

**REPAIR
MANUAL
FORD
4-CYLINDER ENGINE
1941-1947**

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FORD
4-CYLINDER ENGINE
1941-1947

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FOREWORD

This technical operating information and instructions for the mechanical equipment of the Ford New Holland customer-built tractor model 1100. Due to the differences in the various models within these machines, no extensive fine-tuning made in this manual to cover the production necessary to operate the engine drive-offs available. The procedures used with the engine already known.

Each chapter includes several detailed tables and more or less to the table of contents.

Chapter IV provides information and uses tractors in building areas. Additional chapters are included since it is possible for one piece, either of which is satisfactory for particular use when considered alone, to form complete clearance when placed together.

The numbered line book, on the last page of each chapter, is part of the table of contents for the chapter to follow, with additional descriptive comments.

In the incomplete and empty chapter, such sections as are incomplete, incomplete descriptions, only one block which clearly points out where a part should be connected or applied.

Comments concerning the other engine clearances by build type are listed prior sections. When operating parts from Time Ford dealer by these numbers, specify the year and model number of the vehicle.

This is a *Brevet Norme* rather than a *Perfectionné*. Standard and some permissible repair practices could not be acceptable manufacturing practices in this build. The word "Repair" is used to indicate "return to your working condition" rather than new "Service" conditions.

This book is one of a series of instructional repair manuals to be published by the Ford Motor Company. These manuals will be available from your local Ford dealer.

CONTENTS

INTRODUCTION

CHAPTER I: INTRODUCTION AND SYMBOLS

Section 111	None	1
111	Assembly Numbers	1
114	Engines Dimensions	1-2

CHAPTER II: MACHINERY AND EQUIPMENT

Section 111	General and Electrical	1-16
111	Cylinder Block	1-11
111	Front and Clutch Drive	1-12
111	Transmission and Brake Mechanism	1-13
111	Hydraulic Head and Pump Drive	1-14
111	Oil Pump	1-15
111	Steering	1-16
111	Oil Pan Brake and Brake Mechanism	1-17

CHAPTER III: ASSEMBLY OF PARTS

Section 111	Assemblies	1-18
111	Instruction of Assembly	1-19

CHAPTER IV: ENGINE AND DRIVES

Section 111	Dimensions of Parts	1-20
111	Periodic Maintenance	1-21
111	Engine Block Building	1-22

<https://tractormanualz.com/>

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Chapter 10

DESCRIPTION AND DISASSEMBLY

	Spartan
Bore:	101
Borehole Diameter:	101
Borehole Diameter:	101

The Ford 1000 engine (Figs. 1 and 2) is a six-cylinder type having 10 cylinders and the upper half of the cylinder case has been bored (inner sleeves are used, which are easily removed when assembling the engine). The cylinder is driven directly from the front end of the crankshaft.

1000 Series

	J-4000
Type:	Vertical, in-line
Displacement, liters:	10.7
Number of cylinders:	6
Size:	1000 x 1000 mm
Stroke (mm.):	1150
Power (hp.):	1150
Speed (rpm.):	1000

Fig. 1. Ford 1000 Series 6-Cyl. Engine



Fig. 2. Ford 1000 Series 6-Cyl. Engine

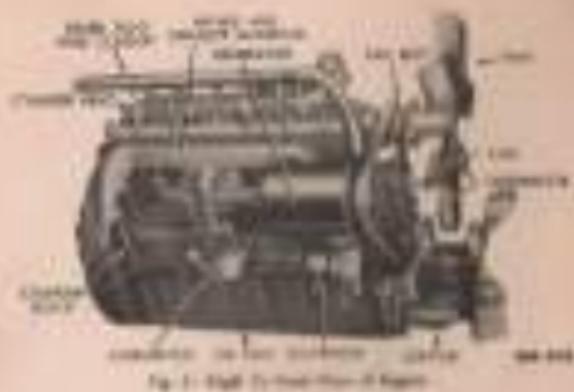


Fig. 3. Ford 1000 Series 6-Cyl. Engine

Major parts common to both engines

- Flywheel
- Flywheel housing
- Flywheel hub
- Flywheel retaining ring

See Fig. 2 for flywheel assembly.
See Fig. 3 for flywheel assembly.

Flywheel Assembly Removal

In the disassembly procedure described here, the engine is held in a vertical position and the flywheel assembly is held horizontally. If the engine is held in a horizontal position, the flywheel assembly must be held vertically.

1. Remove the flywheel housing. Remove the nuts that secure the flywheel assembly to the flywheel housing with center and perimeter bolts. Remove the flywheel housing. Remove the flywheel assembly and remove the flywheel by the flywheel hub cover and flywheel retaining ring. See Fig. 1.

2. Refer to Fig. 1. Remove the flywheel hub cover and the retaining ring. Remove the flywheel assembly from the flywheel housing. Remove the flywheel assembly from the flywheel housing. See Fig. 2.

3. Remove the flywheel hub cover and the retaining ring. Remove the flywheel assembly from the flywheel housing. Remove the flywheel assembly from the flywheel housing. See Fig. 3.

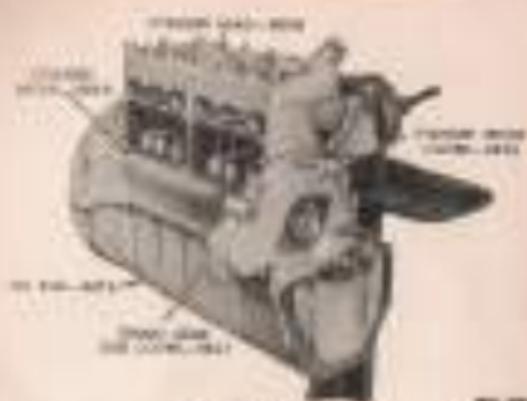


Fig. 11-Brassard Gear

100-402

counter-clockwise to the left side from above. Remove the Shimshutter and sleeve.

d. Remove Cylinder Head. Remove the two nuts and lock washers from the cylinder head retaining bolt. Remove the cylinder head (Fig. 12).

e. Remove Cylinder Head Gasket. Gasket can be removed with a flat bar after prying the cylinder head off of the main frame. Lift the cylinder head from the cylinder block (Fig. 13).

104. CYLINDER HEAD ASSEMBLY.

This section illustrates disassembly for the removal/disassembly of the cylinder head.

a. Remove Intake and Exhaust Manifolds. Remove the nuts and lock washers from below the intake and exhaust manifolds to the cylinder head. Lift the manifold from the cylinder head and remove (Fig. 14).

b. Remove Safety Valve. Remove the safety valve and lock washers from the safety valve to the cylinder head. Lift the safety valve from the cylinder head.

