

## John Deere A and B tractors

### John Deere WW2 lease lend range --- five basic models D A B H and L

#### Important Notice

This document has been put together using motor trader service data sheets produced in 1945 and other information of unknown origin saved by my father as a reference.

All the information below is produced from information which was designed to aid skilled mechanics in a professional workshop, our aim is to make this available to people wishing to restore these vehicles, but please be aware that this document is by no means an instruction sheet or safe working procedure and we cannot be held responsible for any injury or damage whatever the cause.

These tractors were produced in America and shipped into the UK to help with the War effort in the early 1940s on a British / US Government lease lend arrangement, some were supplied on iron wheels, most were converted in the UK either on arrival or at a later date, some rear wheels were fabricated by local engineering company's, in the case of the model B the standard John Deere wheels were on 9" X 38" tyres but some were fabricated in the UK using 9" X 36" rims, the single front tyre of the model BN is quite rare, its a 7.50" X 10" which fits on a split rim.

These tractors are very simple to repair and maintain, you could almost change a clutch in the field, they are a flat twin petrol / paraffin engine, started by opening decompression taps, setting the choke on the carburettor itself, with the three position fuel tap at off, drain the carburettor bowl of any paraffin with a handy brass tap, turn on the petrol, set the hand throttle about half open and pull the flywheel round until it fires up, once running, close the decompression taps taking care not to grab the spark plugs instead, they are only 2" away, set the choke to about 50% until the engine warms up, once hot, open the chock and also switch from petrol to paraffin and away you go.

The main gear stick has 3 forward gears and on reverse, there is a smaller leaver for high / low ratio, close to a similar lever to engage the power take off at the rear.

The clutch is hand operated, when you disengage the clutch, if you push the leaver further it applies a brake to the right side flywheel.

There are two footbrakes, one for each rear wheel, make sure you press them together if you want to stop in a straight line! They are designed like this so one wheel can be braked easily for tight turns in row crop work.

There is a basic implement lift, operated by a peddle to the rear of the foot plate, one hit for up and a second hit for down.

The ignition system is by a magneto, usually made by Wyco, most are fitted with a stop switch, though in practice it is often better to turn off the fuel which uses most of the paraffin in the carburettor which saves draining it all over the floor before the next start.

Below is a table of model information taken from a 1945 document, it shows the different variations, basically the Model B is a scaled down version of the Model A.

MODEL	FEATURES	ENGINE INFO
<u>A</u>	THREE WHEELED TRACTOR DESIGN WITH TWIN CLOSE COUPLED FRONT WHEELS	2 CYLINDER FLAT 3824.6CC
<u>AN</u>	THREE WHEELED TRACTOR DESIGN WITH SINGLE FRONT WHEEL	2 CYLINDER FLAT 3824.6CC
<u>AW</u>	THREE WHEELED TRACTOR DESIGN WITH SINGLE FRONT WHEEL AND TELESCOPIC FRONT AXLE FOR EXTRA GROUND CLEARANCE	2 CYLINDER FLAT 3824.6CC
<u>ANH</u>	THREE WHEELED TRACTOR DESIGN WITH TWIN CLOSE COUPLED FRONT WHEELS WITH SOME SPECIAL WHEEL ALIGNMENT FEATURES (SOME SPECIAL AXLE PARTS)	2 CYLINDER FLAT 3824.6CC
<u>AWH</u>	THREE WHEELED TRACTOR DESIGN WITH SINGLE FRONT WHEEL AND TELESCOPIC FRONT AXLE FOR EXTRA GROUND CLEARANCE, AND ALSO WITH SOME	2 CYLINDER FLAT 3824.6CC

