OPERATOR'S MANUAL

1948 FORD TRACTOR

MODEL 8N

Ford Motor Company

3729-47-G

July 7, 1947

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FOREWORD

The Ford Motor Company has exercised every care in the designing, selection of materials, and the building of this tractor, and you may expect it to operate economically many thousands of hours. Maintenance of the tractor in good working order depends on the skill of the driver in its operation, and the prompt application of corrective measures as soon as the need for adjustments and services is apparent.

Part ONE of this book contains information and instructions that will be of assistance in the operation of the tractor.

Part TWO of this book contains lubrication charts and recommendations for periodic preventive maintenance service. This Part also contains various trouble shooting procedures that will prove of assistance when professional aid is not available (see table of contents on next page).

Part THREE of this book gives instructions for replacements and adjustments that may be performed by the owner.

FORD MOTOR COMPANY
Service Department

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Part ONE

OPERATING INSTRUCTIONS

Chapter I

DESCRIPTION and SPECIFICATIONS

111. DESCRIPTION.

The Ford two-bottom plow tractor (fig. 1) is of the four-wheel type construction. A wide range of wheel spacings are provided. The short wheel base and low over-all height (fig. 2) give it greater flexibility and maneuverability. Implements are easily attached to the tractor by means of the 3-pin mounting.

The Ford tractor is powered by a 4-cylinder, gasoline engine. Model 8N Ford tractors are equipped with a four-forward-speed, constant-mesh transmission. The heavy duty differential divides the power to the semi-floating rear axles.

Internal expansion self-energizing mechanical brakes are provided on the rear wheels. They may be used for steering or manually synchronized as service brakes.

Model 8N Ford tractors are equipped with a new improved hydraulic control containing an automatic draft control and a position control (fig. 1). The position control lever and the hydraulic touch control lever are conveniently located. The operator adjusts the implement from the tractor seat by the hydraulic controls and leveling crank. If an obstruction changes the implement setting, the automatic control will reposition the tool when the obstruction is removed or passed. No external hydraulic connections or hoses are used on the link-mounted implements. Implements equipped with hydraulic cylinders may be easily connected to the hydraulic system.

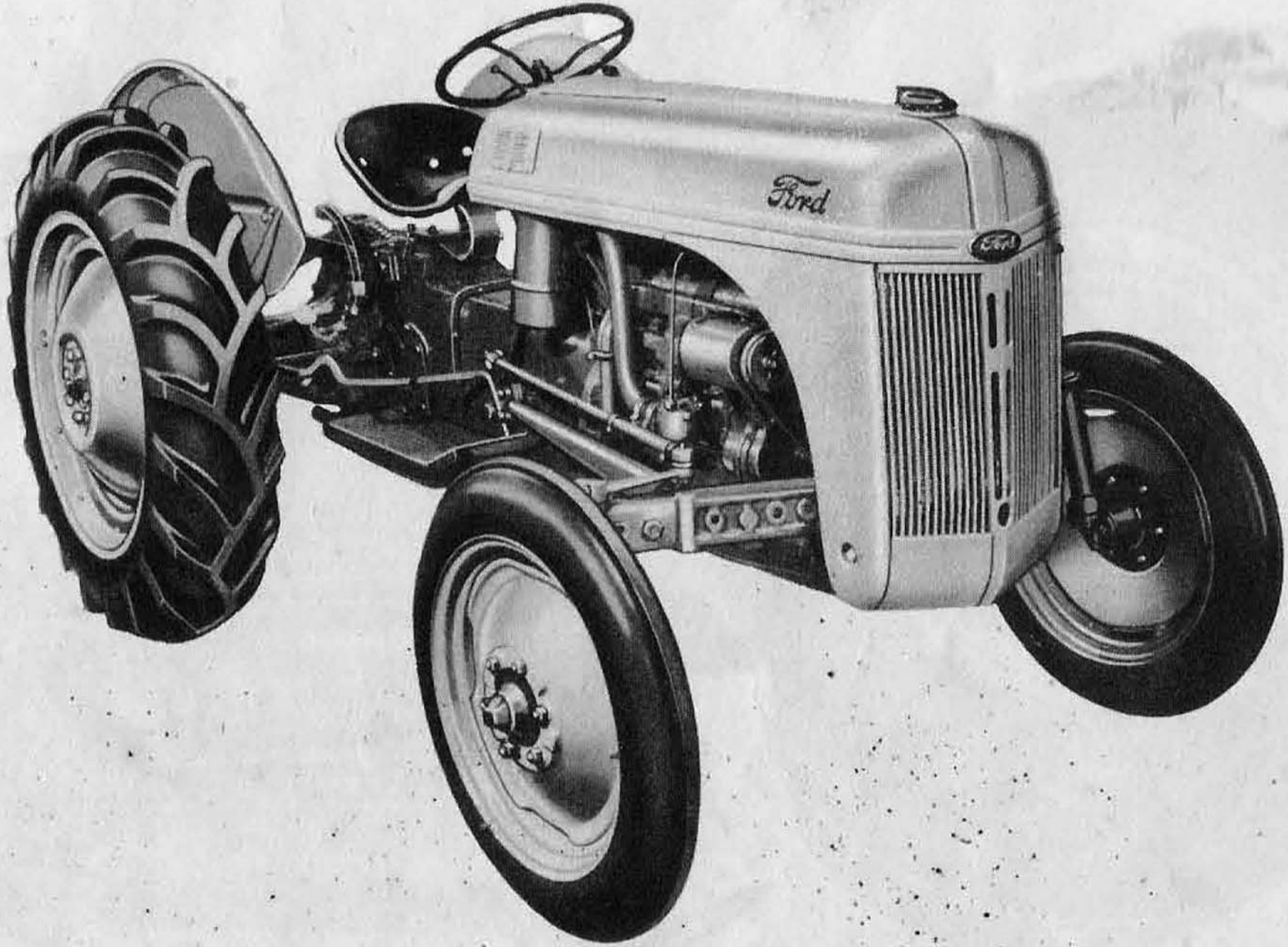


Fig. 1—Ford Tractor, Model 8N; ¾ Front View

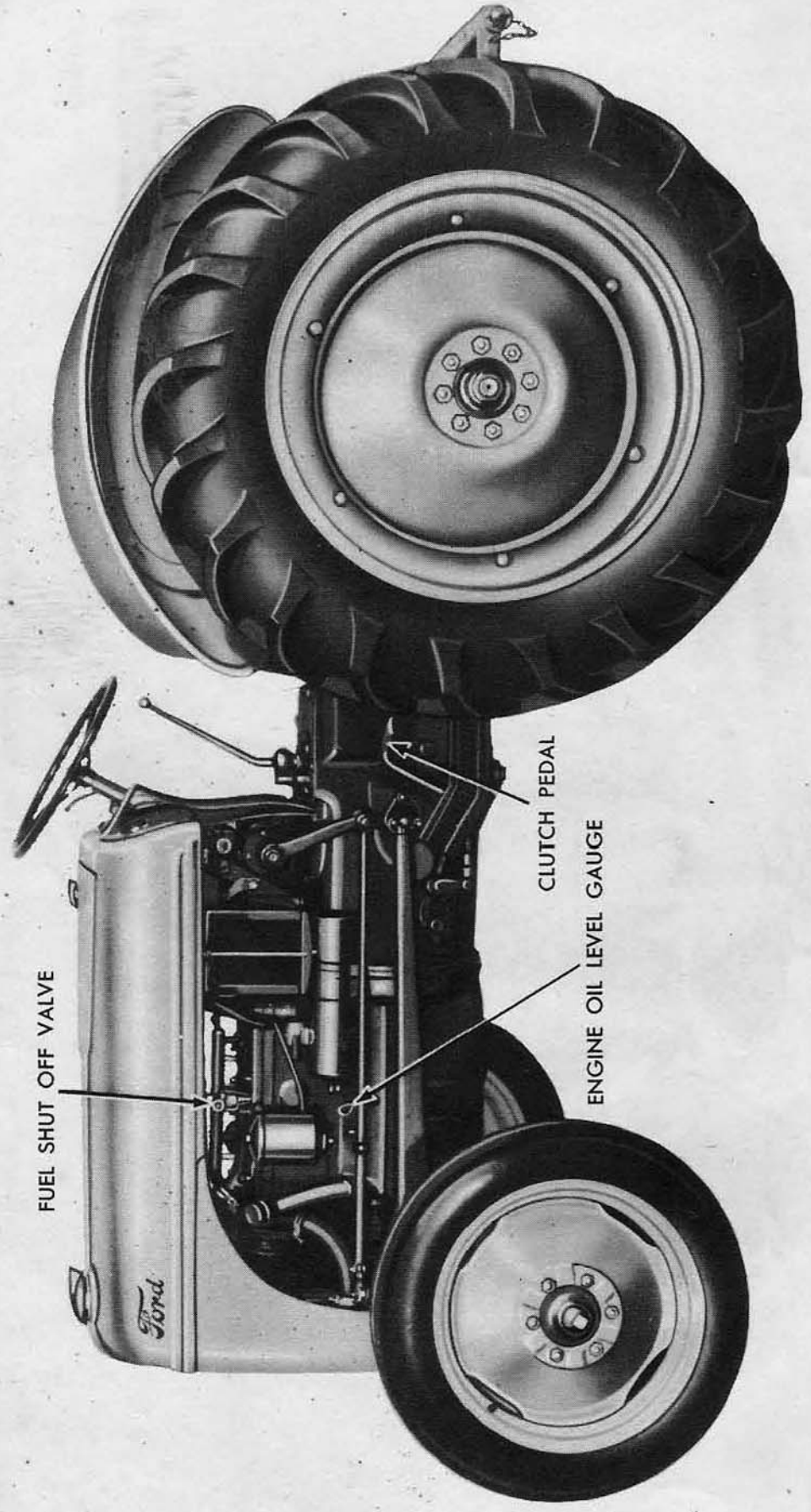


Fig. 2—Ford Tractor, Model 8N, Side View

The tractor serial number is located on the right side of the engine block.

The tractor is provided with a hinged seat and step plates so that the operator can either sit or stand while operating the tractor.

112. SPECIFICATIONS.

The specifications for the Ford tractor, Model 8N, are as follows:

a. General.

Type ..... 4-wheel, general purpose
Wheelbase ..... 70 in. at 48 in. tread width
Over-all length, front to drawbar ..... 115 in.
Over-all height ..... 54½ in.
Over-all width, normal tread ..... 64¾ in.

Tire size:
Front ..... 4.00 x 19—4-ply
Rear ..... 10.00 x 28—4-ply
Front tread ..... 48 to 76 inches in 4-inch steps
Rear tread ..... 48 to 76 inches in 4-inch steps

Ground clearance:
Front axle ..... 21 in.
Rear axle ..... 21 in.
Center ..... 13 in.

Turning circle radius (with use of brakes):
Made by outer front wheel ..... 8 ft.
Made by centerline of tractor at rear axle ..... 3½ ft.

Shipping weight (including gasoline, oil, water, tires filled with air, operator not included) ..... 2,410 lbs.

Drawbar height ..... 8½ to 34¼ in., 18 in. standard setting

Gear Ratio	Final Gear Reduction	Speeds at 1500 R.P.M.	Speeds at 2000 R.P.M.
1 Low (first)	73.33 to 1	2.54 M.P.H.	3.40 M.P.H.
2 Plowing (second)	57.04 to 1	3.28 M.P.H.	4.37 M.P.H.
3 Cultivating (third)	41.45 to 1	4.51 M.P.H.	6.02 M.P.H.
4 High (fourth)	19.86 to 1	9.40 M.P.H.	12.54 M.P.H.
5 Reverse	44.64 to 1	4.19 M.P.H.	5.58 M.P.H.

b. Capacities—U.S. Measure.

Fuel tank ..... 9 gals. standard
1 gal. reserve
10 gals. total

Engine oil pan (less filter absorption)	6 qts.
Transmission, hydraulic lift, and differential	5 gals.
Cooling system	12 qts.
Oil bath air cleaner	Fill to indicated level
Belt pulley	1 qt.

Tire pressure:

10.00 x 28—4-ply	12 lbs.
4.00 x 19—4-ply	26 lbs.

c. Engine.

Type	4-cylinder "L" head
Maximum belt horsepower at 2000 R.P.M.	23.87
Rated belt horsepower (85% of maximum)	20.29
Rated speeds	1500 and 2000 R.P.M.
Idle speed	400 R.P.M.
Cylinder bore	3.188 in.
Stroke	3.75 in.
Piston displacement	119.7 cu. in.
Torque	84 lbs. ft. at 1500 R.P.M.
Compression ratio	6.0 to 1
Sleeves	Dry type
Piston	Cast steel

Rings:

Compression	2
Oil	1
Piston pin	Full floating
Rod bearings	Replaceable shell-type
Main bearings	Replaceable shell-type
Crankshaft	Cast steel, static and dynamic balanced

Compression pressure at cranking speed (sea level)—90 lbs. minimum

d. Ignition System.

Type	Battery

Distributor:

Firing order	1-2-4-3
Drive	Directly by camshaft
Automatic spark advance	Centrifugal governor
Initial timing (degrees of crankshaft)	Top dead center
Maximum advance (degrees of crankshaft)	24°
Distributor breaker cam	4 lobe
Breaker contacts	1 set
Breaker contact spacing	0.015 in.

Spark plugs:

Type	Marked H-10
Size	14 mm
Gap	0.025 to 0.028 in.

e. Carburetor.

Type	Single up-draft
Idle fuel adjustment	1 screw
Main fuel jet	1 screw
Idle speed	1 screw

f. Governor.

Type	Variable speed, mechanically operated, centrifugal type
Governed speed range	800 to 2200 R.P.M.
Maximum governed speed adjustment	1 screw

g. Cooling System.

Radiator cap (pressure type):

Pressure valve opens at	3¼ to 4¼ lbs. per sq. in.
Vacuum valve opens at	½ to 1 lb. per sq. in.

Water pump:

Type	Centrifugal
Drive	V-belt

Fan:

Type	6-blade pull.
Drive	V-belt

Thermostat:

Location	Cylinder head outlet hose
Starts to open	160-165° F.
Fully open	190-200° F.

h. Electrical System.

Generator:

Type	3-brush
Drive	V-belt

Rating:

1500 Engine R.P.M.	10 amps
Maximum output	11 amps
Capacity	119 watts

Generator regulator:
- Cutout closing voltage ..... 6.0 to 6.3 volts
- Voltage regulation ..... 7.0 to 7.3 volts

Battery:
- Type 6-volt
- Number of plates (per cell) 13
- Capacity in ampere hours 85
- Terminal grounded ..... +

Starting motor:
- Type 6-volt
- Drive ..... Automatic engagement

i. Transmission.

Type ..... Constant mesh
Number of speeds forward 4

j. Clutch.

Type ..... Single plate
Release bearing (pre-lubricated) ..... Ball bearing
Pedal free travel ..... 3/4 in.

k. Rear axle.

Type ..... Semi-floating
Ratio ..... 6.66 to 1

l. Brakes.

Type ..... Internal expanding
Control ..... Individual, mechanical
Adjustment at each wheel ..... 1 screw
Brake pedal free play ..... 3/4 in.
Thickness of lining ..... 0.187 in.
Width of lining ..... 2.000 in.
Length of lining ..... 12.910 in.
Total brake lining area (two wheels) ..... 103.3 sq. in.

m. Steering Gear.

Type ..... Automotive ball nut
Ratio, turns of steering wheel for total travel of pitman arms, at 48 in. wheel tread 2.25
Steering wheel diameter ..... 18 in.

n. Hydraulic System.

Type ..... Internal
Maximum pressure ..... 1500-1700 lbs. per sq. in.

Pump:

Type	Scotch Yoke piston
Drive	Direct power take-off shaft
Capacity:	
2000 engine R.P.M.	2.85 gals. per min.
1500 engine R.P.M.	2.15 gals. per min.
Control	Manual and automatic
Oil supply	Transmission and differential

o. Power Take-off Adapter.

Spline	1⅜
Speed (1500 engine R.P.M.)	545 R.P.M.

p. Bell Pulley.

Pulley speed (2000 engine R.P.M.)	1358 R.P.M.
Belt speed (2000 engine R.P.M.)	3199 ft. per min.
Pulley size (standard)	9 in.

