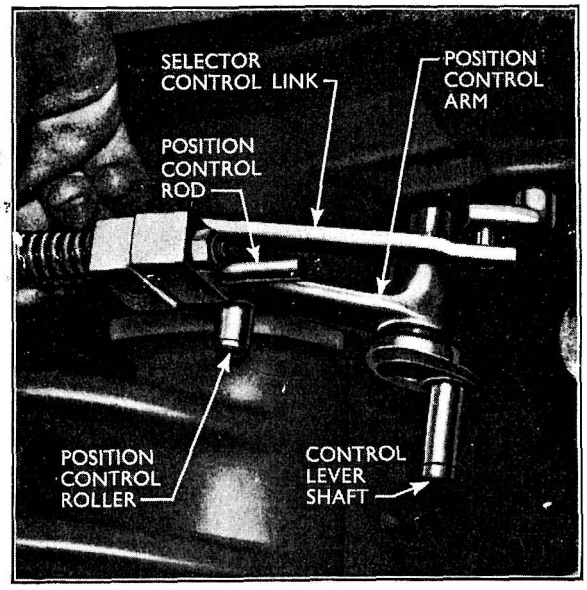

Fig. 35
Assembling Position Control Linkage to Cover

To Rebuild the Lift Cover Assembly

1. Place the ram arm and piston rod in position in the lift cover with the cam on the same side as the selector control arm.

2. If removed, replace the pin and roller in the position control arm, pressing the pin in as far as possible whilst still leaving the roller free to rotate.

Similarly, secure the position control link to the block by pressing in the pin, locating the flat washer between the link and block.

Slide the position control guide rod through the spring, block and arm and secure with a self-locking nut. Tighten the nut until the shoulder on the guide rod seats securely against the position control arm. Pass the position control rod through the position control arm, screw it through the block and secure with a locknut.

3. Slide the control lever cross-shaft through the position control arm and fit this assembly to the lift cover. Install the selector control arm in the lift cover, fit the selector lever and secure with a tension pin.

4. Connect the position control link to the selector arm and secure with a split pin.

5. Assemble the spacer tube into the outer end of the control lever shaft, locating the smaller diameter end in the housing. Using a new gasket, secure the quadrant to the housing with two screws and spring washers. Replace the friction disc, locate the woodruff key in its slot and assemble the friction plate over the key and retain on the shaft with a flat washer, double coil spring washer and self-locking nut. Do not tighten the nut at this stage.

6. Replace the quadrant retainer and secure with two screws.

7. Tighten the self-locking nut on the control lever shaft until a pull of 10 lbs. (4.536 kg.) measured at the ball end of the lever, is required to move the lever.

8. Fit the control valve actuating lever to the control lever shaft with the piston stop pin facing inwards. Secure the actuating lever to the shaft with the special snap ring.

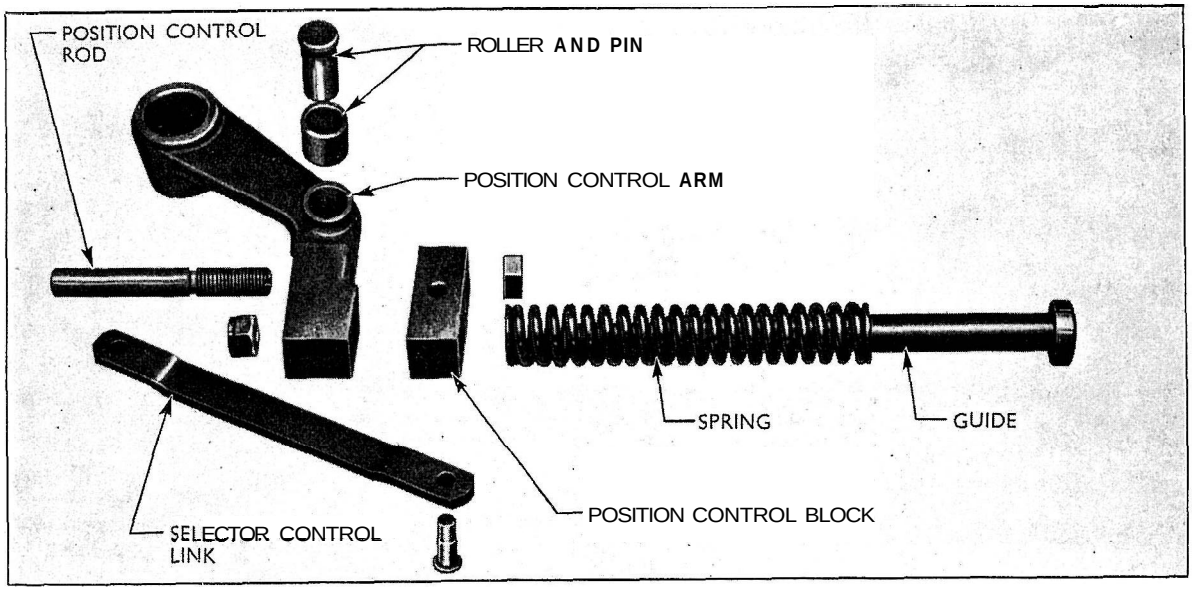

Fig. 36 **Position Control Linkage Assembly**

9. Assemble the qualitrol rod and spring to the fork and secure with a circlip. Connect the rod to the main control spring plunger with a clevis pin and split pin.

10. Fit the main control spring plunger in its bore at the rear of the lift cover, engaging the slot with the guide stud in the housing and sliding the forked end of the assembly over the qualitrol pin in the valve actuating lever.

11. Place the thrust washer between the ram arm and the top cover on the side away from the control valve linkage. Install the lift cross-shaft, engaging the master spline on the centre portion with the corresponding spline on the ram arm.

12. Assemble the lift arm cross-shaft bushes and spacers (two bushes separated by a spacer on each side) to the cross-shaft. Although the bushes are identical, they are chamfered at one end and each should be installed with the chamfered end facing towards the spacer.

13. Fit the lift arms to their respective left- and right-hand locations, engaging the master splines on the cross-shaft. Secure the lift arms with a retaining washer, tab washer and screw. Fully tighten one screw and then slack off for one turn. Fully tighten the other screw to bed down the parts and then slacken off, retightening until the lift arms just fall under their own weight and no end play is apparent in the shaft. Secure in this position by bending the locking tabs against the screw heads.

14. Install new 'O' rings in the top face of the ram cylinder assembly and replace the ring dowels if removed. Assemble the cylinder to the cover as previously described and connect the control valve turnbuckle to the actuating lever, placing its front end in the control valve shroud.

Fig. 38
Assembling Lift Cross-shaft to Cover

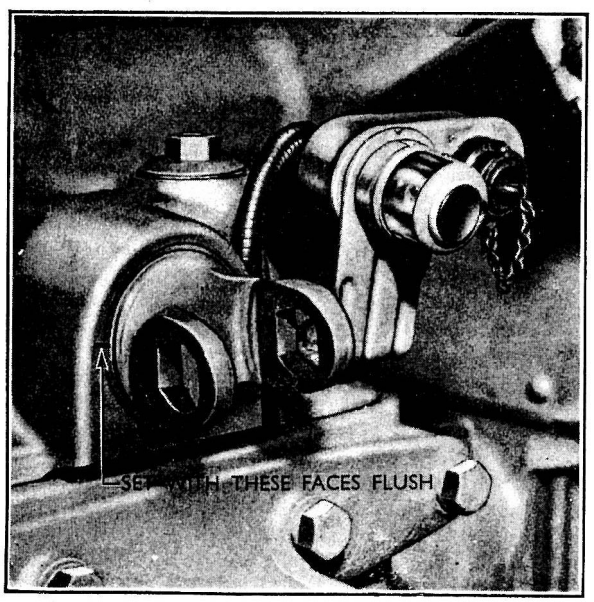

Fig. 37
Main Control Spring Setting

15. Place the main control spring in its housing and screw the main control spring yoke into the plunger until its rear face is flush with the housing.

16. Carry out the Qualitrol and Position Control adjustments as previously described.

17. Replace the auxiliary service and flow control valve plate assembly, using new 'O' rings in the various oil passages.

18. Replace the lift cover on the tractor as previously described, using a new gasket and new 'O' rings between the inlet and exhaust oil passages.

19. Connect the main spring yoke to the rocker, attach the top link to the rocker and the lifting rods to the lift arms.

20. Refit the seat, attach an implement and test the lift for correct operation by raising and lowering the implement several times.

To Remove the Exhaust Oil Filter and Back Pressure Valve Assembly

1. Remove the lift cover as previously described.

2. Remove the screws and spring washers securing the feed pipe to the pump. Remove the two feed pipe locating collets and lower both the feed and exhaust pipes, together with the filter and back pressure valve, until the pipes are free from the passages in the transmission housing, and can be withdrawn through the hydraulic lift cover aperture in the rear transmission housing.

To Replace the Exhaust Filter and Back Pressure Valve Assembly

1. Discard the 'O' rings fitted at the top ends of the pipes and between the pump and pipe flange. Lower the pipes and filter into the transmission housing as an assembly.

2. Pass the top ends of the pipes up through their respective bores in the housing and fit new 'O' rings to the grooves in the pipes. Place the locating collets in the groove in the feed pipe and pull the pipe down to nip the collets in position. Pull the exhaust pipe down until it is flush with the top of the transmission housing and locate a further 'O' ring at this point.

3. Fit a new 'O' ring between the feed pipe flange and the pump and secure with two screws and spring washers.

4. Replace the lift top cover assembly as previously described, using a new gasket between the cover and the transmission housing.

To Overhaul the Back Pressure Valve

1. Remove the exhaust oil filter, feed and exhaust pipe assembly as previously described.

2. Remove the wire retainer from the internal bore of the back pressure valve and extract the plate, spring and valve.

Before reassembly the valve surface and bore of the body should be examined for damage or scoring and renewed if necessary. The valve should be a free, sliding fit in the body which should be free from dirt or obstruction.

If necessary, check the tension of the spring (sec Specification). Reassemble in the reverse order to that described above and replace the complete oil filter and pipe assembly in the rear transmission.

To Renew the Exhaust Oil Filter

This filter will normally only require servicing when major overhauls are being carried out on the hydraulic lift and rear transmission assemblies.

1. Remove the complete exhaust oil filter, back pressure valve and pipes assembly as previously described.

2. Unscrew the back pressure valve from the exhaust oil pipe.

3. Remove the sealing washer from below the filter then withdraw the filter from the pipe.

4. Remove the sealing washer, plain washer and spring from above the filter.

5. Fit the new filter by reversing the dismantling procedure, using new sealing washers if the old ones show signs of deterioration.

6. Refit the complete assembly into the rear transmission housing and replace the lift top cover as previously described.

HYDRAULIC PUMP

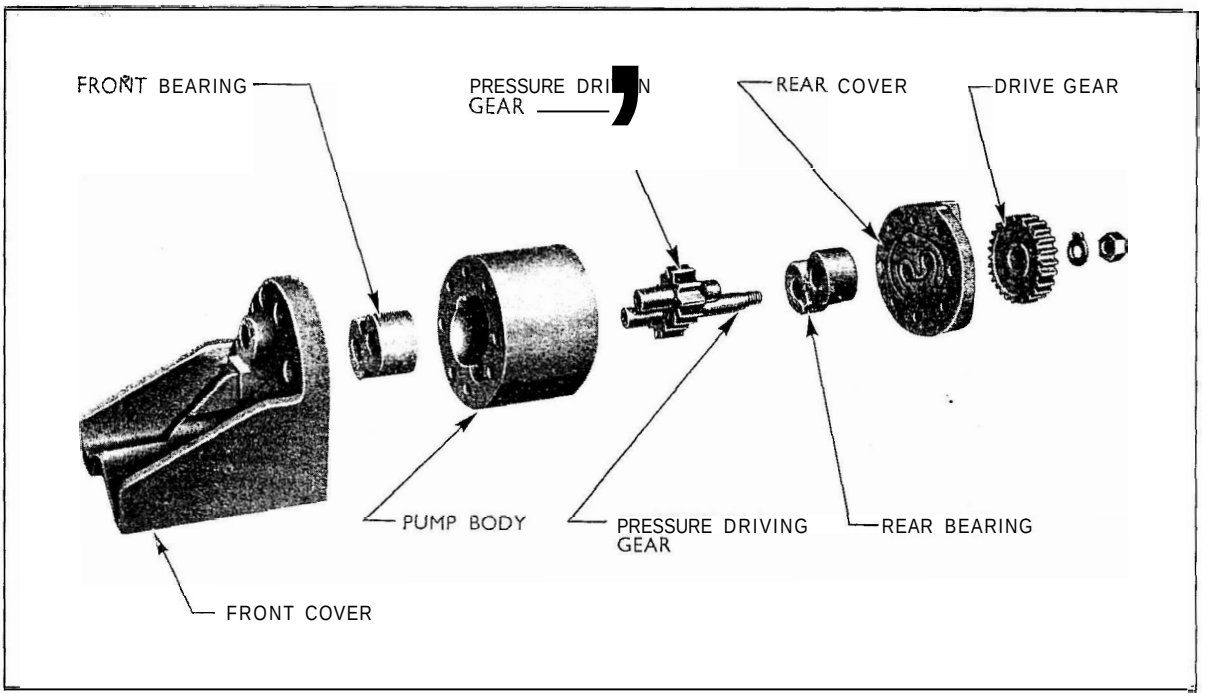

Fig. 39 **Hydraulic Pump Assembly**

The single stage, gear-type, pump is mounted on a pedestal at the base of the rear transmission housing and is driven by a gear on the power take-off extension shaft.