MODEL	FEATURES	ENGINE INFO
	SPECIAL WHEEL ALIGNMENT FEATURES (SOME SPECIAL AXLE PARTS)	
<u>AR</u>	STANDARD 4 WHEEL GENERAL PURPOSE TRACTOR	2 CYLINDER FLAT 3824.6CC
<u>AO</u>	4 WHEEL TRACTOR FOR ORCHARD WORK	2 CYLINDER FLAT 3824.6CC
<u>B</u>	THREE WHEELED TRACTOR DESIGN WITH TWIN CLOSE COUPLED FRONT WHEELS	2 CYLINDER FLAT 2548.1CC
<u>BN</u>	THREE WHEELED TRACTOR DESIGN WITH SINGLE FRONT WHEEL	2 CYLINDER FLAT 2548.1CC
<u>BW</u>	THREE WHEELED TRACTOR DESIGN WITH SINGLE FRONT WHEEL AND TELESCOPIC FRONT AXLE FOR EXTRA GROUND CLEARANCE	2 CYLINDER FLAT 2548.1CC
<u>BNH</u>	THREE WHEELED TRACTOR DESIGN WITH TWIN CLOSE COUPLED FRONT WHEELS WITH SOME SPECIAL WHEEL ALIGNMENT FEATURES (SOME SPECIAL AXLE PARTS)	2 CYLINDER FLAT 2548.1CC
<u>BWH</u>	THREE WHEELED TRACTOR DESIGN WITH SINGLE FRONT WHEEL AND TELESCOPIC FRONT AXLE FOR EXTRA GROUND CLEARANCE, AND ALSO WITH SOME SPECIAL WHEEL ALIGNMENT FEATURES (SOME SPECIAL AXLE PARTS)	2 CYLINDER FLAT 2548.1CC
<u>BR</u>	STANDARD 4 WHEEL GENERAL PURPOSE TRACTOR	2 CYLINDER FLAT 2548.1CC
<u>BO</u>	4 WHEEL TRACTOR FOR ORCHARD WORK	2 CYLINDER FLAT 2548.1CC
<u>D</u>	STANDARD 4 WHEEL GENERAL PURPOSE HEAVY DUTY TRACTOR	
<u>H</u>	LIGHT ROW CROP 3 WHEEL TRACTOR	
<u>L</u>	VERY LIGHT DUTY TRACTOR	

All models except the L have horizontal two cylinder overhead valve engines, the cylinders are side by side with the cylinder head towards the front of the tractor with the crank shaft across the tractor and the whole transmission is by spur gears, starting is by turning the outside flywheel by hand, the clutch is easily accessible in the right side crankshaft pulley, this also serves as a drive pulley and brake drum.

### The Engine,

The crankcase, gearbox and differential housing are all one unit, the cylinder block and head are removed separately.

**Removing the cylinder head**, remove the carburettor and inlet elbow (after isolating and disconnecting the fuel line etc) also the exhaust pipe, rocker cover and rocker shaft, you can now pull out the push rods, remove the bottom water hose, undo the head nuts and withdraw the head clear of the studs, at this stage it can be tilted which means the gasket could be changed, if you need to remove the head altogether, on B models the fan support and fan guard must be removed first, on AR and AO models the bonnet assembly has to be removed first (I seem to recall that the bonnet and fuel tanks come off together) the radiator also needs to be removed.

**The crankshaft** has two main bearings, these are bronze backed white metal shells, the bearing caps are bolted to the housings which in turn are flange bolted to the sides of the outer crankcase, the running clearance is 0.002", this is set by brass shims, (MT supplement has a note saying 'when reassembling see that remaining brass shims are between steel shims' the reason may come clear when doing the job)

To remove the crankshaft, first remove the flywheel (clamped on splines at the near side end of the crankshaft) note when refitting that there should be a 0.005" end float on the crankshaft which is controlled by where the flywheel is clamped on the shaft.

With the cylinder head already removed, remove the piston and con rod assemblies, remove the belt pulley assemble from the off side end of the shaft (this contains the clutch) remove the near side bearing cover and housing from the crankcase, the shaft can now be threaded out through the near side of the housing but care must be taken not to damage the camshaft gear.

When refitting the shaft, line up timing marks on camshaft gears, refit bearing assembly and flywheel distance piece with slotted face outwards, fit bearing cover so that there is a clearance all round the distance piece, this acts as an oil thrower, align slot in distance piece with driving pin in flywheel, and fit flywheel with the deep spline in line with the locating grub screw near the end of the crankshaft. Be sure to test the end float while tightening up the flywheel.

