MODEL 134-172 4-CYLINDER GASOLINE AND DIESEL ENGINES

SECTION 3 - FORD ENGINE SERVICE MANUAL

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Reprinted

OIL PAN, OIL PUMP AND OIL FILTER

The lubricating system used in all model Ford Tractor engines is shown in Figure 32. Oil is picked up from the sump by means of the oil pump and is pumped through the full flow oil filter. After leaving the filter, the oil moves through a drilled passage into the main oil gallery which extends the length of the cylinder block. The oil then flows under pressure to the main bearing journals, and through drilled passages in the crankshaft, to the connecting rod bearings. Oil also flows under pressure from the oil gallery to the camshaft bearing bosses. The camshaft is drilled at the center boss, so that each revolution of the camshaft lines up a set of holes allowing a spurt of oil to be pumped to the rocker arm shaft. Oil then fills the rocker arm shaft to lubricate the rocker arms. Oil dripping from the rocker shaft lubricates the valve stems, drains down through the push rod bores lubricating the tappets as shown in inset "A", Figure 32. The camshaft lobes, cylinder walls, and piston pins are lubricated by an oil spray from a spurt hole in the connecting rods as shown in inset "B", Figure 32. The camshaft gears and governor receive oil through a small metering hole as shown in inset "C", Figure 32.

NOTE: ***The governor is an integral part of the fuel injection pump on diesel engines and therefore is not in the timing gear cover, as in the gasoline engines.***

Crankshaft ventilation is accomplished by an expelling breather on the right side of the rocker shaft cover and an additional intake that is incorporated in the oil filler cap.

OIL PAN

A. Removal

1. Place a drain pan under the oil pan drain plug and remove the plug.
2. Remove the bolts that attach the pan to the cylinder block and remove the pan.

B. Inspection

1. Scrape all dirt and metal particles from the inside of pan. Scrape all gasket material from the mounting surface. Wash the pan in cleaning solvent and dry with a clean rag.
2. Inspect the pan for cracks, holes, damaged drain plug threads or damaged mounting surface. Repair all damage or replace the pan.
3. Clean the oil pan drain plug and screen thoroughly in cleaning solvent.

C. Installation

1. Apply a thin film of heavy grease to the oil pan mounting surface. Place a new gasket on the pan mounting surface.
2. Hold the pan in place on the cylinder block, then install the attaching bolts.
3. Place a new gasket on the oil pan drain plug and install the plug in the pan.
4. Fill the crankcase to the proper level with the specified grade of oil.

   NOTE: ***It is recommended that the oil filter or cartridge be changed after the pan has been cleaned.***
5. Start the engine and check for oil leaks.

OIL PUMP

A gear type oil pump is used on all model Ford Tractor engines. The pump is mounted on the right forward side of the engine inside the crankcase. The pump is driven by the distributor (gasoline) or fuel injection pump drive gear (diesel) through a short hexagon shaft. The oil pressure relief valve is incorporated in the pump body. The pump capacity is 3.5 gpm at 1400 engine rpm.

A. Oil Pump Removal

1. Remove the oil pan.
2. Remove the distributor or fuel injection pump.
3. Disconnect the oil filter inlet tube from the oil pump and the cylinder block, and remove the tube, gasket and seal.
4. Remove the two nuts and lockwashers that attach the pump to the cylinder block. Hold the pump, then pry the two tapered bolts out of the pump and cylinder block. Remove the pump and inlet tube as an assembly.

B. Oil Pump Disassembly

1. Remove the two bolts and washers that attach the oil inlet tube to the pump. Lift the tube, gasket, oil pump cover and cover gasket from the housing, Figure 33.
2. Lift the pump drive gear and shaft assembly and the driven gear out of the pump housing.
3. Remove the oil pump relief valve plug, the relief valve spring and the relief valve from the housing.
4. Clean all parts thoroughly in cleaning solvent and dry with compressed air.

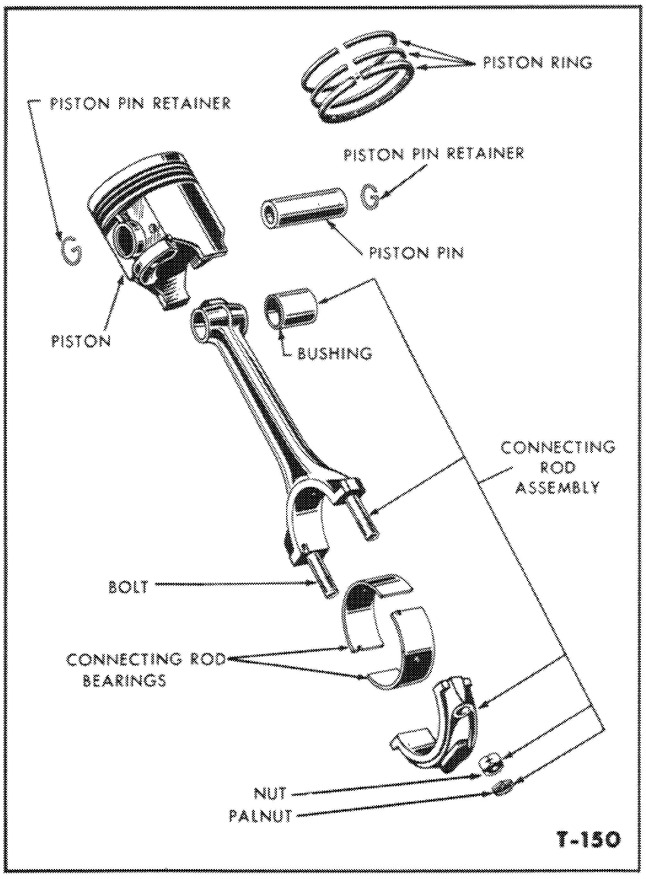

Figure 49—Piston and Connecting Rod Disassembled

4. Tap the piston down into the bore with the handle end of a hammer until the connecting rod is seated on the crankpin. Install the bearing cap on the rod with the cylinder number facing opposite the camshaft side of the engine. Install and tighten the nuts to 45-50 ft. lbs. torque. Install two new Pal nuts on the connecting rod and tighten them to 3-3½ ft. lbs. torque. Install the remaining pistons and rods in the same manner.
5. Install the oil pump, distributor or fuel injection pump and oil pan.
6. Install the fuel tank and hood.
7. Fill the radiator with coolant. Fill the crankcase to the proper level with the recommended oil.
8. Start the engine and check for leaks.

