

Product: 1955-1960 Ford Tractor Series 600,700,800,900,601,701,801,901,1801 Service Repair Workshop Manual
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FORD TRACTOR

1955
—
1960

for

TRACTOR SERIES

600-700-800-900

601-701-801-901-1801

shop manual

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TRACTOR AND IMPLEMENT DIVISION

Ford Motor Company

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DAVE GRAHAM

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FORD TRACTOR SHOP MANUAL

for

TRACTOR SERIES

600-700-800-900

601-701-801-901-1801

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Prepared by

**TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY
BIRMINGHAM, MICHIGAN**

FOREWORD

This manual contains complete service information on all Series 600 through 1801 Ford Tractors. The information contained herein will be useful to the inexperienced mechanics as well as the experienced ones.

Step-by-step procedures for removal, disassembly, inspection, repair, assembly, and installation are presented throughout the manual. Most of the major assemblies are shown disassembled, with each of the component parts arranged in the order of assembly. In many instances, a glance at the disassembled views will show you everything you need to know to assemble the parts.

Whenever possible, the special tools involved in the disassembly or assembly of the various units are illustrated.

Sections on Trouble Shooting, Specifications, and Special Tools are provided at the end of each chapter for quick reference.

The descriptions and specifications contained in this manual were in effect at the time the manual was approved for printing. The Tractor and Implement Division of Ford Motor Company reserves the right to discontinue at any time, or change specifications or design without notice or without incurring obligation.

TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY
SERVICE DEPARTMENT

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I. ENGINE REMOVAL AND INSTALLATION—SERIES 501 THROUGH 901

There are three different size engines used in Ford Tractors. The smallest engine of the three has a 134 cubic inch displacement and is available as a gasoline or LP-Gas model. The next larger size has a 144 cubic inch displacement and is available only as a diesel model. The largest of the three has a 172 cubic inch displacement and models are available for gasoline, LP-Gas or diesel operation.

All Ford Tractor engines are of the four cylinder, four cycle, overhead valve type.

When necessary to remove or install an engine, refer to the specific series tractor involved.

PREPARING THE TRACTOR

A. Series 501-701-901 Gasoline or LP-Engines

1. Disconnect the battery ground strap.
2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
3. On tractors equipped with Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.

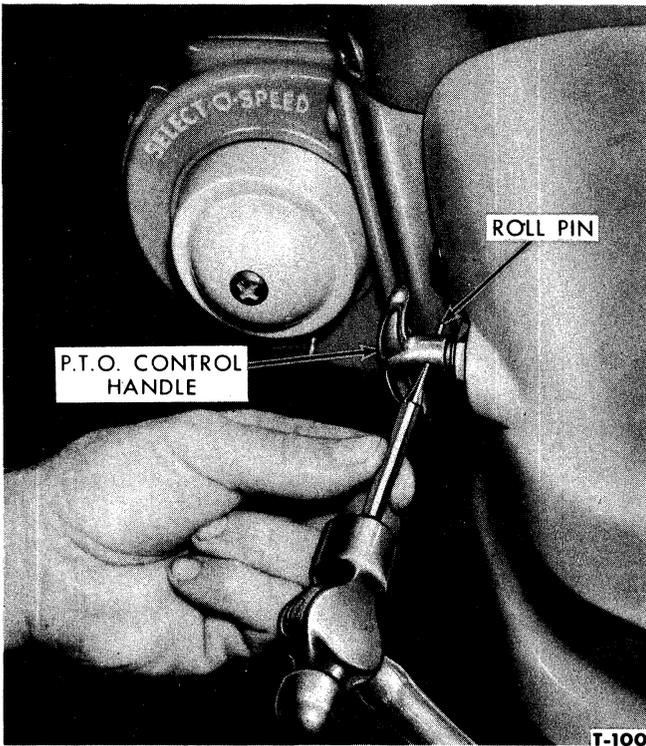


Figure 1—Removing P.T.O. Control Handle

4. Disconnect the bullet type connector adjacent to the headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank gauge.
5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the grille from the front of the hood. Remove the two bolts from each hood side front lower panel flange.

501 Series Tractor: Loosen the three bolts that attach the steering shaft support to the transmission to provide clearance for removing the hood.

6. Loosen the clamps that secure the air cleaner tube to the carburetor and the air cleaner. Remove the air cleaner tube.
7. With an assistant, carefully lift the hood from the tractor.

NOTE: *On tractors equipped with a Select-O-Speed transmission, make certain that the P.T.O. control cable is clear of the hood.*

8. Remove the two air cleaner attaching screws and remove the air cleaner. Remove the bolt that attaches the fuel tank support to the left side of the battery support. On tractors equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that

attach the muffler outlet pipe front support to the fuel tank front support bracket.

Gasoline Engine: Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line at the fuel filter, see Figure 3. Remove the bolts that attach the fuel tank support brackets to the cylinder block. Remove the one nut that attaches the fuel tank front support bracket to the cylinder block. With an assistant, carefully lift the fuel tank and brackets from the tractor.

LP-Gas Engine: Turn the fuel withdrawal valves to the closed position. Disconnect the flexible hose at the vaporizer inlet connection. Disconnect the water temperature gauge line and the oil pressure gauge line from the cable clip bracket at the right rear side of the fuel tank. Remove the four bolts that attach the fuel tank support brackets to the cylinder block. With an assistant, carefully lift the tank, heat shields and support brackets from the tractor.

B. Series 501-701-901 Diesel Engine

1. Disconnect the battery ground strap.
2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
3. On a tractor equipped with Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.
4. Disconnect the bullet type connector adjacent to the headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank gauge.
5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the grille from the front of the hood. Remove the bolts from each side of the hood lower panel flange. With an assistant, carefully lift the hood from the tractor.

NOTE: *On a tractor equipped with a Select-O-Speed transmission, make certain that the P.T.O. cable is clear of the hood.*

6. Loosen the clamp that connects the air cleaner tube to the air cleaner. Disconnect the clamp that attaches the air cleaner tube to the bracket on the left side of the hood rear lower panel and remove the tube. If the engine is equipped with a pre-cleaner, remove the vertical stack in place of the tube.

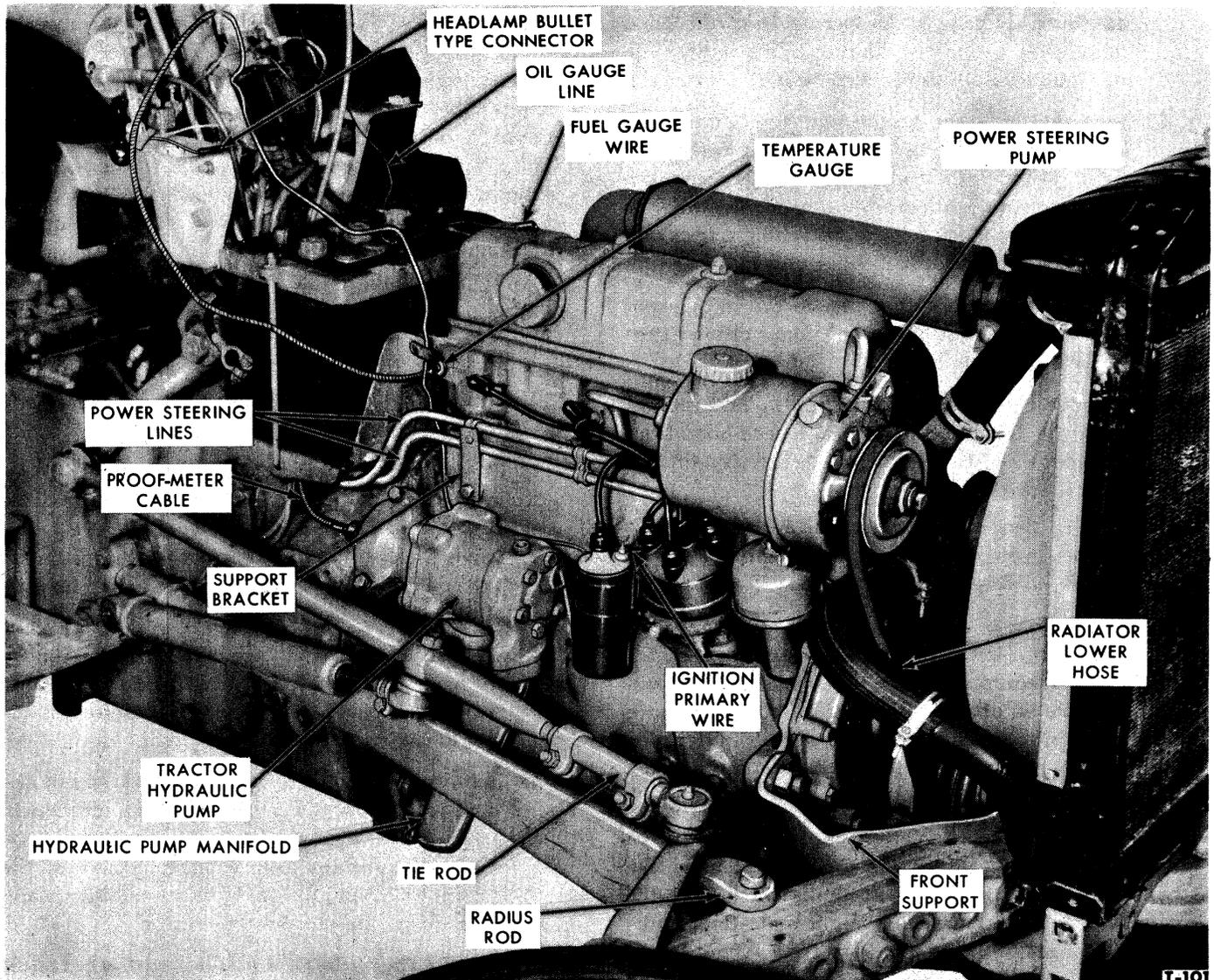


Figure 2—Right Side of Engine

7. On a tractor equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that attach the muffler outlet pipe front support to the fuel tank front support bracket.
8. Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line from the tank and from the fuel filter. Disconnect the excess fuel return line from the forward end of the fuel tank and from the "T" connection on the right side of the cylinder block.
9. Place a piece of wood across the top of the battery to prevent the fuel tank from accidentally contacting the battery posts. Remove nut and lock washer that attaches the fuel tank front support to the cylinder block. Remove the four fuel tank support attaching bolts. With an assis-

tant, carefully lift the fuel tank and support brackets from the tractor.

10. Remove the battery from the battery tray.

C. Series 601-801 Gasoline Engine

1. Disconnect the battery ground strap.
2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
3. On tractors equipped with a Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.
4. Disconnect the bullet connector adjacent to the

headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank.

5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the four attaching bolts from the grille and remove it from the hood. Remove the two hood front lower panel attaching screws and remove the panel (801 series only).
6. Loosen the clamps that secure the air cleaner tube, hoses to the carburetor and air cleaner then remove the tube.
7. Remove the grille attaching screws and remove the grille. Remove the bolt from each hood front side panel. With an assistant, carefully lift the hood from the tractor.

NOTE: *On tractors equipped with a Select-O-Speed transmission, make certain that the P.T.O. cable is clear of the hood.*

8. Remove the bolt that attaches the fuel tank support to the left side of the battery support. On tractors equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that attach the muffler outlet pipe front support to the fuel tank support bracket.

Gasoline Engine: Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line at the fuel filter, see Figure 3. Remove the bolts that attach the fuel tank support bracket to the cylinder block. Remove the one nut that attaches the fuel tank front support bracket to the cylinder block. With an assistant, carefully lift the fuel tank and support brackets from the tractor.

LP-Gas Engine: Turn the fuel withdrawal valves to the closed position. Disconnect the flexible hose at the vaporizer inlet connection. Disconnect the water temperature gauge line and the oil pressure line from the cable clip bracket at the right rear side of the fuel tank. Remove the four bolts that attach the fuel tank support brackets to the cylinder block. With an assistant, carefully lift the tank, heat shields and support brackets from the tractor.

