

may be recognized by the exposed end, which is quite smooth, unlike that of fabricated commutators, from which a metal roll-over and an insulating cone protrude.

A moulded commutator can be reskimmed during service, as described in Section N.5 for the fabricated type, but care must be exercised to ensure that the finished diameter is not less than 1.450 in. (36.83 mm.). If a moulded commutator cannot be completely cleaned up without going below the specified diameter the armature must be renewed.

The insulation between the segments must be undercut to a depth of .020 to .035 in. (.508 to .900 mm.) and a width not exceeding .040 in. (1.02 mm.). It is important to see that the insulating material is cleaned from the sides of each slot to a minimum depth of .015 in. (.381 mm.).

Armature and field coils

Test the armature and field coils in the same manner as described in Section N.5.

To fit new field coils carry out the following procedure:

- (1) Drill out the rivet securing the field coil terminal assembly to the yoke and remove the insulating sleeve from the terminal blade to protect it from the heat of soldering.
- (2) Unsolder the terminal blade and earthing eyelet.
- (3) Continue the procedure detailed in Section N.5.
- (4) After fitting and tightening the new field coils solder the original terminal blade and earthing eyelet to the appropriate coil ends. Refit the insulating sleeve and rerivet the terminal assembly to the yoke.
- (5) Refit the insulation piece behind the junction of the two coils.

SECTION NNN

THE ELECTRICAL SYSTEM

Starter motor

											Section
Removing and replacing	..	..	..	..	..	..	..	..	..	..	NNN.2
Servicing	..	..	..	..	..	..	..	..	..	..	NNN.3
Testing	..	..	..	..	..	..	..	..	..	..	NNN.1

Section NNN.1

TESTING THE STARTER MOTOR

The starter is a Lucas Model M45G, Service No. 26038A. These identification marks are stamped on the yoke. When ordering replacements, always quote these numbers.

Switch on the lamps and operate the starter control. If the lights go dim, but the starter is not heard to operate, an indication is given that current is flowing through the starter windings but that the starter is not rotating. Possibly it is meshed permanently with the geared ring on the flywheel. If the starter pinion has jammed in mesh rotate the squared end of the starter shaft with a spanner. The squared end is usually protected by a push-on cap.

If this is not the cause of the trouble the starter must be removed from the engine for examination.

Should the lamps retain their full brilliance when the starter switch is operated, check that the switch is functioning. If the switch is in order examine the connections at the battery, starter switch, and starter, and also check the wiring between these units. Continued failure of the starter to operate indicates an internal fault in the starter, and the starter must be removed from the engine for examination.

Sluggish or slow action of the starter is usually caused by a poor connection in the wiring which produces a high resistance in the starter circuit. Check as described above.

Damage to the starter drive is indicated if the starter is heard to operate but does not crank the engine.

Section NNN.2

REMOVING AND REPLACING THE STARTER

Disconnect the battery.

To remove the starter release the starter cable from the starter terminal and unscrew the bolts attaching the starter flange to the flywheel housing. The starter can then be withdrawn without difficulty.

Section NNN.3

SERVICING THE STARTER

Examination of commutator and brush gear

Every 12 months or 1,000 hours remove the starter cover band and examine the brushes and the commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the

movement is sluggish remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they no longer bear on the commutator, or if the brush flexible lead has become exposed on the running face, they must be renewed.

Test the brush springs with a spring scale. The correct tension is 30-40 oz. (850-1134 gm.). Fit a new spring if the tension is low.

If the commutator is blackened or dirty clean it by holding a cloth moistened with petrol (gasoline) against it while the armature is rotated by a spanner applied to the square extension of the shaft.

Secure the body of the starter in a vice and test by connecting it with heavy-gauge cables to a 12-volt battery. One cable must be connected to the starter terminal and the other held against the starter body or end bracket. Under these light load conditions the starter should run at a very high speed.

If the operation of the starter is still unsatisfactory the starter should be dismantled for detailed inspection and testing.

Dismantling

Take off the cover band at the commutator end, hold back the brush springs, and take out the brushes from their holders.

Unscrew the nuts from the terminal post.

Take out the two through-bolts and withdraw the commutator end bracket from the yoke.

Remove the driving end bracket complete with armature and drive from the starting motor yoke. If it is necessary to remove the armature from the end bracket it may be pressed out after the drive has been dismantled.

Drive

To dismantle the starter drive from the armature shaft take out the split pin at the end of the drive and hold the squared end of the shaft with one spanner while the square shaft nut is unscrewed. Take off the main spring,

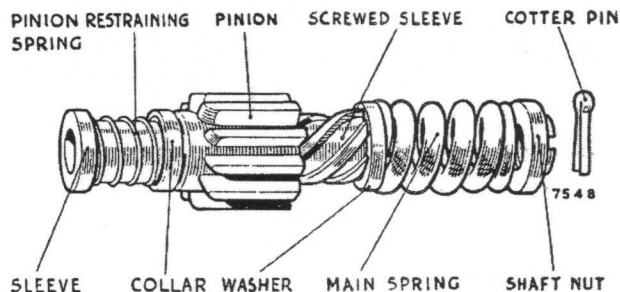


Fig. NNN.1

The starter drive components

washer, screwed sleeve and pinion, collar, pinion restraining sleeve, and sleeve.

NOTE.—If either the screwed sleeve or pinion is worn or damaged they must be replaced as a pair and not separately.

Reassembly of the drive is a reversal of the above procedure.

Commutator

A commutator in good condition will be smooth and free from pits and burned spots. Clean the commutator with a petrol-moistened cloth. If this is ineffective carefully polish with a strip of fine glass-paper while rotating the armature. To remedy a badly worn commutator dismantle the starter drive as described above and remove the armature from the end bracket. Now mount the armature in a lathe, rotate it at a high speed, and take a light cut with a very sharp tool. Do not remove any more metal than is absolutely necessary, and finally polish with very fine glass-paper.

The insulators between the starter commutator segments must not be undercut.

Field coils

The field coils can be tested for an open circuit by connecting a 12-volt battery, having a 12-volt bulb in series in one of the leads, between the tapping points of the field coils to which the brushes are connected. If the lamp does not light there is an open circuit in the wiring of the field coils.

Lighting of the lamp does not necessarily mean that the field coils are in order as it is possible that one of them may be earthed to a pole-shoe or to the yoke. This may be checked with a test lamp connected to one of the

field coil tapping points and to a clean part of the yoke. Should the lamp light, it indicates that the field coils are earthed.

Should the above tests indicate that the fault lies in the field coils they must be renewed.

When renewing field coils, carry out the procedure outlined below, using an expander and wheel-operated screwdriver.

- (1) Remove the insulation piece which is provided to prevent the junction of the field coils from contacting the yoke.
- (2) Mark the yoke and pole-shoes in order that they can be refitted in their original positions.
- (3) Unscrew the two pole-shoe retaining screws by means of the wheel-operated screwdriver.
- (4) Draw the pole-shoes and coils out of the dynamo yoke and lift off the coils.
- (5) Fit the new field coils over the pole-shoes and place them in position inside the yoke. Take care to ensure that the taping of the field coils is not trapped between the pole-shoes and the yoke.
- (6) Locate the pole-shoes and field coils by lightly tightening the fixing screw.
- (7) Insert the pole-shoe expander, open it to the fullest extent, and tighten the screws.
- (8) Finally tighten the screws by means of the wheel-operated screwdriver and lock them by caulking.
- (9) Replace the insulation piece between the field coil connections and the yoke.

Armature

Examination of the armature will in many cases reveal the cause of failure, e.g. conductors lifted from the commutator due to the starter being engaged while the

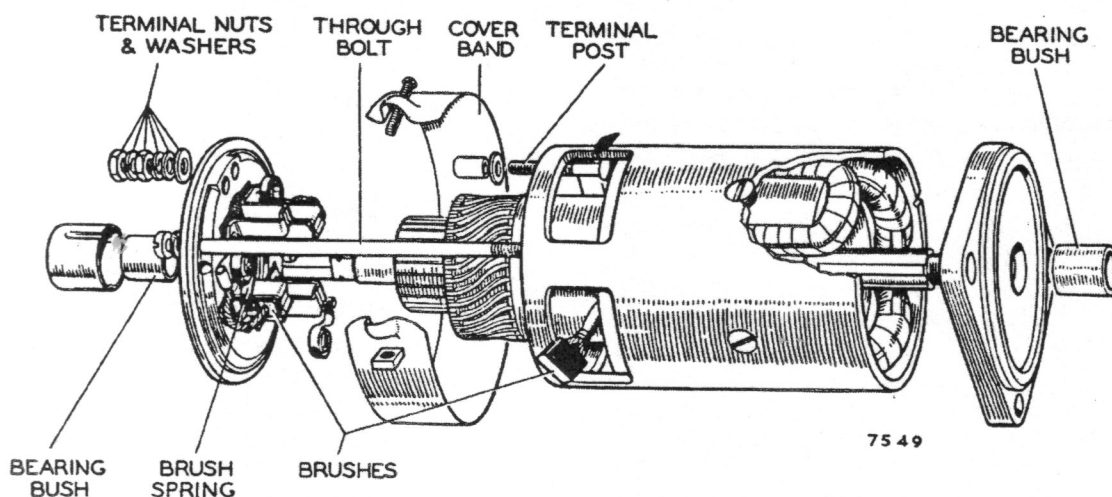


Fig. NNN.2

The components of the starter motor

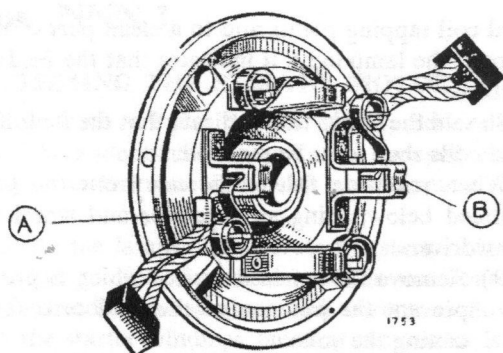


Fig. NNN.3

The starter motor end cover

A. Terminal eyelets.

B. Brush boxes.

engine is running and causing the armature to be rotated at an excessive speed. A damaged armature must in all cases be renewed—no attempt should be made to machine the armature core or to true a distorted armature shaft.

Bearings (commutator end)

Bearings which are worn to such an extent that they will allow excessive side-play of the armature shaft must be renewed. To replace the bearing bushes proceed as follows.

Press the new bearing bush into the end bracket, using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearing.

NOTE.—The bearing bush is of the porous phosphor-bronze type, and before fitting, new bushes should be allowed to stand completely immersed for 24 hours in thin engine oil in order to fill the pores of the bush with lubricant. This period may be shortened two hours by heating the oil to 100° C. (212° F.).

Reassembly

The reassembly of the starter is a reversal of the operations described in this Section.

SECTION O

DRAWBAR

Section

Drawbar (first type)	..	..	..	..	..	..	..	..	..	..	0.1
Extension (first type)	..	..	..	..	..	..	..	..	..	..	0.2
Modification to provide alternative draft link pivots	..	..	..	..	..	..	..	..	..	..	0.5
Removing and replacing	..	..	..	..	..	..	..	..	..	..	0.3
Modified drawbar and frame with alternative draft link pivots	..	..	..	..	..	..	..	..	..	..	0.4

Section O.1

DRAWBAR
(First Type)

The drawbar can be set in either of two positions on the quadrant to make hitch points available at the heights given below.

For a given drawbar pull, raising the hitch point causes an increased weight transference from the front to the rear wheels, therefore the lowest practicable hitch point on the drawbar should always be selected when operating trailed implements or other drawbar-mounted equipment.

A high hitch point, while improving rear wheel adhesion, introduces a very serious risk of rearing, particularly if the clutch is engaged sharply or the throttle opened quickly. Should the front wheels leave the ground the clutch must immediately be disengaged.

The drawbar may swing freely or have its movement restricted by means of pins. The maximum swing at the hitch point from the centre to either side is $9\frac{1}{2}$ in. (241.3 mm.).

Section O.2

DRAWBAR EXTENSION
(First Type)

A drawbar extension is available and is for use with trailed implements driven from the power take-off shaft.

The extension, which bolts onto the main drawbar, extends the hitch point rearwards 8 in. (203.2 mm.) and increases the hitch point swing to 14 in. (355.5 mm.) each side.

The use of a hitch point too far to the rear increases the risk of 'jack-knifing' when cornering or braking suddenly with a heavy trailer coupled to the drawbar. For normal trailer work the drawbar itself should be used whenever possible and not the extension.

The alternative hitch point heights for the Universal Three model with and without the drawbar extension are given below.

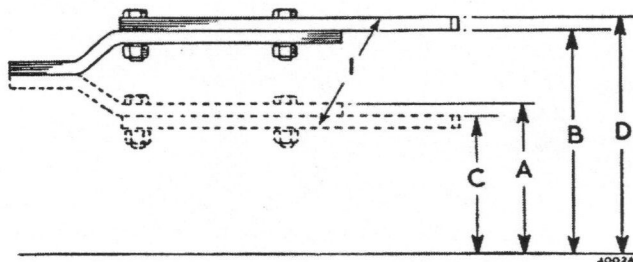


Fig. O.1

Heights of the first-type drawbar on the 3 DL tractor with and without extension (1)

	Without drawbar extension		With drawbar extension	
	A Min. height	B Max. height	C Min. height	D Max. height
With 10.00—28 tyres				
in. mm.	13 330	16 $\frac{3}{8}$ 416	12 $\frac{3}{8}$ 320.6	16 $\frac{3}{4}$ 425.4
With 11.00—28 tyres				
in. mm.	14 355.6	17 $\frac{3}{8}$ 441.3	13 $\frac{3}{8}$ 346	17 $\frac{3}{4}$ 466.7

Section O.3

REMOVING AND REPLACING THE DRAWBAR
AND DRAWBAR FRAME
(First Type)

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 strap assembly.

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.

Reassembly is a reversal of the instructions above.

Section O.4

MODIFIED DRAWBAR AND DRAWBAR FRAME
WITH ALTERNATIVE DRAFT LINK PIVOTS

The modified drawbar incorporates a reversible double-jawed hitch bracket, which can be quickly inverted by removing the self-locking pivot pin, giving a choice of six hitch-point heights. Use the following tables in conjunction with the accompanying diagram for the full range of drawbar heights.

Lateral swinging of the drawbar over the quadrant can be limited by stop pins.

With 10-00—28 tyres						
Without extension	A	B	C	D	E	F
in.	8 $\frac{3}{8}$	10 $\frac{1}{4}$	12 $\frac{1}{2}$	15 $\frac{1}{4}$	17 $\frac{1}{8}$	19
cm.	21	26	31	39	43.5	48
With extension						
in.	8	9 $\frac{1}{2}$	11	16 $\frac{1}{4}$	17 $\frac{3}{4}$	19 $\frac{1}{4}$
cm.	20	24	27.9	40.4	45	45.6

When using 11-00—28 tyres increase the above figures by 1 $\frac{1}{4}$ in. (3.5 cm.).

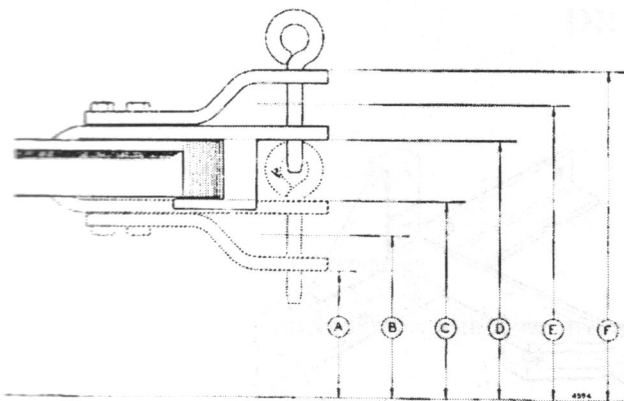


Fig. O.2

Use this diagram of drawbar heights in conjunction with the tables given above

Alternative draft link pivots

An alternative draft link pivot is also made available with the modified drawbar (see Fig. O.3), thus providing the choice of two hitch-point heights for ploughs and other drawn implements.

When ploughing hard, dry ground use the lower draft link pivot to increase the penetration of the plough.

Should there be a tendency for the tractor wheels to slip when ploughing soft ground, connect the draft links to the upper pivot; this will transfer more weight from the plough to the tractor and provide better traction.

To raise the height of the draft link pivot first remove the linchpins from the draft link pivots and check strut brackets on each side. Remove the lift-rod connecting pins and withdraw both draft links.

Unscrew the nut securing each draft link pivot and drive out (towards the outside) the pivot pins, replace them in the upper holes in the frame, and fit and tighten both the nuts.

The check strut bracket on each side must be repositioned on top of the axle casing flange, retaining the same relative position. This is important, for should the

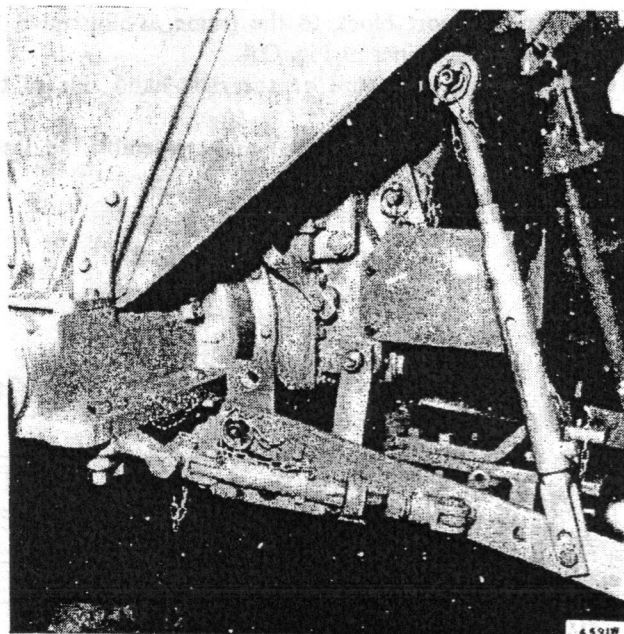


Fig. O.3

The draft link pivot and check strut bracket is here shown in the lower position. Illustrated in dotted white outline is the pivot and bracket in the upper position

bracket be left in the lower position whilst the upper hitch-point is used, damage could be caused to the linkage.

Reconnect the draft links, check struts, and lift-rods.

Removing and replacing the drawbar frame

Instructions for removing and replacing the later-type drawbar are the same as those detailed in Section O.3.

Section O.5

MODIFICATION TO FIRST-TYPE DRAWBAR TO PROVIDE ALTERNATIVE DRAFT LINK PIVOTS

The first-type drawbar on 3 DL tractors may be modified to provide an alternative draft link pivot or hitch-point as follows.

Remove the drawbar frame as detailed in Section O.3.

Remove the draft link pivot pin from the drawbar frame, right-hand side, and assemble it into one of the support blocks.

Position the support block on the left-hand side of the drawbar frame as shown in Fig. O.4. The step in the base of the support block (illustrated by the dotted line in the inset of Fig. O.4) will prevent incorrect assembly. The two pivot pins must be parallel and have a measurement of 2 $\frac{3}{4}$ in. (69.85 mm.) between centres.

Clamp the support web in position and fillet-weld the

Paint the parts after welding and reassemble the draw-bar frame to the tractor.

Hitch-point support web	..	ATJ6045 (R.H.)	1 off
Hitch-point support web ([B] in illustration)	.. ..	ATJ6046 (L.H.)	1 off
Hitch-point support block ([A] in illustration)	.. ..	ATJ6047	2 off



An early-type 3 DL drawbar modified to provide an alternative draft link pivot, giving the choice of two hitch-point heights

- B. Hitch point support web (L.H.).

SECTION P

LUBRICATION

Section

Every day or every 10 hours	..	..	..	..	..	..	..	..	..	..	P.1
Engine											
Transmission											
Air cleaner											
Front axle											
Every 50 hours	..	..	..	..	..	..	..	..	..	..	P.2
Air cleaner											
Clutch cross-shaft and linkage											
Brakes											
Every 200 hours	..	..	..	..	..	..	..	..	..	..	P.3
Engine											
Oil filter											
Steering box											
Dynamo											
Every 400 hours	..	..	..	..	..	..	..	..	..	..	P.4
Fan and water pump hub											
Oil filter											
Every 1,000 hours	..	..	..	..	..	..	..	..	..	..	P.5
Transmission											
Pump suction filter											
Recommended lubricants	..	..	..	..	..	..	..	..	..	..	P.6

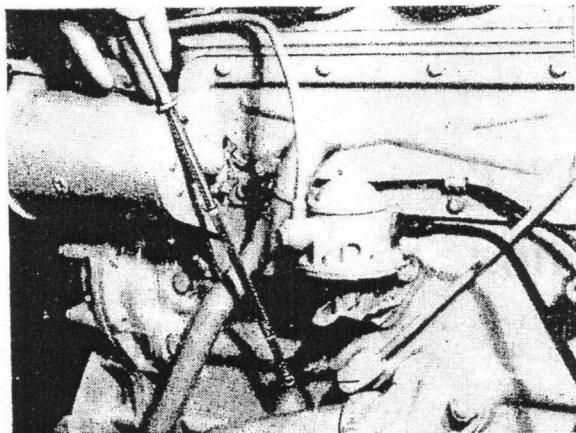


Fig. P.1

The oil level indicator dipstick is on the left-hand side of the engine

Section P.1

EVERY DAY OR EVERY 10 HOURS

ENGINE (A)

Check the level of oil in the engine sump.

