

Section G.11

DIFFERENTIAL LOCK

All tractors bearing the suffix letter 'L' after the serial number have a differential locking device fitted. Tractors fitted with both differential lock and independent hand-operated wheel brakes have the suffix letter 'X' after the serial number.

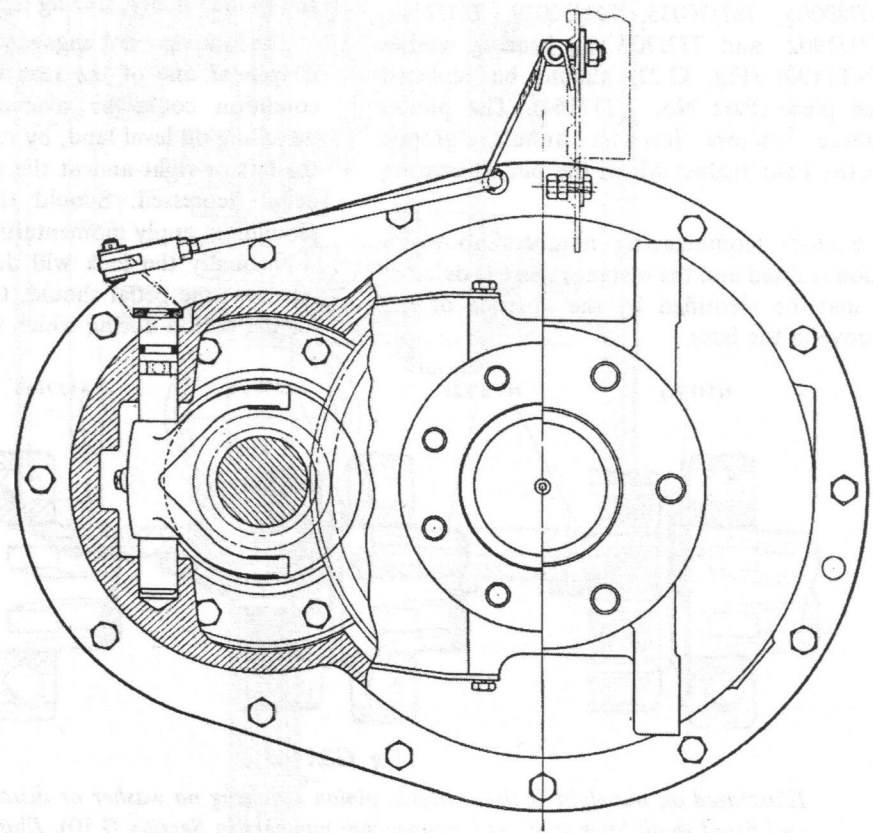
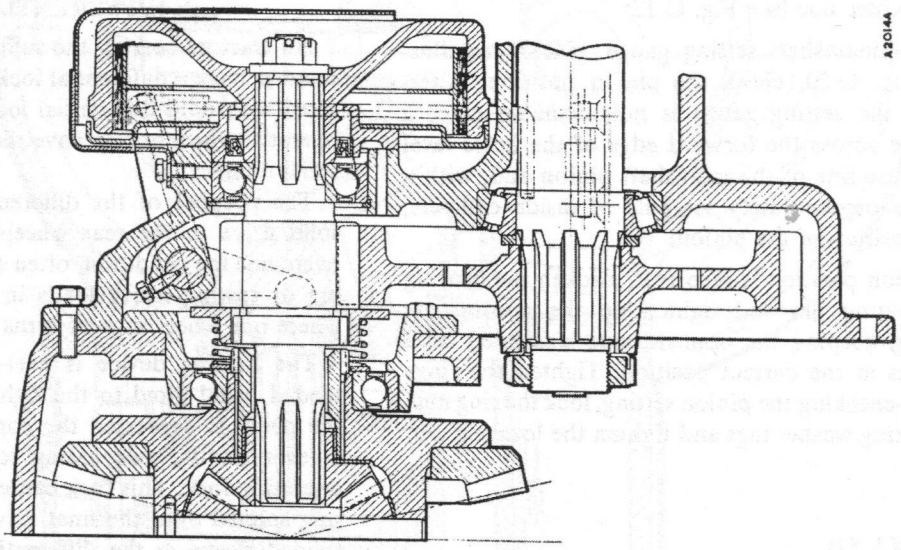
The purpose of the differential lock is to provide a solid drive to the rear wheels and thereby completely overcome the condition, often encountered when ploughing or towing heavy loads in adverse field conditions, where one wheel slips or turns faster than the other.

The locking device is heel-operated from a spring-loaded pedal fitted to the right-hand floor plate. When the pedal is depressed the connecting linkage operates a lever on the axle casing to which is connected an operating fork. This fork causes a spring-loaded locking ring splined onto the final drive pinion to mesh with a splined sleeve in the differential housing, thus locking the differential mechanism. When the pedal is released and the load relieved from the final drive the return spring pushes the locking ring outwards and away from the splined sleeve, freeing the differential.

The lock may not engage when the tractor is in motion if spin of one of the rear wheels is not evident. This condition could be overcome, when the tractor is travelling on level land, by turning the tractor slightly to the left or right and at the same time keeping the lock pedal depressed. Should the lock not engage when ploughing, apply momentarily the land wheel brake.

Normally the lock will disengage when the pedal is released; the pedal should, therefore, be kept depressed for the period during which the lock is needed.

A SECTION THROUGH THE DIFFERENTIAL AND FINAL DRIVE WITH DIFFERENTIAL LOCK



Disengage the lock when about to turn at headlands by releasing the lock pedal just prior to removing the draught of the implement on the tractor (for example, lifting the plough out of the ground) and then turning the tractor. Should disengagement not occur (shown by the tractor not responding to steering-wheel movement), depress momentarily the clutch pedal, or apply pressure to either of the brake pedals.

Inability to disengage the lock when travelling on level ground can be overcome in a similar way.

Precautions

As the differential lock is intended for use only with pneumatic tyres, it must not be engaged when steel rear wheels, girdles, or wheel strakes are fitted. Should the tractor be operated under these conditions, it is recommended that the differential lock pedal be removed until the tractor is again working on pneumatic tyres.

The differential lock must be disengaged before attempting to alter the direction of travel, or to turn the tractor, particularly in confined spaces, by allowing the pedal to return to the 'off' or upward position. When ploughing, however, the tractor will follow a gentle curve in the furrow without damage to the mechanism.

Removing and replacing an axle assembly with differential lock

Note that it is not necessary to remove an axle assembly merely to remove the pinion drive shaft or bearing.

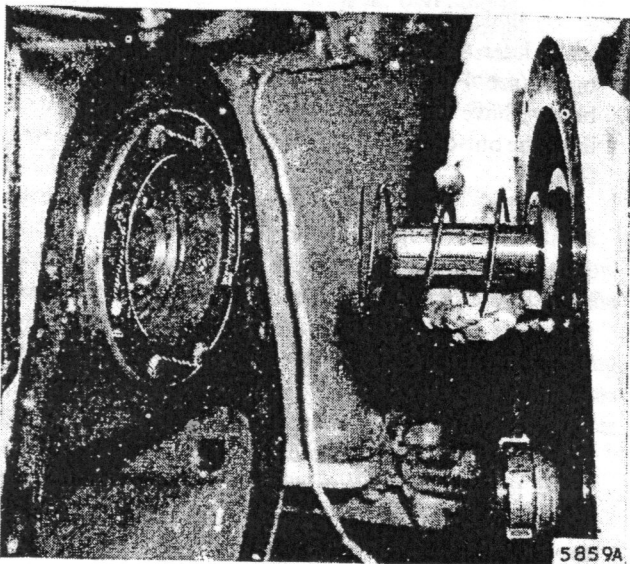


Fig. G.22

The release spring is held in position over the locking ring while the axle assembly is replaced. Ensure that the spring plate is in position over the splined sleeve in the differential bearing housing

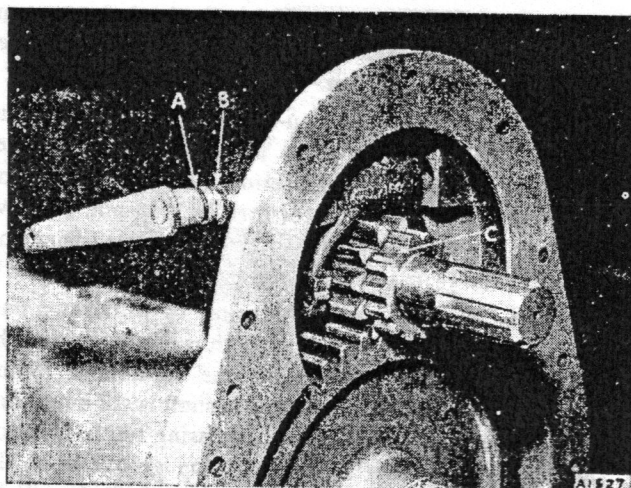


Fig. G.23

The differential lock operating shaft is here shown partly withdrawn from the axle casing to show (A) the oil seal and (B) the retaining screw groove. On the pinion shaft (C) indicates the splined tooth removed to facilitate the removal and replacement of the shaft past the drive gear

To remove an axle assembly carry out the following procedure in addition to that detailed in Section G.1.

Remove the split-pin and withdraw the clevis pin from the yoke connecting the differential lock control rod to the operating lever on the axle casing.

The procedure for replacing the axle assembly is the same as detailed in Section G.1 but note the following.

Before replacing the axle casing assembly ensure that the spring plate is in position on the splined sleeve in the differential bearing housing. Place the release spring over the locking ring and hold it in position as the axle casing is fitted.

Ensure that the spring is correctly registered over the differential splined sleeve.

Reconnect the control rod to the operating lever with the clevis pin and split pin.

Dismantling and reassembling an axle assembly with differential lock

Remove the axle assembly as detailed above.

Remove the release spring and locking ring from the final drive pinion.

Extract the three bolts and spring washers securing the brake-drum cover to the rear axle casing and remove the cover. Slacken the brake adjusting turnbuckle in an anti-clockwise direction as far as it will go. Extract the split pin, remove the nut and washer securing the brake-drum to the final drive, and withdraw the brake-drum.

Extract the bolts securing the brake backplate assembly and remove the assembly complete with brake-shoes and operating mechanism.

Remove the two hexagon-headed dowel bolts from the final drive pinion cover and withdraw the cover complete with oil seal and shims. Remove the locking wire and unscrew the selector fork locking pin. Remove the operating shaft retaining screw on the axle casing and withdraw the shaft from the casing and the selector fork.

In order that the pinion shaft may be withdrawn past the final drive gear, one spline tooth is removed from the differential locking splines on the right-hand pinion shaft. On the end face of the pinion shaft is cut a marking groove which coincides with the missing tooth. Position the pinion shaft so that the marking groove is in the six o'clock position and withdraw the shaft. It will be found helpful in removing the shaft to re-thread the drum-retaining nut, position a large spanner or bar behind the nut and with a hammer tap out the shaft.

Reassembly is a reversal of the above instructions and those in Section G.2.

Before refitting the differential lock-operating shaft smear the shaft lightly with oil and ensure that the rubber sealing ring is in good condition and correctly seated in the groove of the shaft. Fit a new seal if at all doubtful about the condition of the old one.

The instructions for dismantling and reassembling the differential assembly remain the same as detailed in Section G.6.