D. Series 601-801 Diesel

1. Disconnect the battery ground strap.
 2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
 3. On a tractor equipped with Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.
 4. Disconnect the bullet type connector adjacent to the headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank.
 5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the grille from the front of the hood. Remove the bolt from each side of the hood lower panel flange. With an assistant, carefully lift the hood from the tractor.
- NOTE:** *On a tractor equipped with a Select-O-Speed transmission, make certain that the P.T.O. cable is clear of the hood.*

6. Loosen the clamp that connects the air cleaner tube to the air cleaner. Disconnect the clamp that attaches the air cleaner tube to the bracket on the left side of the hood lower panel and remove the tube.
7. On a tractor equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that attach the muffler outlet pipe front support to the fuel tank front support bracket.
8. Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line from the tank and from the filter. Disconnect the excess fuel return line from the forward end of the fuel tank and from the "T" connection on the right side of the cylinder block.

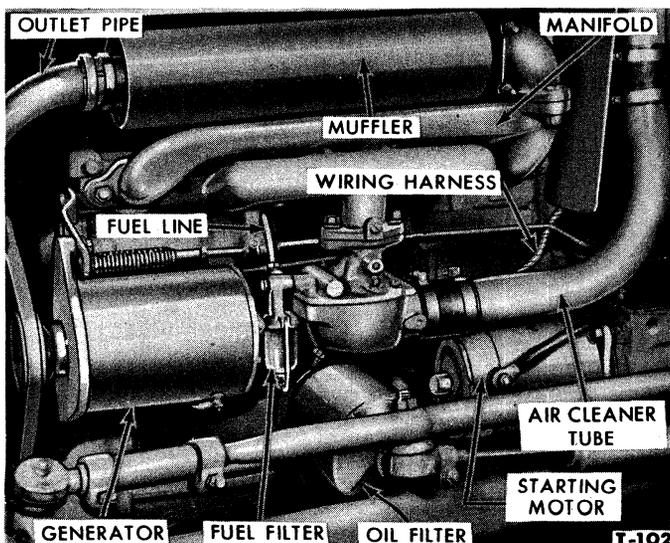


Figure 3—Left Side of Engine

9. Place a piece of wood across the top of the bat-

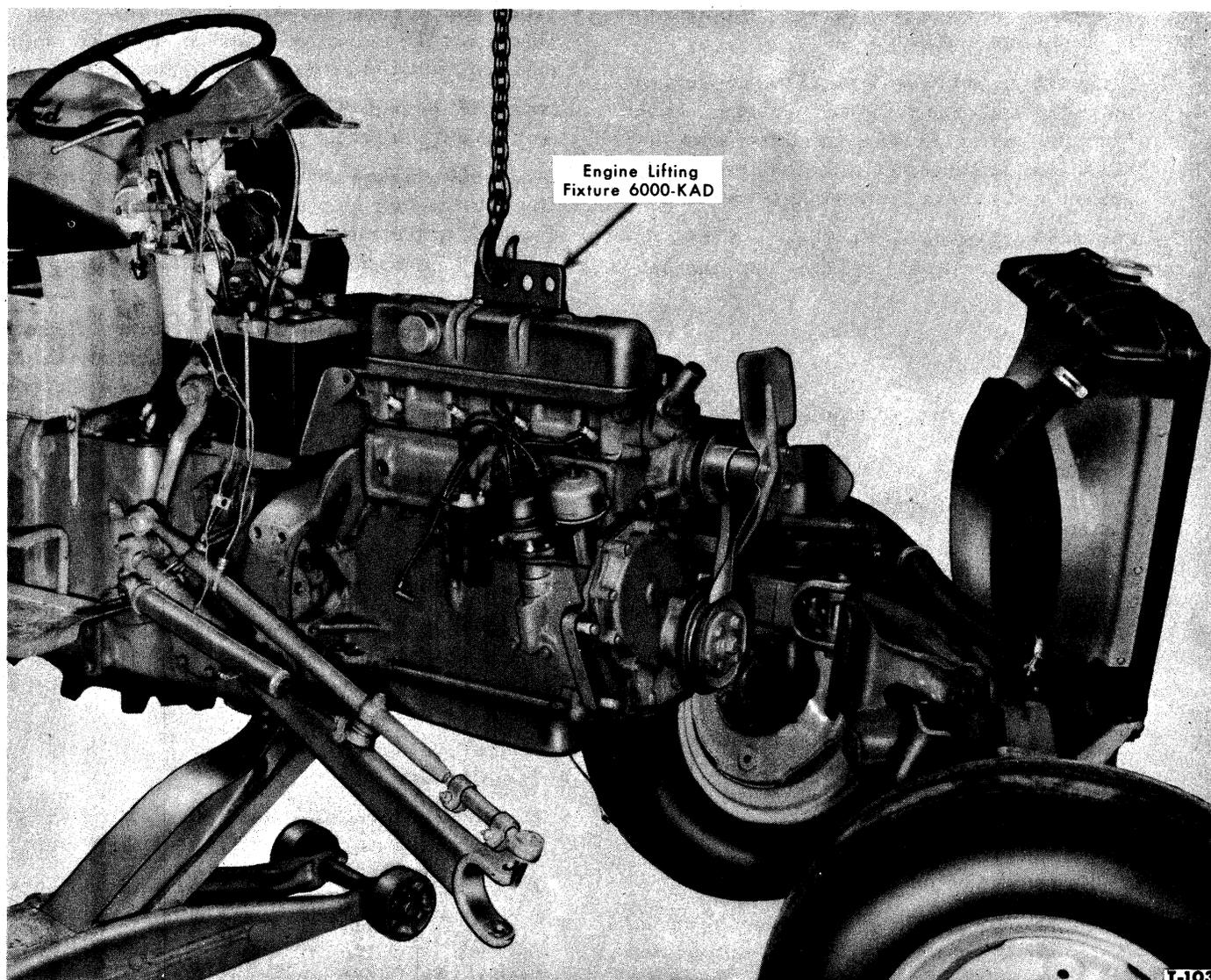


Figure 4—Removing Engine

tery to prevent the fuel tank from accidentally contacting the battery posts. Remove the nut and lock washer that attaches the fuel tank front support to the cylinder block. Remove the four fuel tank support attaching bolts. With an assistant, carefully lift the fuel tank and support brackets from the tractor.

10. Remove the battery from the battery tray.

ENGINE REMOVAL AND INSTALLATION

A. Engine Removal

Power Steering: Disconnect the two hydraulic lines that connect the pump to the steering gear as shown in Figure 2. Remove the bolt that attaches the power steering hydraulic lines support bracket to the valve

cover. Disconnect the spark plug wires from the plugs. Remove the bolts, attaching the power steering pump mounting bracket to the cylinder block and water outlet connection. Remove the pump, mounting bracket and the two hydraulic lines as an assembly.

1. Disconnect the temperature gauge unit from the engine. Disconnect the radiator hoses from the engine. Disconnect the Proof-Meter cable from the hydraulic pump. Disconnect the primary wire from the ignition coil. Place a drain pan under the hydraulic pump and manifold assembly. Remove the five bolts that attach the pump and manifold to the engine and transmission and remove as an assembly. Disconnect the oil gauge line from the fitting in the cylinder block.

NOTE: Row Crop Models: Remove the right

side rail to provide clearance for the hydraulic pump and manifold.

2. Place a drain pan under the oil filter and remove the filter. Disconnect the starting motor cable from the starter. Remove the three bolts that attach the starting motor to the transmission housing and remove the starting motor.

Gasoline Engine: Disconnect the choke rod from the carburetor and the throttle linkage from the bellcrank.

Diesel Engines:

- a. Working through the access hole in the battery tray, disconnect the throttle linkage from the bellcrank. Disconnect the rod connecting the fuel injector pump and bellcrank at the bellcrank.
- b. Loosen the two battery rear support bolts. Pivot the tray upwards and back, then tighten the bolts to hold it in this position.
- c. Remove the fuel injection pump and fuel filter as follows:
 - (1) Remove the two nuts and washers that attach the fuel injection pump to the mounting flange. Disconnect the pressure lines from the injectors and the excess fuel return from the rear of the "T" connection on the cylinder head.

IMPORTANT: *Thoroughly clean all dirt from the injector connections and from the pump mounting flange before disconnecting.*

Cap the injector inlets and lines to prevent dirt from entering. Minute particles of dirt can cause malfunction of the injectors as well as seizure of the pump.

- (2) Remove the two bolts that attach the fuel filter bracket to the cylinder head. Place a drain pan under the injection pump. Lift the injection pump with drive shaft, pressure lines and fuel filter from the engine as a unit.

IMPORTANT: *When removing the injection pump, make certain that the shaft remains in the pump to prevent fuel from leaking down into the crankcase.*

3. Install an engine lifting hook or chain to support the engine.

Series 600 through 801—General Purpose Tractors: Disconnect the radius rod from the right side of the axle and the tie rod from the right steering arm.

Series 700 through 901—Row Crop Tractors: Disconnect the drag link at the pedestal.

Series 600 through 801—General Purpose Tractors: Remove the four nuts that attach the axle support, Figure 2, to the engine. Carefully swing the axle and radiator to the left side of the tractor as shown in Figure 4.

Series 700 through 901—Row Crop Tractors: Remove the radiator. Remove the two bolts that attach the left side rail to the transmission. Remove the bolt that attaches the pedestal to the engine. Remove the pedestal and side rail as an assembly.

CAUTION: *Make certain that the pedestal is firmly supported before removing it from the engine.*

Remove the muffler and muffler outlet pipe from the manifold as an assembly.

4. Remove the engine-to-transmission attaching bolts. Carefully lift the engine away from the transmission as shown in Figure 4. Mount the engine in an engine stand.

B. Installation

1. Attach an engine lift hook or a chain to the cylinder head as shown in Figure 4.
2. Align the hub of the clutch disc with the splines on the transmission input shaft, then move the engine into place against the transmission housing. On tractors having live P.T.O. clutches, the P.T.O. shaft at the rear of the center housing should be turned slowly to engage the splines with the clutch discs.
3. Secure the engine to the transmission with two bolts at each side of the housing. Install the muffler and outlet pipe in place on the manifold, see Figure 3.

Series 600 through 801—General Purpose Tractors: Swing the axle support into place on the engine. Make certain that the radius rod is in place on the axle then install the four nuts that attach the front support to the engine, see Figure 2. Install the radius rod to axle attaching bolt. Connect the tie rod to the steering arm.

Series 700 through 901—Row Crop Tractors: Carefully move the pedestal and side rail assembly into position and install pedestal to engine mounting nut finger tight. Install the left side rail to transmission attaching bolts then tighten the pedestal to engine mounting

nut. Install the radiator and connect the drag link to the steering spindle arm. Connect the radiator upper and lower hoses.

4. Install the remaining engine-to-transmission retaining bolts. Remove the engine lifting sling and the jack from under the transmission.
5. Connect the oil pressure gauge line to the fitting on the right side of the cylinder block. Using new "O" rings, install the hydraulic pump and manifold on the engine.

Series 700 through 901 (Row Crop) Tractors: Install the right side rail.

6. Connect the water temperature gauge line to the engine. Connect the Proof-Meter cable to the hydraulic pump, see Figure 2.

Diesel Engines: Loosen the battery rear support bolts and lower the tray into position, then tighten the bolts. Working through the opening in the battery tray, connect the throttle control rod between the injector pump and the bellcrank. Connect the rod from the throttle control lever arm to the bellcrank. Install the battery and connect the negative cable only.

7. Position the wiring harness, see Figure 3, in the attaching clips on the cylinder block and connect the three wires to the generator.

Gasoline Engine: Connect the choke control rod to the carburetor and the throttle rod to the bellcrank. Connect the primary wire to the ignition coil.

