

longer. Withdraw the three split pins and the three pins (13) from the adjusting levers. Remove the three remaining original set bolts holding the two covers together and then unscrew the three longer set bolts slowly and evenly to prevent distortion. The extra length of these three set bolts will be sufficient to release all the pressure on the 12 independent clutch springs.

Section Q.23

REFACING THE CLUTCH DRIVEN PLATES

When removing old worn facings the rivets should be drilled, not punched, out. A $\frac{5}{16}$ in. (3.97 mm.) diameter drill must be used, and the drill should be inserted through the clearance hole in the opposing facing. The open portion of the rivet readily centres the drill and it will be found that a speedy and clean removal is effected. After the facings have been removed examine the driven plate disc for cracks; if cracks are found a new driven plate assembly should be fitted.

Adopt the following procedure to fit new facings:

- (1) Place one of the facings in position on the side of the driven plate disc at which the hub flange is evident; the counterbored holes in the facing are to be aligned with the holes in the raised portions of the disc.
- (2) Insert the rivets, with their heads in the counterbored holes of the facing, and roll the shanks over securely against the driven plate disc. If a rolling tool is not available a blunt-ended punch will prove satisfactory.
- (3) Secure the opposite facing in a similar manner, when it will be noted that the counterbored holes in the one facing coincide with the clearance holes in the other.
- (4) Place the assembly on a suitable mandrel between lathe centres and spin to check for run-out; if this is more than .015 in. (.38 mm.) prise over as found necessary.

Section Q.24

REASSEMBLING THE CLUTCH UNIT

Clean all parts thoroughly before assembly and renew those which show appreciable wear. It is essential that all major components be returned to their original positions in order that the balance of the clutch may be preserved. It will be necessary during assembly to grease certain specified parts, and the correct grease to use is Duckham's K.G. 24.

The I.P.T.O. clutch pilot bearing (Part No. 7H3303) is packed with grease by the manufacturers. Under no

circumstances should the bearing be washed and used again. If for any reason the bearing should become dirty, or is suspect in any way, a replacement bearing packed with grease must be fitted. No further lubrication is necessary throughout the life of the bearing.

Assembly of the clutch is carried out in two stages, first assembling the power take-off clutch and then the main drive clutch.

Assembling and adjusting the power take-off clutch

Three 1 in. (25.4 mm.) diameter spacers .381 to .379 in. (9.67 to 9.62 mm.) thick will be required, which will take up the space normally occupied by the driven plate.

- (1) If previously removed, fit the pilot bearing and the circlip (20) in the centre of the main drive cover. Place the pressure plate (5) in position on the main clutch cover, ensuring that the two dowels are in position in the independent clutch cover, and place a straight-edge, approximately 8 in. (203.2 mm.) long, upon the clamping surface, thus bridging the central recess in the cover. Locate the spacers under the lugs on the plate.
- (2) Locate the 12 CREAM thrust springs (6) on the pressure plate bosses and position the cups (7) on the springs. Apply a slight smear of grease to the sides of the lugs and pass the cover (4) over the pressure plate, ensuring that the marks made (prior to dismantling) on the lugs and the cover are aligned; the lugs and the spring cups are to pass through the slots and the holes in the cover.
- (3) Bolt the independent clutch cover to the main clutch cover, using the three longer set bolts evenly spaced and turning the bolts a little at a time to avoid distortion; alternatively, if a press is being used arrange a bridge of wooden blocks on the cover (as when dismantling).
- (4) Whilst the clutch is clamped fit the three springs (16) in a position adjacent to the seats (15), with the closed ends of the springs hooked behind the cover. If previously removed, screw the nuts onto the release lever adjusting screws and fit the screws in the levers (14). Apply a slight smear of grease to the faces of the seats and to the total length of the pins (13). Connect the release levers to the appropriate pressure plate lugs by fitting the pins (13) and their split pins; engage the ends of the springs with the holes in the sides of the release levers.
- (5) Apply a slight smear of grease to the inner surface of the lugs on the plate (18), and engage them with the inner tips of the release levers; secure the plate by fitting the split pins through the holes in the lugs and in front of the small leaf springs at the tips of the levers. Operate the clutch several

times by means of a suitable press to settle the parts.

- (6) Whilst the clutch is compressed adjust the release lever adjusting screws until the distance from the clamping surface to the outer face of the release lever plate (18) is 2.51 to 2.49 in. (6.37 to 6.32 cm.). Since it is not possible to measure directly from the clamping surface it is necessary to measure from the straight-edge now in position, subtracting the thickness of the straight-edge from the adjustment figure. Operate the clutch several times, check again and readjust if necessary, and tighten the locknuts.

Release the clamping pressure or remove the long bolts to separate the two covers. Remove the spacers and straight-edge. Place the outer driven plate in position on the main clutch cover, using the independent transmission shaft (Part No. NT6790) to centralize the plate while bolting the independent clutch cover to the main clutch cover, using the six bolts originally removed.

Assembling and adjusting the main drive clutch

Three 1 in. (25.4 mm.) diameter spacers .381 to .379 in. (9.67 to 9.62 mm.) thick will be required to take up the space normally occupied by the inner driven plate. If new bushes have been fitted in the release levers (25) they must be reamed .3135 to .3125 in. (7.96 to 7.94 mm.) after being pressed into position.

NOTE.—Each clutch must be adjusted with the spacers and not with the driven plate in position.

- (1) Fit the nuts (29, 31) on the eyebolts (28, 32) and screw the eyebolts an equal amount into the appropriate ends of the turnbuckles (30).
- (2) Place the pressure plate (2) on a spare flywheel with the plate resting on the spacers (these are to be spaced so that they correspond with the lugs); alternatively, the pressure plate may be placed on the bed of a press with the spacers in position. Apply a slight smear of grease to the machined surfaces of the lugs and also to the full length of the plain pins (33), and connect the right-hand-threaded turnbuckle eyebolts to the lugs by fitting the pins.
- (3) Locate the 12 YELLOW thrust springs (on early models) and LIGHT BLUE thrust springs (on later models) (see item 11, Fig. Q.22), upon the pressure plate bosses, position an insulating washer (12) upon each, and place the cover over the pressure plate springs. Ensure that the marks made (prior to dismantling) on the cover and the pressure plate are aligned and that the springs and washers enter the recesses in the cover.
- (4) Place three spacers evenly spaced on a spare

flywheel. The dimensions of the spacers should be: diameter 1 in. (25.4 mm.) by thickness .381 to .379 in. (9.67 to 9.62 mm.). Position an 8 in. (203.2 mm.) long straight-edge across the central recess in the flywheel. Bolt the clutch assembly to the flywheel with three set bolts $\frac{3}{8}$ in. (19.05 mm.) longer than the original bolts, tightening the bolts a little at a time to avoid distortion. Insert and tighten six of the original clutch assembly bolts. Remove the three longer bolts and fit the three remaining original bolts. Alternatively, if a press is being used arrange a bridge of wooden blocks on the cover (as when dismantling).

- (5) Engage the release levers (25) with the appropriate yokes (23), and position the springs (22) on the outside of the yokes; the levers are to be fitted with their curved inner tips facing outwards, and the springs are to be fitted with the straight portion at the coiled end facing inwards. Apply a slight smear of grease to the full length of the pins (26), pass the pins through the springs, yokes, and levers, and secure with split pins.
- (6) Apply a slight smear of grease to the total length of the pins (27) and to the sides of the turnbuckle eyebolt (28). Connect the eyebolts to the outer ends of the release levers (25) by fitting the pins and the split pins; it may be necessary to adjust the turnbuckles (30) to achieve this, and final adjustment will be carried out on completion of the assembly.
- (7) Apply a slight smear of grease to the inner surface of the machined lugs on the plate (21) and engage the lugs with the inner tips of the release levers. Connect the springs (22) to the other lugs by fitting a split pin and two washers (34) in each case. Operate the clutch several times by means of a suitable ram to settle the parts.
- (8) Whilst the clutch is compressed adjust the release levers by slackening the locknuts (29, 31) and turning the turnbuckles (30) in the appropriate direction until the distance from the clamping surface to the outer surface of the plate (21) is 6.33 to 6.31 in. (16.08 to 16.03 cm.). Since it is not possible to measure directly from the clamping surface it will be necessary to measure from the straight-edge now in position, remembering to subtract the thickness of the straight-edge from the adjustment figure. Operate the clutch several times, check again, and readjust if necessary. Tighten the locknuts. Place three staples (Service tool 18G498) over the release levers (25) and clip them under the independent clutch casing before removing the clutch assembly from the spare flywheel.

Section Q.25

REFITTING THE CLUTCH TO THE FLYWHEEL

Assemble the main clutch thrust sleeve bearing dirt excluder and retainer into the carrier.

Place the thrust sleeve into the fork and secure with the self-lubricating bushes, Belleville, thrust, flat, and spring washers, and set bolts.

Pass the power take-off clutch withdrawal carrier through the main clutch thrust sleeve assembly with the flange on the withdrawal carrier nearest to the thrust sleeve bearing.

Slide the power take-off withdrawal sleeve over the withdrawal carrier, aligning the small hole in the bearing seat with the slot in the carrier.

Insert the anti-rotation pin in the withdrawal sleeve and press on the power take-off clutch thrust bearing.

Replace the withdrawal carrier return spring and circlip.

Pass the independent transmission shaft through the withdrawal carrier sub-assembly.

to the clutch, and the end of the independent transmission shaft should be passed through the power take-off clutch plate splines, pressed into the main drive cover centre bearing, and secured with a circlip.

Assemble the main driving sleeve onto the main transmission shaft with the plain end of the sleeve towards the clutch.

Pass the main transmission shaft and sleeve assembly through the power take-off transmission shaft and engage the main clutch driven plate with the main transmission shaft splines.

Refit the double clutch unit to the flywheel. Complete the reassembly by reversing the instructions given under Section Q.20.

Section Q.27

DRAFT LINK CONVERSION KIT FOR CATEGORY 1 IMPLEMENTS (Early Type)

A conversion kit (Part No. SP32) is available to enable early type Category 1 implements to be operated with the Universal Three Tractor.

The kit comprises: two ball joints, two ball retainers, and eight screws, nuts, and spring washers.

In order to fit the parts remove the four rivets which secure the retainer plates to the outer ends of the two draft links. This is most easily accomplished by filing or grinding the ends of the rivets until the remainder can be driven out. Remove the plates and balls and in their places fit the two ball joints (ATJ6004) and secure them in position with the two retainer plates (ATJ6005). Bolt the plates in position using the countersunk-headed screws, spring washers, and nuts.

Section Q.26

DISMANTLING THE TRANSFER GEAR ASSEMBLY

Drain the oil from the transmission casing.

Remove the driven flange circlip and withdraw the flange from the power take-off driving gear. Take out the 11 bolts and spring washers which secure the housing cover and joint to the transfer gear housing. The cover is removed complete with Gaco oil seal and large bearing assembly.

The power take-off primary shaft cannot be withdrawn upwards. Remove the self-locking nut and Belleville washer and withdraw the driven gear from the splines at the end of the shaft. The shaft may then be withdrawn from the rear after removal of the hydraulic power unit assembly.

Both the power take-off driving and driven gears run in bearings pressed into the rear face of the transfer gear housing. The housing complete with bearings may be withdrawn after removal of the driven gear, giving access to the 10 bolts securing the housing to the transmission casing.

When the hydraulic power unit has been removed drive the power take-off primary shaft to the rear until it is clear of the bearing in the gear housing, withdraw all retaining bolts, and lift the housing clear, leaving the primary shaft sleeve in position on the shaft.

The whole of the above assembly is now offered up

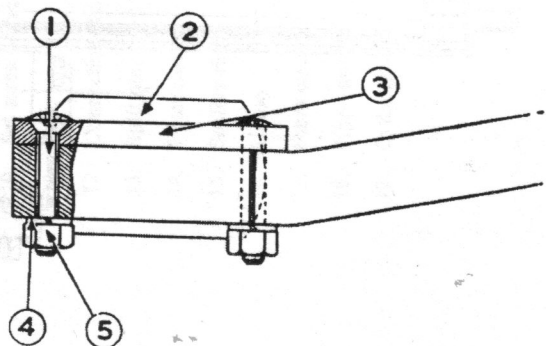
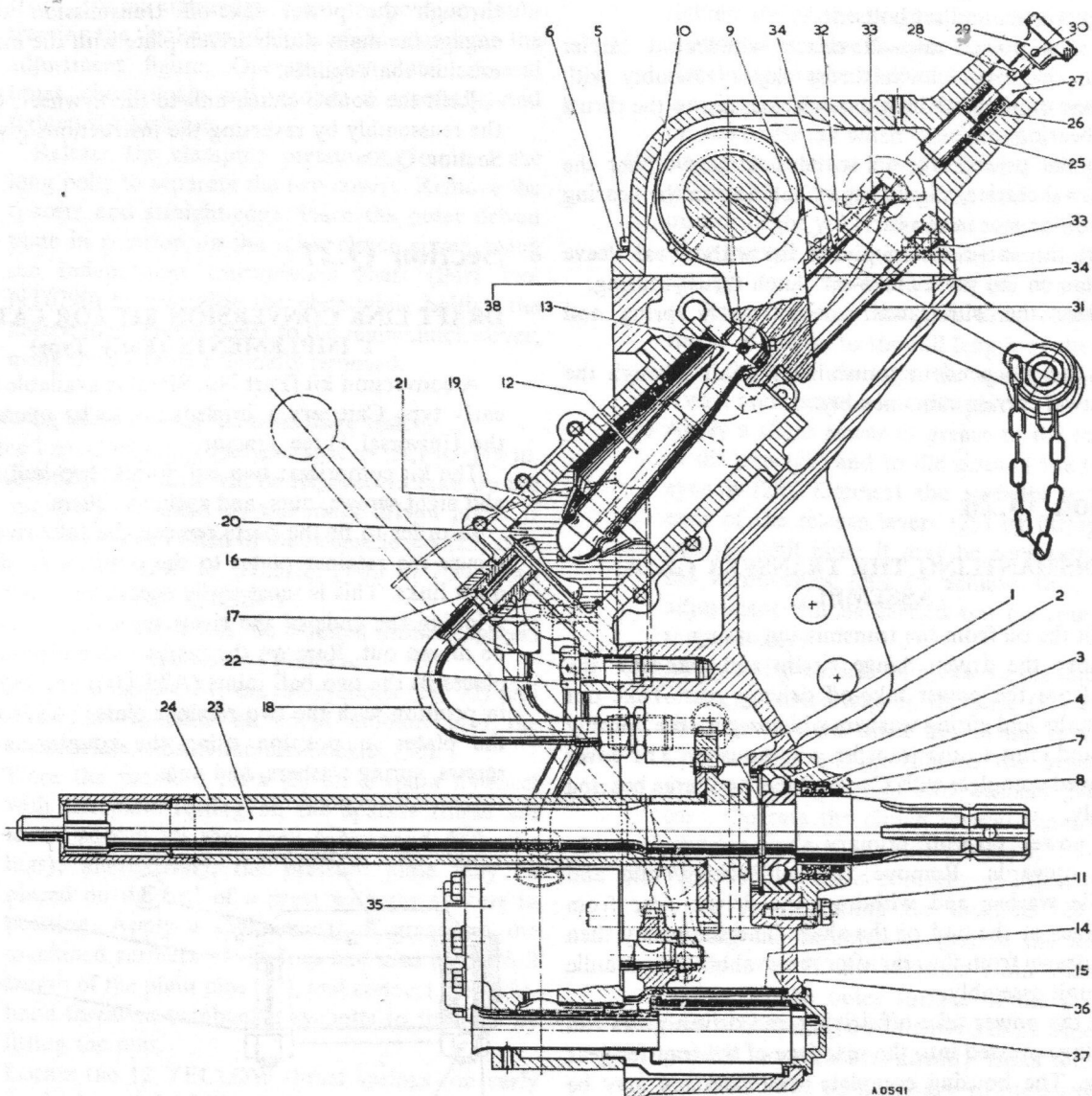


Fig. Q.26

The components of the draft link conversion kit

1. Countersunk-headed screw.
2. Ball joint.
3. Ball retainer.
4. Spring washer.
5. Nut.

THE HYDRAULIC POWER UNIT AND P.T.O.



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

No.	Description	No.	Description
1.	Circlip—small.	20.	Piston.
2.	Circlip—large.	21.	Piston ring.
3.	Bearing.	22.	Special bolt—cylinder to main case
4.	Oil seal.	23.	Shaft—P.T.O.
5.	Bolt—housing to case.	24.	Driving tube.
6.	Spring washer.	25.	Plunger.
7.	Oil seal housing.	26.	Spring.
8.	Felt washer.	27.	Plug.
9.	Key.	28.	Pin.
10.	Set screw—lever to cross-shaft.	29.	Knob.
11.	Bolt.	30.	Pin for knob.
12.	Connecting rod—lever to piston.	31.	Screw—power adjusting.
13.	Split pin.	32.	Screw—auxiliary adjusting.
14.	Filter sleeve.	33.	Spring.
15.	Sealing ring.	34.	Split pin—adjusting screws.
16.	Union.	35.	Hydraulic pump.
17.	Fibre washer.	36.	Washer—filter.
18.	Pipe—auxiliary.	37.	Filter—hydraulic.
19.	Cylinder—hydraulic.	38.	Lever—cross-shaft.

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

<i>No.</i>	<i>Description</i>	<i>No.</i>	<i>Description</i>
1.	Circlip—small.	20.	Piston.
2.	Circlip—large.	21.	Piston ring.
3.	Bearing.	22.	Special bolt—cylinder to main case
4.	Oil seal.	23.	Shaft—P.T.O.
5.	Bolt—housing to case.	24.	Driving tube.
6.	Spring washer.	25.	Plunger.
7.	Oil seal housing.	26.	Spring.
8.	Felt washer.	27.	Plug.
9.	Key.	28.	Pin.
10.	Set screw—lever to cross-shaft.	29.	Knob.
11.	Bolt.	30.	Pin for knob.
12.	Connecting rod—lever to piston.	31.	Screw—power adjusting.
13.	Split pin.	32.	Screw—auxiliary adjusting.
14.	Filter sleeve.	33.	Spring.
15.	Sealing ring.	34.	Split pin—adjusting screws.
16.	Union.	35.	Hydraulic pump.
17.	Fibre washer.	36.	Washer—filter.
18.	Pipe—auxiliary.	37.	Filter—hydraulic.
19.	Cylinder—hydraulic.	38.	Lever—cross-shaft.

Section Q.28

MODIFIED HYDRAULIC POWER UNIT
VALVE UNIT

Commencing at the following tractor serial numbers, the hydraulic power unit is fitted with a tapered valve plunger giving a controlled rate of lift. The modified plunger is interchangeable with the early type on any 2,000 lb./sq. in. unit, and, when fitted, any implement attached to the power unit linkage may 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.

Commencing tractor serial numbers are as follows:

3 DL (U.K.) 771/774, 772/507.

3 DL (not U.K.) 771/962, 772/518.

4 DM (not U.K.) 787/1069, 792/814.

Section Q.29

HYDRAULIC POWER UNIT GRADUAL
LIFT CONTROL

A modified main control lever is now fitted giving greater control over the rate of lift of the hydraulic power unit.

A modified lever may be fitted to earlier tractors, provided the hydraulic power unit has a modified valve plunger fitted (see Section Q.28). To fit the modified lever proceed as follows.

Remove and discard the main control lever.

Assemble the stop bracket (Part No. ATJ6019) to the main control lever bush so that the arm is just clear of the auxiliary lever securing nut as illustrated in Fig. Q.27.

Fit the modified main control lever assembly (Part No. ATJ6021), using all the Belleville washers which were in position before the conversion.

To operate

Engage the hydraulic power unit selector lever and run the engine at 1,400 r.p.m. Attach a suitable implement, such as a plough, to the hydraulic unit linkage, depress the lever trigger (A in Fig. Q.27) to the engaged position, and raise the control lever.

Adjust the rate of lift to the desired speed by screwing in the adjusting screw (B in Fig. Q.27) to decrease and out to increase the rate of lift.

To obtain normal control, release the trigger and pull the main control lever upwards to its full extent.

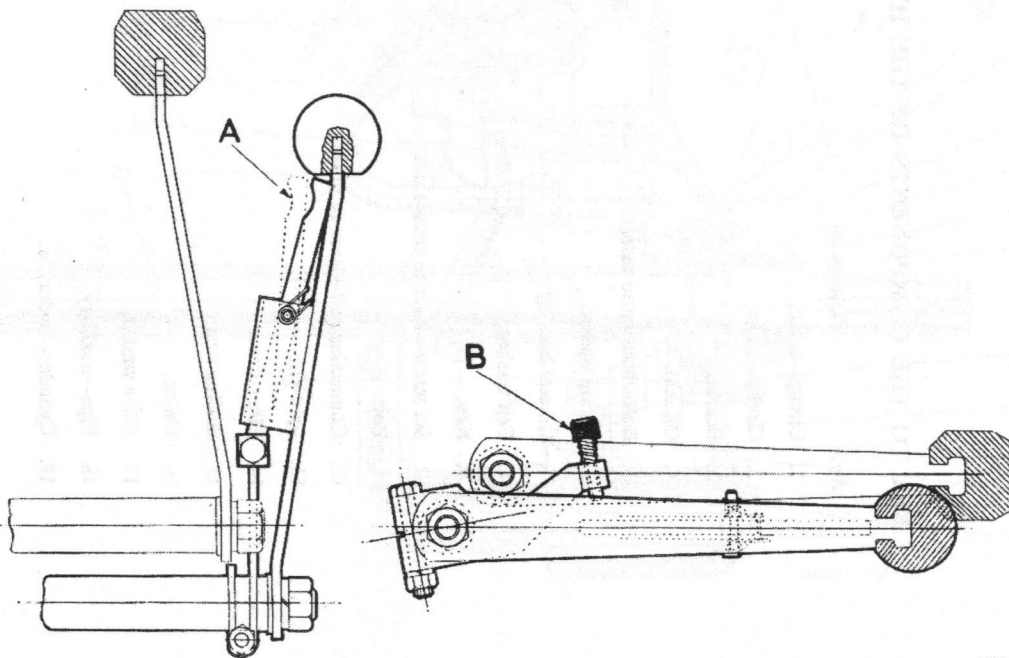


Fig. Q.27

Details of the gradual lift control lever. (A) indicates the trigger lever and (B) the knurled adjusting screw

Section Q.30

INDEPENDENT HAND-OPERATED WHEEL BRAKES

A tractor fitted with independent hand-operated wheel brakes has the suffix letter 'B' added after the serial number. A tractor fitted with wheel brakes and also differential lock will bear the suffix letter 'X' after the serial number.

