INSTRUCTION BOOK

OF THE

Fordson

TRACTOR

AGRICULTURAL
INDUSTRIAL
GOLF COURSE
LAND UTILITY
ROW CROP

FORD MOTOR COMPANY LTD.
DAGENHAM, ESSEX :: ENGLAND

FOREWORD

The Fordson Tractor is simple to operate and maintain, reliable in operation, and, provided it is properly looked after, will give years of good service. In order to utilise the tractor to the best advantage, some knowledge of how it works and an understanding of the maintenance needed is essential.

This book has been prepared to enable the operator to keep the tractor in good condition, and to avoid those abuses likely to cause damage. It deals primarily with the Agricultural Model, though all the information given applies equally to the Row Crop and Industrial Tractor, with a few exceptions which are dealt with in their appropriate sections.

The method of carrying out certain repairs is described, and while, in general, it is safe for an experienced mechanic to carry out this work, it is strongly recommended that the operations described in the repair section of this book should be carried out only by an authorised Fordson dealer. They are described for the benefit of those operators who are situated at a distance from their dealer.

Before using the tractor, read the operation and maintenance section of this book through carefully, and be quite sure that you are thoroughly familiar with the contents. If there are any points on which you are not clear, your local Fordson dealer will be pleased to help you in every way.

Specification

AGRICULTURAL TRACTOR

Engine.—Four cylinder, four-stroke, cylinders cast *en bloc*. Cylinder bore $4\frac{1}{8}$ in. (104.8 mm.). Piston stroke 5 in. (127.0 mm.). Cubic capacity 267 cu. in. (4380 c.c.). Firing order 1, 2, 4, 3. Special cast alloy crankshaft, statically and dynamically balanced, carried on 3 main bearings, 2 in. diam. by 3 in. long. Big end bearings, 2 in. diam. by $2\frac{1}{4}$ in. long. Cast-iron pistons, with 3 compression and 1 oil control piston rings fitted above the piston ring. Side by side valves of special steel alloy. High compression cylinder head for running on petrol. Low compression cylinder head for running on vapourizing oil.

Lubrication by splash system with oil circulation maintained by oil thrown off flywheel by centrifugal action. Ducts lead oil to main bearings and timing gears. Oil capacity $2\frac{1}{2}$ imperial gallons.

Cooling System.—Thermo-syphon, impeller assisted. Efficient cooling ensured by vertical tube type radiator with very large reinforced tanks, in conjunction with ample water jackets round cylinder block and cylinder head, and four-bladed fan which draws 1,700 cu. ft. of air per minute through the radiator. Water capacity, 10 gallons. A radiator blind is fitted at the bottom of the core so that a greater or lesser area is exposed. This permits a satisfactory operating temperature being attained and should be suitably adjusted to compensate for varying load conditions which may be encountered.

Ignition System.—High tension magneto with impulse coupling for easy starting, driven by a helical gear from camshaft gear. Manual advance and retard controlled by lever on dash.

Governor.—Centrifugal type, adjustable to maintain any desired engine speed. Controlled from dash.

Fuel System.—Gravity feed from $17\frac{1}{2}$ imperial gallon overhead tank, through a sediment bulb which filters all fuel before it reaches the vapourizer or carburettor. Tractors equipped to run on vapourizing oil have a one gallon auxiliary tank inside the main one.

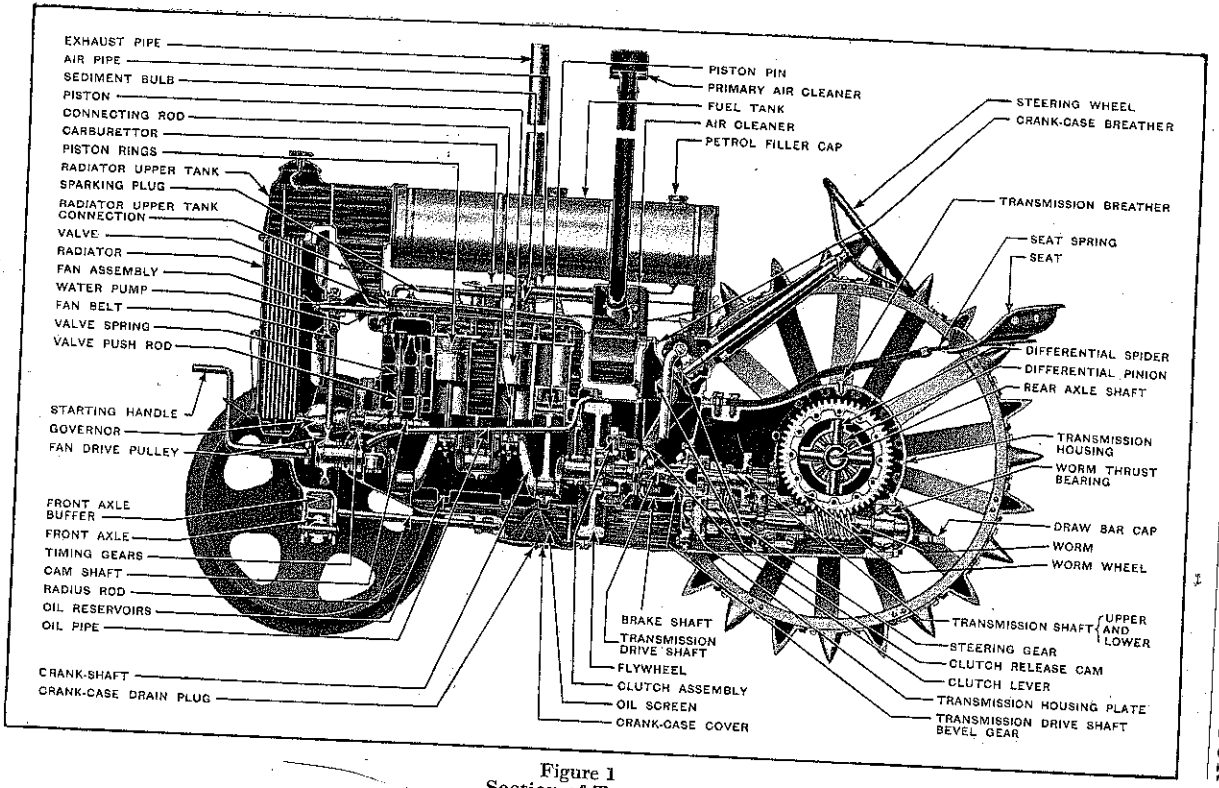

Figure 1
Section of Tractor

Fuel System—*continued.*

Vapourizer.—Tractor fitted with low compression cylinder head for running on vapourizing oil, has a special vapourizer with an adjustable mixture control and an exhaust heated plate to ensure economy and proper vapourization of fuel.

Carburettor.—Tractor fitted with high compression cylinder head for running on petrol has special down draught carburettor.

Air Intake System.—A primary air cleaner at the top of the vertical air inlet pipe, and an oil bath air cleaner ensure that all air used by the engine is thoroughly clean, thus minimising wear on all engine parts.

Steering System.—Steel sector and worm. Ratio 17 to 1. All steering arms and rods are of heavy construction. Easily replaceable steel bushes are fitted to steering shaft and spindle bodies.

Front Axle.—Heavy drop forging, heat treated to provide maximum strength. It is mounted at the centre of the front of the engine on a rubber buffer and a plunger which take up all road shocks. Heavy radius rods are fitted to take up thrust.

Row Crop Steering and Front Axle.—A cast-iron bracket of swan-neck shape is mounted on the cylinder front cover, and is braced with two rods beneath the crankcase. A vertical spindle is carried in the housing of the bracket and either a single pneumatic wheel or dual wheels may be attached to the spindle base by suitable brackets.

The worm and pinion for operating the vertical shaft is incorporated in the housing and is connected to a steering wheel in the normal position behind the dash by means of shafts and universal joints.

Transmission.—Constant mesh sliding selective type with three speeds forward and reverse. All shafts run on ball or roller bearings. Improved clutch makes starting smoother and transmission gear changing easier. Oil capacity approx. $3\frac{3}{4}$ imperial gallons.

Gear Ratios and Speeds when using Standard Gear at 1,100 R.P.M. (Green Spot)—

Gear	Final Ratio	M.p.h.	Gear	Final Ratio	M.p.h.
Low	62.63 to 1	2.195	High	17.74 to 1	7.75
Inter	44.46 to 1	3.092	Reverse	46.39 to 1	2.963

Gear Ratios and Speeds when using Special Ploughing Gear at 1,100 R.P.M. (Red Spot)—

Gear	Final Ratio	M.p.h.	Gear	Final Ratio	M.p.h.
Low	79.027 to 1	1.74	High	17.74 to 1	7.75
Inter.	56.1 to 1	2.45	Reverse	58.5 to 1	2.35

Gear Ratios and Speeds when using Standard Gear at 1,100 R.P.M. with 4.3 Transmission (Green Spot)—

Gear	Final Ratio	M.p.h.	Gear	Final Ratio	M.p.h.
Low	67.32 to 1	2.04	High	31.88 to 1	4.31
Inter	44.49 to 1	3.09	Reverse	78.46 to 1	1.75

Gear Ratios and Speeds when using Special Ploughing Gear at 1,100 R.P.M., with 4.3 Transmission (Red Spot) —

Gear	Final Ratio	M.p.h.	Gear	Final Ratio	M.p.h.
Low	84.99 to 1	1.61	High	31.88 to 1	4.31
Inter.	56.1 to 1	2.45	Reverse	99.01 to 1	1.38

Brake.—Multiple disc on transmission operated by clutch pedal. Hold-out catch fitted which may be hooked over clutch pedal in depressed position and applies transmission brake.

Rear Axle.—Semi-floating, four-pinion differential, running on roller bearings.

Wheels—Front.—Heavy cast-iron, mounted on adjustable roller bearings.

Rear.—Have spokes cast in the hub and rivetted to the rim, which is punched to allow either cleats or spade lugs to be fitted.

Wheels—Front—Row Crop.—Dual iron wheels mounted on an inverted " T " bracket, with adjustable taper roller bearings.

A single pneumatic tyre and wheel is also available and may easily be detached when required.

Toolbox.—On dash with full equipment of tools.

Weight.—Tractor, less driver and fuel, 3,284 pounds, approx.
Front Axle weight, 1,356 pounds, approx.
Rear Axle weight, 1,928 pounds, approx.

Dimensions.—Wheelbase, 63 ins.; distance between rear rims, $44\frac{15}{16}$ ins.; diameter of front wheel, 30 ins.; width of rear rims, 9 ins.; width of extension rim, 9 ins.; diameter of rear rim, 42 ins. (cleats or spade lugs additional). Spade lugs can be fitted on rear wheels as an alternative to cleats. Overall length of tractor $106\frac{7}{16}$ ins., overall width (less

Dimensions—*continued.*

extension rims), 62$\frac{15}{16}$ ins. ; overall height, 72$\frac{1}{2}$ in. Ground clearance, 9 ins. ; height of drawbar from ground, 13$\frac{1}{2}$ ins. adjustment lateral 6 ins. Turning circle 21 ft. 6 in. Improved driver's seat greatly facilitates manipulation of implements operated by tractor. Starting handle may be locked in upright position. Either cleats or spade lugs can be fitted on wheels, if specified when ordering.

Dimensions — Row Crop Tractor.—Wheelbase 83.7 ins. ; Minimum and maximum distances between rear wheel spade lugs are 46 ins. and 74 ins. ; overall length of tractor—with steel wheels 126.7 ins. ; pneumatic wheels 125 ins.

Speeds when using Alternative Tyres

Standard Gear	Low m.p.h.	Inter. m.p.h.	High m.p.h.	Reverse m.p.h.
11.25—24 ins. ...	2.30	3.25	8.15	3.10
11.25—28 ins. ...	2.50	3.53	8.85	3.38
Special Gear				
11.25—24 ins. ...	1.83	2.58	8.15	2.47
11.25—28 ins. ...	1.99	2.80	8.85	2.68
Standard Gear with 4.3 Transmission				
11.25—24 ins. ...	2.15	3.25	4.53	1.84
11.25—28 ins. ...	2.32	3.53	4.92	2.00
Special Gear with 4.3 Transmission				
11.25—24 ins. ...	1.69	2.58	4.53	1.45
11.25—28 ins. ...	1.84	2.80	4.92	1.58

INDUSTRIAL TRACTOR

This differs from the above specification only in the following particulars.

Engine.—With high compression head and petrol carburettor.

Air Cleaner.—A gauze type cleaner is fitted to carburettor intake.

Brakes.—Footbrake : as on agricultural tractor. Handbrake : Internal expanding, on rear wheels.

Lighting Equipment.—6-volt generator and 63-amp.-hour battery. Generator is mounted on a bracket fixed to the radiator top-tank connection and cylinder head, and is driven from pulley on end of crankshaft, by a belt which also drives the fan and water impeller.

Switch.—Four positions, as follows :—

1. Generator earthed, battery not being charged, lights off.
2. Battery being charged, lights off.
3. Battery being charged, lights dipped.
4. Battery being charged, lights normal.

Control.—Switch mounted on dash.

Ammeter.—Mounted on dash.

Horn.—Electrical, mounted on lamp bracket. Horn button mounted on dash.

Speedometer.—Mounted on dash, driven by flexible cable from drive gear fitted to draw-bar cap.

Lamps.—Two headlamps mounted on brackets on radiator side-members.

Coupling Device.—Special automatic drawbar coupling is supplied, as standard equipment.

Tool box.—Supported by brackets from two cylinder-head bolts. Special tool equipment supplied is as follows :—One foot-operated tyre pump, one 30-cwt. jack, two tyre levers, and the tool box also accommodates standard tool equipment.

Gear Ratios and Speeds.—When using standard gears, at 1,100 R.P.M., with 36 ins. pneumatic tyres :—

Gear	Final Ratio	M.p.h.	Gear	Final Ratio	M.p.h.
Low	51.13 to 1	2.46	High	11.48 to 1	10.97
Inter.	36.3 to 1	3.47	Reverse	37.88 to 1	3.33

Weight.—Less driver and fuel, 3,363 pounds.
Front Axle assembly, 1,120 pounds, approx.
Rear Axle assembly, 2,243 pounds, approx.

Dimensions.—Diameter of wheels, over tyres, Front 2 ft. 2 ins.
Rear (dual wheels) 3 ft. $2\frac{1}{2}$ ins.

Tyres.—Front wheels, 23 × 5 ins. Rear wheels, 36 × 6 ins.
Pressure—70 lbs. per sq. in. Pressure—90 lbs. per sq. in.

Low Pressure Tyres—Land Utility.
Front wheels, 6.00 × 19 ins. Rear wheels, 11.25 × 24 ins. and 11.25 × 28 ins.
Pressure—16 lbs. per sq. in. Pressures—8–10 lbs. per sq. in. (General farm work.) 15 lbs. per sq. in. (Road work.)

Location of Engine Number.—Front end of cylinder block on o/s between No. 1 cylinder exhaust port and inlet port.

Important Instructions for Operators

1. The importance of adequate and correct lubrication cannot be too strongly impressed on tractor drivers. The correct grades of oil must be used in the engine and transmission. The oil should be maintained at the proper level at all times and changed frequently. Keep the strainers in the oil filler and bottom of the crankcase clean and in good condition. Clean oil will protect the engine bearings, minimise wear on all engine parts, and cut down sparking plug trouble.

2. The worst abuse that can be given the tractor is racing the engine. Drivers must avoid this at all times. The proper speed to run the engine is 1,100 revolutions per minute. The tractor is equipped with a governor which can be set to give the correct speed to suit operating conditions. The manual control permits the speed to be adjusted by the operator to the desired figure immediately. When the engine is idling cut the speed down as low as possible and retard ignition (ignition lever up). When starting do not race the engine to heat up the manifold quickly. This is destructive to the tractor and will not accomplish your purpose.

3. Do not allow the engine to labour, but change to a lower gear immediately it shows signs of doing so.

4. It is very important that the air cleaner oil level be maintained at all times. If it is not kept cleaned and filled with oil of viscosity S.A.E.20, dirt and grit will be drawn into the cylinders, resulting in premature wear of pistons, rings and cylinders, and loss of power. Never operate the tractor with the air cleaner oil container empty.

5. The Drawbar Cap and Drawbar Extension Plate are provided for your convenience in hitching. Always hitch to this Drawbar Cap or Extension Plate. Do not hitch a chain or rope round the rear axle housing under any circumstances. When pulling a heavy load, or when the tractor is travelling on very soft ground where there may be a tendency for the wheels to sink and dig in, be sure to keep your foot adjacent to the clutch pedal. If the tractor should become bogged, always pull out in low gear. Do not attempt to pull tree stumps out of the ground or do any similar work which may bring the tractor to a sudden stop.

6. Do not race the engine and let the clutch in suddenly, as this may lift the front end of the tractor off the ground. Should this happen, release the clutch immediately—this will bring the front wheels back to the ground at once.

7. Do not attempt to engage or disengage gears until the clutch pedal has been pushed down far enough to release the clutch fully. Always allow the clutch pedal to engage gradually, so taking up the drive smoothly. Do not, however, "slip" the clutch when the tractor is in motion, as this damages the clutch plates, and clutch as a whole. When changing gear, if the clutch is not properly disengaged, the teeth on the gears will not mesh readily, and there is danger of breaking off the edges of the teeth so that in time they will not remain in mesh. Always reduce speed of engine when changing gear.

8. Do not run the tractor downhill with the gears in neutral or with the clutch released. Engage either low or intermediate gear and use the governor to control the speed of the engine. To bring the tractor to a complete stop, declutch and apply the brake by pushing the clutch pedal down as far as possible.

9. Remember that a new machine requires more careful attention during the first few days it is being driven, than after the parts have become thoroughly "run in." The tractor which is driven carefully when new gives the most satisfactory service in the end. See that the tractor has plenty of oil and water before starting work. If the tractor is left in the open overnight, see that it is properly covered and drain radiator if there is any likelihood of frost. Nothing will shorten the life of the tractor more than being left exposed to the weather. INSPECT THE TRACTOR DAILY AND SEE THAT ALL BOLTS AND NUTS ARE TIGHT AND THAT THERE ARE NO OIL LEAKS. Make a practice of taking care of each repair and adjustment as soon as its necessity is discovered; this attention requires but little time and may avoid delay or accident in the field. When the tractor is delivered it is in proper mechanical adjustment. After it has been worked it is plainly the duty of the owner to see that it is kept in that condition.

10. If a noise develops in the engine or transmission, it is important that the cause be investigated at once and corrected. If not corrected it may become more pronounced, thereby causing

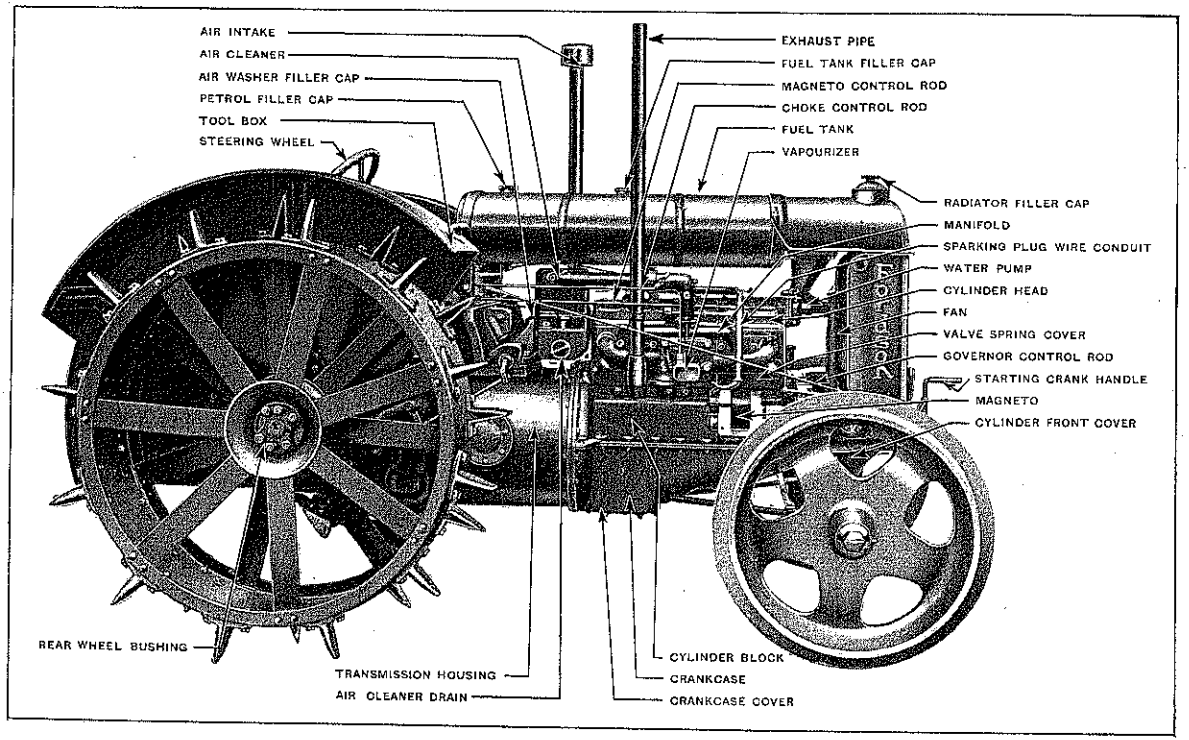

Figure 2
Vapourizer Side of Tractor

lack of power and tending to shorten the life of the tractor. Do not continue to operate the tractor when the engine fires only on two or three cylinders. This, besides causing loss of power and wasting fuel, will allow unburnt fuel to get into the crankcase, thinning the lubricating oil, and accelerating wear.

11. Full use should be made of the radiator blind. When starting the tractor pull the blind up to the fullest extent and on no account should the tap be turned to vapourizing oil until the engine is hot enough to vapourize the fuel completely.

12. The blind should be adjusted during work so that the cooling water is at least 80° C. or 176° F., preferably just below boiling point.

13. Do not run with the mixture richer than necessary. A rich mixture wastes fuel, forms carbon, dilutes the lubricating oil and gives inferior results.

IN CASE OF DIFFICULTY CONSULT YOUR FORDSON DEALER.

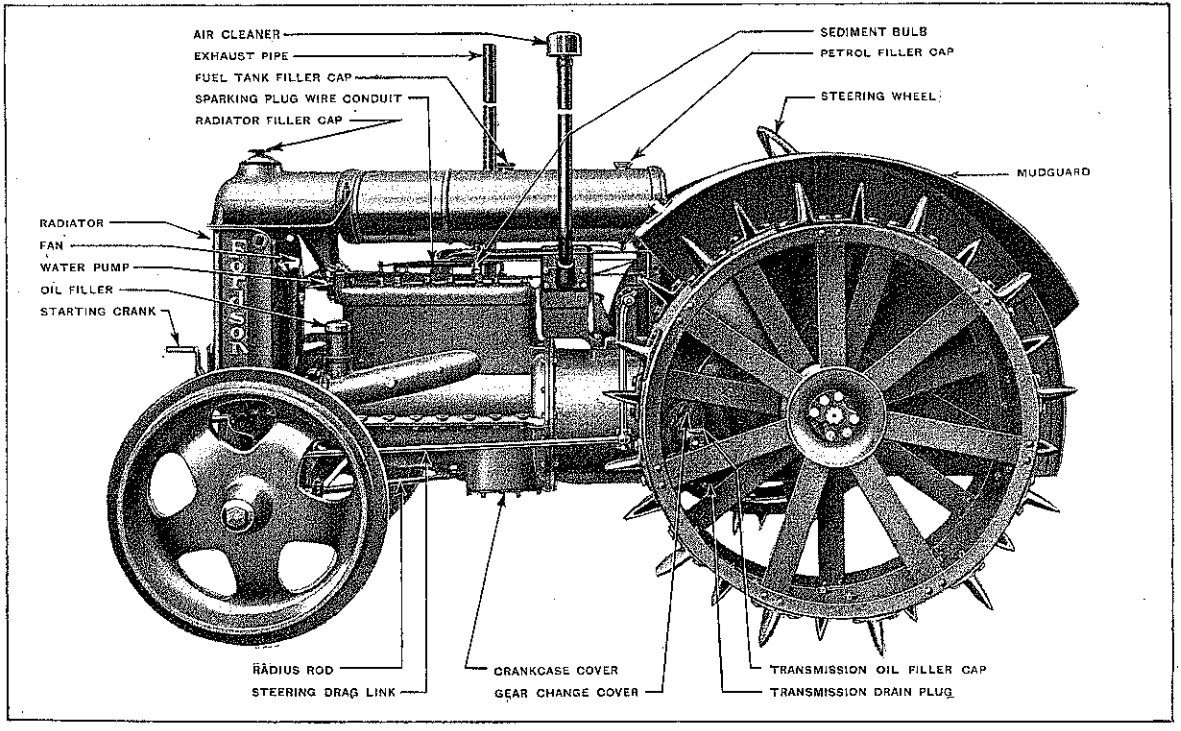

Figure 3
Oil Filler Side of Tractor

Controls

The Choke Control is located on the extreme right of the dash. It is pulled out to enrich the mixture when starting.

The Governor Control is placed immediately on the left of the choke control and controls the speed of the engine. It may be set in any desired position by means of a ratchet. To increase the engine speed, pull the control out.

The Ignition Control Lever which is located to the left of the governor control serves two purposes :—

1. To advance and retard the timing of the spark which ignites the combustible mixture in the cylinders.
2. To stop the engine by earthing the primary current of the magneto.

When the tractor is running, the ignition control lever should be moved down to the stop, which is the fully advanced position. Whenever heavy pulling causes the engine to " pink " the ignition should be retarded by raising the handle just sufficiently to stop the pinking. Driving with the ignition too far retarded is conducive to overheating, high fuel consumption and loss of power.

When the ignition handle is in the " fully retarded " position, it drops into a small notch cast in the dash. If the handle is moved to the right beyond this notch it closes the earth contact on the magneto housing and so stops the engine.

In cases where no Ignition Control Lever has been fitted, a switch in the form of an insulated knob is situated on the magneto body, just above the armature centre line towards the rear. The magneto is always switched on except during such time as the knob is pressed inwards to the limit of its travel, so that the engine may be stopped. It must be firmly pressed until the engine has stopped rotating and no further attention to the switch is required when a restart is to be made. No advance or retard cam ring is fitted to magnetos incorporating the above switch.

The Vapourizer Needle Control (on tractors equipped with paraffin vapourizer) controls the proportion of fuel and air supplied to the engine. It is located on top of the float chamber on the right-hand side of the tractor. To enrich the mixture, turn the needle in an anti-clockwise direction. The normal setting is approximately two and one quarter turns open, but varies according to the tabulation given on Page 45.

The Fuel Valve and Sediment Bulb is located beneath the fuel tank. When the handle on the left-hand side of the valve is turned in an anti-clockwise direction as far as it will go, petrol is

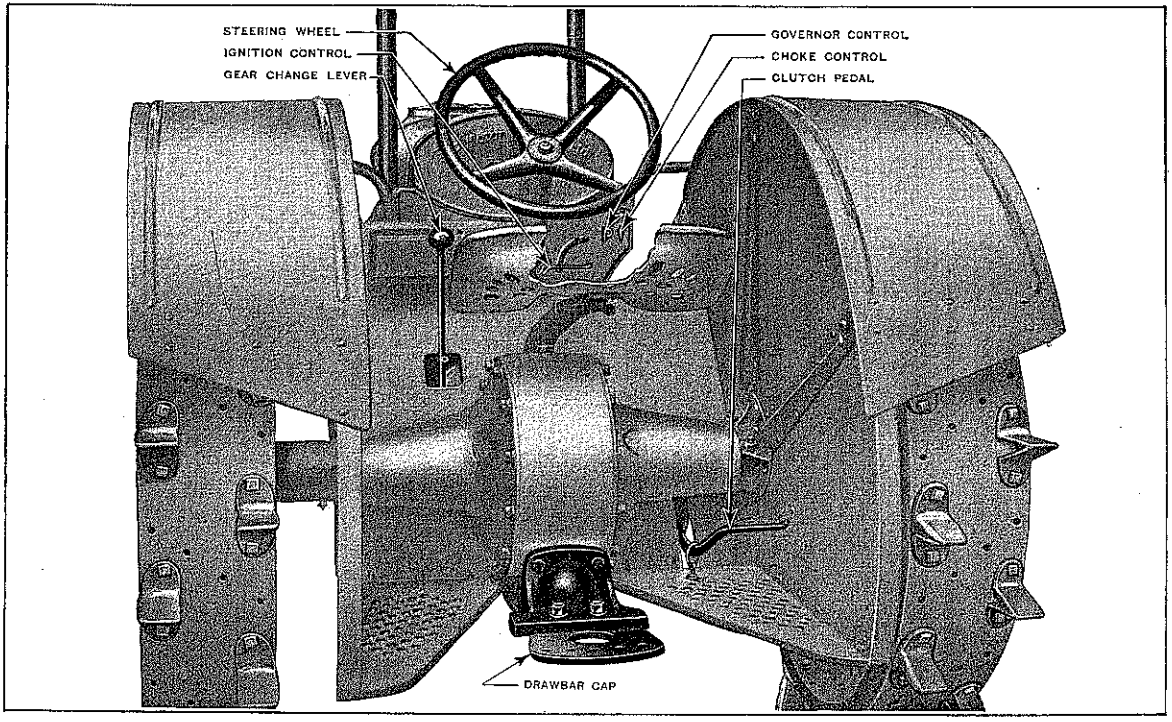

Figure 4
Controls and Drawbar Cap

supplied to the vapourizer. Turning the handle clockwise changes over the fuel supply from petrol to vapourizing oil. When the handle is vertical, the fuel supply is cut off.

To drain sediment or empty the tank, remove the plug at the bottom of the bulb.