With the tractor standing on level ground and the engine stopped, pull out the dipstick situated on the left-hand side of the engine, wipe it with a clean rag, reinsert it fully, and then withdraw it again. The mark made by the oil will now indicate the level. There are two marks on the dipstick and the oil level must never be allowed to fall below the lower mark.

The oil filler tube extends through the bonnet centre panel and is sealed by a snap-on cap.

Use one of the oils to Ref. A (page P.6).

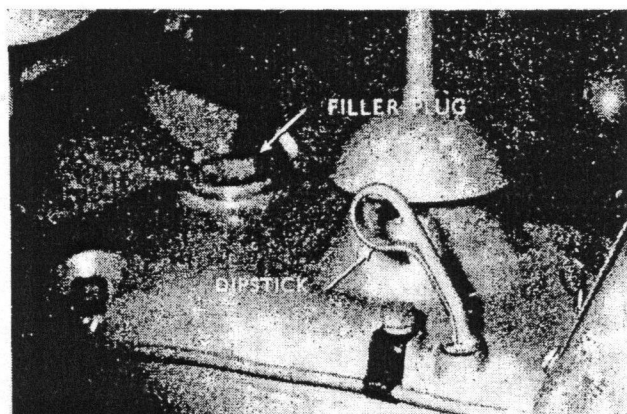


Fig. P.2

The oil filler and dipstick for the transmission casing are situated in the gearbox cover

Use of detergent oils

When lubricating oils of the fully detergent type are to be used, care must be taken to ensure that they are not mixed, either inside or outside the engine, with oils of other grades.

If a detergent oil is to be used adopt the following procedure to ensure that all traces of the previous lubricant are removed:

- (1) Drain all existing oil while the engine is hot.
- (2) Fill the crankcase to just over the lower mark on the dipstick with new oil; run the engine for 10 minutes at 1,000 r.p.m.
- (3) Drain the crankcase and change the oil filter.
- (4) Fill the crankcase with new oil; run the engine for one day only.
- (5) Drain the crankcase, fit a new oil filter element, and refill the crankcase with new oil.
- (6) Carry on with normal routine operation.

TRANSMISSION (B)

Check the level of oil in the transmission.

The transmission dipstick and filler plug are situated on top of the gearbox (see Fig. P.2). The correct level of the oil is indicated by a mark on the dipstick, and the oil capacity is 12 gallons (54.5 litres). Never allow the level to fall so low that there is no reading on the dipstick.

Use one of the oils to Ref. B (page P.6).

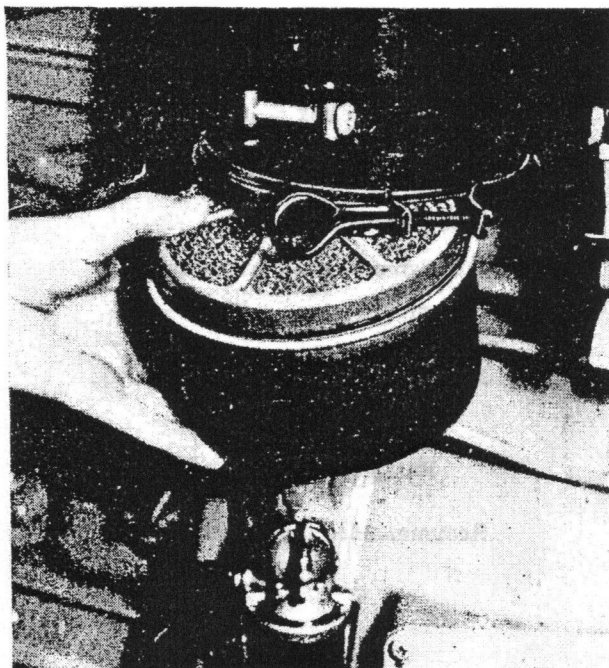


Fig. P.3

The air cleaner bowl is released by unscrewing the clamp screw

AIR CLEANER (A)

When working in dusty conditions change the oil in the air cleaner (change twice daily if working in extreme conditions).

To remove the bowl support the under side, unscrew the clamp screw on the right-hand side of the cleaner, and lower the bowl.

Drain off the old oil from the filter bowl, swill out any sediment with paraffin (kerosene), wipe clean, and refill with engine oil to Ref. A (page P.6). 1½ pints of oil are required to attain the correct level up to the ridge inside the bowl.

FRONT AXLE (C)

The following grease points must receive two strokes of a grease gun filled with grease to Ref. C (page P.6):

Draglink

One grease nipple at each end, requiring two strokes of the grease gun daily (Fig. P.4).

Stub axles

One grease nipple on each axle beam for the stub axle swivel pin, requiring two strokes daily. (It is desirable to jack up the axle when doing this.) (Fig. P.4.)

Front wheel hubs

One grease nipple on each hub, requiring two strokes daily (Fig. P.4).

Trunnion bearing

One grease nipple, requiring two strokes daily (Fig. P.4).

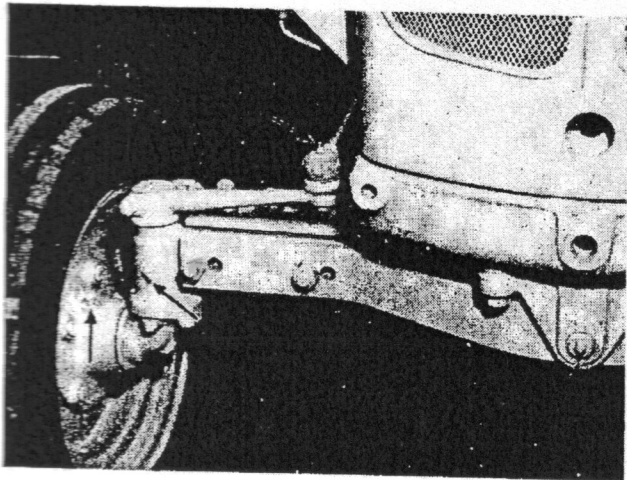


Fig. P.4

The front axle lubrication points on the right-hand side

For a complete summary of attention to be given daily or every 10 hours see 'GENERAL INFORMATION', page 15.

Section P.2**EVERY 50 HOURS****AIR CLEANER (A)**

Remove and clean out the air cleaner bowl as detailed in the previous column.

Unscrew the hose clip and withdraw the hose. Unscrew the air cleaner securing strap and remove the cleaner from the tractor. Clean the filter gauze in petrol (gasoline) to remove any deposit and dry thoroughly. Should the gauze be entirely blocked by chaff, etc., the complete air cleaner must be renewed.

The time for cleaning the air cleaner depends on the operating conditions. Under extreme dusty conditions the oil bath must be cleaned and re-oiled twice daily.

CLUTCH CROSS-SHAFT AND LINKAGE

Oil the exposed working points of the linkage with a few drops of lubricant. Occasionally remove the inspection cover and lubricate the pin joint on the clutch operating rod.

The hand-operated clutch unit fitted to some tractors should be greased at the nipple provided with grease to Ref. C (page P.6).

BRAKES

Lubricate the exposed working points of the linkage with a few drops of oil, and on tractors fitted with a hand brake apply a grease gun filled with grease to Ref. C (page P.6) to the nipple on the brake pedal cross-shaft.

For a complete summary of attention to be given every 50 hours see 'GENERAL INFORMATION', page 15.

Section P.3**EVERY 200 HOURS****ENGINE (A)**

Drain the oil from the engine sump.

This operation is best carried out when the engine is warm and the oil less viscous than when the engine is cold. Remove the drain plug, which is on the left-hand side of the sump, and allow the oil to drain.

Clean and replace the drain plug and refill the sump with a correct grade of oil to Ref. A (page P.6) through the oil filler, taking particular care that the container used is clean.

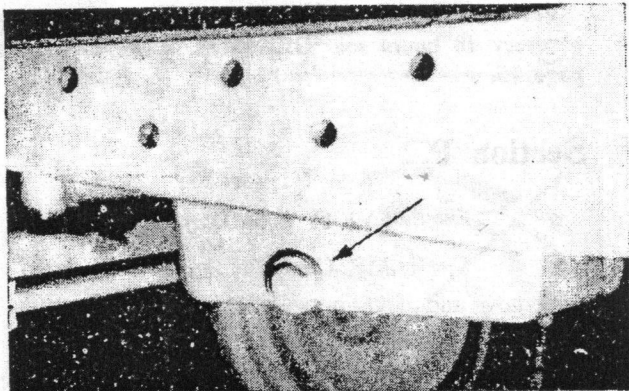


Fig. P.5

The location of the sump drain plug on the left-hand side of the engine

The oil filler tube extends through the bonnet centre panel and is sealed by a snap-on cap.

With the sump drained, the engine oil filter primed with oil, and the tractor standing on level ground, the quantity of oil required to bring the level to the 'HIGH' mark on the dipstick is 14 pints (8 litres).

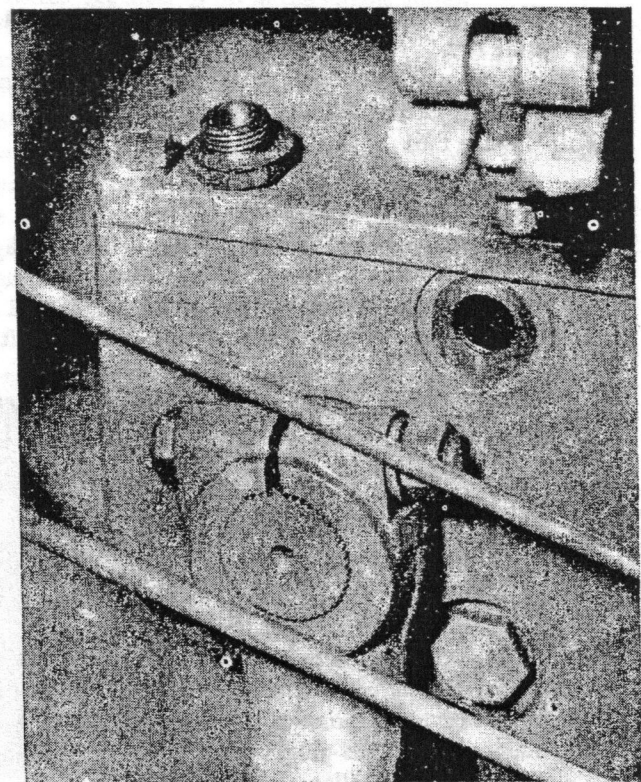


Fig. P.6

The steering gearbox combined filler and level plug and the drain plug

OIL FILTER

Release the external oil filter bowl (see Section P.4), place the element aside, and wash out the bowl in paraffin (kerosene). Replace the element and refit the filter bowl to the engine.

STEERING BOX (B)

Check the level of oil in the steering box.

Remove the combined level and filler plug and check that the level of oil is to the bottom of the level plug hole. Replenish if necessary with clean transmission oil (Ref. B, page P.6) until the level is correct.

DYNAMO (A)

Remove the rubber plug and add **two drops** of engine oil to the central hole in the rear end of the dynamo. Replace the plug.

For a complete summary of attention to be given every 200 hours see 'GENERAL INFORMATION', page 15.

Section P.4

EVERY 400 HOURS

FAN AND WATER PUMP (D)

Give two strokes of the oil gun filled with oil to Ref. D (page P.6) to the fan and water pump hub nipple. Do not overlubricate.

OIL FILTER

Renew the paper-type element in the oil filter mounted externally on the right-hand side of the engine.

To remove the element unscrew the bolt on the lower end of the cover and lower the bowl. Take out the element and wash out the bowl with paraffin (kerosene). Fit the

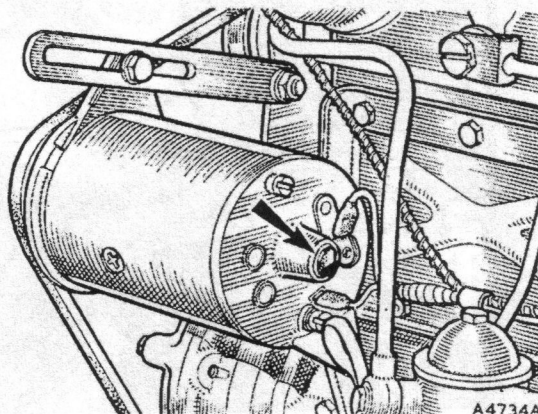


Fig. P.7

The arrow indicates the oil hole in the rear end of the dynamo accessible when the rubber plug is removed

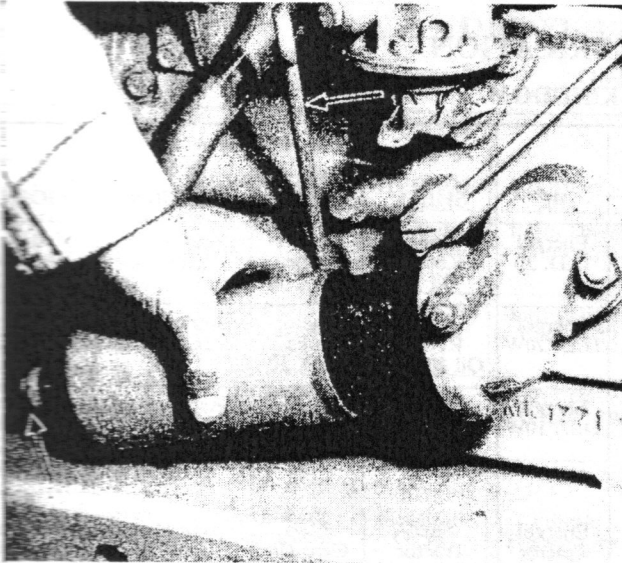


Fig. P.8

The arrows indicate the oil level dipstick and the bolt which must be unscrewed to release the oil filter bowl

new element in the bowl and ensure that the bowl seats evenly on its packing washer as the securing bolt is tightened.

Run the engine for a few minutes. Stop the engine and, after allowing time to settle, check the engine oil level and replenish to the high mark if necessary.

For a complete summary of attention to be given every 400 hours see 'GENERAL INFORMATION', page 15.

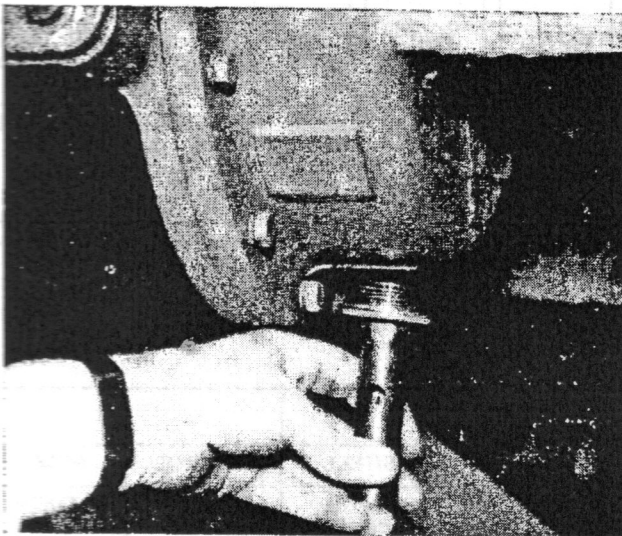


Fig. P.9

Withdrawing the right-hand axle casing drain plug

Section P.5

EVERY 1,000 HOURS

TRANSMISSION (B)

Drain the oil from the transmission.

Remove the two drain plugs, one each side, at the bottom of the axle casing and allow the oil to drain.

Drain the transmission oil only after the tractor has been in use for several hours, since the oil is then warm and will drain more readily.

Clean and replace the two drain plugs, remove the filler plug from the gearbox top, and fill with oil to Ref. B (page P.6). Unscrew the filler plug with the hexagonal tube spanner provided in the tool kit.

Wait a minute or two before checking the oil level with the dipstick to allow the oil to find its correct level.

PUMP SUCTION FILTER

(Hydraulic Power Unit)

Normally the suction filter need only be inspected when the transmission oil is changed and it can then be cleaned if necessary. The plug through which the suction filter may be withdrawn is shown in Fig. P.10.

The filter element is attached to the plug, and if necessary it must be cleaned in petrol (gasoline) and dried thoroughly before being replaced. On no account use rag to clean the element.

For a complete summary of attention to be given every 1,000 hours see 'GENERAL INFORMATION', page 16.

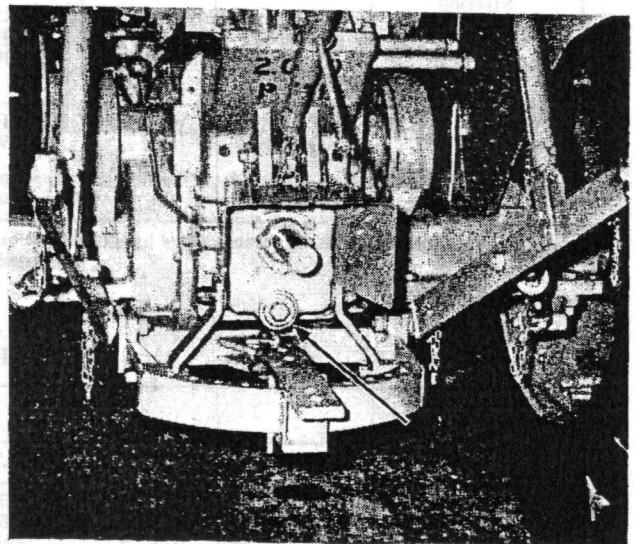


Fig. P.10

The hydraulic power unit pump suction filter

Section P.6

DIESEL LUBRICATION

UNITED KINGDOM

A								
DIESEL ENGINE	DUCKHAM'S	STERNOL	FILTRATE	BP	SHELL	ESSO	CASTROL	MOBIL
Above 32° C. (90° F.)	Duckham's NOL Diesel Thirty	Sterntrac H.D. 30	Farm Diesel Filtrate 30	Energol D.D. 30	Shell Rotella Oil 30	Tractor- lube H.D. 30	Agricastrol H.D. 30	Mobiland Diesel 30 Tractor Oil
-7° C. to 32° C. (20° F. to 90° F.)	Duckham's NOL Diesel Twenty	Sterntrac H.D. 20	Farm Diesel Filtrate 20	Energol D.D. 20W	Shell Rotella Oil 20/20W	Tractor- lube H.D. 20	Agricastrol H.D. 20	Mobiland Diesel 20 Tractor Oil
Below -7° C. (20° F.)	Duckham's NOL Diesel Ten	Sterntrac H.D. 10	Farm Diesel Filtrate 10W	Energol D.D. 10W	Shell Rotella Oil 10W	Tractor- lube H.D. 10	Agricastrol H.D. 10	Mobiland Diesel 10 Tractor Oil
B								
Transmission and Steering	Duckham's Commadcol C.G. 90	Sterntrac G. 90	Farm Filtrate Gear Oil 90	Energol Tractor Gear Oil 90	Shell Tractor Gear Oil 90 S.T.	Eso Gear Oil 90 S.T.	Agricastrol Gear Oil Light	Mobiland Gear 90 Tractor Oil
C								
Grease Points	Duckham's L.B. 10 Grease	Ambroline L.H.T.	Super Lithium Filtrate Grease	Ener- Grease L. 2	Retinax A	Eso Multi- purpose Grease H	Castrolase L.M.	Mobilgrease M.P.
D								
Fan and Water pump bearings	Duckham's NOL E.P. Transmission 140	Ambroleum E.P. 140	Farm E.P. Filtrate Gear Oil 140	Energol S.A.E. 140 E.P.	Shell Spirax 140 E.P.	Tractor- lube Gear Oil G.P. 140	Agricastrol Gear Oil E.P.	Mobiland E.P. Gear Tractor Oil
E								
Power- assisted Steering								
Above -12° C. (10° F.)	Duckham's NOL Diesel Ten	Sterntrac H.D. 10	Farm Filtrate 10W	Energol D.D. 10W	Shell Rotella Oil 10W	Essolube H.D. 10W	Agricastrol H.D. 10	Mobiland Universal
Below -12° C. (10° F.)	Duckham's NOL Five	Albatross 21	Farm Filtrate 5W	Energol D.D. 5W	Shell Rotella 5W/20	Eso Extra Motor Oil 5W/20	Castrol ZZ	Mobiloil Special

Automatic transmission fluids, manufactured by the companies listed, are approved as an alternative to those recommended above for Power-assisted Steering (Column E).

MULTIGRADE ENGINE OILS

A							
Diesel Engine	DUCKHAM'S	STERNOL	FILTRATE	BP	SHELL	CASTROL	MOBIL
All climatic conditions	Duckham's Multigrade Diesel Engine Oil 10W/30	Sternol Minx 10/30 S.L.	Filtrate 10W/30 Multigrade	Energol D.D. Multi- grade	Rotella Multigrade 10W/30	Castrol C.R. 20W/30	Mobiloil Special

We approve the use of these new diesel motor oils, as produced by some of the companies quoted, for all climatic conditions unless the engine is old or in poor mechanical condition.