Chapter II

CONTROLS and OPERATION

121. OPERATOR'S CONTROLS.

Operator's controls are illustrated in figs. 3 through 7.

a. Brakes. Two-shoe, self-energizing mechanical brakes are provided at each rear wheel. They may be operated individually by foot pedals located on the right side of the transmission. Both brakes may be applied by depressing the two pedals with the right foot. Only a slight pressure on the brake pedals is required because of the self-energizing action which automatically increases the engagement pressure at the brake shoes. The brakes may be set by engaging the brake pawl at the end of the brake control shaft (fig. 4). The

Fig. 3—Power Take-off Lever

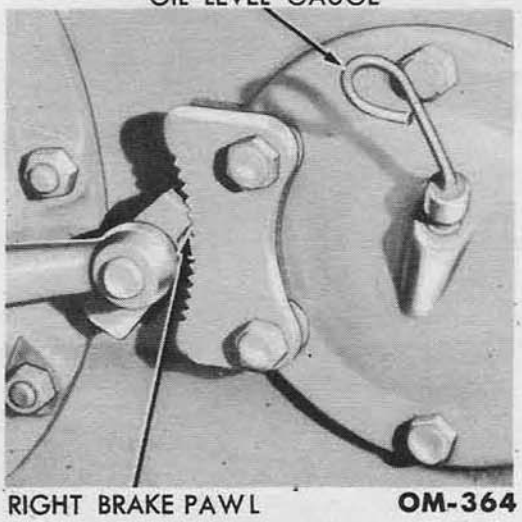


Fig. 4—Brake Pawl

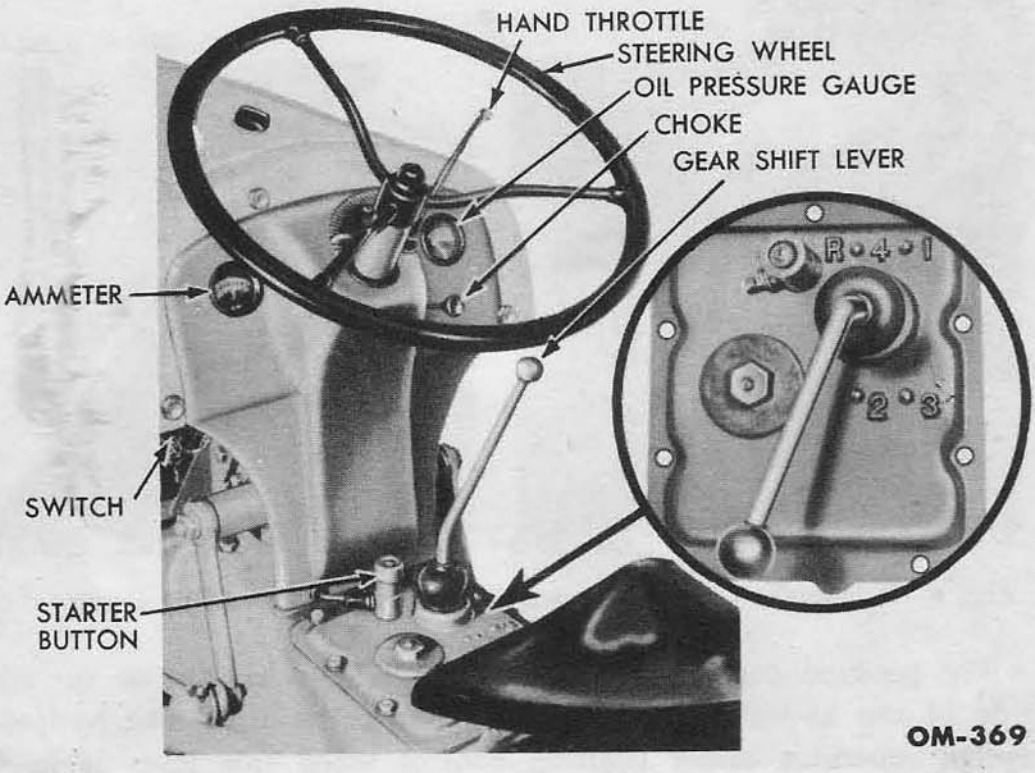


Fig. 5—Operator's Controls

brakes should be used individually to assist in making short turns, and both brakes should be applied to bring the tractor to a stop.

b. Throttle Control. The hand-throttle control is located on the right side of the steering column. The throttle controls the engine speed through a flyball mechanical governor.

c. Clutch Pedal. The clutch pedal is located on the left of the transmission housing. The clutch pedal is depressed to release the transmission from the engine. Avoid operating the tractor with the foot resting on the clutch pedal as this results in premature clutch wear.

d. Gearshift Lever. The gearshift lever is on top of the transmission housing and forward of the seat. Fig. 5 shows the position of the lever for the five gear ratios. The gearshift position is marked on the transmission cover plate for all gears.

e. Power Take-off Lever. The power take-off lever (fig. 3) is part of the inspection plate assembly on the left side of the center housing. In the forward position the power take-off is disengaged. Depress the clutch pedal when engaging or disengaging the power take-off shaft while the engine is running.

f. Hydraulic Control. Constant implement draft and position control are the two types of automatic control incorporated in the Ford tractor hydraulic system.

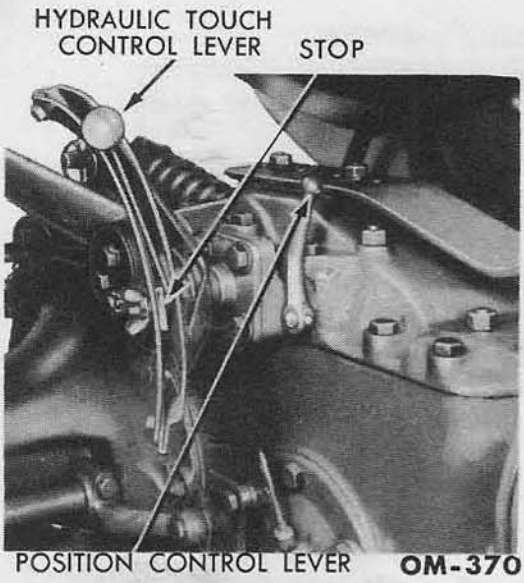


Fig. 6—Hydraulic Control Levers

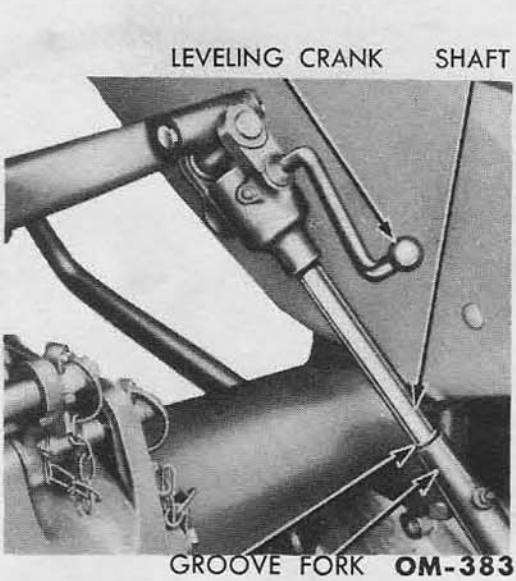


Fig. 7—Leveling Crank

The position control lever is the small lever located on the right side of the hydraulic control cover under the seat. The hydraulic system operates under position control when this lever is in the vertical position, and under constant draft control when it is in the horizontal position.

The hydraulic touch control lever is the large lever located directly behind the position control lever. The hydraulic touch control lever is the master control lever of the hydraulic system, and positioning it governs both the constant implement draft and the position control (fig. 6).

When raising the hydraulic touch control lever, the drawbar or implement will raise. The power take-off shaft must be engaged to operate the hydraulic system. The hydraulic lift mechanism must not be used when the drawbar stays are installed on the tractor. The drawbar stays are the two steel braces installed between the drawbar and the top link yoke.

Constant draft is the control commonly used with tillage tools. The implement will operate at a predetermined depth as long as the soil is uniform. The constant draft control will automatically reposition the implement as needed when crossing ridges and ditches.

The position control is used when implement adjustment is controlled by the position of the lower links. The use of this control also maintains a constant tillage tool depth when operating on level ground regardless of soil variations.

Some hydraulically controlled, pull type, disk harrows, scoops, and grain drills are examples of tools with which the position control may be used.

Turning the leveling crank, located to the right of the operator and in back of the tractor seat, raises or lowers the right lower link. This action will level the 3-link mounted implements to give the desired performance. The two lower links are level when the groove on the shaft is just visible above the fork (fig. 7).

122. INSTRUMENTS AND GAUGES.

Instruments and gauges are provided so that an operator can easily check the performance of the tractor during operation.

a. Ammeter. The induction type ammeter, located on the left-hand side of the instrument panel, indicates the amount of current flowing into or from the battery. The current flow is controlled by the generator regulator, and will vary with the electrical load and condition of the battery. When the battery is fully charged the ammeter will indicate a lower charging rate.

b. Engine Oil Pressure Gauge. The oil pressure gauge, located on the right side of the instrument panel, indicates the oil pressure at the engine bearings. The gauge should read 27 pounds per square inch at 1500 R.P.M., or half throttle, when the engine is at operating temperature. The oil pressure will be higher than normal when the engine is cold. The oil pressure will decrease as the engine speed is decreased. Failure of the gauge to indicate pressure is usually caused by a low oil level in the crankcase. If the pressure is low, the oil level should be checked immediately.

c. Fuel Shut-off Valve. The fuel shut-off valve is located on the left side and below the gasoline tank (fig. 2). The valve is turned to the right to shut off the fuel. Opening the shut-off valve two turns will allow the main fuel supply to be fed to the carburetor. One gallon of fuel, called the reserve supply, cannot be used with the valve in this position. By opening the shut-off valve wide open, the reserve fuel can be used. The operator may drive the tractor on this reserve fuel to the source of refill.

d. Choke Rod Button. The choke button is located on the right-hand side of the instrument panel (fig. 5).

e. Starter Button. The starter button is located to the left of the gearshift lever (fig. 5). It is equipped with a safety latch which will allow the starter button to complete the starting motor circuit only when the gearshift lever is in the neutral position.

f. Ignition Switch. The ignition switch is located on the lower left-hand corner of the instrument panel (fig. 5). The ignition switch is ON when the key is in the vertical position.

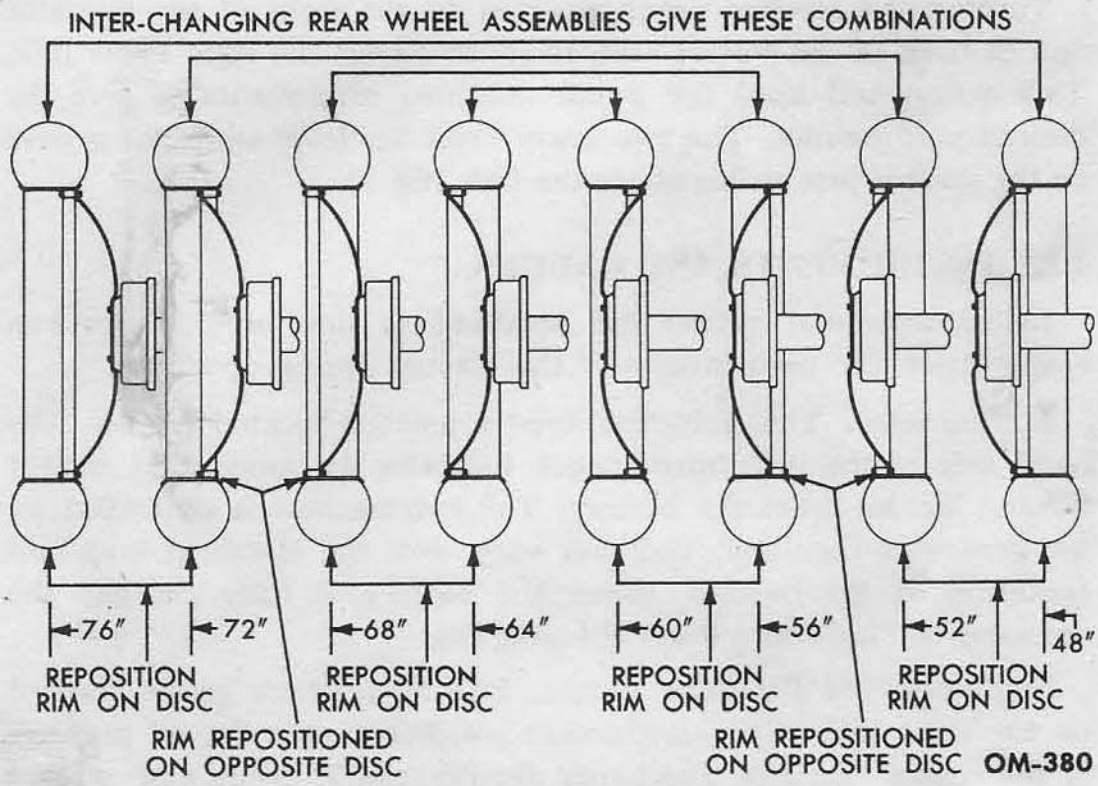


Fig. 8—Rear Wheel Tread Adjustment

g. Oil Level Gauges. The bayonet gauge for the engine oil level is located on the left-hand side of the engine block (fig. 2). The transmission and hydraulic oil level gauge is located on the right-hand side of the center housing (fig. 4). Both oil level gauges have calibrations showing the full and minimum oil levels.

h. Radiator Cap. The radiator cap is of the pressure type. It must have an air-tight fit for the engine to have efficient cooling. When removing the cap, turn it slowly to the first notch. After the vapor pressure has escaped, the cap can be safely removed.

123. TREAD WIDTH ADJUSTMENT.

A large selection of wheel spacing is provided to satisfy the requirements of field crops.

a. Rear Wheels. The rear wheels are adjustable from 48 to 76 inches tread in 4-inch spacings. Tread width settings are made by changing the position of the steel disks and the rims. The tread is widened by installing wheel disks in convex or concave position and/or by installing rims in any of the four positions as shown in fig. 8. To make the change from 52 inch tread to 72 inch tread, it is only necessary to change the wheels from one side of the tractor to the other. Other wheel changes are similar and are shown in fig. 8.

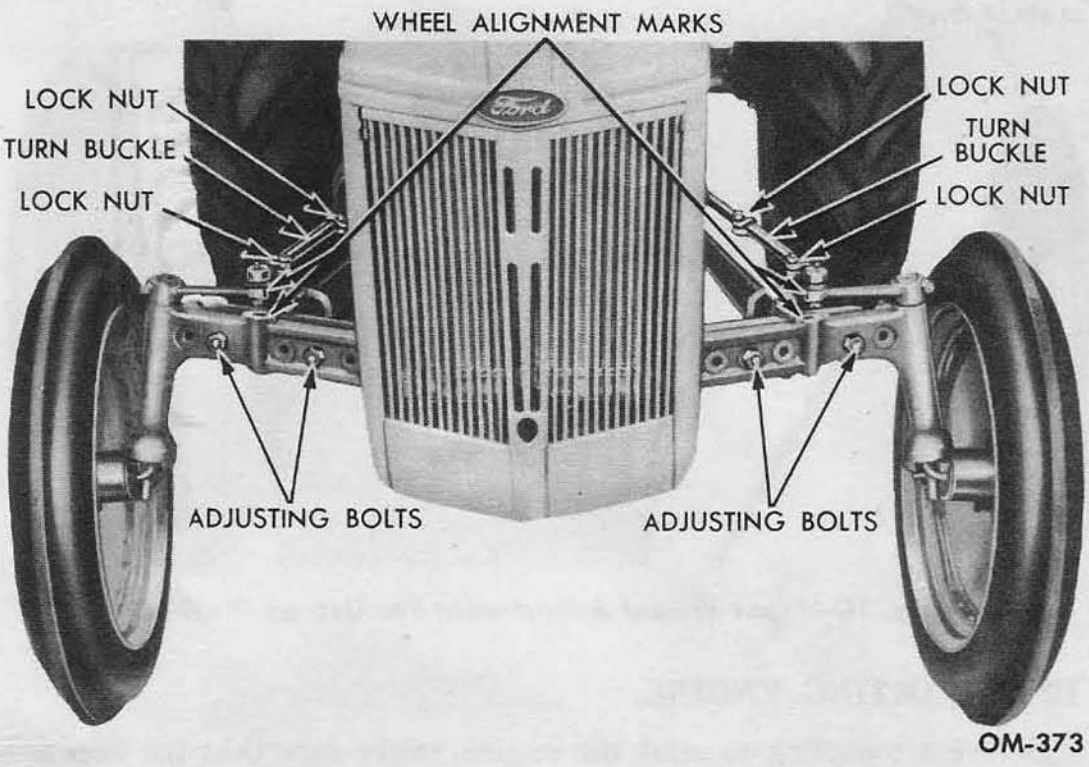


Fig. 9—Front Wheel Tread Adjustment

NOTE: ***In making tread adjustments, the arrow on the side wall must always point in the direction of the rotation of the wheel during forward travel, thus assuring proper cleaning of the tire tread.***

b. Front Wheels. The front wheels are adjustable from 48 to 76 inches in 4-inch spacings. The 48 to 72-inch spacings are obtained by jacking up the front end of the tractor and removing the four bolts holding the three sections of the front axle (fig. 9). Move the front wheels to the desired tread width, and replace the four bolts. Always have at least one open hole between the bolts. The 76-inch wheel spacing is obtained by reversing the front wheels and setting the axle for the 68-inch tread. It is possible to obtain front wheel tread spacings wider than the 76-inch setting, however, these are not recommended.

The drag link must be adjusted when changing the wheel tread. With the steering wheel in the center position, loosen the lock nuts on the drag links and turn the turnbuckle with the plow wrench until the steering arm is centered over the front axle locating mark. Tighten the lock nuts on the turnbuckle. Adjust the other drag link by the same procedure. This will assure obtaining the desirable amount of toe-in of the front wheels. If desired, one front wheel may be set out for use as a marking or guide wheel (fig. 10).

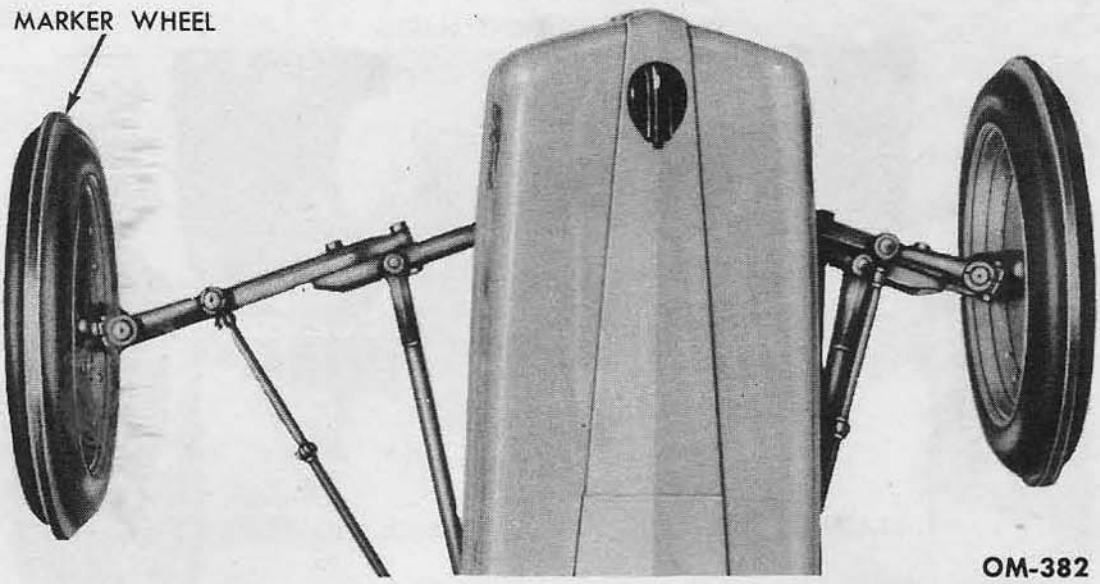


Fig. 10—Front Wheel Adjustment For Use as Marker

124. STARTING ENGINE.

Before attempting to start the engine, make sure that the function of each control and instrument is thoroughly understood. The gearshift lever must be in neutral (fig. 5) before the starter button can be depressed.

To start the engine, turn the ignition switch on, and partially open the throttle. Hold the clutch pedal down, and press the starter button. If the engine does not start promptly, pull the choke button out for several engine revolutions. Use the choke as needed until the engine runs smoothly. During cold weather it may be desirable to let the engine run at approximately 1/3 throttle for 5 minutes to warm up.

NOTE: ***If the engine is hot and does not start promptly, pull the hand throttle down while the engine is being cranked. Do not use the choke. If the engine fails to start, refer to section 221.***

125. OPERATION.

Successful and economical operation of the tractor depends largely upon the skill of the operator. This section gives the essential operating principles.

a. Setting the Tractor in Motion. Before attempting to set the tractor in motion, make sure that the brakes are released. After the engine is running smoothly, fully depress the clutch pedal (fig. 2), and move the gearshift lever to the desired gear. Slowly release the clutch pedal as you increase the engine speed. Increase the engine

speed until the tractor is traveling at the desired speed. The tractor should be started in the same gear in which it is to be operated.

