

Operation
AND
Maintenance



Ferguson Tractor

MODEL TO-20

HARRY FERGUSON, INC.
DETROIT, MICH.



HARRY FERGUSON, INC.

TRACTOR

Warranty

For a period of ninety (90) days from the date of delivery of a new Ferguson Tractor to the original purchaser thereof from a Ferguson dealer, Harry Ferguson, Inc., warrants all such parts thereof (except tires) which, under normal use and service, shall appear to Harry Ferguson, Inc., to have been defective in workmanship or material.

This warranty is limited to shipment to the purchaser, without charge except for transportation costs, of the part or parts intended to replace those acknowledged by Harry Ferguson, Inc., to be defective.

If the purchaser uses or allows to be used on the Ferguson Tractor, parts not made or supplied by Harry Ferguson, Inc., or if any Ferguson Tractor has been altered outside of its own factories or sources of supply, or if implements have been used which were unsuited and harmful to the Ferguson Tractor, then this warranty shall immediately become void. Harry Ferguson, Inc., does not undertake responsibility to any purchaser of a Ferguson Tractor for any undertaking, representation or warranty beyond those herein expressed.

Harry Ferguson, Inc., reserves the right to make changes in design or changes or improvements upon the Ferguson Tractor without any obligation upon it to install the same upon its tractors theretofore manufactured.

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Foreword

● This book has been written for *YOU* — the purchaser of a new Ferguson Tractor. For your confidence in us and our product we sincerely thank you.

Your new Ferguson is as fine a tractor as it is possible to produce. Because it is a precision-built unit, the knowledge of certain fundamentals will help you obtain the most from both the tractor and its equipment. That is the purpose of this book.

Brief suggestions will enable you to make ordinary adjustments. For major repairs, we urge you to consult your dealer. He knows the Ferguson Tractor inside and out . . . has both the experience and equipment for the most satisfactory service.

May we wish you more economical and enjoyable farming with your new Ferguson Tractor!

HARRY FERGUSON, INC. • DETROIT, MICHIGAN

YOUR FERGUSON DEALER _____

ADDRESS _____

PHONE _____

TRACTOR SERIAL NO. _____

(Located—Top of Steering Column)

ENGINE SERIAL NO. _____

(Located—Left Side of Steering Block)

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Ferguson Park

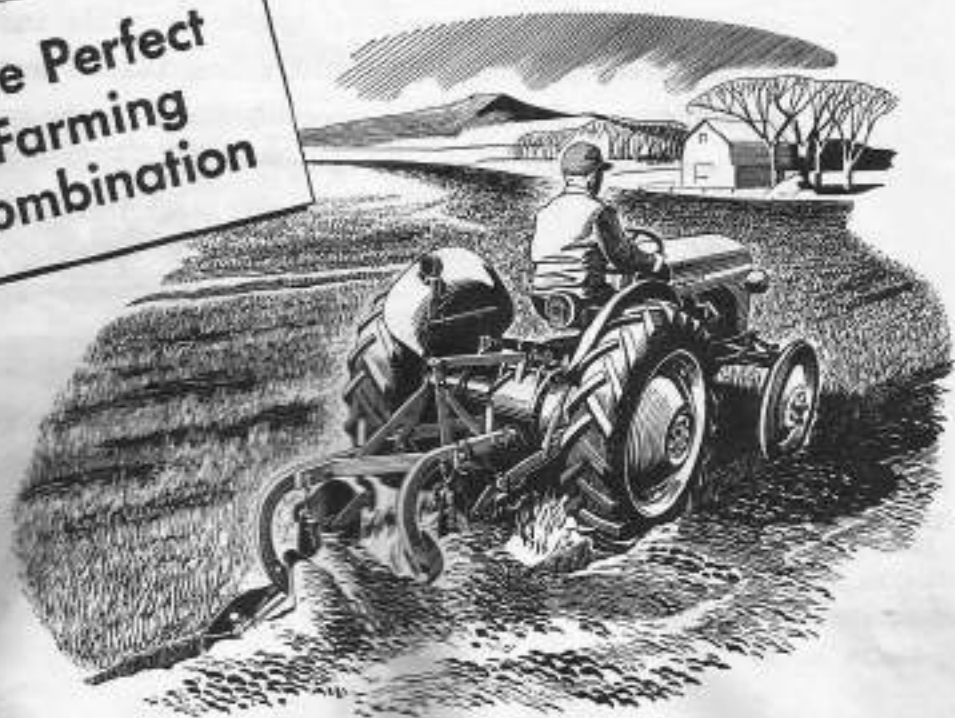
WHERE YOUR TRACTOR WAS BUILT

● In this modern plant, on Southfield Road in Detroit, your new Ferguson was built. This site occupies more than 72 acres. When the development of Ferguson Park is completed, the installation* will be the most modern and complete of its kind . . . housing not only manufacturing operations, but the general offices, parts and service and other departments of Harry Ferguson, Inc. Whenever you're in Detroit, you will be welcome at Ferguson Park.

THE *Ferguson Tractor*

WITH *Ferguson Hydraulic System*

**The Perfect
Farming
Combination**

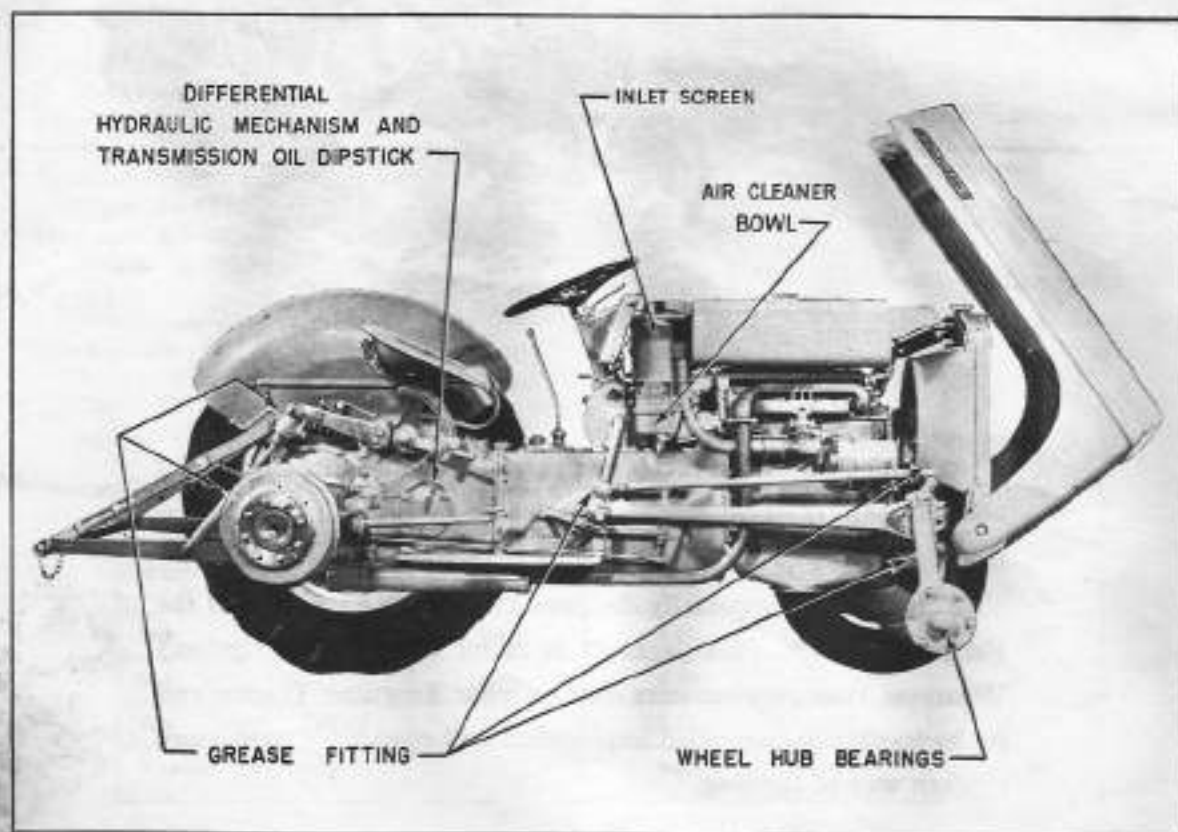


● Your Ferguson Tractor is a precision-built unit designed for efficient performance, economy and ease of operation. It is extremely rugged . . . capable of giving outstanding service.

This tractor is especially designed to take full advantage of the Ferguson System. (See pages 27 to 29 for complete description.) Whatever your requirements may be, your Ferguson Tractor and its hydraulically-controlled implements will open up a new, more modern way of farming.