DIESEL LUBRICATION OVERSEAS

A	DUCKHAM'S	STERNOL	FILTRATE	BP	SHELL	ESSO	CASTROL	MOBIL
Diesel Engine								
Above 32° C. (90° F.)	Duckham's NOL Diesel Thirty	Sterntrac H.D. 30	Farm Diesel Filtrate 30	Energol D.D. 30	Shell Rotella Oil 30	Essolube H.D. 30	Castrol C.R. 30	Mobiloil A
-7° C. to 32° C. (20° F. to 90° F.)	Duckham's NOL Diesel Twenty	Sterntrac H.D. 20	Farm Diesel Filtrate 20	Energol D.D. 20	Shell Rotella 20/20W	Essolube H.D. 20	Castrol C.R. 20	Mobiloil Arctic
Below -7° C. (20° F.)	Duckham's NOL Diesel Ten	Sterntrac H.D. 10	Farm Diesel Filtrate 10W	Energol D.D. 10W	Shell Rotella Oil 10W	Essolube H.D. 10W	Castrol C.R. 10	Mobiloil 10W
B								
Transmission and Steering	Duckham's Commadcol C.G. 90	Sterntrac G. 90	Filtrate Tractor Gear Oil 90	Energol S.A.E. 90	Shell Dentax 90	Essolube Gear Oil S.T. 90	Castrol S.T.	Mobilube C. 90
C								
Grease Points	Duckham's L.B. 10 Grease	Ambroline L.H.T.	Super Lithium Filtrate Grease	Ener- grease L.2	Shell Retinax A	Esso Multi- purpose Grease H	Castrolase L.M.	Mobilgrease M.P.
D								
Fan and Water Pump Bearings	Duckham's NOL E.P. Transmission 140	Ambroleum E.P. 140	Farm E.P. Filtrate Gear Oil 140	Energol E.P. S.A.E. 140	Shell Spirax 140 E.P.	Tractor- lube Gear Oil G.P. 140	Castrol Hi-press	Mobilube G.X. 140
E								
Power-assisted Steering Above -12° C. (10° F.)	Duckham's NOL Diesel Ten	Sterntrac H.D. 10	Farm Filtrate 10W	Energol D.D. 10W	Shell Rotella Oil 10W	Essolube H.D. 10W	Castrol C.R. 10	Mobiloil Special
Below -12° C. (10° F.)	Duckham's NOL Diesel Five	Albatross 21	Farm Filtrate 5W	Energol D.D. 5W	Shell Rotella Oil 5W/20	Esso Extra Motor Oil 5W/20	Castrol ZZ	Mobiloil Special

Automatic transmission fluids, manufactured by the companies listed, are approved as an alternative to those recommended above for Power-assisted Steering (Column E).

SECTION PPP

LUBRICATION

	Section									
Every day or 10 hours	PPP.1
Engine										
Every 50 hours	PPP.2
Fan and water pump										
Every 100 hours	PPP.3
Distributor										
Engine										
Oil filter										
Every 200 hours	PPP.4
Engine										
Every 500 hours	PPP.5
Oil filter										
Recommended lubricants	PPP.6

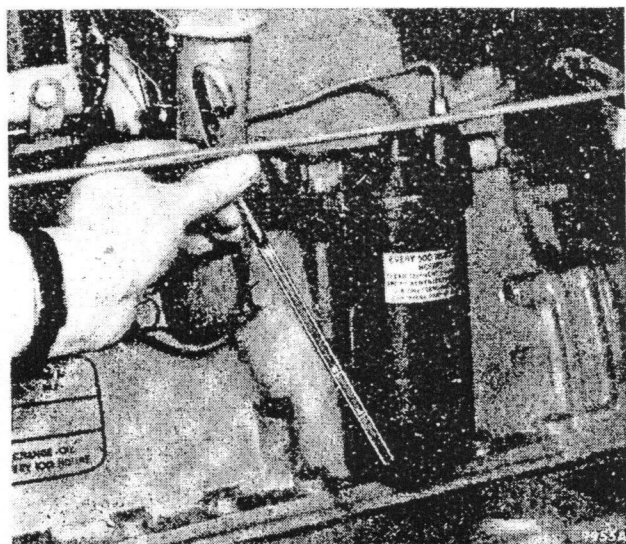


Fig. PPP.1

The engine oil dipstick is located on the right-hand side of the engine near the oil filter

Section PPP.1

EVERY DAY OR EVERY 10 HOURS

ENGINE (A)

Check the level of oil in the engine sump.

With the tractor standing on level ground and the engine stopped pull out the dipstick situated on the right-hand side of the engine (Fig. PPP.1), wipe it with a clean rag, reinsert it fully, and then withdraw it again. The mark made by the oil will indicate the level. There are two marks on the dipstick and the oil level must never be allowed to fall below the lower mark.

The oil filler is located on the right-hand side of the engine.

Use one of the oils to Ref. A (page PPP.4).

For a complete summary of attention to be given every day or 10 hours see 'GENERAL INFORMATION', page 16.

Section PPP.2

EVERY 50 HOURS

FAN AND WATER PUMP

Give two strokes of the grease gun filled with grease to Ref. C (page PPP.4) to the nipple on the fan and water pump hub. Do not overlubricate.

For a complete summary of attention to be given every 50 hours see 'GENERAL INFORMATION', page 16.

Section PPP.3

EVERY 100 HOURS

DISTRIBUTOR (A)

Remove the distributor cover, lift off the rotor arm, and drop a few spots of thin engine oil on top of the spindle to lubricate the cam bearing. Lift off the dust-excluding plate and apply a little clean engine oil to the face of the cam. Drop a spot of oil onto the top of the moving contact pivot pin.

Apply a few spots of thin engine oil to the hole in the contact breaker base plate to lubricate the automatic timing control mechanism. Clean the inside of the cover before replacing.

Carefully clean off all traces of surplus oil and make sure that none has found its way onto the contact points.

ENGINE (A) (M models only)

Drain the oil from the engine sump.

This operation is best carried out when the engine is warm and the oil less viscous than when the engine is cold. Remove the drain plug from the left-hand side of the sump and allow the oil to drain.

Clean and replace the drain plug and refill the sump with the correct grade of oil to Ref. A (page PPP.4) through the oil filter on the right-hand side of the engine taking particular care that the container used is clean.

With the sump drained, the oil filter primed with oil, and the tractor standing on level ground, the quantity of

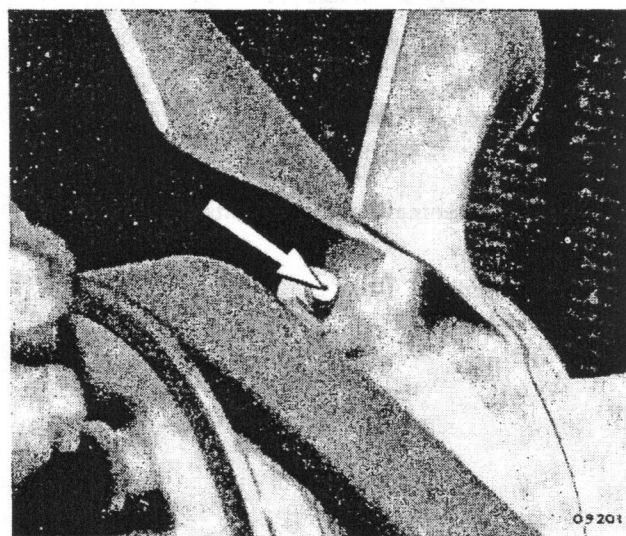


Fig. PPP.2

The grease nipple for the fan hub and water pump spindle

oil required to bring the level to the top mark on the dipstick is 12 pints (6.8 litres).

OIL FILTER

Release the external oil filter bowl by unscrewing the hexagonal bolt at the top of the filter head, place the element aside, wash out the bowl with paraffin (kerosene), and dry thoroughly. Replace the element, ensuring that the spring, location plate, grommet, and element are properly seated in the bottom of the filter bowl. Fill the bowl with engine oil and refit in position on the engine, making sure that the bowl beds evenly on its packing washer. Tighten the bolt.

For a complete summary of attention to be given every 100 hours see 'GENERAL INFORMATION', page 16.

Section PPP.4

EVERY 200 HOURS

ENGINE (A) (PM models only)

Drain the engine oil from the sump and wash out the external oil filter bowl. Adopt the same procedure as that detailed in Section PPP.3 for M model tractors.

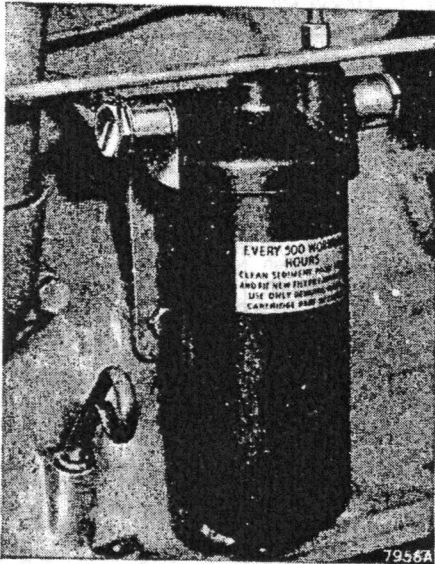


Fig. PPP.3

The engine external oil filter is of the renewable element type

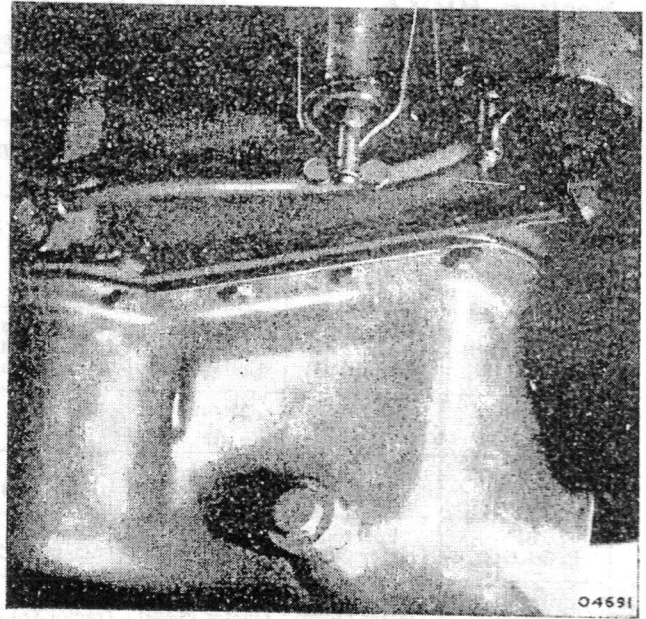


Fig. PPP.4

The engine sump drain plug is located immediately below the fuel filter

For a complete summary of attention to be given every 200 hours see 'GENERAL INFORMATION', page 17.

Section PPP.5

EVERY 500 HOURS

OIL FILTER

Release the external oil filter bowl as detailed in Section PPP.3 and renew the filter element. Prime the filter with engine oil and refit to the engine.

For a complete summary of attention to be given every 500 and 1,000 hours see 'GENERAL INFORMATION', page 17.

Section PPP.6

PETROL AND V.O. LUBRICATION

UNITED KINGDOM

Reference	A				B	C	D
	PETROL ENGINE	V.O. ENGINE	PETROL AND V.O. ENGINES				
Climatic Conditions	Above 32° F. (0° C.)	Above 32° F. (0° C.)	32° F. to 10° F. (0° C. to -12° C.)	Below 10° F. (-12° C.)	Transmission and Steering	Grease Points	Fan and Water Pump Bearings
DUCKHAM'S	Duckham's NOL Thirty Commercial	Duckham's NOL Forty Commercial	Duckham's NOL Twenty Commercial	Duckham's NOL Ten Commercial	Duckham's Commadcol C.G. 90	Duckham's L.B. 10 Grease	Duckham's NOL E.P. Transmission 140
STERNOL	Sterntrac 30	Sterntrac 40	Sterntrac 20	Sterntrac 10	Sterntrac G. 90	Ambroline L.H.T.	Ambroleum E.P. 140
FILTRATE	Farm Filtrate 30	Farm Filtrate 40	Farm Filtrate 20	Farm Filtrate 10W	Farm Filtrate Gear Oil 90	Super Lithium Filtrate Grease	Farm E.P. Filtrate Gear Oil 140
BP ENERGOL	Energol Tractor Oil 30	Energol Tractor Oil 40	Energol Tractor Oil 20	Energol Tractor Oil 10	Energol Tractor Gear Oil 90	Energol L. 2	Energol E.P. S.A.E. 140
SHELL	Shell Tractor Oil 30	Shell Tractor Oil 40	Shell Tractor Oil 20	Shell Tractor Oil 10	Shell Tractor Gear Oil 90	Retinax A	Shell Spirax 140 E.P.
ESSO	Essolube 30	Essolube 40	Essolube 20	Essolube 10	Esso Gear Oil 90	Esso Multi-purpose Grease H	Esso Expee Compound 140
CASTROL	Agricastrol Medium	Agricastrol Medium	Agricastrol Light	Agricastrol Z	Agricastrol Gear Oil (Light)	Castrolase L.M.	Agricastrol Gear Oil E.P.
MOBIL	Mobiland 630 Tractor Oil	Mobiland 640 Tractor Oil	Mobiland 620 Tractor Oil	Mobiland 610 Tractor Oil	Mobiland Gear 90 Tractor Oil	Mobilgrease M.P.	Mobiland E.P. Gear Tractor Oil

OVERSEAS

Reference	A				B	C	D
	PETROL ENGINE	V.O. ENGINE	PETROL AND V.O. ENGINES				
Climatic Conditions	Above 32° F. (0° C.)	Above 32° F. (0° C.)	32° F. to 10° F. (0° C. to -12° C.)	Below 10° F. (-12° C.)	Transmission and Steering	Grease Points	Fan and Water Pump Bearings
DUCKHAM'S	Duckham's NOL Thirty Commercial	Duckham's NOL Forty Commercial	Duckham's NOL Twenty Commercial	Duckham's NOL Ten Commercial	Duckham's Commadcol C.G. 90	Duckham's L.B. 10 Grease	Duckham's NOL E.P. Transmission 140
STERNOL	Sterntrac 30	Sterntrac 40	Sterntrac 20	Sterntrac 10	Sterntrac G. 90	Ambroline L.H.T.	Ambroleum E.P. 140
FILTRATE	Farm Filtrate 30	Farm Filtrate 40	Farm Filtrate 20	Farm Filtrate 10W	Farm Filtrate Gear Oil 90	Super Lithium Filtrate Grease	E.P. Filtrate Gear Oil 140
BP ENERGOL	Energol S.A.E. 30	Energol S.A.E. 40	Energol S.A.E. 20W	Energol S.A.E. 10W	Energol S.A.E. 90	Energol L. 2	Energol E.P. S.A.E. 140
SHELL	Shell X-100 30	Shell X-100 40	Shell X-100 20/20W	Shell X-100 10W	Shell Dentax 90	Retinax A	Shell Spirax 140 E.P.
ESSO	Esstic 65	Esstic 65	Esstic 50	Esstic 42	Esso Gear Oil S.A.E. 90	Esso Multipurpose Grease H	Esso X.P. Compound S.A.E. 140 E.P.
CASTROL	Castrol X.L.	Castrol X.L.	Castrolite	Castrol Z	Castrol S.T.	Castrolase L.M.	Castrol Hi-Press
MOBIL	Mobiloil A	Mobiloil A.F.	Mobiloil Arctic	Mobiloil 10W	Mobilube C. 90	Mobilgrease M.P.	Mobilube G.X. 140

SECTION Q

OPTIONAL EQUIPMENT

	Section		Section
Axle radius arms		Independent hand-operated wheel brakes	..
Fitting	..	Adjustment	..
	..	Brake assembly—dismantling and reassembling	..

Belt pulley unit	..	Independent power take-off	..
Dismantling and reassembling	..	Clutch adjustment	..
Drive gears	..	Clutch pedal maximum travel adjustment	..
Fitting	..	Clutch removing (with engine in frame)	..
	..	Clutch unit—dismantling	..
	..	Clutch unit—reassembling	..
	..	Clutch withdrawal mechanism—dismantling	..
Double clutch gauging fixture	..	Description of clutch	..
	..	Refacing driven plate	..
	..	Refitting clutch to flywheel	..
Draft link conversion kit	..	Transfer gear—dismantling	..

Hydraulic power unit	..	Lighting equipment	..
Cross-shaft assembly—dismantling and reassembling	..	Fitting	..
Dismantling and reassembling	..	Wiring	..
Dowty hydraulic pump
Fitting and removing	..	Locite locking preparation	..
Gradual lift control
Hydraulic valve assembly—dismantling and reassembling	..	Power take-off	..
Lift linkage	..	Fitting and removing	..
Modified Dowty hydraulic pump
Dismantling and reassembling	..	Reverse gear needle-roller bearings—fitting	..
Modified filters
Modified valve plunger	..	Service tools	..
Tracing faults
Valve assembly flow diagrams

Hydraulic power unit with depth control	..	Trailer vacuum brake operating equipment	..
Depth control valve—dismantling and reassembling	..	Kit components	..
Dismantling and reassembling	..	Lubrication	..
Modified depth control anchor bracket	..	Periodical attention	..
Removing and replacing	..	Pipes and connections	..
Valve assembly flow diagrams	..	Testing	..
	..	Twin rear wheels	..

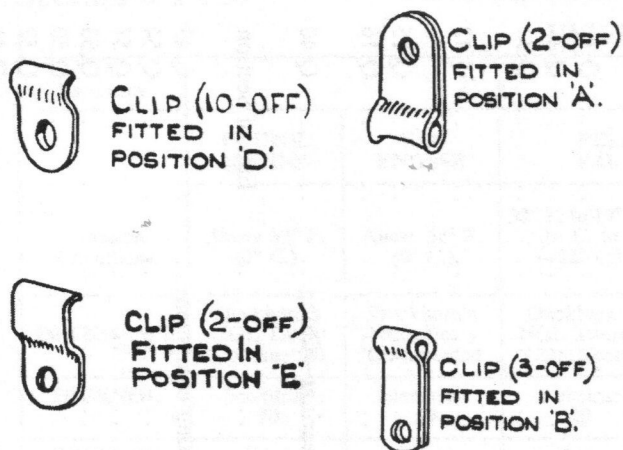


Fig. Q.1

The clips supplied with the electric lighting equipment.
Their locations are illustrated in Fig. Q.6

Section Q.1

LIGHTING EQUIPMENT (Home Market)

The following components are available as a lighting conversion kit and can be fitted to a Nuffield tractor not originally supplied with lighting equipment:

- (1) Front floodlight complete with bracket and bolts.
- (2) Rear floodlight assembly, consisting of rear floodlight, mounting bracket, change-over switch, and registration number-plate.
- (3) Tail lamps complete with brackets, bolts, washers, and nuts.
- (4) Sidelamps complete with brackets, bolts, washers, and nuts.
- (5) Horn complete with bolts, nuts, and washers.
- (6) Horn-push complete with screws, nuts, and washers.
- (7) Lighting switch complete with brown/white cable connected to the switch terminal marked 'A'.
- (8) Dashlamp complete with screws, nuts, and washers.
- (9) Cables comprising:
 - Two 7 ft. 6 in. long (red), switch to sidelamp junction.
 - One 2 ft. 1½ in. long (red), sidelamp junction to change-over switch.
 - Two 6 in. long (red), sidelamp junction to sidelamps.
 - One 1 ft. long (red/blue), change-over switch to rear floodlight.

One 1 ft. 2½ in. long (red/black), change-over switch to tail lamp.

One 2 ft. 2½ in. long (red), tail lamp to sidelamp.

One 3 ft. 6 in. long (blue), right-hand front headlamp.

- (10) Cable clips (17) (see Fig. Q.1) with suitable fixing bolts and nuts.

Section Q.2

FITTING THE LIGHTING EQUIPMENT

Before starting work disconnect both leads from the battery.

To enable the sidelamps, tail lamps, and clips to be fitted to the wings holes must be drilled as follows:

- (1) Left-hand wing: Drill 10 $\frac{3}{32}$ in. diameter holes in the positions shown in Fig. Q.2
- (2) Right-hand wing: Drill 13 $\frac{3}{32}$ in. diameter holes in the positions shown in Fig. Q.3.

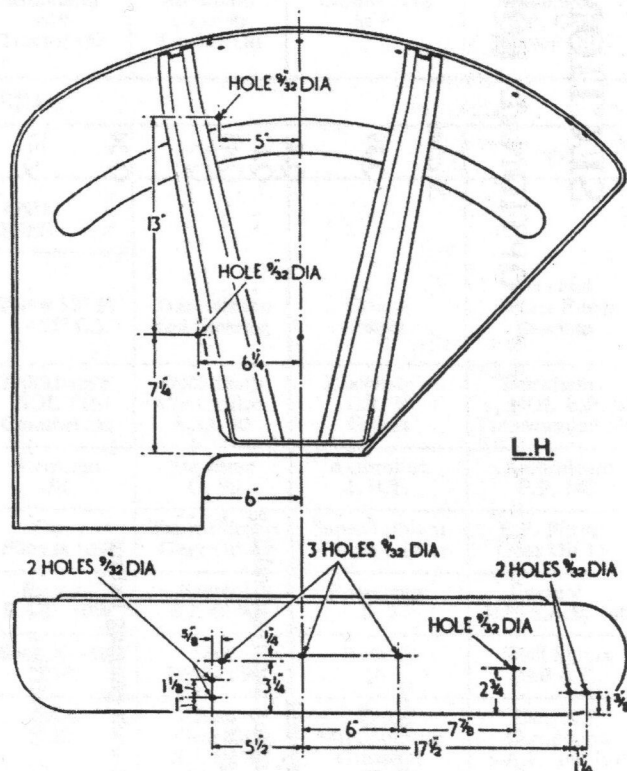


Fig. Q.2

Ten holes $\frac{3}{32}$ in. (7.14 mm.) diameter require to be drilled in the left-hand mudguard as shown

Front floodlight

Remove the two bolts from the right-hand side of the radiator case. Fit the bracket loosely to the radiator case, using the longer bolts supplied. Do not tighten the bolts until the floodlight is wired up and the cable clip type 'A' is in position.

