INSTRUCTION MANUAL

OF THE

Fordson MAJOR TRACTOR

STANDARD
AGRICULTURAL

•

ROW CROP

•

LAND UTILITY

•

INDUSTRIAL

A FORD PRODUCT — MADE IN ENGLAND

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FOREWORD

The Fordson Major 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, Industrial and Land Utility Tractors, with a few exceptions which are dealt with in the appropriate place in the book.

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 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 sections 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 authorised dealer will be pleased to help you in every way.

When reference is made in the text to "right-hand side" or "left-hand side" this is to be interpreted as viewed from the operator's position, facing forward.

Specification

AGRICULTURAL TRACTOR

(Row Crop, Industrial or Land Utility Tractors similar except where noted).

Engine.—Four cylinder, four-stroke, cylinders cast *en bloc*. Cylinder bore 4⅛ 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. (50.8 mm.) diam. by 3¼ in. (82.55 mm.) long. Big end bearings, 2 in. (50.8 mm.) diam. by 2¼ in. (57.15 mm.) long. Cast-iron pistons, with 3 compression and 1 oil control piston rings fitted above the piston pin. Side by side valves of special steel alloy. Industrial Tractor has high compression cylinder head for running on petrol. Low compression cylinder head for running on vaporising 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 2⅝ imperial gallons (11.9 litres) with "dry" engine.

Use a good quality oil of S.A.E. 30 viscosity in Winter and S.A.E. 40 viscosity in Summer. For climates having a temperature above 90°F. use an oil of S.A.E. 50 viscosity, for climates with a severe Winter temperature below 20°F. use an oil of S.A.E. 20 or 20W viscosity.

Engines operating exclusively on petrol can use an engine oil one grade lighter in each case.

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 6-bladed fan (4-blade fitted previously) which draws 1,700 cu. ft. (48.14 cu. m.) of air per minute through the radiator. Water capacity, 10 gallons (45½ litres). 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 to be attained and should be suitably adjusted to compensate for varying load conditions which may be encountered.

A water temperature gauge, mounted on the radiator is visible to the operator and indicates the cooling water temperature. This is not fitted when a pressure cap is supplied as special equipment.

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.

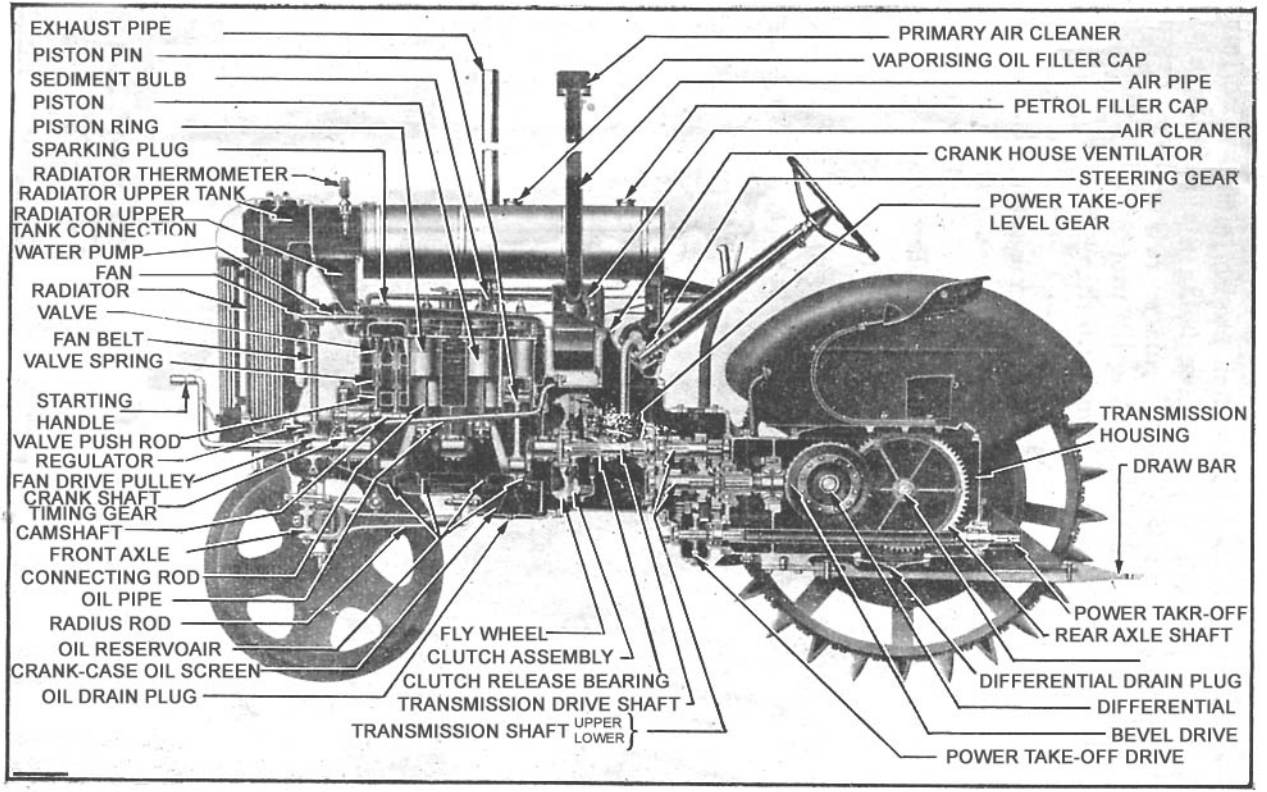


Figure 1
Section of Tractor

Governor.—Centrifugal type, adjustable to maintain any desired engine speed from 400–1,450 r.p.m. Controlled from dash. Optional on Industrial Tractor, which normally has throttle lever beneath steering wheel, directly connected to carburettor.

Fuel System.—Gravity feed from 17½ imperial gallon (79.55 litres) overhead tank, through a sediment bulb which filters all fuel before it reaches the vaporiser or carburettor. Tractors equipped to run on vaporising oil have a one gallon (4.55 litres) auxiliary petrol tank inside the main one.

Vaporiser.—Tractor fitted with low compression cylinder head for running on vaporising oil has a special vaporiser with an adjustable control to ensure economy and proper vaporisation 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. A gauze type of filter may be used when operating on petrol only.

Steering System.—Worm and nut (steel sector and worm on early tractors). Ratio 17 to 1. All steering arms and rods are of heavy construction. Easily replaceable bushes are fitted to steering shaft and spindle bodies.

Front Axle.—Heavy cast steel axle, heat treated to provide maximum strength. It is mounted at the centre of the front of the engine on a trunnion. Heavy radius rods are fitted to take up thrust.

Front Axle, Row Crop.—Adjustable for width by means of extensible ends which can be altered to give track widths from 48 ins to 72 ins. (121.92 cm. to 182.88 cm.) for cast-iron wheels, 49¾ ins. to 73¾ ins. (126.36 cm. to 187.32 cm.) when pneumatic tyres are fitted, without affecting the radius rods or drag link.

Gearbox.—Constant mesh sliding selective type with three speeds forward and reverse. All shafts run on ball or roller bearings. Single plate clutch mounted on flywheel and operating in oil. Oil capacity approximately 2¾ imperial gallons (12.5 litres). Use a good grade of gear oil of S.A.E. 90 viscosity for both Winter and Summer. For hot climates with temperatures above 90°F. use a gear oil of S.A.E. 140 viscosity, for climates having Winter temperatures below 10°F. use a gear oil of S.A.E. 80 viscosity.

Gear Ratios (Based on an engine speed of 1,200 R.P.M.)

Type 4.3 (Low Speed Top Gear)

Standard Ratio (Intermediate Gears)

Gear	Final Ratio	M.p.h. †	M.p.h. *	K.p.h. †	K.p.h. *	Identification
First	73.6 :1	2.18	2.54	3.51	4.09	S.T.D. 43
Second	48.6 :1	3.31	3.85	5.33	6.20	(Green Spot)
Top	34.84:1	4.61	5.37	7.42	8.64	
Reverse	85.9 :1	1.88	2.18	3.03	3.51	

Special Ratio (Intermediate Gears)

Gear	Final Ratio	M.p.h. †	M.p.h. *	K.p.h. †	K.p.h. *	‖ Identification
First	92.9 :1	1.72	2.02	2.77	3.24	S.R. 43
Second	61.32:1	2.62	3.06	3.32	4.92	(Red Spot)
Top	34.84:1	4.61	5.37	7.42	8.64	
Reverse	108.2:1	1.48	1.72	2.38	2.77	

Type 7.7 (High Speed Top Gear)

Standard Ratio (Intermediate Gears)

Gear	Final Ratio	M.p.h. †	M.p.h. *	K.p.h. †	K.p.h. *	‖ Identification
First	68.5 :1	2.35	2.73	3.78	4.39	S.T.D. 77
Second	48.6 :1	3.31	3.85	5.33	6.20	(Green Spot)
Top	19.4 :1	8.30	9.65	13.36	15.53	
Reverse	50.6 :1	3.18	4.04	5.12	6.50	

Special Ratio (Intermediate Gears)

Gear	Final Ratio	M.p.h. †	M.p.h. *	K.p.h. †	K.p.h. *	‖ Identification
First	86.5 :1	1.86	2.16	2.99	3.48	S.R. 77
Second	61.4 :1	2.62	3.06	3.32	4.92	(Red Spot)
Top	19.4 :1	8.30	9.65	13.36	15.53	
Reverse	63.9 :1	2.48	2.93	3.99	4.72	

INDUSTRIAL TRACTOR, WITH PNEUMATIC TYRES

Type 7.7 (High Speed Top Gear)

Standard Ratio (Intermediate Gears)

† With Steel Wheels. * With Pneumatic Tyres.

‖ Stamped on R.H. flange of gearbox housing towards the top where this mates with the flywheel housing.

Handbrake.—Multi-plate disc, running in oil, operated by hand brake lever, acting on transmission.

Foot Brake (optional equipment).—External brake drums fitted to countershaft at each side with internal expanding self energising dual shoes. Foot pedals in duplicate, side by side on left hand of tractor, enabling brake on either side, or both, to be operated.

Foot Brake.—Industrial Tractor. Brake drums fitted to rear wheels, brake back plates carried on axle housings. Brake shoes of internal expanding type, non-servo, with simple adjustment for lining wear.

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

Crown and pinion spiral bevel reduction of 3.5 : 1 to countershaft. Spur gear reduction from countershaft to rear axle shafts 5.308 : 1. Oil capacity, 9 imperial gallons (40.91 litres) approximately. Use a good grade of gear oil of S.A.E. 90 viscosity for both Summer and Winter. For hot climates with temperatures above 90°F. use a gear oil of S.A.E. 140 viscosity, for climates having Winter temperatures below 10°F. use a gear oil of S.A.E. 80 viscosity.

Rear axle shafts 2$\frac{1}{2}$ ins. diameter, 19 spline current production. (Previously 2 ins. diameter, 10 splines). Final reduction gear internal bore diameter to suit.

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

Rear.—Have spokes welded to the rim, which is punched to allow spade lugs to be fitted. Wheels adjustable to vary width of track on Row Crop from 48 ins. to 72 ins. (121.92 cm. to 182.88 cm.) minimum width with pneumatics 52 ins. (132.08 cm.). (Dual Rear Wheels available in service.)

Wheels—Front.—Land Utility and Industrial. Heavy cast-iron, similar to agricultural, mounting pneumatic tyres, 6.00–19 in. Tyre pressure 25 lbs. per sq. in. (1.758 kg. per sq. cm.)

Rear.—Land Utility. Steel wheel, with welded spokes, mounting pneumatic tyres, 11.00–36 in. Tyre pressures: Land work—min. 11 lbs. per sq. in. (0.773 kg. per sq. cm.); Road use—14 lbs. per sq. in. (0.984 kg. per sq. cm.)

Adjustable Drawbar.—A drawbar, adjustable for height and hinged to provide lateral movement if required, is mounted accessibly behind the rear axle housing at the centre.

Rear Towing Attachment.—Industrial Tractor. Automatic coupling mounted o. laminated transverse leaf spring, carried on channel iron frame.

Belt Pulley Drive, having either a fixed drive or a control lever, permitting the drive to the pulley to be disconnected at will, may be fitted. Diameter of pulley 9½ in. (24.13 cm.) fabric type, or 9¾ in. (24.76 cm.) cast-iron type, operating at engine speed, giving belt speed of 2,976 ft. (604.7 m.) per minute for each type.

Power Take-off Shaft above draw-bar at rear centre of axle operates at 574 r.p.m. for 1,200 r.p.m. of engine, clockwise rotation, 6 splines, 1⅜ in. (34.92 mm.) dia. (optional equipment: not available for Industrial Tractor).

Hydraulic Power Lift.—Power take-off from top of gearbox, driving self-contained pump unit and lift, hand lever control (extra equipment. Not fitted to Industrial Tractors).

Electrical System (Extra equipment: standard on Industrial Tractor).—12 volt, two-brush generator, belt-driven from crankshaft pulley, with automatic current control by regulator unit. Battery mounted on dash panel above gearbox, starter fitted on left-hand side of engine with solenoid switch controlled from dash or starter, lamps and horn.

Weight.—Agricultural Tractor, with spade lugs, 4340 lbs. (1968 kg.) approx.

Land Utility Tractor, 4214 lbs. (1911 kg.) approx.

†Row Crop Tractor, with spade lugs, 4368 lbs. (1981 kg.) approx.

Above weights are less driver, but with water and oil.

Weight.—Industrial Tractor, less driver, water, oil and fuel, but including tools, wheel weights and ballast, 2 tons, 13 cwts. 3 qrs. (2730 kg.) approx.

Weight for Taxation.—Over 2 tons. (2032 kg.)

Dimensions.—Wheelbase, 77 ins. (195.58 cm.); diameter of front wheel, 30 ins. (762 cm.); width of rear rims, 9 ins. (22.86 cm.) (Row Crop 4½ ins.) (11.43 cm.); width of extension rim 4½ ins. (11.43 cm.); diameter of rear rim 45 ins. (114.3 cm.) (spade lugs additional). Overall length of tractor 133 ins. (337.8 cm.), overall width 65 ins. (165.1 cm.), 77½ ins. (196.85 cm.) with extension rims less spade lugs, overall height, 82 ins. (208.28 cm.). Ground clearance at front axle, 17½ ins. (44.45 cm.), pneumatics, 16⅜ ins. (41.59 cm.), steel wheels. Ground clearance at engine, 19 ins. (48.26 cm.) steel wheels, or 22 11/16 ins. (57.63 cm.) on pneumatics. Height of drawbar from ground, steel wheels 11½ ins. (29.21 cm.) minimum. 14⅞ ins. (37.78 cm.) maximum; pneumatic tyres, 16¼ ins. (41.28 cm.) minimum, 19 9/16 ins. (49.8 cm.) maximum. Turning circle 26 ft. (7.92 m.) 21 ft. (6.4 m.)—with brakes in operation.

† With Pneumatics 4062 lbs. (1842 kg.).

Dimensions—Industrial Tractor.—Overall length, 10 ft. 8½ ins. (326.4 cm.); overall width, 5 ft. 6 ins. (167.6 cm.); overall height, 7 ft. 4 ins. (223.5 cm.). Ground clearance at silencer, 12 ins. (30.4 cm.) approx. Height at coupling, 18½ ins. (47 cm.) approx. Turning circle, 26 ft. (7.92 m.)

Toolbox.—On the left-hand side of engine on all petrol and vapourizing oil tractors, and on the left-hand mudguard of Diesel engine tractors.

Location of Engine Number.—*CURRENT PRODUCTION:* On the rear flange of the engine block adjacent to the position of the gear ratio. *PREVIOUS PRODUCTION:* Front end of cylinder block on right-hand side 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 1,200 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. A throttle control is fitted beneath the steering wheel on Industrial Tractors and acts directly on the carburettor, without any governor device. 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 correct oil level is maintained in the air cleaner of the oil bath type. If it is not kept cleaned and filled to the oil level mark with engine oil, dirt and grit will be drawn into the cylinders, resulting in premature wear of pistons, rings and cylinders and loss of power. Never operate this type of air cleaner with the oil container empty.

The dry, gauze type air filter should be cleaned approximately every three months, see page 71.

5. The Drawbar or coupling is provided for your convenience in hitching. Always hitch to this and 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 first 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.

The clutch pedal should always be depressed when using the starter motor. Not only does this reduce the oil drag from the gearbox, but it also isolates any of the various drives such as the pulley drive, power take-off shaft or hydraulic lift drive should these not have been returned to the neutral position.

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 disc 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 the speed of the engine when changing gear.

8. Do not run the tractor downhill with the gears in neutral or with the clutch released. Engage either first or second gear and use the governor or throttle lever to control the speed of the engine. To bring the tractor to a complete stop, declutch and apply the hand brake. It is good practice to lift the pawl from the ratchet when pulling " on " the handbrake as this saves wear on these parts. When the footbrake pedals are fitted the tractor wheels may be locked by first engaging the latch which locks both pedals together and then pressing down the pedals to apply the brakes. When firmly applied, engage the pawl which will then enter one of the serrations of the sector (see also page 15 and Fig. 4).

9. Remember that a new tractor 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 the radiator if there is any likelihood of frost. The radiator drain tap is beneath the radiator, to the left-hand side. See Fig. 5. When the tap is opened to drain the radiator, it is good practice to carefully probe the passage when the flow of water ceases as sediment, or some foreign matter, may cause a blockage, thus it may appear that the system is empty when in fact water may be trapped. 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. 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 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 vaporising oil be admitted until the engine is hot enough to vaporise the fuel completely. If the current type adjustable exhaust shutter vaporiser is fitted ensure that the lever is set at the correct position.

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.

The calormeter fitted to the radiator indicates the temperature of the cooling water by means of an indicator needle. For efficient operation, keep the blind so adjusted that the needle of the circular-type calormeter is within the white-coloured sector, and with the pillar-type calormeter the red and white sections must be centrally positioned in the aperture.

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.

14. When electrical equipment is fitted there is the possibility that the battery may freeze in extremely severe conditions of frost,

particularly if it is not fully charged or the electrolyte specific gravity is not correct. Suitable precautions must be taken to obviate damage by such freezing which can result in a cracked container and if the Tractor has to be out of use under conditions of severe frost for some time, the battery should be removed for proper storage.

15. **Do restrict the speed of the tractor when implements are in the fully raised position,** with hydraulic equipment. Severe shock loading can be imposed on the hydraulic pump and lift mechanism, possibly causing damage, if implements, when raised, are subjected to bumps caused by driving too fast over uneven surfaces.

IN CASE OF DIFFICULTY CONSULT YOUR AUTHORISED DEALER.

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 above 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 Throttle Lever on Industrial Tractors is on the right-hand side underneath the steering wheel. To open the throttle, move the lever downwards, i.e., towards the driver.

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.

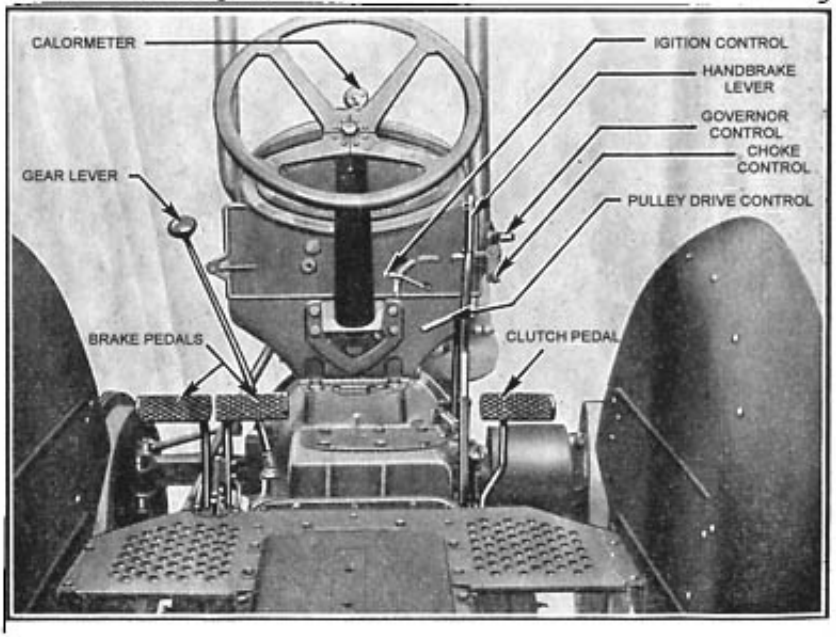


Figure 2
View of Controls

The Vaporiser Needle Control (on tractors equipped with early type vaporisers) 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 best setting is approximately two and one quarter turns open.

Adjustable Exhaust Shutter Type Vaporiser.—On current tractors, an improved vaporiser is fitted which incorporates an adjustable exhaust shutter, thus varying the temperature of the induction manifold heating chamber to suit the operating conditions.

The Carburettor Main Jet Adjusting Needle controls the amount of petrol issuing from the jet. To enrich the mixture, turn the needle anti-clockwise. The setting is approximately two turns open, with the engine warm. (Idling adjustment approximately 1½ turns from the fully closed position.)

The Fuel Supply Control, located beneath the fuel tank, has a tap which is turned anti-clockwise to release fuel. Tractors having vaporisers have an additional fuel valve tap to control fuel from the auxiliary petrol tank when this type of fuel tank is fitted. **Operators must never have both valves open together,**

otherwise vaporising oil and petrol will mix, with consequent difficulty in starting from cold.

A fuel filter is fitted at the top of the sediment bulb to prevent dirt or foreign matter entering the fuel system when the vaporising oil is being used.

On earlier tractors the fuel supply control valve position was similar, but a two-way valve was used for tractors operating on vaporising oil without an independent control valve for the auxiliary petrol tank. Turning the handle clockwise changes over the fuel supply from petrol to vaporising oil. When the handle is vertical the fuel supply is cut off (see also page 55 and Figs. 27 and 28).

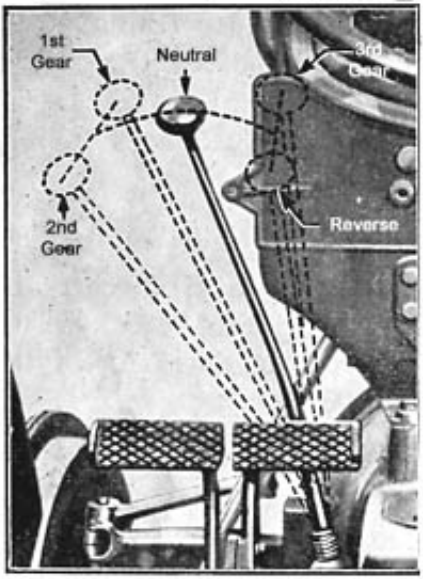


Figure 3
Gear Lever Positions

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. 3):—

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

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

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

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

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

Always press down the clutch pedal 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 Handbrake Lever to the right-hand side of the tractor applies the transmission brake when pulled back, so locking both rear wheels. A safety catch is connected to the balance lever of the clutch pedal so that the handbrake cannot be applied unless the clutch pedal has first been depressed. See Fig. 41.

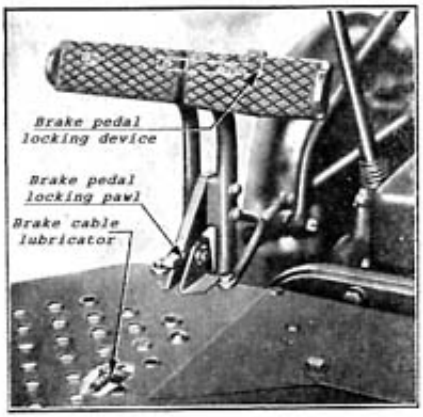


Figure 4
Footbrake Pedals

The Clutch Pedal is situated on the right-hand side of the tractor behind the hand-brake lever mounting. 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.

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.

Footbrake Pedals (extra equipment only and for Row Crop Tractors) when fitted, are to the operator's left. They may be used independently to assist in making a short turn, or by engaging the latch behind they may be locked together, when both brakes will be applied at once. To hold the brakes on, depress the pedals and then lock the pawl by pressing it down to engage the sector. To release, press down the pedals firmly, when the pawl will drop out of engagement due to its weighted end. The pawl will only engage the sector when manually operated.

On Industrial Tractors, there is only one footbrake pedal and this has no pawl or sector.

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.

Starter Switch, with electric equipment only, operates the starter motor and so starts the engine. Release the switch directly the engine starts. On earlier tractors an additional control is fitted at the commutator end of the starter motor. To operate, press the rubber-covered knob.

A Speedometer is fitted to Industrial Tractors and indicates speed and also distance travelled.

Lighting Switch, with electrical equipment only, controls the various lamps and is at the left of the dash panel. There are four positions for the switch handle :—

1. " Off "—straight down.
2. To the right for side lights and rear light.
3. To the left for headlights " dipped," side lights and rear light.
4. As for 3 except headlights are normal beam.

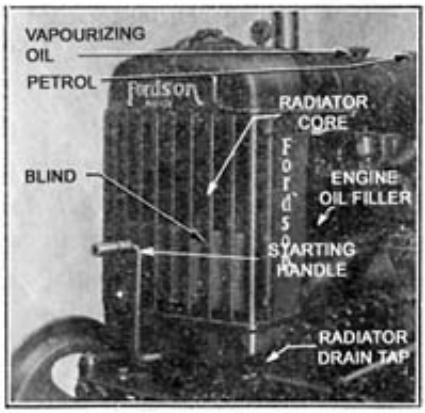


Figure 5
Radiator Blind

Radiator Blind, fitted in front of the radiator core, assists in keeping the cooling water at the most efficient temperature. Adjust by pressing the ends of the upper supporting bar inwards so allowing it to be moved up or down between the radiator side members as required.