The Gear Change Lever is located on the left-hand side of the tractor and engages the gears as required by the driver.

The five positions of the gear lever are as follows (see fig. 5) :—

Neutral.—The central position in which the gear lever can be moved freely from side to side.

Low.—Move the lever outwards to the left and push forward.

Intermediate.—Move the lever outwards to the left and pull backwards.

High.—Move the lever inwards to the right and push forward.

Reverse.—Move the lever inwards to the right and pull backwards.

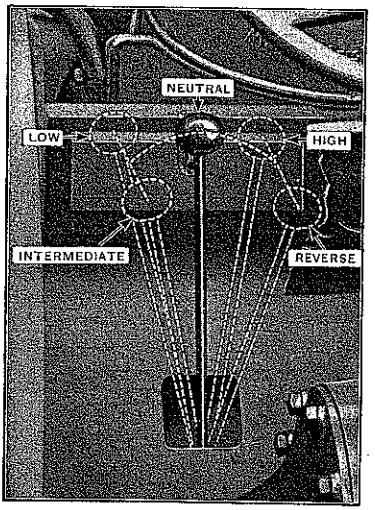

Figure 5
Gear Lever Positions

Always release the clutch before engaging or disengaging gears.

Practise changing gear and get accustomed to the various positions of the gear lever before you attempt to start the engine, or drive the tractor.

The Clutch Pedal is situated on the right-hand side of the tractor immediately behind the rear axle housing. It is used to engage and disengage the clutch to start and stop the tractor and when changing gears. When pressed downwards it releases the clutch, thus disconnecting the engine from the transmission gears ; when pressed right down the clutch pedal brings the transmission brake into operation.

To comply with Ministry of Transport Parking Regulations a catch for holding down the clutch pedal far enough to operate the transmission brake is fitted.

To avoid damage to the clutch plates the engine should be stopped whenever the hold-out catch is in operation.

Always allow the clutch pedal to return slowly and smoothly. Sudden engagement of the clutch imposes excessive strain on all parts and may stall the engine.

The Starting Handle is fitted in front of the engine, and, when not in use, is held out of the way by means of a clip. To crank the engine, disengage the clip, clasp the handle, turn it to the bottom of the stroke and push it firmly towards the engine until you feel the pin engage with the crank ratchet. Then lift the crank upwards with a quick swing. Never attempt to start the engine by pushing downwards on the crank handle.

On Row-Crop Tractors the starting handle is detachable. When out of use it is carried on suitable clips, beneath the seat spring, bolted to the left-hand side of the transmission.

Running-in the Tractor

For a tractor to give its best service, it should be carefully run-in and the extra attention given to it during its first few weeks of use will be repaid handsomely during its subsequent life.

During the first 50 working hours, especial care should be taken to see that the engine and transmission are quite full of oil of the correct grades and that the radiator and air cleaner are full of water and oil respectively. These points should be checked several times daily.

Half a pint of engine oil should be mixed with each gallon of petrol put into the auxiliary tank, to provide an additional lubricant for the valves, pistons, etc., when first started up and before the oil has time to circulate fully.

The engine should not be run at high speed or be allowed to "labour." It is advisable to run the engine slowly at first and gradually increase its speed as it becomes run-in.

After 25 working hours, the engine oil should be changed (see page 23), the rear wheel bolts tightened, the cylinder head screws tightened and all nuts, bolts, screws, etc., gone over and tightened if necessary.

Operating the Tractor

TWICE DAILY BEFORE STARTING THE TRACTOR

In the morning and after dinner the following operations must be carried out, with the engine stopped and the tractor standing level (full details of each of these operations will be found under its proper section) :—

1. See that the radiator is full of soft clean water.
2. See that the engine is filled to the " F " mark on the dipstick with oil of the correct grade and quality.
3. See that the transmission system is filled to the level of the filler hole with oil of the correct grade and quality.
4. See that the fuel tanks, situated immediately above the engine, have ample fuel. Always use a fine mesh filter.
5. See that the air cleaner is full of clean oil of S.A.E. 20 viscosity.

TO START THE ENGINE

Tractors equipped with Vapourizer.

1. **See that the gear lever is neutral,** i.e., the position in which it can be moved freely from side to side.
2. Move the ignition lever on the dash to the upper end of the quadrant (past the notch in the dash) to switch off the ignition. See note on Ignition Control Lever, page 14.
3. With the sediment bulb tap in the " off " position, drain the float chamber by means of the tap provided.
4. Turn the two-way tap at the sediment bulb so that petrol is supplied to the vapourizer, i.e., so that the finger at the upper end of the lever points towards the letter " G " stamped on the body of the sediment bulb.
5. Pull out governor control rod to fifth notch.
6. Set the vapourizer needle as described on Page 45 under " Vapourizer Needle Adjustment."
7. Choke the engine by pulling the choke rod on the right-hand side of the dash to the rear.

8. Prime the engine by pulling up on the starting handle four times only with the ignition switched off. It may be found of assistance to hold out the clutch pedal to reduce oil drag in the gearbox under cold starting conditions and where the hold-out catch is fitted as described on page 17 this may be used. **Gently release the clutch pedal immediately the engine starts.** Do not run the engine continuously with the clutch pedal in this position.
9. Push choke rod in halfway.
10. When starting from cold, pull up radiator blind to its fullest extent.
11. Move the ignition lever halfway down the quadrant on the dash to switch on ignition.
12. Start the engine by pulling the starting handle up sharply until the ratchet of the impulse coupling releases, and the engine fires. It is not necessary to " swing " the engine.
13. When the engine starts, move the governor control back to the slow running position. Release the choke control fully.
14. When the vapourizer is thoroughly warmed up (usually ten to fifteen minutes in cold weather) change over the fuel supply to vapourizing oil by turning the tap on the sediment bulb, so that the finger at the upper end of the lever points to " K."
15. The blind should be adjusted during work so that the cooling water is at least 80°C. or 176°F. The most efficient temperature is just below boiling point.

Tractors equipped with Petrol Carburettor.

1. **If the engine is cold,** pull the choke rod on the dash to the rear. Turn on petrol. See note 8 above *re* depressing the clutch pedal.
2. Prime the engine by pulling up four times **only** on the starting handle with the ignition switched off. See note on Ignition Control Lever on page 14. If the engine is cranked more than this with the choke closed, an excess of petrol will be drawn into the intake manifold and cylinders. If this occurs the engine will not start (even though hot) until the excess fuel is pumped out of the cylinders by considerable cranking.
3. Push choke half-way in and move ignition lever half-way down the quadrant to switch on the ignition.
4. Pull governor control out to the tenth notch.

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5. Start the engine by pulling up the starting handle sharply, move the governor control to the slow running position and open the choke fully as the engine warms up.

6. If the engine is warm, pull out the governor control about two notches, **but do not choke.**

7. Then switch on the ignition and start the engine in the manner detailed above.

TO START THE TRACTOR

After the engine has been started proceed as follows :—

1. Push the clutch pedal down with the foot. This releases the clutch.

2. Move the gear lever to the desired position, and so engage the gear in which it is proposed to start the tractor.

If the gears are in such a position that they will not slip into mesh readily, return the gear lever to neutral position, raise the foot, allowing the clutch to be engaged for an instant, then disengage the clutch by pushing the clutch pedal down and re-engage the gears as directed above.

3. Pull the governor control rod out slightly, and as the speed of the engine increases, allow the clutch pedal to return slowly by gradually raising the foot. As the clutch engages, it transmits the driving effort to the rear axle and sets the tractor in motion.

TO CONTROL THE SPEED OF THE TRACTOR

The best method of controlling the speed of the tractor is by selecting the correct gear ratio to suit the load conditions. Always use the highest gear ratio on which the tractor will give the necessary pull. A little experience will soon teach the proper gear to engage and the best speed at which to run the engine. Don't permit the engine to " labour " in high gear. The speed of the engine is controlled by means of the governor control rod (see page 14) and should be kept nearly constant at all working speeds of the tractor.

The engine is designed to run at 1,100 revolutions per minute and this speed should not be exceeded for any length of time.

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TO STOP THE TRACTOR

1. Return the governor control rod to the closed position thus slowing up the engine.
2. Release the clutch by pushing the clutch pedal downwards.
3. Bring the tractor to a final stop by pushing the clutch pedal all the way down. This applies the brake.
4. Move the gear change lever into the neutral position, disengaging the gears.
5. Allow the clutch to re-engage by releasing the clutch pedal.

TO STOP THE ENGINE

When running on vapourizing oil, turn the fuel off at the sediment bulb and allow the engine to run slowly until it almost stops for want of fuel. Turn to petrol for two minutes, then turn off.

The above procedure is necessary to obviate difficulty in starting the tractor, as the heat stored in the manifold continues to vapourize fuel after the engine is stopped, thus flooding the passage with too rich a mixture; and also it drains all vapourizing oil from the vapourizer, making it ready for the petrol to be used to start the engine.

When running on petrol, turn off the petrol at the sediment bulb, slow the engine down and allow it to idle for two or three minutes to let the valves cool off (this will materially lengthen their life) and then switch off the ignition by moving the ignition control lever to its uppermost position. See note on Ignition Control Lever, page 14.

Lubrication and Maintenance

The importance of correct lubrication, and periodic inspection and adjustment cannot be over-emphasized. On it will depend, to a very large extent, the service which the tractor will give.

Regular attention to the points mentioned below will be amply repaid in long life, freedom from repair, and reliability.

The lubrication and maintenance work may be divided into various groups which require attention after the following periods of use :—

1. Twice daily.
2. Every night.
3. Every 50 hours of use.
4. Every 200 hours of use.

The lubrication chart on pages 64-65 gives full information as to the points requiring attention, and the location of grease gun lubricator fittings.

FOLLOW THE CHART CAREFULLY

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1. TWICE DAILY

Engine.—Check level and replenish if necessary to the mark "F" on the dipstick with oil of the correct grade (see page 23).

Transmission.—Check and refill if necessary to the level of the filler hole with oil of the correct grade (see page 24).

Radiator.—Fill with fresh, clean water if the level is low.

2. EVERY NIGHT

Spindles, Spindle Arms and Steering Joints.—Grease with grease gun. (Regular greasing at these points will prevent the ingress of dirt and water and prolong the life of the joints.)

Air Cleaner.—Check oil level and add clean oil of viscosity S.A.E.20 if necessary. For detailed instructions see page 48.

Protection.—Cover tractor after use to protect from weather.

If the manifold and vapourizer are excessively hot, they should be allowed to cool before putting on the cover as otherwise it may be scorched or even catch fire.

Water Pump.—Give the grease cup cap half a turn or more as may be necessary. Refill the cup when it is empty with special high temperature water-resisting grease.

3. EVERY 50 HOURS OF RUNNING

Engine.—Drain off engine oil, remove crankcase cover,

CHANGING ENGINE OIL

In the Instruction Book it is advised that the engine oil should be drained and replaced with fresh oil at intervals of 50 hours operation.

In order to conserve supplies and as a war time measure only, this may be extended to 60-hour periods of operation, provided that a good grade of oil is used in line with our published list of such approved oils.

Every care must be taken in such cases to ensure that engine operating conditions are carefully controlled in order to prevent excessive oil dilution. Careful attention to maintaining the cooling water at a temperature of 80° C. or 176° F. and correct vapourizer or carburettor adjustment will preserve the best lubricating properties of the engine oil.

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every 200 hours. See page 23.

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4. EVERY 200 HOURS OF RUNNING

Transmission.—Drain transmission, flush out with engine oil, and refill with **extreme pressure lubricant** of correct grade. (Oil will drain more readily if it is warm, immediately after the tractor has been used for a few hours.) Under no circumstances must grease be used in the tractor transmission.

Radiator.—Drain, and flush out with clean water, until water runs out clear.

Wico-type Magneto should have the screwed plug removed and light oil supplied until the orifice is filled. This plug is to the rear, faces sideways and is marked by a plate on the magneto body.

Steering Box.—Examine oil level and add extreme pressure lubricant to level of filler plug.

Air Cleaner.—Drain, clean out sediment, refill with oil of S.A.E. 20 viscosity. Very dusty conditions may necessitate more frequent cleaning.

LUBRICATING THE ENGINE

Under no circumstances must the oil in the engine be allowed to get below the mark " L " on the dipstick, which is located on the left-hand side of the tractor about six inches in front of the bottom of the gear change lever. The correct way to ascertain the oil level is as follows :— With the tractor standing level and the engine stopped, pull the dipstick, wipe it with a clean rag, re-insert and again remove it, when the mark made by the oil indicates its level.

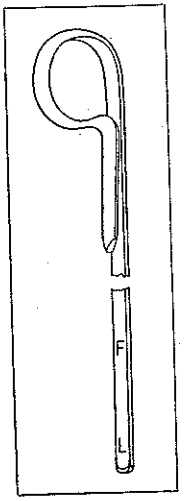

Figure 6
Oil Level Dipstick

The oil filler is located on the left-hand side, to the front of the engine. The capacity of the engine oiling system is about 2¼ gallons.

A new tractor must have the engine oil changed at the end of 25 working hours and thereafter every 50 working hours, approximately. To do this, remove the large plug underneath the crankcase in the centre. When the oil has drained off, it is absolutely essential to remove the crankcase cover, and clean the oil screen and cover thoroughly with petrol, after which they should be reassembled, and the engine filled with oil. Do not flush out the engine with paraffin.

Your local Fordson dealer will be pleased to advise you as to the correct grade of oil to use in the engine.

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TRANSMISSION

The only attention needed by this is to see that the system is kept full of **extreme pressure lubricator** of the correct grade, at all times.

The filler hole is located just below, and to the side of the gear change lever. Before removing the filler cap, wipe off all dirt on, or round, the cap so that none gets into the transmission housing. Pour in the oil until it reaches the level of the filler cap hole, allowing plenty of time for it to reach all parts of the transmission and rear axle. If this is done when the tractor is warm, the heat will make the oil flow more readily and so save time. Change the oil after every 200 hours of operation. To do this, remove the drain plug underneath the housing while the oil is warm. When all the oil has drained out, flush out the housing with a quart or so of engine oil. Replace the plug and refill with oil. The capacity is $3\frac{3}{4}$ gallons.

Should the oil be left unchanged too long, or if too light an oil be used, the transmission housing will overheat when the tractor is operated. This condition must be remedied immediately or excessive wear will be caused.

GREASE GUN LUBRICATOR FITTINGS

In order properly to force lubricant to all parts equipped with the conical-shaped lubricator fittings, a high-pressure grease gun is employed. With this gun, the lubricant can be forced in under a pressure of 2,000 pounds or more per square inch, thus ensuring a more thorough and positive lubrication than can be accomplished any other way.

To fill the grease gun, remove the cap and nozzle (see fig. 7), pack the gun solidly and avoid air pockets. Use a good grade of grease gun lubricant for all bearings having the conical-shaped lubricator fittings.

OPERATING THE GREASE GUN

When the grease gun is held by the handle and pressed against the conical-shaped fittings, the plunger moves forward, forcing the lubricant in the nozzle directly through the fitting into the bearing, under an extremely high pressure.

When the pressure on the handle is released, the internal spring returns the handle to the fully extended position and so makes ready to deliver a charge of lubricant with the next forward thrust.

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LOCATION OF FITTINGS

A list of points at which lubricator fittings are located is given on page 22.

The lubrication and maintenance chart on pages 64-65 also shows the location of these fittings on your tractor.

RADIATOR

The radiator should be kept filled at all times, and should be checked several times daily if the tractor is in continuous use in hot weather. **Clean water only must be used.** The capacity of the cooling system is 10 gallons. Flush every 200 working hours (see page 34). **If overheated allow to cool down before adding water** (see page 33).

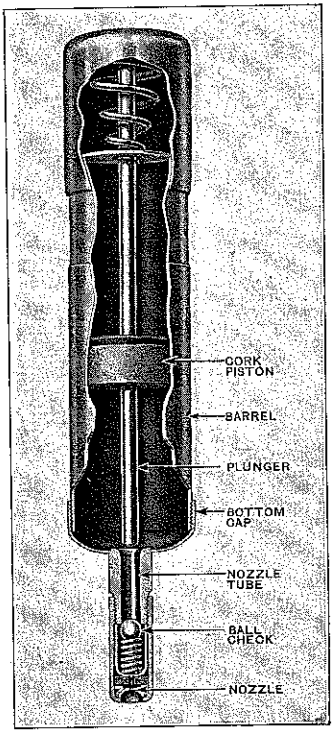

Figure 7
Grease Gun

AIR CLEANER

The air cleaner should be kept filled with oil to the level plug and checked nightly. Every 200 hours the drain plug should be removed and the oil drained off: the dirt trap cover should be unscrewed, removed and the dirt trap thoroughly cleaned out. Engine oil of viscosity S.A.E.20 should be used for the cleaner and care must be taken when replacing the dirt trap cover that it is screwed in tightly, to avoid any possibility of leakage at this point. If used in very dusty conditions the dirt trap may need cleaning at more frequent intervals and it will be of assistance if, when it is required to drain the oil and clean the dirt trap, this be done after the tractor has been stopped and the oil is warm.

The primary air cleaner, mounted at the top of the vertical air inlet pipe, should be examined occasionally to ensure that the air vanes beneath the cleaner are

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free and unobstructed by foreign matter. At the same time the four scoops provided at the top of the cleaner to permit the escape of larger fragments of dust should be examined and cleared if necessary. Failure to maintain the primary air cleaner free from obstruction will cause a relatively greater proportion of partially cleaned air to enter the oil bath and in addition engine performance may be affected.

CLEANING THE TRACTOR

The tractor should be kept free from rust or dirt. If this is allowed to accumulate, it may in time get carried into the bearing surfaces and cause unnecessary wear. Wash the tractor frequently and keep it well painted to prevent rusting. When washing, care should be taken that no water reaches the wiring, magneto, or sparking plugs, as this may result in a short circuit and failure of the ignition system. It is most important to see that the tractor is properly and efficiently lubricated and cleaned. Inspect the tractor frequently and see that all nuts, bolts and screws are tight.

Keep the rear wheel bearings and felt washers and dust caps in good condition, as oil may leak out and dirt may work into the transmission through the rear axle if these bearings are allowed to work loose.

THE RUNNING GEAR

This should be carefully gone over every week to see that all bolts and connections are secure, and any looseness in the steering joints, etc., should be taken up. The working parts should be well lubricated at all times and kept free of dust and mud.

The Engine

The engine is of the four-cylinder, four-stroke, internal combustion type in which petrol or vapourizing oil is supplied to the carburettor or vapourizer, where it is mixed with a certain proportion of air and forms a mixture which is highly inflammable when compressed.

As the crankshaft revolves, the pistons which are connected to the cranks by the connecting rods move up and down in the cylinders. The travel of the piston from the top to the bottom of the cylinder (and vice versa) is called a "stroke."

The camshaft is geared to the crankshaft and revolves at half the speed of the latter; it is so arranged that the cams lift each push rod and so open each valve at the correct time—once every two revolutions of the crankshaft. The valves are closed by the valve springs.

The magneto supplies a high tension current to the sparking plugs, causing a spark to jump the gap between the points and so ignite the mixture when compressed in the cylinders.

THE CYCLE OF OPERATION IN ONE CYLINDER

The Induction Stroke.—With the exhaust valve closed and the intake valve open, the piston moves downwards drawing the mixture from the carburettor or vapourizer into the cylinder.

The Compression Stroke.—At the bottom of the induction stroke the intake valve closes and the piston moves upwards, compressing the mixture in the cylinder head.

The Power Stroke.—When the piston reaches the top of its travel, a spark is produced at the sparking plug points which ignites the compressed mixture, causing it to expand and drive the piston downwards, imparting a power impulse to the crankshaft and so producing the power to drive the tractor.

The Exhaust Stroke.—At the bottom of the power stroke, the exhaust valve opens and allows the upward movement of the piston to expel the burnt gases through the exhaust pipe.

This cycle of operation is repeated in turn in each cylinder and each cylinder "fires" once for two revolutions of the crankshaft. The order in which the cylinders fire is 1–2–4–3 (counting from the front of the engine).

ENGINE LUBRICATION

The engine lubrication is entirely automatic and requires no attention from the operator, except to see that the oil is up to the "F" mark on the dipstick and that it is changed every 50 working hours (see pages 22 and 23).

Oil is thrown by the flywheel into a scoop formed at the end of a pipe running downwards to the front of the engine. The oil flows from holes in the side of this pipe through holes drilled in the upper half of the centre main bearing, lubricating it.

This pipe also feeds oil to the front main bearing and the timing wheels at the front of the engine.

The excess oil then flows into troughs in the crankcase where it is picked up by dippers on the big end caps to lubricate the big end bearings and create an oil mist for the cylinder walls and small end bearings.

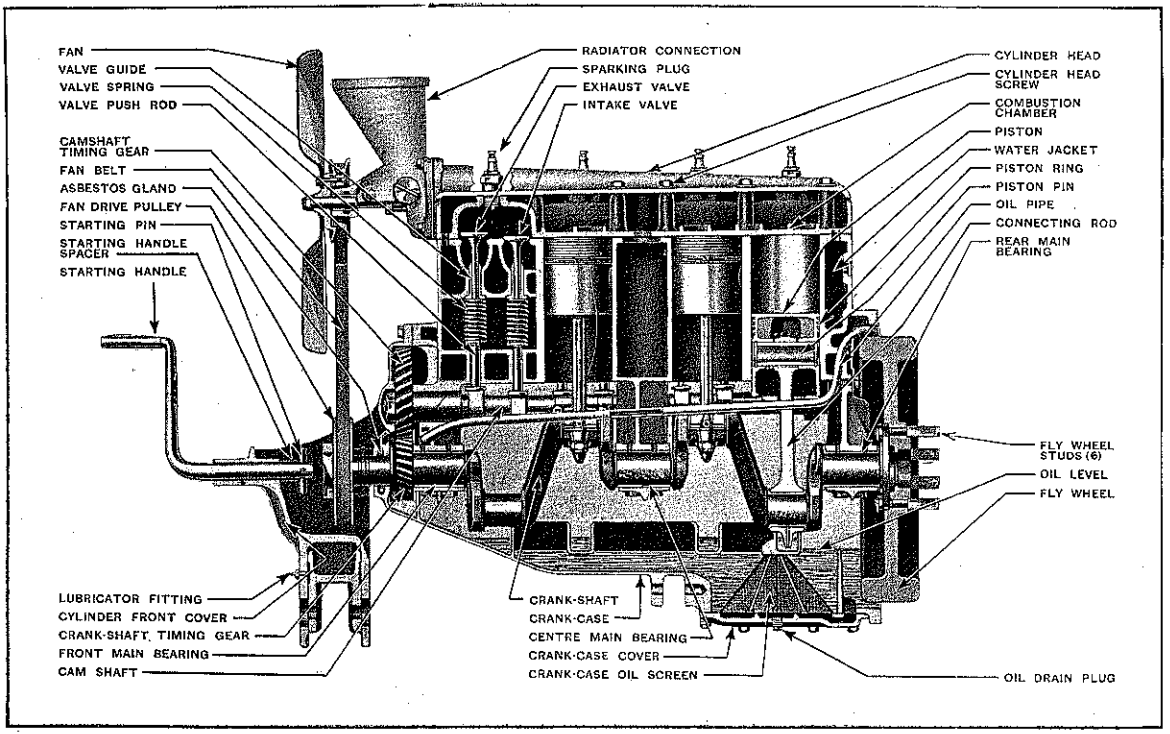

Figure 8
Sectional View of Engine

A dam at the rear of the crankcase prevents the oil from returning direct to the flywheel for re-circulation and forces it first to pass through a large fine mesh gauze screen which removes the particles of dirt and hard carbon which cause most wear.

If the screen is left uncleaned for a very long time and becomes so choked with dirt that oil cannot pass through it, the oil builds up against the dam till it overflows into the flywheel compartment and is so re-circulated.

The dam is low enough to allow the oil to overflow before the level in the flywheel compartment drops to such an extent as to diminish the quantity of oil in circulation at all seriously, though as this oil is unfiltered, it naturally causes much more wear than if the crankcase screen had been properly cleaned.

Full instructions for cleaning the screen are given on page 23.

Engine Components and their Functions

THE PISTON AND PISTON PIN

The Piston moves up and down in the cylinder, drawing the combustible mixture from the vapourizer and compressing it. It then receives the force of the expansion, being driven downward and transmitting the power through the piston pin and connecting rod to the crankshaft, after which it expels the burnt gases.

The Piston Pin holds the piston and connecting rod together and allows them to move in relation to each other; it is held in position by spring retaining rings in the piston pin bosses.

THE CONNECTING ROD

This is used to transmit the power from the piston, and in conjunction with the crankshaft to transform the reciprocal motion of the piston into the rotary motion which drives the tractor. The small end (piston pin) bearing has a bronze bushing; the big end (crankshaft) bearing is of babbitt metal, and shims are provided to allow it to be adjusted to compensate for wear.

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PISTON RINGS

In order to prevent any of the charge under compression escaping past the piston, three compression piston rings are fitted in grooves in each piston. The "spring" of these rings keeps them always in contact with the cylinder walls and provides an efficient seal. Below these is an oil control ring which has slots cut in to allow excess oil to flow through it, and thence through small holes in the ring groove of the piston back into the crankcase. This effectively prevents oil working its way up to the cylinder head, where it would tend to oil up the sparking plug, gum up the valves, and leave an excessive carbon deposit on the piston top and cylinder head.

THE CRANKSHAFT

This is carried on three main bearings, with two cranks between each pair. As this shaft rotates, the cranks revolve, and, being connected to the connecting rods and pistons, cause the latter to move up and down in the cylinders. The main bearings are lined with babbitt metal and may be adjusted to compensate for wear.

THE FLYWHEEL

A heavy flywheel is provided to ensure smooth running at all speeds and steady pulling at low speeds.

VALVES, CAMSHAFT AND PUSH RODS

In order to allow the piston to draw the fuel-air mixture from the vapourizer into the cylinder and to expel the burnt gases after they have done their work, an intake and exhaust valve are provided for each cylinder.

The camshaft is geared to the crankshaft and rotates at half the speed of the latter shaft. The cams lift the push rods which transmit this movement to the valves causing them to open. A spring surrounds each valve stem and one end is attached to the valve by the valve spring seat and valve spring seat retainers, and the other abuts against the cylinder block. This spring closes the valve as soon as the cam has turned sufficiently to allow the push rod to fall. The cams are so arranged that, as long as the gaps between the push rods and valves are accurate, the valves open and close at the proper time for the engine to work at its maximum efficiency.

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VALVE TIMING

Intake valve opens 10° past top dead centre.
Intake valve closes 40° past bottom dead centre.
Exhaust valve opens 30° before bottom dead centre.
Exhaust valve closes at top dead centre.
Lift of valve $\frac{5}{16}$ in.
Clearance between valve and push rod .020 in. to .024 in.

For repairs to Engine see page 84.

The Cooling System

The engine is cooled by the circulation of water in the jackets round the cylinders. The heated water flows by thermo-syphonic action, assisted by a pump at the front of the cylinder head to the radiator, and as it flows downwards through the radiator tubes, it is cooled by the stream of air induced by the fan placed behind the radiator.

REFILLING THE RADIATOR

THE RADIATOR SHOULD BE KEPT FILLED AT ALL TIMES, and should be checked several times daily if the tractor is in continuous use in hot weather, or whenever the cooling water boils.

If **clean** rainwater is obtainable, its use is advisable as it is free from salts, etc., which tend to clog the water passages.

It is advisable to see that the radiator is full before starting, and whenever the tractor is stopped to refill with fuel or oil, and in any case, it must be refilled at least twice daily.

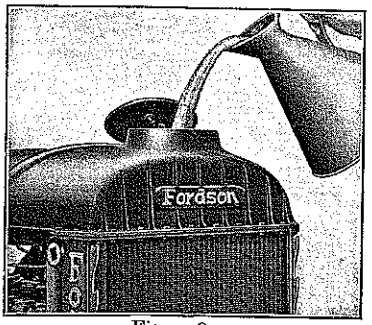

Figure 9
Filling Radiator

To remove the radiator cover, unscrew the nut on top two or three turns and push the cover backwards over the tank (see fig. 9).

Only clean water should be used.

The capacity of the cooling system is 10 gallons.

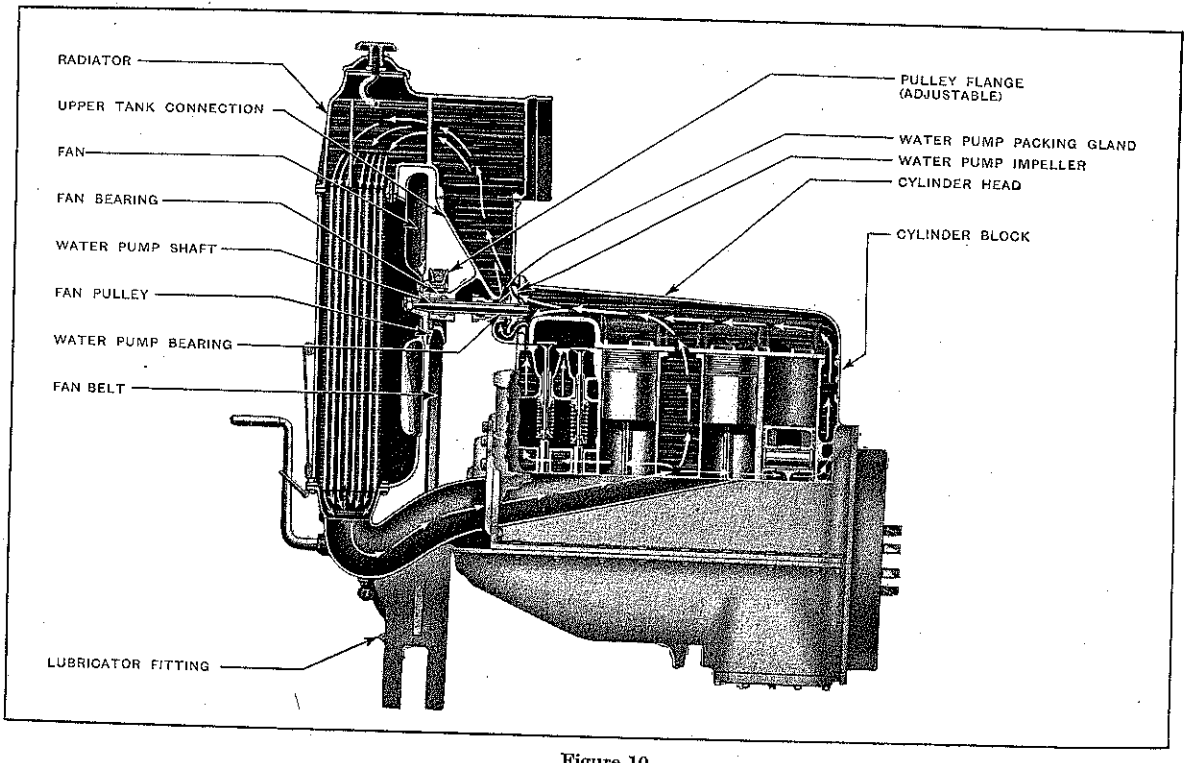

Figure 10
The Cooling System

IF THE RADIATOR OVERHEATS

ALWAYS ALLOW THE ENGINE TO COOL DOWN TILL THE BACK OF THE HAND CAN BE HELD AGAINST THE CYLINDER HEAD WITHOUT DISCOMFORT BEFORE REFILLING WITH WATER.