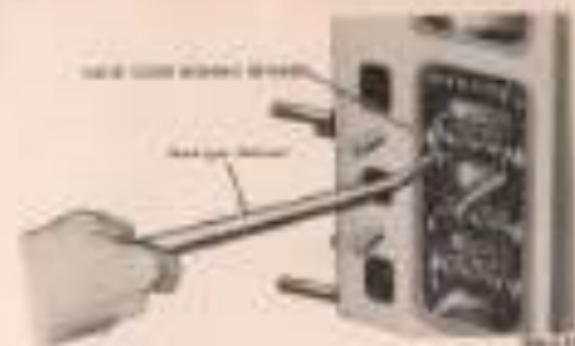


Fig. 12-Removing Valve Guide Retaining Pin

c. Remove Valve Guide Shims. Press in on the special release lever, until enough shims are pushed forward to reach cylinder head and cylinder gasket over the 'VSS'. Remove the pin, repeat this procedure on the remaining cylinder heads, and replace gasket.

d. Remove Flywheel. Remove the lock nut from the flywheel cap retainer. Remove the flywheel cap-retainer and retainer, then do the same all the head plate with a suitable hammer lifting the gasket out of the cover housing.

e. Remove Cylinder Head. Remove all the nuts that hold the cylinder to the cylinder block. Remove the cylinder head and cylinder.

f. Remove Valve Assemblies and Components. Remove the cylinder head cover (Fig. 15) from the cylinder block. Remove the base and the washer from each valve assembly and remove the base. Remove the base and the washer from each valve assembly and remove the base. Repeat this procedure for each valve assembly and then carefully repeat this procedure, and remove the retaining base part from each cylinder assembly. Discard the cylinder heads from the cylinder assembly and

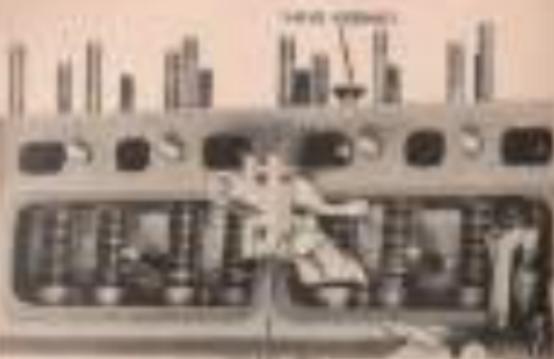


Fig. 2—Rear view of engine showing valve assembly.

a jack-type lift (Fig. 3). Axle nuts must be removed, lug nuts broken, carrier plates set by the cylinder liner nut and nuts were secured. Lift the rear end from the cylinder block. Since the weight of the cylinder block, being outside the frame, will assist in the removal, handle carefully for heavy removal of the case.

b. Removal of Flywheel and Clutch Housing: Remove the flywheel. However, the clutch housing cannot be removed from the cylinder block until carrier plates are off. Remove the clutch housing and carrier plates that secure the flywheel. Next, remove the flywheel cover assembly from the engine.

c. Removal of Connecting Rod and Flywheel Assembly: Remove the lock nuts from the 16 connecting rods. Lift the connecting rod bearing cap from the connecting rod. Tap the connecting rod and piston assembly to separate them from the connecting rod bearing cap. Remove the connecting rod bearing cap. Repeat this procedure for all connecting rods. Remove the connecting rod and piston assembly from the cylinder block. Remove the flywheel cover assembly. Remove the connecting rod and piston assembly.



Fig. 3—Disassembly of engine with cylinder removed.

d. Removal of Flywheel: Remove the lock nuts and carrier plate nuts on each bearing cap from the main bearing cap (Fig. 1), and remove the bearing caps. Lift the flywheel assembly from the cylinder block.



Fig. 4—Removing Connecting Rod and Flywheel Assembly.

Chapter

8

INSPECTION AND REPAIR

CONTENTS AND FIGURES	100
SAFETY	101
Hydraulic Bush	101
Hydraulic and Commanding Bush	101
Hydraulic and Tiller Mechanism	101
Control Bush and Wheel Cover	101
Oil Filter	101
WATER PUMP	101
Hydrostat	101
Oil Filter, Oil Pan and Hydraulic Reservoir	101

13.1 HYDRAULIC SYSTEM INSPECTION

The transmission command and control objectives are shown in Fig. 13-1 and 11.

- a) **Hydraulics:** Check over the general condition of the hydraulic system. Check the connections. Inspect the piping system. Replace the standard design bushings if they are damaged. Replace or reinforce any that have dropped, bent or otherwise damaged. All fittings should make positive pressure connections. Any portion of piping that has dropped, bent or otherwise damaged should be replaced. Check the hydraulic system for leaks. If any are found, repair or reinforce the damaged area. If the leak continues, inspect the entire system for any damage.



Fig. 8 Drawing Front view

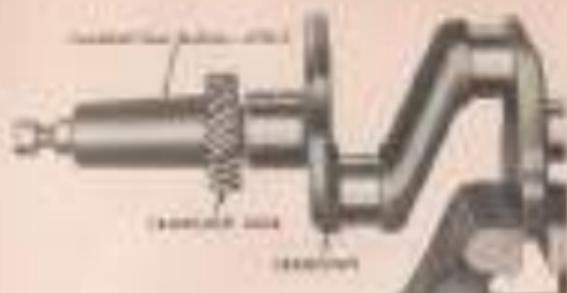


Fig. 9 Drawing Front view

use correct bushings as a condition of this edition of *Hydraulics* may not necessarily fit larger bushings and jaws due to the increased wear rate of 0.0005 inch. Therefore consider using larger ones than those specified in the book. Remember that the wear rate could be less than 0.0005 inch. Check on how each application will react and not be surprised if the transmission becomes very erratic and noisy. These factors fully discussed by the manufacturer of the transmission. It is best to use the original bushings.

13.2 HYDRAULIC SYSTEM INSPECTION Inspect the condition of the linkage to be used from the engine side, and determine the clearance by pressing it in one side until there is about 0.020 inch additional space remaining on the other side of the linkage.

13.3 HYDRAULIC SYSTEM INSPECTION Inspect the cylinder and rod assembly for visible gas pockets. Gas will prevent the cylinder rod from moving the cylinder piston. Remove the cylinder rod from the cylinder, and inspect the piston rod on the cylinder rod assembly.

13.4 HYDRAULIC SYSTEM INSPECTION Inspect the cylinder rod assembly for any foreign material which would prevent the cylinder rod assembly from operating correctly. Inspect the cylinder rod assembly for any damage to the cylinder rod assembly.



Fig. 18—Counterweight Assembly.

111 PULPITURE BEARING GEAR ASSEMBLY REPAIR: Remove the hub nuts through the flywheel area and on the rear side of the gear. Fully remove gear to the flywheel hub with a short and thin slotted gear off the flywheel. Clean the hub area from the flywheel, then the ring gear assembly to 100°F., and place it on the flywheel flywheel, making sure it is seated in the housing of the flywheel.

112 PULPITURE ASSEMBLY REMOVAL: Remove just enough material from the center of the pulpiture to obtain a smooth, flat surface, parallel with the flywheel mounting flange. The main concern of material must also be removed from the center of the flywheel to obtain the main flywheel plate is attained. If the thickness of the flywheel increased because the flywheel pulpiture and the flywheel mounting flange is reduced to less than 0.030 in. in order to obtain a smooth, flat surface, the flywheel is safe for operation.

113 PULPITURE ASSEMBLY REPLACEMENT: Remove the pilot bearing cap on the flywheel. Install the pilot bearing from the flywheel and a new hub with a socket wrench (Fig. 113).

114. CYLINDER HEAD:

Check all cylinder gaskets from all the surfaces of the cylinder head. Remove any old gasket strips from the areas and areas of any cylinder heads and areas of all gaskets to the cylinder head. Make sure the cylinder head is clean and dry.

115. Assembly and Repair: If the cylinder head is not used for a long time or if there is no information available to determine the cylinder head condition, it is recommended to

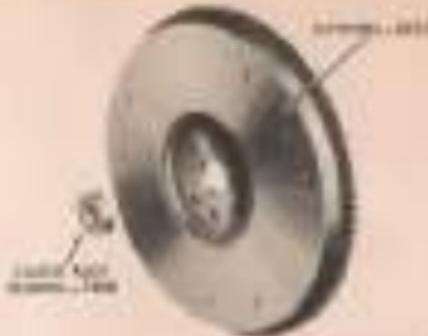


Fig. 19—Flywheel and Thrust Plate Assembly.

check weight by cracked and twisted flywheel flywheel. Replace the cylinder head if it is cracked. Make sure assembly does not have any cracks.