The brake is operated by a hand lever fitted on the right-hand side of the tractor just forward of the foot brake pedals.

When pulled to the rear the lever applies the brake fitted on each side of the tractor between the axle casing and the tractor road wheel. A ratchet mechanism holds the brake in the 'on' position.

The brakes are released by pulling on the lever to take the load and then pressing on the ratchet release before the lever is pushed forward to the 'off' position.

Moving the hand brake lever to the 'on' position causes the lever in the expander body to displace a piston which carries before it a fork. The movement of this fork causes twin segments to roll between the inclined faces of two tappets, forcing them outwards until the shoes contact the drum.

As the brake is applied the primary shoe, due to the clamping force, moves in the same direction of rotation as the drum, causing the adjuster body and the toe of the attendant secondary shoe to move in a similar direction, clamping the secondary shoe against the drum.

With the brake-drum revolving in the opposite direction the reversal of the foregoing occurs; therefore, when the secondary shoe contacts the drum its clamping force is felt through the adjuster screw to the adjuster body; consequently, the primary shoe is forced into contact with the drum.

It will be seen from this that an equal amount of braking power is obtained with the tractor moving in either direction.

NOTE.—All rear wheel track settings on tractors fitted with the above wheel brakes are increased by $\frac{1}{8}$ in. (15.87 mm.) overall.

Section Q.31

ADJUSTMENT

Brake adjustment is necessary if excessive travel of the hand brake lever is required to bring the brakes into operation. Three to four notches on the lever ratchet is

the normal travel; if the number exceeds this, then adjustment must be carried out as follows:

- (1) Place chocks under the front wheels of the tractor to prevent rolling, jack up both the rear wheels, and fully release the hand brake.
- (2) To ensure there is no load on the brake-shoe operating levers in the brake assembly, remove the clevis pins which link the levers to the operating rods.
- (3) Slide back the dust cover at the rear of the right-hand backplate and insert a screwdriver (not exceeding 6 in. [15.2 cm.] in length) through the slot, engaging it with a tooth on the adjuster wheel. Rotate the adjuster wheel **towards** the centre of the axle until the brake-shoes are hard against the drum. Do not strain the adjuster wheel.
- (4) Rotate the adjuster wheel the least possible amount to release the brake-drum and allow the road wheel to revolve. Replace the dust cover.
- (5) Adjust the left-hand brake in a similar manner, but note that the adjuster wheel must be rotated away from the centre of the axle.
- (6) Reconnect the operating rods to the brake assembly levers with the clevis and split pins. Lower the rear wheels to the ground and remove the jack and chocks.

Section Q.32

DISMANTLING AND REASSEMBLING A BRAKE ASSEMBLY

Place chocks under the front wheels, jack up the rear of the tractor on both sides (to prevent the tractor from rolling), fully release the hand brake, and remove the wheels.

Slacken off the brake-shoe adjustment, remove the two countersunk screws which locate the brake-drum to the axle shaft flange, and remove the brake-drum.

Lever one of the shoes against the spring tension to disengage the shoe at each end, when both shoes and springs may be removed.

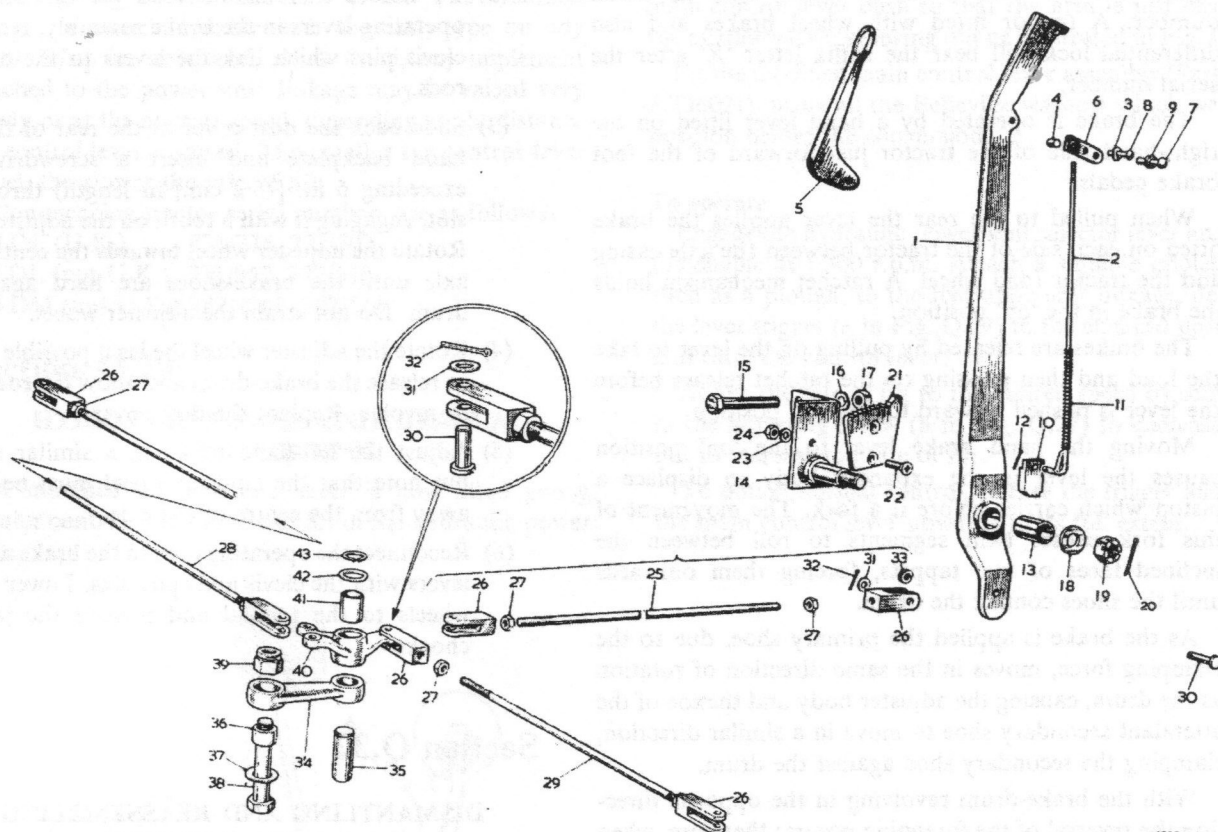
Remove the clevis pin connecting the lever to the operating rod.

Disconnect the clicker spring from the adjuster bracket, hold the adjuster body and wheel steady, and unscrew the adjuster screw; take off the bias spring.

Remove the four bolts and the cover from the bisector body; remove the expander assembly.

Remove the two large bolts and separate the bisector body from the backplate.

INDEPENDENT HAND-OPERATED WHEEL BRAKES, BRAKE LEVER, AND RODS—COMPONENTS



A2750

No. Description

1. Hand brake lever.
2. Pawl rod.
3. Spring washer.
4. Pawl rod nipple.
5. Latch.
6. Latch pivot arm.
7. Rivet (large).
8. Rivet (small).
9. Fibre washer.
10. Pawl.
11. Spring.
12. Split pin.
13. Bush for lever.
14. Support bracket.
15. Bolt for bracket.
16. Spring washer.

No. Description

17. Nut.
18. Plain washer.
19. Nut (slotted).
20. Split pin.
21. Ratchet.
22. Screw.
23. Spring washer.
24. Nut.
25. Brake-rod—hand brake to balance lever.
26. Jaw.
27. Locknut.
28. Brake-rod—R.H. brake to balance lever.
29. Brake-rod—L.H. brake to balance lever.

No. Description

30. Clevis pin.
31. Plain washer.
32. Split pin.
33. Thackeray washer.
34. Pivot arm.
35. Pivot pin.
36. Bush.
37. Plain washer.
38. Bolt.
39. Nut.
40. Balance lever.
41. Bush.
42. Plain washer.
43. Circlip.

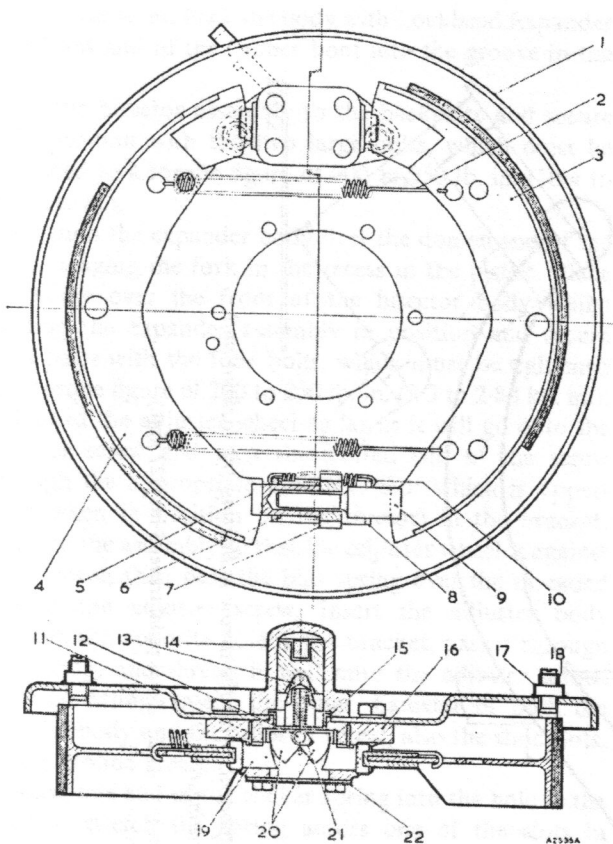


Fig. Q.28

- | | |
|----------------------|----------------------|
| 1. Back-plate. | 12. Pivot pin. |
| 2. Pull-off spring. | 13. Fork. |
| 3. Secondary shoe. | 14. Expander body. |
| 4. Primary shoe. | 15. Spring retainer. |
| 5. Adjuster body. | 16. Bisector body. |
| 6. Bias spring. | 17. Locknut. |
| 7. Adjuster wheel. | 18. Steady pin. |
| 8. Adjuster bracket. | 19. Tappet. |
| 9. Adjuster screw. | 20. Segment. |
| 10. Clicker spring. | 21. Retainer. |
| 11. Dowel pin. | 22. Cover. |

Bisector assembly

Dismantling

Compress the spring in the fork (13, Fig. Q.28), take out the spring retainer (15), and with the tappets (19) fully back against the dowel pins (11) push out the fork and segment assembly.

Press out the pivot pin (12) and remove the segments (20), together with the retainers (21). The stop pin (6, Fig. Q.29) need not normally be removed.

Should it be necessary to remove the tappets (19), insert a lever in the slotted end of each tappet in turn and rotate it 180° in order to shear off the inner end of the dowel pins (11). After the tappet has been removed the remainder of the dowel pin can be drilled out, using a No. 43 drill (.089 in. [2.25 mm.] diameter). Remove all traces of swarf with a high-pressure air jet.

Reassembling

If previously removed fit the stop pin in the end of the fork.

Place a retainer on the side of each segment, engaging the cranked tongue within the locating hole in each segment. Position the segments, with the retainers outermost, within the fork. Align both segments and retainers with the pivot pin hole and fit the pivot pin.

Ease the return spring into the head of the fork and insert the complete assembly into the bisector body.

Compress the spring and insert the spring retainer so that when the spring is released the retainer seats squarely in the body.

Expander assembly

Dismantling

Remove the circlips and tap out the pivot pin (3, Fig. Q.29). Disengage the rubber boot (2) from the groove in the body (4), remove the boot and the lever (1), and ease the boot from the lever; push the piston (5) out of its bore.

Reassembling

Ease the boot on the lever, and insert the lever into the body with the lever heel adjacent to the piston bore. Smear the pivot pin with Lockheed Expander Lubricant, push it through the body and lever, and secure with the circlips.

Insert the piston into its bore with its inclined face

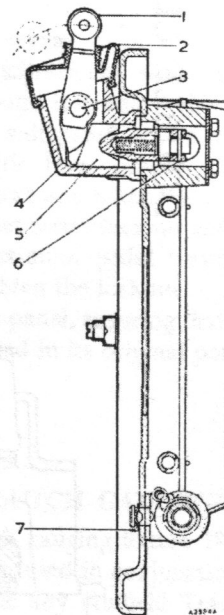
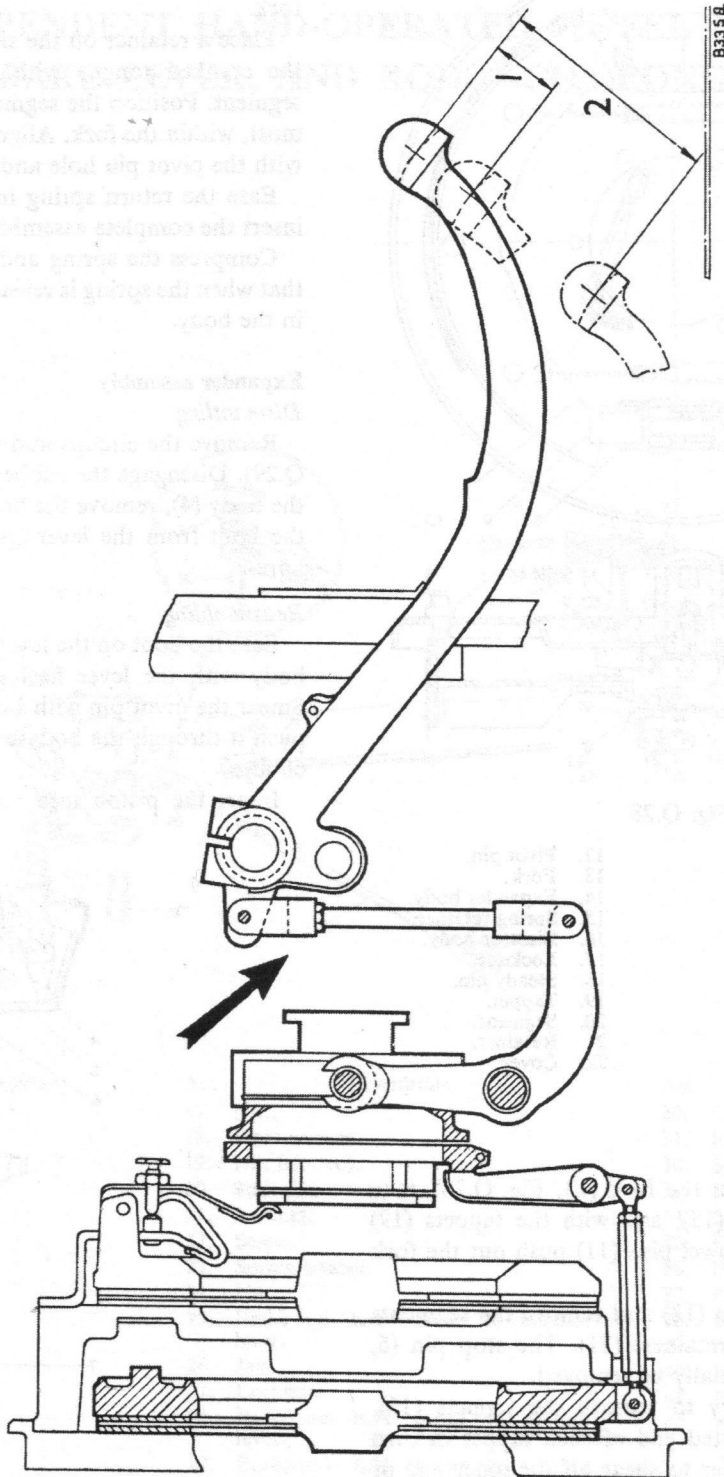


Fig. Q.29

- | | |
|-------------------|----------------|
| 1. Lever. | 5. Piston. |
| 2. Rubber boot. | 6. Stop pin. |
| 3. Pivot pin. | 7. Dust cover. |
| 4. Expander body. | |

DOUBLE CLUTCH COMPONENTS



The double clutch in section showing the components with the arrow indicating the locknut and operating rod

1. Initial free-pedal movement $\frac{3}{4}$ in. (19 mm.).
2. Total pedal travel 5 in. (127 mm.).

towards the lever. Pack the body with Lockheed Expander Lubricant and fit the rubber boot into the groove in the body.

Fit the bisector assembly to the backplate and secure it in position with the two large bolts, which must be tightened to a torque figure of 900 to 950 lb. in. (10.4 to 10.9 kg. m.).

Position the expander body over the domed end of the fork engaging the fork in the recess in the piston. Place the cover over the front of the bisector body whilst holding the expander assembly in position and secure both parts with the four bolts, which must be tightened to a torque figure of 200 to 250 lb. in. (2.3 to 2.88 kg. m.).

Thread the adjuster wheel as far as it will go onto the adjuster screw and pass the slotted end of the screw through the appropriate hole (i.e. that which is uppermost when in position on the tractor) in the bracket. Position the assembly so that the adjuster wheel is against the bracket, then pass the bias spring over the threaded end of the adjuster screw. Insert the adjuster body through the opposite hole in the bracket, pass it through the spring, and thread it well onto the adjuster screw. Prior to fitting, smear the outer diameter of both the adjuster body and the adjuster screw, also the shoe slots, with Lanoline grease.

Hook one end of the clicker spring into the hole in the bracket, stretch the spring across one of the slots in the adjuster wheel, and hook the opposite end in the remaining hole in the bracket.

Lay the brake-shoes on a bench with the 'toe' (the end showing the greater portion of lining platform) of one facing the 'heel' of the other and connect the pull-off springs to the under side of the shoes, using the holes in which they were originally fitted (see Fig. Q.28).

Assemble the shoes on the backplate, with the springs innermost, engaging the toe of the primary shoe (4, Fig. Q.28) with the slot in its tappet and the toe of the secondary shoe engaging the slot in the adjuster screw; locate the heel of each shoe in their respective abutments.

If the steady pins (18, Fig. Q.28) have not been disturbed the 'squareness' of the brake-shoe linings should be correct. If the steady pins have been disturbed it will be necessary to check that the lining of each shoe is parallel with the axis of the axle. Proceed as follows.

Apply the stock of a combination square to the axle shaft flange and adjust the blade of the square across the face of the lining. Check with a feeler gauge that the lining is parallel with the square to within .010 in. (.254 mm.). If adjustment is required screw the steady pins in or out until the linings are square within the limits given and then tighten the steady pin locknuts to a torque figure of 250 to 300 lb. in. (2.88 to 3.45 kg. m.). After tightening, check once more to ensure that the setting has not been disturbed.

Slacken back the brake-shoe adjustment and fit the drum and the road wheel.

Adjust the brakes as described in Section Q.31.

Finally, connect the operating rod to the brake lever with the clevis pin.

If any of the yoke ends on the brake-rods have been disturbed the rods must be reassembled, to the following dimensions between the yoke centres, before any attempt is made to adjust the brakes:

Rod connecting hand brake to balance lever	.. ..	20 $\frac{1}{8}$ in. (523.9 mm.)
Rod connecting balance lever to right-hand brake	.. ..	14 $\frac{7}{8}$ in. (377.8 mm.)
Rod connecting balance lever to left-hand brake	.. ..	37 $\frac{1}{8}$ in. (942.6 mm.)

Section Q.33

CLUTCH PEDAL MAXIMUM TRAVEL ADJUSTMENT

The maximum travel of the main clutch pedal on all tractors fitted with independent power take-off must not exceed 5 in. (127 mm.) from rest to the fully depressed position and measured from the pedal pad. The travel is controlled by an adjustable set screw, secured by a locknut, and is situated in the clutch and steering housing in a position immediately above the clutch pedal shaft lever. Refer to the illustration on page Q.24.

To adjust the pedal travel

Access to the adjustment screw is obtained after removing the left-hand instrument side panel as follows:

- (1) Mark on the side panel, with a pencil, the position of the throttle lever bracket. Unscrew the five retaining screws and withdraw the side panel.
- (2) Slacken the set screw locknut and adjust the screw until the maximum pedal travel is as described above. Retighten the locknut.
- (3) Refit the side panel, ensuring that the throttle lever bracket is fitted in its original position.

Section Q.34

DOUBLE CLUTCH GAUGING FIXTURE

The double clutch gauging fixture 18G563 consists of a kit of parts which, used in conjunction with a suitable flywheel, will enable any Nuffield Tractor clutch to be quickly dismantled, rebuilt, and finally adjusted to a high degree of accuracy.

Detailed below is the procedure for dismantling and reassembling a double-plate clutch. Single-plate clutch procedure is dealt with in Section E.7.

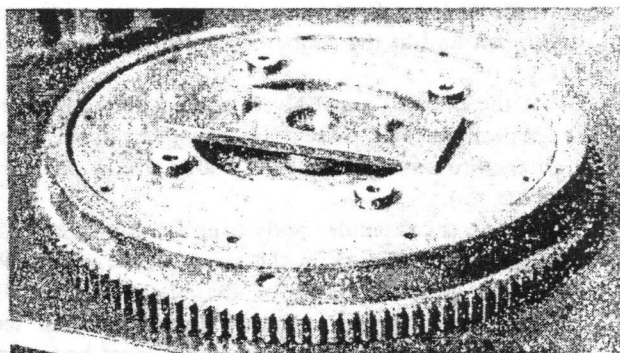
Dismantling

Place a spare flywheel or the one taken from the engine concerned on the bench as a base plate.

Fit the bridge (1, Fig. Q.31) with the boss downwards centrally on the flywheel and secure it with the two countersunk-headed screws.

Place the spacers (5) equidistant around the pressure face of the flywheel (within the diameter of the pressure plate—see Fig. Q.30) and place the clutch assembly (less the main driven plate) in position and bolt it to the flywheel, using the nine long bolts (17) and plain washers. Tighten the bolts a turn or two at a time in diagonal sequence to avoid distorting the cover.