If there is water in the radiator top tank, the radiator may safely be refilled.

Don't be alarmed if the tractor boils occasionally, especially if it is working on heavy ground in hot weather, because the engine is most efficient at a temperature just below that of boiling water. Should the tractor consistently overheat, however, it is advisable to investigate the cause and remedy it.

CAUSES OF OVERHEATING

1. Radiator not full.
2. Excessive carbon deposit on pistons and cylinder head.
3. Valve or valves not seating properly.
4. Retarded ignition.
5. Insufficient or poor grade oil in engine.
6. Racing engine.
7. Vapourizer incorrectly adjusted.
8. Fan belt slipping or broken.
9. Radiator tubes clogged.
10. Radiator blind incorrectly adjusted.

ANTI-FREEZING MIXTURE IN WINTER

The tractor should be properly housed when not in actual use, and so protected from severe weather conditions.

In winter, it is advisable to use an anti-freezing mixture in the cooling system, as the cylinder block, cylinder head, etc., may be cracked if the water freezes.

Before putting the mixture into radiator, the cylinder head screws should be tightened down to prevent the possibility of any getting into the cylinders, where it will cause serious damage.

Various good proprietary brands of anti-freezing mixtures are available. A 60 per cent. concentrated glycerine solution can be used advantageously.

Radiator Glycerine in Solution.	*Freezing point.*
20%	26° F.
30%	22° F.
50%	12° F.

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A good mixture is 60% water, 10% glycerine and 30% alcohol.

It freezes at 8° F.

Fresh alcohol must be added frequently to make up for loss due to evaporation.

If an anti-freezing mixture is not being used in frosty weather, it is essential that the radiator be drained if the tractor is left out overnight, and refilled next morning.

In the case of a tractor to which is fitted an air cleaner of the water washer type it is essential that it should be drained in frosty weather when out of use.

CLEANING THE RADIATOR

Every 200 working hours the entire water circulating system should be flushed out thoroughly. All that is necessary is to open the drain cock in front of the engine, just under the radiator, and pour water into the top tank until such time as the water which comes out of the drain cock is quite clear. Should the tubes become clogged inside, and water not remove the obstruction, they can be cleaned by means of a thin strip of copper wire or cane, inserted through the filler hole. When the fins and tubes become clogged outside with chaff, seed, dust, etc., they should be cleaned, as otherwise the air circulation is retarded.

REPAIRING LEAKS IN RADIATOR TUBES

A small leak may be repaired temporarily by applying brown soap or white lead, but the repair should be made permanent with solder as soon afterwards as possible. A choked radiator tube is a more serious affair. Whilst the stopping of one tube does not seriously interfere with the water circulation, it is bound to cause trouble sooner or later, and the tube will freeze in cold weather.

For repairs to Cooling System see page 97.

The Ignition System

The magneto is driven by a gear from the camshaft through an impulse coupling which provides an intense spark when the engine is cranked. It generates the high tension electric current which is conducted through the high tension leads to each sparking plug in turn, where, in jumping the gap between the points, it produces the spark which ignites the compressed mixture in the combustion chamber.

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To obtain the best results under varying operating conditions, the timing of the spark is variable and is controlled by the ignition control lever on the dash.

When this lever is at the bottom of its quadrant, the ignition is fully advanced. When the lever is moved upward to the indentation in the dash the ignition is fully retarded. When the lever is moved beyond the indentation the primary circuit of the magneto is earthed and the ignition is switched off. See note on Ignition Control Lever, page 14.

THE IMPULSE COUPLING

A pawl carriage, on which two weighted pawls are pivoted, is keyed to the magneto armature shaft and held in position by a nut which is retained by a snap ring in the central boss of the pawl carriage, so that, when the nut is unscrewed from the armature shaft, it pulls off the whole coupling. A hub carrying two cams fit round the boss and is retained by another snap ring. **The Wico-type Magneto** has a parallel shaft and differs slightly in construction but the method of operation is the same. A torsion spring surrounds the pawl carriage and the hub, with one end attached to each. Two lugs on the hub take the drive through a fibre coupling from the magneto gear and so from the crankshaft.

OPERATION ON IMPULSE COUPLING

When the engine is being cranked by hand, the magneto shaft is turned slowly, and, at a certain point, one of the pawls engages a stop on the magneto body. This holds the pawl carriage and magneto shaft stationary while the hub continues to rotate and winds up the torsion spring. When a piston reaches its firing point one of the cams on the hub lifts the pawl clear of the stop, allowing the torsion spring to " flick " the magneto shaft sharply over the firing point of the magneto, which so generates a far more powerful electrical impulse than it would if rotated slowly over its firing point.

When the engine starts, the centrifugal force of the weights on the pawls causes them to move outward, clearing the stop on the magneto body, throwing the impulse coupling out of action, and thus allowing the magneto to operate in the normal manner.

TO DISENGAGE THE IMPULSE COUPLING

The Lucas-type and Wico-type Magnetos have no provision for throwing the impulse coupling out of action.

In the case of the Bosch-type magneto, should it be desired to throw the impulse coupling out of action for any reason (e.g., to adjust the magneto contact breaker points) it may be done quite easily.

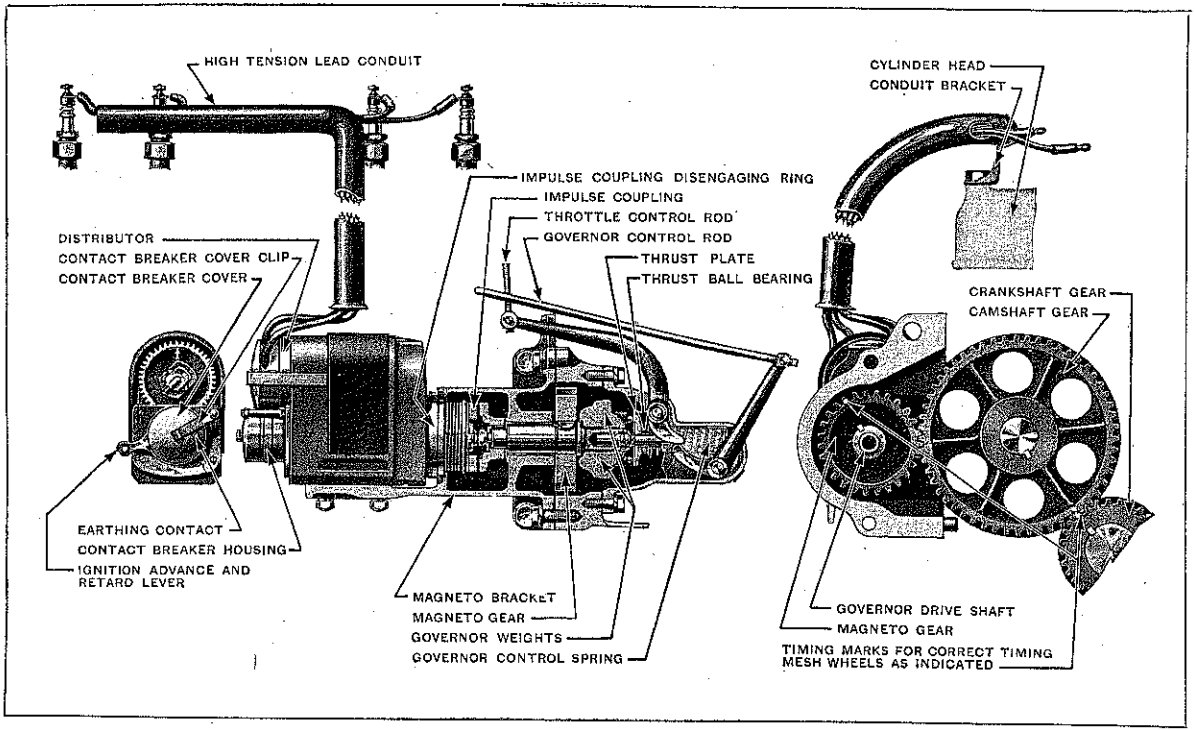

Figure 11
Ignition System and Governor

Clean away all dirt, etc., between the magneto and the magneto bracket, as any dirt which gets into the magneto will cause serious damage.

Remove the screw securing the impulse coupling disengaging ring (see fig. 11) and turn the ring as far as it will go in a clockwise direction (looking to rear of tractor). This brings the end of a circular guide ring against the stop on the magneto body and this lifts the pawl over the stop, allowing the magneto shaft to be rotated steadily instead of being held by the pawl engaging the stop.

Do not attempt to start the engine without re-engaging the coupling and do not fail to replace the securing screw in the impulse coupling disengaging ring.

TROUBLE

In time, carbon will be deposited on the plug points and if not cleaned off will short circuit the plug, causing the cylinder to misfire. Also after prolonged use, the points may burn away to such an extent as to interfere with the regular firing of the plug.

An irregularity in the exhaust note indicates that one or more cylinders are firing intermittently or not at all.

The trouble should at once be located and put right, as otherwise the tractor will not develop its full power and serious damage may be done.

TO LOCATE MISFIRING

Pull out the governor control rod until the engine is running at a fair speed and " short circuit " each plug as follows :—

Hold a wooden-handled screwdriver with the blade against the cylinder head, and the shank about $\frac{1}{64}$ in. from the sparking plug terminal nut. Check each plug in this manner till one is found which when " shorted " makes no difference to the running of the engine.

Examine that plug and high tension lead and see that all is in order.

If a plug is faulty, it should be removed, and cleaned or changed if necessary.

If it is necessary to clean the plugs, proceed as follows :—

Remove the plugs from the engine and clean the points with an old toothbrush dipped in petrol. It is always better, however, to dismantle the plugs by securing the large hexagon steel shell in a vice and loosening the lock nut which holds the porcelain insulator in place. The carbon deposit can then be easily removed from the porcelain and shell with a small knife. Care should be taken not to scrape the glazed surface off the porcelain as this will cause rapid carbonization of the plug. The insulator should be carefully inspected for breakage. In reassembling the plug, care should be taken that the lock nut is not tightened so much that it cracks the porcelain.

The correct gap between the sparking plug points is .030"—.033".

When adjusting plug points, always do so by bending the outside electrodes as if the central one is bent it may crack the porcelain.

Dirty plugs are usually the result of worn piston rings, pistons or cylinder bores, excessive oil in the crankcase, or of using too rich a mixture.

If all the plugs are satisfactory, the trouble may be that a valve is not seating properly (see page 87), that the high tension lead insulation is faulty allowing the high tension to short circuit to earth, or that the contact breaker mechanism needs cleaning or is incorrectly adjusted.

TO ADJUST CONTACT BREAKER POINTS

Remove contact breaker cover.

Rotate crankshaft until the fibre block on the end of the breaker arm is at the high point of the contact breaker cam ring.

When the crankshaft is being turned, it will be found that at a certain point the magneto armature and the contact breaker stop revolving, then, when the impulse coupling releases, they spring round past the firing point of the magneto and the fibre block may pass the high point of the cam.

If this occurs, moving the ignition control lever on the dash fully upwards into the retarded position may rotate the cam ring sufficiently to bring the fibre block back on to the high point of the cam. Should it not do so, the impulse coupling may be thrown out of operation (see page 35), when the magneto armature and contact breaker will rotate steadily with the crankshaft and enable the fibre block to be brought to the exact point on the cam ring desired.

Loosen contact breaker point lock nut and adjust the gap to .015 inch for Bosch type and .012 for Lucas type.

Tighten lock nut and replace contact breaker cover.

Should it be found necessary, however, to reface the points due to pitting, first remove the contact breaker from the armature by unscrewing the central hexagon screw.

Release the spring from the rocker arm, noting that a reinforcement spring is fitted, gently prise the flat spring sideways and ease the arm from the pin. Do not lose the red fibre washer between the flat spring and the shoulder of the rocker arm bush.

Each contact face may then be dressed with a special contact-breaker file (do **not** use an ordinary file) taking care that they meet absolutely squarely when reassembled. If the fixed contact is removed by unscrewing the securing screw, be careful not to lose the insulating washers which must be correctly replaced.

Reassembly may be made in the reverse order, but when reinstalling the contact breaker take care that the key engages correctly with the keyway in the armature and that the carbon earthing brush is not displaced. Adjust the points as described above.

For Wico-type Magneto the distributor cap and rotor must be removed and the fibre block should rest on a lobe of the cam. Loosen the screw at the slotted end of the contact breaker fixed arm and then turn the eccentrically mounted screw adjacent to the points until a gap of approximately .015 inch exists. Recheck this gap when the locking screw has been securely tightened.

To remove the contact breaker points for cleaning or replacement, after the rotor has been withdrawn, undo the screw holding the wire to one end of the spring. Remove the screw holding the rocker arm to the pivot and the assembly may be withdrawn. Do not lose the washers or sleeve.

The fixed contact arm may then be removed after the screw securing the slotted end to the base has been undone.

REPAIRS TO MAGNETO

IN CASE OF FAILURE OF THE MAGNETO IT IS ESSENTIAL TO CONSULT AN AUTHORISED FORDSON DEALER, AS INEXPERT REPAIRING OF MAGNETOS IS ALWAYS UNSATISFACTORY.

For repairs to Ignition System see page 99.

The Governor

The speed of the engine is regulated by a centrifugal governor which is controlled by the governor control rod from the dash.

A short shaft is fitted into a hollow forward extension of the magneto driving shaft and is secured by a pin which projects through this extension and acts as a pivot for two governor weights. A thrust plate, ball thrust bearing and grooved sleeve fit, in order, on to this shaft, and are free to move on it. See Fig. 11.

One end of the governor spring goes over the end of the grooved sleeve, and as this spring is slightly compressed it holds the thrust plate, thrust bearing and grooved sleeve against each other with the thrust plate pressing against hardened steel pegs in the governor weights. These weights are so shaped and pivoted that when they revolve and centrifugal force causes them to move outward, they push the thrust plate, thrust bearing, and grooved sleeve forward against the governor spring till the force exerted by the revolving governor weights is balanced by the force of the spring.

A fork fits into the groove in the sleeve and is connected through the throttle control arm and rods to the throttle valve in the vapourizer or carburettor, and it is so arranged that when the sleeve moved forward against the spring the throttle is closed and when it moves back the throttle is opened.

A small actuating arm abuts the other end of the governor spring and is connected through a shaft and arm to the governor control rod so that when the latter control is pulled out the actuating arm compresses the governor spring restricting the distance the weights can move the grooved sleeve forward and close the throttle.

OPERATION OF THE GOVERNOR

When the engine is stationary the governor weights are lying at their innermost position allowing the spring to push the grooved sleeve into its rearmost position, with the throttle open. When the engine is started the open throttle allows it to speed up, causing the revolving governor weights to move outwards, pushing the grooved sleeve forward against the spring, closing the throttle, until the force of the spring balances the forward thrust of the governor weights. Should the speed increase above the set figure, the weights move further out overcoming the re-

sistance of the spring, pushing the grooved sleeve forward and closing the throttle. Should the speed decrease, the weights move inwards allowing the spring to push the sleeve back and open the throttle, thus correcting any variation in engine speed.

Extensions are provided on the throttle and governor control arms which provide a positive closing action to the throttle valve when the governor control is pushed right in.

For repairs to Governor see page 102.

The Fuel System

The fuel system on tractors using vapourizing oil consists of a tank with two sections—a main tank for vapourizing oil and a small one, built inside it, for petrol for starting the engine—also a sediment bulb with a two-way valve which permits either petrol or vapourizing oil to be used as fuel. On tractors designed to run on petrol, however, there is only one large compartment in the tank. The tanks may be drained by removing the drain plug in the sediment bulb.

Tractors running on vapourizing oil are equipped with a vapourizer ; those running on petrol with a special down-draught carburettor and a cylinder head giving a higher compression ratio.

Under no circumstances should vapourizing oil be used as fuel in a tractor equipped with a high compression cylinder head. Petrol may be used in emergency in tractors equipped with a

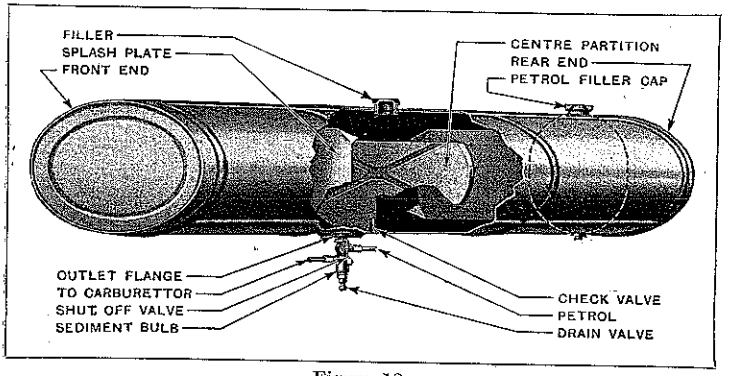

Figure 12
Fuel Tank

vapourizer, but if it is intended to use this fuel regularly, a petrol carburettor and high compression head should be installed.

CARE

All fuel should be carefully strained to prevent water or other foreign matter getting into the tanks, and the vent holes in the filler caps should be kept free of obstruction.

As Tractors frequently have to be refilled at a distance from bulk supplies of fuel, great care should be taken to ensure that the containers used are clean and free from sediment. They should also be so marked as to obviate the tank compartments being replenished with the incorrect type of fuel.

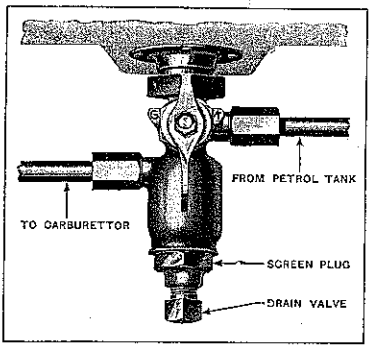

Figure 13
Sediment Bulb

A sediment bulb is provided and this should be drained frequently by unscrewing the square-headed drain plug at the bottom of the bulb—allowing all dirt, etc., to run away. This prevents any foreign matter getting to the carburettor or vapourizer. In cold weather, should the sediment bulb become filled with water which in turn freezes, it may be cleared by wrapping a cloth round it and keeping it saturated with hot water for some minutes until the ice melts and the water may be drained out. Should the carburettor become blocked in the same way, similar treatment should be applied.

THE VAPOURIZER

The vapourizer (or carburettor on petrol tractors) is used to mix the liquid fuel with air and so form a combustible mixture which is drawn into the cylinder by the pistons and ignited by an electric spark.

The vapourizer is illustrated in fig. 14. When using petrol for starting, the two-way valve is turned to " G." This allows petrol to enter the float chamber.

After the engine has been running ten to fifteen minutes the two-way valve on the sediment bulb should be returned to " K, "

to change the fuel used from petrol to vapourizing oil. The paths of the air, fuel, mixtures, and exhaust gases are indicated by arrows, as explained by the key on the diagram (fig. 14). The volume of gas mixture entering the cylinders is regulated by the governor through the throttle valve.

To stop the engine when running on vapourizing oil, change over to petrol for two minutes before turning off the fuel.

FUEL AND AIR RESTRICTORS

In the interests of fuel economy restrictors may be fitted in the fuel passage and in the primary air passage, These are cylindrical in shape, with conical ends. Do not remove or fit restrictors of either type without consulting your Fordson Tractor dealer or unsatisfactory running may result.

The fuel restrictor is fitted in the horizontal passage beneath the float chamber, access to the restrictor is given by removing the screw at the rear outside corner of the float chamber. The air restrictor is fitted in the air passage in the manifold, this passage being the centre orifice disclosed when the vapourizer plate is removed.

OPERATION OF THE VAPOURIZER

Fuel flows through the fuel regulator valve into the float chamber where its level is regulated by the float. It then passes through the adjustable needle valve to a jet at the rear of the float chamber, where it is met by a small stream of air supplied through a by-pass from the choke valve.

The fuel and air mixture is then sucked through the passage in the vapourizer hot plate where the heat of the exhaust gases is used to ensure complete vapourization of the mixture, then up a short pipe, over the throttle valve plate where it mixes with the main air supply from the air washer, and downwards through the intake manifold into the cylinders.

For the mixture to ignite easily, the proportion of fuel and air must be correct, and on tractors having vapourizers this is controlled by the vapourizer needle control. If the mixture is too rich (too much fuel and insufficient air) it aggravates the carbon deposit in the cylinders, heads, pistons, valves, and valve ports, the engine tends to overheat, fuel is wasted, and the engine will misfire at low speeds. Too rich a mixture is shown by excessive exhaust smoke, and too weak a mixture by backfiring in the vapourizer, while with the correct mixture there is very little smoke or odour.

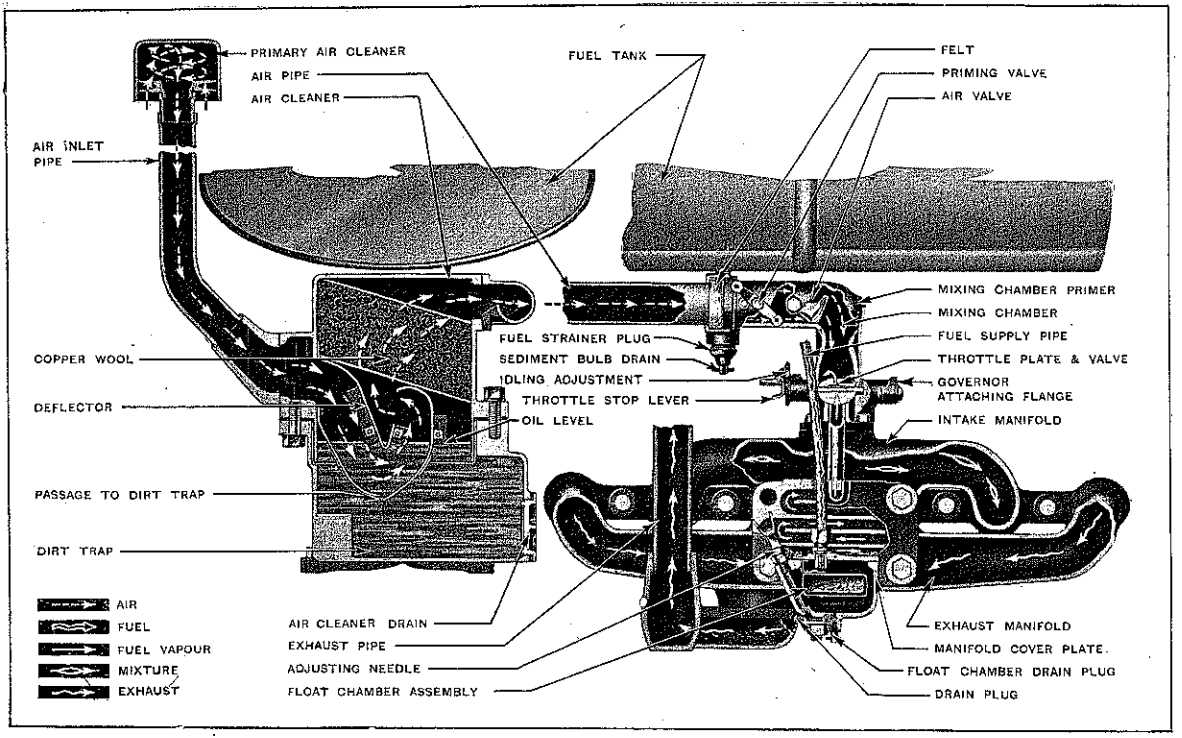

Figure 14
Fuel System with Paraffin Vapourizer

As a rich mixture is needed for easy starting from cold, a dash controlled choke is provided and this may be used to restrict the flow of air to the vapourizer, so causing the engine to draw a larger proportion of fuel into the cylinders. **The choke control must not be pulled out when the engine is warm.**

VAPOURIZER NEEDLE ADJUSTMENT

The following tabulation gives the correct setting for the needle adjustment :—

Identification.	*Modification.*	*Adjustment.*
(*a*) Up to Engine No. 918495.	None.*	$1\frac{7}{8}$ turns open.
(*b*) Engine No. 918496 to 920338.	Smaller hole in air passage.*	$1\frac{1}{2}$ turns open approx.
(*c*) Engine No. 920339 onwards.	As " b " but also fuel restrictor.	$2\frac{1}{4}$ turns open approx.

*Where original equipment is modified by fitting restrictors in both fuel and air passages, or fuel passage only as in case " b," use setting for " c ", i.e., $2\frac{1}{4}$ turns open approx.

Further economy of fuel may be possible by screwing in the adjusting needle when operating under light loads.

TO CLEAN VAPOURIZER PLATE

The vapourizer plate should be cleaned occasionally to remove any carbon which may accumulate. Disconnect the fuel feed pipe and remove the four manifold cover studs ; take off the manifold hot plate. The plate may then be cleaned with a wire brush and reassembled.

TO CLEAN JET

Should the jet become choked with dirt or water, it may be cleared by running the engine fairly fast, opening the vapourizer needle valve and pulling out the choke control and returning it quickly. This has the effect of creating a high suction on the jet and may suck the obstructing matter through. The choke control must not be held out for any length of time as the engine may choke and stop, in which case starting will be difficult.

CARBURETTOR

On tractors designed to run on petrol, in addition to a high compression head, a special downdraught carburettor which has been designed to meet the particular requirements of the Fordson Tractor is fitted.

Fuel flows from the petrol tank to the carburettor float chamber and fills it to a predetermined level which is controlled by a float and a fuel regulating valve.

From the float chamber the petrol flows through calibrated jets, receiving a small quantity of air through the high-speed air bleed which atomises the fuel, and then enters the air stream from the air cleaner through a discharge nozzle into the secondary venturi. The mixture then goes past the throttle valve, which controls the amount of mixture supplied to the engine, and into the intake manifold and so to the cylinders.

Any water or dirt which may have collected in the float chamber may be drained away by removing the gland which carries the main jet adjusting screw, or opening the drain cock where fitted.

A choke valve controlled from the dash is also provided and this may be used to restrict the air supply from the air cleaner to the carburettor, thus enriching the mixture to facilitate starting when the engine is cold. If the choke control is held out too long, liquid petrol may be drawn into the intake manifold, causing the mixture drawn into the cylinders to become too rich for easy starting. The choke must not be used when the engine is warm, or it will act in the same way and may stop the engine. To minimise this effect, two small valves are fitted to the intake manifold and these allow any liquid petrol which may accumulate in the manifold to drain off. As soon as the engine starts these valves close and prevent any air leaking in through them.

Provided the carburettor is maintained in correct adjustment trouble with this component is most unlikely, but cleanliness of the jets is best assured by straining all fuel when filling the tanks.

Should the jet become choked it may be cleared by running the engine at a fair speed, pulling out the choke and returning it quickly, taking care not to hold out the choke control for any length of time, as this may stop the engine and make it difficult to start again.

Slow-Running Adjustment.—The only adjustments required are to the idling adjusting needle and to the throttle stop screw (see Fig. 15). An approximate setting for the idling adjusting needle would be ½ to 1 turn open from the fully closed position.

