

HYDRAULIC SYSTEM

The hydraulic power lift is located in the rear transmission and consists of three major assemblies, the pump, valve control gear and the ram cylinder.

The single stage spur gear pump is mounted on a pedestal inside the rear transmission housing and is gear-driven from the power take-off shaft. (See Fig. 182.) Pipes connect the pump and valve control unit.

OIL FILTERS

Magnetic Filters

The two magnetic filters are located in the pump pedestal so that as the oil passes into the wire mesh screen filter compartment all ferrous metal particles that may be present are extracted. (See Fig. 180.)

To remove the magnet from the bolt, pull out the brass retaining pin to release the magnet and spacer. To refit, gently tap the brass retaining pin in the bolt to secure the magnet and spacer firmly. The spacer is located between the magnet and the bolt.

Wire Mesh Screen Filter

After the oil has passed the two magnetic filters, it enters the wire mesh screen filter compartment in the base of the pedestal. This filter serves to remove any other foreign matter which may be in suspension and the oil is thoroughly filtered before entering the pump.

The wire mesh filter may be removed from the pedestal by unscrewing the four bolts and lockwashers retaining the filter cover plate to the pump pedestal.

(NOTE. — It is not necessary to remove the magnetic filter bolts to remove the cover plate or the pump pedestal.)

Pump Pedestal Ball Valves

On early type tractors $1\frac{1}{4}$ in. diameter steel ball valves could be fitted if desired, and are located above the magnetic filter bolts, so that when the bolts are removed the ball valves seat in the inlet passages and seal off the wire mesh screen filter compartment. (See Fig. 180.)

A small screw and lockwasher are fitted above each ball valve so that they cannot be displaced when the tractor is operated.

On current type tractors the pump pedestal has been modified and it is not possible to fit the ball valves which are no longer available in service.

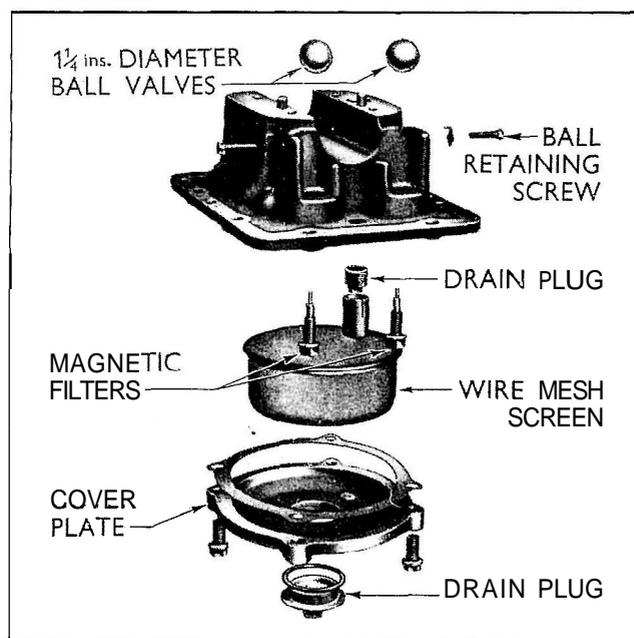


Fig. 180

Exploded View of Early Type Pump Pedestal and Filter

Cleaning the Filter

- 1 Drain the rear axle oil (if ball valves are not fitted). Remove the cover plate and gasket (four bolts and lockwashers) and lift out the wire mesh screen. (See Fig. 180.)
- 2 Remove the magnetic filter bolts.
- 3 Clean all parts thoroughly.
- 4 Refit the wire mesh screen, cover plate and gasket and screw in the drain plug and gasket.
- 5 Install the magnetic filter bolts and refill the rear transmission with an approved grade of lubricant.

THE HYDRAULIC PUMP

Description

The pump gears revolve in opposite directions and the tooth spaces at the inlet side are filled with oil which is carried round and forced through the outlet passage.

To compensate for wear and to maintain minimum possible clearances between the faces of the gears and their bearings, the latter are permitted to move longitudinally in the body.

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Two ducts are formed by the small flat faces of the bearings so that the oil, under pressure, is forced through the duct on the outlet side and fills the space between the outer faces of the bearings and the bracket, thus an inward pressure is exerted on the bearings which tends to push them towards the gears (Fig. 181).

A pressure relief plate, surrounded by an oil seal, is fitted in the space between the bearings at the outlet side thus blanking off an area which is, however, in communication with the inlet passage via the hole in the relief plate and the other duct in the bearings.

The relief plate and oil seal, therefore, restrict the space which is filled by the oil under pressure, and are designed so that the pressure area is correctly proportioned to ensure an even thrust, or inward pressure, against the inner faces of the bearings.

As the pressure area in the space between the outer bearings and the bracket is greater than the pressure area in the pump chamber, the bearings are pushed towards the gears so maintaining the minimum possible clearances and compensate for wear.

If the relief plate, which covers the inlet duct and the proportional area mentioned above, were not fitted, but the inlet duct merely blanked off, the entire space between the outer bearings and the bracket would be under high pressure and not being correctly proportioned would cause the

bearings to tilt inwards at the inlet port, in consequence of the greater pressure against the inlet passage, so resulting in rapid wear of the bearing faces.

The hole in the relief plate is provided as a relief for any oil that may seep past the oil seal, otherwise the pressure might build up in this area and subsequently destroy the function of the plate and give rise to the same conditions as if the plate were not fitted.

Valve Control Unit

The valve control unit is located at the front end of the ram cylinder housing and contains a control lever, piston valve, non-return valve, unloading valve and a jack tapping.

Oil is delivered from the pump, through the feed pipes to the piston valve; movement of this valve along its bore is controlled by the hand lever, which is returned to the neutral position by the cam roller and spring, housed in the lever body, as soon as the lever is released.

A jack tapping is provided, adjacent to the piston valve bore end plate, for those applications where external hydraulic pressure is required. A second valve unit may be bolted to the front of the existing valve body to provide an additional hydraulic service.

Oil is forced via the piston valve and the non-return valve to the ram cylinder thus raising the lift arms.

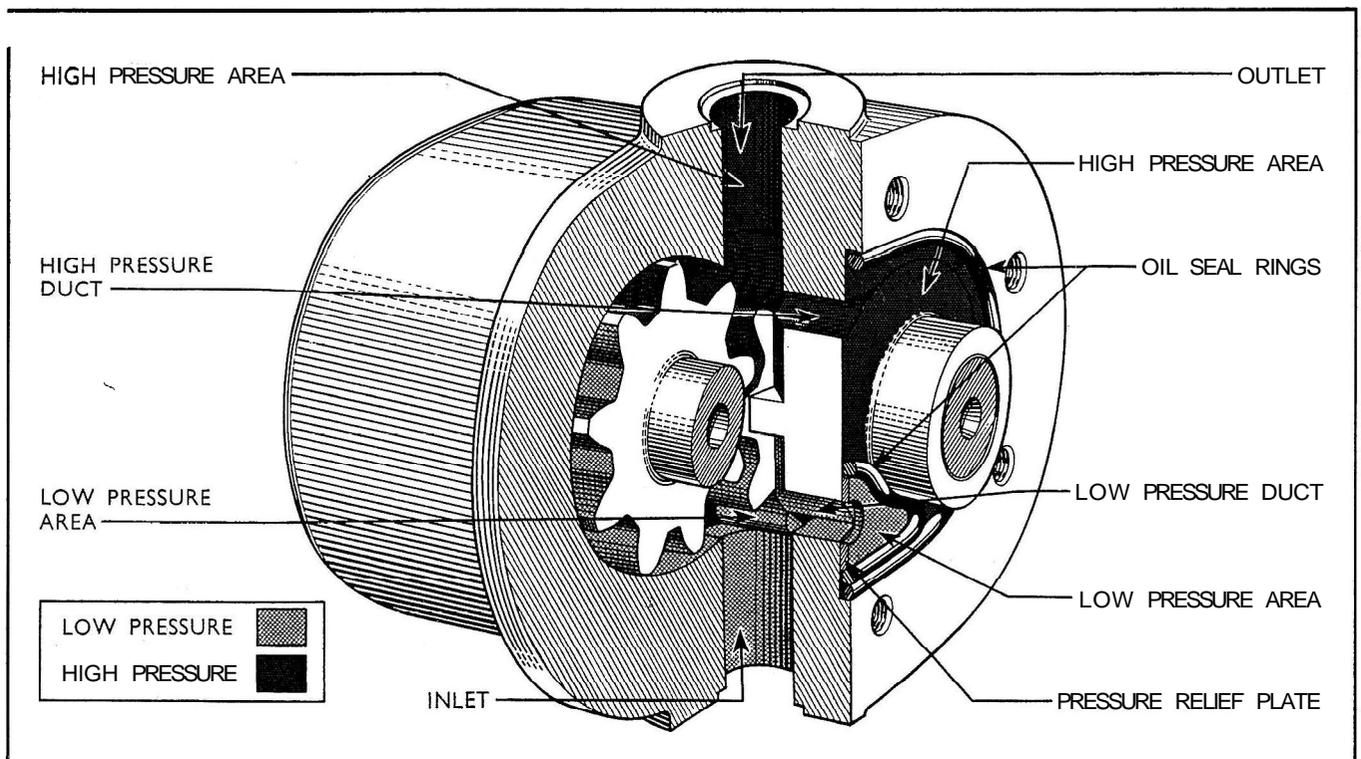
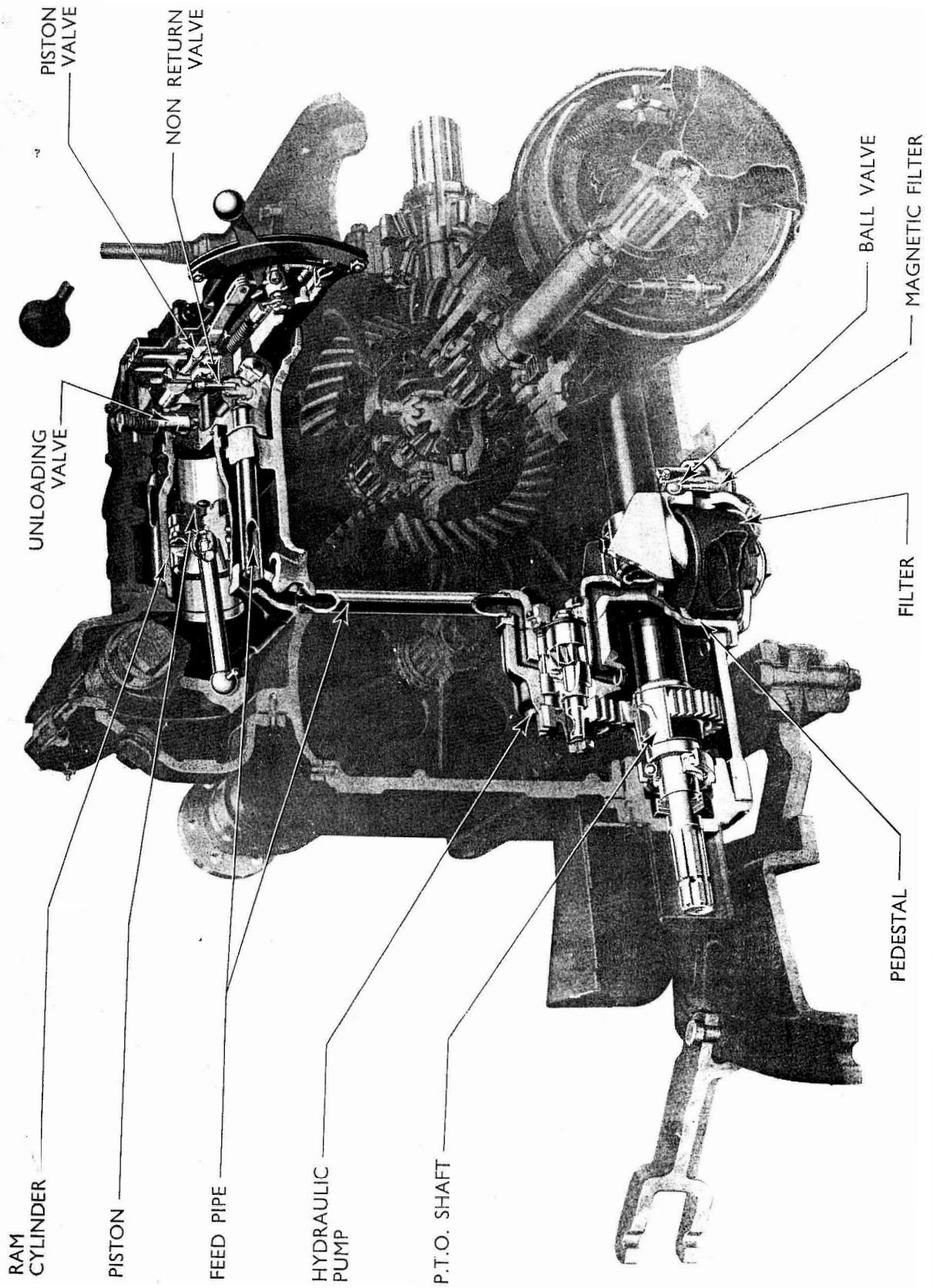