Windscreen Wiper Control, on Industrial Tractors, is pulled out to set the vacuum type wiper motor in operation. It will only work when the engine is running.

Power Take-off Control Lever, when fitted, engages the drive at the take-off shaft at the rear of the tractor. Moving the lever forwards engages the drive. Declutch before meshing the gears.

Pulley Drive Clutch Lever, to the operator's right side, engages the dog clutch so that the pulley may be operated by the engine. Depress the clutch pedal, turn the handle clockwise to mesh the dogs and slowly release the clutch pedal. The pulley drive can be supplied without this clutch lever. (Extra equipment only.)

Hydraulic Power Lift Drive Control, when fitted, enables the drive to the pump unit to be engaged by moving the P.T.O. lever forwards. Disengage the clutch when meshing the P.T.O. gears.

Two types of pump unit may be fitted, having a single or double lever control. For instructions, see page 92.

Rear Towing Attachment on Industrial Tractors consists of an automatic coupling mounted on a transverse leaf spring. To free the

towed vehicle, pull back the catch and on driving forward the jaw will turn, releasing the tow bar. To couple up, enter the tow bar in the open jaw and back the tractor slightly, when the jaw will move forward, securing the tow bar and the catch will lock it in place.

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, special care should be taken to see that the engine, transmission and oil bath type air cleaner have the proper quantity of oil of the correct grades and that the radiator is full of water. These points should be checked several times daily.

Drain the cooling system and flush it out with plenty of clean water after the first day's work as the water may appear dirty and this procedure will avoid fouling the radiator core and cooling system.

Half a pint ($\frac{1}{16}$ litre) of engine oil should be mixed with each gallon (litre) of **petrol** put into the fuel 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 26), the rear wheel nuts tightened, the cylinder head screws tightened and all nuts, bolts, screws, etc., checked and tightened if necessary.

Where the belt pulley is fitted, the hexagon nut securing the pulley to the shaft should be tightened after it has been used for a short period, this will prevent any tendency for it to work loose subsequently.

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. Do not remove the pressure cap, if fitted, until the engine has cooled down.
2. See that the engine is filled to the F mark on the dipstick. If it is necessary to add oil use a good grade of S.A.E. 30 viscosity in Winter and S.A.E. 40 viscosity in Summer. See page 3 for oil to be used in climates having extremely hot or cold temperatures.

EACH NIGHT

1. See that the gear box is filled to the " FULL " mark of the filler with oil of the correct grade and quality and the rear axle oil level is between the marks on the dipstick, see Figs. 9 and 10.
2. See that the square type air cleaner on earlier tractors has clean engine oil to the level of the filler plug. See Fig. 12, also page 71.
3. See that the fuel tanks, situated immediately above the engine, have ample fuel. Always use a fine mesh filter.

TO START THE ENGINE

Tractors equipped with Vaporiser

When the tractor is fitted with a starter motor, the clutch pedal must be depressed, when starting from cold, to reduce the drag caused by the stiff oil. The engine should also be turned over by hand a few times to reduce the severe loading that would otherwise be imposed on the starter motor and battery. The ignition may be left " on " when using the starter motor.

1. When starting from cold, pull up the radiator blind fully.
2. **See that the gear lever is in neutral,** i.e., the position in which it can be freely moved from side to side. Power take-off drive, pulley or hydraulic lift drive, when fitted, should be in neutral position.

3. Move the ignition lever on the dash to the upper end of the quadrant (past the notch on the dash) to switch off the ignition. See note on Ignition Control Lever, page 12.

4. Pull out the governor control lever to the fifth notch.

5. Choke the engine by pulling the choke control, on the right-hand side of the dash, to the rear.

6. With the fuel supply " off," drain the float chamber if vaporising oil is present, otherwise turn on the tap marked " GAS " on earlier tractors with the two-way tap, move the upper end of the lever finger to " G."

7. Set the adjustable exhaust shutter at the desired indentation. (See page 56.)

8. Prime the engine by pulling up the starting handle four times. Have the clutch pedal depressed to eliminate the drag from the oil in the gearbox.

9. Push choke control in half-way.

10. Switch " on " the ignition.

11. 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.

    If the starter motor is fitted, press the switch, releasing it directly the engine starts. On earlier tractors an alternative switch is fitted on the motor itself, a rubber-covered knob at the commutator end.

12. When the engine starts, move the governor control back to the slow running position. Release the choke control fully. **Gently release the clutch pedal immediately the engine starts should it have been held out of engagement.** If the engine will not start readily, ensure the manifold drain valves, see Fig. 32 and page 64, are not allowing air to enter, due to incorrect operation. Test by sealing both valves with the fingers and then having the engine cranked. Should this prove air is leaking, have the valves removed for attention.

13. When the vaporiser is thoroughly warmed up close the petrol tap of the auxiliary petrol tank and then open the tap marked V.O. **Both taps must never be open together.** On earlier tractors, change over the fuel supply by turning the tap so that the upper end of the lever points to "K."

14. 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. When the calormeter, or water temperature indicator, is fitted the indicator needle should be within the white coloured sector.

Tractors equipped for Petrol only

When starting from cold and the tractor has a starter motor fitted, hold down the clutch pedal to minimise the drag caused by the oil in the gearbox. Leave the ignition " on " when using the starter motor with the choke closed, otherwise the engine may be choked with an over-rich mixture.

1. **If the engine is cold,** pull the choke rod on the dash to the rear. Turn on the petrol. Pull up the blind fully.

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 12. If the engine is cranked more than this with the choke closed, an excess of petrol will be drawn into the inlet 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 with the choke released. See note 12 on page 19 *re* Manifold Drain Valves.

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, or where the hand throttle lever is fitted beneath the steering wheel move this downwards slightly to open the throttle.

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. When the starter motor is fitted, press the starter switch on the dash panel, releasing it directly the engine starts. There is also a hand-controlled switch on the starter motor itself, at the commutator end.

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

To ensure the operator's position relative to the controls is most convenient, the seat may be adjusted to bring it nearer to or away from them by slackening off the two seat securing bolts, so allowing it to be moved along the slots provided in the seat spring. Tighten these bolts securely after adjustment.

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. Release the handbrake and if the Row-Crop type footbrake pedals (when fitted) are also applied, these must be released by freeing the pawl.

4. Pull the governor control rod out slightly (or move the throttle lever towards the rear on Industrial Tractors) 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 top gear. The speed of the engine is controlled by means of the governor control rod (see page 12) or throttle lever and should be kept nearly constant at all working speeds of the tractor.

The engine is designed to run at 1,200 revolutions per minute and this speed should not be exceeded for any length of time.

TO STOP THE TRACTOR

1. Return the governor control rod or throttle lever to the closed position, thus slowing up the engine.

2. Release the clutch by pushing the clutch pedal downwards.

3. Apply the handbrake lever by raising the pawl and pulling the lever rearwards : release the pawl. Note that this brake cannot be applied unless the clutch pedal is depressed.

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 vaporising oil, turn the fuel off at the fuel control and allow the engine to run slowly until it almost stops for want of fuel. Change 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 vaporise fuel after the engine is stopped, thus flooding the passage with too rich a mixture ; also it drains all vaporising oil from the vaporiser, making it ready for the petrol to be used to start the engine.

When running on petrol, turn off the petrol supply, 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 12.

Lubrication and Maintenance

The importance of correct lubrication, and periodic inspection and adjustment cannot be over-emphasised. 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 58 and 59 gives full information as to the points requiring attention, and the location of grease gun lubricator fittings.

FOLLOW THE CHART CAREFULLY.

1. TWICE DAILY

Engine.—Check level and replenish if necessary to the mark "F" on the dipstick with oil of S.A.E. 30 viscosity in Winter and S.A.E. 40 viscosity in Summer. For climates having a temperature above 90°F. use an oil of S.A.E. 50 viscosity, for climates with a severe Winter temperature below 20°F. use an oil of S.A.E. 20 or 20W viscosity.

Engines operating exclusively on petrol can use an engine oil one grade lighter in each case.

Figure 6
Water Pump Lubricator

Radiator.—Fill with fresh, clean water if the level is low. (See page 40.)

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

2. EVERY NIGHT

Gearbox.—Check and refill if necessary to the "Full" mark at the filler hole with oil of the correct grade (see page 27).

Rear Axle.—Check and refill if necessary to the high mark on the dipstick at the left-hand rear side with oil of the correct grade (see page 28 and Fig. 10).

Spindles, Spindle Arms, Steering Joints and Sector Shaft.—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, Square Type.—Check oil level and add clean engine oil if necessary. For detailed instructions, see page 71. For circular type, see under " Every 50 hours."

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

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

Belt Pulley Drive (when fitted).—When the belt pulley drive is in continuous use, lubricate this with the grease gun through the lubricator provided, **once daily.**

3. EVERY 50 HOURS OF RUNNING

Engine.—When operating wholly on petrol as in the case of the Industrial Tractor, drain the engine oil after each 100 hours of use. If the engine is operated on vaporising oil, drain off engine oil, remove crankcase cover, clean cover and screen in petrol, reassemble, and refill with an approved grade of oil of S.A.E. 30 viscosity for winter and S.A.E. 40 viscosity for summer. For oils to be used under extremes of climate, see page 3. (The oil will drain off more easily, and completely, when the engine is warm.) DO NOT FLUSH THE ENGINE OUT WITH PARAFFIN. Wash the oil filler cap in petrol, to remove any dirt which may have accumulated in the air filter portion, and pour a little engine oil into the felt.

Fan
***Front Wheel Bearings**
Clutch Balance Lever
Clutch Pedal
Rear Wheel Bearings
Steering Gear Bearing
Brake Pedal (when fitted)
Brake Cables (when fitted)
Lift Shaft (when fitted)
Brake Bell Crank Levers (Industrial Tractor only)

} Grease with grease gun.

* Also check wheel bearing adjustment and re-adjust if necessary. See page 70.

Magneto.—Lubricate with two or three drops of light oil. (No more than two or three drops of oil should be applied, as excessive oil may leak into the body of the magneto and interfere with its satisfactory operation.)

Raise the spring-loaded cover at the top of the magneto adjacent to the distributor and add the oil to the centre of the two holes which appear. The one towards the side is an air vent and oil must not be added at this point.

For magnetos having the stationary type contact breaker, the lubricator position differs somewhat, being nearer the distributor cap. To add oil move the trigger sideways, when the oil hole is disclosed and two or three drops of light oil may then be added. This magneto is illustrated in Fig. 22.

Air Cleaner, Cylindrical Type.—On later tractors having the cylindrical type air cleaner, release the three clips, remove the cleaner base and clean both inner and outer caps. Add clean engine oil to the level mark, see Fig. 11. If used in very dusty conditions, clean at more frequent intervals. Periodically attend to the Primary Air Cleaner, see page 29.

Battery.—When the battery is fitted, top up with distilled water as instructed in the electrical system. (See page 108.)

4. EVERY 200 HOURS OF RUNNING

Radiator.—Drain, and flush out with clean water, until water runs out clear. (See page 44.)

Steering Box.—Examine the oil level and, if necessary, add sufficient gear oil of similar grade to that used in the gearbox, to bring the level to the bottom of the filler plug orifice.

Air Cleaner, Square Type.—Drain, clean out sediment, refill with engine oil to the correct level. See page 29 and Fig. 12. Very dusty conditions may necessitate more frequent cleaning.

5. EVERY 3 MONTHS

Air Cleaner on Industrial Tractor.—Clean the gauze type air cleaner at this period or more often if operated under very dusty conditions, see also page 71.

6. EVERY 6 MONTHS

Gearbox.—Drain the gearbox, flush out with engine oil, and refill with an approved gear oil of S.A.E. 90 viscosity. (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. See page 27.

For oils to be used in extremes of climate, see page 5.

Generator.—When the generator is fitted, add a good grade of petroleum jelly, if required, to the wick in the lubricator at the rear bearing, every six months. The front bearing is packed and requires attention only at overhaul periods.

7. EVERY 12 MONTHS

Drain the rear axle lubricant every 12 months, the drain plug is at the bottom of the housing at the centre. Refill with clean, fresh gear oil of an approved grade of S.A.E. 90 viscosity. For oils to be used in extremes of climate, see page 7. See also page 28.

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 out the dipstick, wipe it with a clean rag, re-insert fully and again remove it, when the mark made by the oil indicates its level. See Fig. 7.

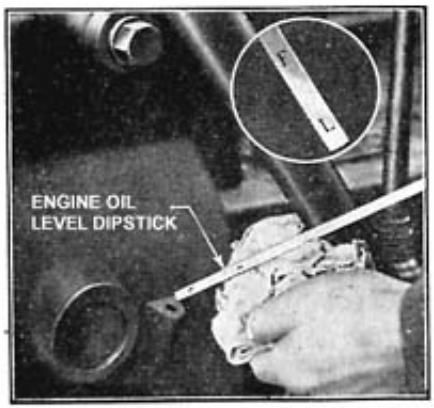


Figure 7
Engine Oil Level Dipstick

The oil filler is located on the left-hand side, to the front of the engine, see Fig. 5. The capacity of the engine oiling system is approx. 2 gallons 5 pints (11.9 litres).

A new tractor must have the engine oil changed at the end of 25 working hours and thereafter every 50 working hours, approximately, except when operating solely on petrol, as in the case of the Industrial Tractor, when it should be changed every 100 hours. To do this, remove the large plug underneath the crankcase in the centre. When the oil has drained off, it is absolutely

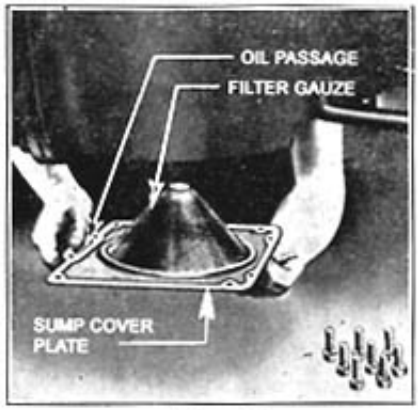


Figure 8
Engine Oil Filter

essential to remove the crankcase cover, see Fig. 8, 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.

It will be found that the quantity of oil required for a "dry" engine will be 2 gallons 5 pints (11.9 litres). Normally when draining and refilling the engine with lubricant the quantity will be approx. 2¼ gallons (10.23 litres).

Your local authorised dealer will be pleased to advise you as to the various grades and brands of oil which have been approved for use in the engine. On page 3 are given details as to the suitable viscosity figures for engine oil for use under various climatic conditions.

THE GEARBOX.—The only attention needed is to see that it is kept filled with oil to the "Full" mark on the filler. Use gear oil of S.A.E. 90 viscosity for summer and winter. If used in extremes of climate, see page 5.

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 around, the cap so that none gets into the gearbox housing, see Fig. 9. Pour in the oil until it reaches the "FULL" mark on the filler, allowing plenty of time for it to reach all parts. 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 six months operation. To do this, remove the drain plug underneath the housing, preferably 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 gear oil. The capacity is 2¾ imperial gallons (12.5 litres).

Figure 9
Gear Box Oil Filler

Should the oil be left un-

changed too long, or if too light an oil be used, the transmission housing may overheat when the tractor is operated. This condition must be remedied immediately or excessive wear could be caused.

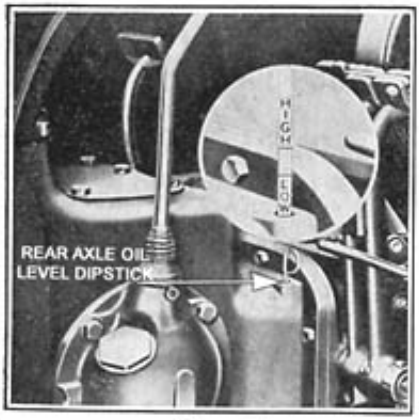


Figure 10
Rear Axle Oil Level Dipstick

THE REAR AXLE

The oil in the rear axle should give adequate service for one year, provided the oil level is kept at the " High " mark on the dipstick ; the dipstick is in the left-hand side of the housing at the top, as shown in Fig. 10. Use a good grade of gear oil of S.A.E. 90 viscosity in summer and winter. For extremes of climate use the grades given on page 7. Oil capacity 9 imperial gallons (40.91 litres).

Drain the rear axle every year and refill with clean oil to the " High " mark on the dipstick. On later Tractors the filler plug has a small air release hole drilled in it. Ensure that this is not fitted in the drain plug location when the axle is drained. When the tractor has pneumatic tyres fitted, the dipstick must bear the part No. E27N-4334-B and this measures approximately 9 $\frac{13}{16}$ in. (25.25 cm.) from the " High " mark to the bottom of the handle loop.

AIR CLEANER, CYLINDRICAL TYPE

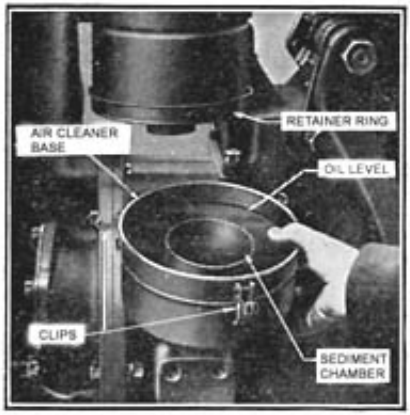


Figure 11
Cylindrical Type Air Cleaner

Every 50 hours, or more often, if necessary in very dusty conditions, release the three clips and lower the base of the air cleaner, when the dirty oil can be discarded and the sediment washed out of the inner and outer cups.

Refill with clean engine oil to the level mark at the side of the base and secure with the three clips. Capacity 2$\frac{1}{4}$ pints (1$\frac{1}{4}$ litres).

The primary air cleaner is similar to that used with the square type air cleaner and should be cleaned periodically as described on page 29.

AIR CLEANER, SQUARE TYPE (on earlier Tractors)

Use engine oil for the air cleaner and check the level nightly.

Fill to the level mark.

Every 200 hours drain off the oil and clean out any sediment: this is best done when the tractor is warm. Make sure that there is no leak from the dirt trap cover when the cleaner is refilled. Capacity 5 imperial pints (2.84 litres).

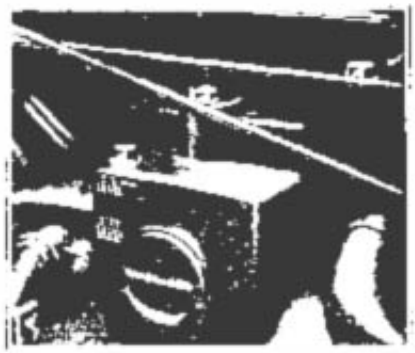


Figure 12
Square Type Air Cleaner

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 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.

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 (140 kg. per sq. cm.), thus ensuring a more thorough and positive lubrication than can be accomplished any other way.

To fill the grease gun, unscrew the cap and then draw the nozzle end outwards as far as possible, which will cause the piston to move to the bottom of the barrel. Using a good grade of grease gun lubricant, pack the gun solidly with grease, avoiding air pockets. Replace the cap securely: do not lose the leather washer which seals the joint at this point, see Fig. 13.

On earlier tractors a slightly different grease gun was used, and to fill this unscrew the bottom cap and nozzle, disclosing the piston in the barrel. Push the piston fully along the barrel, towards the handle end. Fill the barrel as described above, then replace the bottom cap and nozzle.

OPERATING THE GREASE GUN

When the grease gun is pressed against the conical-shaped lubricator fittings, the nozzle moves inwards, forcing the lubricant in the nozzle directly through the fitting into the bearing under an extremely high pressure.

On releasing the hand pressure the internal spring returns the nozzle to its fully extended position, charging it with lubricant ready for the next forward thrust.

The operation of the earlier type grease gun is similar except that the nozzle does not move as it is rigidly secured to the bottom cap. Grease is injected in the usual way and hand pressure applied to the grease gun causes the plunger to move forward, forcing lubricant through the nozzle.

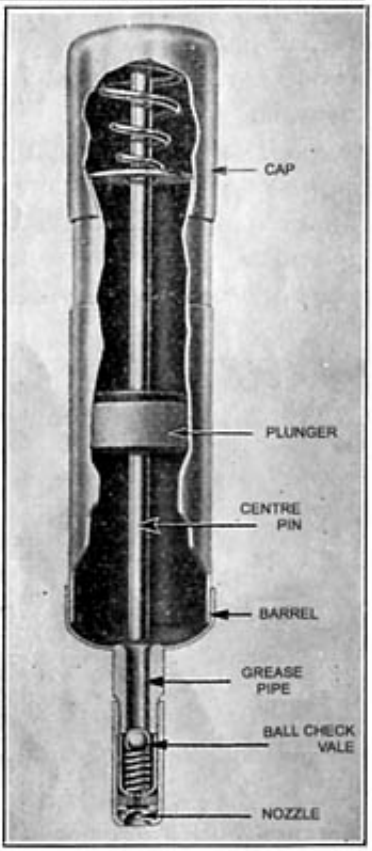


Figure 13
Grease Gun

LOCATION OF FITTINGS

A list of points at which lubricator fittings are located is given on page 24.

The lubrication and maintenance chart on pages 58 and 59 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 (45½ litres). Flush every 200 working hours (see page 44). **If overheated, or a pressure cap is fitted, allow to cool down before adding water** (see page 40).

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

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, or 100 working hours when working solely on petrol (see pages 24 and 26).

Oil is thrown by the flywheel into the mouth of a pipe running downwards to the front of the engine. Previously, the end of the pipe was in the form of a scoop. 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 rear crankshaft bearing is lubricated by oil from the flywheel which reaches the bearing surfaces via holes drilled in the upper half of the bearing, so assuring ample lubrication.

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.

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 27.

DECARBONISING AND VALVE GRINDING

The need for decarbonising arises when an excessive amount of carbon deposit has formed on the inside of the cylinder head, on the top of the pistons and on the heads of the valves.

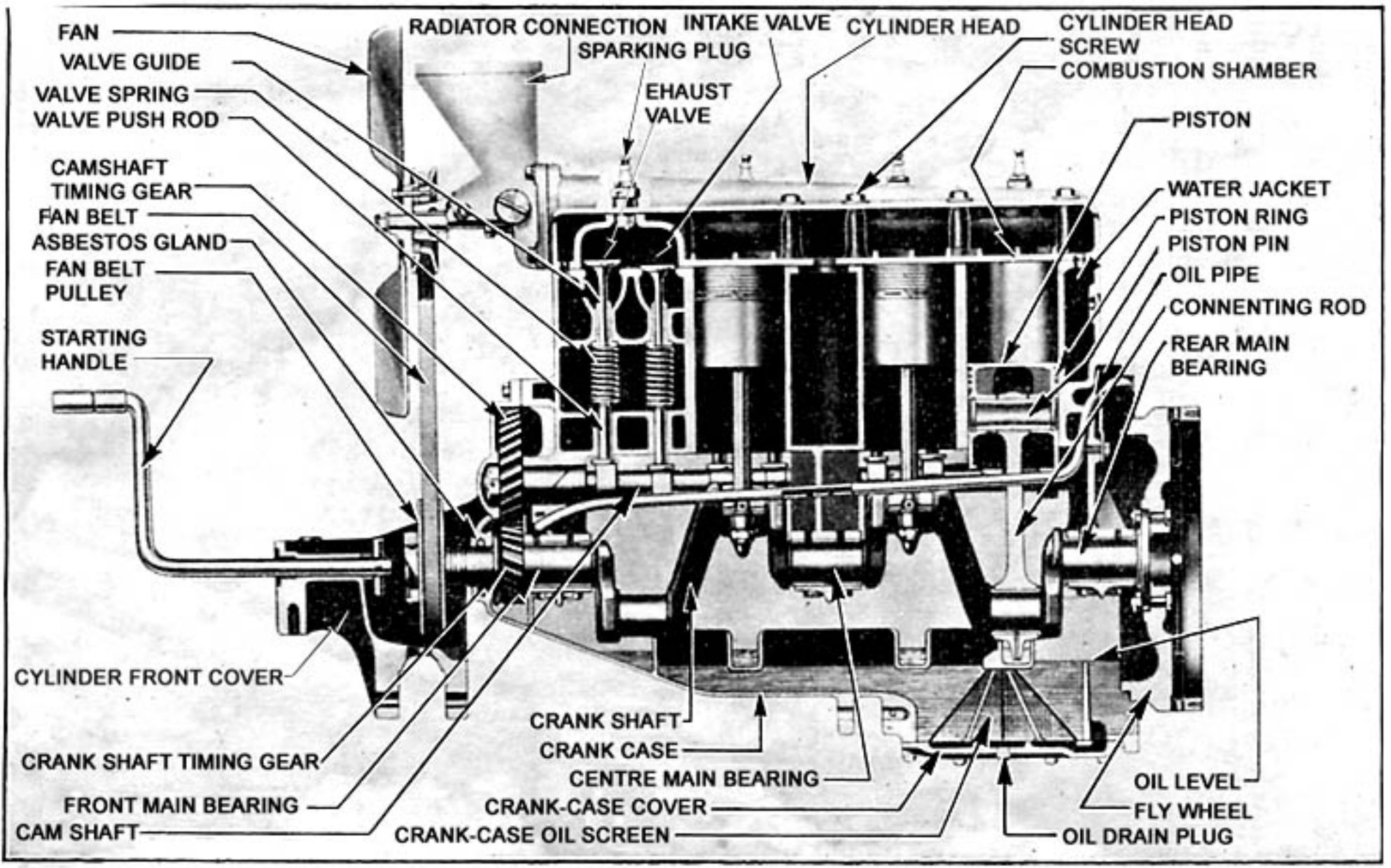


Figure 14
Sectional View of Engine

One cannot stipulate any particular period after which decarbonisation should be carried out since the use of different fuels, lubricating oils and varying operating conditions have a considerable influence on the rate of carbon formation.