Rear floodlight assembly

Remove the number-plate already fitted and replace it with the rear floodlight assembly, using the existing bolts.

Tail lamps

Secure the tail lamp and reflector assemblies to each mud-wing, using the bolts, nuts, and washers provided.

Sidelamps

Remove the covers from the sidelamp bracket assemblies and fit the sidelamps in position to the wings. Do not replace the covers until the sidelamps are wired up.

Horn

The horn must be bolted in position on the front of the battery compartment beneath the starter solenoid.

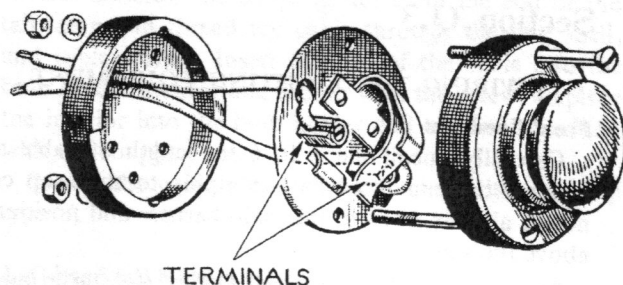


Fig. Q.4

The connection of the cables to the horn-push

Horn-push and lighting switch

To fit these parts it will be necessary to gain access to the back of the instrument panel. Remove the right-hand side panel, remove the screws holding the instrument panel in position, and remove the screw which secures the rear end of the left-hand side panel. (The left-hand side panel should remain in position, otherwise the governor control setting will be disturbed.)

To obtain greater freedom of movement disconnect the oil gauge pipe at the gauge. Disconnect the starter control at the switch.

Remove the knob from the lighting switch by depressing the spring-loaded plunger and unscrewing the fixing nut. Insert the lighting switch through the D-shaped hole in the panel and replace the fixing nut and knob. Remove the blanking plate from the panel but do not fit the horn-push until the cables have been connected. Assemble the dash lamp to the panel. Do not replace the panel until the wiring is completed.

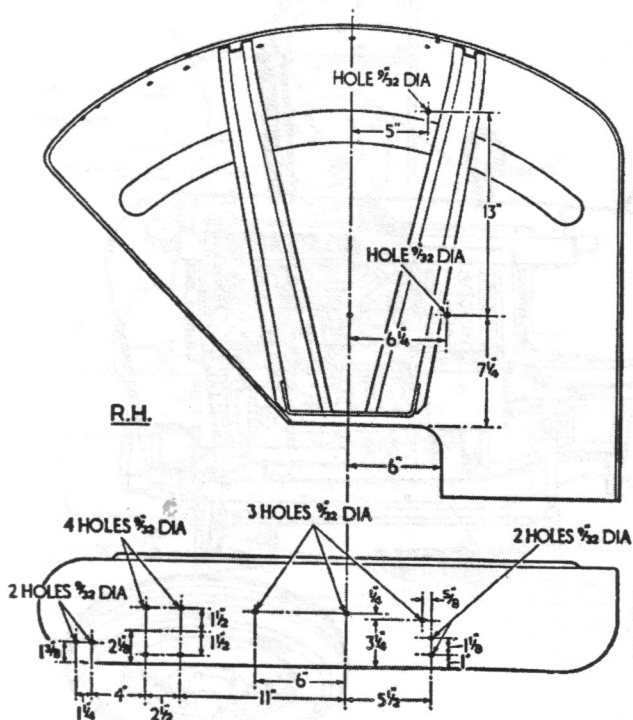


Fig. Q.3

Thirteen holes 5/32 in. (7.14 mm.) diameter require to be drilled in the right-hand mudguard as shown

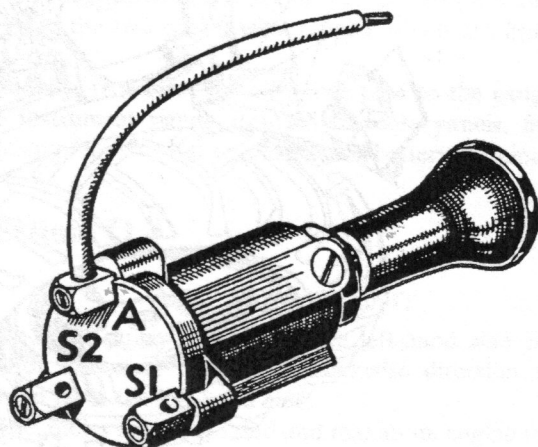


Fig. Q.5

The lighting switch

Section Q.3

WIRING THE LIGHTING EQUIPMENT

Front floodlight

Carefully uncoil the 3 ft. 6 in. length of cable and connect the end fitted with a nipple to the snap connector already fitted to the main harness and positioned above the starter.

Thread the cable downwards behind the starter motor and along the tractor frame, securing it in position by one of the clips type 'A', using the lower floodlight bracket fixing bolt (see Fig. Q.6). (When tightening the bolts note that the lower hole in the bracket is slotted to provide a simple adjustment for the front floodlight beam.)

Remove the front of the floodlight, withdraw the dust-excluding rubber, and remove the reflector. Thread the bared end of the cable through the floodlight fixing stem and then remove the sleeve connector from the bulb holder. Thread the sleeve connector onto the cable, bend back the strands of wire evenly around the side of the sleeve connector, and fit this back into the bulb holder. Replace the reflector, dust-excluding rubber, and the front of the floodlight, taking care to see that the dust-excluding rubber is fitted correctly.

Change-over switch to right-hand sidelamp

Secure the cable connected to the centre terminal of the change-over switch to the mudwing by means of two clips type 'D'. Connect the end of the cable fitted with a nipple to the double snap connector at the right-hand sidelamp (see Fig. Q.6).

Right-hand sidelamp junction to lighting switch

Carefully uncoil one of the 7 ft. 6 in. lengths of cable and connect the end of the cable fitted with a nipple to the remaining connection in the double snap connector at the right-hand sidelamp. Secure both cables from the snap connector junction to the mudwing by clip type 'E' and arrange the cables as shown in Figs. Q.6 and Q.7. The cable should run neatly across the top of the mudwing and down the side at a slight angle and be secured by two clips type 'D'. Continue the cable under the rear of the footplate merging at the side of the transmission casing. Follow the curve of the axle casing flange, pass the cable along the transmission casing top cover, and secure it by means of the two clips type 'B', using the existing holding-down bolts of the top cover (see Fig. Q.7). Feed the cable past the bottom right-hand corner of the instrument panel and connect the cable to terminal 'S1' on the lighting switch, together with the left-hand sidelamp cable after it has been fitted in position (see next paragraph).

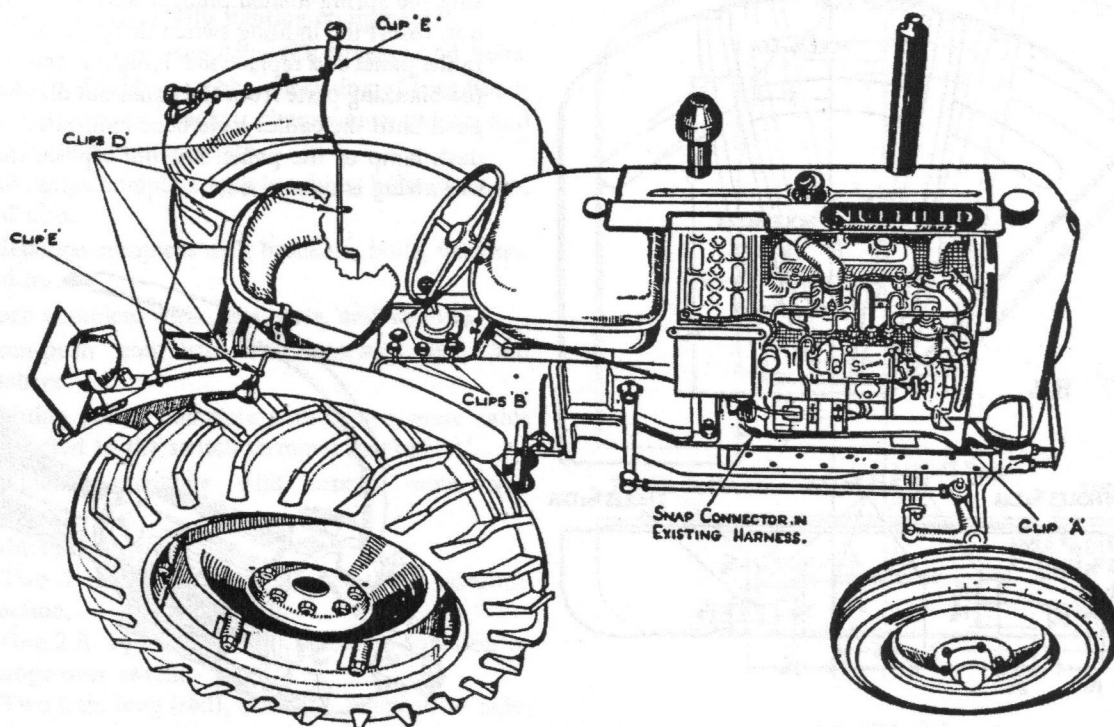


Fig. Q.6

The location of the wiring clips

Left-hand sidelamp junction to lighting switch

Carefully uncoil the remaining 7 ft. 6 in. length of cable and connect the end of the cable fitted with the nipple to the left-hand sidelamp connector junction, passing the cable along and down the side of the mudwing in a similar manner to that described for the right-hand sidelamp, using two clips type 'D' to secure the cable to the mudwing, a further clip type 'D' to secure the cable under the left-hand footplate, and one clip type 'B' under the transmission casing top cover fixing bolt. Pass the cable under the left-hand corner of the instrument panel and connect with the right-hand sidelamp cable to terminal 'S1' on the lighting switch.

Rear floodlight to change-over switch

Connect one end of the 1 ft. long red/blue cable to the rear floodlight in the same manner as previously described for the front floodlight. The other end of the cable must be connected to one of the remaining vacant terminals on the change-over switch.

Right-hand tail lamp to change-over switch

Connect one end of the 1 ft. 2½ in. long red/black cable to the remaining terminal on the change-over

switch. Unscrew the coupling nut from the end of the tail lamp and thread the cable through the nut, shell, and cable washer. Insert the end of the cable into the bulb holder interior and secure with the screw. Replace the interior into the bulb holder and secure in position with the coupling nut.

Secure the cable along the mudwing with one clip type 'A'.

Left-hand tail lamp to sidelamp junction

Connect the end of the 2 ft. 2½ in. long red cable, which carries a nipple, to the left-hand sidelamp snap connector and the remaining end to the left-hand tail lamp in the same manner as described for the right-hand tail lamp. Secure the cable along the mudwing with three clips type 'D'.

Horn-push and lighting switch

Remove the tape from the three cables at the back of the instrument panel (these cables form part of the existing main harness). Connect the blue cable to the lighting switch terminal 'S2'. Pass the brown/white and the purple/black cables through the aperture in the panel, connect the cables to the horn-push (see Fig. Q.4), and fit the horn-push to the panel.

Lighting switch to ammeter

The lighting switch is supplied with a short length of brown/white cable connected to terminal 'A'. Connect the other end of this cable to the ammeter negative terminal already having a brown/white cable connected to it.

Horn

Emerging from the main harness beneath the battery compartment will be found two cables, black and purple/black, each fitted with a single snap connector. Connect to these the two cables with nipples which are fitted to the horn.

Finally, reconnect the oil gauge pipe to the gauge on the instrument panel. Replace the side panels, fit the sidelamp covers, and reconnect the battery terminals.

Section Q.4

BELT PULLEY UNIT

The belt pulley is fitted to the left-hand side of the tractor and runs in an anti-clockwise direction when viewed from the left-hand side.

Belt pulley speeds at rated and maximum engine speeds are to be found in 'GENERAL DATA', page 11.

The pulley drive is engaged by a dog clutch operated by the lever on the pulley housing. The drive is

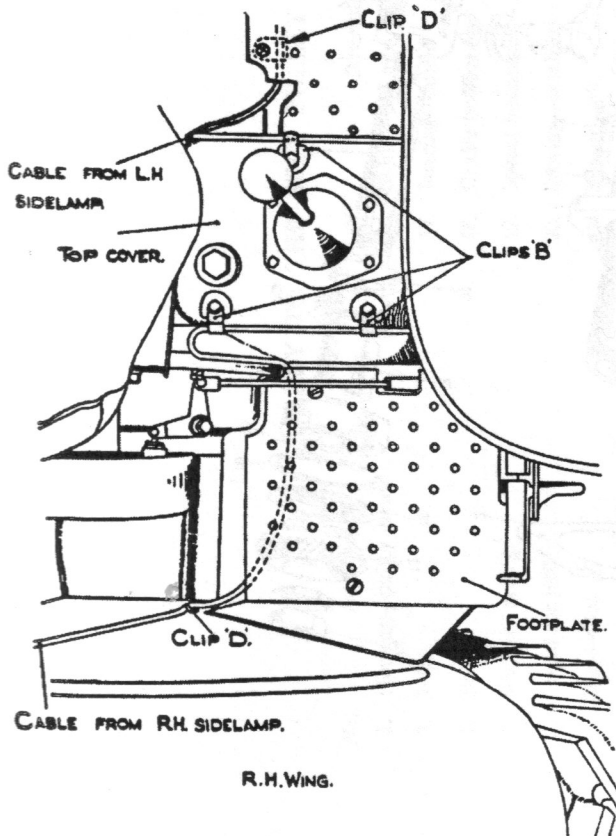
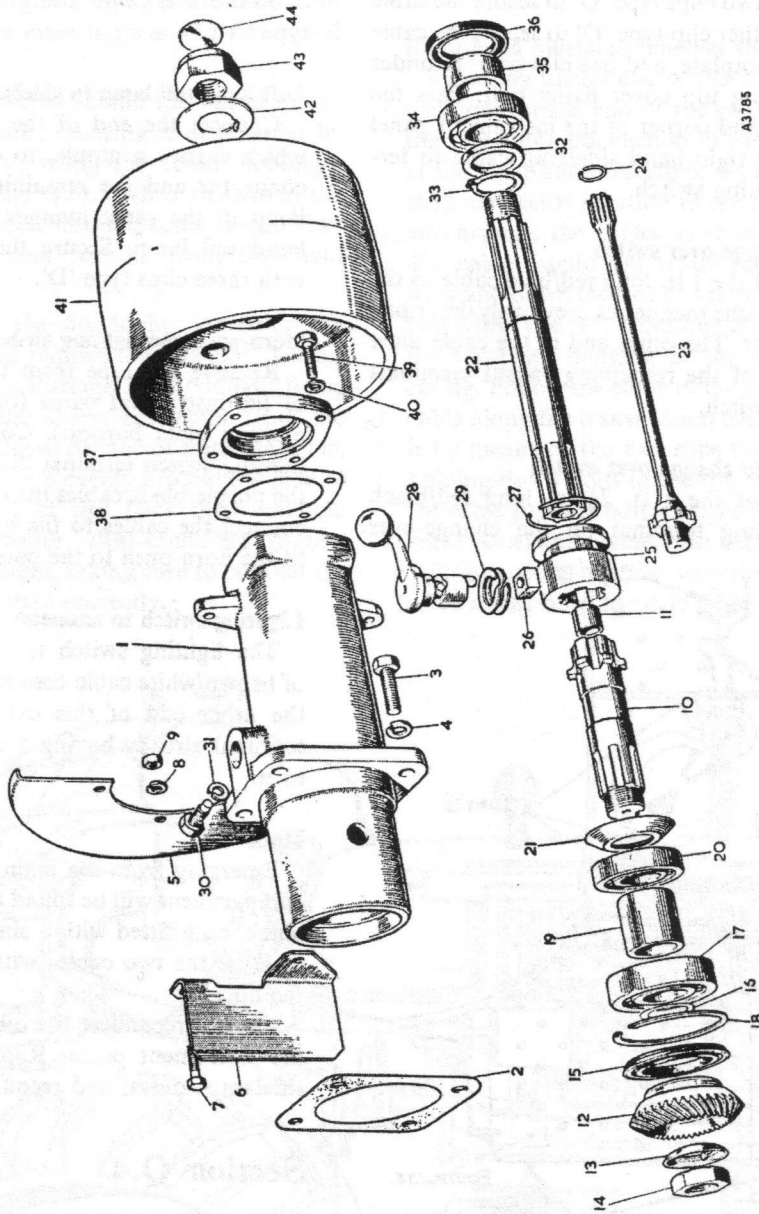


Fig. Q.7

The run of the wiring on either side of the gearbox

THE BELT PULLEY UNIT COMPONENTS



A3785

KEY TO THE BELT PULLEY UNIT COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Housing—pulley drive.	16.	Shim—.003 and .007 in.	31.	Washer—spring.
2.	Joint.	17.	Bearing—large.	32.	Ring—abutment—pulley shaft.
3.	Bolt.	18.	Circlip bearing.	33.	Circlip.
4.	Washer—spring.	19.	Spacer bearing.	34.	Bearing.
5.	Guard for pulley.	20.	Bearing—small.	35.	Collar—seal.
6.	Stop—foot.	21.	Flinger—oil.	36.	Seal—oil.
7.	Bolt.	22.	Shaft—pulley.	37.	Cap—oil seal bearing.
8.	Washer—spring.	23.	Torsion bar.	38.	Shim—.003 in.
9.	Nut.	24.	Circlip.	39.	Bolt.
10.	Drive shaft assembly.	25.	Clutch—drive.	40.	Washer—spring.
11.	Bush.	26.	Pad—clutch-operating.	41.	Pulley.
12.	Gear—bevel.	27.	Spring ring—pad-retaining.	42.	Washer—tab.
13.	Washer—tab.	28.	Lever—clutch-operating.	43.	Cap—nut.
14.	Nut.	29.	Washer for lever.	44.	Plug—welch.
15.	Seal—oil.	30.	Pin.		

disengaged when the lever is towards the pulley and is engaged when the lever is towards the tractor.

An inside safety shield and adjustable belt pulley guard are fitted. The belt pulley guard may be adjusted over an angle of 30° to suit different angles of belt 'run-on'. Adjustment is made by slackening the two rearmost belt pulley unit securing bolts, adjusting the guard to the desired position, and then tightening the securing bolts firmly.

On no account should any attempt be made to adjust the guard while the belt pulley drive is engaged.

A torsion bar drive shaft fitted with skew gears runs on ball bearings which are lubricated by the main transmission oil automatically fed to them by a disc on the layshaft. No additional lubrication is necessary.

To enable a pulley unit to be fitted to any tractor the position of all bevel gears is adjusted with shims to give .003 to .006 in. (.075 to .15 mm.) backlash when meshed with the drive in the gearbox.

IMPORTANT.—It is essential that the tractor stands on reasonably level ground when operating the belt pulley. DO NOT attempt to engage the belt pulley drive without first disengaging the engine clutch. DO NOT start the engine without first disengaging the belt pulley clutch.

The serial number of the belt pulley unit is stamped on the top flange of the housing.

Section Q.5

FITTING THE BELT PULLEY UNIT

Remove the cover-plate fitted to the left-hand side of the transmission case and store it in a safe place.

Clean the joint faces of the case and the pulley unit, using a smooth file to remove any burrs.

Use a new joint seal and place the unit in position with the control lever on top. Engage the gears and secure with the original bolts and spring washers.

The gears are assembled at the Factory to provide for a backlash of .006 in. (.15 mm.) and this should be present when the unit is bolted into position.

Section Q.6

DISMANTLING AND REASSEMBLING THE BELT PULLEY UNIT

Withdraw the pulley from the splined shaft after unlocking and removing the nut. Engage the pulley drive to lock the shaft while unscrewing the nut.

Remove the pulley guard and foot stop.

Detach the belt pulley unit from the tractor by removing the four bolts. It should be stripped on a clean bench and care taken to keep all parts clean.

Four bolts attach the outer bearing cap to the housing and when these are removed the bearing cap can be

taken off complete with the oil seal which is fitted into it. Withdraw the oil seal collar.

Unscrew the retaining pin which secures the clutch operating lever and withdraw the lever and Thackeray washer.

With a hide-faced hammer sharply tap the housing at the pulley shaft end to release the pulley shaft bearing. The pulley shaft complete with bearing, abutment ring, and circlip can then be withdrawn. Remove the circlip and abutment and press the bearing from the shaft. If care is taken when withdrawing the pulley shaft the drive clutch may remain on it. Should, however, the clutch slide off the shaft, it can easily be removed from the housing after the shaft has been withdrawn.

Detach the bevel gear by removing the nut and tab washer securing it to the drive shaft. Carefully take off the shims behind the bevel gear and make sure that they or their equivalent thickness are replaced when the unit is reassembled unless a new bearing or pulley drive housing is fitted.

Remove the circlip locating the drive shaft bearing.

The drive shaft should be removed by pressing or driving it from the pulley end of the housing. To do this use a long copper drift or other suitable implement which will not damage the end of the drive shaft.

The bearings can be pressed off the drive shaft and the spacer and oil thrower removed.

The drive shaft carries a bush in which runs the pulley shaft spigot. If this is to be renewed, after the removal of the original bush press in the new bush and ream it to size .75 in. (19.05 mm.) diameter.

To release the torsion bar from the pulley shaft remove the circlip from the pulley end and withdraw the torsion bar from the splines.