**The connecting rods** have big end bearings white metalled directly onto the rod and cap, (not a loose shell) the running clearance is 0.002" with an end float of 0.015" which is adjustable by shims, the nearside rod and cap should be stamped '1' and the off side stamped '2' the small ends are bronze bushes for a fully floating gudgeon pin.

**The pistons** are of cast iron, they can be 0.045" oversize if the cylinders have been re-bored, the gudgeon pin is held in by spring clips and should be a sliding fit when cold.

**The camshaft** is driven by a helical gear flange bolted to the shaft with 3 off set screws, on model A tractors the shaft runs in tapered roller bearings with a loading spring on the off side. Plain bearings are used on the model B tractors, with shims behind the flange on the near side bearing housing, the end float should be 0.020"

To remove the camshaft, remove the bonnet assembly, fan drive and governor housing, undo near side bearing cover and lift shaft out.

There are timing marks on the gear teeth and on the flywheel rim (L.H.EXH.OPEN) and the cover behind the flywheel towards the rear, the near side exhaust valve should just be starting to open with the marks in line.

**The Valves** are overhead push rod operated and are not interchangeable, they are split cone cotter fixing with a single spring, don't underestimate the strength of the springs, I remember getting a black eye when the spring compressor slipped off while removing an exhaust valve from a model B head.

The valve guides are replaceable, they do not press in up to a shoulder, you press them to the correct distance from the inner end of the guide is the correct distance from the face of the cylinder head (see table)

VALVE DATA				
	Model A		Model B	
	Inlet	Exhaust	Inlet	Exhaust
Head Diameter	2 1/4"	2 1/32"	1 3/4"	1 5/8"
Stem Diameter	1/2"	1/2"	7/16"	7/16"
Spring Length (compressed)	2 3/4"	2 3/4"	2 13/16"	2 13/16"
Spring Length compression pressure	36lb	36lb	35lb	35lb
Valve guide distance from head inner face	2 1/8"	2 1/8"	1 31/32"	1 23/32"

**Tappets and Rockers**, the tappets are mushroom shaped and guided by bushes in a block bolted to the top of the crankcase, this can be removed after the oil pump. The rocker shaft is fairly standard, supported on two carriers bolted to the cylinder head, the end rockers are retained by spring clips.

**The oil pump** sits in the sump, it is a gear type pump driven by skew gears off the cam shaft, the driven gear is supported by a bracket on the tappet guide block. There is what is referred to as a safety coupling on top of the shaft which is designed to shear if the pump gears seize, to remove the pump, drain the oil, disconnect the oil pipe to the filter and undo the three outer setscrews on the pump body flange, it is possible to lower the pump enough to fit a new coupling while working through the top inspection cover, though in my experience you would be very lucky to notice to loss of oil pressure and get the engine stopped without damage. If the pump cover is removed it should be fitted with a new gasket no thicker than 0.020". There is a full pressure filter on the delivery side of the pump, this should have a new element fitted after 120 hours work. On top of the filter body inside the crankcase is an adjustable relief valve, this should be set to allow an oil pressure of 10 to 15 psi on the gauge for a fast idle speed.