The usual indications that decarbonising is advisable are a falling off in performance, possibly accompanied by a tendency for the engine to overheat, or a light tapping or knocking sound produced by the engine when pulling hard. Incidentally, a very similar sound may be caused by having the ignition setting too far advanced.

Because we consider that experience is the best guide in making a decision about when to decarbonise, we recommend that you permit an authorised Fordson dealer to help you in making that decision and also to carry out the work when the occasion arises.

The operation is quite simple and should be carried out in the orthodox manner, but if you are not familiar with the normal methods used and the customary precautions which must be observed it is quite possible that you will do more harm than good. For those who decide to do the work themselves, we have set out the following points for their guidance.

Before starting on the actual work, provide yourself with suitable equipment, cleaning material and the necessary replacement gaskets.

The materials required, other than the standard tool kit, are a valve spring compressor, a suitable tool for removing the carbon deposit, and suction cup valve grinding tool (obtainable from any authorised Fordson dealer), plenty of cleaning rags, a wire brush, a flat tin receptacle and paraffin for washing various components.

TO REMOVE THE CYLINDER HEAD

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

Remove the fuel tank.

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

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

When a generator is fitted, the two right-hand bolts of the water pump housing hold the generator front bracket, whilst the rear bracket is secured to the cylinder head.

When a battery is fitted, this should be disconnected.

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

Lift off cylinder head.

Remove the cylinder head gasket.

TO REMOVE MANIFOLD

Disconnect the following parts :—

Control rods.

Air pipe to carburettor or vaporiser at air cleaner.

Fuel pipe at vaporiser or carburettor.

Exhaust pipe.

Remove the two outer and the two inner manifold securing nuts.

Remove the manifold.

TO DECARBONISE THE ENGINE

It is essential that absolute cleanliness be observed throughout this operation ; carbon should not be allowed to find its way on to the working surfaces of the pistons or cylinder walls since scoring may result, leading to excessive oil consumption.

Place some grease around the tops of cylinders 1 and 4, then rotate the engine until these pistons are at top dead centre. It will be noticed that the grease fills the small gap between the piston and cylinder walls, thus preventing carbon working its way into the piston rings.

Cover the valve ports and fill the remaining bores with clean rag as a precaution against carbon chips.

By means of a bone or wood scraper, remove the carbon by scraping inwards from the edges of the piston towards the centre, taking care not to score the piston crown in the process. A thin film of grease will reduce any tendency of the carbon chips to fly as they are loosened. Remove all the carbon from the piston.

Proceed as above for the other piston at top dead centre and repeat the procedure for the other two pistons. Clean off the grease on completion of the operation.

Thoroughly clean the cylinder walls and oil them to provide initial lubrication during the first few strokes of the engine, until the oil has had time to circulate.

Clean the carbon from the cylinder head and the mating faces of the head and the block, making sure that no burrs are present which may cause trouble with blowing of gaskets.

Remove the carbon from the valve ports, both inlet and exhaust.

Should the valve seats and faces indicate that some leakage has taken place, or should small pits be noted, the valves should be ground in. Assuming the valves are not distorted or badly pitted, hand grinding will generally be found satisfactory, but in cases where it is considered that this will not meet the case other steps should be taken.

TO REMOVE A VALVE, GUIDE OR SPRING

Disconnect the control rods.

Remove the cylinder head (see page 34).

Disconnect the exhaust pipe at the exhaust manifold.

Remove the manifold, vaporiser and carburettor.

Remove the valve cover, held by one bolt at each end.

Rotate the engine so that the valve it is desired to remove is in the closed position and, using a suitable compressor, insert the forked end into the lower coils of the spring and compress the spring (see Fig. 15).

Remove the two halves of the valve-seat retainers from the groove in the valve stem and withdraw the valve upwards from the block. Remove the spring when the valve guide can be driven out of the cylinder block, if necessary.

VALVE GRINDING

It should be appreciated that valve grinding by hand is a finishing process and cannot take the place of valve and seat re-cutting. Excessive hand grinding in an attempt to seat a valve should not be attempted.

Special seat cutters and valve refacers are available and should be used where necessary; the angle of the valve seat is 45° and of the valve 44½°.

It is essential that when the valve is ground in, clearance should exist between the valve foot and the push rod. To ensure this, the push rod must be off the lobe of the cam, i.e., piston at top dead centre, compression stroke, when both valves should be closed.

Alternatively, the following table may be used to make certain that the push rod is not being lifted.

Data for Grinding Valves

Key :—N=Inlet. X=Exhaust.

Valves Open	Valves to Grind
1X and 3N	1N and 2X
1N and 2X	1X and 3N
2N and 4X	3X and 4N
3X and 4N	2N and 4X

The cylinders are numbered from front to rear, the first valve being an exhaust valve.

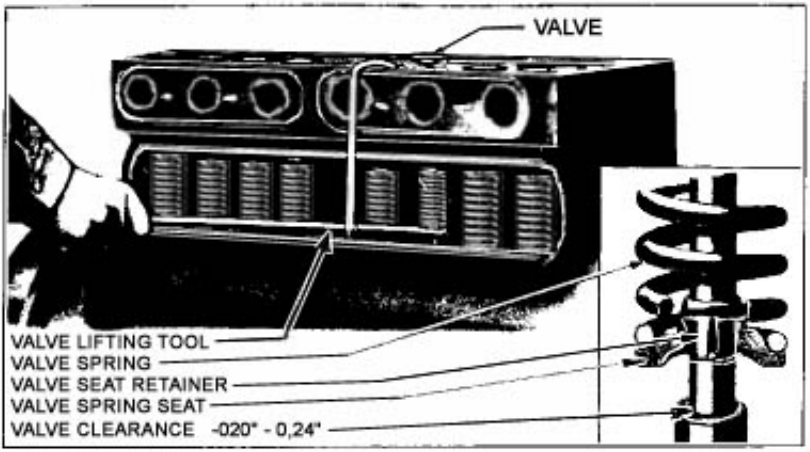


Figure 15
Lifting the Valve Spring

Set the engine so that the valves to be ground in are known and ensure that there is clearance between the valve and push rod.

Apply a small amount of the grinding compound to the seat ; the valve guide may be replaced to locate the valve in its correct position but use only the guide associated with the particular valve.

A rubber suction tool may be used for the hand grinding operation and this is easily rotated backwards and forwards between the palms of the hands, at the same time keeping the valve in contact with the seat. No pressure is required other than the weight of the valve and the tool, and periodically the valve should be lifted and repositioned a quarter or a third of a turn around.

Although coarse grinding paste may be used at the commencement of the operation, this should always be finished by using finer compound.

When correctly ground, the mating faces at the valve seat should present an even, clean, grey matt appearance without any sign of bright rings round the head or pitting.

The valve clearances must be set after grinding, since this operation will probably effect some variation. A clearance as indicated in the table, page 38, must be allowed with the push rod on the lowest part of the cam (see Fig. 15) and the valve cold.

If the clearance is in excess of the higher limit appertaining to that particular valve, it should be reduced to an amount within the limits by a continuation of the grinding operation.

If the clearance has been reduced below the lower limit, it may be brought within the limits by carefully grinding metal from the foot of the valve stem. Care should be taken that the resultant face is square with the axis of the valve or noisy operation and guide wear due to side thrust may result.

Do not estimate the clearance but measure this accurately with a set of feeler gauges; incorrect and unequal setting may affect engine efficiency.

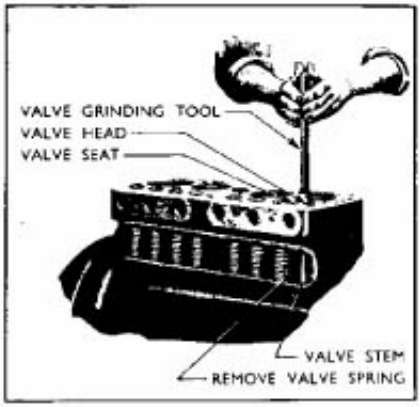


Figure 16
Grinding the Valves

When the valve has been ground in, carefully remove all traces of the grinding compound with a petrol soaked rag, removing the valve guide if necessary; **do not allow excess liquid to wash the paste into the engine.**

Inlet valve clearance	.020—.024 in.
Exhaust valve clearance	.020—.024 in.

REASSEMBLY

The good results which are to be expected from careful and accurate work can only be achieved by careful reassembly under scrupulously clean conditions. Some dirt lodging under a gasket or some grit adhering to the oil film on a cylinder wall can bring about trouble out of all proportion to the cause. Sufficient emphasis cannot be laid upon the necessity to observe the utmost care to prevent dirt, carbon or grit falling on to machined surfaces, gaskets, or oil which is being used for reassembly.

Proceed with the reassembling of the engine in the reverse order to that for dismantling, keeping each valve, guide and spring to its own port.

The spring seat retainers will remain in place better, and so facilitate their reinstallation, if a little grease is put on them. The flat end of the retainer must be downwards.

When refitting the valve chamber cover and manifolds, use new gaskets.

Before replacing the cylinder head and gasket pour a small quantity of clean oil into each cylinder bore to provide initial lubrication. A new

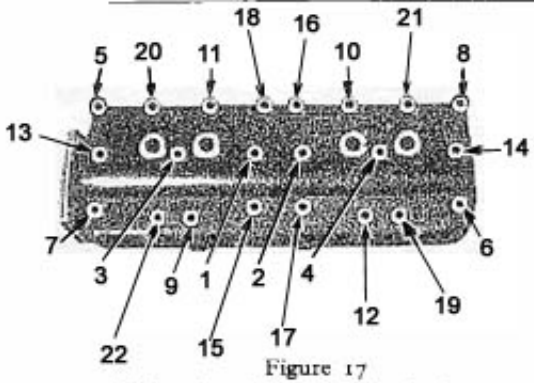


Figure 17

Tightening Cylinder Head Screws

cylinder head gasket should be fitted with the smooth surface downwards. Tighten the screws in the order shown in Fig. 17.

Clean and adjust the sparking plug points as described on page 51. Use a new gasket when replacing each sparking plug.

It is also advisable that the carburettor or vaporiser and magneto receive attention after either decarbonisation or valve grinding has been effected.

Retighten the cylinder head nuts after the engine has warmed up, and again after 6 hours running.

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. A radiator calormeter, or temperature indicator, is fitted to the radiator and enables the operator to see at a glance if the cooling water is at the correct temperature (see page 42).

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.

It is dangerous to remove the pressure cap, when fitted, until the water has been allowed to cool down.

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

It is advisable to see that the radiator is full before starting, and it should be topped up at least twice daily, or whenever the tractor is stopped for refilling with fuel or oil.

To remove the radiator cover, unscrew the nut on top two or three turns and push the cover off the filler (see Fig. 18).

RADIATOR PRESSURE CAP (where fitted)

It is dangerous to remove the radiator pressure cap until the water has been allowed to cool down.

The capacity of the cooling system is 10 gallons (45½ litres).

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.

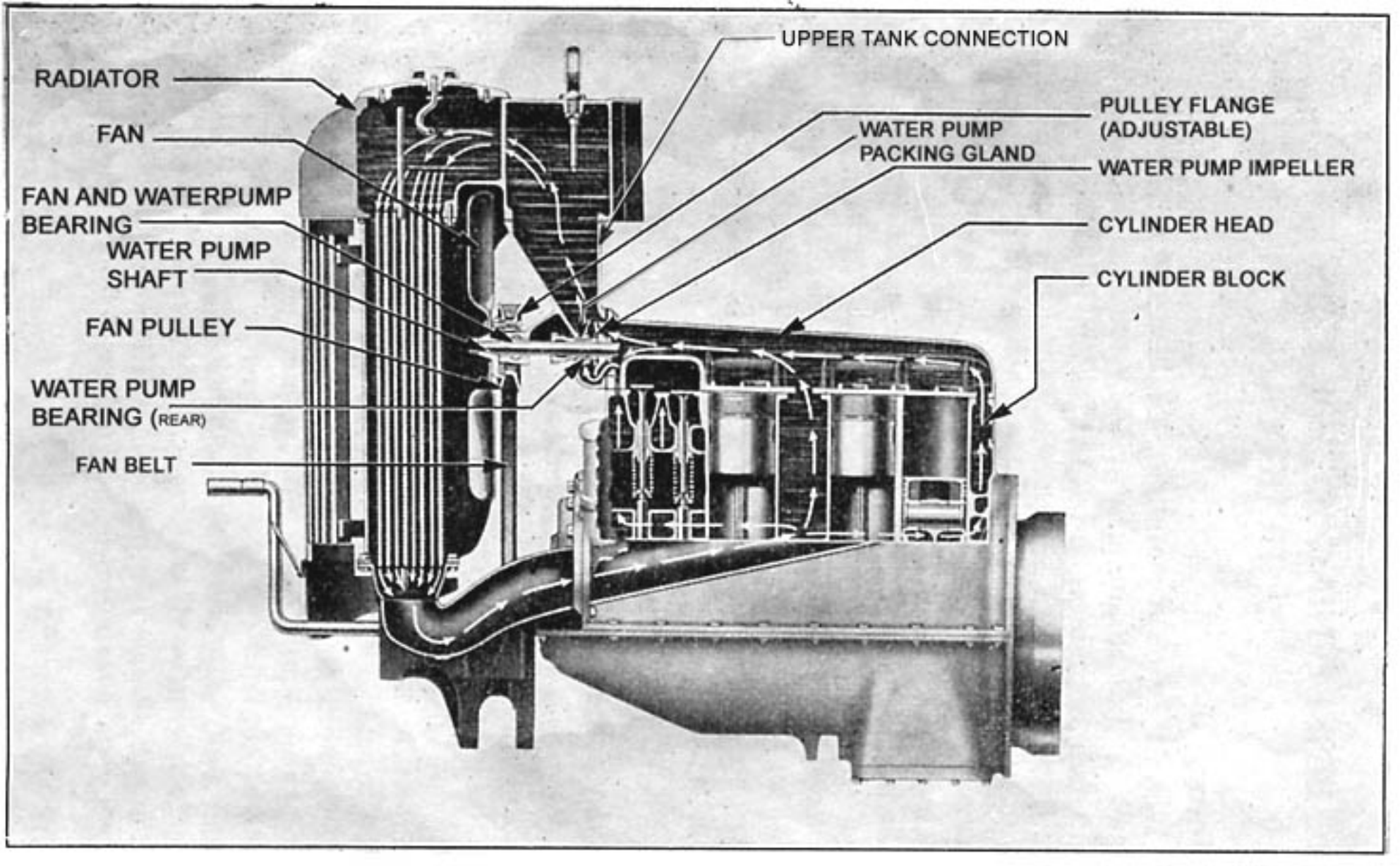


Fig.18.
The Cooling system

THE RADIATOR BLIND

To adjust the blind, press the ends of the upper support bar inwards so that it may be raised or lowered as required, covering a greater or lesser area of the radiator. Keep water temperature at 80°C. or 176°F. See Fig. 5.

Always raise the blind fully when the engine is first started to ensure rapid warming-up and put the tractor to work at once.

On tractors having the circular type calormeter, keep the needle in the white sector: if the needle moves off the white sector to the right-hand side, viewed from the driver's seat, the cooling system is too hot and boiling may occur. If the needle is to the left-hand side the cooling system temperature is too low and the radiator blind should be raised as necessary.

On tractors having the pillar type calormeter, keep the red and white segments centrally positioned in the aperture. If the cooling system overheats the indicator will rotate further, bringing into view diagonal red lines against a white background. Should the cooling system be too cold, the white segment only, with possibly a part of the red sector, will be visible in the aperture.

TO ADJUST THE FAN BELT

Any slackness that may develop in the fan belt after extended use may be readily adjusted, suitable provision having been made for this by means of spacers between the divided type fan pulley boss. The view of the fan pulley, Fig. 19, will make the adjustment an easy matter to carry out when the construction is understood.

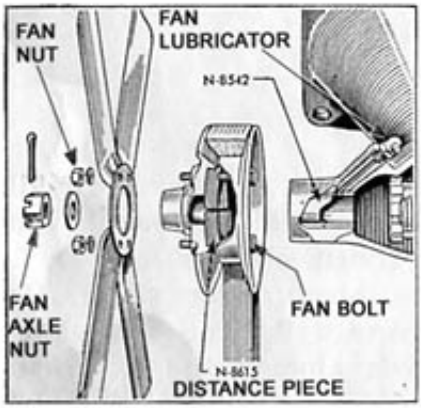


Figure 19
Fan Belt Adjustment

Remove the four nuts of the bolts holding together the two halves of the fan pulley. The two halves of the pulley may then be separated and the distance pieces removed or added to as necessary. In adjusting for a slack fan belt, remove some distance pieces, but if a new belt is to be fitted and which will appear shorter than that which it replaces, then distance pieces must be added. There must be 1 in. (25 mm.) of side movement on the free side of the belt when pushed and pulled, see Fig. 20.

Retain any distance pieces you may have to remove, as

these may be required when a new belt is fitted.

The number of split distance pieces must be the same on each pair of opposite bolts.

The belt must not be allowed to become so slack that it rides on the bottom of the V in the pulley; the drive is transmitted by the grip of the sides of the pulley and the belt will be ruined quickly if allowed to slip due to bottoming.

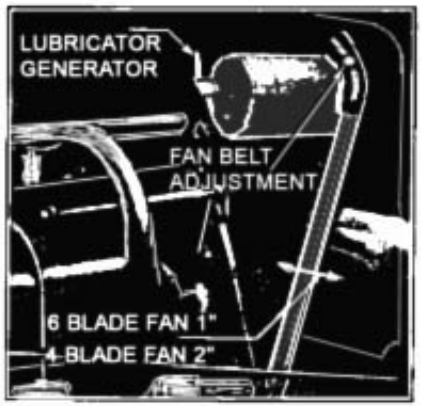


Figure 20
Fan Belt Adjustment with Generator Fitted

When the generator is fitted, this is mounted on the right-hand side of the engine and driven by the belt which passes over both fan and generator pulleys. To adjust the fan belt in such cases, loosen the generator mounting bolts and remove the adjusting bolt at the top of the generator.

Move the generator outwards, secure it temporarily with the adjusting bolt inserted in one of the adjustment arm holes and test the fan belt tension at the mid point between the pulleys, see Fig. 21.

If correct, with the 6-bladed fan, there will be approx. 1 in. (25 mm.) movement (2 in. (50 mm.) movement—4-bladed fan) at this point, when the three bolts should be finally tightened.

When a new belt is fitted this should be inspected after a few hours operation to ascertain if any initial slackness has developed. Should this be so, then re-adjust as described above.

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 the 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.

When obtainable, a good proprietary brand of anti-freezing solution may be used to obviate freezing in winter. A 60 per cent. concentrated solution of glycerine, if available, may be used advantageously.

A table showing the degree of protection afforded against freezing for various strengths of solution is given below :—

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

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.

Top up with an anti-freeze solution when the engine is hot : this will prevent loss of the solution via the overflow pipe as would occur when the radiator is filled and the engine is cold.

CLEANING AND DRAINING THE RADIATOR

It is recommended that the cooling system is drained and flushed out with plenty of clean water after the first day's work as it may be found that the water will appear dirty and this procedure will avoid fouling the radiator core and cooling system.

Every 200 working hours the entire water circulating system should be flushed out thoroughly. All that is necessary is to open the drain tap 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 tap 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 may freeze in cold weather.

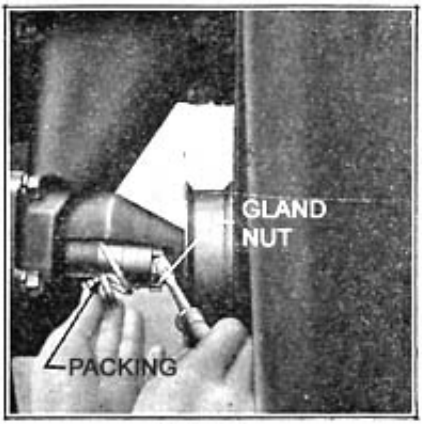


Figure 21
Packing the Water Pump Gland

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 screw-driver. 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 repacked.

TO REPLACE THE WATER PUMP PACKING GLAND

Drain the radiator.

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

Split or the spiral type of 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.

When using the spiral type of gland packing this should be inserted in the gland so that the coil *nearest the radiator* is pointing in the same direction as the shaft rotates, i.e., clockwise when viewed looking from the front towards the engine. See Fig. 21.

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.

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.

To obtain the best results under varying operating conditions, the timing of the spark is adjustable 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 12.

TO ADJUST THE CONTACT BREAKER POINTS

(Stationary type Contact-Breaker.)

Magnetos having the stationary type contact breaker may be identified by the rectangular contact breaker cover, held in position by two screws.

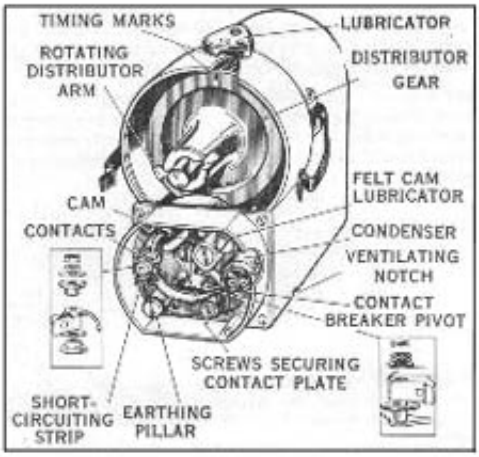


Figure 22
Stationary Type Contact Breaker Adjustment

To adjust the contact breaker gap, disconnect the vertical operating control from the lever on the cover. Then unscrew the two cover screws, noting they are retained in the cover when fully unscrewed from the body.

Removing the cover discloses the contact breaker points, see Fig. 22, and on loosening the two adjustment screws the adjustable contact may be set to give the proper clearance, which is .012 in. (.3mm.) when the cam has

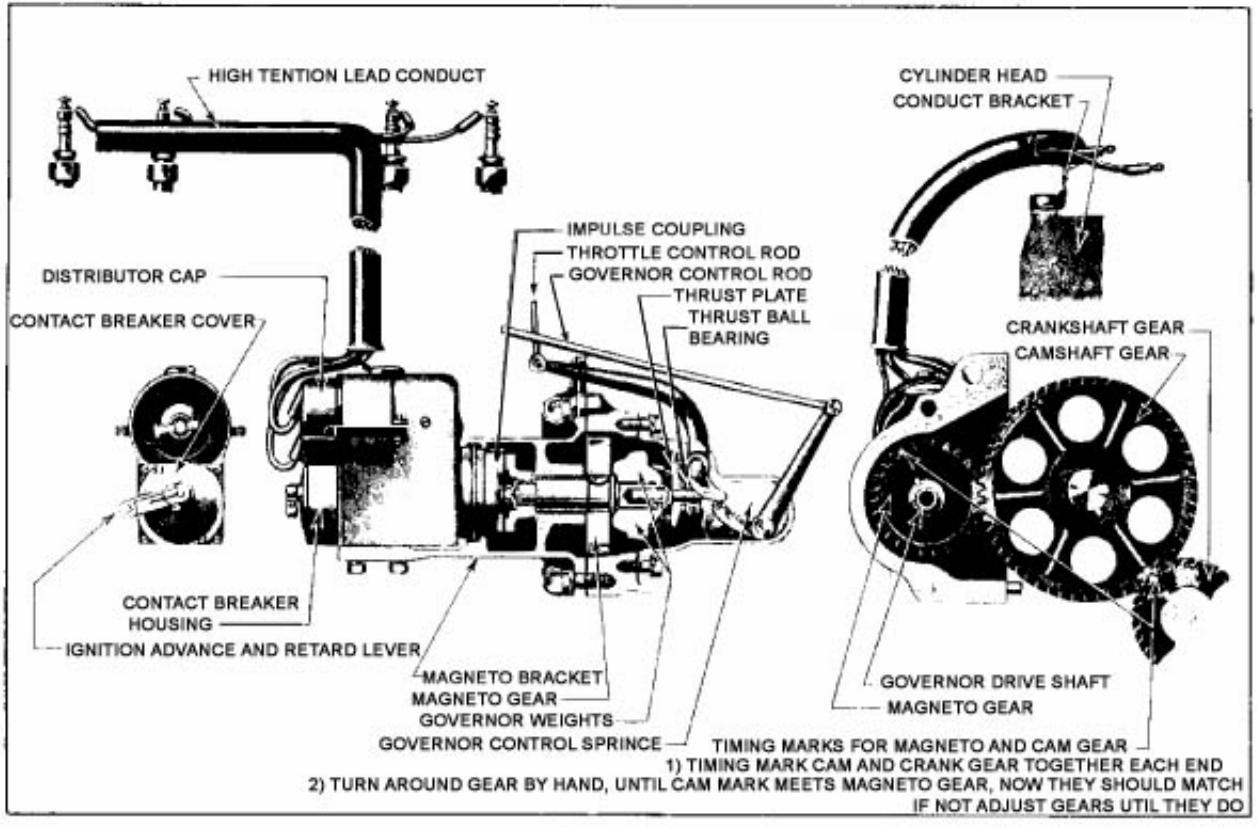


Figure 23

The Ignition System and Governor

RF.4 MAGNETO

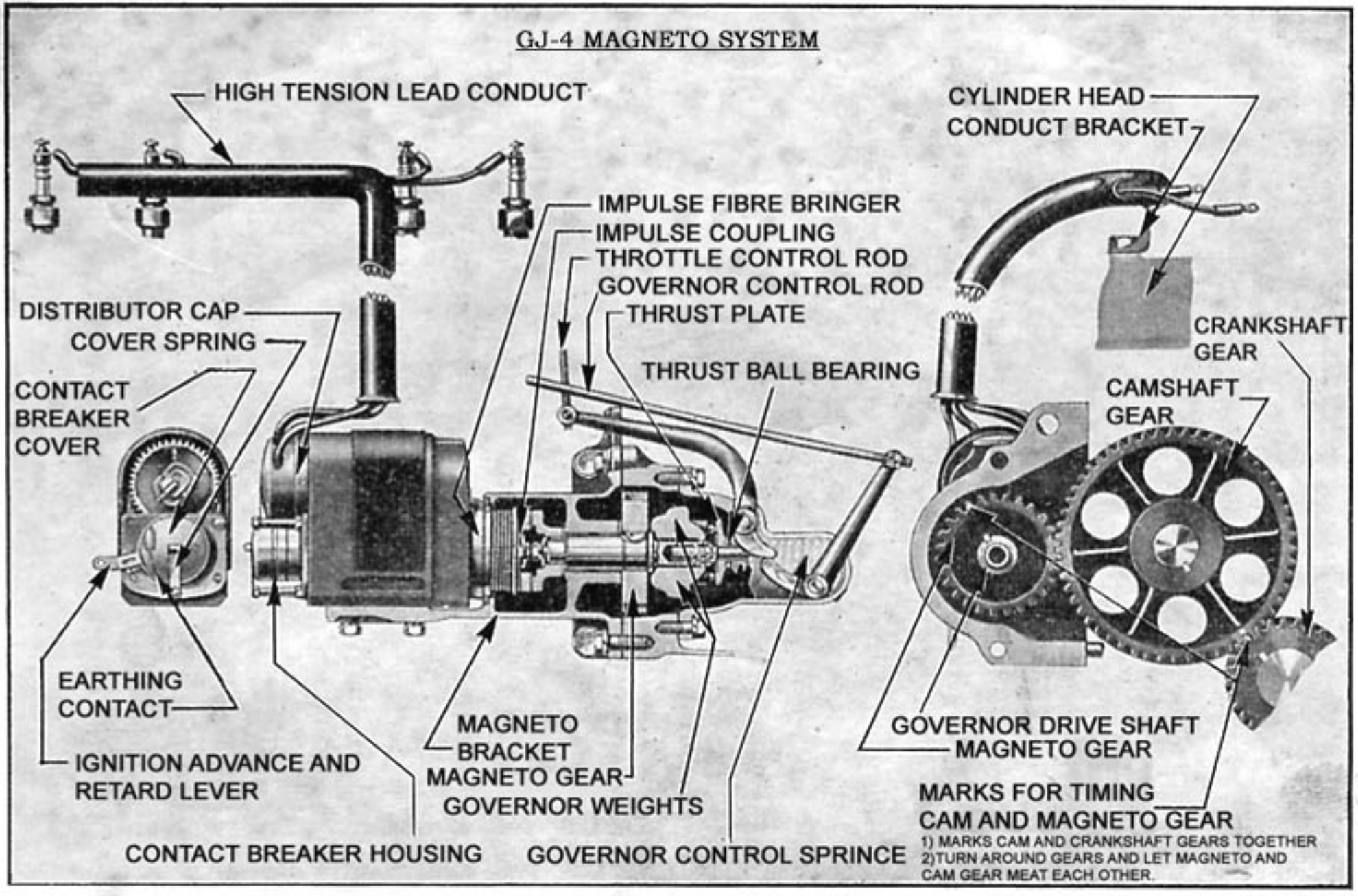


Figure 23B
The Ignition System and Governor
GJ-4 Magneto

fully opened the points. After adjustment, tighten the two adjustment screws and recheck to ensure the gap has not been altered.