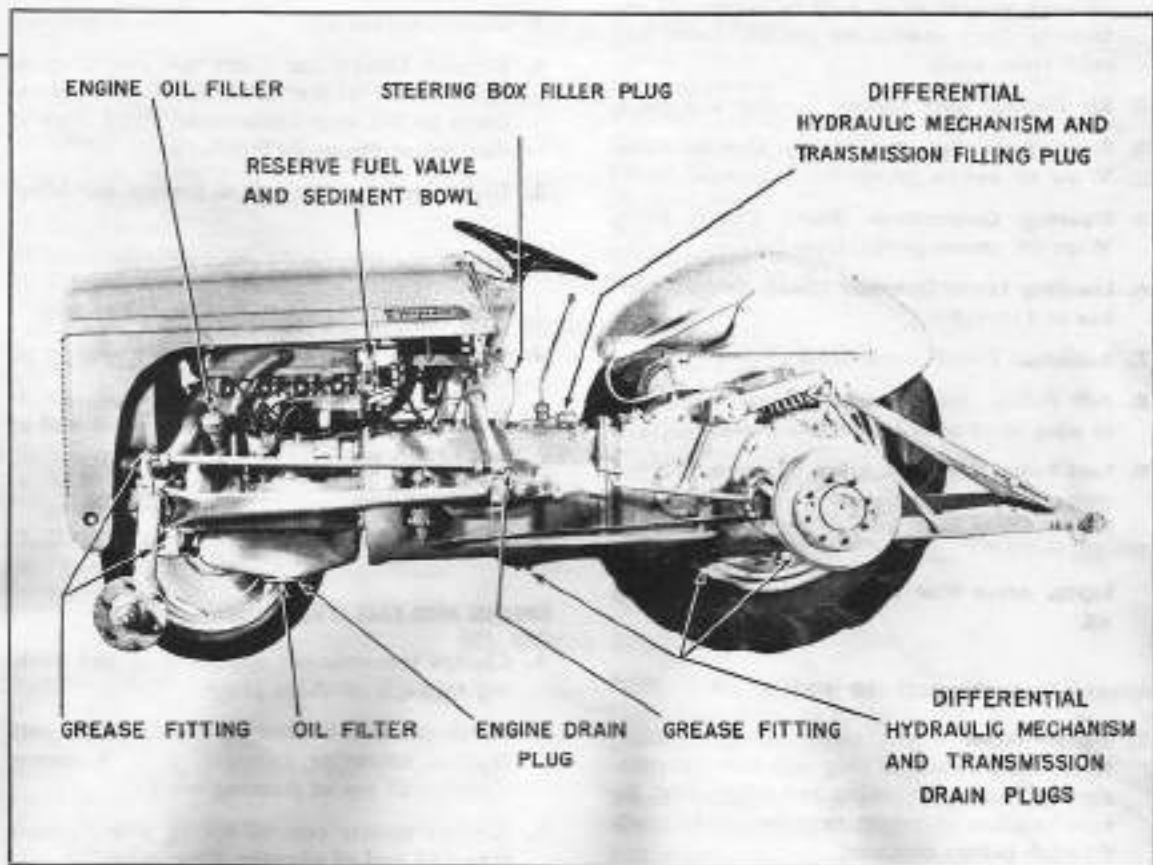
Lubrication and Inspection.

Proper maintenance, including periodic inspection and regular lubrication is essential to the long life and trouble-free operation of your Ferguson Tractor and its equipment. On this and succeeding pages are shown the essential instructions for proper maintenance and lubrication of your tractor at regular work intervals.



Right side of tractor, showing lubrication and maintenance points.

KEY TO LONG LIFE AND ECONOMY



Left side of tractor, showing lubrication and maintenance points.

ENGINE LUBRICATION

Capacity 6 U. S. quarts (5 Imperial quarts). Fill with SAE-30 for temperatures above 50°F. Use SAE-20 for temperatures below 50°F. For temperatures below 10°F. use SAE-10W.

NOTE: When installing a new oil filter cartridge, change engine oil and add one extra quart.

TRANSMISSION, HYDRAULIC SYSTEM AND DIFFERENTIAL

Use straight mineral gear oil SAE-90 for temperatures above 50°F. and the same oil in

SAE-80 for temperatures below 50°F. All oil companies merchandise this type oil.

WARNING: More harm can be done to a tractor in 100 hours with an inferior or wrong type oil than could be done in thousands of hours with the correct oil. Insist on obtaining and using the oil specified.

NOTE: Keep tractor on light work for first 50 hours.

DAILY MAINTENANCE AND LUBRICATION (EVERY 10 WORK HOURS)

1. Check engine oil level to full mark on dipstick. Do not overfill.

2. **Air Cleaner Bowl.** Clean and refill, using oil of same weight as is used in engine. If extremely dirty conditions prevail, clean and refill twice daily.
3. **Air Cleaner Inlet Screen.** Inspect and clean.
4. **Front Axle Spindles (two).** Grease daily. Wipe off excess grease from fittings.
5. **Steering Connections (four).** Grease daily. Wipe off excess grease from fittings.
6. **Leveling Lever Gearbox (two).** Grease gearbox and thread.
7. **Radiator.** Check water level.
8. **Belt Pulley.** (Not standard equipment.) Fill to plug level with transmission oil.
9. **Fuel Tank.** Use good, clean gasoline, pouring through screened funnel or clean chamois. *When filling tank, stop engine!*

NOTE: After first 30 hours—change engine oil.

WEEKLY MAINTENANCE (50 HOURS)

1. **Transmission.** Check oil level on dipstick. Keep filled. A single plug supplies transmission hydraulic mechanism and differential. Be sure to allow sufficient time for oil to reach dipstick before checking.
2. **Generator.** 10 drops of light oil in oiler. (Do not oil excessively.)
3. **Carburetor.** Shut off fuel valve, then remove drain plug and drain carburetor. Remove and clean sediment bowl and filter.
4. **Battery.** Examine battery and, if corroded or dirty, clean top with soft-water-and-soda solution. Check water level—keep filled above plates with distilled water.
5. **Tires.** Pressure—front 26 lbs., rear 12 lbs.

NOTE: Change transmission lubricant in new tractor after first 100 hours. Remove drain plugs (three) from transmission, hydraulic mechanism and differential. When draining, put control lever in "down" position (so oil will drain from the ram cylinder).

BI-MONTHLY MAINTENANCE (EVERY 150 HOURS)

1. Change engine oil.
2. Remove Distributor Cap; put one drop of light oil on breaker lever pivot, and several drops on felt wick under rotor. Put a trace of distributor grease on breaker cam.
3. Grease battery terminals to prevent corrosion.

MONTHLY MAINTENANCE (300 HOURS)

1. Clean spark plugs. Set gaps to .025 inches.
2. Change oil filter cartridge (every second oil change).
3. Tighten six bearing retainer nuts on end of rear axle housings.
4. Tighten all bolts, nuts and screws.
5. Clean radiator and grille.

SPRING AND FALL (750 HOURS)

1. Change transmission oil, draining and flushing through all three plugs.
2. Check oil level in steering housing and refill. Normal operating capacity, 2 U. S. quarts (level with top of steering arm).
3. Remove master control spring yoke; grease threaded end of plunger. (See page 28.)
4. Flush and clean radiator. (See page 24.)

YEARLY MAINTENANCE

1. Wash out front hub bearings with kerosene and repack with short fibre grease.
2. Renew front hub dust seal if condition warrants.
3. Wash tractor thoroughly. Remove rust spots; touch up areas with Ferguson paint.

NOTE: On a Ferguson Tractor these points do not require lubrication: Front Axle Center Pivot Pin, Clutch Connections, Brake Lever Pins and Bearings, Linkage Ball Joints or Pins, Throttle Connections, Engine Water Pump and Fan.

Operating Instructions

All controls of your Ferguson Tractor are within convenient reach of the operator. The accompanying illustration shows the various controls of the tractor and is keyed for your convenience.

A—Ignition Switch. Operated by key on lower left side of instrument panel. (Tractor ignition can be locked if desired.)

B—Hood Release. Lower left side of instrument panel, near ignition switch. (To lower, trip latch at hinge point.)

C—Clutch Pedal. Located on left side of transmission housing.

D—Left Wheel Brake Pedal.

E—Right Wheel Brake Pedal.

F—Master Brake Pedal. Simultaneously controls both brakes.

G—Master Brake Pedal Pawl. Enables operator to lock pedal Master Brake in any position.

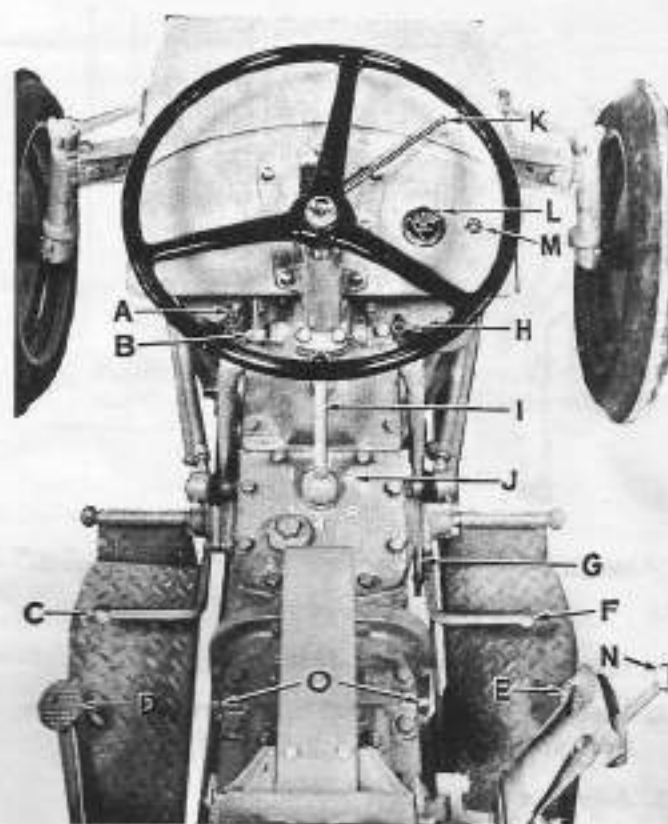
H—Choke. Choke button on the lower right-hand side of the instrument panel.

I—Shift Lever. Located on transmission housing ahead of tractor seat. Various gear speeds are indicated by raised numerals on the transmission housing cover.

J—Starter Switch. The safety starter switch is operated by the gear-shift lever I. It is impossible to start engine when tractor is in gear.

K—Throttle. On right side of steering column. (For adjustment, see "Governor", Maintenance Section, page 19).