NOTE: ***Do not shift gears while tractor is in motion as the transmission may be damaged.***

b. Steering Tractor. The steering wheel turns the front wheels which will steer the tractor. The brakes, used independently, may be used to assist in making short turns and when pulling heavy loads.

c. Choice of Gear Ratios. By intelligent selection of the working gear for a particular field operation, the operator can save fuel and engine wear. Tractors operating in a low gear with a light load and high engine speed are wasting fuel. An engine operating at a high speed and a light load is running with a high manifold vacuum and a low compression pressure which cause inefficient combustion. "Lugging" is a term applied to a condition of excessive engine load for a selected gear and throttle setting. Lugging of an engine increases the wear. The Ford tractor has four forward speeds (fig. 5) to provide for different operating conditions.

	Speed at 1500 R.P.M.
1st for heavy work	2.54 M.P.H.
2nd for plowing	3.28 M.P.H.
3rd for cultivating	4.51 M.P.H.
4th for light work	9.40 M.P.H.

d. Use of Gauges. The operator should be familiar with the ammeter and oil pressure gauges and read them frequently while operating the tractor. When these readings appear abnormal, the engine should be stopped and the cause determined.

e. Stopping the Tractor. Depress the clutch pedal, and at the same time reduce the engine speed. Apply the brakes as needed. The gearshift lever should be shifted to neutral and the brakes set.

f. Hydraulic Control and Leveling Crank. The operator may adjust the hydraulic controls and leveling crank (figs. 6 and 7) while the tractor is in motion to obtain the desired implement performance (sec. 121). Position the hydraulic touch control lever stop so the lever can be immediately positioned when lowering the implement. Temporary changes of the lever position may be made beyond the stop.

g. Belt Pulley Operation. The belt pulley should be installed as outlined in section 127. The tractor must be positioned so the drive and driven pulley shafts are parallel and a line connecting the two pulleys is perpendicular to the pulley shafts. The belt tension is adjusted by slowly driving the tractor away from the driven

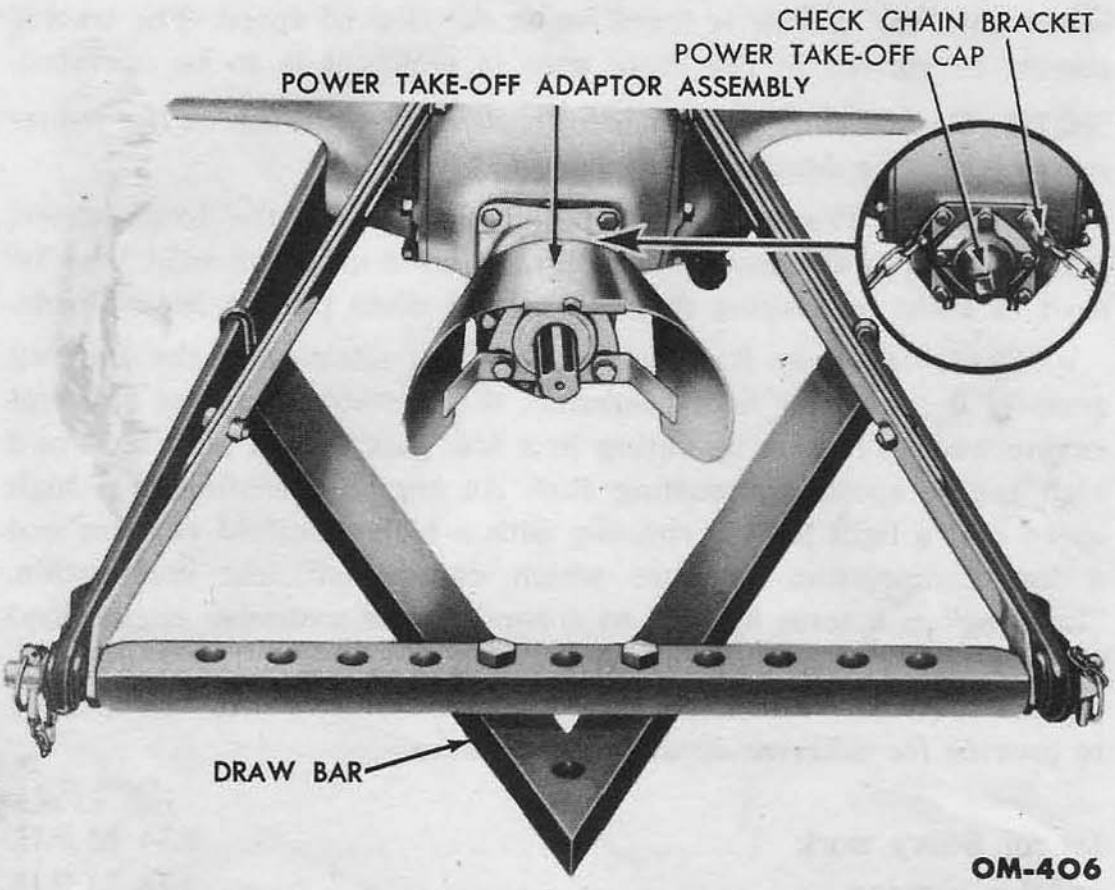


Fig. 11—Power Take-off Adapter Installed

pulley. When the desired tension is obtained, set the wheel brakes and place blocks behind both rear tires. While adjusting the belt tension it may be necessary to slip the clutch. Never slip the clutch more than absolutely necessary. To start the pulley rotating, depress the clutch pedal (fig. 2), engage the power take-off shaft (fig. 3), and slowly release the clutch pedal as the engine speed is gradually increased. Large changes in throttle setting should be made slowly except in emergencies. Short belts must be kept tight to reduce slippage. Belt dressing should only be used as a last resort to reduce slippage. Grounding the tractor will prevent the building of a static charge while using the belt.

126. POWER TAKE-OFF.

The power take-off is used to transfer engine power direct to mounted and drawn implements, and to the belt pulley.

a. Power Take-off Adaptor. The power take-off adaptor has a 1⅜-inch spline shaft and meets the American Society of Agricultural Engineer's specifications for a standard tractor hitch. Any implement built to these standards may be hitched to the Ford tractor without the purchase of additional accessories. The power take-off safety

shield is built to A.S.A.E. standards and will attach to the implement power shaft shield.

NOTE: ***Always use this shield. It is designed to protect the operator.***

To install the power take-off adaptor, first remove the power take-off cap (fig. 11). Remove the four cap screws which hold the check chain brackets to the center housing. Insert the power take-off adaptor over the spline of the power take-off shaft with the grease fitting on the bottom, and fasten it to the center housing with the four cap screws (fig. 11). Drawbar stays should always be used when using the power take-off adaptor. Adjust the drawbar stays to give a drawbar height of 12 inches. Install the drawbar extension. To remove the power take-off adaptor, follow reverse procedure for installation.

NOTE: ***Check chain must be attached with the short section of the bracket on top (fig. 11). If the brackets are not installed correctly, it is impossible to raise the lower links to the top of their travel, thus resulting in excessive pressure in the hydraulic pump.***

b. Power Take-off Speeds. The Ford tractor engine has a dual speed rating of 1500 and 2000 R.P.M. A.S.A.E. standards call for a power take-off speed of 526 to 546 R.P.M. The 1500 R.P.M. engine rating meets the A.S.A.E. power take-off speed standard. Implement manufacturers design their tools for this power take-off speed.

NOTE: ***The 2000 R.P.M. engine rating is for belt and general field use.***

127. BELT PULLEY.

American Society of Agricultural Engineers have standardized the belt speed on farm tractors. Using the standard 9-inch pulley (fig. 12), this belt speed is obtained at the 2000 R.P.M. engine rating. A belt-driven implement designed to these standards will be run at the correct speed without changing any pulleys. Some implements do not meet this standard and others have had the driven pulley changed. For these reasons, it is advisable to use a revolution counter or tachometer to check the driven pulley speed.

The following formulas may be used in calculating belt pulley sizes and pulley speeds:

(a) The diameter of the driven pulley equals the R.P.M. of the drive pulley multiplied by the diameter of the drive pulley divided by the R.P.M. of the driven pulley.

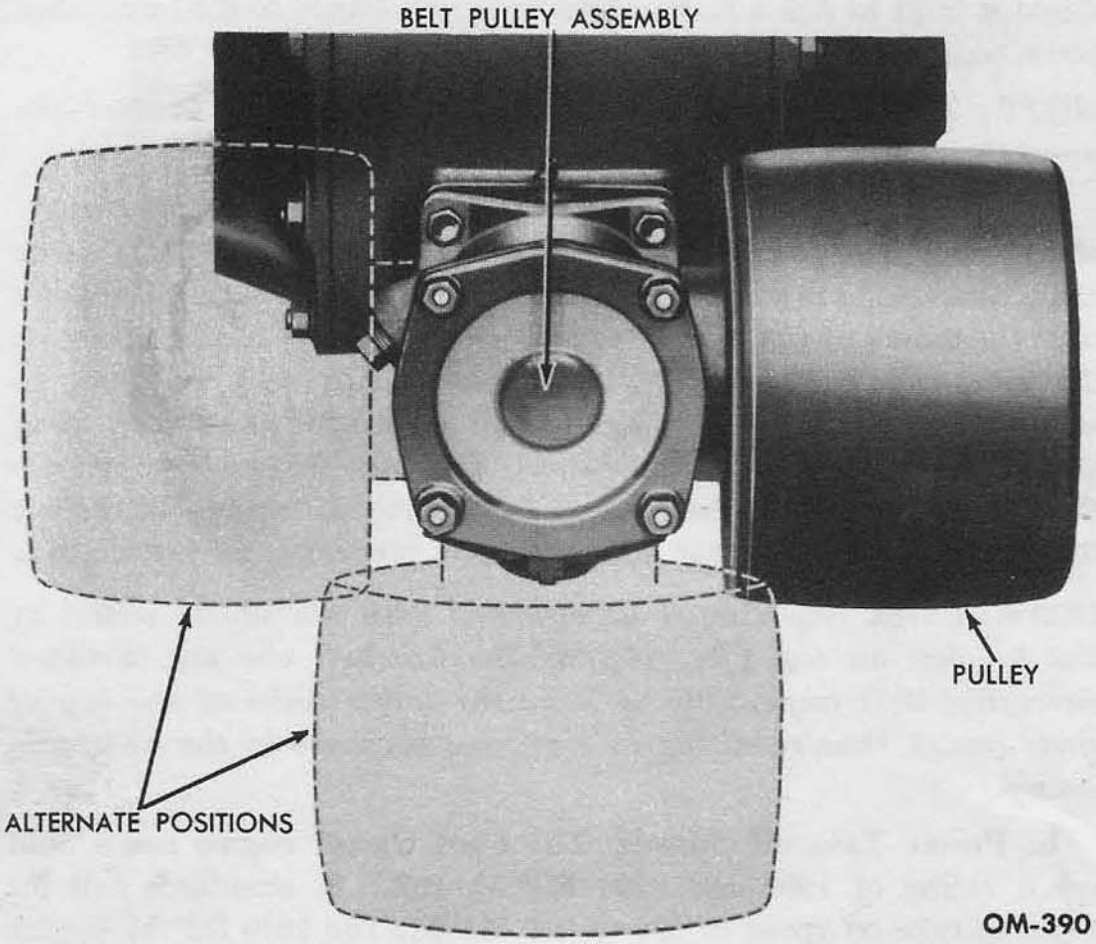


Fig. 12—Belt Pulley

(b) The diameter of the drive pulley equals the R.P.M. of the driven pulley multiplied by the diameter of the driven pulley divided by the R.P.M. of the drive pulley.

(c) The R.P.M. of the driven pulley equals the R.P.M. of the drive pulley multiplied by the diameter of the drive pulley divided by the diameter of the driven pulley.

(d) The R.P.M. of the drive pulley equals the R.P.M. of the driven pulley multiplied by the diameter of the driven pulley divided by the diameter of the drive pulley.

(e) The belt speed in feet per minute equals the R.P.M. of the pulley multiplied by the circumference of the pulley in feet.

(f) The R.P.M. of the pulley equals the belt speed in feet per minute divided by the circumference of the pulley in feet.

NOTE: ***The circumference in feet may be obtained by multiplying the pulley diameter in feet by 3.1416.***

a. Belt Pulley Installation and Pulley Positions. The belt pulley may be installed in three positions.

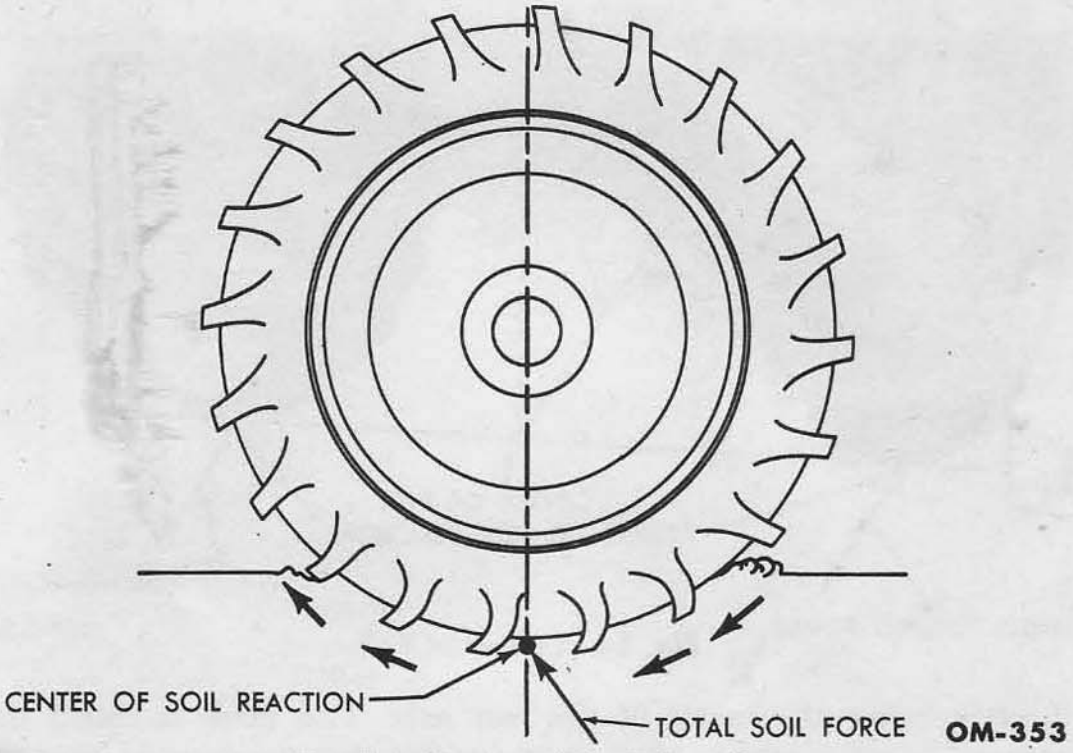


Fig. 13—Center of Soil Reaction

The two horizontal positions are the most common used (fig. 12). The direction of the pulley rotation is reversed by changing the position of the pulley from one side to the other. Choice of the horizontal position will allow the operator to use a straight or crossed belt. It will also allow the tractor to be shifted to the right or left if it is desirable.

The vertical position (fig. 12) is used where the driven pulley is vertical.

NOTE: ***Do not install the pulley in the vertical position above the power take-off shaft.***

To install the belt pulley assembly, remove the power take-off cover (fig. 11). Remove the four cap screws which hold the two lower link check chains. Engage the spline of the pulley assembly on the power take-off shaft. Rotate the pulley assembly to the desired position and secure it with the four cap screws. To remove the pulley assembly, reverse the mounting procedure.

NOTE: ***Check chains must be attached with the short section of the bracket on top. If they are not installed correctly, it will be impossible to raise the lower links to the top of their travel, thus resulting in excessive pressure in the hydraulic pump.***

128. HITCH ADJUSTMENTS.

Pulling forces on a tractor drive wheel equipped with rubber tires may be considered concentrated at a point near the ground level and

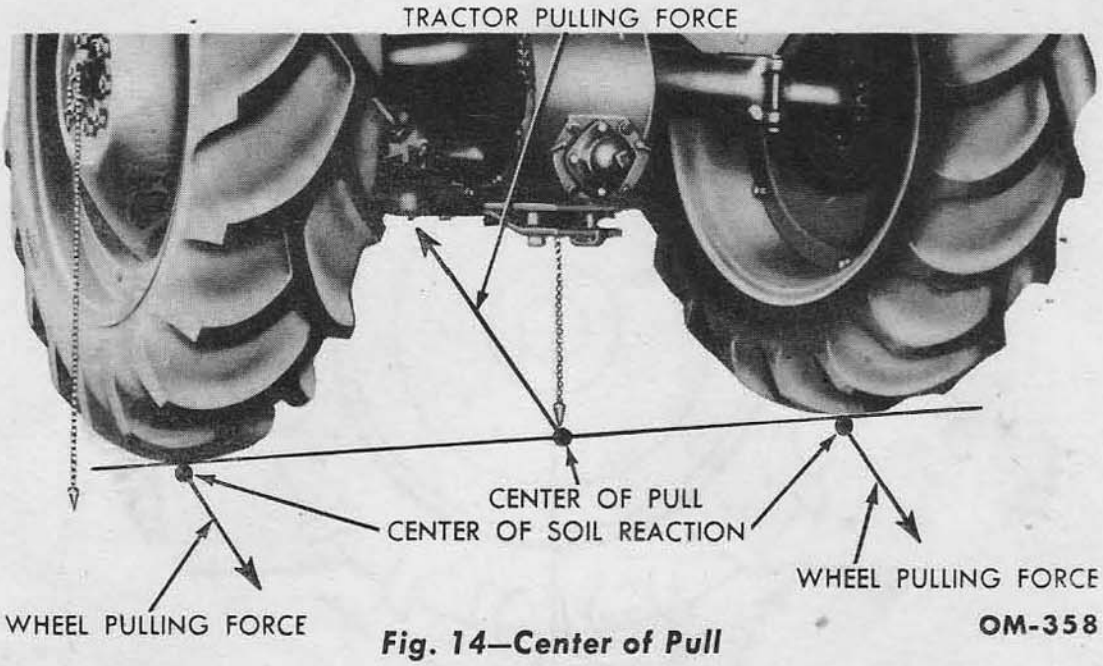


Fig. 14—Center of Pull

directly below the center of the rear axle. This point is called the center of soil reaction. Fig. 13 illustrates the direction of the soil forces, total soil force, and the location of the center of soil reaction.