If it is found necessary to face the contact breaker points, first withdraw the split pin, plain washer and fibre washer from the hinge pin which passes through the fibre mounted contact point. Then unscrew the nut which secures the condenser lead, also the other end of the contact breaker spring. Remove the shakeproof washer and plain washer fitted beneath this nut, which will permit the shouldered fibre washer to be withdrawn and free the condenser lead. The contact breaker point and spring can then be detached.

To remove the adjustable contact breaker, unscrew both adjustment screws and remove them, after which the contact can be lifted off clear of its mounting pin.

Do **not** use an ordinary file when dressing the contacts : use a special contact breaker file and take care the points are quite square when finished so that correct assembly will be achieved.

When replacing the adjustable contact point, install it so that the centre hole fits over the shoulder of the hinge pin. Secure it by the two adjustment screws, noting the spring washers must be fitted against the underside of the screwhead and the plain washers next to them.

Before refitting the contact breaker spring and contact, first fit the insulated washer on the hinge pin, touching the adjustable contact plate. Next, fit the shouldered fibre washer on the outer mounting spring pin, with the shoulder outwards. Over this shoulder fit the plain steel washer.

Then install the contact and spring, lightly oiling the hinge pin and bush. On the hinge pin, install a fibre washer followed by a steel washer and secure with a split pin inserted through the hole drilled for the purpose.

Secure the outer end of the spring against the steel washer and fibre shoulder of the parts already assembled. Enter the condenser lead terminal tag over the shoulder of the remaining fibre bush and then fit this so the shouldered end is the outer end of the spring eye. Fit the plain steel washer, shakeproof washer and nut in that order. When tightening the nut ensure the lead from the condenser is not strained or distorted. Check the contact breaker gap as previously described and correct if necessary.

When refitting the contact breaker cover plate, take care to ensure the two fingers of the advance control register correctly with their respective locations. The upper finger must enter the U-shaped register, whilst the lower finger must enter the rectangular location provided for it just beneath the contact breaker spring. Do not attempt

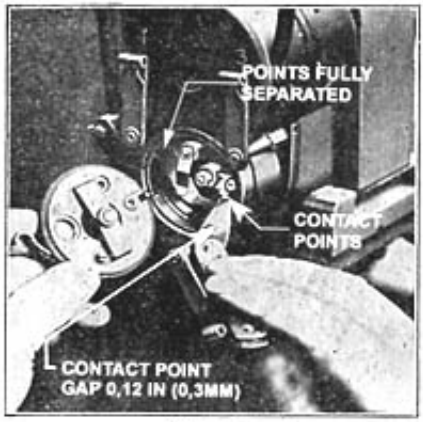


Figure 24
Adjusting the Rotating Type Contact Breaker

to tighten up the cover screws until both fingers are correctly engaged, when the cover will fit flush against its flange.

TO ADJUST CONTACT BREAKER POINTS

(Rotating Contact Breaker type Magneto.)

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 may rotate the cam ring sufficiently to bring the fibre block back on to the high point of the cam.

Loosen contact breaker point lock nut and adjust the gap to .012 in. (.3 mm.).

Tighten the lock nut and replace the contact breaker cover, noting that the lug of the cover must enter correctly the location provided for it in the cam ring. If this is not done the earthing connection may be rendered inoperative.

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 reinforcement springs are fitted, gently prise the flat spring sideways and ease the arm from the pin. Do not lose the 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 overleaf.

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, see page 47, and rotate the magneto impulse coupling anti-clockwise until the rotor arm is pointing towards that segment of the distributor numbered 1 and to which the H.T. lead from No. 1 sparking plug should be connected. Turn the armature so that the points are just about to open with the rotor arm in the above position.

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

Install the fibre coupling and slide the magneto forward on its bracket, insert the four magneto securing screws and tighten these securely. Replace the distributor cover and reconnect the H.T. leads if they have been disconnected.

NOTE

Corrosion of the magneto contact breaker points is liable to occur if the tractor is left in store for any considerable period.,

It is advisable in such instances therefore, to dress the surfaces of the points as described on pages 46 and 49, before putting the tractor back into service.

TROUBLE

In time, carbon will be deposited on the plug points and if not cleaned off will short circuit the plug, causing that 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.

Condensators, which take the form of a thimble-shaped insulator, are fitted on later tractors over the upper end of the sparking plugs to minimise the effect of moisture which can cause surface leakage. Ensure they fit squarely over the plug insulator and only make contact with the centre electrode at the top where the H.T. cable is attached.

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 $\frac{1}{16}$ in. ($1\frac{1}{2}$ mm.) 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 speed of the engine.

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

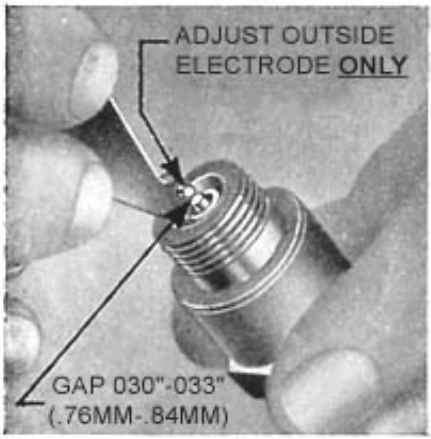


Figure 25
Adjusting Plug Points

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 (take care not to lose the condensators, when these are fitted) 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 nut in the hexagonal hole in the right-hand radiator side member and loosening the lock nut which holds the porcelain insulator in

place. The carbon deposit can then be easily removed from the porcelain and body 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. Do not omit the gasket which is fitted in the shell between the centre electrode and the body. Another gasket must always be fitted between the plug and the cylinder head seating.

The correct gap between the sparking plug points is .030"—.033". (.76 mm.—.84 mm.).

When adjusting plug points, always do so by bending the outside electrode 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, 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.

REPAIRS TO MAGNETO

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

The Governor

OPERATION

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, the linkage thus opening the throttle. 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 resistance 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.

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 governor operating lever (the longer arm on the governor housing) to its uppermost position.

Set the adjustment at the middle of the rod connecting this arm to the throttle control assembly, so that the rod has to be pulled down $\frac{1}{64}$ inch ($\frac{1}{2}$ mm.) 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 vaporiser.

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

The Fuel System

The fuel system on tractors using vaporising oil consists of a tank with two sections—a main tank for vaporising oil and a small one, built inside it, for petrol for starting the engine—also a fuel supply

control which permits either petrol or vaporising oil to be used as fuel. In some cases gas oil may be used and where it is intended the tractor shall operate on such fuel a bronze plate is fitted between the exhaust manifold and the vaporiser plate as described on page 64. On tractors designed to run on petrol, however, there is only one large tank. The tanks may be drained by removing the sediment bulb or, on early tractors, by unscrewing the drain plug at the base of the sediment bulb.

Tractors running on vaporising oil or gas oil are equipped with a vaporiser, those running on petrol with a cylinder head giving a higher compression ratio.

Under no circumstances should vaporising oil or gas 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 vaporiser, but if it is intended to use this fuel regularly a high compression head should be installed.

An improved vaporiser is now fitted to all Fordson Major tractors in production equipped with vaporising oil systems as described in pages 56 to 62.

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.

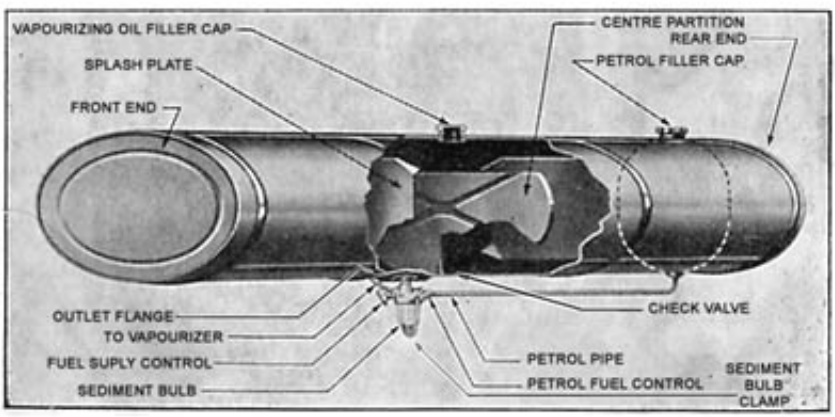


Figure 26
The Fuel Tank

Figure 27
Fuel Supply Control (Later Type)

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.

Any accumulation of water or foreign matter should be removed and its presence is visible as the sediment bulb is of glass : unscrew the clamp at the base, move the retainer aside and lower the sediment chamber for cleaning, see Fig. 27. On earlier tractors unscrew the drain valve (Fig. 28) at the bottom of the bulb, allowing any dirt, etc. to run away. It is not necessary to unscrew this drain valve fully. The sediment bulb tends to prevent any foreign matter getting to the carburettor or vaporiser. On current tractors a filter is now provided at the top of the bulb.

In cold weather, if any water in the sediment bulb or vaporiser freezes, causing a blockage, clear it by wrapping round it a cloth saturated with hot water until the ice melts and the water can be drained away.

To obviate gland leakage when the tap of the later type fuel supply control is open, unscrew it fully to its stop, so causing an internal valve to seat against the gland body and providing a seal.

If leakage of fuel takes place at the tap shaft this may be cured by tightening the gland nut slightly ; if necessary for any reason to repack this gland, fully unscrew the gland nut and install new packing, arranging this so that the coil nearer the gland nut is pointing in a clockwise direction.

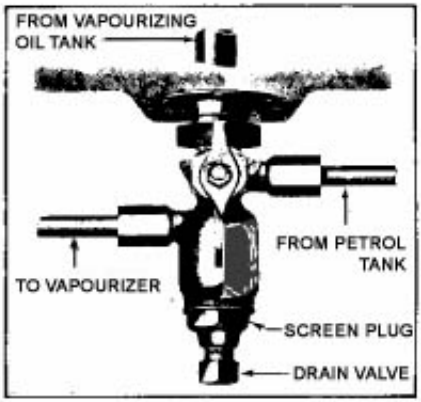


Figure 28
Fuel Supply Control (Original Type)

TO CLEAN THE FILTER SCREEN

After removing the sediment chamber as described on page 55, the filter screen is disclosed just below the tap. If necessary to remove it for cleaning, carefully withdraw the cork gasket, when the gauze filter screen may be drawn downwards for further attention. The cork gasket must be in good condition, otherwise there may be fuel leakage at this point. Clean the cylindrical filter, which is not detachable from the sediment bulb body, so that the mesh is quite free of dirt, etc.

On earlier tractors, remove the filter screen by unscrewing the screen plug (see Fig. 28), which will allow the filter to be withdrawn for cleaning. Replace with the shouldered part uppermost.

THE IMPROVED VAPORISER

The vaporiser 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 at the plug points.

The improved vaporiser induction manifold is completely surrounded by the exhaust chamber, both being cast in one unit. The exhaust gases in the chamber are controlled by means of the adjustable exhaust shutter which is provided with four set positions to regulate the volume of the gases passing round the induction manifold, thus varying the temperature of the induction manifold heating chamber to suit the operating conditions.

Operation of Adjustable Exhaust Shutter

As shown in Fig. 29 the exhaust shutter control lever is marked "HOT" with an arrow embossed just below and the head pointing away from the tractor. A screw and locking nut is located at the end of the lever to secure the shutter at one of the four indentations in the side of the vaporiser body.

Outside Indentation (Maximum Heat)

(LIGHT LOADS and/or COLD WEATHER)

Fig. 31 shows a diagrammatic illustration of the passage of the exhaust gases with the shutter in the open and closed position (vertical exhaust), the intermediate positions of the shutter are shown in dotted lines. In the case of the horizontal exhaust the passage of the gases is shown by dotted arrows.

With the lever set at the outside indentation the shutter is in the closed position and directs the gases around the back of the induction

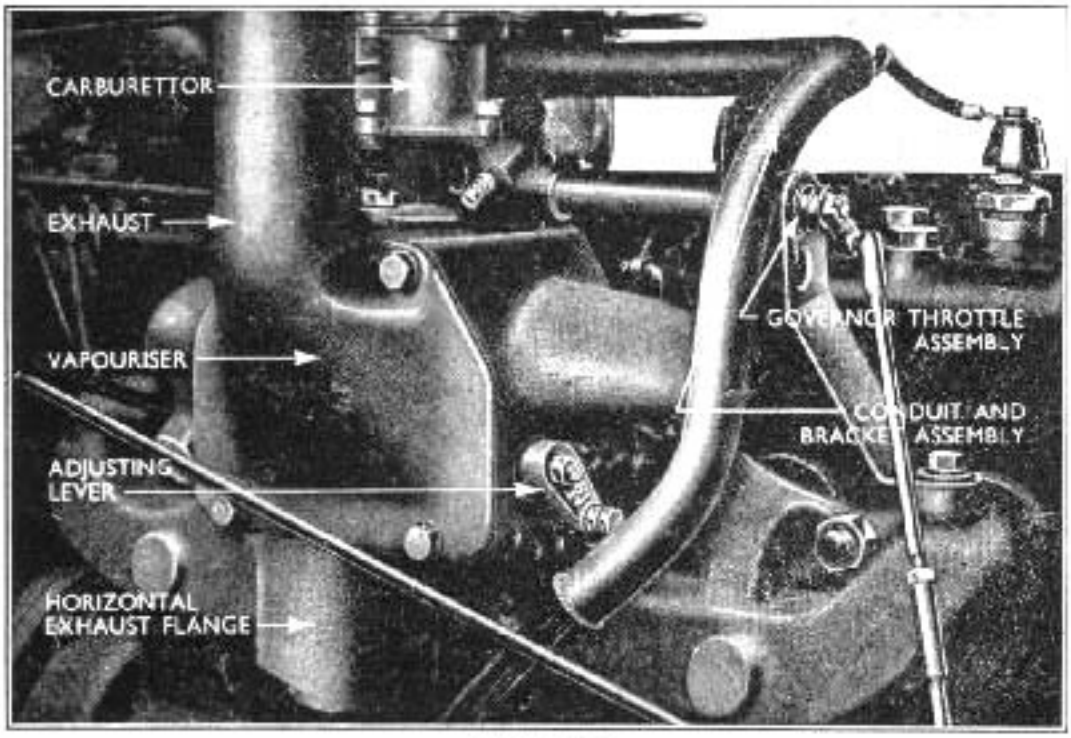


Figure 29
Improved Vaporiser and Carburettor

manifold and out through the exhaust pipe, thus causing the manifold to heat more rapidly and to a greater extent than when in the other positions.

This will be found to be the most suitable position for operating in this country under light and average loads.

Second Indentation

(MEDIUM LOADS and/or COLD WEATHER)

When the lever is adjusted in the second indentation from the front, the shutter is slightly open (see Fig. 31), thus permitting a small amount of the gases to escape under the shutter and the remainder passing round the induction manifold, giving a slightly reduced heating effect.

This position will be found the most satisfactory in this country when operating under average and medium heavy load conditions.

Third Indentation

(MEDIUM LOADS and/or HOT WEATHER)

With the lever set at the third indentation the shutter is opened to a position halfway between the second and the fully open (or inside

TWICE DAILY IN THE MORNING AND AFTER DINNER

(A) FILL WITH FRESH WATER

(B) FILL TO F MARK ON DIPSTICK WITH OIL OF CORRECT GRADE

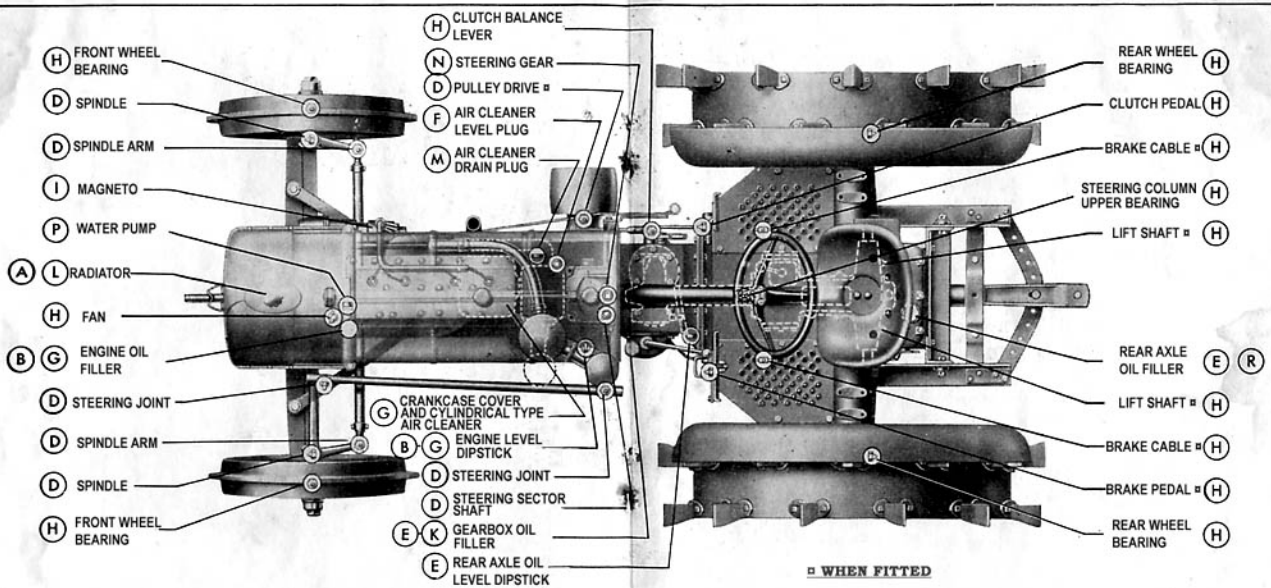
(P) USE SUITABLE WATER PUMP GREASE AS REQUIRED

EVERY NIGHT

(D) GREASE WITH GREASE GUN

(E) CHECK OIL LEVEL AND ADD GEAR OIL IF NECESSARY

(F) CHECK OIL LEVEL AND ADD CLEAN ENGINE OIL IF NECESSARY. COVER TRACTOR TO PROTECT IT FROM THE WEATHER



¤ WHEN FITTED

AFTER EVERY 50 HOURS (100 HOURS WHEN USING PETROL ONLY)

(G) CHANGE ENGINE OIL, REMOVE CRANKCASE COVER, CLEAN COVER AND SCREEN IN PETROL, RE-ASSEMBLE AND REFILL WITH OIL OF CORRECT GRADE, WASH OIL FILLER CAP IN PETROL AND RE-OIL FILTER. CYLINDRICAL TYPE AIR CLEANER, CHANGE OIL, CLEAN OUT SEDIMENT

(H) GREASE WITH GREASE GUN

(I) APPLY 2 OR 3 DROPS OF OIL

AFTER EVERY 6 MONTHS OPERATION

(K) DRAIN, FLUSH WITH ENGINE OIL AND REFILL WITH CORRECT GRADE OF GEAR OIL

AFTER EVERY 200 HOURS

(L) DRAIN AND FLUSH UNTIL WATER COMES OUT CLEAN

(M) DRAIN SQUARE TYPE CLEANER AND REFILL ENGINE OIL (WHEN FITTED)

(N) FILL TO LEVEL OF FILLER HOLE WITH GEAR OIL OF CORRECT GRADE

AFTER EVERY 12 MONTHS OPERATION

(R) DRAIN AND REFILL WITH CORRECT GRADE OF GEAR OIL

FIGURE 30

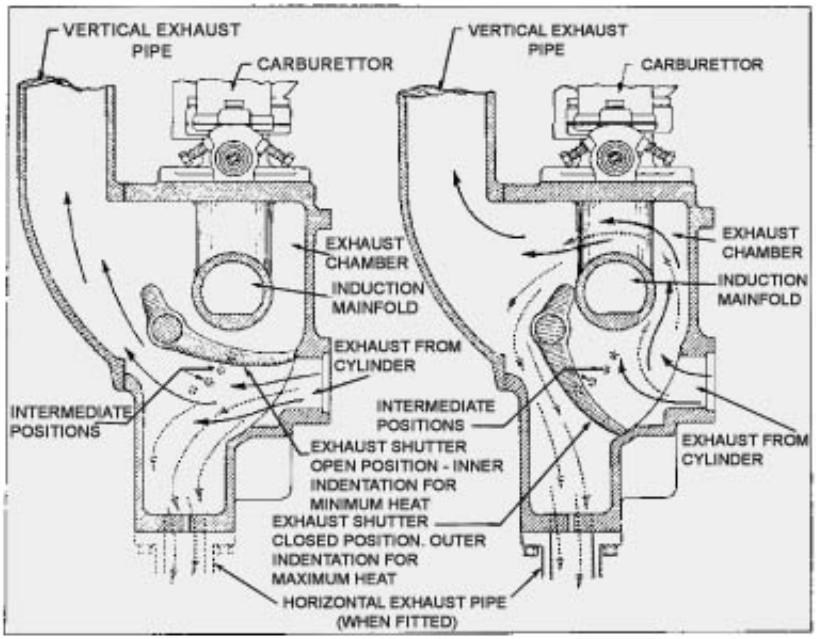


Figure 31
Diagrammatic Sketch of System

indentation) setting which permits an even greater distribution of the gases under the shutter and around the induction manifold with a corresponding reduction in the temperature of the manifold.

In countries where warmer climates are experienced this position will be found suitable for light and average loads, also for maximum loads such as continuous belt work, etc., in this country.

Inside Indentation (Minimum Heat)

(HEAVY LOADS and/or HOT WEATHER)

In this position the shutter is fully open and permits the gases to pass out through the exhaust chamber into the silencer without any restriction, thus keeping the manifold at the minimum temperature which will be found to be the most efficient position under maximum load conditions in warmer climates.

CONVERSION TO IMPROVED VAPORISER AND CARBURETTOR

If it is desired to convert the previous type vaporiser and carburettor to the improved type, conversion kits are available from your Dealer, and should be carried out as follows :—

REMOVAL OF CARBURETTOR AND VAPORISER

1. Disconnect the governor control rod, spark control rod and choke at the connecting ends.

2. Remove the exhaust pipe from the tractor. (See parts to be reworked.)

3. Remove the fuel pipe between the sediment bulb and the carburettor float chamber.

4. Disconnect and remove the adjustable governor link.

5. (*a*) Disconnect the sparking plug leads and remove the magneto cap, leads and conduit.

(*b*) Refit the two cylinder head bolts removed when dismantling the conduit.

6. Detach the air cleaner tube.

7. Remove the four nuts retaining the manifold and carburettor assembly and detach the complete unit which may be further dismantled if desired.

