Foothills Antique Tractor and Engine Club

TECH TIPS

POLARIZING YOUR GENERATOR

Did you know that your generator can deliver current for either a positive or a negative ground system? Well, it can. And you can make it work in either mode. But, if yours produces current with the wrong polarity, you might have to make costly repairs.

A generator produces current by passing conductors (the armature windings) through a magnetic field. The magnetic field is produced by electromagnets that surround the armature. Basically, the field portion of your generator consists of copper windings around iron core, often referred to as the pole shoes.

The voltage and current delivered by your generator is determined by the strength of the magnetic field and the speed at which the generator is running. But, the polarity of the current is determined by the polarity of the pole shoes, or the direction of the magnetic flux or field, which is determined by the direction of current through the field windings.

OK, so you install a generator and take great care to connect the wires properly so you won't burn out your ammeter or cutout relay. What could go wrong if the wires are hooked up right?

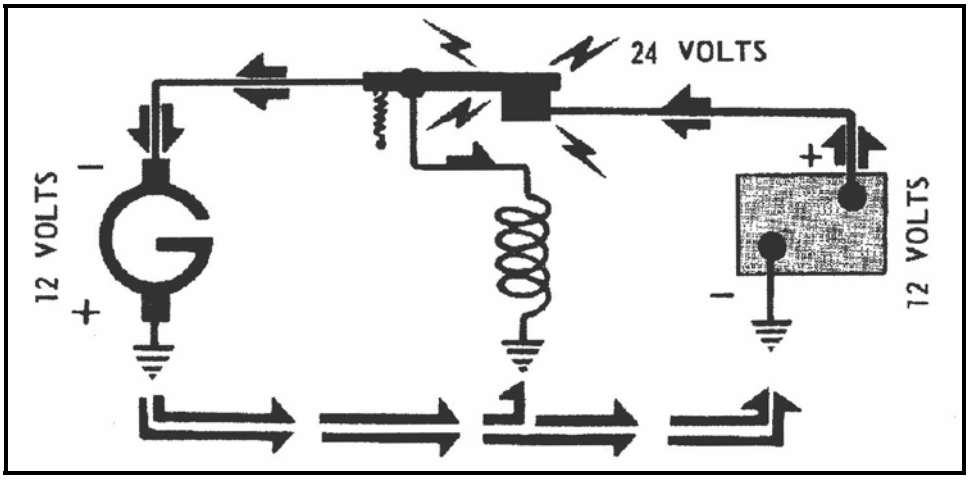

Figure 13-1

Plenty! When you start your engine, the generator will start delivering current. Since the generator is still isolated from the electrical system by the voltage regulator or cutout relay at this point, it will start producing current based on the polarity of the pole shoes. As soon as it begins producing current, some of that current will be directed to the field windings to strengthen the magnetic flux.

Appendix 13, page 2 of 2

According to John Deere's *Fundamentals of Service* manual, if the generator polarity is reversed, the generator will build up voltage and close the cutout relay points. This put the generator in series with the battery, and their voltages are added together. This high voltage across the points (about twice the battery voltage) can cause high current and enough heat to weld the points together.

This damage does not happen immediately. The instant the points close, the voltage is about the same on both sides of the relay coil, so very little current flows, and spring tension reopens the points. But, generator voltage will again close the points, and the cycle will repeat at a rapid rate. Heat and arcing will finally weld the points together.

When the points weld, the battery and generator are connected at all times. The low resistance of the generator allows the battery to continue to discharge through the generator. The high current can create enough heat to burn the armature.

How do you control the polarity of the pole shoes? The polarity is determined by the direction of the last current through the field windings. Since even a very small current can polarize the shoes, never assume the generator is properly polarized. *You must polarize the generator every time it is disconnected or serviced.*

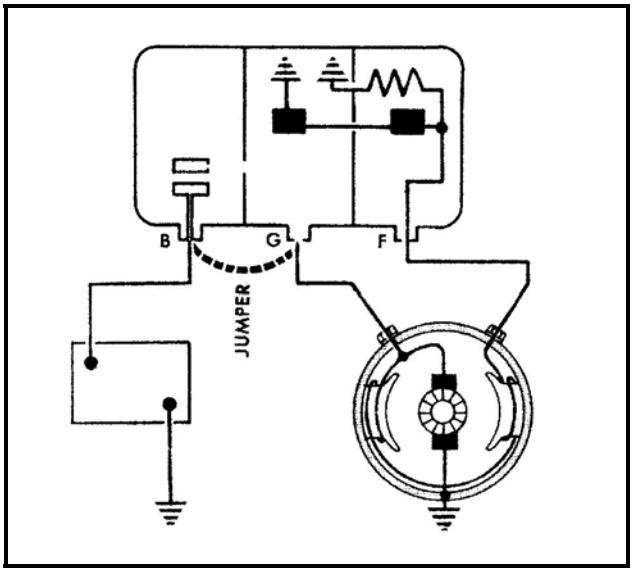

Figure 13-2

To polarize the generator, simply make a short jumper wire to short between the **battery** (b or **bat) and generator** (g or **gen)** lugs on the cutout relay or voltage regulator. Only a split-second or a spark is required, so simply tap your jumper wire onto the lugs and pull them right back off.

Reference: John Deere Fundamentals of Service (FOS): Electrical Systems, Fifth Edition. 1984. Chapter 4, Charging Systems. John Deere Service Training, Dept F, John Deere Road, Moline, IL 61265

http://web.utk.edu/~tprather/FoothillsTractorClub/TechTips/PolarizeGenerator.html

Engine Lubrication System

Oil is forced under pressure through the oil filter by a pump. Filtered oil is then forced through oil lines to the main bearings, and through drilled leads in the crankshaft to connecting rod bearings. The overflow of oil, which is forced out around connecting rod bearings, is caught by the revolving crankshaft and thrown to cylinder walls, bathing governor gears, camshaft, and other parts in the crankcase in oil. Oil is pumped to the tappet case to lubricate and cool valve stems, rocker arms and tappets. And an oil pressure gauge providing the real time reading is in plain view for the operator (from the John Deere Model "H" Restoration Guide, Chapter 3).