Half-way between the center of soil reaction of each wheel is the balance point of the tractor pulling forces. This is called the center of pull (fig. 14). Hitch adjustments must be considered from the center of pull. On the Ford tractor the center of pull is near the ground level, and directly below the rear axle midway between the rear wheels.

a. Vertical Hitch Adjustment. The load hitch point is above the center of pull when using a drawbar. This hitch position reduces front wheel weight and increases rear wheel weight. Additional traction is obtained from this weight transfer. Any additional traction without

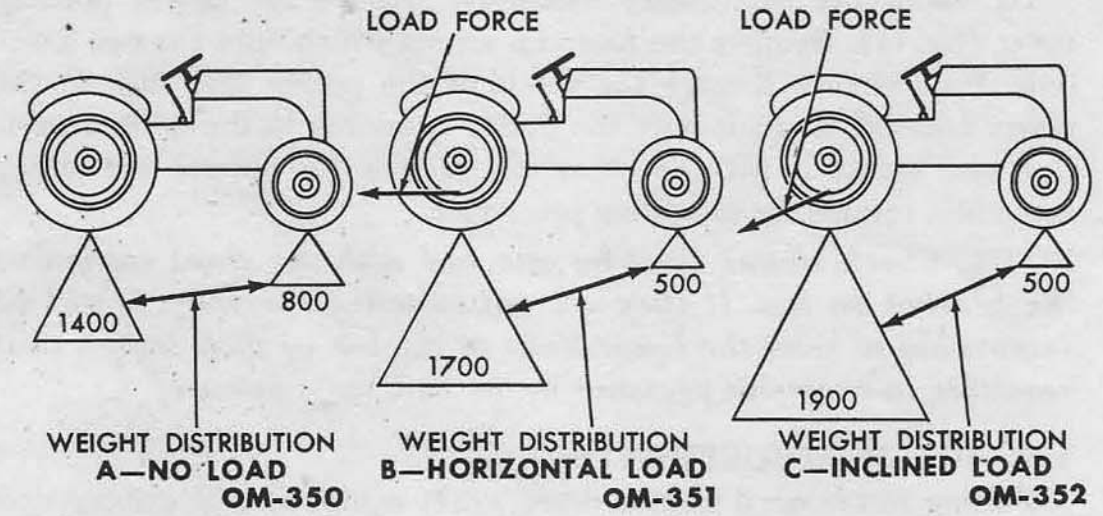


Fig. 15—Vertical Hitch Adjustments

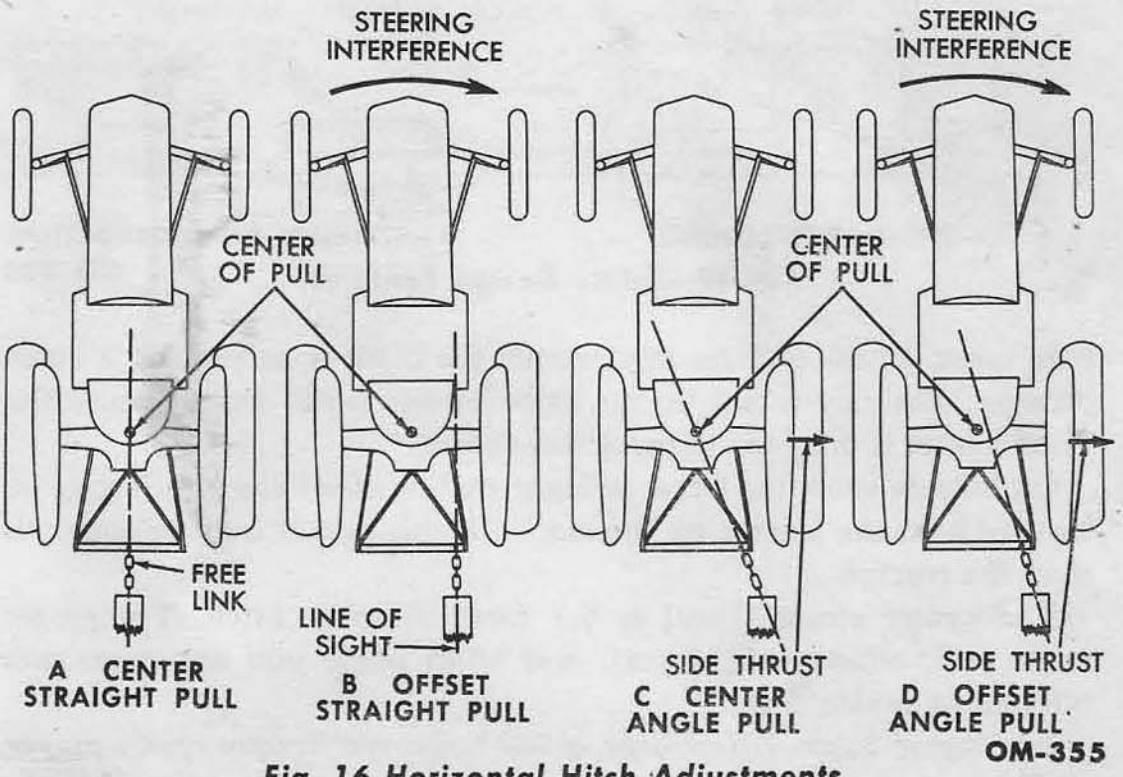


Fig. 16 Horizontal Hitch Adjustments

adding extra weight is a saving in fuel. Compare fig. 15 A, B, and C.

If the center of load is below hitch point, additional traction is secured. Fig. 15C illustrates how additional traction is obtained.

As a general rule, the higher the hitch point, the more weight is transferred from the front wheels to the rear wheels.

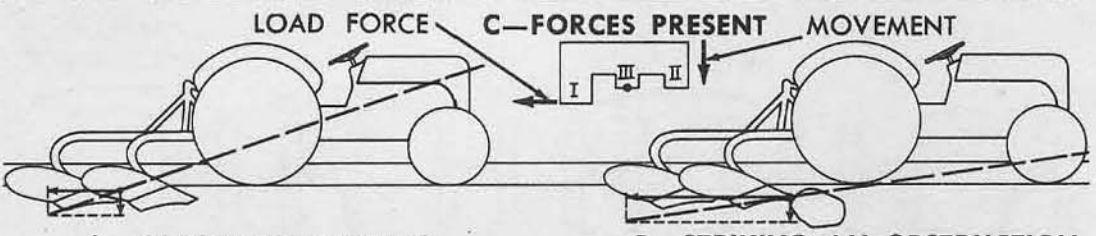
CAUTION: ***A tractor drawbar should be adjusted to have sufficient front end weight for steering and safety (sec. 129). Pull only from the drawbar. Pulling from the top link or the rear axle is definitely dangerous.***

The Ford tractor drawbar height may be adjusted with the hydraulic touch control lever (fig. 6) when not using drawbar stays.

b. Horizontal Hitch Adjustment. The field method of determining the correct horizontal drawbar hitch is by inserting a short chain or clevis as a free link between the implement and tractor hitch point (fig. 16). When under load, the free link will take a line connecting the hitch point and the center of load (fig. 16). The center of load is the balance point of the load forces. By sighting down the free link (clevis or chain), it is possible to determine the position of this line with reference to the center of pull. Study fig. 16 A, B, C, and D to determine the type of hitch and operating characteristics.

If different hitch characteristics are desired, move the hitch point to the right or left as needed.

The best hitch for a particular operation may be any one of the



A—ORDINARY PLOWING B—STRIKING AN OBSTRUCTION OM-405

Fig. 17—Safety Design Features

four types. In many farm implements the hitch is necessarily a compromise. The side thrust on the drive wheels is not serious, since the Ford tractor is designed to carry this thrust.

On hillside work the offset straight pull or offset angle pull may be used to hold the tractor on the slope. In this case it may be easier to steer the tractor.

The center straight pull is the most common hitch. The center angle pull, offset straight pull, and offset angle pull are sometimes referred to as side draft.

Intelligent hitch adjustment gives improved tractor performance and ease of operation.

c. Mounted Implement Hitch. Mounted and drawn implements have the same hitch principles. Implements engineered by Dearborn Motors, Inc. are designed for the Ford tractor and hitch adjustments are engineered in the design. For details of individual mounted implement adjustments, refer to the implement instruction book.

Fig. 17 shows the load force line when plowing under ordinary conditions. When an obstruction is hit, the horizontal load force is greatly increased and the center of load is lowered. Compare horizontal load forces in fig. 17A and B. The load force line is lowered and is much flatter when the obstruction is hit. This tends to increase the front end weight. Fig. 17C illustrates some of the forces present when the plow hits an obstruction. When a pull is exerted on point I, there is a tendency to force point II down since point III is the pivot point. Points I, II and III represent the following:

I—Load force
II—Front wheels
III—Rear wheels

Mounted plow hitch principles and adjustments are outlined in Part FOUR.

d. Swinging Drawbar. A swinging drawbar may be used on many drawbar loads. It is easier to turn the tractor when the swinging drawbar is used. This is acomplished by reducing the moment arm (leverage) of the load which is resisting the turning effort, as shown in fig. 18.

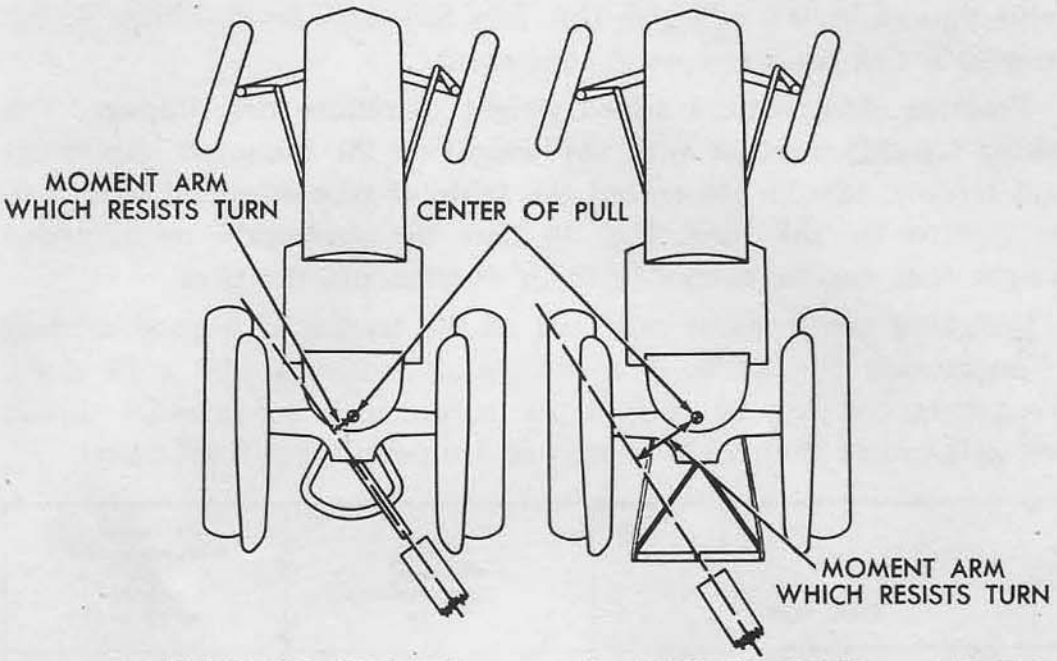


Fig. 18—Turning With a Drawbar Load

e. Wheel Weight. In many farming operations it is desirable to add weight to the tractor to increase traction. Liquid in tires is the most popular method of adding weight as the weight is in the tire where it is the most beneficial. Calcium chloride solution has the advantage of a low freezing point and of weighing more per gallon than water. In a few cases, liquid is added to the front tires as a counterbalance for a heavy implement that is to be transported on the three links. Fluid in tires has the advantage of placing weight where it is needed and not interfering with tractor use. However, unneeded weight added to the tractor will result in a waste of fuel and added load on the engine, therefore weight should be added only if necessary. Fig. 19 shows maximum recommended tire liquid capacities. This table is based on the tires being 90% full with 5 pounds of calcium chloride per gallon of water. The addition of this amount of calcium chloride will prevent freezing. Multiplying the

SIZE OF TIRE	MAXIMUM CALCIUM CHLORIDE SOLUTION		
	Pounds Calcium Chloride	Gals of Water	Weight of Solution Pounds
10.00 x 28—4-ply	116	23	310
6.00 x 16—4-ply	30	6	80
6.00 x 16—6-ply	30	6	80
4.00 x 19—4-ply	15	3	40

Fig. 19—Maximum Recommended Tire Fluid Capacities

table figures by 0.8 will give the data for valve level filling. To fill tires 90% full requires special equipment.

Tractors often require added weight to reduce tire slippage. The added weight, together with the weight of the mounted implement and tractor, should not exceed the table of recommended weight to be carried by the tires. Fig. 20 lists the maximum recommeded weight that can be carried without overloading the tires.

Weighing the front or rear end of the tractor is a good method of measuring tire loads. A tractor equipped with 4.00 x 19—4-ply front tires carrying 26 pounds per square inch air pressure should not weigh more than 1,100 pounds or 550 pounds per front wheel.

TIRE SIZE	Tire Pressure Lbs. Per Sq. In	Maximum Recommended Tire Loads Per Wheel (Pounds)
Rear Wheels:		
10.00 x 28—4-ply	12	1575
10.00 x 28—4-ply	14 Max.	1720
Front Wheels:		
4.00 x 19—4-ply	20	470
4.00 x 19—4-ply	24	525
4.00 x 19—4-ply	26	550
4.00 x 19—4-ply	28 Max.	575
6.00 x 16—4-ply	20	750
6.00 x 16—4-ply	24	835
6.00 x 16—4-ply	26	875
6.00 x 16—4-ply	28 Max.	915
6.00 x 16—6-ply	20	750
6.00 x 16—6-ply	24	835
6.00 x 16—6-ply	26	875
6.00 x 16—6-ply	28	915
6.00 x 16—6-ply	32	990
6.00 x 16—6-ply	36 Max.	1065

Fig. 20—Maximum Recommended Tire Loads

f. Tire Slippage. When a tractor pulls a load, there is a measurable tire slip. Excessive slippage causes additional tire wear and fuel consumption. For example, if 10 rear wheel revolutions should have given 120 feet of travel but slippage reduced this to 90 feet, there is a slip of 25 per cent.

The tractor operator may measure slip by first counting the rear wheel revolutions required to travel 100 feet at no load. Drive the tractor under load the same number of rear wheel revolutions. The difference in the distance traveled in feet in the two runs is the per cent of slip. Slip in excess of 12 per cent will cause excessive tire wear. Excessive slip may be reduced by adding weight to the tractor or reducing the drawbar load.

Economical operation is achieved by using the least amount of weight necessary to keep slippage at a reasonable value.

129. SAFETY.

The Ford tractor embodies all the safety features consistent with good performance. This section describes these safety features, and gives many helpful hints on accident prevention.

a. Four-wheel Construction. Field crops determine the necessary row clearance and wheel spacing. Additional tractor stability is secured by building the tractor as low as possible and with four-wheel construction. A low four-wheel tractor can be turned quickly with additional safety. The safe turning speed on level ground may not be safe on a slope. A negative bank of 20 degrees will reduce the safe turning speed about 25 per cent.

b. Hitch Construction. Drawbar linkage is designed as a built-in safety feature. If the front end should start to raise under load, the drawbar is rapidly lowered which greatly reduces the effectiveness of the force tending to overturn the tractor.

c. Safe Starting. It is necesary for the transmission to be shifted to neutral before the starting motor can be operated through the starter button. This prevents starting the engine when the tractor is in gear and greatly reduces the possibility of a serious accident.

d. Power Take-off Shield. The shield on the power take-off adapter meets the standards of the American Society of Agricultural Engineers. Power shaft shields on implements will fit this shield. Always use the power shaft shield. It is provided for your protection.

e. Dangerous Conditions. The following dangerous conditions should be carefully noted. By following the simple precautions given here, accidents can be avoided.

(1) *REAR WHEELS FROZEN TO THE GROUND.* If the rear tractor wheels are frozen solidly to the ground, it is possible for the tractor to rotate around the rear axle. Under these conditions it is advisable to back the tractor to free the wheels. The front wheels of the tractor will not raise in reverse gear. If backing the tractor is

impossible, be prepared to disengage the clutch quickly while attempting to move forward.

(2) *VERY HIGH HITCH.* The tractor hitch is the part of the tractor designed for pulling. Pulling from the top link, or from the axle housing, can cause the front end of the tractor to raise under ordinary loads. *Always hitch to the drawbar.*

f. Avoiding Accidents. Avoid accidents by:

(1) Reducing speed on turns.

(2) If the front end tends to raise, use reverse gear. If the tractor must move forward, be prepared to disengage the clutch.

(3) When pulling, use the drawbar.

(4) Use good judgment when pulling loaded wagons in high gear.

Your tractor has many built-in safety features, however, good judgment is the best accident preventive.

Chapter

III

STORAGE

131. PREPARING TRACTOR FOR STORAGE.

Tractors which are used only seasonably should be protected while in storage. The following operations are suggested:

(1) Drain and refill transmission with clean oil.

(2) Drain and refill the engine crankcase.

(3) Install new oil filter element and service oil breather cap.

(4) Remove the air cleaner and wash element in the body of the filter.

(5) Install the air cleaner and refill with clean oil.

(6) Repack front wheel bearings.

(7) Apply pressure gun grease to all fittings.

(8) Drive the tractor to insure that all parts are coated with clean oil.

(9) Place the tractor in a dry shed.

(10) Remove the spark plugs and pour clean oil into each cylinder. After turning the engine several revolutions, replace the plugs. This will coat the combustion chamber with an oil film.

(11) If tractor is weighted with water in the tires, they should be drained to prevent possible damage from freezing.

(12) Drain the fuel tank and leave the cap off to allow air circulation.

(13) Stuff a rag in the end of the tail pipe.

(14) Remove the battery and place in storage.

(15) Place blocking under the tractor axles to remove the weight from the tires.

132. REMOVING TRACTOR FROM STORAGE.

Tractors which have been placed in storage should be completely serviced before use. The following operations are recommended.

(1) Inflate the tires to recommended pressure, and remove the blocking under the tractor axles.

(2) Fill cooling system.

(3) Fill fuel tank.

(4) Check oil level in crankcase, rear end and transmission, and air cleaner. Change if dirty.

(5) Install fully charged battery.

(6) Tighten cap screws and nuts on tractor.

(7) Start the engine and let it idle a few minutes. Be sure the engine is receiving lubrication and that each control is functioning correctly.