Fig. 181
Sectioned View of Hydraulic Pump



Sectioned View of Hydraulic System

Fig. 182

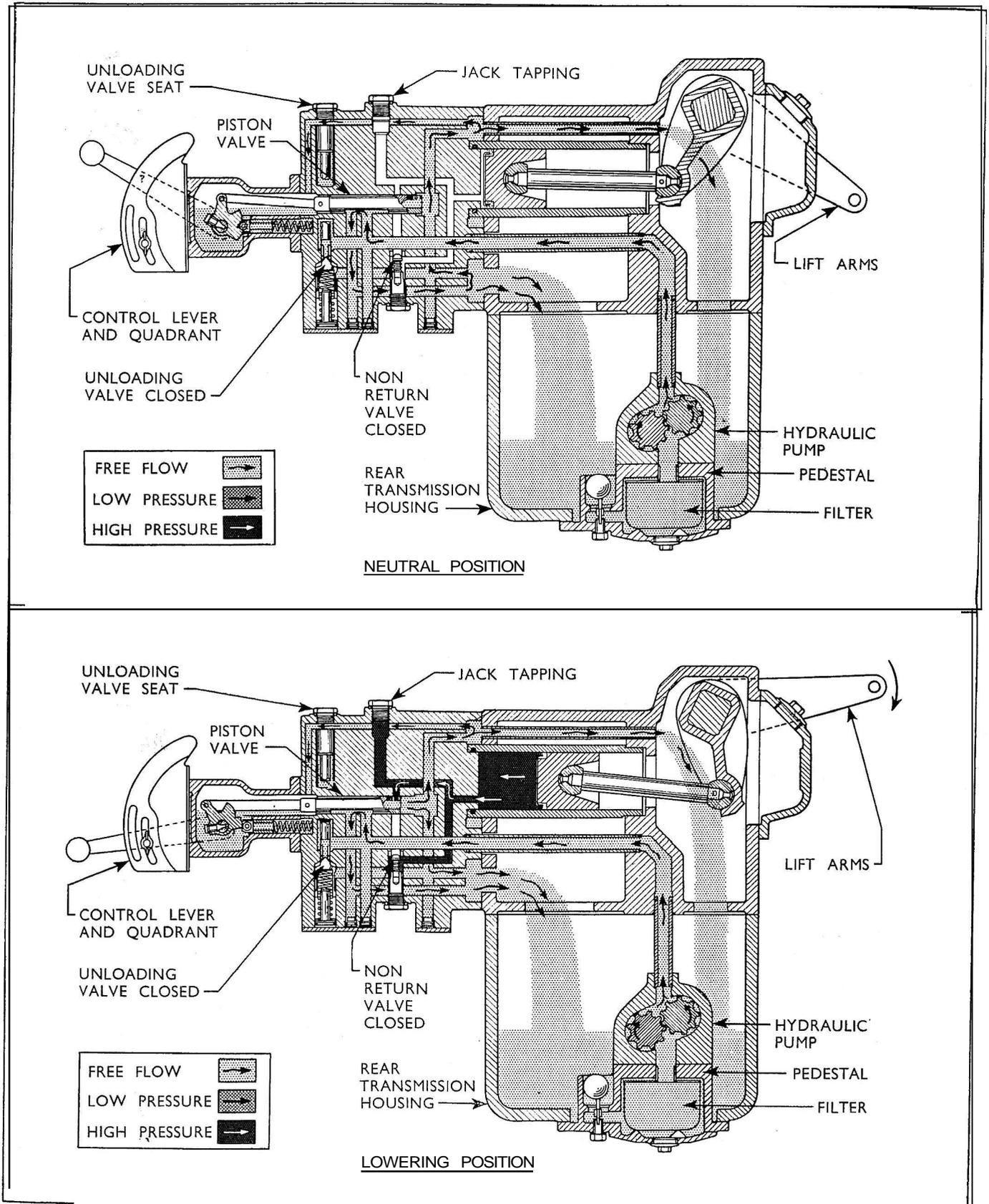


Fig. 183

Diagrammatic Representation of Hydraulic System in Neutral and Lowering Positions

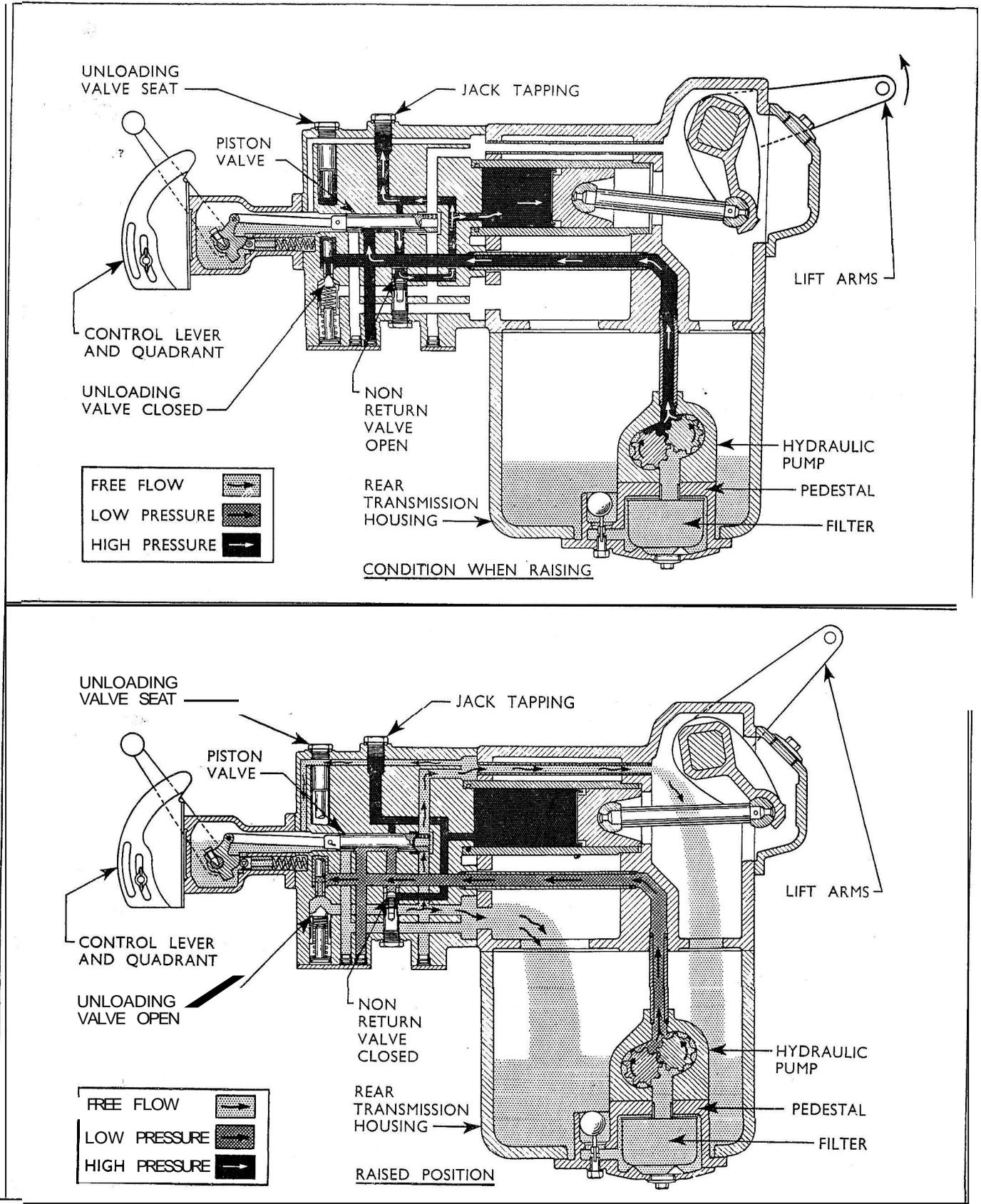


Fig. 184

Diagrammatic Representation of Hydraulic System when Raising and in the Raised Position

Note — Figs. 183 and 184 on pages 150 and 151, show a diagrammatic representation of the Hydraulic System with particular reference to the neutral, raising, raised and lowering positions.

Neutral Position

Oil is delivered from the pump to the piston valve, where it freely passes along the slot in the valve, to be returned to the rear transmission.

This oil will also flood the passages leading to the control lever body, which is half-filled, to lubricate the lever and cam.

At the other end, the passage leads to the top of the ram cylinder housing and oil flows into the rear transmission, lubricating the connecting rod ball end as it passes.

Raising Position

The piston valve is moved along its bore by the control lever, thus the slot connects the main oil passage to the non-return valve passage so that the oil passes through this valve, which is now open, into the ram cylinder. (The unloading valve is closed and the free flow oil passage is shut off by the piston valve.)

This will force the ram cylinder piston back, along its bore, to raise the lift arms.

Raised Position

When the ram piston skirt contacts the stop at the end of the ram cylinder, the pressure in the system will rise until it equals the pre-determined pressure setting of the unloading valve.

This will cause the unloading valve to open, thus the flow of oil to the ram cylinder ceases and the non-return valve spring causes the valve to close and maintain the lift arms in the raised position.

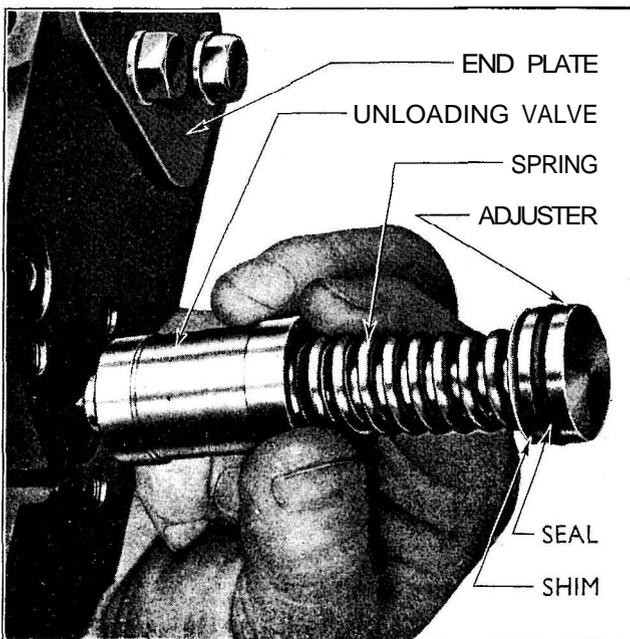


Fig. 185
Unloading Valve

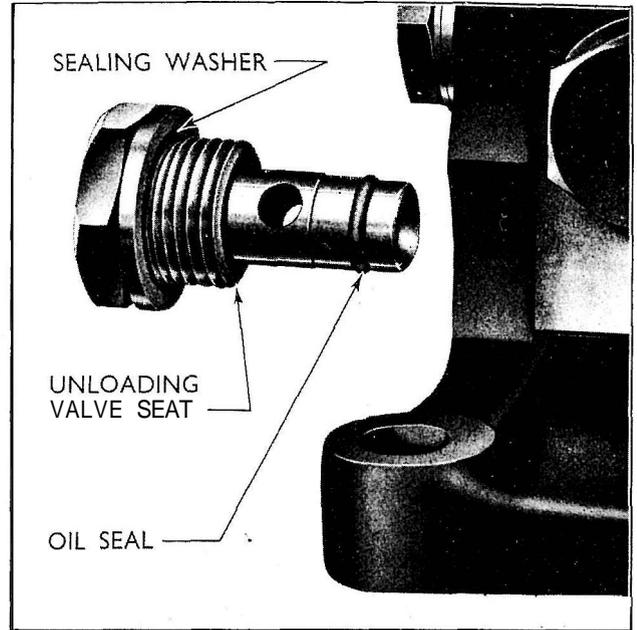


Fig. 186
Unloading Valve Seat

If the lever is still held in the raised position, the oil from the pump will continue past the unloading valve into the rear transmission. Alternatively, as soon as the lever is released, the lever and the piston valve will return to the neutral position.

