

Product: Case IH D Series Tactor/Engine Service Repair Manual

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# **D Series Tractor/Engine Service Manual**

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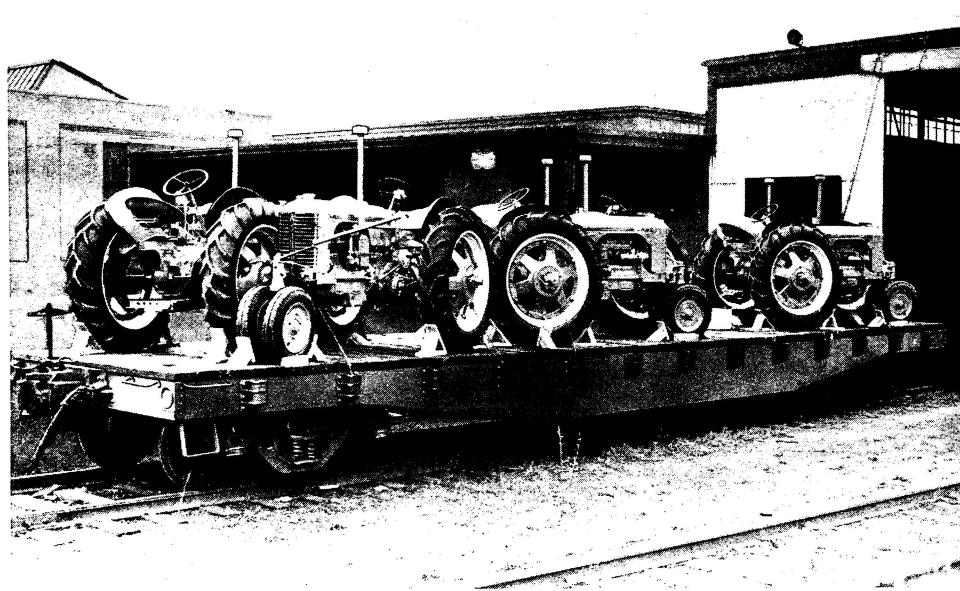
This Dealer's Service Manual has been developed to more completely familiarize Case dealers and their mechanics with all of the service details connected with the economical and efficient servicing of Model "D" Series Tractors and "DE" Engine Units.

It is, therefore, very important that this manual be carefully read and studied by all persons in the dealer's organization. If this is done, then we are sure that all tractors and engine units will be properly serviced either in the field or in the dealer's service shop.

Case tractors are built in modernly equipped factories where quality materials and the finest precision machinery is used, and where the highest grade workmanship is employed. Therefore, all tractors and engine units will perform satisfactorily if the owner is properly instructed in the care and operation.

Case users depend upon their dealers to give them advice and render service to assure long life performance that is built into every Case machine.

Parts for all Case machines are illustrated and are identified by part numbers in the regular parts catalog.



Case tractors are shipped from the factory on flat cars, as shown above, or in box cars. Report any shortages or damages immediately to transportation company. This also applies to tractors shipped via truck.

# INDEX

Page No.	Page No.		
Adjustment of Spiral Bevel Gears .....	42	Oil—Crankcase .....	9
Adjusting Rear Axle Bearing .....	41	Oil Filter .....	14
Adjusting Front Wheel Bearing .....	54	Oil Pressure .....	32
Air Cleaner .....	13	Oil Pump .....	32
Battery .....	18	Oil—Transmission .....	10
Belt Work .....	58	Oil Trap, Air Cleaner .....	14
Brakes .....	47	Operation, Tractor and Engine .....	5
Calcium Chloride, for Tires .....	53	Pistons .....	26
Camshaft .....	32	Piston Rings .....	27
Carburetion .....	21	Power Take-Off .....	55
Clutch .....	28	Radiator .....	12
Cold Weather Operation .....	13	Seat .....	59
Cooling System .....	10	Serial Number .....	59
Connecting Rods .....	26	Service Suggestions .....	38
Crankcase Breather .....	14	Shutter, Radiator .....	12
Crankshaft .....	31	Spacing, Rear Wheel .....	51
Cylinder Head .....	24	Spark Plugs .....	17
Cylinder Sleeves .....	25	Specifications .....	3
Differential Assembly .....	41	Speeds .....	4
“DCS” (Cane) Tractor .....	45	Starting Motor .....	18
Drawbar .....	58	Static Electricity .....	54
Drive Chains .....	41	Steering Gear .....	47
Engine, Removing .....	30	Tires .....	51
Fan .....	11	Tools .....	60
Fan Belt .....	12	Tractor, Splitting .....	28
Fuels .....	19	Tractor, Stopping .....	6
Fuel Filter .....	22	Tractor, Starting .....	5
Generator .....	18	Transmission and Differential .....	39
Governor .....	22	Transmission Breather .....	14
Ignition .....	15	Valves .....	23
Inflation—Tire .....	51	Warranty .....	61
Lubrication .....	6	Water Pump .....	11
Magneto .....	15	Water in Tires .....	53
Manifolds .....	19	Water in Crankcase .....	13
Motor Lift .....	57	Wheel Weights .....	52

# MODEL "D" SERIES TRACTOR

## SPECIFICATIONS

### Engine.

Cylinders ..... 4

Bore ..... 3 $\frac{7}{8}$  inches

Stroke ..... 5 $\frac{1}{2}$  inches

Displacement ..... 259.5

Cylinder Barrels ..... Wet Sleeves

Valve-in-Head

#### Compression Ratio

Low-Cost Fuel ..... 4.88

Gas Fuel ..... 5.58

#### Compression Pressure

Low-Cost Fuel ..... 96

Gas Fuel ..... 115

No Load Speed ..... 1367 RPM

Full Load Speed ..... 1200 RPM

Firing Order ..... 1-3-4-2

Valve Clearance ..... .018 inches when cold

Spark Plug ..... AC Type No. 85 or equivalent

Thread 18 MM—Gap .030"

Carburetor ..... 1 $\frac{1}{4}$ " SAE Flange

Magneto ..... Case Type 4-JMA

Air Cleaner ..... Case Oil Bath Type

Governor ..... Case Fly Ball Type

### Belt Pulley.

Diameter ..... 12 $\frac{1}{4}$ " Face ..... 7 $\frac{1}{4}$ "

No Load Speed ..... 930 RPM

Full Load Speed ..... 818 RPM

Belt Speed ..... 2620 ft. per min.

Ratio Engine Speed to

Belt Pulley Speed ..... 1.466 to 1

### Belt Pulley—"DE" Engine Units.

Diameter ..... Optional No Load Speed ..... 1367

Face ..... 8 $\frac{3}{8}$ -10 $\frac{3}{8}$  Full Load Speed ..... 1200

### Power Take-Off.

Normal Speed ..... 540 RPM

Spline ..... 1 $\frac{3}{8}$ " ASAE Standard

Guard ..... FEI Standard

Located on center line of tractor

### Approximate Capacities.

U. S. IMPERIAL

Engine Crankcase ..... 1 $\frac{3}{4}$  1 $\frac{1}{2}$  gals.

Cooling System ..... 6 $\frac{3}{4}$  5 $\frac{1}{2}$  gals.

Single Fuel Tank ..... 19 16 gals.

Double Fuel Tank (Large) ..... 17 14 gals.

(Small) ..... 2 1 $\frac{2}{3}$  gals.

Transmission and Differential 10 $\frac{1}{2}$  8 $\frac{1}{2}$  gals.

## MODEL "D" SERIES TRACTOR—Continued

### Speeds.

	"D"		"DC"		"DO"		"D"	
Rear Tire Size .....	12-26	13-26	11-38	12-38	13-26	13-26	42" Diameter Steel Wheels	

### Approx. Speeds

1st .....	2.10	2.19	2.10	2.17	2.19	1.95
2nd .....	3.63	3.78	3.63	3.75	3.78	3.36
3rd .....	5.00	5.20	5.02	5.18	5.20	4.64
4th .....	10.11	10.51	10.10	10.40	10.51	9.36
Reverse .....	2.86	2.98	2.87	2.97	2.98	2.65

Note: Speed will vary with weight of wheel, traction, size tire and load.

Calculated at Engine Speed of 1200 RPM

### Shipping Weight.

Model "D" .....	12-26 Tires	4433 lbs.
Model "D" .....	13-26 Tires	4489 lbs.
Model "DO" (Orchard-Grove) .....	13-26 Tires	4602 lbs.
Model "DC3" (General Purpose) .....	11-38 Tires	4766 lbs.
Model "DC3" .....	12-38 Tires	4796 lbs.
Model "DC4" .....	11-38 Tires	4471 lbs.
Model "DC4" .....	12-38 Tires	4501 lbs.
Model "DC3" (General Purpose with Adjustable Front Axle) .....	11-38 Tires	4622 lbs.
Model "DC3" .....	12-38 Tires	4662 lbs.
Model "DCS" (Cane Tractor) .....	11-38 Tires	6360 lbs.
Model "DE" (Engine Unit Less Belt Pulley) .....		1475 lbs.

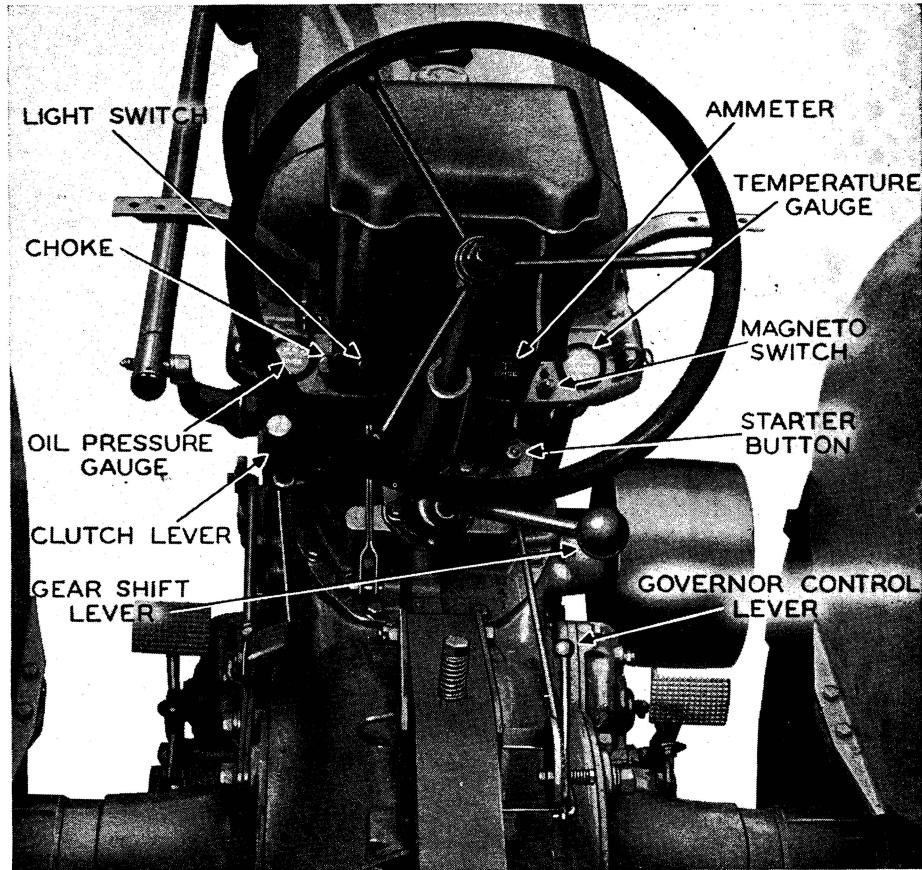


Figure 1. Operating Controls

## TRACTOR AND ENGINE OPERATION

### Starting the Engine.

Before starting the engine, check the oil level in the crankcase and the air cleaner reservoir. Fill the radiator with clean water or with anti-freeze during cold weather. Check the fuel supply.

Place the gear shift in neutral and disengage the clutch.

Push in the magneto switch for starting the engine.

Set the governor control lever at about the mid-position on the quadrant. To increase the governed engine speed, push forward on the lever and to decrease the speed, pull the lever rearward.

Start the engine by pressing down on the starter switch until the engine fires. When hand cranking, pull the crank upward with one-quarter turns, so the operator's hand will be in a position to avoid being struck by the crank, should the engine backfire.

Immediately after starting the engine, check the oil pressure gauge, to see that it is registering.

Set the governor control so that the engine runs about half normal speed and adjust the carburetor needle valve until the engine runs smooth and free.

### To Start the Tractor or Engine Unit.

With the engine running, pull back on the clutch lever until the belt pulley stops rotating; then

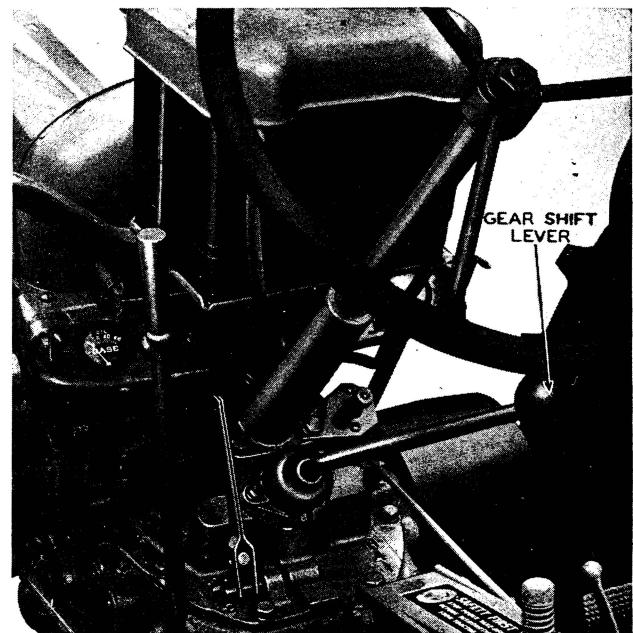


Figure 2. Gear Shift

move the gear shift lever to the position for the speed desired. Push the clutch lever forward gradually until it snaps into full engagement; but do not push on the lever after the clutch is fully engaged. The gear shift lever should be in the neutral position when starting the engine, or when running idle in order to prevent accidents in case the clutch is accidentally engaged.

Occasionally the gears will stop with the teeth ends opposite each other, thereby preventing easy shifting. Should this occur, partly engage the clutch to rotate the gears slowly, then the teeth can be meshed readily. This condition occurs more often when the tractor is new.

Before submitting an engine unit to full load, be-sure it is thoroughly warmed up.

#### Running in a New Engine.

A new tractor should never be loaded to full capacity. For the first 50 hours it should be run at half load with full open throttle or governed speed, before it is put on full load.

#### Stopping the Engine.

When gasoline is used for fuel, the engine is stopped by reducing the speed and then pulling out the magneto switch button on the instrument panel.

When operating on low-cost fuel, turn off the fuel from the main tank and turn on the gasoline a few minutes before stopping. This will allow the low-cost fuel in the lines and the carburetor bowl to be replaced by gasoline. Starting on low-cost fuel is difficult, if not impossible, after the engine has cooled off.