(8) Drive the tractor without a load to be sure it is operating satisfactorily.

(9) Lubricate all fittings.

Part TWO
MAINTENANCE AND TROUBLE SHOOTING

Chapter
I
LUBRICATION and ENGINE TUNE-UP

211. LUBRICATION.

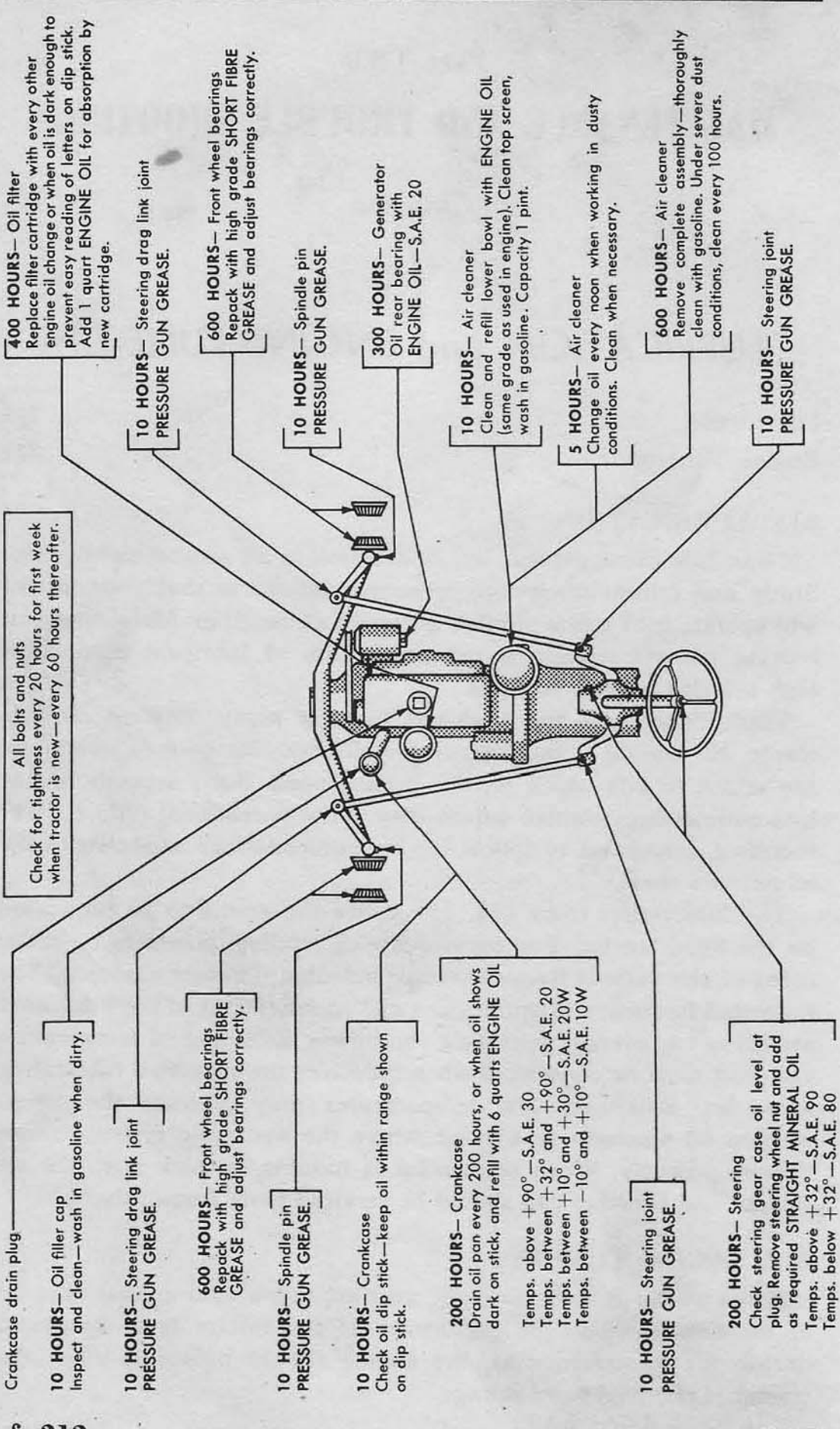
Clean lubricants prevent self destruction in all mechanical devices. Study and follow lubrication recommendations so that your tractor will operate with a film of oil or grease in all bearings. Metal-to-metal bearing contact without a protecting film of lubricant soon ruins high velocity bearing surfaces.

Transmission oils are produced to meet many different requirements. No one oil is satisfactory for all uses. Compounds sometimes are added to oils which form a gum deposit. Such deposits on the hydraulic system control valves may cause operational failure. It is, therefore, important to follow the recommendations as shown in the lubrication chart.

The lubrication chart (fig. 21) shows the points to be lubricated on the Ford tractor. For convenience in reading, points to be lubricated at the various frequencies are indented different amounts. The suggested frequency of application and specifications of the lubricants are given for average operating conditions. Extremes of temperature and dust must be considered when following the suggested lubricating schedules. Extremely low temperatures may increase the transmission oil viscosity to a point where the hydraulic system cannot operate properly. When the tractor is running in thick dust, the air cleaner and breather cap should be serviced more frequently.

212. ENGINE TUNE-UP.

If the tractor is to be used the year around, a semi-annual tune-up of the engine should be performed. If the tractor is to be stored during the winter months, the engine should be tuned when the tractor is removed from storage.



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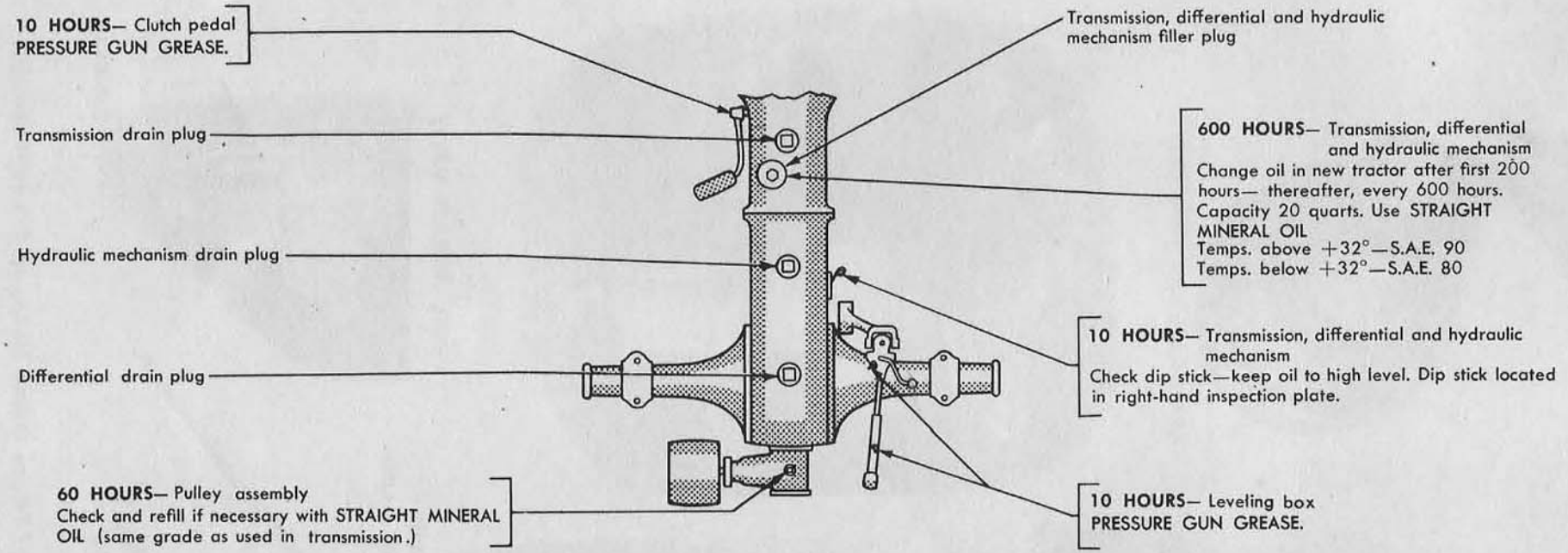

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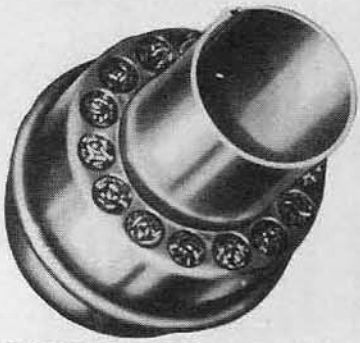
Fig. 21—Lubrication Chart

LUBRICATING STEERING GEAR



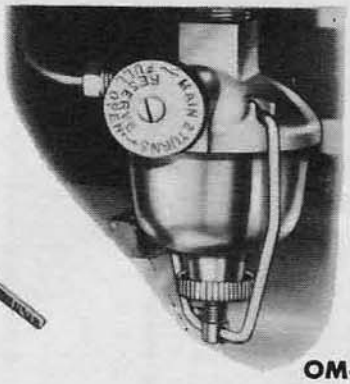
CRANKCASE BREATHER CAP

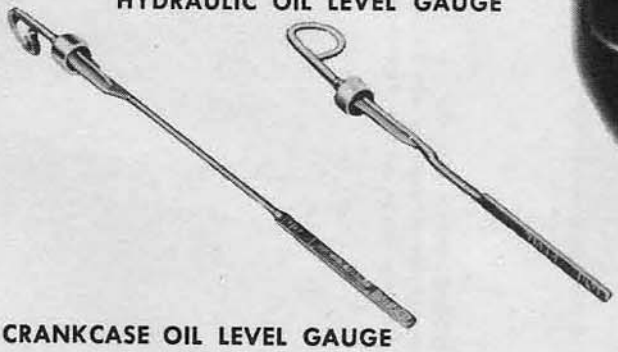
OIL FILTER

AIR CLEANER

TRANSMISSION AND HYDRAULIC OIL LEVEL GAUGE

FUEL SHUTOFF VALVE





CRANKCASE OIL LEVEL GAUGE

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Fig. 22—Frequent Check of These Items Helps to Prevent Trouble

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Tune-up consists of a general conditioning procedure as outlined in the following paragraphs.

a. Spark Plugs. Remove the spark plugs, and have them cleaned with a sand blast cleaner. Set the gaps at 0.025 inch. Replace any plugs that have broken or chipped porcelain, or badly burned electrodes.

b. Compression. Test the compression of each cylinder with a compression gauge. Cylinders with the compression below 90 pounds per square inch have leaking valves or piston rings. Above 140 pounds per square inch compression indicates an excessive accumulation of carbon. If either condition exists, repair is indicated.

c. Cylinder Head. Tighten all cylinder head nuts to approximately 55 pounds-feet, starting from a centrally located nut, and working toward the outer row.

d. Wire Connections. Tighten the wire connections at the ignition switch, generator, generator regulator, coil, starting motor relay, and the starting motor. Clean and tighten the battery terminal connections.

e. Distributor. Check the breaker contacts and replace them if required. Replace the distributor cap and/or terminal plates if they are cracked, have carbon tracks, or are otherwise damaged.

f. Test Spark. Test the length of the spark from each spark plug wire. The spark should jump a $\frac{3}{16}$ to $\frac{1}{4}$-inch gap. If it will not, make the necessary repairs.

g. Generator Regulator. Test the action of the generator and generator regulator as outlined in section 225.

h. Carburetor. Disassemble the carburetor and clean all passages. Reassemble and check for any binding of choke or throttle controls.

i. Fuel Shut-off Valve. Remove the shut-off valve and clean the screens and sediment bowl. Remove the fuel inlet elbow from the carburetor and clean the screen.

j. Adjust Carburetor. Adjust the carburetor idle speed to approximately 500 R.P.M.

k. Air Cleaner. Wash the air cleaner filter assembly in gasoline, and fill the cup to the indicated level with clean oil of the same viscosity used in the crankcase.

Chapter II

TROUBLE SHOOTING

221. ENGINE.

Troubles that are experienced are the result of normal wear, deterioration, or neglect.

The diagnosis of troubles start with symptoms that are apparent and the procedure under one symptom will uncover additional symptoms consecutively until the underlying cause of the trouble and its remedy is apparent.

a. Engine Does Not Develop Full Power. Apparent loss of power may be due to excessive power absorption by the tractor. It may also be due to low power development.

(1) *PRELIMINARY INSTRUCTIONS.* Check for improper governor operation, dragging brakes, improperly loaded tires, restricted exhaust, improper lubrication, or clogged air cleaner.

If the governor is not operating efficiently, the engine will be slow in picking up load and will not reach full rated speed. For adjustment of the governor, see section 345.

Brake drag will be evidenced by the brake drum heating up, even though the brakes have not been applied. To correct this condition, see section 313.

Overloaded tires require excessive power to move the tractor. For correct load limits, see sections 128 and 311.

Make sure that the exhaust pipe has not been bent or plugged with mud.

If the engine has not been properly lubricated, efficiency is reduced and total ruin may result. Follow the instructions on the lubrication chart, section 211.

(2) *WARM UP ENGINE.* Allow the engine to idle until normal operating temperature is reached, and follow whichever of the following conditions that apply:

(a) IF THE VALVES ARE QUIET. If the valves are quiet, proceed with subparagraph (3) below.

(b) IF THE VALVES ARE NOISY. If, with the engine at normal operating temperature, the valves are noisy, either the valve action is sluggish or the spacing is too wide. Wide spacing usually has very little effect on the performance, and since the spacing rarely increases in service, it usually can be assumed that the valve action is sluggish. If the valve action is sluggish with the engine idling, or if there is any evidence of sludge in the oil, or if there is any indication of oil pumping, or excessive carbon, disconnect the air cleaner and slowly pour ¼ pint of light, gum solvent oil into the carburetor throat. The engine speed will slow down as the oil is added. Do not pour the oil in so fast that the engine will stall. This oil will usually free up the valve action, temporarily at least, and should reduce the valve noise.

Add gum solvent to the engine oil (replace the engine oil after 10 hours' operation with a detergent oil).

(3) *CHECK FOR CYLINDERS MISFIRING AT IDLE SPEED.* With the engine running, momentarily short out in turn each spark plug. If the shorting of one or several plugs has no effect on the running of the engine, those particular cylinders are misfiring. Follow the procedure in subpar. (6) below. If this does not correct the misfiring, follow the procedure in subpar. (5) below. If the misfire is now correct or if none of the cylinders were misfiring, proceed with "Test Tractor on Hard Pull" (subpar. (4) below).

(4) *TEST TRACTOR ON HARD PULL.*

NOTE: ***If, during the test, the engine fails to reach or maintain normal operating temperatures, the thermostat may not be operating.***

Accelerate the engine rapidly from idle to half throttle in high gear with the brakes partially applied. Follow whichever of the following conditions that apply:

(a) IF CLUTCH SLIPS UNDER LOAD. If the clutch slips under load, adjust pedal free play or replace the clutch, whichever is required.

(b) IF ENGINE BACKFIRES. If the engine backfires through the carburetor when accelerated rapidly, it indicates the fuel mixture is too lean. Follow the procedure for this symptom under section 223. (Valves holding open or shorted ignition also are possible causes, however, the test under subpar. (3) will have determined if the valves or the ignition are at fault.)

(c) IF ENGINE DOES NOT PING (SPARK KNOCK). If a slight ping cannot be obtained, time the ignition and check the spark advance.

(d) IF ENGINE PINGS EXCESSIVELY. If the engine pings excessively, adjust the timing. If this does not correct the pinging, follow the procedure outlined in subpar. (6) below.

(e) IF ENGINE PULLS EVENLY. If the engine pulls evenly and there is no indication of late spark or excessive carbon, check the fuel system for a lean mixture.

(f) IF ENGINE PULLS UNEVENLY. If the engine pulls unevenly, proceed with subpar. (5) below.

(5) *TEST SPARK AT SPARK PLUG WIRES.* Run the engine at idle speed. Remove the wire from No. 1 spark plug, hold the wire terminal 3/16 to 1/4 inch from the cylinder head, and observe if the spark jumps the gap regularly without missing. Make this test at each spark plug wire. Follow whichever of the following conditions that apply:

(a) SATISFACTORY SPARK FROM ALL WIRES. If a satisfactory spark from all wires is obtained, proceed with subpar. (6) below.

(b) UNSATISFACTORY SPARK. If an unsatisfactory spark is obtained on any cylinder, refer to section 227 for correction of the fault.

(6) *CLEAN AND SPACE OR REPLACE SPARK PLUGS AND TEST COMPRESSION.* Clean and space the spark plugs to 0.025-inch air gap or replace if necessary. Before reinstalling the plugs, test the compression of each cylinder. Compression pressure should be from 100 to 110 pounds per square inch at cranking speed. Follow whichever of the following conditions that apply:

(a) NORMAL COMPRESSION. If the compression is normal, time the ignition.

(b) ABOVE NORMAL COMPRESSION. If the compression of any cylinder is above 140 pounds per square inch, remove the carbon from

the combustion chamber, and while the head is removed, make sure that the valve stems are not gummy.

(c) BELOW NORMAL COMPRESSION. If the compression of any cylinder is below 90 pounds per square inch, remove the cylinder heads and make necessary repairs to the valves, cylinders, or pistons. Compression will be slightly low on new tractors until they are broken in.

(7) *REPEAT TEST ON HARD PULL.* Repeat the test of the engine on hard pull (subpar. (4) above). If the engine now pulls unevenly or still lacks power, the fuel mixture is probably lean. Follow the procedure in section 223.

(8) *TIME IGNITION.* If the above procedure has not corrected the trouble and if this operation has not already been performed, time the ignition.

b. Engine Cranks But Will Not Start. If the engine fails to start when cranked, the fault lies in the ignition or the fuel system. The following procedures will assist in locating the defects.

(1) *PRELIMINARY INSTRUCTIONS.* Make certain the ignition switch is ON and that there is fuel in the fuel tank, and follow the procedure given below for whichever of the conditions that apply:

(a) IF ENGINE IS WET. If the engine is wet, wipe all moisture from the distributor cap, coil, spark plugs, and spark plug wires.

(b) IF ENGINE IS HOT. If the engine is hot, open the throttle and crank the engine. This clears away vapor lock which may be present.

(c) IF ENGINE IS FLOODED. If the engine is flooded (due to repeated attempts to start while the carburetor was choked), release the choke and open the hand throttle. Crank the engine several revolutions to exhaust the surplus fuel.

(d) IF ENGINE IS EXTREMELY COLD. If the engine is extremely cold, make sure that the choke is working, and pull the choke button out to the stop. Hold the clutch pedal down. With the ignition switch ON, press the starter button.