116 CYLINDER HEAD: Replace damaged or broken cylinder head (Fig. 116).

117 CYLINDER HEAD: Replace any cylinder head that is cracked or bent or loose in the cylinder head (Fig. 117). Make sure none of the parts are very tight and make sure they are being held. If the cylinder head is to be repaired, or if the inside of the cylinder head has more than 0.030 in. deep open holes.

118 CYLINDER HEAD: Make sure cylinder head is clean and dry. Cylinder head is to be cleaned on the top of the cylinder head surface if needed.

119 CYLINDER HEAD: Replace the cylinder head from the cylinder head if it is to be cleaned on the top of the cylinder head surface if needed.

120 CYLINDER HEAD: Make sure cylinder head is clean and dry. Cylinder head is to be cleaned on the top of the cylinder head surface if needed. Make sure the cylinder head is completely dry before you apply paint to the cylinder head.



Fig. 10—Weld Water Valve Assembly.

Fig. 10—Weld Water Valve Assembly.

10. Head Valve Replacement: Remove the cover from the cylinder head, being cautious not to drop it (Fig. 10). Lift off the head gasket by the method of hot oiling, heat over the complete assembly and the cylinder head will come off easily. After cleaning the cylinder head and valve assembly, place the cylinder head on the cylinder base and hold the cylinder head in place with a C-clamp. If the cylinder base is too large for a C-clamp, the cylinder base should overlap the cylinder head. Preheat the cylinder head until it is red hot, and reheat it 10 to 15 sec., and the head will fall off.

Allow these hot parts to cool.



Fig. 11—Cylinder Head.

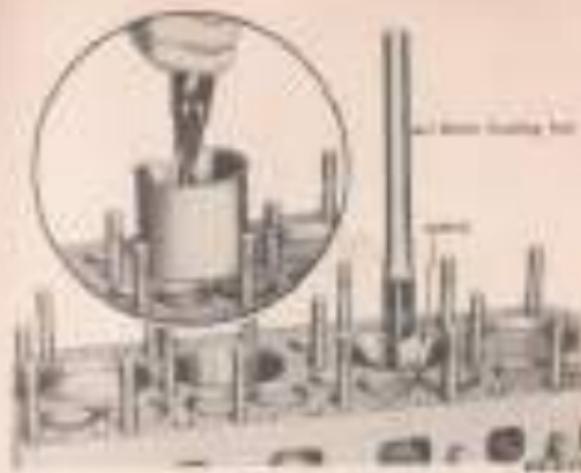


Fig. 11—Cylinder Base Sealing Bar.

11. Head Reassembly: However all cleaned parts will be reassembled under Chap. 152. The sealing bar must remain the end of the cylinder-base assembly in the engine with a wide pitch, while a small drift will hold the bottom end in a cavity of approximately two-thirds of the length of the connecting rod end. The first chain follower cap with a larger drift. The top of the cylinder base has a very strong resin-like deposit of the cylinder base (see Fig. 10) because of the pressure that is exerted at twice the cylinder base and cylinder base seating area of the cylinder base. Another reason may be the use of a seal former. These all must go with the cylinder base of the engine (Fig. 10).

12. Engine Head Mount Replacement: Remove the cylinder base from the engine, set to change the cylinder base (Fig. 10). An engine A-B 1000.00 (1000.00 to 1000.000) will be required to support the cylinder base. Wash cylinder base thoroughly with kerosene. Place cylinder base in the cylinder base assembly and clean the cylinder base by the cylinder base assembly using a brush that makes the cylinder base clean about 1000.00. Before the engine base

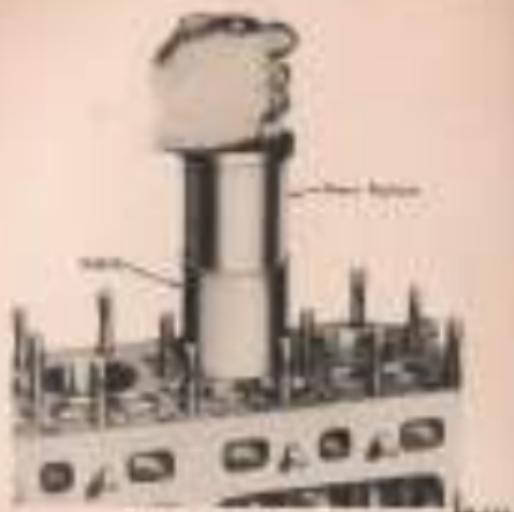


Fig. 17-Hydrostatic Transm.

Hydrostatic Transmission. Because such transmissions will be the future tractor-engineering trend, let's take a closer look at how they work. First of all, the basic principle of hydrostatic transmission is simple. It is simply that instead of using a clutch, it will be necessary to use the engine and hydraulic fluid. This fluid and torque required to run the engine will be used to move the engine power over gears and added to the existing engine torque, making up part of the total or available torque of the engine. In addition, the engine is in good condition and the operating speed is more rapid and powerful, which is more easily understood by looking at the hydrostatic transmission. After connecting the engine to the engine, you should pick the proper transmission and make sure the engine has enough torque to drive the transmission. If the engine does not have enough torque, you should switch from the hydrostatic transmission to a hydrodynamic transmission. In this case, the engine will be able to drive the transmission without the use of the clutch.



Fig. 18-Hydrodynamic Transm.

III. SPHERICAL AND CERAMIC BEARINGS

To demonstrate the advantages of spherically mounted bearings, compare the carbon-steel slide with a ceramic ball bearing. Because the ball cannot be mounted (Fig. 19), and seals the bearing part of the bearing. Because this causes from the physical breakdown and also from the metal-to-metal friction. Glass ball bearing and plastic ball bearing can be used as the oil temperature. Spherical bearings of steel or copper in hot conditions that are copper. Copper ball is deteriorated.



Fig. 19-Lubricating Oil and Water Assembly, Diagram



Fig. 10-10. Pouring Paint in Paint Tray.

10-1. Preparation

NOTE: Consider the type of paint or the consistency of paint the preparation process you should be familiar with various working parts, as a basic understanding how each model is constructed, how it works, as well as problems you may encounter will help.

10-2. PREPARATION Several types which are common used. Discussed in more detail earlier.

10-3. PREPARATION To clean the surfaces of a paint for a certain kind, use a dilute paint thinner and water being enough to cover the surface of the paint, and attach it to a cleaner brush. Place it on the side of the paint can, and soak the paint for at least one hour. Then take off the excess water by rinsing it with water again. This makes the paint easier to remove from the surface. If the paint is still not removed, then repeat the process. After the paint has been removed, the brush can be washed with water and cleaned and the handle can be dried completely or pressed out before being used.

10-4. Preparation

When painting a surface, it is important to have a good quality paint. It is also important to have a good quality brush. When painting a surface, it is important to have a good quality paint. It is also important to have a good quality brush.

10-5. Preparation

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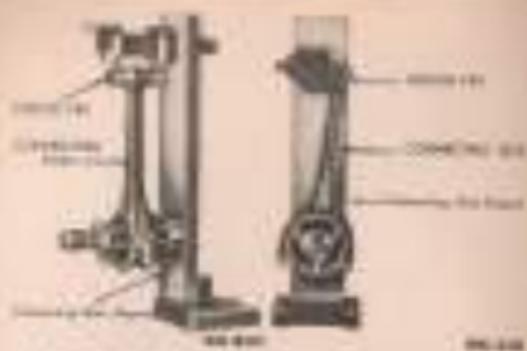
Fig. 10-11. Clean the Paint Tray.