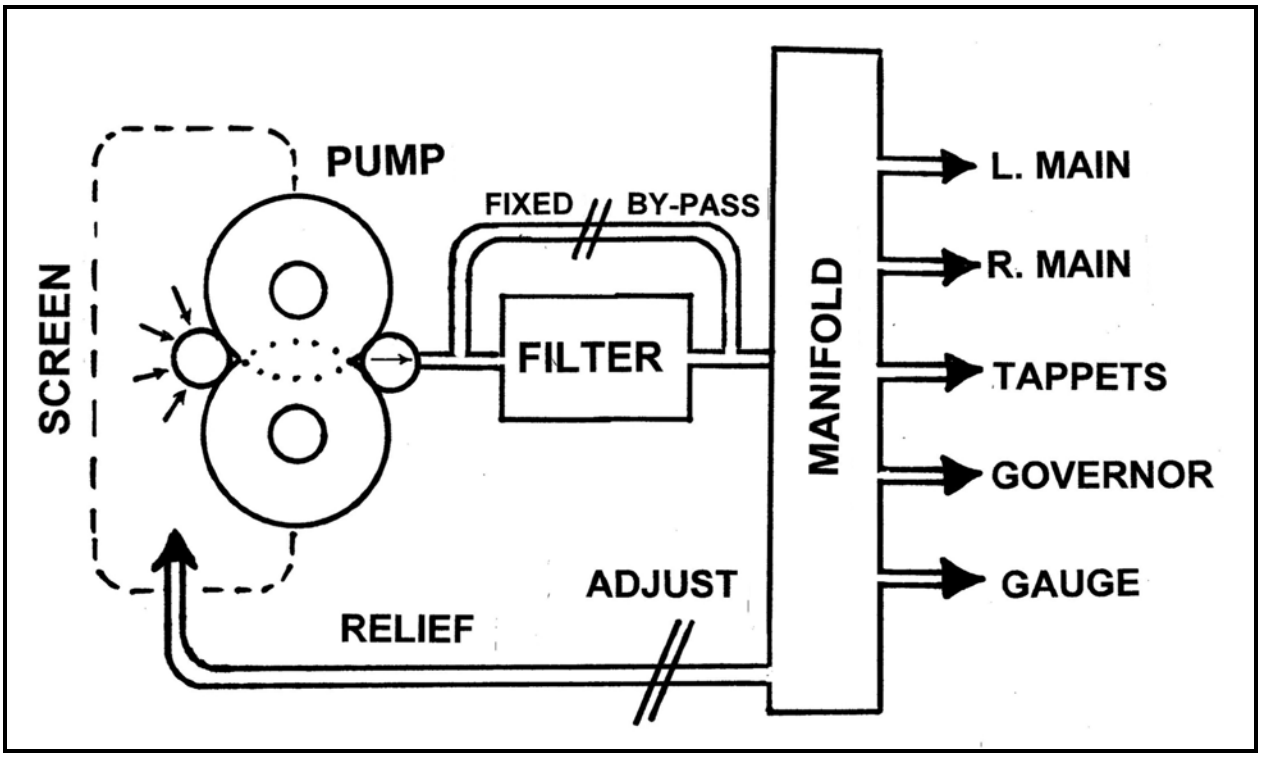

Figure 14-1, Schematic Diagram of Engine Oiling

John Deere two-cylinder tractors will employ a system similar to the schematic. The pump consists of a gear pair that simply and positively "grabs oil" in the gear teeth traveling around the perimeter of the gears and forces that oil through the filter and on to various destinations. Above we have the Model "H" schematic, others will be similar in principle, differing in design (leaf springs, spring-loaded plungers, etc.). Oil pressure is user-adjustable, the adjustment method varies among models, but the concept is the same. Without regulation, the amount of oil being pumped will vary with temperature and oil viscosity. At initial start-up when more oil is being pumped, excess oil is returned to the pump inlet section (Relief). This regulating scheme is a function of a relief spring held against a port of the manifold (Adjustment) under tension of another spring and adjustment screw. The end result is to be an oil pressure reading within a well-defined range of from 10 to 15 PSI (between M and H on the gauge). The pump is situated at the bottom of the crankcase. Oil drawn into the pump is screened, and oil pumped out to distant points of the engine returns to the crankcase. Note also an avenue for oil to bypass the filter. There is found another spring-tensioned gate, a "safety" in event the oil filter becomes totally blocked – allowing unfiltered oil to be pumped throughout the engine.

Figure 14-2 is a peek down into a JD-H crankcase, oil pump & pipes installed, but no crankshaft. Take note of the oil filter body and oil filter body head – nice and square in appearance.