### LUBRICATION

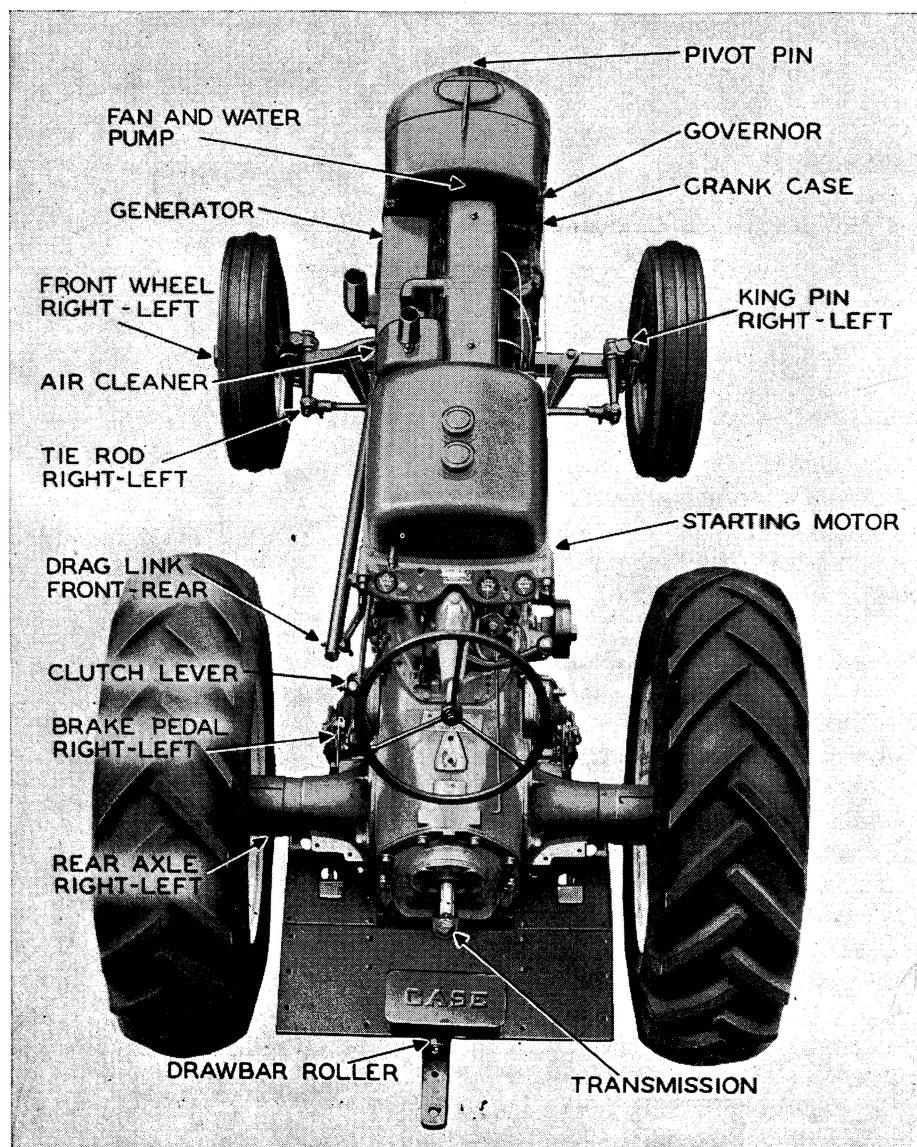


Figure 3. Lubrication Diagram—Models "D" and "DO"

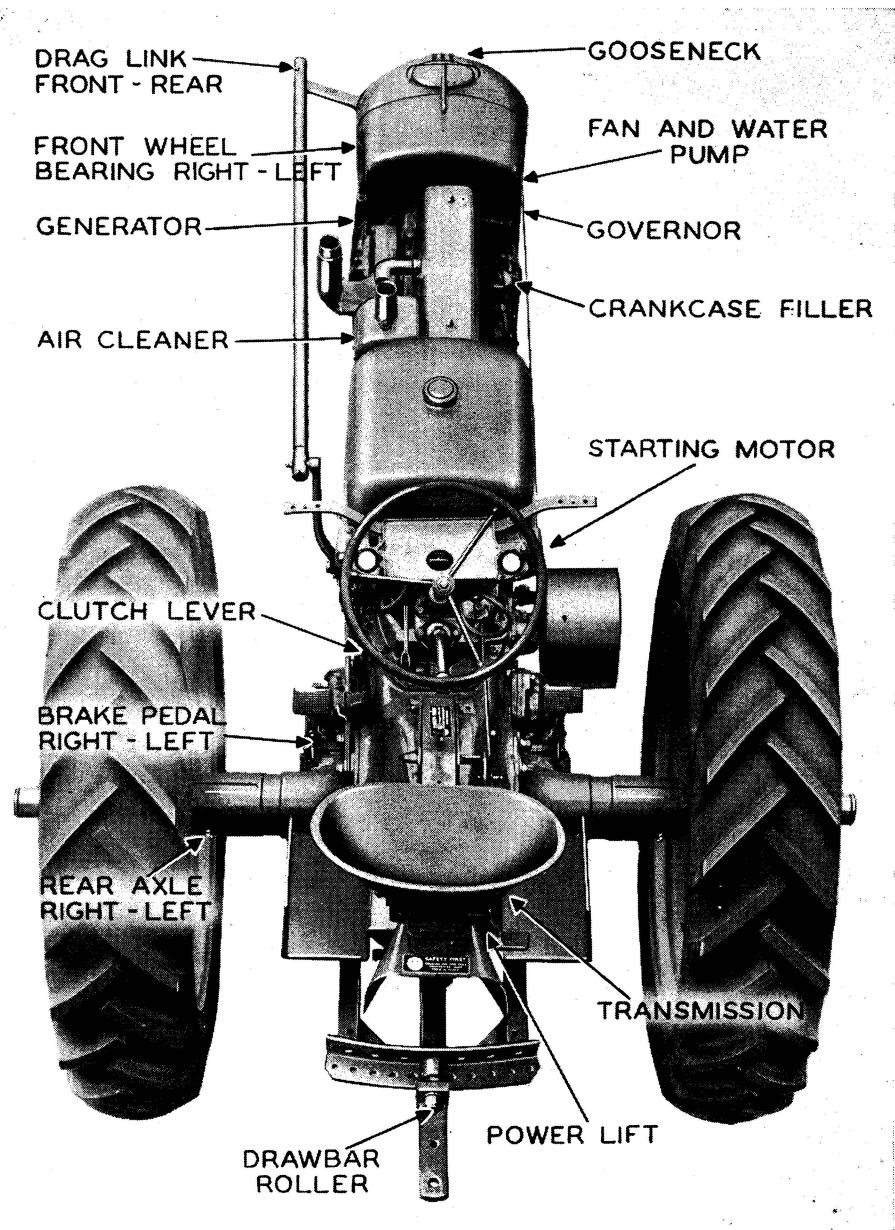


Figure 4. Lubrication Diagram—Model "DC"

#### General Lubrication.

Your tractor is equipped with pressure fittings wherever automatic lubrication cannot be provided. These fittings are few but important, so do not neglect to lubricate these points regularly. A good grade of semi-fluid pressure gun lubricant should be used in the grease gun in warm weather. In cold weather a lighter grade of lubricant is desirable, to insure that the lubricant will reach the bearing surfaces. Wipe the pressure fittings clean before using the grease gun.

#### Engine Oil Recommendations.

Capacity—1 $\frac{3}{4}$  U.S. Gallons

1 $\frac{1}{2}$  Imperial Gallons

SAE No. 30 for summer or temperature above 90° F.

SAE No. 20 for spring and fall or temperature between 90° F. and 32° F.

SAE No. 10 for winter or temperature between 32° F. and +10° F.

SAE No. 10-W for temperature below +10° F.

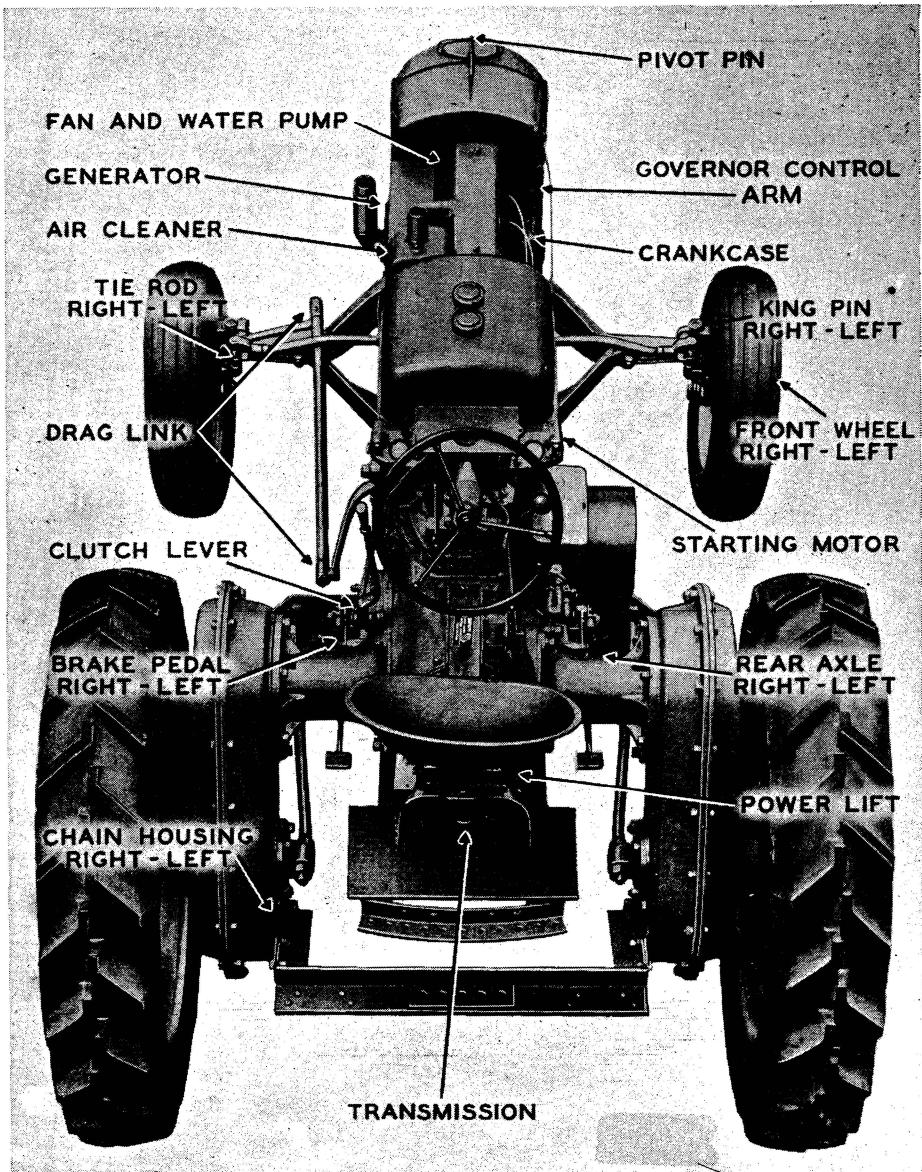


Figure 5. Lubrication Diagram—Model “DCS”

**First Group**—Attention Daily—Every 10 hours of operation

**Rear Axle Bearings**

**Gooseneck**

Two fittings. “DC” only.

**Drag Link**

Two fittings.

**Front Axle Pivot Pin**

“D,” “DO” and “DCS.”

**King Pins**

Four fittings. “D,” “DO” and “DCS.”

**Tie Rod**

Two fittings. “D,” “DO” and “DCS.”

**Independent Brake Pedals**

**Clutch Lever**

**Drawbar**

**Belt Pulley**

On tractors prior to serial number 4805353. On tractors after 4805353 ball bearings are lubricated from within the transmission case.

**Power Take-off**

**Second Group**—Attention every 60 hours of operation.

**Governor**

**Fan Bearing**

**Third Group**—Attention every 200 hours of operation.

**Generator**

Add a few drops of oil to each of the oil cups—one on front flange and one on the rear cover. Clean around the oilers before opening. Use a good grade of light oil.

### Starting Motor

Add a few drops of a good grade of light oil to oiler in front end of starter. Clean the end of starter before swinging the small cover on oil hole to one side.

**Fourth Group**—Attention every 250 hours of operation.

### Oil Pump Screen

Every 250 hours of operation, the oil pump screen should be removed and cleaned. Also remove any sludge or dirt in oil pan.

### Transmission

Transmission is filled to height of level plug on rear transmission cover. Inspect level every 250 hours and refill if needed.

### Front Wheel Bearings.

These bearings are packed with grease at the factory and under normal conditions, will require no attention for the first 250 hours of operation. The wheel bearings should then be removed, cleaned thoroughly and repacked with a good grade of fibre grease. This should be repeated every 250 hours thereafter.

### Clutch Housing.

Oil from the crankcase is constantly circulating through the clutch housing and a small amount of oil is retained in the clutch housing when the engine is stopped. The clutch housing drain plug should be removed and the clutch housing drained at the same time that the crankcase oil is changed. Install plug after draining.

### Magneto.

The Case magneto is equipped with sealed oil bearings and oil-impregnated bushings which re-

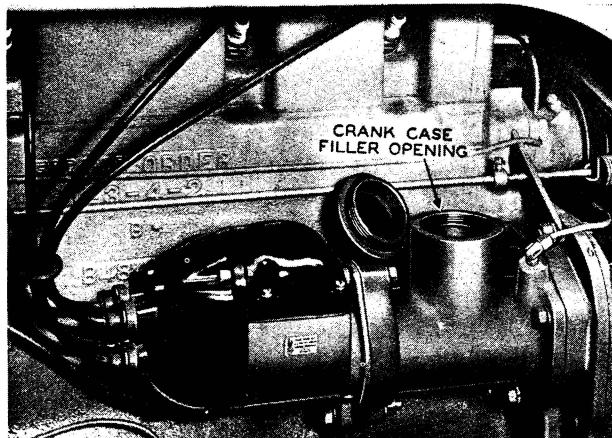


Figure 6. Crankcase Filler

quire no lubrication except at time of general overhaul.

### Engine Lubricating System.

A pressure feed lubricating system built into this engine assures positive lubrication to all working parts. A gear type oil pump equipped with non-adjustable relief valve circulates oil in the engine block to all main, connecting rod, camshaft bearings, clutch pilot bearing and clutch throwout bearing, valve rocker arms and governor. All other parts operate in an oil spray from connecting rod bearings. Valve lifters are flood lubricated.

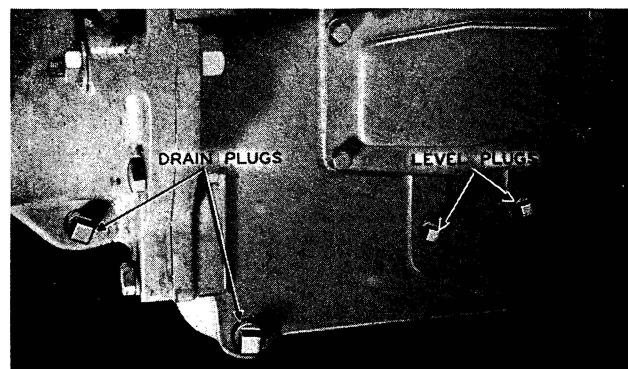


Figure 7. Oil Level and Drain Plugs

### Crankcase Oil.

Before starting a new tractor, make sure that the oil pan contains oil up to the proper level. Inspect the oil level by removing the level plugs on the right side of the engine; the oil level should be between the two plugs when the engine is not running.