Lowering Position

To lower the lift arms the control lever is pushed down to the lowering stop on the quadrant. This movement of the lever draws the piston valve along its bore so that one of the bleed holes at the end of the piston valve lines up with a passage in the valve body and releases the pressure flow through this passage and the oil is returned to the rear transmission.

The holes in the piston valve are progressively larger so that the further the lever is pushed down, the larger the hole in line with the return passage, with a consequential increase in the speed at which the arms are lowered.

The slot in the piston valve when in the lowering position connects the main oil passage direct to the oil return passage and the oil flows into the rear transmission.

VALVE CONTROL UNIT ADJUSTMENT

Note — Whenever carrying out adjustments or repairs to the Hydraulic System, it is always desirable to fit new oil seals and gaskets.

Certain tests and adjustments can be carried out without doing any actual dismantling.

Unloading Valve Testing

- 1 Remove the jack tapping plug, fit a pressure gauge, tool No. Tr/D 994675, reading up to 4,000 lbs. per sq.

inch, into the $\frac{1}{2}$ in. B.S.P. jack tapping in the valve control unit. Run the engine at normal fast idling speed.

- 2 The valve control lever should be pulled upwards towards the raised position. The lever should be held in this position and the pressure should rise to 2,000—2,200 lbs. per sq. inch. If the unloading valve pressure is too low, shims must be added behind the adjuster. If the pressure is too high, shims must be removed from behind the adjuster.

Two thicknesses of shims are available in service as shown in the Specification Data at the rear of this section.

To Remove the Unloading Valve

- 1 Remove three bolts and the unloading valve cover plate at the top of the valve control unit.
- 2 Remove the gasket, adjuster, spring and unloading valve (see Fig. 185).
- 3 Remove the unloading valve seat and washer by unscrewing the hexagonal plug, adjacent to the non-return valve (see Fig. 186).
- 4 Examine unloading valve seat for dirt and clean it thoroughly.

To Replace the Unloading Valve

- 1 Fit a new oil seal in its groove and replace the unloading valve seat and sealing washer. Tighten the hexagonal plug securely. (See Fig. 186.)
- 2 Replace the valve, spring and adjuster with appropriate number of shims, gasket and cover plate (Fig. 185) and secure with the three bolts. Test as described above.

Non-Return Valve Testing

- 1 The valve control lever should be pulled upwards to the raised position and held in this position with the pressure gauge Tr/D 994675 fitted at the jack tapping. If the non-return valve seating is faulty the pressure on the gauge will drop and the implement will gradually lower to the ground.

To Remove the Non-Return Valve

- 1 Remove the non-return valve blanking plug situated at the base of the valve control unit.
- 2 Remove the washer, non-return valve spring, and non-return valve (see Fig. 187).
- 3 Examine the non-return valve seating and the non-return valve face.
- 4 Clean all parts thoroughly.

Note — The valve seat is pressed in the valve passage and normally need not be withdrawn.

If any doubt exists regarding the seat it may be restored by locating a $\frac{5}{8}$ in. steel ball bearing on the seat, next insert a suitable drift in the passage, which may then be given **one** sharp tap.

To Replace

- 1 Fit the non-return valve, spring, washer and non-return valve plug and seal, secure firmly in the valve control unit housing.

Rate of Fall Adjustment

The rate of fall should be between two seconds and four seconds. This can be regulated by the rate of fall adjusting screw situated on the control lever quadrant. The further down the lever is pushed the faster the implement is allowed to drop. Position the adjusting screw to suit the individual operating conditions.

VALVE CONTROL UNIT

To Remove

- 1 Unscrew the seven bolts and lockwashers retaining the valve control unit to the ram cylinder housing.
- 2 Remove the unit and the gasket.

To Dismantle

- 1 Remove the unloading valve seat by unscrewing the hexagonal plug in the recess, adjacent to the non-return valve, and withdraw the plug which forms the unloading valve seat. Detach the special washer behind the plug head and remove the rubber sealing ring from the stem of the seat. (See Fig. 186.)

Note — This special washer has a rubber sealing ring bonded to the internal diameter. This ring must not be detached.

- 2 Remove the unloading valve by unscrewing the three bolts (and lockwashers) retaining the unloading valve end plate and detach the plate.

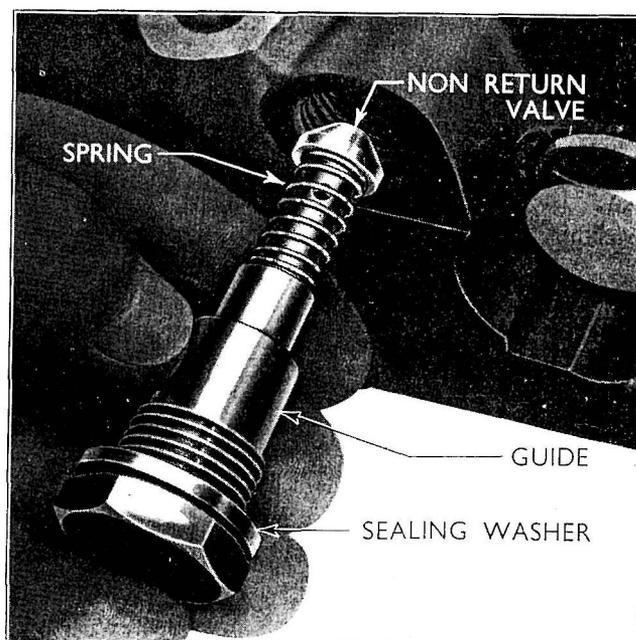


Fig. 187
Non-Return Valve

- 3 The head of the adjuster has a tapped hole, and is removed by inserting a screw ($\frac{1}{16}$ in. dia.) and pulling the unloading valve adjuster, shims, valve and spring out of the housing. The number and thickness of shims should be checked since these control the relief pressure of the valve (see Fig. 185).
- 4 Remove the non-return valve by unscrewing the hexagonal plug adjacent to the unloading valve seat, and withdraw the plug, special washer, spring and valve (see Figs. 187 and 190).

Note — This special washer has a rubber sealing ring, bonded to the internal diameter, which is not removable.

NON-RETURN VALVE SEAT

The non-return valve seat is pressed in the valve passage and normally need not be withdrawn.

If any doubt exists regarding the valve seat it may be restored by locating a $\frac{5}{8}$ in. steel ball bearing on the seat, next insert a suitable drift in the passage, which may then be given one sharp tap.

A suggested method of re-seating would be to spot face the seat or ream out the bore, using suitable equipment and in either case do not extend beyond 0.020 in.

Note — Internal diameter of seat 0.436– 0.438 in. (11.074– 11.125 mm.).

To Remove the Piston Valve and Control Lever

- 1 Unscrew and remove the three screws retaining the

control lever body to the valve body and **carefully** pull the lever assembly which will withdraw the piston valve (see Fig. 188).

- 2 Withdraw the lever return spring and the cam roller from the body.
- 3 Remove the split pin and the clevis pin retaining the piston valve to the control lever link so that the valve is free.
- 4 Remove the top lever guide bolt, nut and spacer and move the guide clear of the lever. Unscrew the four bolts and lockwashers holding the cover to the lower body and detach the cover and quadrant.
- 5 Remove the locking wire, unscrew and remove the square-headed screw retaining the cam to the lever shaft, pull the shaft out of the body when the cam and link may be lifted away.
- 6 Remove the two rubber seals from the control lever shaft.

To Remove Valve Cover Plate, Sealing Plugs and Jack Tapping

- 1 Unscrew and remove the six bolts (and lockwashers) retaining the cover plate to the valve body. Detach the cover plate and gasket which will expose a rubber sealing ring in a recess in the centre of the body. (See Fig. 189.) Remove this sealing ring.
- 2 Unscrew and remove the hexagonal jack tapping plug and special rubber-bonded sealing washer.