CYLINDER BLOCK

A. Inspection

1. Make a thorough check for cracks. Minute cracks, not visible to the naked eye, may be detected by coating the suspected area with a mixture of 25% kerosene and 75% light motor oil. Wipe the part dry and immediately apply a white coating of zinc oxide (white lead) dissolved in wood alcohol. If cracks are present, the white coating will become discolored at the defective area.
2. Inspect the cylinder bores for scoring. Inspect the expansion plugs for rust at the edge of the plug. Rust indicates leakage. If leakage is indicated, replace the plug.
3. Check the cylinder bore for taper, out of round and wear, with a cylinder bore gauge, telescope gauge, or inside micrometers, see Figure 51.
4. Record measurements taken lengthwise and crosswise at the top and bottom of the piston ring travel, as follows:
   a. Lengthwise of the block, measure and record as "A" the diameter of the cylinder at the top of the cylinder where the greatest ring wear occurs.
   b. Also, lengthwise of the block, measure and record as "B" the cylinder diameter at the bottom of the piston skirt travel.
   c. Crosswise of the block, measure and record as "C" the diameter of the top of the cylinder at the greatest wear point.
   d. Measure and record as "D" the diameter at the bottom of the cylinder bore, and crosswise of the block.
   e. Reading "A" compared to reading "B" and reading "C" compared to reading "D", indicates cylinder taper.
   f. If cylinder taper exceeds 0.008", rebore the sleeve to accommodate the next oversize piston. Reading "A" compared to reading "C"

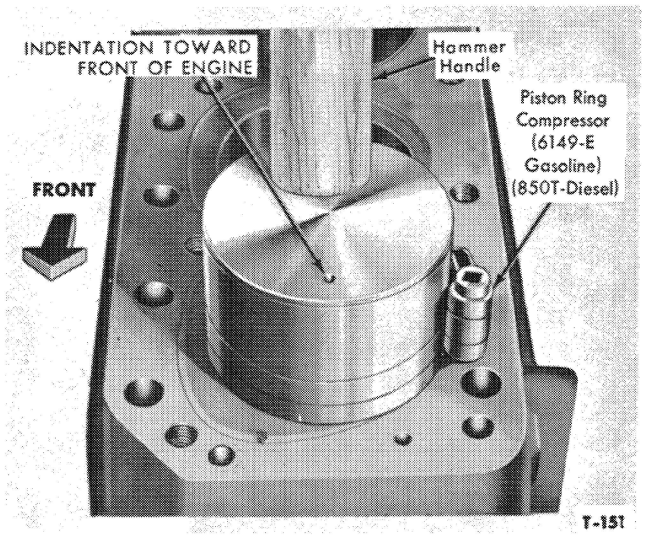

Figure 50—Installing Piston and Connecting Rod

from the front pulley and remove the drive hub and universal shaft.

5. Remove the fan belt, crank ratchet nut or bolt, and remove the front pulley and hub.
6. Disconnect the governor linkage from the governor arm.
7. If the engine is equipped with a governor housing, remove the housing from the cylinder front cover. Slip the governor off the crankshaft. If the governor housing is integral with the cylinder front cover, remove the cover then remove the governor. Clean all gasket surfaces thoroughly.

B. Disassembly

1. Remove the snap ring from the front end of the governor.
2. Lift the governor fork base, thrust bearing, race assembly and roller weights or balls as shown in Figure 67.
3. If disassembling a ball type (early type) governor, remove the rear snap ring and remove the thrust washer and case assembly from the driver and sleeve assembly.
4. Refer to Inspection, Paragraph C, below, then remove the fork retaining screw and slip the lever and shaft assembly from the housing.
5. Drive the needle bearings and seal from the governor housing or cylinder front cover with Remover and Replacer—18182, Figure 68.
6. Remove the crankshaft oil seal from the housing or cover with a bushing driver.

C. Inspection

1. Check the shaft for excessive clearance in the bearings. If excessive clearance is evident, replace the bearings and/or shaft.
2. Replace the races if there is evidence of scoring, pitting or wear.
3. Replace the thrust bearing if any of the bearings are missing or if the retainer is damaged.
4. Replace the sleeve and driver assembly if worn or damaged. Replace the steel balls or roller weights if worn or damaged.
5. Replace a governor housing or cylinder front cover that is cracked or damaged. Machined surfaces should be smoothed with a fine stone if nicked or burred.

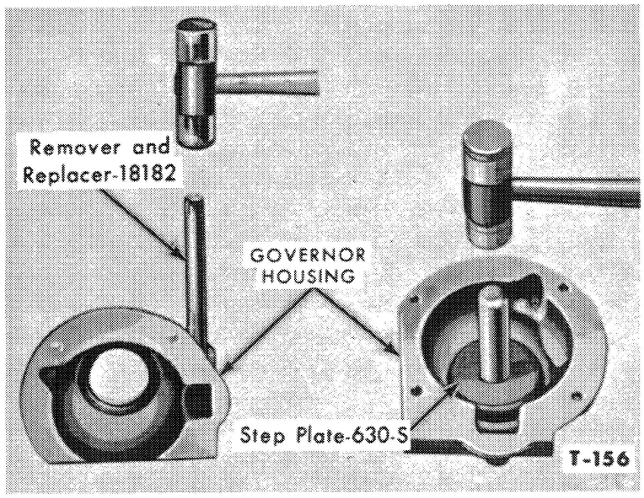

Figure 68—Removing or Installing Needle Bearings and Installing Crankshaft Oil Seal