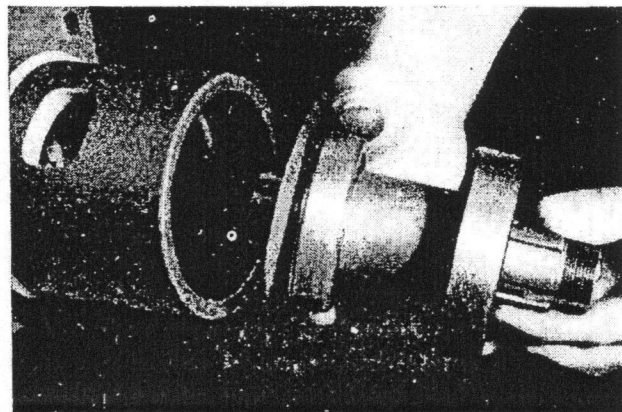


Fig. Q.8

Replacing the drive shaft assembly. The oil flinger is fitted convex side towards the bearing

Reassembly commences with the bearings and spacer being pressed onto the drive shaft. The oil thrower goes on first and is followed by the small bearing, the spacer tube, and the large bearing. Press in the drive shaft assembly and replace the outer retaining circlip.

Insert the torsion bar in the pulley shaft and secure with the circlip.

Replace the circlip, abutment ring, and bearing on the pulley shaft.

With the operating pad secured by the spring ring to the driving clutch slide the clutch onto the pulley shaft (tapered side away from the pulley). Smear grease onto the locking ring and pad to prevent them rotating freely and to assist alignment with the operating lever spigot.

Press the shaft and bearing into the housing, aligning the spigot with the bush in the drive shaft end.

Rotate the shaft to align the pad, and replace the lever and Thackeray washer, carefully aligning the spigot. Locate the lever with the retaining pin.

Replace the oil seal collar, tapered side away from the bearing, and lightly bolt up the oil seal housing: the seal lip must be towards the bearing. With feeler gauges measure the gap between the housing flange and the transmission casing; remove the housing and insert the requisite thickness of shims:

To control the backlash and make all pulley drive units interchangeable the bevel gears must be set to a standard position which is controlled by the thickness of the shims between the gear and the bearing.

Unless a new bearing or pulley drive housing has been fitted the unit must be reassembled with the shims which were removed, or their equivalent.

If new components have been fitted the thickness of the shims must be adjusted. Measure the distance be-

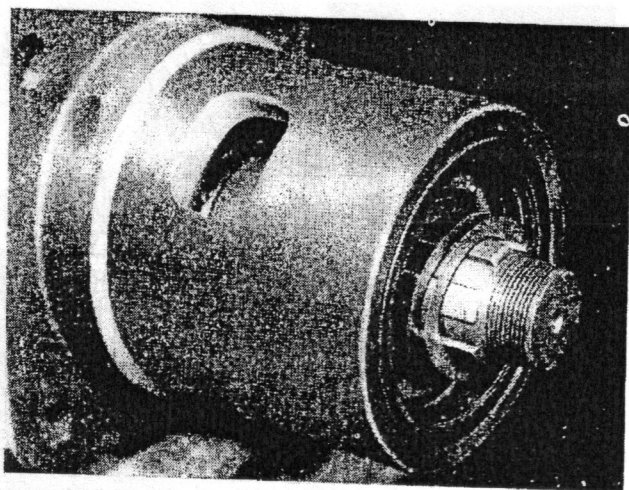


Fig. Q.9

Ensure that shims of the correct thickness are fitted between the bearing and the bevel drive gear and that the lip of the oil seal is towards the bearing

tween the machined face of the securing flange of the housing and the outer face of the bearing nearest the bevel gear. The procedure for measuring this distance is illustrated in Fig. Q.10. Subtract dimension (B) from dimension (A). This distance should be 4.35 in. (11.04 cm.). The difference between the reading obtained and 4.35 in. gives the thickness of shims to be fitted.

Fit the oil seal to the gear, lip side towards the teeth, and replace and secure the bevel gear.

Refit the pulley guard and foot stop. Assemble the pulley with the large boss away from the housing and secure in position with the cap nut and lock washer.

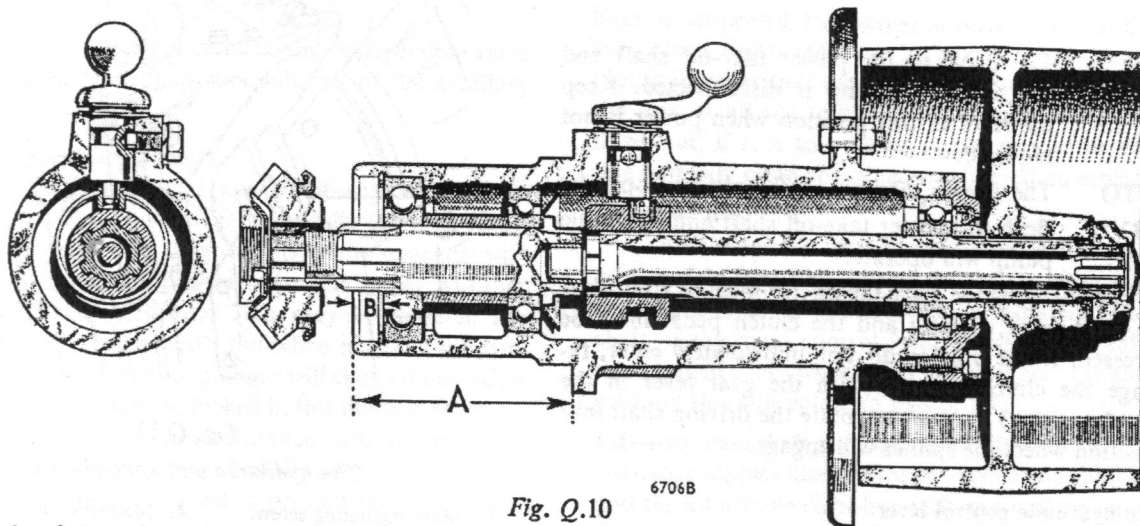


Fig. Q.10

A sectional view of the belt pulley unit. Subtract dimension (B) from dimension (A). The difference between the resulting figure and 4.35 in. (11.04 cm.) gives the thickness of shims to be fitted between the gear and the housing

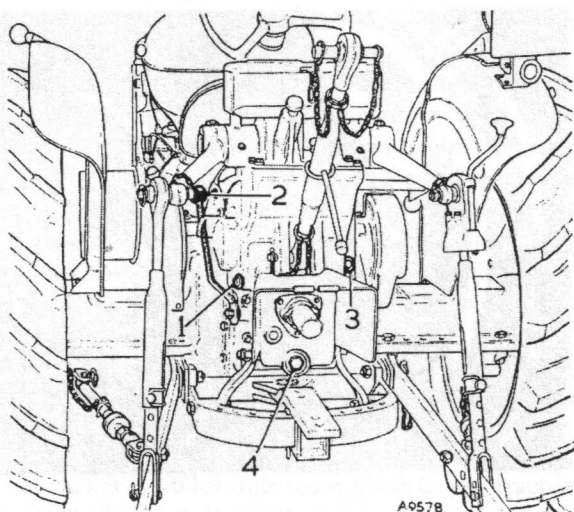


Fig. Q.11

The hydraulic power unit

- | | |
|----------------------------|---------------------------------|
| 1. Main hydraulic tapping. | 3. Auxiliary hydraulic tapping. |
| 2. Power selector lever. | 4. Pump suction filter. |

Section Q.7

THE HYDRAULIC POWER UNIT

This is a completely self-contained unit which also embodies a power take-off shaft. It uses as its working fluid the main transmission lubricant.

The serial number of the unit is stamped on the edge of the top flange.

Power selector lever

This lever is situated on the left-hand side of the tractor and has three positions.

When in the position marked:

- 'N' The drive to the power take-off shaft and the hydraulic pump is disconnected. Keep the lever in this position when power is not required.
- 'PTO' The power take-off shaft only will operate.
- 'HYD' Both the power take-off shaft and hydraulic pump will operate.

When engaging the drive the tractor must be stationary with the engine running and the clutch pedal must be depressed. If the splines do not immediately enter, re-engage the clutch slightly (with the gear lever in the neutral position) in order to rotate the driving shaft into a position where the splines will engage.

Main hydraulic control lever

The main hydraulic control lever is situated on the right-hand side of the tractor and is the lever with a

round knob. It regulates the flow of fluid under pressure to the hydraulic lift cylinder.

When the lever is raised the implement is lifted hydraulically. As soon as the implement has reached the highest position the control lever is automatically returned to the neutral position, where the lift is hydraulically held and the pump relieved of high pressure.

An implement can be raised very slowly or at the normal speed, depending on the distance the control lever is raised. The smaller the control lever travel, the slower the rate of lift.

The arrangement facilitates the operation of a number of different types of implement and can be used when ploughing with a mounted plough to improve wheel adhesion by transferring part of the weight of the plough to the rear wheels of the tractor.

The system can in no way be called a 'weight transfer system', and it is stressed that it cannot be used for depth control. Any plough used with the Nuffield three-point linkage must be provided with a depth wheel.

With very little practice weight transference from implement to tractor may be obtained in almost any degree and so provide traction otherwise obtainable only with wheel weights or by ballasting the rear tyres.

When the lever is moved downwards the lift-arms descend under the weight of the attached implement.

The main regulating screw is the lower one of the two

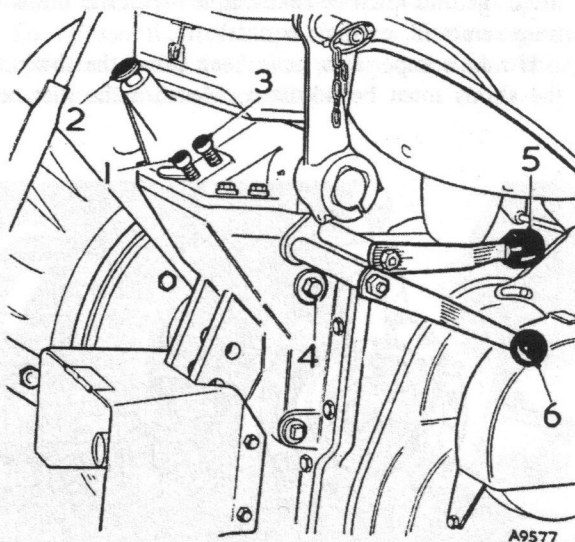


Fig. Q.12

The hydraulic unit control levers

- | | |
|--------------------------------|-----------------------------|
| 1. Main regulating screw. | 4. Magnetic filter plug. |
| 2. Locking plunger (engaged). | 5. Auxiliary control lever. |
| 3. Auxiliary regulating screw. | 6. Main control lever. |

screws situated immediately to the right of the locking plunger and it has a circular knob. An automatic device limits the maximum speed of descent of the lift-arms, irrespective of the load applied to them. If a slower rate of descent is desired the main regulating screw must be screwed inwards (turned clockwise).

The main hydraulic power tapping (denoted by a circle painted on the casing) is on the left-hand side of the tractor and approximately above the power selector lever. It is connected to the pipe supplying the fluid to the internal cylinder and is normally sealed by a $\frac{1}{2}$ in. BSP plug, but may be fitted with a self-sealing coupling and flexible hydraulic pipe communicating with an external cylinder.

When the hydraulic lift is locked in the raised position by the rocker shaft locking plunger the supply of hydraulic power to this tapping is controlled by the main control lever. The main regulating screw can be used, if necessary, to restrict the rate of descent of the equipment from this tapping.

Auxiliary hydraulic control lever

The auxiliary control lever is situated on the right-hand side of the tractor and has a square knob by which it can be identified. It controls only the hydraulic power from the auxiliary hydraulic tapping. The action of this lever is similar to that of the main control lever.

The auxiliary regulating screw is the top one of the two regulating screws and is fitted with a square knob. It acts in the same way as the main regulating screw.

The auxiliary hydraulic tapping (denoted by a square painted on the casing) is on the right-hand side of the tractor exactly opposite the main hydraulic tapping and is normally sealed by a $\frac{1}{2}$ in. BSP plug. It is intended for the operation of external or front-mounted equipment where the hydraulic lift is in use with a rear-mounted implement.

The rate of lift of implements having independent rams can also be controlled by manipulation of the auxiliary lever.

Rocker shaft locking plunger

This is the large round knob half-way between the two lift-arms (see Fig. Q.12). To engage the lock rotate the plunger until the key on its stem engages with the keyway in its surrounding boss. The spring will then draw the plunger inwards. This may be done in any position of the rocker shaft and when next the lift-arms are fully raised the locking plunger will click into position.

The lift-arms should be locked in this manner when it is proposed to travel for some distance with an implement in the raised position. Drive carefully over uneven ground when the implement is raised to prevent the rocker shaft hammering against the plunger and putting excessive strain on the power unit cover.

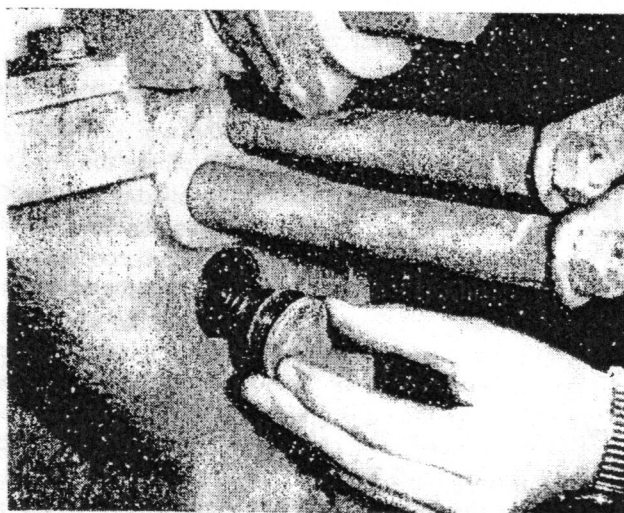


Fig. Q.13

Withdrawing the magnetic filter plug from its housing below the control lever shafts on the right-hand side

To disengage the lock the plunger must first be relieved of its load by raising the main control lever to admit pressure to the cylinder. With the arms lifted hydraulically the plunger can be withdrawn and rotated until it is retained in the disengaged position.

Pump suction filter

The suction filter should be inspected every 12 months or 1,000 hours when the transmission oil is changed, and then be cleaned if necessary.

The plug aperture through which this filter may be withdrawn is situated immediately below the power take-off shaft. The element is attached to the plug and is withdrawn and replaced with it.

The filter is below the oil level, and if choking of the filter is suspected the tractor should be stopped on a very steep down-grade or its rear wheels driven onto blocks in order that the plug may be unscrewed without the loss of all the transmission lubricant. Any oil that flows out, if it is to be used again, should be collected in a perfectly clean container and filtered on replacement.

Magnetic filter

A small magnetic filter plug is fitted in the stream of oil escaping from the control valve. It is situated on the right-hand side of the tractor immediately below the shaft of the main control lever. It should be taken out and cleaned every week or 50 hours. Since it is above the oil level this will entail no loss of oil.

Lift-arm cross-shaft and right-hand lift-rod

Grease nipples fitted to the lift-arm cross-shaft housing and the adjustable right-hand lift-rod must receive attention from a grease gun filled with grease to Ref. C (page P.6).

Section Q.8

FITTING AND REMOVING THE HYDRAULIC POWER UNIT

Remove the drawbar pin and lift off the drawbar.

Remove the drawbar frame as detailed in Section G.1.

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. Remove the bolts and lift off the rear cover from the transmission casing. If the rear end of the tractor is raised before the oil is drained the quantity to be stored will be reduced. The capacity of the transmission case is 12 gallons (54.5 litres).

Clean the joint faces of the transmission casing and the hydraulic power unit to ensure a good joint when the unit is bolted in position. Any burrs present on the joint surfaces should be removed with a fine-cut flat file. Fit the dowels supplied with the hydraulic power unit in position on the transmission casing flange.

Position a standard paper seal on the joint face of the unit. A light smear of grease on the transmission casing will keep the seal in the correct position.

Smear the bush (Part No. NT3947) supplied with the unit liberally with transmission oil and slide it into the bore machined in the end of the layshaft of the gearbox.

Place the power selector lever in the neutral or 'N' position and pass a rope around and beneath the boss of each of the lift-arms of the unit (see Fig. Q.14). Then, with the aid of suitable lifting tackle, raise the unit sufficiently to line up the spigot on the power take-off shaft with the bush in the layshaft.

To assist in locating the unit when fitting it may be considered worth while to make up and use two guide pins, one screwed into each side of the transmission casing. The pins can be produced from two pieces of $\frac{7}{16}$ in. (11.1 mm.) diameter steel approximately 6 in. (15 cm.) long. Thread one end to suit the tapped holes of the transmission casing face and slightly taper the other end. Cut a screwdriver slot in the end of the pin to assist withdrawal after the unit is in place.

Move the unit towards the tractor, keeping the joint faces parallel until engagement is complete. Tap the flange of the unit in the vicinity of the dowels with a lead or hide mallet if necessary to assist the dowels to enter to their full extent in their locating holes.

Move the power selector lever into the engaged position and check that the dog clutch engages readily.

Bolt the unit into position onto the tractor by means of the original bolts, making sure that there is a spring washer beneath the head of each bolt and that the long bolt is returned to its position in the centre of the top

flange. When fitting the selector lever gate ensure that the distance pieces are fitted between the bracket and the housing and not immediately below the bolt heads.

Lift the drawbar frame, re-engage the two supporting links with their support pins, and refit the drawbar. Fit the top link, lift-rods, draft links, and stabilizers.

Refill the transmission casing with oil to the correct level.

The method of removing a hydraulic power unit from a tractor is a reversal of the procedure given above for the initial fitting of a unit.

After draining the transmission oil and removing the drawbar frame and lifting links support the weight of the unit with a sling around the ends of the cross-shaft. Take out the magnetic filter from the right-hand side of the unit and remove the bolts which fasten the hydraulic unit to the transmission casing. Use two of the bolts, screwed into the tappet holes on either side of the casing, as extractors. As soon as the bolts come into contact with the face of the transmission casing turn each bolt

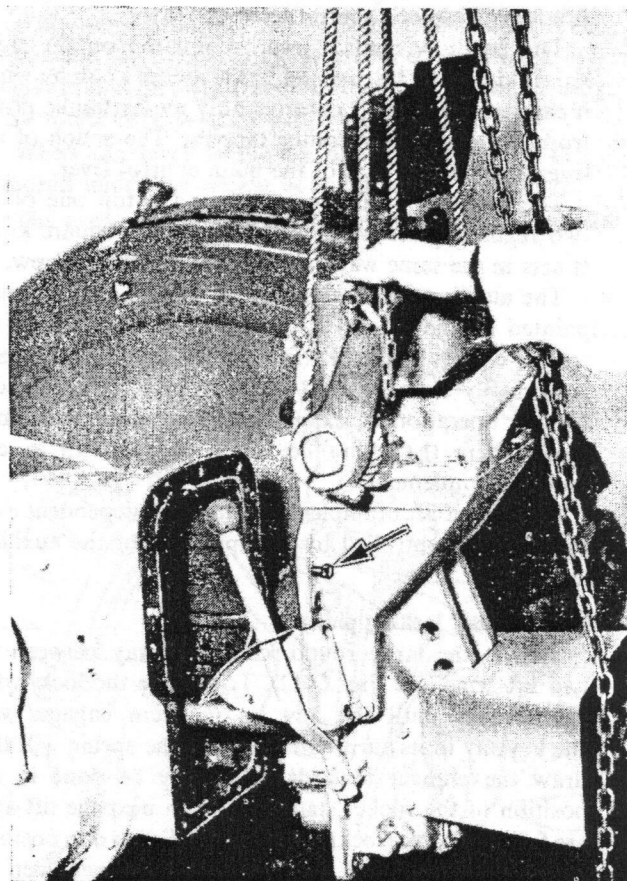


Fig. Q.14

Withdrawing the hydraulic power unit from the transmission casing. Note the position of the rope sling and arrowed is one of the securing bolts used as an extractor

alternately half a turn at a time until the pressure causes the faces to part. Continue turning the bolts until the casing is clear of the dowels and the unit may be lifted clear.

After removing the unit always remember to remove the bush which is fitted in the bore machined in the end of the layshaft. This bush serves as a support for the front end of the power take-off shaft and may remain on the spigot of the shaft when the unit is withdrawn. Retrieve it and store it for future use.

Section Q.9

DISMANTLING AND REASSEMBLING THE HYDRAULIC POWER UNIT

Remove the hydraulic power unit as detailed in Section Q.8.

Extract the bolts and lift off the cross-shaft housing assembly, taking care not to bend the regulating screw extensions as the cover is placed aside for storage.

Place the auxiliary (square knob) hand lever in approximately the horizontal position to free the linkage, remove the split pins, flat washers, and clevis pins, and release the plunger link from the control lever. Disconnect the main control lever (round knob) in a similar manner.