8. Position the starting motor on the engine rear cover plate and secure with three bolts.

NOTE: *Make sure the choke control rod bracket is in place when installing the starting motor inner attaching bolt (gasoline engine only).*

Connect the starting motor cable to the starting motor.

9. Install a new oil filter or cartridge.
10. On a tractor equipped with power steering, hold the pump and lines in place on the engine and install the two pump mounting bolts. Connect the two hydraulic lines to the steering gear (600 through 801 Series). Connect the hydraulic line bracket to the valve cover with the attaching bolt, see Figure 2.
11. Install the fan belt and adjust the generator to permit $\frac{1}{4}$ " deflection of the belt.
12. Position the power steering drive belt over the

crankshaft pulley and over the power steering pump pulley.

13. Place a piece of wood across the top of the battery to prevent the fuel tank from accidentally contacting the battery posts. With an assistant, carefully lift the fuel tank and supports into place on the engine then install the nut and lock washer that secures the front support to the cylinder block. Install the four attaching bolts. Connect the fuel line to the fuel filter. Open the fuel shut-off valve.

NOTE: *If the engine is equipped with power steering, the right front fuel tank support bolt also connects to the power steering pump bracket.*

If equipped with power steering, connect the power steering pump adjusting link to the pump. Adjust the turnbuckle to obtain $\frac{1}{4}$ " belt deflection midway between the pulleys.

Diesel Engine:

- a. Make certain that the fuel injection pump drive gear and the flywheel are properly positioned as detailed in Chapter V.
- b. Position the fuel injection pump, fuel filter and pressure lines into place as an assembly. Install the two injection pump attaching nuts and washers. Install the fuel filter attaching bolts.
- c. Carefully remove the caps from the injectors and pressure lines. Connect each pressure line to its respective injector. Connect the excess fuel line to the "T" connection in the cylinder head. Connect the other end of the excess fuel line to the fitting in the forward end of the fuel tank.
14. With an assistant, carefully lift the hood into position on the tractor. Install all of the attaching nuts, bolts and screws. Install the grille. Connect the headlamp wiring.

Select-O-Speed Tractors: Connect the P.T.O. cable to the hood and install the P.T.O. control handle, see Figure 1.

15. Fill the hydraulic system to the proper level. Fill the crankcase to the proper level with the recommended oil. Fill the cooling system with water or the required anti-freeze.
16. Start the engine and check for oil and water leaks.

Gasoline and LP-Gas Engines: Adjust the ignition timing and carburetor as required.

2. ENGINE REMOVAL AND INSTALLATION—SERIES 1801

The removal procedure for the gasoline engine and diesel engine is very similar. Whenever a variation occurs, the procedure for both engines will be explained in the text.

A. Removal

1. Drain the coolant from the radiator, and cylinder block, the oil from the crankcase and the hydraulic oil from the center housing. Disconnect the battery ground cable, the positive (negative on diesel models) battery cable.

NOTE: Do not drain the hydraulic oil from the reservoir.

2. Disconnect the headlamp wire from the bullet type connector located at the rear of the right hood panel and from the connector located in the hydraulic reservoir area at the front of the hood.
3. Remove the six Phillips head screws, nuts, lock washers, flat washers and insulators from the front of the hood. Remove the Phillips head screws from the rear of the hood. Remove the bolts from the underside of the hood panels. Working through the hood opening, remove the nuts and lock washers that attach the hood to the top rear panel. With an assistant, carefully lift the hood from the tractor.
4. Remove the air cleaner tube. Remove the air cleaner attaching bolts and the air cleaner. On diesel engines, remove the air cleaner tube only.

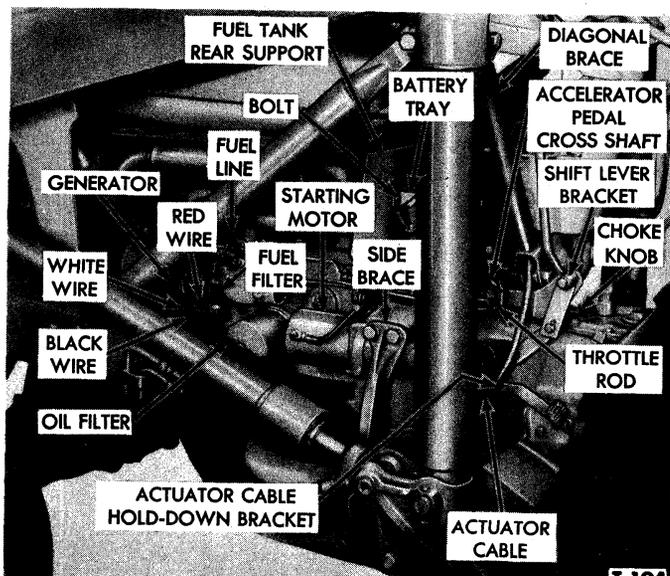


Figure 5—Left Side of Engine

Remove the bolt that attaches the battery tray to the left side of the fuel tank rear support, see Figure 5.

5. Remove the cotter pin and clevis pin that attaches the adjusting link to the power steering pump. Remove the bolt that attaches the pump to the mounting bracket, Figure 6, then lay the pump to one side. Remove the nut and lock washer that attaches the power steering hose retaining bracket to the right front side of the cylinder block.
6. Place a piece of wood over the top of the battery to prevent the fuel tank from accidentally contacting the battery terminals. Loosen the bolt at the right side of the fuel tank support. Remove the bolt and oil pressure gauge retaining clip from the right side of the rear support. Turn the fuel shut-off valve clockwise to close it. Disconnect the fuel line from the filter. Disconnect the fuel gauge wire from the rear of the tank. Remove the two bolts that attach the muffler outlet pipe support bracket to the left side of the fuel tank front support (gasoline engine only). Remove the nut and lock washer that secures the fuel tank front support to the cylinder block. Disconnect the excess fuel line from the forward bottom side of the fuel tank (diesel engine only). Remove the bolt and lock washer from the left side of each fuel tank support. With an assistant carefully lift the fuel tank and supports from the tractor. Remove the wood from the top of the battery.
7. Place a pan under the oil filter, then remove the filter or cartridge. Disconnect the starting motor cable at the starting motor. Remove the three bolts and lock washers that attach the motor to the engine and remove the motor.

Gasoline Engines: Disconnect the throttle rod from the accelerator pedal cross shaft. Disconnect the governor compensating rod spring from the governor lever and remove the assembly. Disconnect the choke rod from the carburetor. Unscrew the knob from the rod. Remove the choke rod.

8. Disconnect the three wires from the generator, see Figure 5.

Gasoline Engines Only: Disconnect the primary wire from the ignition coil, see Figure 6. Lift the wiring harness from the three retaining clips and place it to one side.

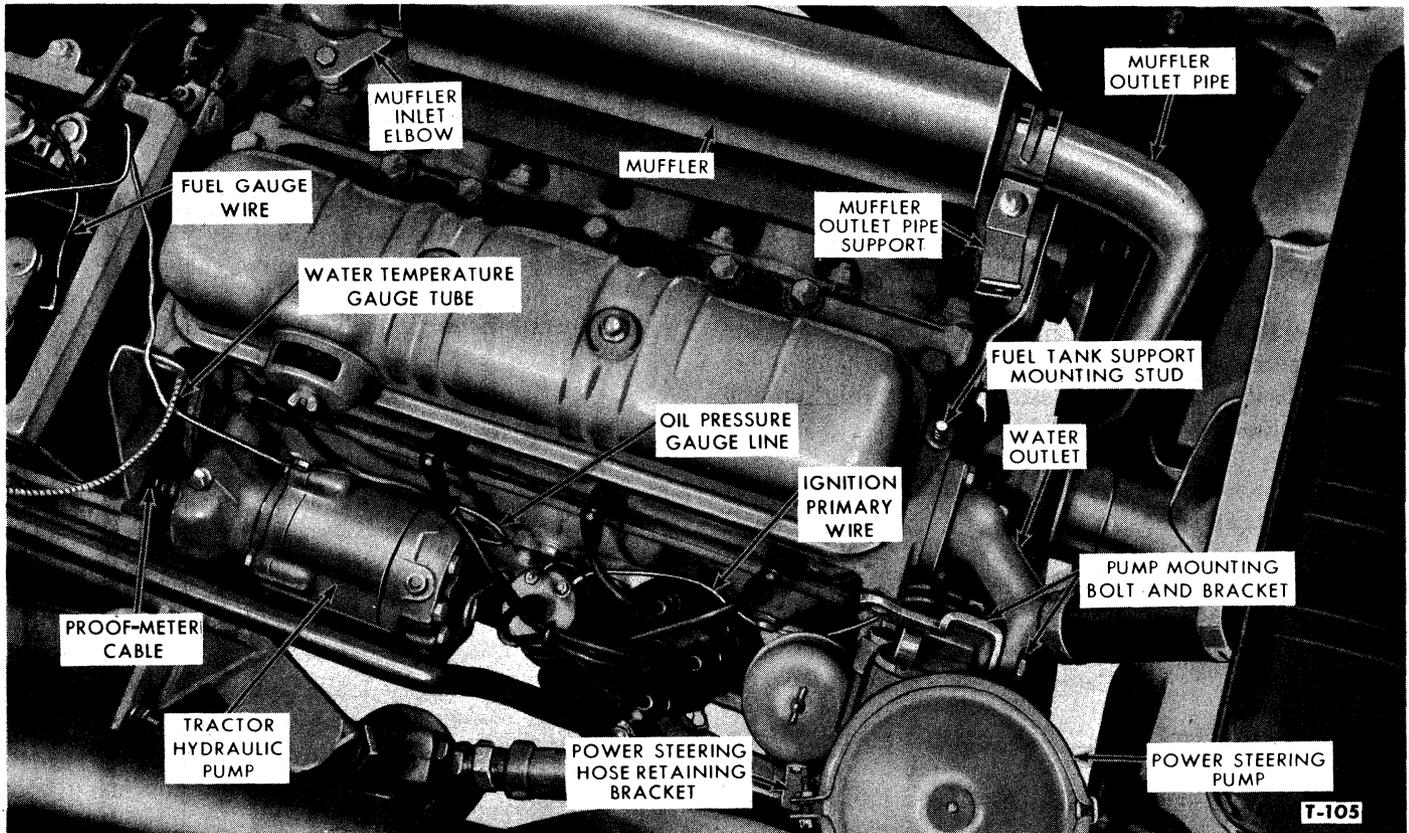


Figure 6—Top View of Engine

9. Disconnect the radiator hoses from the water outlet and from the water pump.
10. Disconnect the water temperature gauge tube from the right side of the cylinder block, see Figure 6.
11. Remove the five right side rail bracket attaching bolts and remove the bracket.
12. Place a drain pan below the hydraulic pump and manifold. Remove the five attaching bolts and washers from the pump and manifold. Carefully pry the hydraulic tubing away from the engine just enough to provide clearance for the hydraulic pump and manifold. Disconnect the oil pressure gauge line from the fitting in the cylinder block.

Tractor With Loader:

- a. Remove the three bolts and lock washers that attach the control valve to the control valve support, see Figure 7. Remove the two bolts and lock washers that attach the control valve support to the cylinder block. Remove the "U" clamp that attaches the support to the filter tube mounting bracket and remove the support.
- b. Remove the two bolts, nuts and lock washers that attach the right diagonal brace to the transmission and the loader frame. Manipulate the brace to free it from the transmission. It is not necessary to remove the brace from the control handles.