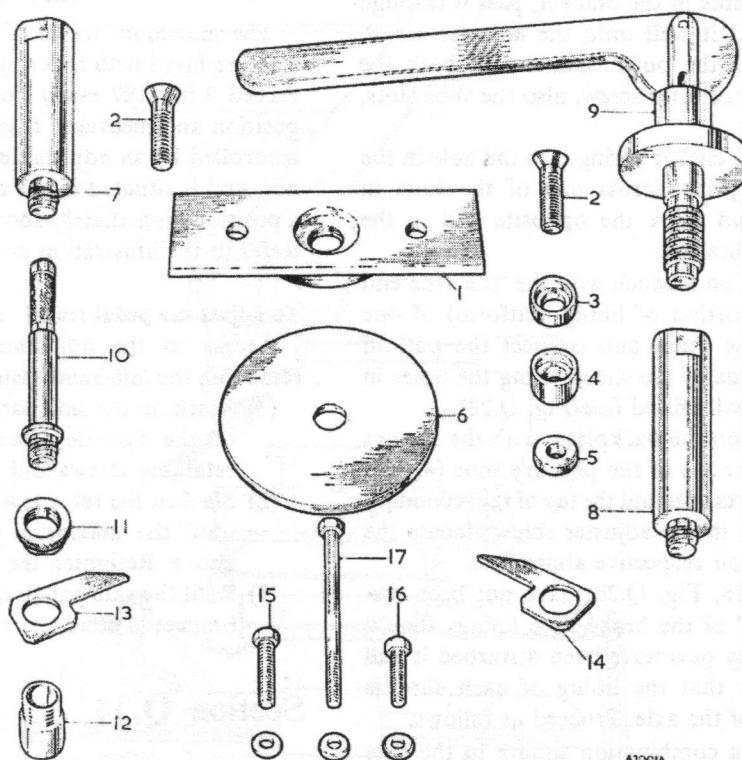
Screw the long spacer adaptor (8) into the bridge. Place the joggling platform (6) onto the main clutch release lever plate and screw the joggle assembly (9) into the adaptor. Depress the joggle lever until the retaining staples (18G498) can be removed from the main clutch



A4126

Fig. Q.30

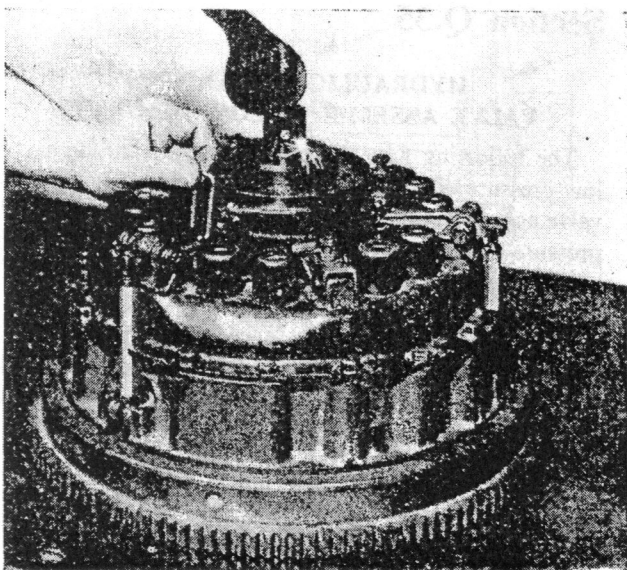
The bridge, from the double clutch gauging fixture 18G563, fitted on a flywheel with four spacers placed equidistant around the pressure face prior to fitting the clutch assembly



A3001A

Fig. Q.31**Components of the double clutch gauging fixture 18G563**

- | | | |
|------------------------------|----------------------------|----------------------------|
| 1. Bridge. | 7. Spacer adaptor (short). | 13. Gauge finger (long). |
| 2. Bridge securing screws. | 8. Spacer adaptor (long). | 14. Gauge finger (short). |
| 3. Spacer adaptor (code 4). | 9. Joggle assembly. | 15. Bolt (1 1/4 in. long). |
| 4. Spacer adaptor (code 8). | 10. Centre pillar. | 16. Bolt (short). |
| 5. Spacer (code 3). | 11. Nut—gauge finger body. | 17. Bolt (long). |
| 6. Platform—joggle assembly. | 12. Gauge finger body. | |



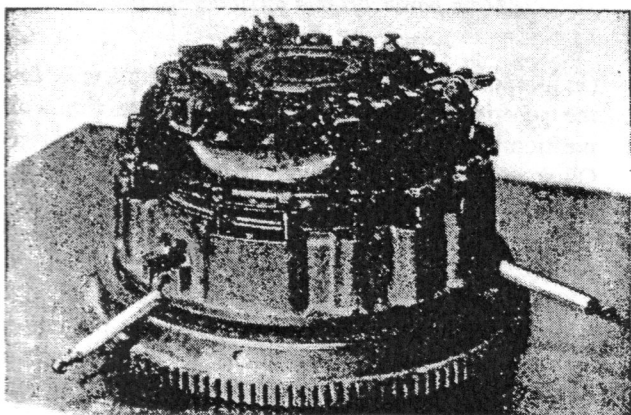
A4127

Fig. Q.32

The retaining staples 18G498, which are fitted prior to removing the clutch assembly from the tractor, are here shown being removed with the aid of the joggle assembly

levers. Depress the lever only sufficiently to release the retaining staples.

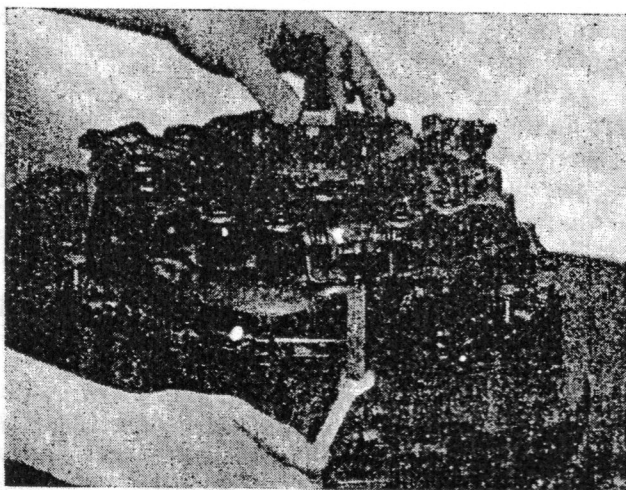
Remove the clevis pins from the ends of the main and independent power take-off (I.P.T.O.) clutch release levers (see Fig. Q.33). Remove alternate bolts from the six securing the I.P.T.O. clutch cover to the main clutch and screw into the full depth of the holes three of the $\frac{5}{16}$ in. UNF. bolts, $1\frac{1}{2}$ in. (31.7 mm.) long (15), together with plain washers.



A4128

Fig. Q.33

The clutch assembly with the clevis pins removed from the ends of the release levers and the clutch retaining bolts unscrewed to relieve both clutches of spring pressure



A4129

Fig. Q.34

Adjusting the release levers on the main clutch

Unscrew a half-turn at a time the nine long bolts and the three remaining I.P.T.O. clutch bolts until the I.P.T.O. clutch cover comes into contact with the three $1\frac{1}{4}$ in. (31.7 mm.) long bolts just fitted. Continue to unscrew all the bolts and set screws a half-turn at a time until both clutches are free of spring pressure (Fig. Q.33). Remove the bolts and set screws and the clutches can be dismantled.

If required, the I.P.T.O. driven plate can be removed without dismantling the I.P.T.O. clutch by leaving the I.P.T.O. clutch release lever clevis pins in position.

Reassembling

Reassemble the clutches on the flywheel with four spacers (5) on each clutch surface. Compress the I.P.T.O. clutch springs with three of the $1\frac{1}{4}$ in. (31.7 mm.) long bolts (15) until three of the standard bolts can be screwed into the three remaining holes. Continue to screw in all the bolts a half-turn at a time until the nine long bolts can enter their threads. Tighten all the bolts a half-turn at a time in diagonal sequence until both clutches are secure. Replace the clevis pins in the ends of the clutch levers.

Resetting the clutch release levers

Main clutch

Screw the long spacer adaptor (8) onto the bridge and place the joggle platform onto the main clutch release lever plate. Screw in the joggle assembly, operating it a few times to settle the clutch parts. Remove the joggle assembly and platform.

Screw the centre pillar (10) into the adaptor, place the spacer adaptor (3) onto it, with the recessed end down-

wards, together with the gauge finger body (12) complete with the long gauge finger (13).

Adjust the turn-buckles so that the main clutch release lever plate is just below the gauge finger. Press firmly on the gauge finger body to ensure that it is bearing squarely on the adaptor. Readjust the turn-buckles until the finger just touches the release plate at all points (Fig. Q.34). Secure the adjustment by tightening the turn-buckle locknuts.

Joggle the clutch and re-check the adjustment with the gauge finger in position.

I.P.T.O. clutch

Fit the short spacer adaptor (7) and screw in the joggle assembly. Operate the lever a number of times to settle the parts and remove the joggle assembly.

Screw the centre pillar (10) into the spacer adaptor, place the spacer adaptor (3) onto it with its recessed end downwards, and fit the gauge finger body together with the short gauge finger.

Slacken the nuts locking the I.P.T.O. clutch adjusting set screws and turn the screws so that the I.P.T.O. clutch lever plate is just below the gauge finger. Press firmly on the gauge finger body to ensure that it is bearing squarely on the adaptor. Readjust the set screws until the finger just touches the release plate at all points (see Fig. Q.35). Secure the adjustment by tightening the set screw locknuts.

Joggle the clutch and re-check the adjustment with the gauge finger in position.

Remove the spacers after dismantling the clutch assembly and fit the I.P.T.O. clutch driven plate.

Do not disturb any of the adjustments during this operation.

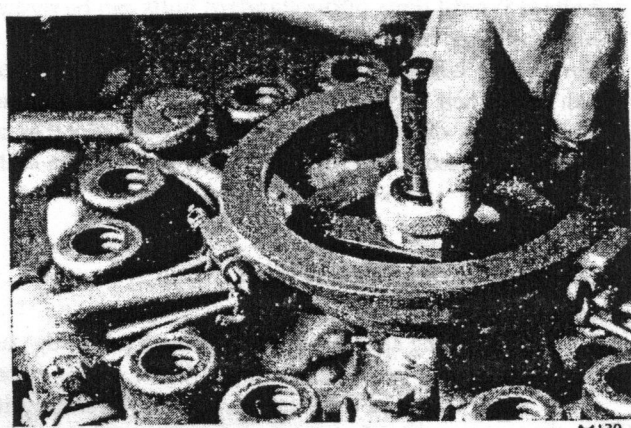


Fig. Q.35

Adjusting the release levers on the independent power take-off clutch

Section Q.35

HYDRAULIC POWER UNIT VALVE ASSEMBLY FLOW DIAGRAMS

The following flow diagrams illustrate the high- and low-pressure oil galleries within the hydraulic power unit valve assembly, and in addition the function of the high-pressure and low-pressure release valves, and of the auxiliary and main power lift plungers.

Fig. Q.36. Main power lift and auxiliary lift neutral

With the main and auxiliary hydraulic control levers in their neutral positions oil from the pump enters at

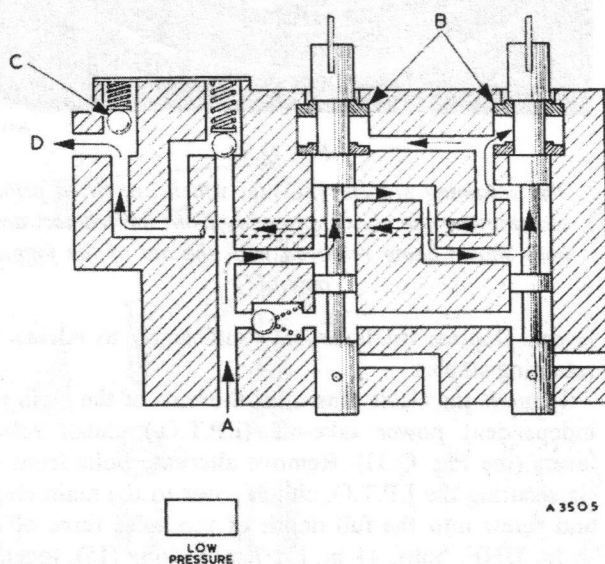


Fig. Q.36

Main power lift and auxiliary lift neutral

(A) at approximately 50 lb./sq. in. (3.52 kg./cm.²), filling the galleries and holding both plungers in the neutral position by exerting pressure on the plunger pistons (B). Oil returns to the sump via the lower pressure release valve (c) and outlet (D).

Fig. Q.37. Main power lift rising, auxiliary lift neutral

When the main hydraulic control lever is raised the main power lift plunger (E) is lowered into the position shown. Oil from the pump enters at (A), lifts the non-return valve (F) from its seat, and passes round the lower annular groove of the auxiliary lift plunger (G), through an internal passage, and round the lower annular groove of the main power lift plunger to the outlet (H) leading to the power lift cylinder.

The purpose of the non-return valve (F) is to prevent a crash drop of the implement or load in the unlikely event

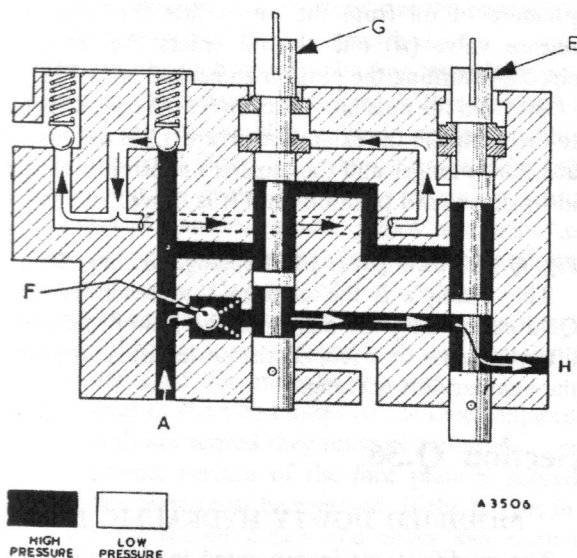


Fig. Q.37

Main power lift rising, auxiliary lift neutral

of a power failure whilst a main or auxiliary power lift is in progress. With the absence of oil pressure from the pump the weight of the implement or load forces the oil back through the galleries from the lift cylinder, allowing the non-return valve ball to close on its seat, thereby creating a hydraulic lock holding the load in the position it has reached.

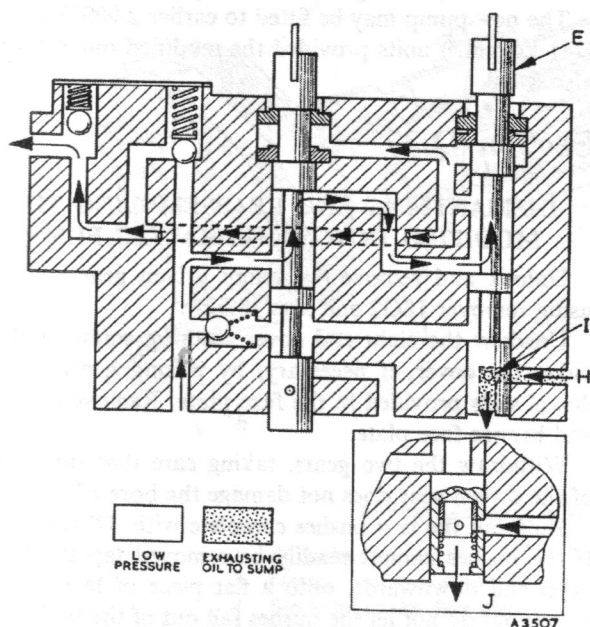


Fig. Q.38

Main power lift dropping, auxiliary lift neutral

Fig. Q.38. Main power lift dropping, auxiliary lift neutral

When the main hydraulic control lever is moved downwards the main power lift plunger (E) is raised to the position shown; this brings the exhaust aperture (I) in the plunger base into line with the lift cylinder oil gallery (H). The exhaust aperture in conjunction with the spring-loaded valve (J) in the plunger base automatically controls the rate of drop to not less than $1\frac{1}{2}$ seconds irrespective of the implement weight. By means of an external adjustment the drop rate can be reduced to zero if required.

In Figs. Q.36, Q.37, and Q.38 the auxiliary plunger is shown in the neutral position only, but it can be used independently to produce the same results in its circuit as those already described for the main power lift circuit. In addition, the control levers which operate the plungers may be used together to produce various combinations of auxiliary and main power lift operations, and some typical examples are illustrated in Figs. Q.39, Q.40, and Q.41.

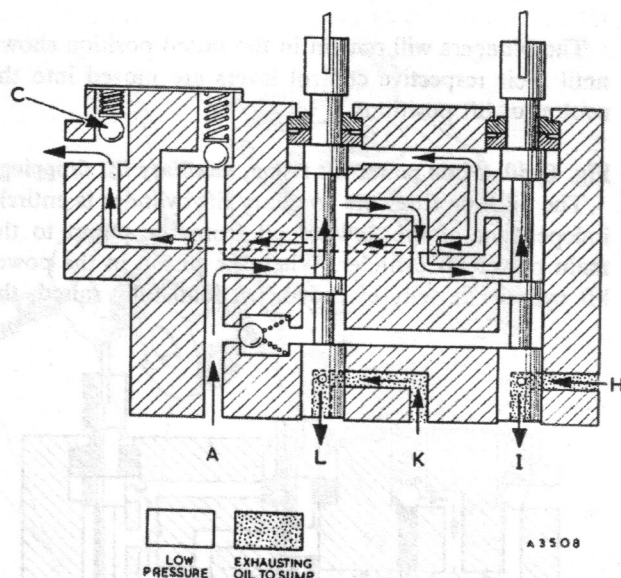


Fig. Q.39

Main power lift and auxiliary lift dropping

Fig. Q.39. Main power lift and auxiliary lift dropping

When both the main and auxiliary control levers are moved downwards both plungers are raised into the pressure release position. Oil from both main and auxiliary lift cylinders enters at (H) and (K) respectively and is returned to the sump via the exhaust apertures (I) and (L) in the plunger bases. Oil from the pump which enters at (A) circulates at low pressure through the galleries, round both plungers, and out to the sump via the low-pressure release valve (C).

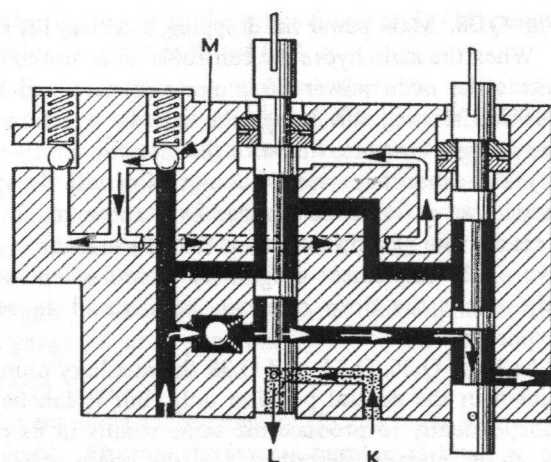


Fig. Q.40

Main power lift rising, auxiliary lift dropping

The plungers will remain in the raised position shown until their respective control levers are moved into the neutral or lift positions.

Fig. Q.40. Main power lift rising, auxiliary lift dropping

The oil flow from the auxiliary lift cylinder is entirely independent of the flow of oil from the pump to the main power lift cylinder. When the piston in the power lift cylinder is fully extended, i.e. load fully raised, the

pressure of oil from the pump lifts the high-pressure release valve (M) and the oil enters the low-pressure circuit, returning the plunger to neutral as in Fig. Q.36.

Oil from the auxiliary lift cylinder (K) continues to flow to the sump via the exhaust aperture (L) in the base of the auxiliary plunger and the auxiliary control lever remains in its downward position until it is moved manually.

Fig. Q.41. Main power lift dropping, auxiliary lift rising

This example is the same as that described for Fig. Q.40 except that the action of the power and auxiliary lift cylinders is reversed, i.e. the power lift is dropping and the auxiliary lift is rising.

Section Q.36

MODIFIED DOWTY HYDRAULIC PUMP

The modifications incorporated in the new hydraulic pump now fitted to all tractors equipped with hydraulic power units are as follows.

The driver and driven gears now have an undercut machined in place of the radius previously existing between the shaft and the front face of the gear. The front pair of matched bushes are replaced by two phosphor-bronze bushes pressed into a new end cover. Gear thrust is taken on a steel-backed phosphor-bronze bearing plate fitted between the end cover and the pump body.

The pump mounting does not change, although, due to the modified bushes, the depth of the pump body is reduced, necessitating a new outlet pipe.

The new pump may be fitted to earlier 2,000 lb./sq. in. (141 kg./cm.²) units provided the modified outlet pipe is also fitted.

Section Q.37

DISMANTLING AND REASSEMBLING THE MODIFIED DOWTY HYDRAULIC PUMP

Unlock and remove the pump driven gear and key, using remover 18G2 and legs 18G2A.

Unscrew the eight end cover securing screws and remove the cover, if necessary, by prising gently in the dowel slots provided in the face plate. Remove the steel and bronze face plate.

Withdraw the two gears, taking care that the thread of the driven gear does not damage the bore of the bush.

Slide out the two bushes complete with 'O' ring seals. If the bushes cannot readily be removed tap the body, open end downwards, onto a flat piece of lead or soft wood, but do not let the bushes fall out of the body onto a bench or other hard surface. Do not attempt to drive the bushes out. The use of slight heat on the body will

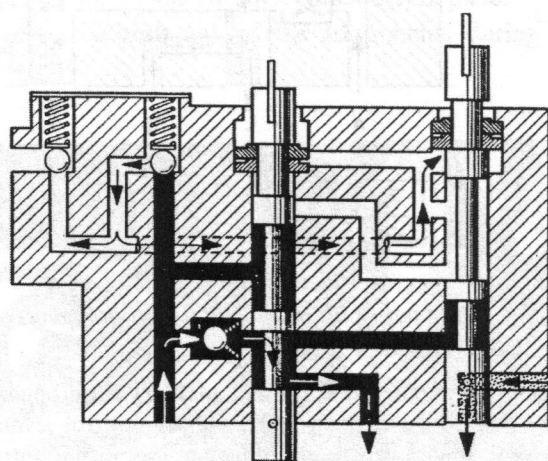


Fig. Q.41

Main power lift dropping, auxiliary lift rising

cause it to expand sufficiently to release the bushes if they cannot be removed as already described.