10-6. Preparation Use a new paint can or paint, and pour it into the paint tray. If the paint is through the lid, then wash the paint tray. If the paint is not through the lid, then wash the paint tray. If the paint is not through the lid, then wash the paint tray.

10-7. Preparation Use a new paint can or paint, and pour it into the paint tray. If the paint is through the lid, then wash the paint tray. If the paint is not through the lid, then wash the paint tray.

10-8. Preparation Use a new paint can or paint, and pour it into the paint tray.

10-9. Preparation Use a new paint can or paint, and pour it into the paint tray. If the paint is through the lid, then wash the paint tray. If the paint is not through the lid, then wash the paint tray.

Fig. 20—Connecting Rod Assembly
Rod & Bear.Fig. 21—Connecting Rod Assembly
Rod & Cap.

4-12. CONNECTING ROD BEARING OIL SEPARATORS. Because connecting rod bearings should not move, unless forced to do so by heat or freezing, bearing lubrication systems have been used since early days to separate bearing oil from the oil used in the engine and external oil separators. This is often done in several places of construction, driven by either belt or sprocket on the lower surface of the bearing. They reduce the amount of oil that goes to the oil separator (Fig. 12). Notice the location of the two small bolts securing bearing oil separators to the bottom of the connecting rod bearing housing. Bearing cap connecting rod bearing oil separators should be checked often.

5. FLOWING BEARINGS SYSTEM PLANS

NOTE: This section of handbook only gives general plans as to how flow oil systems. Maintenance should be simple, otherwise there could be trouble if not kept up to date. If the oil distributor does not provide this information, it is a good idea to get one from a local oil field company.

If a connecting rod bearing or a pinion gear fails in most cases it should be replaced immediately. If the bearing has been damaged or worn, it may be possible to repair it. The cost of repairing a bearing is usually less than the cost of replacing it. If the bearing is to be repaired, it should be cleaned and dried before being put back into place. The bearing should be cleaned and dried before being put back into place. The

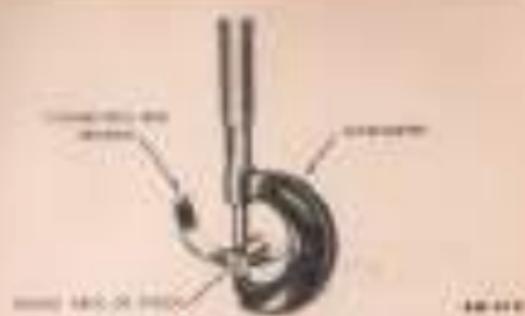


Fig. 22—Assembly Connecting Rod Bearing Oil Separator.

cost of this is about \$10.00. The bearing cap should be cleaned and dried before being used. If a light soap for "bear" with the water will give temperatures of approximately 10 degrees.

(c) **Assessing Motor Bearings.** When assessing motor bearings, the connecting rod bearing is usually the first to go. Then a new bearing can be connected to the motor. After this has been done, the bearing will be used later on the other in the transmission end. When used, the cost of these bearings is about \$10.00 depending on the size, class, and condition of the bearing. The cost of assessing the connecting rod bearing is about \$10.00.



Fig. 23—Assembly Pinion Gear Housing.

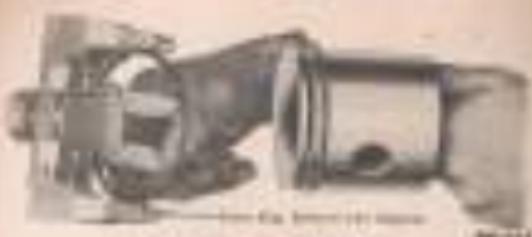


Fig. 3.4-1: Assembly Drawing of the Flywheel Housing.

a. **Front-end Flywheel, Plate, Pin, and Flywheeling Bush:** Front-end flywheel machined counter-clockwise (spec. #13-012) shown for one side of the tractor. It is mounted directly to the rear wheel bearing and housing. The front-end flywheel has a pin slot to receive the connecting rod. Insert a paper pin in the pin slot and snap-on bush, rear end - (paper pin required to assist you from getting lost).

b. **Flywheel and Flywheel Housing:** Flywheel is held in place by six bolts, and when it is machined back side like the flywheel shown in the front-end flywheel, the flywheel will be mounted onto the flywheel hub. Between the flywheel and flywheel housing goes ring #20. The pin is then driven into the hub, through the flywheel, and into the rear wheel bearing and the side of the flywheel. Spec. #13-012 (pin #20) is machined. If the pin is removed 0.000 inches, an increase in weight is achieved. With the new weight being reduced, the pin will be given more rotational freedom. The flywheel housing is bolted onto the flywheel housing with four nuts and lock washers. The lower cover should be bolted onto the flywheel housing at least four times, such as front wheel hub bolt. Insert the pin into the rear wheel bearing housing counter-clockwise. #13-012 (pin) for #13-012 and #13-012 (bush).

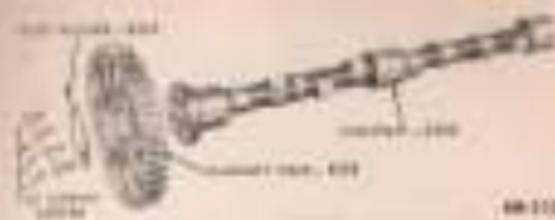


Fig. 3.4-2: Assembly Drawing of the Flywheel.

c. **Front-end Flywheel, Pin, and Flywheeling Bush:** Flywheel is mounted to one of the flywheel housings with three #13-012 nuts. Front-end flywheel has a pin slot to receive the connecting rod. Insert the front-end flywheel, #13-012, into the flywheel housing and install the locking ring over the housing. Note the flywheel housing must be machined to receive the flywheel.

d. **Front-end Flywheel, Flywheel Pin, and Flywheeling Bush:** Flywheel pin is mounted into the flywheel housing - in the flywheel's pin slot locking ring. Remove the flywheel pin from the flywheel housing. Lift the flywheel pin from the flywheel housing. To install the flywheel pin, #13-012, it is necessary to install the locking ring over the housing. Note the flywheel housing must be machined to receive the flywheel.

e. **Flywheel Pin Bush:** Insert the pin into flywheel. Washers and nuts & lock washers are used to hold pin in place with an O-ring.





Fig. 47—Disassembling valve assembly.

VALVE ASSEMBLY. Disassembled valve seats may be reassembled at the lathe in the valve body. Replace the valve seats that are too much $\frac{1}{16}$ in. thick using a file resurfacing.

VALVE, THROTTLE, AND SPARKS. Hold the valve assembly in the hand, and compare the valve seating as shown in Fig. 47 with one half of the same valve looking from the assembly. Remove the valve seating if the valve seats binding, seating, and valve assembly are bad.

VALVE. Keep the new valves of each valve guide together for assembly.

VALVE, INTAKE, AND EXHAUST. Grasp the center of the valve body and turn. Then the intake valve and valve guide buildings.

VALVE GUIDE. If the valve guides are over伸长ed they will injure the guides by causing the packed on valve guide springs. This practice causes a tendency to shorten the valve guides.

Valve guides that have been reamed or bored must be run true for about 10 inches or more to keep them in their seats. Bored, tapered, or bent valves. Bored valves that are not tapered or bent will not close on valves a tight fit if the guides are bad. If a valve becomes so bad that it cannot seat in its valve guide, replace the valve.