PARTS TO BE REWORKED

Silencer Assembly (Vertical Type)

Cut off the "U" shaped portion at the bottom to give an overall dimension of 34½ ins. Then cut two slots (diametrically opposite) in the bottom end approximately $\frac{1}{16}$ in. wide and 3¾ ins. long.

Governor Operating Lever

Remove the governor operating lever ball from the inside position and fit the new ball supplied to the outside of the lever so that the latter does not foul the vaporiser body.

Carburettor to Sediment Bulb Fuel Pipe

It may be necessary carefully to bend the existing pipe in a loop, or reduce its length, to suit the new components.

FITTING VAPORISER AND CARBURETTOR

NOTE.—It will be found more convenient if the carburettor is assembled to the vaporiser before fitting the assemblies to the cylinder block. Do not omit the spring and plain washers under the head of the hexagon bolt when securing the governor throttle shaft assembly to the vaporiser.

Ensure that drain valves are fitted in the base of the vaporiser body with a deflector plate located under the drain valve at the magneto end of the vaporiser.

1. Locate the six copper manifold gaskets in position around the inlet and exhaust ports.

2. Mount the vaporiser and carburettor assembly (prepared above) and secure by means of the four nuts.

3. Position and secure the new air cleaner tube.

4. Attach the carburettor choke control rod, spark control rod and governor control rod.

(The governor control (ratchet) rod bracket is now approx. 1½" long and secured by the lower rear exhaust retaining screw.)

5. Assemble in position the four sparking plug leads, conduit and magneto cap using the longer cylinder head bolt supplied to retain the conduit and the spark control rod support (loop upwards) at the third bolt hole from the front and the rear conduit bracket at the fifth hole from the front.

6. Connect the pipe between the carburettor and sediment bulb.

7. Mount the exhaust pipe in position. In the case of the horizontal exhaust pipe ensure that the plate covering the shutter chamber is securely mounted by means of the four bolts supplied.

8. Start the tractor and adjust the vaporiser and carburettor as desired. (See also pages 65 to 67 and Fig. 34.)

THE PREVIOUS TYPE VAPORISER

The previous type vaporiser is illustrated in Fig. 32. When using petrol for starting, turn off the fuel control tap and open the petrol tap. (On earlier models, turn the two-way valve to "G.")

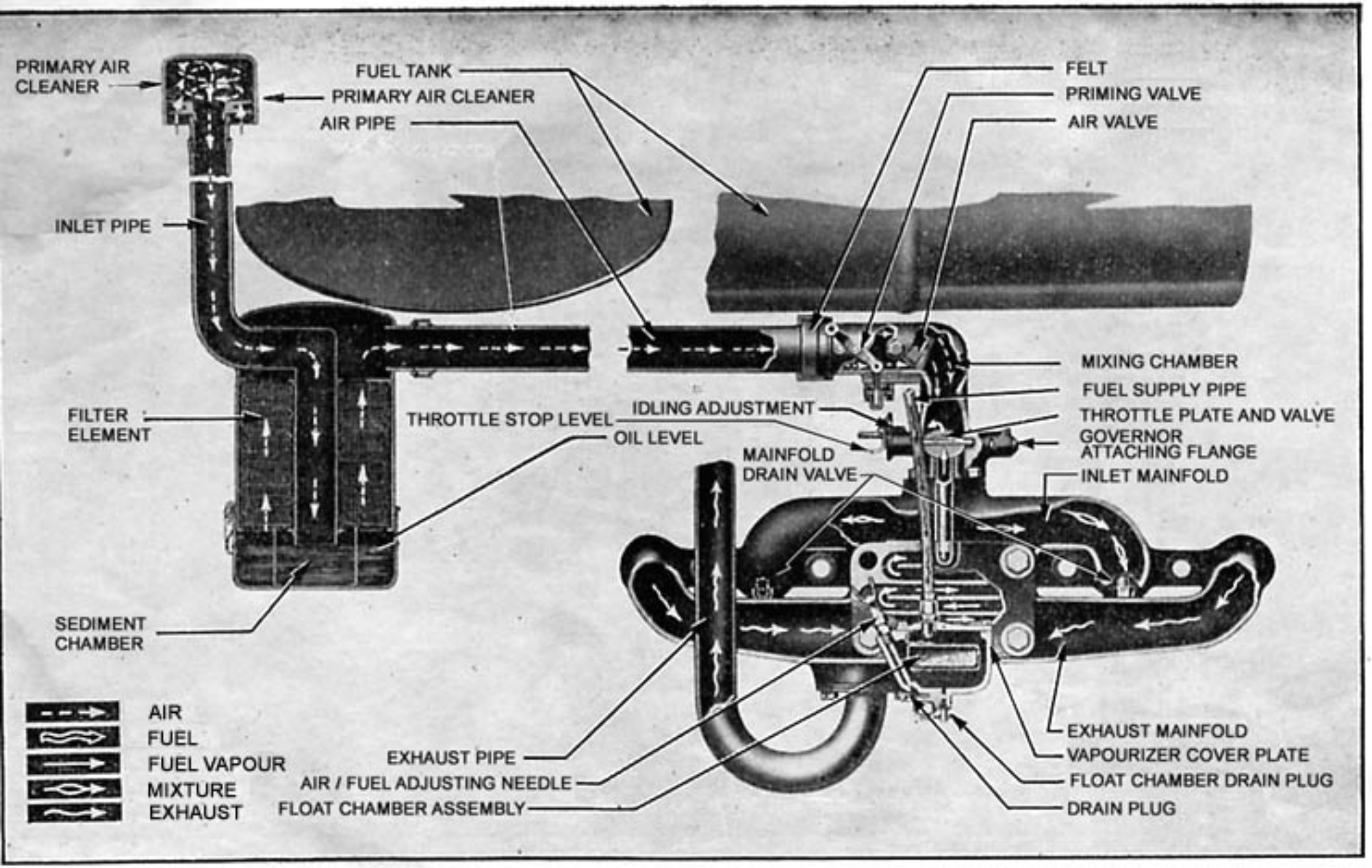
After the engine has been running for ten to fifteen minutes, change the fuel used from petrol to vaporising oil or gas oil. The paths of the air, fuel, mixtures, and exhaust gases are indicated by arrows, as explained by the key on the diagram (Fig. 32). The volume of gas mixture entering the cylinders is regulated by the governor through the throttle valve.

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

NEEDLE ADJUSTMENT

The external adjusting needle controls the admission of fuel to the main jet and this provides the operator with a ready means of adjusting the fuel supply for any particular operating condition. The best setting is approximately 2¼ turns open but on light loads it may be found advantageous to screw this down a little, which, besides effecting economy in fuel, will ensure that the mixture is not too rich.

If there is any considerable discharge of black smoke from the exhaust this is usually an indication of an over-rich mixture, but may also mean that the vaporiser plate is either too cool or fouled with carbon. To clean the vaporiser plate see page 64.


PRIMARY AIR CLEANER
FUEL TANK
PRIMARY AIR CLEANER
AIR PIPE
FELT
PRIMING VALVE
AIR VALVE
INLET PIPE
MIXING CHAMBER
FUEL SUPPLY PIPE
FILTER ELEMENT
THROTTLE STOP LEVEL
IDLING ADJUSTMENT
THROTTLE PLATE AND VALVE
OIL LEVEL
GOVERNOR ATTACHING FLANGE
MAINFOLD DRAIN VALVE
INLET MAINFOLD
SEDIMENT CHAMBER
AIR
FUEL
FUEL VAPOUR
MIXTURE
EXHAUST
EXHAUST PIPE
AIR / FUEL ADJUSTING NEEDLE
FLOAT CHAMBER ASSEMBLY
EXHAUST MAINFOLD
VAPOURIZER COVER PLATE
FLOAT CHAMBER DRAIN PLUG
DRAIN PLUG

SLOW-RUNNING ADJUSTMENT

Unscrew the nut and remove the cover as shown in Fig. 33, turn the throttle stop screw clockwise about 1 to 1½ turns after the screw just touches the throttle stop, for normal slow-running, turn further to increase slow-running speed.

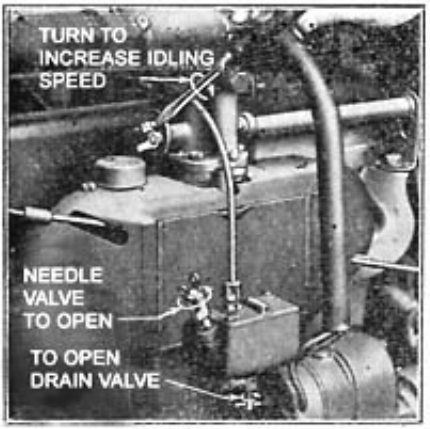


Figure 33
Slow Running Adjustment

TO CLEAN VAPORISER PLATE

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

The vaporiser plate for use with gas oil differs somewhat from that used for vaporising oil in that it is of bronze and the exhaust manifold is cut away so that the exhaust gases impinge directly on it. It is advisable to clean out the vertical passages as well as the horizontal fuel passages to ensure the proper degree of heat is transferred to the fuel mixture. When refitting the bronze plate take care to install it with the horizontal passages outwards, i.e., towards the float chamber.

TO CLEAN JET

Should the jet become choked with dirt or water, it may be cleared by running the engine fairly fast, opening the vaporiser 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.

MANIFOLD DRAIN VALVES

Two manifold drain valves are fitted, one at each end of the inlet manifold, at the bottom, so that any excess petrol or fuel drawn into the system may escape when the engine is stopped. Each has a small valve which is normally open; when the engine is running, however, the valves are drawn onto their seats by suction and so prevent any air leak, see Fig. 32.

If these valves tend to remain open they will contribute to difficult starting and so should be checked occasionally. See also page 19. They are fitted to tractors operating on petrol, vaporising oil or gas oil.

CARBURETTOR

The modified carburettor fitted with the latest type vaporiser is of the double venturi downdraught type as used previously on petrol tractors with the addition of a conveniently located drain valve assembly incorporated in the base of the float chamber so that it may be drained of vaporising oil if desired.

Tractors running only on petrol are fitted with a higher compression cylinder head.

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 inlet manifold and so to the cylinders.

Any water or dirt which may have collected in the float chamber may be drained away by unscrewing the gland which carries the main jet adjusting screw.

To prevent any possibility of the taper needle being forced into the jet orifice when refitting the gland, slacken back the adjusting needle, re-adjusting when the gland is tightened.

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.

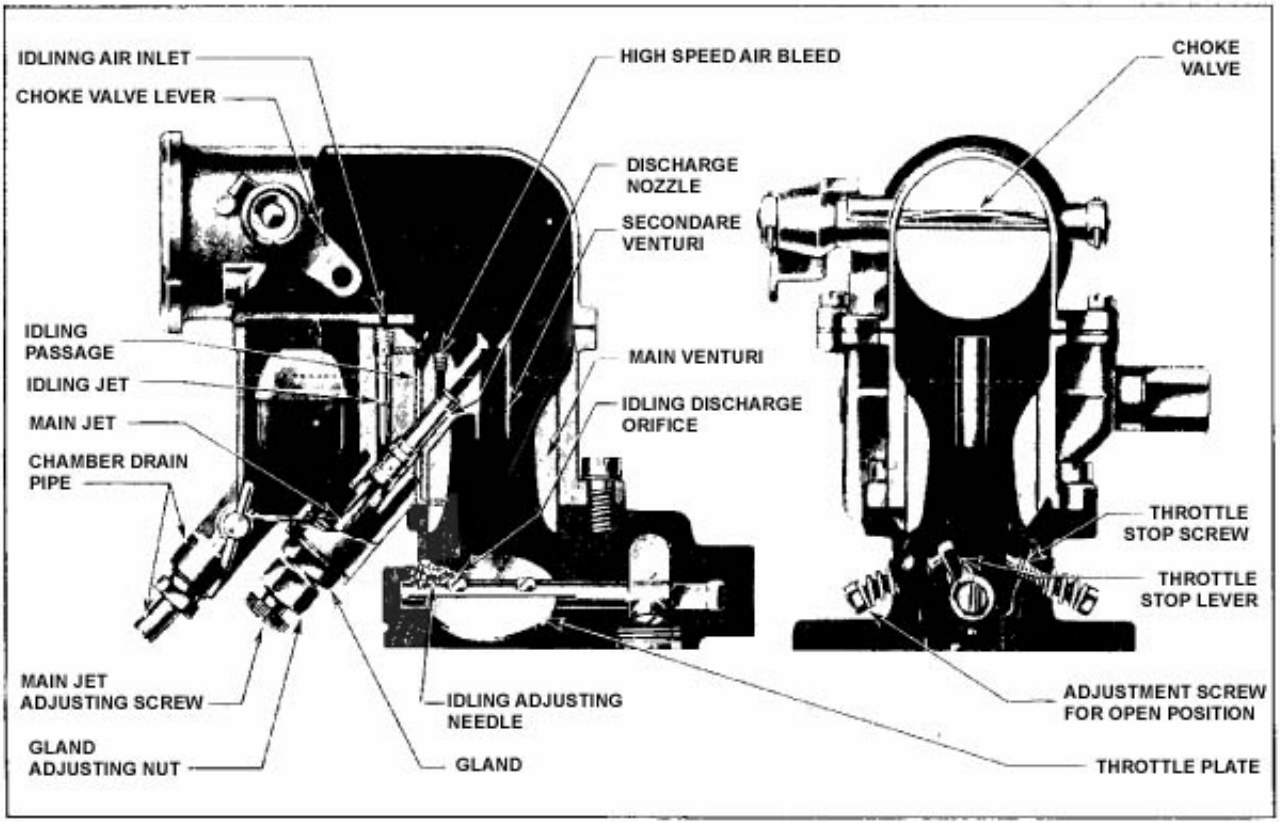


Fig. 34
The Carburettor (Current type)

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.

ADJUSTMENTS

Idling Adjustment

The idling adjusting needle should be adjusted so that a steady idling speed is obtained after the engine has been warmed up and with the choke valve in the open position (running on Vaporising Fuel). This should be found to be approximately **1½ turns** open from the fully closed position.

The throttle stop screw limits the amount by which the throttle plate may be closed so that when in this position the engine depression is directed as required upon the idling discharge orifice. By screwing this adjustment in or out the desired engine idling speed may be obtained. Approximate setting **1½ turns** after the screw touches the lever.

Main Jet Adjustment

The main jet may be adjusted by means of the main jet adjusting screw. Turning the screw in a clockwise direction causes the jet needle to enter further into the orifice to restrict the amount of fuel that will flow past the jet, causing the fuel mixture delivered to the engine to be weaker.

The jet should be adjusted to suit the working conditions of the tractor for the maximum efficiency and fuel economy. Should the needle be screwed in too far, resulting in a weak fuel mixture, loss of power will be noticed accompanied by overheating of the engine with poor performance. An excessively rich fuel mixture, due to the needle being screwed too far out, will invariably give rise to sooting up of the sparking plugs and irregular running of the engine usually accompanied by a black exhaust.

It will be found that approximately **2 turns** of the adjusting screw from the fully closed position will give the best results.

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

FLOODING CARBURETTOR AND VAPORISER

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.

Unscrew the union nut, when the adaptor can be unscrewed and removed. This may then be cleaned and examined for particles of grit or other foreign matter, whilst the needle valve will be exposed to view. When refitting the adaptor, ensure its gasket is in position and in good condition : take care the needle valve enters the drilled passage in the adaptor before screwing it into place in the float chamber.

If, after reconnecting the petrol pipe and testing, the carburettor still floods, it will be necessary to undo the six screws holding on the float chamber cover, when the internal parts may be inspected and replaced, if necessary.

The Air Intake System

On the Standard Agricultural, Land Utility, or Row Crop Tractor, air is drawn through a number of vanes at the base of the primary air cleaner, and these impart a rotary motion to the inconing 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 across 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 in the base of the cleaner.

Before leaving the cleaner the air passes through a final filter of wire mesh type 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 square type 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.

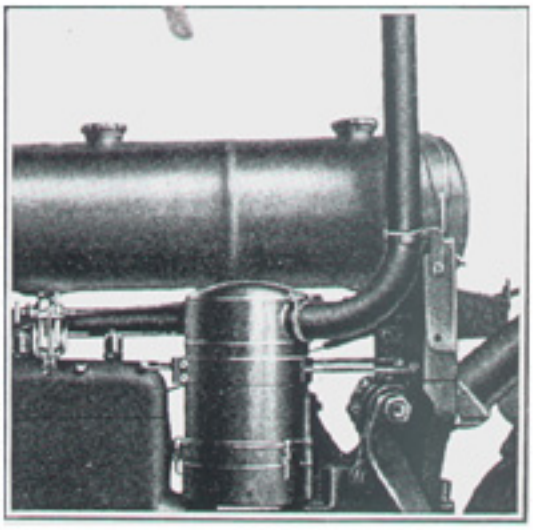


Figure 35
The Cylindrical Type Air Cleaner

The **square type air cleaner** is mounted on the housing, immediately behind the cylinder block and is secured by three bolts, two at the bottom and the third at the apex of the mounting bracket. These bolts should be inspected periodically to ensure that they are quite tight.

The **cylindrical type air cleaner** is mounted to the left-hand side, between the cylinder block and dash panel.

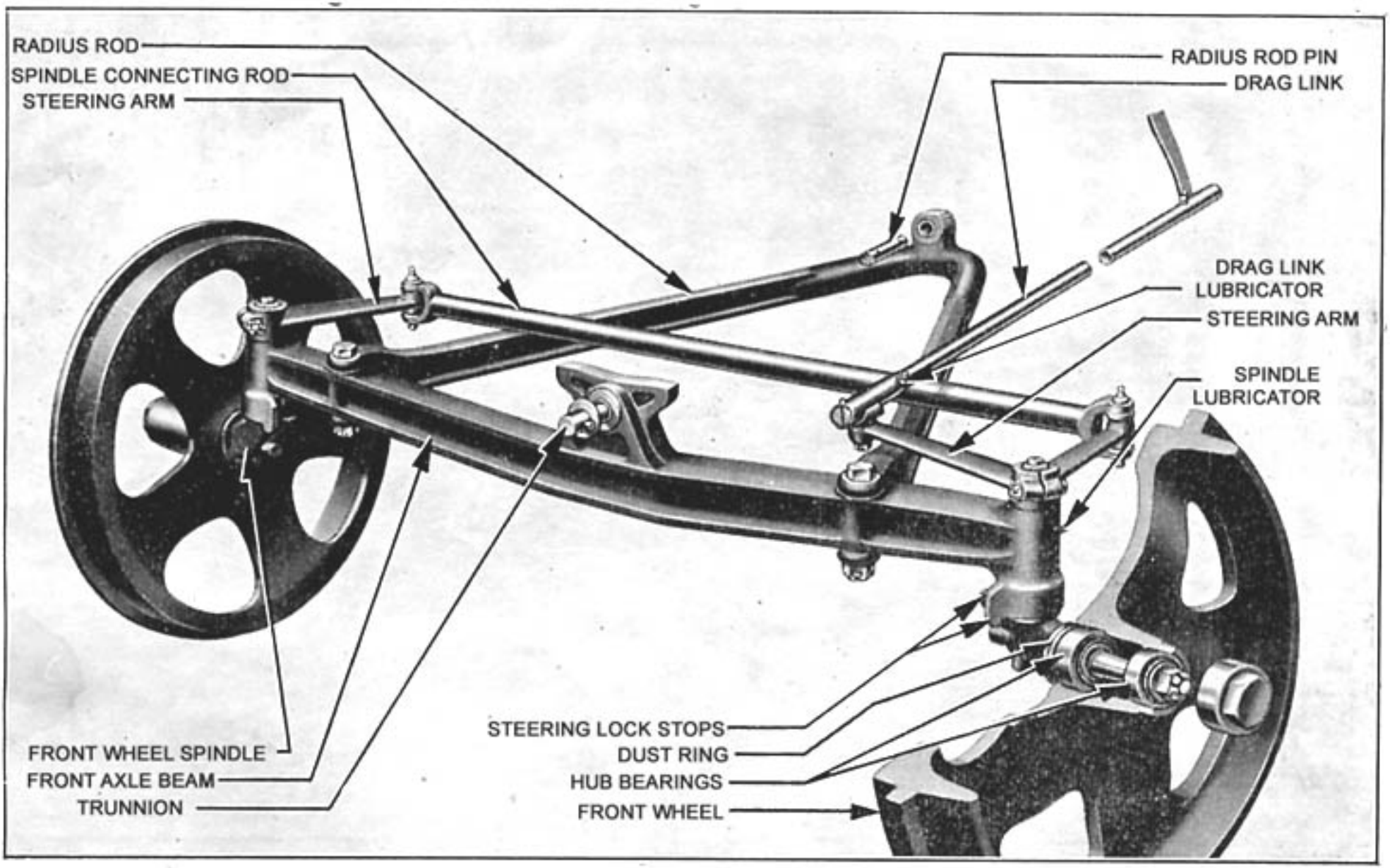


Figure 36
Row Crop Front Axle

There is a short connecting pipe from the air outlet elbow direct to the vaporiser, or carburettor as the case may be, through which the cleaned air is drawn into the engine.

CARE

The cleaner depends for efficient operation on a supply of clean engine oil which is contained in a suitable reservoir in the base and across which all the air is drawn.

On the **cylindrical type air cleaner** sediment may be cleaned out and the oil changed every 50 hours by releasing the three clips and lowering the base. Use engine oil and fill to the level mark shown in Fig. 11 : the oil capacity is approximately 2½ pints (1¼ litres).

For the **square type air cleaner** a detachable dirt trap cover is 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 readily and sediment is more easily removed.

The dirt trap cover is screwed into the base 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 render the cleaner less efficient.

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

The capacity of the cleaner is approximately 5 pints (2.84 litres). The clean engine oil should be inserted through the filler to the correct oil level. The filler cap should be screwed home and the drain plug and gasket checked for oil leaks. Never run the tractor with the oil container empty, or the filler plug missing.

THE AIR CLEANER (for Tractors operating on petrol)

A gauze type air cleaner may be fitted 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.

The Steering Gear and Front Axle

The Steering Gear is of the worm and nut type, on earlier tractors of the hour-glass worm and sector type, mounted on the housing at the base of the dash panel.

The steering-box has a filler plug for replenishment and gear oil should be used, filling to the orifice, Fig. 38.

A lubricator is provided on the housing to enable grease to be injected from the grease gun for lubricating the sector shaft bearings. Another lubricator is fitted at the upper end of the column for lubricating the steering column shaft.

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 work its way into some bearing surface and cause undue wear.

The front axle is mounted in the cylinder front cover and is located by a trunnion. Heavy radius rods are bolted to the ends of the axle to take up thrust and preserve alignment.

ROW CROP FRONT AXLE

To facilitate cultivation, the front axle of Row Crop models has

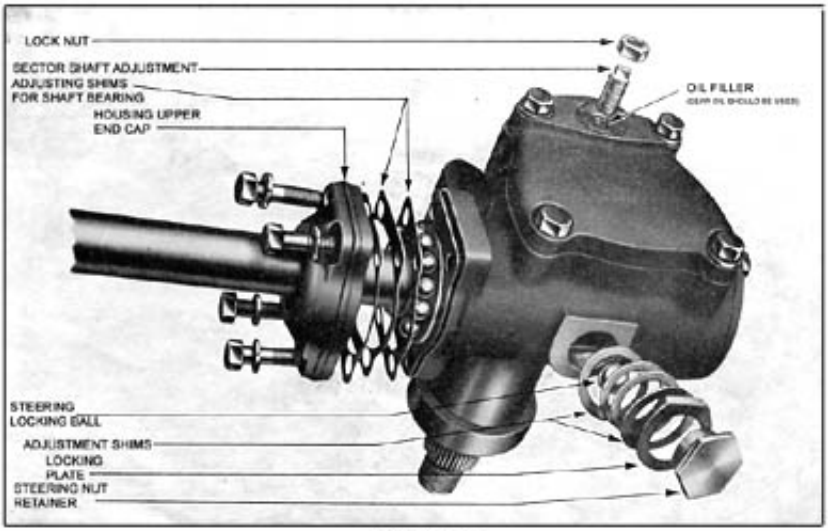


Figure 37
Worm and Nut Steering Gear

extensions which may be adjusted in relation to the axle beam, so permitting the wheel track to be set between widths of 48" to 72" (121.9 cm. to 182.9 cm.) with iron wheels. When pneumatic tyres are fitted the wheel track may be adjusted between the widths of 49¾ ins. and 73¾ ins. (126.4 cm. to 187.3 cm.).

The radius rod is bolted to the axle beam itself in such a way that it is unaffected by any alteration to the wheel track adjustment since the forward ends of it permit the extensions to slide readily through the jaws. (Fig. 36.)

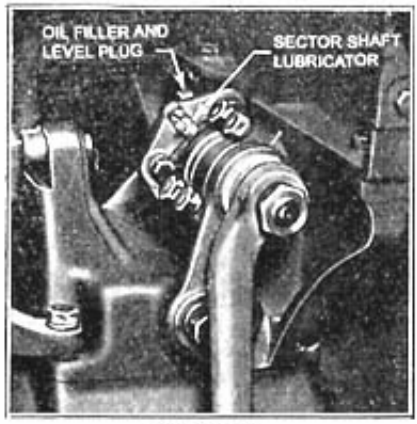


Figure 38
Steering Gear Lubrication

With any alteration in track width the layout of the steering drag link is such that it will permit correct operation between the widest and narrowest wheel track adjustments and so no adjustment for the drag link setting is necessary or is provided.

It will be necessary, however, to set the spindle connecting rod, which is adjustable for length, according to the particular wheel track setting which is selected for the work in hand, so that the wheels are in correct track.