L—Oil Pressure Gauge. Right side of instrument panel. Normal reading approximately 25-35 lbs. per square inch at full throttle. Always check for adequate oil pressure.



M—Charge Indicator Light. Right side of instrument panel. Light comes on if generator is not charging.

N—Finger Tip Control Lever. Controls hydraulic system. *Always lock in "down position" when drawbar stays are in place.*

O—Twin Hydraulic Pump Outlets. For use with tools and equipment requiring external hydraulic pressure.

P—Power Take-off Lever (in engaged position)

—Lever must be in position shown before hydraulic system or power take-off can be operated. Lever is part of inspection plate assembly on left side of center housing.



Starting AND Breaking-In



"Always open doors before starting the engine."

1. Open fuel valve by turning fully to the left;
2. Insert ignition key and turn to right. (Charge indicator light should glow red);
3. Advance throttle $\frac{1}{4}$ open;
4. Pull out and hold choke in open position;
5. Disengage clutch (push pedal down) and engage starter by lifting gearshift lever and moving to right and forward to "Start" position (indicated on transmission housing by "S"). This starts engine cranking;
6. Release choke when engine starts. Charge indicator light will go out when generator starts charging.
7. Don't race engine immediately after starting—give the oil a chance to circulate freely. Oil pressure gauge should register 25-35 lbs. at full throttle.
8. Allow engine to thoroughly warm up before working tractor. This eliminates condensation and formation of sludge and corrosion which cause rapid wear of moving parts.

A double hinge provides two more positions of tractor seat for comfort of operator.

BREAK-IN

1. Keep your tractor on light work for initial 50-hour break-in period. A properly broken-in tractor will give better service, greater economy and improved, heavy-duty operation.
2. Change crankcase oil after first 30 hours.
3. Change transmission oil after first 100 hours.
4. Call dealer for 100-hour tune-up.
5. Tighten all nuts, bolts and screws.



"Keep hay, straw, inflammable material away from exhaust pipe to prevent fire."



Adjusting Wheel Tread Widths

The different work you will do with your Ferguson Tractor will require various tread-width adjustments. These adjustments are simply made, due to the unique design of your Ferguson Tractor.

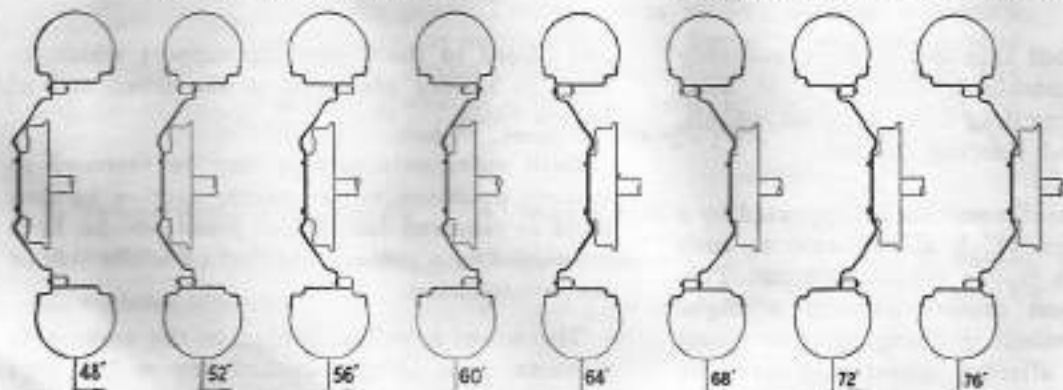


Wide tread width for row-crop operation.

The front wheels may be adjusted—in 4-inch steps—from 48 to 72 inches by assembling the three-section front axle in various lengths. Even when the front axle is fully extended, an addi-



Adjusting front wheel tread width.



REAR WHEEL TRACK SETTINGS FOR FERGUSON TRACTOR

tional 4-inch width on either side may be obtained by removing and turning the front wheels so that the wheel-dish is on the inside. This gives a total spread of 80 inches. To obtain a 76-inch tread, leave the wheels in this 80-inch position, but move the two outer axles in one hole on the center sections. Do not operate with the front wheel



Adjusting rear wheel tread width. Note use of Ferguson Power Jack.

discs turned out unless necessary, since this throws an additional load on the outer front wheel bearings.

Note: In adjusting front axle, always leave at least one bolt hole between the two bolts to prevent undue strain on front axle.

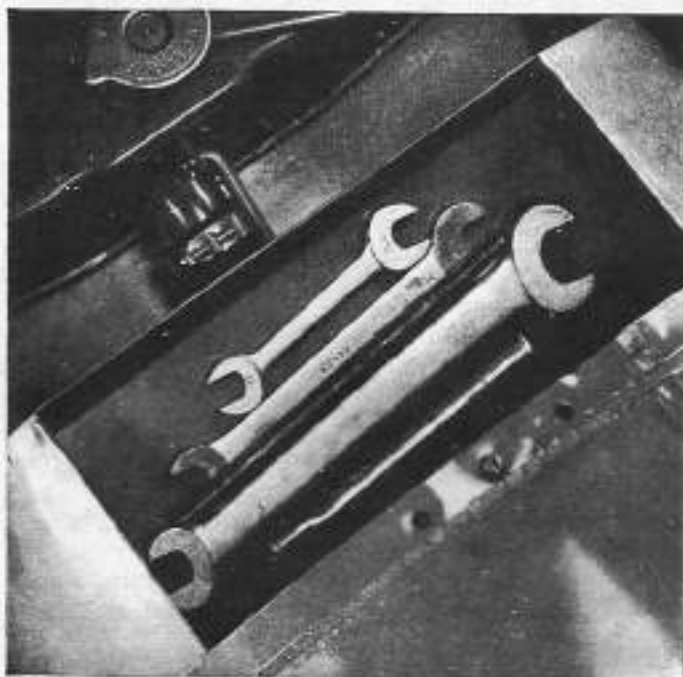
REAR WHEEL WIDTH SETTINGS Rear wheel tread settings may include 48, 52, 56, 60, 64, 68, 72 and 76 inches. To obtain rear tread widths of 56, 60, 72 and 76-inch intervals, switch wheels to the opposite side and adjust according to diagram. The tire side wall arrow should always point in the direction of travel. For normal plowing operations set wheel widths at 52 inches.

Diagram reveals the rear wheel tread settings. Note that wheels are switched to obtain 56, 60, 72 and 76-inch intervals.

Maintenance and Service

SECTION

While we recommend that major overhauls, replacements and adjustments be done by the dealer whenever possible, occasions may warrant the owner making minor repairs and adjustments. For that reason, the following material has been compiled to give you a working knowledge of your Ferguson Tractor.



The tool box of your Ferguson Tractor, located under the hood, just back of the radiator.

Front Axle and Steering Assembly

The Ferguson front axle and steering assembly include the adjustable tri-section front axle, radius rods, steering drag links, spindles, wheels, steering wheel and steering column.

Front Axle. The center section is supported by a $1\frac{3}{4}$ -inch pivot pin which allows axle to rock slightly as wheels follow ground contour. This exclusive Ferguson feature permits a slight front-to-rear movement in changing front wheel spacing without altering wheel alignment or steering geometry. The pin itself is pressed in

and bolted to the front axle support which, in turn, is solidly anchored to the front end of engine block.

Each outer axle section may be fastened in various positions to the center section by two bolts as required for various tread widths. It is supported by a radius rod attached to the side of the transmission.

The wheel spindles, housed in the outer axle sections, turn in steel-backed bronze bushings pressed into top and bottom of the housing.

Weight is transferred from axle to spindle through a thrust bearing at the lower end of the axle.

The front wheel, consisting of hub and wheel disc with standard 6-inch bolt circle, is mounted on the spindle with two tapered roller bearings. The wheel discs have a 2-inch offset, permitting



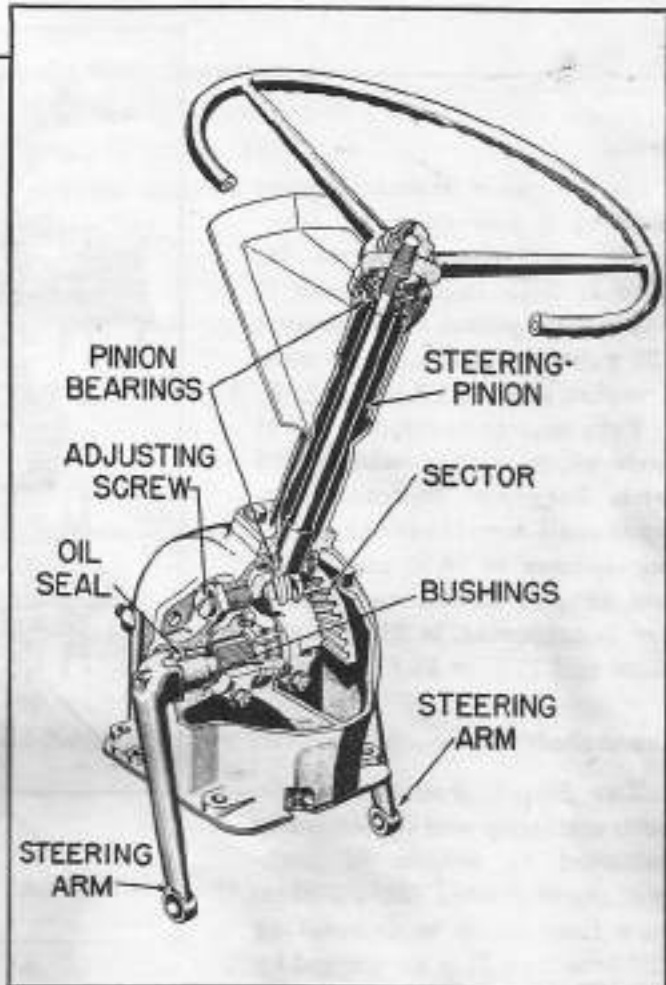
Measuring correct toe-in.

an additional 4-inch outward movement, if either wheel is reversed—or an 8-inch outward movement, if both wheels are reversed.