The two spur type gears which produce the high pressure oil required to operate the hydraulic power lift operate in specially designed bearing blocks which are a precision fit in the pump housing. The pressure driving gear is formed integrally with a shaft, the end of which protrudes through the pump casing and is tapered to accept an external gear which is keyed to the shaft. This external gear meshes with a driving gear keyed to the power take-off extension shaft and the hydraulic pump is therefore only in operation when the power take-off selector lever is in the engaged position.

When a "Live" power take-off is fitted the transmission clutch may be disengaged without affecting the drive to the pump.

Rotation of the pressure gears draws oil from the rear transmission housing, past two magnetic filters in the pump pedestal and through a wire gauze strainer into the inlet side of the pump. The oil then fills the spaces between the gear teeth and is carried around the outside of the chamber until, as the teeth in the two gears mesh, the oil is forced from between the teeth and delivered through an outlet port in the front face of the pump. The feed pipe is connected to this port, being sealed with 'O' rings at either end and connected at its upper end to a flange in the top of the transmission housing from where the oil is led to the hydraulic lift.

An oil duct incorporated in the high pressure side of the pump directs oil to the back faces of the bearings where is is trapped between the bearings and their respective cover plates. An 'O' ring is fined in a specially shaped groove in each cover plate to prevent leakage between the bearings and the cover plate. This high pressure oil has the effect of loading the bearings, moving them towards the gears, and keeping end-float to a minimum with the effect of automatically compensating for wear and ensuring maximum efficiency from the pump.

A duct on the low pressure side of the pump, together with spiral grooves in the bearing and small reservoirs in the cover plates, ensures a continuous supply of low pressure oil to the bearing surfaces for lubrication purposes.

A special seal fitted in the rear cover plate safeguards the pump by keeping out air ; this seal should always be fitted with the sealing lip facing outwards, its purpose being to prevent ingress of air, not leakage of oil.

To Remove the Hydraulic **Lift** Pump

1. Drain the oil from the rear transmission housing.

2. Remove the lift top cover as previously described.

3. Disconnect the feed pipe leading from the pump to the top of the transmission housing.

4. Remove the three screws and lockwashers securing the pump to the pedestal and lift the pump free of the two locating dowels.

To Dismantle the Hydraulic Pump

1. Straighten the locking tab and remove the nut securing the external driven gear to the pump pressure driving gear shaft.

2. Using puller tool No. T.8515, remove the external driven gear from the shaft.

3. Remove, the woodruff key from the pump pressure driving gear shaft.

4. Remove the nuts, bolts and washers securing the two end covers. The two bolts in line with the screws securing the feed pipe adaptor are dowel bolts, machined to fine limits, and must not be mixed with the other retaining bolts. These dowel bolts are marked with a " D " on their heads for identification purposes.

5. Remove the two covers and extract the "O" ring from its locating groove in each cover.

6. If necessary the seal can be removed from the front cover, after removal of the retaining circlip, by carefully driving the seal from the cover with a drift of approximately the same size as the seal. A washer is fitted between the oil seal and the pump cover and care should be taken not to misplace it.

7. Remove the pump gears and bearing blocks as an assembly. Under no circumstances should any force be applied to the gear shafts.

8. Examine the bearings for signs of seizure or scoring on the face or journals. Light score marking can be removed by careful lapping on a surface plate, using "O" grade emery paper and paraffin.

9. Examine the body for wear in the gear running track. If the track is worn deeper than 0.0025 in. (0.0635 mm.) on the inlet side, the body must be replaced.

10. Examine the gears for excessive wear or damage on journals, faces or teeth. Run-out across the gear face to the tooth edge should not exceed 0.001 in. (0.025 mm.). The gear journals can, if required, be lightly polished with "O" grade emery paper to remove wear marks. The gear faces may be polished by sandwiching the emery paper between the gear and a scrap bearing and rotating the gear.

If new gears are fitted the journal sizes on either side of each individual gear must be paired within 0.001 in. (0.025 mm.) of each other. The face widths of each pair of gears must be held to within 0.001 in. (0.025 mm.) of each other, this applies equally to the mixing of gears from different pumps or the replacement of single gears.

11. All rubber seals, "O" rings, etc. should be replaced when servicing the pump.

To Reassemble the Hydraulic Pump

The two bearings, although of similar appearance are not identical and they must be assembled in correct relationship to the gears and housings. The pump main body should be placed on the bench on its side and the gears and bearings arranged as shown in Fig. 42. In this position the right-hand (front) bearing will have the small run-out slots from the oil ducts at the upper end of the right-hand (high pressure) ducts and the lower end of the left-hand (low pressure) duct.

The left-hand (rear) bearing will have the run-outs at the upper end of the left-hand (high pressure) duct and the lower end of the right-hand (low pressure) duct.

1. With the right-hand (front) bearing in the position shown in Fig. 42, i.e. with the plain side of the bearing downwards and the run-out from the bores to the left (i.e. low pressure side of pump) assemble the pump pressure driven gear to the further bore of the bearing.

2. Assemble the pump pressure driving gear to the nearer bore of the bearing, threaded end of the shaft pointing upwards and teeth meshing with the pressure driven gear (see Fig. 41).

3. Turn the left-hand (rear) bearing so that the plain face points upwards and assemble to the gears, so that the small relief on the outer diameter of each

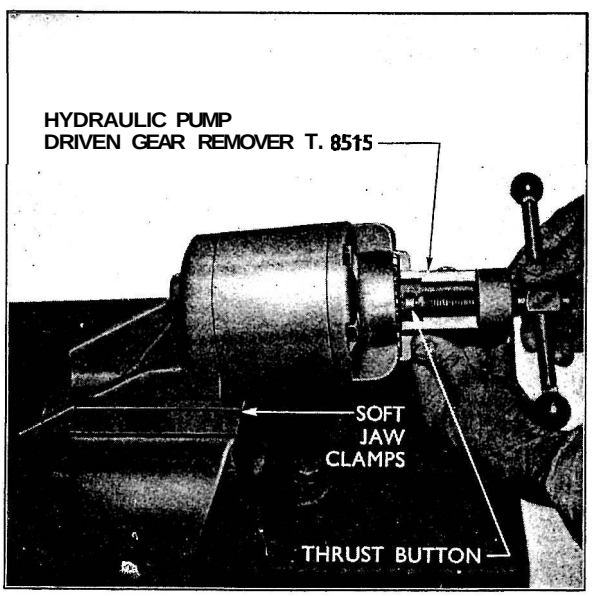

Fig. 40
Removing Hydraulic Pump Driven Gear

bearing (i.e. the high pressure side) is on the right-hand side of the assembly.

4. Install the bearing and gear assembly in the pump housing, with the threaded end of the pressure driving gear pointing to the left and the small reliefs on the outer diameter of the bearings upwards.

5. Fit a new "O" sealing ring to each cover plate and assemble the plates to the pump body.

6. Lightly secure the end covers to the pump body with the two dowel bolts which must be correctly positioned, as previously described. Fit the remaining six bolts together with the nuts and spring washers, taking care to locate the square bolt heads in the square recesses in the front cover. Tighten the nuts evenly to 40 to 45 lbs. ft. torque (5.528 to 6.219 kg.m.).

It is essential that this torque figure is not exceeded and an accurate torque wrench must be used on this operation.

7. Replace the woodruff key in the pump pressure driving gear shaft and assemble the external gear to the shaft. Place a locking tab washer on the threaded end of the shaft, assemble and fully tighten the retaining nut, then turn the tab over to lock the nut in position.

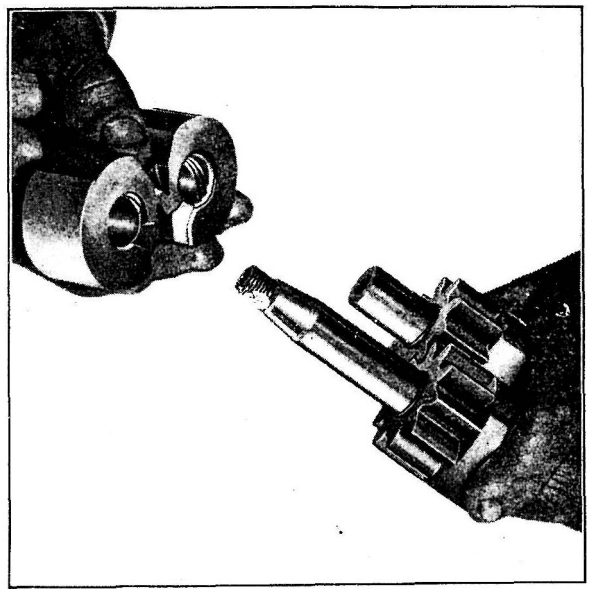

Fig. 41
Assembling Gears and Bearings

To Replace the Hydraulic Lift Pump

I. Locate the pump carefully on the locating dowels in the pedestal and secure the pump with three screws and lockwashers.

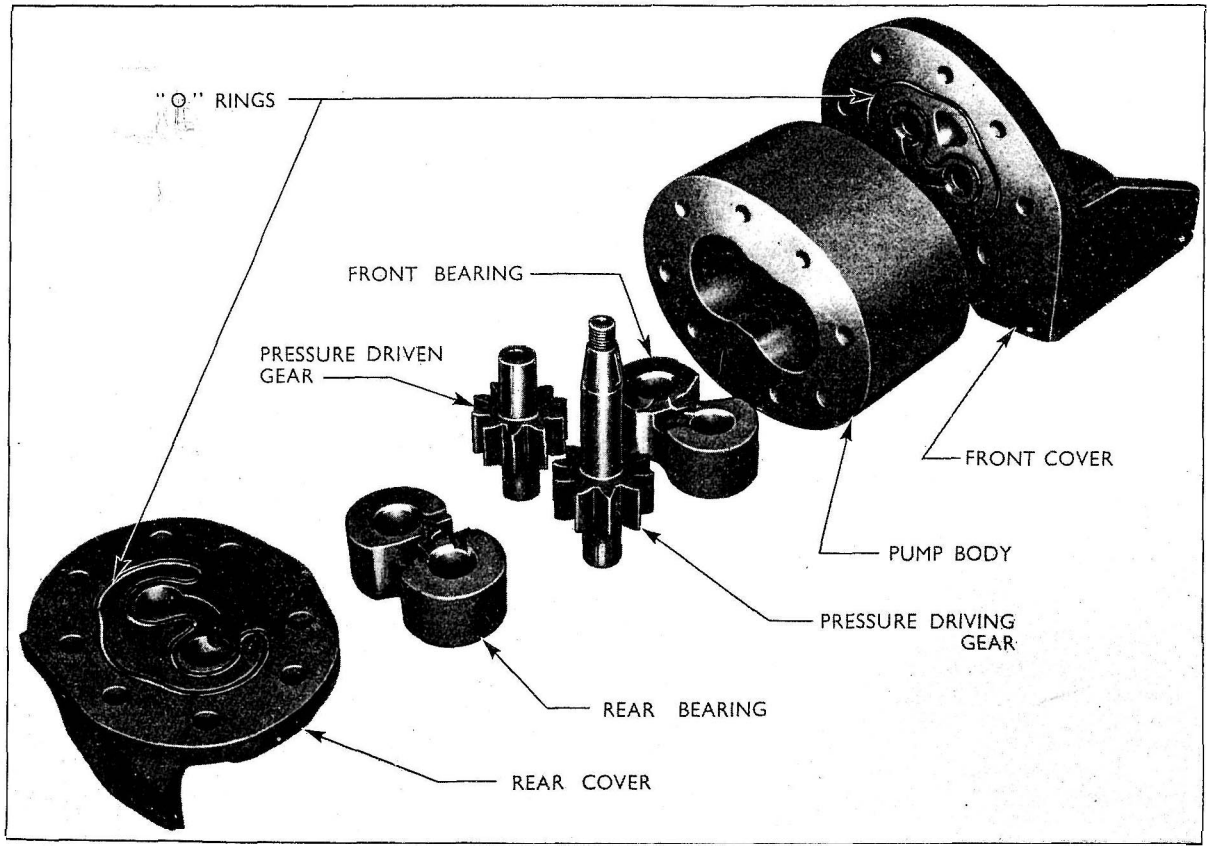

Fig. 42 Hydraulic Pump Body, Gears and Bearings

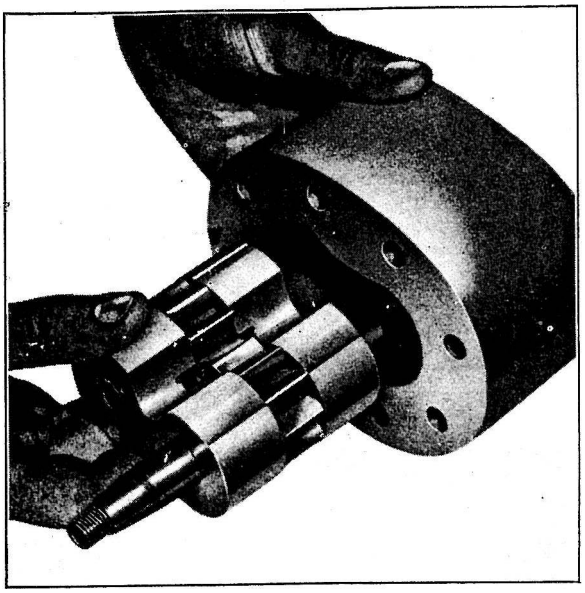

Fig. 43
Assembling Gears and Bearings to Pump Body

2. Secure the feed pipe, using a new "O" ring between the pipe flange and pump.

3. Replace the lift cover as previously described.

4. Fill the rear transmission housing with the correct quantity of oil of the approved grade.

TESTING THE HYDRAULIC SYSTEM

The pressure relief valve located in the hydraulic lift top cover is set during production to open at pressures in excess of 2,450 to 2,500 lbs/sq. in. (172.24 to 175.77 kg/sq. cm.). Should it be suspected that the pressure in the hydraulic system is incorrect it may be checked by installing a pressure testing gauge T.8503 in conjunction with T.8503-1.