No attempt should be made to remove the splined sleeve from the differential housing as these two items are serviced as an assembly. The bush in the splined sleeve, however, may be renewed if necessary. New bushes must be pressed into the bottom of the counter-bore in the differential housing and then reamed to 2.248 to 2.249 in. (57.102 to 57.127 mm.) diameter.

Fixed pedal stop

At no time must the pedal travel be restricted by the internal mechanism, or damage may result. Always ensure that it is the pedal stop, fixed to the floor plate (illustrated on page G.20), which prevents further downward movement of the pedal.

Adjust the linkage as follows:

- (1) Slacken the locknut and remove the split pin and clevis pin from the fork end that connects the control rod to the operating lever on the axle.
- (2) Hold the pedal down onto the fixed stop and fully engage the differential lock by hand pressure on the operating lever.
- (3) Align the hole in the fork end with the hole in the operating lever so that the clevis pin will enter

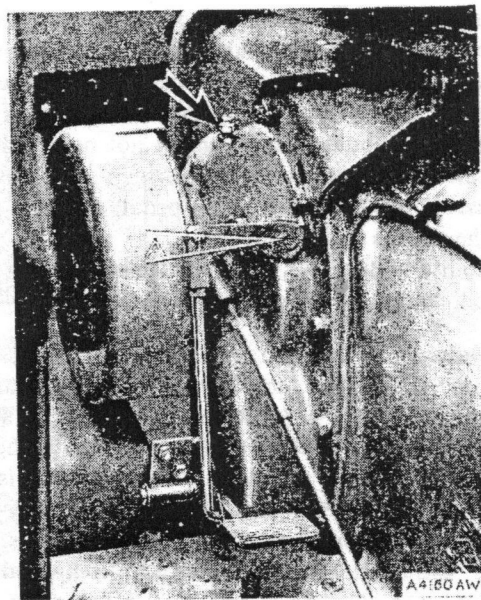


Fig. G.24

On tractors with differential lock modified pedal arrangement the $\frac{3}{8}$ in. (9.52 mm.) free travel of the operating lever is measured at point (A). The arrow indicates the adjusting screw on the axle casing

both parts. From this position **unscrew** the fork end one turn and tighten the locknut.

- (4) Refit the clevis pin and plain washer and fit a new split pin.

All later tractors fitted with a modified pedal arrangement (see Fig. G.24 and commencing numbers given below) have incorporated an additional adjustment to limit the out-of-engagement or free travel of the operating fork.

This free travel is measured at the operating lever as illustrated in Fig. G.24 and must be approximately $\frac{3}{8}$ in. (9.52 mm.) from the fully raised position of the lever to the point where the differential lock commences to engage. It is important to ensure that the pressure of the differential lock return spring is overcome when checking this travel to avoid a false measurement.

Carry out the procedure detailed in paragraph (1) above and then slacken the operating fork adjusting screw locknut on the top of the axle casing and turn the adjusting screw in to reduce and out to increase the travel. When the correct free travel as detailed is obtained tighten the locknut and continue with the remainder of the adjustment detailed in paragraphs (2) to (4) above.

Commencing numbers of tractors fitted with modified pedal arrangement:

- | | | |
|------|----|-----------------------|
| 3 DL | .. | 771-7004, 772-1940. |
| 4 DM | .. | 787-11504, 792-10761. |

Section G.12

FINAL DRIVE GEAR NUT

A modified final drive gear nut, now fitted to all tractors, has been provided with an additional locking device and is fitted in addition to the present tab washer.

The modified nut is drilled and tapped as shown in Fig. G.25 with a slot cut part of the way through the nut in line with its threads. A $\frac{5}{16}$ in. UNF. set screw is threaded into the nut and, when tightened, locks the drive gear nut to the shaft. The set screw is fitted with a spring washer and locked in position with wire.

The original nut fitted to earlier tractors may be modified as shown in Fig. G.25.

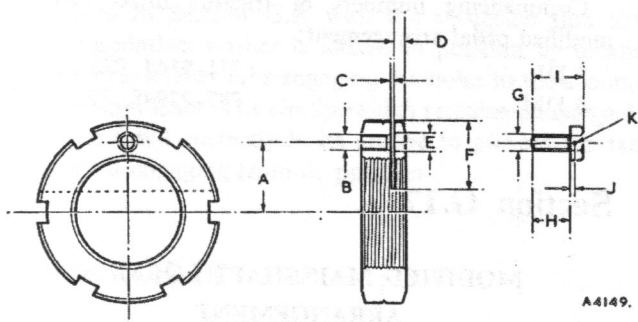


Fig. G.25

A modified final drive gear nut

- | | |
|------------------------------------|------------------------------------|
| A. 1.312 in. (33.34 mm.). | F. 1.250 in. (31.75 mm.). |
| B. $\frac{5}{16}$ in. UNF. thread. | G. $\frac{5}{16}$ in. UNF. thread. |
| C. .062 in. (1.59 mm.). | H. .625 in. (15.87 mm.). |
| D. .187 in. (4.76 mm.). | I. .828 in. (21.03 mm.). |
| E. .343 in. \times .312 in. | J. .080 in. (2.03 mm.). |
| (8.73 mm. \times 7.94 mm.). | K. .062 in. (1.59 mm.). |

Section G.13

GEARBOX TOP COVER SEALING

The gear change lever housing on all tractors is now fitted with a gaiter to seal the housing against the possible entry of dust and dirt.

The lever boss on the top cover has a machined seating for the gaiter and a countersunk machine screw replaces the set screw previously fitted to locate the change lever ball. The gaiter is clipped in position at the bottom.

Section G.14

LOCKING OF DIFFERENTIAL BEARING HOUSING BOLTS

To eliminate the possibility of the final drive gear fouling the locking wire it is essential that the differential bearing housing retaining bolts are wire-locked in the identical manner to that illustrated in Fig. G.26.

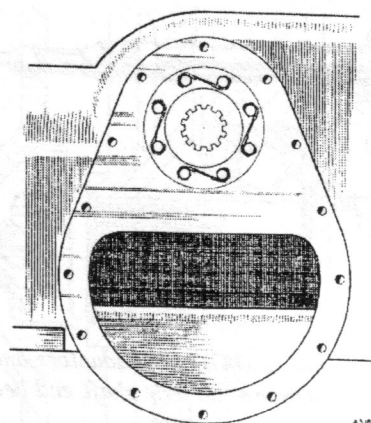


Fig. G.26

The correct wire locking arrangements for the differential housing bolts

Section G.15

CHECKING END-FLOAT ON MODIFIED AXLE SHAFT

With the introduction of a modified axle shaft with involute splines the accommodation washers normally fitted behind the reduction gear are deleted and a revised method of end-float adjustment is required.

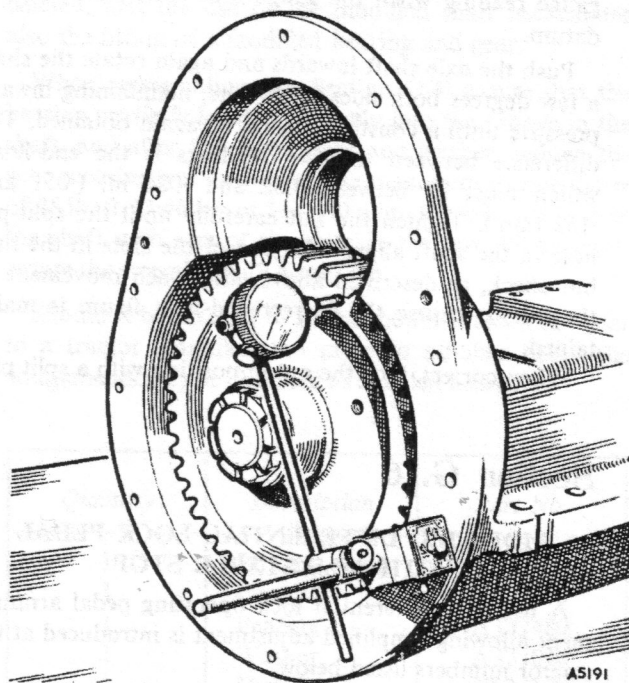


Fig. G.27

Position the foot of the dial gauge on the rim of the final drive gear for checking the axle shaft end-float

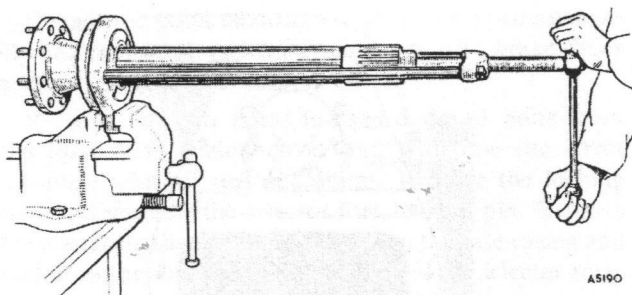


Fig. G.28

Using basic tool 18G47C with adaptors and long legs 18G47AF to remove the axle shaft end bearing inner race

Follow the instructions detailed in Section G.2 as far as assembling the shaft into the axle casing and assembling the inner bearing roller cage and inner race onto the shaft. Then proceed as follows.

Fit the final drive gear onto the shaft and thread on the axle shaft nut. Tighten the nut until approximately .010 to .015 in. (.254 to .381 mm.) end-float is apparent.

Chalk a datum-line across the rim of the final drive gear and fit a dial gauge as shown in Fig. G.27. Grip the axle shaft, pull outwards, and rotate the shaft a few degrees both sides of the datum, still maintaining pressure until a constant reading is obtained. Note the gauge reading when the gauge foot is aligned with the datum.

Push the axle shaft inwards and again rotate the shaft a few degrees both sides of the line, maintaining inward pressure until a constant reading is again obtained. The difference between the two readings is the end-float, which must be between .002 and .006 in. (.051 and .152 mm.). Tighten the nut carefully until the split-pin hole in the shaft aligns with one of the slots in the nut, but check, as described above, after each movement of the nut to ensure the correct end-float figure is maintained.

When correct, lock the nut in position with a split pin.

Section G.16

MODIFIED DIFFERENTIAL LOCK PEDAL WITH ADJUSTABLE STOP

A modified differential lock operating pedal arrangement allowing simplified adjustment is introduced at the tractor numbers listed below.

A pedal to lever connecting rod of fixed length replaces the adjustable rod with fork previously fitted, and an adjustable pedal stop is fitted to the floor plate, replacing the fixed stop fitted previously.

Adjustment is carried out as follows.

Ensure that the $\frac{3}{8}$ in. (9.52 mm.) free travel of the operating lever is present (see Fig. G.24), and correct if necessary by means of the adjusting screw on the axle casing. It is not necessary to disconnect the rod for this adjustment.

Screw in the adjustable stop on the floor plate until a clearance exists between the stop and the pedal with the differential lock **fully** engaged. Screw out the stop until the clearance is taken up and then continue a further half a turn and lock the adjustment.

IMPORTANT.—It must be the pedal stop on the floor plate and not the internal mechanism which limits the extent of differential lock engagement.

Commencing numbers of tractors fitted with the modified pedal arrangement:

3 DL	771-9844, 772-3008.
4 DM..	787-22948, 792-12458.

Section G.17

MODIFIED MAINSHAFT LOCKING ARRANGEMENT

An improved method of locking the gearbox mainshaft is introduced at Gearbox No. T27497.