TO ADJUST THE ROW CROP FRONT AXLE

Raise the front end of the tractor and unscrew and remove the nuts and bolts holding the extensions to the axle beam.

Remove the bolt each side which clamps the spindle connecting rod to the adjustable yoke and completely remove each bolt from the clamp.

Set each side to give the correct distance for the work in hand, noting that each side must be an equal distance from the centre, see Fig. 39.

When the correct adjustment of the extensions has been obtained, replace the bolts, noting that the innermost bolt at each side must be in that hole in the axle beam which is between the centre of the axle and the radius rod bolt. Of the remaining two bolts each side, one must be at the extreme outer end of the axle beam. These bolts must be tightened up very firmly before the tractor is set to work and it is good practice to check them again after a short period of operation.

Next, line up the front wheels each in the straight-ahead position, so that the bolts may be inserted through the clamps, passing also through the spindle connecting rod. Note that the appropriate slots are machined on the adjustable yoke ends to provide positive locking in definite stages according to the particular wheel track adjustment.

When finally adjusted, the spindle connecting rod must be equally centred between its adjustable yoke ends, after which the nuts must be split pinned when they have been tightened.

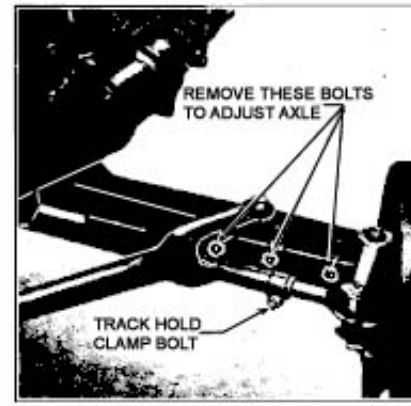


Figure 39
Row Crop Front Axle Adjustment

The rear wheels on row crop tractors may also be adjusted for track width, details concerning these being given on page 82.

FOOT BRAKE OPERATION—ROW CROP TRACTORS

When the foot-brakes are fitted these assist in row crop operation, notably in assisting in obtaining short turns, by applying the brake shoes on that side of the tractor towards which the turn is to be made.

TESTING AND ADJUSTING FRONT WHEEL BEARINGS

To determine if there is excessive play in the bearings, jack up the front of the tractor, grasp the sides of the wheel and shake it.

Do not mistake loose steering spindle bodies or bushes for end play in the wheel bearings.

If there is excessive play in the bearings they can be adjusted as follows :—

Take off the hub caps, jack up front of tractor, take out the split pin and, on later tractors, remove the clamping bolt to free the adjusting nut from the threads of the wheel spindle.

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

Revolve the wheel to ensure all working surfaces coming in contact.

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

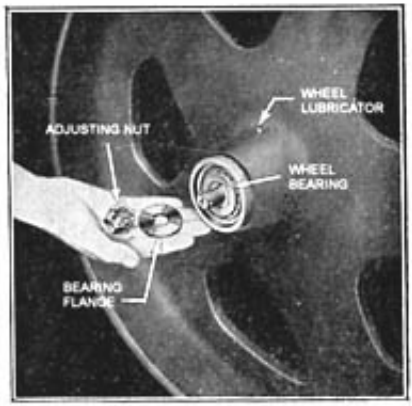


Figure 40
Adjusting the Front Wheel Bearings

this position with a cotter pin. Tighten the locking bolt incorporated in the adjusting nut where fitted.

Finally, replace the hub cap filled with grease and lower the front end of the tractor to the ground.

These bearings should be tested for correct adjustment every 50 hours and re-adjusted if necessary. (See page 24.)

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.

For Pneumatic Tyre Fitting Instructions, see page 83.

The Transmission

The transmission consists of a clutch, gearbox, hand operated transmission 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 components are enclosed in separate compartments, each having their own oil supply which, provided it is kept up to the correct level, assures adequate lubrication for all working parts.

As all shafts and gears are of specially hardened steel with a large number of heavy duty ball or 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 S.A.E. 90 viscosity (S.A.E. 140 viscosity in hot climates having temperatures above 90°F. or S.A.E. 80 viscosity in climates having severe temperatures below 20°F.), and that the oil is changed at the recommended periods, for which see the sub-headings for the components affected.

The Clutch

The clutch is of the single plate disc type, running in oil, the pressure plate springs being set to the required pressure before the tractor leaves the factory, and in no circumstances should any attempt be made to adjust the pressure by interfering with the setting of the clutch release fingers.

Operating the tractor with the foot resting on the clutch pedal will result in excessive wear of the release bearing and clutch lining, necessitating frequent adjustment of the clutch, besides causing loss of power through clutch slip.

CLUTCH RELEASE BEARING

The clutch release bearing is of the " greaseless " type and requires no lubrication.

TO ADJUST THE CLUTCH PEDAL

After the tractor has been in use for some time, wear may cause the pedal to strike the floor-plate before the clutch is fully engaged, in which case the pedal should be adjusted or slip may occur.

Remove the split pin from the clevis pin (Fig. 41), loosen the lock nut and then pull out the pin, which will enable the clevis to be freed

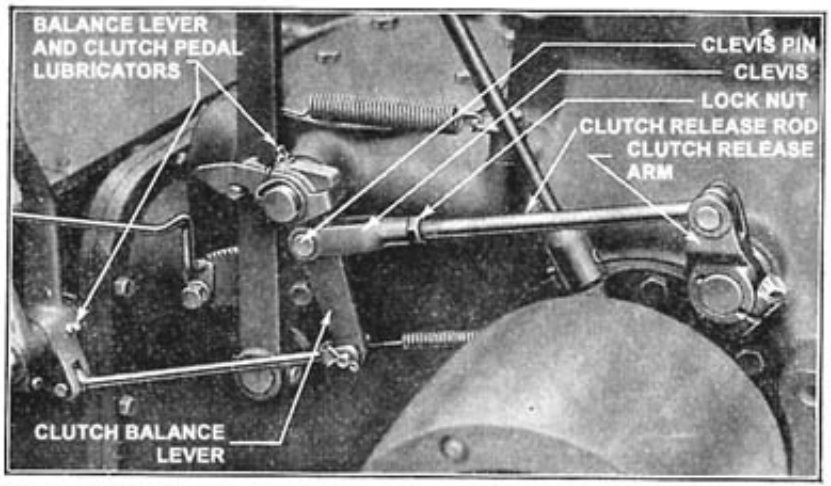


Figure 41
Clutch Pedal Adjustment

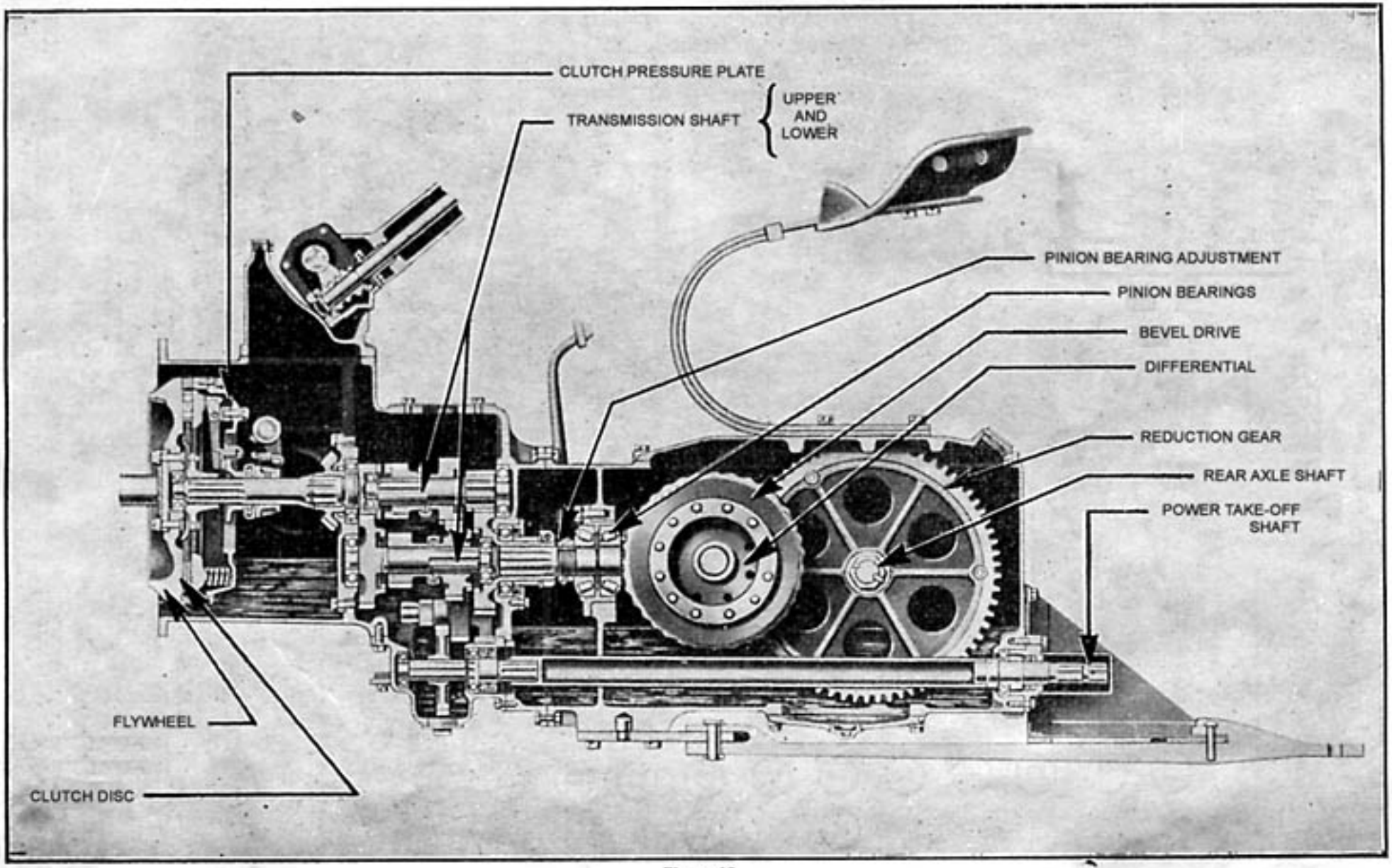


Figure 42
The Gearbox and Rear Gear

from the balance lever. Screwing the clevis further on to the rod will reduce the free movement. When approx. $\frac{1}{2}$ in. (13 mm.) free movement exists, fit a new split pin in the clevis pin and retighten the lock nut.

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

The Gearbox

The gearbox is of the constant mesh selective type, fitted with heavy ball or 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 inwards 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.

Row Crop Brake Adjustment

Loosen the fly-nut, see Fig. 43, and raise the hinged cover disclosing the expander inside the drum. It may be necessary to turn the brake drum to bring the aperture into register with cover plate before the expander is visible.

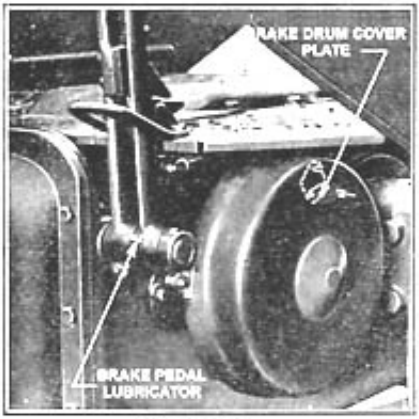


Figure 43
Brake Drum Cover Plate

The expander is provided with horizontal projections, thus permitting a screwdriver to be used to turn it. Moving the projections upwards expands the shoes, taking up normal lining wear.

Rotate the expander until the shoes touch the brake drum then release them until they are just free of the drum by moving the expander downwards approximately eight " clicks."

After approximately every fourth normal wear adjustment, loosen the centraliser nut at the back of the brake plate, and allow it to take up its normal position in the elongated hole in the brake plate. Retighten the nut securely after this adjustment.

Industrial Tractor
Foot Brake Adjustment

To allow for wear at the brake shoe linings, there is a simple external adjustment which permits the shoes to be expanded within their brake drums.

Using the brake adjusting tool provided with the tractor, enter this on the squared shank of the brake adjusting wedge. Turn this in a clockwise direction, when it will move in the series of " clicks." Adjust until it is felt that the shoes are pressed against the brake drum ; then slacken off in the reverse direction until the brake drum, when lightly tapped, emits a clear ringing sound, indicating that the shoes have sufficient clearance.

Treat each adjusting wedge in a similar manner, testing the brake pedal to ensure it has no undue movement before the brakes are applied.

Rear Axle

The power of the engine is delivered through the clutch and gearbox to the rear axle and thence to the rear wheels.

The drive from the gearbox is transmitted to each pinion shaft by means of a crown wheel and bevel pinion, the latter being directly connected to the gearbox and meshing with the crown wheel. A differential of the four pinion type with a four armed spider is bolted to the crown wheel and provides a balanced drive to each pinion shaft. Each pinion shaft has a small spur gear on it which meshes with a larger ring gear on the rear axle half-shaft.

On Row-crop tractors a brake drum is fitted at each side of the pinion shaft and brake pedals are connected so that either or both rear wheels may be braked. See also page 15 for further details.

The rear axle shafts are of the semi-floating type and the drive to these is transmitted by the large reduction gears which mesh with the smaller gears of the pinion shafts.

Current tractors are fitted with rear axle shafts that have been increased in diameter from 2¼ ins. to 2½ ins. and the number of splines changed from 10 to 19. To accommodate the increased splines and larger diameter shafts, the internal spline bore of the Final Reduction Gear has been enlarged to suit.

Each rear axle shaft is mounted on taper roller bearings, the outer one being lubricated through an external lubricator by the grease gun, the inner one being lubricated in the normal way from the oil contained in the axle housing. See Fig. 44. On Industrial Tractors, the rear axle shaft bearing lubricator at the outer end is in front of the housing, mounted on the brake plate, on the left-hand side and behind it, in a corresponding position, on the right-hand side. The rear axle filler plug is beneath the seat, to the left side of the cover plate.

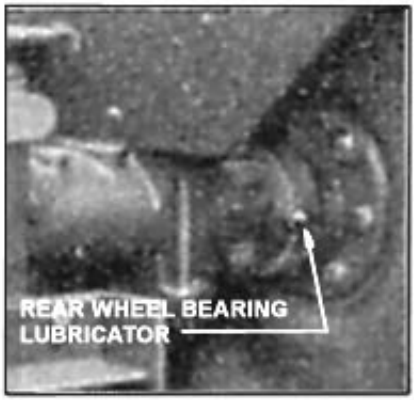


Figure 44
Rear Wheel Bearing Lubricators

A flange formed integral with the shaft, provides the mounting for the rear wheel.

REAR WHEELS

Agricultural Type

The rear wheels are bolted directly to the axle shaft flanges by studs and nuts. Earlier tractors had *left-hand threaded studs and nuts* on the *left-hand side* of the tractor. Right-hand nuts are stamped R and left-hand nuts are stamped L, on one of the hexagons.

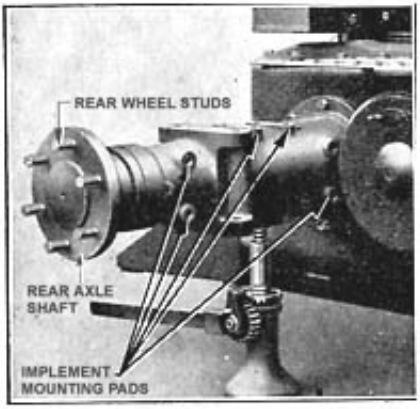


Figure 45
Rear Axle Shaft

To remove the rear wheel, apply the handbrake, place the jack in position beneath the rear axle housing, see Fig. 45, but before raising the wheel fully from the ground, loosen the six wheel nuts with the spanner provided in the tool kit. Raise the wheel fully and then unscrew the nuts when the wheel can be removed from the studs. Take care not to damage the threads by allowing the weight of the wheel to be taken on the studs.

To replace the rear wheel, ensure that the flange of the axle shaft and the mating flange of the wheel are clean. Then place the wheel in position so that the register on the flange of the shaft enters the counterbore, with the dished side of the wheel centre towards the tractor. Take care not to damage the wheel stud threads when mounting the wheel in position. Install the washers on the studs, tapers to the wheel.

Refit the nuts, *which are not interchangeable from side to side on earlier tractors due to their being right-hand threaded for the right-hand side and left-hand threaded on the left-hand side.* The letter R or L, stamped on the hexagon, provides a means of identification. Apply a little grease to the threads of the nuts before these are finally tightened. Do not tighten these nuts consecutively round the circle, but pull them up, a little at a time, diagonally, i.e., across the circle. This will ensure that the wheel is correctly seated and will minimise any tendency for the nuts to work loose when the tractor is working.

Lower the jack and remove it, again giving the nuts a final tighten after the tractor has been in use for a short time.

Row Crop Type

The width between the wheels may be altered in stages of 4 in. due to the fact that the wheel disc is offset with respect to the axle shaft flange and may be reversed, in conjunction with the wheel rim which has spoke mountings, also offset in relation to the wheel centre. Thus

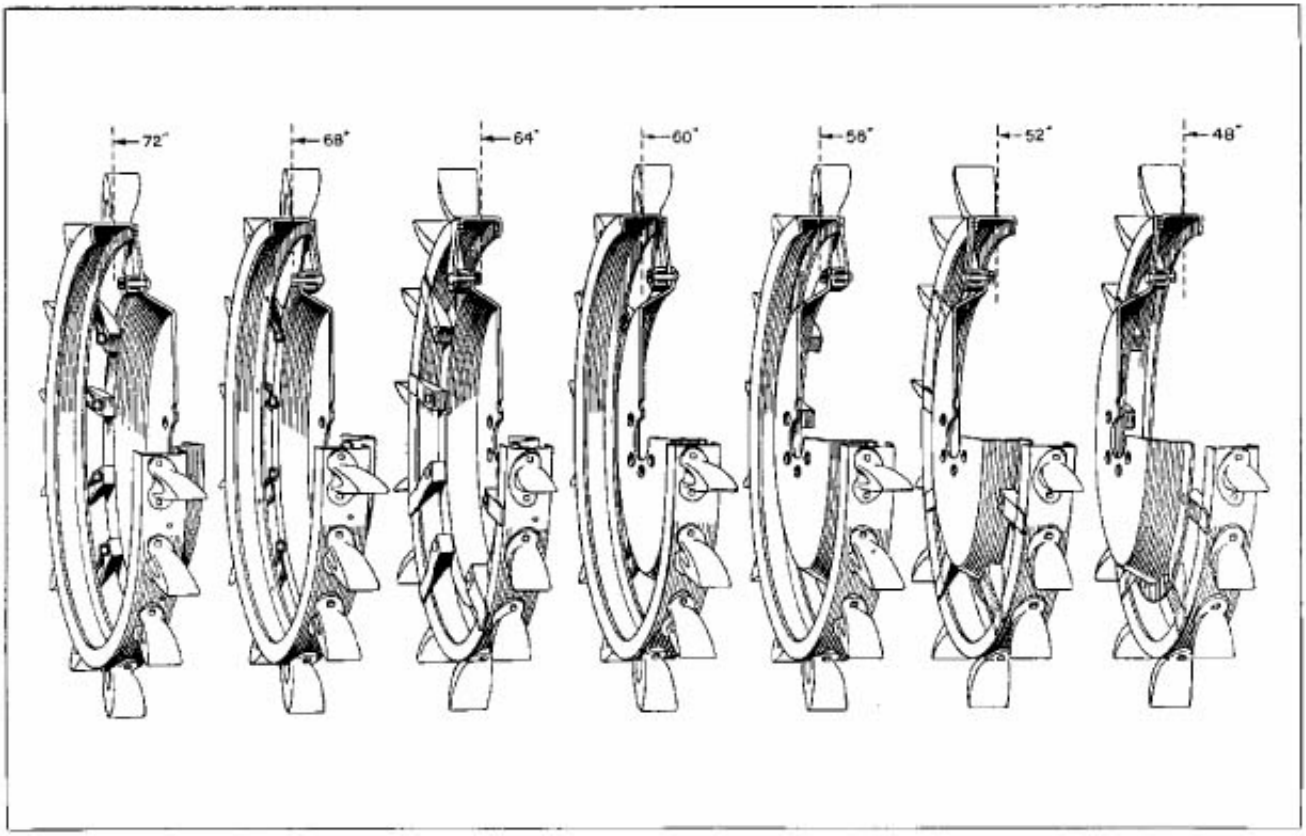


Figure 46
Adjustment for Row Crop Rear Steel Wheels

track widths of 48" (121.9 cm.), 52" (132 cm.), 56" (142.2 cm.), 60" (152.4 cm.), 64" (162.6 cm.), 68" (172.7 cm.) and 72" (182.9 cm.) may be obtained by suitably mounting the wheels and wheel discs as illustrated in Fig. 46.

When pneumatics are fitted the minimum width obtainable is 52 ins. (132 cm.), not 48 ins. (121.9 cm.).

For track widths of 48" (121.9 cm.), 52" (132 cm.), 56" (142.2 cm.) and 60" (152.4 cm.) the *wheel disc* has the dished part *towards* the tractor whilst for track widths of 64" (162.6 cm.), 68" (172.7 cm.) and 72" (182.9 cm.) the dish is *outwards* or away from the tractor. The wheel itself may be reversed and bolted to the outer or inner face of the wheel disc as shown in Fig. 46 for the various combinations. For instructions on fitting extension rims see Page 107.

WHEELS WITH PNEUMATIC TYRES—TYRE REMOVAL

Tractors fitted with pneumatic tyres have wheels of the well-base type which renders tyre removal or replacement, if required, a straightforward operation if the following instructions are followed.

Completely deflate the tyre and place the wheel flat on the ground. Unscrew the valve lock nut on rear wheels and then 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. The inner tube may then be removed when the tyre valve has been withdrawn from its location in the wheel rim.

To remove the tyre completely, work the other bead into the well-base and then similarly lever it over the rim edge.

REAR DUAL WHEELS—REMOVAL

When operating tractors, equipped with dual rear wheels, under heavy soil conditions the space between the dual tyres may become clogged with soil which will become packed quite solid.

To avoid the possibility of personal injury, wheels in this condition must not be detached unless the soil is removed or the tyres deflated.

This is most important as if the soil is left packed solid between the tyres when the wheels are removed, the force is sufficient to strip the last few threads of the wheel studs.

TYRE REPLACEMENT

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 the cover and wheel so that it revolves in the direction indicated.

Should the tyre have been removed completely, place the wheel on the ground and work one side of the tyre bead 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.

Prepare the cover by lightly dusting the inside with French chalk. Inflate the tube until it begins to round out and lubricate the base half of the tube, also the inside and outside of the beads of the tyre with a frothy solution of soap and water or French chalk, before inserting the tube in the cover.

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

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.

Before inflating, make sure the tyre beads are on the rim seat and then inflate until the beads are fully seated. Then remove the valve core and so deflate the tube completely; on again inflating the tyre the tube will have been permitted to take up its position so there is no undesirable local stretching present. This is most important with tubes of synthetic rubber. Tighten the valve lock nut when the tyre is fully inflated.

TYRE PRESSURES

On new tractors, tyre pressures may be above normal. This is to avoid undesirable deflation in storage and pressures should be corrected before the tractor is put into use, see below :—

Industrial and Land Utility Tractor—Front tyre size 6.00—19. Tyre pressure 25 lbs. per sq. in. (1.758 kg. per sq. cm.).

Industrial and Land Utility Tractor—Rear tyre size 11.00—36. Tyre pressure for land work, min. 11 lbs. per sq. in. (0.733 kg. per sq. cm.); for road use 14 lbs. per sq. in. (0.984 kg. per sq. cm.).

Tyres, 11–36 size, marked " Replaces 9.00–36 " must not be paired with 9.00–36 on the same tractor; either two tyres 11–36 or two 9.00–36 must be fitted, and not one of each.

SPARK PLUG AIR PUMP

To inflate tyres to the correct pressures as indicated above, a spark plug air pump is supplied and should be used as follows :—

Remove one spark plug, reconnecting its lead and earthing it by laying the plug on the cylinder head.

Screw the pump unit on the plug orifice, by hand only, and attach the pump connection on the hose end to the valve.

For best results the engine should be run slowly.

WATER BALLAST FOR REAR WHEELS

If it is found necessary to increase adhesion on the rear wheels where extra draw-bar pull is required on tractors having pneumatic tyres, water may be pumped into the inner tubes to provide additional weight.

To provide protection against frost a suitable anti-freeze solution must be used, otherwise ice may form inside the tube, become broken up when the tractor is used and so cut the tyre or tube, rendering them unfit for further use.

A suitable anti-freeze solution, which will not affect the valve core, inner tube or outer casing, is water mixed with calcium chloride ($Ca\ Cl_2$). 2 lbs. (.2 kg.) of *commercial* calcium chloride should be dissolved in each gallon (litre) of water, increasing the quantity of calcium chloride proportionately if considerable frost is anticipated.

Mix the solution, *adding calcium chloride to the water first*, in a wooden barrel or container for preference. Allow to cool before pumping the solution into the tyre.

Common salt may be used as a substitute for calcium chloride and should be used in the proportion of 2 lbs. per gallon (.2 kg. per litre) of water.

Radiator anti-freeze solutions must not be used in tyres or calcium chloride solution used in the radiator.

The solution may be put into the tyre either by gravitational methods with a tank 6 to 8 feet (1.8 to 2.5 m.) above the tyre or by means of an ordinary hand pump in conjunction with one of the special adaptors.

Adaptor N–1726–A can be identified by means of the deflator valve button on the side of the adaptor. Adaptor N–1726–B can be distinguished by means of a thin metal tube, one end of which passes through the side of the adaptor, the other end projecting through the valve screw end. A plastic tube is supplied with this adaptor and should be placed over the metal tube projecting from the screw end of the adaptor. The length of tubing supplied is for use with 11.00 — 36 tyres and approximately 2 inches (5 cm.) must be cut off the end if 9.00 — 36 tyres are to be filled. In any case, ensure that the tube does not foul the crown of the inner tube.