Dealers aiready in possession of this equipment will also require a special adaptor T.8503-3 in order to test the Super Major hydraulic system.

To test the pressure, first operate the tractor to bring the transmission oil to its normal working temperature and then remove the plug from the threaded hole in the front, right-hand side of the lift cover (this hole connects into the main feed from the hydraulic pump). Screw the special adaptor T.8503-3 into the threaded hole then assemble the "T" piece of the pressure testing equipment to the adaptor. Connect the pressure gauge to the "T" piece and then install the return pipe and flow control tap assembly between the "T" piece and the rear transmission filler plug hole as shown in Fig. 45. The flow control tap should be assembled with the arrow pointing in the direction of flow, i.e. towards the rear transmission filler hole..

Fully open the flow control tap in the pressure testing equipment, start the engine and run at a fast idling speed: Move the auxiliary service control to its outer position and move the main control lever to the top of the quadrant. If the lift arms are in the fully raised position the main control lever will need to be taken past the fixed stop at the top of the quadrant. Gradually close the shut-off valve,

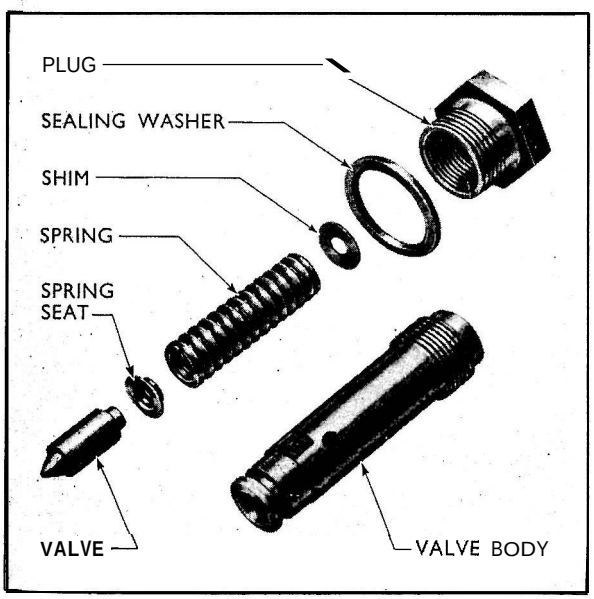

Fig. 44
Pressure Relief Valve Assembly

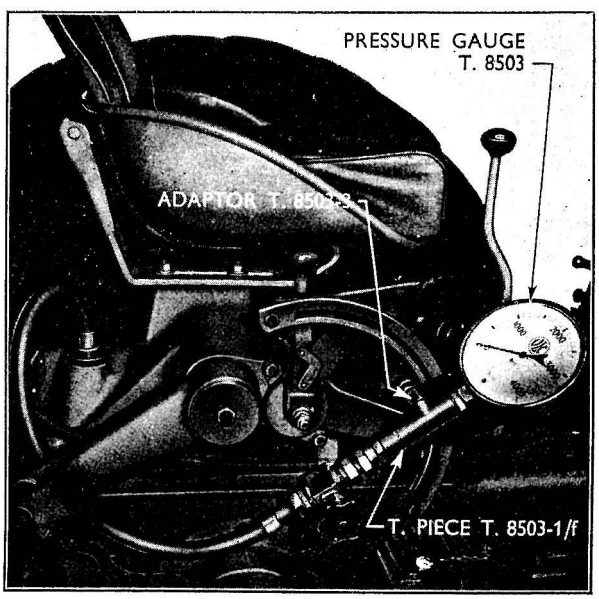

Fig. 45
Hydraulic Pump Test Equipment

observing the reading on the pressure gauge which should rise steadily to 2,450 to 2,550 lbs/sq. in. (172.24 to 175.77 kg/sq. cm.). At this pressure the relief valve should blow-off and the pressure drop to approximately 300 lbs/sq. in. (21.09 kg/sq. cm.).

If the relief valve blows off at a lower pressure than this it may be that insufficient shims have been fitted between the relief valve spring and plug (a faulty relief valve spring can also produce the same symptoms). Shims are available in thicknesses of 0.010 in. (0.254 mm.) and 0.025 in. (0.635 mm.) for this adjustment.

If the pressure relief valve does not blow off, either :—

(1) Too many shims have been added, in which case the pressure shown on the gauge will exceed 2,500 lbs/sq. in. (175.77 kg/sq. cm.) or :—

(2) The pressure may not be sufficiently high, which could be caused by a badly worn or damaged pump or by leaking oil seals either on the main feed pipe from the pump to the lift cover or within the lift cover assembly.

Checking the Hydraulic Lift After Reassembly

The following tests can be quickly applied to a tractor after overhaul of the hydraulic lift as a check for correct adjustment of the internal linkage and against internal oil leaks.

Attach weights of approximately 1,500 Ibs, or a suitable implement, to the lower links, start the engine and run at 1,600 r.p.m. Set the lift on Qualitrol and slowly raise the main control lever within the quadrant, the lift arms should start to raise when the lever is approximately 0.9 in. (22.76 mm.) from the top stop.

With the lift arms in the fully raised position the system should not make more than three corrections within two minutes. Any figure in excess of this shows that excessive leakage is occurring either from the ram cylinder or within the valve chest and the system should be checked to locate this fault before putting the tractor back into service.

A further test which can be applied, to check the operation of the internal Qualitrol linkage is as follows :—With the tractor set up as detailed above, slowly raise the control lever until the lift arms raise, move the lever 1 in. (25.4 mm.) down the quadrant, when the lift arms will lower. It should then be possible to cause the lift arms to raise by applying a compressive load to the main control spring yoke.

HYDRAULIC LIFT SPECIFICATION

Lift Cylinder

Ram cylinder diameter .. .. 3.3795 to 3.3810 ins. (85.843 to 85.881 mm.)
Ram piston diameter .. .. 3.378 to 3.379 ins. (85.805 to 85.830 mm.)
Control valve spring :
No. of coils 18
Length .. .. 1.43 ins. under load of 24 to 26 lbs. (36.3 mm. under load of 10.89 to 11.79 kg.)
Cylinder safety valve :
Blow-off pressure .. .. 2,750/2,850 lbs. per sq. in. (193.35/200.38 kg. per sq. cm.)

Control and Unloading Valve Bush Bores

Colour marking	Diameter (ins)	Diameter (mm)
Blue/White	over 0.9994 to 0.9996	25.385 to 25.390
White	,, 0.9996 to 0.9998	25.390 to 25.395
Blue	,, 0.9998 to 1.0000	25.395 to 25.400
Yellow,	,, 1.0000 to 1.0002	25.400 to 25.405
Green	,, 1.0002 to 1.0004	25.405 to 25.410
Orange	,, 1.0004 to 1.0006	25.410 to 25.415
Green/White	,, 1.0006 to 1.0008	25.415 to 25.420

Control and Unloading Valve Bushes and Unloading Valve Plug

Colour marking	Diameter (ins)	Diameter (mm)
Blue/White	over 1.0000 to 1.0002	25.400 to 25.405
White	,, 1.0002 to 1.0004	25.405 to 25.410
Blue	,, 1.0004 to 1.0006	25.410 to 25.415
Yellow	,, 1.0006 to 1.0008	25.415 to 25.420
Green	,, 1.0008 to 1.0010	25.420 to 25.425
Orange	,, 1.0010 to 1.0012	25.425 to 25.430
Green/White	,, 1.0012 to 1.0014	25.430 to 25.435
Red/White	,, 1.0014 to 1.0016	25.435 to 25.440

Control Valve

Colour marking	Diameter (ins)	Diameter (mm)
White	over 0.5917 to 0.5919	15.029 to 15.034
Blue	,, 0.5919 to 0.5921	15.034 to 15.039
Yellow	,, 0.5921 to 0.5923	15.039 to 15.044
Green	,, 0.5925 to 0.5926	15.049 to 15.052
Orange	,, 0.5927 to 0.5928	15.055 to 15.057

Auxiliary Service Control Valve Bore in Plate		
Colour marking	Diameter (ins)	Diameter (mm)
Green	from 0.7487 to 0.7490	19.017 to 19.025
White	over 0.7490 to 0.7493	19.025 to 19.032
Blue	,, 0.7493 to 0.7496	19.032 to 19.040
Yellow	,, 0.7496 to 0.7500	19.040 to 19.050
Orange	,, 0.7500 to 0.7503	19.050 to 19.058

Auxiliary Service Control Valve		
Colour marking	Diameter (ins)	Diameter (mm)
Green	from 0.7482 to 0.7485	19.005 to 19.013
White	over 0.7485 to 0.7488	19.013 to 19.020
Blue	,, 0.7488 to 0.7491	19.020 to 19.028
Yellow	,, 0.7491 to 0.7494	19.028 to 19.036
Orange	,, 0.7494 to 0.7497	19.036 to 19.043

Flow Control Valve Plunger Bore Diameter		
Colour marking	Diameter (ins)	Diameter (mm)
Red	from 0.6675 to 0.6677	16.955 to 16.960
Yellow	over 0.6677 to 0.6679	16.960 to 16.965
Blue	,, 0.6679 to 0.6681	16.965 to 16.970
Green	,, 0.6681 to 0.6683	16.970 to 16.975
White	,, 0.6683 to 0.6685	16.975 to 16.981

Flow Control Valve Plunger		
Colour marking	Diameter (ins)	Diameter (mm)
Red	from 0.6670 to 0.6672	16.942 to 16.948
Yellow	over 0.6672 to 0.6674	16.948 to 16.953
Blue	,, 0.6674 to 0.6676	16.953 to 16.958
Green	,, 0.6676 to 0.6678	16.958 to 16.963
White	,, 0.6678 to 0.6680	16.963 to 16.968

Back Pressure Valve

Blow-off pressure .. .. 20 to 29 lb. per sq. in. (1.406 to 2.039 kg. per sq. cm.)
Spring length .. .. 0.74 ins. under load of 2.64 to 2.92 lb. (18.8 mm. under load of 1.197 to 1.324 kg.)

Hydraulic Pump

Flow capacity .. .. 4.93 galls. per minute (22.41 litres per minute) at 1,600 r.p.m.

Lift Cover

Pressure relief valve :
Thickness of shim .. .. 0.010 in. (0.254 mm.), 0.025 in. (0.635 mm.)
Blow-off pressure .. .. 2,450 to 2,500 lb. per sq. in. (172.24 to 175.77 kg./sq. cm.)

Check valve :
Check valve bore diameter .. .. 0.749 to 0.750 in. (19.025 to 19.05 mm.)
Check valve seat land diameter (rear of 'O' ring) .. ..0.7510 to 0.7505 in. (19.08 to 19.06 mm.)

Check valve spring :
No. of coils 9.5
Length .. .. 0.70 in. under load of 10.2 to 12.2 lbs. (17.78 mm. under load 4.65 to 5.53 kg.)

Cross-shaft :
Shaft journal diameter .. .. 2.260 to 2.262 ins. (57.41 to 57.46 mm.)
Bush inside diameter .. .. 2.265 to 2.267 ins. (57.53 to 57.58 mm.)
Bush outside diameter .. .. 2.620 to 2.622 ins. (66.55 to 66.60 mm.)

Position control spring :
No. of coils 21.5
Length .. .. 4 ins. under load of 85 lb. (101.6 mm. under load of 38.56 kg.)

Qualitrol spring :
No. of coils 16
Length .. .. 3.39 ins. under load of 85 lb. (86.11 mm. under load of 38.56 kg.)

Tightening Torque Figures	lbs/ft.	kg/m.
Lift top cover to transmission housing screws	40 to 45	5.33 to 6.22
Lift cylinder to top cover screws	50 to 55	6.91 to 7.60
Auxiliary service plate to top cover screws	40 to 45	5.53 to 6.22
Check valve plug	45 to 55	6.22 to 7.60
Hydraulic pump through bolts	40 to 45	5.53 to 6.22
Flow control valve linkage pivot bolt	5 to 6	0.69 to 0.83
Control lever quadrant to shaft nut	10 lb.*	4.536 kg.

* Measured at ball of **main** control lever

HYDRAULIC POWER LIFT

Since the introduction of the Super Major a number of changes have been made to the hydraulic system, and whilst details of these changes have been issued in Service Letters, they have not been incorporated in this section of the Manual.