The arrangement now includes a splined accommodation washer which is turned to lock in an annular groove cut in the mainshaft splines. The accommodation washer is locked in position by a splined tab washer, which is in turn secured by a circlip.

Before refitting a mainshaft incorporating the new locking arrangement the correct accommodation washer must be chosen (five different thicknesses are available)

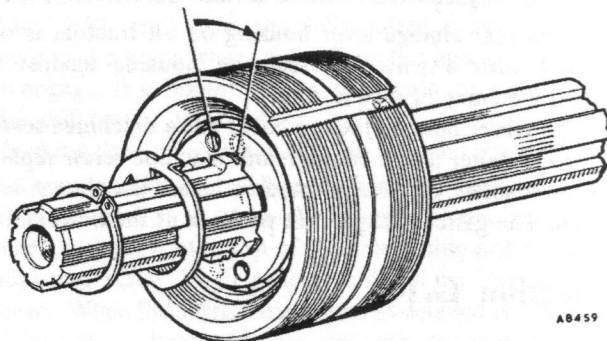


Fig. G.29

The assembly sequence of the mainshaft bearing locking arrangement. The splined accommodation washer is turned on the shaft in the direction indicated in order to lock the bearing

which will allow the minimum of end-float of the mainshaft on the bearing.

With the mainshaft on the bench, slide on the bearing thrust collar and then press on the centre bearing which is to be used in the gearbox so that it is hard against the thrust collar. Slide an accommodation washer onto the shaft and turn it to disengage its splines from those on the shaft. If the accommodation washer cannot be turned on the mainshaft a thinner one must be fitted, or, alternatively, if end-float is present a thicker washer must be fitted.

Dismantle the mainshaft assembly and fit the centre bearing into the transmission casing. The procedure for fitting the mainshaft into the gearbox is the same as described in Section G.9, with the exception that the accommodation washer is locked in position by means of the lock washer tabs engaging the holes in the accommodation washer. The circlip, which remains unchanged, must be fitted correctly in its groove to prevent the tab washer disengaging from its position.

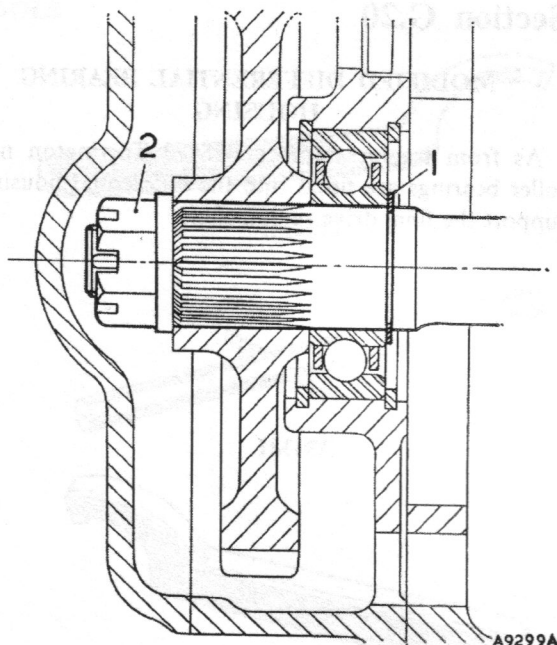


Fig. G.30

The modified power take-off shaft and gear

1. Circlip. 2. Securing nut.

Section G.18

LOCTITE LOCKING PREPARATION

Conventional locking devices cannot always be employed on some parts of the Nuffield Tractor. In such instances a preparation known as Loctite is used during the initial assembly.

It is important, therefore, that when a tractor is serviced in respect of these particular applications, Loctite must be used.

The following application affects parts mentioned elsewhere in Section G, but see also Section Q: the three core plugs (Part No. ATJ7102) in the side of the gearbox casing.

The recommended grade of Loctite is 'AV' and it is important that this grade be used. It may be obtained in bottles (10 c.c. capacity) by quoting Part No. 17H8058.

Section G.19

MODIFIED POWER TAKE-OFF PRIMARY SHAFT AND GEAR

A modified independent power take-off primary shaft and gear is now fitted as from tractor number 51210.

The gear end of the modified shaft is increased in diameter and the bearing shoulder on the original shaft

is replaced by a circlip. The original bearing washer is deleted, and the use of the modified shaft necessitates also the fitting of a modified bearing and gear.

When reassembling (see Section G.4) ensure that the bearing circlip is located correctly into the groove in the shaft, and after fitting the gear and washer, tighten the gear securing nut as near to the maximum torque figure of 25 lb. ft. (3.46 kg. m.) as will align the split-pin hole in the shaft with one of the slots in the nut. When tight, secure the assembly with a split pin.

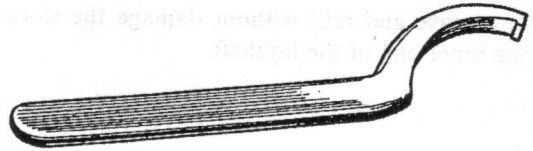
Should it be decided to fit the modified shaft and gear to a tractor manufactured prior to number 51210 the components may be obtained as detailed below.

Quantity	Description	Part No.
1	Primary shaft	ATJ7478
1	Gear	ATJ7479
1	Bearing	ATJ7480
1	Washer	ATJ1048
1	Nut	FNN412
1	Circlip	CNN120
1	Split-pin	CPS0516

SERVICE TOOLS

18G474. Mainshaft Adjusting Spanner

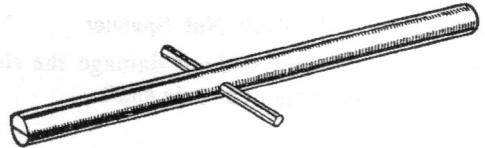
This 'C' spanner is essential for the removal without damage of the gearbox mainshaft centre bearing housing locking rings.



18G474

18G477. Mainshaft Setting Gauge

A gauge which facilitates the setting of the mainshaft pinion without error. The gauge is placed across the forward edge and on the horizontal centre-line of the crown wheel bearing housing holes in the transmission case.

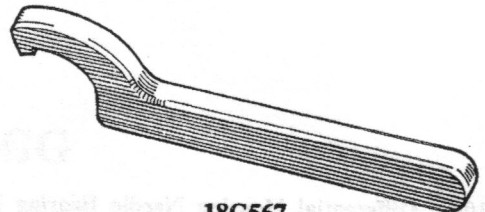


18G477

The pinion position is correct if the pinion face contacts the gauge peg.

18G567. Rear Axle Shaft Nut 'C' Spanner

When dismantling or reassembling an axle assembly the use of this spanner will prevent damage and facilitate the removal or replacement of the axle shaft nut.

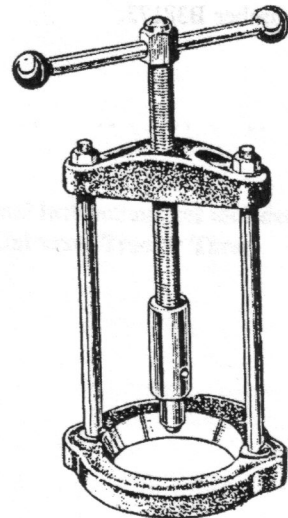


18G567

A1514

18G47C. Differential Bearing Remover

A standardized basic tool which must be used with the appropriate adaptor.

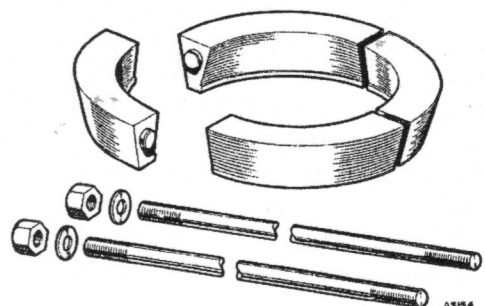


8721

18G47C

18G47AF. Rear Axle Bearing Remover Adaptor

To be used in conjunction with basic tool 18G47C. The short legs of the basic tool are replaced with the long ones from the adaptor set and the split rings placed in position under the rollers of the bearing.

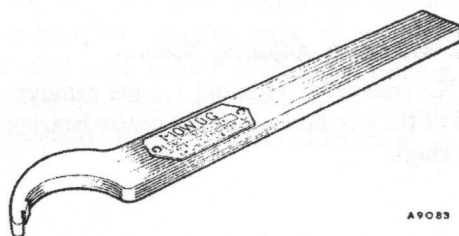


A5184

18G47AF

18G687. Layshaft Nut 'C' Spanner

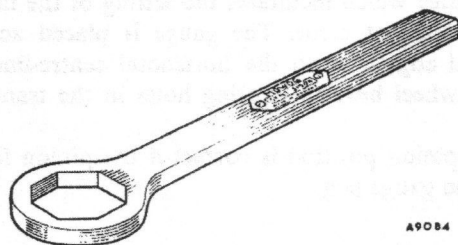
To remove and refit without damage the slotted nut on the inner end of the layshaft.



A9083

18G687**18G686. Rear Axle Shaft Nut Spanner**

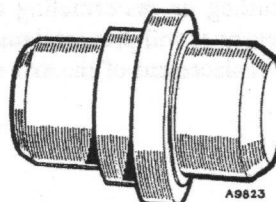
To remove and refit without damage the slotted nut on the inner end of the rear axle shaft.



A9084

18G686**18G1007. Differential Housing Needle Bearing Replacer**

To position correctly the needle roller bearings fitted from tractor number B38173.



A9823

18G1007

Section GG.1

REMOVING AND REPLACING THE AXLE ASSEMBLIES

Before commencing these operations it is advisable to position the tractor parallel to the axle to enable the axle assembly to be supported.

Remove the front axle from the tractor by the front end of the shaft fork from the front of the tractor and the lift rod assemblies from the rear of the tractor.

Remove the front and lift off the drive shaft.

Remove the spring washers and the drive shaft steady brackets to the axle.

SECTION GG

THE GEARBOX AND TRANSMISSION

Axle assemblies

Removing and replacing

Section

GG.1

Section GG applies only to the Universal Tractor Four. Information and instructions not included in this Section are the same as those given in Section G for the Universal Tractor Three

Remove the front axle from the tractor by the front end of the shaft fork from the front of the tractor and the lift rod assemblies from the rear of the tractor.

Remove the front and lift off the drive shaft.

Remove the spring washers and the drive shaft steady brackets to the axle.

Remove the rear axle from the tractor by the rear end of the shaft fork from the rear of the tractor and the lift rod assemblies from the front of the tractor.

Remove the rear and lift off the drive shaft.

Remove the spring washers and the drive shaft steady brackets to the axle.

Remove the two construction-headed screws and the

Section GG.1

REMOVING AND REPLACING THE AXLE ASSEMBLIES

Before commencing these operations it is advisable to position the tractor beneath lifting tackle to enable the axle assemblies to be supported.

Disconnect the forward end of the stabilizers from the hinge pins, remove the front end of the draft links from the link pins, and disconnect the lift rod assemblies from the lift arm swivel pins.

Remove the drawbar pin and lift off the drawbar.

Unscrew the nuts and remove the spring washers and bolts securing both drawbar steady brackets to the axle casing.

Unscrew the self-locking nut and withdraw the clevis pin from the front mounting bracket.