Steering Gear. The specially designed Ferguson steering gear makes possible use of the adjustable three-section front axle. The pinion operates two sectors simultaneously—one moving forward and the other backward—the same distance. These sectors, in turn, control the position of the steering arms, drag links and front wheels. Because both the radius rods and the drag links are the same length and operate in the same plane, they move in the same arc as the wheel spacing is changed. Thus the wheel alignment and the steering geometry remain unchanged.

Clearance between pinion and the sectors is controlled by two adjusting screws (one on either side), which contact the back of, and hold the sector fully meshed with the pinion gear. A lock-nut holds each screw firmly in position.

Steering Lubrication. Add transmission oil to bring oil level to top of steering arm. Check level each year (normally, oil should not require changing). Changing oil will require either removing housing from tractor and draining by



removing plate beneath or sucking oil out through filler cap hole with suction pump. The pinion shaft bearings are completely lubricated at time of manufacture.

Servicing. Other than adjustments to meet operating conditions, servicing requirements are simple. Grease spindles and steering joints daily during operation. Each year, or oftener, depending upon operation, remove wheels, wash bearings and pack with a short fibre grease.

Wheel bearings should be adjusted so that wheel shows a slight drag when rotated freely . . . then back off adjusting nut one notch and install cotter key.

Periodically check wheel alignment for toe-in of "0" to $\frac{1}{4}$ inch (measured between tire rib centers at hub height). To adjust, loosen clamp bolts at back and front of either drag link and turn link in or out as required—then tighten clamp bolts.

Your Ferguson Tractor is powered by a four-cylinder, four-cycle, wet sleeve engine. Its bore is $3\frac{9}{16}$ inches, stroke is $3\frac{3}{4}$ inches, piston displacement 120 cubic inches, and the compression ratio is 6.1 to 1.

Your tractor is rated as a 2-14 inch plow tractor when used with Ferguson hydraulically-operated implements. Belt horsepower is 26.50 maximum, and 85% or 22.53 rated. Drawbar horsepower is 21.77 maximum and 75% or 16.33 rated.

Crankshaft (A)

The drop-forged crankshaft, both statically and dynamically balanced to within $\frac{3}{4}$ inch-ounces, is drilled for oil pressure from main to connecting rod bearings. It is supported by three main bearings with replaceable liners. End thrust is taken by the front main bearing.

Connecting Rods (B)

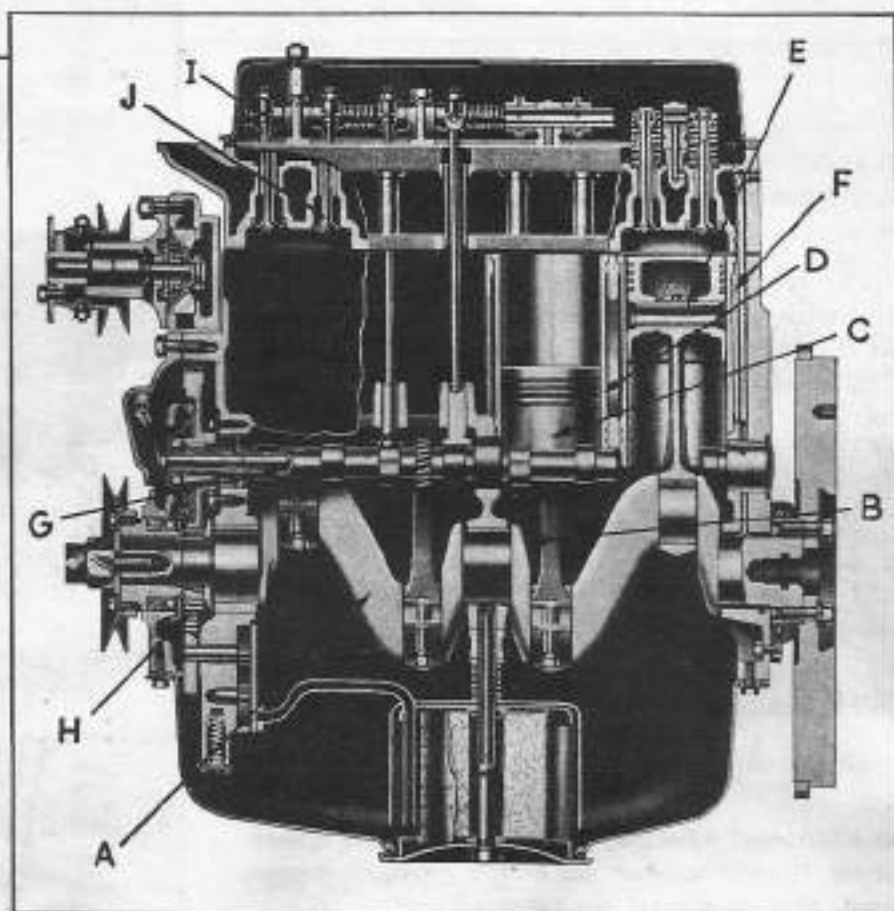
The forged steel connecting rods are balanced so there is, at most, no more than $\frac{3}{4}$ ounce variation in weight between any two of them.

Pistons (C)

Cam-ground aluminum alloy pistons are matched with their respective sleeves at the factory—are replaced as an assembly. Arrow on head indicates correct placement of piston in cylinder—should always point to front of engine.

Piston Rings (D)

There are three compression rings and one oil control ring—all made of close-grained cast iron. Top compression ring has beveled outer edge



Right side of Ferguson Engine

and top inner side has 30° bevel. All rings are stamped "top" for correct assembly **and are not interchangeable.**

Piston Pins (E)

Full-floating type, made of cold drawn steel tubing and secured at both ends by snap rings.

Sleeves (F)

Sleeves are centrifugally cast of uniformly grained cast iron, easily pressed into position in block. They are sealed against leakage at the bottom by two neoprene rings. They project from .002 to .005 inches above cylinder top so that the head and its gasket hold them securely in position.

Camshaft (G)

The cast alloy camshaft turns in three ground bearings in the cast-iron engine block.

Timing Gears (H)

Both the steel crankshaft and camshaft gears are available in three sizes—"standard", "undersized" and "oversized". Gears are stamped to indicate size—an "S" for standard, "O" for over-size and "U" for undersize—followed by a number to show amount of over or undersize.

The cam gear section of block is also stamped to indicate original installation with an "S", "+", or "-", followed by a number to show amount of over or undersize. When replacing both gears on block marked "+1", use one standard and one .001-inch oversize. When replacing one gear after considerable use, the next larger gear should be used to give a .001-inch tight fit to take up wear.

Rocker Arms (I)

Rocker arms operate on a shaft which receives oil from rear main bearing and distributes it to rockers through drilled holes in shaft. They are fitted with steel-backed, babbitt-lined bushings, and are assembled with radial groove toward push rod side. The rocker arm shaft is assembled with drilled holes facing valve springs.

Valves (J)

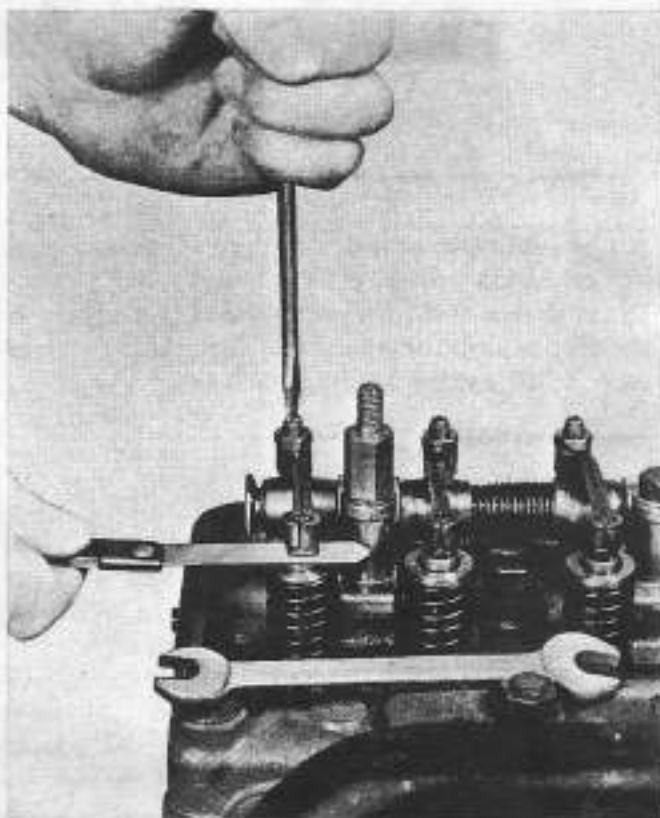
Of one-piece construction, the valves have a 45-degree seat-angle.

Note: In reassembling, exhaust valve should just be closed and intake valve should be ready to open, with piston at top dead center following exhaust stroke.

VALVE ADJUSTMENT

Proper valve adjustment is essential for quiet, smooth operation and long valve life. Check and adjust as follows:

1. Remove gas tank and cylinder head cover.
2. Remove spark plugs.
3. Rotate engine with crank until number 1 piston reaches exact top dead center compression. (Compression stroke is determined by extreme pressure from #1 spark plug hole when hole is covered with thumb.)
4. Remove Timing Hole Button Plug (back of left engine flange) to verify top dead cen-



Showing how feeler gauge is used to adjust valve tappet clearance.