These changes are summarized below as some of the components affected have been carried through to the New Super Major hydraulics, details of which are given at the end of this section.

CONTROL VALVE

To give improved operation of the hydraulic system a modified control valve has been fitted to all Super Majors from Engine No. 1584892. The current valve is the only one which is now being supplied through service and it may be identified from the previous valve by an annular recess in the front land as shown in Fig. 46.

This recess ensures that hydraulic pressure is evenly distributed around the valve when the lift is in the raised position and was introduced to overcome complaints of the valve sticking.

Where complaints of this nature are registered on tractors prior to Engine No. 1584892, the current type valve should be installed. As a general rule the modified valve to be used will have the same colour grading as that originally fitted unless a new bush is also being installed in which case the selected valve should be the largest size which will operate in the bush (without binding) after the bush has been assembled to the valve chest.

It will be necessary to reset the linkage adjustment, as detailed on page 16 of the Hydraulic Section of the Super Major Repair Manual Supplement, when a new control valve is fitted.

MAIN CONTROL SPRING

To obtain maximum sensitivity from Qualitrol it is important that the correct setting is obtained of the main control spring yoke in relation to the main control spring. Control springs vary slightly between production limits and therefore the setting of the yoke will differ between tractors. The common denominator is the compressive force required on the spring to effect a correction and this force may be checked in the following manner :—

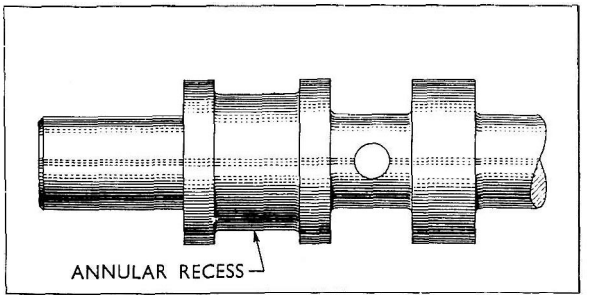

Fig. 46
Modified Control Valve

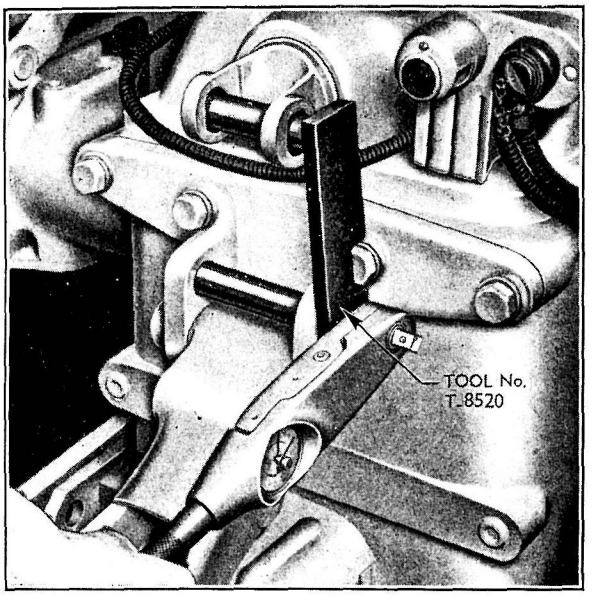

Fig. 47
Checking Main Control Spring Setting

With weights, or an implement, attached to the lower links start the engine and set to run at 1,600 r.p.m. Select Qualitrol and move the control lever slowly up the quadrant until a raise is effected, note this point on the quadrant and then move the lever 1 in. (25.4 mm.) back down the quadrant. The weights will then lower and they must lift again on the application of a horizontal thrust on the yoke of not more than 110 lbs. (49.89 kg.).

To check the setting of the spring this thrust may be applied by means of a torque wrench and Tool No. T.8520 as shown in Fig. 47. The adjustment of the yoke should be such that a correction is obtained when the torque wrench registers not more than 48.5 lb. ft. (6.7 kg.m.) which corresponds to the specified direct thrust of 110 lbs. (49.89 kg.).

This is the specified **maximum** figure which should not be exceeded and it will be found that as the yoke is gradually tightened, a point will be reached where a half turn of the yoke will increase the torque above the maximum. The yoke should be left in this position i.e. the position which will require the nearest torque to, but below, that specified to obtain a correction.

For details of the yoke setting on New Super Major Tractors, refer to pages 48 and 50.

FEED PIPE AND BRACKET ASSEMBLY

Effective with approximate Engine No. 1589010 a change was made to the feed pipe and bracket

assembly to improve the accessibility of the screws securing the pipe flange to the hydraulic pump. Failure to tighten these screws has resulted in a few instances of high pressure oil blowing past the 'O' type sealing ring between the flange and the pump.

The flange was increased in thickness and is now secured with two screws $1\frac{1}{4}$ in. (31.8 mm.) in length, in place of the $\frac{7}{8}$ in. (22.23 mm.) screws previously used.

A further change was made to the feed pipe and bracket assembly effective with Serial No. 08A303242. At this time, the exhaust filter, previously secured to a bracket on the feed pipe, was relocated on a bracket secured to the hydraulic pump front right-hand securing bolt and due to this change the pump securing bolts were increased in length by $\frac{1}{8}$ in. (3.17 mm.). The current and previous parts are interchangeable providing that if a new feed pipe is fitted in place of the previous part the current exhaust filter support bracket and longer pump securing bolts are also used.

HYDRAULIC LIFT CYLINDER

Instructions previously given in the Repair Manual Supplement for replacing the control valve bush specify that the bush should be pulled into place until the front face is flush with the front of the cylinder. The control valve is, however, adjusted with the slip gauge on its rear face and to obviate errors caused by variation in the length of the bush it is now specified that the bush is located with its rear face flush with the rear of the cylinder,

BACK PRESSURE VALVE

To overcome complaints of faulty unloading valve operation due to low back pressure, changes were made to the back pressure valve body effective with Serial No. 08B746216. These changes are recognisable by the current valve body having four oil exhaust ports whereas the previous part had only one port.

UNLOADING VALVE SEAL

To minimise the possibility of the unloading valve sticking under conditions of high temperature and pressure the seal fitted to this valve after Tractor Serial No. 08B747301 is manufactured from a different type of rubber to that previously used. To assist identification of the current valve seal it is marked with a white paint spot.

QUALITROL/POSITION CONTROL SELECTOR ARM

With effect from Serial No. 08A304421 an 'O' ring has been fitted to a groove in the spindle of the selector arm to improve oil sealing at this point. Current and previous parts are interchangeable, the 'O' ring can however only be fitted to the latest part incorporating a machined groove.

AUXILIARY CONTROL VALVE SPOOL AND HOUSING

To minimise the possibility of oil leaking into the ram cylinder when the control valve is in the outer position, changes were made to the spool and housing with effect from Tractor Serial No. 08B764393. These changes, whereby a second 'O' ring was added to the valve spool and machining modifications made to the housing bore, did not prove suitable and with effect from Serial No. 08B775949 the original type was reinstated for production and service.

Both types of spool are interchangeable but it is essential that the correct 'O' ring is used. The single seal type should be fitted with 'O' ring, Part No. 87034–ES whilst the double seal type should be

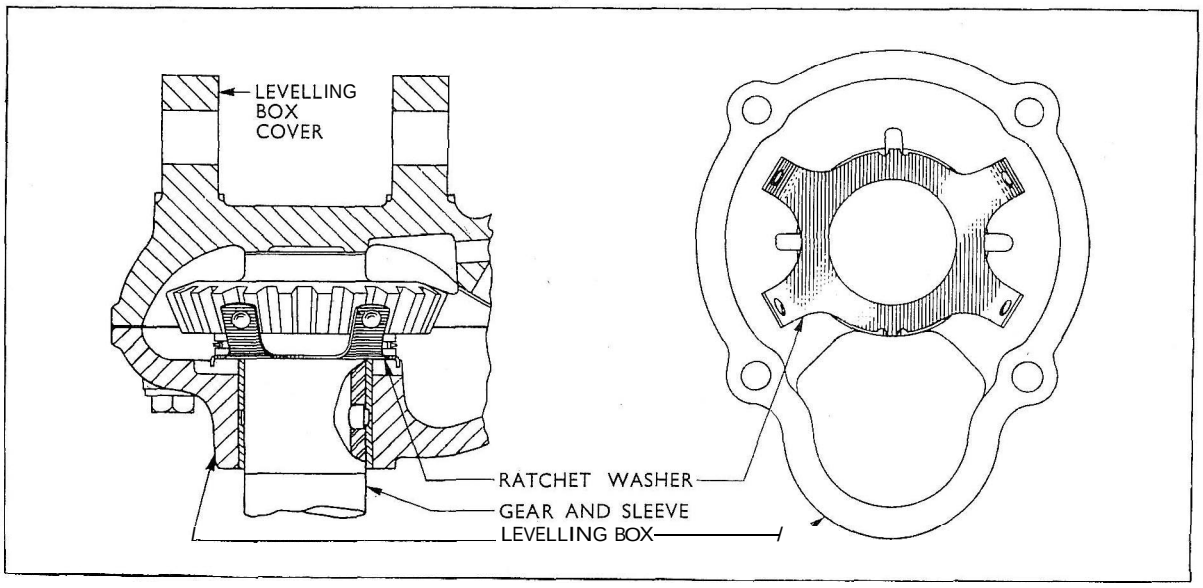

Fig. 48
Levelling Box Modification

fitted with 'O' ring 87016–ES in the outer location only. No 'O' ring should be fitted to the inner location on this type of spool.

HYDRAULIC LIFT LEVELLING BOX

Complaints were received on early Super Majors of the hydraulic lift levelling box gears rotating under load and thus upsetting the level of the implement. To overcome this complaint dimensional changes were made to the levelling box, levelling box cover and the vertical gear and sleeve. At the same time a ratchet washer was added between the thrust pad and the housing. Two lugs on the washer engage in the bottom of the housing to prevent the washer rotating and four extended sections engage with the sides of the gear teeth to prevent rotation unless it is being positively turned by the pinion gear. (See Fig. 38.)

The current and previous gear, sleeve and levelling box cover are interchangeable as the changes are only to minor dimensions. Where it is required to fit a previous levelling box with the ratchet washer it will be necessary to use three extra gaskets between the box and the cover. When using the previous internal components in a new levelling box it will be necessary to fit the ratchet washer. If these precautions are not taken the vertical gear and sleeve will not have the correct free movement.

TOP COVER AND CROSS-SHAFT

To serve the dual purpose of preventing oil leaks and dust entry an 'O' ring has been fitted to each side of the cross-shaft between the lift arms and the adjacent edge of the top cover.

There has been no change in Part No. for the top cover but identification of the current part can be made by the recesses .machined in the top cover to accept the 'O' sealing ring. When fitting the 'O' rings they should be lightly oiled to prevent friction.

Previous instructions for tightening the lift arm securing bolts were to tighten the bolts until the lift arms just drop under their own weight. If this procedure is followed when 'O' rings are fitted there will be excessive end-float in the cross-shaft and, therefore, the correct procedure is now to fully tighten one side, back off slightly, finally tightening the opposite side until all end-float is eliminated, but not so tight as to prevent rotation of the lift arms and 'cross-shaft.

AUXILIARY SERVICE CONTROL VALVE

Complaints are occasionally encountered of oil leakage from the blanking plugs and seals fitted to the oil passages in the auxiliary service control valve unit. Whilst certain of these plugs are drilled and tapped for removal purposes this is not a practical proposition with the smaller plugs, Part No. E148–WP–9, fitted to the drillings marked A, B and C in Fig. 49.

The recommended method of removing these plugs is to insert suitably sized balls in the connecting drillings and then use a screwdriver behind the balls to lever the plugs out of their locations. A careful note should be made of the number of balls inserted and a check made that the same number of balls are removed from the passages after extracting the plugs.