Slacken the nuts and bolts securing the support links to the drawbar frame and to the axle casing. Pull the drawbar frame rearwards to disengage it from the front mounting bracket and lower the front end to the ground. Finally, remove the nuts and bolts from the support links and withdraw the frame from the tractor.

Drain the transmission oil by removing the plug from the base of each axle casing. Use a clean receptacle if the oil is to be used again and make sure that the oil is passed through a filter before it is returned to the transmission casing.

On tractors fitted with a lighting set disconnect the sidelamp cables from the switch. To do this **disconnect the battery**, remove the screws holding the instrument panel in position, and remove the right-hand-side panel and the screw which secures the rear end of the left-hand-side panel. Disconnect and withdraw the sidelamp cables. The left-hand-side panel should remain in position, otherwise the governor control will be disturbed. Remove the bolts which secure the sidelamp cable clips to the transmission casing top cover.

IMPORTANT.—Place blocks between the main frame side-members and the front axle beam to prevent the tractor swivelling at the trunnion when the rear wheels are raised.

Place blocks at the front and rear of the front wheels to restrict movement of the tractor. Jack up beneath the transmission casing to raise the tractor until the rear tyres are clear of the ground and then place supports beneath the axle casings.

Slacken and remove the eight bolts and withdraw the wheels.

Disconnect the brake rods at the rear end.

Remove the two countersunk-headed screws and the

hexagon-headed bolt securing each floor plate. Take care not to lose the packing pieces on the under side.

Unscrew the four bolts which fasten the mudguard to the bracket on the axle casing and lift off the mudguard assemblies complete with floor plates, sidelamps, and cables.

Raise the tractor slightly by the jack until the axle casings are clear of the supports, and then pack up beneath the rear of the transmission casing. Make sure that the tractor is properly supported.

Secure eyebolts in the axle flange holes next to those used for securing the drawbar side-members in position or place a sling around the axle casing.

Support the weight of the axle assembly and remove the bolts which fasten the axle casing flange to the transmission casing. (Note that the two bolts in each flange which pass through the seat support bracket are slightly longer than the others and they should be replaced in the same position.) The power selector lever gate must be detached from tractors fitted with a power take-off shaft to give access to some of the axle casing bolts. Using two of the bolts, screw them into the tapped holes on either side of the axle casing flange. As soon as the bolts come into contact with the face of the transmission casing, turn each bolt alternately half a turn at a time, until the pressure causes the faces to part. Continue turning the bolts half a turn at a time until the axle casing is clear. Withdraw the unit until the drive pinion is clear of the differential assembly and then lift the axle assembly clear.

The method of replacing the axle assemblies is a reversal of the dismantling procedure. Make sure that the casing faces are clean and free from abrasions. If necessary, carefully smooth the faces with the aid of a flat, fine-cut file. Use a new joint seal, placing it in position on the face of the transmission casing. Use a good-quality jointing compound on both joint faces.

To facilitate locating the unit when refitting it is of assistance to make up two guide pins, screwing one into each side of the transmission casing face. Suitable pins can be produced from two pieces of $\frac{7}{16}$ in. (11.1 mm.) diameter steel approximately 6 in. (152.4 mm.) long screwed $\frac{7}{16}$ in. UNF at one end to suit the tapped holes of the transmission casing face and slightly tapered at the other, with a screwdriver slot in the tapered end of the pin to permit easy withdrawal after the unit is in place. (The same guides may be used when refitting power take-off units and hydraulic power units.)

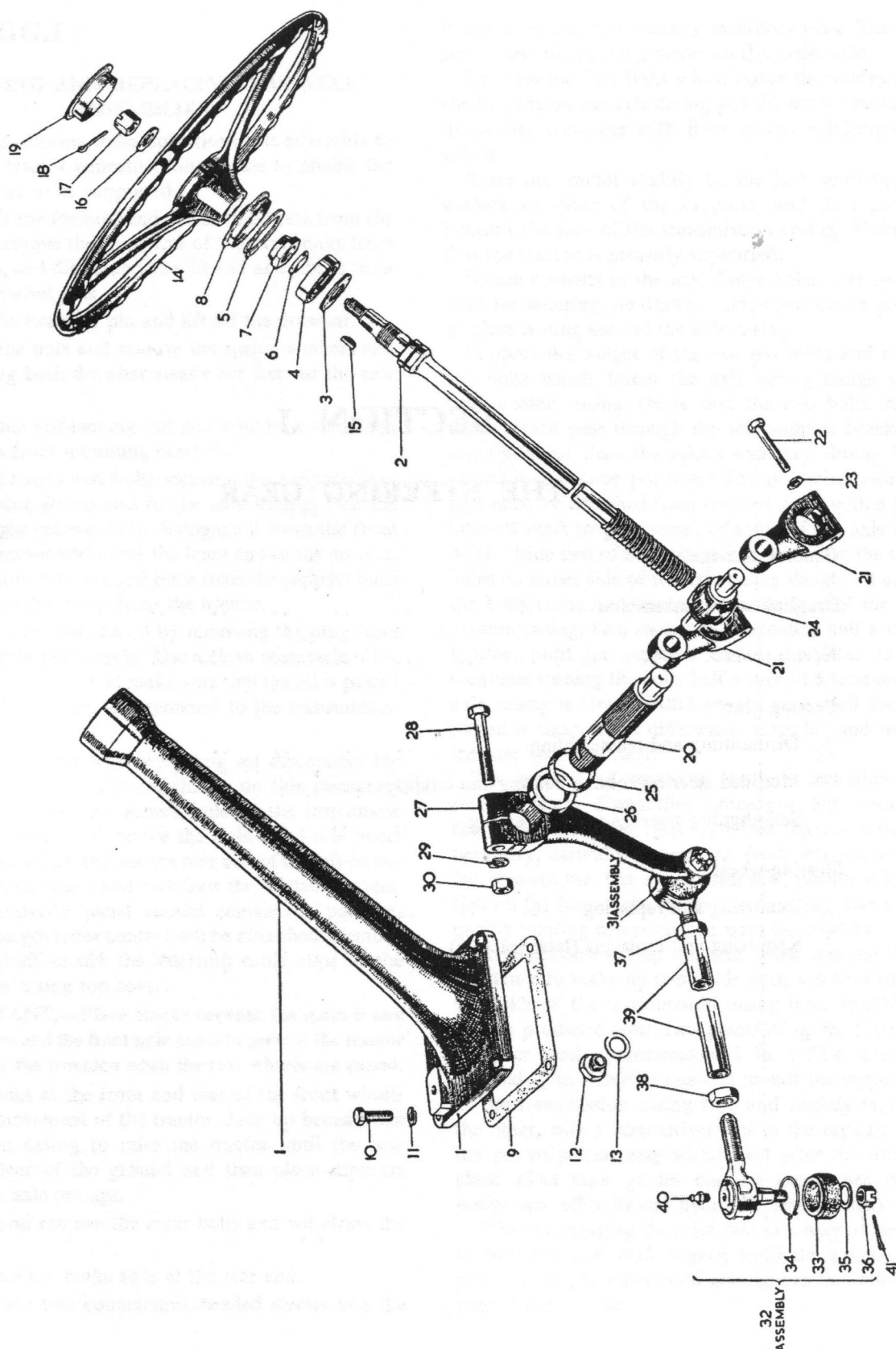
When re-engaging the drive pinion it may be necessary to turn the axle shaft slightly until the splines of the pinion enter the differential gear before the unit can be pushed right home.

SECTION J

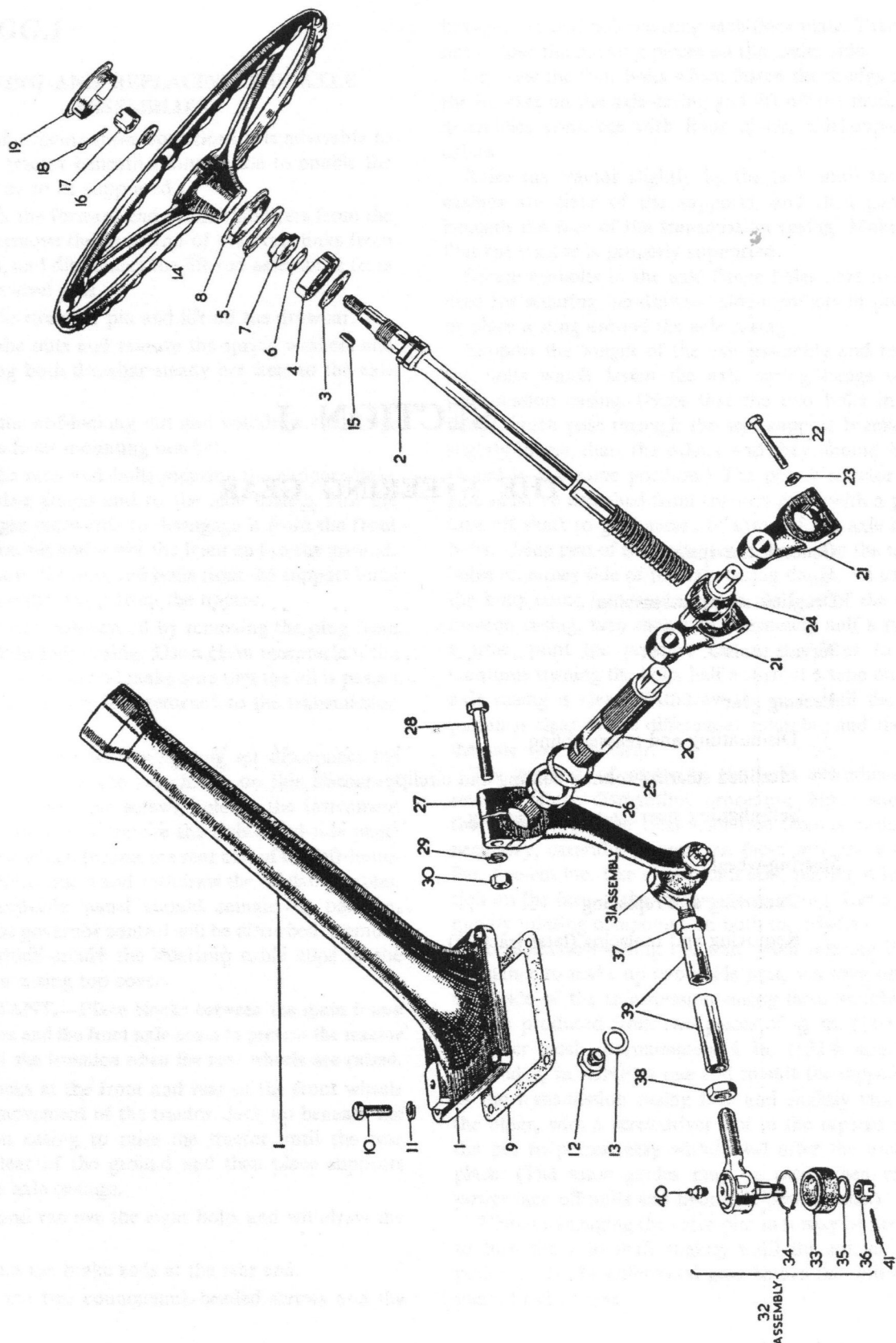
THE STEERING GEAR

General description	Section
Draglink socket assemblies.. .. .	J.3
Service tools	End of Section
Steering gear	
Dismantling and reassembling	J.2
Modified steering-column bearing and circlip	J.4
Self-aligning steering-column bearing	J.5
Steering-wheel	
Removing and replacing	J.1
Removing and replacing (later tractors)	J.6

THE STEERING GEAR COMPONENTS



THE STEERING GEAR COMPONENTS



KEY TO THE STEERING GEAR COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Steering column.	15.	Key.	29.	Washer—spring.
2.	Shaft.	16.	Washer—plain.	30.	Nut.
3.	Seal—rubber (for shaft).	17.	Nut—slotted.	31.	Socket assembly—R/H.
4.	Bearing—shaft.	18.	Split pin.	32.	Socket assembly—L/H.
5.	Circlip.	19.	Cap—wheel.	33.	Boot—rubber.
6.	Washer—Belleville.	20.	Cross-shaft—steering.	34.	Clip.
7.	Nut for shaft.	21.	Lever—trunnion.	35.	Washer.
8.	Cover for column.	22.	Bolt—trunnion lever clamping.	36.	Nut for ball pin.
9.	Joint.	23.	Washer—spring.	37.	Locknut—R/H
10.	Bolt—column to steering housing.	24.	Nut—trunnion.	38.	Locknut—L/H.
11.	Washer—spring.	25.	Seal—oil.	39.	Tube—intermediate.
12.	Steering box drain and filler plugs (two).	26.	Distance piece.	40.	Greaser.
13.	Washer for plug.	27.	Drop-arm.	41.	Split pin for ball pin nut
14.	Steering wheel.	28.	Bolt—drop-arm clamping.		