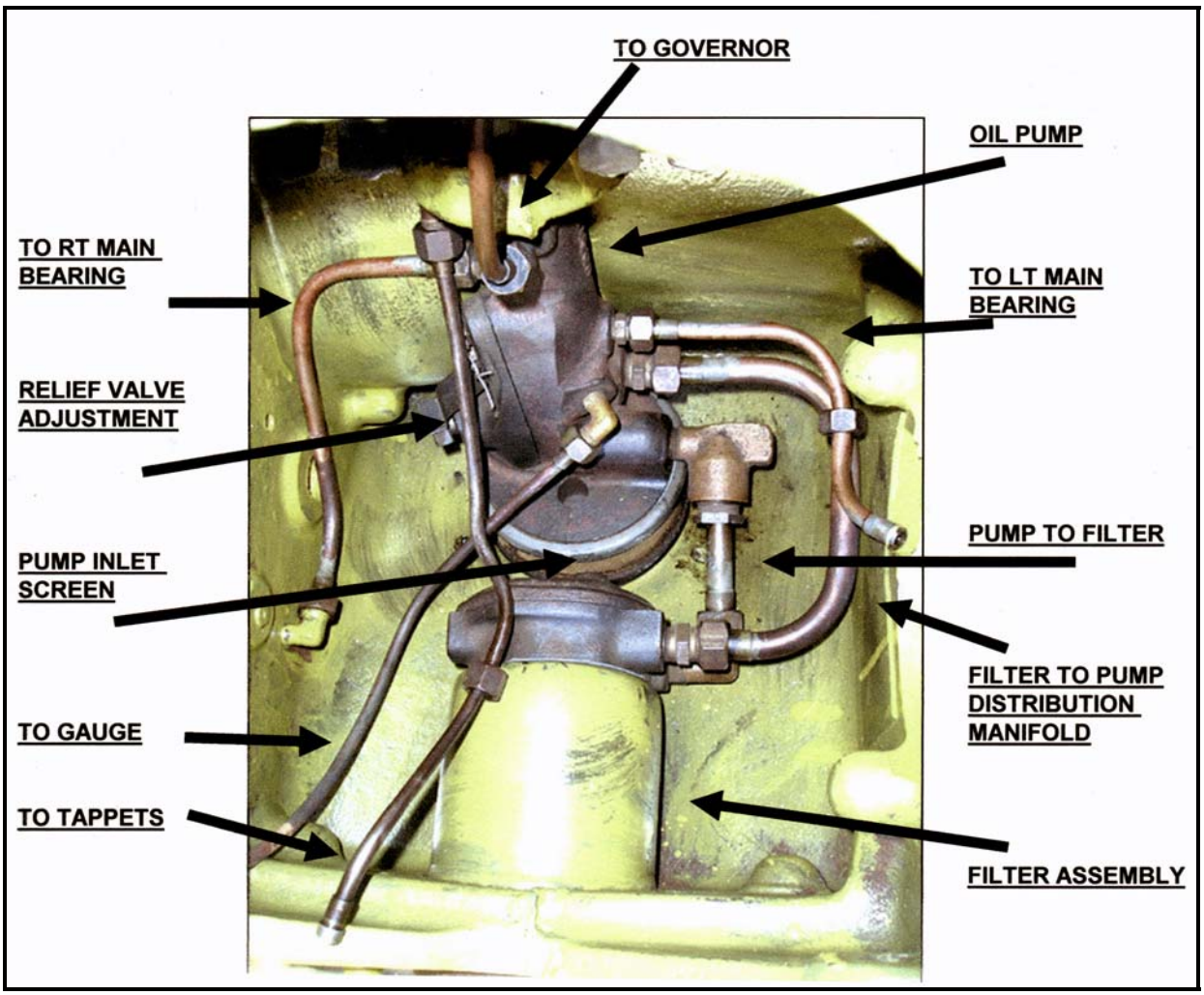

Figure 14-2. Oil Pump with Pipes

Pressure Regulation – Figure 14-3A illustrates the regulating part of the engine lubricating system. The adjust screw, when turned INWARD (CW) will exert pressure on the thin-looking relief spring by means of (unseen) a small coil spring – to increase oil pressure. The relief spring is pressed up against the sixth port of the manifold. Only when pressure exceeds a preset amount will the relief spring be pushed back to allow Relief oil (Fig 14-1) to return to the pump's input side.

For nearly all two-cylinder John Deere tractors, the oil pressure specification of from 10 to 15 PSI (between M & H) – this regardless of engine temperature or speed; even at slow idle! At least 10 PSI to ensure oil reaches intended destinations. And oil pressure shouldn't exceed 15 PSI because where pressure is too high, excessive amounts of oil are pumped, and this "excess oil" can cause an engine to use oil – the rings cannot scrape the excess oil away fast enough!

Figure 14-3 (A&B). John Deere "H" Oil Pressure Regulator Unit (left), and on the right is the "Author's Choice" of oil for Two-Cylinders Tractors

Engine Oil – Many ask what oil is best suited for the John Deere Model "H" and similar vintage two-cylinder tractors. At this writing, Figure 14-3B represents the "author's choice" once the "break-in" period is concluded.

Pressure Regulation -- The Details -- In Figures 14-4 (A&B), you see illustrated the detail of the relief spring, of the small pilot or "pip" as some tend to call it, the coil spring and also the adjustment screw. For some models, this adjustment can be accessed from outside the main case – usually by removal of a pipe plug. For some models, this adjustment is accessible only by removing the crankcase cover. In any case, instructions will generally tell one to stop the engine before making any such adjustment. You should consult your tractor's service manual before adjusting.

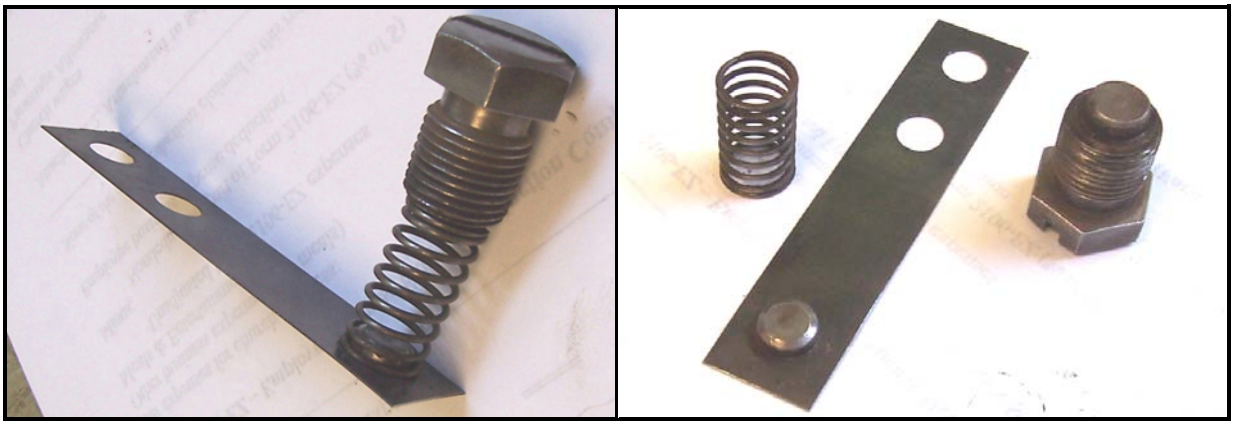

Fig 14-4 (A&B), Relief Spring Set; flat relief spring with pilot, coil spring and adjustment screw

A System of Interacting Pressures -- Looking back at the schematic on page 1 for a moment, many factors come into play when setting oil pressure. Each of the manifold outputs is designed for certain volume, and the individual calculated circuit resistances come into play to determine overall resistance to oil flow. This is much like having four or five hoses connected to one hose bib on the side of the house – if one bursts, all will lose pressure. If one is plugged up, the pressure increases for the rest. This system is much the same. So if an output is clogged, like the governor line on a "B" tractor for instance, pressure will rise. If your tractor has worn out main bearings allowing much of the oil to slide back into the crankcase prematurely, pressure will be lower. The bottom line here is that any rather sudden rise or fall in oil pressure should be taken as a signal that your engine's oiling system needs attention.

If You Have No History with The Tractor – A high or a low oil pressure reading will not tell you much. In this case, you must methodically test each engine oiling section to determine the cause for the "out-of-spec" reading, and take remedial action in order to protect the engine.

Fixed By-Pass for the Oil Filter -- As visualized in figure 14-1, and briefly stated in the paragraph below figure 14-1, The oil filter head contains a "spring-tensioned gate" relief valve. Figure 14-5A illustrates the spring contained in the cap section. In figure 14-5B, we see the leaf spring with its pilot; the valve port being just below the pilot. This valve operates under a fixed tension, and is designed to permit the system to continue to oil the engine long after the oil filter has become clogged. When this happens, of course, unfiltered oil is lubricating the engine.