In cold weather it is important to use good oil that flows freely through the screen of the oil pump and permits easy cranking when starting. A simple method of checking this is to remove lower level plug and see if the oil flows freely.

### Engine Lubrication

#### When Gasoline Is Used for Fuel.

Add new oil through filler opening on the governor housing to bring to level of upper plug. After 120 hours of operation, remove the crankcase drain plug when the engine is hot, and drain all oil out of crankcase. Replace the drain plug. Then fill the crankcase with  $1\frac{3}{4}$  U.S. gallons or  $1\frac{1}{2}$  Imperial gallons of new oil through the filler opening in the governor housing.

Although the oil level should be maintained to the level of the upper plug, no difficulty will be experienced if the engine is operated with the level slightly below this top level. Under no circumstances should it be operated if the oil level is below the lower plug.

### Engine Lubrication When Low-Cost Fuel Is Used.

After every 10 hours of operation, remove lower level plug and allow oil to drain to this level. Add new oil through filler opening on the governor housing to bring to level of upper plug. After 90 hours of operation, remove the crankcase drain plug when the engine is hot, and drain all oil out of crankcase. Then fill the crankcase with  $1\frac{3}{4}$  U.S. gallons or  $1\frac{1}{2}$  Imp. gallons of new oil to the upper level plug through the filler opening in the governor housing.

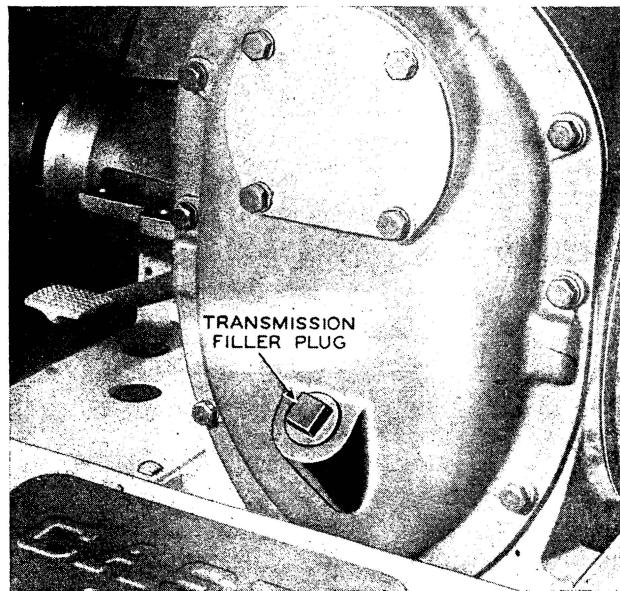


Figure 8. Transmission Filler Plug

#### Transmission Lubrication.

Capacity—Approximately  $10\frac{1}{2}$  U.S. or  $8\frac{1}{2}$  Imperial Gallons.

#### Body of Oil

SAE 140  
SAE 90

#### Temperature

32° F. and above  
Below 32° F.

The transmission should be drained, flushed and refilled with a high quality oil every 2000 hours or once a year. Approximately  $10\frac{1}{2}$  gallons will be required.

If the tractor is to be used in cold weather (below 32° F.) with SAE 140 oil, drain 2 to 3 gallons of the oil from the transmission case, and replace it with an equal amount of a good grade SAE 10 or 10W engine oil. The thin oil will dilute

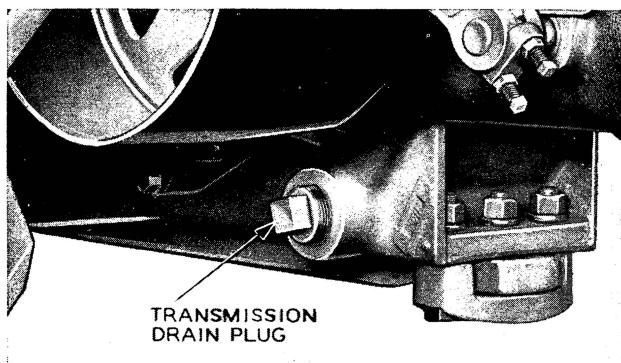


Figure 9. Transmission Drain Plug

the SAE 140 oil sufficiently for it to remain fluid in cold weather and thereby prevent the transmission gears or chains from channeling in the lubricant.

In cold weather use a good grade of SAE 90 oil.

When doing belt work, the tractor should be set level, so all bearings, shafts, etc., will be properly lubricated.

#### Motor Lift Lubrication.

On motor lift equipped tractors, it is necessary to have the motor lift housing filled with oil to the level of the filler plug. Use the same grade of oil as is used in the transmission case.

### COOLING SYSTEM

The capacity of the cooling system is  $6\frac{3}{4}$  U.S. or  $5\frac{1}{2}$  Imperial gallons.

Cooling solution is circulated by means of an impeller type pump, through the radiator, engine block and engine head. The pump is driven by a V-belt from the crankshaft. The heat of the engine is controlled by regulating the air draft through the radiator, which in turn affects the temperature of the cooling solution. This is accomplished by means of the radiator shutter; therefore, before starting, close the shutters until the engine reaches operating temperature.

The water temperature should always be 180° to 200° F. or just below the boiling point. Low-cost fuel, if used, can then be turned on and the shutters opened just enough to keep the engine at this temperature.

**CAUTION:** Never pour water into a hot engine in which the water has been allowed to become very low. To do so may result in cracking the cylinder block or cylinder head. If water is poured into a cold engine that has been drained, add the water slowly. Too rapid pouring may result in breakage.

#### Cleaning the Cooling System.

At least once a year, particularly in the spring after draining the anti-freeze, the cooling system

should be given a treatment with washing soda solution to remove any sludge and sediment that is accumulated. The easiest way is to drain the system and put back 3½ gallons of fresh water. Then bring to a boil an equal amount of water and add all the common washing soda that will dissolve. While this is still hot, add it to the cooling system. Operate the engine for 24 hours, drain, flush thoroughly, and refill with clean water.

Use of an anti-rust oil is recommended to preserve the interior surface of the cooling system.

Keep radiator hose clamps tight. Remove all trash from the core of the radiator to prevent overheating.

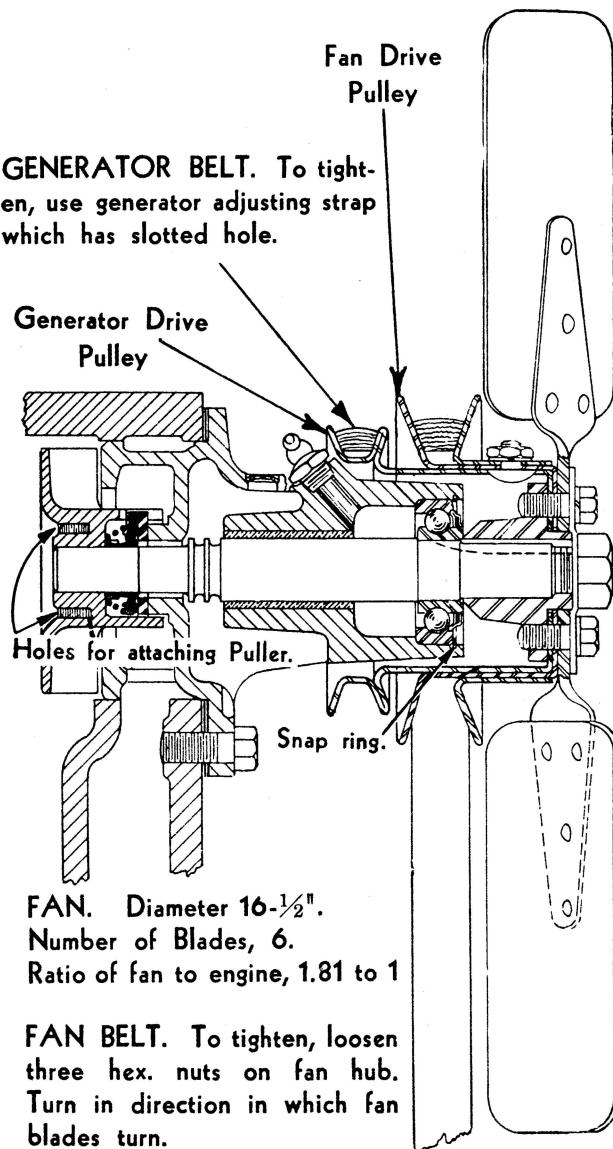


Figure 10. Fan and Water Pump

#### Servicing the Fan and the Water Pump.

This pump is of the mechanical seal type, and no attention is required other than periodic lubrication and occasional adjustment of the fan belt

tension. The lubricant is the same as used for other pressure fittings. Lubricant is fed only to the ball bearing and to a long plain bushing; the sealing member of the pump requires no lubrication, and hence water pump grease should not be used. To prevent damage to the seals of the ball bearing, do not use an excessive amount of grease.

#### Fan and Water Pump Disassembly.

Remove the radiator. Remove the four capscrews securing the fan and pull the fan hub, Figure 10. Remove the three capscrews, securing the water pump body to the engine block.

To remove the impeller, use a puller that has a center adjustment. When securing the puller to the impeller, use two  $\frac{5}{16}$ " NC bolts, screwed all the way to the bottom of the tapped holes in the impeller. The holes are shown in Figure 10. Puller No. 332 3AA is used to pull the impeller.

Remove the snap ring which secures the ball bearing in place, from the pump body. The shaft can then be withdrawn from the pump body by removing it from the fan end. Remove the nut from the end of the shaft, and with a puller, remove the hub from the shaft. Remove the ball bearing from the fan end of the shaft.

If the bushing must be taken out of the pump body, it should also be removed from the fan end.

#### Fan and Water Pump Assembly.

When replacing the water pump bushing, ream to .8735"- .875" after the bushing has been pressed into place.

Press the bushing for the water pump into the pump body, then ream to size so the pump shaft turns freely. The water pump impeller, which has its parts held in place with a snap ring, is press fitted on one end of the shaft. The spring should be assembled with the small end facing the impeller. The seal spring guide fits on the flexible seal. The other end of the shaft fits into the pump and through a bearing which is held in place by a snap ring. The fan hub, which drives both the impeller and the fan is keyed to this end of the shaft. A nut holds the fan hub in place.

The fan pulley consists of an adjustable half and the drive hub half, fitted together. This assembly fits over the generator drive pulley, which in turn fits over the fan hub. The fan blade assembly is fastened (spider portion to the front), to the hub with four  $\frac{5}{16} \times \frac{7}{8}$  capscrews. The hexagon nut is locked to the water pump and fan shaft by the lock, which is held in place by two capscrews.

The water pump and fan assembly is driven through a belt, from the fan drive pulley. A second belt, in turn, drives the generator.

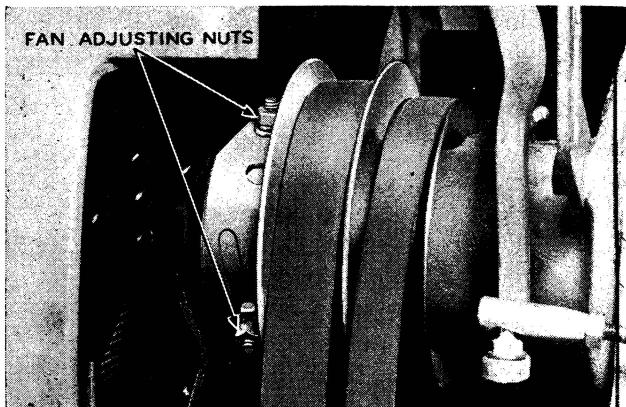


Figure 11. Fan Belt Adjustment

#### Adjusting Fan and Water Pump Belt.

For your safety, remove all spark plug wires to avoid any possibility of engine starting while working on the fan and water pump assembly.

Loosen three hexagon nuts, Figure 11, and tighten the belt by turning the front half of the pulley in the direction in which the fan blades turn. The tension should be just enough to take up any looseness or slack. A properly adjusted belt can be easily depressed 1" by the thumb midway between the pulleys. Too tight a belt causes excessive belt wear, excessive load on the bearings, and does not aid cooling. The belt should always ride on the sides of the V pulley and never on the bottom of the pulley. After adjusting the belt, tighten hexagon nuts.

#### Installing New Belts.

Remove the fan blades by taking out the four capscrews, two of which are shown in Figure 10. The fan blades may then be dropped down just in back of the radiator core. This operation may be facilitated by disconnecting the radiator and shifting it ahead a few inches, or by removing it completely.

Loosen the adjustable flange on the water pump. The old belts then can be slipped off the fan shaft, and removed from the lower pulley by working them between the starting crank and starting jaw on the crankshaft, and between the drive pulley and fan shroud. If preferred, the starting crank can be removed by taking out the two capscrews holding the assembly to the radiator bracket.

#### Removing the Radiator.

The following suggestions will facilitate the removal of the radiator.

Disconnect the spark plug wires to avoid any possibility of the engine starting.

Drain the coolant and remove the outlet drain pipe. Take off the radiator cap, the air intake pipe and the fuel tank cap. Remove the hood from over the engine. Disconnect the shutter control rod on the upper right front side. Remove the heat indicator bulb from the radiator inlet elbow.

Disconnect the battery cables, the headlight wires and the wire at the generator. Remove the generator completely and lay aside to avoid damaging it.

Remove the two capscrews holding the cylinder inlet elbow to the cylinder block at the lower left hand side of the engine. Remove the two capscrews connecting the radiator inlet elbow to the cylinder head. Gently withdraw the gasket to prevent damaging it.

Remove the capscrews holding the radiator on the radiator bracket. Raise and remove the radiator with the inlets attached to it. If the fan blades interfere, turn them by hand to clear the radiator shrouds.

Lay the radiator shim aside for safekeeping.

#### Installing the Radiator.

Set the radiator back on the radiator bracket, turning the fan blades by hand if necessary, to clear the radiator shrouds. Fasten the cylinder inlet elbow to the cylinder block with the two capscrews. After slipping the gasket into place between them, secure the radiator inlet elbow to the cylinder head.

Slip the radiator shims back in place between the bracket and the radiator. Securely install the two radiator mounting capscrews.

Install the generator in place and attach the generator wire. Connect the headlight wires, and the battery cables. Replace the heat indicator bulb in the radiator inlet elbow. Connect the control rod to the shutter.

Put the hood back on the engine. Replace the fuel tank cap, the air intake pipe and the radiator cap. Install the outlet drain pipe. Restore the coolant to the system.

Put the wires back on the spark plugs.