Take care not to bruise the bushes, especially on the faces adjacent to the sides of the gears. It is essential that the bushes are reassembled in their original positions, and it is suggested that a light identification mark, which is visible from the driven end of the pump, is scratched on the reduced diameter prior to removing the bushes.

Wash all the parts in petrol (gasoline) or a cleansing solvent, and thoroughly dry with an air blast.

Inspect the gears. 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.

If the bores of the two bushes or the faces adjacent to the gear teeth are scored they must be renewed.

If the bronze surface of the face plate is scored or distorted the plate must be renewed. If the bushes in the end cover are scored a new end cover and bush sub-assembly must be fitted.

Check the bearing clearances between the gear shafts and the bushes, making sure that these are mated as when

assembled in the pump. The clearance must not be greater than .007 in. (.178 mm.). If this figure is exceeded new bearing bushes and end cover and bushes sub-assembly must be fitted. In the event of one bearing clearance being excessive it would be advisable to renew the bearings throughout.

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

If the 'O' ring seals are damaged or worn they must be renewed. It is a good policy to renew these rings if the pump has had considerable service, even though they appear to be undamaged.

Before reassembling ensure that all parts are perfectly clean.

Smear the 'O' ring seals with a thin, good-quality mineral-base grease and fit them to the reduced diameters of the two bearing bushes. Slide the two bushes into the body, making sure that the 'O' rings remain in position on the bushes. The bushes must be kept square during

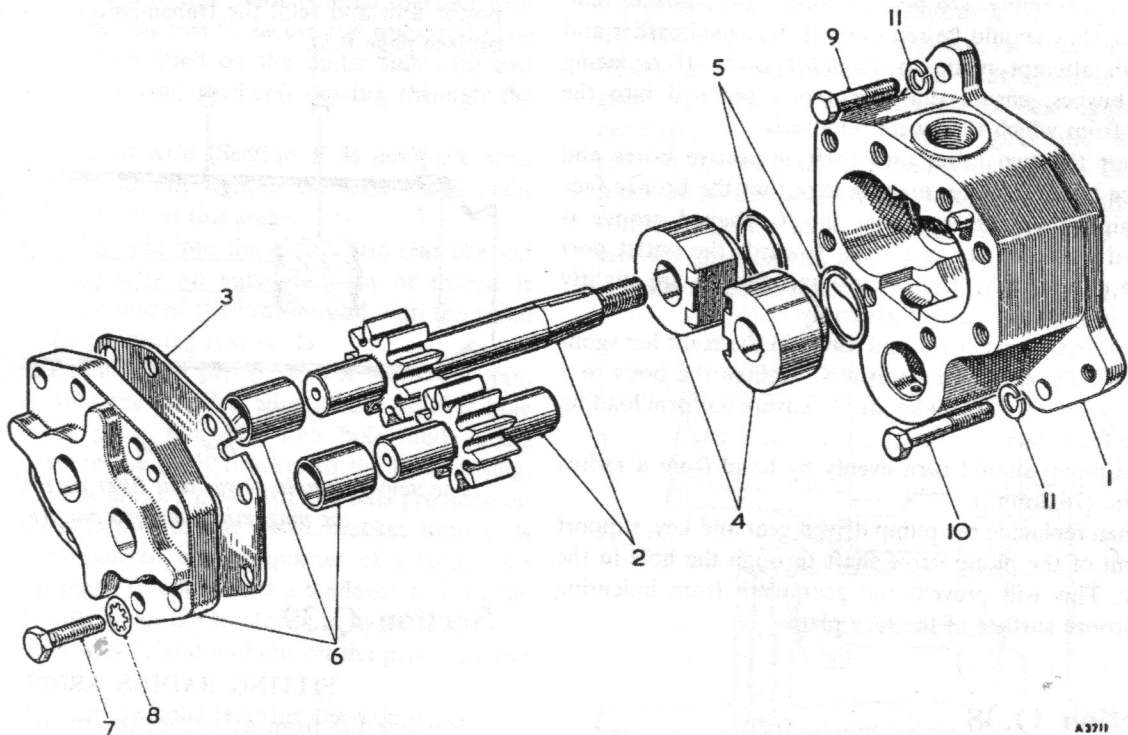


Fig. Q.42

The components of the later-type Dowty hydraulic pump

- | | |
|---------------------------------|------------------------------|
| 1. Pump body. | 7. Cover bolt. |
| 2. Gears. | 8. Spring washer. |
| 3. Steel and bronze face plate. | 9. Pump mounting bolt—short. |
| 4. Inner bushes. | 10. Pump mounting bolt—long. |
| 5. 'O' ring seals. | 11. Spring washer. |
| 6. End cover with bushes. | |

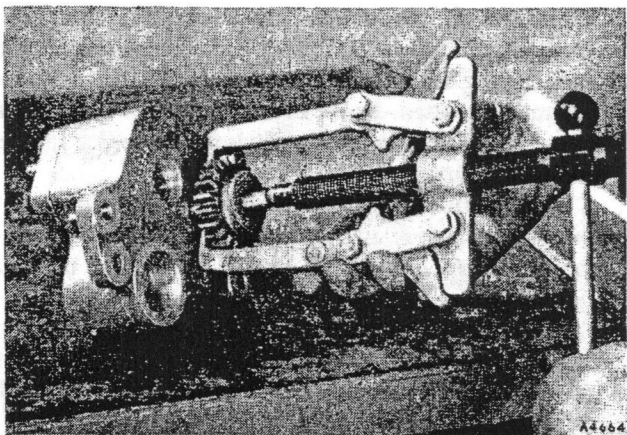


Fig. Q.43

Use remover 18G2 and legs 18G2A to remove the pump drive gear

assembly, both to the bore and to each other, to prevent damage. Oiling the bushes and their bores in the body will ease assembly. Do not use force; if the bushes tend to stick they should be removed as described earlier and a fresh attempt made to assemble them. If replacing used bushes, ensure that they are assembled into the bores from which they were removed.

Insert the two gears into their respective bores and replace the face plate, making sure that the bronze face is against the gears and that the 'C'-shaped groove is located with the gap in the 'C' towards the outlet port in the pump body. The pump cover dowels are slightly offset to facilitate correct assembly.

Replace the end cover and screw in the eight hexagon-headed bolts and spring washers. Tighten the bolts to a torque of 35 lb. ft. (4.84 kg. m.) to ensure uniform loading of the face plate.

The pump should turn evenly by hand from a radius of 3 in. (76.2 mm.).

When replacing the pump driven gear and key, support the tail of the pump drive shaft through the hole in the cover. This will prevent the gear teeth from indenting the bronze surface of the face plate.

Section Q.38

HYDRAULIC POWER UNIT MODIFIED FILTERS

At Hydraulic Power Unit No. 2000/25938 the filter Part No. NT7238 (page Q.14, item 19) was replaced by a modified filter (Part No. ATJ6013) having a finer-mesh gauze.

At Hydraulic Power Unit No. 2000/38502 a new filter assembly (Part No. ATJ9379) was introduced, retaining

the same fine-mesh gauze but with the addition of a magnetic filter (see Fig. Q.44). The magnetic filter originally fitted in the right-hand side of the power unit housing below the control lever shafts has been deleted and the aperture closed by a taper plug.

Maintenance attention to both magnetic and gauze filters is unchanged (see page Q.11). The filter assembly or magnetic filter alone may be withdrawn for cleaning without draining the transmission oil as follows. Carry out the work while the oil is cold, and if a spare assembly is not available to retain the oil while the filter is cleaned, drive the tractor onto a steep down-grade or block up the rear wheels in order that a minimum amount of oil will be lost.

The new filter assembly Part No. ATJ9379 is interchangeable with filters Part Nos. NT7238 and ATJ6013, and when fitted to earlier tractors the original magnetic filter may be retained.

To obtain full benefit from the new filter drain and discard the transmission oil.

Remove the hydraulic power unit and clean the interior of the transmission and power unit casings. Refit the power unit and refill the transmission casing with fresh oil (see page P.5).

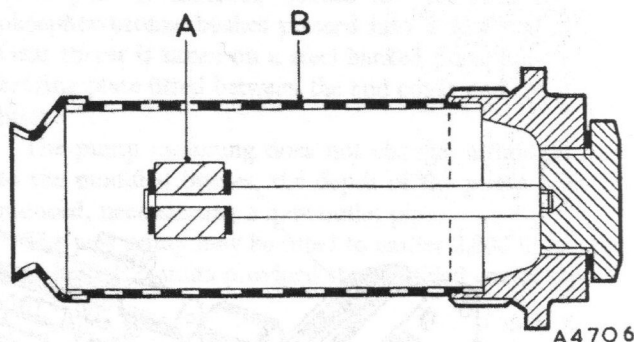


Fig. Q.44

The new hydraulic power unit filter assembly (B) with the magnetic filter and plug (A)

Section Q.39

FITTING RADIUS ARMS

Remove the front axle from the tractor as described in Section K.3.

Slacken the nuts and bolts and remove the track-rod clamps.

Take out the bolts and withdraw each extending axle beam.

Referring to Fig. Q.45, mark out and drill two holes on the under side of the axle beam and tap $\frac{7}{16}$ UNF.

Fit the radius arm assembly to the axle beam, securing

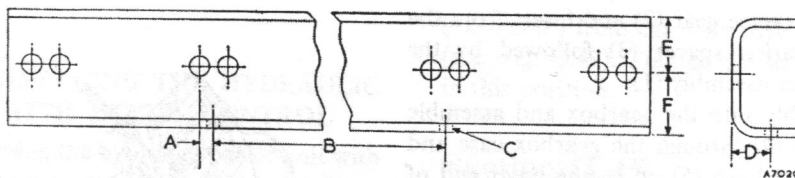


Fig. Q.45

Axle beam drilling dimensions

- A. On under side of beam from hole shown $\frac{1}{8}$ in. (12.7 mm.).
- B. $26\frac{1}{2}$ in. (673.5 mm.) centres.
- C. Drill two holes, and tap $\frac{7}{16}$ UNF.

- D. $1\frac{1}{8}$ in. (28.58 mm.) from front face of beam.
- E. 2 in. (50.8 mm.) from top face of beam.
- F. 2 in. (50.8 mm.) from bottom face of beam.

it with two bolts (fitted with spring washers) screwed into the tapped holes in the axle beam.

Reassemble the extending axle beams and secure them in position with four bolts. Two bolts are supplied which are $\frac{1}{4}$ in. (6.35 mm.) longer than those previously fitted, and these two bolts must be fitted into the radius arm bracket and axle beam. Secure all four bolts with nuts and spring washers.

Two modified track-rod clamps, provided with tapped holes, are supplied and these must be used together with two of the original clamps to secure the track-rod. The threaded clamps are fitted on the under side with two bolts (fitted with spring washers) passing through the top clamps.

Replace the front axle (Section K.3) complete with radius arms but do not tighten the axle beam pivot bracket securing bolts at this stage.

Thread the pivot pin into the radius arm rear bracket so that approximately an equal amount of thread is showing on either side of the bracket and with the small diameter of the pin facing rearwards.

Slide the radius arm pivot bracket onto the pin, making sure that the bevelled edge of the bracket hole is towards the pivot pin. Use two bolts and spring washers to secure the pivot bracket to the main casing.

Turn the pivot pin, by means of the flats provided on its forward end, towards the pivot bracket until it is tight and then slacken back a quarter of a turn. This adjustment is made to counteract a tendency to load the pivot pin threads when the tractor is in motion.

Fit the plain washer and locknut on the pivot pin and securely tighten.

Finally, tighten the bolts securing the axle beam pivot bracket.

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

Remove the primary shaft as detailed in Section G.4 and continue to dismantle the gearbox as detailed in Section G.8 as far as removing the reverse gear shaft. A modified mainshaft locking arrangement may be incorporated in some boxes, in which case see Section G.17.

On some tractors, depending upon casting variations, the reverse gear may be withdrawn without disturbing the layshaft, but in other cases not. After removal of the reverse gear shaft withdraw the gear upwards from the gearbox. If the gear abuts against the bearing flange it is necessary to replace the reverse gear and shaft and remove the layshaft as detailed in Section G.8. After removal of the layshaft the reverse gear shaft may be withdrawn once more and the gear removed sideways into the gearbox and then lifted out.

Place a needle-roller assembly (1, Fig. Q.46) into one

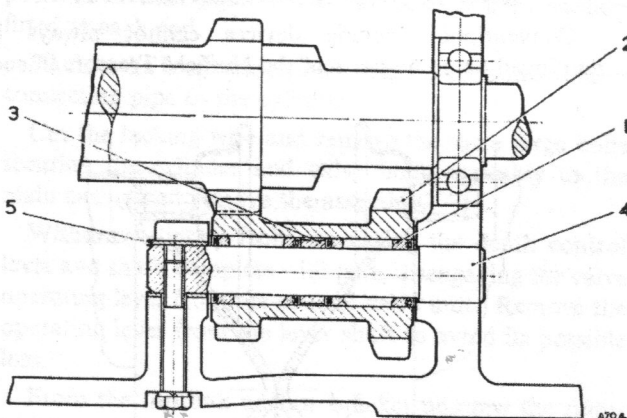


Fig. Q.46

Arrangement of reverse gear with needle-roller bearings

- 1. Needle-roller bearings (NT8360).
- 2. Reverse gear (NT8356).
- 3. Spacer (NT8359).
- 4. Reverse gear shaft (NT8357).
- 5. Bush (NT8358).

Section Q.40

FITTING REVERSE GEAR NEEDLE-ROLLER BEARINGS

Remove the rear axle assemblies as detailed in Section G.1.

end of the modified reverse gear (2) and insert from the opposite end the bearing spacer (3) followed by the remaining needle-roller assembly (1).

Fit the gear assembly into the gearbox and assemble the reverse gear shaft (4) through the gearbox case and reverse gear. Insert the bush (5) on to the inner end of the shaft and into the casing, aligning the hole in the bush with that in the shaft. Replace and securely tighten the shaft locking bolt.

Rebuild the gearbox as detailed in the latter part of the above-mentioned sections for dismantling.

Section Q.41

TWIN REAR WHEELS

When twin rear wheels are to be fitted the inner pair of wheels must be assembled to a track setting of 56 in. (1.42 m.)—see page L.10.

Secure the inner pair of wheels on the axle with the wheel nuts (inner, (1) Fig. Q.47), tightening them securely.

The outer pair of wheels must be fitted with the wheel disc and rim assembled in the same manner used for a track setting of 80 in. (2.03 m.)—see page L.13.

Fit the wheels and tighten the nuts (outer, (2) Fig. Q.47) securely.

Section Q.42

LOCTITE LOCKING PREPARATION

Conventional locking devices cannot always be employed on some parts of the Nuffield Tractor. In such

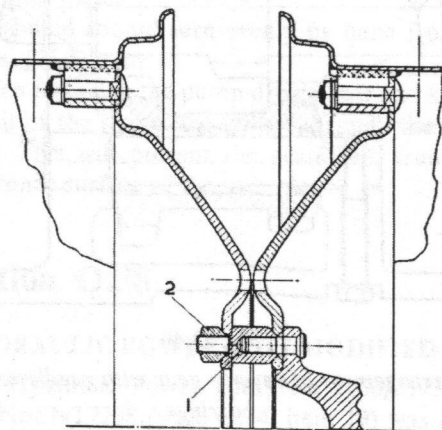


Fig. Q.47

The correct-assembly for twin rear wheels

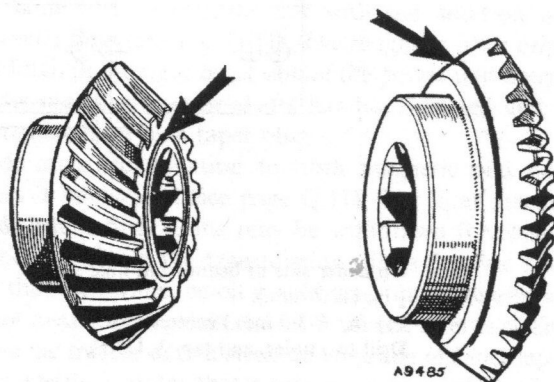


Fig. Q.48

The arrows indicate the identification grooves machined in the latest belt pulley unit drive gears, which must only be fitted in pairs

instances a preparation known as Loctite is used during the initial assembly.

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

The following applications affect parts mentioned elsewhere in Section Q, but see also Section G.

- (1) The plugs (Part No. NT3384 or ATJ6108) in the hydraulic power unit valve body (Part No. NT7039 or ATJ6107).
- (2) The valve plunger cap (Part No. ATJ6156) in the outer end of the depth control plunger valve (Part No. ATJ6155).

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

Section Q.43

BELT PULLEY UNIT DRIVE GEARS

Due to a change in tooth formation of latest belt pulley unit drive gears it is important that belt pulley units bearing serial number B445801 onwards are only fitted to gearboxes bearing serial number 43957 onwards.

Replacement gears for gearboxes and belt pulley units carrying numbers prior to those given above must be fitted in pairs, using gears of the latest type. Identification grooves machined in the latest gears are located as illustrated in Fig. Q.48.

The fitting and assembly instructions are unchanged from those given in Sections G.4 and G.6.

Section Q.44

REMOVING AND REPLACING THE HYDRAULIC POWER UNIT WITH DEPTH CONTROL

The method of removing the hydraulic power unit with depth control is the same as detailed in Section Q.8 excepting that the magnetic filter is no longer fitted in the right-hand side of the casing but is incorporated in the drain plug.

The method of refitting the same hydraulic power unit is a reversal of the removal procedure. If, however, a new unit is to be fitted, then the following procedure must be adopted.

Before fitting the hydraulic power unit slacken the bolts securing the P.T.O. shaft bearing and oil seal housing.

Fit to the tractor the hydraulic power unit and bolt it in position.

Move the engagement lever rearwards and push the P.T.O. shaft inwards to its limit. With the aid of feeler gauges measure the gap between the bearing housing and hydraulic power unit mating faces. Having determined the gap, shims which exceed the figure by .040 in. (1.02 mm.) \pm .010 in. (.254 mm.) must be fitted behind the bearing housing. Shims .020 in. (.508 mm.) are available.

Fit the shims by removing the P.T.O. shaft and bearing housing, threading on the appropriate shims, and replacing the shaft and housing. Fit and tighten the securing bolts.

It is now necessary to correctly position the adjustable selector lever gate in relation to the engaged position of the lever. Slacken the two bolts securing the lever gate to the bracket, and move the selector lever rearwards from the 'N' position into the 'HYD' position. If the splines will not engage turn the engine by hand until the splines do engage. Move the lever rearwards; at the same time rotate the P.T.O. shaft by hand until the splines can be felt to be attempting to engage. Now adjust the position of the gate so that the rear edge of the slot (HYD) is $\frac{1}{2}$ in.

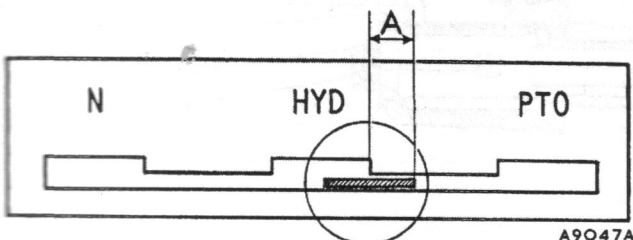


Fig. Q.49

The selector lever gate must be positioned so that when engagement of the gears can just be felt the dimension (A) is $\frac{1}{2}$ in. (12.7 mm.)

(12.7 mm.) from the rear edge of the engagement lever (see Fig. Q.49). Tighten the securing bolts with the gate in this position.

Section Q.45

DISMANTLING AND REASSEMBLING THE HYDRAULIC POWER UNIT AND DEPTH CONTROL MECHANISM

Remove the hydraulic power unit as detailed in Section Q.44.

Extract the bolts and lift off the cross-shaft housing assembly, taking care not to bend the auxiliary regulating screw extension 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.

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 fit the same number when reassembling. Unscrew the spindle bushes from the main casing and withdraw the auxiliary and power lift spindles complete with the friction discs.

Remove the blanking plug on the right-hand side of the hydraulic power unit casing.

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.

Slacken the banjo union bolt securing the control valve connecting pipe to the cylinder.