D. Assembly

1. If assembling a ball type (early type) governor, install the bearing lower race, thrust washer and snap ring on the rear of the sleeve and driver assembly, Figure 67.
2. Position the ball or roller weights in the sleeve and driver assembly then install the bearing race.
3. Position the thrust bearing and governor fork base on the race, then install the snap ring.
4. Install the two needle bearings in the governor housing or cylinder front cover with Remover and Replacer—18182, if they were removed.
5. Install a new crankshaft oil seal with the correct Step Plate from Tool Set FT-48.
6. Install the lever shaft oil seal in the left side of the governor housing or cover.
7. Slide the shaft into the housing or cover far enough to start the fork on the shaft, then slide the shaft the rest of the way in. Install the fork retaining screw and lock washer.
8. Install a new plug in the housing or cover. Make sure that the lever operates freely.

E. Installation

1. Apply a light film of grease on the gasket surface and position a new gasket on the cylinder block or front cover.
2. Slip the governor into place on the crankshaft.
3. Install the cylinder front cover or governor housing. Tighten the attaching bolts to 10-15 ft. lbs. torque.
4. Connect the governor linkage to the governor arm.
5. Install the front pulley and hub. Install the fan belt.
6. If working on an industrial tractor, install the universal shaft and drive hub.
7. Install the power steering pump and adjust the belt tension.

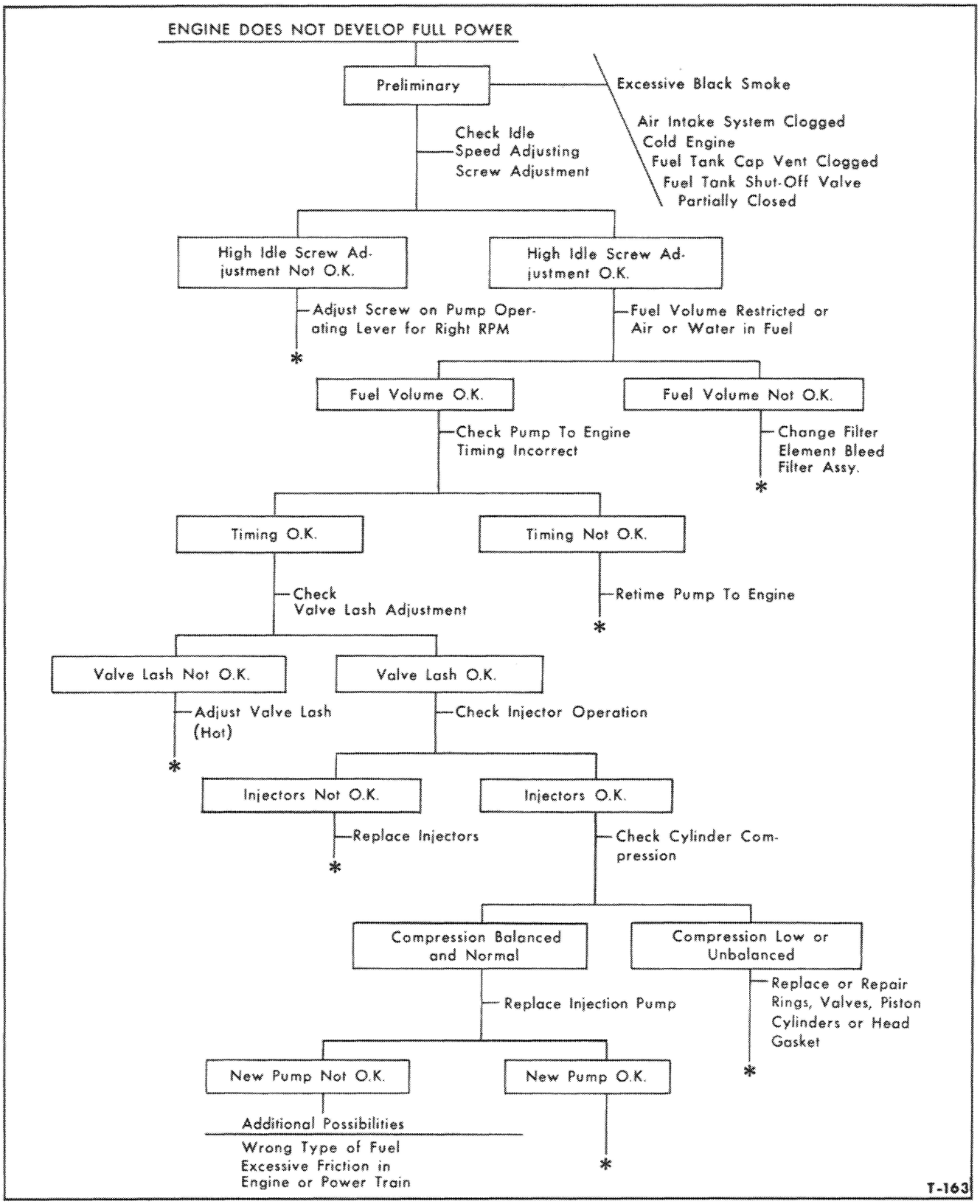

Figure 76—Engine Does Not Develop Full Power—Road Map

BATTERY

The battery is used to convert chemical energy into electrical energy and is the source of current in all Ford Tractor electrical systems. Its primary function is to provide current for the ignition and starting systems to start the engine. After the engine has been started, the generator will replenish the current in the battery that was used when starting the engine. In addition to keeping the battery charged, the generating system supplies current for ignition, lights and electrical accessories.