#### Radiator Shutter.

Model "D" Series Tractors are equipped with shutters. The shutter control is operated from operator's seat by a crank on the right hand side of instrument panel. The correct water temperature recommended for satisfactory operation is

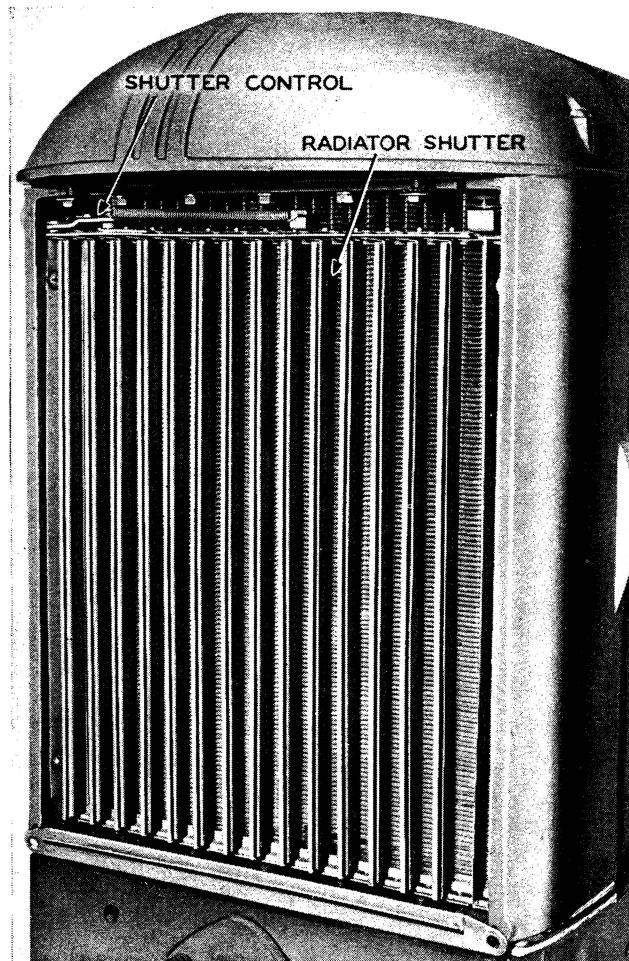


Figure 12. Radiator Shutter

about 180° to 200° F., or just below the boiling point.

To open shutters, turn crank on right hand side of instrument panel to "left."

To close shutters, turn crank on right hand side of instrument panel to "right."

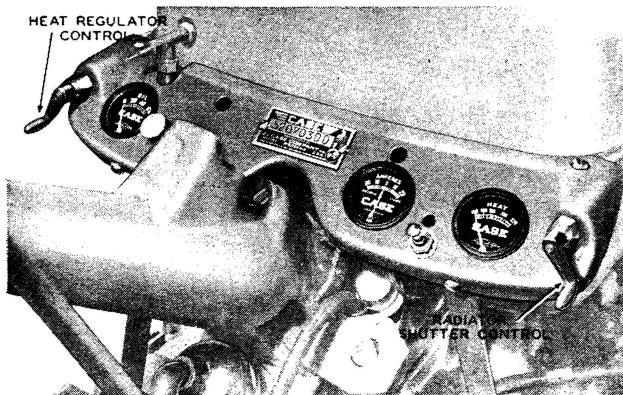


Figure 13. Shutter Control

#### Care of the Cooling System for Winter Operation.

When operating an engine in cold weather, always use a good grade of anti-freeze in the

cooling system. Any nationally advertised brand will work satisfactorily in a Case Tractor. Under no circumstances use a compound of unknown composition, as this might prove harmful to the cooling system. No solutions of calcium chloride, sodium chloride or magnesium chloride should be used. The electrolytic and corrosive action is very damaging to metal parts. Likewise, no substances such as lubricating oil, kerosene, honey or sugar solutions, sodium silicate or glucose should be used. Extra fire hazard, destruction of the radiator hoses and gumming action on the interior surfaces of the cooling system may result from the use of such solutions.

#### Water in the Crankcase.

There is a great amount of condensation in the engine crankcase during cold weather. If a sufficient amount of this water of condensation is allowed to collect, it may freeze in the bottom of the crankcase or on the oil pump screen and result in a broken oil pump or burned out bearings. To avoid any danger from this cause, it is advisable to loosen the oil pan drain plug daily, after the tractor has been idle for a few hours, and check for the presence of water. It is not necessary to entirely remove the drain plug. Simply turn it out until one or two threads are holding. Any water present will then run out of the crankcase. Be sure to tighten the drain plug before starting the tractor.

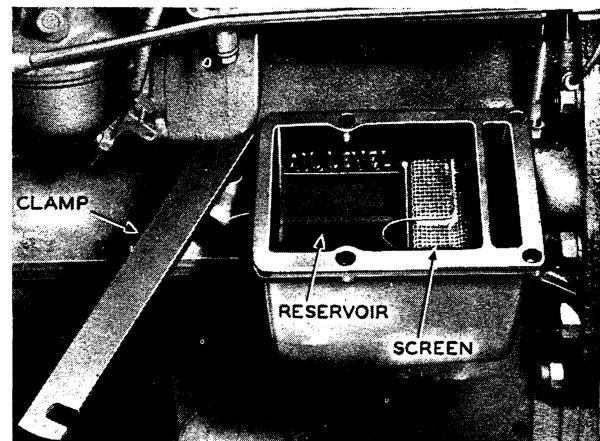


Figure 14. Air Cleaner

#### AIR CLEANER

The function of the air cleaner is to prevent dirt and abrasive material from entering the engine. Proper servicing should be maintained at all times because dirt or dust taken into the engine with the intake air is extremely harmful. They will cause excessive wear on pistons and cylinders, sticking of valves, wear on valve stem guides and may cause the valves to become sluggish or hold open so that they will leak or burn.

To remove the reservoir for cleaning, loosen hand nut and swing clamp strap to one side.

Discard the old oil from reservoir and clean out all foreign matter.

In very dusty conditions, use a long screw driver to dislodge dirt from bottom and sides of intake passage.

The air cleaner oil reservoir should be removed daily, cleaned and filled to the level mark on reservoir with an oil having a viscosity of SAE 10. However, if the engine is operated when the weather is quite cool, it might be necessary to thin out the SAE 10 oil with a slight amount of kerosene.

The daily inspection and cleaning of air cleaner is imperative when operating under normal conditions. However, in extremely dusty conditions, more frequent servicing may be found necessary.

#### Care of Connections.

Gasket between air cleaner and carburetor must be properly installed and kept tight at all times, otherwise excessive engine wear will result if there are any leaks between the air cleaner and carburetor.

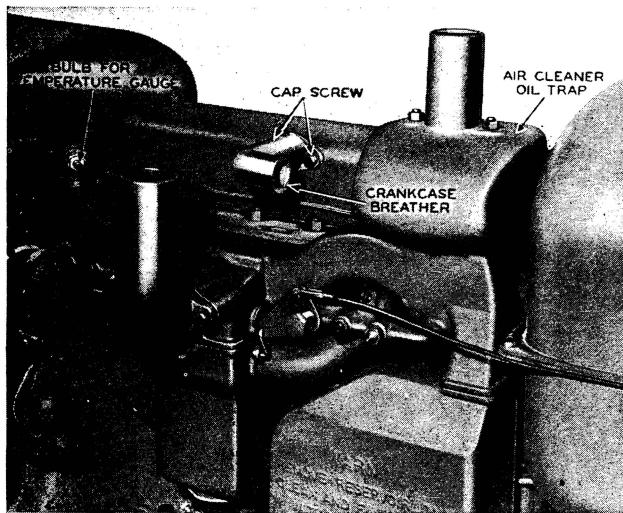


Figure 15. Air Cleaner Oil Trap

#### Air Cleaner Oil Trap.

The air cleaner oil trap is located over the air cleaner in the air intake pipe and is attached to the exhaust manifold. The oil trap prevents oil from being thrown out of air cleaner if engine should back-fire.

#### OIL FILTER

The purpose of an oil filter on an engine is to separate and remove dirt and other foreign substances from the oil to prevent these materials from being circulated to the engine. Therefore, it is important that the element, No. 33516, be replaced every time the oil in crankcase is

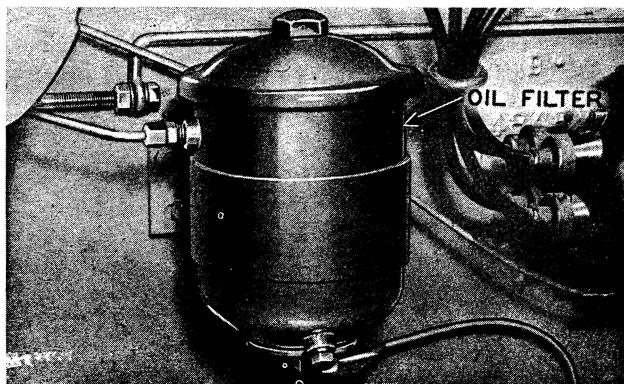


Figure 16. Oil Filter

changed, which is approximately every 120 hours of operation.

To replace filter, it is only necessary to remove top nut and cover after which element can be lifted out. Before replacing element, remove drain plug from bottom of filter and drain out all old oil. Also remove foreign matter from inside of filter.

#### CRANKCASE BREATHER, SCREEN TYPE

The crankcase breather is located on outside of cylinder head cover as shown in Figure 15. It is recommended that when operating engine in dusty conditions that an examination be made about every 100 hours to see that all screens are clean and that breather is operating freely. Under extremely dusty conditions, this should be checked oftener.

To clean screens, remove the two capscrews holding the breather elbow. Wash entire elbow assembly in gasoline until all dirt and sediment are removed.

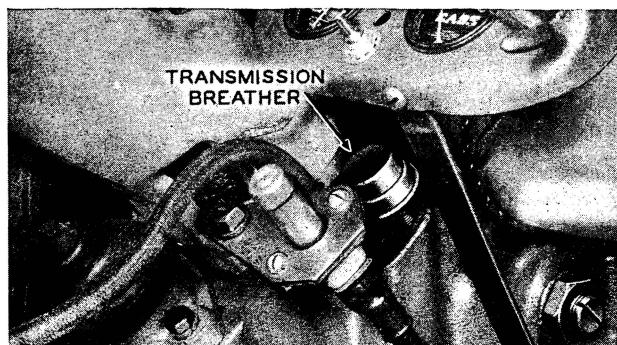


Figure 17. Transmission Breather

#### TRANSMISSION BREATHER

The transmission breather located on the transmission case top cover should be removed and cleaned in gasoline or fuel oil every 100 hours. Put a few drops of engine oil in the breather before putting it back in place.

Under extremely dusty conditions, this breather should be checked and cleaned more often.

## IGNITION

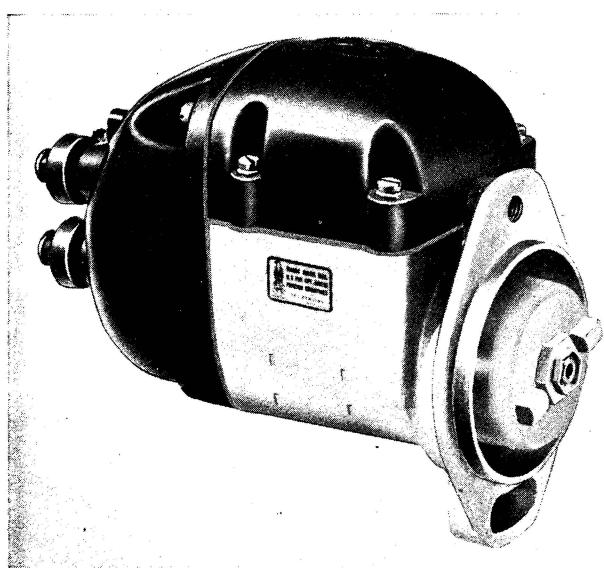


Figure 18. Case 4-JMA Magneto

### Magneto.

The Case 4-JMA magneto—located on the right side of the engine—is a very precisely built, self-contained unit which should not be taken apart in the field. Many magnetos are ruined because they are tampered with by inexperienced operators, under dirty, dusty conditions or at places where proper service tools are not available.

Should the magneto require attention other than that described herein, take it to one of the authorized Service Stations listed in our Magneto Service Station directory.

### Servicing Magneto.

This should include only service operations involving the timing of the engine or replacement of the entire magneto unit.

In normal use, the magneto will seldom require timing unless it has been removed from the engine for servicing. The magneto has been properly timed and adjusted at the factory and the position of the crankshaft in relation to the occurrence of the spark does not change appreciably in use.

**NOTE:** No Warranty Service Work will be approved should it be done on a Case Magneto by any one other than an authorized Case Magneto Service Station or Case Magneto Depot Station as they have all the necessary tools and equipment to do this work in a satisfactory manner and are familiar with handling Magneto Warranty Service.

### Removing the Magneto from the Engine.

Disconnect all wires from the magneto to spark plugs, see Figure 22. Disconnect the grounding wire. Take out the two capscrews attaching the flange of the magneto to the magneto drive. The magneto can then be lifted off.

### Installing and Timing Magneto.

When the magneto is installed on the tractor, it must be re-timed. Follow this procedure:

Remove all spark plug wires as well as No. 1 spark plug. The spark plugs in No. 2, 3 and 4 cylinders remain in place. Figure 22.

Make sure the gear shift lever is in neutral position.

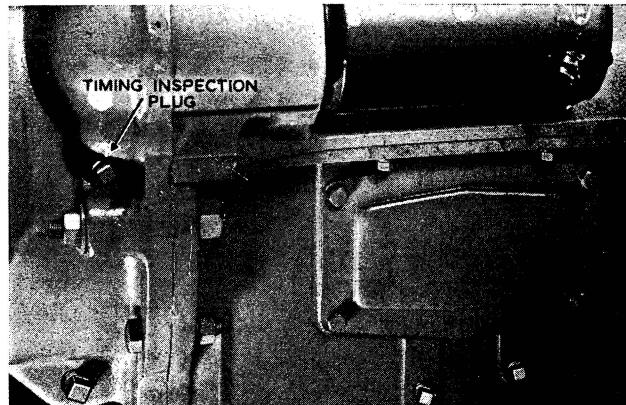


Figure 19. Timing Inspection Hole

Remove the plug from the timing inspection hole on the right side of the clutch housing. Figure 19.

The compression stroke may be determined by removing No. 1 spark plug and holding the thumb over the spark plug opening. While the engine is cranked slowly, outward pressure is felt when the piston is coming up on the compression stroke. A lighter pressure is also felt on the exhaust stroke. Do not confuse the two.

The proper position of the flywheel for timing the magneto, is when the letter "D" appears in the center of the inspection hole. To locate "D," turn the belt pulley clockwise with the clutch engaged until the "D" centers in the inspection hole.



Figure 20. Locating Number 1 Firing Position on Magneto

Support the magneto in an upright position, as shown in Figure 20. Connect one of the spark plug wires to No. 1 terminal of the magneto cap. The terminal is marked 1 and is the upper right hand terminal. Hold the free end of the spark plug wire about  $\frac{1}{8}$  inch from the frame of the magneto. Turn the impulse with the wrench one click at a time until a spark jumps between the wire and the frame. Use care to hold the wrench and magneto firmly so impulse will not move beyond the point where it trips and the spark occurs. The position at which the spark occurs indi-

cates the approximate setting of the magneto for firing position of No. 1 cylinder.