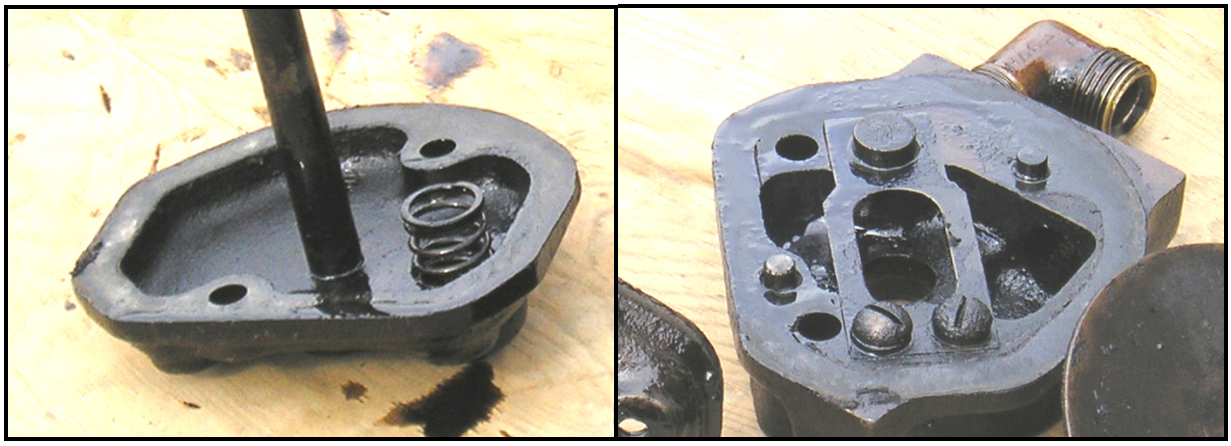

Figure 14-5 (A&B). Oil Filter Head, spring on left, relief spring & valve on right

Crushed Filter Body – Figure 14-6 -- Note the cave-in of the canister at the canister/filter head interface. This distortion, the drawing of the filter head too tightly into the filter body, was the result of applying excessive torque to the oil filter cap screw. Why? Men will apply added torque in attempts to stop oil leaking around the cap. The issue, however, is usually a hardened A519R filter cover gasket.

This tractor lost all oil pressure – because pumped oil escaped back into the crankcase without reaching the manifold, leaking out between filter body and filter head! The one single remedy is to renew the oil filter body (the canister); no easy task and special tooling is required! Consult your tractor's Service Manual. The lesson to be learned here is to renew the A519R oil filter cover gasket at least once per season. The most sound practice would be to renew this gasket with each oil filter change.

Fig 14-6. This oil filter body was removed from H-47511.

Finally, a peek down into the crankcase with the crankshaft installed reveals very limited access to the oil pump and its lines with only the C/C cover removed. The lesson here is to remove, and clean/overhaul both the oil pump and filter head assemblies when the crankcase is empty.

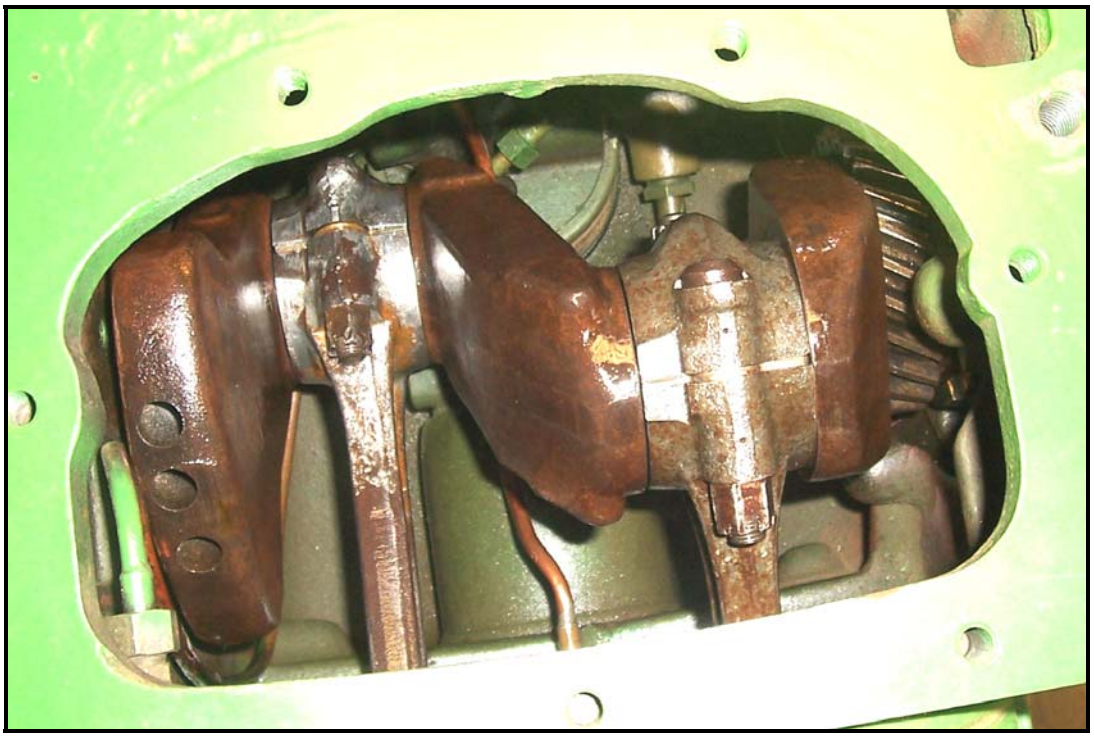

Fig. 14-7. Crankcase cover removed

Stories and Tales – I close with this section with words from others. From the annals of data I have viewed, I tell what others and I have found, or have heard of relating to either **low oil pressure** or **none at all** for Model "H" tractors. The format below is a Trouble-Shooting Guide. Some are from "victims of the experimentation of others"; before they realized they were victims! In your travels, continue to be aware that six or seven decades have passed since your tractor was built. This leaves it subject to the wiles of many so-called "brave" folks more than willing to tear into one of these gems with nothing to guide them. I caution that if one is spending the usual thousands dollars for a tractor, another $50 or $100 in manuals is a small price to pay for guidance!

1. Defective Oil Pressure Gauge. Check the gauge. If defective, replace it!

2. Sludge-filled Oil Pressure Sense Line. Disassemble and clean!

3. Improper Oil Regulator Adjustment. If no marked improvement is noted after adjustment, consider:

4. Sludged Oil Pump Intake Screen. Disassemble and clean!

5. Defective Relief Spring – One finding; the pilot (item # 39, PC304, page 3) became unattached to the relief spring (# 38) and was laying beside the H312R spring. This is equivalent to having a by-pass.

6. Wrong Pump Gasket -- New pump gasket (item # 28, PC304, page 3) was homemade – too thick – allowing "free" flow of oil within the pump. Oil "slips around" the pump gears.