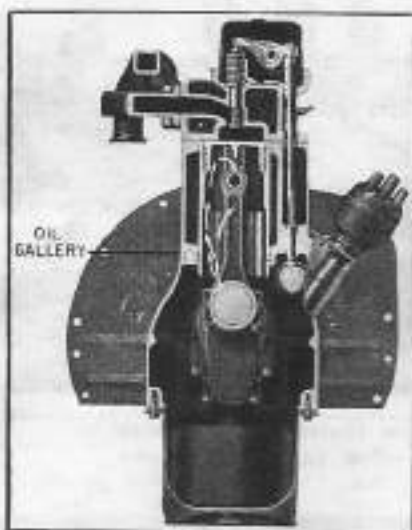
Removing timing hole button plug

ter of #1 cylinder. After compression is felt, turn slowly with crank until graduated line, indicated by letters "D.C." on flywheel, is aligned with groove in timing hole.

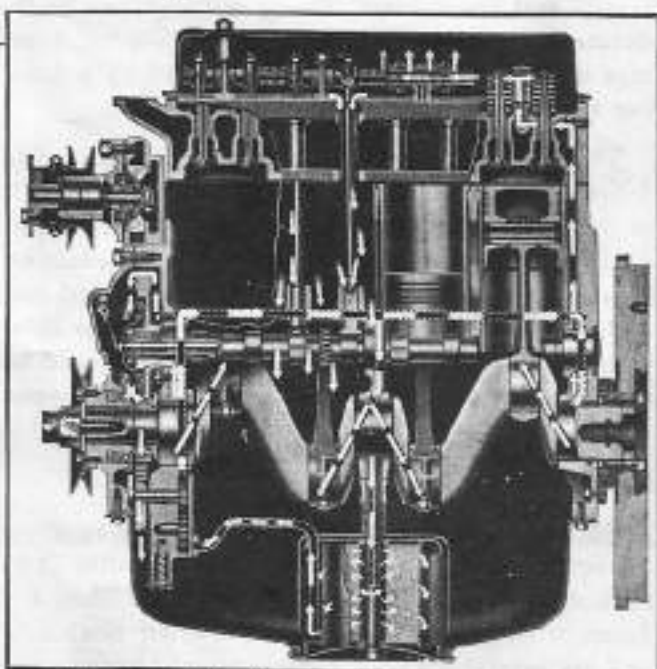
5. Set both valves with engine cold at .014.
6. Engine firing order is 1-3-4-2. Set other valves by following foregoing procedure.
7. Recheck valves with engine operating at slow idle speed, using a .013-inch feeler gauge.

ENGINE *Oiling System*

• The crankcase capacity of the full-pressure oiling system is 6 U. S. quarts, (5 Imperial quarts). Oil is drawn from the sump through a screen in the oil pan into the pump, and forced, under pressure, to all engine bearing surfaces.



Position of oil gallery and connecting rod spurt holes for lubricating cylinder walls. Oil returns from the cylinder head through the push rod tubes.



Phantom photo of Ferguson Tractor engine shows forced oil circulation to all vital engine points.

From the front main bearing, oil passes through the drilled crankshaft to the front connecting rod bearing and front camshaft bearing, being metered through the camshaft retaining plate to the governor and timing gears. Oil from the gallery passes to the center main bearing and through the crankshaft to the second and third connecting rod bearings. The rear main bearing is also lubricated from the oil gallery through the rear connecting rod and camshaft bearings.

A passage leading from the rear main bearing to the rear support of the rocker arm shaft provides lubrication from the rocker arm bushings and valves. On the return through the push rod holes, it lubricates cams, tappets and center camshaft bearing. Another tube carries the oil from the center main bearing through the oil filter where it is cleaned.

OIL FILTER The oil filter, located in the engine pan, removes dirt, water, sludge, carbon, grit, dust, metal and other foreign particles. Its position in the bottom of the sump eliminates all external oil lines, and its efficiency is increased because it operates at engine oil temperature. Its care is important to insure long engine life and lower maintenance costs.



Removing oil drain plug from crankcase.



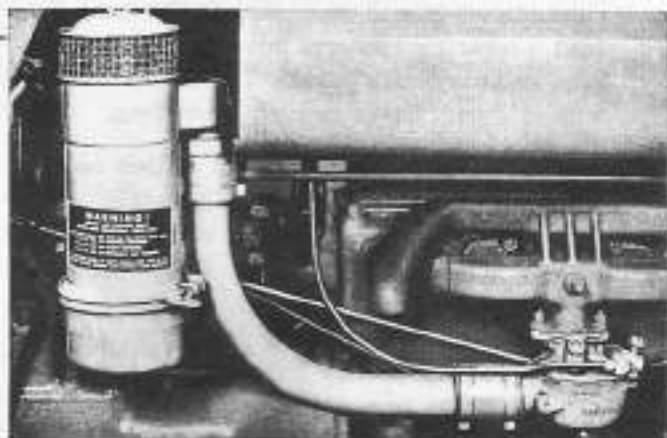
Removing oil filter and screen.

Change engine oil every 150 hours, draining it from the bottom of the crankcase. Change oil filter cartridge every 300 hours. Use only an *inside-to-outside* type filter cartridge. To replace cartridge, drain oil, remove cover and withdraw used cartridge and wash screen. *Add one extra quart of oil when new filter cartridge is installed.* To prevent leaks due to gasket stretching, firmly shellac filter cover gasket to pan or gasket cover.

OIL PUMP The engine oil pump is of the single-stage gear type, and is located on the lower side of the front main bearing. A relief valve in the pump body by-passes oil when pressure builds up to 25-35 p.s.i.

OIL SEALS Engine oil losses are prevented by oil seals at both ends of the crankshaft. Use care in replacing oil seals to insure proper sealing.

Fuel System



Air cleaner, air intake and carburetor



Clean air-cleaner screen daily for best engine operation.



Air-cleaner bowl should be removed and cleaned daily.

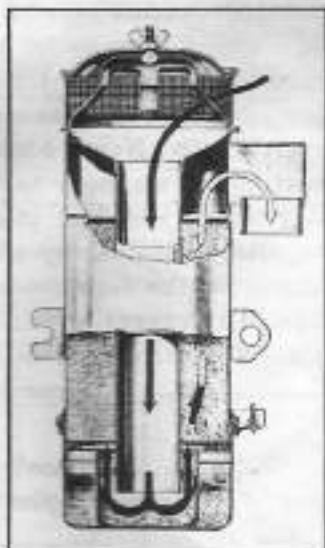
Your tractor fuel system includes a fuel tank under tractor hood (capacity: 10 U.S. or 8.3 Imperial gallons), fuel sediment bowl-and-filter, air cleaner, carburetor and governor.

When filling gas tank, turn off engine, use good clean gasoline, straining through screened funnel or through chamois.

AIR CLEANER

The air cleaner (right side of tractor, adjacent to battery) removes dust and dirt particles from all the air that passes into the carburetor. This excludes abrasives which would normally cause excessive wear on cylinders, pistons, rings and valves.

Diagram shows how air loses larger dirt particles in top screen, deposits more in bottom oil bath, and drops remaining particles in the filtering elements in the body of the air cleaner which, due to the washing action, causes foreign matter to settle in the bowl at the bottom of the filter.



CARE OF THE AIR CLEANER

The air-cleaner bowl should be cleaned and re-filled daily with clean oil of the same viscosity as that used in the engine.

Under very dusty and dirty conditions, however, it may be advisable to clean *vice* each day.

Remove top inlet screen daily and wash in gasoline. Never oil this screen. If main filtering ele-

ment is plugged with lint or other foreign matter which cannot be washed out, install a new air cleaner, as any restriction of air flow will cause a choking action, resulting in excessive fuel consumption and loss of engine power.

Inspect cleaner periodically for breaks in center tube and outside case to insure good cleaning action. The tube and hose between air cleaner and carburetor should be regularly checked for air leakage. Any leakage or by-passing of air cleaner may result in serious damage to the engine.

FUEL FILTER AND SEDIMENT BOWL

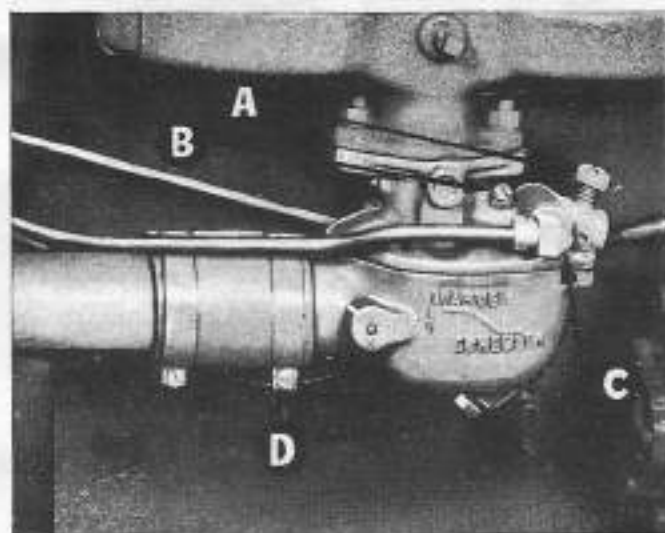
The fuel filter and sediment bowl assembly, which traps sediment and foreign matter in the gasoline, is screwed into the bottom of the left side of the fuel tank. It serves as a shut-off valve, stopping the gasoline flow to the carburetor, and controls both main and reserve fuel supplies. (Note: Valve has a lefthand thread.) Turn fully to right (clockwise) to shut off fuel supply. Turn fully to the left (counterclockwise) to operate main fuel supply through the standpipe which extends approximately one inch above tank bottom. The reserve supply contains approximately one gallon which is released by turning shut-off valve two complete turns to right from full open position, thus opening the reserve fuel line which is flush with the bottom of the tank.