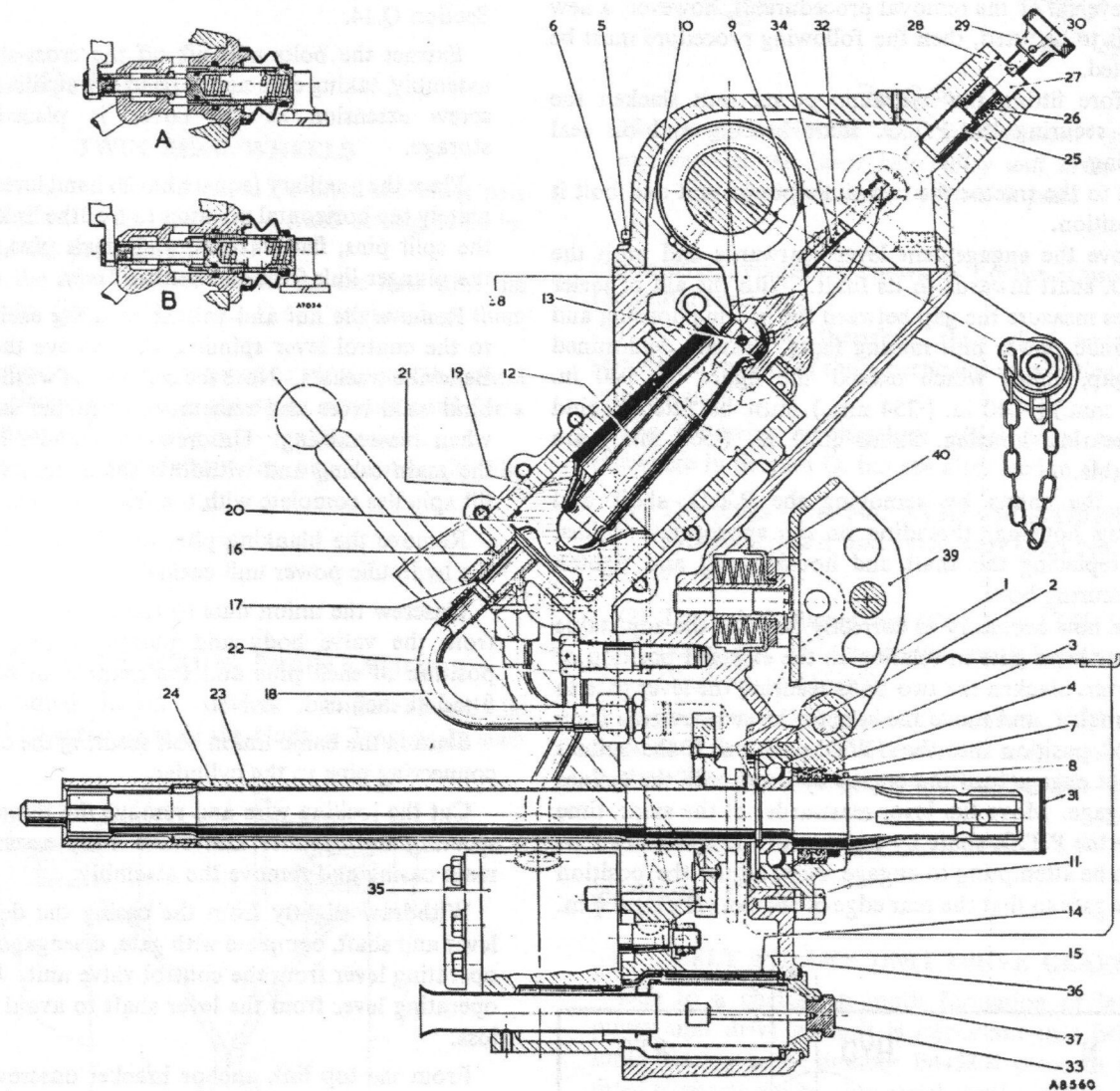
Cut the locking wire and remove the three large bolts securing the cylinder and valve body assembly to the main casing and remove the assembly.

Withdraw slightly from the casing the depth control lever and shaft, complete with gate, disengaging the valve operating lever from the control valve unit. Remove the operating lever from the lever shaft to avoid its possible loss.

From the top link anchor bracket unscrew the right-hand pivot pin. To do this it is necessary to depress the depth control valve with a brass rod or drift.

Remove the large clip securing the rubber bellows on the depth control valve, unscrew the two set screws and withdraw the valve unit. The depth control valve, if necessary, can be removed without first removing the main cylinder and valve body assembly by slackening the connecting pipe banjo bolt.

THE HYDRAULIC POWER UNIT AND P.T.O. WITH DEPTH CONTROL



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

No.	Description	No.	Description
A.	Control valve—fully open.	B.	Control valve—fully closed.
1.	Circlip—small.	21.	Piston ring.
2.	Circlip—large.	22.	Dowel bolt—cylinder to main case.
3.	Bearing.	23.	Shaft—P.T.O.
4.	Oil seal.	24.	Driving tube.
5.	Bolt—housing to case.	25.	Plunger.
6.	Spring washer.	26.	Spring.
7.	Bearing and oil seal housing.	27.	Plug.
8.	Felt washer.	28.	Pin.
9.	Key.	29.	Knob.
10.	Set screw—cross-shaft lever.	30.	Pin for knob.
11.	Bolt.	31.	Cover—P.T.O. shaft.
12.	Connecting rod—piston lever.	32.	Screw—auxiliary adjusting.
13.	Split pin.	33.	Magnetic filter and plug.
14.	Filter sleeve.	34.	Split pin—adjusting screw.
15.	Sealing ring.	35.	Hydraulic pump.
16.	Union.	36.	Washer—filter.
17.	Fibre washer.	37.	Filter—hydraulic.
18.	Pipe—auxiliary.	38.	Lever—cross-shaft.
19.	Cylinder—hydraulic.	39.	Anchor bracket.
20.	Piston.	40.	Spring plate retainer.

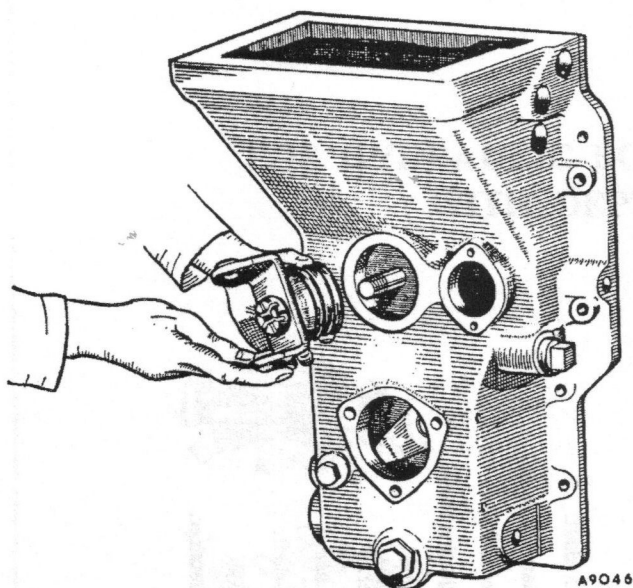


Fig. Q.50

Reassembling the plunger pivot bracket. Use grease to assist in retaining the eight Belleville washers in position

Remove the two bolts securing the selector rod support bracket to the pump and remove the bracket. Remove the two remaining bolts securing the pump to the 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.

Unscrew the two bolts and withdraw the P.T.O. shaft protection shield.

From the left-hand side of the top link anchor bracket unscrew the remaining pivot pin. Extract the split pin from the lower pivot pin, drive out the pivot pin and remove the bracket.

Unscrew the three set screws from the P.T.O. shaft bearing and oil seal housing. Pull the power selector lever rearwards to the fully engaged position and with a copper drift and hide mallet drive the P.T.O. shaft out rearwards complete with the bearing and oil seal housing. As the shaft is withdrawn take care to ensure that the splines on the forward end of the shaft clear those on the inside of the drive tube. Note the number of shims fitted between the bearing housing and the casing, and ensure the original shims are refitted if the same hydraulic power unit is to be replaced.

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.

Extract the split pin from the slotted spacer nut and with a soft metal drift carefully unscrew the nut. With-

draw the plunger pivot, spring plate retainer, and the eight large Belleville washers from the spring plate stud. Carefully note the arrangement of the Belleville washers as they must be replaced in the same order.

The power unit is reassembled by reversing the 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.

Ensure that the travel of the driving tube and gear is not restricted by the protruding ends of the pump body bolts. If it is, then washers of suitable thickness must be fitted under the head of each bolt or the bolts must be shortened to provide the necessary clearance.

To refit the anchor bracket assembly, first position the plunger pivot bracket on the spacer nut followed by the spring plate retainer, and then assemble the eight Belleville washers on the spacer nut in the positions illustrated on page Q.50. Use grease to assist in retaining the washers in position whilst the assembly is carefully fitted to the casing and the spacer nut tightened on to the spring plate stud. Tighten the spacer nut to its limit and then slacken the nut back sufficient only to align the split pin hole in the stud with the nearest slot in the nut. Lock the nut with a split pin.

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.

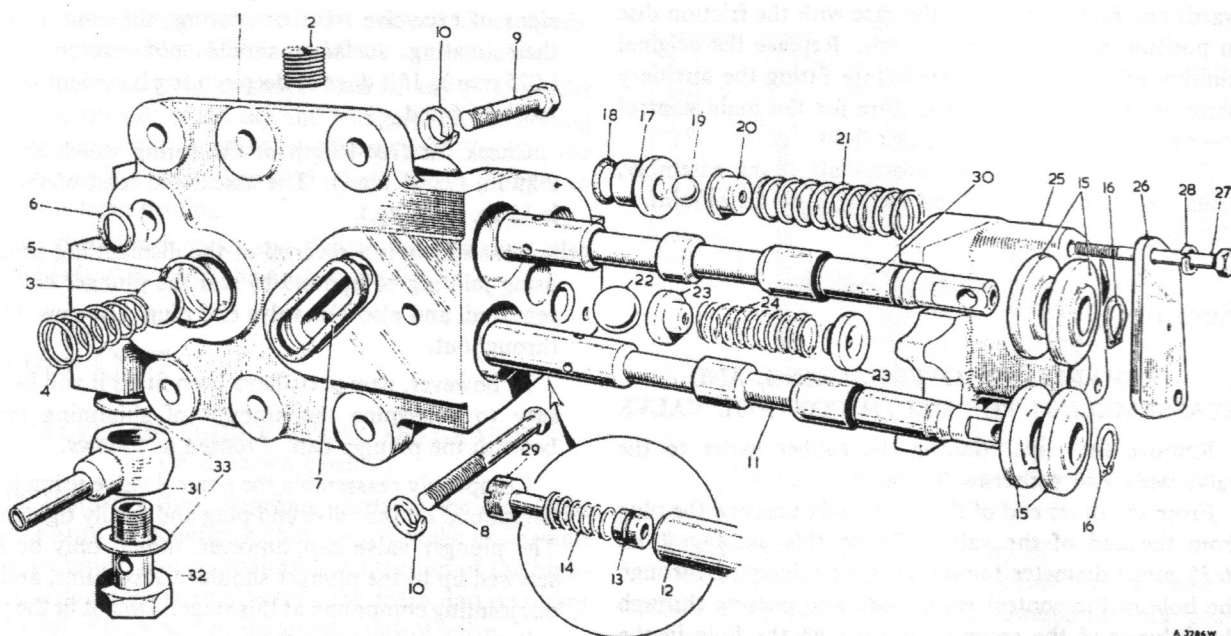
Ensure that the oil seals are in good condition and that the mating faces of the bearing and oil seal housing and main casing are clean before refitting. Use a new joint seal.

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

Before refitting the cylinder and valve body assembly, slacken the banjo bolt securing the control valve connecting pipe to the cylinder in order to ease the assembly of the pipe into the control valve. After tightening and wiring the bolts securing the cylinder tighten the banjo bolt.

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 an increase in the depth of mesh. Three different thicknesses of fibre washers 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

THE HYDRAULIC POWER UNIT VALVE ASSEMBLY COMPONENTS



A 3786W

No.	Description
1.	Body—hydraulic valve.
2.	Plug.
3.	Ball—non-return valve.
4.	Spring—ball retaining.
5.	Oil seal—large.
6.	Oil seal—small.
7.	Oil seal—oval.
8.	Bolt—long.
9.	Bolt—short.
10.	Washer—spring.
11.	Plunger assembly—main
12.	Plunger—valve.
13.	Valve limiting.
14.	Spring—limiting valve.
15.	Piston—detent.
16.	Circlip—plunger.
17.	Orifice—H.P. valve.

No.	Description
18.	Seal—oil—orifice.
19.	Ball.
20.	Seat.
21.	Spring.
} H.P. valve.	
22.	Ball.
23.	Seat for spring.
24.	Spring.
} L.P. valve.	
25.	Housing valve.
26.	Cover—housing.
27.	Bolt.
28.	Washer—spring.
29.	End plug.
30.	Plunger assembly—auxiliary.
31.	Banjo—connecting pipe.
32.	Bolt—banjo.
33.	Washer—joint.

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.46

DISMANTLING, OVERHAULING, AND REASSEMBLING THE DEPTH CONTROL VALVE

Remove the clips securing the rubber gaiter to the valve body and withdraw the gaiter.

From the other end of the valve body unscrew the plug from the end of the valve. To do this use two $\frac{1}{4}$ in. (6.35 mm.) diameter tommy-bars, one inserted through the hole in the control valve body and passing through the valve, and the second bar through the hole in the valve plug.

Remove the circlip from the gaiter end of the valve body and extract the plunger retaining washer.

Carefully withdraw the plunger and valve assembly from within the body. Withdraw the valve from the plunger and take out the spring. If necessary the plunger cap may be separated from the plunger by applying a close-fitting spanner to the flats on the cap holding the plunger from turning by means of a small bar inserted

in the hole in the valve plunger. Take care not to lose the shims, fitted beneath the cap, which must be replaced unless new parts are fitted.

Examine the valve, plunger, and valve body bore for signs of excessive wear or scoring; the concentricity of their mating surfaces should not exceed .001 in. (.025 mm.). If it does or deep scoring is evident new parts must be fitted.

Check the free length of the spring which should be 2.89 in. (73.41 mm.). The assembled load of the spring is 12 lb. (5.44 kg.).

Reassembly is a reversal of the dismantling procedure using jointing compound to seal the plunger end cap, if removed, and also the valve end plug. Use new 'O' rings throughout.

If, however, new parts have been fitted it will be necessary to determine the amount of shimming required beneath the plunger cap. Proceed as follows.

Completely reassemble the control valve using jointing compound on the valve end plug and finally tightening it. The plunger valve cap, however, should only be lightly screwed up to the plunger shoulder, less shims, and without jointing compound at this stage. Do not fit the rubber gaiter.

Refit the control valve to the hydraulic power unit (Section Q.45) and also the power unit to the tractor (Section Q.44).

Screw into the main hydraulic tapping the oil pressure test gauge 18G548, using adaptor 18G548A.

Start the tractor engine and move the hydraulic depth control lever as far as it will go rearwards. Push the main hydraulic control lever right down and hold it in this

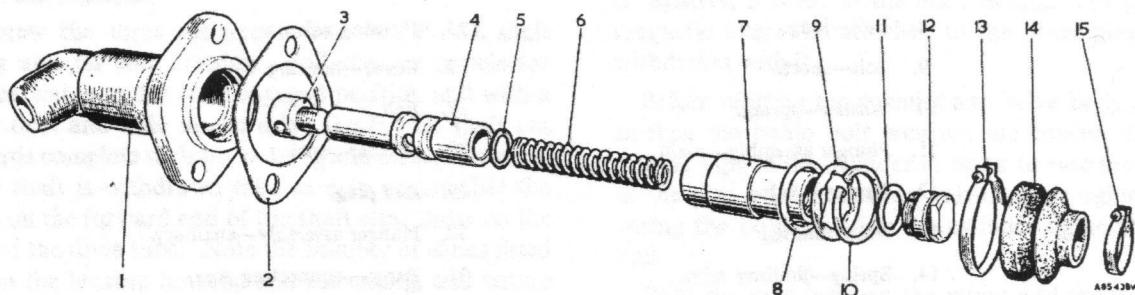


Fig. Q.5

Exploded view of the depth control valve

- | | | |
|---------------------|-------------------------|---------------------------|
| 1. Valve body. | 6. Spring—valve. | 11. Shim. |
| 2. Seal—valve body. | 7. Plunger valve. | 12. Cap—plunger valve. |
| 3. Plug. | 8. 'O' ring—valve body. | 13. Clip—large. |
| 4. Valve. | 9. Retaining washer. | 14. Gaiter—valve plunger. |
| 5. 'O' ring—valve. | 10. Circlip. | 15. Clip—small. |

position. With the engine running at 1,400 r.p.m. a pressure not less than 1,500 lb./sq. in. (105.5 kg./cm.²) should be shown on the gauge. If the pressure shown is less than this figure stop the engine and add shims beneath the plunger cap until the correct figure is obtained (shims .010 in. [.254 mm.] thick are available).

Finally, unscrew the end cap, clean off any oil from the shims and threads of the cap and plunger, and refit, using jointing compound to effect an efficient seal. Tighten the end cap, using a small bar in the hole in the plunger to prevent it from turning.

Refit the rubber gaiter and tighten the two clips, also the right-hand pivot to the anchor bracket.

Section Q.47

VALVE ASSEMBLY FLOW DIAGRAMS (With Depth Control)

The following flow diagrams illustrate the high- and low-pressure oil galleries within the hydraulic power unit valve assembly, and in addition the function of the high- and low-pressure release valves, the main and auxiliary power lift plungers, and the depth control valve.

Main power lift and auxiliary lift neutral

With the main and auxiliary hydraulic control levers in their neutral positions oil from the pump enters at (A) at approximately 50 lb./sq. in. (3.52 kg./cm.²) filling the galleries and holding both plungers in the neutral position by exerting pressure on the plunger pistons (B). Oil returns to the sump via the lower pressure release valve (c) and outlet (D).

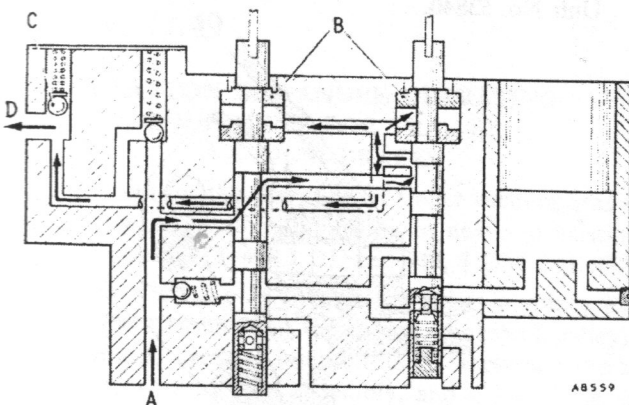


Fig. Q.52

Main power lift and auxiliary lift neutral

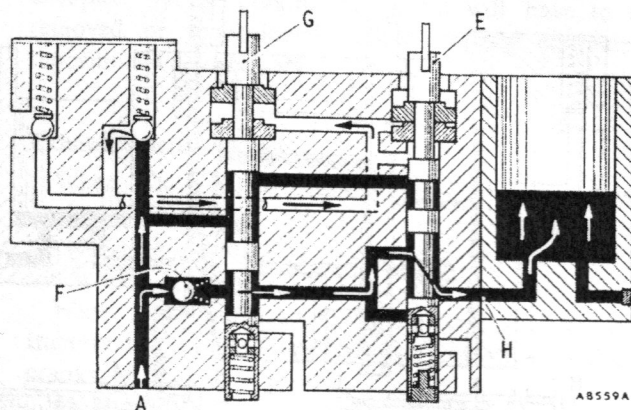
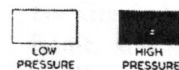


Fig. Q.53

Main power lift rising, auxiliary lift neutral

Main power lift rising, auxiliary lift neutral

When the main hydraulic control lever is raised the main power lift plunger (E) is lowered into the position shown. Oil from the pump enters at (A), lifts the non-return valve (F) from its seat, and passes round the lower annular groove of the auxiliary lift plunger (G) through an internal passage and round the lower annular groove of the main power lift plunger to the outlet (H) leading to the power lift cylinder.

The purpose of the non-return valve (F) is to prevent a crash drop of the implement or load in the unlikely event of a power failure whilst a main or auxiliary power lift is in progress. With the absence of oil pressure from the pump the weight of the implement or load forces the oil back through the galleries from the lift cylinder, allowing the non-return valve ball to close on its seat, thereby creating a hydraulic lock holding the load in the position it has reached.

When the power lift cylinder is full the rising pressure of the oil lifts the high-pressure relief valve, at a pressure of 2,000 lb./sq. in. (140.63 kg./cm.²), and enters the low-pressure circuit and returns the main power lift plunger to neutral as shown in Fig. Q.52.

Main power lift dropping, auxiliary lift neutral

When the main hydraulic control lever is moved downwards the main power lift plunger (E) is raised to the position shown; this brings the exhaust aperture (I) in the plunger base into line with the lift cylinder oil gallery, simultaneously aligning two further holes in the plunger base with the oil feed gallery from the pump and the exhaust aperture leading to the depth control valve (2, Fig. Q.54). The exhaust aperture in conjunction with

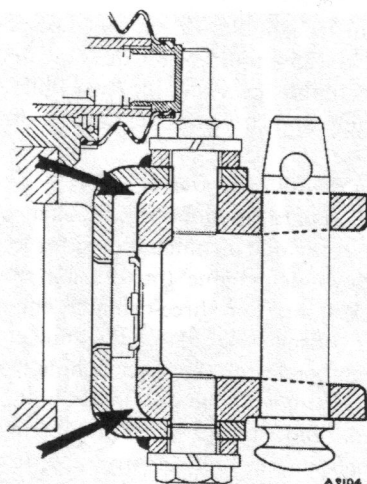


Fig. Q.57

The arrows indicate the forward corners of the anchor bracket, which must be given a $\frac{3}{8}$ in. (9.52 mm.) radius

When the new pivot bracket is used as a Service replacement the existing spacer nut ATJ6100 must be replaced by spacer ATJ6200 and nut ATJ6201.

It is also necessary to replace the stud ATJ6099. The new stud still carries the same part number but is $3\frac{3}{8}$ in. (85.72 mm.) long and not $3\frac{5}{16}$ in. (84.14 mm.) as previously.

To fit the new plunger pivot bracket to an existing top link anchor bracket necessitates the removal of metal from the two forward corners of the anchor bracket casting to form a radius of $\frac{3}{8}$ in. (9.52 mm.), as shown in Fig. Q.57.

Section Q.49

CLAYTON DEWANDRE OPERATING EQUIPMENT FOR TRAILER VACUUM BRAKES

Equipment for the operation of trailer vacuum brakes is available in kit form for fitting to new and existing Nuffield tractors (Types 3 DL and 342, 4 DM and 460).

The kit (Part No. ATJ5010) comprises a rotary exhaustor (belt driven from the engine crankshaft pulley), oil separator, vacuum reservoir tank, vacuum control valve with control lever assembly, and a quick-release coupling, together with all the necessary connecting pipes, brackets, nuts, bolts, and washers.

These installation instructions apply to tractors fitted with standard equipment but less the belt pulley unit. The unit must be removed from a tractor if one is fitted.

The major units comprising the braking equipment are attached to the left-hand side of the tractor main frame, and it will be seen therefore that any items of ancillary equipment already fitted in positions to be occupied by the braking equipment will have to be removed or repositioned or the braking equipment repositioned as necessary.

Exhauster driving pulleys

When Clayton Dewandre trailer brake operating equipment is ordered with the tractor an exhaustor driving pulley will be fitted to the tractor crankshaft pulley at the Works.