To obtain the exact setting for the individual engine proceed as follows :—

When the engine is warm, turn the throttle stop screw so that the engine will run sufficiently fast to prevent stalling. The idling adjusting needle should then be turned in or out until the engine runs evenly ; the throttle stop screw may now be readjusted if the

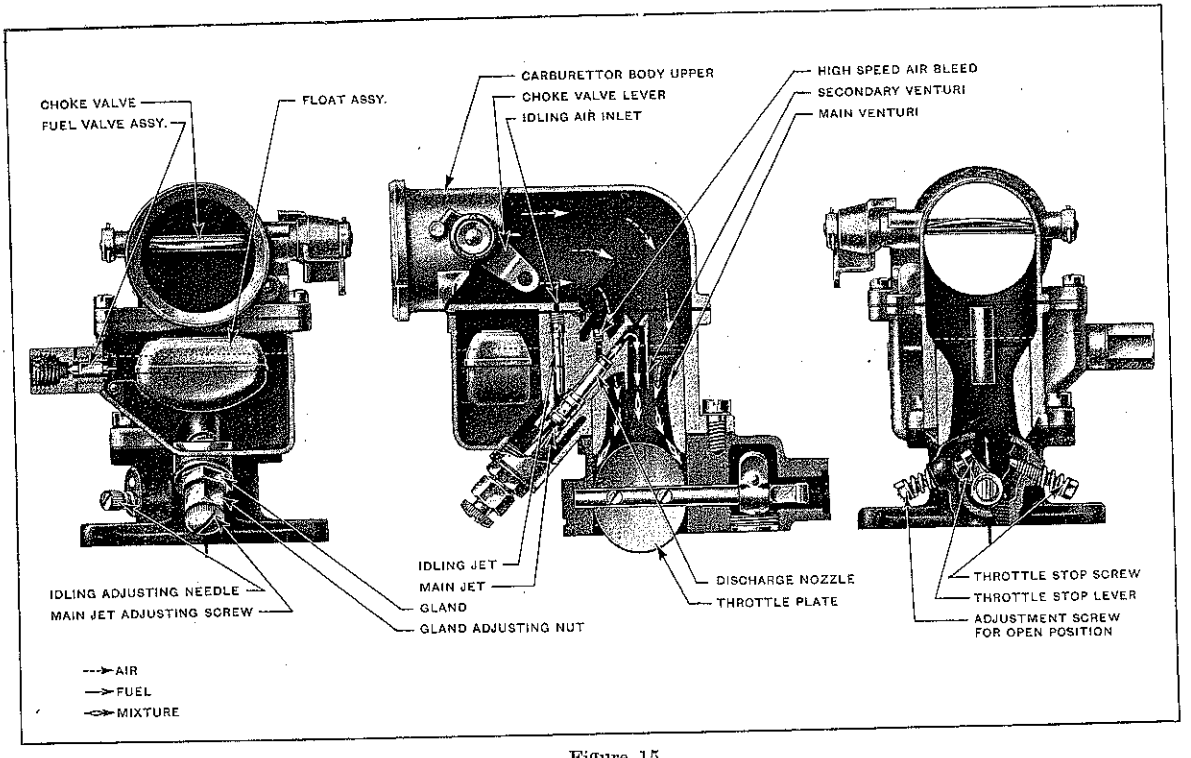

Figure 15
Carburettor

[illegible] the idling adjusting needle. These operations should be repeated until the idling speed is satisfactory.

The screw opposite the throttle stop screw controls the fully open position of the throttle plate and should not be altered.

Main Jet Adjustment.—The approximate setting for the main jet adjusting screw is 1 to 1½ turns open for maximum power.

Should this needle be open too far a rich mixture will be caused, which may result in a black exhaust, fouled sparking plugs, and loss of power, in addition to heavy fuel consumption. A mixture which is too weak, due to the needle being screwed in too far, may cause overheating, " pinking ," and loss of power.

In cases where there is no external throttle stop screw or main jet adjustment, remove the stop screw cover and adjust as necessary, in conjunction with the idling adjusting needle.

Approximate settings are :—

Idling Adjusting Needle—½ to 1 turn open.

Throttle Stop Screw—Screwed in about 1 to 1½ turns after the screw just touches the throttle stop.

Do not expect a new engine which is stiff to idle properly at low speed or to " rock " on compression when stopped.

FLOODING CARBURETTOR

Should petrol flow from the float chamber, it may be due to the fuel regulating valve not seating properly, or to the float being punctured.

Turn off the fuel at the sediment bulb.

Remove the screws (4) holding on the float chamber, when the regulating valve and float may be examined, repaired or replaced if necessary.

The Air Intake System

On the Agricultural Tractor (for Industrial Tractor see page 70) air is drawn through a number of vanes at the base of the primary air cleaner, and these impart a rotary motion to the incoming air, causing the larger particles of dirt, chaff, etc., to fly outwards and upwards against the top of the cleaner, thence through four small scoops to the atmosphere.

The partially cleaned air then flows down the vertical air inlet pipe and enters the air cleaner at the left-hand side of the tractor.

A suitably shaped deflector is fixed inside the air cleaner and the level of oil contained in the base of the cleaner is such that the

air has to pass through the oil bath before it can enter the engine. Owing to the internal construction, together with its speed, impurities in the air are deposited in the oil and find their way through a suitable passage formed for the purpose into a dirt trap in the base of the cleaner.

Before leaving the cleaner the air passes through a final filter of copper wool which besides preventing any chance of oil being carried through with the air stream, tends to impregnate the cleaned air with a finely divided oil-mist.

A small release valve is fitted beneath the outlet elbow of the cleaner so that any fuel or oil which may find its way to this point may escape. This valve opens when the engine is at rest and it should occasionally be inspected to ensure that it is free and unobstructed.

The cleaner is located on the crankcase, between the cylinder block and dash, being secured by three bolts. The top securing bolt is suitably drilled and registers with a passage communicating with the crankcase. In the cleaner a passage is formed which in conjunction with this drilled bolt allows fumes from the crankcase to be drawn into the cleaner and so consumed.

CARE

The cleaner depends for efficient operation on a supply of clean engine oil of viscosity S.A.E.20 which is contained in a suitable reservoir in the base and through which all the air is drawn. A drain plug and detachable dirt trap cover are provided and the oil should be changed at intervals of 200 hours operation. If the oil be drained when warm, after the engine is stopped, the operation is rendered easier as the oil flows freely and sediment is more easily removed.

The dirt trap cover is screwed into the case and when this is removed all sediment may be cleaned out through the hand-hole. When replacing the cover plate care must be taken that it is tight since any leak at this point will permit oil to escape and possibly render the cleaner ineffective.

Check the release valve beneath the outlet elbow periodically to ensure that it is operating freely.

The capacity of the cleaner is approximately 6 pints. The clean engine oil of viscosity S.A.E.20 should be inserted through the filler till the level reaches the top of the filler pipe when the correct oil level is maintained. The filler cap should be screwed home and the gasket and drain plug checked for oil leaks. Never run the tractor with the oil container empty, or the filler cap missing.

For repairs to Air Intake System see page 103.

Figure 16
Front Axle and Radius Rods

The Steering Gear and Front Axle

Steering Gear is of hour-glass worm and sector type, mounted on the dash, and adjustable for wear.

The steering-box has a filler plug for replenishment and extreme pressure lubricant should be used.

The steering connections are of heavy construction with lubricator fittings wherever necessary. They should be greased daily with the grease gun as these parts are usually covered with mud or dirt, which may easily work its way into some bearing surface and cause excessive wear.

The front axle is mounted in the cylinder front cover and is located by a trunnion in a sleeve which is free to move vertically against a rubber buffer which acts as a spring. Heavy radius rods are bolted to the ends of the axle to take up thrust and preserve alignment.

Row crop steering gear and braking system.—The steering gear and front axle of the row crop tractor form an assembly which is mounted on the cylinder front cover and the vertical shaft has a gear splined on it. Meshing with this is a worm connected by shafts and universal joints with the steering wheel.

The steering worm and gear operate in oil, a filler plug being provided on the left-hand side of the steering assembly.

A lubricator is fitted beneath the worm housing so that grease may be injected into the lower roller bearing which carries the weight of the front end of the tractor. The upper bearing, also of the taper roller bearing type, is covered by an internally threaded cap in which grease may be inserted and when replaced forces lubricant into the bearing assembly. Capacity of steering box is $1\frac{3}{5}$ pints of extreme pressure oil.

The steering is inter-connected with a brake on each rear wheel so that, when the front wheel is moved through approximately 45°, the brake on the same side as that to which the front wheel is pointing is applied.

As the front wheel also trails behind the vertical centre line of the shaft the combined effect is to render a sharp turn possible with the minimum of effort.

Details for brake adjustment are given on page 104.

For repairs to Steering Gear and Front Axle see page 110.

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The Transmission

The transmission consists of a clutch, gearbox, brake and rear axle, and is used to transmit the engine power to the rear wheels and so drive the tractor.

CARE

The clutch is lubricated by the oil in the engine crankcase and needs no attention in normal running. The gearbox and rear axle are located in the transmission housing and lubricated by **extreme pressure lubricant** in this housing.

As all shafts and gears are of specially hardened steel with a large number of heavy duty roller bearings, wear is reduced to a minimum and no attention is needed except to see that the transmission is kept full of gear oil of the correct grade, and that the oil is changed every 200 working hours (see page 23).

The Clutch

To enable the power of the engine to be taken up smoothly and to facilitate the engagement and changing of the gears, a clutch is provided. It is the means by which this power is supplied to, or cut off from, the gearbox and rear axle.

A set of driving plates fit on six studs fixed in the flywheel; a set of driven plates is interleaved with the driving plates and fit on six keys in the clutch drum which is fixed on the drive shaft. When the clutch is engaged—by allowing the clutch pedal to rise—six springs force all the plates together, the resulting friction causing them to revolve as one solid unit.

When the clutch is disengaged—by pressing down the clutch pedal—the spring pressure on the plates is released, allowing them to disengage and thus permit the engine to run free.

Fig. 41A shows the relative assembling positions of these parts.

The clutch is lubricated and cooled by oil picked up by six scoops on the side of the clutch housing. No adjustment is necessary in the clutch itself, though the movement of the clutch pedal may be adjusted (see page 53).

The clutch is controlled by the pedal on the right-hand side of the tractor, which acts through a fork on to the clutch release

The Gearbox

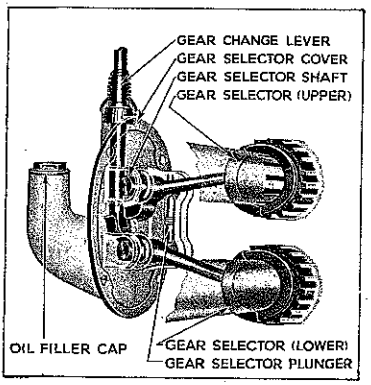

Figure 18

Selector Cover

The gearbox is of the constant mesh selective type, fitted with heavy roller bearings wherever necessary. Three forward speeds and one reverse are provided and are engaged by means of the gear change lever on the left-hand side of the tractor which works through two selector forks. The gear change lever is mounted in a ball and socket so that when the top of the lever is moved outwards in the neutral position, the bottom end moves inward and engages the upper selector fork which fits over collars on the two sliding gears on the upper main shaft.

When the top of the gear change lever is moved forward, the bottom moves back carrying the selector fork and meshing the gears to provide low speed. When the top of the lever is moved back the bottom moves forward, carrying the selector fork and engaging intermediate speed. Similarly, when the top of the gear lever is moved inwards in the neutral position, the bottom engages the lower selector fork and meshes high or reverse speeds with a forward or backward movement of the gear change lever.

The path of the transmitted power in the various gears is shown in fig. 19.

For repairs to Gearbox see page 120.

The Transmission Brake

The reverse idler gear is pressed on to one end of a short splined hub, which has an internal phosphor bronze bush. This assembly is mounted on a hollow steel shaft in the transmission plate through which the brake shaft runs, while a stationary brake plate is fitted between the reverse idler gear and the transmission plate to act as a thrust washer.

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plate, causing the clutch housing to move in a forward direction. This releases the spring pressure from the clutch plates.

After engaging gears always let the pedal rise slowly, allowing the drive to be taken up smoothly and without stalling the engine. When driving, do not rest your foot on the pedal, as it will cause unnecessary friction and wear the clutch release plate, besides causing the clutch to slip.

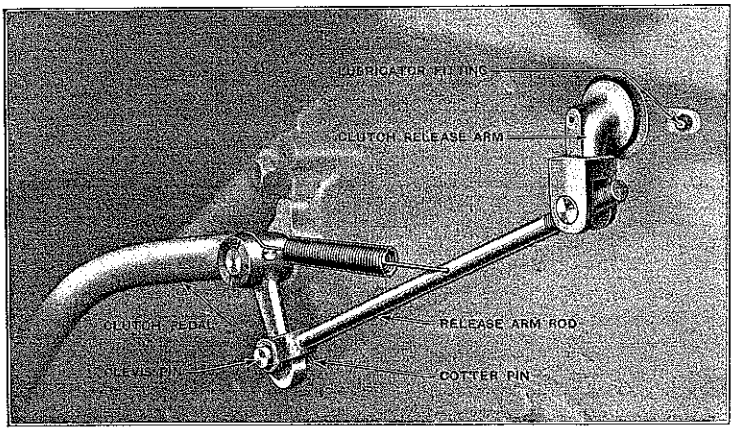

Figure 17
Clutch Pedal Adjustment

TO ADJUST THE CLUTCH PEDAL

(For Industrial Tractor see page 69.)

After the tractor has been in use for some time, wear on the clutch release plate may cause the pedal to strike the foot plate before the clutch is fully disengaged or the brake fully applied, in which case the pedal should be adjusted by removing the cotter pin and clevis pin and screwing out the clutch release arm rod, taking care to replace the clevis pin and cotter pin after making the adjustment (see fig. 17).

Resting the foot on the clutch pedal is likely to result in excessive wear on the clutch release plate, and the necessity for frequent adjustment of the clutch pedal.

For repairs to Clutch see page 119.

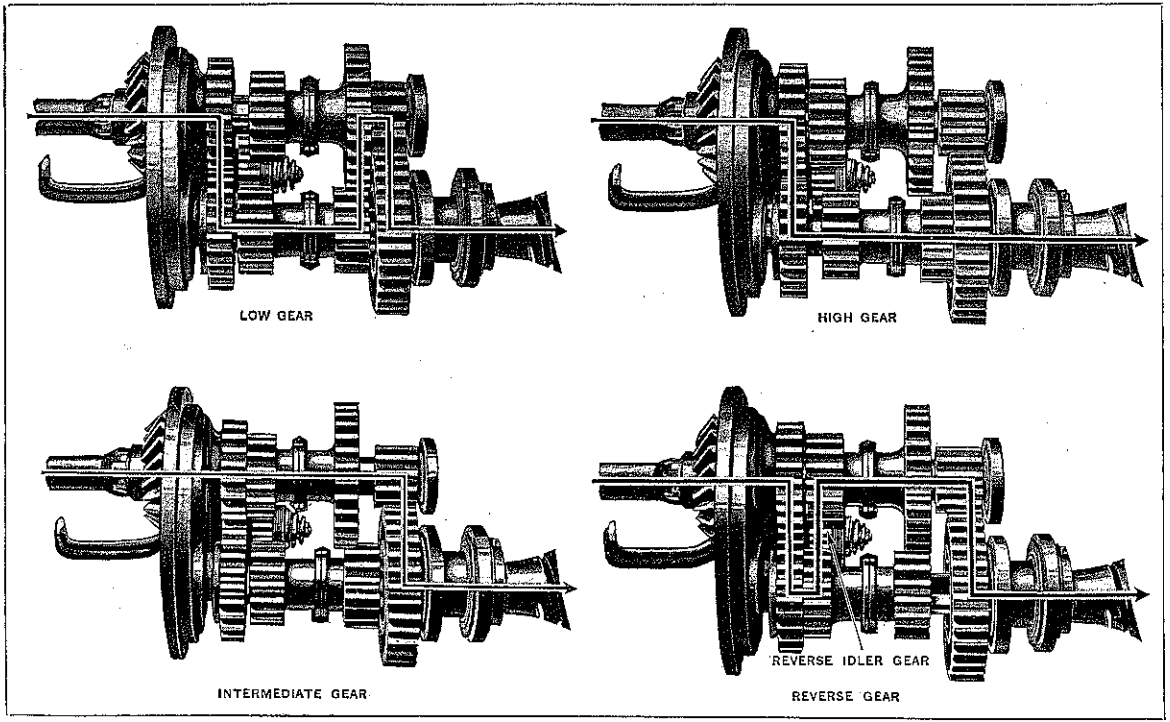

Figure 19
Meshing of Wheels and Path of Transmitted Power in Various Gears

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Five steel plates are mounted on the splines on the reverse idler hub and revolve with it. Interleaved with these plates are six plates which are held in position and stationary by two pins in the transmission plate. A conical coil spring surrounds the brake shaft and holds a retaining plate against a shoulder on the brake shaft. The spring is held in compression by a nut at the end of the brake shaft.

When the clutch pedal is fully depressed a set screw in an extension on the clutch throw-out fork pulls forward the brake shaft compressing the spring, pressing the retaining plate against the brake plates, and forcing the brake plates together.

As the reverse idler gear is constantly in mesh and the five revolving brake plates revolve with it, the friction brought about

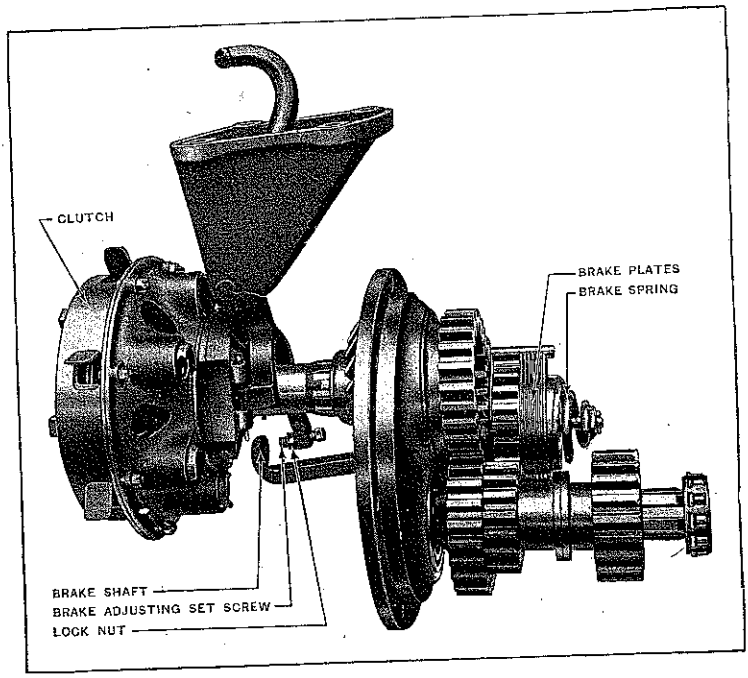


Figure 20

Transmission Plate Assembly showing method of Adjusting Brake

by forcing them and the stationary plates together is very great and provides a brake which may be relied upon to stop the tractor under the severest conditions.

TO ADJUST THE BRAKE

Should the brake not be sufficiently powerful, see that the clutch pedal does not foul the foot plate when fully depressed and if necessary adjust the clutch pedal (see page 53). If the brake is still unsatisfactory remove the footrest plate (Industrial Tractor) or the power take-off pulley (if fitted) or plate (Agricultural Tractor) from the right-hand side of the tractor.

Pull the brake shaft forward till all the play in the plates is taken up.

Depress the clutch pedal fully and the brake shaft should be pulled forward just under $\frac{1}{8}$ inch more. Should it be pulled forward more than $\frac{1}{8}$ inch or should the braking effort not be sufficiently powerful, loosen the lock nut (see fig. 20) and screw the brake adjusting set screw in or out as necessary to give the required adjustment.

For repairs to Brake see page 122.

Rear Axle

The power of the engine is delivered through the clutch and gearbox to the worm which transmits it to the worm wheel, and through the differential, to the axle shafts and rear wheels.

All shafts transmitting power are mounted on roller bearings which are lubricated from the main transmission oil supply except the outer roller bearings which are greased through external lubricators.

TO REMOVE THE REAR WHEEL

Jack up the rear axle till the wheel is clear of the ground.

Remove the wheel securing screws (4) from the hub with the spanner and bar supplied with the tractor.

Tighten up the hub puller screws (2) until the wheel is free on the bushing.

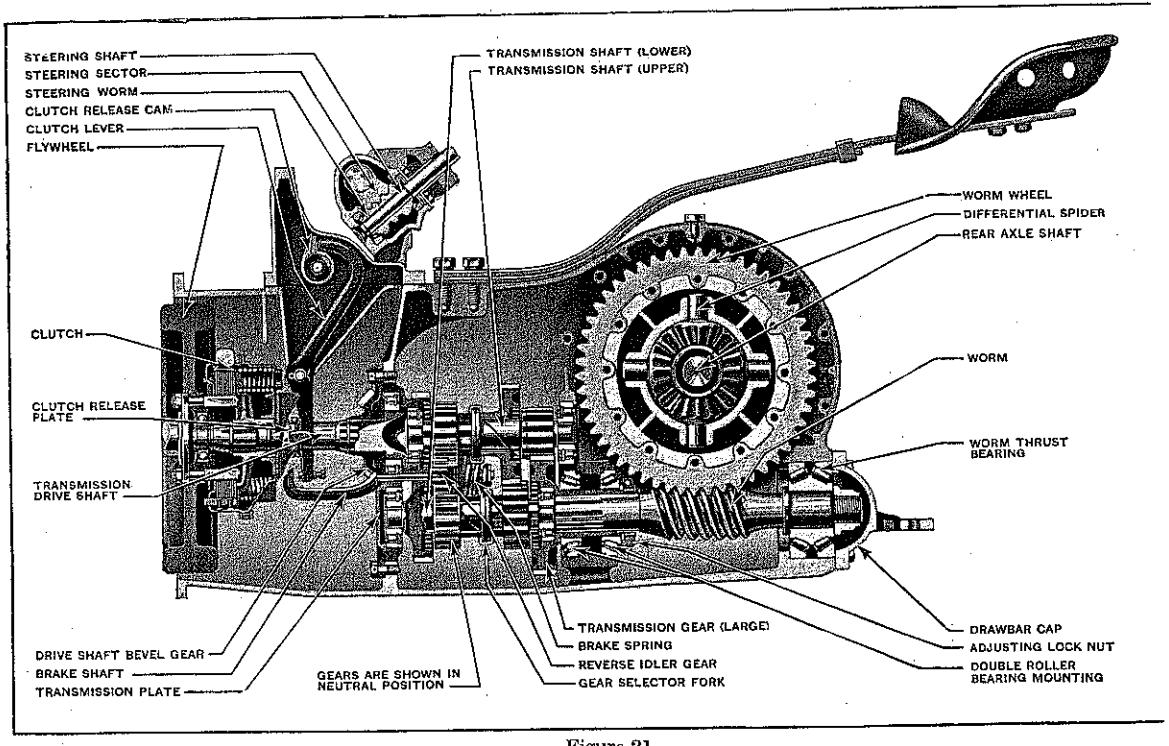


Figure 21
Transmission

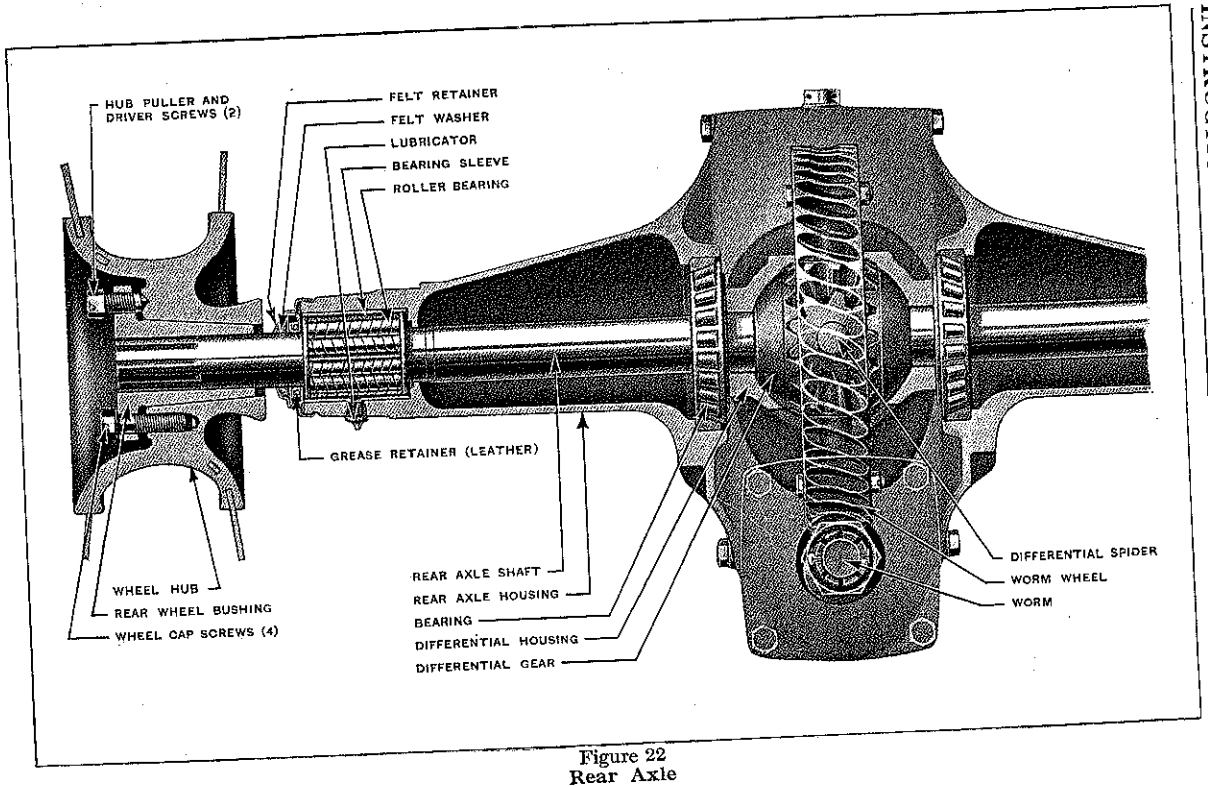


Figure 22
Rear Axle

Apply the hooked end of the bar to the flange and lever the bushing off the axle.

When replacing the wheel, undo the hub puller screws.

Insert the four securing screws and tighten them equally, tightening up one screw, then the one opposite it, and so on, till the end of the axle is flush with the outside of the bushing. Then do up the hub puller screws till they fit snugly against the hub.

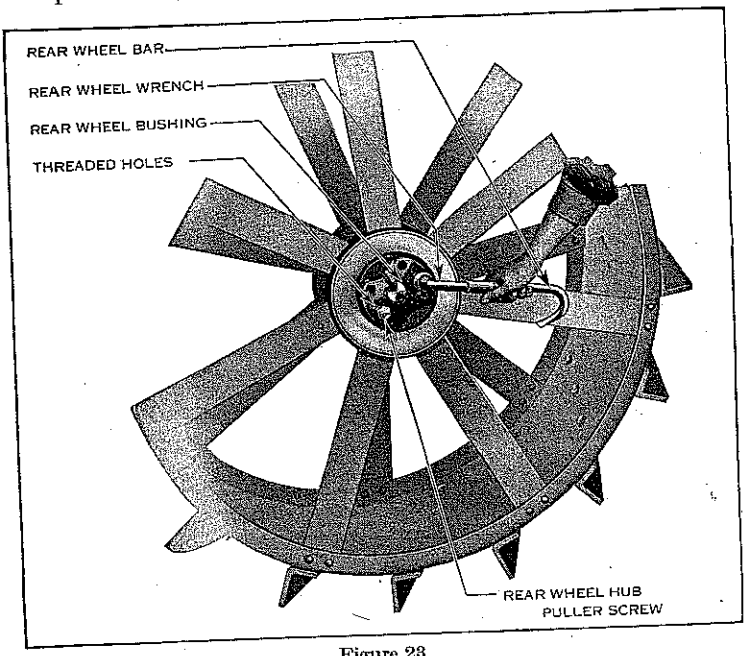


Figure 23
Removing Rear Wheel

Row Crop Rear Wheels.—Splined extension axle shafts are fitted so that the distance between the rear wheels may be altered to suit the particular ground which is being cultivated. The method of securing the wheels to the axle shafts by means of the split bushing is the same as that used on the Agricultural Tractor, but a periodic check should be made to ensure that the extension shafts are kept firmly tightened.

For repairs to Rear Axle see pages 122—125.

Storing the Tractor

If the tractor is to be stored for any length of time :—

Drain off the dirty engine oil, clean the crankcase cover and screen, and refill with fresh oil.

Run the engine for a minute or two to allow the clean oil to cover all parts of the engine.

Drain off all water from radiator and flush out : drain water washer when fitted.

Drain off all petrol and vapourizing oil from fuel tanks.

Grease all points fitted with lubricator fittings.

Cover the tractor and store in a dry place.

Every month, the sparking plugs should be removed, a spoonful of engine oil poured into cylinders and the engine cranked a few times.

In addition to the above the following operations are necessary when storing an **Industrial Tractor.**

Remove battery and send it to an authorised Fordson dealer for proper attention and storage.

Jack up tractor to take the weight off the tyres.

If the tractor is to be stored for a long time it is advisable to remove the tyres and wrap them in an airtight package.

Belt Pulley Attachment

TO FIT ATTACHMENT

Remove the plate on the right-hand side of the transmission housing just below the air cleaner on the Agricultural Tractor, or the footrest plate in the same position on the Industrial Tractor (6 screws).

Place the two paper gaskets supplied with the attachment in position round the pulley attaching flange. They can most easily be kept in place with a little grease.

Install the pulley attachment with the bevel gear meshing with the bevel on the main transmission shaft of the tractor, and the clutch lever shaft in line with the hole in the mudguard shield.

Re-insert the screws previously removed.

Engage the pulley attachment clutch (see page 63). Hold the pulley between the two hands and make sure that there is a slight amount of play or backlash between the gears.

When correctly assembled there should be approximately $\frac{1}{8}$ in. rock, measured at the circumference of the pulley.

If there is insufficient backlash, remove the attachment and fit another gasket, which can quite easily be made from ordinary brown paper.

If the tractor is operated with the pulley gears too tightly in mesh, a grinding noise will be noticed, and if not remedied, excessive wear will take place on the gears and ball bearings and power will be wasted.

Grease the bearings with the grease gun through the lubricator fitting provided.