(e) IF ENGINE CRANKS SLOWLY. If the engine cranks slowly, make sure the battery is not partially discharged and that the viscosity of the engine oil is correct for the prevailing temperature. If the cranking speed is still slow, follow the procedure under Starting System, section 226.

(f) IF ENGINE STILL FAILS TO START. If the engine still fails to start after the above procedures have been followed, proceed with the procedures below in the order given until the trouble has been corrected.

(2) *DETERMINE IF FUEL IS BEING DELIVERED TO CARBURETOR.* Remove a drain plug from the carburetor float chamber. If gasoline runs from the drain, it indicates fuel is being delivered to the carburetor.

If no gasoline is observed at the drain on the carburetor, fuel is not reaching the carburetor. Follow the procedure given in section 223, Fuel System.

(3) *DETERMINE IF CURRENT IS BEING DELIVERED TO SPARK PLUGS.* Turn the ignition switch ON. Remove the wire from any spark plug and hold the wire terminal 3/16 to 1/4 inch from the cylinder head while the engine is being cranked. If a spark does not jump this gap, the ignition is at fault. Follow the procedure under section 227.

c. Engine Backfires But Will Not Start. This symptom indicates that the spark plugs are not firing in their proper order, either due to the ignition high tension system being shorted, the spark plug wires being transposed, or the camshaft out of time. Perform the following operations in the order given.

Wipe all dust and moisture from the exterior of the distributor, coil, spark plugs, and spark plug wires, and again attempt to start the engine. If the engine still fails to start, make sure each spark plug wire is attached to the correct spark plug. Make sure that the spark plug wires are installed at the correct terminals of the distributor cap, and that the interior of the distributor cap is not wet. Replace the distributor cap if there is evidence of damage. If the above procedure has not corrected the trouble, the camshaft probably is out of time, remove the engine front cover plate, and correct the camshaft timing by aligning the marks on the camshaft and crankshaft gears.

d. Engine Runs Unevenly and Backfires Through Carburetor. If the engine is cold, the carburetor may need further choking until the engine is warmed up.

Check to determine if the spark plug wires are attached to the spark plugs and the distributor cap in their proper firing order. Replace the distributor cap if it is cracked or shorted. If the ignition is found not to be at fault, check the fuel system as outlined in section 223.

e. Engine Starts But Fails to Keep Running. If the engine starts and stops after a short period of running and cannot again be started, fuel is not reaching the carburetor in sufficient quantity, follow the procedure under section 223.

In rare cases the ignition coil or condenser will allow the engine to start but will fail to deliver a spark when hot. Turn the ignition switch ON. Remove the wire from any spark plug and hold the wire terminal 3/16 to 1/4 inch from the cylinder head while the engine is being cranked. If the spark does not jump the gap, remove the distributor and have it tested.

f. Engine Misfires at High Speed. Misfire at high speed may be caused by an incorrect fuel and air mixture, by improper spark plug gap, by faulty distributor, coil, or breaker contact setting, or by sticking valves.

(1) *INCORRECT FUEL AND AIR MIXTURE.* See section 223 for correction procedure.

(2) *IMPROPER SPARK PLUG GAP.* Remove the spark plug and clean with sand blast. Set the gap at 0.025 inch.

(3) *FAULTY DISTRIBUTOR AND COIL.* See section 227 for correction procedure.

(4) *STICKING VALVES.* Run the engine at idle speed at normal operating temperature, and observe if any of the valves are noticeably noisy. Abnormally noisy valves indicate sluggish valve action. Make the necessary corrections to the valves.

g. Engine Misfires on Fast Acceleration or Hard Pull. Run the engine at idle speed. Remove the wire from No. 1 spark plug, hold it 3/16 to 1/4 inch from the cylinder head. Observe if the spark jumps regularly without missing. Make this test at each spark plug wire. If an unsatisfactory spark or no spark is obtained at any of the wires follow the procedure given for whichever symptom applies (sec. 227).

Clean and space spark plugs or replace damaged or faulty plugs.

NOTE: ***It may be advisable to check the engine compression while the spark plugs are removed to again avoid removing the spark plugs later.***

Remove and clean the carburetor thoroughly. Reset the float level if required.

Test the compression of each cylinder, and make corrections as required. Run the engine at idle speed and observe if any of the valves

are noticeably noisy. Abnormally noisy valves indicate sluggish valve action. Make the necessary correction to the valves.

222. COOLING SYSTEM.

The cooling system may be at fault when the engine overheats or fails to reach operating temperature.

a. Preliminary Instructions. The various factors that control the cooling of the engine are so designed as to provide a liberal margin of safety, and, in most cases, the reestablishment of these factors back to normal will reestablish adequate cooling.

(1) *SHROUDS.* On tractors, the fan shroud assures the air being drawn through the radiator, and, if the shroud has been removed, it should be installed before any tests are made.

(2) *PROPER DRIVING.* Tractor operation requires operation through whatever transmission gear ratio is required to keep the engine from lugging. By using the higher ratios the engine and consequently the fan speed is increased, thus providing adequate cooling.

(3) *ANTI-FREEZE.* Heavy duty operation requires the use of Ethylene Glycol anti-freeze rather than alcohol. This raises the boiling point of the coolant from 160°F. to 212°F. and eliminates overheating attributable to loss of coolant due to evaporation of the alcohol.

b. Engine Overheats. The following suggested procedures will usually correct engine overheating.

(1) *CORRECT EXTERNAL LEAKAGE.* Fill the cooling system and idle the engine. Inspect for leakage at all hose and hose connections, and tighten connections or replace hose as required. Inspect the radiator cap for tightness and the condition of the gasket. If leakage is observed at the cylinder head gaskets, replace the gaskets (including remove carbon). Inspect the radiator for leakage, and repair or replace if required. Rust spots or wet spots on the radiator core are an indication of radiator leakage, even though there is no dripping.

(2) *ADJUST FAN BELT.* Adjust or replace the fan belt if required.

(3) *CLEAN RADIATOR CORE.* If the air flow through the radiator is restricted (insects, leaves, grease, dirt, etc.), clean the fins and the air passages. If the above procedure has not corrected the trouble, proceed as follows.

(4) *LEAN CARBURETOR MIXTURE.* Adjust the fuel system as outlined in section 344.

(5) *TIME IGNITION.* Time the ignition as instructed in section 227.

(6) *CHECK RADIATOR HOSE.* Remove the radiator hose, and replace any hose that has become soft or collapsed.

(7) *CHECK THERMOSTAT.* Remove the thermostat and submerge it in hot water. It should start to open at 160°F. to 165°F., and be fully opened at 190°F. to 200°F. Replace thermostat if it is faulty.

(8) *FLUSH COOLING SYSTEM.* Use a good cooling system cleaner according to directions on the container.

(9) *CHECK FOR INTERNAL LEAKAGE.* Drain the oil from the engine oil pan, and observe if there is water in the oil. If an abnormal amount of water is found in the oil, remove the spark plugs, and observe if water is present at the plug holes. If water is evident from either of these inspections, remove the cylinder head, inspect for faulty gasket or head, and examine for cracks in the cylinder block usually found in the vicinity of the valve ports. Replace the cylinder head gasket or make the necessary corrections in case of a cracked block.

(10) *ADDITIONAL POSSIBLE CAUSES.* If the engine continues to overheat, remove the cylinder head, and inspect the water openings in the cylinder head and cylinder block for excessive lime deposits. If excessive lime deposits are present, the cylinder block and heads must be replaced as flushing will not remove lime deposits.

NOTE: ***Excessive deposits of lime are the result of using hard water, having a high mineral content, in the cooling system.***

Soft or rain water should be used in the cooling system.

c. Engine Fails to Reach Normal Operating Temperature. Remove the thermostat, and test it to make sure that it is closing at 160°F.

223. FUEL SYSTEM.

Troubles encountered in the fuel system will be: excessive fuel consumption, fuel not reaching the carburetor, carburetor flooding, and fuel mixture too lean or too rich.

a. Excessive Fuel Consumption. So many factors can result in excessive fuel consumption that it is usually advisable to recommend an engine tune-up (sec. 212) and a complete lubrication of the tractor as outlined in section 211. If this does not correct the trouble, proceed as follows, omitting consideration of such factors as are known to be right.

(1) *PRELIMINARY INSPECTIONS.* Make sure the brakes are not dragging and that the tires are inflated to the specified pressure.

Make sure that the exhaust tail pipe has not been bent or plugged with mud so as to cause restriction of the exhaust.

Excessive added weight or tire slippage will increase fuel consumption. Correct weight and slippage may be determined as outlined in section 128.

Make sure the spark plugs are spaced correctly. Remove the wire from No. 1 spark plug and hold the wire 3/16 to 1/4 inch from the cylinder head. Observe if the spark jumps the gap regularly without missing. Make this test at each of the spark plug wires. If an unsatisfactory spark is delivered from any of the wires, follow the procedure which applies under section 227.

(2) *PROCEDURE.* If the fuel consumption is believed to be higher than normal, accelerate the engine in high gear with the brakes partially applied. If a ping is not heard, it indicates the ignition timing is late. Ignition timing must be adjusted as outlined in section 364.

NOTE: ***If the above procedure has not corrected the higher than normal fuel consumption, proceed as follows, omitting those operations that have already been performed.***

Service the air cleaner as outlined in section 342. With the air cleaner removed, make sure the choke valve opens fully each time the choke button is released. Make whatever adjustments are required.

Clean the spark plugs and adjust the gaps to 0.025 inch. Replace any faulty plugs.

Test the compression of each cylinder, and make the necessary repairs to the valves, rings, and pistons.

Remove, disassemble, and adjust the carburetor as outlined in section 344.

(3) *ADDITIONAL POSSIBLE CAUSES.* The above procedure will correct excessive fuel consumption in nearly every case, how-

ever, several other unlikely conditions are possible, and, if the trouble still is not corrected, one of the following may be the cause:

(a) BRAKES DRAGGING WHEN HOT. Feel of the brake drums after the tractor has been in operation. If they are hot, adjust as outlined in section 313.

(b) EXCESSIVE EXHAUST BACK PRESSURE. Disconnect the muffler from the exhaust manifold, and compare fuel consumption. If the fuel consumption is noticeably less, replace the muffler.

(c) CAMSHAFT OUT OF TIME. The camshaft may be out of time if either gear has been replaced or major repairs have just been made. If the main bearings have been replaced, the crankshaft may have dropped low enough to get the gear out of time. The timing marks are shown in fig. 23. Remove the engine front cover plate to inspect.

(d) TOO LITTLE VALVE CLEARANCE. Too little valve clearance results in valves not completely closing when hot. Remove the valve chamber covers to inspect.

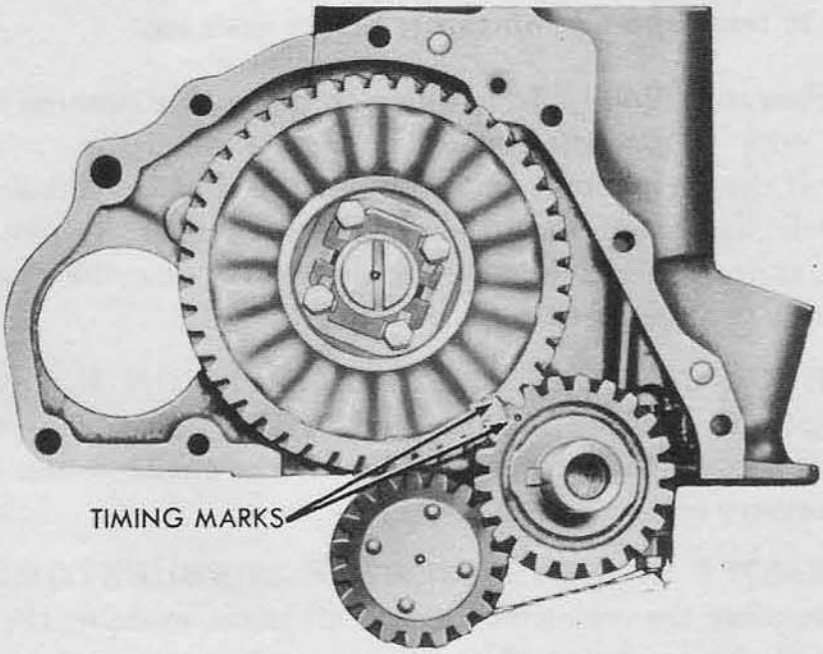


Fig. 23—Timing Marks

NOTE: ***Intake valve clearance should be from 0.010 to 0.012 inch and the exhaust valve clearance should be 0.014 to 0.016 inch. Uneven valve clearance will make an engine noisy.***

(e) TOO MUCH VALVE CLEARANCE. Too much valve clearance results in valves opening late and closing early. Remove the valve chamber covers to inspect.

(f) VALVES STICKING. It is possible for the valve action to be sluggish during operation and not show up as noisy during idle. Repair as needed.

(g) ENGINE TIGHTNESS. Wrong size parts may have been installed. This is particularly true if piston rings have been installed without sufficient gap.

b. Fuel Not Reaching Carburetor. Make sure that the fuel shut-off valve is open and that there is a sufficient supply of fuel in the tank.

(1) *CHECK FUEL LINE.* Disconnect the fuel line from the carburetor. If the fuel continues to drain from the line, the vents are open and the fuel line is not plugged. If necessary, repair as outlined in section 343.

(2) *CHECK FOR WATER IN FUEL TANK.* Remove the fuel shut-off valve assembly, and drain any accumulation of water or sediment from the tank. In freezing weather, water in the fuel tank will freeze and may prevent fuel from entering the fuel line. Allow the tank to reach room temperature before draining.

c. Carburetor Floods. In addition to the engine running unevenly, a strong odor of gasoline usually is present when the carburetor is flooding. If the carburetor is flooding due merely to overchoking, open the throttle wide and crank the engine to exhaust the rich gases in order to start the engine. Foreign material under the float needle may cause a carburetor to flood.

(1) *CHECK CARBURETOR CHOKE ACTION.* Remove the air line connection, and operate the choke rod. Observe the carburetor choke plate to see that it opens freely. If the choke action is faulty, make necessary corrections.

(2) *REMOVE AND DISASSEMBLE CARBURETOR.* Remove and disassemble the carburetor. Clean all parts, examine the float for leaking and the condition of the float needle valve and seat. Make repairs as required and set the float level. Reinstall the carburetor on the engine (sec. 344).

d. Fuel Mixture too Lean or too Rich. Check fuel lines as outlined in par. **b** above. Clean and adjust the carburetor as outlined in section 344.

There may be leaks in the intake manifold system. If so, replace the gaskets.

224. GOVERNOR.

The governor opens and closes the carburetor butterfly automatically to maintain a set engine speed with changing load. Faulty governor operation may result in a sluggish engine which will not come up to speed. External adjustments are responsible for most governor faults.

a. Hand Throttle Inoperative on First Section of Quadrant. The hand throttle being inoperative on the first section of the quadrant is caused by end play in the governor spring. The governor spring should be adjusted as outlined in section 345.

b. Engine Idle Speed too High. Preload on the governor spring may increase the idle speed. The spring and linkage should be adjusted as outlined in section 345.

c. Engine Will Not Run at Top Speed. The throttle linkage and spring are not allowing the governor to bring the engine up to speed. They should be adjusted as outlined in section 345.

d. Engine Hunts or Sluggish. Hunting and sluggish operation can be caused by foreign material and binding in the governor and governor linkage. The carburetor throttle shaft must work freely. The carburetor-to-governor rod must be straight and the ball joints must work freely. If the throttle shaft and rod are free, the governor should be removed. The governor should be cleaned, repaired, and adjusted as required (sec. 345).

e. Repeated Governor Shaft Breakage. Repeated governor shaft breakage is usually the result of worn timing gears. To correct the shaft breakage, it is usually necessary to replace both the camshaft and crankshaft gears.

225. GENERATING SYSTEM.

The condition of the battery reflects the condition of the generating system.

WARNING: ***Do not allow flames or sparks to be brought near the vent opening of the battery since hydrogen gas, produced in the tractor, may be present in the battery and might explode. The liquid in the battery is a solution of sulphuric acid which, if accidentally spilled on the skin or spattered in the eye should, as a first-aid measure, be flushed away promptly with quantities of clear water only. Seek medical aid if discomfort continues. If***

acid is spilled on the clothes, wet it thoroughly with a weak solution of ammonia or with sodium bicarbonate or baking soda dissolved in water.

a. Battery Gassing and Using Excessive Water. Gassing and using an excessive amount of water is a condition of overcharging. Charging is controlled by the voltage regulator. If it is set too high, it can be adjusted. If it is inoperative, it must be replaced. As a temporary measure, the generator may be adjusted to a lower rate.

b. Battery Low in Charge. If the battery fails to keep charged, it may be possible that the current used is greater than the capacity of the generator due to:

Excessive use of lights.

Accidental discharge of the battery due to a short circuit.

Excessive current used in starting as would be true with a tight engine, heavy oil, need of adjustment of the spark plugs, distributor contacts, etc.

(1) *RECHARGE OR REPLACE BATTERY.* Recharge the battery if its specific gravity is below 1.225. Replace the battery if a high discharge test, after charge, indicates it is worn out or under capacity.

(2) *GENERATOR OUTPUT LOW.* Connect a jumper wire between the two connections on the generator housing and observe the ammeter reading. Remove the jumper wire, and follow the procedure given below that applies.

(a) If the charging rate increases, the voltage regulator is set too low and must be adjusted.

(b) If the charging rate shows no change, turn the charge rate adjustment on the generator to a higher setting.

(c) If neither of the above adjustments corrects the trouble, search for poor connections causing high resistance.

(d) If the above does not correct the trouble, repair or replace the generator, whichever is required.

226. STARTING SYSTEM.

A discharged battery and the use of heavy oil in sub-zero weather are the two most common causes of starting trouble.

a. Discharged Battery. If the battery tests lower than 1.225 with a hydrometer at room temperature, have the battery recharged and an after-charge test made. Replace the battery if so indicated.

b. Sub-zero Cranking. For starting in sub-zero temperatures, oil dilution is recommended as follows:

(1) *DILUTE ENGINE OIL.* Where temperatures from 10°F. below zero to 65°F. below zero prevail, dilute the engine oil by adding one quart of gasoline. This gasoline should be added while the engine is still warm. Stop the engine and add oil of S.A.E. 10 or 10W viscosity up to the FULL mark. Then add one quart of gasoline. This will bring the level of the oil higher than normal. This level should be marked on the gauge for future reference.

(2) *DILUTION INCREASES OIL CONSUMPTION.* The presence of a large percentage of light dilutent will increase oil consumption, and for that reason the oil level should be checked frequently. If the tractor is operated four hours or more at operating temperature, redilution will be necessary if it is anticipated the tractor will be left standing unprotected for five hours or more.