A. Maintenance

1. Check the level of the electrolyte at regular intervals to make certain that it is at the ring in the filler holes. If it is lower than the rings, bring it to the proper level by adding distilled or purified tap water.
2. Battery terminals should be kept tight and free of corrosion. Two tablespoons of baking soda mixed with one pint of water makes a satisfactory solution for cleaning terminals, battery case and battery support. Plug all vent holes to prevent entry of cleaning solution. After cleaning, the soda water should be rinsed away with clean water. Apply a small portion of petroleum jelly to the terminals to counteract corrosion. Remove plugs from vent holes.
3. Check the specific gravity of the battery with a hydrometer. Compare the hydrometer reading with the Battery Specific Gravity Chart to determine the state of charge.

BATTERY SPECIFIC GRAVITY CHARGE

State of Charge	Specific Gravity Temperate Climates
Fully Charged	1.275
75%	1.250
50%	1.225
25%	1.200
Discharged	1.175

Hydrometer readings will be accurate in temperature from 70°F. to 90°F. Readings must be compensated to .004 specific gravity for each 10°F. For every 10° above 80° add .004 gravity points and for every 10° below 80° subtract .004 gravity points. For example, an uncorrected reading of 1.225 specific gravity with an acid temperature of 0°F., would indicate a 50% charged battery. However, with a temperature correction of .004 specific gravity for each 10°F. change from the reference temperature of 80°F. or .032 specific gravity (8 x .004=.032), the correct reading would be 1.193 specific gravity (1.225—.032= 1.193) or approximately a 25% charged battery. Most hydrometers have a thermometer and correction scale built in so that a temperature correction can be readily made.

B. Removal

1. Disconnect the battery ground cable (— cable diesel tractors and + cable on all others).
2. Remove the nut and washer from each hold-down clamp bar and remove the bars.
3. Remove the battery and hold-down clamp from the battery support. Lift the clamp from the battery.

C. Installation

1. Make certain that the electrolyte is at the proper level and that the battery is fully charged.
2. Position the hold-down clamp on the battery. Place the battery on the battery support.

   NOTE: ***The positive post of a six-volt battery must be toward the right side of the tractor while the negative post of a twelve-volt battery must be toward the right side of the tractor.***
3. Secure the battery with the two hold-down bars, washers and nuts. Tighten the nuts only enough to prevent the battery from shifting on the support.
4. Connect each battery cable to its respective post.

   IMPORTANT: ***Always connect the ground cable last.***

D. Light Load Battery Test

1. Disconnect the coil to distributor secondary wire from the coil on LP-Gas or gasoline models. On diesel models, place the throttle lever in the closed position.
2. Crank the engine from 3 to 5 seconds to stabilize battery voltage.
3. Turn the headlights on and, after one minute, check each battery cell with an O-4 voltmeter. Record the readings.
4. If all cell readings are 1.95 volts or more and variation is less than 0.5 volt between all cells, the battery is in good condition.
5. If any cell reads less than 1.95 volts and variation is less than 0.5 volt between all cells,

2. Remove the cover band from the armature frame.

3. Remove the two through bolts from the rear end plate, then remove the front end plate and armature from the frame, Figure 22. Slip the front end plate off the armature shaft.

4. Remove the two screws that attach the ground brushes to the frame. Disengage the brushes from the brush holders then remove the brush end plate from the frame.

C. Inspection

Visual Checks:

1. Replace brushes if worn to less than $\frac{5}{16}$" in length, broken or if the leads are frayed or damaged.

2. Inspect the armature for a bent shaft or a rough commutator. Replace the armature if the shaft is bent. A rough commutator can be turned in a lathe or with a turning tool as shown in Figure 14.

   NOTE: ***Do not undercut the mica on a starting motor armature.***

3. Place the end plates in their respective positions on the armature shaft. If any looseness is noted, replace the bearings.

4. Inspect the starting motor drive, see Figure 21, for burrs, broken or worn teeth. Check the action of the pinion on the worm. It should slide freely on the threads. Check the drive spring to see if it is cracked, broken, or if the end tangs are bent. Check the anchor plate for cracks or damage. Replace the starting motor drive unit if any of these conditions are evident.

5. Replace the terminal on the frame if broken, worn or stripped.

Electrical Tests:

1. Connect a voltmeter lead and a battery lead to the frame and contact the other voltmeter lead to each brush as shown in Figure 23. If no reading is obtained on the voltmeter, the field circuit is open and the field coils must be replaced. Connect the voltmeter and battery as shown in Figure 24. If the voltmeter shows any voltage, the field coils are grounded and must be replaced.

2. Connect a voltmeter and battery to the armature as shown in Figure 25. If a reading is obtained on the voltmeter, the armature windings are grounded and the armature must be replaced. A burned segment on the commutator indicates an open circuit making it necessary to replace the armature. Each segment of the commutator must be checked.