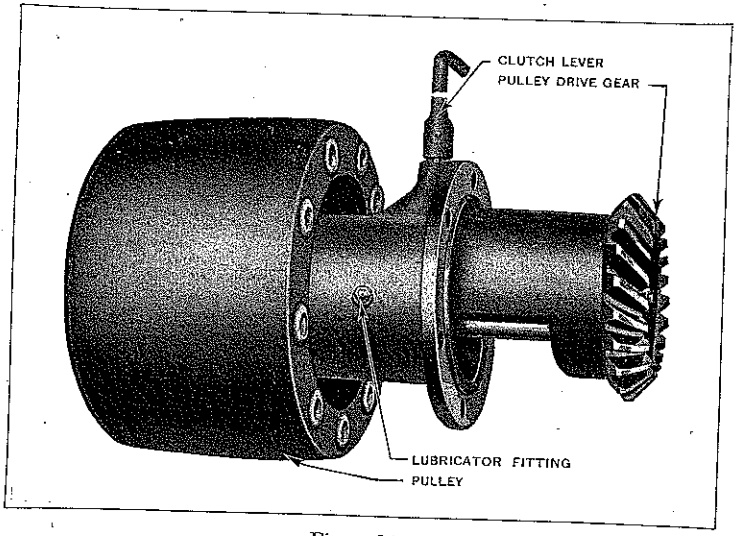


Figure 24
Belt Pulley Attachment

Install the clutch lever through the mudguard shield, and secure it to the clutch lever shaft with the securing and cotter pins supplied.

OPERATING THE PULLEY

Depress the clutch pedal.

Engage the pulley clutch by turning the clutch lever clockwise.

Let the clutch pedal return slowly allowing the drive to be taken up gradually.

When the pulley is in continuous use, it should be lubricated daily with the grease gun.

Power Take-off Attachment

A power take-off, independent of the belt pulley attachment, may be fitted to Fordson tractors having the **4.3 transmission only** : the drive is taken from the transmission by replacing the cover plate below the clutch pedal pivot shaft with the take-off unit and the drive is led to the rear of the tractor on the off-side, the shaft being splined for the attachment of suitable fitments.

Having verified that the tractor is fitted with 4.3 transmission, drain off the oil from the transmission, take out the six screws securing the cover plate from the transmission and remove the cover plate. Carefully clean the face, attach a new gasket by a smear of grease and line up the holes in readiness to assemble the take-off. From the off-side of the rear axle housing remove the two bolts which will be replaced by two cap screws and these secure the drive shaft tail support bracket. It may be necessary to support the mudguard footplate and clearance may have to be provided at the splash shield to permit the drive shaft to pass through.

Clean face of the take-off, offer it up to the transmission housing, using two original bolts for the top holes but replacing the other four bolts with the longer type supplied. Do not tighten these bolts till the rear support cap screws have been entered when the take-off bolts may be evenly tightened up : when tightening the tail shaft support bearing, if no mudguards are fitted a distance piece must be fitted between the bracket and the axle housing.

The shaft should turn easily by hand when these two bolts are tight and any stiffness corrected by fitting shims of .010 in. and .015 in. which should permit the bearing to be correctly lined up. Engage gear and check the backlash, any correction to increase backlash being effected by the addition of gaskets to the take-off. Suitable alteration will have to be made to the rear support bearings to preserve the alignment of the shaft. Replace the

transmission drain plug and refill with extreme pressure lubricant; undue noise or heating up should not be permitted, adjustment should be made as described above.

A lubricator fitment is provided for the rear bearing and grease should be supplied to this bearing when the take-off is in operation. the take-off itself being lubricated automatically from the engine.

After installation, check for any oil leaks which is best done after the engine has been started and oil in the transmission thoroughly circulated.

COMBINED PULLEY AND POWER TAKE-OFF

An attachment comprising a pulley and power take-off shaft is available for tractors whose number is 776024 or over, the drive being taken from the bevel gear of the main drive shaft.

Grouser Plates

When operating the tractor fitted with cleats in light, sandy soil, a set of grouser plates may be desirable, as they add three inches to the depth of the rear wheel cleats, providing greater grip in the soil.

These grouser plates can be easily bolted to the cleats of the rear wheels. A set of grouser plates consists of twelve for each rear wheel, together with bolts and nuts for attaching.

They are not necessary with spade lugs.

Price can be obtained from nearest Fordson dealer.

Extension Rims

When operating the tractor in soil of a loose, sandy or volcanic ash nature, a pair of extension rims will prove a valuable addition. The rims can be easily assembled to the wheels by means of special clamps provided for that purpose; this method of installing eliminates any necessity of drilling the rim.

A set of extension rims consists of two rims with all parts necessary for installation.

Price can be obtained from nearest Fordson dealer.

The Industrial Tractor

The information given in connection with the Agricultural Tractor, applies equally to the Industrial Model which differs from it, as far as operation and maintenance is concerned, only in the following details :—

Throttle lever.
Clutch pedal.
Handbrake.
Air cleaner.
Fan belt adjustment.
Wheels and pneumatic tyres.
Electrical system.

and these are dealt with below.

THE THROTTLE LEVER

The speed of the engine is controlled by a throttle lever just beneath the steering wheel in the centre of the dash instead of a governor and governor control rod as on the agricultural tractor, though a governor may be fitted, if required, at an extra charge.

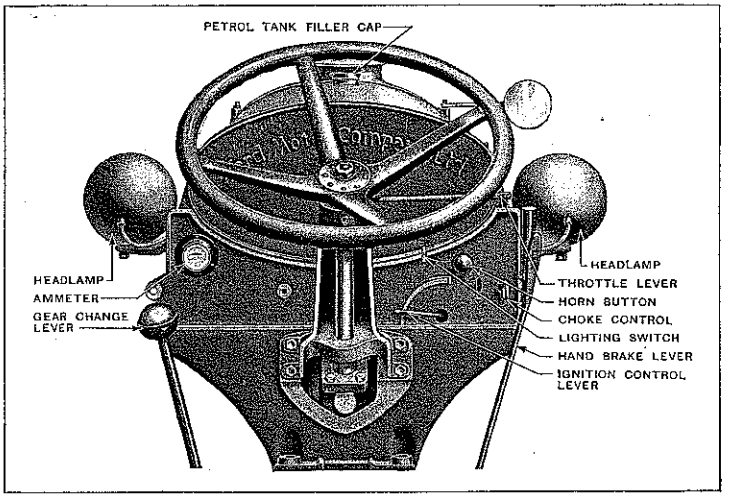


Figure 26
Industrial Tractor Controls

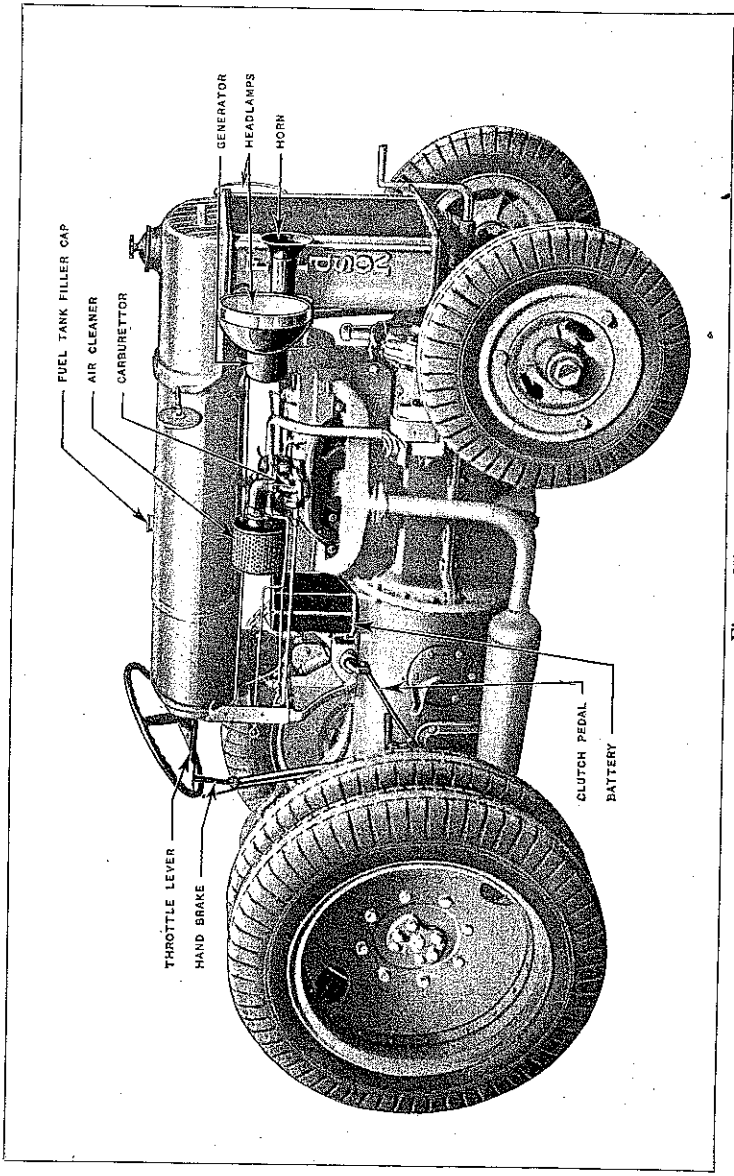


Figure 27
Industrial Tractor

When the throttle lever is moved backwards, it opens the throttle valve in the carburettor and increases the speed of the engine.

THE CLUTCH PEDAL

This is located just in front of the rear axle, and operates the brake in exactly the same way as on the agricultural model (see page 52); no pedal adjustment is provided.

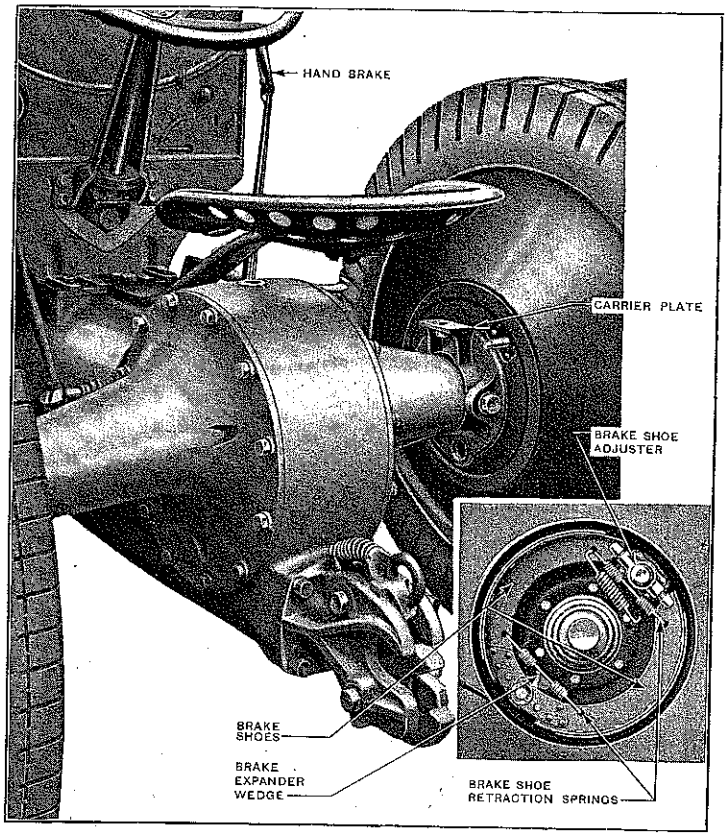


Figure 28
Industrial Tractor Handbrake

The clutch pedal fitted to the industrial tractor differs from the agricultural model in that the pedal is shorter, but the method of operation is the same. Do not rest the foot on the clutch pedal when driving as this will cause unnecessary friction, wear the clutch release plate and may tend to cause clutch slip.

HANDBRAKE LEVER

This is situated on the right-hand side of the tractor, and when pulled back applies the rear wheel brakes fitted to the industrial model.

It is held on by means of a ratchet and, to release it, it is necessary to press the spring grip on the handle and move the brake lever forward.

TO ADJUST THE HANDBRAKE

This should not be necessary till the tractor has been in service for a very long time, and the brake linings have worn to such an extent that the handbrake lever can be pulled to the rearmost position without applying the brake fully.

Where an external, square-headed adjuster is fitted on the brake housing plate, turn clockwise, viewed from the centre of the tractor, to expand the shoes. It will turn with a "series of clicks," and when the shoes are fully expanded, must be backed off approximately two "clicks" to obviate brake drag.

If this expander does not appear on the brake housing plate, it will be necessary to adjust the operating linkage as described below.

Remove cotter and clevis pins from the brake operating arm (see fig. 29).

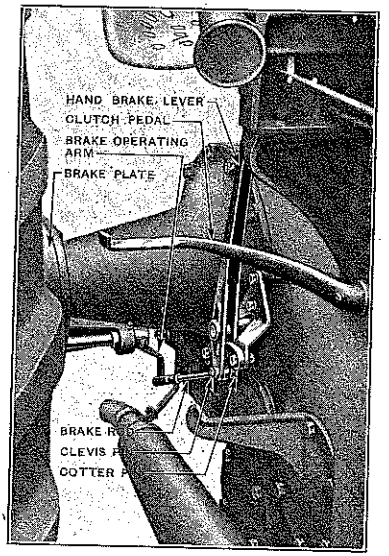


Figure 29
Handbrake Lever and Adjustment

Reassemble the brake pull rod to the upper hole in the brake operating arm.

This must be done on both sides of the tractor as otherwise the braking effort on the wheels will be unequal.

Should it be necessary to compensate for unequal wear in the brake linings :—

Remove the cotter and clevis pins, screw the clevis on the brake pull rod in or out as required and reassemble.

THE AIR CLEANER

A gauze type of air cleaner is fitted to the industrial tractor and needs little attention except to clean the gauze.

Every three months, unscrew the wing nut at the centre of the air cleaner cover, remove the cover, withdraw and clean the gauze, after which the air cleaner should be reassembled.

If the air cleaner is left uncleaned too long, it will become choked with dirt which will restrict the air supply to the carburettor, causing the mixture to become too rich for satisfactory running and cause excessive fuel consumption.

TO ADJUST THE FAN BELT

On the industrial tractor, the fan belt may be adjusted by loosening the nut holding the generator to its supporting bracket and moving the generator outwards. The correct tension is when the free side of the fan belt is alternately pushed and pulled and the total movement does not exceed 2 inches.

It may also be adjusted in the same way as the agricultural model (see page 97).

Wheels and Pneumatic Tyres

On taking delivery of a new Tractor it may be found that the tyres are inflated somewhat above the pressures tabulated on page 72. This is a temporary measure used when the Tractor is supplied, and before being put into service, the operator should carefully check the tyre pressures.

Operating the Tractor with excessively high tyre pressure causes undue wear of the tyres, whilst, if the tyre pressure is too low, rim cutting will also be experienced.

Test the tyre pressures every few days.

The industrial tractor is equipped with pneumatic tyres, and detachable rear wheels, while certain wheels have detachable rims to facilitate the fitting of tyres.

Alternatively, solid tyres may be fitted, twin tyres being fitted to the rear wheels.

Sizes —Front, 26 in. × 3½ in.
Rear, 40 in. × 5 in.

Pneumatic Tyres :

Sizes —Front, 23 in. × 5 in.
Rear, 36 in. × 6 in.

The correct pressures are :—
Front wheels, 70 lbs. per square inch.
Rear wheels, 90 lbs. per square inch.

Pneumatic Tyres :—

The following tyres may be fitted to agricultural tractors :—

Dunlop —Low Pressure,	**Front**	**6.00 in.**	**—**	**19 in.**
	Rear	**11.25 in.**	**—**	**24 in.**
	Rear	**11.25 in.**	**—**	**28 in.**
Firestone—Low Pressure,	**Front**	**6.00 in.**	**—**	**19 in.**
	Rear	**11.25 in.**	**—**	**24 in.**
	Rear	**11.25 in.**	**—**	**28 in.**
Firestone—" Golf Course,"	**Front**	**6.00 in.**	**—**	**16 in.**
	Rear	**11.25 in.**	**—**	**24 in.**
Goodyear—Low Pressure,	**Front**	**6.00 in.**	**—**	**19 in.**
	Rear	**11.25 in.**	**—**	**24 in.**
	Rear	**11.25 in.**	**—**	**28 in.**
Row Crop — Single Pneumatic Front Wheel		**9.00 in.**	**—**	**10 in.**
Rear Wheel		**9.00 in.**	**—**	**36 in.**

The correct pressures for low pressure tyres are :—
Front, 16 lbs. per square inch.
Rear, 8–10 lbs. per square inch (general farm work).
Rear, 15 lbs. per square inch (road work).

Weights for bolting to the wheels to increase adhesion are available for use with Dunlop wheels 11.25 in.— 24 in., these being secured by bolts passing through the wheel flange and held with nuts and washers.

TO REMOVE REAR WHEELS

Loosen the hub nuts (8).

Jack up the side of the axle from which the wheels are to be removed.

Completely undo the hub nuts and remove the wheels.

See also page 58.

TO REMOVE TYRE—Well-base Wheels

No detachable rims are used on well-base type wheels as the tyre may be levered over the rim edge when the rest of the bead has

been forced into the well. Careful adherence to the following instructions should facilitate the operation and avoid damage to the tyre which might occur if excessive force was used :—

Remove wheel from tractor.

Completely deflate tyre and place wheel flat upon the ground.

Release the valve lock nut, press the tyre bead into the well-base opposite the tyre valve for as great a circumferential distance as possible.

Use a tyre lever adjacent to the tyre valve to lift the tyre bead over the edge of the rim.

Remove the inner tube, work the other tyre bead into the well-base and similarly lever the bead over the rim edge.

TO REPLACE TYRE—Well-Base Wheels

The use of soap on the beads of the tyre greatly facilitates replacement.

In cases where there is an arrow moulded on the tyre wall, replace it so that the wheel revolves in the direction indicated.

Place the wheel flat on the ground and work one side of the tyre over the rim, into the well-base. When the majority of the tyre has thus been installed a lever may be used to complete the operation and, provided the bead is kept correctly in the well-base, no undue force should be required.

Insert the tube, pass the valve through the hole drilled to receive it and secure it temporarily with the nut.

Press the tyre into the well-base opposite the tyre valve and lever the bead over the rim edge, taking care not to nip the tube.

Inflate the tyre and ensure that each tyre bead leaves the well-base and is correctly positioned against the rim flanges. Tighten the valve lock nut.

TO REMOVE TYRE—Rear Wheels—Detachable Rim Type

Remove wheel.

Completely deflate the tyre.

Remove spring ring securing the rim to the wheel (where fitted).

Remove rim.

Lift off tyre and inner tube together.

TO REMOVE TYRE—Front Wheels—Detachable Rim Type

Loosen the wheel rim nuts (3).

Jack up the side of the axle from which the tyre is to be removed.

Completely deflate the tyre.
Completely undo the wheel rim nuts and withdraw the rim.
Remove the valve lock nut.
Rotate the wheel till the valve is at the top.
Pull the tyre clear of the wheel at the bottom and lift off the tyre and tube.

TO REPLACE TYRE in Detachable Rim Type Wheels

Inflate the tube till barely rounded out and insert in the outer cover.

Install the tube protector, making sure that the hole at either end is fitted over the valve and that the protector is not twisted or creased in any way.

Reinstall the tyre and tube on the wheel.

Replace the rim and secure it either with spring retaining ring (rear wheel) or the three nuts (front wheel).

Inflate to the correct pressure.

REMOVAL OF ROW CROP SINGLE PNEUMATIC WHEEL

Raise the front of the tractor clear of the ground and remove the spindle securing bolts so that the wheel, together with the spindle pin, may be disengaged from the slotted yokes of the wheel bracket. See fig. 38.

If not already deflated, take care to release the air under pressure in the tube.

Unscrew the four rim bolts so that the rim may be detached and the tyre and tube then removed : the inside diameter is such that it will readily pass over the hub cap.

When replacing the spindle in the slotted yokes of the bracket note that the protecting lips of the hub caps are fitted uppermost to prevent dust and similar foreign matter from entering the hub as the life of the bearings would then be considerably reduced.

See page 113 for dismantling instructions.

TO REPLACE THE REAR WHEEL

Clean the faces of the wheels and the hub flange where they bear together, and the countersunk holes in the wheels on which the hub bolts and nuts fit.

When tightening the hub nuts, proceed in a criss-cross fashion and not round the circle and so make sure that the wheels are on absolutely square.

The hub nuts should be tightened again after the tractor has run some little distance and allowed the wheels and nuts to bed themselves into position.

The Electrical System

The Industrial Tractor is fitted with an electrical system which comprises the following components :—

Battery.	Lamps.
Lighting switch.	Horn.
Generator.	Ammeter.

THE BATTERY

This is a six-volt unit of 63 ampere-hour capacity. It is placed underneath the fuel tank in front of the dash.

CARE OF THE BATTERY

Every two weeks, check the electrolyte in the battery to see that it is at the proper level, i.e., $\frac{3}{8}$ in. to $\frac{1}{2}$ in. above the top of the plates. If below this point, add distilled water until the electrolyte reaches the proper level. Water for battery use should be kept in clean, covered vessels of glass, china, rubber or lead. In cold weather, add water only immediately before running the engine, so that the charging will mix the water and electrolyte and prevent freezing.

Excessive use of water by the battery is usually an indication of excessive charging (see page 77).

Excessive charging of the battery greatly shortens its life. and is to be avoided.

On the other hand, the battery should not be allowed to become unduly discharged, or to stand in a run-down condition as this will materially affect its life.

Loose or corroded battery connections increase the line resistance, raising the voltage of the generator often beyond the capacity of the **light bulbs**, causing them to burn out.

Keep the battery filling plugs and connections tight, and the top of the battery clean. Wiping the battery with a rag moistened with ammonia will counteract the effect of any of the solution which may be on the outside of the battery. A coating of vaseline will protect the terminals from corrosion. It is of vital importance that the battery is firmly secured.

When repairs are necessary, or if the tractor is to be laid up for the winter, take the battery to an authorised Fordson dealer for proper attention and storage. Do not entrust your battery to inexperienced or unskilled hands.

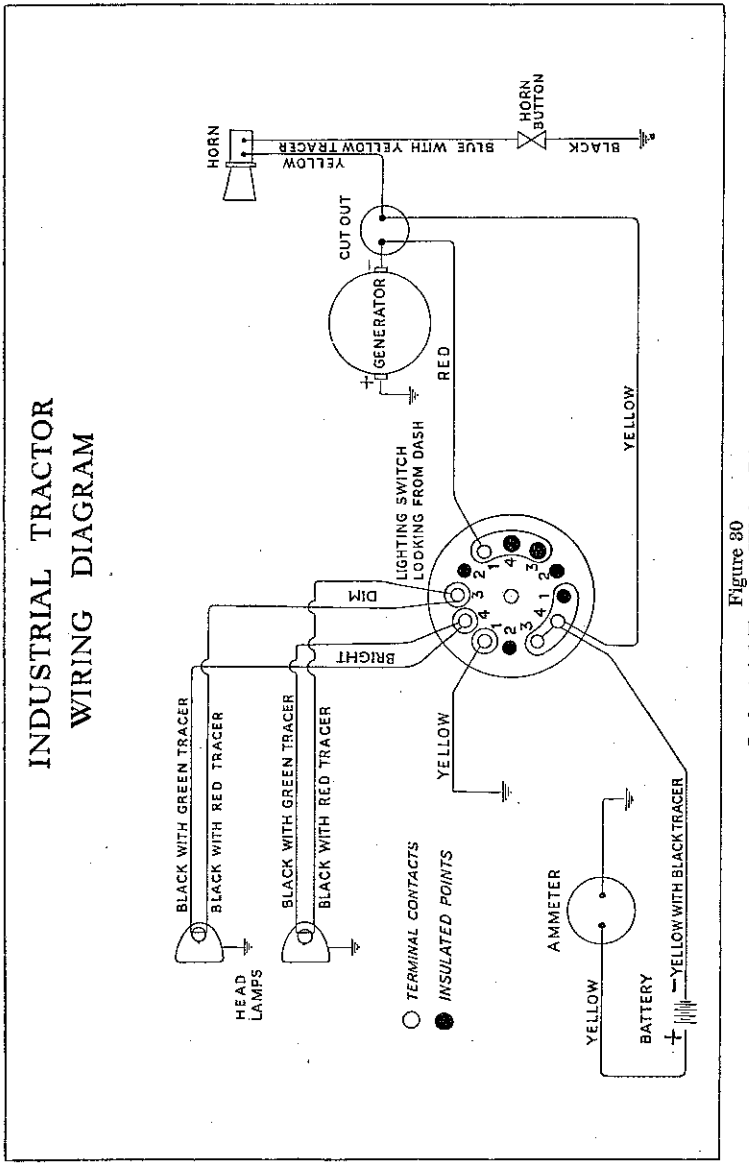


Figure 30
Industrial Tractor Wiring Diagram

To remove the battery from the tractor, take off the lid, remove terminal leads, undo the securing nuts, and lift off the battery. When replacing the battery, be sure to install it with the POSITIVE TERMINAL EARTHED as shown in fig. 30.

LIGHTING SWITCH

This is located on the right-hand side of the dash just below the fuel tank. It has four positions :—

Lever straight up	" Off."
First position downward	" Charge."
Second position downward	" Headlamps dipped."
Third position downward	" Headlamps normal."

and is so arranged that the generator charges the battery except when set at the " Off " position.

USE OF THE " CHARGE " POSITION

The generator charging rate is so adjusted, when the tractor leaves the factory, as to provide sufficient electric current to compensate for that used when the lamps are all turned on. As a general rule tractors do most of their work by day and therefore if the battery is continually on " charge," with very little call on it to supply current for light, etc., it will soon become overcharged. This will materially shorten its life, and should therefore be avoided. Excessive use of water by the battery is usually an indication of overcharging.

Should it become discharged it may be recharged on the tractor by keeping the lighting switch in the " charge " position, when the tractor is working. If the tractor is not being used much at the time, the battery should be sent to an authorised Fordson dealer to be recharged.

The ideal at which to aim, is to charge the battery as little as possible and still maintain it in a fully charged condition.

GENERATOR

This is mounted on a bracket to the right of the cylinder head at the front and is driven from the crankshaft by the fan belt.

TO INCREASE OR DECREASE THE GENERATOR CHARGING RATE

The charging rate may be varied to meet exceptional circumstances under which the tractor may operate by removing

the generator cover and moving the third brush. This is the one just on the left of the top centre line. To increase the charging rate move the third brush in the direction of rotation. To decrease the rate, move the brush in the opposite direction. The output of the generator is indicated by the ammeter on the dash.

ATTENTION NEEDED BY THE GENERATOR

Every fortnight, fill the oil cup at the rear of the generator with engine oil, and put two or three drops into the oiler on the front bearings just behind the generator pulley.

Where the ventilated type generator is fitted, no lubricator is provided at the pulley bearing as it is packed at assembly and only the lubricator at the commutator end will require attention.

At intervals of 10,000 miles the felt pad in this lubricator should be moistened with vaseline.

Every six months, clean the commutator by holding a strip of very fine glass paper against it with a small piece of wood whilst the engine is idling. Then blow out any carbon dust that may have accumulated and examine the brushes for excessive wear. Replace any that have worn to such an extent that there is any possibility of the brush lead fastenings fouling the commutator, or at which excessive sparking occurs. See that all connections are clean and tight.

HEADLAMPS

The headlamps are properly aligned and focussed when the tractor is delivered and should not be interfered with in the ordinary way. Should the headlamps get out of focus or alignment they may be quite easily corrected.

TO FOCUS HEADLAMPS

This is accomplished by means of the central screw at the back of each lamp which moves the bulb backwards or forwards in the reflector and so varies the " spread " of light given by the lamp.

TO ALIGN THE HEADLAMPS

Loosen the nut holding the headlamp to its bracket and move the lamp as desired.

REPLACING HEADLAMP BULBS

When replacing burnt-out bulbs be sure that you get genuine Ford bulbs, as satisfactory results cannot be obtained from the many inferior bulbs on the market. Genuine Ford bulbs have the name "FORD" marked on the base. When replacing headlamp bulbs, make sure that the word "top," which will be found stamped on the base, is uppermost as otherwise it will not be possible to focus the lamps properly.

REPLACING THE HEADLAMP LENS

Lens must be fitted with the embossed word "top" uppermost and with all the lettering reading properly from the front.

THE HORN

This is located just below the right-hand headlamp and is operated by pressing the button on the dash.

A high frequency type horn is used as compared with the motor operated type fitted to earlier Tractors.

When the motor operated horn is fitted, the cover should be removed occasionally and a drop or two of oil put on to the felt at the rear of the motor armature.

TO ADJUST THE NOTE OF THE HORN

Press the horn button on the dash.

In cases where the motor type of horn is fitted turn the screw at the back of the horn marked "adjust" in an anti-clockwise direction until the horn motor revolves without touching the diaphragm.

Then turn this screw clockwise one notch so that the diaphragm is just actuated by the motor.

Where the horn is of the high frequency type, remove the cover to effect adjustment.

Towards the centre of the armature a round-headed screw will be noted, beneath which is a hexagon lock-nut. Loosen the lock-nut and adjust the screw until the correct note is obtained when the lock-nut may be retightened and the cover replaced.

General Advice on Carrying Out Repairs

Full instructions for dismantling are given; to reassemble it is only necessary to reverse the order of operations, paying attention to any points which may be specially mentioned.

Before dismantling any part, examine its general arrangement, details of fitting and, if necessary, mark adjacent parts, so that when the part is reassembled, it is replaced exactly as it was to start with.

In case of trouble always take care of adjustments and small repairs first. They are much more likely to be necessary than major repairs.

Always make sure **all** nuts, bolts, screws, etc., are undone before attempting to remove any part.

Always keep the valves and push rods in the correct order, so that they may be replaced in their correct position.

When reassembling, see that **all** locking devices are correctly installed, as serious damage may occur if this is neglected :—

Always wire the main bearing screwheads.

Always wire the transmission plate screwheads.

Always put cotter pins in the big end bearing nuts, and any other places where castellated nuts are fitted.

Always open both legs of cotter pins.

Always replace spring washers.

Each connecting rod and its big end cap is numbered. Always keep them together and when reassembling fit the cap to the rod with the numbers together and see that the slot in the dipper is toward the valve side of the engine.