When it is desired to fit the equipment to existing tractors it may be found necessary to fit a modified crankshaft pulley.

The exhaustor driving pulley (Part No. ATJ70) has three holes, which are used for attaching the driving pulley to the crankshaft pulley. Early 4 DM and 3 DL tractors are equipped with a crankshaft pulley that has only two tapped holes, and where this is the case this pulley must be exchanged for one containing three tapped holes. The part numbers of the correct pulleys to use are: 4 DM models AMK2570 and 3 DL models AMK2603.

Removing and refitting a crankshaft pulley

To obtain access to the crankshaft pulley for removal it is recommended that the radiator and case be removed as detailed in Section C.7, and then proceed as follows.

Slacken the dynamo securing bolts and remove the dynamo driving belt.

Slacken and remove the starting-handle jaw nut, using spanner 18G97, and withdraw the crankshaft pulley with remover 18G231 and adaptors 18G231A. Fit the new crankshaft pulley and secure in position with the starting dog nut. Tighten the nut and bend over the tab washer before fitting the exhaustor driving pulley.

Fit the exhaustor driving pulley (Part No. ATJ70) to the crankshaft pulley by means of the three $\frac{7}{16}$ in. UNF. bolts, $1\frac{1}{2}$ in. (38.1 mm.) long together with the lock plates provided. Do not omit to bend over the lock plates after the bolts have been securely tightened.

Mounting the exhaustor

Fit the exhaustor mounting bracket to the left-hand side-member of the main frame.

On four-cylinder engine tractors use the left-hand top and bottom holes in the mounting bracket and attach it to the frame member, using the third and fourth holes from the front.

On three-cylinder engine tractors use the right-hand top and bottom holes in the mounting bracket and attach it to the frame member, using the fourth and fifth holes from the front.

Secure the mounting bracket with two $\frac{3}{4}$ in. UNF. bolts, $2\frac{1}{2}$ in. (63.5 mm.) long, with nuts and spring washers.

Fit the exhauster driven pulley onto the exhauster drive shaft, engaging the key in the shaft with the keyway in the pulley. Secure with the slotted nut, and when tight lock in position with a split pin.

Place the exhauster on the support bracket and assemble the driving belt onto both pulleys. Secure the exhauster in position, using four $\frac{3}{8}$ in. UNF. bolts, $1\frac{1}{2}$ in. (38.1 mm.) long, with the nuts and plain and spring washers fitted beneath the bracket. Slotted holes are provided in the support bracket for belt adjustment and

the exhauster should be so positioned that approximately 1 in. (25.4 mm.) of up and down movement of the belt is available between the two pulleys. Ensure that both driving and driven pulleys are in correct alignment.

Mounting the oil separator

The oil separator mounting bracket is provided with two holes, only one of which is used for fixing the bracket. On four-cylinder engine tractors use the lower hole in the bracket and on three-cylinder engine tractors use the upper (offset) hole. Attach the bracket to the left-hand frame member, using the seventh hole from the front on tractors. Secure with one $\frac{3}{4}$ in. UNF. bolt $2\frac{1}{2}$ in. (63.5 mm.) long, nut, and spring washer, ensuring that the two small holes in the bracket are uppermost and that the bracket is level with the main frame. Securely tighten the nut.

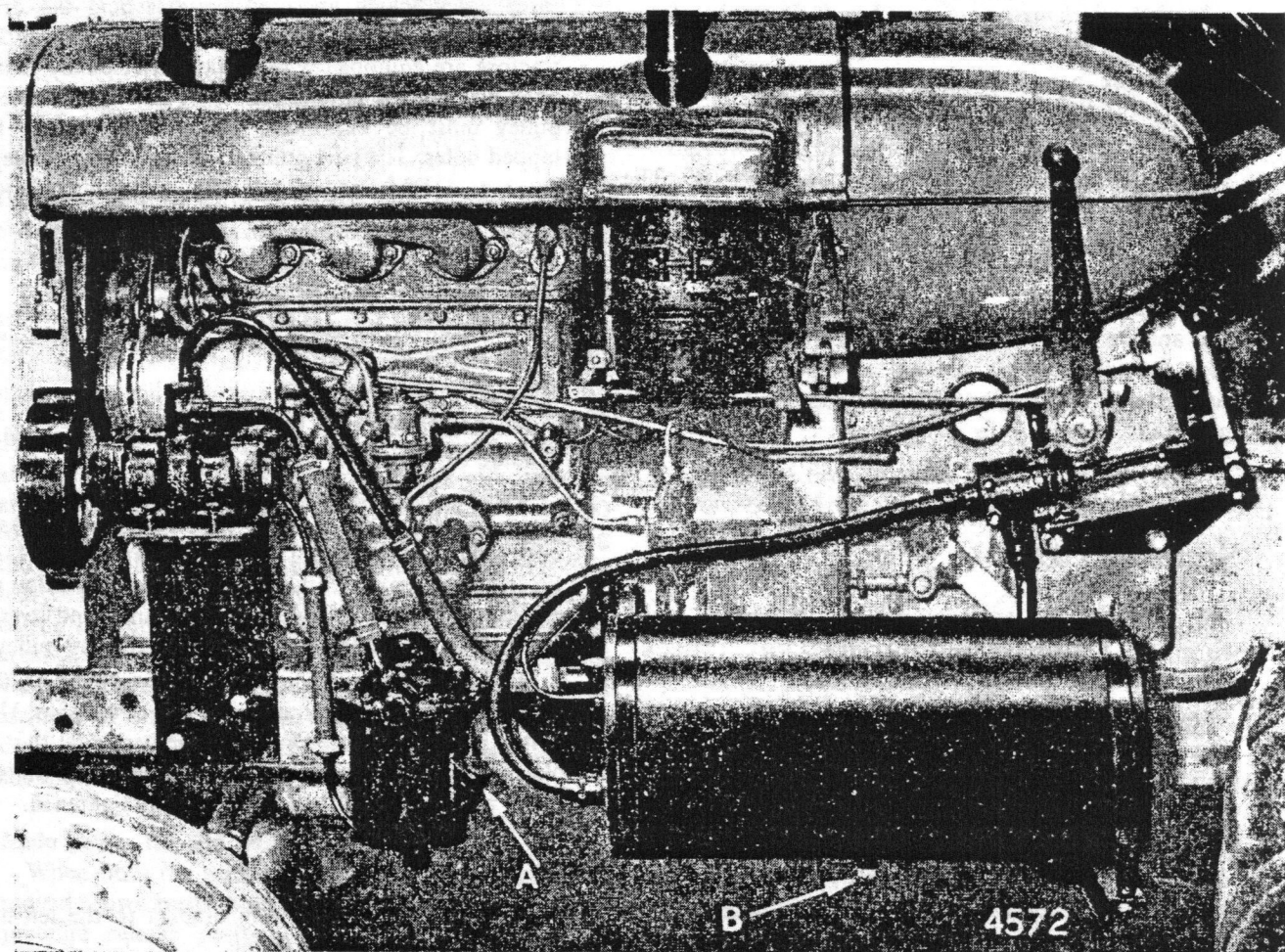


Fig. Q.58

The layout of the trailer brake operating equipment on a three-cylinder engine tractor. (A) indicates the oil filler plug on the oil separator and (B) the water drain plug in the base of the vacuum reservoir

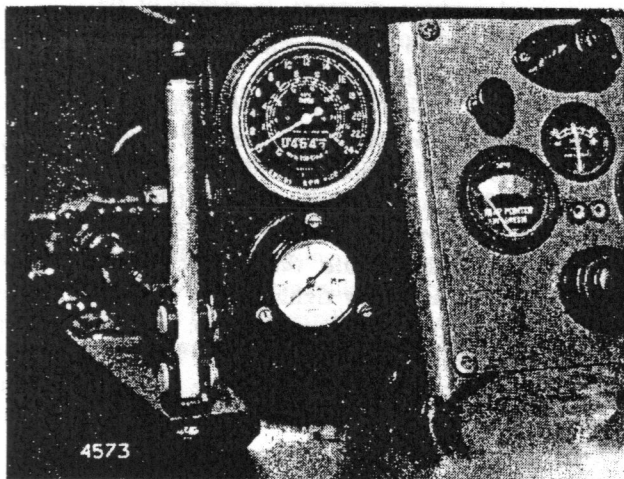


Fig. Q.59

The control lever is pulled rearwards to operate the trailer brakes. The vacuum gauge, which reads in inches of mercury, is clearly shown in this picture

Mount the oil separator on the support bracket, using two $\frac{1}{2}$ in. UNF. bolts, $1\frac{1}{4}$ in. (31.7 mm.) long, with nuts and spring washers.

Mounting the vacuum reservoir tank

Secure the reservoir tank front mounting bracket to the left-hand frame member, using the rear hole on all tractors.

Remove the two left-hand bolts securing the lower portion of the transmission casing to the main frame and use them to secure the reservoir tank rear mounting angle iron bracket to the transmission casing.

Position the reservoir tank onto the brackets with the non-return valve in an upright position and facing forward.

The metal securing straps are provided with two adjusting nuts and two locknuts. Thread back the locknuts as far as they will go (towards the strap). Fit the straps and tighten the adjusting nuts until the tank is secure. Avoid overtightening and unduly straining the straps. Finally, tighten the locknuts.

Vacuum gauge

The vacuum gauge must be fitted to the left-hand side of the instrument panel.

If a tractometer is fitted, or on early models an R.P.M. indicator and speedometer, the mounting bracket must be removed from the instrument panel left-hand side cover and the new bracket provided fitted in its place. This bracket has provision for both the tractometer and vacuum gauge.

Tractors fitted with independent power take-off will not have sufficient clearance between the vacuum gauge bracket and the power take-off lever unless an additional hole is drilled in the instrument panel side cover for attaching the bracket. Details for marking and drilling this hole are given in Fig. Q.60.

The vacuum gauge is secured in the bracket by means of three 4 B.A. screws, $\frac{7}{16}$ in. (11 mm.) long, with nuts and spring washers.

Vacuum control valve and lever assembly

Remove the two top bolts from the belt pulley blanking plate and use them to secure the control valve mounting bracket over the blanking plate. The end of the mounting bracket, having two holes, must face forward.

Fit the vacuum control valve, with the hexagon barrel nut facing rearwards, to the forward end of the mounting bracket, using two $\frac{5}{8}$ in. UNF. bolts, $\frac{3}{4}$ in. (19 mm.) long, with nuts and spring washers.

To the rear end of the mounting bracket fit the control lever assembly. The length of the valve operating rod should be adjusted to provide the most suitable lever position and the spring box adjusting nut tightened so that the spring is slightly compressed. Tighten all the locknuts.

Quick-release coupling

Attach the mounting bracket for the quick-release coupling to the left-hand rear axle case flange, using the fifth and seventh holes from the left-hand side. Secure the bracket to the axle casing with two $\frac{3}{4}$ in. UNF. bolts, $2\frac{1}{2}$ in. (63.5 mm.) long, with nuts and spring washers.

The coupling is secured to the bracket by two $\frac{1}{2}$ in. UNF. bolts, $1\frac{1}{4}$ in. (31.7 mm.) long, with nuts and spring washers.

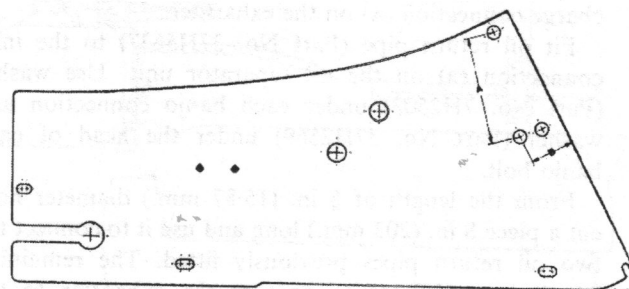


Fig. Q.60

The additional $\frac{11}{32}$ in. (8.73 mm.) diameter hole which requires to be drilled in the instrument panel side cover on tractors fitted with independent P.T.O.

Dimension (A) $3\frac{1}{4}$ in. (82.55 mm.).

Dimension (B) $1\frac{9}{16}$ in. (32.54 mm.).

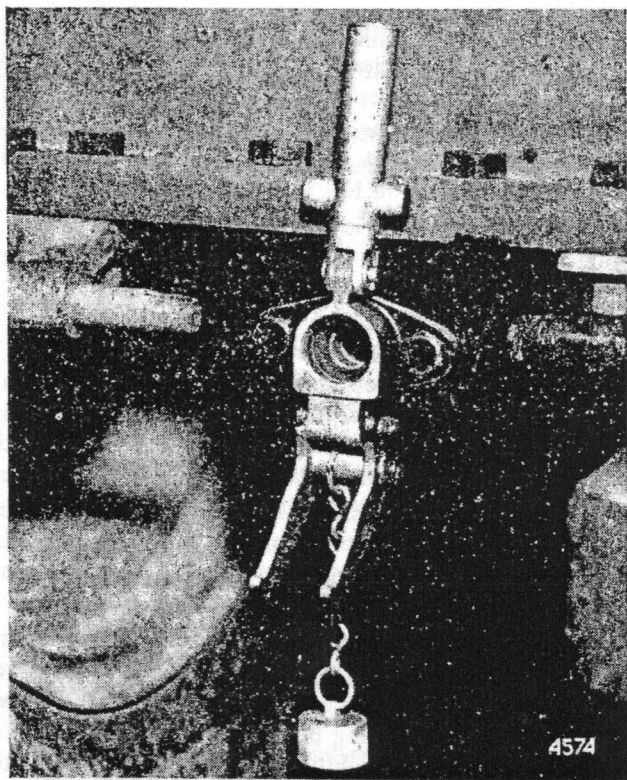


Fig. Q.61

The quick-release coupling shown opened prior to fitting the trailer vacuum pipe. Keep the plug in position when the pipe is not connected

Section Q.50

PIPES AND CONNECTIONS

Reference to Fig. Q.62 is made throughout the following directions.

Exhauster to oil separator and vacuum tank

Fit oil return pipe (Part No. 37H5636) to the discharge connection (A) on the exhauster.

Fit oil return pipe (Part No. 37H5637) to the inlet connection (B) on the oil separator unit. Use washer (Part No. 7H2503) under each banjo connection and washer (Part No. 37H2569) under the head of each banjo bolt.

From the length of $\frac{5}{8}$ in. (15.87 mm.) diameter hose cut a piece 8 in. (203 mm.) long and use it to connect the two oil return pipes previously fitted. The remaining length is used later to connect the exhauster to the vacuum tank.

Secure the hose in position with two clips (Part No. 17H5747).

Fit oil inlet pipe (Part No. 37H5634) to the oil supply connection (C) on the exhauster.

Fit oil inlet pipe (Part No. 37H5635) to the oil outlet connection (D) on the separator unit. Use washer (Part No. 7H2537) under each banjo connection and washer (Part No. 37H5643) under the head of each banjo bolt.

Connect the two pipes with the 8 in. (203 mm.) length of $\frac{3}{8}$ in. (9.52 mm.) bore pipe (Part No. 37H5639) and secure in position with two clips (Part No. 37H5641).

Screw the adaptor (Part No. 37H5659) with washer (Part No. 7H2503) into the inlet connection (E) on the exhauster and fully tighten. Into the adaptor screw the vacuum pipe (Part No. 37H5638). Use the remaining length of $\frac{5}{8}$ in. (15.87 mm.) diameter hose to couple the vacuum pipe to the non-return valve (F) on the vacuum reservoir tank. Secure the pipe with two hose clips (Part No. 17H5747).

Vacuum tank to vacuum control valve

Connect one end of the vacuum pipe (Part No. 37H5645) to the adaptor (G) on the vacuum tank and the other end to the control valve connection (H).

Connect one end of the vacuum gauge pipe (Part No. 37H5647) to the vacuum gauge and the other end to the connection (I) on the reservoir tank. Run the pipe neatly beneath the pipe from the control valve, securing it in position with two clips (Part No. 37H5661).

Vacuum control valve to quick-release coupling

Connect one end of the vacuum pipe (Part No. 37H5646) to the control valve connection (J) and the other end to the connection (K) on the quick-release coupling.

Section Q.51

LUBRICATION

Remove the filler plug from the oil separator and fill to the top of the filler neck with an oil to Specification S.A.E. 30.

The action of the exhauster rotor blades causes oil to be drawn through the bottom filter in the oil separator into the exhauster, thoroughly lubricating all moving parts. It is then ejected through a port in the top of the exhauster and returned through the inlet port of the oil separator where it passes through the top filter in the strainer to the oil reservoir, thus completing the circulation.

Section Q.52

TESTING

Run the engine until a reading of 25 in. (63.5 cm.) Hg is obtained on the vacuum gauge. The vacuum gauge is

calibrated in inches of mercury, reading from zero to 30 in. (76.2 cm.). Stop the engine and time the rate of fall of the gauge needle, which must not exceed 1 in. (25.4 mm.) Hg in three minutes. If the rate of fall exceeds this figure check all the pipe connections for leaks except those between the control valve and the quick-release coupling. Tighten the connections if necessary.

Make sure that the blanking plug is firmly in position in the quick-release coupling and then repeat the above test with the control lever pulled back. The gauge needle will drop as the lever is initially operated but should then remain steady, and any further drop must not exceed 1 in.

(25.4 mm.) in three minutes. If the rate of fall exceeds this figure check the pipe connections between the control valve and the quick-release coupling for leaks, and tighten the connections if necessary.

Section Q.53

PERIODICAL ATTENTION

Daily

Check the level of the oil in the separator, and top up if necessary with fresh oil to Specification S.A.E. 30.

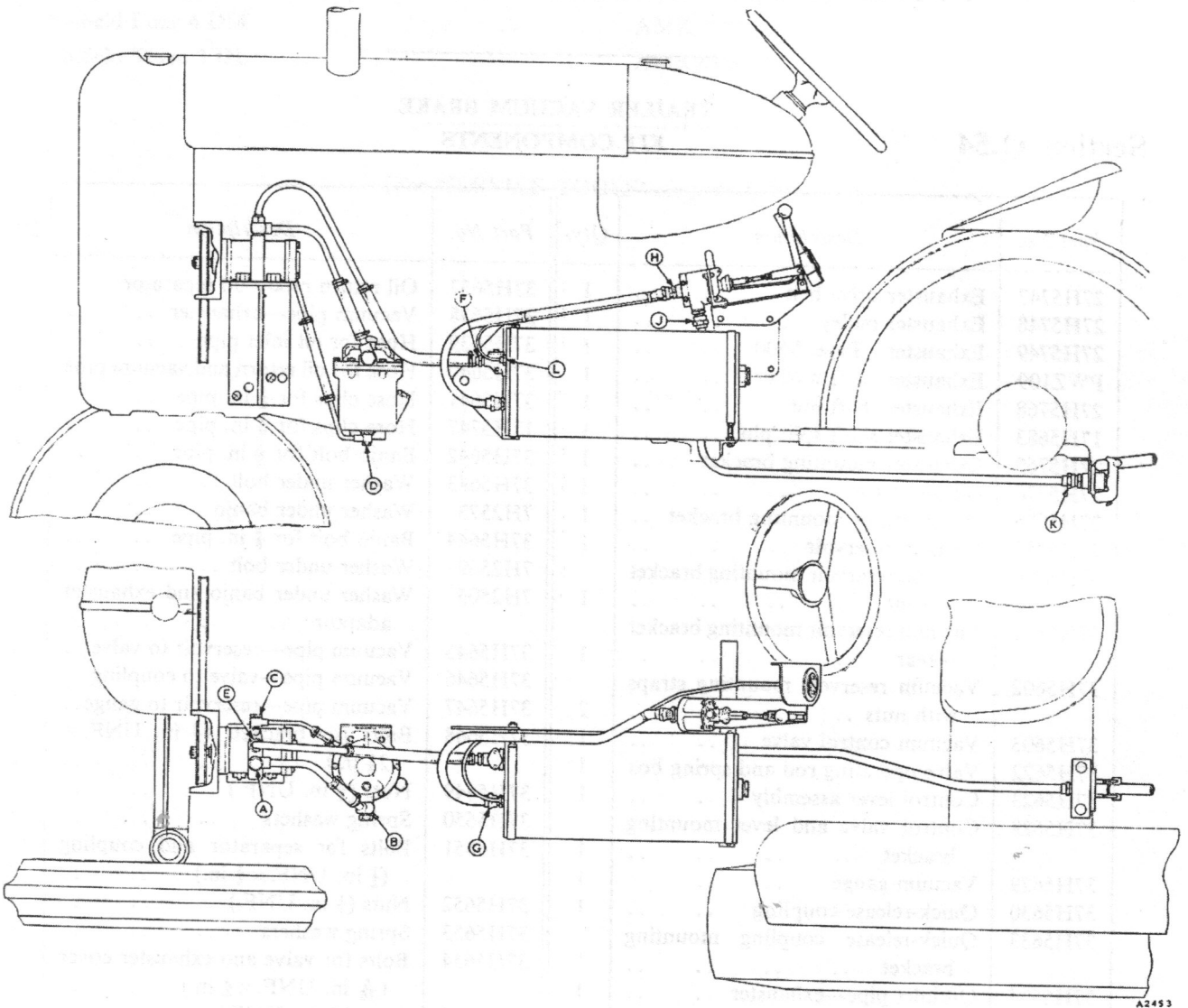


Fig. Q.62

The layout of the trailer brake operating equipment is here shown in plan and elevation. The letters are referred to in the text

Every 200 hours

Due to condensation, a certain amount of water will collect in the bottom of the vacuum reservoir tank. Remove the drain plug from beneath the tank and allow any accumulation of water to drain off. Replace the drain plug.

Check the condition of all pipes and the tightness of all pipe connections to ensure that there are no leaks.

Examine the condition of the rubber sealing washer in the quick-release coupling; in the event of it being damaged or perished a new one must be fitted. The gaiter on the control valve should also be examined, and if damaged or worn it must be renewed.

Lubricate lightly all moving parts of the control lever assembly.

Every 1,000 hours

Remove the drain plug from the base of the oil separator, drain off the old oil, and disconnect the pipes. Remove the separator from the support bracket, extract the six screws, remove the top cover and filter assembly, and wash, together with the body and lower filter, in paraffin (kerosene). Dry thoroughly and re-assemble.