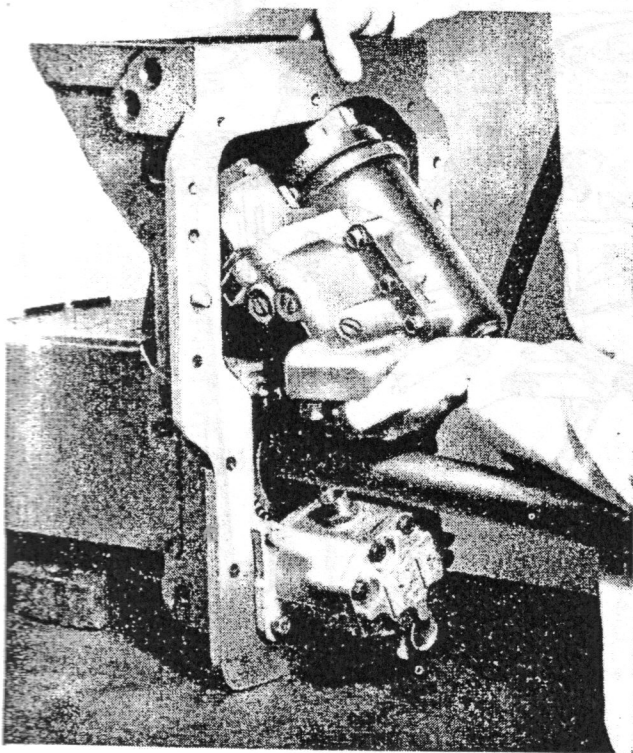


Fig. Q.15

Withdrawing the valve and cylinder assembly from the hydraulic power unit housing

Remove the nut and washer securing each hand lever to the control lever spindles and remove the levers and Belleville washers. Note the number of washers fitted behind each lever and remember to use the same quantity when reassembling. Unscrew the spindle bushes from the main casing and withdraw the auxiliary and power lift spindles complete with the friction discs.

Take out the magnetic filter by unscrewing the plug.

Unscrew the union nuts to release the hydraulic pipes from the valve body and pump. Carefully note the position of each pipe and the number of fibre washers fitted at each end.

Cut the locking wire and remove the three large bolts securing the cylinder assembly to the main casing and remove the cylinder.

Extract the bolt securing the selector rod support bracket to the pump and remove the bracket. Take out the three dowel bolts securing the hydraulic pump to the main casing and remove the pump. Removal of the pump body also releases the filter sleeve; the filter itself can only be withdrawn with the filter plug.

Remove the three bolts from the power take-off shaft oil seal housing and remove the housing complete with oil seals and felt washer.

Pull the power selector lever rearwards to the fully engaged position and use a brass drift to drive the shaft and bearing rearwards from the housing. If the lever has been removed take great care that the drive tube splines will clear those on the shaft as it is driven out.

Draw the driving tube forward and lift the gear from engagement with the selector rod fork.

Disengage the selector rod from the casing and selector shaft.

The power unit is reassembled by reversing the above dismantling procedure and paying careful attention to the following points:

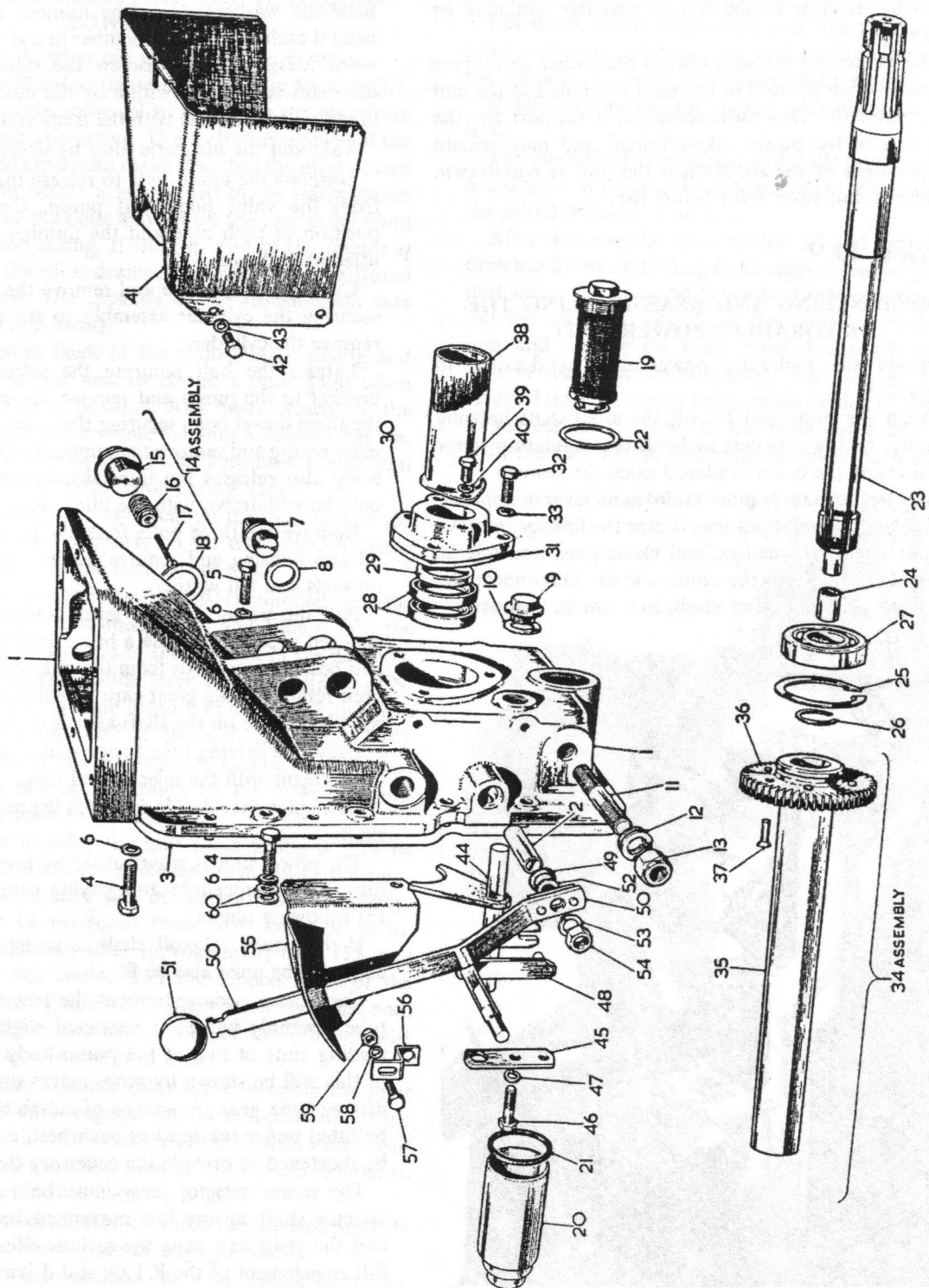
If the power take-off shaft is to be renewed a new driving tube must also be fitted.

Cases have occurred where the travel of the driving tube assembly has been restricted slightly by the protruding ends of two of the pump body bolts. Evidence of this will be shown by score marks on the face of the driving tube gear. A washer of suitable thickness must be fitted under the head of each bolt, or the bolts must be shortened to provide the necessary clearance.

The power selector lever must be a tight fit on the selector shaft as any lost movement between the lever and the shaft can have the serious effect of preventing full engagement of the P.T.O. and driving tube splines.

Make sure that the oil seals are in good condition and that the faces of the seal housing and main casing are clean before the seal is replaced. Use a new joint seal if necessary.

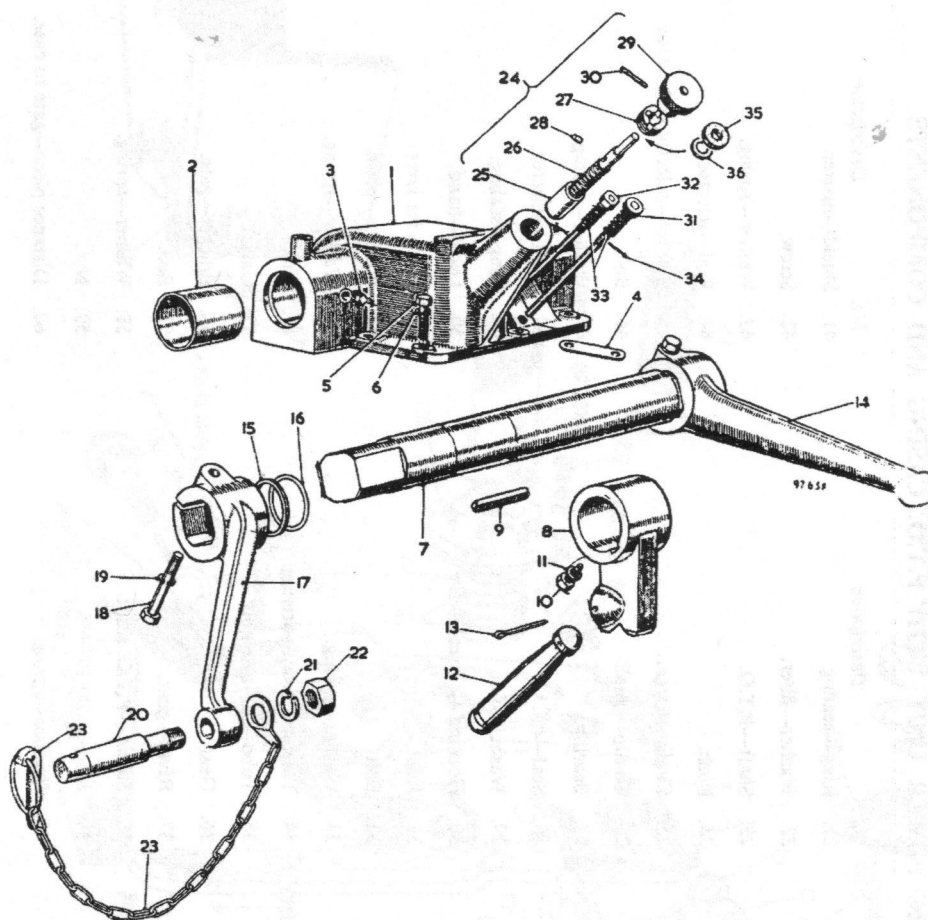
THE HYDRAULIC POWER UNIT WITH P.T.O. CASING AND COMPONENTS



KEY TO THE HYDRAULIC POWER UNIT WITH P.T.O. CASING AND COMPONENTS

<i>No.</i>	<i>Description</i>	<i>No.</i>	<i>Description</i>	<i>No.</i>	<i>Description</i>
1.	Main casing.	21.	Ring—sealing.	41.	Shield—master.
2.	Bush—main casing.	22.	Washer—filter.	42.	Screw.
3.	Joint.	23.	Shaft—P.T.O.	43.	Washer—spring.
4.	Bolt—long.	24.	Bush.	44.	Rod—selector.
5.	Bolt—short.	25.	Clip—large.	45.	Bracket—selector rod steady
6.	Washer—spring.	26.	Clip—small.	46.	Bolt.
7.	Plug.	27.	Bearing.	47.	Washer—spring.
8.	Washer.	28.	Seal—oil.	48.	Shaft—selector.
9.	Plug.	29.	Washer—felt.	49.	Ring—sealing.
10.	Washer—copper.	30.	Housing—oil seal.	50.	Lever—hand.
11.	Stud—support link.	31.	Joint.	51.	Knob for lever.
12.	Washer—Thackeray.	32.	Bolt.	52.	Washer—plain.
13.	Locknut.	33.	Washer—spring.	53.	Washer—spring.
14.	Filter—magnetic.	34.	Tube assembly—driving.	54.	Nut.
15.	Plug.	35.	Tube—sub-assembly.	55.	Gate.
16.	Element.	36.	Gear.	56.	Bracket—gate.
17.	Screw.	37.	Rivet—gear.	57.	Bolt.
18.	Washer—magnetic filter plug.	38.	Shield—P.T.O. shaft.	58.	Washer—spring.
19.	Filter—hydraulic.	39.	Screw.	59.	Nut.
20.	Sleeve—filter.	40.	Washer—spring.	60.	Distance piece—gate to case.

THE HYDRAULIC POWER UNIT CROSS-SHAFT HOUSING COMPONENTS



No. Description

1. Housing for cross-shaft.
2. Bush for housing.
3. Greaser.
4. Bracket for top link clip.
5. Bolt.
6. Washer—spring.
7. Cross-shaft.
8. Lever for cross-shaft.
9. Key.
10. Set screw.
11. Washer—spring.
12. Rod—connecting—lever to piston.
13. Split pin—rod to cross-shaft lever.
14. Lift-arm—R/H.
15. Washer.
16. Seal (rubber).
17. Lift-arm—L/H.
18. Bolt—clamping lift-arm to cross-shaft.

No. Description

19. Washer—spring.
20. Pin—swivel.
21. Washer—spring.
22. Nut.
23. Pin—retaining (with ring, tag, and chain).
24. Plunger assembly—cross-shaft locking.
25. Plunger.
26. Spring.
27. Plug.
28. Pin.
29. Knob.
30. Pin for knob.
31. Screw—power adjusting.
32. Screw—auxiliary adjusting.
33. Spring.
34. Split pin.
35. Ring—plunger sealing.
36. Washer for sealing ring.

Replace the pump, positioning the filter sleeve behind the pump and ensuring that the sealing ring on which it registers is fitted to the main casing. The filter itself is attached to the drain plug and is withdrawn with it.

After tightening and wiring the bolts securing the cylinder refit the pipe between the pump and the valve body, using a new olive at the lower end. Pack with fibre washers the space between the top end of the pipe and the union (see Fig. Q.16) to prevent strain on the pipe and a tendency to cause harshness in the drive gears by increasing the depth of mesh. Three different thicknesses of fibre washer are available. Similarly the elbow pipes must be packed with washers at each end until they are in line with, and seat correctly on, the unions without strain when tightened. Leakage from a bad seating or fractured pipe would allow a load on the hydraulic lift to drop.

When replacing the control levers insert the short (forward) one first from inside the case with the friction disc in position and screw in the bush. Replace the original number of Belleville washers before fitting the auxiliary hand lever. Repeat the procedure for the main control lever and connect up the plunger links.

Replace and secure the cross-shaft cover assembly, using a sealing compound on the metal-to-metal joint.

Section Q.10

DISMANTLING AND REASSEMBLING THE CROSS-SHAFT ASSEMBLY

Extract the clamp bolts and drive the lift-arms from the cross-shaft with a hide mallet.

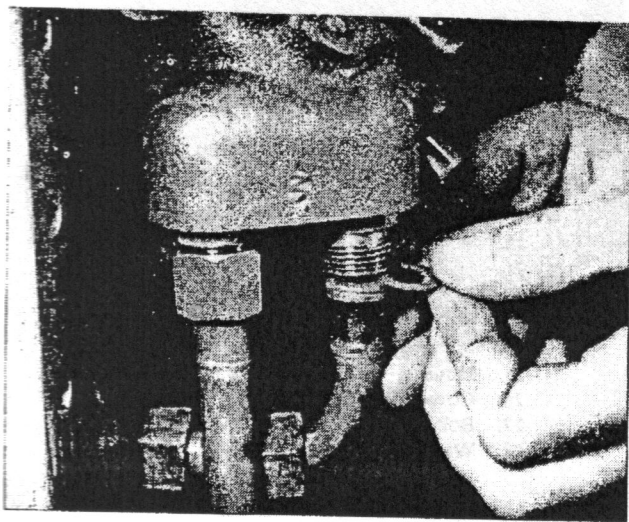


Fig. Q.16

Three thicknesses of fibre washer are available for packing the ends of the pipes to ensure correct alignment

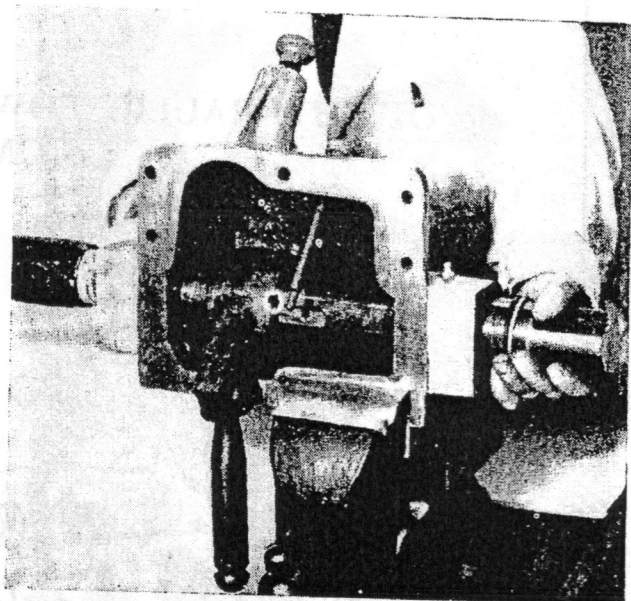


Fig. Q.17

Driving the cross-shaft from the housing. Note the washer and sealing ring on the cross-shaft

Remove the set screw from the cross-shaft lever and drive the shaft through the lever and bushes until the key can be withdrawn. Take care not to damage the key whilst removing it. Withdraw the cross-shaft from the housing.

Take out the rubber seals and retainers and if necessary press out the bushes for renewal.

Reassembly is a reversal of the dismantling procedure. Ensure that the oil seals and retainers are correctly positioned before refitting the lift-arms.

Should it be necessary to withdraw the locking plunger, it is extracted by unscrewing the plug in which the locking pin engages.

Section Q.11

DISMANTLING AND REASSEMBLING THE HYDRAULIC VALVE ASSEMBLY

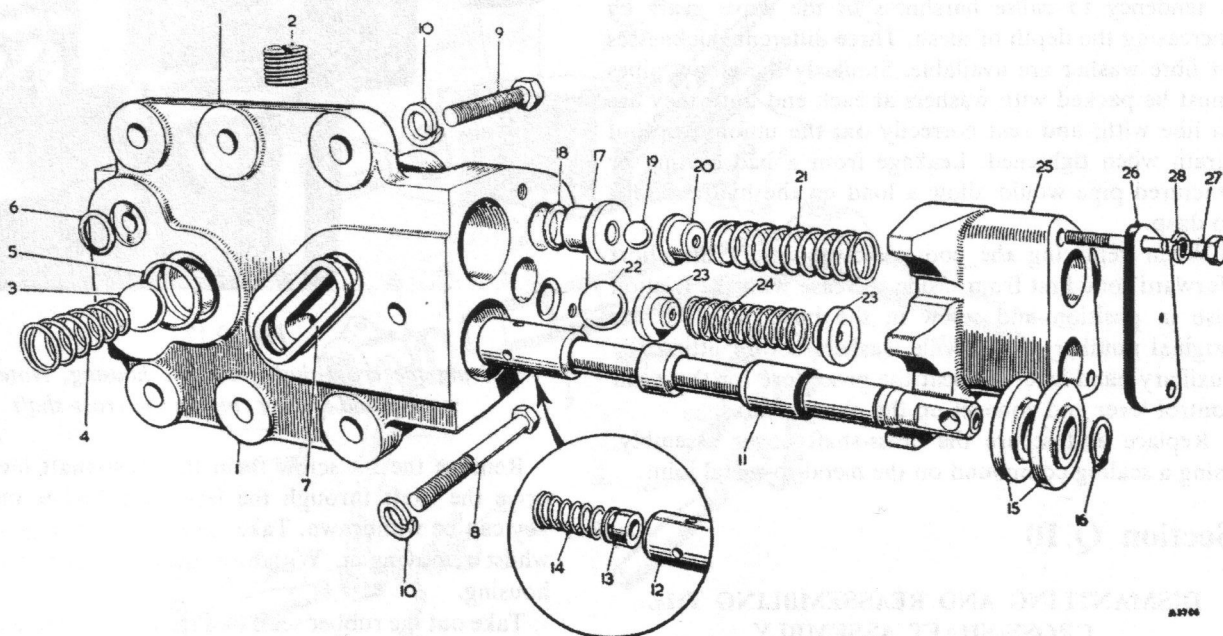
Separate the valve body from the cylinder, taking care not to lose the ball and spring of the non-return valve or the four oil seals (see Fig. Q.18).

Extract the two bolts securing the relief valve cover and housing to the valve body and remove the cover, housing, springs, spring retainers, and valve balls. Withdraw the valve plungers, marking each to enable them to be identified and returned to their original positions.

The high-pressure valve seating may also be removed together with the oil seal beneath it if necessary.

The limiting valve and spring can be withdrawn from the lower end of each plunger if the outer coil of the

THE HYDRAULIC POWER UNIT VALVE ASSEMBLY COMPONENTS



No.	Description
1.	Body—hydraulic valve.
2.	Plug.
3.	Ball—non-return valve.
4.	Spring—ball-retaining.
5.	Seal—oil (large).
6.	Seal—oil (small).
7.	Seal—oil (oval).
8.	Bolt—long.
9.	Bolt—short.
10.	Washer—spring.
11.	Plunger assembly.
12.	Plunger valve.
13.	Valve—limiting.
14.	Spring—limiting valve

No.	Description
15.	Piston—detent.
16.	Circlip—plunger.
17.	Orifice—H.P. valve.
18.	Seal—oil (for orifice).
19.	Ball
20.	Seat
21.	Spring
22.	Ball
23.	Seat for spring
24.	Spring
25.	Housing—valve.
26.	Cover for housing.
27.	Bolt.
28.	Washer—spring.

spring is raised from the annular groove inside the plunger.

Release the two plunger return pistons from each plunger by removing the circlip.

Reassemble the valve assembly in the reverse order to the dismantling procedure. The plunger return pistons are fitted with the lips upwards, towards the plunger circlip.

Fit a new seal below the high-pressure valve seat and replace the seating. Position the relief valve housing and place the balls on their seatings, the small ball on the renewable seat.

The two large spring retainers are fitted to the small spring over the large ball and the remaining retainer is fitted over the high-pressure ball and followed by the large spring (see Fig. Q.19).

Replace the relief valve body cover and secure the assembly with the two long bolts.

Renew the four oil seals and replace the non-return ball valve and spring with the small end of the conical spring towards the ball. Secure the valve assembly to the cylinder.