D. Repair

1. Remove the bearing from the brush end plate as shown in Figure 26 with Clutch Pilot Bearing Remover 7600-E.

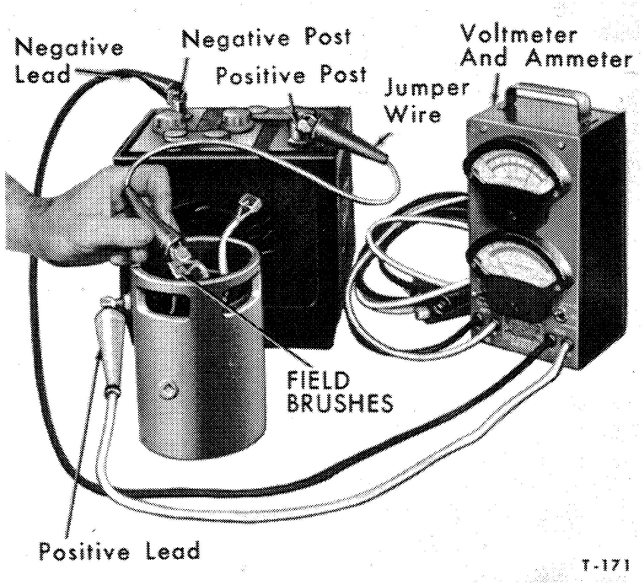

Figure 23—Checking Field Coils for Open Circuit

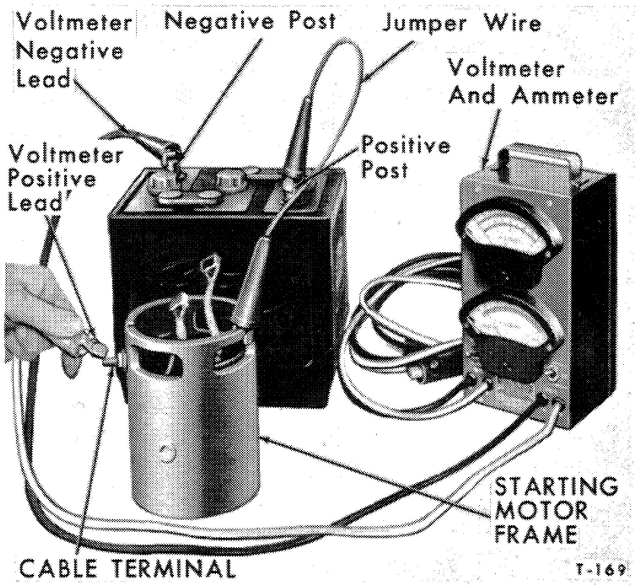

Figure 24—Checking Field Coils for Grounded Circuit

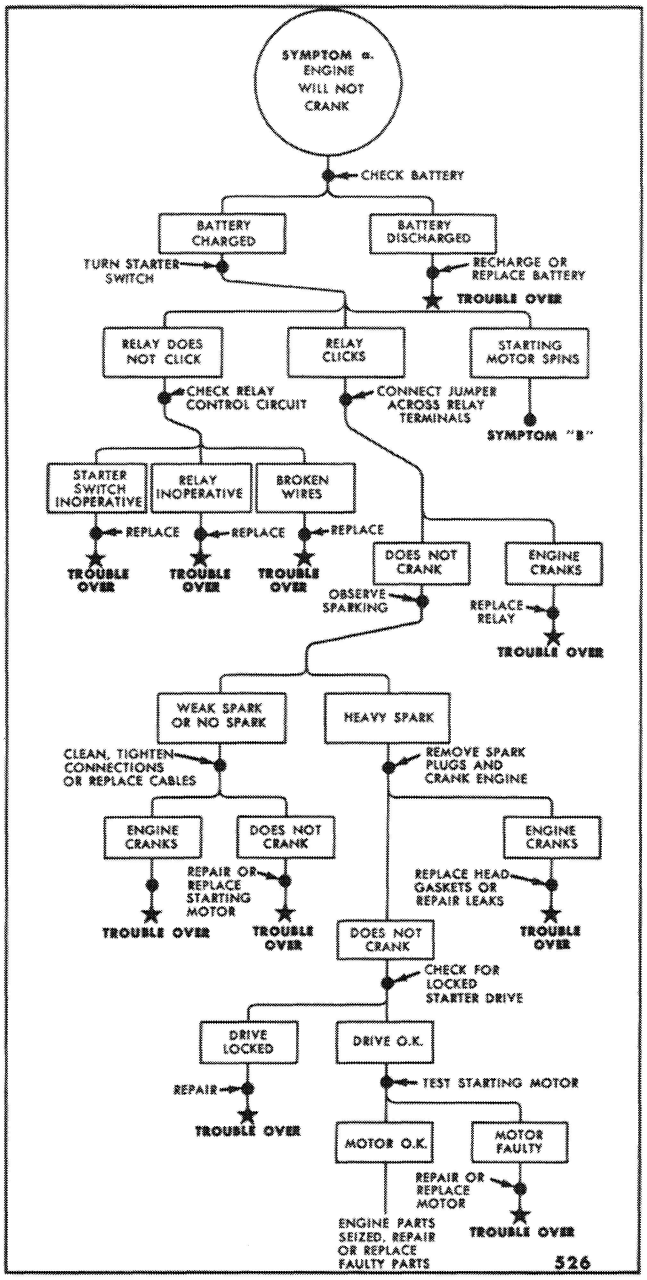

Figure 38—Engine Will Not Crank—Road Map

Test No. 2. If the relay clicks when the starter button is pressed, connect a heavy jumper from the relay battery terminal to the starting motor. If the engine does not crank, observe the spark when connecting and disconnecting the jumper. If there is a heavy spark, see (2) below. If the spark is weak or if there is no spark at all, proceed as follows:

(1) With the jumper wire connected, inspect the battery-starter cables for corrosion and broken connectors. Check the ground cable to see if it is broken or badly corroded. Inspect all cable connections. Clean and tighten them if necessary. Replace any broken or frayed cables. If the engine still will not crank, the trouble is in the starting motor and it must be repaired or replaced.

(2) If a heavy spark is obtained when the jumper wire is connected, remove all the spark plugs and attempt to crank the engine with the starting motor.

If the engine cranks with the spark plugs removed, water has leaked into the cylinders causing a hydrostatic lock. The cylinder head must be removed and the cause of leakage repaired.

(3) If the engine will not crank, loosen the starter mounting bolts to free the starter pinion. If the starter drive is locked, remove the starting motor from the engine and examine the starting motor drive pinion for burred or worn teeth. Exam-