Refit the separator to the support bracket, connect the pipes, and refill with fresh oil (S.A.E. 30) to the top of the filler neck.

Section Q.54
**TRAILER VACUUM BRAKE
KIT COMPONENTS**

<i>Part No.</i>	<i>Description</i>	<i>Qty.</i>	<i>Part No.</i>	<i>Description</i>	<i>Qty.</i>
27H5747	Exhauster drive belt	1	37H5637	Oil return pipe—oil separator ..	1
27H5748	Exhauster pulley	1	37H5638	Vacuum pipe—exhauster	1
27H5749	Exhauster—Type A500	1	37H5639	Hose for oil inlet pipe	1
PWZ109	Exhauster shaft washer	1	37H5640	Hose for oil return and vacuum pipe	1
27H5768	Exhauster shaft nut	1	37H5641	Hose clips for $\frac{3}{8}$ in. pipe	2
17H5683	Exhauster shaft split pin	1	17H5747	Hose clips for $\frac{5}{8}$ in. pipe	4
27H5769	Exhauster mounting bracket ..	1	37H5642	Banjo bolt for $\frac{3}{8}$ in. pipe	2
27H5770	Oil separator	1	37H5643	Washer under bolt	2
27H5796	Oil separator mounting bracket ..	1	7H2573	Washer under banjo	2
27H5797	Vacuum reservoir	1	37H5644	Banjo bolt for $\frac{5}{8}$ in. pipe	2
37H5600	Vacuum reservoir mounting bracket —front	1	7H2569	Washer under bolt	2
37H5601	Vacuum reservoir mounting bracket —rear	1	7H2503	Washer under banjo and exhauster adaptor	3
37H5602	Vacuum reservoir mounting straps with nuts	2	37H5645	Vacuum pipe—reservoir to valve ..	1
37H5603	Vacuum control valve	1	37H5646	Vacuum pipe—valve to coupling ..	1
37H5622	Valve operating rod and spring box	1	37H5647	Vacuum pipe—reservoir to gauge ..	1
37H5623	Control lever assembly	1	37H5648	Bolts for brackets ($\frac{3}{4}$ in. UNF. \times $2\frac{1}{2}$ in.)	6
37H5628	Control valve and lever mounting bracket	1	37H5649	Nuts ($\frac{3}{4}$ in. UNF.)	6
37H5629	Vacuum gauge	1	37H5650	Spring washers	6
37H5630	Quick-release coupling	1	37H5651	Bolts for separator and coupling ($\frac{1}{2}$ in. UNF. \times $\frac{3}{4}$ in.)	4
37H5633	Quick-release coupling mounting bracket	1	37H5652	Nuts ($\frac{1}{2}$ in. UNF.)	4
37H5634	Oil inlet pipe—exhauster	1	37H5653	Spring washers	4
37H5635	Oil inlet pipe—oil separator ..	1	37H5654	Bolts for valve and exhauster cover ($\frac{5}{16}$ in. UNF. \times $\frac{3}{4}$ in.)	3
37H5636	Oil return pipe—exhauster ..	1	37H5655	Nuts ($\frac{5}{16}$ in. UNF.)	3
			LWZ202	Spring washers	3

OPTIONAL EQUIPMENT

Part No.	Description	Qty.	Part No.	Description	Qty.
37H5656	Screws for gauge (4 B.A. $\times \frac{7}{16}$ in.)..	3	37H5661	Clips—vacuum gauge pipe ..	2
37H5657	Nuts (4 B.A.)	3	37H5662	Bolts for exhaustor ($\frac{3}{8}$ in. UNF. \times 1 $\frac{1}{2}$ in.)	4
37H5658	Spring washers	3	37H5663	Nuts ($\frac{3}{8}$ in. UNF.)	4
37H5659	Adaptor for exhaustor vacuum pipe ($\frac{1}{2}$ in. B.S.P. $\times \frac{5}{8}$ in. pipe) ..	1	7H5686	Plain washers	4
37H5660	Cover—exhaustor pulley	1	7H5706	Spring washers	4

NOTE.—Early 4 DM and 3 DL tractors are equipped with a crankshaft pulley having two tapped holes machined in the pulley face. In order to fit the exhaustor driving pulley (Part No. ATJ70) this crankshaft pulley must be replaced with one having three tapped holes. The part numbers of the crankshaft pulleys required are as follows:

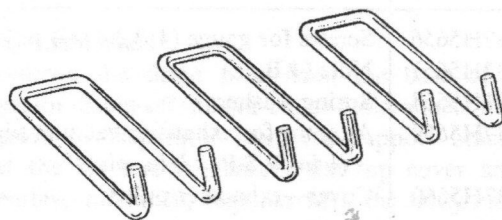
Nuffield Four 4 DM AMK2570.
 Nuffield Three 3 DL AMK2603.

(For 'SERVICE TOOLS' see page Q.64)

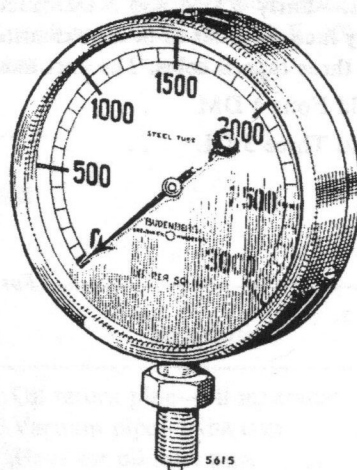
SERVICE TOOLS

18G498. Double Clutch Retaining Staples

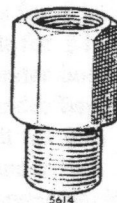
For use when removing the double clutch these staples, supplied in sets of three, are placed over the three main clutch release levers and hooked beneath the independent clutch cover.

**18G498****18G548. Oil Pressure Gauge**

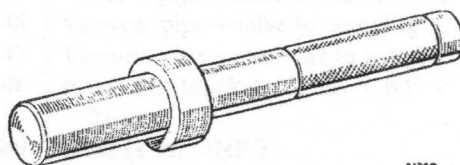
An oil pressure gauge, 4 in. (101.5 mm.) in diameter, having a dial calibrated from 0 to 3,000 lb./sq. in. (0 to 211 kg./cm.²), may be used to check the hydraulic power unit maximum pressure. The gauge is screwed into either the main or auxiliary tappings, using adaptor 18G548A

**18G548****18G548A. Adaptor**

For use with pressure gauge 18G548.

**18G548A****18G566. Independent Power Take-off Layshaft Bush Replacer**

Use this tool to replace the I.P.T.O. primary shaft bush in the hollow layshaft and minimize the risk of damage or distortion to the bush.

**18G566****18G563. Double Clutch Gauging Fixture**

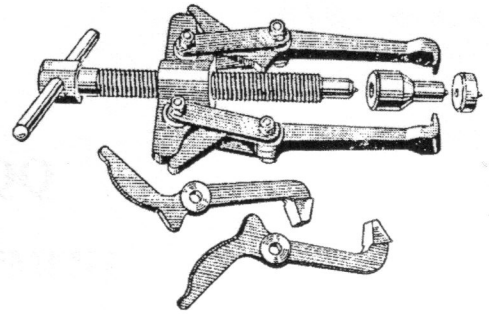
When used in conjunction with a spare flywheel, which forms the base plate, the fixture is invaluable for dismantling, rebuilding, and finally adjusting, to a high degree of accuracy, both single- and double-plate clutches.

18G2. Crankshaft Gear, Pulley, and Propeller Shaft Flange Remover

A multipurpose tool with alternative legs readily interchangeable. The use of this tool when removing the Dowty hydraulic pump drive gear will ensure that no damage to pump or gear occurs.

18G2A. Gear Remover Legs

For use with 18G2.



18G2

SECTION QQ

OPTIONAL EQUIPMENT

											<i>Section</i>
Axle radius arms											
Fitting	..	..	..	..	..	..	..	..	..	..	QQ.9
Belt pulley—rear drive	..	..	..	..	..	..	..	..	..	..	QQ.6
Darvill retractable strakes	..	..	..	..	..	..	..	..	..	..	QQ.7
Hand clutch conversion equipment—fitting	..	..	..	..	..	..	..	..	..	..	QQ.4
Lighting equipment	..	..	..	..	..	..	..	..	..	..	QQ.1
Fitting	..	..	..	..	..	..	..	..	..	..	QQ.2
Wiring	..	..	..	..	..	..	..	..	..	..	QQ.3
Overload release mechanism—fitting	..	..	..	..	..	..	..	..	..	..	QQ.5
Power-assisted steering	..	..	..	..	..	..	..	..	..	..	QQ.12
Description	..	..	..	..	..	..	..	..	..	..	QQ.13
Installation	..	..	..	..	..	..	..	..	..	..	QQ.14
Kit components	..	..	..	..	..	..	..	..	..	..	QQ.17
Maintenance attention	..	..	..	..	..	..	..	..	..	..	QQ.15
Servicing	..	..	..	..	..	..	..	..	..	..	QQ.16
Twin rear wheels											
Flanged axles	..	..	..	..	..	..	..	..	..	..	QQ.11
Sliding hub axle	..	..	..	..	..	..	..	..	..	..	QQ.10
'V' twin front wheel unit—fitting	..	..	..	..	..	..	..	..	..	..	QQ.8

Section QQ applies only to the Nuffield Four Tractor. Information and instructions not included in this Section are the same as those given in Section Q for the Nuffield Three Tractor

Section QQ.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 and white cable connected to the switch terminal marked 'A'.
- (8) Dashlamp complete with screws, nuts, and washers.
- (9) Cables comprising:

Two 8 ft. 3 in. long (red), switch to sidelamp and sidelamp junction.

One 1 ft. 8 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 14½ in. long (red), change-over switch to tail lamp.

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

One 4 ft. long (blue), right-hand front headlamp.

- (10) Cable clips (18) (see Fig. QQ.1) with suitable fixing bolts and nuts.

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 '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 beneath the battery compartment.

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.)



CLIP (2-OFF)
FITTED IN
POSITION 'A'.



CLIP (3-OFF)
FITTED IN
POSITION 'E'
63043F

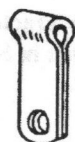
Section QQ.2

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. (7.14 mm.) diameter holes in the positions shown in Fig. QQ.2.
- (2) Right-hand wing: Drill 14 $\frac{3}{32}$ in. (7.14 mm.) diameter holes in the positions shown in Fig. QQ.3.



CLIP (3-OFF)
FITTED IN
POSITION 'B'.



CLIP (10-OFF)
FITTED IN
POSITION 'D'.

Fig. QQ.1

The clips supplied with the electric lighting equipment.
Their locations are illustrated in Fig. QQ.4

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.

Section QQ.3

WIRING THE LIGHTING EQUIPMENT

Front floodlight

Carefully uncoil the 4 ft. 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 'A', using the lower floodlight bracket fixing bolt (see Fig. QQ.4). (When tightening the bolts

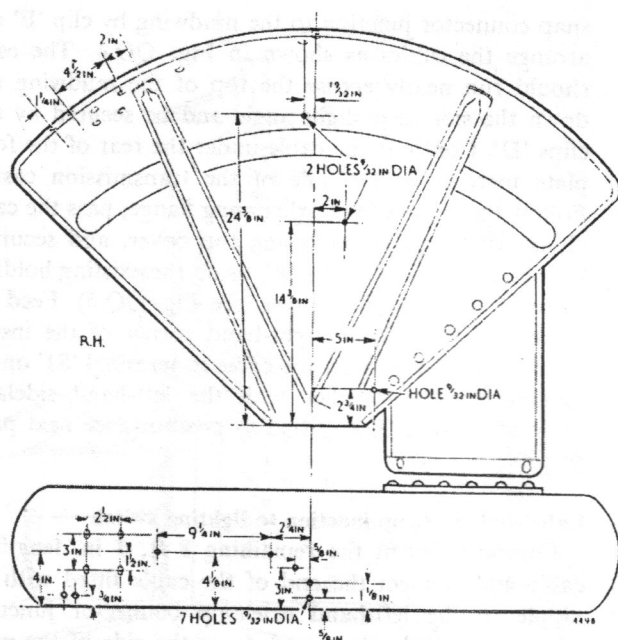


Fig. QQ.3

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

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 'D'. Connect the end of the cable fitted with a nipple to the double snap connector at the right-hand sidelamp (see Fig. QQ.4).

Right-hand sidelamp junction to lighting switch

Carefully uncoil one of the 8 ft. 3 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

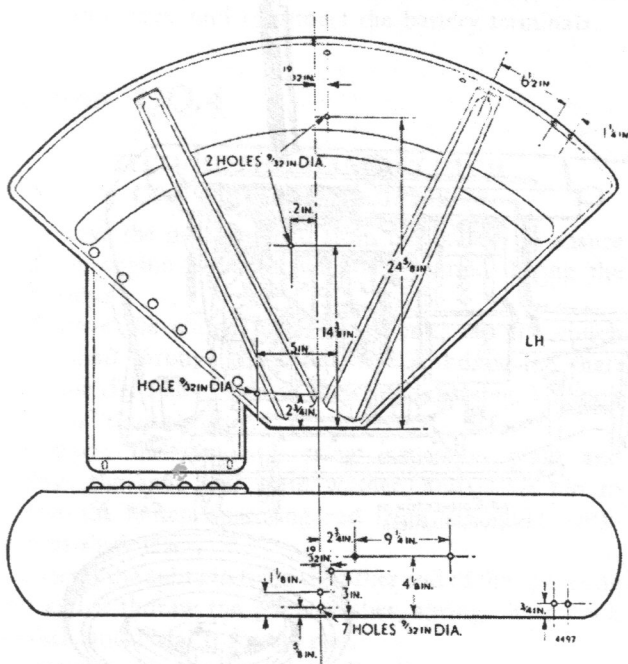


Fig. QQ.2

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

snap connector junction to the mudwing by clip 'E' and arrange the cables as shown in Fig. QQ.4. 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 'D'. Continue the cable under the rear of the foot-plate 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 'B', using the existing holding-down bolts of the top cover (see Fig. QQ.5). 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).

Left-hand sidelamp junction to lighting switch

Carefully uncoil the remaining 8 ft. 3 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 one clip 'E' and two clips 'D' to secure the cable to the mudwing, and one clip '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 14½ 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 two clips type 'D' and one clip '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

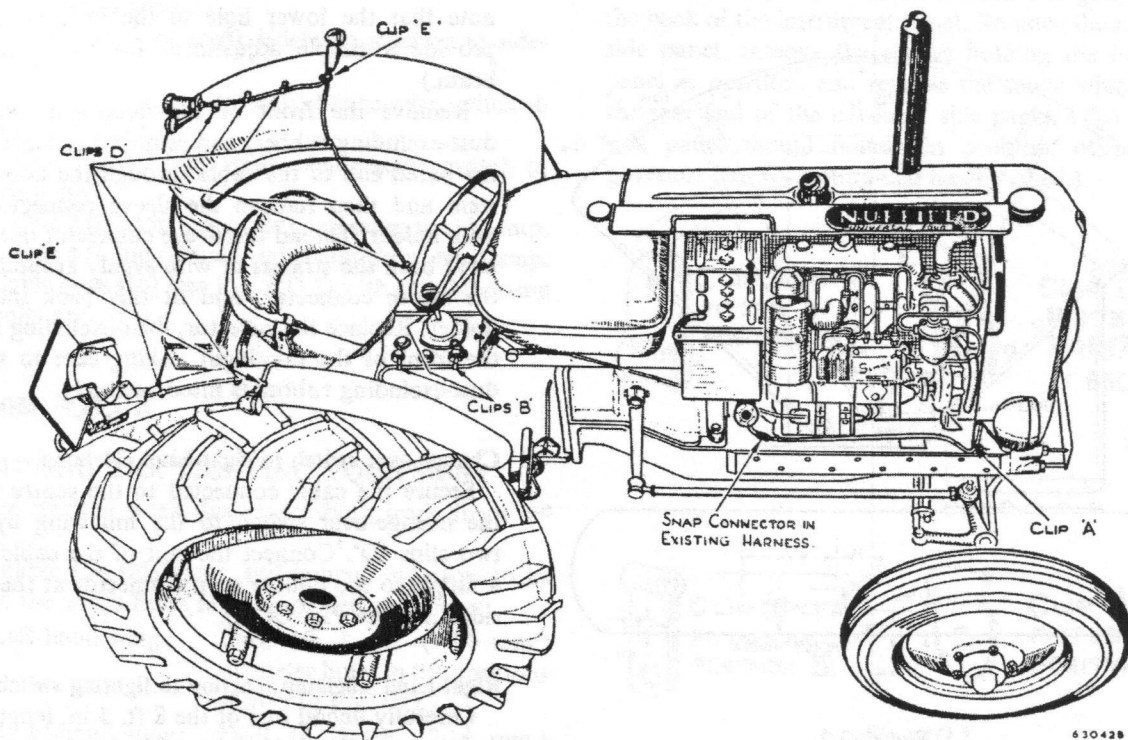


Fig. QQ.4

The location of the wiring clips

lamp in the same manner as described for the right-hand tail lamp. Secure the cable along the mudwing with two 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 and white and the purple and black cables through the aperture in the panel, connect the cables to the horn-push, and fit the horn-push to the panel.

Lighting switch to ammeter

The lighting switch is supplied with a short length of brown and white cable connected to terminal 'A'. Connect the other end of this cable to the ammeter negative terminal already having a brown and 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 QQ.4

FITTING THE HAND CLUTCH CONVERSION EQUIPMENT

Remove the negative lead from the battery to ensure that the engine is not accidentally started during the operations.

Remove the clutch pedal pinch-bolt, tap the clutch pedal shaft through the pedal, and withdraw the shaft from the right-hand side of the clutch housing. Unhook the pedal return spring.

Remove the clutch housing inspection plate and remove the split pin, plain washer, and clevis pin to release the clutch operating rod from the clutch withdrawal shaft lever.

Extract the split pin from the other end of the operating rod and withdraw the plain washer, spring, inner plain washer, and pedal from the rod.

Unscrew the clutch pedal adjusting nut, replace the existing plain washer by the thicker one supplied (Part No. NT4699), and refit the adjusting nut. Thread the catch lever pivot pin (Part No. NT4180) onto the clutch operating rod with the inner plain washer, 5 in. (127 mm.)

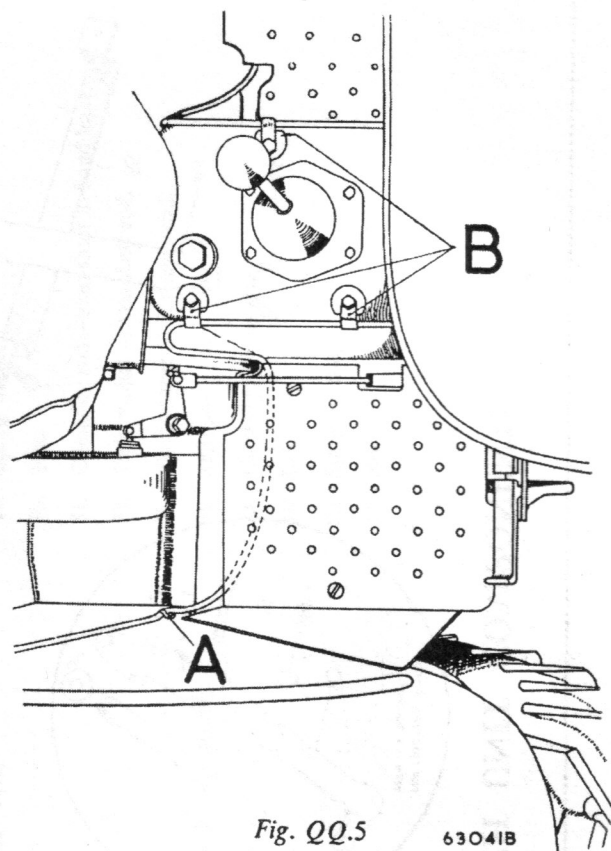


Fig. QQ.5

63041B

The run of the wiring on either side of the gearbox

A. Clip (Type 'D').

B. Clip (Type 'B').

spring (Part No. NT4698), and outer plain washer, then secure with a split pin.

Secure the clutch operating rod to the clutch withdrawal shaft lever by refitting the clevis pin, plain washer, and split pin.