(3) *REDILUTION OF ENGINE OIL.* This can be accomplished by adding oil of S.A.E. 10 or 10W viscosity to the FULL mark, then add gasoline to the dilution mark on the gauge described in subpar. (1) above. Start the engine and allow it to run for two minutes to assure mixing of the oil and gasoline. This mixture will have a very low viscosity for easy starting, and the gasoline will vaporize and pass off very quickly when the engine is running, leaving the oil at its original viscosity.

c. Engine Cranks Slowly with Clutch Released. Make certain that the viscosity of the engine oil is correct for the prevailing temperature. If recent major repairs have been made, the engine may be tight.

(1) *TEST STARTER RELAY AND STARTING MOTOR.* Test the state of charge and the condition of the battery. If the battery is satisfactory, remove the cable from one side of the starter relay, and contact the loose end of the cable against the terminal on the other side of the relay.

If cranking speed is now normal, replace the starter relay.

If cranking speed is still low, repair or replace the starting motor.

d. Starting Motor Spins But Does Not Crank Engine. If the starting motor spins and does not engage with the flywheel gear,

remove the starting motor, and clean the starter drive. Replace worn or damaged parts as required.

CAUTION: ***Do not oil the starting motor, clean the starter drive in gasoline and dry it thoroughly.***

227. IGNITION TROUBLE SHOOTING.

In the procedures outlined in this section, it is assumed that the engine can be cranked with the starting motor. If this is not the case, refer to trouble shooting on the starting system (sec. 226 above).

a. No Spark at Any of the Spark Plug Wires. Turn the ignition switch on. Hold the end of a spark plug wire $\frac{1}{16}$ inch from the cylinder head while the engine is being cranked. Repeat this test for the remaining cylinders. If the spark fails to jump the gap, disconnect the primary wire from the top of the coil. Turn the ignition switch on and observe if a spark occurs when the coil lead is grounded. If a spark occurs, the distributor and coil assembly are at fault. The distributor and coil assembly should be removed and repaired.

If no spark occurred when the coil lead was grounded, the trouble is located between the starter relay and the primary lead on the coil. To locate the trouble between the coil terminal and the starter relay, the three terminals on the terminal block should be grounded in the following order. If a spark does not occur when the lower center terminal is grounded, the trouble is in the connection between the terminal and the starting motor relay. Turn the ignition switch on and ground the upper right terminal. If no spark occurs when the upper right terminal is grounded, the ignition switch or its leads are faulty. With the ignition switch on, ground the upper left terminal. If no spark occurs, the resistance unit is faulty. If a spark occurs, the connection is faulty between the terminal just grounded and the primary connection on the coil.

b. Satisfactory Spark from Some But Not All Spark Plug Wires. Hold the one spark plug wire $\frac{3}{16}$ inch to $\frac{1}{4}$ inch from the cylinder head while the engine is running about 500 R.P.M. If a spark fails to regularly jump this gap, it is considered weak. Since a satisfactory spark is obtained from some spark plug wires, it is evident that the coil, condenser, breaker contacts, and distributor rotor are satisfactory, since they affect the the output of all spark plug wires. Make sure that the spark plug wire terminals are clean and firmly seated in the socket. Spark plug wires should be soldered to the terminals. Replace spark plug wires which have damaged insulation. If this does not correct the trouble, remove the distributor cap, and inspect for cracks and carbon runs to ground.

c. Intermittent Spark at All Spark Plug Wires. When an intermittent spark is received by all cylinders, the trouble is probably in the primary circuit. Check and tighten the following terminals: battery, starter relay, three terminals on the terminal block, and the primary lead to the coil. Replace and/or respace the distributor contacts if required. The distributor assembly should be thoroughly cleaned. Make sure that the breaker arm is not binding. Install a new condenser and check the system. If the trouble has not been corrected, install a new coil and check the ignition. In a few cases foreign material around the distributor cap and rotor will cause an intermittent spark.

228. HYDRAULIC SYSTEM.

Oils which depart from the specifications outlined in section 211 may cause failure in the hydraulic system. Dirty oil may cause the machined surfaces in the pump and ram cylinder to be scored. Oils that form a heavy gum deposit may prevent the valves from moving freely. S.A.E. 80 or 90 mineral oil that is clean can be relied upon to give good results.

a. Preliminary Procedure. Depress the clutch and engage the power take-off. If the links do not raise, proceed as follows:

Check oil level and if it is low, fill to the required level, and again try the hydraulic system.

Remove the inspection plate on the right side of the center housing. Move the hydraulic touch control lever, and feel to determine if both control valves are moving freely (fig. 60). If not, remove the hydraulic pump as outlined in section 383. Wash the control valves and control valve bushing in gasoline. After the control valves operate freely, replace the pump as outlined in section 383.

b. System Will Not Raise Full Load. If a pressure gauge which will register pressures of 2500 pounds per square inch accurately is available, follow subpar. (1). If no gauge is available, follow subpar. (2).

(1) Remove the inspection plate on the right side of the center housing. Attach the pressure gauge to the hydraulic pump. Secure the lower links in a lowered position. Start the engine, engage the power take-off, and raise the hydraulic touch control lever to the top of the quadrant. If the pressure is between 1400 to 1600 pounds per square inch, the system is developing its full lifting force. If the pressure is below 1400 pounds per square inch, inspect the system

for leakage. Feel the end of the safety valve to determine if it is relieving the pressure (fig. 60). Replace the safety valve assembly if necessary. Leaks in the hydraulic system may be located by oil sprays and excessive oil turbulance.

(2) Mount an implement on the tractor which can be lifted only by a hydraulic system that is operating correctly. Remove the inspection plate on the right side of the center housing. Start the engine, engage the power take-off, and raise the hydraulic touch control lever to the top of the quadrant. Feel the end of the safety valve to determine if it is relieving the pressure (fig. 60). Replace the safety valve assembly if necessary. Leaks in the hydraulic system may be located by oil sprays and excessive oil turbulance.

c. System Will Lift Only at High Engine Speeds. The trouble is usually due to a leak in the hydraulic system. Follow the procedure outlined in par. **b** above.

d. System Will Not Lower. If the links will not lower, either the exhaust control valve is frozen in the closed position, or the exhaust lines have become clogged with dirt. Remove the inspection plates, and inspect the mechanical linkage for binding or damaged parts. If the inspection does not reveal the difficulty, remove the hydraulic pump as outlined in section 383. Remove the hydraulic unit as outlined in section 382. Have the pump and hydraulic unit adjusted and checked, and the pump thoroughly flushed.

e. System Raises and Lowers in the Transport Position. There should be no noticeable fluctuation in the height of the link mounted implement when carried in the transport position, unless the hydraulic controls are moved.

If such fluctuation occurs, the following procedure will assist in locating the trouble.

Attach a link mounted implement and place the position control lever for constant draft control (forward). Be sure the power take-off is engaged. Remove the two inspection plates from the center housing. With the engine running at idle speed, raise the hydraulic touch control lever to the top of the quadrant. If the implement is not steady in the transport position, inspect the system for internal leakage as indicated by excessive oil spray or dripping. Leaking gaskets and scored ram cylinders are examples of possible causes. There is a remote possibility that the difficulty is in the pump. In this case, a trained service man should be consulted.

f. Position Control Inoperative. If the constant draft control is operating correctly, the hydraulic pump is satisfactory. Remove the hydraulic unit as outlined in section 382. Check for damaged linkage. Check the adjustments of the unit as outlined in section 384.

g. Bobbing. Bobbing is a rhythmic raising and lowering of an implement when using the constant draft control. Bobbing can be the result of improper implement adjustment or a hydraulic system which is in need of repair and adjustment or both. The following steps should be taken to correct bobbing:

(1) If there is end play at the control spring, the implement may bob. Check the control spring adjustment as outlined in section 384.

(2) Resharpened plow shares which have the point dubbed down should be replaced with a set of new shares. In a few cases, extending the top link will eliminate bobbing. As the plow share wears, it may be necessary to again shorten the top link.

(3) If the above steps have not corrected the trouble, adjust the hydraulic unit as outlined in section 384.

h. Hydraulic Controls Not Synchronized. To test for the control synchronization, the engine should be operated at idle speed. Engage the power take-off and lower the hydraulic touch control lever to the bottom of the quadrant. Place the position control lever for constant draft control (forward) and measure the drawbar height. Place the position control lever for position control (vertical). Raise the hydraulic touch control lever to the top of the quadrant. After the links have raised to the top of their travel, place the hydraulic touch control lever at the bottom of the quadrant. Be sure the quadrant stop, shown in fig. 6, does not prevent the hydraulic touch control lever from being placed at the bottom of the quadrant. Measure the drawbar height.

If the two drawbar height measurements vary by more than three inches, the hydraulic system should be adjusted as outlined in section 384.

If the adjustment procedure in section 384 does not correct the trouble, the unit should be readjusted as outlined but using a 7/8-inch setting of the hydraulic touch control lever in place of the 3/4-inch position shown in fig. 67.

Part THREE
ADJUSTMENTS AND REPLACEMENTS

Chapter I

WHEELS, TIRES, and BRAKES

311. WHEELS AND TIRES.

Before a tire is removed, drain the calcium chloride solution, if any, from the tire into a barrel. This solution can be reused when the tire is replaced.

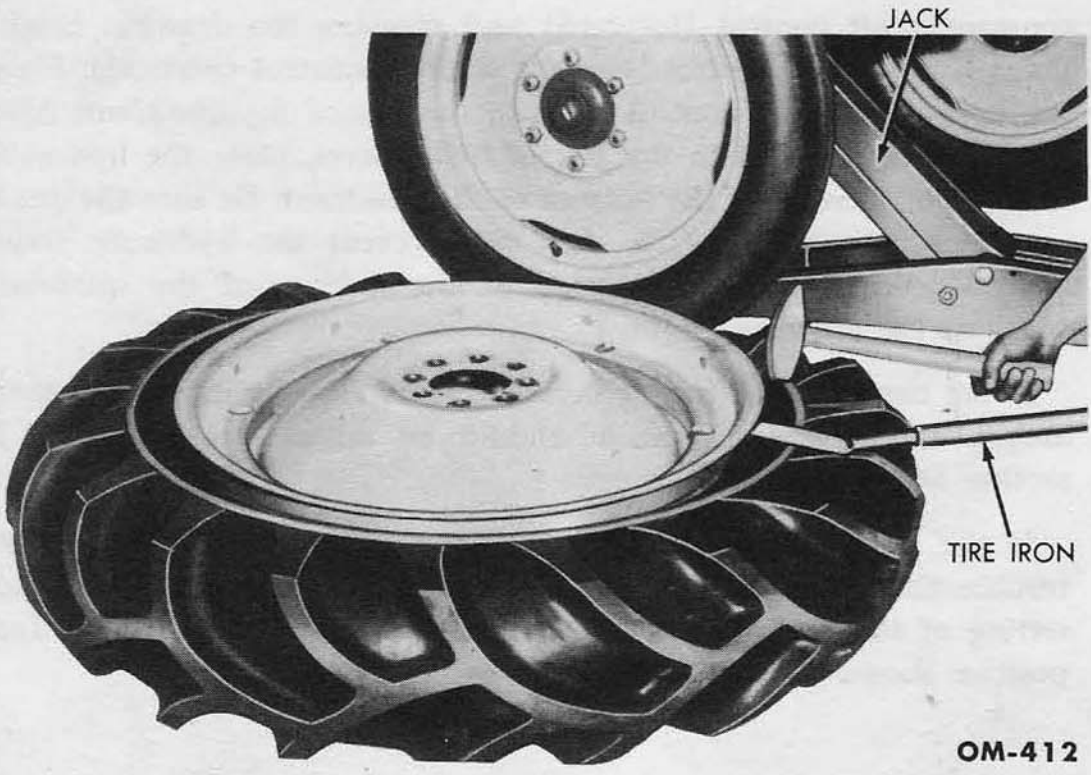


Fig. 24—Loosen Bead From Rim Edge

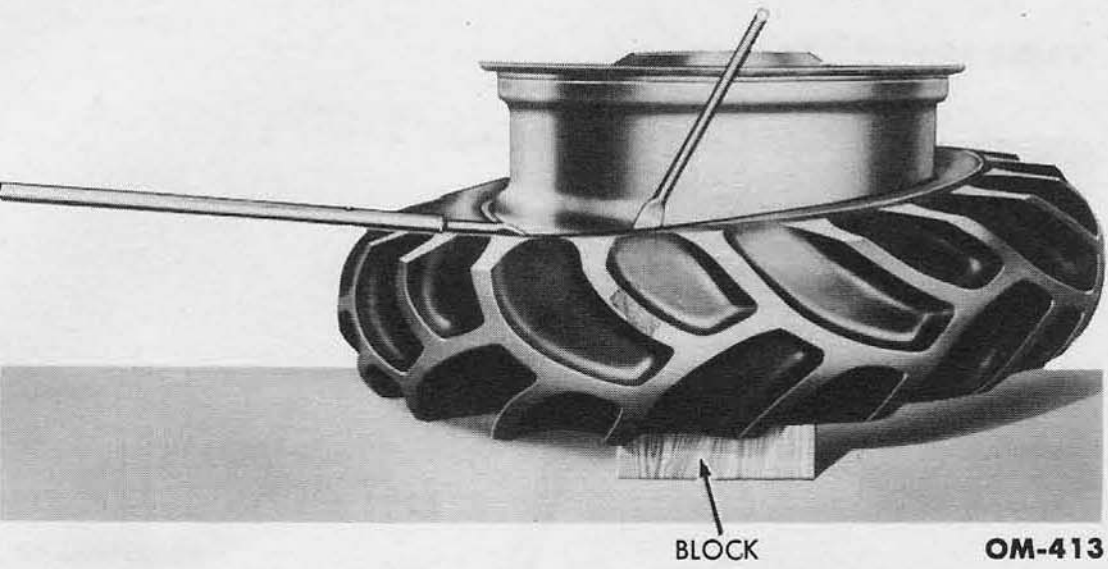


Fig. 25—Wheel in Position to Pry Rim Out of Tire

a. Remove Tire. Remove the wheel from the hub. Deflate the tube completely. Loosen both beads from the rim edges, using a tire iron and heavy mallet. In case of rear tires sticking to the rim, it may be necessary to jack up the front end of the tractor, slide the rear wheel under a front wheel, and let the tractor down on the tire as shown in fig. 24. Stand on the tire, with feet about 15 inches apart, opposite the valve, and force the bead off the bead seat into the drop center of the rim.

CAUTION: ***Care should be taken that the soft rubber tip on the inner edge of the tire bead is not damaged by the tire iron, as such damage will have a tendency to chafe the inner tube.***

Insert two tire irons about 8 inches apart between the bead and the rim flange, near the valve. Pry a short length of bead over the flange. Leave one tire iron in position, and follow around the rim with the other iron to remove the remainder of the bead. Remove the inner tube.

Turn the rear wheel over and block up the disk until the tire is clear of the floor (fig. 25). Pry the tire off the rim, starting with a small section and following around the wheel.

b. Install Tire. Place the wheel and rim in a flat position. Inflate the inner tube until it is barely rounded out. Install the tube in the tire.

NOTE: ***It is advisable to coat the inside and outside of the tire beads with soft soap. This will assist in moving the bead over the edge of the rim and will also protect the inner edge of the bead.***

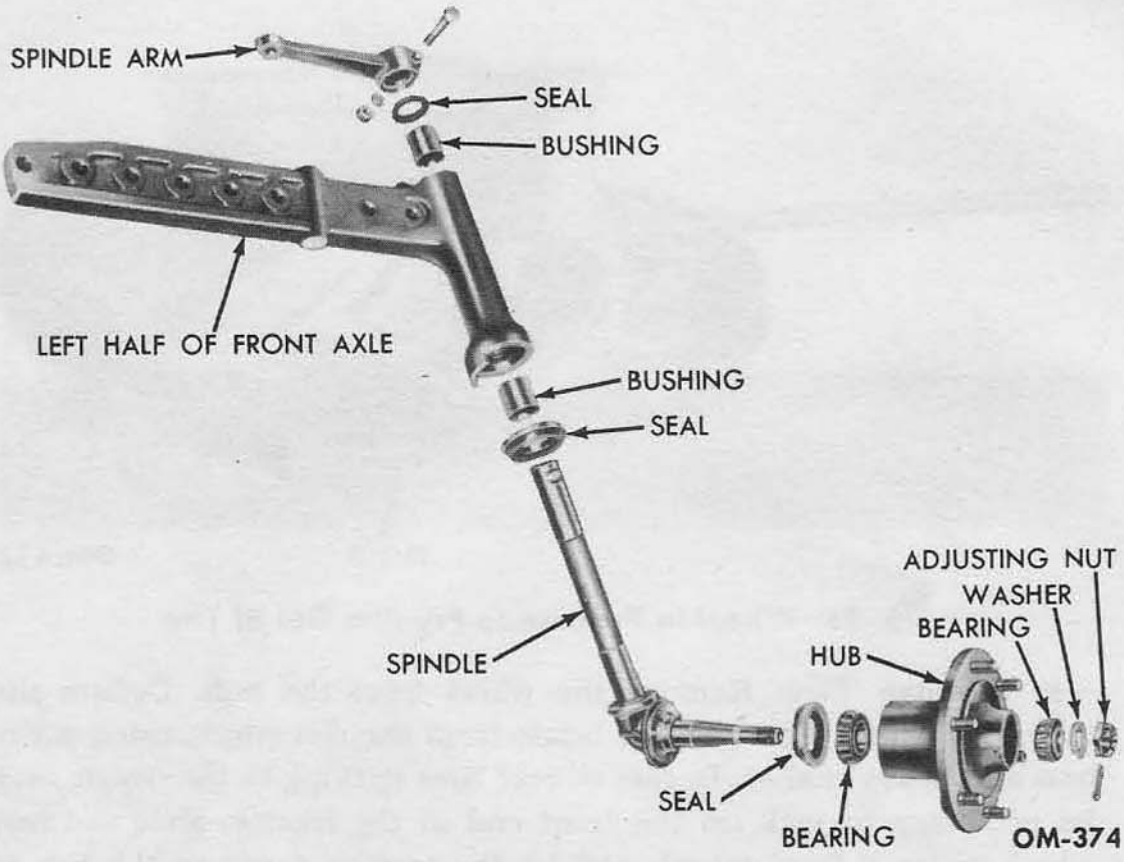


Fig. 26—Front Hub and Spindle Assembly

Place the tire on the rim, and guide the valve through the valve hole. Push the bottom bead down into the drop center of the rim at the valve. Force the bead over the flange, using the tire irons.