Balls which are available and are suitable for use in this manner are :—

354069–S .. .. $\frac{7}{16}$ in. (11.11 mm.) diameter
353076–S .. .. $\frac{1}{4}$ in. (6.35 mm.) diameter

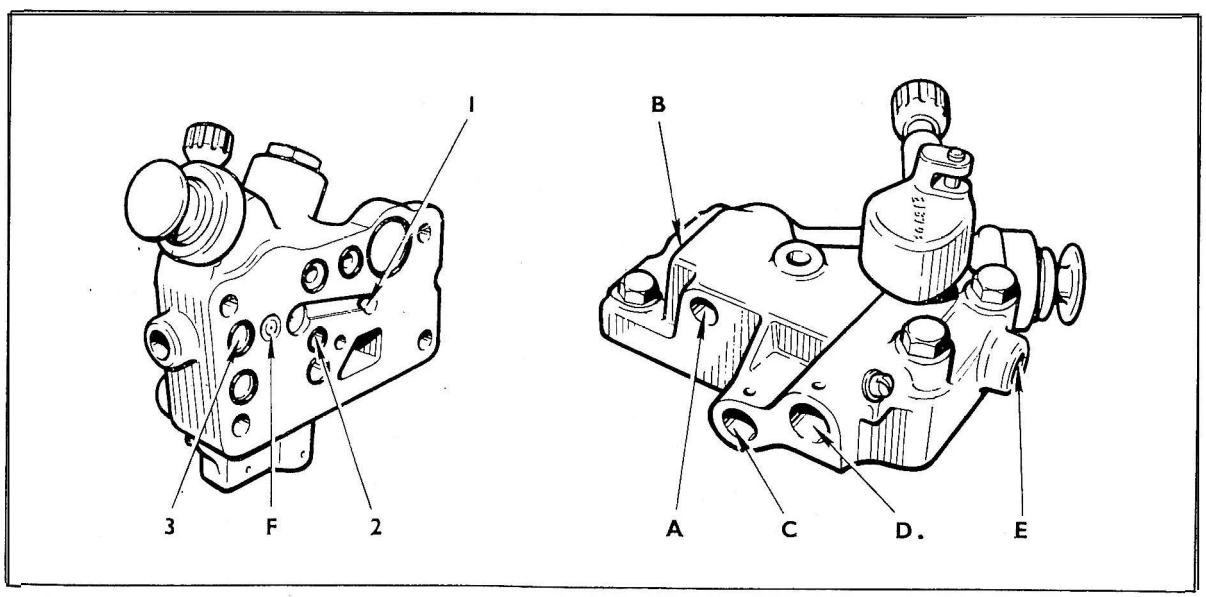

Fig. 49
Auxiliary Service Control Plug Removal

PLUG A

Move' the auxiliary service control valve spool to the outer position, feed three or four $\frac{7}{16}$ in. (11.11 mm.) balls into hole marked " 1 " on Fig. 49 then insert a screwdriver into hole " 1 " and lever against the rear face of the balls to force the plug out of its location.

PLUG B

Remove the plug from hole A as detailed above, insert one $\frac{7}{16}$ in. (11.11 mm.) ball through hole **A,** on to inner face of plug B, and lever out the plug.

PLUG C

Feed twelve $\frac{1}{4}$ in. (6.35 mm.) balls into hole " 2 " and lever the plug out.

PLUG D

This plug is drilled and tapped No. 6–32 NC and a screw with this size of thread may be inserted and gripped with a pair of pliers to effect removal. Alternatively the plug may be dislodged by lightly tapping it as it has the flow control valve spring located behind the plug.

PLUG E

This is also drilled and tapped No. 6–32 NC and may be removed with a screw and pliers in a similar manner to plug ' D.' Alternatively insert one $\frac{7}{16}$ in. (11.11 mm.) ball through hole " **3** " and then use a screwdriver behind the ball to lever the plug out.

PLUG F

This plug, in the base of the chest, is also drilled and tapped No. 6–32 NC and may be removed, with the aid of a screw and a pair of pliers, in a similar manner to plug ' D.'

HYDRAULIC PRESSURE RELIEF VALVE

To increase the efficiency of the hydraulic system a new pressure relief valve was introduced at Tractor Serial No. 08C955882. Whereas the previous valve was of the two stage unloading valve type, i.e., once the valve was lifted off its seat it would remain unseated until the pressure dropped to approximately 300 lb./sq. in. (21.09 kg./sq. cm.), the current valve is a conventional relief valve and will reseat after only a very small drop in pressure.

When operating loaders and. other similar equipment, the valve is frequently lifted off its seat due to shock loadings transmitted through the hydraulic system during the raising cycle. Previously this meant moving the hydraulic control lever down the quadrant to neutralise the system or slowing down the engine to allow the pressure to drop and the valve to reseat before the lifting cycle could be continued. The new valve reseats almost as soon as it is unseated thus obviating this complaint, as the pressure will only drop slightly and allow the system to continue raising as required.

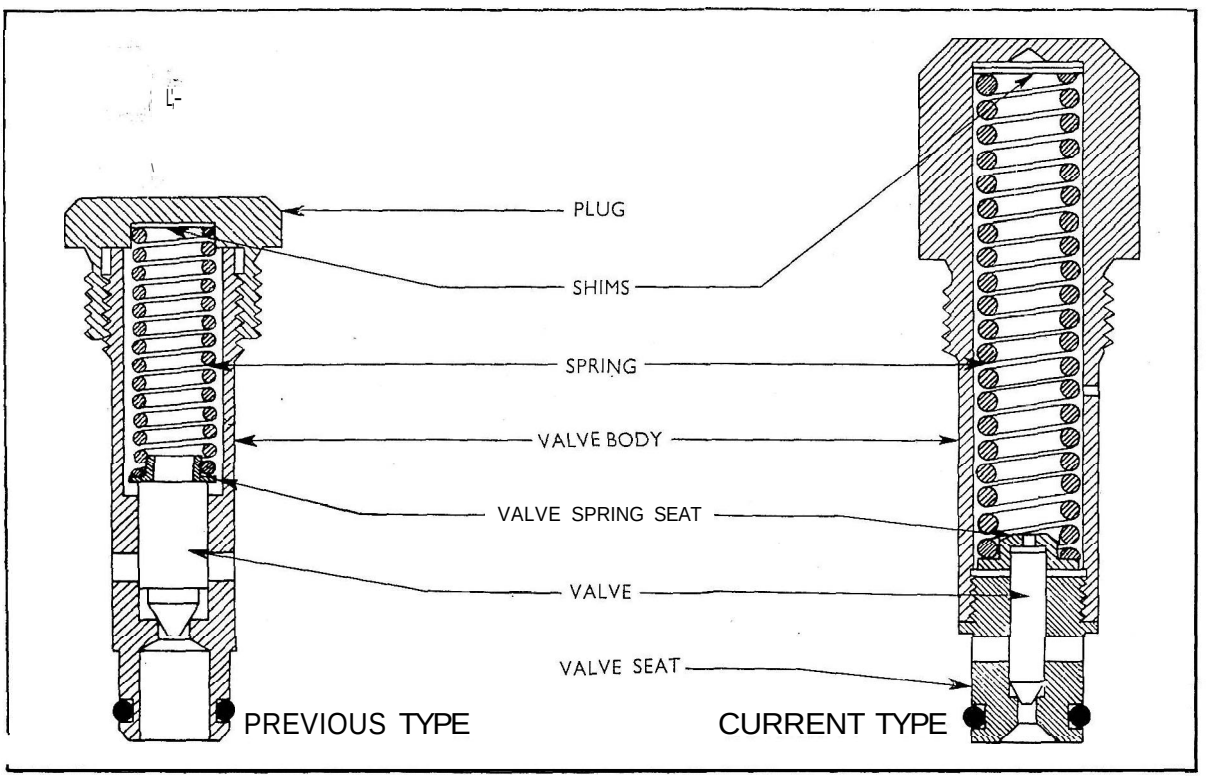

Fig. 50
Pressure Relief Valve

As can be seen from Fig. 50 the construction of the new valve varies considerably from the previous type and, with the exception of the spring adjusting shims, individual components are not interchangeable between current and previous valves. The current valve assembly may, however, be fitted as a complete unit to tractors carrying out loader work, or using heavy implements where the relief valve will prove beneficial.

The correct setting for the relief valve is as before, 2,450–2,500 lb./sq. in. (172.24–175.77 kg./sq. cm.). Care should be taken when setting the valve that shims are not added to the extent that the spring becomes solid. As mentioned previously, with the current valve there will only be a slight drop in pressure when the valve lifts and it will be found when checking the pressure relief valve setting that as the screw-down tap of the testing equipment is closed the gauge will rise to a pressure slightly above the setting, and then drop slightly when the valve lifts.

HYDRAULIC PUMP

Shortly after the above changes to the pressure relief valve changes were made to the hydraulic pump in that new front and rear cover plates were introduced. They differ from those previously fitted in the "run" of the 'O' sealing ring groove. The 'O' type sealing ring was also changed, the new 'O' ring being slightly larger in diameter than the previous part.

The bearing blocks were also modified by removal of the "run-out" slots and a common block is now used at both front and rear of the pump where previously a different type of block was fitted in each location. The new bearing blocks may be fitted to a previous type pump providing that the previous and new type are not mixed, i.e. front and rear bearing blocks must be of the same type.

The new front and rear cover plates may be fitted to a previous type pump provided that the correct 'O' rings are also used.

The complete pump assembly is interchangeable with that fitted to previous Super Major tractors.

NEW SUPER MAJOR HYDRAULICS

With the hydraulic system fitted to previous Suprr Major tractors, Qualitrol was effective only as long as the implement draft was sufficient to produce a compressive forte in the top link. Certain implements working at shallow depth were sufficiently heavy at the rear end to cancel out the draft forces from the soil and produce tension in the top link with the result that changes in draft were not corrected bp the hydraulics.

This disability has now been overcome by modifying the hydraulic assembly, particularly around the main control spring area, so that Qualitrol is now effective with all implements, under all conditions, irrespective of whether the implement produces compression or tension in the top link.

The hydraulic oil flow is unchanged apart from the addition of a " rate of implement drop " control which involves the introduction of a variable restrictor in the exhaust oil passage of the ram cylinder. The ram cylinder becomes a new part as the drilling from the front of the cylinder to the exhaust passage for the drop control restrictor makes it unsuitable for use with the previous Super Major hydraulics. The valves and other ram cylinder components are identical with those previously used, whilst the pressure relief valve is identical to that introduced in April 1963, described in the previous section.

HYDRAULIC PUMP

The hydraulic pump is driven from a gear on the power take-off extension shaft and, therefore, its maximum output is affected by any change in the speed of the shaft. With the introduction of the New Super Major the ratio of engine to P.T.O. speed was increased i.e., the P.T.O. shaft now revolves slower for any given engine speed. Therefore to maintain the hydraulic pump output at the same level as on previous Majors the number of teeth on the pump driving gear has been changed from *33* to 34 and on the driven gear from 21 to 18.

LINKAGE MODIFICATIONS

Most of the detailed parts of the internal linkage have been re-designed and are not interchangeable with those used in previous Super Major hydraulics. It will therefore be necessary to ensure that the

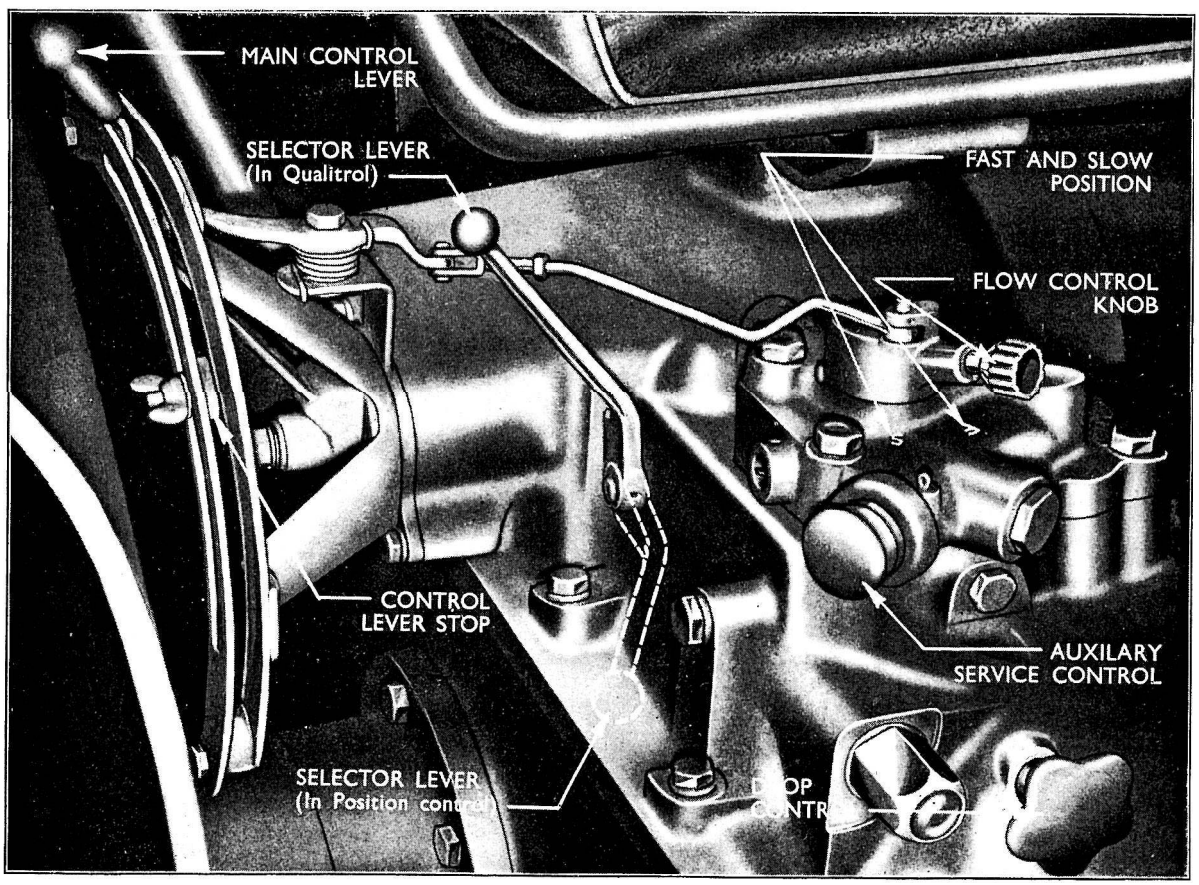

Fig. 51
Hydraulic Controls

correct parts are selected and fitted when overhauling the new hydraulic top cover assembly.