Sediment bowl with reserve fuel control. Remove bowl and filter and clean every week.

CARBURETOR

The balanced updraft type carburetor is fully sealed against entrance of dust and dirt. An excess fuel drain (a porous, fused metal-substance in the bottom) permits escape of excess fuel yet prohibits entry of dust or other foreign matter.



(A) Main jet, (B) idling adjustment, (C) fuel inlet and (D) drain plug are shown above.

At the bottom of the carburetor bowl is a drain plug which permits draining fuel from the carburetor to remove water or dirt.

The carburetor is designed with two settings—an idling system and main fuel system. Each has a separate adjustment.

MAIN JET ADJUSTMENT

1. Adjust only when engine is warm. Adjust main jet by screwing down needle valve to fully closed position, then backing off one

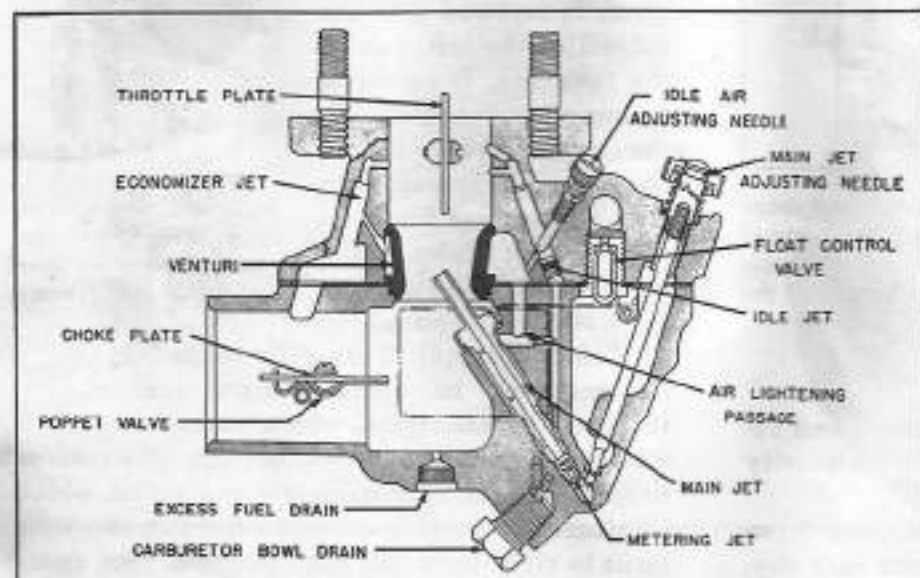
full turn for approximate setting. Final adjustment should be made so that the engine runs smoothly and according to the load. Too lean a mixture reduces power, overheats engine and may burn valves. Too rich a mixture wastes fuel, causes uneven operation.

FIELD TEST With tractor pulling under normal load at approximately one-half throttle, fully open throttle. If engine coughs or stalls, open main jet $\frac{1}{8}$ turn and repeat test. Continue until engine responds immediately to increased acceleration and runs smoothly and evenly. (Under certain conditions it may be necessary to open main jet $1\frac{3}{8}$ turns to obtain maximum power.)

IDLING ADJUSTMENT

2. The idle adjustment should be set at approximately $\frac{1}{8}$ of a turn open. Accurate setting may be obtained by using a vacuum gauge and adjusting for maximum vacuum. (Adjust only when engine is warm.) An adjusting screw on the throttle shaft arm regulates minimum idling speed.

CLEANING CARBURETOR The carburetor should be cleaned seasonally. Remove carburetor from manifold, *take out main adjusting screw*, and disassemble. Always disassemble and clean each part individually. Never blow out carburetor by connecting an air hose to the fuel jet. The elbow strainer at the fuel inlet connection should be regularly cleaned by simply removing the gas line from the carburetor and unscrewing the elbow. To prevent wrench from collapsing elbow, place a $\frac{1}{4}$ -inch fuel-line nut in elbow fitting when removing or replacing.



Various parts and adjustments of the carburetor are shown in this photo-diagram. (See "How to adjust carburetor".) Never remove or probe the excess fuel drain plug.

"Don't refuel when engine's running or very hot!"



GOVERNOR

The flyweight type governor has 4 evenly-spaced, die-cast weights, and is attached to the front side of the camshaft gear. It is completely enclosed by the timing gear housing except the control linkage (see illustration). It permits selection of required speed by hand throttle from 400 to 2200 r.p.m., and maintains selected speed between 1200 and 2200 r.p.m. even though the load may vary.

HOW IT OPERATES Opening the hand throttle increases the governor spring tension. This causes the governor linkage to overcome force of the flyweights, opening the carburetor throttle plate and increasing the engine speed. Such speed increases give greater force to the governor's flyweights, which begin to overcome the spring tension and gradually close the carburetor throttle plate. A balance is reached between the action of the flyweights and the spring tension which is maintained until either the load or position of the hand throttle is changed.

Note: When the hand throttle is set for a certain speed and the load increases, the tractor speed tends to decrease. This reduces the force of the governor flyweights, and the spring tension opens the throttle plate to compensate for the increased load. Exactly the opposite occurs if the load is decreased.

SERVICING THE GOVERNOR The governor is lubricated by engine oil forced through bleeder holes from the front camshaft bearing. It requires no special lubrication.

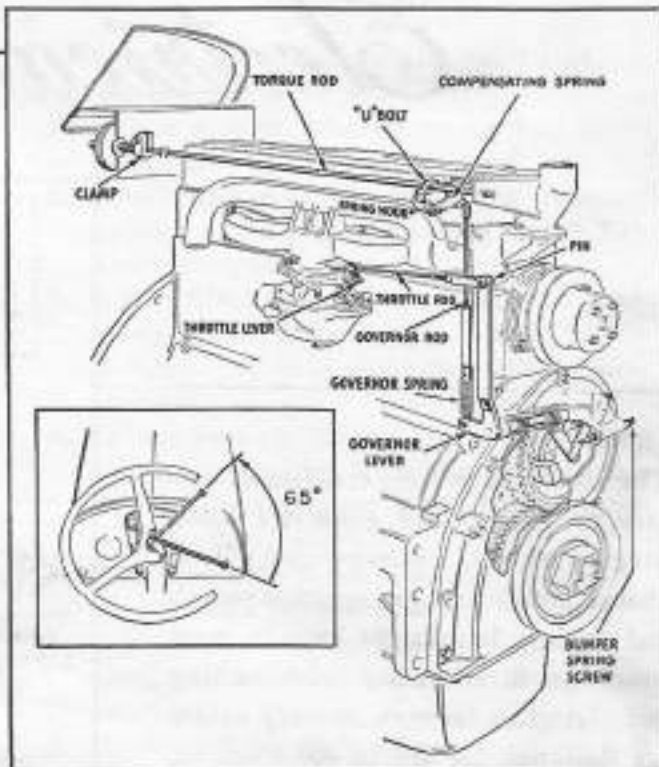
The governor must have perfectly free movement at all locations. Any slight binding will result in erratic action.

To adjust the governor (see illustration):

1. Warm up engine.
2. Set main carburetor jet from 1 to $1\frac{3}{8}$ turns open.
3. Set idling jet to $\frac{3}{8}$ of a turn open.
4. Disconnect throttle rod.
5. With throttle lever against idling stop, adjust idling screw to speed of 400-500 r.p.m.
6. Shut off engine.
7. Open hand throttle to create tension on governor spring.
8. Adjust throttle rod length until carburetor throttle lever is $\frac{1}{32}$ -inch off full stop.
9. Disconnect and remove

governor rod from governor spring.

10. Back off bumper spring screw. Check governor lever for free movement. Check carburetor throttle shaft for binding, and reconnect throttle rod. (Pins must fit freely and clevis must not bind against vertical arm.)
11. Set hand throttle at full open position against steering post.
12. Move approximately 65 degrees forward to idling position.
13. Loosen U-bolt and turn on torque rod until spring hook is just touching torque rod. Tighten U-bolt.
14. Check governor spring.



(Open coils indicate a stretched spring and should be replaced.) Spring length is set by opening or closing end loop until spring is neither loose nor in tension when in position on governor rod and against governor lever. With hand throttle at idling position and throttle against idle stop, adjust governor rod length until spring may be connected.

15. Start engine.

16. Check engine speed with hand throttle fully down (see diagram). If not between 2100 and 2200 r.p.m., loosen U-bolt and

turn until correct speed is attained. Then tighten the U-bolt.

17. With engine operating at full throttle, screw in bumper-screw until speed begins to increase. Lock in position with lock nut.

18. If hand throttle tends to creep, adjust friction disc under instrument panel. (This is done by loosening the clamp, compressing the spring and re-tightening the clamp.) If hand throttle still creeps, compensating spring must be shortened by $\frac{1}{4}$ -inch. (Normal length of spring is 4 inches.)

Note 1. Clamp must be located so that it will not strike battery when throttle is operated.

2. For further adjustments of governor, see "Trouble Shooting Section" pages 39 to 42.
3. If governor difficulties continue, see your Ferguson dealer.

TABLE FOR CHECKING ENGINE SPEEDS

Engine r.p.m.	P.T.O. Shaft r.p.m.	Pulley r.p.m.	Rear Wheel r.p.m., with 1 wheel locked—1st gear
400	145	270	10.1
500	181	338	12.7
2000	727	1358	50.8
2100	763	1425	53.3
2200	800	1493	56.