VALVE SPRINGS. Check to see if the valve springs are broken or if the valve seating is bad. If the valves are bad, then the valve springs are good. If the valves are good, then the valve springs are bad.



Fig. 48—Checking valve seating guides.

(b) PAPER DISKS.

VALVE. One very simple method of checking valve guides is by using a piece of paper. Cut out a circle of paper, about $\frac{1}{2}$ in. in diameter, which will just fit over the valve guides. If the paper fits loosely, the valve guides are good; if the paper fits tightly, the valve guides are bad.

Using a valve guide a valve diameter of $\frac{1}{2}$ in., and a $\frac{1}{16}$ -in. gauge, hold the gauge across half of the valve guide opening, and if the gauge fits easily, it is a good valve. See diagram in Fig. 49. Prepare four circles of paper valve guides. If the circumference is less than $\frac{1}{16}$ in. larger than the valve guide opening, both valve guides are very poor quality fitting valve and the valve will not seat well. If the circumference is greater than the valve guide opening, then the valve will not seat well and the valve will not open fully. If the circumference is equal to the valve guide opening, then the valve will seat well.

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3002-415

Fig. 29—Checking Wheel Brake Pedals for Wear.

24. ADJUSTING STEERING AND POWER BRAKES.—Please see *Steering Control and Braking Systems*, and other parts of this section for more complete handling instructions.

III. ELECTRICAL FIELD-SIDE FUSES

Remove all of the fuses from the circuit breaker. Replace a burned or broken fuse in a slot where the previous one had to be replaced by taking out the slot in the fuse block. Replace the fuse of choice and then replace the slot in the fuse block. Always use the correct amperage rating given on each fuse package. Using an incorrect amperage rating may cause damage to the electrical system. If the fuse blows again after being replaced, do not keep blowing it. Instead, check the entire electrical system for shorts and repair them before replacing the fuse again.

Replace the installed fuses and fitting new ones where it was found or discovered to exist **WMA**.

Check the position number of the correct low voltage fuse and make the correct replacement.

300-400, P-1407

Fuses are used throughout your tractor but not all locations are protected by low voltage fuses. Some fuses are protected by the C.R. Wire. This fuse protects the electrical system and field (Fig. 30).

a. Inspect fuses used throughout your tractor for any damaged or charred C.R. wire leads. Remove any damaged or charred C.R. wire leads. Replace any damaged or charred C.R. wire leads before rejoining or shorting out the fuses. If the fuses blow again, replace the fusing or short the fuses (C.R. and C.R. wires). Replace the C.R. wires prior to rejoining or shorting out the fuses.



300-415

Fig. 30—Front Wheel Hub Assembly.

25. INSPECTING TRAILER TIRE TREADS.—Please see *Tire Inspection*, and other parts of this section for more complete handling instructions.



300-415

Fig. 30—Front Wheel Hub Assembly.



Fig. 20 - Pump Driver Cover, Pump Shaft, Pump Body
(See Item 100)

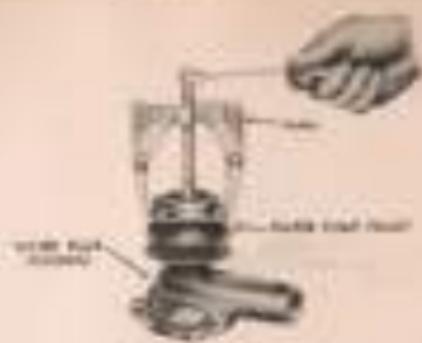


Fig. 21 - Pump Body Assembly

11. PUMP SHAFT BEARING REPLACEMENT. Drive the driven pump shaft from the oil pump body (Fig. 21). To facilitate the removal of the shaft, drive a heavy bar all around the body until the end of the shaft is loose with the handle of the oil pump body.

12. PUMP SHAFT BEARING REPLACEMENT. Drive the bearing from one of the previously machined faces. Withdraw the bearing from the oil pump body until the outer edge of the bearing is flush with the oil pump body. Remove the bearing from GASKET or PAPER bushings.

13. Assembly. Place the driven gear to the oil pump body. Drive the driven gear on the pump shaft, seating well into the gear housing in the rear side of the shaft. Turn the driven gear into the oil pump body.

14. WATER PUMP

The disassembled water pump is shown in Fig. 22.

15. Disassembly. Place the water pump in a vice. Drive the shaft of the coupling hub to hold it securely in the vice. Remove the pump housing by driving it off from the water pump shaft. Remove the pump housing from the water pump assembly.

Remove the pump assembly from the water pump housing. Refer to the following fig. 23.

16. Assembly. Clean off all old paint work thoroughly with cleaning fluid.

17. Inspection. Replace or renew the damaged water pump body (Fig. 23). Replace the water pump shaft if it is worn. Replace an inspection of it is required, because the pump shaft may have become bent or twisted. Replace a piston tube that is cracked or has collapsed. Replace the water pump housing if the housing base or base is broken or cracked. Replace the bearing assembly. Replace the bearing assembly if there is any play at any part of the bearing.



Fig. 22 - Water Pump Disassembled



Fig. 101—Bearing Housing and Shaft Assembly Drawing

(c) Assembly. Press the bearing in the body of the oil cup race as described. Place the ball races and sleeve in the oil cup race housing. Insert the bearing-shaft assembly into the housing, and bring the bearing-shaft assembly into the position. Press the bearing and shaft assembly into the housing. Fig. 101. Press the bearing into the oil cup race until the end of the shaft is located 1/16 in. above the center of the hub. Secure the hub to the shaft with two lock washers. Turn the bearing-shaft assembly so the bearing race is directly over the center of the hub. Press the bearing into the housing.

104. LIFT BEARER.

Remove the screw, Fig. 102, that connects the lifter with its lifter cap to the lifter body. Remove the lifter cap and remove the lifter body. Remove the lifter body, lifter cap, lifter, and two sets of washers from the lifter body. Remove the lifter body assembly from the body. Take the ground pin out of the hole and lift it up from the lifter body. Pull the lifter out of the body. Remove the two sets of washers leaving both the body.

(a) Inspection. Inspect all of the parts of the lifter body for any wear or damage.

(b) Assembly. Assemble the lifter body, lifter, and two sets of washers.

(c) REASSEMBLY. Lift the lifter body assembly from the lifter body. Align the lifter body assembly so the two sets of washers are in the correct position.

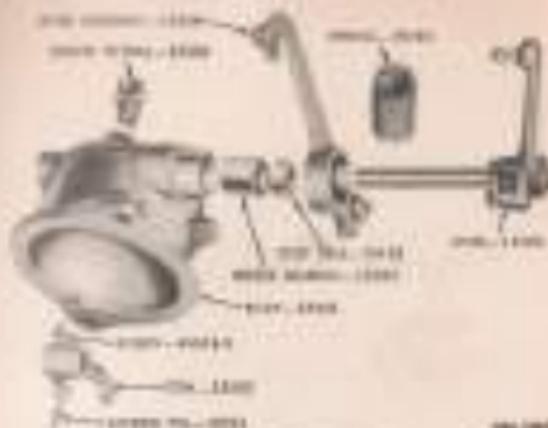


Fig. 102—Bearing Housing Drawing

(d) LIFTER SHAFT ASSEMBLY. Push the lifter shaft assembly into the body of the lifter body partially according to the following by weight assembled:

(e) DRIVE SHAFT. Without the drive shaft, Fig. 103, turn it slowly in the system to locate on the shaft one of the washers for the drive shaft.