7. Worn Pump – Inspect the idler and drive gear, the oil pump cover, and oil pump body for wear.

8. Damage Filter Can and Body Gasket – Inspect the top of filter head for damage caused by tightening nut on filter cover too tight. Pressure is lost due to leakage between the oil filter head and oil filter body.

9. Loose or Broken Oil Pipe -- One of the oil pipe fittings was loose; the nut had completely backed off and slid to the other end of the line. Once reconnected and tightened, pressure was restored.

10. Other Comments -- from the Gallery include the following:

10a. The rod-to-crankpin clearance was about 0.010 instead of the specified 0.001 – 0.003. And on this same tractor, the left-side main bearing found with 0.010 clearance instead of the specified 0.002 - .0004.

10b. I drained the crankcase and found an abundant amount of small seeds, somehow carried into the crankcase by some animal, blocking the pump's intake screen.

11. One hypothesizes -- the causes for poor oil pressure include a distorted or broken relief spring (38), missing pilot (39), or a broken spring (40). (See item numbers for PC304, page 3). A final such event would be that the adjust screw was backed all the way out and has fallen from position so that it cannot be restarted from outside the case.

12. One person tended to suggest -- that the John Deere "H" oil pressure-regulating screw may be adjusted while the engine is running. I rather imagine that fellow would be in for a shock as he stuck his long flat bladed screwdriver in only to have the crankshaft mangle the stuffing out of it! ++++

Appendix 15
Pan Seats

C1785 and D1796 Seats – The early unstyled (US) tractors (D & GP) carried first the C1785 pan seat, and then later on the D1796 seat – both having a pressed steel structure similar to the AD1606R. All three seats are interchangeable, however, the seat bolt may be peculiar to the seat part number. Both of the two earlier seats contained 24 holes arranged in two rows, with 13 holes in the upper row and 11 holes in the lower.

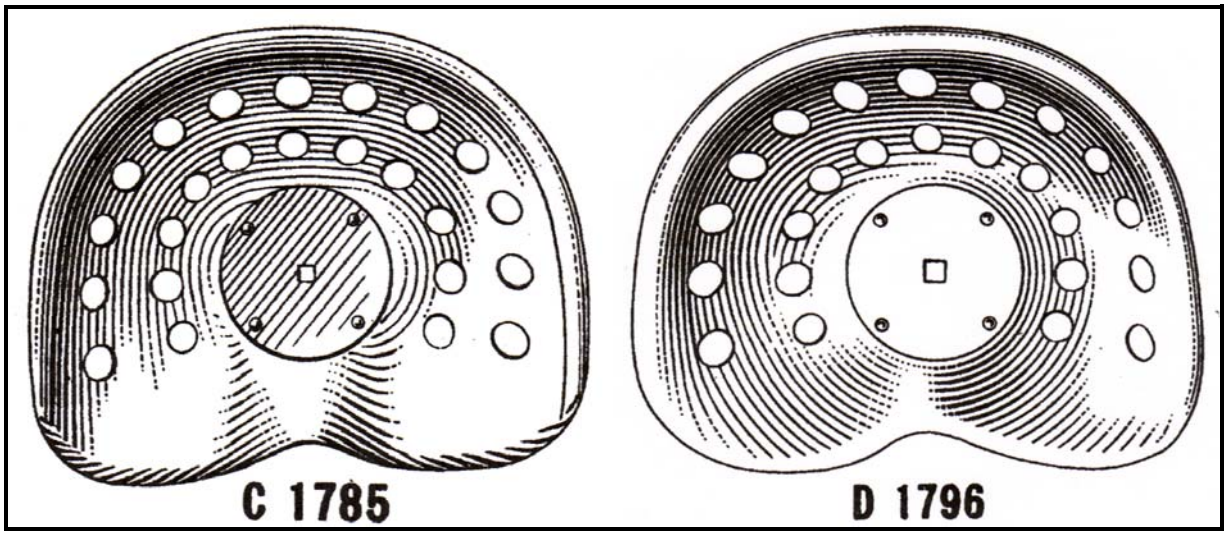

Figure 15-1

For the "D" tractors, we have C1785 seat from the beginning up through 109943 (end of 1931 production), and then the D1796 seat up through 130699 (end of 1936 production. For the GP Series tractors, C1785 was used on all GP Standard tractors and on GP Wide Tread from the beginning in 1929 until early into the 1932 production year, changing to the D1796 for 404810-up. D1796 was used on GP-Orchard tractors from Day 1 to the end.

D1796 was the factory-installed seat for the US-A & B tractors as they came into production. Indications are that AD1606 (9-hole) was used on the US-G tractor from day 1. As is always true for manufacturing concerns, inventory remnants of otherwise serviceable seats (C1785 & D1796) were

installed to exhaust supply, so it is within reason to see variance to these statements along the way.