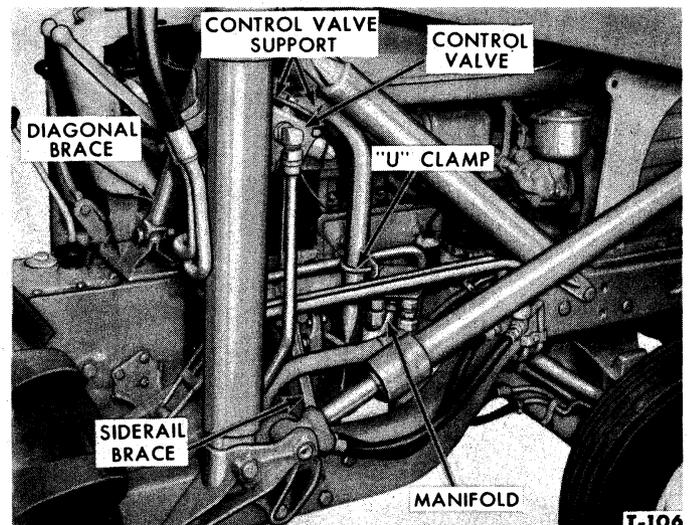


Figure 7—Loader Control Valve and Hydraulic Lines

Tractor With Loader: Remove the left diagonal brace attaching bolts and lock washers, then remove the brace, see Figure 5.

NOTE: *If the tractor is equipped with a reversing transmission, remove the rear bolt and loosen the front bolt of the shift lever bracket. Then swing the bracket outward to provide clearance for removal of the diagonal brace inner bolt.*

Power Steering: Disconnect the actuator cable from the steering gear housing. Disconnect the cable hold-down bracket from the transmission and from the left frame side rail, see Figure 5.

13. Remove the two nuts that attach the engine to the front support.

Diesel Engine: Remove the battery and the battery support to gain access to the top two transmission-to-engine attaching bolts. Disconnect the fuel injection pump linkage at the bellcrank.

14. Place a jack stand under each frame side rail.
15. Remove the two step plates from the tractor.
16. Place a jack under the transmission housing to support the weight. Remove the four fender and side rail attaching bolts. Disconnect the tail lamp wire from the bullet type connector on the left axle housing. Remove the fenders.
17. Install an engine lifting fixture or chain on the

engine. Connect a chain hoist to the engine lifting fixture.

18. Carefully roll the axle rearward approximately 10".
19. Remove the remainder of the engine-to-transmission attaching bolts. Carefully lift the engine away from the transmission as shown in Figure 8.
20. Install the engine in an engine stand.

B. Installation

1. Remove the four bolts and washers that attach the pump drive coupling to the crankshaft pulley and remove the front half of the coupling. Slip the front half of the coupling onto the hydraulic pump shaft.
2. Lower the engine into place and align the clutch splines with the transmission input shaft. Move the engine back against the transmission and install the two upper bolts and the lower bolt.

NOTE: *It may be necessary to rock the engine slightly to enter the input shaft in the clutch.*

3. Carefully roll the rear axle forward while guiding the two engine support studs into the rubber mounts in the support. Install the two engine support nuts and flat washers.
4. Install the fenders. Install the frame side rail braces but do not tighten the attaching bolts. Install the rear fenders and tighten the attaching bolts. Tighten the side brace attaching bolts. Connect the tail lamp wire to the bullet type connector. Secure the wire to the brake cross shaft with the two retaining clips.
5. Align the hydraulic pump coupling hub with the crankshaft and install the four bolts and washers.
6. Install the two step plates.

Power Steering: Connect the power steering actuator hold-down bracket with the two upper left running board attaching bolts at this time.

Diesel Engine: Connect the fuel injection pump linkage to the bellcrank and install the battery tray and battery.

NOTE: *Do not connect the positive battery cable at this time.*

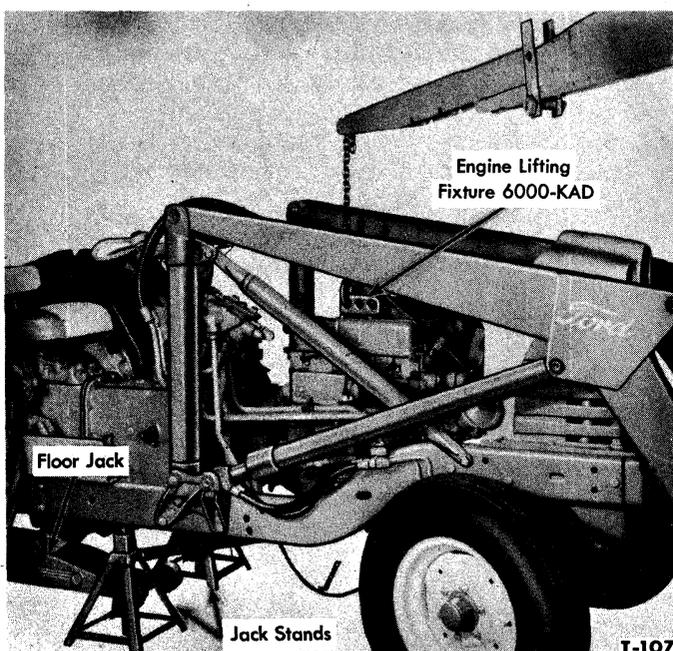


Figure 8—Removing Engine From Tractor

Tractor With Loader: Install the left diagonal brace and secure with two bolts, lock washers and nuts.

Reversing Transmission: Secure the shift lever bracket to the transmission, see Figure 5.

7. Connect the oil pressure gauge line to the fitting in the left side of the cylinder block. Place two new "O" rings on the hydraulic pump manifold mating surface on the transmission and a new gasket on the cylinder block. Position the hydraulic pump and manifold in place and secure with five bolts and washers.

NOTE: *It may be necessary to pry the hydraulic lines away from the engine to provide clearance for the pump and manifold.*

Tractor With Loader:

- a. Secure the right diagonal brace with two bolts, lock washers and nuts.
- b. Secure the control valve support to the lower end of the cylinder block with bolts, lock washers and nuts. Secure the control valve to the support with three bolts and lock washers. Connect the filter tube mounting bracket to the support with the "U" clamp.
8. Place the bushing over the temperature gauge heat bulb and connect the bulb to the cylinder block.
9. Connect the radiator lower hose to the water pump and the upper hose to the water outlet connection.
10. Connect the wiring harness to the generator.

Gasoline Engine: Connect the primary wire to the ignition coil. Place the wiring harness in the three retaining clips on the cylinder block.

11. Working from the front side of the reversing transmission shift lever bracket, insert the threaded end of the choke rod through the bracket and install the knob.

Gasoline Engine: Connect the choke rod to the carburetor.

12. Place a piece of wood over the top of the battery to prevent the fuel tank from accidentally contacting the battery terminals. With an assist-

ant, carefully position the fuel tank and supports in place on the engine. Install and tighten the nut and lock washer that attaches the fuel tank front support to the cylinder block. Install and tighten the four fuel tank support mounting bolts, nuts and lock washers. Make certain that the oil pressure gauge tube retaining clip is in place on the right rear bolt. Connect the fuel line to the filter.

Diesel Engine: Connect the excess fuel line to the bottom forward end of the tank.

Turn the fuel shut-off valve counterclockwise to open the valve. Remove the wood from the battery.

13. Attach the muffler outlet pipe support to the fuel tank support with two bolts and lock washers. Attach the battery support to the fuel tank support with a bolt, lock washer and nut, see Figure 5.

Power Steering: Connect the power steering pump to the mounting bracket with a bolt and lock washer. Connect the belt to the pump and connect the adjusting link with a clevis pin and cotter pin. Adjust the link to obtain $\frac{1}{4}$ " deflection of the belt midway between the pulleys. Attach the power steering hose retaining bracket to the right front side of the cylinder block with a nut and lock washer.

14. Install the air cleaner and air cleaner tube.

NOTE: *If the tractor is equipped with a diesel engine, the air cleaner should be in place making it necessary only to install the tube or the pre-cleaner stack.*

15. Position each hood panel in place on the tractor and install the attaching insulators, bolts, flat washers, lock washers, nuts and screws. Connect the headlamps to the bullet type connector at the front of the hood and at the connector located near the right rear side of the hood.
16. Connect the cable to the battery. Fill the radiator with coolant. Fill the crankcase to the proper level with the recommended oil. Fill the hydraulic system to the proper level with the recommended oil.

17. Start the engine and check for leaks.

Gasoline Engine: Adjust the ignition timing, and carburetor as required.

3. CYLINDER HEAD AND VALVES

The cylinder head assembly consists of the rocker arm mechanism, valves, springs, and valve guides.

The procedures below cover the removal, disassembly, cleaning, inspection, repair and assembly of the cylinder head and valves.

A. Cylinder Head Removal

1. Remove the hood. Drain the coolant from the radiator and cylinder block.
2. Remove the fuel tank and fuel tank support brackets.
3. Disconnect the muffler from the exhaust manifold.

Gasoline Engine: Disconnect the choke rod and accelerator rod from the carburetor.

Gasoline or LP-Gas Engine: Disconnect the fuel line from the fuel filter or carburetor. Disconnect the spark plug wires at the plugs.

CAUTION: Refer to Chapter VI, Section 6 before attempting the removal of an LP-Gas fuel tank.

Diesel Engine: Remove the air cleaner tube. Disconnect the manifold heater wires at the manifold heaters.

4. Remove the nuts and washers that attach the intake and exhaust manifold to the cylinder block. Remove the manifold.

NOTE: On diesel engines, the intake manifold is separate from the exhaust manifold.

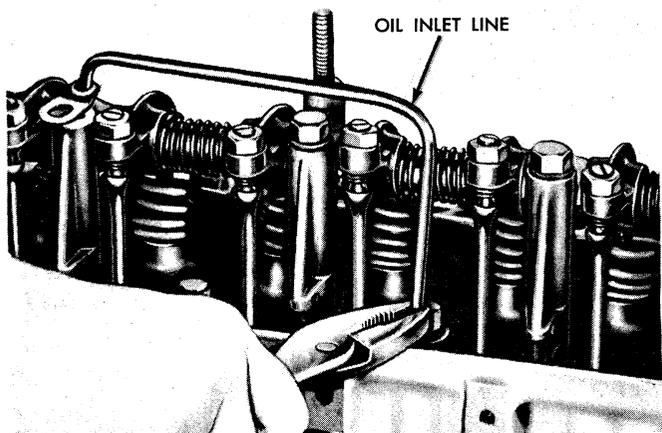


Figure 9—Removing Rocker Arm Oil Inlet Line

5. Disconnect the water temperature gauge from the cylinder head. Remove the radiator upper hose.
6. Disconnect the adjusting link from the power steering pump. Remove the bolts that attach the pump to the cylinder head and the water outlet elbow.
7. Remove the rocker arm cover and gasket.
8. Loosen the rocker arm support attaching bolts evenly and alternately until all tension has been relieved then remove the bolts and washers.
9. Remove the rocker arm oil inlet line from the cylinder block as shown in Figure 9. Lift the oil inlet and outlet lines from the rocker arm supports. Lift the rocker arm assembly from the cylinder head. Lift the push rods out of the cylinder head, and place in a numbered rack so that they may be reinstalled in their respective position.

Diesel Engines:

- a. Disconnect the excess fuel line at the tee connection, Figure 10. Remove the four bolts that attach the excess fuel line to the injectors and remove the line.
 - b. Remove all dirt from the fuel injector pressure line connections. Disconnect the pressure line at each injector. Cap off the exposed ends of the injectors and the lines to prevent the entry of dirt.
 - c. Remove the two attaching bolts from each injector. Attach Injector Lifting Bar, EIADDN-17098 to the injectors as shown in Figure 11. Make sure the legs of the tool bear against the cylinder head rather than the rubber injector seal. Remove the fuel injectors and the injector seat washers from the cylinder head.
 - d. Remove the two bolts and lockwashers that attach the fuel filter to the cylinder head.
10. Remove the bolts that attach the cylinder head to cylinder block. Carefully lift the cylinder head from the block.

NOTE: If available, use Cylinder Head Overhaul Fixtures, 6085-F.