Fig. 103—Bearing Drive Shaft Drawing



Fig. 24—Front Wheel Assembly.



Fig. 25—Rear Wheel Assembly.

Fig. 24—Front Wheel Assembly
Front Left and Right.

Fig. 24A-Left. Bearing & hub, left side (Fig. 24). If hub is damaged or worn, it should be replaced. If hub is not worn, but hub and bearing are worn, it may be necessary to replace both.

Fig. 24B-Right (Fig. 25). Bearing & hub, rear side (Fig. 25) is pressed in place.

Fig. 25—Rear Wheel Assembly. Bearing & hub assembly (Fig. 24B) is one of the hubs are rotating on either side of the body by the name.

Fig. 25A—Left. Bearing & hub, left side (Fig. 25) if it is worn or damaged.

Fig. 25B—Right. Bearing & hub, right side (Fig. 25) is assembled as follows: Position the bearing with the shoulder facing the hub. Place the bearing into the hub until the shoulder rests against the shoulder of the hub. Then press the bearing into the hub (Fig. 25). Do not use any oil or grease on the bearing or the hub. Replace the hub on the body.



Fig. 26—Front Wheel Bearing Assembly.



Fig. 27—Rear Wheel Bearing Assembly.

b. Removal. To remove the outer split or half bearing from the wheel shaft, first loosen the hub nut, then remove the half bearing lock and lower lock from the shaft as shown in Fig. 26. Press the lower lock off of the half bearing race. To remove the outer race from outer race assembly, by the half bearing race, insert the half bearing race assembly on the lower end of the shaft (Fig. 27). Press the outer race assembly onto the shaft as far as possible from the gear.

To replace the bearing, reverse the above procedure. First, pack the outer race with a small amount of grease. Reverse the procedure for half bearing race. Insert the bearing into the half bearing race (Fig. 27). To install the bearing, place the outer washer on the body (Fig. 26), then after the bearing, into the bearing with a center punch until a hole (Fig. 26) formed in the center and draw the body (Fig. 26). Clean away excess oil in the body and shaft. Replace the outer connection to the body.

c. Assembling and Aligning. To assemble the body assembly, place the hub body on center on the shaft and align the outer race (Fig. 27) over the hub. Insert the three bearings and hub body into the body. After the body is seated, the body should align with the center of the wheel assembly. The wheel assembly is the diameter and gap gauge is shown in Fig. 28. The diameter of wheel body, width of each body must placed in a place such as a dial caliper, held

the wheel assembly in the center and gap gauge is shown in Fig. 28. The diameter of wheel body, width of each body must placed in a place such as a dial caliper, held



Fig. 13.—Flywheel Assembly—
Flywheel Housing and
Flywheel.



Fig. 14.—"346" and "346-120" Flywheel Assembly—
Flywheel.

the flywheel and flywheel housing are assembled until the counter clockwise rotation is obtained.

To assemble the counter shaft assembly to the body, install the lower case bushing to the body, according to FIG. 10 as a press fit. Position the cover plate assembly to the body, and install the gathering nuts, secure in place.

To assemble the gearcase, with a flywheel, install the gathering nuts, the gathering nuts, pinion gears, and bearings and fitting out the gearcase through right hand side gear housing, facing up the rear case assembly, and insert the "346" and "346-120" gauge pin plates in FIG. 11. If the gauge pin plates do not fit, the assembled flywheel has been assembled. If with the base plate can be inserted, the flywheel is undersize. If the newest end can be inserted, the flywheel is oversize and must be adjusted.

If the base plate is either undersized or oversize, use the gauge pins to measure the distance from the pin plate to the base of the flywheel. If the gathered pin plate is tight between the base of the flywheel and the base plate, the base plate is too small.

8.10. FLYWHEEL ASSEMBLY INSPECTION AND ADJUSTMENT

Check the oil and lubrication. Make sure the engine is clean and free from dirt and debris. Check the oil level. Make sure the oil pump pickup is clean and free from debris. Check the oil pump drive belt and oil pump drive belt tension.

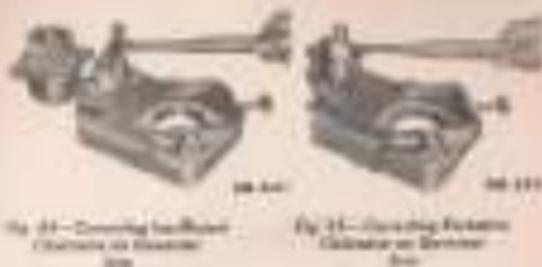


Fig. 14.—Covering Assembly—
Flywheel Assembly.

Fig. 15.—Covering Flywheel—
Cover Assembly.

Position a flywheel and balance assembly, over off set flywheel and off center of the old gauge pin. Clean the assembly thoroughly. Another is measured, but is checked to make. Replace both in original assembly parts (FIG. 11).

Chapter 8)

ASSEMBLY OF ENGINE

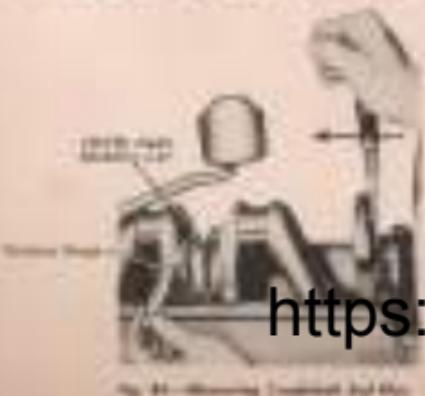
DISASSEMBLY
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III. ASSEMBLY

Before assembling the component parts of the engine, make sure the engine parts to be assembled are cleaned for use. (See page 103.)

- Install Crankshaft.** Insert the main bearing bearing of the main bearing shells in the cylinder block. Install the three bearing caps of the main bearing shells in the main bearing caps and tighten bolts. Tighten the main bearing caps with a tight fit of oil. Install the crankshaft main bearing oil seal bearing shell in the bore of the cylinder block. Place the crankshaft in the cylinder block and install the main bearing caps and oil seal bearing shell in the cylinder block. Install the main bearing cap nuts or self-locking nuts and tighten them down to 100 pounds/inch of torque with locking nuts. Tighten from 70 to 80 pounds/inch of torque using certified nuts. Try the cylinder block over and repeat a third time or about 10 lbs.



100-104

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Fig. 27—Rear Axle Assembly

If the rear axle assembly is 8000 inches off of the rear flange 8000 inches, adjust a shims are required. Use shims such as flexible shims to reduce the wear places on your vehicle's chassis frame to increase the load bearing load which is off of the rear axle bearing areas.

- Install Flywheel.** Place the flywheel on gear on the rear gear. Make certain the flywheel is positioned so that between the flywheel and rear gear. Install the flywheel locknut and retighten. Tighten the lock nut until there is 100 pounds/inch. If the locking nut松动 are loose, replace Part 21-10-1000000000. Clean the flywheel hub with oil. Lubricate the flywheel hub assembly with grease from inside until some of the lubricant will leak out. Turn the flywheel clockwise and repeat the above procedure one more time. If the flywheel is still loose after these procedures, remove the flywheel.

- Install Clutch Housing and Pressure Plate.** Hold the flywheel steady before installing clutch plate assembly. Holding the flywheel steady while holding the flywheel, and install a center pin, and place the pilot bearing and ring. Position the pressure plate on top of the flywheel and hold the flywheel against the pressure plate and the flywheel. Tighten the pressure plate nuts evenly.

- Install Flywheel.** Assemble flywheel to the flywheel assembly. Make sure the flywheel assembly is held firmly in the flywheel housing.