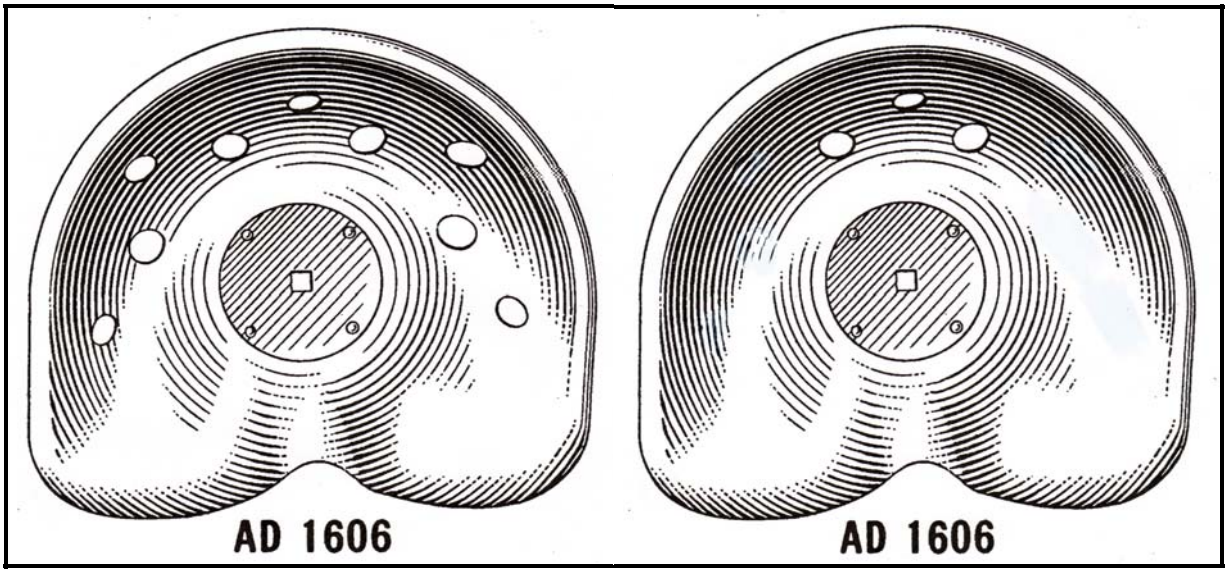

Figure 15-2

AD1606R Seat -- Per JR Hobbs, the AD1606R was first used on 1937 D tractors, and was adopted for use also on late US-A, & B tractors; most likely late in 1937 production. Models D, H, L & LA plus orchard & standard tractors used AD1606R seats for all years. Tractor owners often debate the number of holes to be found in the AD1606R pan seat for a given production year tractor. According to reliable sources which includes the Two-Cylinder Magazine, near-universal use of this seat was for all styled tractors equipped with a pan seat, but the number of holes changed over time! From the beginning, until some time in late 1941 production, the seat had 9 holes. Then it was changed to a 7-hole pattern that held through most of 1944 production. Beginning with 1945 you should expect to see 5 holes. It appears a 3-hole decision was implemented by late 1946, and continued into 1947 when this seat was phased out on A, B & G tractors. Widely used on later tractors, AD1606R remains available from Deere, but it comes with ZERO holes – even-though later parts catalogs show the seat with three! Comparing this trend from the 24-hole seats used during the early US tractor era makes the production use and evolution of pan seats an interesting observation! ++++

Appendix 16

Steel Washer Specifications, John Deere Model H Tractor

(Ref PC304 Parts Catalog)

Old No.	New No.	ID x OD x Thickness	Comments
24H 1R	24H1317	.422 x .750 x .018	
24H 39R	24H1290	.328 x .750 x .035	
24H 43R	24H1306	.406 x 1.00 x .035	
24H 72R	-none-	2.04 x 2.72 x .020	
24H 79R	24H1569	1.781 x 2.25 x .036	
24H 82R	24H1589	2.000 x 3.188 x 0.36	
24H 132R	24H1286	.281 x .500 x .063	
24H 143R	24H1136	.344 x .688 x .065	Zinc
24H 154R	24H1305	.406 x .812 x .065	
24H 155R	24H1299	.375 x 1.25 x .065	
24H 156R	24M7096	.413 x .709 x .063	200HV hardness
24H 169R	24H1325	.469 x .922 x .065	
24H 183R	24H1227	.531 x .812 x .060	
24H 205R	24H1375	.688 x 1.125 x .060	
24H 233R	24H1660	.891 x 1.375 x .060	
24H 234H	24H1660	" " "	
24H 234R	24H1660	" " "	
24H 239R	24H1431	.906 x 2.00 x .060	
24H 448R	24H448	.781 x 1.125 x .090	
24H 469A	24M7180	.512 x 1.457 x .118	200 HV hardness
24H 481R	24H1355	.578 x 1.125 x .120	
24H 482R	24H1211	.562 x 1.375 x .105	
24H 490R	24H1106	.688 x 1.750 x .134	
24H 496R	24H1392	.781 x 1.375 x .120	
24H 502R	24H1236	.812 x 2.00 x .149	
24H 553R	24M7180	.512 x 1.457 x .118	200 HV hardness
24H 560R	24H1236	.812 x 2.00 x .149	
24H 685R	24H1429	.906 x 1.75 x .194	
24H 845R	24H1281	.158 x .375 x .049	
24H 847R	24H1503	1.297 x 2.219 x .060	
24H 954R	24H1589	2.00 x 3.188 x .036	
24H 991R	24H1355	.578 x 1.125 x .120	
24H 992R	24H1211	.562 x 1.375 x .105	
24H 993R	24H1378	.688 x 1.469 x .134	
24H 994R	24H1392	.781 x 1.375 x .120	

Appendix 17, Page 1 of 3
Overhaul - Power Lift Unit

Reference Fig 17-1 -- shows an exploded view of the JD-H Power Lift. The principal parts are:

A - Operating Lever
B - Control Valve
C - By-Pass Valve
D - Valve Housing
E - Relief Valve
F - Pressure Adjusting Washer
G - Drop Speed Adjusting Screw
H - Discharge Cap
I - Remote Cylinder Hose
J - Check Valve
K - Control Arm
L - Cover
M - By-Pass Valve Detent Ball Assembly

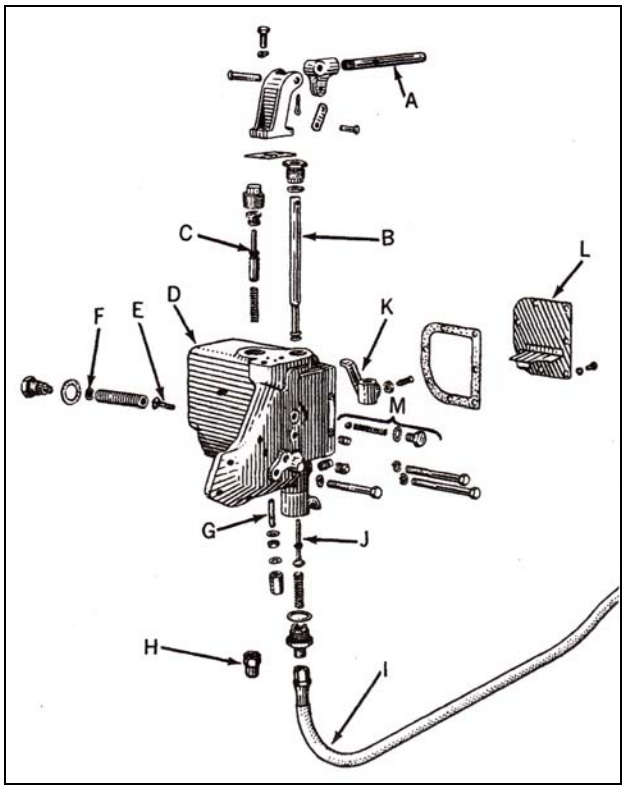

Fig 17-1 -- Housing Exploded

DISASSEMBLY

Control Valve.

Remove cover "A", Fig 17-3 from housing

Loosen yoke lock nut and remove lock screw "B" from control arm.

Loosen packing control arm nut and pull control valve up and out of housing.

Remove packing nut, and packing. Discard packing.