The position of magneto driving slots when the piston is at top dead center is 25 degrees (or two teeth) beyond the horizontal center line in direction of rotation as shown in Figure 21.

Without disturbing the settings of the engine or magneto as established above, install the magneto on the engine. Install the cap-screw and bolt holding the magneto to the housing in this position.

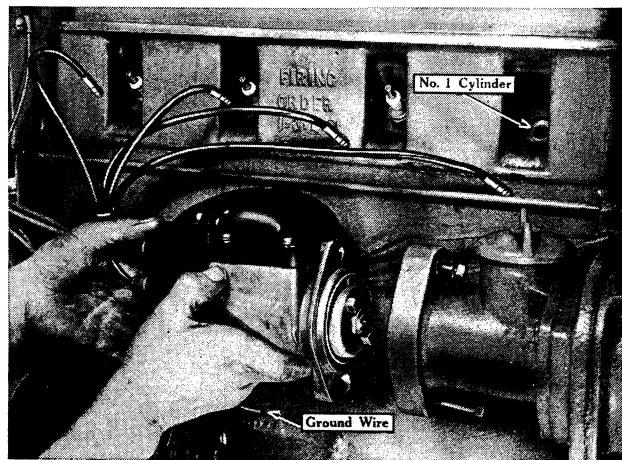


Figure 22. Magneto in Proper Position for  
Installing on Engine

Connect the grounding wire and install the spark plug wires. Connect the No. 1 terminal as marked on the distributor cap with the No. 1 spark plug, the No. 2 terminal with No. 2 spark plug, etc.

The final setting for maximum economy will be when the impulse trips at the time the "D" on the flywheel is in the center of the inspection hole in clutch housing. This can be adjusted by rotating the magneto on the governor bracket.

#### Lubricating the Magneto.

The Case Type 4-JMA magneto used on this tractor is equipped with sealed ball bearings and oil impregnated bushings which require no lubrication.

#### Governor Gear Timing.

The magneto drive gear is timed with the cam-shaft as shown in Figure 54, Page 31.

Should it be necessary to service the governor assembly, without removing the radiator and front gear cover, proceed as follows:

Set the engine with No. 1 piston at top dead center.

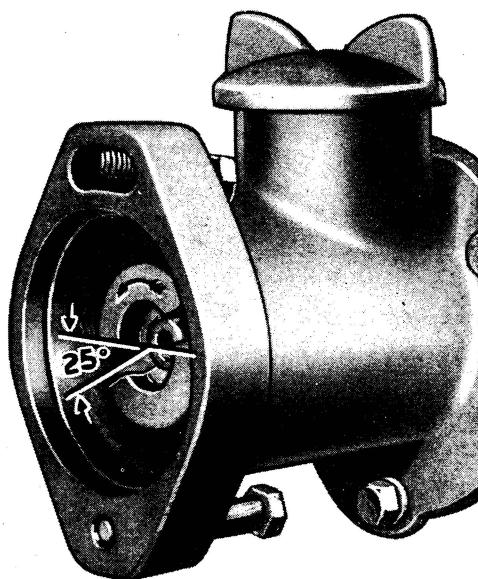


Figure 21. View of Couplings in Governor Bracket

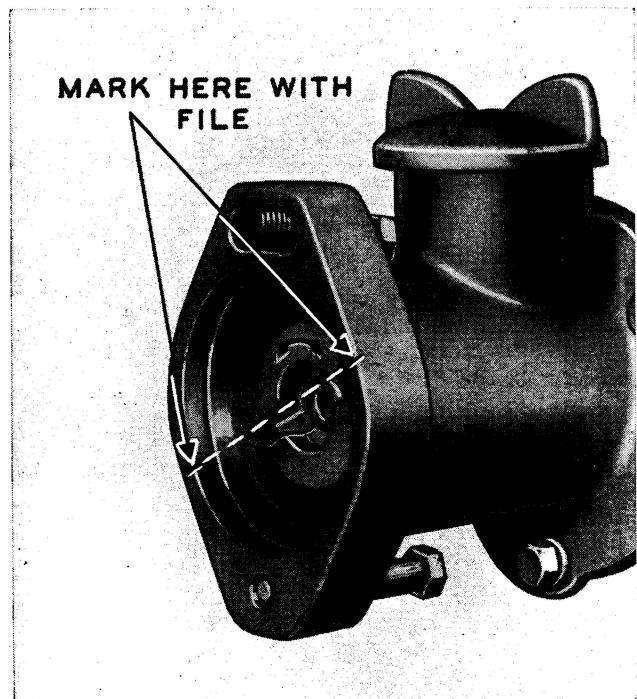


Figure 23. Coupling Location Mark

Mark the location of the coupling on the face of the governor assembly flange, Figure 23.

Remove the governor assembly from the engine.

Before installing the governor assembly, be sure that the engine is again on No. 1 top dead center.

Install the governor assembly with the slot in the coupling, which drives the magneto, lined up with the mark made on the flange.

This mark will be 25 degrees beyond the horizontal center line in the direction of rotation, as shown in Figure 21.

This will be correct every 180 degrees.

In the event the gears are not in their correct setting, one tooth would be 13 degrees before or after the correct position and, therefore, this will be very easily detected without measuring.

Following the above instructions makes it possible to set the governor gear in correct timing without removing the radiator, or front gear cover.

#### Spark Plugs.

Spark plugs used are of the 18 mm. thread size. AC spark plug No. 85 or any equivalent plug will work very satisfactorily. A gap of .030 inch should always be maintained between the electrodes, and the shank length should be  $1\frac{1}{2}$ ". It must be remembered if the gap between the electrodes is

too great due to improper setting or burning, the spark may jump elsewhere in the circuit, resulting in misfiring. Therefore, it is always very important that the correct gap be maintained at all times.

If one cylinder is misfiring, the cause may be either failure of the ignition or low compression. To locate the cause, crank the engine slowly and notice the compression on that cylinder. Sometimes a valve sticks open, which always causes the cylinder to lose compression.

If the compression is satisfactory, replace the spark plug with a new one, or one from a live cylinder. If the cylinder then fires, the trouble was due to a defective spark plug, or plug not being sufficiently tightened in the head.

If further difficulty is experienced, examine all wires leading to the plugs and see that they are in good condition. When removing or installing spark plugs, use the special socket wrench furnished with the tools.

Never use any other wrench as it is the only kind that will avoid distortion of the plug and insure the insulator against damage or breakage.



Figure 24. Spark Plug

**There are only four things that can happen to spark plugs.**

**They are:**

1. Normal Wearing Out
2. Dirty
3. Worn Gap
4. Broken Insulator

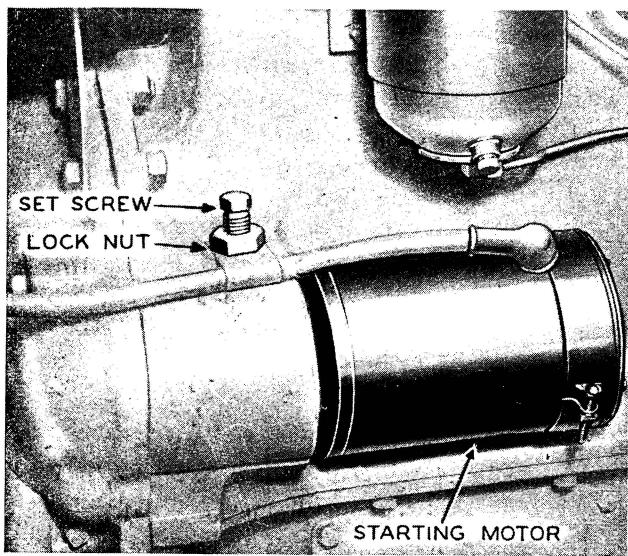


Figure 25. Starting Motor

#### Starting Motor.

The starting motor is held in position by means of a heavy set screw and lock nut. This screw must be tight to prevent rocking of the starting motor in the housing.

The terminal post on the starter to which the cable from the starter switch is attached is copper. Care must be exercised in tightening the nut because the post can easily be broken off if too much pressure is applied to the wrench.

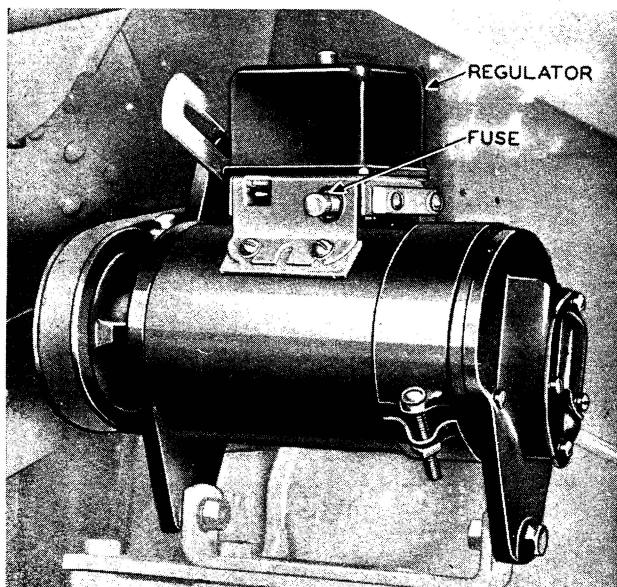


Figure 26. Generator

#### Generator.

The generator is belt driven, of the adjustable third brush type, with charging rate controlled by a "two-rate" regulator. As adjusted at the factory, the generator charges approximately 11-14 am-

peres when the battery is only partly charged, but when the battery approaches full charge the two-rate regulator automatically reduces the charging rate to approximately 3 amperes, which is sufficiently low to prevent overcharging.

Charging rate is adjusted by shifting the position of the "third" brush, which is reached by removing the cover band on the rear end of the generator; the movable third brush is on top, somewhat toward the engine. Moving the third brush in the same direction as the rotation of the generator armature increases the charging rate.

**NOTE:** No Warranty Service Work will be approved should it be done on Electrical Equipment by any one other than an authorized Electrical Equipment Service Station, as they have all the necessary tools and equipment to do this work in a satisfactory manner and are familiar with handling electrical equipment.

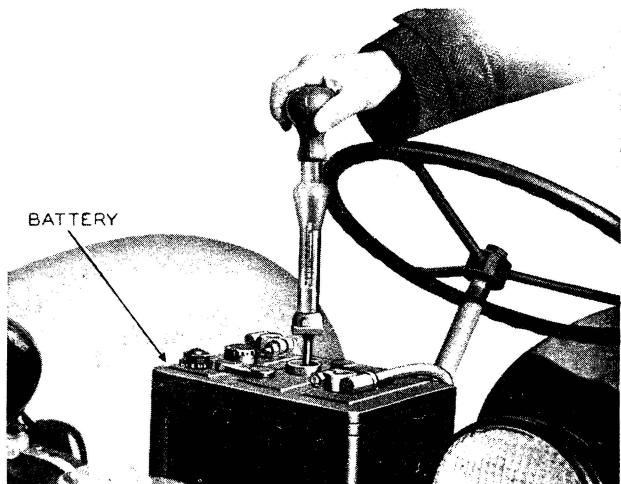


Figure 27. Servicing the Battery

#### Storage Battery.

When working around the battery remember that all its exposed metal parts are "alive" and that no metal tool or wire should be laid across the terminals as a spark or short-circuit will result.

Sparks and lighted matches or exposed flames should be avoided near the battery due to the danger of exploding the gas in the battery.

Low electrolyte temperature reduces the battery capacity as though numbed by cold. In cold weather if the battery is kept warm its capacity will be greatly increased (do not allow temperature to exceed 110° F.). Regular maintenance is essential.

Periodically take and record hydrometer readings of each cell.

If readings are below 1.240 the battery is not receiving sufficient charge. The electrical system

should be adjusted to increase the charge rate. (In zero weather there is danger of freezing if readings are below 1.175; at  $-35^{\circ}$  F.)

#### Adding Water.

If water is added in freezing temperature and battery is not charged to mix water and electrolyte, water will remain on top and freeze. In freezing weather never add water unless the tractor is to be immediately operated. Sufficiently charge battery to thoroughly mix water with electrolyte by gassing of battery on charge before the water can freeze. If this is not done the ice may break the rubber container.

#### Replace Vent Plugs.

Always keep vent plugs in place and tight except when filling and taking gravity readings. Be certain that holes in vent plugs are clean and free of dirt to prevent gas pressure in cells breaking sealing or container.

#### Keep Battery Clean and Dry.

If wet or dirty, wash with baking soda solution or ammonia, then with clear water. Be sure vent plugs are tight before washing.

#### Keep Cable Terminals Tight and Clean.

If terminals are corroded, disconnect and clean, wash as in above. Apply a thin coat of vaseline (or light cup grease) to terminal and battery posts before re-applying terminal.

Be sure that ground connection where it attaches to frame is also kept clean.

#### Idle Batteries.

An idle battery requires a charge every month or two, or at sufficient intervals to keep the gravity above 1.240.

### THE USE OF DIFFERENT FUELS

Case Tractors and Engines have long been recognized for their ability to efficiently and economically operate on low-cost fuels.

The Model "D" Series Tractor when equipped with the proper manifold, will operate very satisfactory on low-cost fuels as well as gasoline.

The best assurance of getting a quality fuel, of whatever grade desired, is to purchase your fuel from a reliable fuel dealer in your home community or from a reputable oil firm. The best fuel will give trouble if it contains an appreciable percentage of dirt or foreign ingredients.

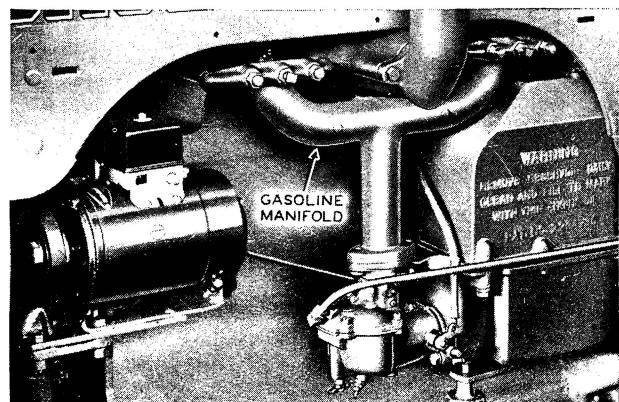


Figure 28. Gasoline Manifold

#### Gasoline Manifold.

When gasoline is to be used exclusively, greater efficiency will be obtained by using the gasoline manifold.

When the gasoline manifold is used and it is desired to operate the engine warmer to handle the gasoline used, especially with a light load or in cold weather, additional heat needed should be controlled by the adjustment of the shutter.

#### To Remove Manifold.

Remove the exhaust pipe, manifold clamps, bolts from the exhaust elbow, and the elbow. Remove the fuel line at the carburetor, and the governor control rod. The air cleaner, carburetor and manifolds can then be lifted off as a unit.