Proceed as follows :—

1. Jack up the rear of the tractor, turn the wheel to bring the valve to the top with the deflator valve button type or the bottom of the wheel with the plastic tube type adaptor.
2. Secure the tyre valve with a piece of wire to prevent it slipping inside the rim, then unscrew the valve core, so releasing all pressure in the tube.
3. Connect up the adaptor to the valve, passing the plastic tube through into the crown of the tyre when using the latest type adaptor. Do not place the tube in position until the valve is to the wheel top. Connect up the solution line from the pump or other container used.

4. Pump in the solution or allow it to enter from the gravitational tank if this method is used. When using the deflator valve type adaptor, the solution should be periodically shut off and the deflator button located on the adaptor pressed to release any trapped air from the inner tube. The tube is filled to the correct level when the deflator is pressed and the solution issues from it in a stream. With the plastic tube type adaptor gradually turn the valve round while the liquid is flowing into the inner tube until the valve is at the top, so that the air can escape. When water issues from the small pipe in the side of the adaptor with the valve in the top position the tyre is full.
5. Remove the adaptor quickly, replace the valve core and inflate the tyre to about 30 lbs. per sq. in. (2.11 kg. per sq. cm.) to seat the cover beads correctly. Then reduce the pressure to 2 lbs. per sq. in. (.14 kg. per sq. cm.) above the normal working pressure to allow for the added weight. For tyre pressures see Page 84.

REAR WHEEL WEIGHTS

To increase rear wheel adhesion, wheel weights may be fitted and used either in conjunction with water ballast or not as required. Each weight is of cast-iron and weighs approximately 100 lbs. (45.36 kg.), and normally 300 lbs. (136 kg.) on each rear wheel will be found suitable for most conditions. They should be equally distributed on each wheel and may be obtained in sets, comprising weights, bolts, nuts, etc., through your authorised dealer.

Note that the weight (E27N–1065) which is to be bolted directly to the wheel disc differs slightly from the auxiliary weight (E27N–1076)

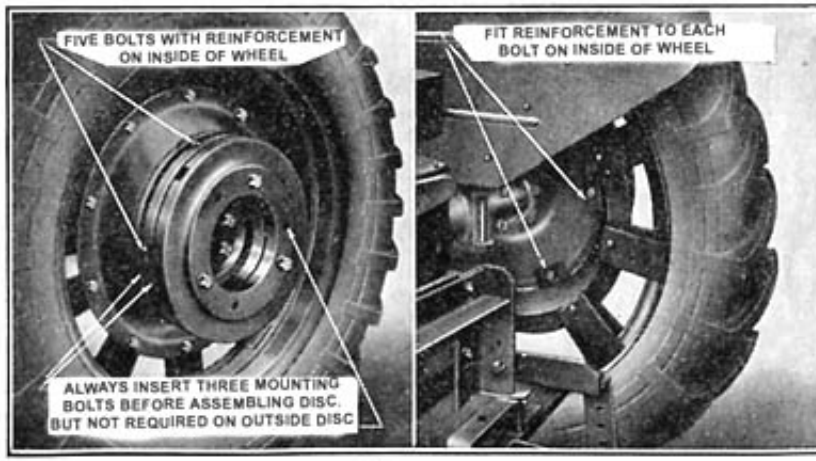


Figure 47
Rear Wheel Weights

as the former has five mounting holes drilled in the periphery of the weight and the latter five recesses at this point.

Fit the weights as follows :—

Assemble the five reinforcement discs (E27N–1077) on the bolts (21198–S) and insert the bolts from the *inside* of the wheel disc. If the wheel weight only is to be used, secure it to the wheel disc by the five bolts, nuts and washers. (See Fig. 47.)

Should, however, auxiliary weights be required, it will be necessary to fit the three mounting bolts (23103-S) with the head in the recessed hole provided **before** securing the weight to the rear wheel disc. Assemble the auxiliary weight to these three bolts, using the nuts and washers provided and if further additional weight is desired, adopt the same procedure, making certain that the three bolts are assembled to the preceding weight **before** securing it to the wheel disc or auxiliary weight.

On Tractors having undrilled wheel discs, mark off five points at a diameter of 20.19 ins. (50.85 cm.), each being spaced 72° apart, and drill $\frac{11}{16}$ in. diameter holes in the disc. The weight (E27N-1065) may also be used as a template for drilling but if this method is adopted the holes must be concentric with respect to the wheel disc.

On Industrial Tractors a rectangular section weight is bolted in the angle of the sub-frame beneath each rear wheel, each weight being 100 lbs. (45.36 kg.).

ADJUSTABLE DRAWBARS AND IMPLEMENT PADS

The forward end of the drawbar is mounted beneath the rear axle housing at the front end on early tractors and is free to move sideways at the rear end either side of the centre line across a rack to which it may be locked in any one of thirteen positions.

On later tractors the drawbar is adjustable for sideways travel, nine positions are provided and may also be adjusted for height by removing one bolt each side of the longitudinals and raising or lowering the drawbar as required. There are three alternative positions for height adjustment and one for the rear cross bracket.

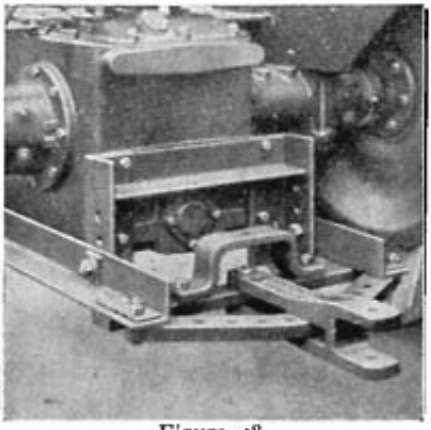


Figure 48
Drawbar Mounting

Beyond ensuring that the bolts at the front and rear end are always kept tight (Fig. 48) no further attention is required. Since the drawbar is designed to transmit the pulling effort of the tractor no attempt is to be made to attach implements by bolting attachments to the power take-off shaft flange which is not intended for such a purpose.

Implement pads are provided on the tractor as under :—

(*a*) Rear axle housings. See Fig. 45.

(*b*) The right- and left-hand side of the transmission housing.

(*c*) Cylinder front cover beneath radiator.

(*d*) Top rear face of the rear axle housing. No holes are drilled and if it is necessary for implements to be attached at this point the holes must be drilled in accordance with Fig. 49.

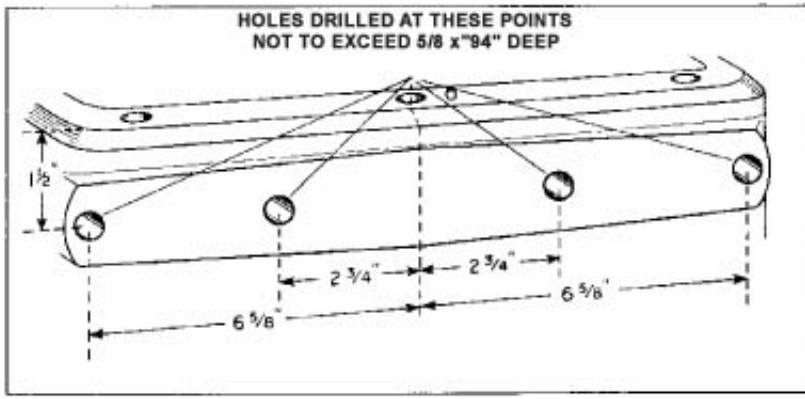


Figure 49
Rear Implement Mounting Pad

Power Take-off Attachment

A power take-off, independent of the belt pulley attachment, may be fitted to Fordson Major tractors having Type 4.3 (low speed top gear) or Type 7.7 (high speed top gear) transmission, standard or special ratio (intermediate gears): the drive is taken from the gearbox by replacing the cover plate below the gear box with the take-off unit and the drive is led to the rear of the tractor, the shaft being splined for the attachment of suitable fitments.

Due to the differing gears for the Type 7.7 (high speed top gear) and Type 4.3 (low speed top gear) ratios it will be necessary for the power take-off installation to be correctly mated with the existing gears both of the tractor gearbox and the power take-off unit.

The ratios fitted to the tractor when produced are indicated by a series of numbers stamped on the right-hand flange of the gearbox housing towards the top where this mates with the flywheel housing.

The identification numerals are tabulated on page 6.

The power take-off for fitting on the Type 4.3 (low speed top gear) transmission differs from that for the Type 7.7 (high speed top gear) as shown in the following tabulation, irrespective of standard or special ratio (intermediate gears).

TRACTOR GEAR BOX

Ratio.	No. of Teeth on Low Transmission Pinion.
Type 7.7 (High speed top gear)	20
Type 4.3 (Low speed top gear)	26/20

POWER TAKE-OFF UNIT

Ratio.	Type of Idler Gear.
Type 7.7 (High speed top gear)	Double Idler Gear
Type 4.3 (Low speed top gear)	Single Idler Gear

The direction of rotation of the power take-off shaft viewed at its splined driving end at the rear of the tractor is *clockwise*.

To fit the power take-off unit it will be necessary to drain off the oil from the gearbox and also the rear axle.

Unscrew the seven bolts from the horizontal flange of the bottom cover and five bolts from the vertical flange and remove the cover. Re-use the gaskets only if undamaged, otherwise fit new ones, holding them in position with a film of grease at the crankcase joints.

For the **vertical** flange two gaskets of different thickness have been used, .006 in. (.152 mm.) and .012 in. (.3 mm.) : if only the former are available, use two together. Gaskets at this point must not overlap the chamfer and reach the horizontal flange or an oil leak may result ; cut back the gasket, if necessary, to suit.

Bolt the power take-off unit in position and tighten the bolts a little at a time so that it fits firmly against the right-angled faces of the gearbox. Check the drain plug in the housing ; a gasket is used at this point and must be in place before the plug is finally tightened.

To install the power take-off shaft remove the four bolts securing the cover plate to the rear axle housing at the centre just above the draw-bar platform. If the gasket is damaged, clean off all traces from the housing face.

With the outer bearing and spacer pressed on to the shaft, insert it in the housing, so that the internally splined end may be engaged with the splined shaft of the power take-off unit. This can be located and the splines engaged before the ball bearing assembly at the rear enters the location of the axle housing.

Then press the shaft and its bearing into the housing ; position a new gasket on the housing flange and ensure that the oil seal is correctly installed in the retainer. The sharp edge of the seal must be fitted so that it is towards the bearing. Bolt the bearing retainer in position, taking care not to damage the oil seal when inserting this over the splined end of the shaft or to disturb the gasket. Tighten the four bolts securely, then test the shaft for freeness by turning it by hand when in the neutral position, i.e., with the slotted end of the shifter shaft in its outermost position.

Connect up the control lever so that the offset handle is towards the left-hand side, to clear the tool box. The mounting for this lever is at the left-hand side of the housing, to the rear of the axle flange.

The control rod lever is fitted so that the end having the greater distance from the slotted hole at the centre is to connect up with the control rod. Bolt the other end to the housing with the special bolt supplied, using a flat washer and spring washer. Test for free operation before installing the cotter through the yoke end of the shifter shaft and the slotted end of the lever. Secure the cotter with the cotter pin, the legs of which must be well opened to prevent it working out in use.

Connect up the control rod to the lever and note that at the rear a castellated nut and bolt is used to secure the rod to the operating lever. Check the lever to ensure that it operates the mechanism correctly before filling the gearbox and rear axle housings with oil. If that oil which was drained out is to be re-used it must be carefully filtered to remove any foreign matter which might be present.

Inspect the drain plugs and other joints to ensure that there is no oil leakage. (See note on Page 28 re Rear Axle Drain and Level Plugs.)

When out of use the shaft may be protected by the cover which is secured by two bolts.

To engage the Power Take-off drive when the engine is running, hold out the clutch by pressing down the clutch pedal and move the control lever forwards to mesh the gears. If the control lever cannot be moved forward to the full extent of its travel due to the gears not sliding readily into mesh, release the clutch pedal momentarily which will alter their relative positions and allow them to be then meshed easily. When the power take-off shaft is coupled up and the tractor is stationary, allow the clutch pedal to be released slowly to take up the drive gradually, without imposing strain on the various parts of the drive.

The Hydraulic Power Lift Attachment

GENERAL

Provision is made on all Fordson Major Tractors for a Power Lift attachment for " Unit " equipment. This is optional equipment which may be already fitted or may be installed by the owner.

The lift drive is installed in place of the cover plate on top of the gearbox and takes its drive from the low transmission gear on the upper transmission shaft. The pump and lift assembly is mounted on the rear axle housing top cover.

Two types of lift drive gears are available to suit tractors with either Type 7.7 (high speed top gear) or Type 4.3 (low speed top gear) ratios.

The top gear ratio fitted to the tractor when produced is indicated by numbers stamped on the front right-hand flange of the gearbox housing towards the top, these numerals being indicated on page 6. Should there be any doubt, since these might have been altered in service and the numbers on the flange left as originally marked, the following will assist in positive identification.

GEARBOX		LIFT DRIVE ASSEMBLY			
Gear	Identification Markings	No. of teeth on Transmission Low Gear	No. of teeth on Idler Gear	No. of teeth on Drive Gear	Length of Drive Shaft
Type 4.3 (low speed top) Standard ratio (intermediate gears) Special ratio (intermediate gears)	S.T.D. 43 (Green Spot) SR 43 (Red Spot)	21	26	29	13 $\frac{27}{32}$ * or 18 $\frac{7}{16}$ †
Type 7.7 (high speed top) Standard ratio (intermediate gears) Special ratio (intermediate gears)	S.T.D. 75 (Green Spot) SR 75 (Red Spot)	27	23	29	13 $\frac{27}{32}$ * or 18 $\frac{7}{16}$ †

* Single-lever type lift. † Two-lever type lift.

The direction of rotation of the lift drive shaft viewed from the rear of the tractor is anti-clockwise.

INSTALLATION

Remove the gearbox top cover plate. It should be noted that the bolt nearest the hand brake lever is of a smaller diameter than the remaining bolts. Remove the seat and spring from the rear axle housing top cover and detach the seat from the spring. Remove the tool box.

Place the lift drive assembly in position on the top of the gearbox, using a new gasket if the old one has been broken or torn, and fit the bolts and lockwashers. Ensure that the smaller diameter bolt is toward the hand brake lever and that the bolts are tightened evenly.

Slide the pump shaft (drilled) coupling onto the pump shaft and then ream out the pump shaft hole to $\frac{3}{16}$ in. diameter for the pin. Pin the coupling to the shaft, and then locate the lift drive shaft (tongued) coupling on the lift drive shaft. Line up the two couplings so that they engage easily when the pump is slid into position.

Slide the hydraulic power lift pump assembly into position on the rear axle housing top cover, ensuring that the two couplings are fully engaged, and bolt the pump assembly to the cover. Place the two halves of the pump drive shaft guard round the drive shaft and tighten the cover clips so that it is firmly held on the pump and pump drive housings.

Fit the lift arms (E27N-994620, Right-hand side and E27N-994621, Left-hand side) with the offset outwards and nearly horizontal when in the lowered position.

Attach the seat to the new spring (supplied with the kit) and then bolt the spring and seat assembly to the top of the hydraulic pump housing.

Relocate the tool box on the L.H. side of the engine, using two supports and longer cylinder head studs. It will be necessary to drill two more holes in the tool box, in line with the existing two holes in the bottom of the tool box, to fasten it to the support with the nuts and bolts provided. The large hole in the base of the tool box should then be blocked up to prevent any tools being lost.

Fill the hydraulic pump housing with the correct quantity of oil of the correct grade.

There are two different types of hydraulic pump and lift assemblies, one having a single control lever mounted on top of the pump casing and the other has two control levers, one at each side of the pump

casing. The Single lever type has an oil capacity of 2 gallons and the Two lever type has an oil capacity of 7 pints. There is no separate oil level plug fitted on either type of pump assembly, the correct oil level is when the oil is just below the filler plug orifice.

MAINTENANCE

No provision is made for the lubrication of the pump drive assembly as this is lubricated by oil splashed up from the gearbox.

The hydraulic pump and lift assembly operates in its own independent filtered oil supply. It is recommended that the oil should be drained after the first 50 hours working, and thereafter at regular intervals, and refilled with the correct grade of lubricant. The oil capacity of the Single lever type hydraulic lift is 2 gallons (9.09 litres) and of the Two lever type hydraulic lift 7 pints (4 litres). Use the lubricant supplied under Part No. M–100502–C and available from your Fordson Dealer for the Two Lever pump. The recommended grades of lubricant for the Single Lever pump are as follows :—

Above 32°F.	S.A.E. 50
Above 0°F.	S.A.E. 20 or 20W
Above —20°F.	S.A.E. 10W
Below —20°F.	S.A.E. 10W plus 10% kerosene.

The oil filler plug is at the top of the pump casing at the rear. The oil drain plug for the Single lever type hydraulic lift is the lower bolt holding the rear cover in position and on the Two lever type hydraulic lift it is located on the left-hand side of the pump casing. There is no separate oil level plug fitted : the correct level of the oil is just below the filler plug orifice, or up to the level marked on the dip-stick on later type Two lever hydraulic lifts.

Should the lift have been out of use for some time, before it is used for normal lifting purposes, it should be allowed to operate light for a short period to ensure the oil has circulated to all the working parts.

Periodically lubricate the lift arm cross shafts by forcing a good quality soft grease through each of the two lubricators.

OPERATING INSTRUCTIONS

Hydraulic Power Lift Drive.—The hydraulic power lift drive is easily engaged by declutching and moving the control lever forwards when the drive will operate all the time the engine is running, and the clutch pedal is released. The drive is disengaged by pushing the lever rearwards.

Always disengage the power lift drive when the hydraulic lift is out of use to eliminate unnecessary wear.

Single Lever Type Hydraulic Lift.—The " up " and " down " positions of the control lever are marked on the casting. There is a neutral position to which the handle is automatically returned on completion of the lift.

(1) *To attach the implement*

Move the lift control lever to the " down " position when the lift arms will be lowered and the implement may then be attached.

(2) *To raise the implement*

After ensuring that the power lift drive is engaged, move the lift control lever smartly to the " up " position and release the lever. When the implement is fully raised, the control lever will automatically return to the neutral position.

If the lever is restrained from returning to the neutral position, the pump will operate unnecessarily, although a relief valve will come into operation to prevent excessive pressures being built up in the hydraulic system. As soon as the control lever is released it will return to the neutral position.

(3) *To lower the implement*

Move the lift control lever smartly over to the " down " position when the oil will be released from the hydraulic system and the implement will be lowered. At the completion of the drop the control lever will not return to the neutral position.

The rate at which the implement is lowered is fixed by an external screw adjustment adjacent to the control lever. On manufacture the rate of fall is set at 2 to 4 secs. To **increase** the rate, slacken off the locknut and **tighten up** the adjuster; to **decrease** the rate, slacken off the locknut and **unscrew** the adjuster. Always tighten the locknut after adjusting the rate of lowering.

(4) *External Hydraulic Tapping*

An external high pressure oil feed, tapped ½ in. B.S.P., is provided on the left-hand side of the pump body for actuating external jacks when required.

If the external high pressure tapping only is in use, the pump control lever should be moved to the " up " position when the lift arms will be raised before actuation of the external jacks begins and they will remain up during successive operations.

Two Lever Type Hydraulic Lift.—There are two control levers :—the right-hand control lever controls the lift arms and the left-hand control lever controls the supply of oil to external hydraulic jacks when these are to be used. The " up " and " down " positions of the lift control lever are **not** marked on the casting. There is **no** neutral position of the lift control lever. A stop is provided across the jack lever gate on later units to prevent this lever being accidentally moved into the operating position.

(1) *To attach the implement*

Pull the **right-hand** lift control lever **upwards** as far as possible when the lift arms will be lowered and the implement may then be attached.

(2) *To raise the implement*

After ensuring that the power lift drive is engaged. Push the **right-hand** lift control lever **down** as far as possible, and release the lever, when the implement will be raised.

(3) *To lower the implement*

Pull the **right-hand** lift control lever **upward** as far as possible when the oil will be released from the hydraulic system and the implement will be lowered. No external provision is made for the adjustment of the rate of lowering of the implement.

(4) *External Hydraulic Tapping*

An external high pressure oil feed, tapped $\frac{1}{4}$ in. B.S.P., is provided on the left-hand side of the pump body for the actuation of external jacks. If the high pressure tapping only is in use, the **left-hand** or shorter jack control lever should be pushed **downward** as far as possible and held there to extend the jacks and pulled upward as far as possible and held there to release the jacks.

As soon as the jacks are at the extended position the lever should be released, when it will be pulled back to the centre position by the centralizing spring. The pump will be loaded unnecessarily if the lever is held in the downward position after the jacks are extended.

Replace the stop across the jack lever gate on later units to prevent the jack lever being accidentally moved into its operating position.

TO CLEAN THE OIL FILTER

Single Lever Type

To drain the oil, remove the bottom screw holding the rear cover in position.

Remove the screws holding the left-hand cover in position and remove the cover. The filter can then be drawn away from the impeller housing and washed in petrol or paraffin.

Refit the filter, side cover and drain plug.

Clean round the filler plug on the top of the rear cover and remove it. Refill to the level of the filler plug orifice with fresh winter grade

(S.A.E. 50) (see also page 94) engine oil using a No. 60 mesh filter to prevent any foreign matter entering the casing. The oil capacity is 2 gallons (9.09 litres).

Two Lever Type

To drain the oil, remove the drain plug on the right-hand side of the lift casing.

Remove the screws holding the rear cover in position when the oil filter, situated below the ram cylinder can be removed.

Clean the filter in paraffin or petrol.

Replace the filter, ensuring that it is properly connected to the suction pipe.

Refit the rear cover plate and replace the drain plug.

Clean round the oil filler plug on top of the lift casing and remove it. Refill the lift casing to the level of the filler plug orifice or up to the level mark on the dipstick on later units with fresh oil of the correct grade, which is available from your dealer under Part Number M-100502-C, see page 94, using a No. 60 mesh filter to prevent any foreign matter entering the casing. The oil capacity is 7 pints (4 litres).

Hydraulic Lift Linkage

Before attempting to attach any implement to the hydraulic lift linkage, it is essential to ensure that the linkage is properly assembled.

Check that the lift arms are fitted in their correct position. For rear mounted implements, the arms should make an angle of approximately 39° below the horizontal (the eye of the lift arm should be approximately $\frac{1}{8}$ in. (3 mm.) above the base of the pump). If this condition is not obtained, *i.e.*, the arms make an angle of 14° approximately

to the horizontal (the eye of the lift arm is approximately 4½ ins. above the base of the pump), then the lift arms are fitted on the wrong side of the pump and should be transposed.

Where the lift arms are stamped with the letter " R " or " L," the one stamped " R " is fitted to the right-hand or furrow-side and the one stamped " L " is fitted to the left-hand or land-side of the pump.

Ensure that the lifting rods are assembled correctly for the type of work to be undertaken.

The lifting rods comprise a clevis end for connecting to the lower link and an inner sleeve, tapped at the upper end to accommodate a screw from the levelling box on the furrow side or from the lift arm on the land side.

The lower hole in the clevis is connected to the lower link for tractors with pneumatic tyres and the upper hole for steel-wheeled tractors (see Figs. 50 and 51).

The inner sleeve has two holes drilled in the lower end at right-angles and 1¼ in. (32 mm.) apart. The pin retaining the sleeve to the clevis is located through the hole at the rear of the clevis and the lower hole of the sleeve when ploughing and, in the case of the land-side lifting rod, the length of the rod should be adjusted so that the distance from the upper hole of the clevis to the knuckle eye at the lift arm end is 21 in. (53.3 cm.) as shown in Fig. 50 and the locknut tightened up in this position.

When using the plough or an implement with not more than one depth adjusting wheel, it is essential that lifting rods are fitted and that the locating pin is fitted in the lower hole (see Fig. 50) so that the lifting

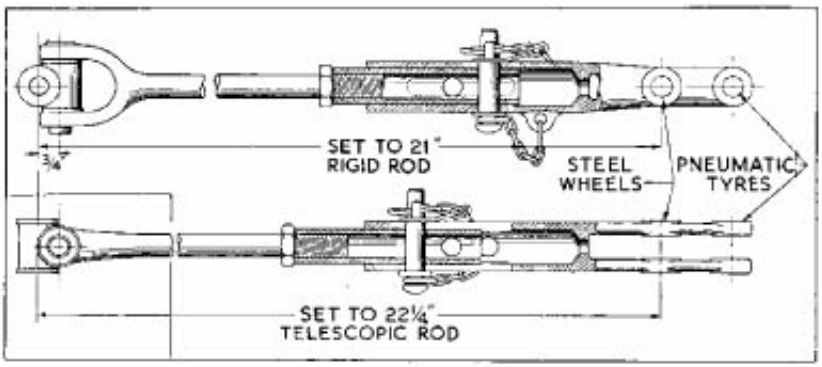


Figure 50
Lifting Rod

rod is rigid. If it is attempted to plough with the locating pin in the slot, the rod is then telescopic, and it will be impossible to control the depth of ploughing on the depth wheel. Levelling of the implement is then controlled by the levelling lever on the furrow-side lifting rod.

When using a toolbar, or implement with more than one depth adjusting wheel, the locating pin is fitted in the slot in the clevis and the upper hole in the inner sleeve, as shown in Fig. 50, so that the rod is telescopic and will not interfere with the depth control wheels on the implement.

When the lower links are attached to brackets welded on the drawbar frame the drawbar position should be adjusted according to the tractor wheel equipment as shown in Fig. 50, *i.e.*, in the lower hole for pneumatics or the second for steel wheels.