ALWAYS KEEP DISMANTLED PARTS FREE FROM GRIT AND DIRT, AND CLEAN THEM THOROUGHLY BEFORE REPLACING.

Gaskets are fitted between many parts which do not move in relation to each other—always see that they are in good condition and correctly replaced.

Always oil bearing surfaces during reassembly. This includes such points as valve stems, piston pins, pistons, main and big end bearings, ball and roller bearings, gear shaft bearings, camshaft bearings, clutch and brake plate surfaces, etc.

Always remove sharp edges, or burrs from ground bearing surfaces with an oil stone.

Before starting the engine after carrying out any repair, always see that the radiator is full, that the oil levels in the engine, air cleaner and transmission are correct, and that any part which has been dismantled is properly greased through the lubricator fittings.

It is strongly advised that the operations described in the repair section marked with an asterisk (*) in this book be carried out, should they become necessary, by an authorised Fordson dealer. The fact that he has been officially appointed is proof that he has ample stocks of spare parts, mechanics who are familiar with the tractor, and may be relied upon to carry out all repairs and adjustments quickly and economically.

Engine Trouble Chart

A.—ENGINE FAILS TO START

1. Fuel System.

Fuel supply turned off.
Trying to start on vapourizing oil.
Mixture too lean.
Mixture too rich.
Sediment bulb choked or blocked with ice.
Fuel pipe choked.
Water or dirt in vapourizer or jets.
Jets choked.

2. Ignition System.

Ignition switched off.
Short circuit in earth clip.
Incorrect contact breaker point gap.
Plug point gap incorrect.
Water on high tension leads.
Water or moisture in magneto.
Contact breaker point stuck open.
Impulse coupling failed.
Magneto failed.

B.—ENGINE LACKS POWER OR RUNS IRREGULARLY

1. **Fuel System.**

Mixture too lean.
Mixture too rich.
Choked sediment bulb.
Partially choked fuel pipe.
Partially choked jets.
Punctured float, or fuel regulator valve in vapourizer stuck open causing vapourizer to flood and produce too rich a mixture.
Air leak in intake manifold.
Excessive carbon on vapourizer plate.

2. **Ignition System.**

Plugs dirty.
Plug point gap incorrect.
Magneto contact breaker points dirty or incorrectly adjusted.
Sparking plug gaskets leaking.
Incorrect type of plugs fitted.
Advance or retard not working.
Carbon brush broken or missing in magneto.
Oil in interior of magneto.

3. **Mechanical Faults.**

Valve spring weak or broken.
Cylinder head gasket leaking.
Valve stuck open.
Valve badly burnt.
Valve clearance incorrect.
Broken piston rings.
Badly worn piston rings and/or cylinder bores.
Badly worn valve stems and/or guides.

C.—ENGINE STOPS SUDDENLY

1. **Fuel System.**

Fuel tank empty.
Water in fuel.
Dirt in vapourizer or fuel pipe.
Mixture too lean.
Overheated owing to lack of oil and water.

2. **Ignition System.**

Contact breaker points stuck open.
Magneto shorted or earthed.
Magneto failed.

D.—ENGINE OVERHEATS

Incorrect mixture.
Ignition retarded too far.
Dirty or incorrect sparking plugs.
Racing engine.
Lack of water in radiator.
Insufficient or poor grade of oil.
Clogged radiator tubes.
Fan belt slipping or broken.
Excessive carbon in pistons and cylinder head.
Valve not seating properly.
Radiator blind incorrectly adjusted.

Knocks

Should a knock develop in the engine or transmission, the cause should be investigated and a remedy effected, as otherwise serious damage may occur. As a general rule, only an experienced mechanic can locate the exact cause of any particular knock, and in consequence it is advisable to consult an authorised Fordson dealer if one becomes apparent.

The most usual knocks are given below, with an indication of how to diagnose and cure them.

Ignition Knock.—This is caused by running with the ignition lever too far advanced for the particular conditions under which the tractor is working. The cure is to retard the ignition just enough to stop the knock.

It sounds very like a carbon knock but it may be distinguished from it by retarding the ignition when an ignition knock will vanish though a carbon knock will persist.

Knock due to using the wrong type of plug.—This is easily avoided by obtaining replacements only from an authorised Fordson dealer.

Knock due to using wrong type of fuel.—A sound, resembling a carbon knock, may be noticed and this may still persist even when the ignition is retarded. It may be found also that there is some tendency for the engine to overheat and in such cases the quality of the fuel should be checked.

The characteristics of certain " lamp " oils render them unsuitable for use in tractors and operators should have their attention drawn to the necessity for using only good quality vapourising oils.

Carbon Knock.—This only occurs after the tractor has been in service for a considerable time. It is noticeable when the engine is hot and pulling hard. Running with the ignition retarded, in addition to burning out the valves and causing overheating, increases the carbon deposit and should be avoided at all times.

The cure is to decarbonise the engine (see page 85).

Piston Slap.—This is due to wear in the pistons and cylinders. It is most noticeable when the engine is cold, and diminishes as the engine warms up.

It is usually due to the tractor being operated with the air cleaner filler plug missing, or with unsuitable or inferior oil in the engine. It also occurs after prolonged service, owing to normal wear. The cure is to have the cylinders rebored and oversize pistons fitted, but this is an operation which can only be satisfactorily carried out by an authorised Fordson dealer.

Small End Knock.—This is due to undue play between the piston, piston pin and connecting rod small end bearing. It is most noticeable when the throttle is suddenly closed and the engine is slowing down, when it appears as a rattle in the engine. The cure is to replace or correct the faulty part or parts (see page 93).

Big End Knock.—This occurs when the babbitt metal in the big end bearings has worn so that there is play between the bearing and crankpin. It is noticeable when the engine is pulling hard. It may be cured by adjusting the big end (see page 91).

Main Bearing Knock.—Wear in the babbitt metal of the main bearings will in time give rise to a knock which will be heard as a rumble if the engine is speeded up and then suddenly slowed down. It may be cured by adjusting the bearing (see page 91).

Transmission Knocks.—These are due to a variety of causes, such as end play in the shafts, chipped gear teeth, worn bushes, damaged bearings, etc. Provided, however, that the transmission is kept full of oil of the correct grade, and no dirt is allowed to work into it, it is unlikely that any trouble will arise in this connection.

Repairs to the Engine

*TO REMOVE THE FUEL TANK

Turn off the fuel at the sediment bulb.

Disconnect the sediment bulb to vapourizer fuel pipe at the sediment bulb.

* See pages 80 & 81.

On Industrial tractors, remove the steering wheel.

Undo the nuts on the fabric lined metal straps at each end of the tank (four in all) and the tank may be lifted off.

It is not necessary to empty the tank, though this may be done to enable it to be lifted more easily.

*TO REMOVE THE CYLINDER HEAD

Drain all the water from the cooling system by opening the drain cock in front of the engine under the radiator.

Remove the fuel tank.

Disconnect the sparking plug leads and take out the sparking plugs.

Undo the water pump to cylinder head screws (4).

Undo the cylinder head to cylinder block screws (22).

Lift off cylinder head.

When replacing the head, see that no water is in the cylinder head screw holes in the top of the cylinder block, as if any is present, it will prevent the screw being tightened down properly. New copper asbestos gaskets of the correct type should be fitted between the cylinder head and cylinder block, and between the cylinder head and water pump. Make sure that they, and the support for the ignition control rod, and the bracket for the high tension lead conduit are all properly replaced. The cylinder head gasket should be fitted with the name "Fordson" uppermost.

When tightening down the cylinder head screws, tighten the screw in the centre of the head first, then one at a corner, then one at the diagonally opposite corner, then the other two corners and then the rest. The reason for doing them up in this order is to make quite sure that the cylinder head sits absolutely square on the cylinder block.

The cylinder head screws should be tightened after the engine has been run for some time and is still hot. Always use the spanner provided in the tool kit as this is the correct size and will not damage the heads of the screws.

*TO DECARBONISE THE ENGINE

Remove the cylinder head.

Scrape all the carbon from the cylinder block, cylinder head, piston top and valve heads with a screwdriver or putty knife. Take care that no carbon is allowed to fall down the valve stems, or to lodge between the valves and their seats.

* See pages 80 & 81.

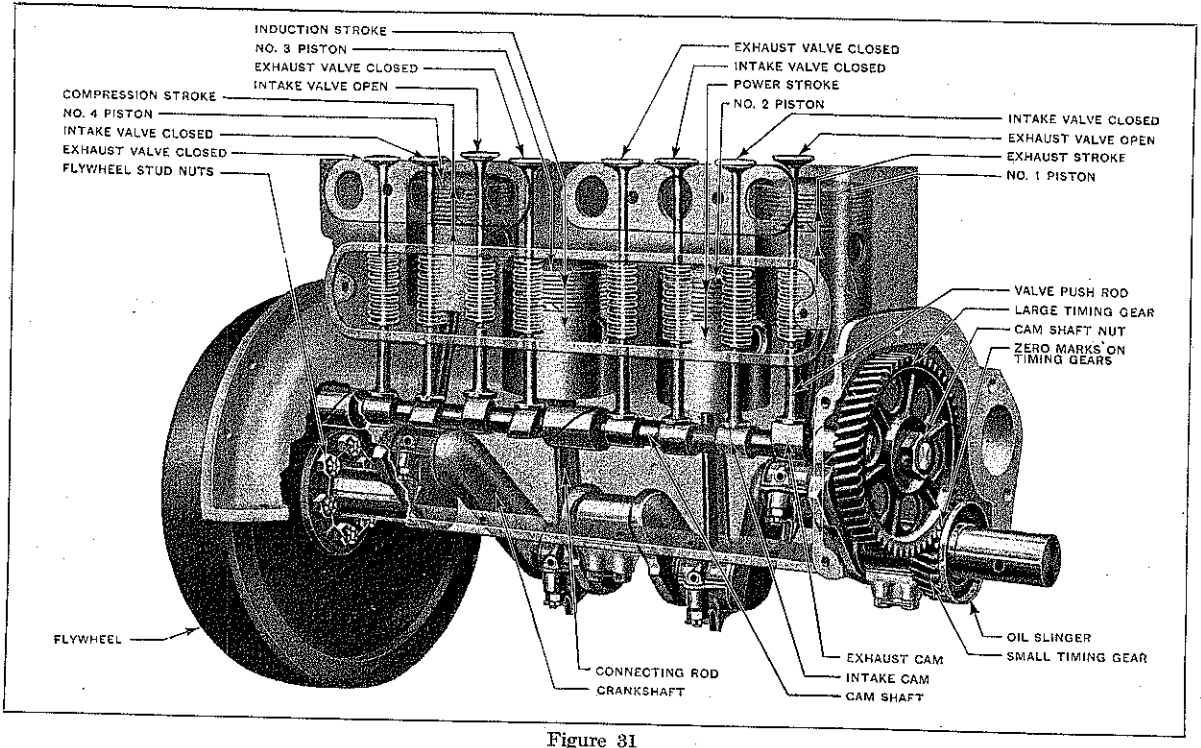


Figure 31
Cylinder Assembly

Wipe all the carbon off carefully, particularly round the valves, and replace the cylinder head.

It is advisable to remove and examine the valves when decarbonising.

*TO REMOVE MANIFOLD

Disconnect control rods.
Disconnect air pipe at air cleaner.
Disconnect fuel pipe at vapourizer or carburettor.
Disconnect exhaust pipe.
Remove manifold securing nuts (4).
Remove manifold.

*TO REMOVE THE VALVES

Disconnect control rods.
Remove cylinder head.
Disconnect the exhaust pipe at the exhaust manifold.
Remove the manifold and vapourizer.
Remove valve cover.

Lift valve spring and spring seat on one of the valves which is closed as shown in fig. 32.

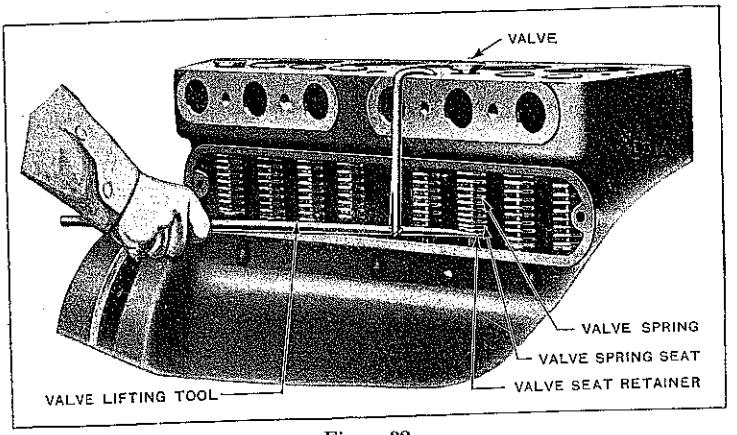


Figure 32
Lifting Valve Spring

* See pages 80 & 81.

Remove the two spring seat retainers. As these are very small, care should be taken to prevent them getting lost, or being dropped into the engine.

The valve may now be drawn out from the top and the spring removed. If the valve which is to be removed is opened, it is advisable to rotate the crankshaft till the valve closes.

During reassembly, the spring seat retainers will remain in place better, and so facilitate their reinstallation, if a little grease is put on them.

*TO REMOVE VALVE GUIDES

Remove valve and spring.

The valve guide may now be slipped downward into the valve chamber. If it does not come out freely, it may be tapped gently from the top with a piece of soft wood.

REPLACING VALVES AND PUSH RODS, VALVE GUIDES, VALVE SPRINGS

A valve should be replaced by a new one if:—

The head is so badly worn or pitted that it will not make an efficient gastight seal.

If a ridge is present on the stem diameter at the end of the portion worn by the movement of the valve through its guide.

If the base of the stem has worn to such an extent that it is impossible to obtain the correct clearance between valve and a new push rod.

A new valve should always be ground in, though if the seat is in good condition very little grinding should be needed.

A push rod should be replaced by a new one if it is worn to such an extent that it is impossible to obtain the correct clearance between it and a new valve.

A valve guide should be replaced by a new one if it is worn to such an extent that the stem of a new valve fits "sloppily" in it.

A valve spring should be replaced by a new one if it is broken, or so weak that when compressed to a length of $2\frac{7}{8}$ ins. it exerts a pressure of less than 30 lbs.

* See pages 80 & 81.

*TO GRIND THE VALVES

Clean the valve and seat.

Remove valve and inspect.

If the valve or valve seat is pitted, apply a little coarse valve grinding paste to the valve seat. Replace the valve. See that the valve stem is not touching the push rod, and rotate the valve backwards and forwards (about a quarter of a turn) a few times by means of a valve grinding tool (see fig. 33). Then lift the valve just clear of its seat and turn it through a quarter of a turn, and rotate as before. Continue until the pits are ground almost out.

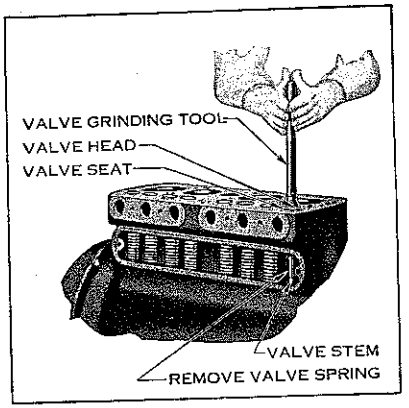


Figure 33
Grinding Valve

Wipe off the coarse paste and apply a little fine grinding paste and continue to grind as above till the valve is seating properly all round. This is when the greyish grinding marks form a thin continuous line round the valve and seat.

If the valve or seat is not badly pitted, use only fine grinding compound.

WHEN THE VALVE IS SEATING SATISFACTORILY, REMOVE THE VALVE, WASH THOROUGHLY IN PARAFFIN, CLEAN THE VALVE SEAT AND MAKE ABSOLUTELY SURE THAT NONE OF THE ABRASIVE COMPOUND REMAINS IN THE VALVE GUIDES, VALVE PORTS OR CYLINDERS. THIS IS BEST ASSURED BY PUTTING ONLY THE MINIMUM AMOUNT OF PASTE ON THE VALVE SEAT.

*TO REFACE THE VALVE SEATS

Should the valve seat be so badly pitted that coarse grinding paste will not remove the pits, it will be necessary to cut a fresh seat with a valve reseating tool.

To do this remove the valve.

Push the guide rod of the reseating tool through the valve guide.

* See pages 80 & 81.

Lower the cutter gently on to the valve seat, and rotate it in a clockwise direction, maintaining a steady downward pressure. Remove only sufficient metal to eliminate the pits.

Clean the valve seat.

Grind in the valve.

*TO ADJUST THE VALVE CLEARANCE

The clearance between the valve stem and the push rod may be checked by means of standard feeler gauges and when the push rod is on the heel of the cam it should be between .020 in. and .024 in.

If it is less than .020 in. the stem of the valve may be filed to give the correct clearance. Great care must be taken to see that the end is filed absolutely square. It is preferable, however, to have the work carried out by a Fordson dealer, who has proper equipment for grinding the valve to the correct length.

If the clearance is more than .024 in. either the valve, or rod, or both, should be replaced, and the clearance checked.

*TO REMOVE THE CRANKCASE

Drain oil from engine by removing crankcase drain plug.

Withdraw radius rod retaining pin at rear end of radius rods.

Row Crop Tractor, remove radius rods at each end.

Undo radius rod to front axle nuts and withdraw bolts (2).

Remove radius rod.

Undo the crankcase to transmission housing bolts and screws (8).

Undo the crankcase to cylinder block screws (22).

It is advisable to support the crankcase before undoing the final screws.

When replacing the crankcase, it is advisable to fit new crankcase to cylinder block gaskets and to see that the crankcase to transmission gasket and the packing gland surrounding the crankshaft at the front of the crankcase are in good condition and correctly replaced.

Put in two screws at diagonally opposite corners, then two in the middle of the sides and then the others. Make sure the crankcase is up tight and absolutely square.

* See pages 80 & 81.

*TO ADJUST BIG END BEARINGS

Remove crankcase.

Remove cotter pins and undo the nuts (2) holding on the cap of No. 1 big end. Between the cap and the connecting rod will be found a number of shims of .0025 in.

The crank pin should be measured with a micrometer gauge to be sure that it has not worn oval, as it is impossible to obtain a satisfactory bearing with an oval crank pin.

Take off shims of equal thickness from each side (.0025 in. each side should be tried first).

Replace the cap, making sure that it is on the correct way round (i.e., with the slot in the oil dipper on the cap facing towards the valve side of the engine and the punch marks on the connecting rod and the cap together) and tighten the nuts fully.

Test tightness of bearing by turning crankshaft with the starting handle. The correct adjustment is when the " drag " of the bearing can just be felt. If tapped lightly with a hammer, the bearing should move from side to side of the crank pin. It may be necessary to take the cap off several times and remove or add shims as required.

When this bearing is correctly adjusted, loosen the nuts and proceed to adjust each of the others in the same way.

When all have been done satisfactorily, take off each cap in turn and oil the bearing surface, replace the cap, tighten the nuts up and insert the cotter pins and see that the bearings are not so tight that it is impossible to turn the crankshaft when they are all tightened.

Replace crankcase and radius rods.

After adjusting the big end bearings it is advisable to run the engine light for some little time, keeping it well supplied with water and oil before running it under load.

*TO ADJUST MAIN BEARINGS

Should this adjustment in time become necessary, the big end bearings will probably also need adjustment and if the two jobs are done together much time can be saved.

Remove crankcase.

Remove wire through the front main bearing screwheads.

Undo the screws (4).

Remove the cap.

Examine the bearing cap babbitt metal to be sure that the bearing is making perfect contact over all its area.

* See pages 80 & 81.

A number of shims, .005 in. and .0025 in. thick, will be found between the bearing cap and the cylinder block.

Remove shims of equal thickness from each side of the crankshaft (try .005 in. each side first).

Replace the cap, do up the screws and test the crankshaft for tightness by turning it with the starting handle. The " drag " of the bearing should be just felt. It may be necessary to undo the bearing cap and add or remove shims several times before the adjustment is correct, though it is impossible to obtain a satisfactory bearing if the crankshaft journal has worn oval.

When the front main bearing is correctly adjusted, undo the bolts and adjust the centre and then the rear main bearing in the same way.

When all these are satisfactorily adjusted, do all the screws up tightly and re-wire their heads. Then make sure that the bearings are not so tight that it is impossible to turn the crankshaft with the handle.

If the big end bearings are adjusted at the same time, see that when all bearings are tightened, it is possible to turn the crankshaft with the handle.

Replace the crankcase and radius rod.

After adjusting the main bearings it is advisable to run the engine light for some little time, keeping it well supplied with water and oil before running it under load.

*TO REMOVE PISTON AND CONNECTING ROD

Remove cylinder head.

Remove crankcase.

Remove cotter pins from, and undo the big end nuts.

Remove big end cap.

Push the piston and connecting rod out through the top of the cylinder.

*TO REMOVE PISTON PIN

Remove piston and connecting rod.

Remove the retainer rings (where fitted) from the piston pin bosses.

Support the piston in a semi-circular block with a hole through which the piston pin can pass.

Push out the piston pin with a drift of the same diameter as the piston pin ($1\frac{3}{8}$ in.).

The connecting rod may then be withdrawn from the piston.

* See pages 80 & 81.

After replacing the piston pin be careful to fit the retainer rings firmly in their grooves in the piston pin bosses.

WHERE EXTERNAL RETAINER RINGS ARE NOT FITTED, TO REPLACE PISTON PIN IT IS NECESSARY TO USE A TAPER PILOT TO LOCATE AND EXPAND THE SPRING RETAINING RING IN THE SMALL END OF THE CONNECTING ROD.

IT IS INADVISABLE TO REMOVE THE PISTON PIN UNLESS SUCH A PILOT IS AVAILABLE.

*TO REPLACE CONNECTING ROD OR PISTON

Remove piston and connecting rod.

Remove the piston pin.

The connecting rod may then be withdrawn from the piston.

If there is appreciable play between the piston and connecting rod, the parts should be carefully inspected to see if the wear has occurred in the small end bearing of the connecting rod or in the piston pin hole in the piston.

If the wear is in the connecting rod, the connecting rod should be replaced by a new one, as also it should be if the babbitt metal in the big end is worn to such an extent that the bearing is loose when all the shims under the bearing caps are removed and nuts are done up tightly.

If the wear is in the piston, a piston pin .002 in. over size may be obtained, though to fit it, it is necessary to remove the piston pin retaining ring from the connecting rod small end, if so fitted, and reamer out the small end bushing and the piston pin hole in the piston, after which the retaining ring must be replaced, and the piston and connecting rod reassembled.

*TO REMOVE PISTON RINGS

Remove piston and connecting rod.

The piston rings may then be removed by slipping the blade of a penknife under one end of the ring and working it gradually off over the top of the piston.

*TO REPLACE PISTON RINGS

The piston rings should be replaced by new ones when the compression in a cylinder is poor, or when excess oil is working past the piston into the combustion chamber.

First clean the ring grooves in the piston thoroughly, then check that they have not worn so as to allow a new piston ring to move vertically in the groove. If there is any wear in the groove, the piston should be replaced with a new one. The easiest way to fit a piston ring is to use three strips of thin metal

* See pages 80 & 81.

(old hacksaw blades are suitable) as "skids" and, placing the strips at right angles to the ring grooves and equally spaced round the diameter of the piston, ease the ring over the top of the piston to its appropriate groove. Always fit the rings with the word "Top" towards the top of the piston. When fitted in the cylinder, the top ring should have a gap of .011 in. to .015 in., the middle two, .008 in. to .011 in. and the oil control ring .008 in. to .015 in.

*TO REPLACE PISTON AND CONNECTING ROD IN CYLINDER

Set the gaps in the piston rings so that no two are directly in line. It is best to have the gaps equally spaced round the circumference of the piston. Remove the big end cap from the connecting rod.

Clean the crank pin and big end bearing surfaces.

Insert the connecting rod and piston in the cylinder, making sure that the assembly is the correct way round (when the big end cap is replaced the punch marks on the cap and rod should be together and the orifice in the dipper should be towards the valve side of the engine).

Compress the piston rings with a piston ring compressor and tap the piston into the cylinder with the ball of the hand.

Replace the big end on the crankshaft and adjust this bearing as described above (see page 91).

*TO REMOVE MAGNETO AND MAGNETO BRACKET

Remove distributor cover with high tension leads from magneto.

Disconnect ignition control rod.

Undo magneto bracket to cylinder block screws (2).

Undo magneto bracket to cylinder front cover screws (2) and bolt (1).

The magneto may be removed from the bracket by removing the magneto bracket to magneto screws (4).

*TO REMOVE THE GOVERNOR

Disconnect the governor control rod.

Disconnect governor to throttle control rod.

Undo the governor to cylinder front cover screws (4).

Slide the governor casing forward.

Remove the governor weights securing pin.

* See pages 80 & 81.

*TO REMOVE STARTING HANDLE (Except Row-Crop Tractor)

Remove cotter pin securing starting pin.

Withdraw starting pin.

Withdraw starting handle.

*TO REMOVE CRANKSHAFT PULLEY

Remove starting handle.

Remove cotter and securing pins from pulley. This may be done through the hole in the cylinder front cover, just behind the pulley.

Two tapped holes are provided in the pulley to enable a puller to be used to remove it.

*TO REMOVE THE CYLINDER FRONT COVER

Remove fuel tank.

In the case of the Row-Crop Tractor first undo the steering column brackets from the dash when the interconnecting shafts may be eased towards the rear of the tractor. The worm shaft may be pulled out of the steering assembly and through the radiator bracket.

Remove radiator.

Remove magneto bracket.

Remove governor.

Remove the crankshaft pulley.

Raise the front end of the tractor slightly.

Withdraw the radius rod retaining pin from the rear of the crankcase.

Place a support underneath the flange at the front of the transmission housing.

Remove the cotter pin from the front axle trunnion and withdraw the trunnion.

Row-Crop Tractor.—Undo two nuts securing the brake rod bracket, uncouple the brake rods, and release the front end of the radius rods. Unscrew the four bolts holding the steering housing to the cylinder front cover and remove the assembly.

Remove the front axle and buffer.

Undo crankcase to cylinder front cover screws (4).

Undo the cylinder front cover to cylinder block screws (4).

Slide the cylinder front cover forward and off.

* See pages 80 & 81.

*TO REMOVE CAMSHAFT

Remove manifold (see page 87).

Remove valve cover.

A hole is drilled in each valve push rod, and when the valve is lifted the push rod may be raised till this hole is uncovered, when a cotter pin can be inserted which will prevent the push rod falling into the crankcase.

When all the push rods are pinned up, remove the cylinder front cover and the camshaft may be withdrawn.

*TO REMOVE PUSH RODS

Remove manifold.

Remove valve cover, lift valves and valve springs and remove spring seat retainers.

Remove cylinder front cover.

Remove crankcase.

Insert cotter pins in holes in push rods.

Withdraw camshaft.

Remove cotter pins.

The push rods can then be withdrawn.

*TO DISMANTLE CAMSHAFT TIMING WHEEL

Remove camshaft.

Remove cotter pin from nut holding timing wheel on camshaft.

Remove nut.

The timing wheel may then be pulled off the camshaft.

When being reassembled, the timing wheel must engage the key fitted to the camshaft, and have the timing mark on the same side of the wheel as the securing nut.

*TO REPLACE CAMSHAFT

When replacing the camshaft, the marked tooth on the crankshaft timing gear must come between the two teeth on the camshaft timing wheel at the zero mark, and when the shafts are revolved the marked tooth on the magneto wheel must also come between these two teeth at the zero mark on the camshaft timing wheel.

* See pages 80 & 81.

The backlash between the camshaft and crankshaft timing gears should be tested with standard thickness gauges, and if it exceeds .0065 inches the gears should be replaced, as otherwise the gears will prove noisy in operation.

Cooling System

*TO REMOVE THE RADIATOR

Drain off water by opening the cock under the left-hand side of the radiator.

Loosen front fuel tank strap by undoing the nuts on radiator tank (2). Temporarily support tank by suitable packing.

Remove the screws (3) holding the radiator to the cylinder front cover.

Remove the screws (4) under the top tank holding the radiator to the water pump.

Lift off radiator, taking care not to damage the gaskets used to keep the connections watertight.

When reassembling, see that the water pump to radiator and cylinder front cover to radiator gaskets are in good condition, and correctly placed, and do not forget the washer that goes between the radiator and the cylinder front cover on the right-hand side.

Row-Crop Radiator.—Removal is similar except that the steering shaft passes through the left-hand side of the radiator. Withdraw the shaft by releasing the steering bracket from the dash and gently easing the shafts rearwards.

The worm shaft will then be disengaged from the splines of the steering assembly and pulled through the radiator side member. Always recheck the oil level of the steering housing since some oil will escape when the worm shaft is withdrawn.

*TO REMOVE THE RADIATOR CORE

Remove radiator. See note above for Row-Crop Radiator removal.

Undo the radiator core to radiator upper tank screws (4), nuts (5) and bolts (14).

Undo the radiator core to radiator lower tank bolts (24).

Any faulty tube or the entire core may now be replaced.

*TO ADJUST THE FAN BELT

Remove the nuts on the bolts (4) holding together the two portions of the fan pulley. The rear portion of the pulley may

* See pages 80 & 81.

then be slipped back and split distance pieces removed or added as required. To tighten the belt, remove distance pieces.

See also page 71 for adjustment of Industrial Model Tractor Fan Belt.

*TO ADJUST WATER PUMP PACKING GLAND

Should any water be seen leaking from the water pump round the pump shaft, it can probably be stopped by tightening the water pump packing gland nut (clockwise) with a screwdriver. If tightening this does not stop the leak, a new gland ring should be fitted and if this is not satisfactory the whole gland should be replaced.

*TO REPLACE THE WATER PUMP PACKING GLAND

Drain the radiator.