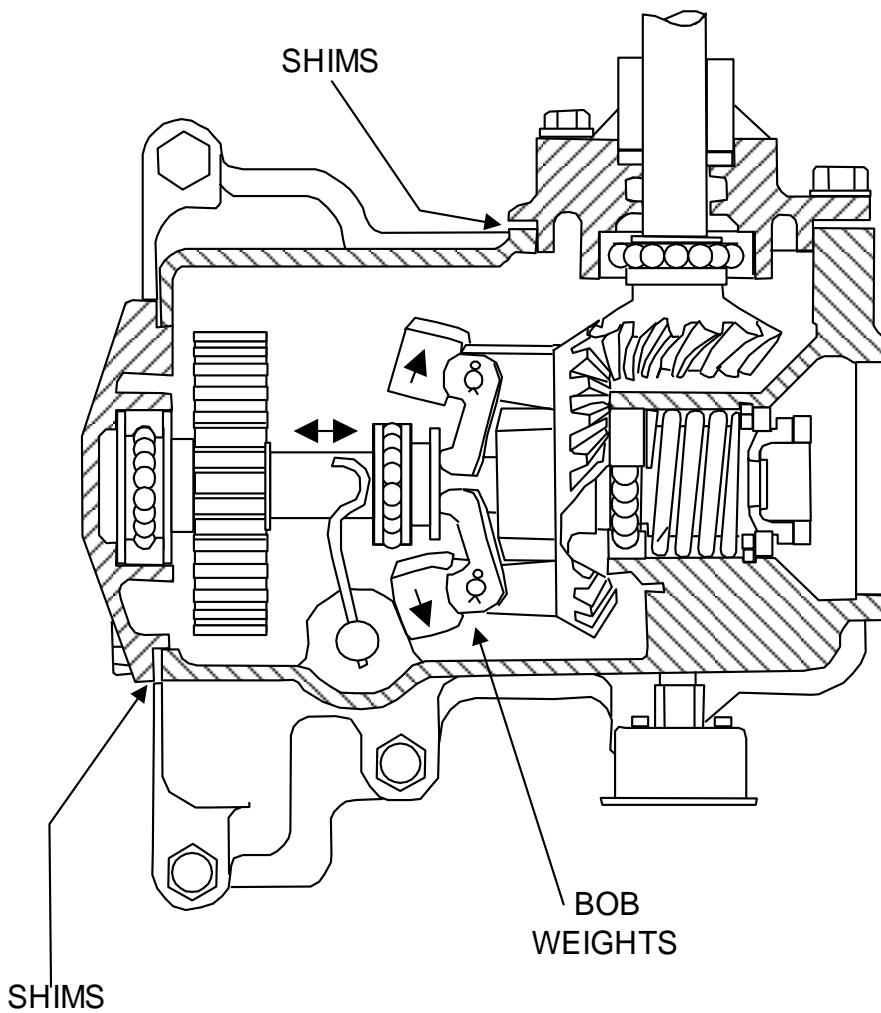
**The carburettor** is a Schebler horizontal type with an adjustable main jet, it is designed to run on petrol or paraffin, the main jet is adjustable by needle screw, the main is the farthest away of two L shaped adjusting screws on top of the carburettor, (on AR and AO models it is the nearest screw) screw out to richen the mixture, it would normally be set between  $\frac{3}{4}$  and 1 turn open. The other L shaped screw is the slow jet adjustment, this would normally be set  $1\frac{1}{2}$  to  $1\frac{3}{4}$  turns open on A models and 1 to  $1\frac{1}{4}$  turns open on B models. If the carburettor floods check the float level, it should be  $\frac{3}{8}$ " from the float chamber top when the needle valve is seated with the float horizontal, this can be corrected by slightly bending the lever. The air supply to the carburettor is via an oil bath air cleaner, the oil bath should be removed, cleaned out and filled to level with engine oil, filter element should be cleaned every 10 working hours.

**The ignition system** is by a Wico magneto with an impulse coupling to aid starting, this is mounted on the off side, its main failing is the it sticks out from under the bonnet and water of the bonnet tends to drip onto the distributor cap.

To adjust the contact breaker gap, remove the distributor cap and rotor arm, the fixed contact is mounted in its back plate with an eccentric adjusting screw.

The timing can be checked by observing that the impulse for number one cylinder operates as the LH impulse mark on the flywheel lines up with the fixed mark on the cover behind, the magneto mounting holes are slotted for fine adjustment, if this is not enough it may be that the drive gear chain has been assembled incorrectly. To reset this, remove the magneto and detach the governor housing plate on the near side, complete with bearing, slacken the setscrew on the governor lever and draw the gear out of mesh, turn it until the punch mark on it lines up with the camshaft gear, then line up the 'V' notch in the governor vertical shaft with the setscrew in the arm and tighten it, use grease to stick the bearing into governor housing and replace the assembly, never try to re assemble the governor with the magneto in place.