Where continuous ploughing at shallow depths is undertaken, it may be advisable to adjust the drawbar position one hole higher than that shown in Fig. 51, so that the load on the tractor is reduced and the lower links are brought into the line of draught.

The check chain position should then be adjusted according to the location of the drawbar as shown in Fig. 51. When the check chain has been fitted correctly, its length should be adjusted by rotating the turnbuckle, so that it is as slack as possible when the plough is at work and at the same time short enough to prevent the plough or lower links fouling the tractor wheels or the drawbar in the lifted position.

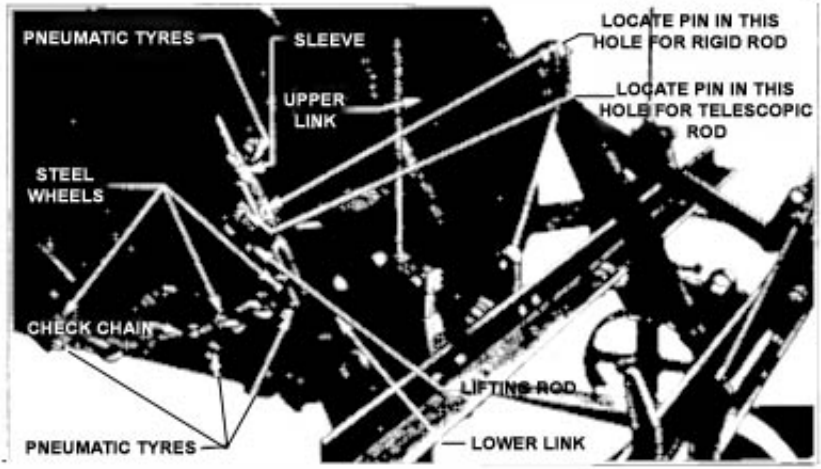


Figure 51

Hydraulic Lift Linkage

The Hydraulic Automatic Clutch Release

The hydraulic automatic clutch release is designed to provide a positive means of clutch disengagement, when excessive resistance to the earth working parts of the implement is encountered.

The unit, together with its upper link support bracket assembly and linkage, replaces the standard upper link and support bracket.

INSTALLATION INSTRUCTIONS

(*a*) It will be necessary to remove the existing upper link support bracket, and install the new upper link support bracket assembly (see Fig. 52). This assembly is secured to the upper link bracket plates by the same four bolts, washers and nuts.

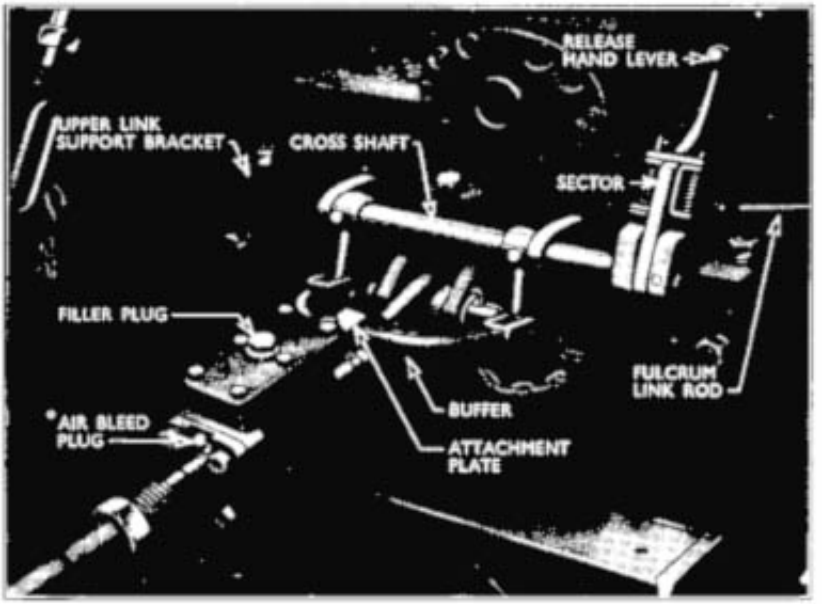


Figure 52
Hydraulic Top Link and Release Lever

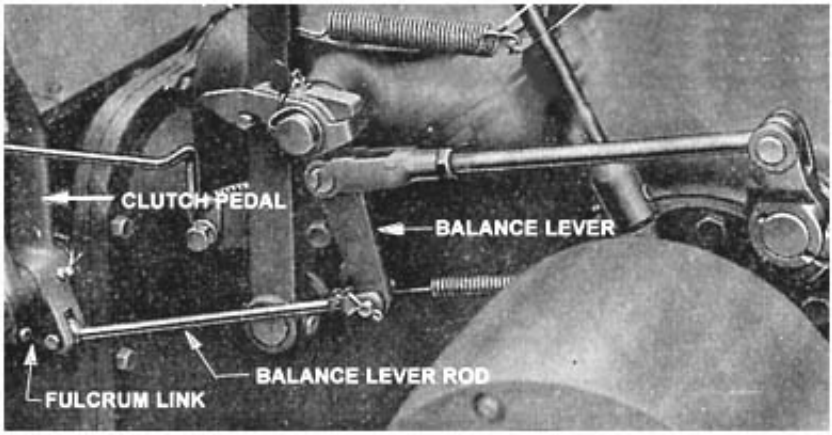


Figure 53
Release Linkage

(*b*) Attach the buffer to the legs of the cross shaft and secure by means of a clevis pin and split pin at each side.

(*c*) Remove the existing clutch pedal to balance lever rod (see Fig. 53).

(*d*) Fit the fulcrum link in the forked end of the clutch pedal.

(*e*) Connect the shorter rod between the fulcrum link and the balance lever.

(*f*) The long, cranked fulcrum link rod assembly should now be fitted with the slotted end of the rod to the clutch pedal fulcrum link.

(*g*) Pull the hand lever rearwards so that it hangs in a downward position.

(*h*) Pull the buffer rearwards, avoiding the fulcrum link rod clevis, thus rotating the cross shaft towards the tractor.

(*i*) Place the hydraulic clutch release in its location in the upper link support bracket, fit the pin and retain it in position by the lynch pin. Secure the unit to the buffer by means of the attachment plate, securely tightening the attachment plate bolt.

(*j*) Ensure that the clutch is engaged and push the hand lever assembly forward so that the left-hand spring-loaded plunger is on top

of the left-hand cam and the right-hand plunger abutting the right-hand cam. (See Fig. 53).

(*k*) Adjust the forked end of the fulcrum link rod so that the hole in the forked end lines up with the hole in the hand lever sector, and then insert the clevis pin through the rod and sector, and secure by means of a split pin.

(*l*) Fit the retracting spring and clamp to the fulcrum rod hooking the face end of the spring through a $\frac{1}{4}$ in. diameter hole drilled in the vertical flange of the right-hand platform at a point which will allow the spring a direct pull. Adjust the clamp so that the spring is in tension, when the clutch is engaged.

The hydraulic automatic clutch release and linkage assembly is now set ready for work.

OPERATING INSTRUCTIONS

The only adjustment necessary to the hydraulic automatic clutch release is the setting of the relief valve to provide a suitable breaking load for varying soil conditions and cultivating operations.

The relief valve is easily adjusted by removing the unit from the tractor.

To Remove

Detach the implement.

Remove the attachment plate.

Release the plungers by moving the hand lever forward.

Pull the buffer rearwards.

Remove the lynch pin, and then the pivot pin, when the unit can be removed.

Line up the hole in the joint ball with the hole in the tractor end of the link. A screwdriver can now be inserted through these holes, when the relief valve adjusting rod can be screwed in or out as required.

The average setting of the adjusting rod from the fully tightened position for general conditions, is as follows :—

Light work	7 to 9 turns
Heavy work	5 to 7 turns

If operating conditions are such that a setting above that for which the unit is already set is required, the adjusting rod may be screwed in a clockwise direction until the necessary breaking load is obtained. For reducing the operating pressure, the adjusting rod should be turned anti-clockwise.

To Release the Clutch and Reset the Unit

When the tractor has been brought to rest after the disengagement of the clutch, the gear lever should be moved to the neutral position.

Further depress the clutch pedal, and move the hand release lever forward, which will cause the spring-loaded plungers to be raised, the inner plunger being lifted over the cam, which is welded to the top bracket, the outer plunger being lifted clear of the cam which is pinned to the cross shaft.

The linkage to the clutch pedal will now be released, allowing the clutch to be re-engaged, and the hand lever sector returned to its normal position.

Disengage the clutch, and select reverse gear.

Slowly re-engage the clutch, and at the same time raise the implement, so that the action of reversing and raising the implement is co-ordinated in order to ensure it is clear of the obstruction.

MAINTENANCE

The unit is completely self-contained, and does not require lubricating, since it operates in its own oil supply.

The oil capacity is a half pint of hydraulic fluid, part number M-100502-C, available from your Fordson dealer.

The filler plug and air bleed plug are clearly illustrated in Fig. 52.

No maintenance is required, apart from topping up, and this will not be necessary unless external oil leaks are evident.

An oil level plug is provided on the left-hand side of the cylinder, and oil should be maintained at this level.

Should the unit lay idle for some time, it is suggested that before using, the oil level is checked, and the system bled.

In the event of the unit operating, and so causing the clutch to be disengaged without obstructions being encountered, it may be due either to the adjuster rod being incorrectly set, insufficient oil, or air in the system.

With the unit detached from the tractor and implement, it should not be possible to compress the link more than $\frac{1}{16}$ in. by hand. Any movement in excess of this indicates that the unit requires topping up, or bleeding, or both.

To Fill and Bleed the Unit

(*a*) Place the unit in a horizontal position.

(*b*) Remove the oil filler plug.

(*c*) Completely compress the unit, i.e. push the piston rod as far into the cylinder as possible.

(*d*) Pour a half pint of Hydraulic Fluid (Part No. M-100502-C) slowly into the reservoir through the filler plug.

(*e*) Replace the filler plug loosely.

(*f*) Tilt the unit to approximately 30° with the air bleed plug uppermost.

(*g*) Extend the unit so that the oil will be drawn from the reservoir into the space at the head of the piston.

(*h*) Loosen the air bleed plug in the rear cover and gently tap the piston rod to expel any air which will be in the system.

(*i*) Tighten the bleed screw.

(*j*) With the link extended and placed in a horizontal position and the filler plug still loose, remove the oil level plug from the left-hand side of the cylinder when the surplus oil will drain away.

(*k*) Tighten the oil level and filler plugs securely.

(*l*) Check the unit for compression, by hand, when no more than $\frac{1}{16}$ in. movement of the rod should be possible.

If more than $\frac{1}{16}$ in. movement is observed, it will be necessary to tilt the unit, loosen the air bleed plug again, and gently tap the rod as previously mentioned.

Belt Pulley Attachment

A pulley attachment is available as special equipment, obtainable, if not already fitted to the tractor, through your nearest authorised dealer. This attachment is driven from the bevel gear on the transmission drive shaft between the engine flywheel and the gearbox and runs at the same speed as the engine.

The pulley, which has a diameter of 9½ in. (24.13 cm.)—cast iron type pulley 9¾ in. (24.76 cm.)—rotates clockwise when looking at the outer face; the attachment can be supplied with or without the clutch lever illustrated in Fig. 54, the purpose of which is to put the drive in or out of gear.

TO FIT THE ATTACHMENT

Remove the plate on the right-hand side of the housing beneath the steering gear. Take care not to lose the retraction spring, with a distance piece, of the clutch balance lever which is secured to the adjacent bolt by a small bracket, when these six bolts are removed.

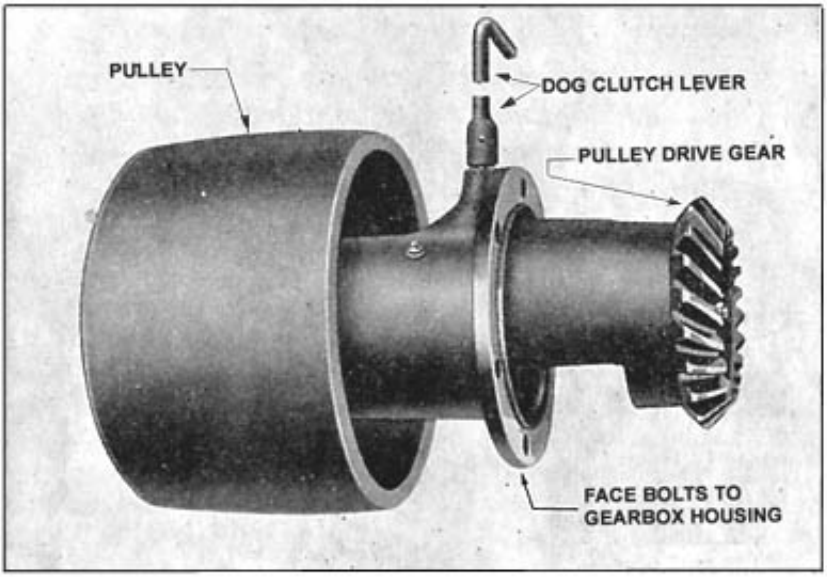


Figure 54
Belt Pulley Attachment

Ensure that the flange of the pulley attachment is clean and also the corresponding flange on the housing has the gasket undamaged. An imperfect seal at this point would permit the loss of engine oil whenever the engine is being operated.

Place the paper gaskets supplied with the attachment in position round the flange: they can most easily be kept in position with a little grease.

Install the pulley attachment with the bevel gear meshing with the bevel on the transmission shaft of the tractor. When the clutch lever is fitted to the pulley attachment this must be so arranged as to bring the handle adjacent to the hand-brake lever. Do not fit the attachment with the cut-away part of the housing uppermost or oil may work its way along the shaft in sufficient quantity to pass the oil retainer at the outer end.

Replace the bolts previously removed, the upper left-hand bolt must have the retraction spring and distance piece attached to it in the same manner as originally.

Engage the pulley attachment clutch and, holding the pulley between the hands, rock it backwards and forwards to test the backlash. 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 will have the effect of bringing the bevel gears a little further out of mesh.

Should the tractor be 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 apart from the power waste due to the maladjustment.

Before the attachment is put into use the lubricator should have a charge of grease injected through it from the grease gun. When the attachment is in constant use the bearings should be lubricated daily.

OPERATING THE PULLEY (when fitted with hand clutch lever)

Press down the clutch pedal.

Engage the pulley clutch by turning the clutch lever, see Fig. 54, clockwise. If the drive cannot be meshed readily, allow the clutch pedal to rise sufficiently for the relative positioning of the dog clutches to alter, when the lever can be turned the full amount, which is $\frac{1}{2}$ turn.

Let the clutch pedal return slowly when the drive will be gradually taken up.

When the pulley is in continuous use, it should be lubricated daily with the grease gun. This applies to pulley attachments with or without the clutch lever.

The surface of the pulley on which the belt operates is curved, the highest part being at the centre : this assists in ensuring that the belt runs truly in the centre since it tends to run to the highest part of the rim.

It is important to line up the tractor accurately so that the belt runs squarely with both the driving and driven pulleys, seating for its full width on both pulley surfaces. No oil or grease must be permitted to reach the working surfaces of the belt or pulleys or slip may be caused and an attempt to tension the belt to prevent such slipping will impose additional unnecessary loading on the belt as well as the pulley bearings.

Take care not to permit the edge of the belt to come in contact with any part of the tractor other than the pulley such as the radiator side member or the top of the front axle beam.

Two types of pulley may be fitted, the compressed fabric type, having a diameter of 9½ ins. (24.13 cm.), or the cast iron type which has a thinner rim, illustrated in Fig. 54, with an outside diameter of 9¾ ins. (24.76 cm.).

Rear Wheels and Extension Rims

For Row Crop tractors having steel wheels, these are 4½ inches (11.43 cm.) wide, but an extension rim, also having a width of 4½ inches (11.43 cm.) may be bolted on to it, so giving an effective width of 9 ins. (22.86 cm.). Keep the nuts and bolts, which hold them together, tight at all times and these bolts should be checked periodically, particularly just after the rims have been installed.

In some cases eighteen spade lugs in two rows of nine are fitted to each rear steel wheel of Row Crop tractors, these being equally spaced around the periphery of the wheel rim to which they are secured by nuts and bolts so that the lugs are all towards the centre of the tread.

In other cases the Row Crop rear wheels were drilled to take 26 spade lugs in two rows of 13 each : on such wheels the lugs must be bolted to the wheel so that all face away from the centre of the tread.

The wheels on current production tractors, however, are drilled with 62 holes to accommodate either two rows of 9 or 13 spade lugs as described in the preceding paragraphs.

The extension rims in all cases are drilled to take 13 spade lugs, equally spaced round the periphery of the rim. Each flange is drilled and has ten holes on one side and five on the other to enable road bands to be used to avoid damaging the surface when the tractor is taken on the road.

When fitting extension rims, that side having **ten holes in the flange** must be bolted to the rear wheel, whilst the spade lugs of the extension rim are to be offset outwards. Always bolt the extension rim to the rear wheel so that the spokes are between the wheel and rim.

If a rear wheel having 26 spade lugs is used with an extension rim, under certain circumstances it may be advisable to remove the middle row of 13 spade lugs. Should the extension rim, however, be removed at any time the 13 lugs must be correctly refitted to the wheel to obviate excessive vibration.

With the latest type rear wheels (62 holes) the spade lugs should be re-arranged, if necessary, to suit the spacing on the extension rim.

Any adhering, caked mud should be removed before bolting on the extension rim otherwise there will be difficulty in obtaining good metallic contact and slackness may develop in use.

The Electrical System

The tractor may be fitted with an electrical system as extra equipment comprising some or all the following :—

Battery.	Lighting switch.	Generator.
Lamps.	Horn and switch.	Ammeter.
	Starter motor and switch.	Cut-out and regulator unit.

THE BATTERY

This is a twelve-volt unit of 57 ampere-hour capacity. It is placed at the rear end of the fuel tank on a suitable mounting bracket.

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. (9.5 mm. to 12.7 mm.) 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.

If the battery is allowed to stand in frosty weather in an unduly discharged condition there is the possibility that it may freeze, so causing damage to the container. Take care, therefore, always to keep the battery as fully charged as possible (*i.e.*, 1.270 to 1.290) since then it is unlikely to be affected by frost. A battery which is $\frac{3}{4}$ charged (sp. gr. approx. 1.245) will not freeze until a temperature of nearly — 50°F. has been reached, whilst when fully discharged it will freeze at 16°F. (16° below freezing point).

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, and may cause the voltage of the generator to rise, possibly leading to bulb failure should the lamps be switched on at the time.

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. Coating of a good grade of petroleum jelly 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 dealer for proper attention and storage. Do not entrust your battery to inexperienced or unskilled hands.

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.

LIGHTING SWITCH

This is located in the instrument panel box attached to the battery platform above the steering column. It has four positions :—

Lever straight down	" Off."
To right	" Side lights."
To left	" Headlamps dipped."
Second position to left	" Headlamps normal."

and is so arranged that the generator charges the battery in any position of the switch, but the charging rate is automatically controlled by the regulator.

A trailer connection for the rear light is provided on the Industrial Tractor. The connection is to the right of the tail lamp on the rear axle : a plug is inserted in it to keep out dust, etc., and is secured by a small chain to the bracket.

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.

The generator charging rate is adjusted automatically by the regulator to provide sufficient electric current to keep the battery fully charged.

ATTENTION NEEDED BY THE GENERATOR

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.

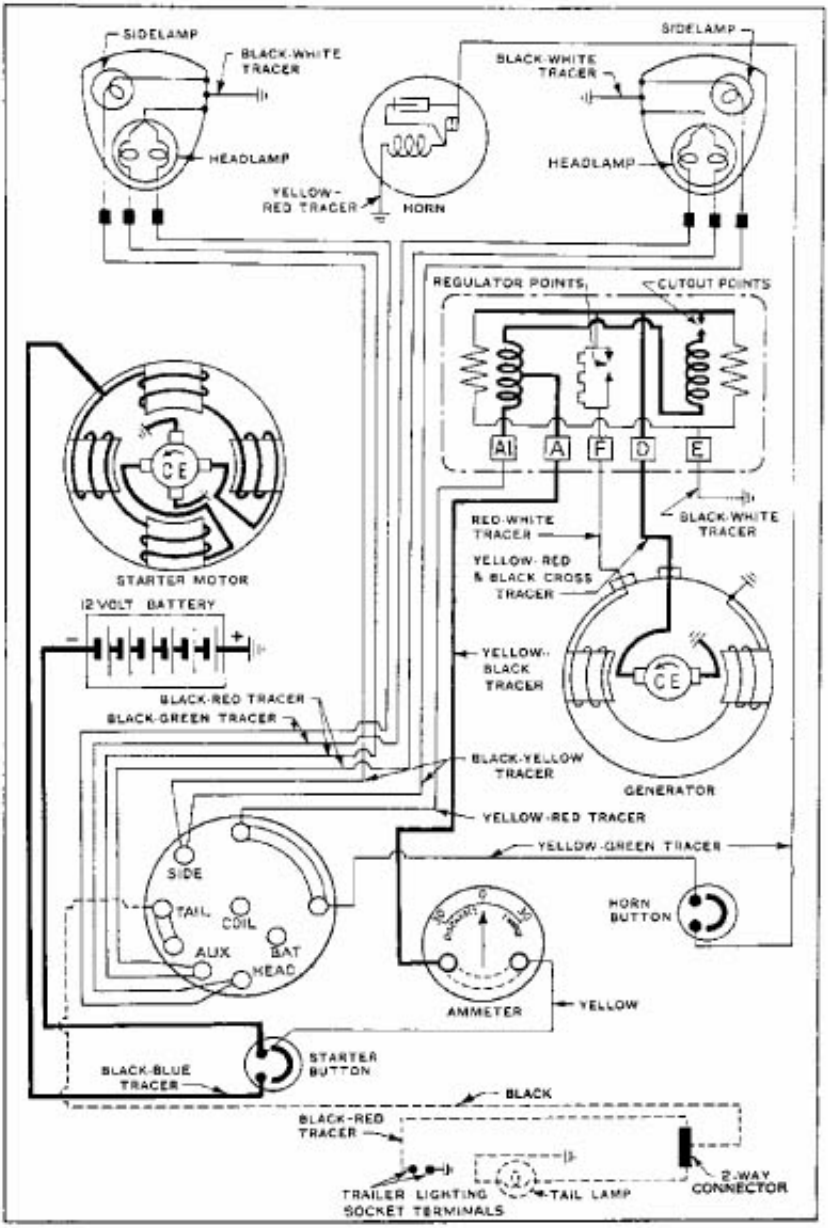


Figure 55
Wiring Diagram

At intervals of approximately six months the felt pad in this lubricator should be moistened with a good grade of petroleum jelly. See Fig. 20.

Every six months, clean the commutator by holding a strip of very fine glass paper against it (not emery cloth) 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 a possibility of the brush lead fastenings fouling the commutator, or at which excessive sparking occurs. See that all connections are clean and tight.

THE CUT-OUT AND VOLTAGE REGULATOR

The cut-out and regulator is a self-contained unit which automatically connects the generator to the battery when the output has risen sufficiently and also prevents the battery discharging itself when for any reason the charging rate falls below a minimum value as, for instance, when the engine is idling or stopped.

There is also provision for automatic regulation of the current supplied by the generator so that if the battery is considerably discharged the charging rate increases. When the battery is fully charged the charging rate will decrease and so there is no provision for any external adjustment on the generator or regulator unit.

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

Loosen the headlamp rim clamp screw and push it downwards free of the clamp. The rim, headlamp glass and reflector may then be removed as a unit. Loosen the clamp behind the headlamp, when the bulb and its carrier may be moved nearer to or away from the reflector as necessary. Tighten the clamp when the bulb is correctly focussed and, when refitting the headlamp rim, insert the tongue in the corresponding slot at the top of the headlamp body first.

The headlamp rim may then be pressed into position so that the slotted clamp is accurately lined up with the clamp screw which must then be moved into position and tightened up.

TO ALIGN THE HEADLAMPS

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

REPLACING HEADLIGHT OR SIDELIGHT BULBS

Remove the headlamp rim and reflector unit as described in " To Focus Headlamps."

The sidelight bulb may be removed by carefully grasping the holder, which is retained by friction grip in the reflector, and pulling it out of its location. The bulb is secured in a bayonet type holder and may be replaced as required. Do not pull the holder out by dragging on the sidelight cable.

To remove the headlamp bulb, turn its holder anti-clockwise sufficiently to free the retaining lugs when it may be drawn out of its mounting in the reflector. The bulb is held in a bayonet type holder.

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.

Note that the holder lugs are of unequal width, so assuring its correct replacement in the reflector to bring the TOP marking of the bulb uppermost.

REPLACING THE HEADLAMP GLASS

Free the reflector by releasing and removing the six spring clips round the edge of the rim : the glass front may then be detached when the reflector is separated from the rim.

When fitting the new glass to the reflector, with the cork gasket between, ensure the indented part of the glass and reflector are correctly registered.

Install the other cork gasket on the outside shoulder of the glass and then fit the rim so the indentation of the reflector is adjacent to the internal rim tongue which locates it.

Secure the reflector and glass in place in the rim with the six clips.

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.

TO ADJUST THE NOTE OF THE HORN

Press the horn button on the dash.

A countersunk screw is fitted adjacent to the mounting bracket at the rear of the horn. Turn this screw to adjust the note of the horn.

Storing the Tractor

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

Drain 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 off all petrol and vaporising 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 the cylinders and the engine cranked a few times.

Remove battery (if fitted) and send it to an authorised dealer for proper attention and storage.

Jack up tractor to take the weight if rubber tyres are fitted.

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

Before using the tractor after a period of storage, see note on page 50, regarding the magneto contact breaker points.