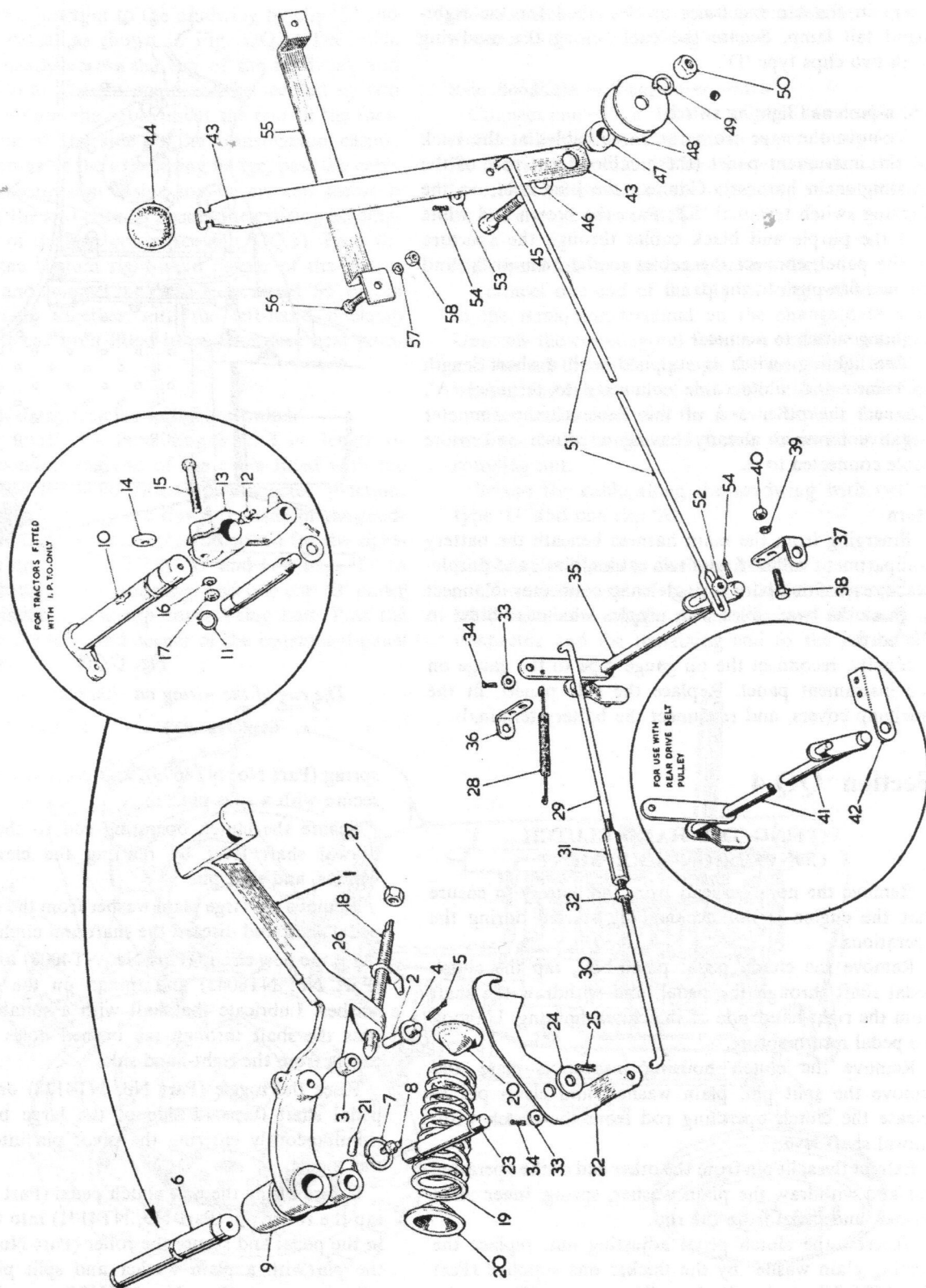
Remove the large plain washer from the original clutch pedal shaft and discard the shaft and circlip.

Fit the new circlip (Part No. NT4008) to the new shaft (Part No. NT8045) and thread on the original plain washer. Lubricate the shaft with a suitable grease and pass the shaft through the bushed holes in the clutch casing from the right-hand side.

Place the toggle (Part No. NT4178) onto the clutch pedal shaft (tapered side of the large boss inwards), simultaneously entering the pivot pin into the hole in the toggle.

Before fitting the new clutch pedal (Part No. NT5685) tap the roller pin (Part No. NT4171) into the blind hole in the pedal and secure the roller (Part No. NT4172) on the pin with a plain washer and split pin. Screw the adjusting screw (Part No. NT5686) into the lug on the pedal arm until the pointed end just appears on the other side of the lug.

THE HAND CLUTCH UNIT COMPONENTS



KEY TO THE HAND CLUTCH UNIT COMPONENTS

<i>No.</i>	<i>Description</i>	<i>No.</i>	<i>Description</i>	<i>No.</i>	<i>Description</i>
1.	Clutch pedal.	21.	Spring pivot pin.	40.	Nut.
2.	Pin—roller.	22.	Catch lever.	41.	Cross-shaft and levers assembly.
3.	Roller.	23.	Pivot pin.	42.	Bracket—L/H.
4.	Plain washer.	24.	Plain washer.	43.	Hand lever.
5.	Split pin.	25.	Split pin	44.	Knob for lever.
6.	Shaft for clutch pedal.	26.	Tag for spring.	45.	Bolt.
7.	Circlip.	27.	Locknut.	46.	Belleville washer.
8.	Greaser.	28.	Return spring.	47.	Distance piece.
9.	Toggle.	29.	Connecting link—L/H.	48.	Washer—large.
10.	Shaft for clutch pedal.	30.	Connecting link—R/H.	49.	Spring washer.
11.	Circlip.	31.	Turnbuckle.	50.	Nut.
12.	Greaser.	32.	Locknut.	51.	Operating rod—cross-shaft to hand lever.
13.	Toggle.	33.	Plain washer.	52.	Plain washer—cross-shaft end.
14.	Key.	34.	Split pin.	53.	Plain washer—hand lever end.
15.	Bolt.	35.	Cross-shaft and levers assembly.	54.	Split pin.
16.	Spring washer.	36.	Bracket—R/H.	55.	Gate—hand lever.
17.	Nut.	37.	Bracket—L/H.	56.	Bolt.
18.	Screw—adjusting.	38.	Bolt.	57.	Spring washer.
19.	Spring—clutch operating.	39.	Spring washer.	58.	Nut.
20.	Spring cup.				

Fit the pedal to the pedal shaft and secure it with the remaining circlip (Part No. NT4008). Refit the original pedal return spring and screw the greaser (Part No. UHN105) into the tapped hole in the shaft end.

Fit the catch lever (Part No. NT4181) onto the pivot pin so that the cranked portion points downwards and secure with the plain washer (Part No. PWN109) and split pin.

Place the spring pivot pin (Part No. NT4177) in the blind hole in the under side of the toggle, place the spring cup (Part No. NT4175) against the pin, and follow with the spring (Part No. NT4176) and remaining spring cup. Hold the spring assembly with the left hand and screw in the adjusting screw until the end carrying the flats protrudes approximately $1\frac{1}{8}$ in. (28.5 mm.) from the pedal lug. Fit the return spring tag (Part No. NT4174) and the locknut (Part No. FNN109). The final adjustment can be checked later when the whole of the equipment has been fitted.

Marking out the wing for drilling

Remove the left-hand wing, leaving the wing bracket and floor-plate in position. In the case of a tractor equipped with lighting, the wing lamp and its wiring must first be removed.

Place the wing on the bench with the strengthening ribs uppermost and remove the starting handle clip.

Set a straight-edge across the centres of the upper pair of caged nut holes and scribe a line to both edges of the wing. Continue this line round the edges of the wing and on to the other side. Turn the wing over and scribe a line between the marks at the wing edges.

With the driver's side of the wing uppermost, position a set-square on the line last scribed and scribe a line vertically through the centre of the starting handle clip bolt hole. Work from these two lines to mark out and drill the holes shown in Fig. QQ.6.

Refit the wing, wing lamp wiring, and starting handle clip.

Four $\frac{11}{32}$ in. (8.75 mm.) diameter holes are provided in the floor-plate flange.

Fitting controls to hand clutch mechanism

Bolt the two brackets and the cross-shaft and lever assembly (Part No. NT4183) into position. The shorter of the two brackets (Part No. NT4190) must be fitted nearest to the transmission casing. Position the brackets so that the cross-shaft works freely.

When fitting the hand lever ensure that the distance piece (Part No. NT4196) is fitted to the lever (Part No. NT4193) so that the lever will work freely on the register on the distance piece.

Thread onto the bolt (Part No. HBN0914) the following items in the order given: one Belleville washer, the hand lever, the distance piece, and a large plain washer (Part No. NT4197). Pass the bolt through the $\frac{3}{8}$ in. (15.1 mm.) diameter hole which has been drilled in the wing and thread on the remaining large plain washer, the spring washer, and the nut.

When the nut is tight check the lever movement. If there is undue stiffness it is permissible to remove the Belleville washer, or, alternatively, if the lever is too free an extra Belleville washer can be fitted. The lever movement must be free, but without rattle.

Fit the gate (Part No. NT4609) and bolt up with the bolt heads adjacent to the gate.

Final adjustments

Depress the clutch pedal to allow the catch lever to engage with the roller on the clutch pedal. Set the clutch pedal adjusting nut to allow the pedal 1 in. (25.4 mm.) of free movement.

Assemble the connecting link from Part Nos. NT5687, NT5688, NT5689, and FNN105.

Fit the assembly by securing one cranked end to the catch lever with a plain washer and split pin, then fit the other end, which must be set in the opposite direction, to the vertical lever on the cross-shaft and lever assembly, securing it with a plain washer and split pin.

The turnbuckle (Part No. NT5689), which is provided with right- and left-hand threads, must be adjusted so that when the cranked portion of the catch lever is downwards the inner lever on the cross-shaft is vertical. Lock the turnbuckle in position with the locknut. Hook in the return spring (Part No. NMS228/7).

The cranked end of the operating rod (Part No. NT4191) is attached to the hand lever and the looped end to the lever on the cross-shaft. Both ends must be

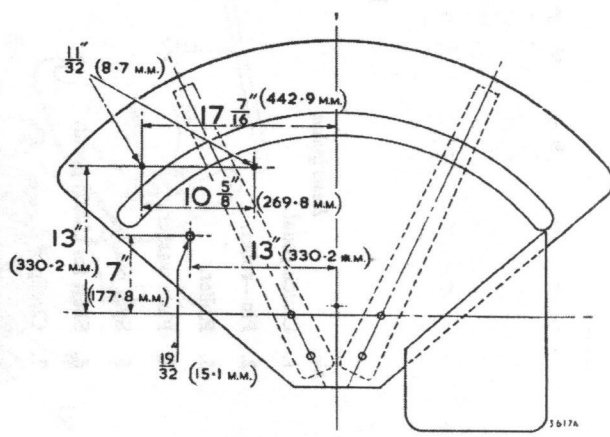


Fig. QQ.6

The additional holes required in the left-hand wing

secured by plain washers and split pins. Apply a grease gun to the clutch shaft greaser and lubricate the other working parts with an oilcan.

Final test of equipment

When the clutch is operated by hand the large spring must exert sufficient pressure to disengage the clutch completely, and the distance piece (Part No. NT4699), which acts as a clutch stop, should then be in contact with the clutch housing. If too much pressure is exerted by the spring extra physical effort will be required to operate the hand lever.

Refit the battery lead, start the engine, and check the operation of the clutch, using both hand operation and foot control.

If the instructions have been carefully followed the gears will engage without noise.

Section QQ.5

FITTING THE OVERLOAD RELEASE MECHANISM

The overload release mechanism operates in conjunction with the mid-mounted drawbar and the hand clutch, and it is essential that these attachments are fitted correctly before the overload release mechanism is fitted.

Preliminary dismantling

Remove the bolts securing the drawbar frame to the guide brackets and withdraw the special clevis pin securing the drawbar frame to the front mounting bracket. Lower the front end of the drawbar to the floor and remove the front mounting bracket.

Dismantling the release trip mechanism assembly

Remove the circlip (Part No. NMS94/28) from the end of the pivot pin (Part No. NT4047) and withdraw the cam (Part No. NT4737), cam spring (Part No. NT4079), and bell-crank lever (Part No. NT4558) from the pivot pin.

Reassembling the trip mechanism

Remove the clevis fork from the lower end of the control handle rod and secure the fork to the bell-crank lever with a clevis pin, plain washer, and split cotter pin. Pass the countersunk-headed bolts (Parts Nos. XUB310/20R and CMN0736) through the appropriate holes in the base plate adjacent to the trip mechanism.

Reassembly is the reverse of the dismantling procedure. The relative positions of the parts will be seen from Fig. QQ.7.

As the spring (Part No. NT4079) is quite strong, fitting is made easier if the coils are wired together in two places.

Clamp the base plate in a bench vice, place the bell-crank lever on the pivot pin, and follow it with the spring support spacer (Part No. NT4082).

Fit the spring and cam in position with the cranked end of the spring under the bell crank lever and the looped end hooked over the peg on the cam. Lever the cam towards the base plate flange until the peg slips over the top of the bell-crank lever and secure the cam in position with the circlip (Part No. NMS94/28). Cut and remove the wires holding the spring coils together.

Bolt the base plate assembly to the transmission casing flanges and fit the drawbar frame, using the special clevis pin.

Fitting the control handle assembly

Remove the two lower set bolts which secure the belt pulley assembly to the transmission casing and fit the control handle bracket.

Place the nine $\frac{3}{8}$ in. diameter balls in the control handle bearing. Hold the lower race in position and pass the rod through the holes in the bracket and transmission casing flange. Screw the threaded end of the rod into the clevis fork which has already been fitted to the bell-crank lever.

Setting up

Engage the hand clutch mechanism for use with foot control and note the position of the lever which points downwards from the cross-shaft lever assembly. This lever must be vertical; if it is not, adjust the connecting link accordingly as described in the instructions for fitting the hand clutch.

Check the dimension $\frac{5}{16}$ in. (3.97 mm.) as shown in Fig. QQ.7. If this dimension cannot be obtained by slight adjustment of the connecting link the holes in the floor-plate should be elongated to allow movement of the cross-shaft and lever assembly brackets upwards or downwards as the case may be.

Operating instructions

The load at which the release mechanism trips and allows the clutch to be disengaged can be set by the control handle, and this load should be little more than that required to draw the implement in work. Any increase on this load caused by obstructions in the ground will cause the clutch to be disengaged immediately.

The tractor can be manoeuvred by use of the hand clutch to disengage the implement from an obstruction. Normal operation can be resumed by placing the hand lever in the forward position and depressing and releasing the foot clutch pedal.

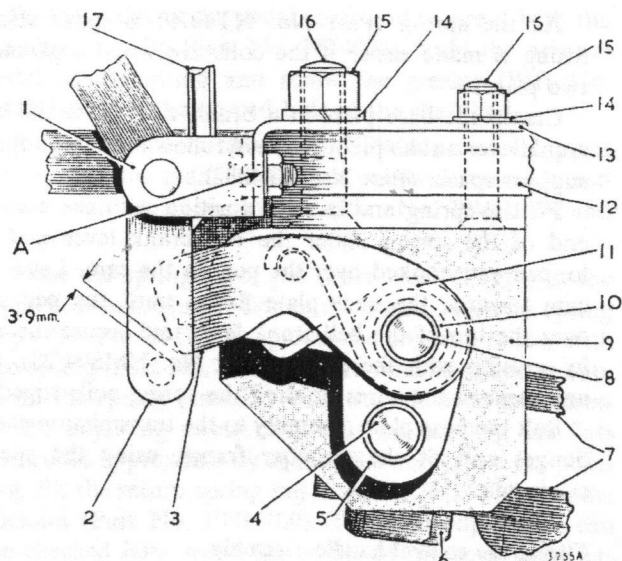


Fig. QQ.7

The relative positions of the release trip mechanism components

- A. If the dimension $\frac{3}{8}$ in. (3.97 mm.) cannot be achieved by adjustment these holes may be elongated
- | | |
|------------------------------------|---------------------------------|
| 1. Cross-shaft bracket. | 9. Base plate. |
| 2. Cross-shaft and lever assembly. | 10. Spacer. |
| 3. Cam. | 11. Spring. |
| 4. Trunnion lever. | 12. Transmission casing flange. |
| 5. Bell-crank lever. | 13. Floor-plate. |
| 6. Clevis pin. | 14. Spring washer. |
| 7. Drawbar frame. | 15. Nut. |
| 8. Pivot pin. | 16. Countersunk-headed bolt. |
| | 17. Control handle rod. |

Locking the overload release mechanism

The overload release mechanism must be placed out of action when doing work which does not require the use of an overload release.

Screw down the control handle in a clockwise direction until the release spring is coil-bound. This will prevent the mechanism from releasing the clutch under any conditions.

Section QQ.6

BELT PULLEY, REAR DRIVE

A kit of parts is available to enable the belt pulley drive to be taken to the rear of the tractor.

The kit consists of the following parts (see Fig. QQ.8):

- A. 1 Leg-guard (NT4683).
- B. 1 Adaptor for mudguard bracket (NT6025).
- C. 1 Extension floor-plate (NT4685).
- D. 1 Bracket for leg-guard (NT4686).
- 1 Cable extension for sidelamp (NT4729).
- Suitable nuts, bolts, and washers.

Prepare the tractor for use with the belt drive to the rear in the following manner:

Set the rear wheel track to 57 in. (1.44 m.) (see page LL.4).

Remove the left-hand lift-rod and lock the lift-arms in the raised position.

Remove the left-hand mudguard with bracket.

Remove the front bolt of the left-hand seat support plate and secure the leg-guard bracket (NT4686) with this bolt.

Remove the belt pulley guard and bolt the new leg-guard (NT4683) into position on the belt pulley shaft housing at the front and the brake-drum guard bolt and the bracket (NT4686) at the rear.

Bolt the mudguard bracket adaptor (NT4684) into position and fit the mudguard to the new position on the adaptor.

Bolt the extension floor-plate (NT4685) to the floor-plate and the mudguard.

On tractors fitted with a lighting set incorporate the cable extension (NT4729) into the cable at the left-hand sidelamp connection.

Where a starting handle is fitted move the starting handle clips from the left-hand side to the same relative position on the right-hand side. Use the existing holes in the right-hand floor-plate and drill a $\frac{3}{8}$ in. (7.14 mm.) hole in the mudguard after the position of the hole has been marked from the clip while correctly positioned on the starting handle.

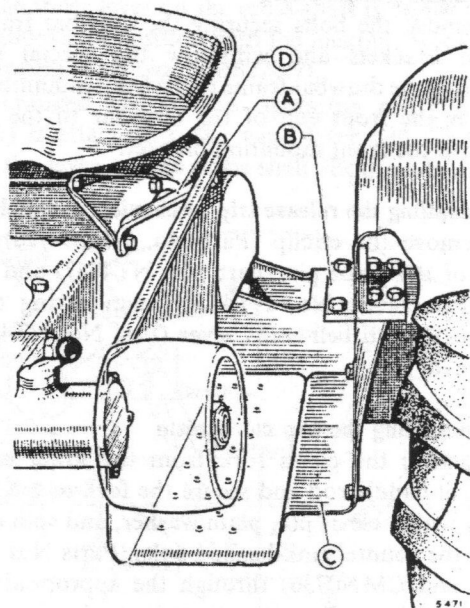


Fig. QQ.8

The assembly of the rear drive belt pulley conversion kit

Section QQ.7

DARVILL RETRACTABLE STRAKES (Nuffield Pattern)

In order to increase the wheel adhesion when operating the tractor under poor ground conditions Darvill retractable wheel strakes are available for mounting on the pneumatic-type wheels. The strakes are constructed in wheel form and are adjustable, thus allowing the tractor to be driven on metalled roads without damaging either the road surface or the strake assembly.

NOTE.—There are left- and right-hand strake assemblies, marked N/S and O/S respectively.

Fitting strakes of an early pattern to the rear wheels

Darvill strakes of an early pattern having four fixing lugs can be fitted to current tractor rear wheels by means of a simple conversion. A template, as illustrated in Fig. QQ.9, requires to be made up and is then used as a jig to drill the four extra holes in the wheel disc required for the strakes. Proceed as follows with the wheel in position on the tractor.

Use any two of the five holes already existing in the wheel disc and bolt the template to the disc.

Mount a $\frac{1}{4}$ in. (6.35 mm.) diameter drill in a suitable power brace and drill through the hole marked No. 1 on the template and through the wheel disc.

Unbolt the template and move it round the wheel to the right, that is, in the direction of the arrow marked on the template, until the left-hand hole in the template registers with the hole in the wheel disc previously in line with the right-hand hole in the template. Bolt the template in this position and drill through the wheel disc with a $\frac{1}{4}$ in. diameter drill. Repeat the operation, using in turn the third hole in the template and finally the fourth hole. Remove the template.

The wheel disc should now have four $\frac{1}{4}$ in. diameter holes drilled at equal intervals on a circle of $19\frac{7}{8}$ in. diameter (504.8 mm.) round the wheel centre.

Using a drill $\frac{11}{16}$ in. (17.46 mm.) diameter, drill through each of the four $\frac{1}{4}$ in. pilot holes. Remove any burr from the edge of the holes.

The strake can now be fitted and secured in position using the existing securing bolts with the addition of nuts and spring washers. The nuts must be on the inner side of the wheel discs.

To adjust the strakes for operation

With the tractor standing on soft ground slacken off the two clamping nuts on the outside centre rings of both assemblies; drive the tractor forward slowly to expand the strakes. If the strakes do not make sufficient contact with the ground to begin their expansion grasp

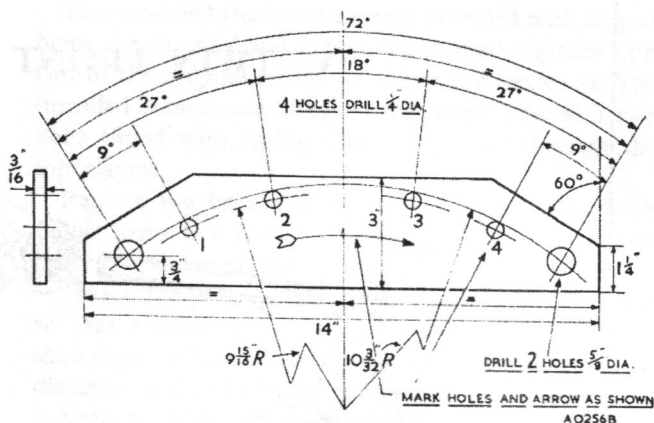


Fig. QQ.9

The template which requires to be made up to enable the four extra holes required when fitting strakes of an early pattern to current tractor wheel discs to be drilled accurately

one of the strakes and hold it against rotation as the tractor moves very slowly forward.

Tighten down the clamping nuts when the strakes are expanded to the required amount.

To retract the strakes slacken off the clamping nuts and reverse the tractor. If the strakes do not retract fully the final retraction can be effected by grasping the tip of a strake and holding it against rotation while the tractor slowly reverses. When the strakes are fully retracted tighten down the clamping nuts.

Section QQ.8

FITTING A 'V' TWIN FRONT WHEEL UNIT

Removal of the standard front axle as detailed in Section K.3 and the fitting of the 'V' twin front wheel unit is a straightforward exchange of units with the exception that the front extension also must be removed. Remove the front number-plate and the four bolts securing the front extension to the frame and lift off the extension. The same bolts are used to secure the 'V' twin front wheel unit to the frame. It should be noted that the final setting up of the steering linkage requires some care.

Remove the draglink and determine the central position of the steering wheel by halving the number of turns from lock to lock. The steering drop-arm should now be vertical, and from this position the steering wheel must be rotated half a turn to the left so that the steering drop-arm points slightly forward.

Set the draglink to $43\frac{1}{4}$ in. (109.8 cm.) centres by screwing out the ball sockets. There should be an equal amount of thread in each end of the tube.