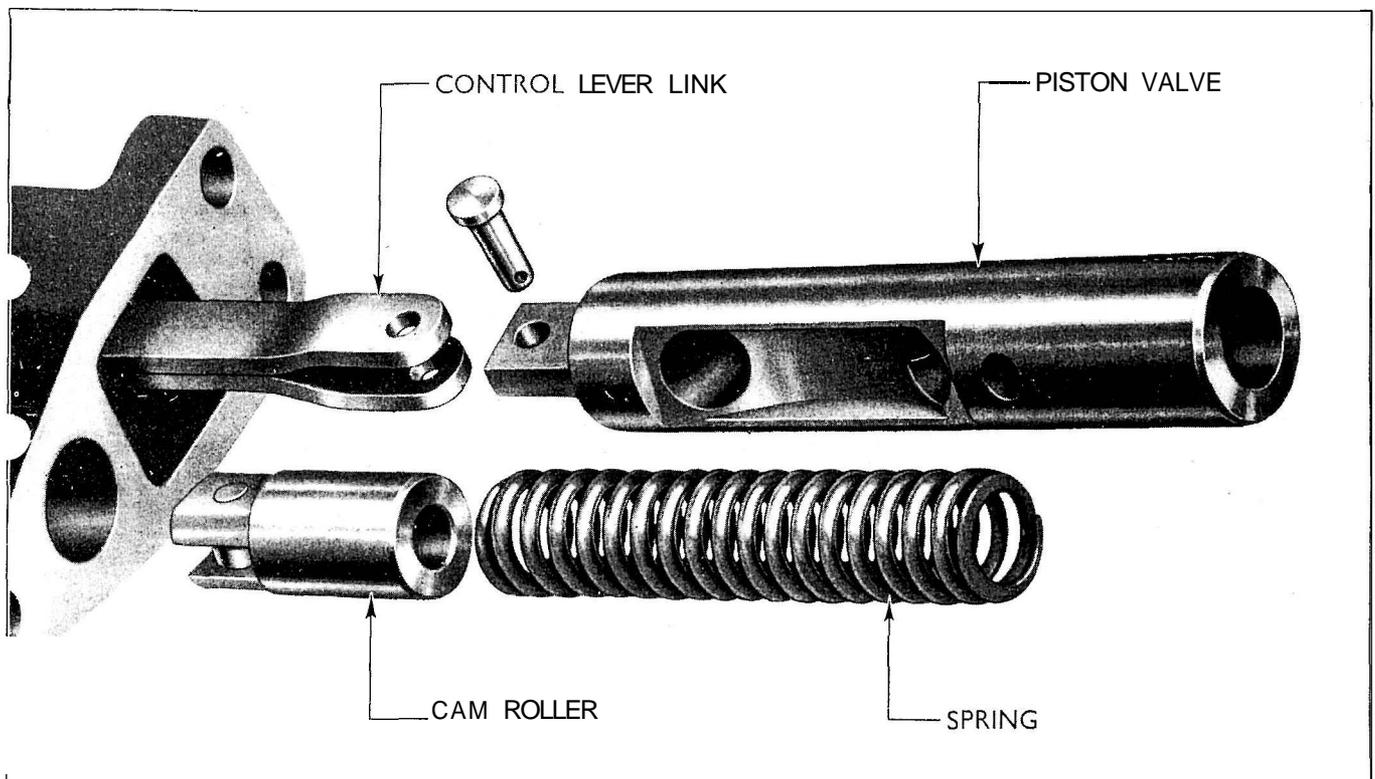


Fig. 183
Piston Valve, Link, Cam Roller and Spring

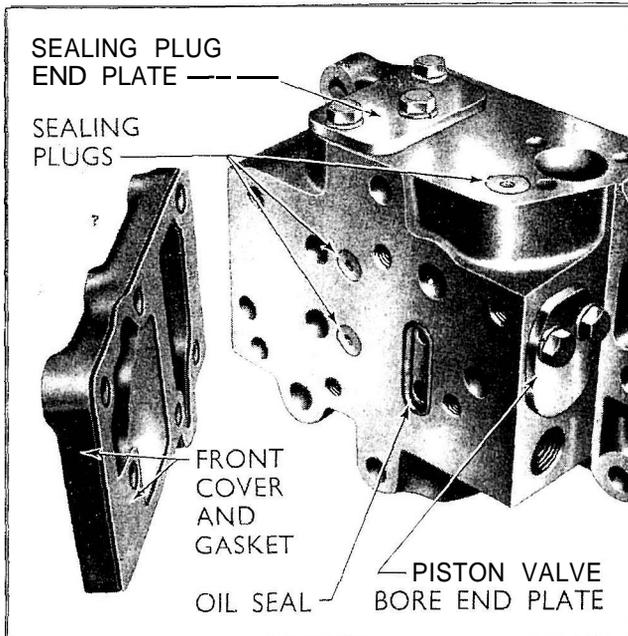


Fig. 189
Valve Body and Cover Plate

- 3 Unscrew and remove the two bolts and lockwashers securing the piston valve bore end plate. Remove the end plate and detach the rubber sealing ring from the groove in the end of the bore.
- 4 Insert a screw ($\frac{1}{16}$ in. dia.) in the tapped hole of each of the sealing plugs and pull them out of the valve body. (See Fig. 189.)

A sealing ring is located in a groove on each plug. It will be necessary to remove the end plate adjacent to the unloading valve to expose two of these plugs.

Inspection

Clean all parts thoroughly and make sure that the oil passages are not obstructed. Renew all rubber sealing rings which must be soaked in transmission lubricant before assembly. **Oil seals must not be fitted dry.**

Inspect the unloading valve, non-return valve and component parts and make certain they are in good condition and fit for further service.

If any doubt exists regarding the non-return valve seat it may be restored by locating a $\frac{5}{8}$ in. steel ball bearing on the seat, next insert a suitable drift in the passage, which may then be given **one** sharp tap.

A suggested method of re-seating would be to spot face the seat or ream out the bore using suitable equipment, and in either case do not extend beyond 0.020 in.

Internal diameter of seat 0.436 in. to 0.438 in. (11.074 to 11.125 mm.).

To Reassemble the Valve Control Unit

- 1 Locate each of the sealing plugs with new seals installed, and push them in their respective bores.

- Secure the end plate over the two adjacent to the unloading valve.
- 2 Screw in the jack tapping plug and special washer.
- 3 Position a new sealing ring in the recess in the valve body (cover plate face), place the cover plate gasket so that the centre bar of the gasket covers the two sealing plugs and fit the front cover. Tighten the six bolts and lockwashers evenly so that the cover is secured.
- 4 Refit the unloading valve seat by first locating a new special washer on the unloading valve seat and fit a new sealing ring on the stem. Then enter the seat but do not tighten until the unloading valve is installed.
- 5 Refit the unloading valve by locating the original number and thickness of shims on the shank of the unloading valve adjuster, enter the valve, spring and adjuster in the valve bore, and push in position. Retain by means of the end plate which is secured by three screws and lockwashers.
- 6 Tighten up the unloading valve seat.
- 7 Refit the non-return valve by placing the special washer on the guide, locate the valve and spring in the guide and screw the assembly in the bore (see Fig. 190).

To Refit the Control Lever and Piston Valve

- 1 Check that the correct piston valve is fitted, refer to Fig 188, the piston valve is a selected fit in the bore and supplied in various grades with a colour mark for identification. See Specification and Repair Data at the end of this section for all relative details.

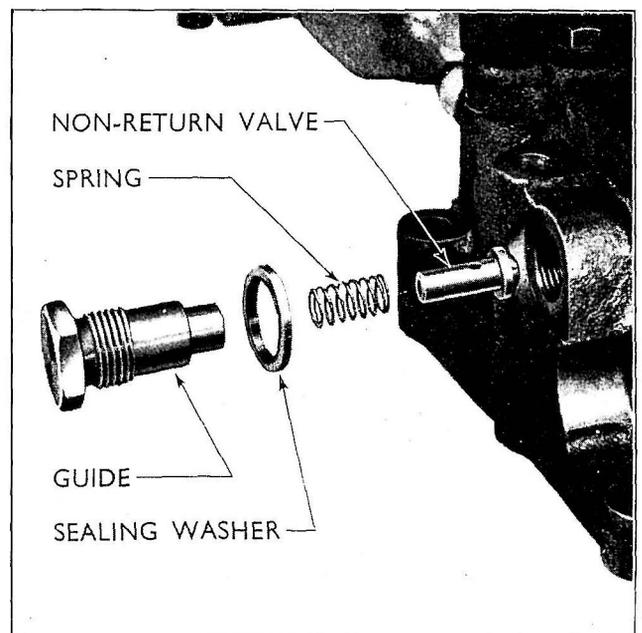


Fig. 190
Non-Return Valve

Note — The piston valve should always be selected to the corresponding bore diameter in the valve body which can easily be checked by means of the colour marking.

- 2 Fit the two rubber oil sealing rings in the grooves on the lever shaft, place the cam and the link between the bosses of the body and push the lever in carefully. Ensure that the sealing rings are not damaged. Lock the shaft by means of the square-headed screw and wire the head so that it is retained securely.
- 3 Retain the piston valve to the link by the clevis pin and the split pin. Bend over the split pin legs so that they will not foul the piston valve bore.
- 4 Slide the cam roller into position so that it engages the cam and locate the lever return spring (see Fig. 191).
- 5 Fit the cover and gasket to the lever body, locating the two bolts to the front of the tractor first, then mount the quadrant and guide.
- 6 Enter the piston valve and lever assembly (with the gasket between the body and valve unit) into the valve body, taking care not to disturb the cam roller. Fit the three retaining bolts and tighten them up evenly.

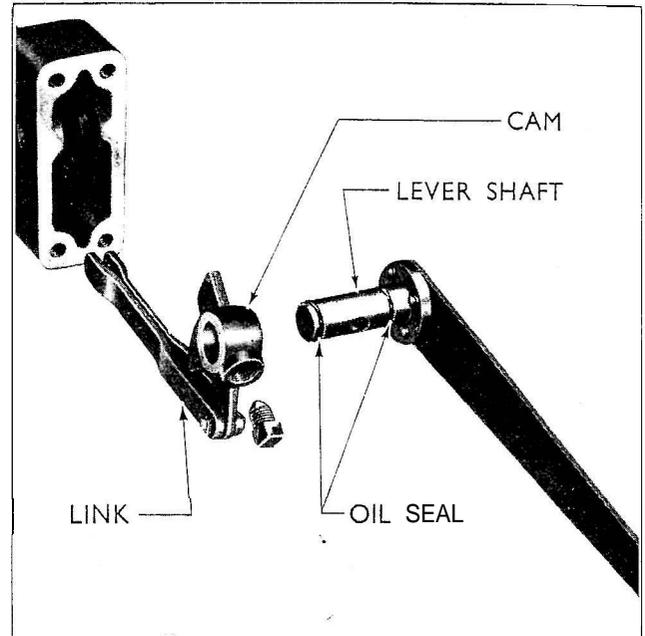


Fig. 192
Fitting the Control Arm

To Replace Valve Control Unit to Ram Cylinder

- 1 Refit the valve control unit to the rain cylinder. Check that the ram cylinder piston engages the crank

arm and that an oil seal is fitted at the front end of the ram cylinder. Ensure that the oil pipe (8½ ins. long) between valve gear and ram cylinder has an oil seal at each end and is properly located.

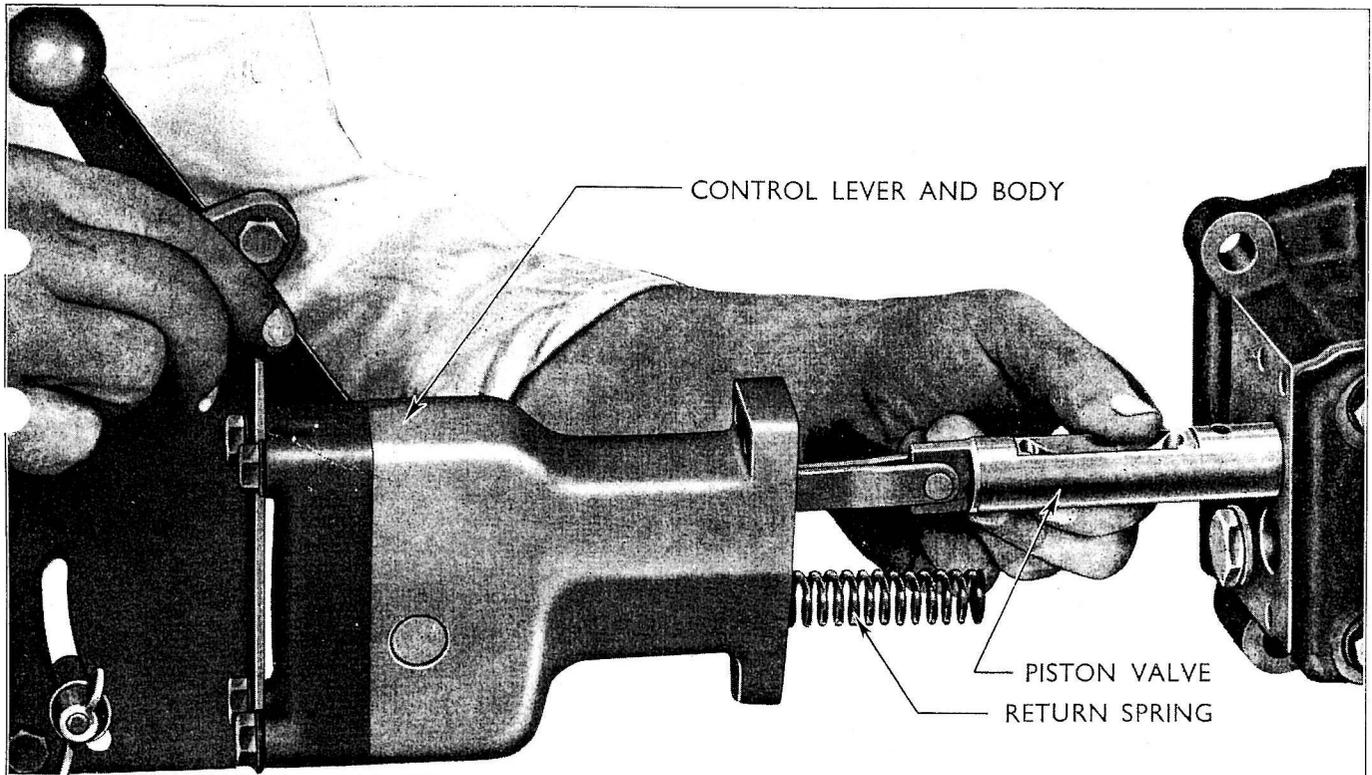


Fig. 191
Fitting the Control Lever and Piston Valve to Body

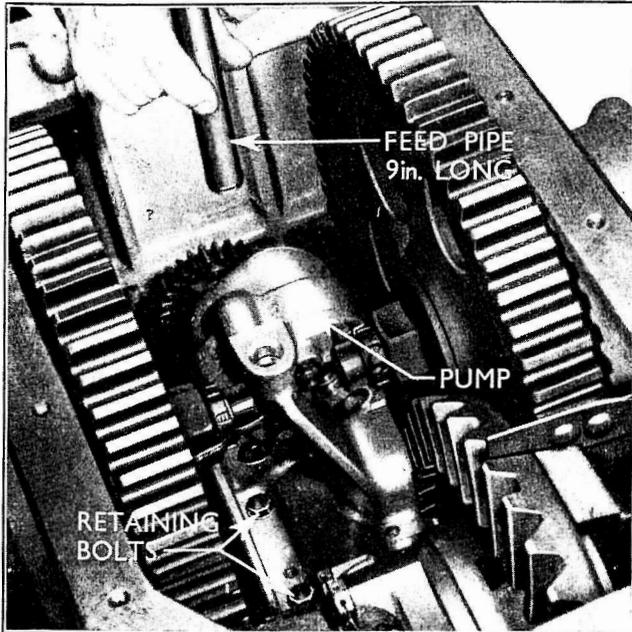


Fig. 193

Removing the Hydraulic Pump Feed Pipe

RAM CYLINDER AND LIFT ARMS

To Remove Ram Cylinder Housing from the Tractor

Note — Always fit new oil seals.