Hydraulic piston ring

If the ring has been removed from the hydraulic piston ensure that the narrow side of the overlap joints is on the

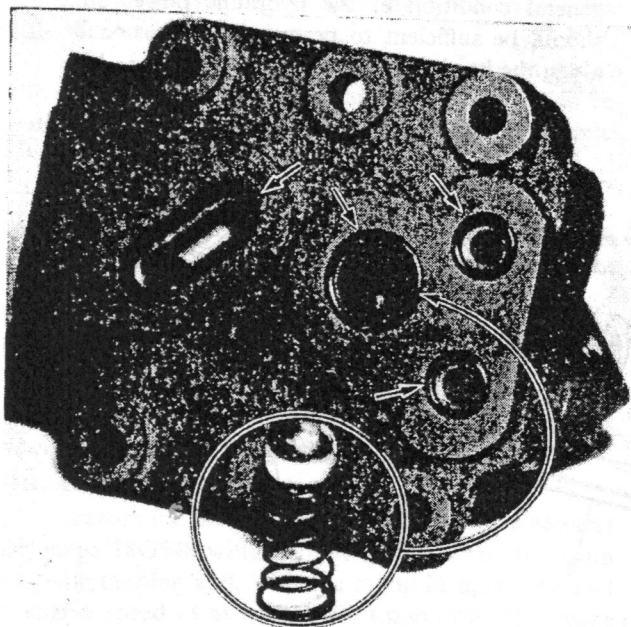


Fig. Q.18

The arrows indicate the oil seals in the face of the valve body and the housing in which the non-return valve ball and spring are fitted

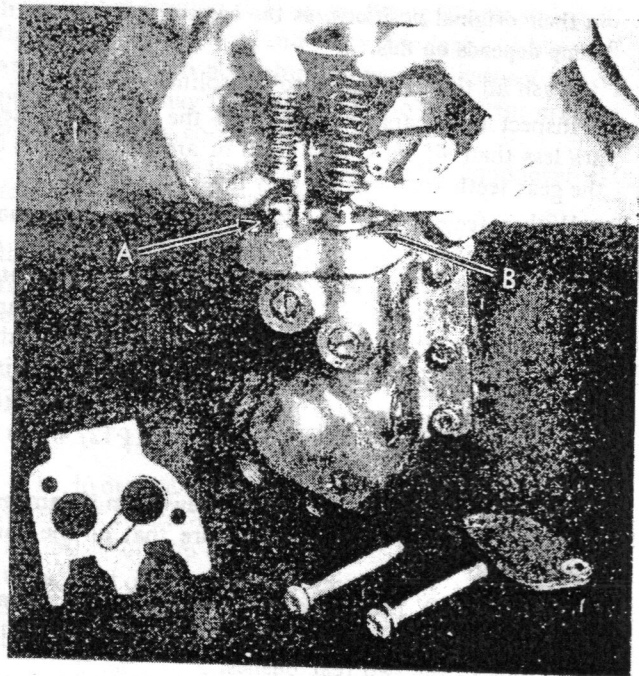


Fig. Q.19

The correct assembly position of the balls, springs, and seats of the pressure relief valves. (A) is the low-pressure valve and (B) is the high-pressure valve

pressure side when it is refitted. The piston ring itself is marked to indicate the pressure side.

When the valve and cylinder assembly have been refitted to the hydraulic casing the large ball of the low-pressure valve should be visible through the magnetic filter hole. Check that the valves have been replaced correctly.

Section Q.12

DISMANTLING AND REASSEMBLING THE DOWTY HYDRAULIC PUMP

Remove the hydraulic power unit as detailed in Section Q.8 and dismantle the unit as detailed in Section Q.9.

Unlock and remove the pump driven gear and key. Unscrew the eight hexagon-headed bolts and shake-proof washers; remove the end cover.

Slide out the two front bushes, the drive shaft and gear, the driven gear, the two rear bushes, and the two 'O' ring seals.

If the inner bushes cannot readily be removed tap the body, open end downwards, onto a flat piece of lead or soft wood. Do not use concussion force. The use of slight heat on the body will cause it to expand sufficiently to release the bushes if they cannot otherwise be removed.

NOTE.—It is essential that the bushes are reassembled

in their original positions, as the correct operation of the pump depends on this.

Wash all the parts in petrol (gasoline) or a solvent.

Inspect the gears and shafts. If the shaft diameters are less than .75 in. (19.05 mm.) or are badly scored or the gear teeth are damaged they must be renewed.

With a feeler gauge check the bush bores and shaft diameters, ensuring that the bushes and bores are as originally installed. The clearance must not be greater than .007 in. (.2 mm.) or replacement of the bushes and gears is necessary. Gears and bushes are mated for width within .0002 in. (.005 mm.) and must be replaced in pairs.

In operation the gears produce slight marks in the pump body. Should these exceed .005 in. (.127 mm.) in depth, the body must be renewed.

Examine the 'O' ring seals and renew them if damaged or worn. Before reassembling ensure that all the parts are perfectly clean.

Smear the 'O' ring seals with Acheson's Z.E. Grease or a good-quality graphite grease and fit them to the outer side of the two rear bushes.

Assemble the two rear bushes, the driver and driven gears, and the two front bushes together and slide them carefully into the body. Oiling these parts and the bores of the body will facilitate their assembly.

Check that the slotted faces of the bushes are adjacent to the gears before insertion, and that the 'O' ring seals are against the bottom of the bore in the body.

Replace the end cover and screw in the eight hexagon-headed bolts, using new shakeproof washers. Tighten the bolts evenly.

Refit the pump driven gear but do not drive the gear into position on the pump spindle or damage to the pump bearings or the pump case may result. Place the gear in position on the spindle and engage the key, fit the tab washer and nut. Tighten the nut until the gear is secure. Do not overtighten. Finally lock the nut with the tab washer. The pump should now turn evenly by hand, from a radius of 3 in. (76.20 mm.).

If the pump suction tube has been removed it must be refitted so that the bell mouth end of the tube is $\frac{1}{2}$ in. (12.7 mm.) from the face of the pump body. Secure the tube in position with the locating screw.

Section Q.13

TRACING HYDRAULIC UNIT FAULTS

Pressure drops under load

If the lift arms will not hold an implement in the raised position for a reasonable period of time, check for oil leakage from those parts of the hydraulic system which are under pressure. The actual time that the implement will remain fully raised depends upon the implement weight, the temperature of the oil, and the general condition of the hydraulic power unit, which should be sufficient to permit the tractor to be driven along the headland between runs.

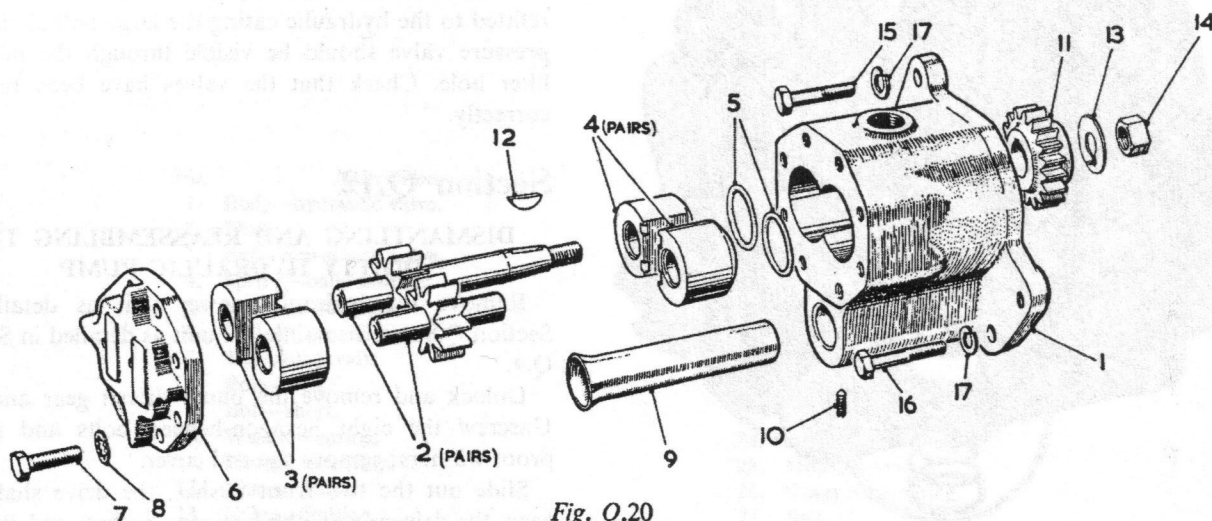


Fig. Q.20

The components of the Dowty hydraulic pump are shown in this illustration

- | | | |
|--------------------------------------------|-----------------------|-------------------------------------|
| 1. Pump body. | 7. End cover bolt. | 13. Lock washer. |
| 2. Driver and driven gears (matched pairs) | 8. Shakeproof washer. | 14. Nut. |
| 3. Front bushes (matched pairs). | 9. Pump suction tube. | 15. Pump to main case bolt (short). |
| 4. Inner bushes (matched pairs). | 10. Locating screw. | 16. Pump to main case bolt (long). |
| 5. 'O' ring seals. | 11. Pump driven gear. | 17. Spring washer. |
| 6. End cover. | 12. Gear key. | |

Check the piston ring by leaving an implement held overnight in the raised position by the hydraulic pressure only. As the implement drops, any oil which passes the piston ring will fill the piston crown and eventually cover the piston. Remove the cross-shaft cover to examine the state of the piston.

To fit a new ring crank the engine, using spanner 18G564 on tractors not supplied with a starting-handle, with the hydraulic drive engaged until the ring is above the bore.

If there is no leakage at the piston the complete unit must be removed to examine the unions on the pipe supplying pressure to the main hydraulic tapping to make sure that they do not leak. Examine the pipe for cracks.

Examine the oil seals between the cylinder and the valve body.

Failure of an implement attached to the auxiliary tapping may also be traced to leakage at one of the above points, with the exception of the piston ring, which is not under pressure when the auxiliary circuit is in use.

Implement drops in jerks

The limiting valve in the lower end of each valve plunger controls the maximum rate of drop of the lift-arms at approximately $1\frac{1}{4}$ seconds when the main regulating screw (see Fig. Q.12) is right out, irrespective of the weight of the implement.

A weak valve spring will allow the implements to drop in jerks. If the limiting valve is omitted when re-assembling the unit, or falls out afterwards, the implement will crash down out of control.

Low-pressure relief valve

If the return of the control lever to neutral is sluggish, or it does not return, test the operating pressure of the low-pressure relief valve.

With the pump working, remove the round knob from the main lift control lever and raise the lever with a spring balance and hook. The spring balance should show a reading of 6 to 16 lb. (2.7 to 7.2 kg.) until the lever is high enough to close the neutral circuit.

High-pressure relief valve

To measure the blow-off pressure of this valve connect test gauge 18G548 with adaptor 18G548A to the main hydraulic tapping and, with the pump in operation and an engine speed of at least 1,400 r.p.m., raise the main control lever (round knob). Hold the lever in the raised position against the pressure attempting to return it to neutral and read the blow-off pressure on the gauge. This should remain constant between 1,900 and 2,200 lb./sq. in. (133.6 and 154.65 kg./cm.²).

If the reading obtained is low examine the spring, the ball seating, and the rubber seal below the seat for

leakage. See Section Q.11 when fitting a new spring. If the reading is very low and the valve does not blow off and the levers do not return to neutral, suspect the oil pump, which may be worn, and also check for cracked pipes or leaking connections.

If the high-pressure valve is leaking the hand lever will return to neutral prematurely.

The high-pressure relief valve will blow off to release the oil pressure if the hydraulic lift is overloaded, also the control lever will snap back to neutral and the load will not rise.

Section Q.14

HYDRAULIC LIFT LINKAGE

The hydraulic lift linkage is designed to suit a wide variety of tractor-mounted implements and equipment. It consists of two lift-rods, two draft links and check struts, and a top link. Locating pins with retaining chains enable the linkage to be attached or removed in a few seconds.

Lift-rods

The two lift-rods are attached to the arms of the hydraulic lift and to the draft links by swivel pins. They can be adjusted to any one of four different lengths by engaging the locking pins, which normally pass through the lower holes in the outer tubes, with the appropriate holes in the sliding rods. To accommodate equipment

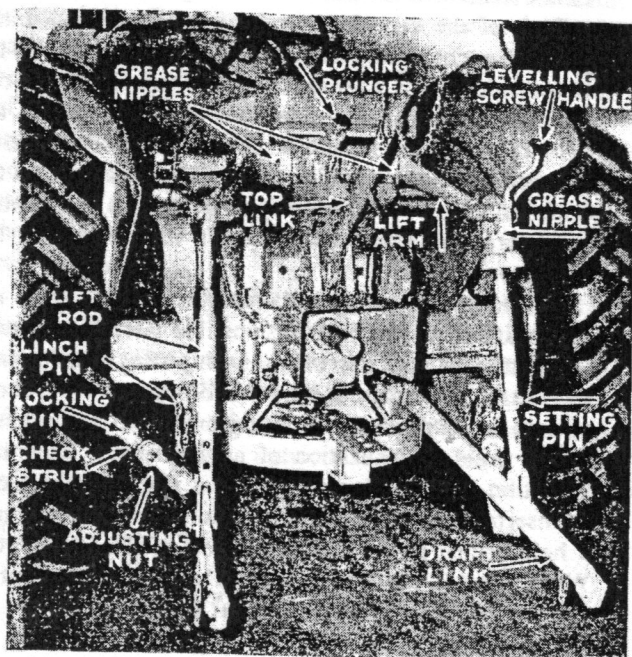


Fig. Q.21

The hydraulic power unit linkage

which requires freedom to float vertically or rock relative to the tractor, slots are provided in the outer tubes of the lift-rods through which the locking pins can be inserted.

The right-hand lift-rod is also adjustable for length by means of an adjusting screw which is operated by gearing connected to a conveniently placed handle.

When using tractor-mounted ploughs of current design insert the lift-rod locking pins in the lowest hole but one of each lift-rod, obtaining the necessary tilt of the plough by turning the adjusting handle in an anti-clockwise direction to shorten the right-hand rod.

In the case of other implements, adjust the length of the lift-rods to give the minimum ground clearance when the implement is in the raised position. This adjustment reduces idle time while lifting and lowering and will also ensure that the implement can reach its maximum working depth without being arrested by the limit of travel of the lift-arm. It is important not to allow the linkage to act as a stop limiting the downward movement of the implement.

Draft links

The two draft links, universally jointed at each end, form the main fixing points for tractor-mounted implements and equipment. They are secured to the implement or equipment and to a bracket on a fixed member of the drawbar unit by retaining pins. They are raised by the lift-rods and their lateral control is effected by means of the check struts.

Check struts

Each of the two check struts is attached to a hinge pin and anchor plate assembly which is secured to the under side of the axle casing flange by means of two bolts. The hinge pin and anchor plate assemblies are bolted through the second and third holes from the outside ends of the axle casing flange. They are fixed to the draft links by swivel pins secured by circlips and control the lateral movement of the draft links and thus the implement.

When the adjusting nuts on the forked rods are screwed fully to the rear the possible lateral movement is at a maximum. By screwing the adjusting nuts forward the lateral movement is diminished and can be reduced to zero for implements requiring no lateral movement.

For rapid centralization of an implement for transportation each check strut carries a stop-pin which can be inserted through a hole in the outer tube and through a hole drilled in the sliding portion of the forked rod. When inserted this pin locks the check strut in a central position and no lateral movement is possible.

Top link

The top link is secured between two lugs on the rear casing by a pin and retainer.

The adjustment of this link controls the angle at which the implement penetrates the ground. This adjustment is made by rotating the centre-tube of the top link by means of the attached sliding tommy-bar.

Linkage settings for mounted implements

To suit a wide range of proprietary implements the hydraulic lift linkage is provided with adjustments at several points. Precautions must be taken to ensure that the adjustment is satisfactory for the attached implement before it is put into operation.

In the case of certain implements the use of too short a lift-rod adjustment can cause the top link to foul the casing of the hydraulic power unit, and under the action of the pressure exerted by the hydraulic piston the result has been to bend the top link.

After mounting the implement, move it into the 'lift' position very gently to confirm that no fouling is likely to occur.

The safest method is to depress the clutch pedal, engage the hydraulic unit drive, and then raise the main control lever (round knob). By gradually releasing the clutch pedal the rate of lift can be controlled, and if fouling is imminent it can immediately be arrested by again depressing the pedal. Alternatively, the rate of lift can be controlled by the use of the hand lever as described in Section Q.7.

On certain ploughs repositioning of the width or depth control handles (or both) may be necessary to avoid damage to the toolbox.

The check struts also should be adjusted to give ample freedom of sideways movement. The plough must always be lifted clear of the ground before turning on the headland. If this is not done the heavy side pressure on the landside or mould board may cause bending of the draft links. Care should be taken when turning on sloping ground, with the implement raised, to avoid vigorous swinging of the implement.

Lift-rod adjustment—dismantling and reassembly

Remove the right-hand lift-rod from the hydraulic power unit and unscrew the adjustment mechanism from the lift-rod.

Remove the grease nipple and the gear cover. Remove the nut and washer holding the pinion gear in place and slide the gear and distance piece off the shaft. Pull the adjustment handle clear and remove the grub screw and fibre pad which lock the thread. Unscrew the bush behind the gear wheel. To remove the gear wheel or bearing remove the split pin and nut and drive the gear wheel and bearing from the shaft.

To reassemble reverse the dismantling procedure.

Section Q.15

POWER TAKE-OFF UNIT

The power take-off is available either as an independent unit or as an integral feature of the hydraulic power unit.

The take-off shaft is mounted centrally at a nominal height of $24\frac{1}{8}$ in. (63 cm.) above hard ground level with 10-00—28 tyres. The power shaft is provided with $1\frac{1}{8}$ in. (35 mm.) splines in accordance with British and A.S.A.E. standards and rotates at 528 r.p.m. at an engine speed of 1,400 r.p.m.

The control lever is mounted on the left-hand side of the rear casing. When moved to the mark 'P.T.O.' it is in the engaged position, and in neutral when at the mark 'N'.

Lubrication to all parts is provided from the oil in the main transmission, therefore no special attention to lubrication is required.

When engaging the drive the tractor must be stationary and the clutch pedal depressed. If the splines do not immediately enter re-engage the clutch slightly (with the gear lever in neutral position) in order to rotate the driving shaft into a position where the splines engage.

The serial number of the unit is stamped on the edge of the top flange.

Section Q.16

FITTING AND REMOVING THE POWER TAKE-OFF UNIT

Remove the drawbar pin and lift off the drawbar. Remove the drawbar frame as detailed in Section G.1.

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. If possible, it is recommended that the rear end of the tractor is raised to reduce the quantity of oil that will drain from the transmission casing. The total capacity is 12 gallons (54.5 litres).

Remove the bolts and lift off the rear cover from the transmission casing.

Clean the joint surfaces of the transmission casing and power take-off unit to ensure a good joint when the unit is bolted in position. Any burrs present on the joint surfaces should be removed with the aid of a flat fine-cut file. Fit the dowels supplied with the power take-off unit in position in the transmission casing.

Position a standard paper joint on the joint surface of the unit. A light smear of grease on the surface of the cover will assist to keep the paper joint in position.

Smear the bush (Part No. NT3947) supplied with the unit liberally with transmission oil and slide it into the

bore machined in the end of the layshaft of the gearbox. Place the power selector lever in the neutral or 'N' position and, with assistance, lift the unit to the required height. Keeping the face parallel to the face of the transmission case, carefully engage the spigot on the power shaft with the bush in the layshaft.

To assist in locating the unit when fitting it may be considered worth while to make up and use two guide pins, one screwed into each side of the transmission casing. The pins can be produced from two pieces of $\frac{7}{8}$ in. (11.11 mm.) diameter steel approximately 6 in. (15 cm.) long. Thread one end to suit the tapped holes of the transmission casing face and slightly taper the other end. Cut a screwdriver slot in the end of the pin to assist withdrawal after the unit is in place.

Move the unit towards the tractor to complete the engagement and, if necessary, tap the flange of the unit in the vicinity of the dowels with the aid of a lead or hide mallet to assist the dowels to enter the locating holes to their fullest extent.

Bolt the unit onto the tractor by means of the original bolts, making sure that there is a spring washer beneath the head of each.

Move the power selector lever into the engaged or 'P.T.O.' position and check that the dog clutch engages readily.

Re-engage the two drawbar supporting links with their support pins and refit the drawbar.

Refill the transmission casing with oil to the correct level.

When removing the unit obtain the help of an assistant to steady it. Remove the bolts which fasten the main casing to the transmission casing and, using two of the bolts, screw them into the tapped holes on either side of the main casing. 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 until the casing is clear of the dowels and the unit may then be lifted clear.