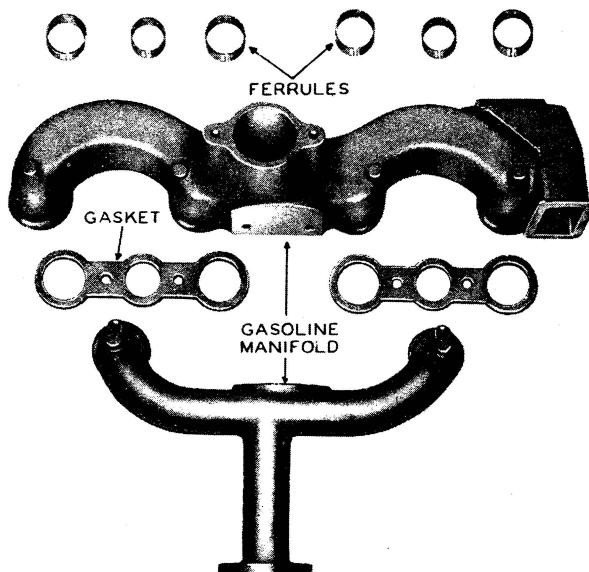


Figure 29. Detailed Gasoline Manifold

When assembling the gasoline manifold to the engine, ferrules must be installed in the ports of the manifolds. Gaskets should always be in place before tightening the manifold to the cylinder head.

## Fuel System.

### (Gasoline Manifold Equipped.)

The fuel system of this tractor is gravity flow. Capacity of the fuel tank is 19 U.S. or 16 Imperial gallons.

When filling tank on a new tractor, add a pint of light oil to each five gallons of fuel. The engine is designed to operate on gasoline having a minimum rating of 65 octane. To obtain maximum performance, a high grade of fuel should be used.

The air vent in the fuel tank cap should be kept open at all times to assure the proper flow of fuel.

**CAUTION:** Never fill the fuel tank when near an open flame or when the engine is running.

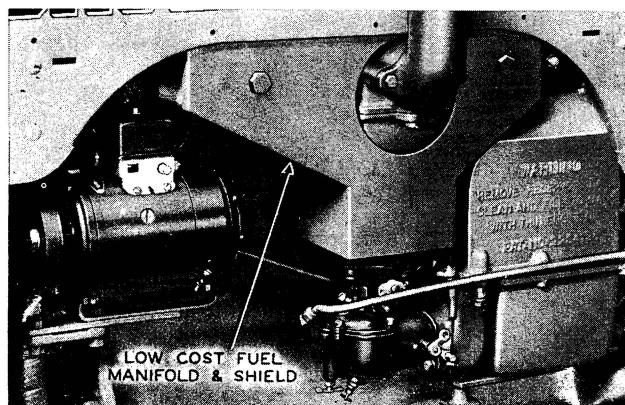


Figure 30. Low-Cost Fuel Manifold

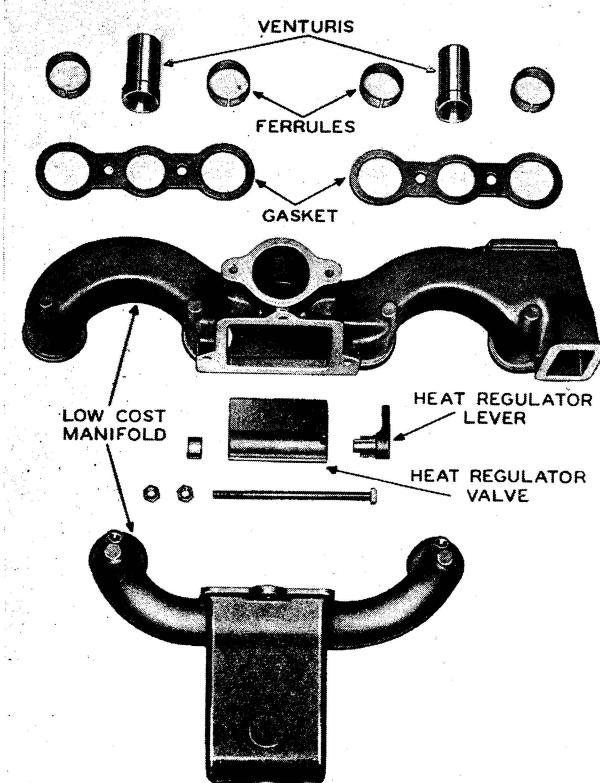


Figure 31. Detailed Low-Cost Fuel Manifold

## Low-Cost Fuel Manifold.

When using low-cost fuel, it is necessary to use gasoline for starting. The heat regulator lever should then be set in "Hot" position with manifold shield in place.

Low-cost fuel manifolds are equipped with a heat regulator valve. The regulation of this valve

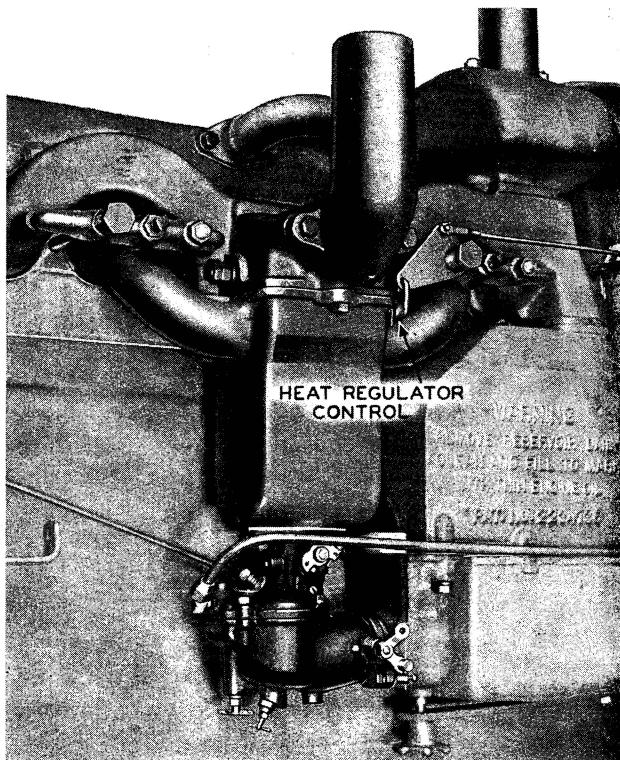


Figure 32. Heat Regulator Control

controls the amount of exhaust gases which pass around the intake manifold. In extremely warm weather, better results may be obtained if shield over manifold is removed.

When assembling low-cost fuel manifold to engine, be sure that venturis are properly installed in ports of intake manifold. Gaskets should also be in place before tightening manifold to cylinder head.

**NOTE:** When gasoline is used for operating Case tractors equipped with low-cost fuel manifolds, better results may be obtained without the use of the manifold shield. The crank connected to the valve located in the manifold, should then be placed in "Cold" position.

## Fuel System.

### (Low-Cost Fuel Manifold Equipped.)

The fuel system of this tractor is gravity flow. Capacity of the main fuel tank is 17 U.S. or 14 Imperial gallons and small tank is 2 U.S. or 1½ Imperial gallons.

### Starting Engine.

Before starting engine equipped with low-cost fuel manifold, fill the main tank with low-cost fuel and small tank with gasoline. Shut off valve under the tank when filling. Also note valve at rear of tank on tractors equipped with low-cost fuel manifold.

The air vent in fuel tank cap should be kept open at all times to assure the proper flow of fuel. Also check air vent in cap on small tank.

**CAUTION:** Never fill the fuel tank when near an open flame or when engine is running.

Open drain valve at bottom of the carburetor and turn on the gasoline. Allow enough gasoline to run through to clean out the fuel line and carburetor bowl and then close drain cock.

### Stopping Engine.

**IMPORTANT:** In stopping engine when operated with low-cost fuel, turn off the low-cost fuel and drain carburetor, or turn to gasoline a few minutes before stopping so that the carburetor will contain only gasoline.

### CARBURETION

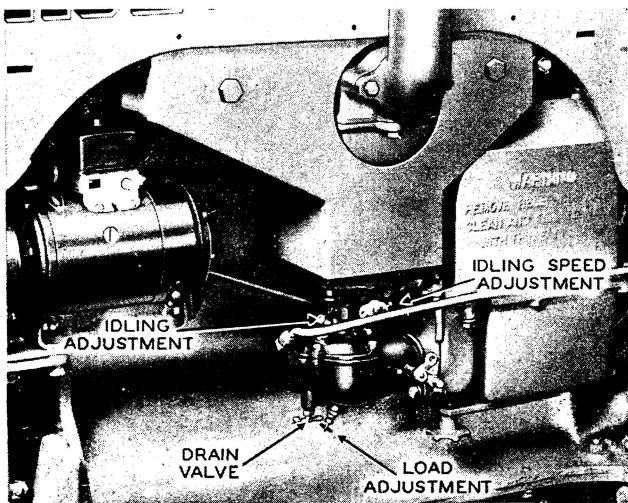


Figure 33. Zenith Carburetor

### Zenith Carburetor.

If the carburetor is out of adjustment, and the engine not running, turn the **load adjustment** clockwise until it seats lightly, being careful not to force the point against the seat, as doing so may ruin the seat. Next turn it back about one and one-half turns. The engine should start on this adjustment and it should be sufficiently close to run until the final adjustment is made.

Always run engine until it is thoroughly warm

before making final adjustment. When this adjustment is made, it is best to have the engine under load to which it is to be adjusted.

The **load jet** is the high speed jet and exerts its greatest influence at higher engine speeds and loads. It is a direct suction jet and its flow increases with the flow of air. Its size is predetermined to give economical operation.

To adjust the supply of fuel through the load jet, turn the load adjustment **clockwise** for a **lean mixture** and **counter-clockwise** for a **rich mixture**.

### Idling Adjustment.

To adjust the idle speed, proceed as follows: Set **idling speed adjustment** so that the engine "turns over" slowly, but not so slowly that the magneto impulse catches. Turn in or out on idling adjustment until engine runs smoothly. Then back off on stop screw until desired engine speed is obtained. The correct idling adjustment is usually found with the idling adjustment between 1 and 3 turns open.

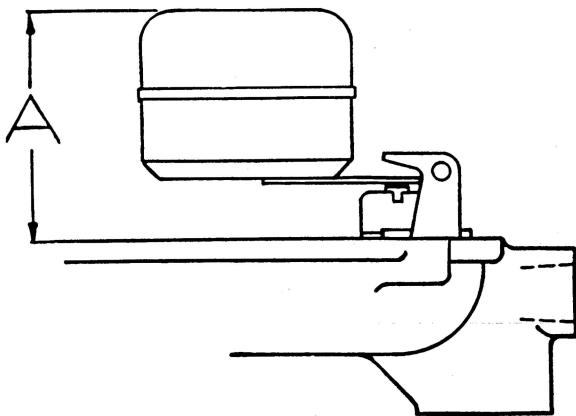


Figure 34. Diagram Showing Measurement of Zenith Carburetor Float Level

Measurement "A" should be  $1\frac{3}{4}$ " plus or minus  $\frac{3}{64}$ ".

### Float Level.

Disassemble carburetor bowl cover from body by removing the four slotted head capscrews.

Turn the carburetor bowl cover over so that weight of the float holds fuel valve firmly on the seat. Measure distance from machined surface of bowl cover to bottom (top inverted) of float. Correct distance is  $1\frac{3}{64}$ " plus or minus  $\frac{3}{64}$ ". Move the gasket to one side while making the measurement.

The float is not adjustable. In cases where the fuel valve and seat are worn, replace with a new assembly.

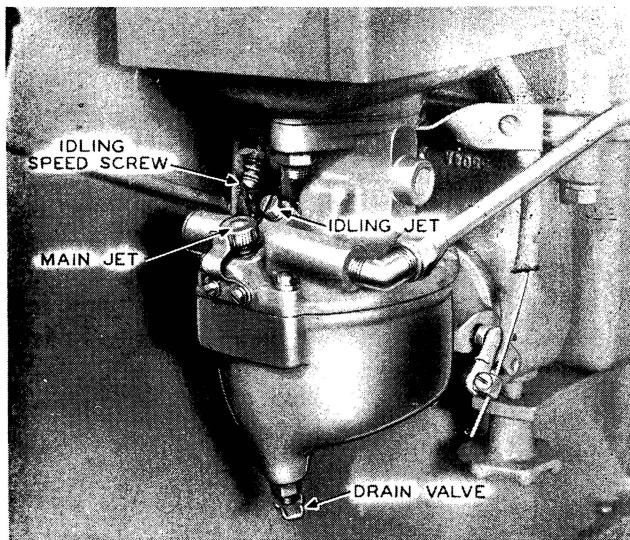


Figure 35. Marvel-Schebler Carburetor

#### Marvel-Schebler Carburetor.

Marvel-Schebler carburetors, which were used on some Model "D" Series Tractors, will give satisfactory results, when adjusted as follows:

#### Preliminary Adjustments.

Open the main jet adjusting needle 2 turns, and the idling jet adjustment  $2\frac{1}{2}$  turns.

#### Low Speed Adjustment.

Start the engine, and when warm, close the throttle or governor control, and set the engine speed at approximately 500 RPM (approximately 340 RPM at the belt pulley) with the idling speed screw. Turn the idling jet adjustment in, or clockwise, until the engine begins to falter or roll from richness. Then turn the screw out, or counter-clockwise, until the engine runs smoothly. The normal adjustment for the idling jet is from  $2\frac{1}{2}$  to  $3\frac{1}{4}$  turns open.

#### Power Adjustment.

Advance the throttle or governor control to full speed; then turn the main jet adjusting needle in, or clockwise, a little at a time until the speed drops. Then turn the needle out, or counter-clockwise, until the engine picks up speed and runs smoothly. The normal adjustment for the main jet needle is from approximately  $1\frac{1}{2}$  to  $2\frac{1}{4}$  turns open.

#### Fuel Filter.

The fuel filter is located under the fuel tank, having a removable filter element and a glass bowl which allows sediment collected at bowl to be seen.

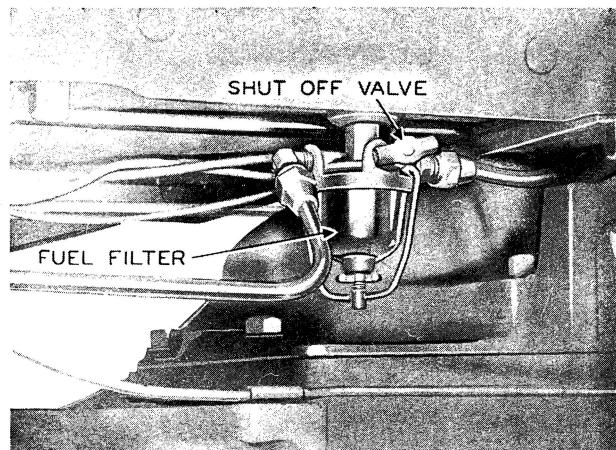


Figure 36. Fuel Filter

The filter should be inspected and cleaned daily if necessary. Shut off the fuel supply valve, and remove the glass sediment bowl. Clean out any foreign matter adhering to the filter screen, by shaking it in clean gasoline. Clean the bowl and reassemble. In cold weather, watch for water or ice that may collect in the bowl.