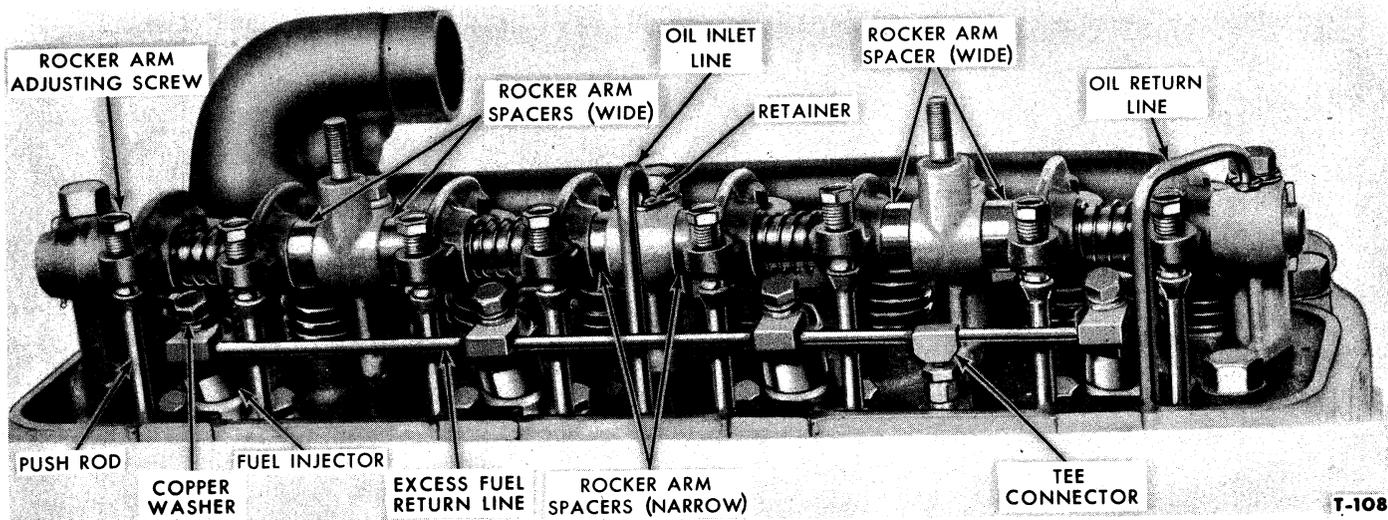


Figure 10—Diesel Engine With Rocker Arm Cover Removed

B. Cylinder Head Disassembly

1. Remove the two bolts and lockwashers that attach the water outlet elbow to the cylinder head. Remove the elbow and thermostat.
2. Prior to removing the valves, clean all carbon deposits from the combustion chambers. Position Valve Spring Compressor 6513-EE over the valve and spring as shown in Figure 12 and compress the valve spring. Remove the two valve spring retainer locks, sleeve, retainer, spring and

spacer from each valve. Lift the valves from the head and place them in a numbered rack so that they can be installed in their respective guides.

NOTE: Exhaust valves are provided with a cap and do not have a sleeve. Spacers are used originally only under the exhaust valve springs on diesel engines.

3. Remove the cotter pin, flat washers and spring washer from each end of the rocker shaft, Figure 13.

NOTE: Diesel engines do not have the flat washers and spring washer.

Remove the rocker arms and rocker arm locat-

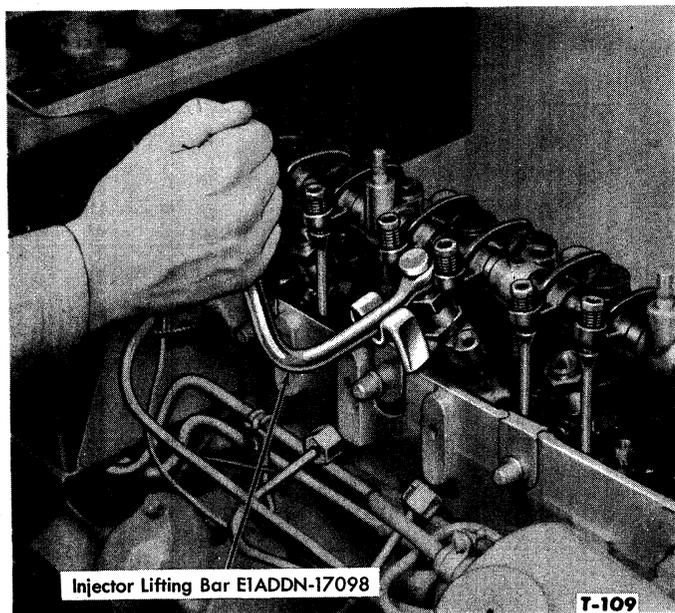


Figure 11—Removing Fuel Injectors

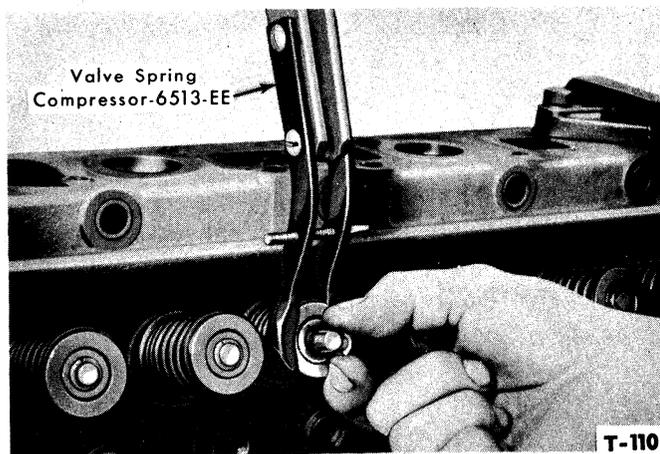


Figure 12—Removing Valve Spring Retainer Locks

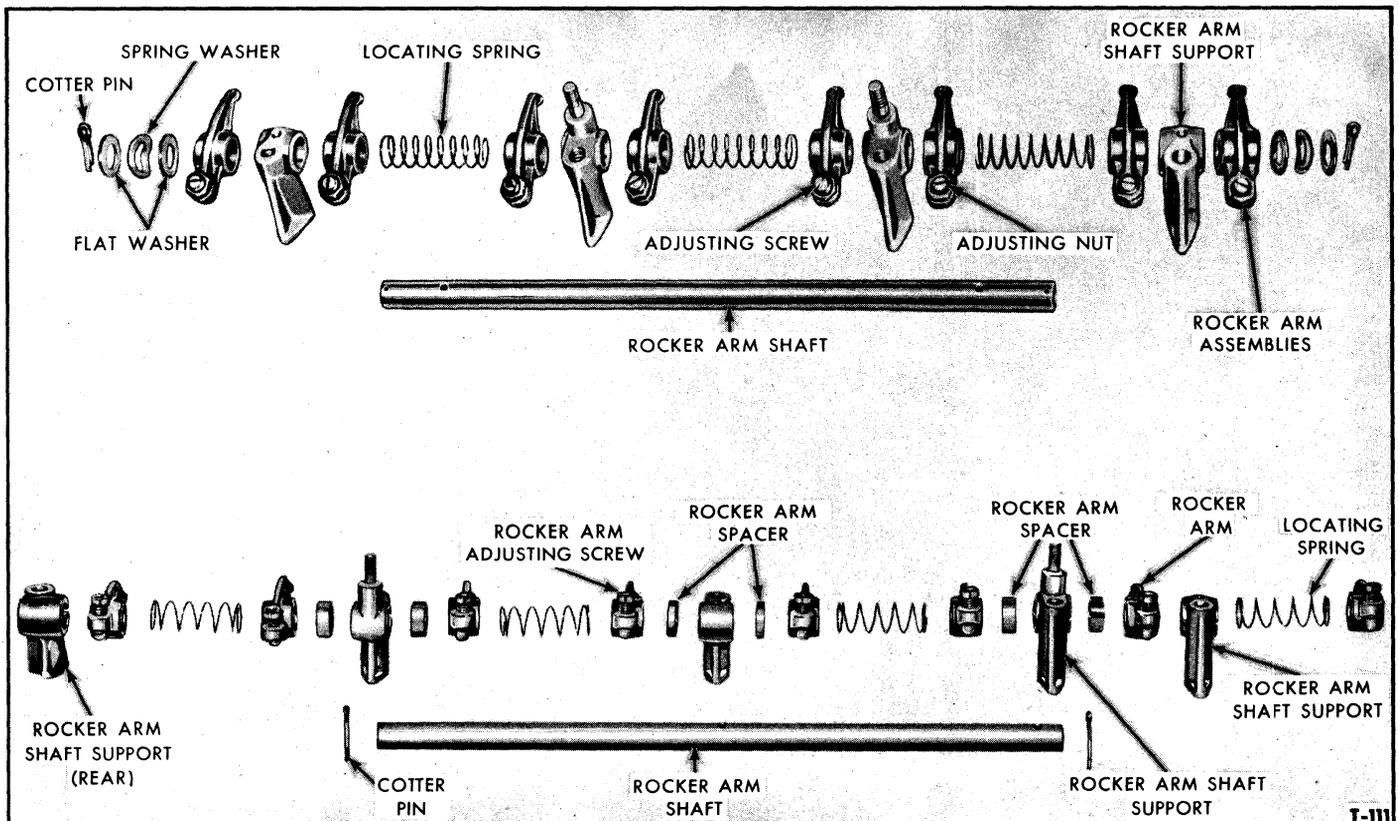


Figure 13—Rocker Shaft Assemblies

ing springs from the shaft. Drill a hole through a plug in the end of the rocker arm shaft. Insert a rod through the hole that is long enough to contact the opposite plug then drive the plug out of the shaft. Drive the remaining plug out of the shaft.

NOTE: Diesel engines are provided with a rocker arm spacer on each side of No. 2, 3 and 4 rocker shaft supports, Figure 13. The narrower spacers are used at support No. 3.

C. Cleaning

Gasoline Engines:

Remove all grit, dirt and grease from the cylinder head with cleaning solvent. Scrape any carbon that was not previously removed with a scraper. Clean the valve guides with a valve guide cleaning tool. Scrape all gasket surfaces clean.

Diesel Engines:

Remove any injector washers that remained in the bores with a screwdriver that has approximately the

same width blade at the I. D. of the washer. Tap the screwdriver so that the blade bites into the washer, then twist the screwdriver to free the washer. Clean all carbon and dirt from the injector bores.

Diesel Engines:

Soak the head gasket surface with paint remover to

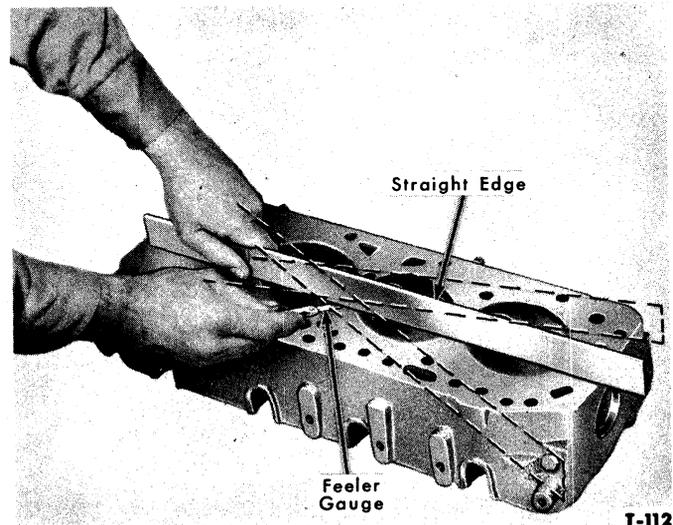


Figure 14—Checking Cylinder Head Flatness

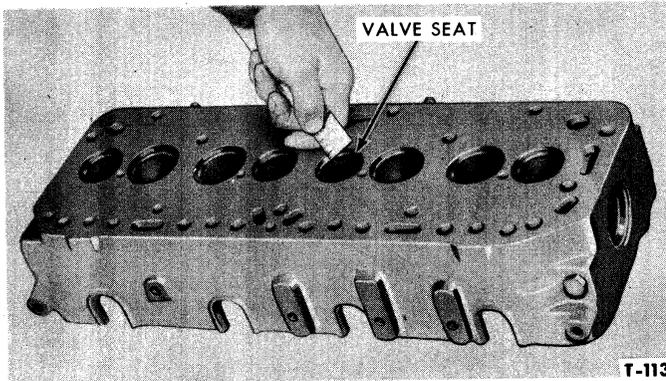


Figure 15—Measuring Valve Seat Width

loosen the gasket material. Carefully scrape the gasket from the head, applying the paint remover as required.