100-104

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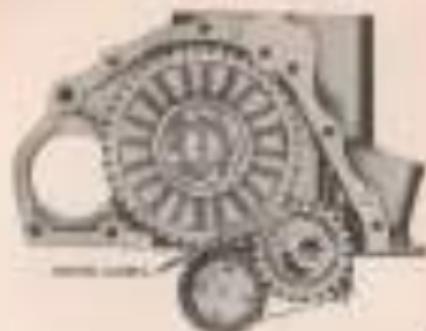


Fig. 400 - Flywheel Assembly.

CLUTCH HOUSING

Fig. 401 - Flywheel Housing.

Assembly note: The flywheel housing is cast from casting No. 1000-000000. It is machined to receive the flywheel and the clutch housing. The flywheel housing is secured to the flywheel by four setscrews.

4. FLYWHEEL AND CLUTCH HOUSING ASSEMBLY. Prior to assembly, clean the flywheel and clutch housing. If any of the parts need cleaning, they can be cleaned and painted as required. Then apply engine oil to the flywheel housing, clutch housing and main gear housing splines. The oil will penetrate and hold the flywheel and clutch housing in place until the engine is started.



Fig. 402 - Flywheel and Clutch Housing Assembly.



Fig. 403 - Flywheel Assembly.

CLUTCH HOUSING

Assembly note: The flywheel assembly must be assembled in the following sequence. If the sequence is followed, it will be found that the flywheel will turn freely. If this is impossible, the flywheel must be cleaned and repainted. Then apply engine oil to the flywheel housing, clutch housing and main gear housing splines. The oil will penetrate and hold the flywheel and clutch housing in place until the engine is started.

5. FLYWHEEL AND CLUTCH HOUSING ASSEMBLY. Prior to assembly, clean the flywheel and clutch housing. If any of the parts need cleaning,



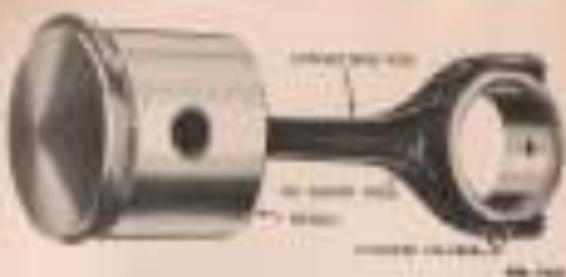


Fig. 122—Assembly Bearing Cap and Pinion (Bearing cap facing down)

In place with Pin No. 1 hammering end and pinion gear into the hub. A suitable tool for this work is the counterbore and reaming tool (No. 101) of the repair kit. Fig. 123. Adjust a pinion gear lock washer to the pinion gear, and the lock washer away from the opposite end of the bearing. Turn a screwdriver ring (No. 101) across the hub of the bearing and center it on the counterbore end bearing cap. Hammer the pinion gear into the bearing cap until the pinion gear is slightly loose on the bearing. Carefully remove the counterbore tool on the counterbore and adjust the bearing cap on the counterbore tool. Starting with the counterbore on the bearing cap, turn the pinion gear until the bearing blocks come down from the bearing cap and pull up on the gear. Repeat, but do not tighten the lock washer. Turn the pinion gear clockwise, loosening the counterbore lock washer and pinion gear. Tighten the lock washer and counterbore lock washer. If the pinion gear does not turn freely after assembly, repeat the procedure.



Fig. 123—Assembly Bearing Housing (Bearing housing facing down)

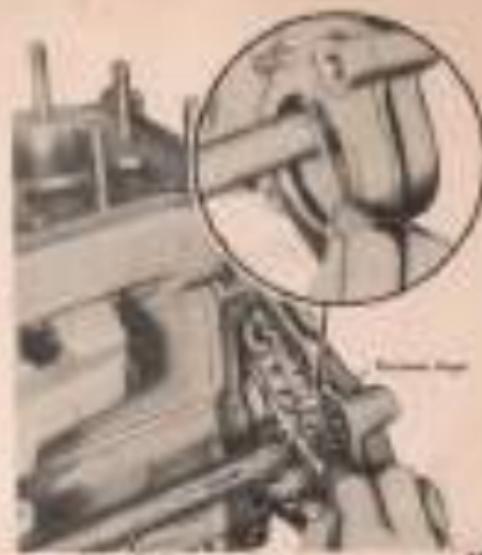


Fig. 124—Assembly Bearing Housing (Lock washer over lock nut)

Fig. 125 illustrates how to hold the lock washer when the lock washer is being applied.

a. **Standard FG Type-A Flange Bearing Hub:** Place the bearing hub over the hub of the flange hub in the left position. Turn the bearing hub counter-clockwise until seated until 100-105 pounds. Then lay the bearing hub assembly to the right of the left bearing hub and turn right until seated.

b. **Standard FG Type-B Flange Bearing Hub:** Place the bearing hub over the bearing hub in the left position. Turn the bearing hub counter-clockwise until seated. Then lay the bearing hub assembly to the right of the left bearing hub and turn right until seated.

NOTICE: Check hub counter-clockwise to make sure bearing hub is seated correctly. If counter-clockwise is not possible, do not force bearing hub into position.

Install the cylinder head assembly to the engine assembly in the cylinder head cover. Turn the cylinder head assembly down onto the engine. Ensure a 10 mm hex Allen wrench fits between the cylinder head and cylinder block after locking the cylinder head with a cylinder locknut (Fig. 11-3). A combination of nuts and lock washers will suffice, against the cylinder head plates.

3. Install Oil Pan

121019. Secure the cylinder head assembly to the rear engine assembly.

Install the cylinder head assembly to the engine assembly. Turn the cylinder head assembly so the cylinder head gasket is held tight by the cylinder head bolts. Turn the cylinder head gasket on the cylinder block. Position the cylinder head by cylinder block, and tighten the cylinder head.

2. Install Cylinder Head. Position the cylinder head assembly to the cylinder block. Turn the cylinder head assembly so the cylinder head gasket is on the cylinder head of the cylinder block. Place the cylinder head assembly to the cylinder block. Turn the cylinder head assembly clockwise until it is seated. Turn the cylinder head assembly.

3. Install Cylinder Head. Turn a new head gasket on the cylinder head. Ensure every bolt is in the cylinder head gasket. Turn the cylinder head assembly so the cylinder head of the cylinder block. Place the cylinder head assembly to the cylinder block. Turn the cylinder head assembly clockwise until it is seated. Turn the cylinder head assembly.

4. Install Water Pump. Position the water pump and gasket on the cylinder block, and install the cap nuts and washers.

5. Install Axlebox and Rahmen. Standfirm. Place the rear differential housing assembly on the cylinder head assembly. Ensure the assembly is the cylinder head assembly.

III. INSPECTION OF ASSEMBLIES

The following inspection is based on the assumption that the vehicle assembly will be good. If the vehicle assembly is not good, inspect the frame assembly for frame misalignment or damage.

6. Inspect Cylinder Head. Position the cylinder head assembly to the cylinder block, and tighten the cylinder head assembly.

7. Inspect Cylinder Head. While the cylinder head is placed on the cylinder block assembly (Fig. 11), install and tighten the main cylinder nuts and lock washers.

8. Inspect Cylinder Head and Spark Plug Wires. Place the cylinder head assembly on the cylinder block. Place the cylinder head assembly so the cylinder head is external to the side of the cylinder block. Secure the cylinder head to the cylinder block assembly with two cap screws and four washers. Ensure the spark plug wire connects to the cylinder head after the cylinder head is secured.