The main control spring, which is now double acting, is fitted between two spring seats, the forward one of which is positioned over, and locates against, the qualitrol plunger at the forward end of the spring chamber in the top cover. The rear seat locates in a threaded retainer nut which screws into the internally threaded outer end of the spring chamber.

The yoke, as on previous Super Major hydraulics, passes through the main control spring and screws into the qualitrol plunger but it now slides inside the retainer nut instead of directly in the housing.

To minimise free play in the spring and bouncing of the implement in the transport position the ram arm has been modified and has a machined thrust face on its rear surface. This face contacts the qualitrol plunger when in the fully raised position, eliminating free play in the spring components. The position control cam profile on the ram arm has been modified to suit the latest position control parts and under no circumstances must current and previous parts be mixed.

As the ram arm is now in contact with the qualitrol plunger when the lift arms are fully raised, the position at which the ram piston contacts the knock-off pin in the actuating lever and moves the control valve into the neutral position is now more critical than on previous assemblies. The pin has therefore been made eccentric and adjustable, being secured to the actuating lever with a self-locking nut (see Fig. 52). The adjustment of this eccentric is covered under the heading "Setting The Hydraulic Linkage."

To facilitate adjustment of the position control linkage the position control arm and block have been modified and the rod now passes through the arm and block below the spring where it is more accessible than on the previous hydraulics where it was located above the spring.

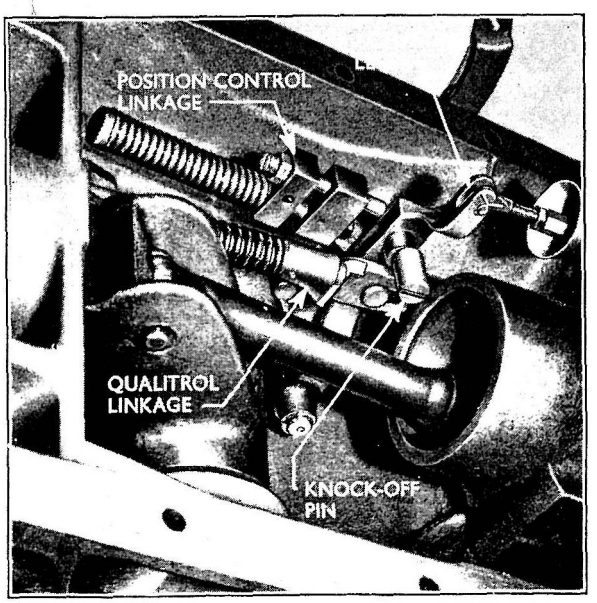

Fig. 52
Internal Hydraulic Linkage

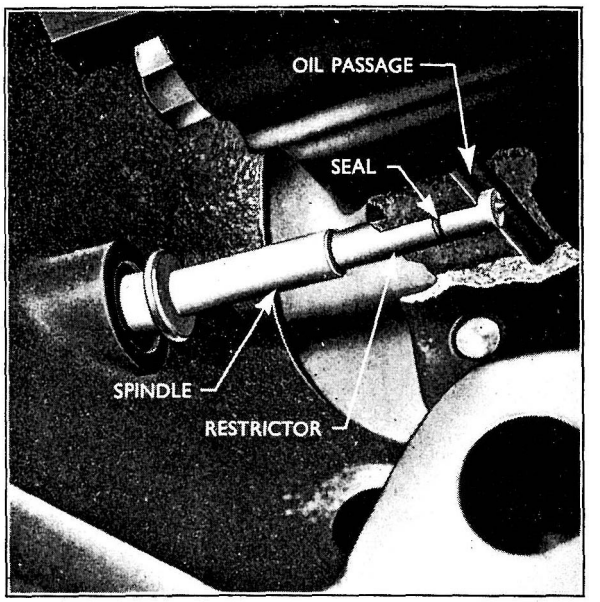

Fig. 53
Drop Control Restrictor

The re-arrangement of the position control linkage has made it desirable to extend the length of the Position Control/Qualitrol selector lever and a new, longer lever is now fitted at this point.

The new piston knock-off pin and the modified position control linkage has necessitated a new control valve actuating lever. A new control lever cross-shaft has also been introduced which may be identified from the previous shaft by the larger throw of the eccentric section.

To prevent operators from connecting the top link direct to the yoke, and thus risking damage to the internal components of the hydraulics by over-compression of the main control spring, the rocker has been modified and now fits inside the yoke.

DROP CONTROL

When the control lever of the previous hydraulics is placed in a lowering position the rate of implement drop is dependent upon the amount of rearward movement of the control valve and this in turn is governed by the position the main control lever is placed within the lowering section of the quadrant, i.e. the further the control valve is moved to the rear the greater the number of oil exhaust holes uncovered in the control valve bush.

If the control lever is placed so far down the quadrant that the rate of implement drop is too great, then slight movement of the lever in an upward direction will move the control valve forward thus shutting off some of the exhaust holes and slowing down the speed of drop.

With the new hydraulics the rate of drop cannot be controlled in this manner, particularly when a heavy

implement is fitted, as tension in the top link also affects the control valve movement in the following manner :—

When the lift arms are in the fully raised position the ram arm holds the qualitrol plunger firmly against the inside rear face of the cover and compresses the main control spring in a rearward direction. If the control lever is now placed in a lowering position on the quadrant and the lift arms begin to drop the ram arm will move away from the qualitrol plunger, the main control spring will expand and push the plunger forward thus opening up a gap between the plunger and the lift cover.

All implements produce tension in the top link when they are clear of the ground and the geometry of the linkage is such that this tension increases as the implement drops. Because of the gap which now exists between the qualitrol plunger and the cover the increasing tension in the top link tends to draw the qualitrol linkage rearwards thus allowing the control valve spring to push the control valve fully rearwards and open up the maximum number of exhaust holes.

Without some form of additional control a heavy implement would, under these circumstances, fall rapidly to the ground with the risk of consequential damage to the implement. The drop control fitted to the new hydraulics is designed to obviate this possibility by providing a variable restrictor in the exhaust oil passage of the ram cylinder.

The restrictor takes the form of a plunger which, as it is pushed inwards by a control knob located on the front of the top cover, progressively closes the exhaust passage (see Fig. 53). The control knob has a threaded spindle which screws into a corresponding threaded hole in the cover and its inner end contacts the end of the restrictor plunger.

Control is effected by screwing the knob into, or out of, the cover but there is no direct connection between the control and the restrictor, i.e. as the control knob is screwed into the cover it pushes the restrictor further into the exhaust passage but the restrictor is returned by oil pressure in the exhaust passage when the control knob is screwed out.

It will be necessary, therefore, for the operator to adjust the position of the control knob before commencing work in accordance with the rate of drop he requires with the particular implement he is using. The recommended procedure is to begin with the control knob fully in and then to screw the knob outwards until a satisfactory rate of drop is achieved.

HYDRAULIC OPERATION

Qualitrol

As previously stated, any implement when it is raised clear of the ground produces a tension in the top link. With light implements such as cultivators and one, two or three furrow ploughs this tension turns into compression when the implement is in the ground and the tractor is moving forward.

When tail heavy implements such as large reversible ploughs or four furrow ploughs, and even when three furrow ploughs are operated at shallow depths, the weight of the implement overcomes the draft force from the soil and the top link remains in tension at all times.

The new hydraulics cater for these variations as explained in the following sections.

Light Implements—Lowering into Work using Qualitrol (Fig. *54)*

With the selector lever ' A ' in the upward position, downward movement of the main control lever ' B ' moves the top of the actuating lever ' C ' forward pivoting about the qualitrol fork and allowing the control valve spring ' D ' to move the control valve ' E ' into the lowering position.

Lowering stops when the implement draft compresses the main control spring ' F ' in a forward direction a sufficient amount to overcome the pressure of the control valve spring and move the control valve into a neutral position.

Hydraulic Operation when Implement Draft is sufficient to produce Compression in Top Link

(a) Increased Draft (Fig. *55)*

When working in Qualitrol an increase in draft at the implement will compress the main control spring ' F ' in a forward direction thus moving the control valve actuating lever ' C ' forward, overcoming the pressure of the control valve spring ' D ' and moving the control valve ' E ' into the raising position.

As the implement is raised the draft force and hence the pressure on the main control spring decreases to the original amount and the control valve spring will then move the control valve into a neutral position.

(b) Decreased Draft

A decrease in draft at the implement will reduce the compression of the main control spring ' F ' and hence the pressure on the actuating lever ' C ' thus allowing the control valve spring ' D ' to push the control valve ' E ' into the lowering position.

As the implement runs deeper the draft will increase to its original amount and the control valve will again be returned to the neutral position.

Heavy Implements—Lowering into Work using Qualitrol

The following action occurs when the implement always produces tension in the top link.

Downward movement of control lever ' B ' moves the top of the actuating lever ' C ' forward, pivoting about the qualitrol fork and allowing the control valve spring ' D ' to move the control valve ' E ' into the lowering position.

As the implement descends the tension in the top link increases, compressing the main control spring ' F ' against the spring rear seat ' G.' At the same time the forward pressure on the actuating lever is reduced and the control valve spring is then able to move the control valve further into the lowering position thus increasing the rate of drop.

As explained under " Drop Control " this rate should be adjusted when the particular implement is first mounted on the linkage.