Undo the brass water pump packing gland nut and withdraw the old gland.

Split glands are supplied for replacement.

Slip one gland ring over the water pump shaft, straighten it and push it back into its recess. Screw up the packing gland nut, so positioning the gland ring, then unscrew the nut, put on a further ring and screw up the nut again.

Fit as many rings as necessary in this manner.

Grease the gland by means of the lubricator before tightening the gland nut.

Tighten the gland nut only enough to prevent water leaking.

It will probably be necessary to tighten the gland nut once or twice after the engine has run for a while.

*TO REMOVE WATER PUMP

Drain the radiator.

Undo the water pump to cylinder head screws (4).

Undo the water pump to radiator upper tank screws (4).

Withdraw the water pump.

*TO DISMANTLE THE WATER PUMP

Remove the water pump.

Withdraw the cotter pin securing the castellated nut which holds the fan assembly on to the water pump shaft and remove the nut.

Withdraw the fan assembly from the shaft.

Undo the water pump packing gland nut.

*See pages 80 & 81.

The water pump shaft and impeller may then be withdrawn and any parts necessary may be renewed.

The bronze fan bearing bush and the brass water pump bearing bush may then be withdrawn.

It is inadvisable to remove the brass water pump bush if it can be avoided, as if it is incorrectly replaced water will leak between it and the water pump casing.

When reassembled, the square brass thrust washer must seat properly in the recess in the impeller, the bearing bush and gland must be greased before assembly, and also afterwards by means of the lubricator.

Ignition System

*TO TIME THE MAGNETO

Rotate the crankshaft by means of the starting handle till No. 1 cylinder is at firing point. This is when the piston is at top dead centre with both valves closed. The easiest way to find this is to remove the valve cover and No. 1 sparking plug, insert a piece of wire down the sparking plug hole on to the top of the piston and rotate the crankshaft until both valve springs are fully extended showing that both valves are shut, and the upward movement of the wire stops showing that the piston is at top dead centre.

Remove the distributor cover from the magneto, and rotate the magneto impulse coupling anti-clockwise until a line (sometimes marked " R ") on the fibre distributor gear is pointing straight up and coincides with the line on the distributor housing.

As the distributor gear is not visible on the Wico-type magneto take care to set the rotor contact so that it registers with No. 1 cylinder high tension cable contact.

The lugs on the magneto coupling will be horizontal and the lugs on the timing shaft will be vertical.

Install the fibre coupling and slide the magneto forward on its bracket and insert the magneto securing screws.

*TO DISMANTLE THE IMPULSE COUPLING (Lucas type)

Remove magneto from tractor (see page 94).

Unscrew the nut in the centre of the impulse coupling holding it to the magneto armature shaft. This nut is secured in the

impulse coupling by a spring retaining ring, so that when the nut is unscrewed, it acts as a puller, and draws the coupling off the armature shaft.

Remove the outer snap ring which secures the inner member to the outer case.

Withdraw the inner member, at the same time releasing the spring so that it is retained in the outer case.

Remove each snap ring and washer so that the pawls may be detached.

The spring may be removed from the outer case but take care to release the tension gently.

The impulse coupling securing nut is fixed in the same manner as in the earlier Bosch type referred to below.

The Wico-type coupling is held on a parallel shaft and is similar to the above except no washers are fitted on the pawl pivot pins and the securing nut is not held with a snap ring.

In the case of the Bosch type of impulse coupling disconnect the end of the torsion spring from the hub.

Remove the snap ring surrounding the boss on the pawl carriage, which holds the hub in position on the pawl carriage, and withdraw the hub, thin steel washer and torsion spring.

Two groups of three small screws will be found diametrically opposite each other on the circumference of the pawl carriage.

Unscrew the centre screws and the pins securing the pawls may be taken out, allowing the pawls to be withdrawn.

Unscrew the other screws (4) and the central boss may be taken off.

The impulse coupling securing nut may be removed from the boss of the pawl carriage at any stage of the dismantling by withdrawing the snap ring holding it in position.

*TO REASSEMBLE IMPULSE COUPLING (Lucas type)

Grease the torsion spring and fibre strip which is interleaved with it and engage the inner ends in the slot machined upon the boss of the inner member so that it is wound in a clockwise direction. Do not permit this fibre strip, however, to extend into the hooked outer end of the spring otherwise difficulty may subsequently be experienced in engaging the lug of the inner member.

Wind up the spring so that it enters the outer case but ensure that the outer hooked end does not stand so proud of the remaining coils that it cannot be pushed into position afterwards.

* See pages 80 & 81.

Next, hold the inner member with the pawl pivot pins towards he operator and horizontal. Place the upper pawl on the left-and pivot pin with the trailing part towards the right. Secure it vith a flat washer and circlip.

Install the lower pawl on the right-hand pivot pin with the railing part towards the left-hand side and similarly secure it with a flat washer and circlip.

It is essential that each pawl is free to move within its limits of travel as the member is rotated : any stiffness in action may prevent the impulse coupling from operating correctly.

Place the boss of the inner member in the bore of the outer ase so that the protruding lug may be inserted in the hooked end of the spring.

Do not fully enter the inner member until the spring has been given approximately a quarter turn, when the stops of the inner nember will register with the spaces of the outer case. Press the nner member into position and secure it with the circlip.

If the nut and washer have been removed from the centre hese should be replaced, first installing the spring washer, followed by the nut and securing them with the circlip.

The Wico-type coupling is assembled in a similar manner xcept the spring should be installed in the outer member first, nd wound in a clockwise direction. Install the inner member, winding up the spring which will require approximately $\frac{3}{4}$ turn after he coils have been entered in the outer member.

Install the pawls so that the weighted ends lead when the oupling is turned in a clockwise direction, viewed from the pawl ide, secure them with the circlips and ensure they operate freely.

Where the Bosch-type of coupling is fitted, attach the awl carriage boss to the pawl carriage (4 screws).

Fit the two pawls with their sides marked "R" owards the keyways marked "R" and "L" in the pawl arriage boss. Install the securing pins and fix in position with he screws which were first removed. See that the pawls move reely on the securing pins.

Fit the torsion spring round the pawl carriage, and place the nd in the hole in the circumference of the pawl carriage, marked R."

Fit the hub round the boss and inside the torsion spring, nd install snap retaining ring.

Place the pawl carriage and hub together in the correct osition so that the hole in the hub for anchoring the other end of he torsion spring is diametrically opposite the spring anchorage ole marked "R" of the pawl carriage. Install the steel washer nd snap ring.

Next pull the free end of the spring in a clockwise direction viewed from the driving end until it is possible to anchor it in the hole provided for it in the hub.

If the impulse coupling securing nut has been withdrawn, it should be replaced and secured with its retaining ring.

When reinstalling the impulse coupling on the magneto, engage the keyway marked "R" with the key on the magneto armature shaft.

Governor

*TO DISMANTLE THE GOVERNOR

Disconnect the governor and throttle control rods.

Undo the governor housing to cylinder front cover screws (4).

Withdraw the governor casing with control arms, spring and grooved sleeve. The thrust bearing and plate may then be withdrawn.

Remove cotter pin from the pin securing the governor weights to the forward extension of the magneto drive shaft, and remove this pin, when the weights and thrust bearing supporting shaft may be withdrawn and any faulty or worn parts replaced.

When reassembling, make certain that the weights move freely about their securing pin and that the yoke is not sticking in the grooved sleeve. The spring should exert a pressure of 90 lbs. when compressed to $1\frac{3}{8}$ ins.

*TO ADJUST THE CONTROL RODS

Turn the short lever on the throttle control assembly to its uppermost position.

With the governor assembled on the tractor, move the throttle control arm (the longer arm on the governor housing) to its uppermost position.

Adjust the block on the lower end of the rod connecting this arm to the throttle control assembly, so that the rod has to be pulled down $\frac{1}{64}$ inch to go into the hole in the arm, and connect the control rod to the inner side of the control arm. This is necessary to prevent the load from the governor spring being transferred to the throttle stop on the vapourizer.

When the adjustment is correct, a piece of paper may be slipped between the stop lever and its stud.

*See pages 80 & 81.

Air Cleaner

TO REMOVE AIR CLEANER ASSEMBLY

Remove the vertical air pipe which is attached to the air inlet port on the left-hand side of the tractor by withdrawing the draw-bolt which secures it.

Undo 2 bolts securing flange of air cleaner to carburettor pipe and remove from the cleaner. Tractors in current production have the flange cast integral with the cleaner body.

Unscrew the two bolts securing the air cleaner to the dash bracket : then unscrew the crank case breather bolt which passes through the top of the dash support bracket. The air cleaner may then be removed from the left-hand side of the tractor, taking care that the fuel line is not damaged when passing the cleaner beneath it.

TO DISMANTLE AIR CLEANER

This may be done when the air cleaner is removed from the tractor as owing to its construction the top portion has to be lifted approximately $3\frac{1}{2}$ in. vertically before it may be removed and insufficient clearance exists if this be attempted in place.

Take care that the small release valve beneath the outlet elbow is not damaged : the valve must be free to move and close the outlet when the engine is running.

Unscrew the two bolts when the assembly may be parted and thorough examination of the interior provided. The copper wool assembly is designed to operate for a considerable period without attention and no attempt should be made to remove this. The dirt trap hand-hole provides access to enable all sediment to be removed and no useful purpose is effected by dismantling the cleaner.

When re-assembling the two halves of the cleaner the cork gasket should be in good condition and mounted correctly in register with the air port formed in each half of the air cleaner.

On replacing the air cleaner on the Tractor, ensure that the drilled bolt is correctly refitted at the apex of the bracket so that fumes from the crankcase are drawn into the passage formed for that purpose in the cleaner body.

Refill with an engine oil of viscosity S.A.E.20.

Row Crop Steering Brakes

Adjustment of brake shoes.—There is an external adjustment to compensate for brake liner wear which may take place, and this adjustment may be easily effected by turning the expander studs which protrude through each brake housing plate. These may be identified by their squared ends : turning each stud in a clockwise direction, viewed from between the wheels, expands the shoes in the drum. The studs should afterwards be backed off approximately two notches to obviate any drag.

***Replacement of brake shoes.**—Should it be found necessary to replace the brake shoes, reconditioned assemblies are obtainable through authorised Fordson Dealers, and their use not only effects a saving in time but also ensures that the liner is correctly mounted with the proper radius.

After the Tractor has been jacked up with the rear wheels clear of the ground, the extension shafts and wheels should be removed by unscrewing the six bolts in each side which pass through the flanges. After these have been removed the wheel bush may be extracted from the brake drum by using the two hub puller screws as described on page 58. Ensure that the brake shoes are not in contact with the hub drum before attempting to remove it from the axle shaft.

The brake retraction springs may then be released and the shoes removed from the housing plate.

As the brakes are of the self-energising type, correct replacement of the parts is essential, otherwise considerable braking effect will be lost.

Note that the brake operating wedge has unequal faces, one side having an arrow stamped upon it. Should this wedge be disturbed, replace it with the arrow pointing towards the front of the Tractor.

The brake shoes themselves are interchangeable but take care to install the short retraction spring so that one end is hooked in the upper end of the brake shoe towards the front of the Tractor and the other end is carried in a hole drilled in the housing plate beneath the upper retraction spring. Ensure that the brake links are free in their housing and lightly lubricate the moving parts with grease before replacing the brake drum and wheels. Adjust by the expander studs as described above.

* See pages 80 & 81.

***Resetting the brake linkage.**—Should it be necessary to reset the brake linkage, first adjust the brake shoes and ensure that the pedals operate freely, returning to the limit of their travel when released. Check also the brake shaft brackets as it is essential for satisfactory operation that the steering brake arm is free to override the brake rod lever.

Turn the front wheel through approximately 45° from the straight-ahead position or two and a half turns of the steering wheel would give the corresponding position.

The bracket carrying the two brake rods will then move so that the brake rod on the side towards which the front wheel is moved is applying the brakes and the brakes on the opposite wheel are free.

Should the brake be insufficiently applied when so set, first check the front end of the long brake rod and if necessary adjust it until the rod is screwed through the clevis flush with the end. Tighten the lock-nut firmly and ensure that the set in the rod is so placed as to enable it to line up with the brake pedal.

The adjusting nuts in the brake spring link should next be set so that the spring is compressed approximately half an inch. Secure the nuts, turn the wheel to the corresponding position on the other side and adjust the linkage in a similar manner.

Adjusting the linkage to shorten the brake rods brings the brakes into operation when the steering is turned through a lesser angle, but the foregoing setting should be satisfactory for all normal conditions.

Once set, any further adjustment for liner wear should be made on the brake adjusting studs.

ROW CROP WORM STEERING.

As the worm and steering gear are enclosed in an oil bath they should give satisfactory service over long periods provided the oil level is maintained with an approved grade of **extreme pressure lubricant.**

The lower shaft bearing may be greased through the external lubricator but the upper bearing must be lubricated by removing the cap which is screwed over it. Refill the cap with grease, and when it is replaced this grease is forced into the roller bearing.

Both universal joints are of the needle bearing type and being enclosed the initial supply of lubricant is sufficient, so no further attention should be required.

* See pages 80 & 81

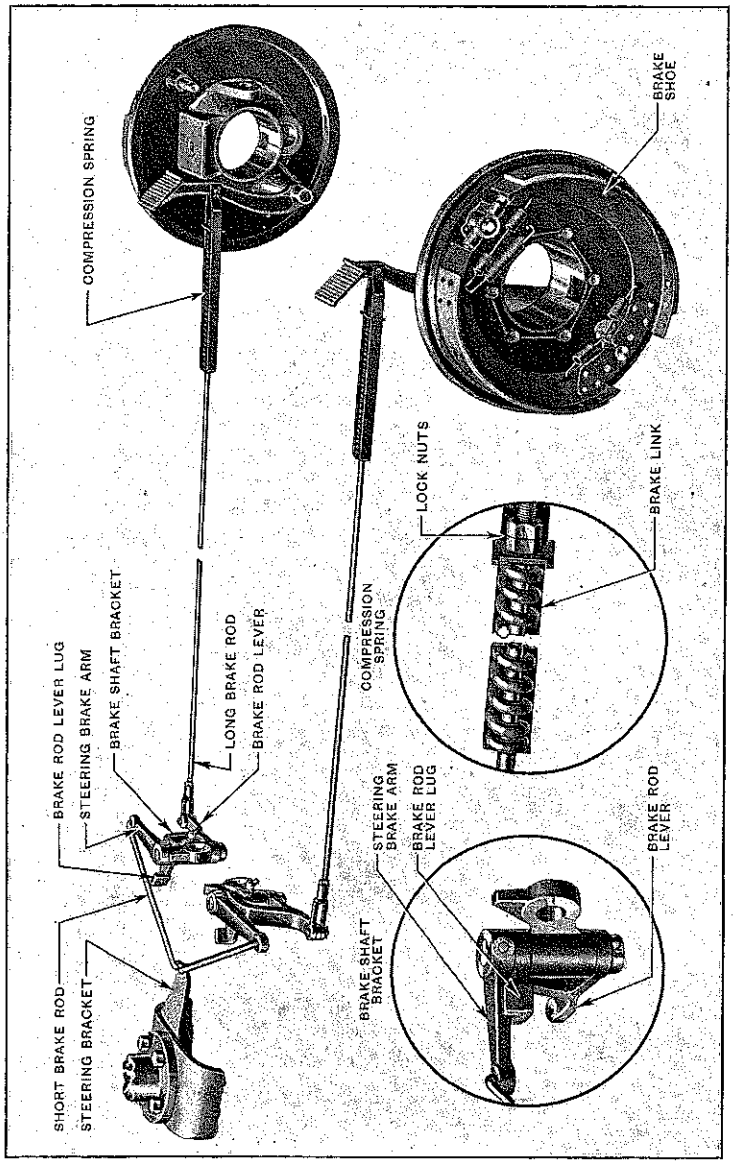


Figure 34
Row Crop Brake Linkage

***To adjust the vertical shaft bearings.**—If play develops after considerable service, adjust as follows :—

Raise the front of the Tractor clear of the ground and remove the upper cap. Withdraw the cotter pin and tighten the castellated nut until all play is taken up. Do not overtighten the adjustment and carefully test for freeness of operation before fitting a new cotter to lock the castellated nut.

Repack the cap with grease and replace it ; lower the front of the Tractor to the ground.

***To dismantle the steering gear.**—Drain the oil from the steering housing by unscrewing the lower drain plug, and unscrew the bolts holding the steering column to the dash. Then gently ease the column and shafts towards the rear of the Tractor, so that the splined shaft may be withdrawn from the steering worm housing.

Raise the front end of the Tractor clear of the ground and disconnect the wheel and bracket from the lower flange of the vertical shaft by removing the four bolts. Swing the brake rod bracket clear after the wheel bracket has been removed.

Next remove the cap, extract the cotter from the castellated nut, unscrew this nut, then remove the washer and inner race.

Mark the housing cover and body so that their relative positions are clearly shown, unscrew the five bolts and remove the housing cover.

Detach the snap ring from the shaft and carefully drive this splined vertical shaft downwards through the housing. The steering gear may then be lifted out of the steering housing. The outer race of the lower bearing may then be driven downwards from the machined location in which it is pressed and it will bring with it the oil seal which prevents oil leakage at this point.

Unscrew the four bolts holding the worm cover plate and remove it, noting carefully the number of gaskets fitted over the shoulder, between the mating faces.

The inner race and laminated washers may be driven out of the worm housing cover, again taking careful note of the packing washers which are fitted in the machined location in which the race is carried. The other worm bearing is a press fit in the housing.

If necessary, the outer race may be driven out of the upper housing cover and the flat washer beneath this race should be carefully preserved.

* See pages 80 & 81.

All parts should be washed and examined, ready for re-assembly. Scrutinise the bearing races and replace them if necessary.

***Reassembling the worm and bearings.**—Press in the front worm bearing, with the taper towards the rear of the Tractor and ensure it is properly seated to the limit of the machined location. Oil the worm bearings and replace it in the housing.

Next, install the plain washers originally fitted in the worm housing cap, followed by the laminated spring washer with the concave face towards the worm and finally press in the outer race with its taper also towards the worm.

Place the same number of gaskets on the machined shoulder of the worm housing cap as were originally fitted, install it and firmly

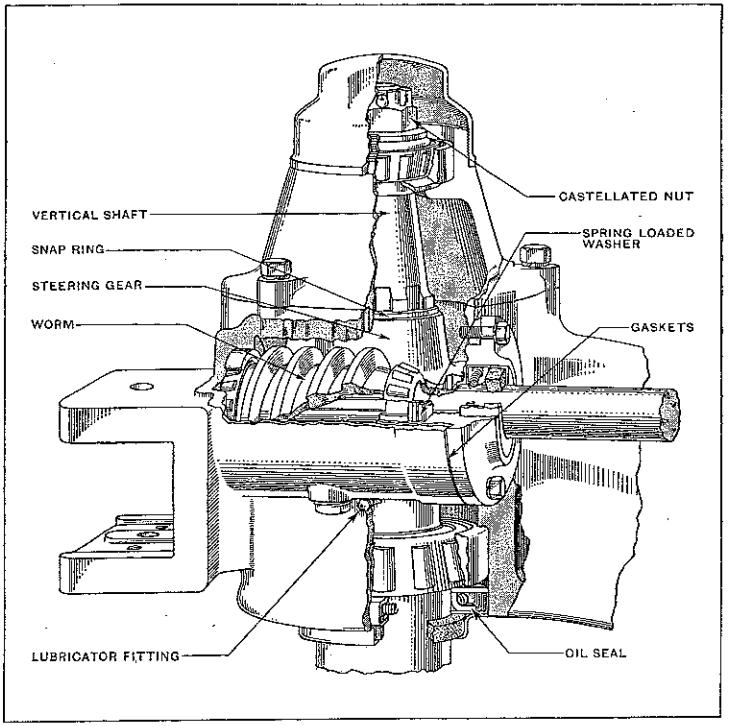


Figure 35
Row Crop Steering Assembly

* See pages 80 & 81.

tighten the four bolts which secure it. An initial loading must be placed upon the worm bearings so that a torque of approximately 13½ in. lbs. is required to rotate it.

If adjusted too tightly, fit gaskets at the housing flange face joint until this figure is obtained. If a torque of less than this figure results, suitable washers may be fitted in the worm housing cover between the laminated washer and the end of the machined housing in which the outher race is carried.

The oil seal must be in good condition and if this is replaced the sharp edge of the leather must be towards the worm. Finally install the felt dust excluder.

***Reassembly of the vertical shaft.**—Drive the lower race, taper downwards, into its location, grease it and install the inner race with the taper upwards. A new oil seal and dust felt should then be driven into place, beneath this inner race, noting that the sharp edge of the leather is upwards. Do not drive this oil seal in too far as there is no limiting stop and, if driven in too far, the leather may come in contact with the race, thus tending to cause oil leakage.

The steering lock is controlled by a lug on the steering gear which engages with two limiting stops on the housing cover. Correct replacement is very important otherwise unequal steering lock may result.

Install the vertical shaft, taking care that the shoulder at the lower end correctly abuts the inner race. Turn it so that when **two** of the four bolt holes in the flange face equally towards the front of the Tractor, the **space** of a spline shall face also forwards.

Then install the steering gear so that the lug is towards the right-hand side, adjacent to the bolt hole which is opposite the worm housing. Use a new snap ring and ensure that it engages correctly in the machined groove.

After the plain washer has been positioned in the flange at the bottom of the bearing housing, press in the outer race, taper upwards towards the threaded end.

Fit a new gasket to the housing face and bolt the cover in place so that original position corresponds to the marks previously made.

Grease and enter the roller bearing, taper downwards, followed by the tongued washer which must engage with the slot of the shaft. Screw on the castellated nut and firmly tighten it. Then slacken it approximately a quarter turn, check for free operation without slackness and secure the nut with a new split pin.

* See pages 80 & 81.

Should it be considered that there is excessive backlash, an unworn part of the steering gear may be brought into use by replacing it **two** splines from its original position. The housing cover must be replaced through **one-fifth** of a turn to ensure equal steering lock, since the gear may be installed in any one of ten positions, but there are only five alternative positions for the cover.

Replace the cap with a fresh supply of grease and install the drain plug in the housing. Bolt on the wheel bracket and connect brake linkage.

Carefully enter the splined shaft in the worm and housing, taking care not to damage the oil seal and bolt the column to the dash. Refill the housing with the correct grade of an **extreme pressure oil** to the filler plug lever, the approximate capacity being $1\frac{3}{5}$ pints.

Finally move the steering from lock to lock to ensure that it operates freely and actuates the brakes correctly, then lower the front end of the Tractor.

Steering Gear and Front Axle

TO REMOVE STEERING GEAR

Remove rear fuel tank strap nuts (2) supporting fuel tank with suitable packing when the dash is removed.

Undo steering wheel nut and remove steering wheel.

Remove the two mudguards to dash brackets, 2 bolts each side. Disconnect dash controls and remove the 4 securing bolts. Unscrew drop arm nut and remove drop arm.

Unscrew 5 steering bracket bolts and remove steering assembly.

*STEERING DROP ARMS

As the steering columns are at different angles on the Agricultural and Industrial Tractors, a different steering drop arm is used for each model and IT IS ESSENTIAL THAT THE CORRECT DROP ARM BE FITTED as the travel of the worm sector is limited.

When renewing a drop arm, the old one should be carefully examined and the new one should be of the same type.

The correct drop arm for either the **Industrial Tractor or Agricultural Tractor** may easily be distinguished by the disposition of the steering shaft splines as illustrated in Fig. 36.

When the drag link having the spring loaded ends is fitted a shorter drop arm is used for both agricultural and industrial models. In these cases the angles shown in Fig. 36 will be 28° and 8° respectively.

* See pages 80 & 81.

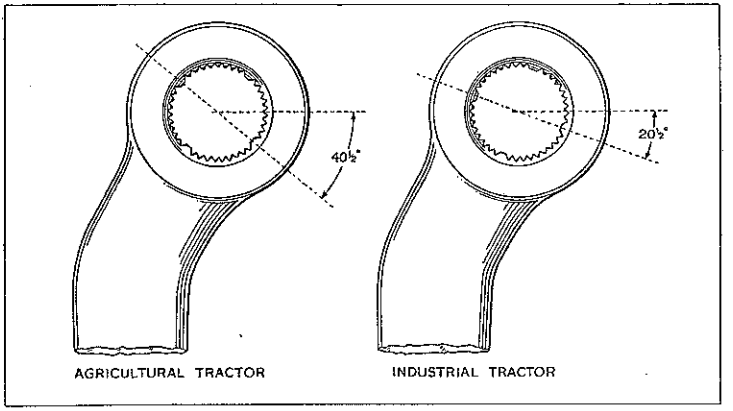


Figure 36
Steering Drop Arms

*TO TIGHTEN LOOSE STEERING JOINTS

Should the steering connections become loose, they may be tightened in the following manner :—Disconnect the two halves of the ball sockets which surround the steering arm ball and file the surface until they fit snugly round the ball. If the ball is badly worn it should be replaced by a new one. If the yoke pins in the steering spindle arms appear to be loose, the steel bushings should be replaced by new ones. The bushings in the front wheel spindle should also be replaced by new ones if the spindle pin is too loose. Excessive movement of the spindle in a vertical direction can be remedied by renewing the two spindle thrust washers.

Tractors in current production utilise a spring loaded type of ball joint and any wear which may develop in service is automatically taken up.

*TO ADJUST STEERING GEAR

If wear develops after service, provision is made to take up slackness in the steering-box and four adjustments are provided for this purpose. To ensure satisfactory operation it is advised that they be carried out in the order given below as this will ensure that each individual adjustment is completed and does not subsequently have to be altered to permit additional adjustments to be made.

End Play Adjustment in Sector Shaft.—If end play exists in the sector shaft, with the housing bolts securely tightened, this

* See pages 80 & 81.

It should be noted that the worm is so constructed that close mesh with the sector teeth is provided when the steering is in the central position.

***Centralization of the Tooth Contact.**—When the sector teeth are properly centred in relation to the worm thread, there should be an equal amount of backlash at one-half turn of the steering wheel each side of the straight ahead position. If this is not the case, adjust as follows :—

Place the steering in the straight ahead position, then note the backlash obtained if the wheel be turned one-half turn to the right.

Similarly, turn the shaft to the same position on the left-hand lock and compare the backlash in each position.

If there is **less** backlash on the left-hand lock the eccentric rivet, Fig. 37, should be turned slightly in a clockwise direction.

Should however, there be less backlash with the shaft turned one-half turn on the right-hand lock than on the corresponding position on the left lock, then the eccentric rivet should be turned in an anti-clockwise direction to correct this.

When correctly set, with backlash equal on both sides, recheck for correct mesh of teeth with the worm, remembering that after adjustment the mesh adjustment lock nut must be tightened first.

*TO REMOVE FRONT WHEELS

Take off hub cap, jack up front of tractor, take out cotter pin and unscrew nut from end of wheel spindle. The wheels can then be drawn off along with the outer roller bearing. The inner roller bearing can then be removed, allowing the dust excluder to be taken off. **Before replacing the wheel**, clean hub and spindle thoroughly with paraffin, and then fill up the hub and cap with fresh grease. Be careful in replacing roller bearings that the stamped faces of the outer rings face each other.

*ROW CROP PNEUMATIC FRONT WHEEL

Should it be necessary to dismantle the spindle assembly after the wheel and tyre have been removed, as described on page 74, proceed as follows :—

Withdraw each hub cap from the spindle and remove the locknut, lockwasher, adjusting nut, tongued thrust washer and plain washer. The spindle may then be drawn from the hub, leaving the races and dust shields in position.

* See pages 80 & 81.

may be taken up by releasing the lock-nut and screwing in the sector thrust adjusting screw until all end-play is just taken up. After this adjustment, tighten the lock-nut and retest for end-play, at the same time checking to ensure that the shaft is free at all positions.

***Adjustment for Correct Mesh of Sector Teeth.**—With the drag-link disconnected and the steering in the straight ahead position, gauge the lost-motion present by movement of the sector shaft, grasping the drop arm which will enable this to be felt.

Loosen the three nuts securing the housing one-quarter turn each and the mesh adjustment lock-nut one-half a turn.

Turn the eccentric adjusting sleeve clockwise very gradually, checking at each movement the amount of lost-motion still existing at the drop arm.

Do not adjust more than is necessary to eliminate all backlash, being sure to finish the movement of the sleeve in a clockwise direction.

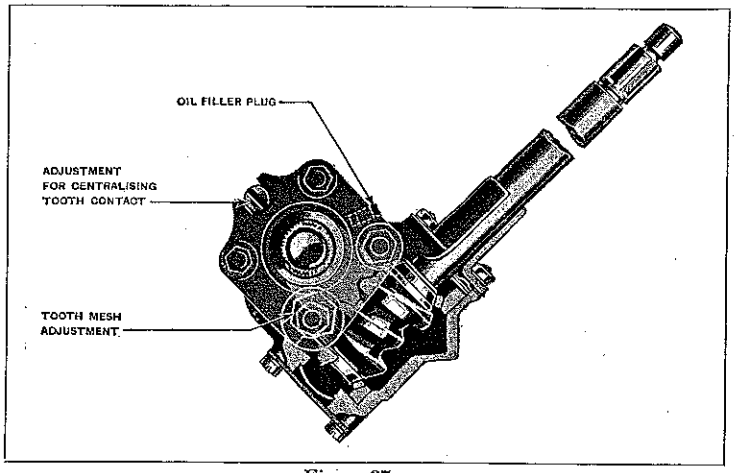


Figure 37
Steering Adjustment

If this stiffens up the steering unduly, free the adjustment by turning the eccentric adjusting sleeve in an anti-clockwise direction and then readjust as described above, more carefully.

After adjustment, first tighten the mesh adjustment lock-nut, then the housing cover nuts.