GENERAL DESCRIPTION

The steering wheel movement is transmitted by means of a worm, integral with the steering shaft, threaded into a trunnion nut at the base of the column through a cross-shaft and steering drop-arm lever to the draglink and track-rod. The worm and trunnion nut are immersed in oil.

The upper end of the steering shaft is mounted in a single-row ball race retained in position by a circlip.

The steering wheel is secured on a tapered seat on the shaft by a key and slotted nut.

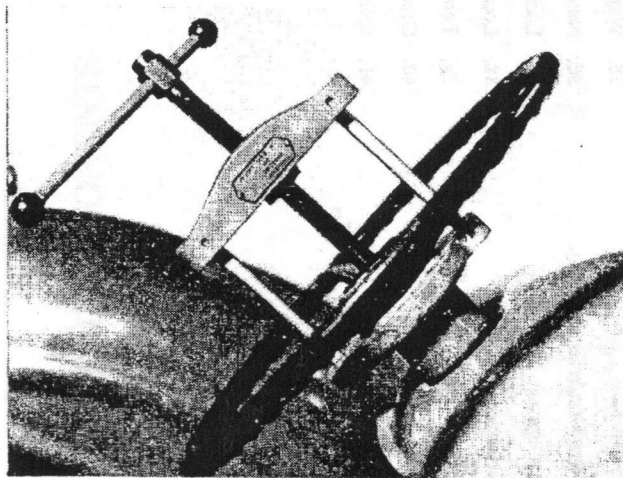


Fig. J.1

Using special tool 18G70 to withdraw the steering wheel from its tapered seat

Section J.1

REMOVING AND REPLACING THE STEERING WHEEL

Prise the centre cap all round until it is free of the wheel. Unlock and remove the nut and flat washer and, using tool 18G70 illustrated in Fig. J.1, withdraw the wheel from its tapered seating. The key may be removed if necessary but is best left in position.

Section J.2

DISMANTLING AND REASSEMBLING THE STEERING GEAR

Disconnect the battery.

Remove the steering wheel (Section J.1).

Drain and remove the fuel tank (Section D.3).

Obtain a suitable clean receptacle, remove the lower plug positioned close to the steering drop-arm lever on the side of the steering housing and drain the oil—approximately 3½ pints (1.84 litres).

Remove the forward fuel tank support bracket from the top of the steering box cover and the clutch housing.

Temporarily refit the steering wheel and take out the bolts securing the steering box top cover.

Raise the cover and turn the steering wheel in an anti-clockwise direction until the shaft is free of the trunnion nut. Remove the cover and column assembly.

Disconnect the draglink from the steering drop-arm lever. Unscrew the nut, remove the spring washer and pinch-bolt and withdraw the lever from the steering cross-shaft.

Unscrew and remove the spring washers and pinch-bolts from both trunnion levers. Draw out the cross-shaft, taking care to avoid damage to the oil seal fitted behind the distance piece.

Lift out the trunnion levers and nut from the steering box.

To dismantle the column shaft and tube assembly secure it in a vice and remove the steering wheel and key. Remove the dust cover from the tube and the circlip and then drive the shaft out with a mallet.

Clamp the column shaft in a vice and take off the bearing nut. Remove the dished washer beneath the nut, noting that the concave side is uppermost with the outer rim contacting the nut; the centre of the washer forms a conical thrust against the inner race of the bearing.

Press the column shaft from the bearing, taking care not to damage the thread. Remove the rubber seal from the shaft.



Fig. J.2

Temporarily refit the steering wheel and turn it in an anti-clockwise direction to free the shaft of the trunnion nut

Reassembly is a reversal of the above procedure. Repack the bearing with grease before refitting it to the column tube.

When refitting the trunnion nut and levers the tapped part of the pinch-bolt holes must be towards the bottom of the housing.

Ensure that the cross-shaft oil seal is in good condition before it is refitted. Fit a new one if the seal lip is at all worn or damaged.

Clean the joint surfaces and position the cover joint seal.

To engage the column shaft with the trunnion nut, replace the steering-wheel and key temporarily and hold the end of the worm against the face of the nut. With the aid of an assistant, turn the steering-wheel clockwise until the worm has entered the trunnion and then lower the cover into position and secure it with the four bolts.

Check that the drain plug is tight and then remove the combined level and filler plug situated above the drain plug. Fill the steering gearbox with transmission oil to Ref. B (page P.6) until the oil level is to the bottom of the level plug hole. Replace and tighten the plug.

After refitting the fuel tank replace the steering-wheel,

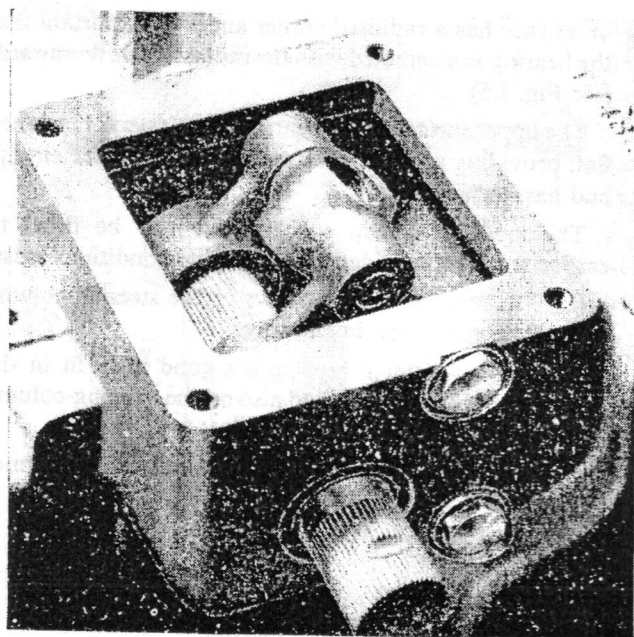


Fig. J.4

The steering cross-shaft, trunnion levers, and nut. Ensure when refitting the levers that the tapped part of the pinch-bolt holes is to the bottom

tighten the slotted nut securely and lock in position with a split pin. Replace the centre cap.

Section J.3

DRAGLINK SOCKET ASSEMBLIES

It is essential that the draglink socket assemblies are fitted to the draglink tube at 90° to each other in order to ensure free operation at all points in the steering range.

After a lengthy period of service the socket assemblies must be checked for wear. The ball pins must be tight enough to prevent end-play yet loose enough to allow free movement. Renew as complete assemblies if necessary.

Examine the rubber dust covers for signs of perishing or cracks, and renew if necessary.

Examine the draglink tube and renew if it is bent or damaged.

Section J.4

MODIFIED STEERING-COLUMN BEARING AND CIRCLIP

A modified steering-column bearing and circlip is now fitted to all tractors. One side of the modified bearing



Fig. J.3

Withdrawing the steering shaft complete with top bearing from the column tube

outer race has a radiused corner and it is important that the bearing is assembled with the radiused side **downwards** (see Fig. J.5).

The upper surface of the bearing outer race is machined flat, providing a larger area to bear against the circlip, and has a sharp corner.

The modified circlip and bearing may be fitted to earlier tractors provided the following conditions exist:

- (1) The annular circlip groove in the steering-column is not damaged in any way.
- (2) The replacement bearing is a good push fit in the bore of the column and also on the steering-column shaft.

New parts must be fitted if these conditions cannot be attained.

Section J.5

SELF-ALIGNING STEERING-COLUMN BEARING

A self-aligning bearing (Part No. ATJ4186) is fitted in the top of the steering-column.

Dismantling and reassembling is in accordance with Section J.2 together with the following procedure.

After fitting a new bearing use the thickest possible circlip to eliminate clearance between the circlip and the bearing. The circlip (Part No. ATJ4192) is available in four sizes ranging from .079 to .088 in. (2 to 2.25 mm.). On assembly pack the bearing with grease to Ref. C.

Fit the bearing over the column shaft with the radiused side downwards. Fit the dished bearing washer and nut. Ensure that the bearing recess and the circlip groove are clean and free from burrs before assembly.

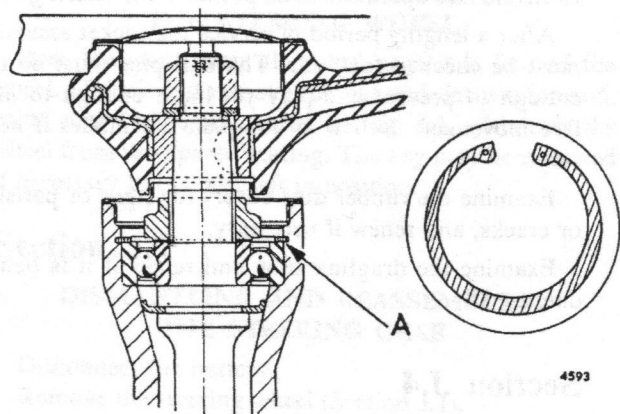


Fig. J.5

The arrow (A) indicates the modified circlip (also shown in the inset). The radiused side of the bearing must be fitted downwards

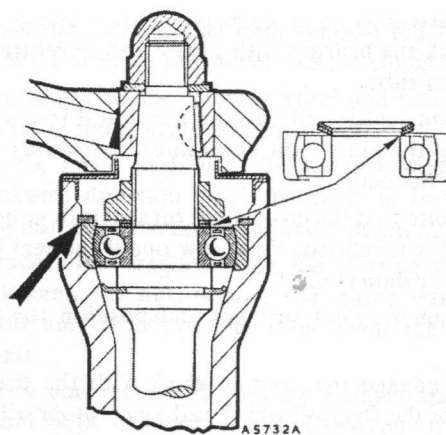


Fig. J.6

The large arrow indicates the square edge of the bearing outer race which must be fitted against the circlip

Press the dust shield into position and fit the steering-wheel, dome nut, and washer. Tighten the dome nut securely.

Section J.6

REMOVING AND REPLACING THE STEERING-WHEEL (LATER TRACTORS)

Prise the centre cap all round until it is free of the wheel. Unscrew the dome nut and extract the spring and plain washers.