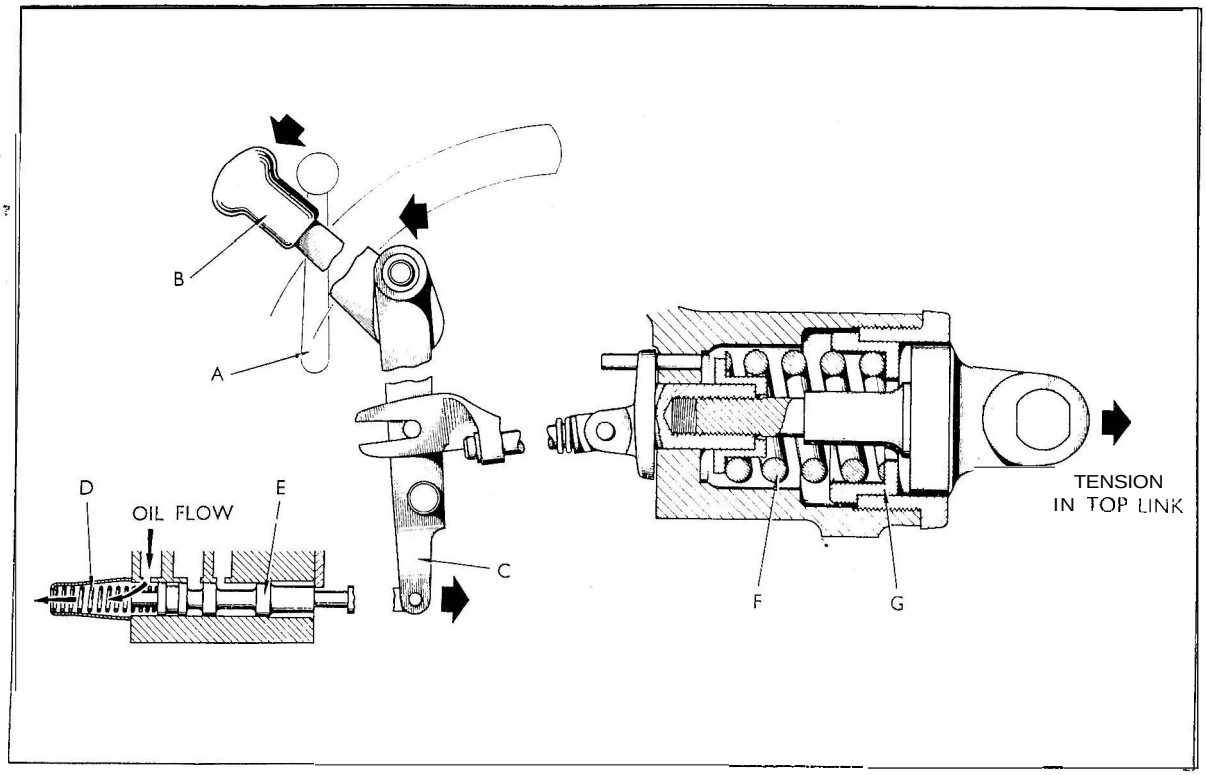

Fig. 54
Qualitrol—Lowering Into Work

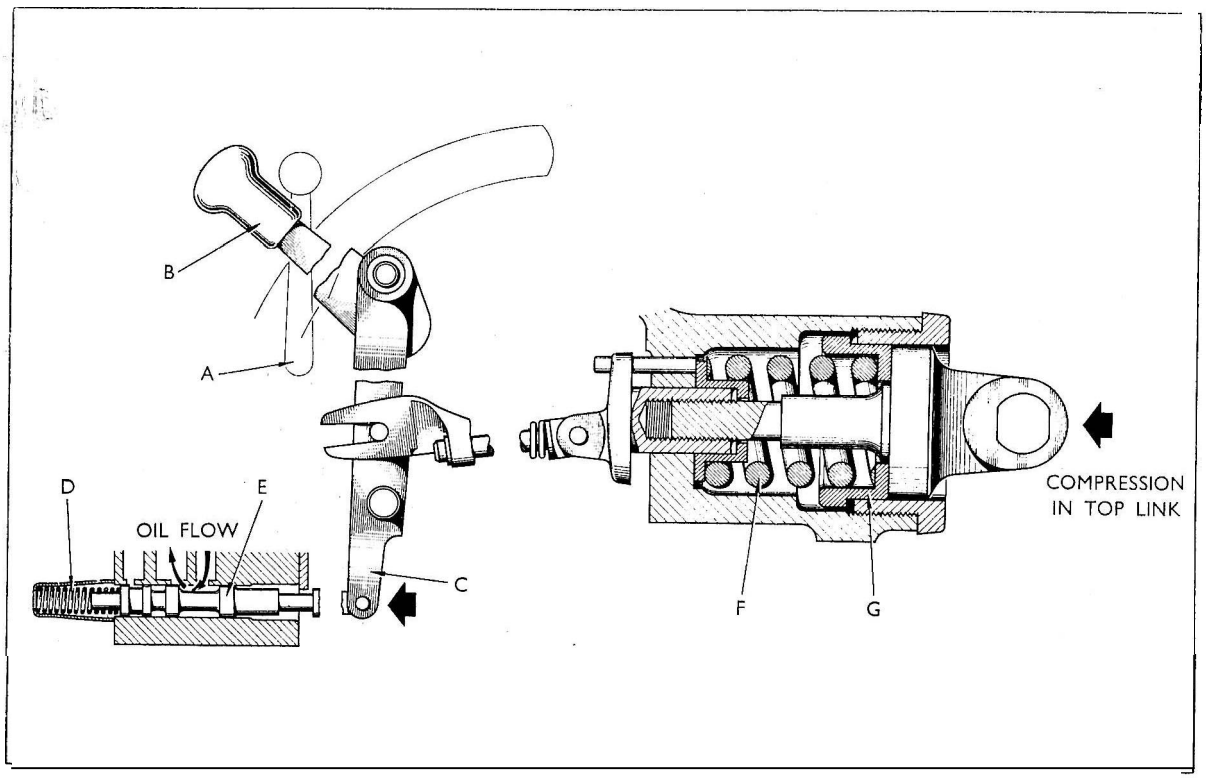

Fig. 55
Qualitrol—Raising In Work Due to Increase in Top Link Compression

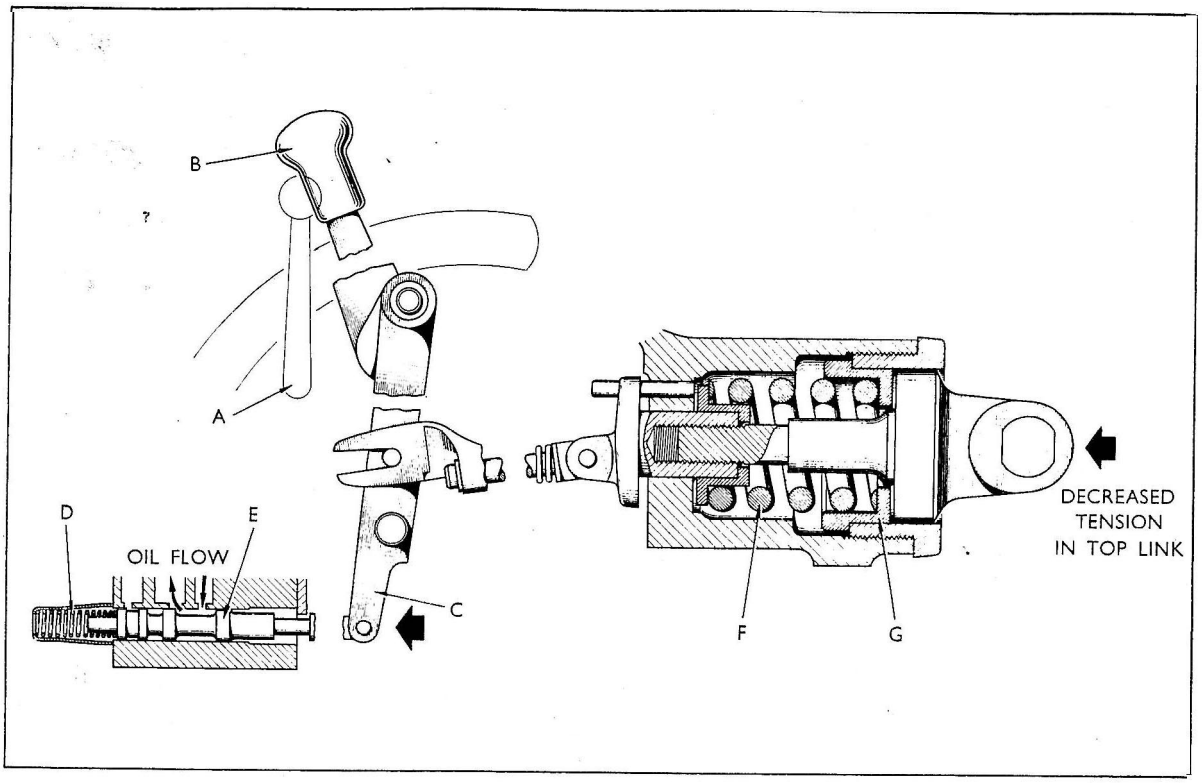

Fig. 56
Qualitrol—Raising In Work Due to Decrease in Top Link Tension

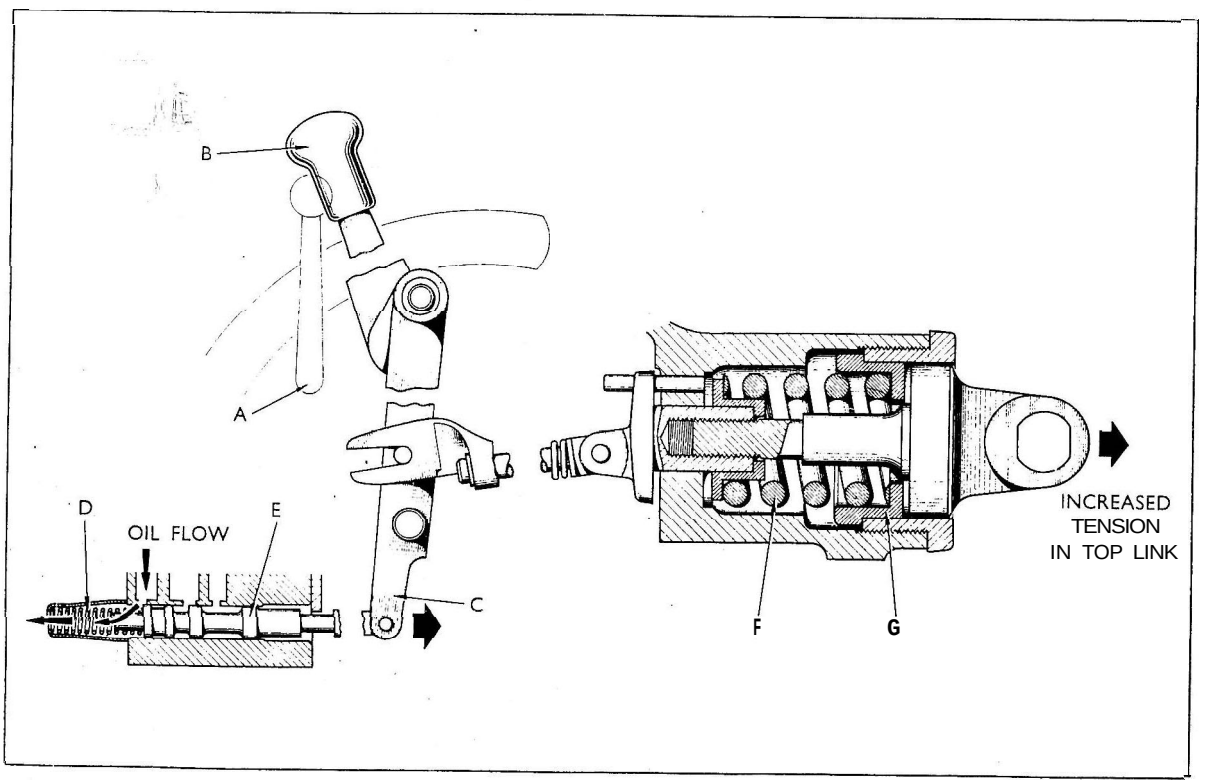

Fig. 57
Qualitrol—Lowering In Work Due to Increase in Top Link Tension

Lowering stops when the implement draft reduces the tension in the top link a sufficient amount for the main control spring to push the qualitrol plunger and hence the actuating lever forward, overcoming the rearward pressure of the control valve spring and moving the control valve into the neutral position.

Hydraulic Operation when Implement Draft is insufficient to produce Compression in the Top Link

When the implement draft is constant but is insufficient to overcome the weight of the implement the top link will be in tension and the main control spring compressed rearward against spring seat 'G.'

(a) Increased Draft (Fig. 56)

An increase in draft will now produce a **decrease** in tension in the top link allowing the main control spring 'F' to expand in a forward direction thus pushing the qualitrol linkage and actuating lever 'C' forward, moving the control valve 'E' into the raising position.

As the implement is raised the draft will decrease but the tension in the top link will **increase.** The qualitrol linkage will, therefore, be pulled rearwards away from the actuating lever, compressing the main control spring until the original draft is obtained. The control valve spring will then move the control valve into the neutral position.

(b) Decreased Draft (Fig. 57)

A decrease in draft will produce an **increase** in tension in the top link and the qualitrol linkage will be drawn rearwards away from the actuating lever, increasing the rearward compression of the main control spring and allowing the control valve spring to move the control valve into the lowering position. As the implement runs deeper the draft will increase until such time as the original draft is obtained.

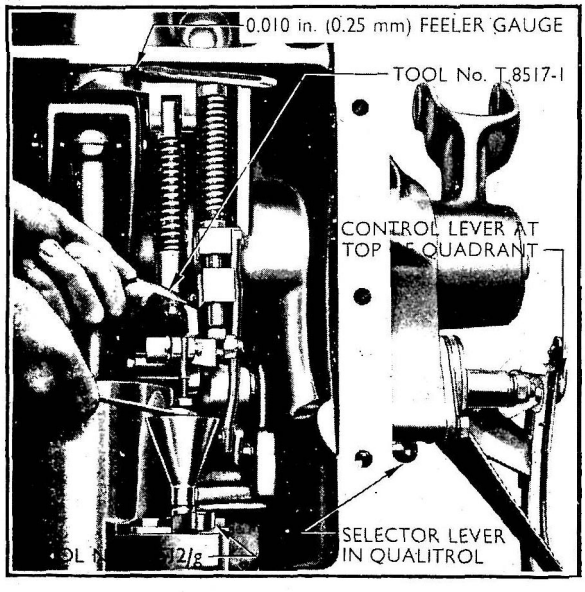

Fig. 58
Qualitrol Linkage Adjustment

Tension in the top link will decrease and the main control spring will then expand in a forward direction thus moving the qualitrol linkage and actuating lever forward and the control valve into the neutral position.

SETTING THE HYDRAULIC LINKAGE

The setting of the new hydraulic linkage differs from that necessary with the previous hydraulics and careful note should be made of the following procedure :—

Main Control Spring

To set the main control spring initially, first screw in the yoke until all free play is eliminated and then unscrew to the nearest position at which the pin holes in the yoke are horizontal. To obtain the correct setting it is necessary to carry out the functional check (see page 48).

Qualitrol Setting (Fig. 58)

1. Place the selector lever in qualitrol, i.e. upward position.

2. Insert a 0.010 in. (0.25 mm.) feeler blade between the qualitrol plunger and the rear inner face of the top cover.

3. Screw in the main control spring yoke fully to pull the qualitrol plunger against the housing and move the lift arms to the fully raised position so that the machined face on the rear of the ram arm contacts the qualitrol plunger, pushing it rearwards and trapping the feeler blade between the plunger and the cover.

4. Place the main control lever at the top of the quadrant, i.e. beyond the normal top stop.

5. Slacken the locknut on the position control rod and screw the rod fully rearwards, away from the control valve actuating lever.

6. Locate the thicker end of slip gauge, Tool No. T.8512/g, marked "Position Control," between the rear face of the ram cylinder housing and the adjacent shoulder of the control valve.

NOTE.—This gauge is double-ended and was used for setting the qualitrol and position control linkage of previous Super Major hydraulics. The "Qualitrol" end of the gauge is not used with the new hydraulics.

7. With slip gauge T.8512/g still in position check that there is a gap of 0.2 in. (5.08 mm.) between the front face of the qualitrol fork and the retaining circlip on the qualitrol rod.

A new gauge, Tool No. T.8517-1, has been produced to facilitate the checking of this gap. If necessary adjust the length of the control valve turnbuckle to obtain the correct gap.

Piston Knock-off Pin Setting

As previously described this pin is eccentric and must be so positioned that it is contacted by the piston when the lift arms reach the fully raised position. To set the pin proceed as follows :—

1. Remove the ram cylinder safety valve.

2. With gauge T.8517–1 and the 0.010 in. feeler blade in position and the lift arms fully raised, as when setting the qualitrol adjustment detailed above, slacken the locknut on the piston knock-off pin, and use a screwdriver to rotate the pin so that the smallest portion of the eccentric is adjacent to the piston bore in the ram cylinder housing.