- 2 Mount the valve unit and the gasket to the ram cylinder and retain by means of the seven bolts and lockwashers.
- 3 Test the valve unit as outlined on pages 152 and 153.

- 1 Detach the rear lamp cable and side lamp cable from the transmission cover housing (nine clips). (This will only be necessary if the tractor is fitted with electric lighting.)
- 2 Unscrew the bolt and remove the tail lamp and bracket from the cover plate.
- 3 Remove the split pin and clevis pin and disconnect the lift rods from the lift arms.
- 4 Remove the seat assembly (four bolts and lockwashers).
- 5 Remove the securing bolts, washers, oil seals and remove the lift arms from the cross-shaft.
- 6 Unscrew the retaining bolts which retain the ram cylinder housing to the rear transmission housing, fit the lifting eyebolt (Tr/D 994781) and remove the ram cylinder housing. The vertical oil pipe (9 ins. long) from ram cylinder to pump map come away with the housing and map now be removed (see Fig. 193).

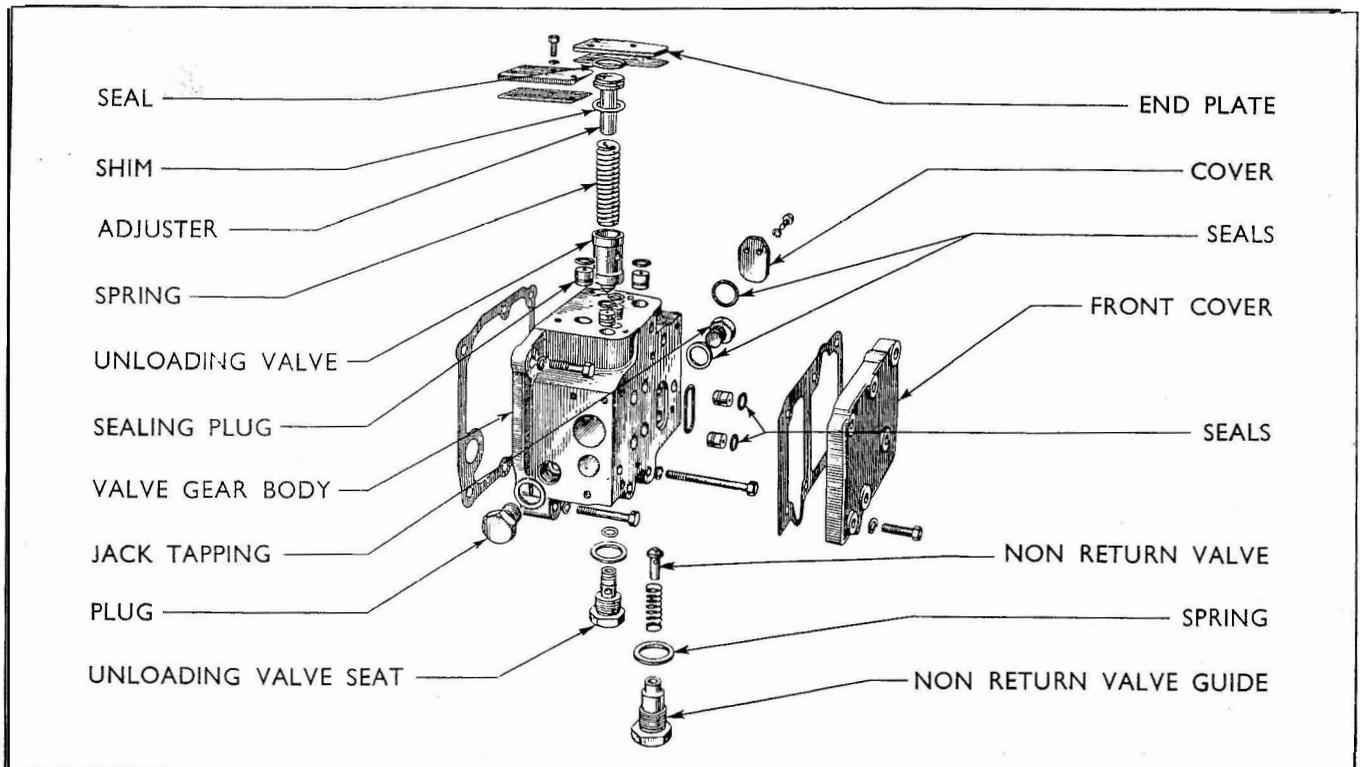


Fig. 194

Exploded View of Valve Control Unit

To Replace the Ram Cylinder Housing to the Tractor

- 1 Position the ram cylinder housing on the rear transmission housing ensuring that the vertical feed pipe (9 ins. long) is correctly positioned and that new seals are fitted at both ends.
- 2 Secure the tail lamp and bracket to the rear transmission housing with bolt and lockwasher.
- 3 Clip up the rear lamp cable and side lamp cables to the transmission housing and fit the remaining ram cylinder retaining bolts.
- 4 Attach the lift rods to the lift arms and fit the clevis pins and split pins.
- 5 Replace the four bolts and washers to retain the seat to the ram cylinder housing.

To Remove and Dismantle the Ram Cylinder and Piston

NOTE. — Can be carried out in situ if required.

- 1 Remove the ram cylinder and piston by unscrewing the valve unit retaining bolts and lockwashers and withdraw the valve unit. The ram cylinder and piston may come away as the valve control unit is removed. If not, extract the ram cylinder and piston from the housing. (See page 153 for Dismantling the Valve Control Unit.)
- 2 Pull out the oil feed pipe (8½ ins. long) and remove the oil seals at each end (see Fig. 196).

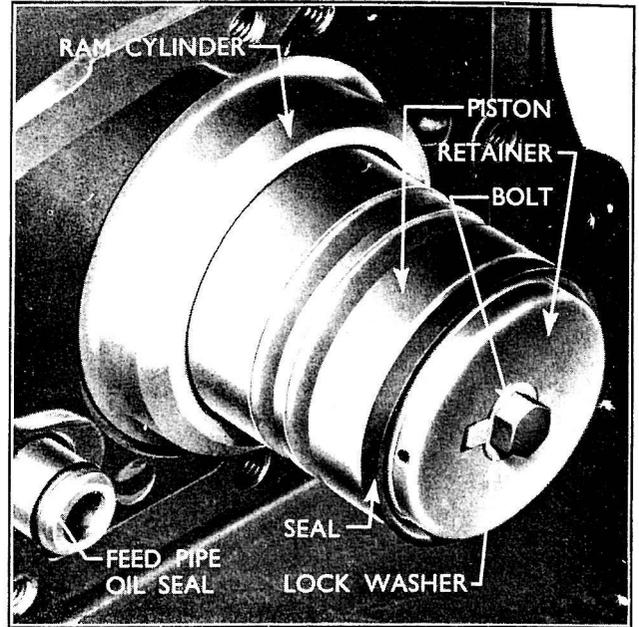


Fig. 196

Fitting the Ram Cylinder Piston

- 3 Remove the ram cylinder piston after extracting the oil sealing ring from the front end of the cylinder and push the piston out from the rear of the cylinder. (Do not remove the piston from the front end of the cylinder as the piston seal may become trapped in the oil seal groove.)
- 4 Dismantle the piston after bending down the tab of the lockwasher, unscrewing the bolt in the centre of the piston head and lift off the retainer and seal.

To Remove the Lift Arms and Cross-shaft

NOTE. — Can be carried out in situ if required.

- 1 Unscrew the six bolts and lockwashers retaining the cover plate at the rear of the housing. Remove the plate and the gasket (see Fig. 197).
- 2 Remove the lift arms and withdraw the shaft. Support the crank arm during this operation.
- 3 Lift out the crank arm and connecting rod.
- 4 Withdraw the bearings, bearing liners and spacers from the ram cylinder housing.