Keeping the fuel clean will prevent trouble due to clogging of the filter. Water in the fuel is especially troublesome because it may not be completely removed by the filter. Occasionally open the drain valve in the bottom of the carburetor bowl so that any water and foreign material will drain out.

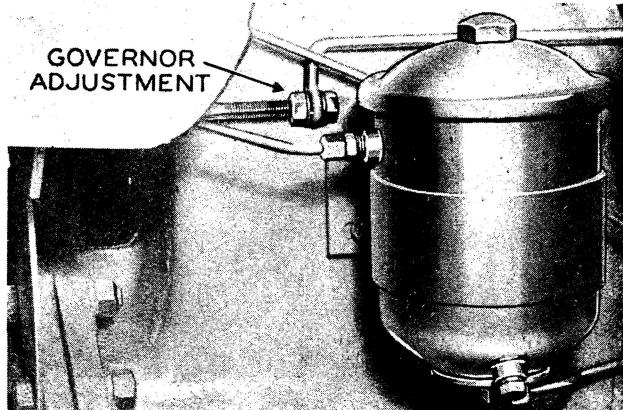


Figure 37. Governor Adjustment

#### GOVERNOR

Tractor has been adjusted at the factory to provide a no-load engine speed of approximately 1367 RPM, which gives a no-load pulley shaft speed of 930 RPM. Full load engine speed is 1200 RPM. This gives a belt pulley shaft speed of 818 RPM, corresponding to a belt speed of 2620 feet per minute.

To determine the engine speed, multiply the belt pulley speed by 1.47. Example:

Belt Pulley	Ratio	Engine Speed
930	×	1.47 = 1367

### Setting Governor.

Before starting this operation, be sure that all end play is out of governor. Also see that governor weights and other connections are free.

Disconnect rod to carburetor, then move governor arm back until fork touches thrust bearing on governor shaft sleeve. Move governor arm forward about  $\frac{1}{4}$ " and proceed to adjust carburetor rod until the throttle valve is in wide open position.

Start engine and move throttle control to the wide open position. If governor has a tendency to surge or hunt, then shorten rod at governor arm  $\frac{1}{2}$  turn at a time, testing with each half turn until engine operates smoothly when throttle is wide open.

For further test on this adjustment, engage clutch quickly. The momentum of belt pulley or any slight load at high speed or low speed should make governor work satisfactorily. When governor is adjusted properly, check RPM of engine for proper speed.

The governor adjustment should be made by adjusting throttle rod near oil filter, as shown in Figure 37.

When replacing governor bearing carrier bushing, after same has been pressed in place, ream to .376"-.377"

## VALVES

### Valve Cover and Gaskets.

The valve cover located on engine head covers the valve rocker arm assembly.

Remove gasoline filler cap and remove engine hood. Replace gasoline filler cap. Remove nuts holding valve cover to head and remove valve cover.

**To Install:** Inspect and clean valve cover thoroughly. Install new valve cover gasket and reinstall valve cover. After completing check gasket for leaks.

### Valves and Rocker Arms.

Some engine difficulties can be traced to the operation and adjustment of the valves. Hard starting, engine missing, engine overheating, lack of power and explosions in the exhaust pipe are a few of these difficulties.

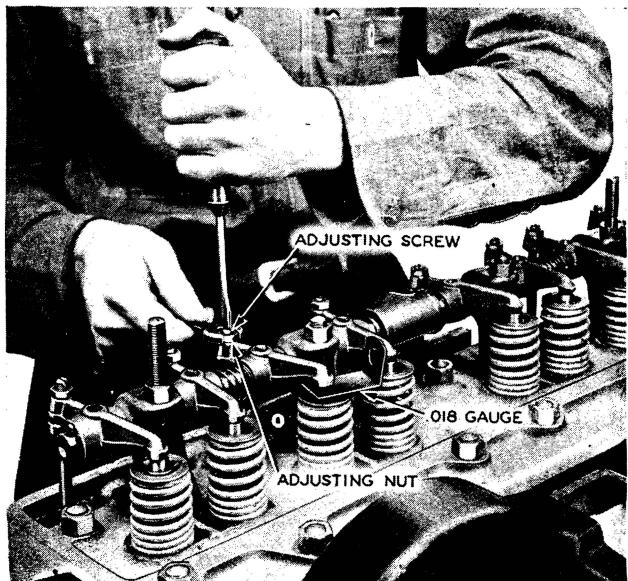


Figure 38. Adjusting Valve Clearance

### Adjusting Valve Clearance.

The engine hood and the valve cover must be removed and all spark plugs taken out in order to adjust valve clearance.

Clearance between rocker arms and ends of valve stems should be kept properly adjusted. **The clearance should be .018 inch when the valve is fully closed and the engine cold.**

Be sure that lock nut is securely tightened when adjustment has been made.

To simplify this adjustment, a gauge .018" thick is furnished with each tractor. This gauge is located on one of the long studs which passes through the rocker arm shaft bracket.

When replacing valve rocker arm bushing, after same has been pressed in place, ream to .6265"-.6275".

### Valves and Valve Seats.

One of the sources of lack of power is lack of compression in one or more cylinders. An engine with poor compression is inefficient and should not be kept in service.

The engine can easily be tested for compression leaks. Before making the test, the engine should be run until it is warmed up to working temperature and the valves and other parts properly oiled. **Do not try to test compression on a cold engine.** When a warm engine is hand cranked, there should be marked resistance as each piston is on compression stroke. If compression is poor, it is probably because of compression leaks past the valves.

If the compression is poor, remove the valve cover and put kerosene on the valve stems and rocker arms to remove any gummy oil accumulation; then oil with light oil. Many times this care will cause valves to seat tight.

Generally speaking, if the engine has good power, it is best to leave the valves alone. It is time enough to recondition valve seats when they are known to be the cause of lack of power.

#### Reconditioning Valve Seats and Guides.

If the engine lacks power due to leaking past the valves, valve seats may be distorted or pitted, and when this occurs, mere grinding will not tune up the seat and restore the conditions that are necessary for satisfactory operation.

The exhaust valve seats are hard alloy steel inserts and cannot be reconditioned with hand tools. Use modern valve grinding equipment for reconditioning the seats. The intake seats may be refaced with hand tools. ALL SEATS HAVE A 45° ANGLE.

Compressor tool simplifies the removal of valves.

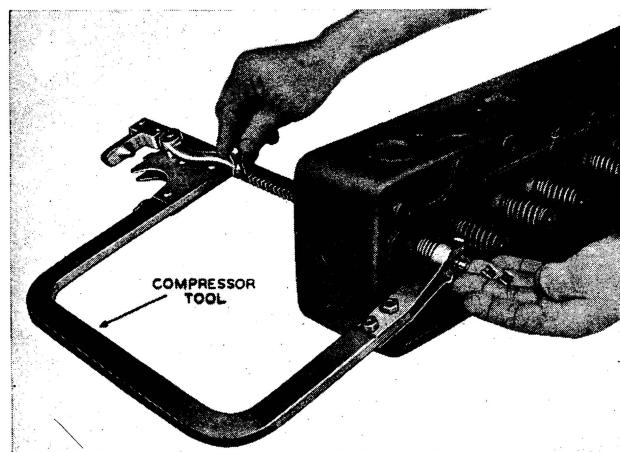


Figure 39. Valve Compressor Tool

When the valve guide is replaced, it is necessary to ream the guide after it is pressed in place. After reaming, check the reamed hole with a .4375" go gauge to be sure the hole is up to size. This also applies when reaming the carbon out of an old guide.

#### VALVE SPRINGS

Valve springs should be checked while head is removed and should meet these specifications:

Free length— $2\frac{3}{8}$  inches approximately.

Pressure at a compressed height of  $1\frac{1}{3}\frac{5}{8}$  inches (valve open)—99 to 108 lbs.

Pressure at a compressed height of  $1\frac{2}{3}\frac{9}{16}$  inches (valve open)—39 to 44 lbs.

#### CYLINDER HEAD

##### To Remove the Cylinder Head.

Drain the radiator. Remove the engine hood and the two capscrews securing the radiator inlet elbow to the cylinder head. Gently force the elbow away from the head far enough to permit the gasket to drop out. Place the gasket in a safe place until time to replace it. Remove the manifold, the valve cover, the spark plug wires and the nuts holding the rocker arm assembly. Lift off the rocker arm assembly. Remove the push rods, and the nuts from the cylinder head stud bolts. Lift the cylinder head up and off.

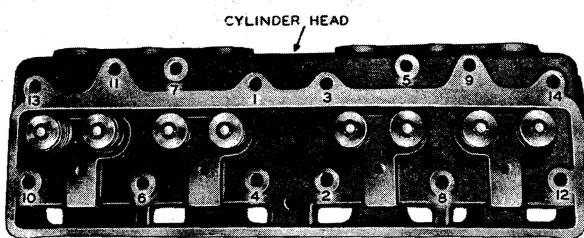


Figure 40. Cylinder Head Tightening Chart

##### To Install the Cylinder Head.

Remove all of the carbon from the cylinder head and inspect it thoroughly. Before placing the head on the block, slip the gasket on over the studs, after checking it for damaged sections or turned up edges. At time of general overhaul, or after a period of long service, it is desirable to install a new cylinder head gasket.

Gently lower the head onto the block. Tighten all of the cylinder head stud nuts evenly, beginning with the center studs and progressing outward. Tighten to 75 foot pounds.

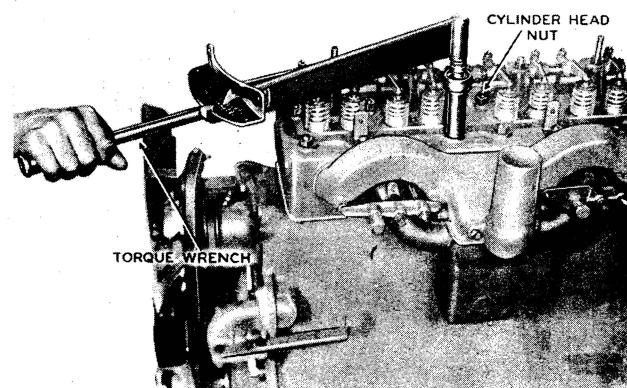


Figure 41. Tightening Cylinder Head

Replace the push rods, the rocker arm assembly, and the nuts holding the assembly down. Connect the spark plug wires; install the manifold and the valve cover. Slip the gasket in place and fasten the radiator inlet elbow to the head with

the two capscrews. Put the engine hood back on the engine.

Restore the coolant to the system.

After the engine has run for about an hour, and is well warmed up, retighten all of the stud nuts.

Reset the valve clearance to .018", when cold, as discussed in "Adjusting Valve Clearance."

## ENGINE OIL PAN

### Removing the Engine Oil Pan.

Most operations relative to the underside of the engine can be readily performed through the hand holes, by removing the hand hole covers; however, to check or replace either the main bearings, or the oil pump, it is necessary to remove the oil pan. This can easily be accomplished if the following procedure is observed.

Remove the oil pan and the clutch housing drain plugs and drain out all lubricating oil. Replace the plugs.

Remove three capscrews and take out the oil pump screen. Do not damage the gasket. Remove the bolts that attach the oil pan to the transmission flange front end. The gasket used herein is in one piece, handle it carefully. Remove the bolts that attach the pan to the radiator bracket.

Loosen the engine to transmission bolts and the engine to radiator bracket bolts slightly to permit the pan to drop freely. Take out all of the capscrews that fasten the oil pan to the block. Lower the oil pan.

### Installing the Engine Oil Pan.

Place the gasket on the pan and guide into place, after aligning the gasket and pan holes. Thread the capscrews loosely into the block. Two guide bolts are located on each side to help align the pan. Replace the bolts, lockwashers and nuts and tighten securely.

Put the screen back on the oil pump, being careful of the gasket. Fasten securely with the three capscrews. Replace the engine oil.

## CYLINDER SLEEVES

The engine block is equipped with removable wet-type cylinder sleeves. Before the sleeves can be taken out, the cylinder head, connecting rods and pistons must be removed.

The removal of the sleeve from any "D" series engine is simplified by using Cylinder Sleeve Puller as illustrated. After the sleeve is pulled and the rubber packing ring is removed, thoroughly clean the packing groove, the counter bore at the top of the block and the shoulders on the sleeve.

Fit a new rubber packing ring into the lower groove of the cylinder block. Put a light coating of grease or oil around the lower outside end of

the cylinder sleeve, and slide the sleeve into place. Push the sleeve down in place so that the top shoulder seats in the corresponding recess in the block. The final position of the sleeve is .001 to .003 inches higher than the top surfaces of the block.

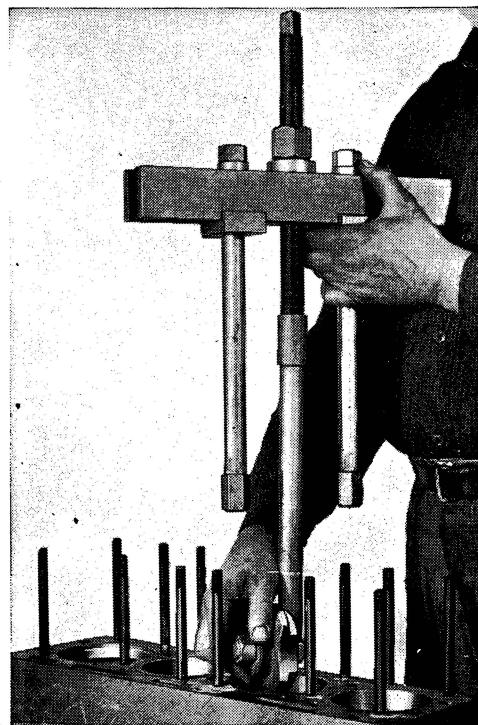


Figure 42. Inserting Puller into Cylinder Sleeves Preparatory to Pulling

1—Sleeves Should be .001 to .003" Higher Than Top Surface of Block When Cylinder Head is Tightened in Place.

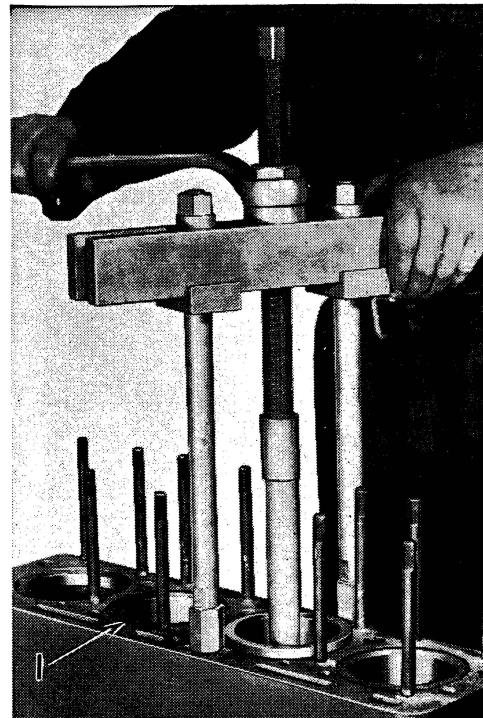


Figure 43. Cylinder Sleeve Partially Pulled from Block

**CAUTION:** Engines that have had new cylinder sleeves and piston assemblies installed, should be given the same consideration that is given a new tractor. Pistons and cylinder sleeves are machined and honed to a very fine finish and should be handled carefully. Always use SAE 10 engine oil for starting. For the first fifty hours, run at half load or less before going to full load.