CAUTION: Do not allow paint remover to contact the body or clothing.

Clean all carbon and dirt from the valves with a mechanical wire brush. Clean all sludge and dirt from inside the rocker shaft. Discard all old gaskets and seals.

D. Inspection

1. Inspect the cylinder head for being cracked, nicked or burred on the gasket surfaces. Replace the head if it is cracked. Remove all burrs or nicks with an oil stone. With a straight edge and thickness gauge, check the flatness of the cylinder head as shown in Figure 14. Specifications for flatness are 0.005 inch maximum overall or 0.003 inch in any 5 inches. Check the exhaust

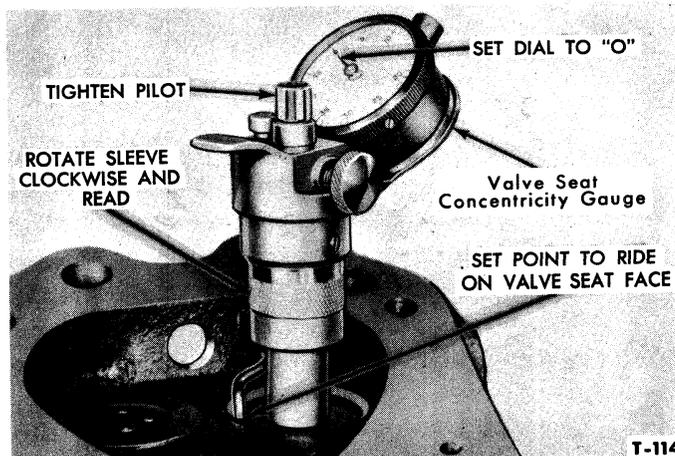


Figure 16—Checking Valve Seat Concentricity

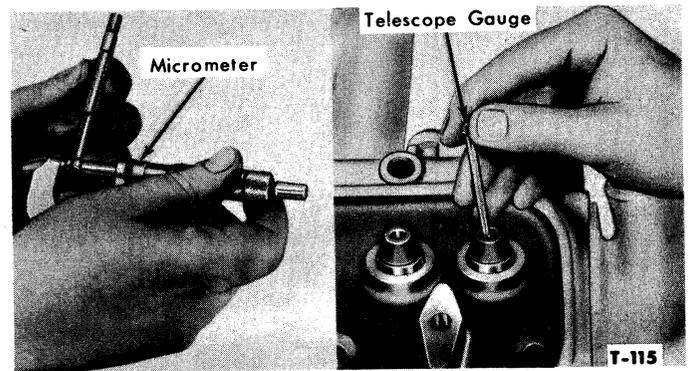


Figure 17—Measuring Inside Diameter of Valve Guides

valve seat inserts for cracks, looseness or excessive wear. Replace the inserts if any of these conditions exist. Check the width and concentricity of the valve seat, Figures 15 and 16. Replace the seats if they are pitted, if they are wider than 0.110 inch, or if the runout exceeds 0.0015." Measure the inside diameter of the valve guides with a telescope gauge as shown in figure 17. If the diameter of the guides exceeds 0.345", replace them. Check the core hole plugs in the cylinder head for leakage. Replace plugs that show evidence of leakage.

2. Discard burned, cracked or warped valves that show any evidence of heat checks on the face of the valve, or that have a head margin of less than $\frac{1}{32}$ " after being refaced, Figure 18. Reface all valves.
3. Discard valve springs that show evidence of rust. Check each valve spring for squareness as shown in Figure 19. Discard valve springs that are in excess of $\frac{1}{16}$ " of being square. Check the spring tension as shown in Figure 20. Each spring should exert a pressure of 54-62 lbs. when compressed to a length of 1.82" or 124-140 lbs.

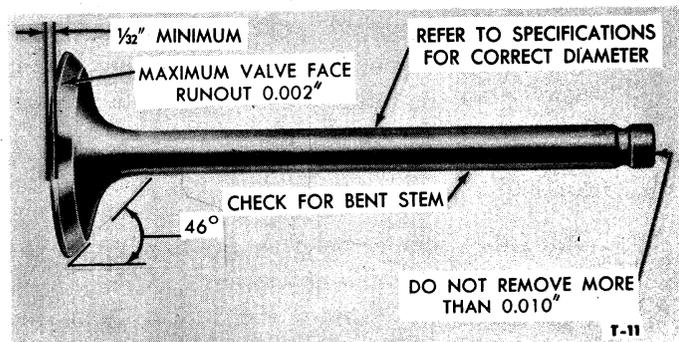


Figure 18—Critical Valve Tolerances

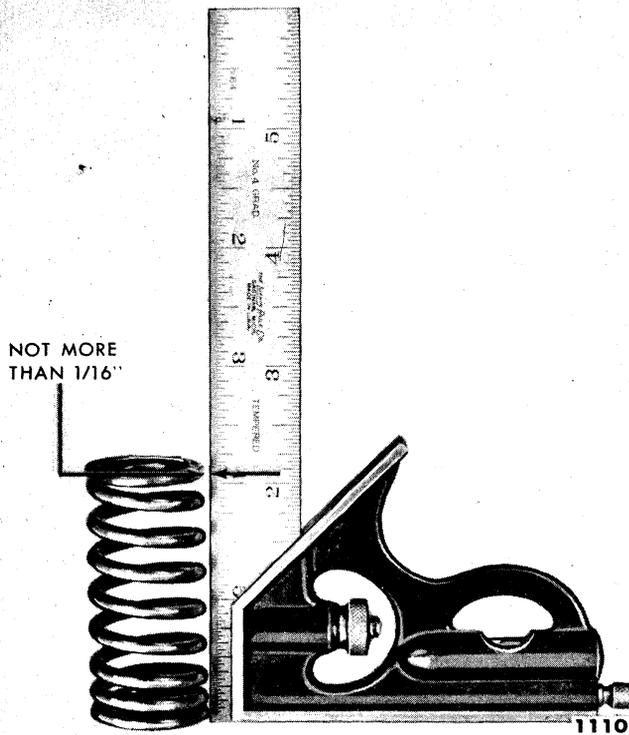


Figure 19—Checking Valve Spring Squareness

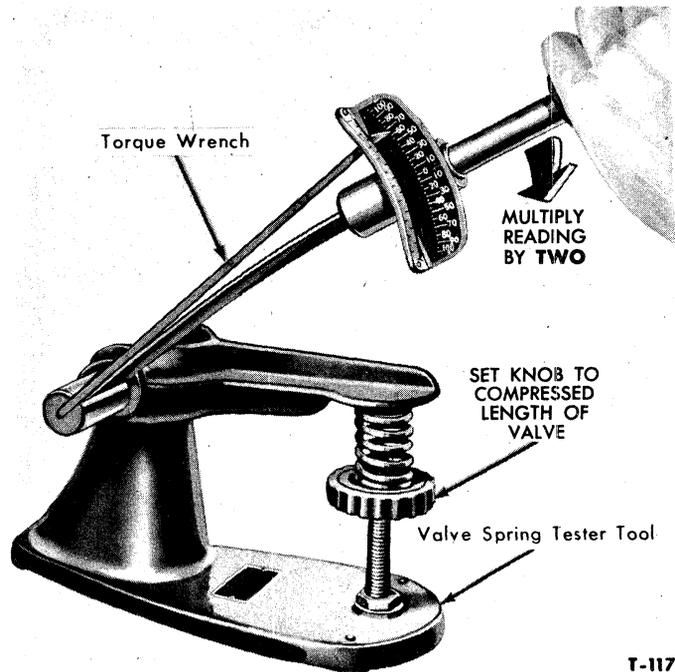
when compressed to 1.505". If the spring pressure is 7 or more lbs. below specifications, replace the spring.

NOTE: *Never immerse valve springs in a caustic cleaning solution as it may remove the protective coating and cause them to rust.*

4. Check the rocker arm to shaft clearance with a micrometer and a telescope gauge. If the clearance exceeds 0.007", replace the defective parts. Inspect the pad end of the rocker arm for roughness or grooves. Replace the rocker arms if these conditions exist. Inspect the rocker arm adjusting screws and the push rod end of the rocker arms for stripped or worn threads, and the ball end of the adjusting screw for nicks, scratches, or excessive wear. Inspect rocker arm locating springs and oil tubes for breaks or other damage.

E. Repair

1. Place the cylinder head on the bench with the gasket surface facing downward and blocked up approximately 2" from the bench. Drive the valve guides out of the head with Valve Guide Remover 6510-AF as shown in Figure 21. Place



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Figure 20—Checking Valve Spring Tension

the new valve guide in position and slip the Adapter of 6510-AF over the guide. Drive the guide into the cylinder head until the Driver bottoms on the Adapter.

2. Carefully remove the defective exhaust valve seat inserts with a tool that will not damage the insert bore. Clean the valve insert bore thoroughly. Place the new valve seat inserts on dry ice and allow them to chill for approximately 20 minutes, then drive them into place with Step Plate 630-5 from Tool Set FT-48. Reface the valve seat insert as detailed in sub-paragraph 4 below.

NOTE: *144 cu. in. engines are not provided with valve seat inserts.*

3. The valve refacing operation should be closely coordinated with the valve seat refacing operation so the finished angle of the valve is 1° more than the valve seat to provide an interference angle for better seating, Figure 22. Be sure that the refacer grinding wheel is properly dressed and the valve is set at 46° to the wheel, Figure 22. Remove only enough stock to clean up the pits and grooves. Check the edge of the valve head; if less than $\frac{1}{32}$ margin as shown in Figure 18, replace the valve. Grind off all groove or

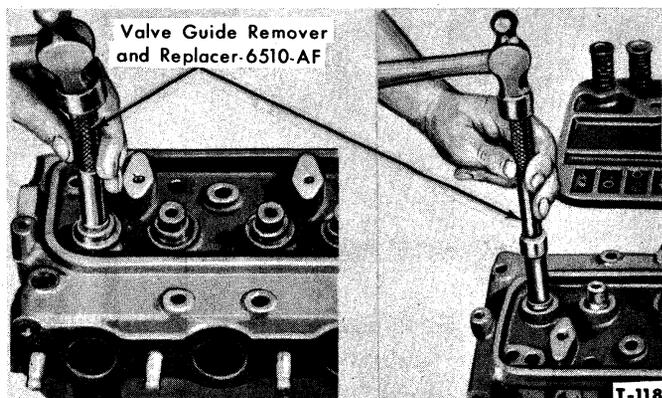


Figure 21—Replacing Valve Guides

score marks from the end of the valve stem, then chamfer the sharp edge slightly.

NOTE: Do not remove more than 0.010" from the end of the valve stem.

Position the valve spring retainer and valve retainer locks on the exhaust valve stem as shown in Figure 23. Exert pressure against the valve spring retainer to seat the locks against the valve stem. Install the rotating cap on the end of the valve stem and press firmly on the cap while exerting pressure on the spring retainer. If no movement is felt at the retainer, the cap is seating at the valve. Remove enough stock from the end of the valve stem to obtain a clearance of 0.002-0.004 inch between the cap and stem, Figure 23. Keep each rotating cap with its respective valve after the correct clearance has been established.