To check: Jack up one rear wheel. Place mark on tire and count revolutions per minute with tractor running in 1st gear.

Electrical System

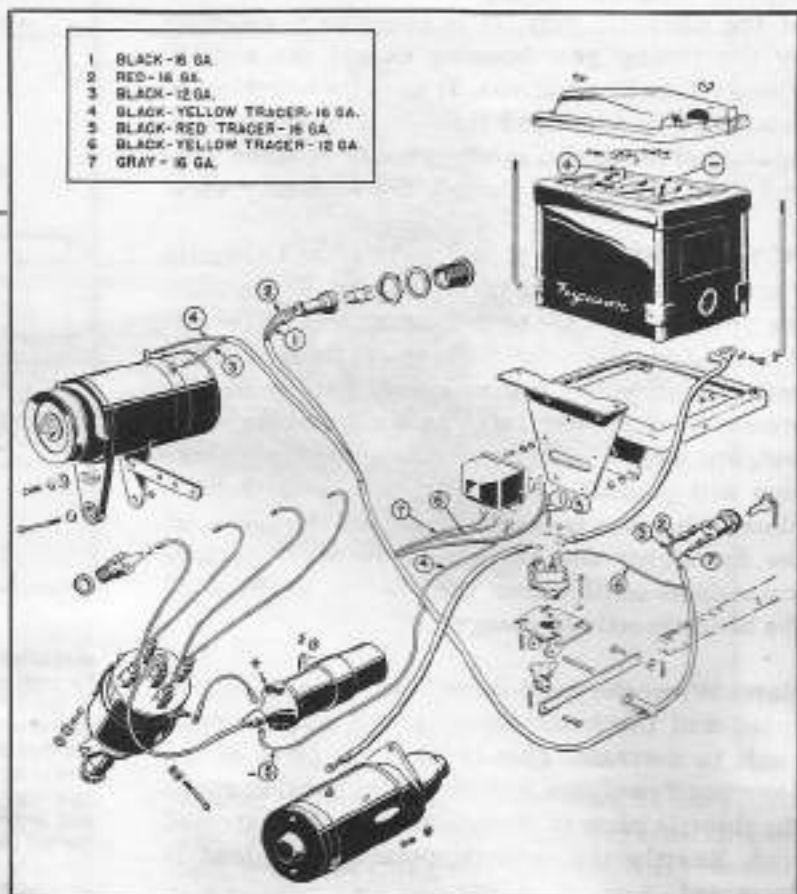
The electrical system consists of battery, coil, distributor, generator, spark plugs, starter, voltage regulator, charge indicator light, ignition switch and wiring. It must be kept in good condition to eliminate hard starting and electrical failures. Battery cables are designed for 200 to 400 amperes, but their capacity will be reduced by loose, dirty terminals. Good ground connections are essential between the chassis and battery—starter and generator. The high-tension wires must be kept in good condition to prevent loss of spark. The remaining low-voltage system wiring should be regularly inspected and connections kept clean and secure. Chafed insulation may cause a short.

Many owners will wish to add the Ferguson Lighting Kit for night work as well as other electrical equipment. Description of these and other extra equipment will be found in the Accessories Section, page 37.

BATTERY 13-plate, 6-volt. Capacity: 80-ampere hours. Cold weather reduces battery efficiency by slowing up electrochemical action. A fully charged battery with 100% cranking power at 80° F. will drop to 40% cranking power at 0° F. (engine requires 2½ times more cranking effort at 0° than at 80°).

Check battery as follows:

1. **Cable corrosion.** Keep cleaned and greased.
2. **Cracked or broken cases.** May allow escape of solution.
3. **Broken sealing compound.**
4. **Broken or cracked terminal posts.**

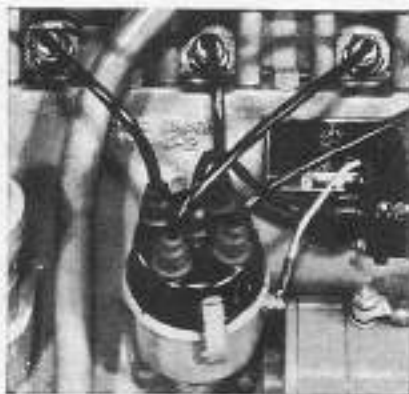


Wiring diagram of Ferguson Electrical System

5. **Freezing,** due to partially discharged condition.
6. **Poor terminal condition.** Keep clean with ammonia or baking soda.
7. **Looseness,** caused by vibration and heavy jars. Keep well tightened to prolong battery life.
8. **Water level.** Fill with distilled water to cover plates. Do not overfill.



DISTRIBUTOR AND MAINTENANCE The distributor is fully automatic, advancing the timing as engine speed increases. A special seal between the cap and housing makes the unit dustproof.



Dustproof wire caps keep dirt and moisture from the distributor.

Lubrication. Distributor oil reservoir is filled and sealed at the factory with light engine oil. No further lubrication is necessary for 1500 hours normal operation. When overhauling, refill housing with SAE-20 engine oil, but don't overfill. (Leave small air space above plug hole.) When plug is replaced, seal with sealing compound.

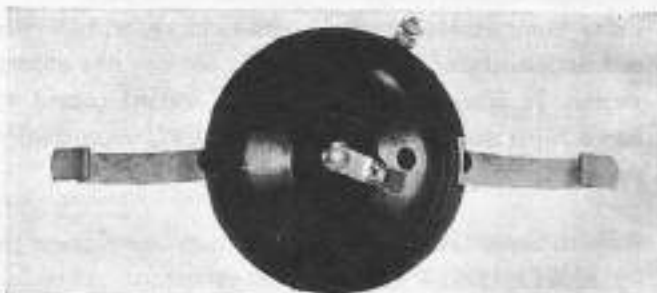
Put a trace of distributor grease on breaker cam every 150 hours. At same interval, put one drop of light engine oil on breaker lever pivot, and a few drops on felt wick under rotor. Avoid excessive lubrication.

Inspection. Remove cap and dust seal at regular intervals for examination of contact points, rotor and cap. Check high-tension wiring for frayed or damaged insulation. Be sure there are good connections at cap and plugs (replacing wire if necessary). Cap and rotor should be replaced if former is cracked or if carbonized paths indicate secondary current is leaking to ground over surface.

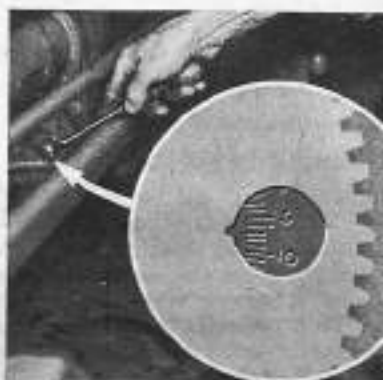
Adjusting Distributor. Distributor points set too close will pit or burn. Points set too wide will give weak spark. Use feeler gauge to check point opening of .020 inch. Keep points clean.

For correct spark delivery, points should open at 7 degrees before top dead center on compression stroke. To set, remove #1 spark plug and crank engine until compression creates pressure on finger held on spark plug hole. Remove timing hole button plug and *crank slowly* until graduated lines on front of flywheel can be seen.

When line indicating 7 degrees before T.D.C. is aligned with groove in timing hole, distributor points should just be open. (See "Valve Adjustment," page 15.) If not, loosen distributor clamp screw and slowly rotate complete distributor



Distributor cap removed to show Bakelite separator which protects points and mechanism from dust and ozone.



Flywheel timing marks.

Distributor points have just "broken open" in this view of the distributor.



until points just break contact. In case of spark failure, have the condenser coil checked by your dealer.

IGNITION COIL Coil is oil-filled and hermetically-sealed to prevent moisture entrance. A Bakelite insulator, with resistance to surface leakage, protects the high-tension terminal. Always keep all leads tightly connected.

GENERATOR Six-volt, third-brush type. Driving end rolls on a ball bearing, while commutator end has a bronze bushing. A special drive-end frame and support bracket provide hinge type mounting. A slit in the drive-end frame allows adjustment of the fan belt tension.

Lubrication. Put 8 to 10 drops of light engine oil in the two hinge cap oilers every 50 hours. *Caution: Never oil commutator.*

Inspection. Remove cover band and inspect commutator and brushes at regular intervals. Clean dirty commutator with No. 00 sandpaper, blowing out accumulated dust. *Caution: Do not use emery paper.* If commutator is rough, out-of-round or has a high mica glaze, have your Ferguson dealer repair it. Replace worn brushes.

Adjustment. Generator output may be stepped up by moving third brush in direction of armature rotation (counterclockwise, viewed from rear). To reduce, move third brush in opposite direction. It is advisable to have your Ferguson dealer make this adjustment since charging rate is controlled by the voltage regulator, and generator failure may result if output is set too high.

Installation warning: When reinstalling generator or reconnecting leads after they have been disconnected, connect a jumper lead *momentarily* between battery and generator armature terminals *before starting the engine.* This provides a current surge from battery to correctly polarize generator. Do not operate tractor when generator leads are disconnected.

THE STARTER The 4-pole, 4-field, 6-volt starter is mounted on the flywheel housing with a special flange. Its armature rotates in oilless bushings in the commutator end and drive housing. The Bendix drive is keyed to the armature shaft . . . auto-



matically engages the cranking pinion with the flywheel ring gear when the cranking motor armature begins to revolve. When the engine starts, the flywheel's overrunning effect on the pinion disengages the latter from the flywheel.

The starter is engaged by raising and moving the gearshift lever to the right and forward. Starter operates when gearshift lever reaches point marked "S" on transmission housing.