3. Pass a length of suitably curved or flexible rod through the ram cylinder safety valve hole and force the piston fully rearwards, ensuring that the piston rod is correctly located in the centre of the piston.

4. Rotate the eccentric stop pin so that it contacts the piston and secure in this position by means of the locknut.

5. Refit the safety valve and sealing washer then remove the gauge and feeler blade.

6. Reset the main control spring yoke to its initial position.

Position Control Setting (Fig. 59)

This adjustment should only be carried out after the preceding checks and adjustments have been made.

I. Place the selector lever in the downward position and the control lever at the bottom of the quadrant.

2. Using Tool No. T.8517 set the lift arms in the lowered position.

3. Check the gap between the rear face of the ram cylinder housing and the adjacent shoulder on the control valve, using the thicker, "Position Control," end of slip gauge T.8512/g. Adjust the gap by screwing the rod into, or out of, the position control block as required. Tighten the locknut and recheck the setting.

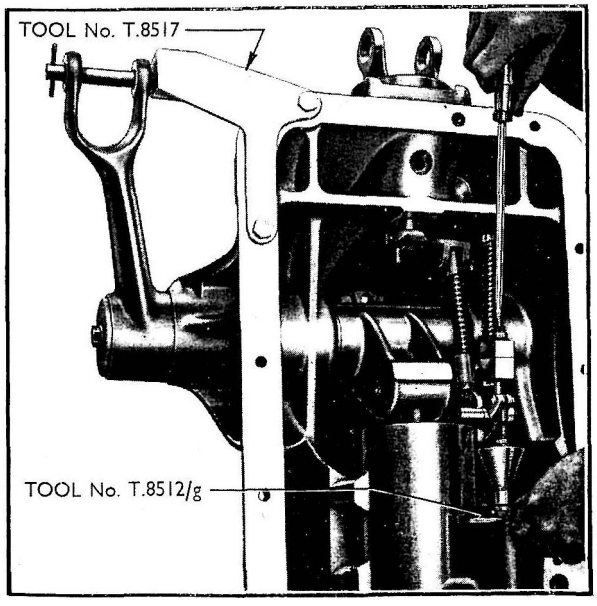

Fig. 59
Position Control Linkage Adjustment

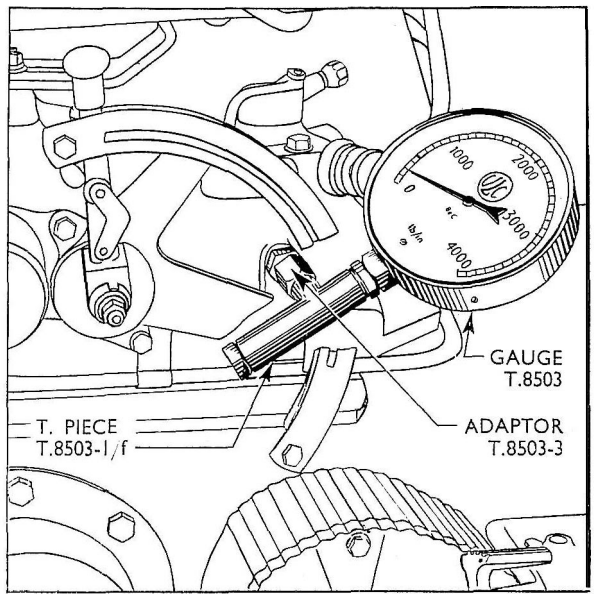

Fig. 60
Checking Eccentric Knock-Off Pin Setting

Functional Check

Assemble weights of 1,500 lbs. (681 kg.), or a suitable implement, to the lower links, start the engine and set it to run at 1,600 r.p.m.

With the selector lever in the Qualitrol position, move the main control lever up the quadrant to beyond the top stop and ensure that the piston moves the control valve into neutral when the lift arms reach the fully raised position.

An easy way of checking that this is happening satisfactorily is to fit a pressure gauge into the pressure testing point as shown in Fig. 60. Before commencing to lift the weight the pressure in the system will be in the region of 150–200 lb./sq. in. (10.55–14.06 kg./sq. cm.). As the load is raised the pressure will rise, and then, provided that the knock-off pin is correctly adjusted, as the lift arms reach the fully raised position the pressure will drop to its original level. If it does not do so it will be necessary to remove the lift cover and readjust the eccentric stop pin.

With the lift arms in the fully raised position check the number of height corrections that occur in a two minute period.

This can vary, but, bearing in mind the service age of the tractor, the weight supported, the oil temperature, etc., the acceptable maximum should not exceed approximately 30.

Move the main control lever to the bottom of the quadrant and then slowly move the lever upwards until a raise occurs. Move the control lever 1 in. (25.4 mm.) downwards from this point and check that the lift arms drop to the lowered position. With the control lever still at this position apply a compressive force of 250 lbs. (113.5 kg.) to the qualitrol yoke. This should produce a raise if the system is operating correctly.

To facilitate this test an extension, Tool No.

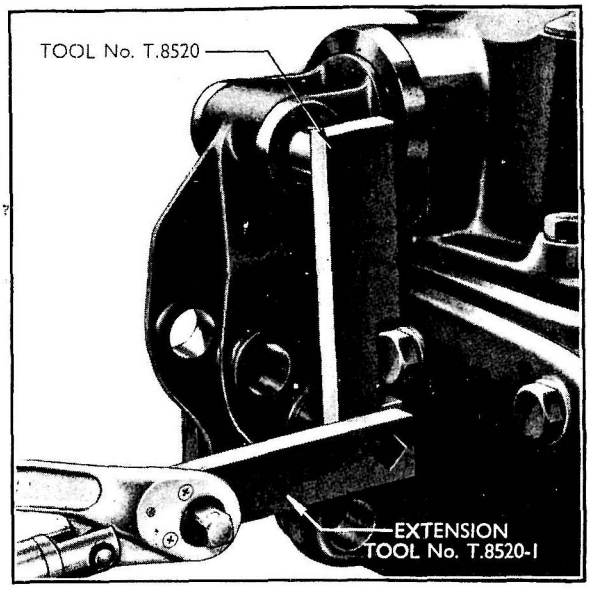

Fig. 61
Checking Main Control Spring Setting

T.8520–1, has been produced for use with the existing Main Control Spring Pre-load Tool No. T.8520, and a suitable torque wrench. This extension must be assembled at right-angles to the arm of the existing tool, connection being made to the square hole in the arm (see Fig. 61). The torque wrench is then applied to the outer end of the extension and an upward force of 80 lbs. ft. (11.06 kg.m.) applied. The leverage provided by the tool and extension multiplies this force to the required 250 lbs. (113.5 kg.) direct thrust on the spring.

OVERHAUL PROCEDURE

As the components of the new hydraulic lift cover assembly vary only in detail from those used on the previous hydraulics, dismantling procedure will be virtually identical with that previously detailed. The following information covers those items which are completely new in design :—

To Remove Drop Control and Restrictor

1. Remove the hydraulic lift top cover assembly from the tractor.
2. Remove the auxiliary service valve unit.
3. Remove the ram cylinder assembly.
4. Withdraw the restrictor from the front of the ram cylinder.
5. Drive out the pin securing the control knob to the drop control restrictor spindle.
6. Screw the spindle inwards through the top cover.
7. Remove and discard the seal from the counterbore in the front of the housing and the seal on the restrictor.

To Replace Drop Control and Restrictor

1. Fit a new seal to the front of the housing. This seal should be fitted with the lip facing outwards as its main function is to prevent ingress of dirt into the hydraulics and the rear transmission housing.
2. Screw the spindle into position from inside the top cover housing.
3. Locate the control knob on the spindle and secure in position with the appropriate pin.

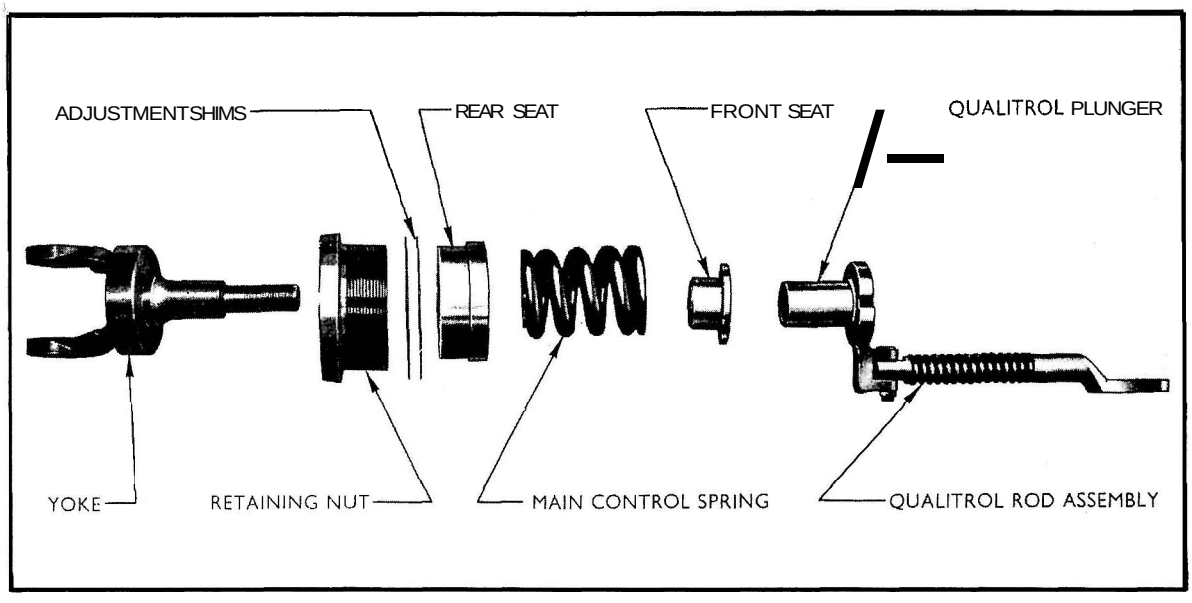

Fig. 62
Qualitrol Linkage Exploded

4. Fit a new 'O' sealing ring to the restrictor and then locate the restrictor in its drilling in the ram cylinder housing. The restrictor must be fitted with its domed end facing outwards and the end with the small central, cone facing into the housing.

5. Replace the ram cylinder assembly.

6. Replace the auxiliary service valve assembly.

7. Replace the top cover assembly on the tractor.

To Remove Main Control Spring and Spring Seats

It is unlikely that the spring, inner spring seat, or outer spring seat will require attention in service but should it be necessary to change any of these components the following procedure should be followed :

1. Disconnect the top link rocker from the yoke.

2. Unscrew and remove the yoke.

3. Using special adaptor, Tool No. T.8521, unscrew the spring rear seat retaining nut and remove the adjusting shims from the nut.

4. Withdraw the rear seat, spring and inner seat.

5. Clean, inspect and renew as necessary.

To Replace Main Control Spring and Spring Seats

1. Replace the spring inner seat and pack the spring chamber with approximately $\frac{1}{3}$ lb. (150 gms.) of general purpose grease.

2. Assemble the spring and rear seat.

3. If new parts have been fitted it will be necessary to check the gap between the spring rear seat retaining nut and the lift housing and to then select the appropriate thickness of shims in the following manner :

(*a*) Assemble the retaining nut without shims and tighten until the spring is just gripped between the seats.

(*b*) Using feeler blades check the gap between the nut and the housing then remove the nut and fit the same thickness of shim.

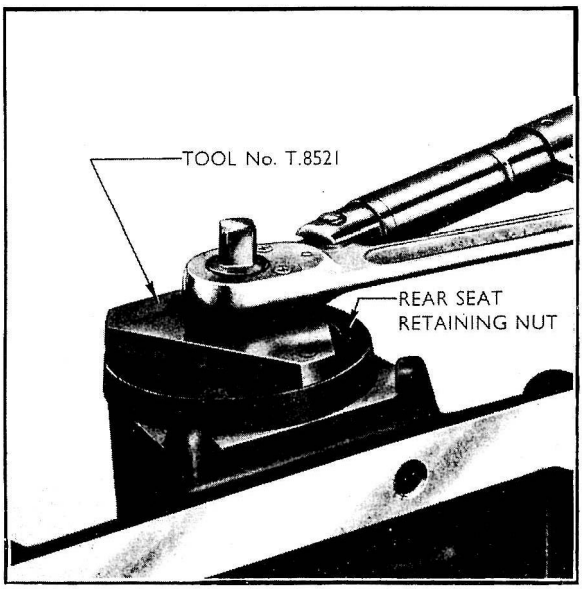

Fig. *63*

Replacing Main Control Spring Rear Seat Retaining Nut

NOTE.—Each shim has a thickness of 0.008 to 0.012 in. (0.020 to 0.031 mm.) and in selecting the number to be used the total thickness must be as near as possible **below** the measured gap. It must not be greater than the gap.

(c) Replace the nut and shims and tighten to a torque of 80/85 lb. ft. (11.06/11.74 kg.m.) using special adaptor Tool No. T.8521, and a suitable torque wrench (see Fig. 63).

4. Screw in the yoke until the spring is just nipped (i.e. until free horizontal movement of the yoke is just eliminated) then unscrew to the nearest position at which the pin holes in the yoke are horizontal.

5. Reconnect the top link rocker to the yoke.