BASIC SKETCH OF GOVERNOR LAYOUT



**The governor** is a centrifugal type which is gear driven from the camshaft and is mounted in a housing on top of the crankcase, it operates by bob weights pivoted on lugs in the back of the bevel gear which drives the fan shaft, as the gear spins they are forced outwards, this force acts on a lever via a ball thrust race bearing, the shaft to which the bevel gear is attached, is supported in semi thrust bearings, the outer race of the off side bearing is spring loaded to provide self adjustment of the bearing, for this reason it is important to remove the magneto before the governor shaft is assembled, as there is a danger of the drive

dogs getting out of line.

The governor spring is a flat blade attached to the leaver at one end and to the hand throttle arm at the other, in effect the more you open the throttle the more tension is applied to the spring, the max and min running speed stops are via stop screws on the hand throttle column, the max speed should be set for a no load speed of 1,075 rpm on the model A and 1,310 rpm on the model B. The front stop screw at the bottom of the hand lever should be set so that the throttle rod does not bend when the leaver is pulled back shut. The length of the throttle rod should only be adjusted so that the butterfly, you should set the throttle stop on the carburettor so that the engine runs at maximum revs without governor surge.

**The cooling system** is of thermo siphon design, (there is no water pump) the fan is driven by a long shaft which is mounted over the top of the horizontal engine, and is driven by bevel gears in the governor housing. To remove the fan, first the radiator must be removed, the fan is splined onto its shaft and is retained by a split cone cotter similar to those used on valves, behind the fan is a spring which loads the semi thrust bearing the shaft, press the fan back, compressing the spring to release the spit cotter, at the rear end of the shaft is a bearing housing which bolts to the governor housing, this has shims behind it to adjust the mesh of the bevel gears (backlash should be between 0.004" and 0.007") To drain the cooling system, remove the plug in the bottom of the cylinder head.

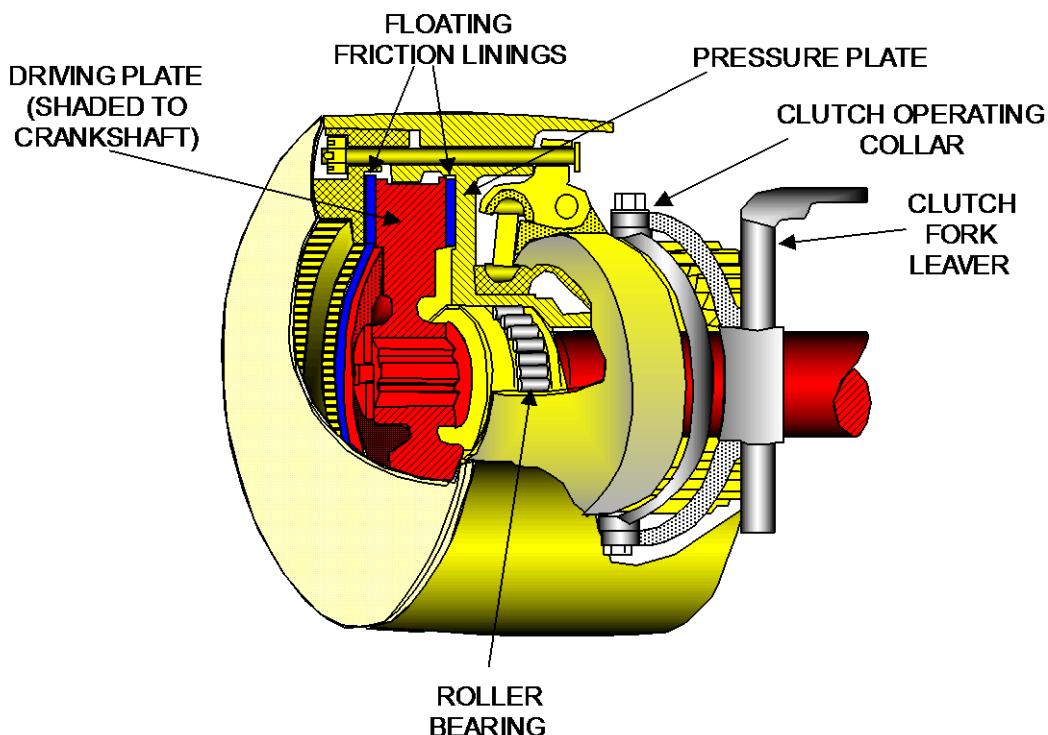
**The Clutch** is a 10" dia dry plate, on a model A (8" on a model B) it is hand operated and is inside the belt drive pulley, driving disc is splined to the off side end of the crankshaft the friction discs are floating and are retained in grooves in the pressure plate which is part of the pulley. There are three long bolts which go through the pulley and apply pressure to the pressure plate, effectively nipping the friction discs, a bell crank arrangement when the clutch is operated. To adjust the clutch, remove the outer tin clutch cover with a screwdriver (it only presses in) Push the leaver forward to engage the clutch, remove the split pins from the castle nuts on the three long bolts, equally, one slot at a time until the clutch lever operates with a snap (requiring about 80lbs at the end of the leaver, the small clutch brake should then be adjusted to operate when the leaver is fully back.