## PISTONS AND CONNECTING RODS

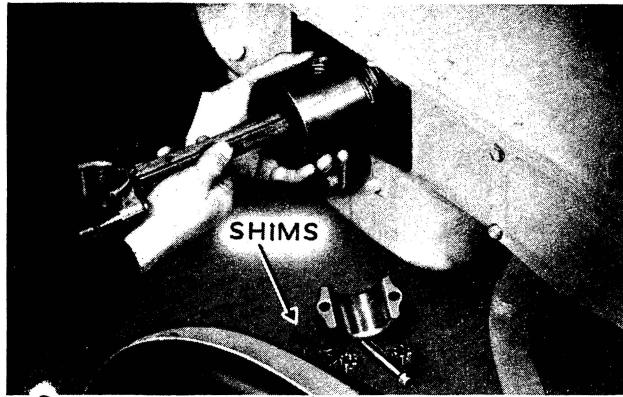


Figure 44. Removing Piston

Pistons and connecting rods may be removed through the lower part of the engine with the oil pan removed, or through the hand holes in the sides of the pan. When new sleeves are installed, at which time the head must be removed, the pistons and the connecting rods can be taken out

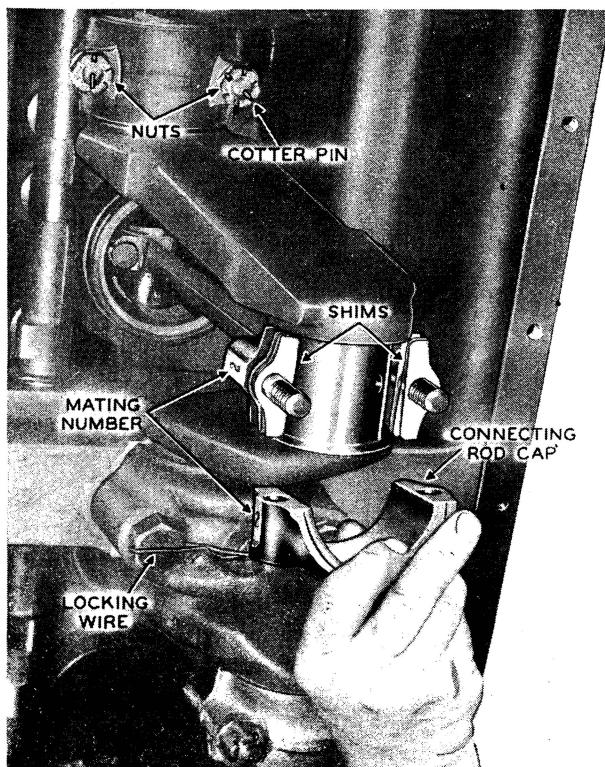


Figure 45. Rod and Cap Mating Number

through the top if so desired.

When removing bearing caps, note their positions and keep them separated so there will be no error in reassembling. Connecting rods and caps are numbered. The numbered side of the rod and cap are on the side away from the camshaft. Rods are numbered from one to four, number one being at the front of the engine. Replace the caps in the correct order on the rods.

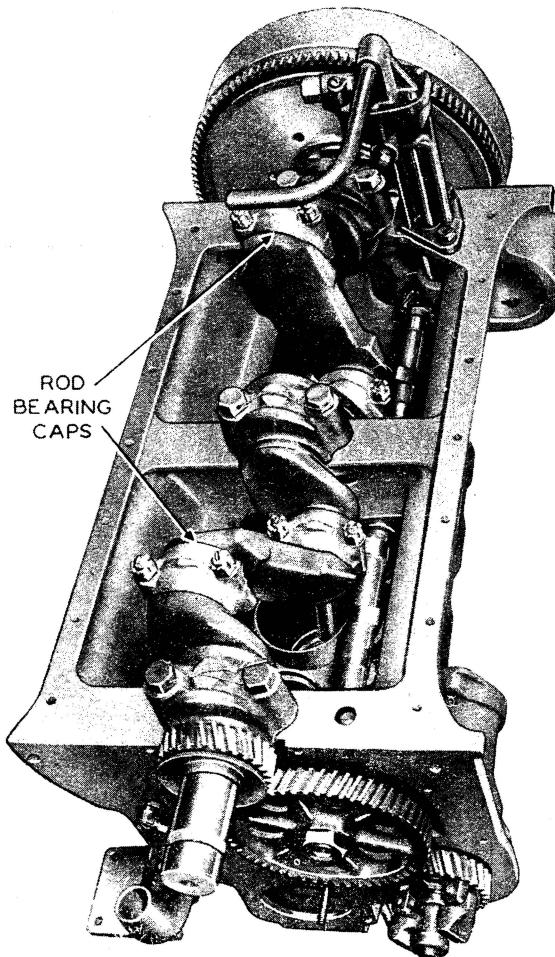


Figure 46. Rod Bearing Caps

The connecting rod bearings on the crank end of the rod are made from high grade babbitt, centrifugally cast.

### Connecting Rod Specifications.

The connecting rods used in this tractor are accurately machined to the following specifications:

Center to center length.....	10 <sup>3</sup> / <sub>4</sub> "
Crank pin hole diameter .....	2.2515" to 2.2520"
Total bearing length .....	2.118" to 2.120"
Bearing running clearance...	.0015" to .003"
Bearing end play .....	.005" to .012"

The connecting rod should be straight, free of twist and parallel to the piston. The connecting rod and cap are assembled with two heat-treated bolts and nuts. There are three shims under each side of the cap. When assembling, be sure that the nuts are tightened to 70 foot pounds.

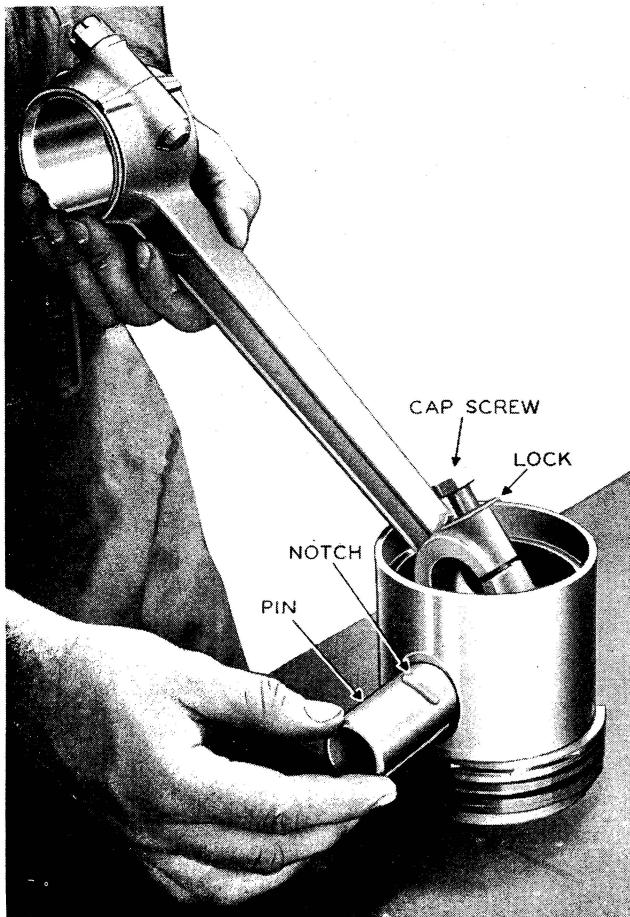


Figure 47. Removing Piston Pin

The pistons are removed from the connecting rods by backing off the piston pin clamp screw and tapping the pin out. As the pin clears the first hole in the piston and the piston pin bearing, the rod will drop away from the piston. Gently push



Figure 48. Removing Piston Ring

the pin the rest of the way out. **NOTE:** Do not clamp the rod in a vise to remove the piston pin. To hold the assembly and loosen the capscrew, insert a long bolt or rod into the piston pin.

The pistons are cast iron, with four rings, all above the piston pin. The rings include three compression and one ventilated oil type.

A ring tool should be used when removing or replacing piston rings. Care should be used in fitting new rings to the grooves, in accordance with the specifications listed below. Stagger the ring gaps around the piston, and lubricate both piston and rings before assembling.

#### Ring Specifications.

Piston material.....	Special Grey Iron
Piston clearance at skirt.....	.004" to .006"
Rings per piston .....	4
Compression rings .....	3
Oil rings .....	1
Compression ring width.....	.1240"-.1235"
Oil ring width .....	.2490"-.2485"
Gap of compression ring, when compressed to 3.875" .....	.015" to .025"
Gap of oil ring, when compressed to 3.875" .....	.010" to .020"
Clearance in groove of first compression ring .....	.0015" to .003"
Clearance in groove of second and third compression rings .....	.001" to .0025"
Clearance in groove of oil ring .....	.001" to .0025"
Tension required to close rings to 3.875 diameter.....	8 lbs. min., 12 lbs. max.

When assembling the new pistons to the connecting rods, be sure to use new lip washers under the connecting rod clamp screws. Open up the slot in the small end of the connecting rod to permit the piston pin to enter the rod. Line up the groove in the piston pin so that the clamping screw will enter the thread easily. When the screw is tight, bend one lip of the washer down and one up, to securely lock the clamping screw.

#### Piston Pin Specifications.

Length of piston pin— $3\frac{7}{16}$  inches.  
Diameter of piston pin—1.2335 inches—1.2332 inches.

Select pin .0005 of an inch smaller than piston hole.

Pin is removed by loosening the locked capscrew and pushing the pin out.

## REMOVING THE CLUTCH ASSEMBLY

## Preparing the left hand side of the tractor for clutch removal:

The clutch can be removed and new friction discs installed in a short time. To do this work, it is necessary to split the tractor:

Remove the hood. Remove battery cables. Block the drive wheels securely and install a jack beneath the transmission case.

### Preparing the right hand side of the tractor for clutch removal:

Remove the spark plug wires to avoid all possibility of the engine starting while working on the clutch.

Disconnect the starting cable from the starting motor and from the cylinder block clip.

Remove the pin from the belt pulley brake shoe and disconnect and/or remove the shutter control rod.

Disconnect the wire from the ammeter to the generator, and the magneto switch wire.

Disconnect the governor lever rod.

## Preparing the left hand side of the tractor for clutch removal:

Remove the air cleaner reservoir and the fuel tube.

Disconnect the oil tube to the oil pressure gauge and the heat regulator rod at the rear end of the fuel tank. (If a combination manifold is used.)

Remove the clutch throwout arm from the clutch throwout shaft.

Remove the choke control, and disconnect the temperature gauge thermal bulb at the radiator inlet.

Separate the steering drag link from the steering arm ball.

### Preparing the clutch housing for removal of the clutch:

Remove both clutch hand hole covers.

Remove the  $\frac{3}{4}$ " transmission flange bolt on each side of the flange and replace with two  $\frac{3}{4}$ " by  $13\frac{3}{16}$ " splitting pins. There special pins bear the number, 139-AA. Oil these pins

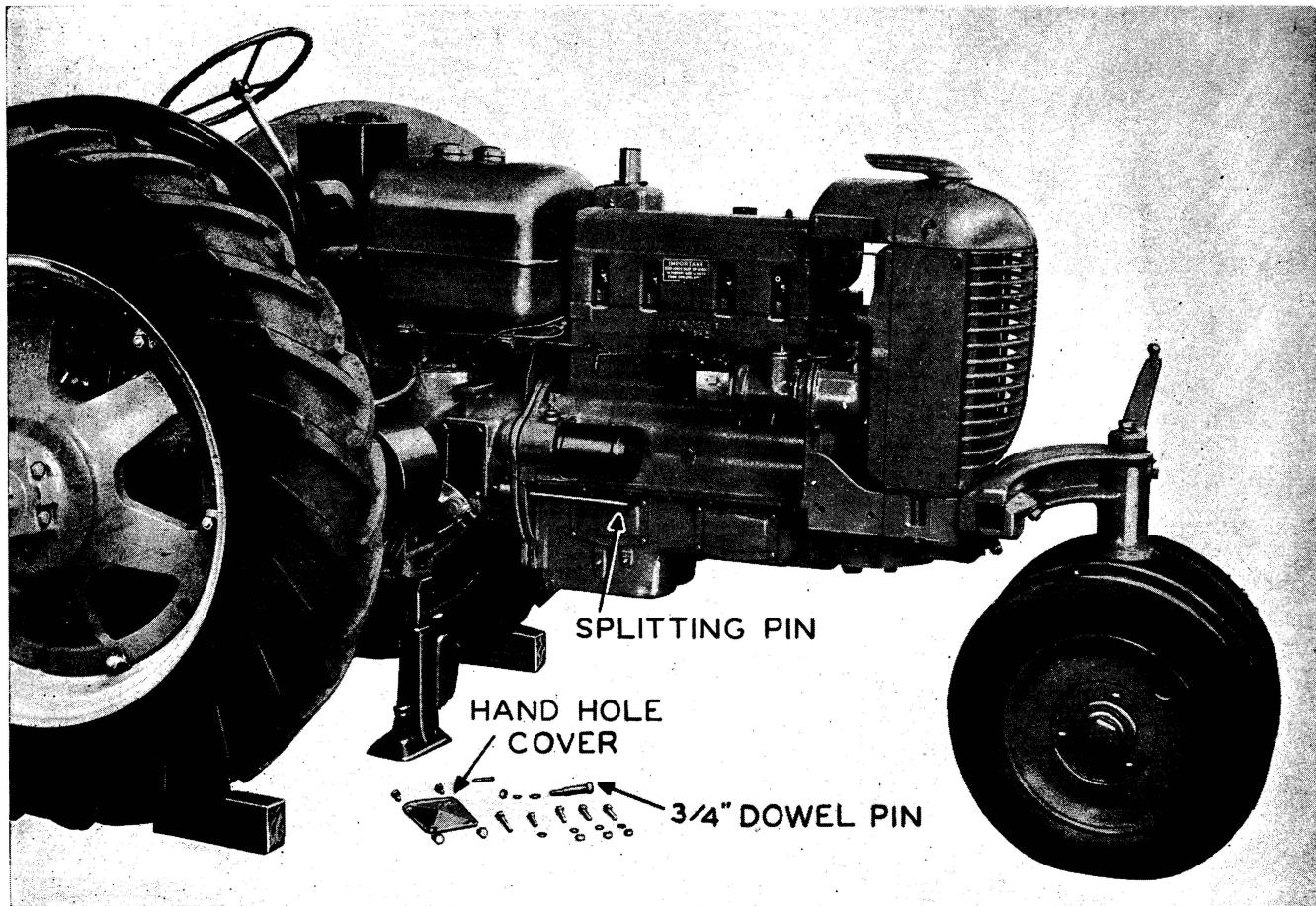


Figure 49. Preparing the Tractor for Splitting