Starter Maintenance. Ruggedly designed, the starter should give no trouble other than possible

periodic renewal of brushes. In case of failure, disconnect terminal lead and remove two mounting bolts holding unit to drive housing and take entire starting unit to your Ferguson dealer for inspection and overhaul.

SPARK PLUGS Recommended are the 18 mm. AC #87 Commercial, Champion #8 Commercial, Autolite BT 8 or their equivalent. Examine frequently for excessive carbon deposits, pitted or burned points and broken porcelain. (Any one of these will decrease engine efficiency.) Regularly clean every 300 hours on a sandblasting machine.

Inspection and Maintenance. Regularly check gap-setting with feeler gauge (preferred setting .025 inch). *Note:* In setting gap, bend *outside* electrode to prevent cracking the plug porcelain. Be sure connections are tight and wires in good condition. Before starting tractor, remove any moisture collection in spark plug wells with a dry cloth. Do not overtighten—to do so may distort gap setting.

VOLTAGE REGULATOR This sealed unit is built to last the lifetime of your tractor. Never attempt to adjust it. Should regulator appear defective, remove by disconnecting four leads and unscrewing two bolts holding to mounting plate back of instrument panel. Have it checked by your Ferguson dealer.

STARTER SWITCH Mounted on transmission housing, just ahead of the steering column. Its contact points are sealed against dirt and moisture . . . are actuated by a plunger projecting inside clutch housing. Plunger is actuated by a rocker connected by a linkage to the reverse shift rail. When transmission shift rail is moved rearward by shift lever, the rocker forces the plunger upward, engaging the switch.

Servicing Starter Switch

If switch is to be removed, follow this procedure:

1. Remove battery, ignition and starter cables.
2. Remove four bolts securing switch housing.
3. Raise and tilt switch forward to remove pin. (To prevent switch-to-rail connecting link

from dropping down, fasten with wire or string.)

4. Pull pin and remove switch.
5. To adjust starter switch, loosen anchor nuts and move assembly forward or backward until correct engagement or disengagement is obtained.

Cooling System

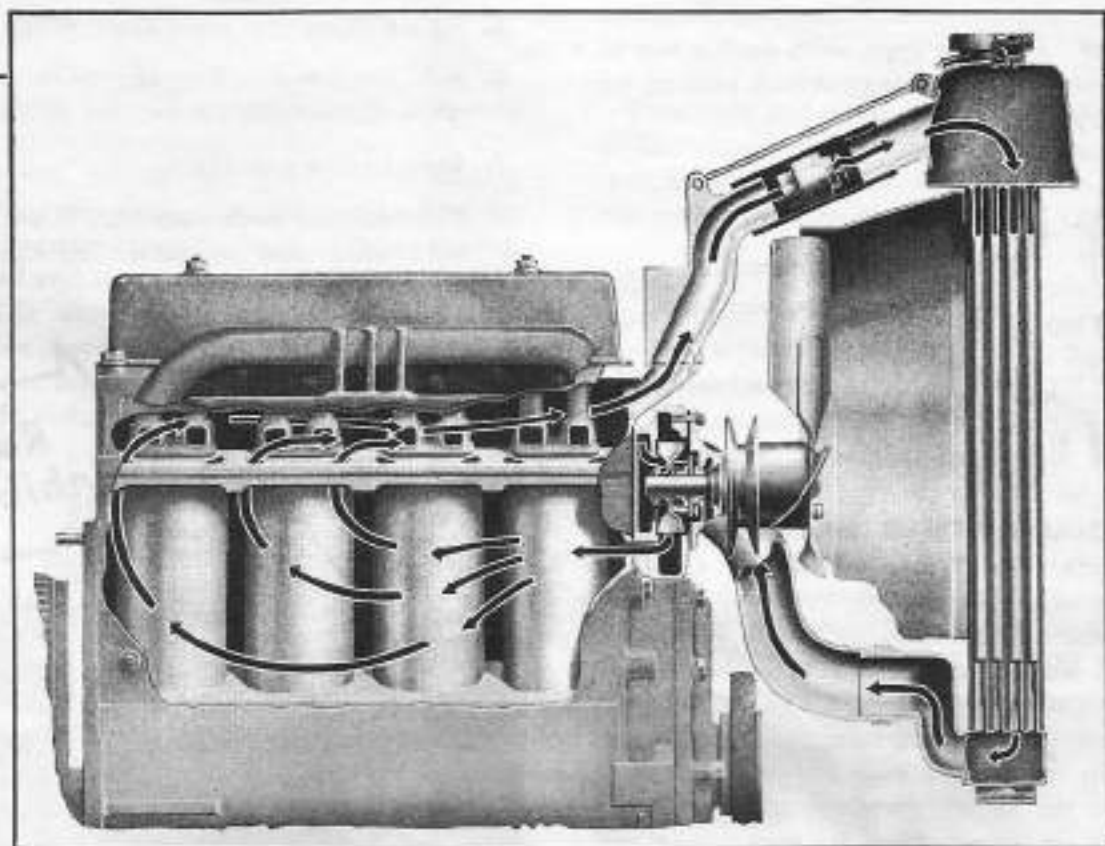


Diagram of engine cooling system.

There are six major parts to the cooling system—radiator, thermostat, pressure-type filler cap, fan, water pump and hose connections. Capacity: 10 quarts (8 Imperial quarts).

RADIATOR CAP Pressure-type permits 3 to 4 pounds internal pressure, raising boiling point of coolant 12 to 16 degrees.

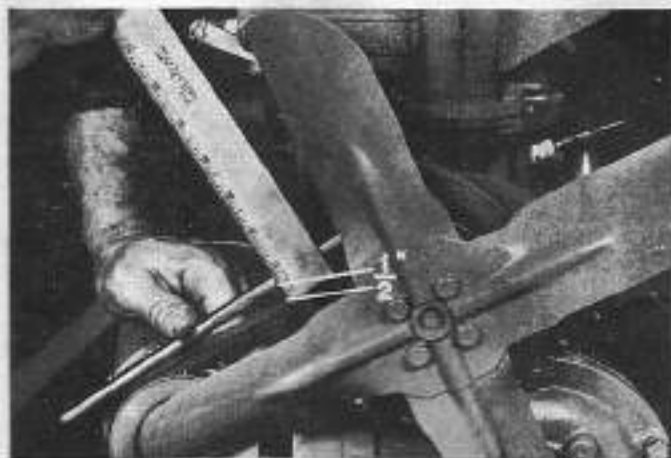


"Don't remove pressure cap when radiator's very hot."

Remove radiator cap *slowly and carefully* when engine is hot to prevent injury from escaping steam or scalding water. Remove cap when draining radiator.

RADIATOR FAN Four-blade, pull-type, mounted

on pump pulley. Turns on a *sealed, pre-lubricated* bearing which needs no additional lubrication.



Allow approximately $\frac{1}{2}$ inch slack in adjusting fan belt.

THERMOSTAT Bellows-type, in upper radiator hose. When engine is first started, the thermostat remains closed until coolant temperature reaches approximately 160 degrees. Then bellows expand, opening valve to permit water circulation.

Note: Install thermostat with bellows nearest engine.

WATER PUMP Impeller-type, with double row of sealed, pre-lubricated bearings which require no lubrication by owner.

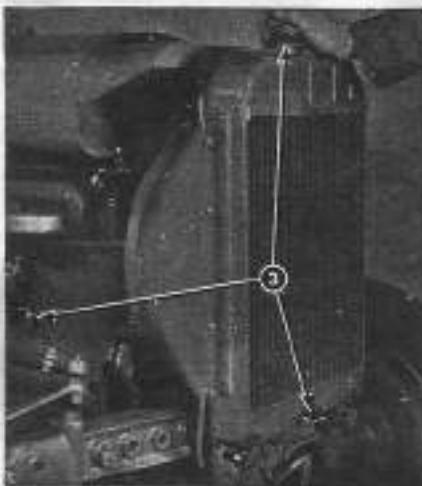


"Inspect radiator hose regularly to prevent leaks."

CARE OF COOLING SYSTEM Soft water or rain water is preferable. Water containing alkalis, acid, salt or other impurities hastens rust and scale formation (also induced when engine is overheated). To prevent corrosive action, use a recommended rust inhibitor.

Clean and flush cooling system twice each year, preferably in fall before addition of antifreeze, and again in the spring (when antifreeze is replaced with clear water). Here are necessary steps in adequate cleaning:

1. Run engine until warm to stir up any accumulation of rust, sludge or sediment.
2. Stop engine, remove filler cap and drain before foreign matter can settle (drain taps are located at bottom of radiator and on right side of cylinder block).
3. Close drain taps and fill system with flushing solution composed of $\frac{1}{4}$ pound of washing



After loosening radiator cap to prevent a vacuum, water is drained from the bottom of the radiator and from the right front side of the engine block.

soda per quart of water (i.e. $2\frac{1}{2}$ pounds of soda).

4. Replace cap and run engine 30 minutes.
5. Again drain and close drain plugs.
6. Add fresh water. Run engine to permit complete circulation for several minutes.
7. Stop engine and drain.
8. Fill radiator with water or, if cold weather, with water and recommended antifreeze.



Clean clogged radiator fins of dust, dirt or bugs, with an air hose or, in stubborn cases, use a brush.

When straightening bent fins, use care not to damage tubes or break bond between fins and tubes.

ANTIFREEZE If using a permanent-type antifreeze, be sure all hose connections are tight or replace with new hose. (Antifreeze will leak where water will not.) Use only recommended antifreeze solutions. These solutions are *not* recommended: calcium chloride, honey, glucose, sugar, kerosene or oils.

Warning: Never run engine with cooling system empty. Avoid filling with cold water when engine is very hot. (If necessary, run engine at idling speed and add cold water *very slowly*.)