* See pages 80 & 81.

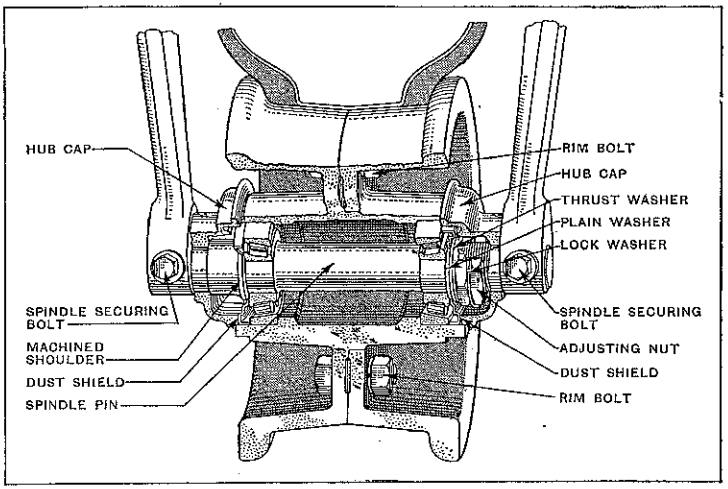


Figure 38

Row Crop Pneumatic Front Wheel and Hub

Each inner roller bearing may be tapped out from the opposite side, together with the dust shields. The outer races may be removed if necessary and they are a press fit in the hub.

Reassembly may be carried out in the following order :—

After the outer races have been installed with the tapers outwards, pack the hub with grease and apply a film to the races. Tractors now in production have a lubricator fitted so that grease may be injected.

Place one inner race, taper towards the centre, in the hub (on that side where the wheel rim is cast integral) and press in a dust shield so that the concave outer edge is towards the centre of the hub.

Pass the threaded spindle end through the centre and suitably support the wheel in a horizontal position so that the spindle shoulder enters the race correctly.

Then assemble the other inner bearing over the shaft, followed by the dust sheld, also with the concave outer edge towards the hub centre and press it into contact with the outer race.

Finally, enter the plain washer, the tongued thrust washer and screw on the bearing adjusting nut.

Install a new lockwasher, screw on the locknut and adjust so that the adjusting nut has been unscrewed approximately a quarter turn from the fully tight position. When the adjustment is correct, with the wheel free to turn but without slackness, secure the nuts with the lockwasher.

Enter both hub caps on the splines of the spindle and note that their protruding lips must be uppermost when the wheel is replaced.

*FIT OF CONES AND CUPS

The cups should be a good press fit in hubs and seated firmly against shoulder in hub. The cones should be a close push fit on the spindle with no play in the bearing. In no case, however, should wheel cones fit tightly on spindle.

*TO ASSEMBLE AND LUBRICATE

Fill the hub between the cups, and pack the inner cone with a good quality medium body grease, being sure that the space between the rollers is filled with grease.

Before putting the wheel on the spindle, place the inner cone in the inner end of hub.

Install the dust ring, which should be a tight fit in the hub, then place the wheel on the spindle.

Pack the outer cone with grease and place it on the outer end of spindle.

Re-install tongued lock washer and adjusting nut.

*ADJUSTMENT

Screw adjusting nut home but do not force it so tight that the wheel will bind, as this will damage the bearing immediately.

Revolve wheel to ensure all working surfaces coming in contact.

Loosen the adjusting nut $\frac{1}{8}$ to $\frac{2}{3}$ turn, enough to allow wheel to rotate freely but with no end play, then lock the adjusting nut in this position with a cotter pin.

Put on hub cap filled with grease.

*See pages 80 & 81.

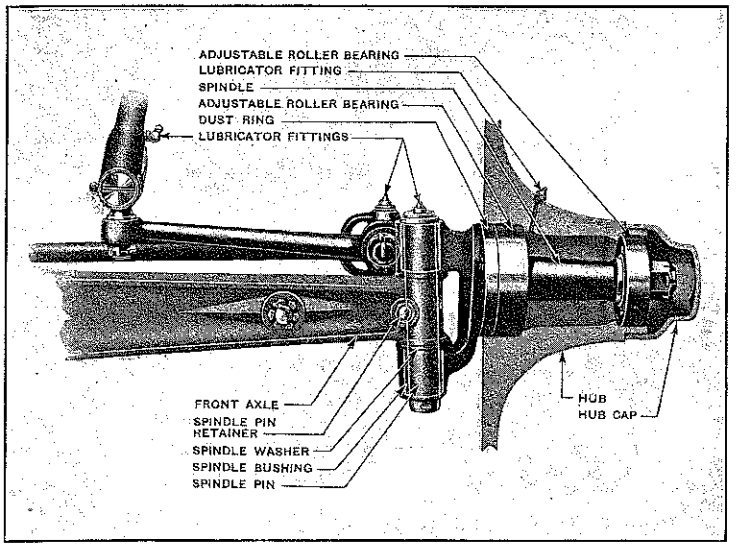


Figure 39
Spindle Assembly

ROW CROP TRACTOR DUAL FRONT WHEELS

These are mounted on an inverted "T" bracket and their adjustment and maintenance follow closely the instructions given above whilst the hub layout is similar to that illustrated in Fig. 39.

CAUTION

Care should be taken that no dirt or water gets on the bearings or in the hubs when the wheels are being readjusted and lubricated. When adjusting the front wheel bearings, do not mistake loose steering knuckle on steering knuckle bolt for end play in bearings. When making the adjustment, place a chisel or tapered bar between the axle and the steering knuckle to hold the steering knuckle rigid while making the adjustment.

*TO REMOVE THE FRONT AXLE

Jack up the front of the tractor and remove the wheels. Disconnect the steering drag link from the steering arm.

* See pages 80 & 81.

Withdraw the radius rod retaining pin from the crankcase.

Support the front axle.

Remove the cotter pin from the front axle trunnion, withdraw the trunnion, and remove the axle.

*STRAIGHTENING FRONT AXLE

Should the front axle or spindle become bent owing to an accident, the parts must be sent to an authorised Fordson dealer where they can be straightened in fixtures designed for the purpose.

In cases of emergency, when it is impossible to obtain the services of an authorised Fordson dealer, the part should be straightened cold, as heating them will untemper the steel.

VERY GREAT CARE MUST BE TAKEN TO STRAIGHTEN THE PARTS ACCURATELY AS IT IS ESSENTIAL THAT THE WHEELS LINE UP PROPERLY. IMPROPER ALIGNMENT WILL CAUSE DEFECTIVE STEERING AND STRAIN THE PARTS.

Transmission

*TO REMOVE ENGINE FROM TRANSMISSION

Drain oil from engine.

Drain water from cooling system and air washer, when fitted.

Remove fuel tank.

Remove air cleaner. This is not absolutely necessary but if the air cleaner is removed it will lighten the transmission assembly for handling.

Disconnect steering arm from the drag link.

Disconnect ignition, governor control, and choke rods.

Support the transmission housing and crankcase separately.

Put a wedge each side between the cylinder front cover and the front axle, to prevent the engine tilting when disconnected from the transmission.

Remove the engine to transmission bolts (6) and screws (10) and the rear part of the tractor may be drawn away from the engine.

* See pages 80 & 81.

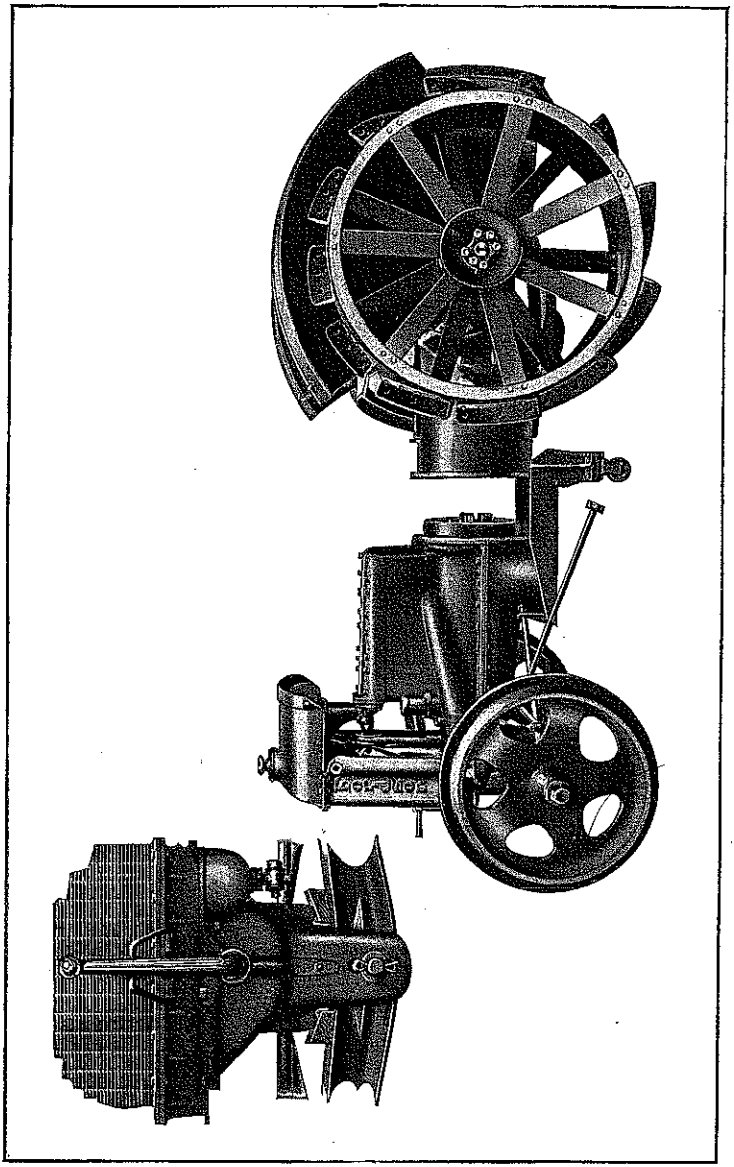


Figure 40
Removing Engine from Transmission

When reassembling the tractor always insert the two bolts, one on each side of the cylinder block, just above the crankcase first, as the holes for these bolts are smaller than the others, and are accurately reamered so as to line up the two parts of the tractor correctly, and make sure the engine to transmission gasket is properly replaced.

*TO REMOVE THE CLUTCH

Remove the engine from the transmission.

Remove the clutch retaining snap ring which holds the clutch in place and pull the clutch assembly off the drive shaft.

*TO DISMANTLE THE CLUTCH

If the clutch slips when working it will be due to weak springs or worn plates, and they should be replaced by new ones. If the clutch sticks and does not release easily it should be taken apart and examined.

Remove the clutch.

The clutch can then be dismantled by removing the eight bolts holding the front and rear housings together. Some means should be provided for holding the two halves together and relieving the tension of the springs gradually. (See fig. 41.)

The clutch driven plates are dished $\frac{1}{8}$—$\frac{5}{32}$ inch and the clutch driver plates are flat. Should any buckled plates be found, or should plates be insufficiently dished, they should be replaced.

In assembling, oil the plates well and be sure they are replaced in their proper order; that is, the driving and the driven plates must alternate, and the front and rear plates must be driven plates (have the slots on the outer edge).

In addition, the clutch driven plates must be reassembled with the flats on their outer periphery staggered helically round the drum in such a manner that each consecutive driven plate is advanced one-sixth of a turn.

There are nine driven plates and eight driving plates.

FIGURE 41

"A" shows the parts in their relative assembly positions.

"B" shows the position of the clutch during assembly.

"C" shows the clutch being drawn together by means of a bolt.

* See pages 80 & 81.

"D" shows the clutch being drawn together by means of two C clamps.

"E" shows the clutch on the drive shaft with the snap ring expander in position.

*TO DISMANTLE GEARBOX

Remove the rear half of the tractor from the engine as described above.

Drain the oil from the transmission housing by removing the drain plug just under the gear selector cover.

Remove the selector cover by unscrewing the four screws holding it to the transmission housing.

Remove clutch retaining snap ring from the end of the transmission drive shaft and draw off the clutch.

Remove the eight screws holding the transmission plate; then, by pulling on the drive shaft, the plate, together with the lower transmission shaft, can be removed from the housing in one unit. Later tractors have seven bolts.

If it is necessary to remove the upper transmission shaft :—

Remove mudguards (see page 123).

Remove rear axle shafts and differential assembly (see page 124).

Remove worm (see page 123).

Undo lock screw, and loosen nut securing large transmission gear to transmission housing.

Partially withdraw this gear and the upper transmission shaft may be removed.

When reassembling the large transmission gear, tighten the securing nut **fully,** then turn the nut back one notch of the locking ring, engage the locking piece, do up the lock screw and secure it. This adjustment must not be over-tightened.

Before replacing the gears in the housing clean them well with paraffin.

Examine the bushes in those gear wheels fitted with them, and if they are worn the wheels should be sent to an authorised Fordson dealer, who has the special equipment necessary to

* See pages 80 & 81.

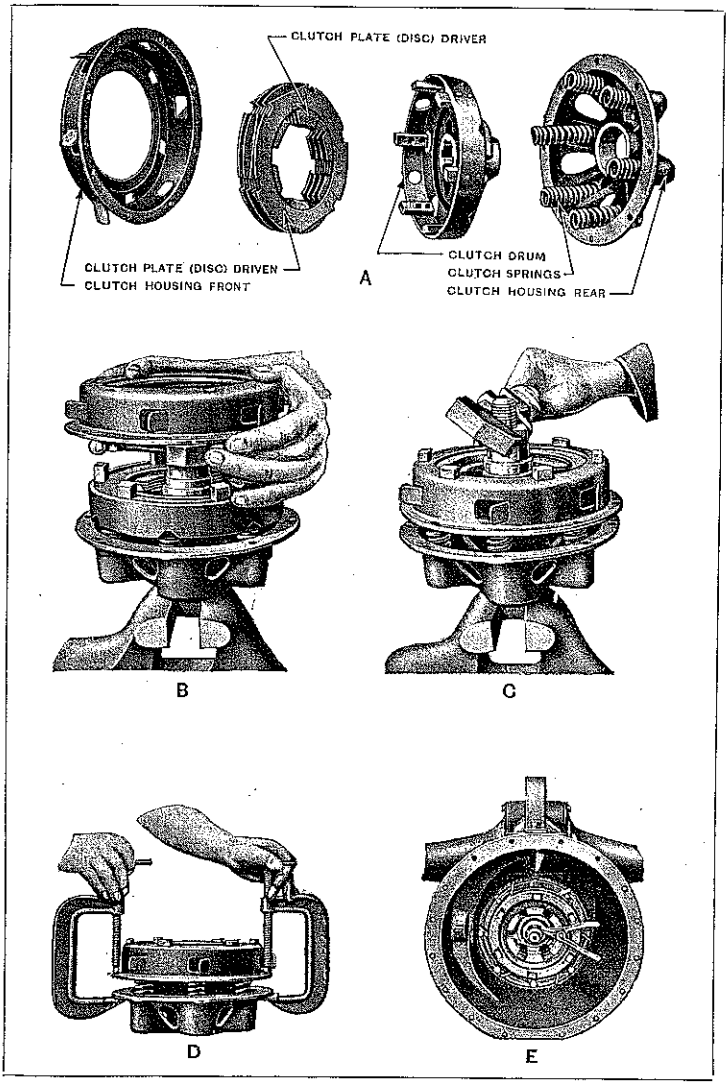


Figure 41
Clutch

rebush them correctly. If the gear teeth are chipped, great care should be taken to remove all loose particles of steel, as these will cause serious damage to the gearbox generally.

The housing should also be flushed out with paraffin to remove any grit or gummed oil. Also clean and examine all ball and roller races. If it has been found necessary to remove the bearings, be very careful in assembling them on the shafts again that they are replaced in exactly the same position as before removing, i.e., the stamped face of the outer rings must face towards the ends of the shaft. The inner ring of the bearing is pressed on the shaft while the outer ring is pressed into its seat before the parts are assembled.

*TO DISMANTLE BRAKE

Remove rear half of tractor from engine.

Remove gear selector cover by undoing the four screws holding it to the transmission housing.

Remove transmission plate (see page 120).

Remove cotter pin and nut from end of brake shaft : the brake plates may then be removed, care being taken that the packing fitted to the brake shaft is not lost when it is removed from the transmission plate. When replacing the brake shaft, carefully enter the asbestos packing into the groove provided to ensure an efficient oil seal at this point.

The return spring must be correctly replaced over the brake shaft so that it is compressed between the brake shaft hub and the reverse idler shaft.

When reassembled, the plates should be alternately revolving and stationary, the first and last plates being stationary ones, and their surfaces should be well oiled.

When replacing the spring securing nut, tighten it only sufficiently to be able to insert the cotter pin.

*TO REPLACE THE REAR AXLE GREASE RETAINERS

The roller bearing at the outer end of the axle shaft is protected against grit and dirt by a felt washer, cork washer, and a leather grease retainer which are held in position by a steel cover. On agricultural models, except the Row Crop Tractor, a dirt shield is fitted to extend over the axle shaft and protect the dirt falling from the wheels working into the bearings where it may cause undue wear. The washers or grease retainer should be replaced if unduly dirty or if badly worn, or if oil leaks past them.

* See pages 80 & 81.

To do so—remove rear wheel.

Remove the steel cover on the end of the rear axle housing with a hammer and drift.

The felt washer, cork washer, and the grease retainer may then be removed.

When installing the leather grease retainers, the sharp edge of the leather should be pushed on the axle first.

After replacing the steel cover, the edge should be bent into the groove in the end of the axle housing, to prevent it coming off.

*TO REMOVE WORM

Drain oil from transmission.

Undo screws (4) holding drawbar cap.

Switch off ignition, engage **reverse** gear and crank the engine when the worm and rear taper roller races will be forced out.

The roller races may then be dismantled by removing the cotter pin and nut at the rear end of the worm assembly and drawing off the race. Note that this nut has a **left-hand thread.**

When reassembling the races, the nut should be run home tight, and secured with the cotter pin.

If the whole rear axle is being dismantled the worm should be removed after the rear axle shafts and differential assembly has been removed.

TO REMOVE MUDGUARDS (Land Utility Tractor)

Remove mudguard bracket to dash screws (2). Remove 6 screws securing mudguard to shield and 1 bolt securing floor plate to rear axle housing.

After removing wheel, the brake plate assembly and mudguard may be removed.

Agricultural Tractors

Remove mudguard bracket to dash screws (2). Unscrew 11 (eleven) mudguard to shield screws. Remove 1 bolt, floor plate to rear axle housing : slacken bolt securing mudguard to rear axle, unscrew rear bearing lubricator fitting, remove rear wheel and withdraw mudguard.

* See pages 80 & 81.

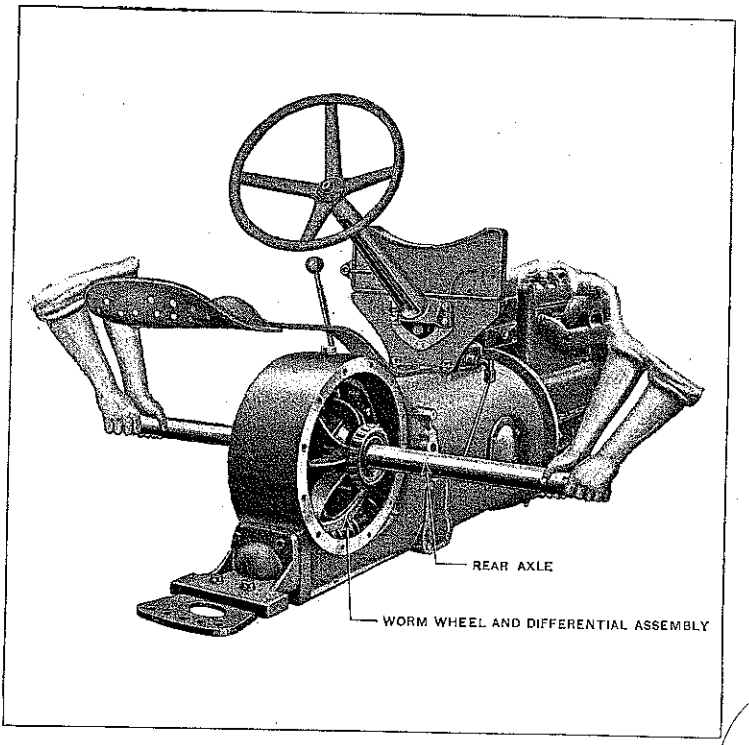


Figure 42
Removing Rear Axle Shaft Assembly

*TO REMOVE AND DISMANTLE THE REAR AXLE ASSEMBLY

Drain the oil from the transmission housing.

Jack up the rear end of the tractor and remove the rear wheels.

Remove mudguards (see page 123).

Remove the cap screws (11) from each of the rear axle housings and draw them off.

The rear axles and differential can then be lifted out in one unit.

* See pages 80 & 81.

The worm wheel and differential housings can then be taken apart by removing the twelve bolts holding them together. The relative assembly positions of these parts are shown in fig. 43.

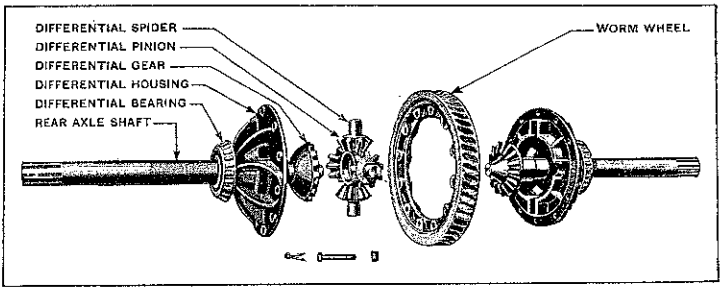


Figure 43
Assembly Position of Rear Axle Shafts and Differential Assembly

To remove the worm, undo the screws (4) holding the drawbar cap and withdraw worm from the rear.

When reassembling, take care to oil the differential spider where the differential pinions fit, and the surface on the differential cases on which the backs of the gear wheel on the axle shafts bear, and reinstall the securing bolts alternately from either side.

INDEX

Index to Illustrations

Printed in England. G.87/354

This packet contains : **INSTRU**

AND SCHEDULE OF REPAIR CHARGES

Fordson Tractor

DIRECTIONS

RUNNING IN

Half a pint of engine oil should be mixed with each gallon of petrol put into the auxiliary tank, to provide an additional lubricant for the valves, pistons, etc., when first started up and before the oil has time to circulate fully.

It is advisable to run the engine slowly at first and gradually increase its speed as it becomes run-in.

After 25 working hours, the engine oil should be changed, the rear wheel bolts tightened, the cylinder head screws tightened and all nuts, bolts, screws, etc., gone over and tightened if necessary.

LUBRICATION

TRANSMISSION

Summer Use	Winter Use
SHELL EP SPIRAX HEAVY	SHELL EP SPIRAX LIGHT
MOBILOIL EP	MOBILOIL EPW
VIGZOL HY-EX	VIGZOL HY-EX LIGHT
TRAFFORD EP FILTRATE	EXTREME PRESSURE FILTRATE (regd.) S A E 90
CASTROL HI-PRESS	CASTROL HI-PRESS 90 HEAVY
ADCOL XS-PRESS	ADCOL TRANSMISSION OIL *F F S*
ESSOLEUM EXPEE S A E 90	ESSOLEUM EXPEE 140

ENGINE

Summer Use	Winter Use
ESSOLUBE 40	ESSOLUBE 30
TRIPLE SHELL	DOUBLE SHELL
GARGOYLE TRACTOR OIL—HEAVY	GARGOYLE TRACTOR OIL MEDIUM
VIGZOL Y SUMMER	VIGZOL Y WINTER
CASTROL XL	CASTROL XL
FARM FILTRATE SUMMER	FARM FILTRATE WINTER
N P 3 ADCOL	ADCOL N P X X

In the Air Cleaner use engine oil of Viscosity S.A.E.20.

IMPORTANT

BEFORE STARTING ENGINE :

1. Fill radiator with clean water.
2. Fill air cleaner with oil of viscosity S.A.E.20 to level of filler plug.
3. Fill crankcase with lubricating oil of correct grade up to "F" mark on the oil level dipstick.
4. Fill transmission with extreme pressure gear oil up to level of filler plug.
5. Fill the fuel tank.

CONSULT YOUR DEALER ABOUT FORD INSPECTION SERVICE

FORD MOTOR COMPANY LIMITED, DAGENHAM, ESSEX

Printed in England

G.275/2114

TWICE DAILY, IN THE MORNING AND AFTER DINNER

(A) FILL WITH FRESH CLEAN WATER, IF REQUIRED

(B) CHECK LEVEL AND FILL TO "F" MARK ON DIPSTICK WITH OIL OF CORRECT GRADE, IF NECESSARY

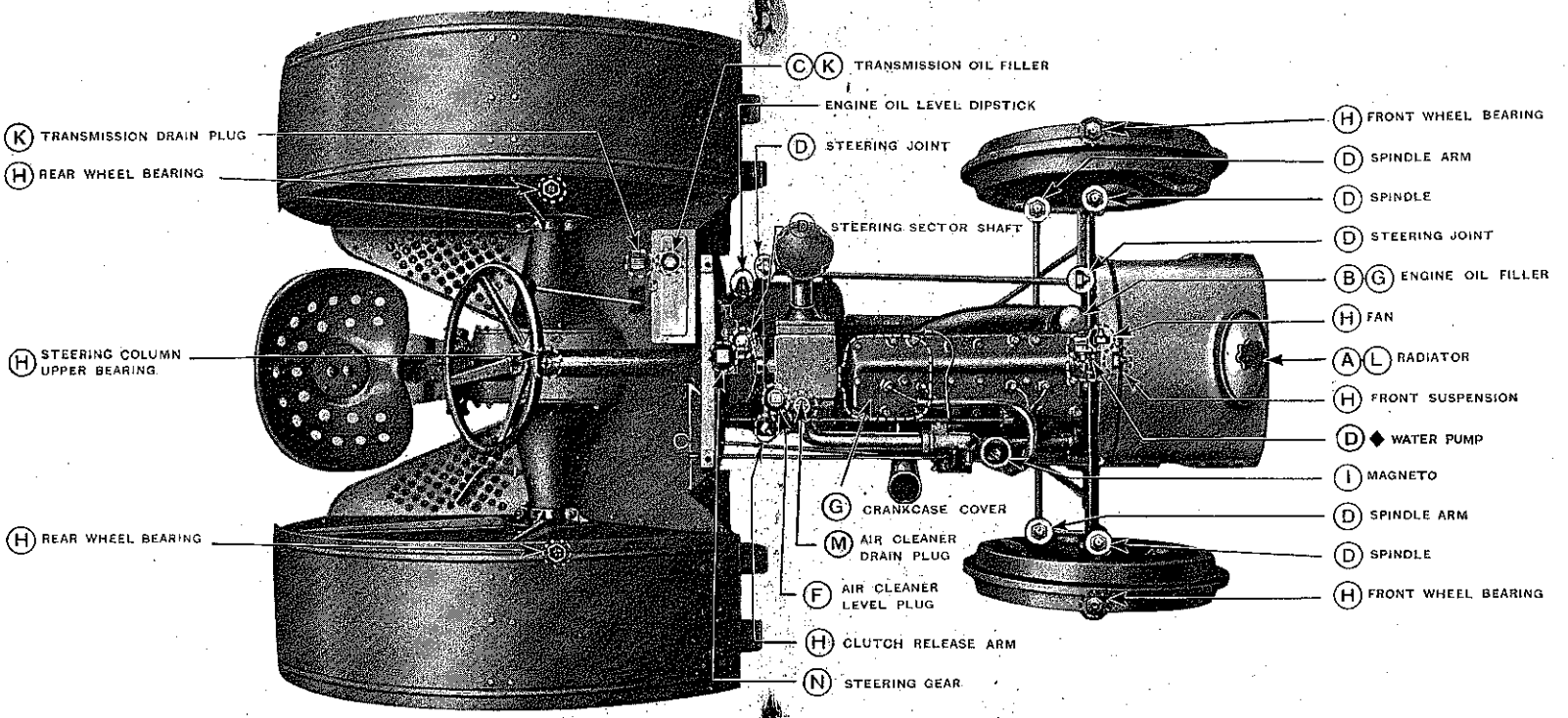
(C) CHECK LEVEL AND REPLENISH IF NECESSARY TO LEVEL OF FILLER HOLE WITH **EXTREME PRESSURE LUBRICANT** OF CORRECT GRADE

EVERY NIGHT

(D) GREASE WITH GREASE GUN

(D) ◆ USE SUITABLE WATER PUMP GREASE

(F) CHECK OIL LEVEL, AND ADD CLEAN OIL IF NECESSARY
COVER TRACTOR TO PROTECT IT FROM THE WEATHER



AFTER EVERY 50 HOURS RUNNING

(G) CHANGE ENGINE OIL, REMOVE CRANKCASE COVER, CLEAN COVER AND SCREEN RE-ASSEMBLE AND REFILL WITH OIL OF CORRECT GRADE. CLEAN OIL FILLER CAP AND RE-OIL FILTER

(H) GREASE WITH GREASE GUN

(I) APPLY TWO OR THREE DROPS OF OIL. FOR WICO-TYPE SEE PAGE 23.

AFTER EVERY 200 HOURS RUNNING

(K) DRAIN, FLUSH WITH ENGINE OIL AND REFILL WITH CORRECT GRADE OF **EXTREME PRESSURE LUBRICANT**

(L) DRAIN AND FLUSH UNTIL WATER COMES OUT CLEAR

(N) FILL TO LEVEL OF FILLER HOLE WITH **EXTREME PRESSURE LUBRICANT** OF CORRECT GRADE

(M) DRAIN AIR CLEANER AND REFILL WITH CLEAN OIL OF S.A.E. 20 VISCOSITY

Figure 25
Lubrication and Maintenance Chart