Screw the remover adaptor 18G70B onto the column shaft and place the remover 18G70 in position on the wheel. Tighten up the centre screw of the remover until a slight load is imposed upon the wheel and the shaft. A blow with a copper hammer on the head of the centre screw should release the steering-wheel from the taper of the steering-column shaft.

If further dismantling of the steering-column is to be carried out, extract the key from the slot in the column shaft.

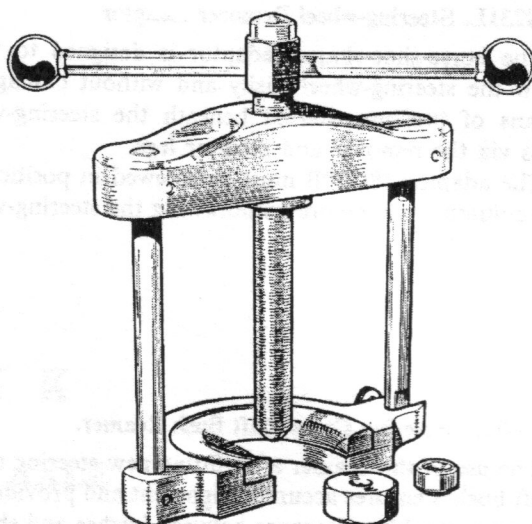
Before replacing the steering-wheel ensure that the taper on the column shaft is clean and free from burrs. Position the steering-wheel over the column shaft aligning the groove in the wheel with the key in the shaft. Position a plain and spring washer over the threaded portion of the shaft and screw on the dome nut. The dome nut must be tightened to a torque figure of 90 lb. ft. (12.44 kg. m.).

Finally, tap the centre cap into position in the steering-wheel hub.

SERVICE TOOLS

18G70. Steering-wheel Remover

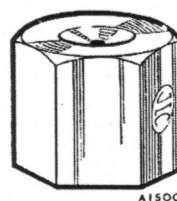
A movable leg enables the tool to be placed quickly into position, and the neoprene buffer is proof against damage to the surface of the wheel. The centre screw incorporates a hardened-steel ball to reduce friction when engaging the adaptor 18G 70 B.



18G70

18G70B. Steering-wheel Remover Adaptor

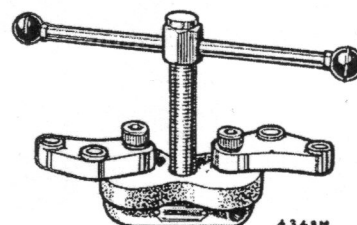
To avoid damage to the steering-column shaft when removing the steering-wheel with remover 18G70. The adaptor must be screwed onto the shaft top.



18G70B

18G231. Gear and Pulley Remover

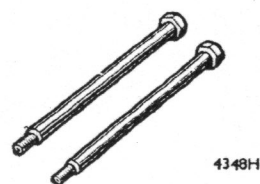
This basic tool used in conjunction with the necessary adaptors will remove the steering-wheel from later-type tractors easily and without damage to the steering-wheel or column shaft.



18G231

18G231B. Gear and Pulley Remover Adaptor Legs

Use in conjunction with remover 18G231 and adaptors 18G231L and 18G70B.

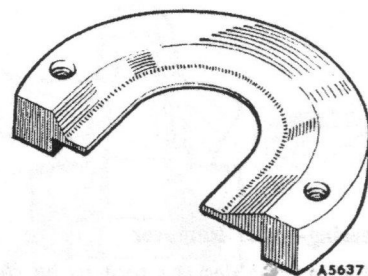


18G231B

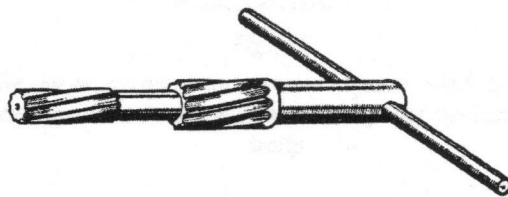
18G231L. Steering-wheel Remover Adaptor

The horse-shoe-shaped adaptor is designed to withdraw the steering-wheel easily and without damage by means of pressure exerted beneath the steering-wheel boss via the remover and adaptor legs.

The adaptor 18G70B must be screwed in position on the column shaft before withdrawing the steering-wheel

**18G231L****18G601. Steering Cross-shaft Bush Reamer.**

The use of this reamer after fitting new steering cross-shaft bushes ensures accurate alignment and provides the necessary working clearance between bushes and shaft.

**18G601**

SECTION K

THE FRONT AXLE

Section

General description

Front axle

Dismantling and reassembling	K.4
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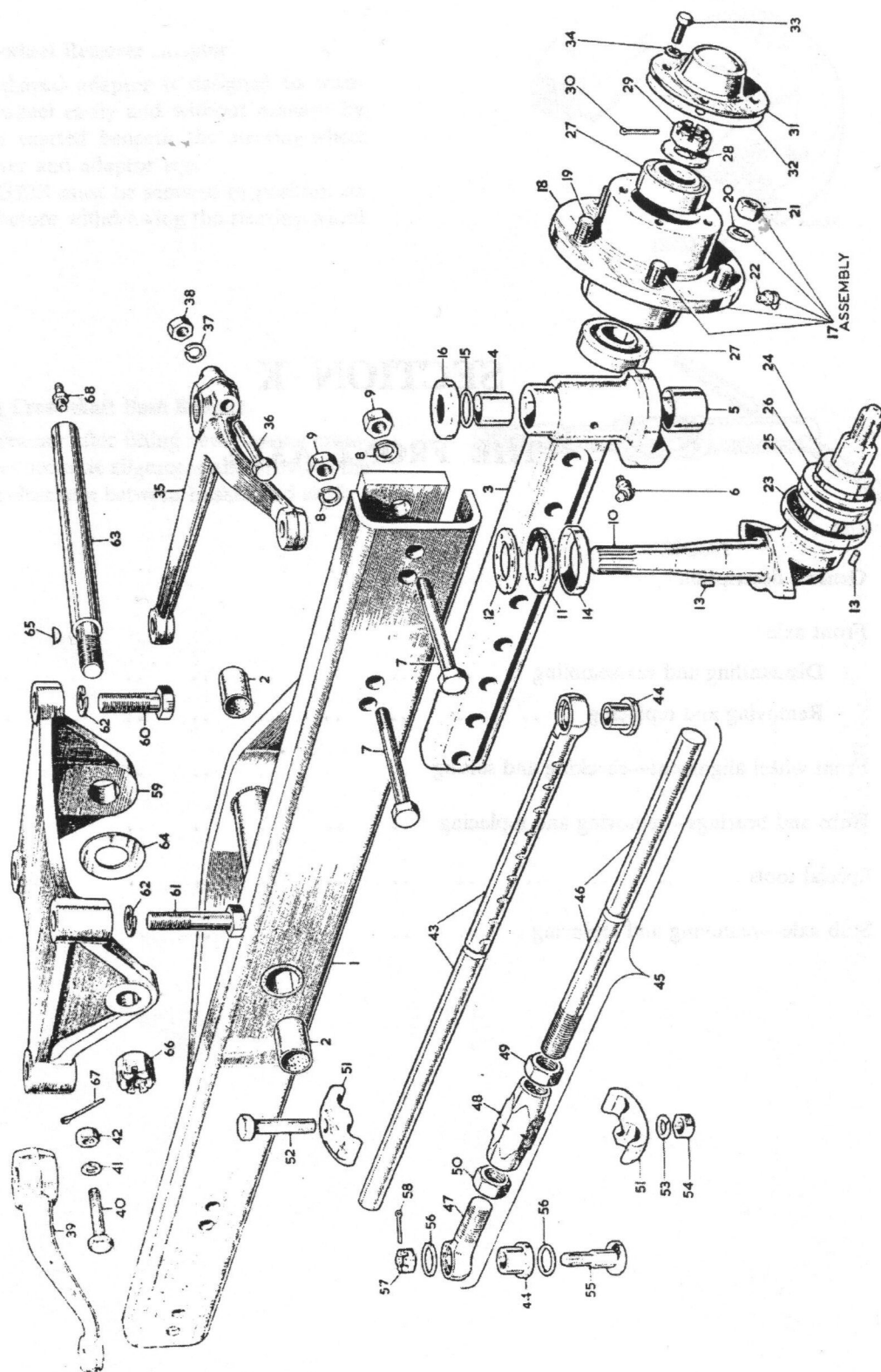
Removing and replacing	K.3
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Front wheel alignment—checking and setting	K.5
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Hubs and bearings—removing and replacing	K.1
--	-----

Special tools	End of Section
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Stub axle—removing and replacing	K.2
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KEY TO THE FRONT AXLE COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Axle beam.	24.	Distance piece.	47.	Bar—joint.
2.	Bush.	25.	Oil seal.	48.	Adjusting nut.
3.	Extending beam.	26.	Washer—oil seal protection.	49.	Locknut—R/H.
4.	Upper bush—small.	27.	Bearing—inner and outer.	50.	Locknut—L/H.
5.	Lower bush—large.	28.	Tongue washer.	51.	Clamp.
6.	Greaser.	29.	Slotted nut.	52.	Bolt.
7.	Bolt.	30.	Split pin.	53.	Spring washer.
8.	Spring washer.	31.	Cap for hub.	54.	Nut.
9.	Nut.	32.	Joint.	55.	Pin—link—track-rod to track-rod lever.
10.	Stub axle—R/H and L/H.	33.	Bolt.	56.	Sealing ring.
11.	Thrust washer—thick.	34.	Spring washer.	57.	Slotted nut.
12.	Thrust washer—thin.	35.	Steering and track-rod lever—R/H.	58.	Split pin.
13.	Pin—washer—location.	36.	Bolt.	59.	Pivot bracket.
14.	Cup—thrust washer retaining.	37.	Spring washer.	60.	Bolt—short.
15.	Sealing ring—top.	38.	Nut.	61.	Bolt—stop—long
16.	Top cover.	39.	Track-rod lever—L/H.	62.	Spring washer.
17.	Front hub assembly.	40.	Bolt.	63.	Trunnion pin.
18.	Hub.	41.	Spring washer.	64.	Distance washer—.120, .150, or .180 in.
19.	Wheel stud.	42.	Nut.	65.	Key.
20.	Spring washer.	43.	Track-rod—R/H.	66.	Slotted nut.
21.	Wheel nut.	44.	Bush.	67.	Split pin.
22.	Greaser.	45.	Track-rod assembly—L/H.	68.	Greaser.
23.	Retaining cup.	46.	Rod—track adjusting.		

GENERAL DESCRIPTION

The axle is mounted on a pivot pin supported in a bracket attached to the front end of the main frame. Large clearances allow 15° of axle rock or a 12 in. (30.5 cm.) difference of wheel level at minimum track.

An extending beam is bolted to each side of the main axle to carry the stub axles, and by using the nine positions available these beams provide a track range varying from 52½ in. (1.34 m.) to 68½ in. (1.75 m.). By reversing the wheel centres on their hubs the tyres are moved outwards by a further 1½ in. (3.1 cm.) on each side, giving a maximum setting of 71½ in. (1.8 m.).

Details of adjustment will be found in Section L.8.