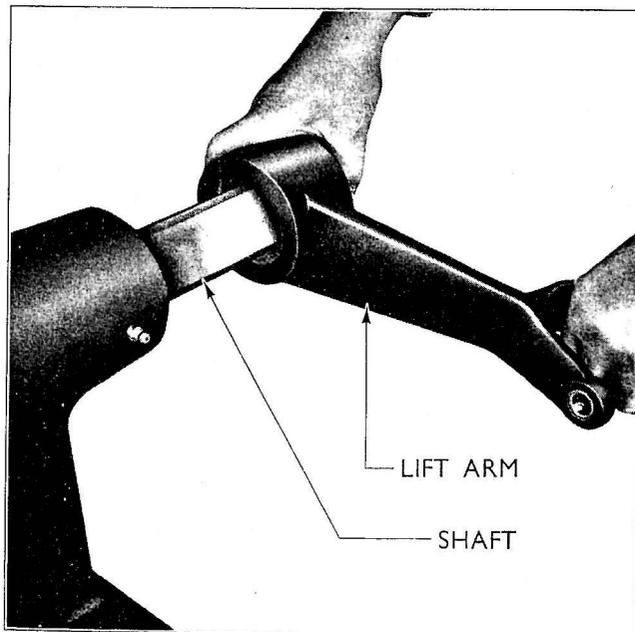


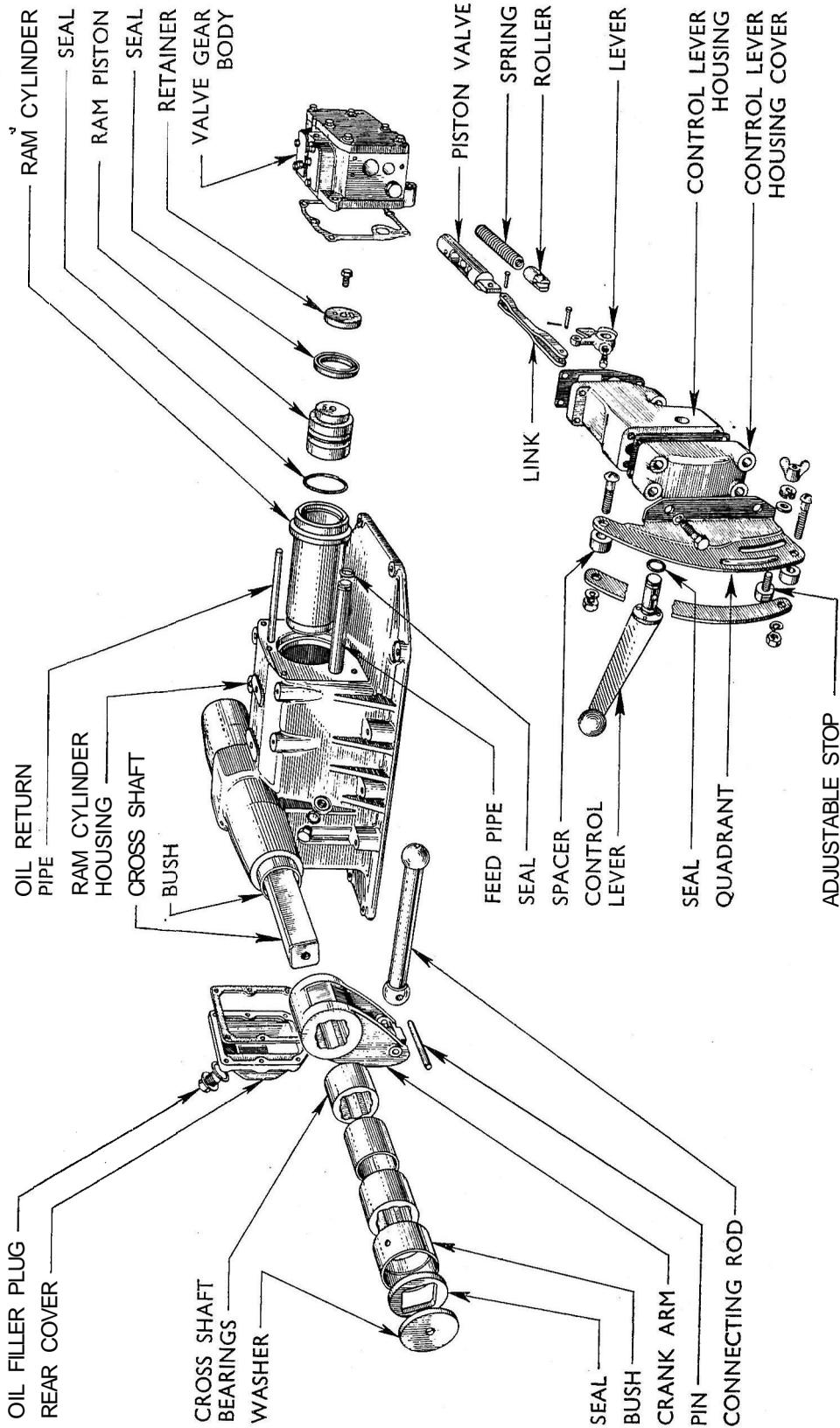
Fig. 195

Fitting a Lift Arm

To Reassemble the Ram Cylinder and Piston

NOTE. — Always fit new oil seals.

- 1 Reassemble the piston by installing the new seal with the lip towards the crown of the piston, then fit the retainer with the flange located in the seal. Secure by means of the bolt and lockwasher, making certain that the tongue of the lockwasher fits in the slot in the piston head and bend the tab to lock the bolt (see Fig. 196).



Exploded View of Ram Cylinder, Lift Arms and the Valve Control Gear

Fig. 197

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- 2 Before fitting the ram cylinder locate a new oil seal in the grooves at each end of the oil feed pipe (8½ ins. long) and position the pipe in the housing, then enter the ram cylinder and push it firmly into its seating.
- 3 Enter the piston with the crown towards the front and push it, down the bore to receive the crank arm.

Note — If the lift arm cross-shaft has been removed do not push the piston down the bore at this stage.

- 4 Locate the oil seal in its groove in the front end of the ram cylinder.
- 5 Refit the valve unit to the front end of the ram cylinder housing and secure with the bolts and lockwashers.
- 6 Fit the retaining bolts and flat washers and secure the lift arms to the cross-shaft, ensuring that the lever is in the lower position. The arms should be approximately 45° to the ground.

To Reassemble the Lift Arms and Cross-shaft

- 1 Smear the lift arm shaft and bearings liberally with clean lubricant and refit the crank arm and connecting

rod, bearings and bearing liners (with spacers between) in the cross-shaft housing (see Fig. 198). Ensure that the oil holes in the bearing liners are in line with the lubricator holes.

Note — It is important that the lift arm shaft and bearings are adequately lubricated before assembly.

- 2 Enter the cross-shaft. Do not omit the oil seal between the large washer and the housing at each end.
- 3 Position the lift arms in the midway position so that the connecting rod is located conveniently to receive the piston which may now be engaged with the rod.
- 4 Refit the rear cover plate and gasket to the housing with the six bolts and lockwashers.
- 5 Start the tractor and check the operation of the lift arms and hydraulic system.

Note — The hydraulic system should be operated occasionally, particularly if the power equipment is not in use, to ensure that the lift arms are maintained quite free. Two lubricating points are located on the top of the lift arm housing, but it is essential the arms are raised and lowered to assist thorough lubrication.

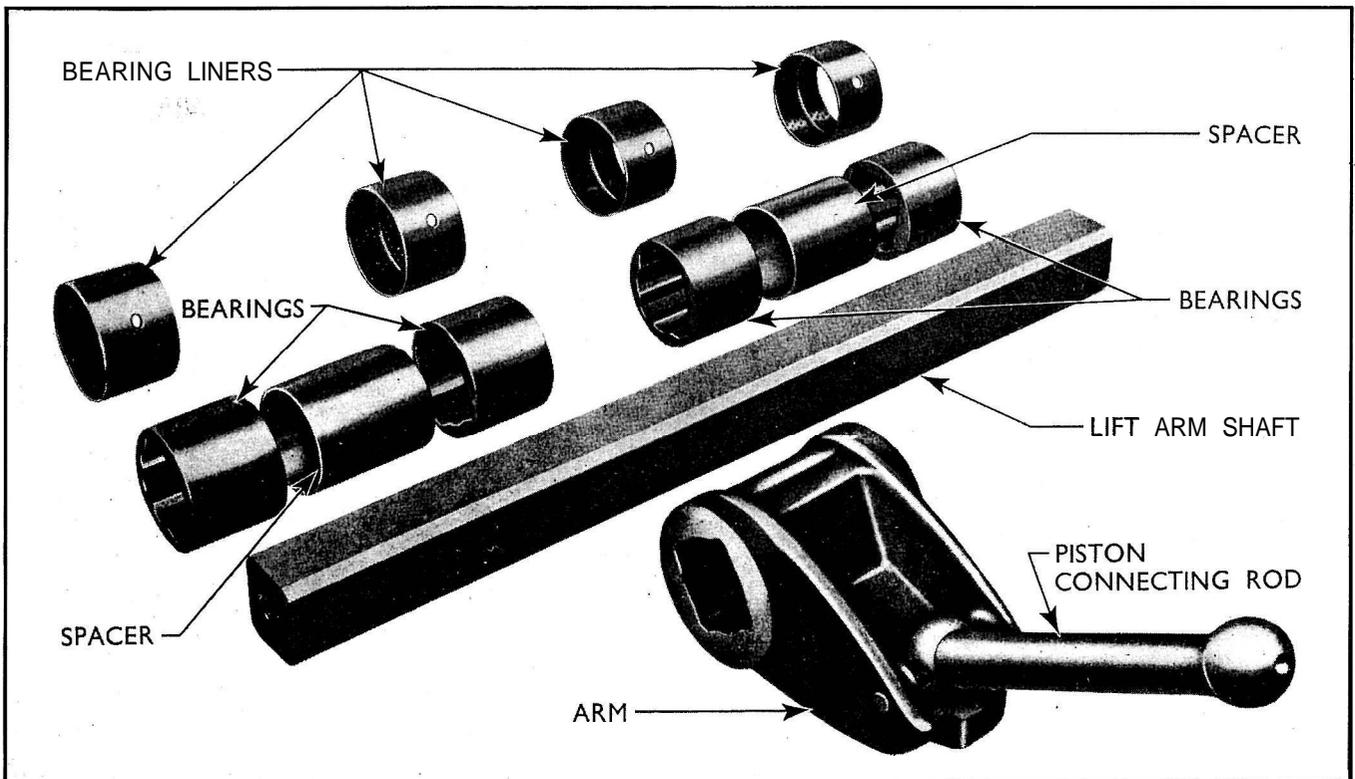


Fig. 198
Exploded View of Lift Arms, Cross-shaft, Bearings and Piston Connecting Rod

HYDRAULIC PUMP TESTING

Testing the valve control unit is given on pages 147 and 148 and the Fault Diagnosis on page 165 covers the most likely conditions that may be experienced in service.

To check the pump efficiency in service attach a mounted implement, or suitable weights (approximately 1,120 lbs.), to the lift arms and operate the hydraulic system. Normally, the rate of lift of the average implement would be approximately two seconds. The rate of fall is variable and can be regulated by means of the adjustable stop on the control lever quadrant.

If the pump is suspect, after making certain that the valve control unit and ram cylinder are satisfactory, it will be necessary to check that the wire mesh filter in the pump pedestal, see Fig. 180, is quite clean and not causing an obstruction in the flow of lubricant in any way. Full details of "Cleaning the Filter" are given on page 147.

The following sequence of operations will be found adaptable in service in overcoming any obscure condition that may arise :—

- 1 Remove the valve control unit and fit a service unit

that is known to be working satisfactorily. (See pages 152 and 153.)

- 2 Operate the hydraulic system and if the condition still exists the ram cylinder and piston must be examined and new parts fitted as required. (See pages 156 and 157.)
- 3 (a) Should the condition continue, check that the pump wire mesh filter in the pedestal is perfectly clean.
 - (b) Remove the rear transmission cover and check the ram cylinder to pump oil pipe seals (see Fig. 193).
 - (c) Finally, if required, remove and dismantle the hydraulic pump.

Note — On all occasions when carrying out repairs or adjustments to the hydraulic system it is advisable to fit new oil seals.

Before the hydraulic pump itself is removed, it is necessary to drain the oil from the rear transmission housing. The drain plug, situated in the cover, should be unscrewed and the oil collected in a suitable container.