## **CUT AWAY SKETCH OF CLUTCH**

PARTS TURNED BY CRANKSHAFT SHADED IN RED.

PARTS TURNED WHEN CLUTCH IS ENGAGED SHADED IN YELLOW.

FRiction PLATES SHADED IN BLUE.



The clutch can be relined without removing the pulley, simply remove the three nuts from the long actuating bolts, the pressure plate can then be removed, along with the outer friction pad, please remember that there is a good chance that these old friction pads contain one of the more nasty forms of asbestos, and if the clutch is warn out, most of it will be deposited as dust on the inside of the drum, may I suggest that you first visit the web site of the HSE to study how best to deal with this safely.

The driving plate is splined on the end of the crankshaft, the Motor Trader Supplement of December 1945 suggest it can be removed by removing the setscrew and washer on the end of an A series crankshaft, or the castle nut in the case of a B series, the drive plate can be drawn off the spline by using two  $\frac{1}{2}$ " bolts and nuts, the threaded end of the bolts is passed through shaped slots in the disc so that nuts back against the disc, and screw in the bolts against the face of the pulley so that the disc is pushed off, care should be taken to make sure that the bold ends do not press on the swaged end of the driving pin which comes through the back of the pulley and drives the clutch operating sleeve. Once the plate is off, the inner friction ring can be replaced. Please note when you come to refit the drive plate onto the crankshaft spline make sure that the rivet in the female spline lines up with the shorter tooth on the shaft spline.

To remove the complete pulley assembly, disconnect and remove the operating assembly which is bolted to the front of the reduction gear cover, leaving the three long actuating bolts alone draw off the drive plate as above, the whole assembly can be slid off the end of the crankshaft. If the bush in the pulley is warn it should be replaced from the pinion end.

If the operating leaver is removed from the fork, the spline should be marked so it is refitted in the correct place, if it is not marked, assemble leaver at about 90° to the fork.

**The Gearbox** was initially a four speed sliding gear type, the shafts going across the tractor in line with the crankshaft, for use with pneumatic tyres an extra set of gears was often fitted, this gave a total of six forward and two reverse, in effect a three speed box with separate lever for high and low ratio.