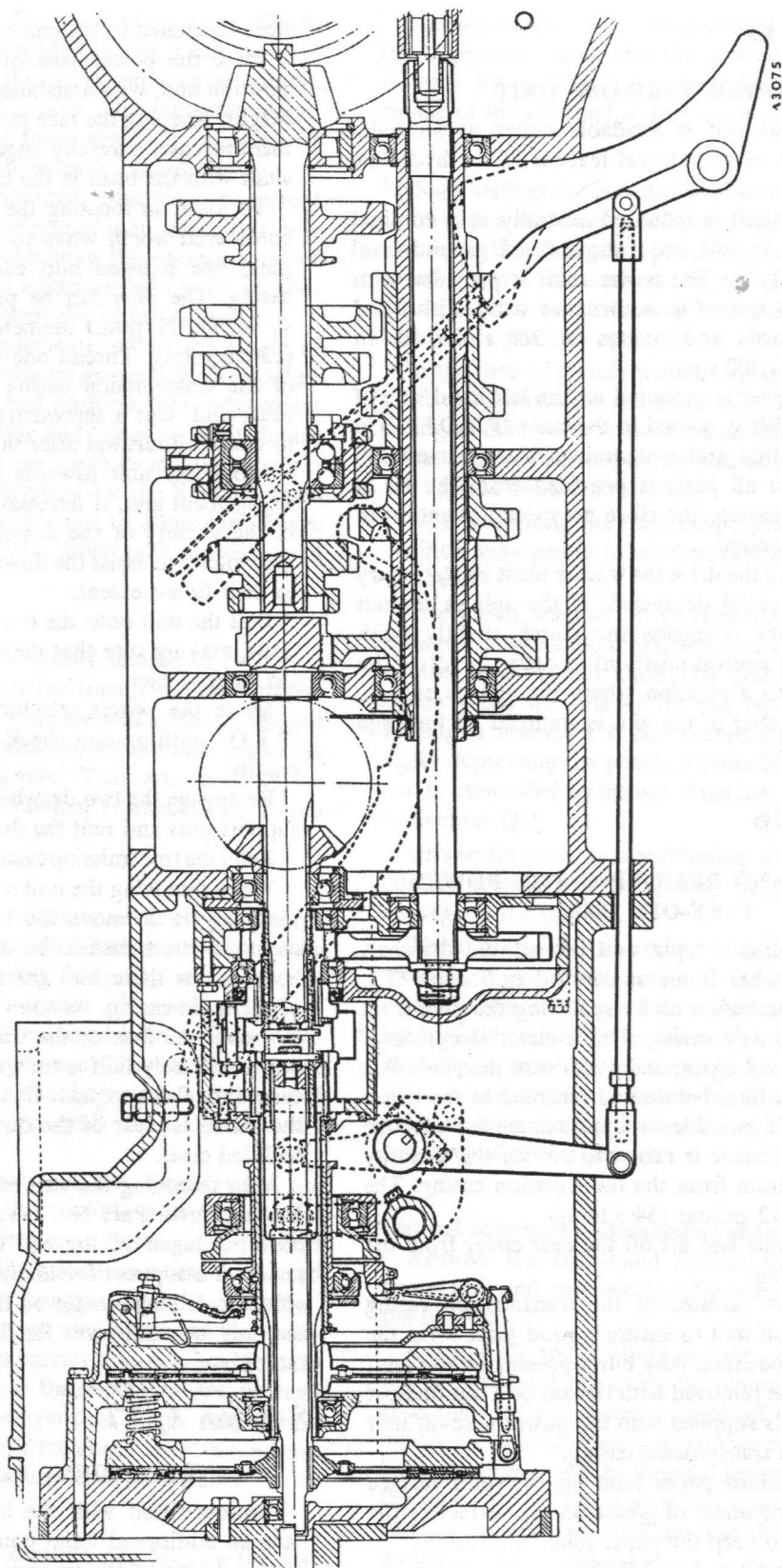
After removing the unit remember also to remove the floating bush (Part No. NT3947) which is fitted in the bore machined in the end of the layshaft. This bush serves as a support for the front end of the power take-off shaft. It may remain on the spigot of the shaft when the unit is withdrawn. Retrieve it and store it against future use.

Section Q.17

INDEPENDENT POWER TAKE-OFF

Tractors fitted with the independent power take-off have an additional hand control lever mounted on the left-hand side of the transmission casing to operate the clutch controlling the power take-off shaft.

THE INDEPENDENT POWER TAKE-OFF



The normal position of this control lever is forward. In this position the clutch is fully engaged. When pulled towards the rear the lever releases the independent power take-off clutch and, with the power selector lever engaged, breaks the drive to the independent power take-off shaft. When pulled back to its full extent the lever will lock in position and hold the clutch fully disengaged. Operation of this lever does not affect the normal working of the tractor, which has its own main clutch controlled by a pedal in the normal way.

NOTE.—For short periods, up to a maximum of 10 minutes, the independent power take-off clutch may be disengaged by operating the hand control lever. Should it be necessary to prolong disengagement beyond 10 minutes, disengage the power selector lever and then return the clutch lever to the normal position. Should it be necessary for some reason to disengage the power selector lever, first disengage the power take-off clutch and then move the power selector lever forward into neutral. Release the power take-off clutch lever.

The procedure when using an implement driven by the independent power take-off is as follows.

Moving coupled implement to work site

The independent clutch hand lever must be in the forward position and the power selector lever in the disengaged or forward position (marked 'N'). The independent power take-off shaft is then stationary and the tractor and implement can be driven in the normal way.

Implement in position to commence work

The tractor must be out of gear with the engine running. Pull the independent power take-off clutch hand lever backwards gently with the right hand and move the power selector lever rearwards with the left hand to engage the power take-off shaft. Release the clutch lever when the power lever is fully engaged. The implement will now be operating, with the tractor stationary.

Moving forward into work

Engage the tractor gear most suitable for the work in the normal way, using the main clutch pedal and change speed lever, and drive forward.

Reducing tractor speed

Depress the clutch pedal and, if necessary, engage a lower gear. The implement is being driven directly from the engine and the operating speed is unaffected.

To stop and restart implement

Pull back the clutch hand lever into the latched position, and to restart it release the lever and ease it forward immediately the implement re-enters the work area.

When turning tractor on headland

Pull back the clutch hand lever to the latched position. Release the clutch hand lever and move it gently into the forward position as the next run is commenced.

Section Q.18

DESCRIPTION OF THE CLUTCH

Power take-off clutch

The power take-off clutch (see Fig. Q.22) comprises a cover (4), a pressure plate (5), 12 thrust springs (6) carried in cups (7), and a driven plate with a splined hub (19) to which is riveted a disc (17) carrying two friction facings (3). The splines in the driven plate hub engage splines on the power take-off shaft. The power take-off cover is attached to the main drive cover (1) by six bolts fitted with spring washers.

Three lugs on the pressure plate pass through slots in the cover, and on each of these a release lever (14) is pivoted by means of a pin (13); the lugs also serve to transmit the drive from the cover to the pressure plate. Each release lever carries an adjusting screw. The inner ends of the levers are shaped to locate with the forked lugs of a plate (18). This plate is retained by split pins fitted behind retainer springs riveted to the inner ends of the levers. Three further springs (16) engage holes in the sides of the release levers and hook behind the cover. These springs ensure that the adjusting screws are always in contact with the seats (15). The seats act as fulcrums for the release levers.

Main drive clutch

The main drive clutch comprises the cover (1), a pressure plate (2), 12 thrust springs (11) which seat on insulating washers (12), and a driven plate with a splined hub (8) to which is riveted a disc (9) carrying two friction facings (10).

The splines in the driven plate hub engage splines on the main drive shaft, which passes through the centre of the hollow power take-off shaft. A pilot bearing for the end of the power take-off shaft is housed in a recess at the centre of the cover and is retained by a circlip (20).

The pressure plate is connected by three turnbuckles (30) to the outer ends of three release levers (25), each of which is bushed and mounted within a yoke (23). Each turnbuckle (30) carries at the release lever end a left-hand-threaded eyebolt (28) which is connected to the lever (25) by a headed pin (27). At the other end of each turnbuckle a right-hand-threaded eyebolt (32) is carried and is connected to a forked lug on the pressure plate by means of a plain pin (33); in this way the movement of the release levers is transmitted to the pressure plate. The lugs on the pressure plate engage slots in the main drive cover and transmit the drive to the pressure plate.

A plate (21) is retained against the inner tips of the release levers by three springs (22); one end of each spring is connected to the plate by means of a split pin whilst the other end is mounted on the pivot pin (26).

Principle of operation

With both clutches engaged, as illustrated in Fig. Q.22, the thrust springs (11) are clamping the inner driven plate (10) between the flywheel and the pressure plate (2), and the other thrust springs (6) are clamping the outer driven plate (3) between the main drive cover (1) and the pressure plate (5); engine torque is therefore transmitted to, and shared by, the main drive shaft and the power take-off shaft. To obtain the transmission of engine torque through the main drive clutch disengage the power take-off clutch, and to obtain engine torque for the P.T.O. shaft disengage the main drive clutch.

To disengage the main clutch the outer release lever plate (21) is displaced nearer to the flywheel, pushing the inner tips of the release levers (25) with it; the levers pivot about the pins (26), thus the turnbuckles (30) displace the pressure plate (2) nearer to the gearbox and against the load of the thrust springs (11), releasing the clamping pressure from the driven plate facings (10) and disconnecting the main drive from the engine.

To disengage the power take-off the inner release lever plate (18) is displaced nearer to the flywheel, pushing the inner tips of the release levers (14) with it; the adjusting screws and seats (15) act as fulcrums about which the levers pivot, and the resultant outward movement of the outer ends of the levers causes the pressure plate (5) to be displaced nearer to the gearbox and against the load of the thrust springs (6). In this way the clamping pressure is released from the driven plate facings (3) and the power take-off is disconnected from the engine.

From the above it follows that simultaneous dis-

engagement of both main drive and power take-off can be achieved by depressing the clutch pedal and pulling on the independent clutch lever at the same time.

Section Q.19

CLUTCH ADJUSTMENT

Main clutch

When the free movement of the clutch pedal is reduced to $\frac{1}{2}$ in. (12.7 mm.) measured at the pedal pad the clutch operating rod length must be adjusted.

Remove the inspection plate secured by four screws in front of the clutch pedal shaft. Turn the nut on the operating rod (Fig. Q.23) anti-clockwise and, using the holes provided in the operating rod, rotate the rod anti-clockwise until the correct free movement of $\frac{3}{4}$ in. (19 mm.) is obtained at the pedal pad before the actual clutch spring resistance is felt.

When the adjustment is correct retighten the locknut and replace the inspection cover.

See also Section Q.33.

Independent power take-off clutch

The correct free movement between the independent power take-off clutch thrust bearing and the release lever plate is .06 in. (1.5 mm.). Approximately 1 in. (25.4 mm.) free movement (see Fig. Q.24) measured at the tip of the hand lever indicates that the .06 in. (1.5 mm.) free movement at the thrust bearing is present, and this clearance is set by adjusting the length of the power take-off clutch operating rod.

Slacken the locknut (see Fig. Q.24) at the front end of the operating rod (right-hand thread) and, using a spanner on the nut welded to the rod, screw or unscrew the rod as necessary from the yoke attaching it to the clutch shaft lever.

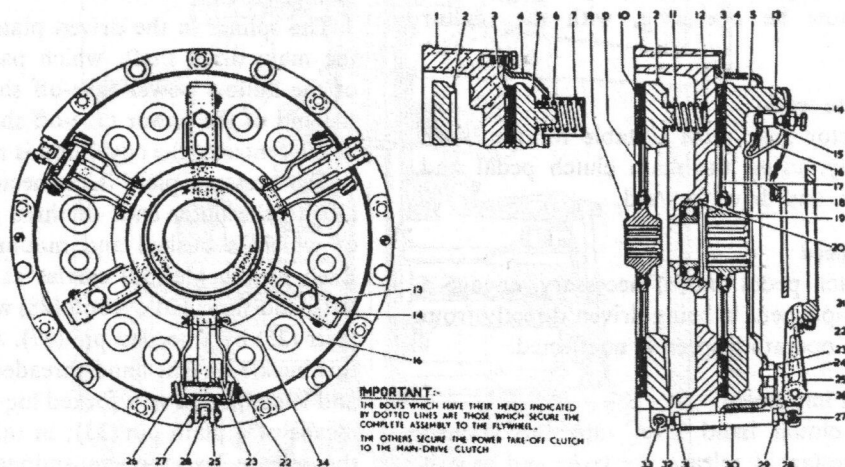


Fig. Q.22

The clutch unit in plan and section. The numbers are referred to in the text

Section Q.20

REMOVING THE CLUTCH WITH THE ENGINE IN THE FRAME

Remove the bonnet, fuel tank, and clutch housing as detailed in Section A.21, Operations 1 to 26.

Disconnect the independent clutch operating rod from the P.T.O. clutch operating lever by removing the clevis pin.

Withdraw the P.T.O. clutch fork clamping bolt and washers securing the fork to the operating shaft. Drive out the shaft with the lever attached.

Detach the carrier bracket assembly (which is in two halves) from the transfer housing cover by removing the five set bolts securing it to the withdrawal carrier sub-assembly, the four screws securing it to the transfer gear housing cover, and the four screws holding the halves together. To remove the bottom half of the carrier bracket assembly revolve it in a clockwise direction after withdrawing one of the bolts securing the cover of the transfer gear housing and preventing the bracket being revolved.

NOTE.—A large hole is machined in the flange of the withdrawal sub-assembly. Position the hole in turn over each of the four bolts securing the driving flange to the driven flange and remove the four bolts. Draw the driving flange forward slightly and remove the P.T.O. driving dog which is numbered for correct assembly.

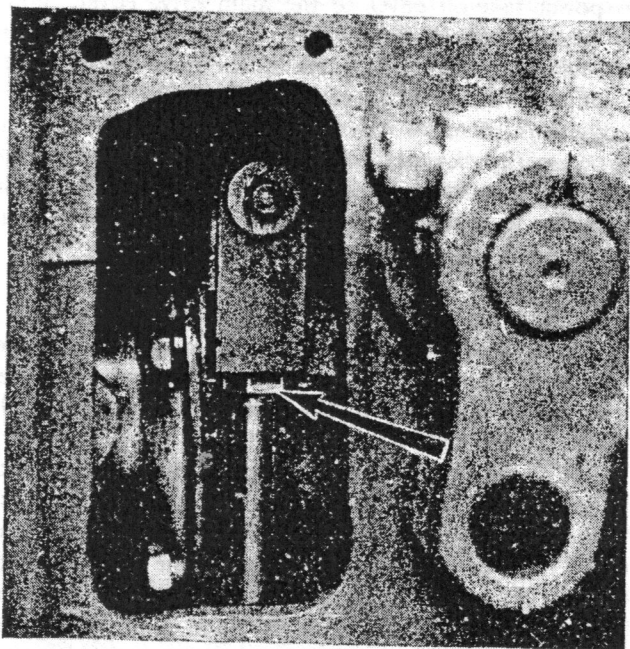


Fig. Q.23

The arrow indicates the locknut which must be released before the operating rod is rotated to set the main clutch pedal free movement

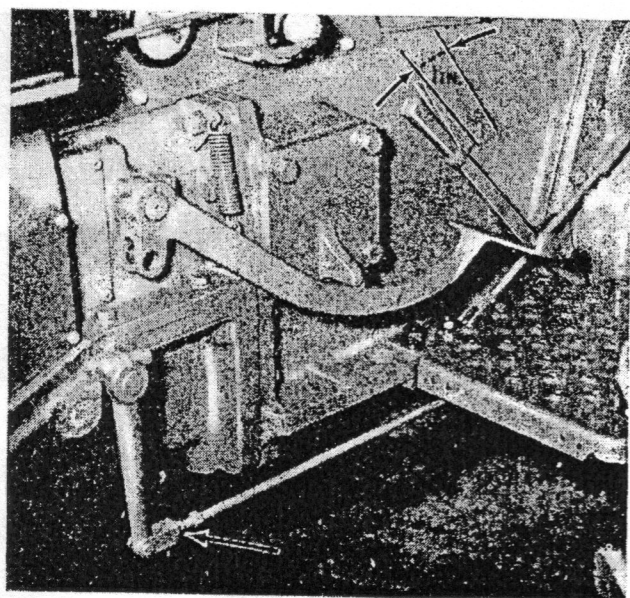


Fig. Q.24

From the fully forward position 1 in. (25.4 mm.) free travel on the operating lever rearwards must be present to ensure full engagement of the clutch. The lower arrow indicates the I.P.T.O. operating rod locknut. The other nut is used to rotate the rod

Uncouple the main transmission shaft from the primary shaft by removing the locking wire and withdrawing the two clevis pins. Push the driving sleeve forward into the independent transmission shaft, and unscrew the plugs with the fibre washers from the end of the main drive primary shaft and the main drive shaft.

With the aid of a 4 B.A. screw remove the main clutch operating shaft locating peg situated in the right-hand side of the frame. Extract the screw securing the operating fork to the shaft. Drive out the shaft and remove the fork.

Place a staple (Service tool 18G498) over the three main clutch release levers (25) (see Fig. Q.22), and hook the end of each staple beneath the independent clutch cover (4) (Fig. Q.22).

Remove the clutch assembly complete with the transmission shafts from the flywheel by taking out the nine securing bolts shown dotted in Fig. Q.22.

Section Q.21

DISMANTLING THE CLUTCH WITHDRAWAL MECHANISM

After removing the double clutch assembly as detailed in Section Q.20 the withdrawal carrier and both transmission shafts must be removed from the clutch assembly as follows.

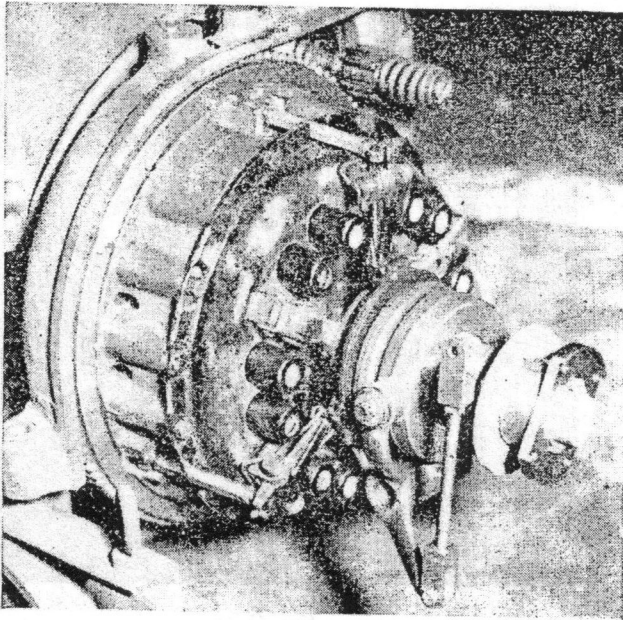


Fig. Q.25

The clutch unit and withdrawal assembly can be removed from the tractor separately or while mounted on the engine as shown here

Withdraw the main transmission shaft and driving sleeve from within the P.T.O. transmission drive sleeve.

Remove the circlip from the forward end of the P.T.O. transmission drive sleeve and drive out the sleeve from the pilot bearing in the main drive clutch cover. When removed, the withdrawal carrier, carrier sleeve, main thrust sleeve, and thrust bearing assemblies will be released.

Dismantle the withdrawal carrier sleeve assembly as follows.

Remove the circlip from the withdrawal carrier and the return spring from the P.T.O. clutch sleeve.

Press the independent clutch thrust bearing from the withdrawal sleeve, taking note of the way the bearing is fitted. The anti-rotation pin is now free to be taken out, thus allowing the P.T.O. clutch withdrawal sleeve to be separated from the withdrawal carrier.

Remove the main clutch thrust sleeve, thrust bearing, and carrier.

Dismantle the main clutch withdrawal assembly by taking out the set bolt, spring washer, plain washer, thrust washer, and four Belleville washers securing it to each arm of the fork. Separate the main clutch thrust sleeve from the fork by extracting the self-lubricating bush from each fork arm.

Press the main clutch thrust sleeve, the dirt excluder, and the bearing from the thrust sleeve carrier.

Section Q.22

DISMANTLING THE CLUTCH UNIT

To preserve the balance and correct assembly of the clutch mark suitably the relative positions of the following parts:

- (1) Power take-off cover (4) and main drive cover (1).
- (2) Release levers (14) and lugs on pressure plate (5).
- (3) Release levers (25) and yokes on power take-off cover.
- (4) Power take-off cover (4) and lugs on pressure plate (5).
- (5) Main drive cover (1) and pressure plate (2).

Compress the clutch under a press. The load of the press must be taken by wooden blocks arranged on the cover in the form of a bridge, with the uprights on the flange; wooden blocks must also be arranged under the pressure plate (2) so that the cover is free to move downwards when the load is applied.

Whilst the clutch is clamped disengage the release lever plates (18, 21) by removing the six split pins, disengage the springs (16) from the holes in the release levers (14), remove the pins (13, 26, 27) to disengage the release levers, and unscrew the six bolts securing the power take-off cover to the main drive cover. Slowly release the clamping pressure to prevent the thrust springs from flying out, and lift the various components off the clutch. Disconnect the turnbuckles (30) from the pressure plate by removing the pins (33). **Do not** unnecessarily disturb the setting either of the eyebolts (28, 32) in the turnbuckles or of the adjusting screws in the release levers (14). Remove the circlip (20) and the ball bearing from the main drive cover if necessary.

Alternatively:

Bolt the double clutch assembly to a spare flywheel with the main clutch driven plate in position, using three set bolts evenly spaced. The bolts should be $\frac{3}{4}$ in. (19.05 mm.) longer than those removed.

With the clutch bolted down, remove the three staples (Service tool 18G498) from the three main clutch release levers. Remove the three split pins and the three pins (27) from the turnbuckles. Withdraw the three set bolts holding the clutch to the flywheel, unscrewing them slowly and evenly to prevent distortion.

Dismantling the independent clutch

Remove three of the six set bolts (evenly spaced) holding the independent clutch cover to the main drive cover and replace with three set bolts $\frac{1}{2}$ in. (12.7 mm.)