Each hub runs on two taper-roller bearings and these bearings and the removable bushes fitted to the pivot bracket, stub axles and track-rod ends are effectively sealed against the entry of foreign matter.

Section K.1

REMOVING AND REPLACING THE HUBS AND BEARINGS

Support the front of the tractor and, for ease of handling, remove the road wheel by unscrewing the five nuts which secure it to the hub.

Detach the hub cap by removing the four bolts attaching it to the hub.

Withdraw the split pin from the hub retaining nut, unscrew the nut and remove the tongue washer.

The hub, complete with the bearings and oil seal, can then be withdrawn from the axle and the inner race assembly of the outer bearing lifted out. To remove the inner race assembly of the inner bearing, the oil seal and protection washer must be removed. With both inner race assemblies removed, the outer races can be pressed out or tapped out with a hammer and suitable drift.

Before reassembly and replacement of the hub, which is a reversal of the above procedure, note the following points:

Clean all the grease out of the hub and repack it with grease to Ref. C (page P.6). Smear the bearings with grease.

Take care that the distance piece is correctly located by the peg passing through the retaining cup.

Examine the oil seal for damage, and renew it if necessary. Remember to fit the oil seal protection washer into the hub before fitting the seal itself. Smear the lip of the seal with grease and ensure that it is fitted with the lip away from the bearing.

Take care when sliding the assembled hub onto the axle and over the distance piece not to injure the lip of

the oil seal. Push the hub home with a rotary motion to assist the correct fitting of the oil seal.

To adjust the bearings correctly, tighten the hub retaining nut until the hub is locked and then slacken the nut at least one-sixth of a turn. Make sure that the hub turns freely before locking the nut.

Section K.2

REMOVING AND REPLACING A STUB AXLE

Raise the front of the tractor on a jack, place a suitable support beneath the axle, apply the brakes and remove the wheel.

If the stub axle is to be changed, or for some reason is to be completely stripped, the hub bearings should be removed as in Section K.1. It is not necessary to remove the hub merely to renew the swivel pin bushes on the extending axle beam.

Remove the split pin, slotted nut and flat washer from the pin securing the track-rod to the steering lever and withdraw the pin.

Scribe a line across the top of the stub axle and the steering lever to ensure replacement in the same position.

Unscrew and remove the nut and spring washer from the pinch-bolt securing the steering lever to the stub axle.

Prise the steering lever from the stub axle splines and remove the top cover and sealing ring. Withdraw the

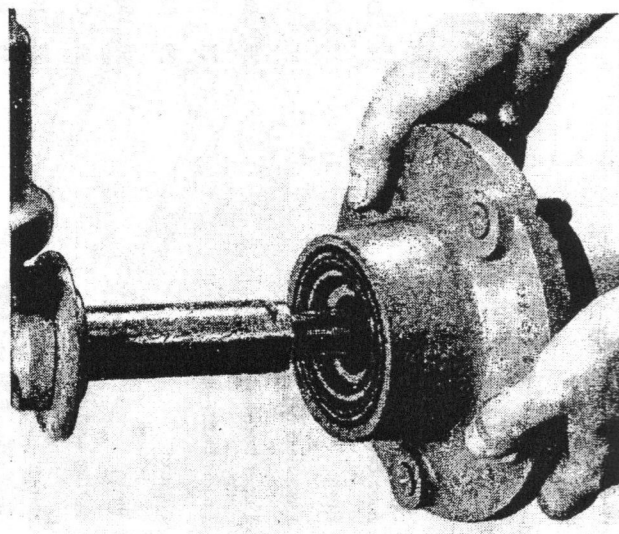


Fig. K.1

When replacing the hub on the axle ensure that the oil seal is fitted with the lip away from the bearing and that it is not damaged as the shaft is engaged

stub axle from the beam. Lift off the thrust washers and retaining cup for examination, and renew if necessary.

Remove the old bushes and press in new ones.

Line-ream the lower bush to 1.625 in. (41.275 mm.) diameter and the upper one to 1.250 in. (31.75 mm.) diameter. A combination reamer (tool 18G478) has been designed for this purpose. The stub axle should be a sliding fit.

Before reassembling the stub axle to the axle beam clean out the space between the swivel pin bushes, taking care that all the swarf from the reaming operation has been removed, and then repack with grease.

Reassembly of the stub axle is a reversal of the above procedure. The lower thrust washers and cup are located by a dowel pin in the stub axle. Ensure that they are correctly located.

When replacing the steering lever on the stub axle make sure that it is replaced on the original splines. The marks made when dismantling must coincide.

Section K.3

REMOVING AND REPLACING THE FRONT AXLE

Disconnect the draglink from the steering lever by tapping the circumference of the steering lever eye smartly with a hammer, supporting the lever against the blow.

Raise the front of the tractor, block up under the frame, and apply the brakes.

Take out the four bolts securing the trunnion bracket

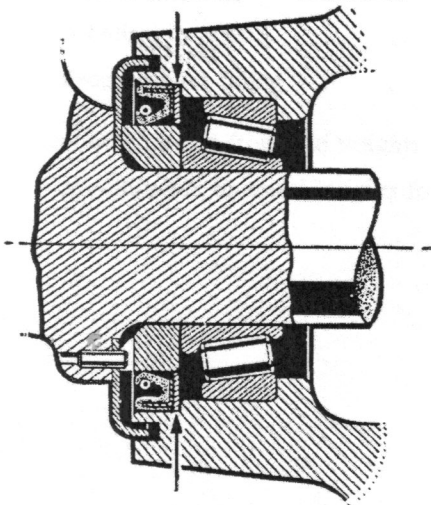


Fig. K.2

A sectional view of a front wheel hub. Note the peg locating the distance piece and retaining cup. The arrows indicate the oil seal protection washer

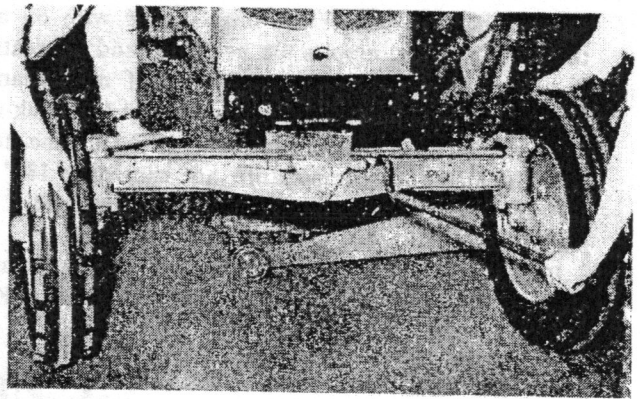


Fig. K.3

Removing the front axle assembly. Take care to prevent the axle beam swinging over centre

to the main frame, taking care not to let the axle swing over centre as the last bolt is removed (see Fig. K.3). Remove the axle complete.

Reverse the foregoing procedure when replacing the axle. Tighten the trunnion bracket bolts securely.

Section K.4

DISMANTLING AND REASSEMBLING THE FRONT AXLE

The front axle can either be removed as a unit, as detailed in Section K.3, and then stripped down or be dismantled in position. The latter method is given below.

Support the front end of the tractor safely on blocks and remove the wheels and hubs as detailed in Section K.1 and the stub axles as in Section K.2.

If necessary disconnect the steering draglink from the right-hand steering lever before removing the lever from the stub axle.

Take out the bolts and withdraw each extending axle beam.

Take out the four bolts and lower the trunnion bracket and axle beam.

Unlock and remove the nut securing the trunnion pin and withdraw the pin forwards. Note the thickness and position of the distance washers fitted between the front face of the trunnion bracket and the axle. These distance washers are available in three sizes—120, 150, and 180 in. (3.05, 3.81, and 4.57 mm.)—to eliminate end-float at this point.

Examine the swivel pin bushes and renew as detailed in Section K.2 if necessary.

Examine the bushes in the steering track-rod, also the rubber sealing rings, and renew if necessary. When fitting new bushes use a hand or hydraulic press and ensure the bushes enter their bores squarely.

The track-rod bushes are impregnated with oil and therefore greasing nipples are not fitted and lubrication is unnecessary in the normal course of maintenance. Every 1,000 hours it is recommended that the track-rod ends are immersed for a minimum period of one hour in oil heated to a temperature not exceeding 180° F. (82° C.). Use one of the engine oils recommended on page P.6.

Reassembly is a reversal of the dismantling procedure. Check the wheel alignment as detailed in Section K.5.

Section K.5

CHECKING AND SETTING FRONT WHEEL ALIGNMENT

The correct alignment of the front wheels is with $\frac{1}{8}$ in. (3 mm.) toe-in, and the setting of the front wheel tracks for row-crop work will not affect the toe-in provided the row-crop settings are carried out correctly (see Section L.8).

Drive the tractor onto a level floor and turn the front wheels to the straight-ahead position.

Adjust the trammel pointers to the height of the wheel centres.

Place the trammel between the wheel rims in front of the axle and adjust it longitudinally so that both pointers

register against the inside rim of each wheel. Mark the rim at the point where the trammel was set.

Move the tractor forwards so that the wheels make exactly half a revolution, thus bringing the marks on the rim to the rear at axle height.

Place the trammel at the rear of the wheels with one pointer registering against one of the rim marks. For the alignment to be correct the other pointer should stand away from its rim $\frac{1}{8}$ in. (3 mm.).

Should it not do so, adjust the track by releasing the two locknuts on the left-hand track-rod and rotating the centre adjusting nut in the required direction until the correct toe-in is obtained. The adjusting nut has a right-hand and left-hand thread to enable this operation to be carried out without the removal of the track-rods.

After making an adjustment, push the tractor backwards and forwards a short distance before checking the track to disperse any stretch or scrub on the tyres which could give a false reading.

Retighten the two locknuts and re-check the toe-in to make sure no alteration has taken place during re-tightening.

If preferred the trammel can be used against the outside edges of the rims if it is long enough to span them, in which case the first measurement must be taken with the trammel behind the axle.

SPECIAL TOOLS

18G478. Stub Axle Bush Reamer

A combination reamer designed to line-ream the upper and lower stub axle bushes to the correct diameter.



18G478

SECTION L

THE WHEELS AND TYRES

Section

Front wheels

Track-setting	L.8
Track-settings with B.S.I. front wheels	L.11
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Rear wheels

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Wheel weights and front-end weights	L.5
Modification to wheel weights for fitting to W12×24 rear wheels	L.10

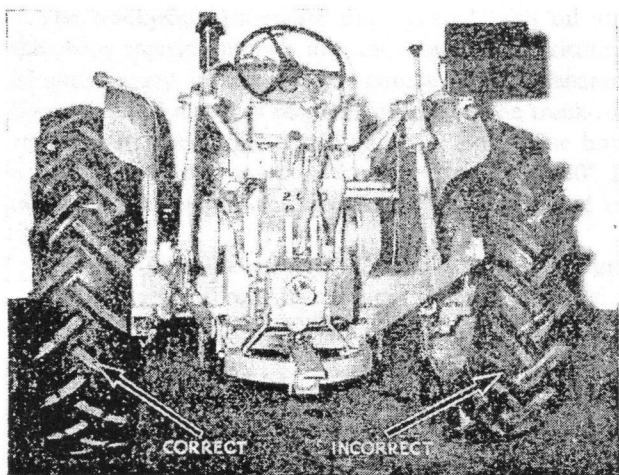


Fig. L.1

The running direction of the tyre tread is important. Here is shown the tyre fitted correctly and incorrectly

Section L.1

TYRE PRESSURES AND VALVES

The pressure at which the tyres are run is most important and the pressures given in 'GENERAL DATA' must be adhered to rigidly.