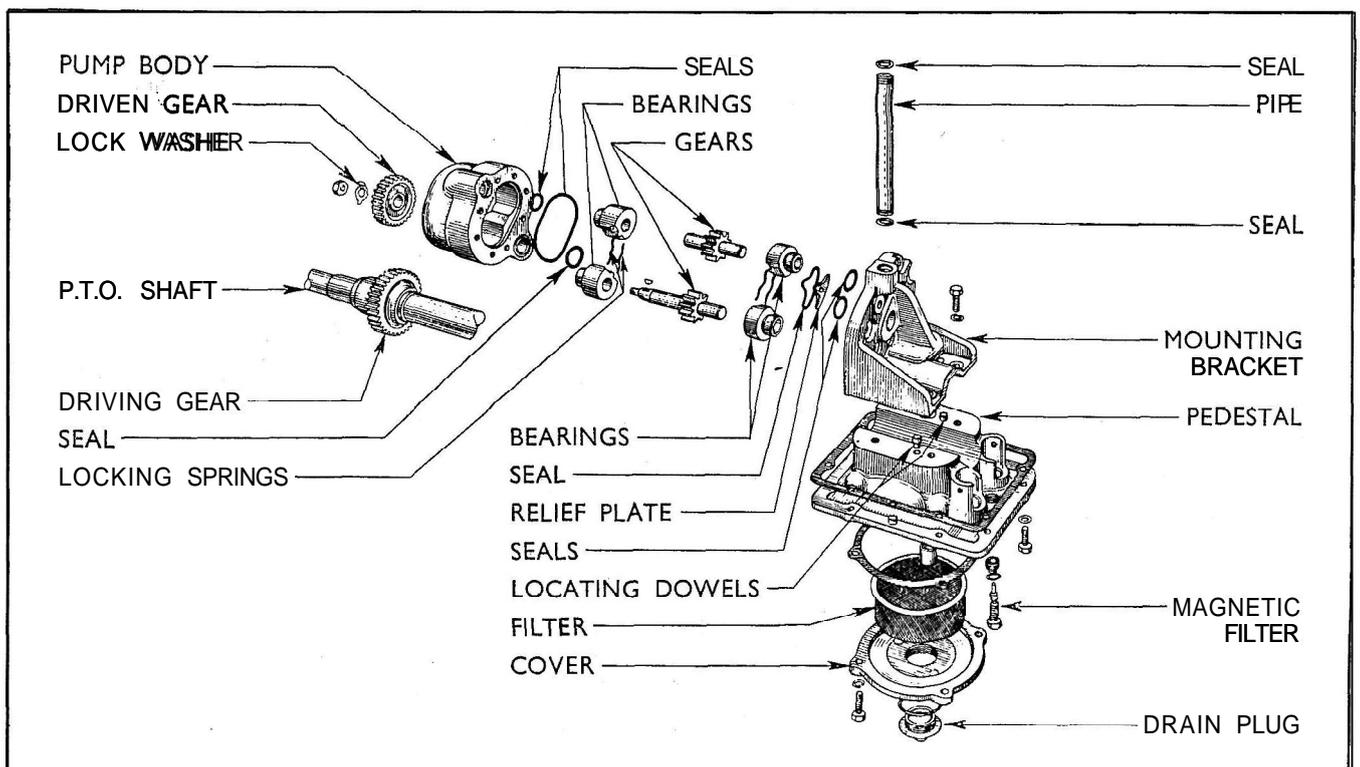


Fig. 199
Exploded View of Hydraulic Pump

To Remove the Hydraulic Pump

- 1 Remove the drain plug and washer from the cover, and drain off the rear transmission oil.
- 2 Remove the ram cylinder assembly with the valve control unit and lift arms as described on page 157.
- 3 Remove the vertical feed pipe.
- 4 Remove the pump by unscrewing the three retaining screws and lockwashers securing the pump to the pedestal. Two dowels locate the pump.

To Dismantle the Pump

Note — Before attempting to dismantle the hydraulic pump the unit must be thoroughly cleaned.

- 1 Remove the drive gear from the tapered shaft, after first straightening up the tabs on the locking washer and removing the nut. Next locate the gear remover (tool No. ATTr/NVMD 6306-A), and tighten up the centre bolt until the gear is removed, when the key may be detached. **Do not use shock methods or leverage.** (See Fig. 201.)
- 2 Detach the bracket from the pump body after removing the eight retaining screws and lockwashers. (See Fig. 200.)
- 3 Remove the rubber oil sealing ring located in the groove at each bearing spigot housing bore.

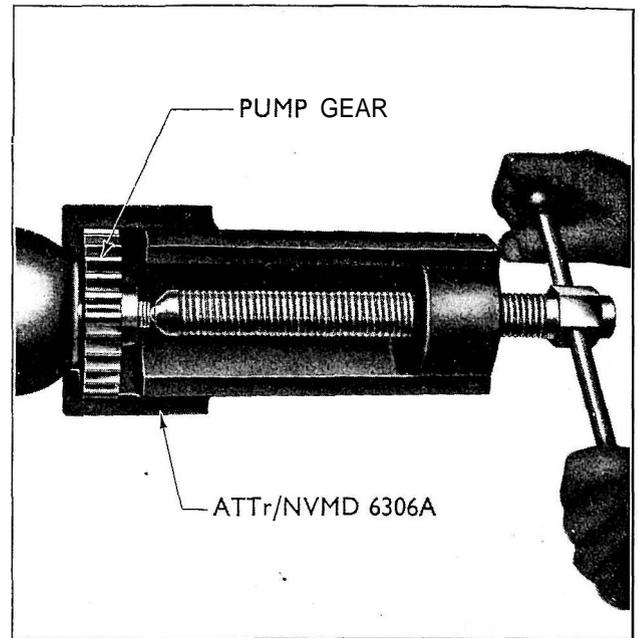


Fig. 201
Removing the Pump Drive Gear

- 4 Lift out the pressure relief plate, together with its oil seal and remove the body oil seal from the front face of the pump body.

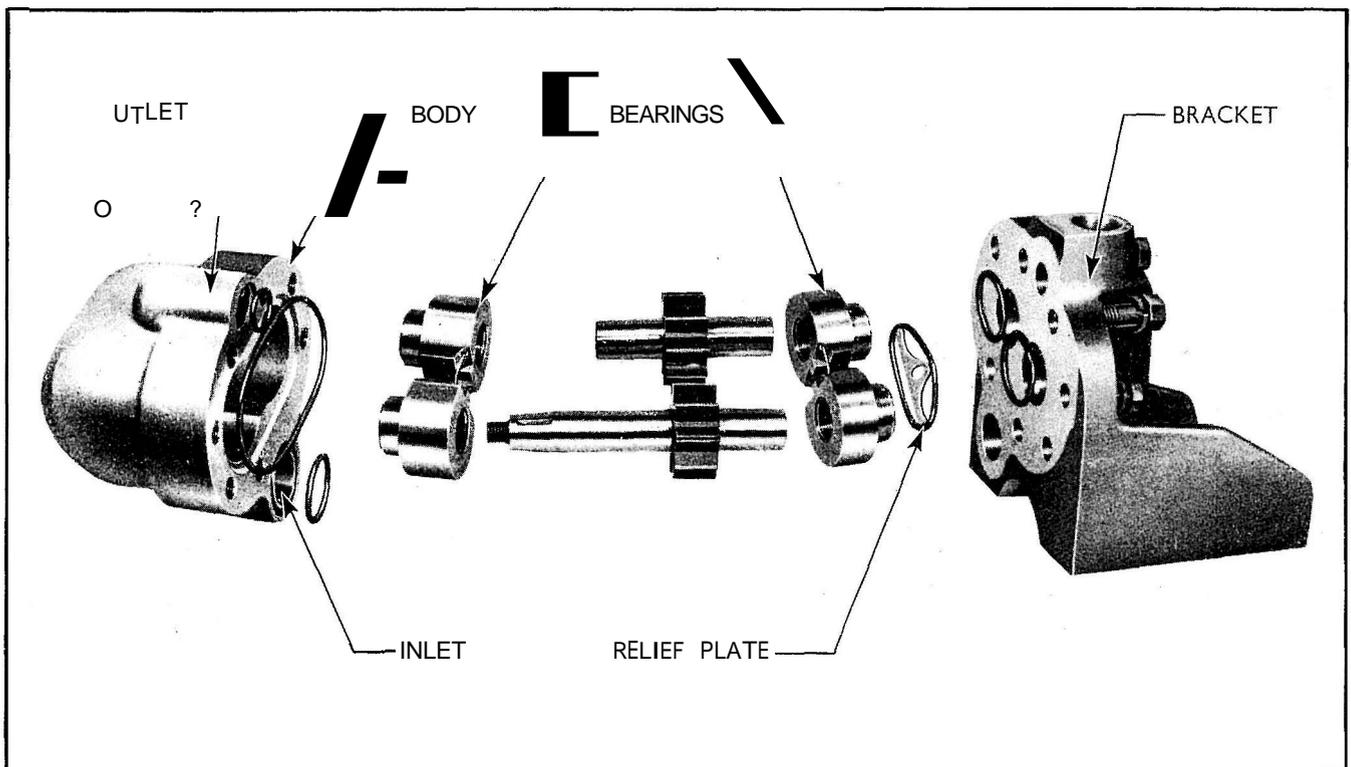


Fig. 200
Exploded View of Hydraulic Pump

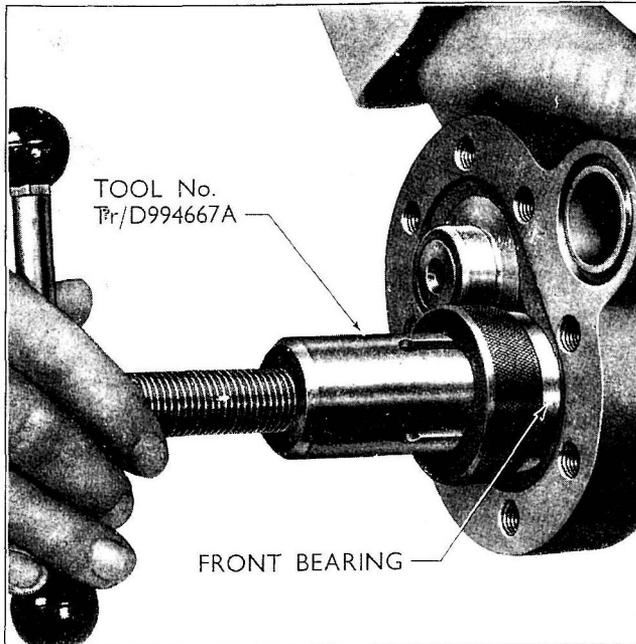


Fig. 202

Removing the Pump Front Bearings

- 5 Remove the inlet and outlet passage oil seals from their grooves in the body.
- 6 Remove the front bearings by locating the bearing remover (tool No. Tr/D 994667-A) in the groove in the drive gear bearing (see Fig. 202), tighten the centre bolt so that the bearing is pulled out of the body approximately $\frac{1}{4}$ in, and both bearings are unlocked and may then be withdrawn. Separate the bearings and locking springs.
- 7 Remove the drive and driven gears by lifting them out of the housing.
- 8 Remove the rear bearings by pushing the drive bearing approximately $\frac{1}{4}$ in. towards the front of the body (see Fig. 203), using the bearing remover (tool No. Tr/D 994668-A), so that both bearings are unlocked and may be extracted from the body and the bearings and springs separated.

Inspection

Clean the component parts thoroughly and make sure that the oil passages are not obstructed.

Carefully check the pump body, bearings and gears for evidence of excessive wear, scores, or damage. Bearings are only supplied in pairs, i.e., two front or two rear. Under no circumstances may they be replaced singly. If the bearings and/or gears are not in good condition it is more practical to fit a new pump.

Renew all oil seals, which should be well soaked in transmission lubricant before assembly. **Oil seals must not be fitted dry.**

To Reassemble the Pump

Note — Careful reassembly is most essential as it is necessary to rejit the pump, ram cylinder and valve gear before tests can be carried out as described in the appropriate sections.

- 1 Refit the rear bearings by locating the two locking springs in the holes in the pair of rear bearings, identified by the deeper flange, and enter them, spigot first, into the housing, one approximately $\frac{1}{4}$ in. in advance of the other.

Turn them in an anti-clockwise direction so that the bearings lock and push them fully into the body ; final pressure applied to the uppermost bearing will lock them both in position.

Note — **Do not drive the bearings in under any circumstances.**

- 2 Reassemble the gears in the body, entering the tapered end of the shaft through its bearing, then fit the driven gear in mesh with the driving gear.
- 3 Refit the front bearings by locating the locking springs in the holes in the pair of front bearings and enter them, spigot away from the gears in the body, one

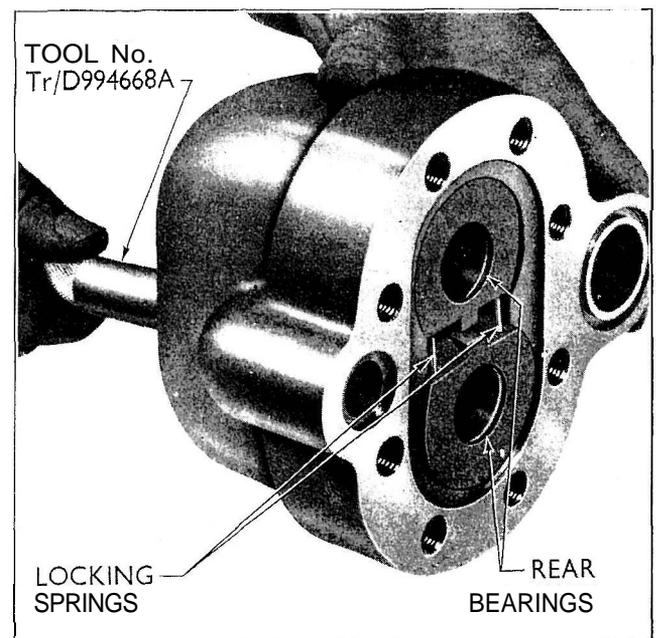


Fig. 203

Removing the Pump Rear Bearings

approximately $\frac{1}{4}$ in. in front of the other. Turn them in an anti-clockwise direction so that the bearings lock, push them fully into the body, when final pressure to the uppermost bearing will lock them both in position.