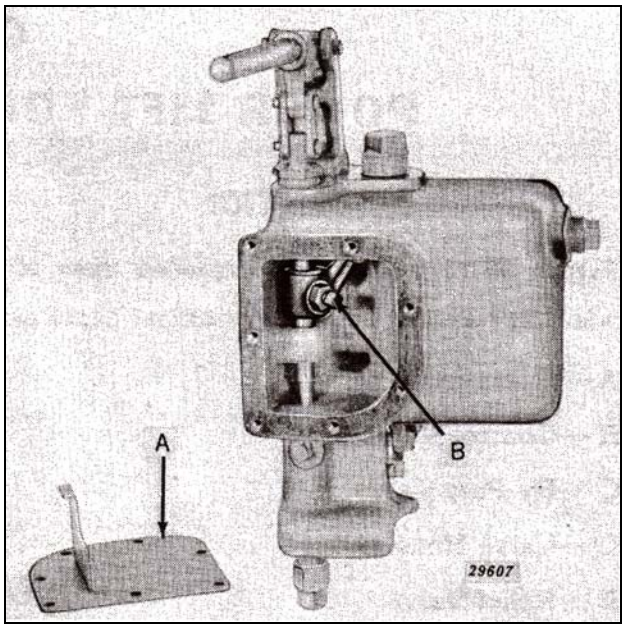

Fig 17-3 -- Control Arm Lock Screw

Relief Valve.

Remove relief valve "A", Fig 17-5. Use care not to lose pressure adjusting washers "B".

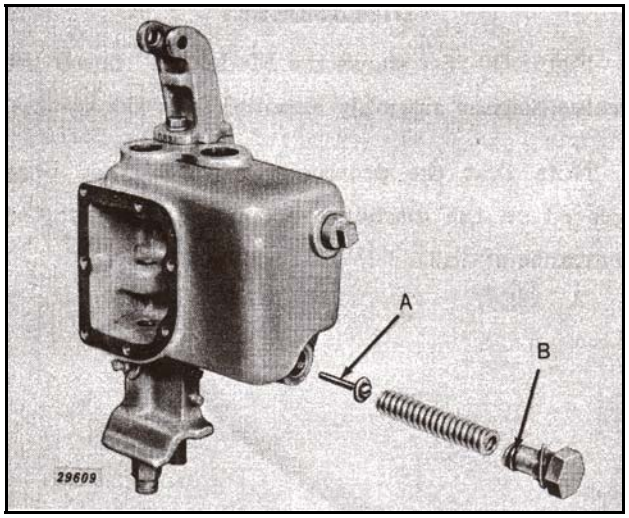

Fig 17-5 -- Relief Valve

By-Pass Valve.

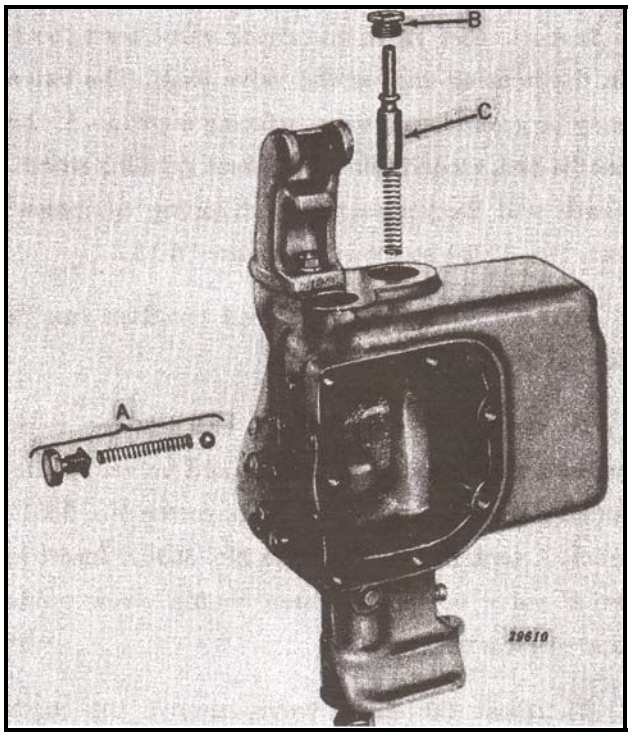

Fig 17-6 -- By-Pass Valve

Remove by-pass valve detent ball and spring assembly "A", Fig 17-6.

Remove retainer plug "B".

Remove by-pass valve "C" and spring.

Check Valve.

Remove check valve assembly "A", Fig 17-7.

Remove fast drop speed control screw assembly "B", Fig 17-7.

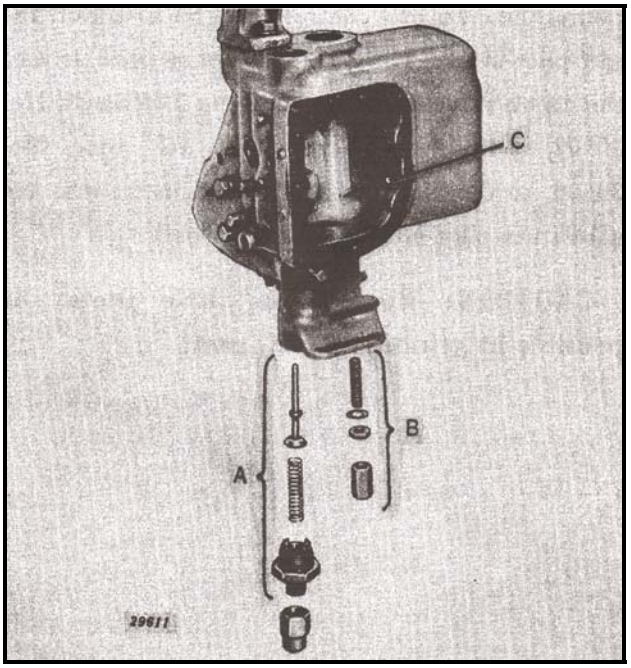

Fig 17-7 -- Check Valve

INSPECTION AND REPAIR

Wash all parts thoroughly with solvent. Blow out all passages.

Inspect valve housing for cracks, holes or other damage. Inspect hole at lower end of

by-pass valve passage "C", Fig 17-7 to be sure it is open. Check freedom of movement of by-pass valve in passage.

Inspect relief valve and check valve seats, both in the housing and on the valve itself. The valve may be ground on a valve re-facing machine. If the seat is bad, recondition it with seat grinding stones. Valves that are in fair condition may be lapped to their seats.

To reseat the relief valve, unscrew the relief valve screw, remove spring and valve. Using a "guided" stone, grind a new seat. This same technique is employed to recondition the check valve seat.

CAUTION - remove as little metal as possible in grinding a new seat.

ASSEMBLY

Make certain that all parts are clean. Use Fig 17-1 as a guide in assembly.

Coat relief valve "E," by-pass valve "C," control valve "B" and check valve "J" with oil before assembling.

Install relief valve "E," spring, adjusting washers "F" and retaining screw and gasket. Tighten screw securely, Fig 17-5.