Do not neglect the pressures until the tyres look as though they need more air.

Use a tyre pressure gauge and check the pressure daily before using the tractor.

Valve caps, in addition to preventing dirt from entering the valve, form a secondary air seal and should always be fitted. The valves may be tested for airtightness by rotating the wheel until the valve is at the top and inserting its end in an eggcup full of water. If bubbles appear the seating is faulty and the valve interior should be removed and replaced by a new one. It is advisable to change the valve interiors every 12 months.

Section L.2

DIRECTION OF TYRE TREAD

When fitting rear tyres, or when wheels have been removed for any purpose, care must be taken to ensure that the correct direction of rotation of the tyres is maintained (see Fig. L.1).

In cases where rear wheel track adjustments are being carried out and reversal of the wheel position is called for, as in ranges 'B' and 'D' of the rear wheel track adjustments, the wheel must be fitted to the opposite side from which it is removed (see Section L.9).

An arrow embossed on the wall of the tyre indicates the direction of rotation. The 'V' formed where the tyre treads meet should point towards the ground on the front portion of the tyre.

If the direction of rotation is incorrect the tyres will tend to clog, thus losing the effectiveness of their grip.

Section L.3

REMOVING AND REPLACING FRONT TYRES

The tyre manufacturers (Messrs. Dunlop Rubber Co.) advise the use of special levers for the removal and replacement of the tyres. The Part Nos. are TL12 (2 levers), TL14 (1 lever), and TL20 (2 levers).

Wires are incorporated in the beads of the tyres. Do not attempt to stretch the beads of the tyre cover over the rim of the flange, as this tends to damage the beads and serves no helpful purpose. Force is unnecessary and may be dangerous.

Fitting or removing will be quite easy if the tyre beads are carefully adjusted into the rim well. If this is found difficult, the operation is not being performed correctly.

Lubrication of the beads and levers with water or a soapy solution will make the fitting and removal easier.

Do not use oil or grease.

Remove the valve cap and core to deflate the tyre and place these parts where they will be free from dirt and grit.

Press each bead in turn off its seat (Fig. L.2), using levers TL12 and working round the tyre in small steps. Two or three circuits of the tyre may be necessary to free the bead completely.

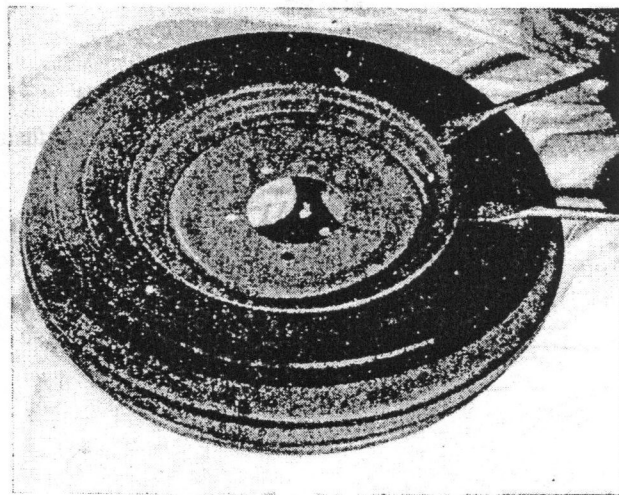


Fig. L.2

Using two levers, press each bead in turn from its seat

Insert a lever at the valve position (Fig. L.3), and while pulling on this lever press the same bead into the well of the rim diametrically opposite the valve position.

Insert a second lever close to the first and prise the bead over the rim flange, holding the removed portion of the bead with the first lever.

Remove one lever and reinsert a little farther away from the first (Fig. L.4). Continue round the bead, proceeding in small steps until the bead is completely off the rim.

Remove the tube from the cover.

Stand the wheel upright (Fig. L.5), insert a lever between the remaining bead and the rim flange, and pull the cover back over the flange. If difficult to remove, maintain the pressure on the lever and tap the bead with a rubber mallet where it passes over the top of the flange.

Replacing a tyre

Place the cover eccentrically over the rim (Fig. L.6) and press the lower bead by hand, as much as possible, into the well of the rim.

Insert a lever as close as possible to the point where the bead passes over the flange (Fig. L.7) and lever the bead over the flange. Repeat until the bead is completely over the flange.

Inflate the tube until it is just rounded out, i.e. filled with air without stretching it. Too much air will make the fitting operation difficult.

Insert the tube in the cover with the valve through the hole in the rim, taking care that the valve, which is fitted in the side of the tube, is on the correct side of the rim.

Press the bead into the well of the rim diametrically opposite the valve, insert a lever as close as possible

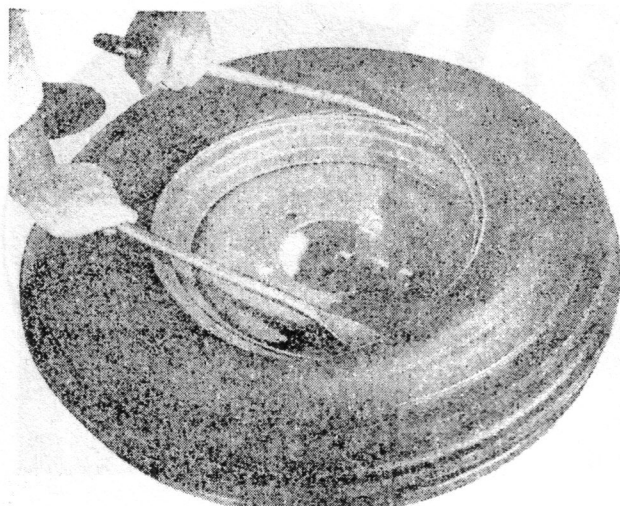


Fig. L.4

Work the bead over the rim with one lever and at the same time hold the removed portion with a second lever

to the position where the bead passes over the flange (Fig. L.8), and lever the bead over the flange. Repeat until the bead is completely over the flange, finishing at the valve position.

Push the valve inwards to make sure that the tube adjacent to the valve is not trapped under the bead. Pull the valve back into position and, during inflation, see that the valve protrudes squarely from the rim. If it does

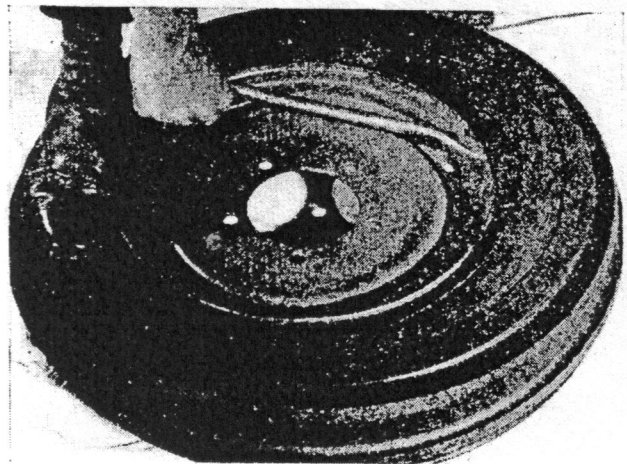


Fig. L.3

Insert the lever at the valve position and, diametrically opposite, press the same bead into the well



Fig. L.5

Removing the remaining bead with one lever

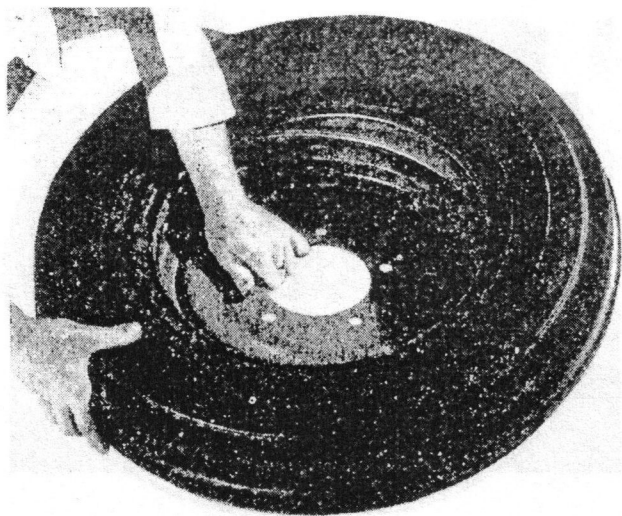


Fig. L.6

The cover placed eccentrically over the rim

not do so, deflate the tyre and adjust the position of the cover and tube on the rim.

Inflate the tyre and check the concentricity of the fitting line on the cover and the top of the flange to ensure that the beads are seated correctly.

Remove the valve core to deflate the tube completely but do not disturb the beads of the cover. Re-inflate to the recommended working pressure. The object of this double inflation is to permit any stretched portions of

the tube to readjust themselves in the cover and relieve any strain in the tube.

Section L.4

REMOVING AND REPLACING REAR TYRES

The first four paragraphs of Section L.3 equally apply when dealing with rear tyres as they do when dealing with front tyres.

Remove the valve cap, core and rim nut, placing these parts where they will be free from dirt and grit.

Press each bead off its seat, using the cranked lever (TL14) and working round the tyre in short steps. Two or three circuits of the tyre may be necessary to free the bead completely (see Fig. L.9).

Insert two spoon levers (TL20) 3 or 4 in. (7 or 10 cm.) apart at the valve position and prise the bead over the rim flange with both levers (Fig. L.10).

Remove one lever and reinsert a little farther away from the first, and again prise the bead over the flange, holding the removed portion of the bead with the first lever.

During these operations the unremoved part of the bead must be kept on the well of the rim (Fig. L.11).

Remove the tube from the cover.

Stand the wheel upright and insert a lever between the remaining bead and the rim flange and pull the cover back over the flange (Fig. L.12). If difficult to remove, maintain the pressure on the lever and tap the bead with a rubber mallet where it passes over the top of the flange.



Fig. L.7

Insert the lever as close as possible to the point at which the lower bead passes over the flange

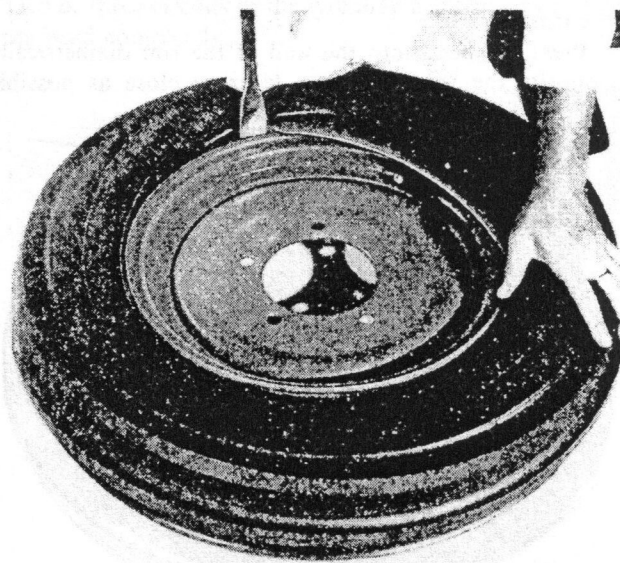


Fig. L.8

Lever the bead over the flange, finishing at the valve position