- 4 Check the clearance between the pressure relief plate and the bracket by locating the plate (without its oil seal) so that it is in its normal location adjacent to the inlet passage. Position a straight edge and feeler gauge as shown in Fig. 204. The straight edge must be held so that it is positioned approximately across the centre of the relief plate and bears on the pump body. Four thicknesses of plate are available (refer to Specification) and the clearance between the straight edge and the plate must be within 0.003 in. and 0.0055 in.

If the top faces of the bearings are proud of the body recess, and/or not quite in line, measure the clearance from the highest face.

In the event of the top face of the bearings being lower than the body recess, it will be necessary to determine the depth (without the relief plate in position) from the body face to the top of the bearings, by using a suitable depth gauge. Then select a relief plate, the thickness of which, when deducted from the total depth obtained from the gauge reading, will leave a clearance of between 0.003 in. and 0.0055 in.

Fit the pump body seal in the recess in the body and locate the correct relief plate and oil seal at the inlet side of the pump.

- 5 Locate new oil seals in the grooves in the inlet and outlet oil passages, and at the grooves in the bearing spigot bores in the bracket. Assemble the bracket to

the body, engaging the bearing spigots in the bores and taking care not to displace the relief plate.

Fit the eight bolts and lockwashers with the longer bolts to the thicker flange at the top of the bracket, and tighten up securely.

- 6 Carefully locate the driven gear on the tapered shaft and key, position the tab washer and nut and retain the gear by using a wrench on the flat on the boss and tighten up the nut securely. Bend down the locking tab to secure in position.

Note — Do not drive the gear on to the shaft.

- 7 Mount the pump on the two dowels on the pedestal and retain in position by the three bolts and lockwashers. Locate the oil feed pipe—9 ins. long—(with an oil seal at either end) to the pump and refit the ram cylinder housing.
- 8 Refit the ram cylinder housing and lift arms as described on page 160.
- 9 Test the pump as described on page 161.

PUMP PEDESTAL AND SCREEN FILTER

To remove the pump pedestal itself, it will be necessary to remove the ram cylinder assembly and hydraulic pump. It is possible to remove the screen filter without removing the pump pedestal.

Note — Originally the stepped dowel used to locate the pump pedestal to the rear transmission housing had the larger portion of the dowel in the pump pedestal and the smaller diameter in the rear transmission housing. (Two dowels are fitted.)

Current tractors have the larger diameter of the stepped dowel in the rear transmission housing and the smaller diameter in the pump pedestal.

If fitting a current type pump pedestal to the earlier rear transmission housing a special stepped dowel will be required as follows :—

The larger diameter (0.377 in. to 0.378 in. (0.972 mm.)) must be a press fit in the pump pedestal before it is installed to the rear transmission housing and the smaller end (0.373 in. to 0.374 in. (0.955 mm.) diameter) a close fit in the rear transmission housing.

An alternative method is to ream the dowel holes in the rear transmission housing to 0.406 in. to 0.407 in. (10.3 mm.) diameter and use the existing dowels.

To Remove the Screen Filter

- 1 Remove the drain plug (and washer) and drain off the rear transmission oil into a suitable container.

Note — If $1\frac{1}{4}$ ins. diameter steel balls are fitted in the rear transmission it will be necessary to remove the two magnetic filter bolts to allow the balls to seat, when the oil may be drained from the filter compartment.

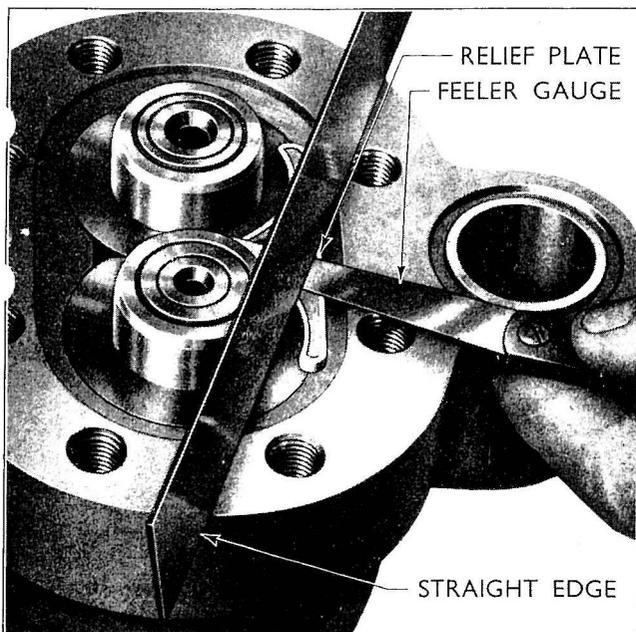


Fig. 204
Checking the Relief Plate Clearance

- 2 Unscrew the four bolts securing the cover, and lower the cover, gasket and screen filter.
- 3 Remove the magnetic filter bolts.
- 4 Wash out the filter with paraffin and examine the gauze for damage. Remove any foreign matter from the magnetic filters.

To Replace

- 1 Reposition the filter gauze in the transmission housing and fit a new gasket to the pedestal housing. Secure the cover to the pedestal housing.
- 2 Refit the drain plug and washer. Refit the two magnetic filter bolts and lock the heads by means of a piece of wire.
- 3 Refill the rear transmission with an approved grade of lubricant.

Refer to page 147 for details of "Cleaning the Filter."

To Remove the Pump Pedestal

- 1 Remove the ram cylinder assembly, lift arms and hydraulic pump as described previously.
- 2 Remove the pump pedestal complete with magnetic filters, wire screen filter and gasket from the base of the rear transmission housing by unscrewing the eight pedestal to transmission retaining bolts.

To Replace

- 1 Fit a new gasket and secure the pump pedestal to the transmission housing with the eight retaining bolts.
- 2 Fit the hydraulic pump and ram cylinder assembly as described previously.

FAULT DIAGNOSIS

Note — It is assumed that the correct grade of lubricant, as specified in the Operators Instruction Book, is being used.

Implement will not Lift

- 1 Blocked gauze in the filter screen.
- 2 Any faulty oil seals in the hydraulic pump.
- 3 Worn gears or bearings in pump.
- 4 Woodruff key retaining pump driven gear sheared on the drive shaft.
- 5 Insecure hydraulic pump retaining bolts.
- 6 Seals faulty on the feed pipes.
- 7 Faulty valve control lever linkage.
- 8 Any loose securing bolts in the valve control housing.
- 9 Any faulty blanking plug seals in the valve control housing.
- 10 Piston valve worn.
- 11 Piston valve cylinder worn or scored.
- 12 Any faulty gaskets on the valve control housing.
- 13 Unloading valve seat faulty or dirty.
- 14 Faulty oil seal on the ram cylinder.
- 15 Faulty oil seal on the ram piston.

Implement Lifts Slowly

This symptom could be caused by any of the points which have been checked under "Implement will not Lift."

Implement will not remain in the Raised Position with the Control Lever in "Neutral"

- 1 Seal faulty on the ram piston.
- 2 The ram cylinder scored.
- 3 Seal faulty on the ram cylinder.
- 4 The jack tapping cap loose or the washer faulty.
- 5 The non-return valve cap loose or the washer faulty.
- 6 The non-return valve seat scored or dirty, or valve spring tension low, not permitting valve to close.
- 7 Faulty gland on the front cover plate.
- 8 The piston valve or bore worn.
- 9 Loose retaining bolts between the valve control unit and the ram cylinder.

Implement does not attain its Full Lift when the Lever is moved to the "Raised" position

- 1 Incorrect adjustment of the unloading valve.
- 2 Check all points under "Implement will not Lift."

Implement Drops Slowly when the Lever is moved to the "Lower" position

- 1 The rate of fall stop screw incorrectly positioned.
- 2 The bleed holes blocked in the piston valve.
- 3 Faulty control lever linkage.

SPECIFICATIONS AND REPAIR DATA

HYDRAULIC PUMP (All Models when fitted)

Backlash between driven and driving gears	0.006"-0.015" (.152-.381 mm.)
No. of teeth on Driven gear	28
Driving gear	33
Pump pressure gears (two) ..	9
Diameter of pump pressure gear shafts	0.8725"-0.8735" (22.162-22.187 mm.)
Internal diameter of pump pressure bearings	0.8750" min. (22.225 mm.)
Total length of front pressure bearing	1.370" (34.798 mm.)
Total length of rear pressure bearing	1.601" (40.665 mm.)
Thickness of oil pressure relief plate :	
EIADKN-994699-A	0.1125"-0.1130" (2.857-2.870 mm.)
EIADKN-994699-B	0.1150"-0.1155" (2.900-2.933 mm.)
EIADKN-994699-C	0.1175"-0.1180" (2.985-2.997 mm.)
EIADKN-994699-D	0.1200"-0.1205" (3.048-3.060 mm.)
Relief plate to body clearance ..	0.003"-0.0055" (.0762-.139 mm.)

VALVE GEAR ASSEMBLY

Control lever :	
Angular movement from neutral to raise ..	30
Angular movement from neutral to lower ..	42
Unloading valve—shim thickness :	
EIADKN-994613-A	0.0164" (.4162 mm.)
EIADKN-994613-B	0.028" (.711 mm.)
Initial setting	2,000-2,200 lbs. sq. in.
Jack tapping	½" B.S.P. × .75" thread

Piston Valve Diameter

Part No.	Diameter	Identification
EIADKN-994742-A	0.8685 in. to 0.8687 in. (22.0599-22.0649 mm.)	Marked Red paint

Part No.	Diameter	Identification
EIADKN-994742-B	Over 0.8687 in. Up to 0.8689 in. (22.0649-22.0700 mm.)	Marked Yellow paint
EIADKN-994742-C	Over 0.8689 in. Up to 0.8691 in. (22.0700-22.0751 mm.)	Marked Blue paint
EIADKN-994742-D	Over 0.8691 in. Up to 0.8693 in. (22.0751-22.0802 mm.)	Marked Green paint
EIADKN-994742-E	Over 0.8693 in. Up to 0.8695 in. (22.0802-22.0853 mm.)	Marked White paint

Piston Valve Bore Diameter

	Marked
EIADKN-994552-A	-0.8690"-0.8692" (22.0726-22.0777 mm.)
(Paint mark indicates valve size to be fitted)	0.8692"-0.8694" (22.0777-22.0828 mm.)
	0.8694"-0.8696" (22.0828-22.0878 mm.)
	0.8696"-0.8698" (22.0878-22.0929 mm.)
	0.8698"-0.8700" (22.0929-22.0980 mm.)
	Red
	Yellow
	Blue
	Green
	White

Ram Cylinder Housing Assembly

Cross-shaft bearing dia.	1.752"-1.754" (44.501-44.552 mm.)
Cross-shaft bearing bush	2.622"-2.626" dia. (66.6-66.9 mm.)
	when pressed in 2.750" (69.8 mm.) dia. bore
Lift arm :	
Effective length	9" (228.6 mm.)
Total angular movement	78
Crank arm—effective radius :	
When lift arms fully raised ..	3.14" (79.76 mm.)
When lift arms fully lowered ..	3.41" (86.61 mm.)
When lift arms in middle position	4.10" (104.14 mm.)
Ram cylinder :	
Diameter	2.874"-2.876" (72.998-73.048 mm.)
Piston diameter	2.871"-2.872" (72.923-72.948 mm.)
Length of stroke	5 3/16" (137.668 mm.)