4. Insert the seat refacing pilot into the valve guide and expand the pilot until it fits tightly. Make

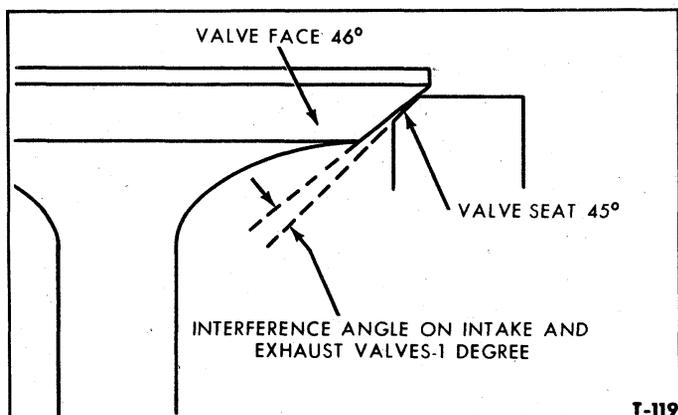


Figure 22—Interference Angle on Valve Face

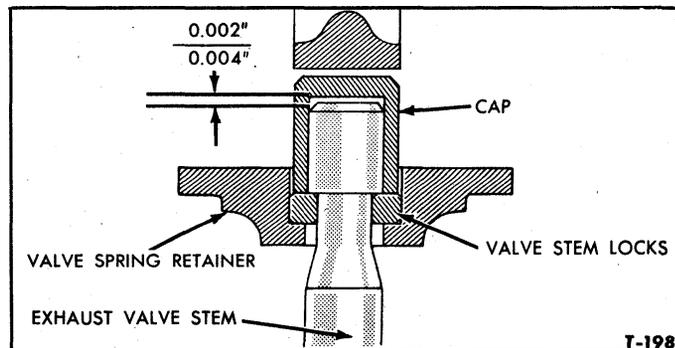


Figure 23—Exhaust Valve Stem to Cap Clearance

certain that the stone is dressed to a 45° angle and is of the correct grit.

NOTE: The stone must be dressed frequently to assure correct grinding of all valve seats.

Grind the seat, as shown in Figure 24, only enough to remove all pits and grooves or to eliminate an out of round condition. After refacing, if the seat exceeds the width shown in Figure 25, it must be narrowed. Remove enough stock from the top of the seat (lower the seat) with a 60° stone and enough from the bottom with a 30° stone (raise the seat) to make the width within specifications, Figure 25. Check the valve seat concentricity after the refacing operation.

The finished valve seat should contact the approximate center of the valve face circumference. To determine where the valve seat contacts the face, coat the seat with prussian blue, then set the valve in place. If the blue is transferred to the center of the valve face, the seat contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat. If the blue is transferred to the bottom edge of the valve face, raise the valve seat.

F. Cylinder Head Assembly

1. Lubricate all moving parts with engine oil prior to assembly.
2. Apply sealer to two new rocker shaft plugs and install them in the shaft with a driver. Make sure that they are only in the shaft far enough to permit installation of the cotter pin.
3. Assemble the rocker arms, springs and brackets in the sequence shown in Figure 13.

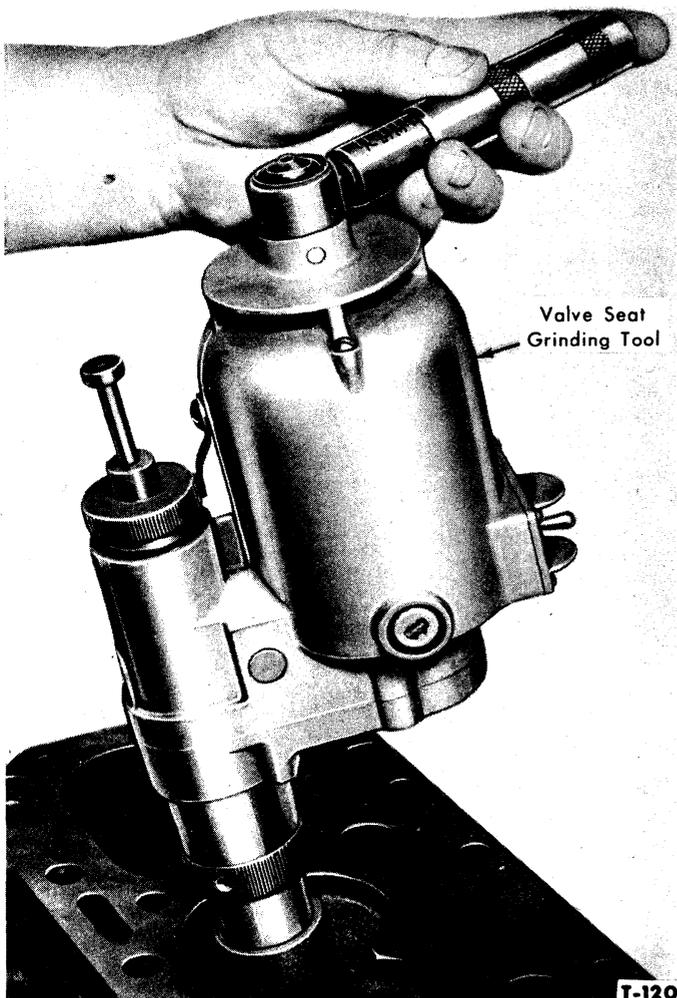


Figure 24—Grinding Valve Seats

NOTE: Diesel engines use six spacers to locate the rocker arms. Make certain that the two narrower spacers are installed at No. 3 support and the wider spacers are at No. 2 and 4 supports, Figure 13.

4. Position a spring washer between two flat wash-

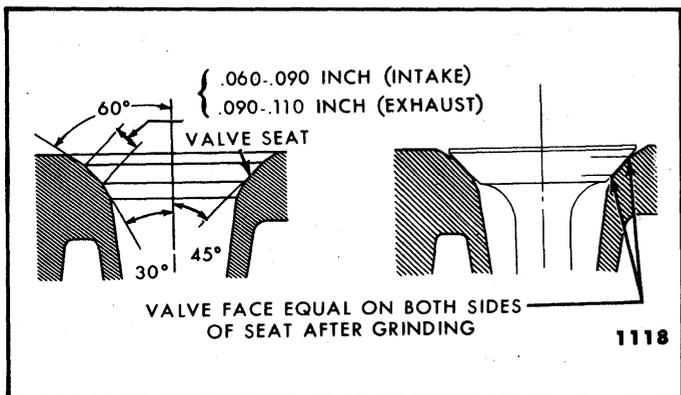


Figure 25—Valve Seat Width

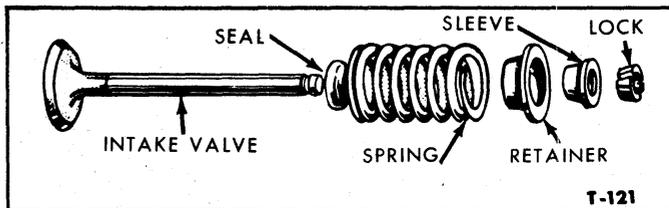


Figure 26—Intake Valve Assembly

ers and position them on each end of the shaft. Secure the washers in place with cotter pins.

NOTE: Diesel engines are not provided with washers. Use only the cotter pins to retain the rocker arms.

5. Insert each valve in the guide from which it was removed. Position a new valve seal over each intake valve and guide.
6. Install the valve springs over the valve guides making sure the close wound coils are contacting the head.

NOTE: Place a valve spring spacer under each exhaust valve spring on diesel engines.

7. Install the spring retainer sleeve as shown in Figure 26 on the intake valves. Install the spring retainer as shown in Figure 27, on the exhaust valves. Compress the spring with Valve Spring Compressor 6513-EE and install the valve locks, Figure 12.
8. Place the rotating cap that was previously selected on its respective valve (exhaust only).
9. Install the thermostat, water outlet elbow, and new gasket on the cylinder head.

G. Cylinder Head Installation

1. Place a new head gasket on the cylinder block then carefully position the cylinder head on the gasket. Install the cylinder head attaching bolts finger tight. If Cylinder Head Overhaul Fixtures 6085-F were used, remove them at this time.

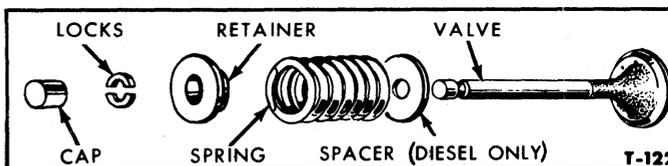


Figure 27—Exhaust Valve Assembly

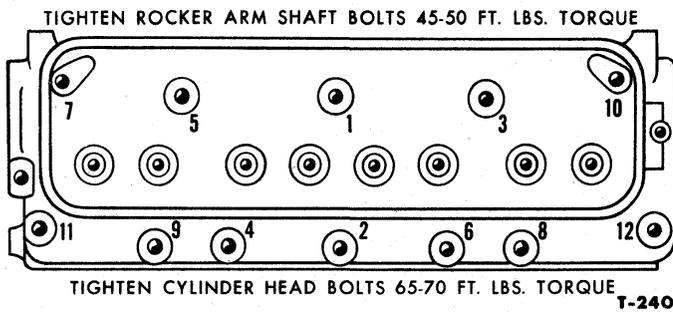


Figure 28—Cylinder Head Tightening Sequence (Gasoline Engines)

2. Tighten the cylinder head bolts in the proper sequence and to the specified torque shown in Figures 28 and 29.

Diesel Engines:

- a. Install the four fuel injectors with new seat washers in the cylinder head. Torque the attaching bolts to 15-18 ft. lbs. **DO NOT USE A HAMMER TO SEAT THE INJECTORS.**
- b. Install the excess fuel line and fuel injector lines.
- c. Install the fuel filter on the cylinder head.

Gasoline Engines:

- a. Install the spark plugs with new gaskets in the cylinder head.
 - b. Connect the spark plug wires to their respective plugs. The firing order is 1-2-4-3.
3. Install the push rods with the cupped end upward.
 4. Position the rocker arm in place on the cylinder head.
 5. Install a new "O" ring on the oil inlet line. Install the inlet line in the cylinder block and rocker arm making sure it is free of the valve mechanism.
 6. Install the rocker arm attaching bolts finger tight making sure that the ball end of the rocker arm adjusting screws are seated in the cupped end of the push rods. Tighten the rocker arm attaching bolts evenly and alternately to 45-55 ft. lbs. torque.

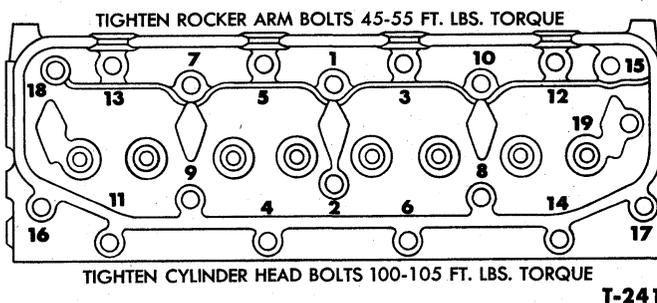


Figure 29—Cylinder Head Tightening Sequence (Diesel)

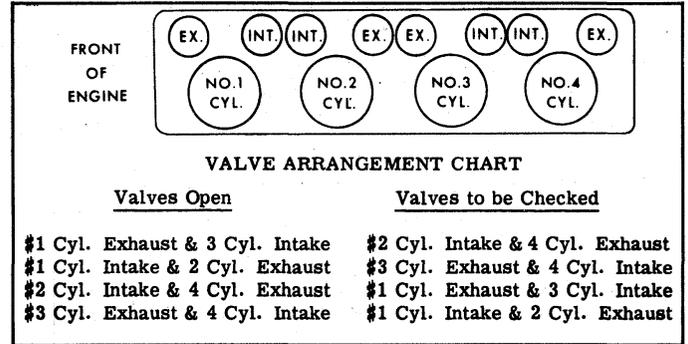


Figure 30—Valve Initial Adjustment Chart

7. Refer to Figure 30 and make an initial valve adjustment as indicated in the chart.
 8. Install the intake and exhaust manifold and new gaskets. Connect the muffler to the exhaust manifold using a new gasket.
 9. Connect the temperature gauge to the cylinder head.
 10. Install the fuel tank. Install the air cleaner and tube. Install the hood.
 11. Install coolant in the radiator.
 12. Start the engine and allow it to run until it reaches normal operating temperature.
 13. Adjust the tappets to 0.014-0.016 inch clearance as shown in Figure 31 while the engine is running at idle speed.
- NOTE: Later model engines have a self-locking adjustment screw, while the earlier models have an adjustment screw and lock nut.**
14. Install the rocker arm cover and new gasket. Tighten the cover nuts to 20-30 in. lbs. torque.