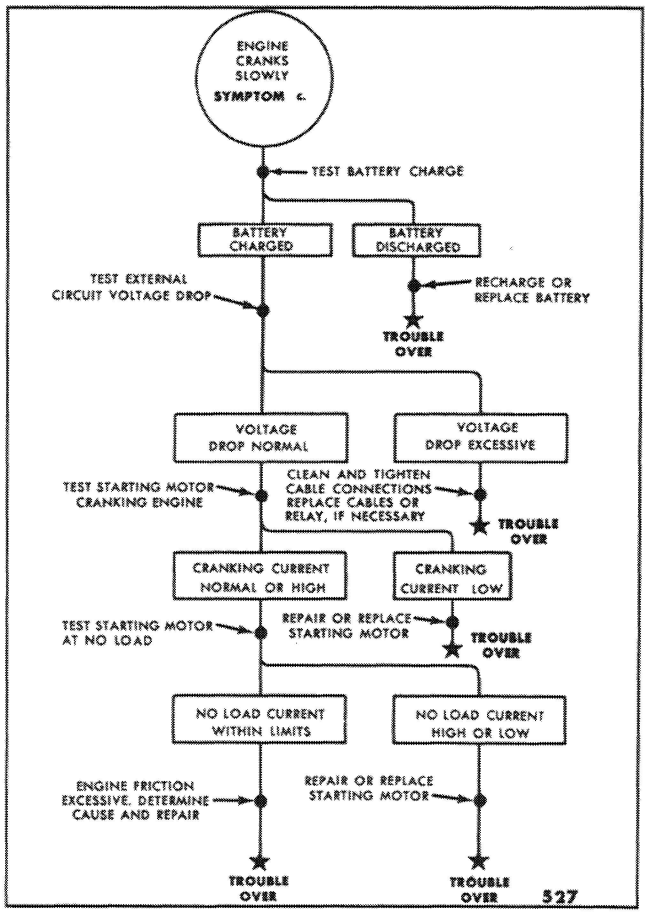

Fig. 39—Engine Cranks Slowly—Road Map

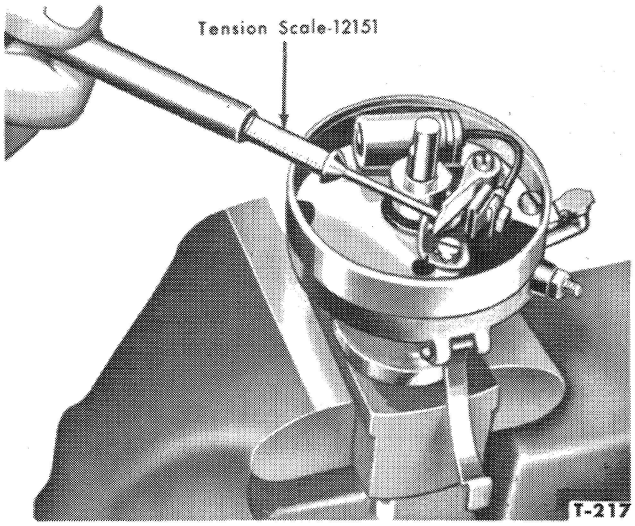

Figure 12—Checking Breaker Point Tension

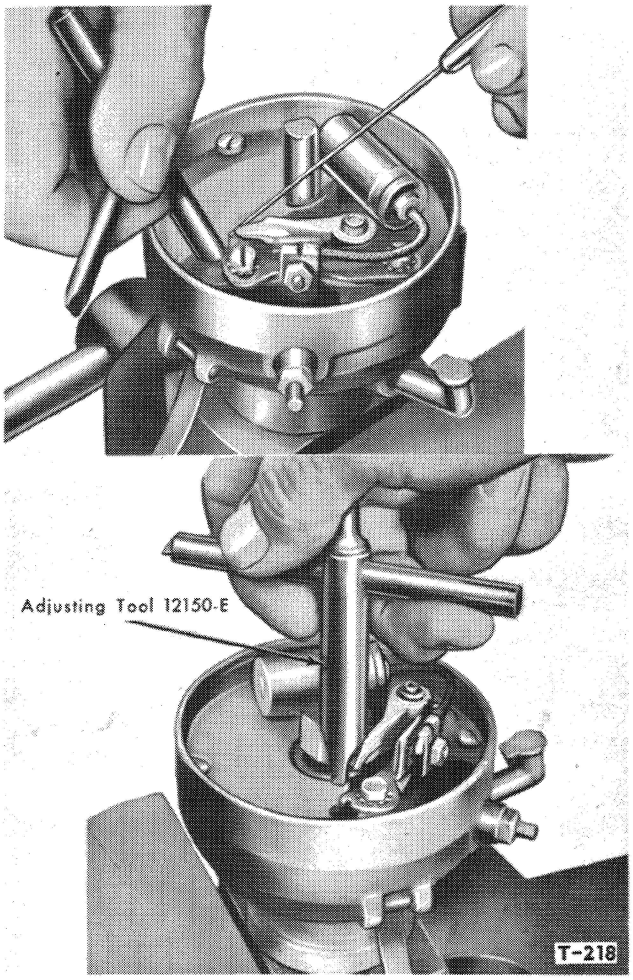

Figure 13—Aligning and Adjusting Breaker Points

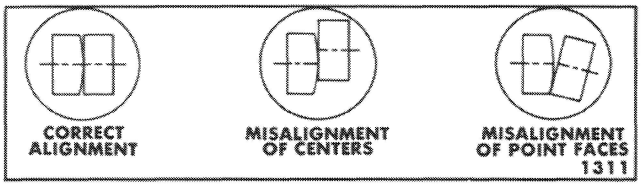

Figure 14—Breaker Point Alignment

E. Installation

1. If the crankshaft has not been rotated while the distributor was removed, install the distributor with the rotor aligned with the mark previously scribed on the breaker dust cover with the primary terminal in its approximate previous position.

   If ignition timing is required, rotate the crankshaft until No. 1 piston is on T.D.C. after the compression stroke, then position the distributor in the cylinder block with the rotor at the No. 1 firing position and the breaker points open, and install the hold down clamps.

   IMPORTANT: ***Make sure the oil pump intermediate drive shaft is properly seated in the distributor. It may be necessary to crank the engine with the starter after the distributor drive gear is partially engaged, in order to engage the intermediate shaft fully in the distributor.***

2. Install the retaining screws and lockwashers but do not tighten the screws at this time. Connect the distributor primary wire.

3. Rotate the distributor base clockwise until the breaker points are just starting to open. Tighten the screws. Install the rotor and distributor cap. Start the engine, and check the ignition timing and centrifugal advance with a timing light.