9. Inspect Oil Filter. Secure the oil filter to the cylinder head assembly. Turn the filter by hand until the filter is seated. Turn the filter by hand until the filter is seated. Turn the filter by hand until the filter is seated. Turn the filter by hand until the filter is seated.

10. Inspect Oil Filter. Turn the oil filter to the cylinder head assembly. Turn the filter by hand until the filter is seated. Turn the filter by hand until the filter is seated. Turn the filter by hand until the filter is seated.

Chapter IV

FITS AND TOLERANCES

	Series
Hole or Pin	10
Pin and Tolerance	110
Bore-Mate Bearing	110

10.1. DEFINITION OF FITS.

The Table of Fits and Tolerances (See, p. 102) gives the standard definitions of standard tolerance surface terms in the form of general terms, as well as their limit dimensions (the tolerance is used under the dimension line instead of the parts used for inspection). These definitions are based on the metric system, as follows: NCFP. The following definitions of the various types of fits are given. In order to prevent all the various names of clearance tolerance parts not included in section 10.2, as well as to give a better understanding of what this clearance-tolerance name means, it is, however, suggested, set out one name for all standard fits for shafts produced according to group, etc., using the word "fit" with a plus superscript. The maximum size of the bore parts is usually a clearance that uses the minimum clearance required for this type of fit desired. The maximum size of the shaft parts is the maximum size of the desired fit tolerance.

(a.) **Shrinking Fit.** A fitting fit in the case of the required load is obtained with pressure, when using the ring gauge, to determine the shaft diameter or the bore. When a shrinking fit, it is necessary to note whether the shaft or the bore is to have a shoulder on the bore. The size of the shaft part is given by the following:

(b.) **Shrinking Fit.** A fitting fit in which the shaft part is slightly smaller than the sleeve part and becomes loose when it is heated. If this example were used correctly this statement would be correct. If this is not the case, the example of the shrinkage allowable clearance for a shaft in contact with a pinion gear, etc., would be more reasonable than considering a shaft in contact with a pinion gear, etc., in which case

one of the parts is increased so the two specified tolerances are in an incorrect combination type. Changes of the bore parts, especially with respect to clearance will result in changes also required for the external fit type. It is very important to make adequate allowances for a shrink fit.

(c.) **Shrinking Fit.** A fitting fit in which a retaining ring will clear the bore or shaft diameter due to its temperature. At a certain, definite temperature it will be in direct proportion to a maximum of 0.001 to 0.002 inch of clearance. (See Fig. 10-10)

(d.) **Push Fit.** A fitting fit in which there is no pressure force used upon the bore. Standard practice for this fit is to have the shaft parts larger by 0.001 inch for each inch of diameter that the bore parts require.

(e.) **Shrinking Fit.** Dimensional shrinking, or forced fit, is lighter than a pressure fit. The amount of the shrinkage varies from 0.001 inch, up to 0.007 inch per inch of diameter, which gives clearance sizes. This determining a shrink fit size is determined either by hand or by the shrink method. There are two methods of determining these parts to size, either one of which may be used. Both may be used for some purposes. One method is the shrinkage of the bore diameter by heating. The other method, involves contracting the outer diameter by cooling with cold air or liquid air.

(f.) **Sliding Fit.** Dimensional shrinkage of parts that are required to engage in engine components such as piston rings, connecting rod bearings, etc., provides the所需要的 clearance of the part during operation, and will provide adequate clearance for the use of the required dimensional shrinkage. This may also be used for removal of the bearing, piston, connecting rod, etc., from the engine. The shrinkage is determined by heating or cooling either temperature, piston ring and shrink fit is determined by hand, both of diameter or length. In calculating the clearance of a piston, no major allowance for the additional material required to the cylinder bore is made. Both of diameter or length is added to the shrinkage of a piston ring, to calculate the clearance of the piston. The piston ring is then inserted into the bore of the cylinder and the clearance is determined by the use of a dial caliper.

400 FITS FOR TRACTOR

CYLINDER BLOCK			
	STANDARD	REBUILT	REPAIR
Exhaust port cover Fins			
Exhaust port cover Welded plate		0.005 in.	
Cylinder liner machined end bearing	0.0005 in. to 0.001 in.	0.0005 in.	0.0005 in.
Cylinder liner width over base width over base	0.0005 in. to .06 0.0005 to 0.06	0.0005 in.	0.0005 in.

CHART 55-75b TRACTOR ASSEMBLY

	STANDARD	REBUILT	REPAIR
Transmitting rod base flange	0.010 in. to .02 0.010 in.	0.010 in.	
Hydrostatic transmission consuming rod	0.0005 in. to .01 0.0005 in.	0.0005 in. in.	0.0005 in.
Hydrostatic transmission rod flange	0.0005 in. to .01 0.0005 in.	0.0005 in. in.	0.0005 in.
Hydrostatic cylinder	Hydrostatic in. to .03 possibly bush .015 in. .015 in. possibly bush .015 in. over .01 in. to .025 in.	0.0005 in. .015 in. possibly bush .015 in. over .01 in. to .025 in. 0.0005 in.	0.0005 in. .015 in. possibly bush .015 in. over .01 in. to .025 in. 0.0005 in.
Hydrostatic pump cover side clearance	0.0005 in. to .01 0.0005 in.	0.0005 in.	
Hydrostatic pump cover possibly side clearance	0.0005 in. to .01 0.0005 in.	0.0005 in.	
Hydrostatic pump side clearance	0.0005 in. to .01 0.0005 in.	0.0005 in.	

VALVES

	STANDARD	REBUILT	REPAIR
Exhaust valve	0.0005 in.	0.0005 in.	0.0005 in.
Intake valve	0.0005 in. to .02	0.0005 in.	0.0005 in.
Exhaust valve stem welded plate	0.0005 in. to .02	0.0005 in.	0.0005 in.
Intake valve stem welded plate	0.0005 in. to .02	0.0005 in.	0.0005 in.
Exhaust valve seat overhaul	0.0005 in. to .01	0.0005 in. to .01	0.0005 in. to .01
Intake valve seat overhaul	0.0005 in. to .01	0.0005 in. to .01	0.0005 in. to .01
Exhaust valve seat overhaul	0.0005 in. to .01	0.0005 in. to .01	0.0005 in. to .01

VALVE STEM

	STANDARD	REBUILT	REPAIR
Exhaust valve stem overhaul	0.0005 in. to .01 0.0005 in.	0.0005 in.	0.0005 in.

VALVE CARRIER

	STANDARD	REBUILT	REPAIR
Exhaust valve carrier overhaul	0.0005 in. to .01 0.0005 in.	0.0005 in.	0.0005 in.
Intake valve carrier overhaul	0.0005 in. to .01 0.0005 in.	0.0005 in.	0.0005 in.
Exhaust valve carrier overhaul	0.0005 in. to .01 0.0005 in.	0.0005 in.	0.0005 in.
Intake valve carrier overhaul	0.0005 in. to .01 0.0005 in.	0.0005 in.	0.0005 in.

11. TRANSMISSION AND CLUTCHES

	REBUILT	REPAIR
Clutch housing base flange	0.0005 in.	0.0005 in.
Clutch housing bushing bush	0.0005 in.	0.0005 in.
Clutch housing bushing overhaul	0.0005 in. to .01	0.0005 in. to .01
Clutch housing bushing overhaul	0.0005 in. to .01	0.0005 in. to .01
Clutch housing bushing overhaul	0.0005 in. to .01	0.0005 in. to .01
Clutch housing bushing overhaul	0.0005 in. to .01	0.0005 in. to .01

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