The 1945 motor trader service sheet describes the gear train layout: "Primary shaft driven by reduction gear from clutch, drives main shaft either direct or through overdrive gears revolving free on Layshaft. Two sliding pinions on main shaft pick up gears on layshaft proper, which drives differential through extra pinion. For reverse gears second gear sliding pinion on main shaft meshes directly with differential gear"

The gearbox can be dismantled without touching the differential or final drive, remove the gearbox cover complete with leavers, also remove the fifth and sixth speed gear cover on the near side. If fifth and sixth gears are fitted, release the gear pickups from the selector rod, and slide out the rod and fork with the gear from the layshaft, unscrew the setscrew in the end of the main selector rod, and plug. Slacken the setscrew with locknut in the top of the box locating rod, and draw out the rod, catching the three selector forks as they are released, locking balls and springs are recessed in the forks. Undo the nut on the end of the main shaft and remove the fifth and sixth speed gear. The main shaft can then be removed though the near side, taking care to catch the ball bearing sliding gears as they are released.

Remove the layshaft taper roller bearing housing on the off side, the off side end of the layshaft can then be tilted up and removed complete with its gears. The overdrive cluster gears on the offside end of the layshaft runs in a Hyatt roller bearing. The fixed gears are splined to the shaft, they are separated by distance pieces and are held in place along with the bearing inner race by a nut on the nearside end of the shaft.

When you refit the main selector rod, you need to slide the forks so that the gears are in mesh, then screw in the plug at the end of the shaft and insert the setscrew but do not tighten it fully, the plug provides axial adjustment, adjust until the gears are fully in mesh, then lock with the setscrew and tighten the locating screw in the top of the box.

The Differential, a reduction gear pressed onto a shaft running in tapered roller bearings carry the differential planet pinions. Side bevel gears which are integral with the final drive pinions, fun free on this shaft. (on AR and BR models the shaft is extended to the near side to carry a drum for the band brake)

To remove the differential assembly, take the weight of the tractor on blocks under the gearbox and support the front end in such a way that it cannot roll over! On four wheeled tractors the mechanic would normally wedge the front axle so it could not tilt, on a three wheeled tractor it may require support frames to be made to bolt to the main forward casting, remember that the rear axle is being removed which leaves the front three quarters of the tractor sitting on one wheel, about a ton ready to fall on you if not well supported.

Motor trader describe the procedure as: " Detach power take off guard and rear bearing cover, and extract the spring ring that locates the ball bearing on the shaft, take off the nuts holding the rear axle housing to the

gearbox, on AR, AO, BR, and BO, steering column support carrying throttle and clutch controls must first be dismantled. Rear axle can then be wheeled clear. Detach differential shaft near side bearing housing, move differential to near side and lift out to rear, offside bearing outer race is located in gearbox by spring ring. When reassembling fit shims behind flange of nearside bearing housing so shaft turns freely without play, see that paper shim is placed either side of steel shims to prevent oil leaks”

**The final drive gear**, each axle shaft has its final drive gear fitted on a spline and retained by a nut, the shaft runs in tapered roller bearings in a banjo casting. To adjust bearing, remove rear cover and tighten pinned nut on end of shafts until there is no end float but shafts turn freely. The felt oil seals on the outer end of the shafts should be replaced if they are worn, to do this the axle shaft must be removed.

**The Brakes**, Models AR and BR have a band brake on the differential shaft, acting through the differential, the only adjustment is by the nut on the end of the brake band.

The row crop and orchard models have two independent internally expanding brakes, these are separately driven from the final drive gears, each brake unit with its own directly attached pedal is flange bolted to the gearbox above the differential shaft, adjustment is by a square headed adjuster on the brake back plate, tighten the adjuster then back off five notches on model A (four notched on model B)

To reline the brake, remove the whole unit from the tractor, undo the castle nut on the inner end of the shaft, banging the threaded end of the shaft against a wooden block seems to be a recognised way of removing the gear wheel, then draw out the shaft complete with its drum which is riveted on.

**Steering Gear**, on models AR, AO, BR, and BO, there is a worm and wheel in a housing mounted on the crankcase with an arm at the bottom, the worm shaft is carried in a tapered bearing, this adjusted by a screwed plug, it should be tightened the backed off  $1/8^{\text{th}}$  of a turn, backlash between worm and wheel can be adjusted by shims.

On row crop models the steering is by a worm and sector (a section of a gear wheel) mounted on the top of the main vertical shaft to which the front wheel assembly is attached.