F. Setting Basic Ignition Timing

1. Place the gear shift lever in neutral position and turn the ignition switch off before attempting to set ignition timing.

2. Remove the distributor cap from the distributor and the spark plug from the number one cylinder.

3. Hold your thumb over the spark plug hole as the engine is cranked. Observe the distributor rotor closely while it rotates, then mark its exact location on the breaker dust cover the moment compression blows by your finger.

As the throttle plate is slowly opened from the idle position, the secondary idle orifice is gradually subjected to greater manifold vacuum, and as the manifold vacuum increases, the orifice ceases to bleed air to the idle fuel passage. Instead, fuel is fed from the idle fuel passage through the secondary idle orifice to the engine. With the throttle open wider than idle, a greater amount of air is admitted, necessitating a greater amount of fuel than can be supplied through the primary idle orifice. The additional fuel supplied through the secondary idle orifice maintains the correct fuel air ratio for the engine.

As the throttle is opened wider, the idle fuel delivery begins to fade and the power fuel system starts to function.

3. The power fuel system, shown in Figure 4, supplies fuel to the engine in the speed ranges beyond idle and slow speed.

   As engine speed is increased, the air flow through the venturi (17), Figure 4, is increased. The increased air flow creates a vacuum at the nozzle tip (14). The pressure then is lower at the nozzle than it is in the fuel bowl chamber (9), Figure 3, and the accelerating well (16), Figure 4. Fuel, therefore, flows from the fuel bowl, through the main adjustment needle and seat assembly (19) and out the nozzle (14) and into the air stream at the venturi. At the same time, the fuel in the accelerating well is forced through the nozzle air bleeds (15) in the nozzle. However, due to the size of the power jet and the restriction at the main adjustment needle seat, the fuel in the accelerating well is soon exhausted, and air enters the accelerating well through the nozzle air vent (20), Figure 4. The amount of air that can enter is limited by the size of the nozzle air vent. This air helps to atomize the fuel passing through the nozzle, and it helps to regulate the rate of discharge of the fuel fed from the accelerating well during acceleration. It also provides the correct mixture proportions for full throttle operation. When the throttle plate is opened suddenly to the wide open position, the fuel in the accelerating well is forced out through the nozzle air bleeds very rapidly, providing the extra rich mixture the engine needs to meet the sudden load. When the throttle is closed again, fuel fills the accelerating well, ready for the next acceleration.

4. The function of the choke plate is to restrict the air flow into the carburetor which causes a higher vacuum on the discharge nozzle, giving a richer mixture for starting purposes. The choke plate and choke system are shown in Figure 5. A small movement in the choke plate causes a great change in the fuel air mixture.

   The relief valve opens and then closes automatically depending on engine load and speed.

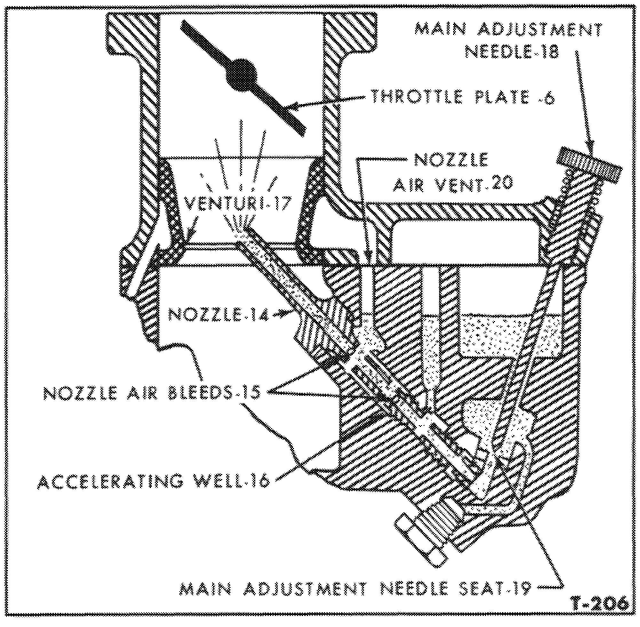

Figure 4—Power Fuel System

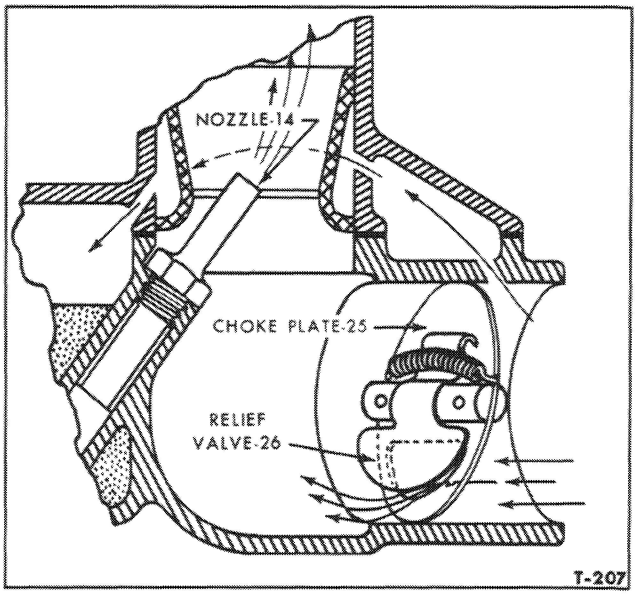

Figure 5—Choke System

FUEL TANK

A. Removal

1. Disconnect the battery ground cable from the right side of the tractor.
2. Remove the hood assembly.
3. Turn the fuel shut-off valve to the "OFF" position. Disconnect the fuel line from the fuel filter. Disconnect the fuel return line from the forward end of the tank.
4. Place a piece of wood across the top of the battery to prevent the tank from accidentally contacting the post or straps. Remove the bolt and lockwasher that attaches the tank to each side of the fuel tank rear support.
5. Loosen the nut that attaches the fuel tank to the front support.
6. With an assistant, slide the tank back approximately one inch to free it from the front mounting bolt, then lift it from the tractor. Disconnect the fuel line from the tank.