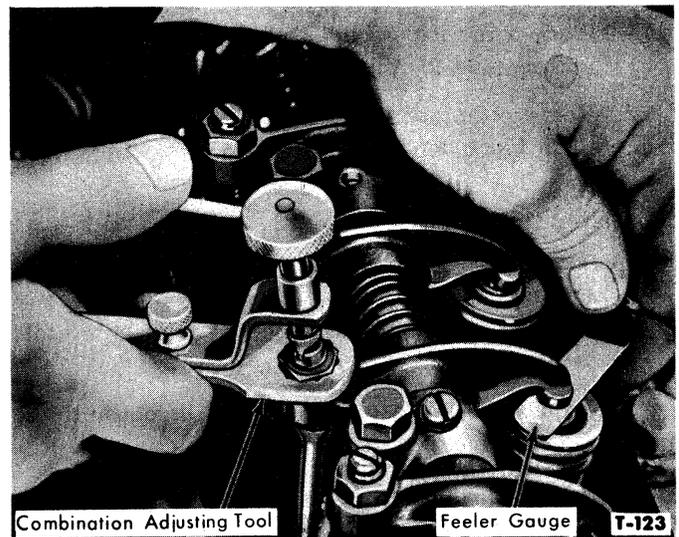


Figure 31—Adjusting Valve Tappet Clearance

4. 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.

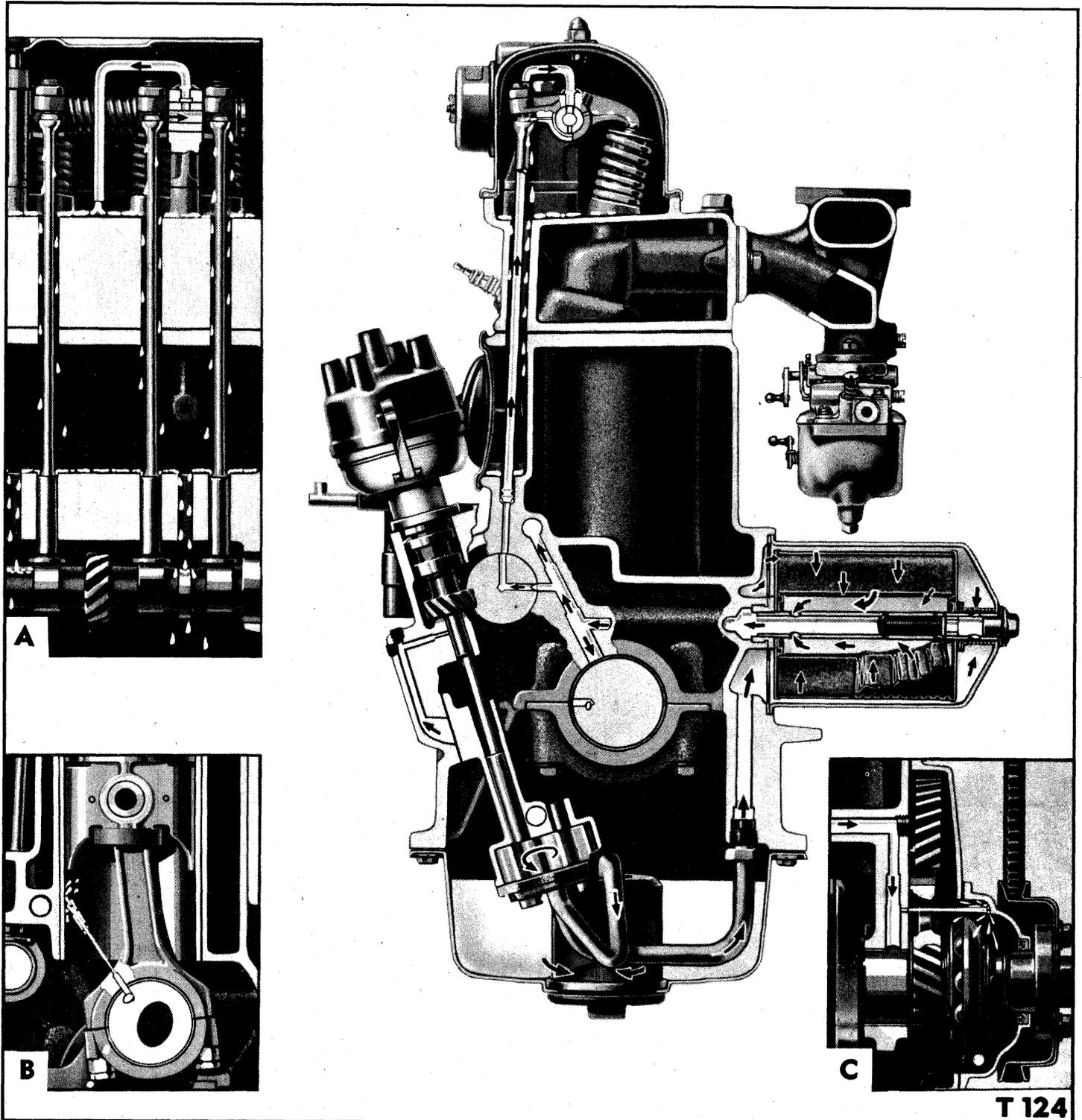
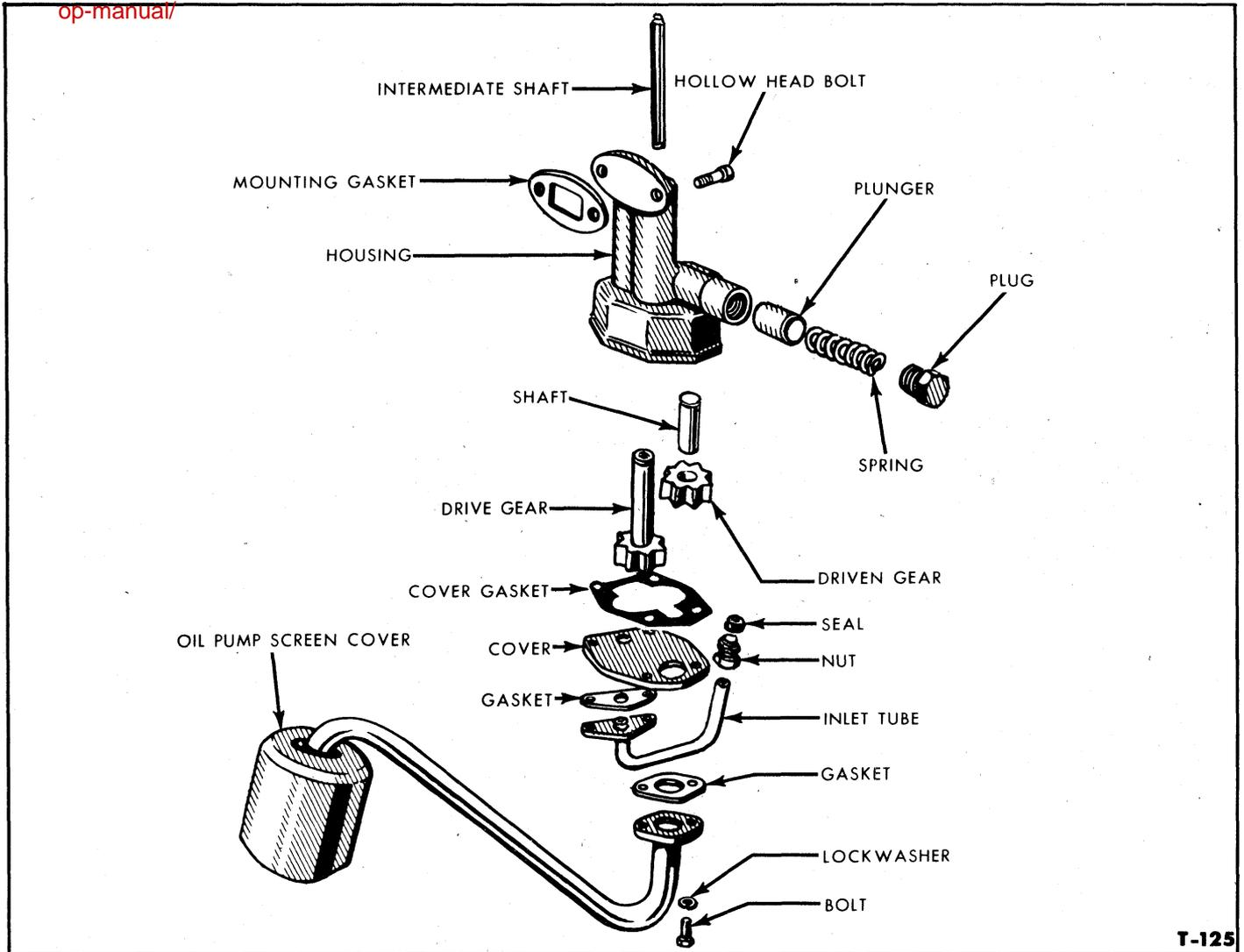


Figure 32—Engine Lubrication System



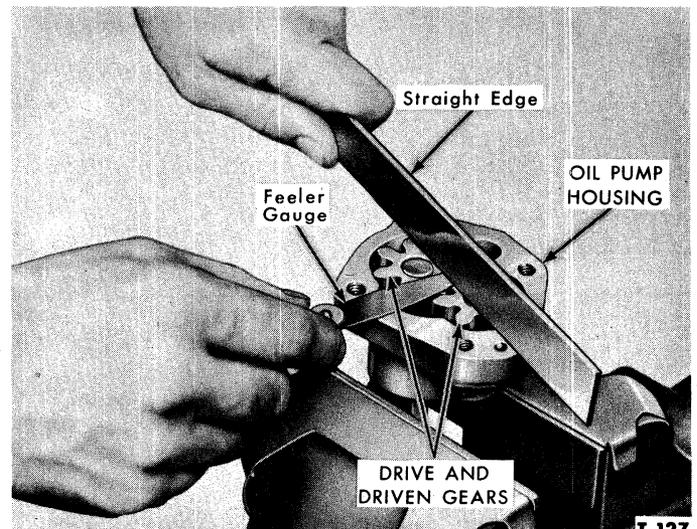
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Figure 33—Oil Pump Disassembled

C. Inspection

1. Check the mating surface of the pump cover for wear. If the pump cover is visibly worn, scored, or damaged, replace it.
2. Check the pump housing for scores, cracks or damage and replace as necessary.
3. Check the gears for being chipped, broken or worn and replace as necessary.
4. Place the gears in the housing as shown in Figure 34. Place a straight edge on the pump body across the gears, then check the clearance with a feeler gauge. If the clearance exceeds 0.004", replace the gears and/or housing.
5. Check the clearance between the gear teeth and housing. If the clearance exceeds 0.005", replace the gears and/or housing.

pressed to 1.56". If the spring is not within these specifications replace it.



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Figure 34—Checking Oil Pump for Wear

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6. Check the pressure relief valve spring tension. The pressure should be 9.76-9.84 lbs. when com-