Install by-pass valve spring, by-pass valve "C," and retainer spring, Fig 17-6.

Install control valve "B" and control arm. Tighten set screw in control arm securely and lock with jam nut. Use new packing on control valve, Fig 17-3.

Install by-pass valve detent ball assembly, Fig 17-6.

Install check valve assembly and fast drop speed control screw, Fig 17-7.

Renewing gasket, install cover "L", Fig 17-1.

Install all remaining plugs and screws.

CHECKING CRACKING PRESSURE

System Operating Pressure is 555 PSI. Relief valve cracking pressure of from 675 to 720 PSI is checked after unit is installed on the tractor. To do this, obtain a 3/8" pipe coupling and a 3/8" to 1/4" pipe reducer. See Fig 17-11.

Remove cylinder from end of hose and install gauge along with its fittings in its place.

Warm lift unit oil to 100°F. With engine at fast idle, move control lever down as far as it will go, and then to "raise".

Cracking pressure will register on the gauge, pressure maintained by closed check valve.

Adjust pressure with 24H1R washers, adding to increase - deleting to decrease.

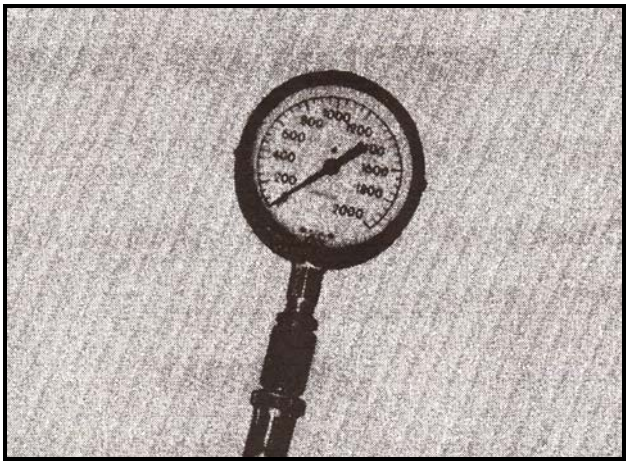

Fig 17-11 -- Gauge for Checking Pressure

Appendix 18, Page 1

Hydraulic Lift System Troubleshooting Chart

Lift Will Not Raise

Cause	Remedy
1. Overload	1. Examine and increase tension of the implement lifting spring or add booster spring to implements.
2. Too light an oil	2. Change to same weight as specified in instruction book for tractor crankcase.
3. Too heavy an oil	3. (same as # 2 above)
4. Not enough oil in lift	4. Fill to oil level hole
5. Relief valve leaking	5. Wash and/or grind valve to a complete seat or replace valve.
6. Yoke loose on control	6. Lock in place with set screw valve shaft
7. Yoke broken	7. Replace yoke
8. Power lift control handle not moved to lowest position before being raised	8. Force handle down against stop on power lift housing and then raise it.
9. Piston cup damage	9. Replace with new cup
10. Ball check valve in piston oil return passageway not sealing	10. See JD-H Service Guide, paragraph 6-4, Servicing Cylinders for "H" power lifts [Clean and Overhaul]
11. Piston connecting rod bent	11. Replace piston & rod
12. Engine at "part throttle"	12. Operate engine at full govern speed

Lift Will Not Start

1. Control shaft not pushed	1. Force valve operating handle down against stop on power lift housing and then raise it.
2. Yoke loose on control valve shaft	2. Tighten set screw
3. Yoke broken	3. Replace with new yoke

Appendix 18, Page 2

Lift Will Not Stay in Raised Position

Cause	Remedy
1. Damaged piston cup	1. Install new cup
2. Leaking check valve	2. Use valve lapping compound and grind valve to a better seat.
3. Oil leakage at the cylinder	3. See JD-H Service Guide, paragraph 6-4, Servicing Cylinders for "H" power lifts [Clean and Overhaul]

Power Lift Oil Overheating in Valve Housing

1. Using oil too light in	1. Change to correct weight of oil viscosity
2. Overloading power lift	2. Check implements as in Complaint # 1 above.
3. Scored pump gears	3. Replace with new parts
4. Failure of the by-pass valve to open fully	4. Remove valve through top filler plug after ball and spring detent are removed through side of valve housing and clean.

Oil Leakage into Crankcase

NOTE: Since the volume of oil in he valve housing changes according to the position of the lift, it is necessary to provide a breathing passageway to permit air to enter the power lift housing. When the lift is raised, air is expelled. The breather passageway is connected to the crankcase and therefore air entering the lift is filtered by the moss-type air cleaner used with the crankcase breathing system.

1. Too light a weight oil. This results in a foaming condition, and the foam is easily forced into the crankcase unnoticed.	1. Replace with proper weight oil
2. Overloading the lift unit	2. Overloading causes oil to operate at high temperature for a long period of time, resulting in overheating
3. Damaged oil seal on power lift pump	3. Replace the oil seal
4. Filling valve housing with oil when the lift is in the raised position - too much oil!	4. Oil level in the valve housing should be determined with the lift in the LOWERED position, so that all the oil in the system is in the valve housing.

Appendix 18, Page 3

Oil Leakage at Cylinder

Cause	Remedy
1. Cylinder installed upside down	1. End of cylinder marked "top" should be installed in the higher position (i.e., facing UP).
2. Arrows on the underside of cylinder	2. Arrows should be on the top side of the cylinder in order to take away any oil that seeps past piston.

Oil Leakage at Cylinder (Continued)

3. Oil leakage past ball check valve in piston	3. See JD-H Service Guide, paragraph 6-4, Servicing Cylinder for "H" Power Lifts. [Clean and Overhaul]
4. Damaged piston cup	4. Replace with new cup leather
5. Oil return plunger binding in bore of piston due to rust or oversized plunger, creating a drag greater than the plunger spring is capable of working against.	5. Replace plunger or remove rust spots with very fine emery cloth.
6. Broken Plunger	6. Replace with new plunger

Oil Leakage Through Ball Check Valve

1. Foreign matter under ball	1. Flush tap or disassembly and clean
2. Check ball, spring, and seat assembly installed backwards.	2. Replace with new assembly
3. Spring lodged under ball	3. Replace with new spring and thread into hole. Do not drive spring into place.

Oil Leakage When Removing Cylinder Hose

1. Engine in operation	1. Stop engine
2. Broken fittings	2. Replace fittings

By-Pass Valve Fails to Open

Lift will raise, but pump continues to labor. Control handle is forced up with full pump pressure - takes considerable force on the handle to move it to the lowered position.	The by-pass valve is not opening for one of two reasons: (1) Engine speed is too low, or (2) Valve passageway contaminated with foreign Material.