B. Cleaning

1. Water caused by normal condensation, accumulates in the fuel tank when allowed to stand low or empty for a period of time (usually overnight). Therefore, it is a good practice to fill the tank to capacity at the end of each day of operation to prevent moisture laden air from forming water, rust and gum formation. Long periods of tractor storage may also cause gum formations in the tank.
2. If it is necessary to clean the tank, drain the fuel completely and remove the shut-off valve fitting.
3. Wash the interior of the tank thoroughly with a mixture of alcohol and acetate or any other suitable solution. Disassemble the fuel shut-off valve and clean it thoroughly. Dry the tank thoroughly, then reassemble the shut-off valve and mount it on the tank.

C. Installation

1. Connect the fuel line to the fuel shut-off valve but do not tighten the line fitting. With an assistant, position the tank on the support brackets making sure the tank front mounting bracket engages the carriage bolt at the fuel tank front support.
2. Install the two rear attaching bolts. Tighten the front mounting bolt.
3. Connect the fuel line to the fuel filter, and tighten both fittings. Connect the fuel return line to the front of the fuel tank.

   NOTE: ***Tighten fuel line connections carefully. The fittings are brass and it is possible to strip the threads if they are over-tightened.***
4. Install the hood assembly.
5. Turn the fuel shut-off valve to the "ON" position. Remove the wood from the top of the battery. Connect the battery ground strap to the right side of the tractor.
6. Bleed the fuel system as detailed in Section 3 below.
7. Fill the air cleaner oil bath tray to the oil level mark with the specified engine oil. Using a new oil bath tray gasket, secure the tray to the air cleaner.
8. Connect the air inlet tube to the air cleaner and secure with the hose clamp.

BLEEDING AND FLUSHING THE FUEL SYSTEM

A. Bleeding the Fuel Filter

1. Open the fuel tank shut-off valve at the bottom of the tank.
2. Open the drain cock at the bottom of the fuel filter base, Figure 4. Close the drain cock when the fuel begins to flow.
3. Open the bleed screw at the top of the filter cover two turns to release any air that may be trapped. After a solid flow of fuel appears, tighten the bleed screw.

   IMPORTANT: ***Never open the bleed screw when the engine is running as air will be sucked into the system.***

B. Flushing the Injectors and Pressure Lines

1. Disconnect the pressure line from each injector. Move the pressure lines $\frac{1}{32}$-$\frac{1}{16}$" away from the injectors.

D. Fuel Injection Pump Installation and Timing

Prior to installing the pump, the engine flywheel timing mark must be at 18° BTDC (172 cu. in. engine) or 20° BTDC (144 cu. in. engine) with No. 1 cylinder on compression.

1. Install a new "O" ring on the pilot diameter of the pump mounting flange.
2. Blow any dirt out of the pressure lines with an air hose.
3. Install new washers—one on the inside and one on the outside of each banjo fitting and bolt the pressure lines loosely to the pump head.
4. Turn the pump drive shaft counterclockwise several times to make sure there is no binding in the pump.
5. Remove the timing window cover and gasket, then turn the shaft counterclockwise until the movable timing mark on the governor cage is about ⅛" to the right of the fixed mark on the cam.
6. Install the pump on the engine, making sure that the tang on the pump shaft seats in the slot of the pump drive gear.
7. Remove any backlash in the pump and drive gear as follows:
   a. Rotate the engine with the starter until the timing mark in the pump is out of sight at the right side of the window.
   b. Use a screwdriver on the flywheel ring gear to bring the mark back to its original alignment position.
8. Rotate the complete pump assembly slightly so that the timing marks are aligned as shown in Figure 19.

   IMPORTANT: ***If the timing marks cannot be aligned, recheck for proper pump drive gear installation.***

9. Secure the pump assembly in position after the timing marks have been properly aligned and rotate the engine two complete revolutions. The timing marks should again be in alignment. The flywheel should read 18° BTDC (172 cu. in. engine) or 20° BTDC (144 cu. in. engine) and No. 1 cylinder should be on compression. If these factors disagree, recheck the previous steps.
10. Install the timing window cover on the pump using a new gasket.
11. Connect the throttle linkage to the pump, plus the excess fuel line to the pump cover and the fuel line to the pump head. Do not connect the pump pressure lines to the injector inlets until they have been flushed as outlined in Section 3.

MANIFOLD, MUFFLER AND OUTLET PIPE

The intake and exhaust manifolds are separate units on the Ford Diesel Tractor. However, a single manifold gasket is utilized for both manifolds. The muffler is mounted directly above the manifolds as shown in Figure 20.

The air cleaner is mounted directly to the intake manifold. Air is drawn in from a pre-cleaner and a grille located on the left rear side of the hood through an air inlet tube to the intake manifold.

A. Manifold Removal

1. Remove the clamp that secures the outlet pipe to the muffler outlet pipe support elbow. Lift the outlet pipe, clamp and rain cap off the elbow as an assembly. Remove the rain cap from the outlet pipe if either is to be replaced.
2. Remove the four bolts that attach the heat shield to the fuel tank supports and remove the heat shield, Figure 20.
3. Disconnect the wire from the manifold rear heater. Loosen the clamp that secures the air intake tube to the air cleaner. Remove the two air cleaner attaching bolts and remove the air cleaner.

   NOTE: ***Do not disconnect the manifold heater wire if the intake manifold is not going to be removed.***

4. Remove the nut and bolt that attaches the upper part of the muffler outlet pipe support elbow to the fuel tank front support. Remove the bolt that attaches the elbow to the cylinder head. Remove the elbow from the muffler.
5. Loosen the one nut that attaches the exhaust manifold to the cylinder head one turn. Hold the nut in that position then run another nut against it to act as a jam nut as shown in Figure 21. Remove the stud from the cylinder head.
6. Remove the four attaching bolts and washers. Lift the exhaust manifold up and away from the cylinder head.