To apply the top bead, insert a tire iron between the top bead and flange at a point on the wheel opposite the valve. With the other tire iron, pry on the top bead, working all the way around the rim. Inflate the tire slowly until the tire seats evently all the way around. "Centering" may be done by pounding the casing all the way around while it is being inflated.

c. Loading Tires. It is possible to increase the weight of the tractor as much as 620 pounds by the use of a solution of calcium chloride and water in the tires.

312. FRONT HUB AND BEARING REPLACEMENT.

The front hub and bearing should be removed at the beginning of the spring season for cleaning and relubricating. The hub and bearing are illustarted in fig. 26.

a. Removal. Raise the front of the tractor until the wheel is clear of the ground. Remove the hub cap, cotter pin, wheel bearing adjust-

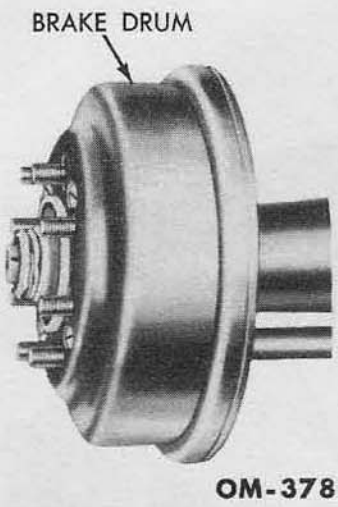


Fig. 27—Wheel Removed to Expose Brake Assembly

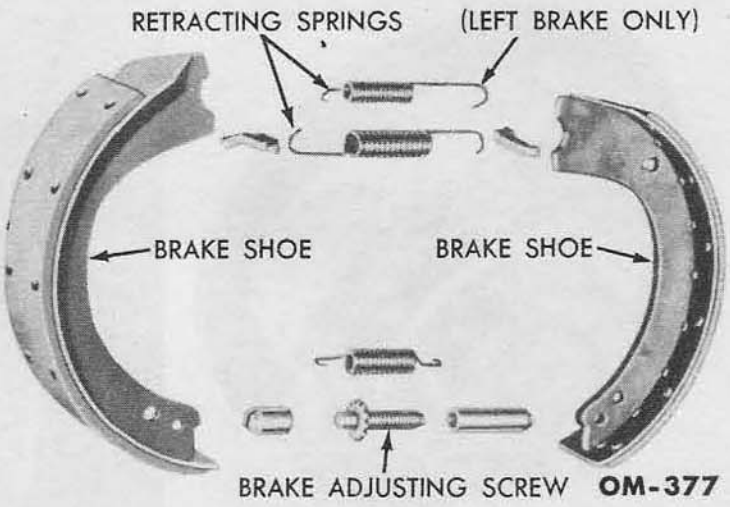


Fig. 28—Brake Shoe Assembly, Disassembled

ing nut, and washer. Pull the wheel outward until the outer roller bearing is near the end of the spindle. Push the wheel back on, and remove the outer bearing. Pull the wheel assembly off the spindle. Drive the inner bearing and grease retainer out of the wheel.

b. Installation. To install the wheel bearing, pack the inner wheel bearing with wheel bearing grease, and place it in the hub. Drive the retainer into the hub.

NOTE: ***Use a new retainer if the old one is worn or damaged.***

Place the wheel on the spindle. Pack the outer wheel bearing with wheel bearing grease, place the bearing on the spindle, and install the washer. Install the bearing adjusting nut, draw it up tightly, then back it off approximately ⅛ turn. There should be no visual looseness, yet the wheel should rotate freely. Install the cotter pin and hub cap. Lower the front of the tractor.

313. BRAKES.

When the brakes can no longer be adjusted to satisfactorily stop the tractor or assist in turning, the brake linings should be replaced.

a. Removal. Jack up the rear end of the tractor, and remove the rear wheels. Remove the four screws from the brake drum, and slide the drum off the shaft (fig. 27).

On the left brake, remove the two retracting springs. On the right brake, remove the one retracting spring. Remove the brake shoes (fig. 28). Install new lining and/or shoes as needed. If one brake shoe is replaced, it is advisable to also replace the other three shoes

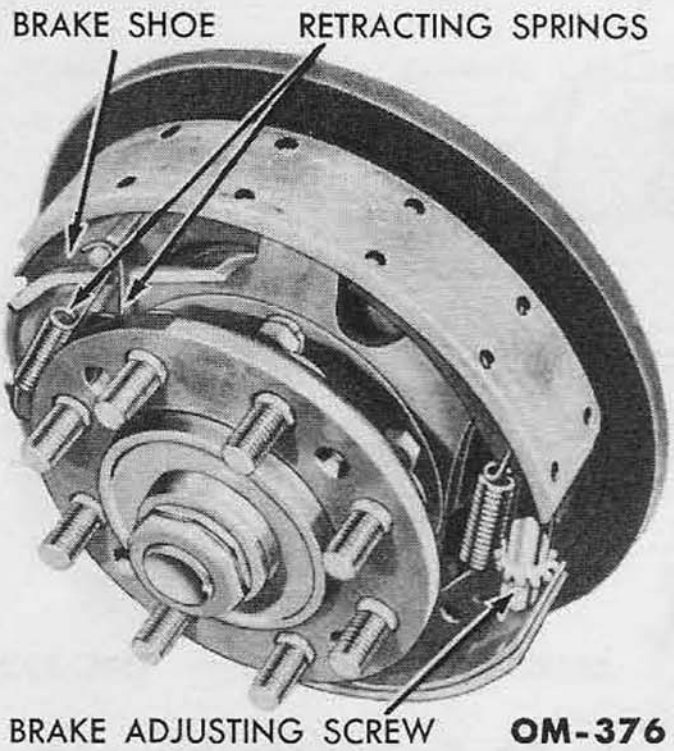


Fig. 29—Brake Assembly with Brake Drum Removed

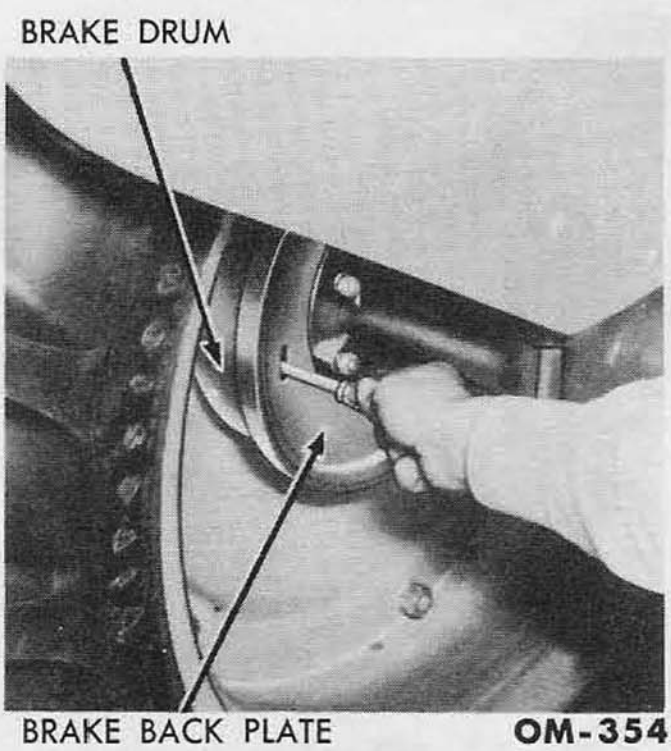


Fig. 30—Adjusting Brakes

to assure equalized braking action. Inspect the brake backing plate felt, and replace it if needed.

b. Installation. Place the shoes in the brake support plate, and attach the retracting spring (fig. 29). The left brake has two retracting springs, and the right brake uses one retracting spring.

Adjust the brakes so they are completely retracted, and install the brake drum. Mount the rear wheel.

c. Adjustment. Jack the tractor up until both rear wheels are free of the ground. Remove the brake adjustment cover, and turn the adjustment (fig. 30) until the brake drags with the pedal in the released position. Back off the adjustment until the wheel turns with a very slight brake drag. Shorten or lengthen the left brake tie rod, by using the clevis, until both brake pedals are in line with both brakes engaged. During the first hour of operation, after the brakes have been adjusted, feel of the drums occasionally to be sure that they are remaining cool. If the drums are hot, readjust as outlined above.

Chapter

II

STEERING ASSEMBLY and FRONT AXLE

321. STEERING ASSEMBLY REPLACEMENT.

The steering assembly may require removal from the tractor for service to the assembly itself or to gain easy access to the transmission.

a. Removal. Remove the hood as outlined in section 331. Disconnect the drag links. Remove the choke and throttle rods. Remove the oil pressure gauge line. Remove the air cleaner. Remove the battery. Remove the battery rack and tool box. Disconnect and tag the electrical leads. Do not omit the starter button lead. Unhook the spring which is attached to the governor linkage. Remove the steering wheel. Remove the dash assembly. Remove the steering assembly.

b. Installation. Mount the steering assembly on the transmission housing. Assemble the dash to the steering assembly. Connect the electrical leads. Mount the battery rack and tool box. Connect the choke and throttle rods. Install and connect the battery. Mount the air cleaner. Attach the governor linkage spring. Install the oil pressure gauge line. Install the hood as outlined in section 331. Install the steering wheel.

c. Adjust Steering Sector Clearance. The steering sector clearances may be adjusted with the steering gear in place. The left sector may be adjusted by removing the four cap screws which secure the left sector bearing housing to the steering housing. The bearing housing (fig. 31) is eccentric. By rotating the sector bearing housing, it is possible to adjust the backlash between the sector and the nut. The minimum backlash that will not cause hard steering is the desirable adjustment. Repeat the same procedure for adjusting the backlash on the right-hand sector.

NOTE: ***It is necessary to adjust the left sector first. If the right sector is adjusted first, it will become incorrect after the left sector is adjusted.***

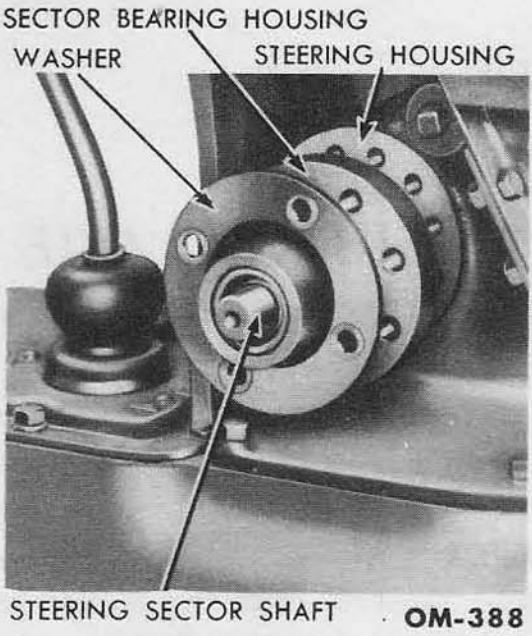


Fig. 31—Steering Sector Clearing Adjustment

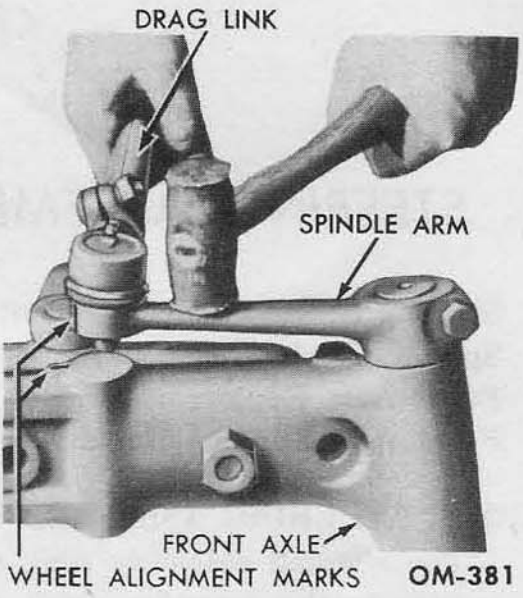


Fig. 32—Drag Link Removal

322. SPINDLE REPLACEMENT.

Support the front end of the tractor, and remove the wheel hub as outlined in section 312. Disconnect the drag link from the steering arm (fig. 32). Remove the steering arm bolt, and remove the steering arm. Remove the key at the upper end of the spindle. Remove the spindle. Drive out the spindle bushings.

Install new bushings, seals, and spindles as required. Press the spindle bushings in place. Assemble as shown in fig. 26. Install the front wheel hub as outlined in section 312. Install the drag link.

323. FRONT AXLE REPLACEMENT.

Remove the hood as outlined in section 331. Drain the cooling system. Remove the radiator hose connections. Remove the radiator. Support the tractor under the engine assembly. Remove the king pin as shown in fig. 33.

Remove the radius rod from the front axle assembly. Remove the tread width adjusting bolts.

Install the center section of the front axle in the front axle support as shown in fig. 34.

Attach the radius rods to the front axle. Adjust the front wheels to the desired width. Install the radiator and radiator hose. Install the hood as outlined in section 331.

324. FRONT AXLE SUPPORT REPLACEMENT.

Remove the hood as outlined in section 331. Drain the cooling system, and remove the radiator. Support the tractor under the oil

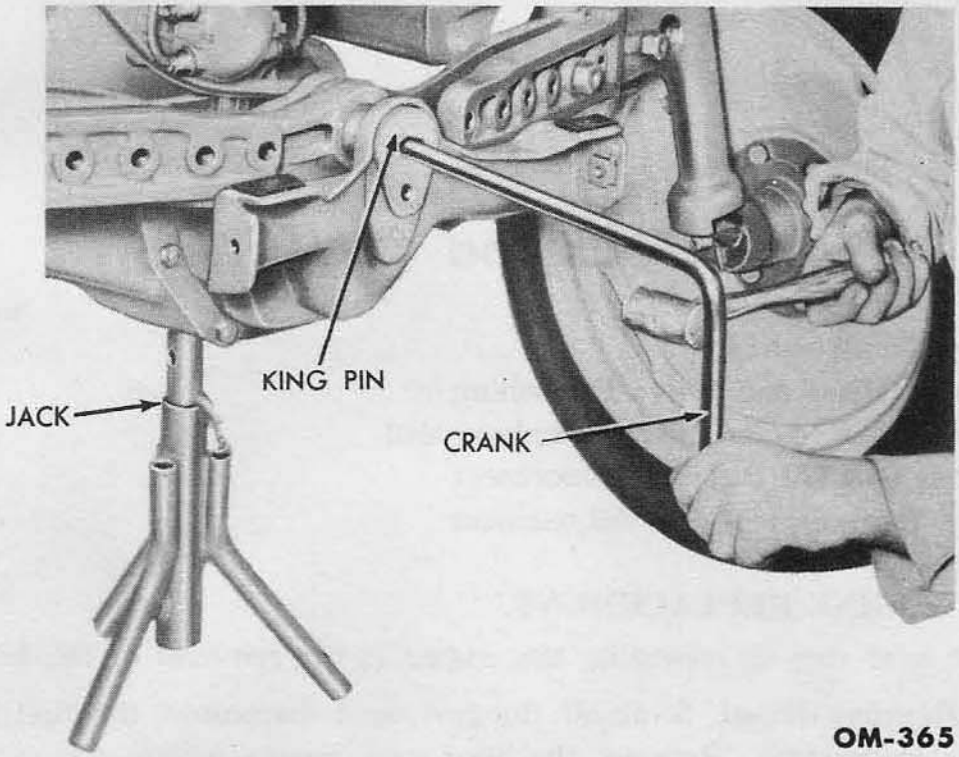


Fig. 33—King Pin Removal

pan. Remove the king pin as shown in fig. 33. Remove the front axle support.

Attach the front axle support to the engine. Install the king pin as shown in fig. 34. Install the radiator and radiator hose connections. Install the hood as outlined in section 331.

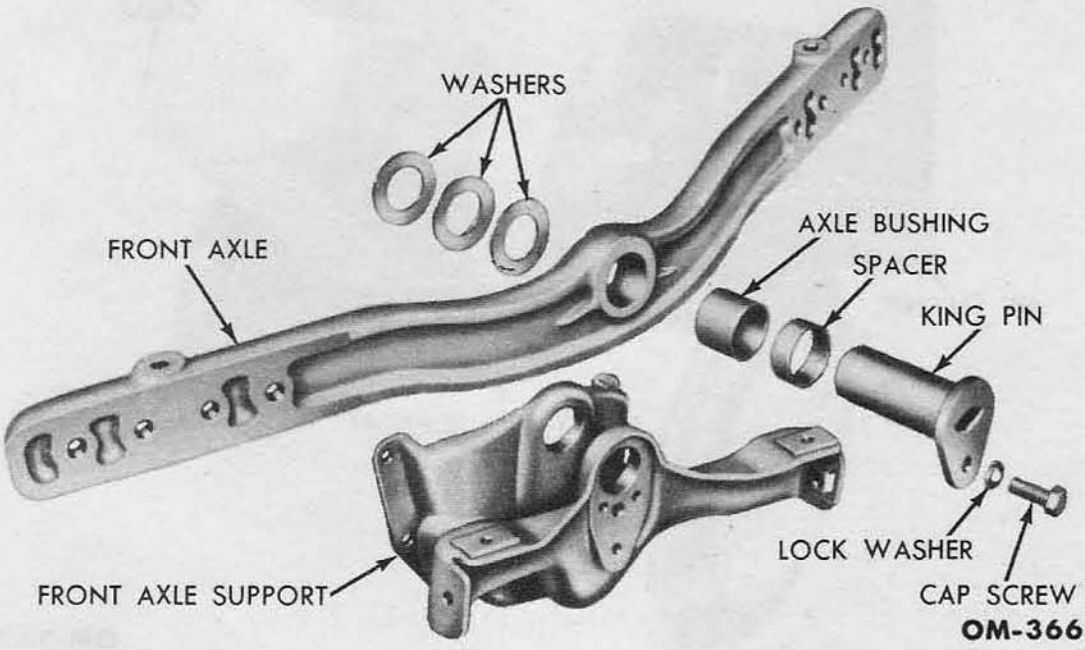


Fig. 34—Front Axle Support Assembly, Disassembled

Chapter III

ENGINE and CLUTCH

331. ENGINE REPLACEMENT.

The first step in removing the engine is the removal of the hood.

a. Remove Hood. Shut off the fuel, and disconnect the fuel line to the carburetor. Remove the four cap screws which secure the hood to the instrument panel. Remove the cap screws which secure the hood to the front axle support. Remove the intake air screen and connection from the hood. Remove one hinge cap screw from the grille. Remove the hood as shown in fig. 35.

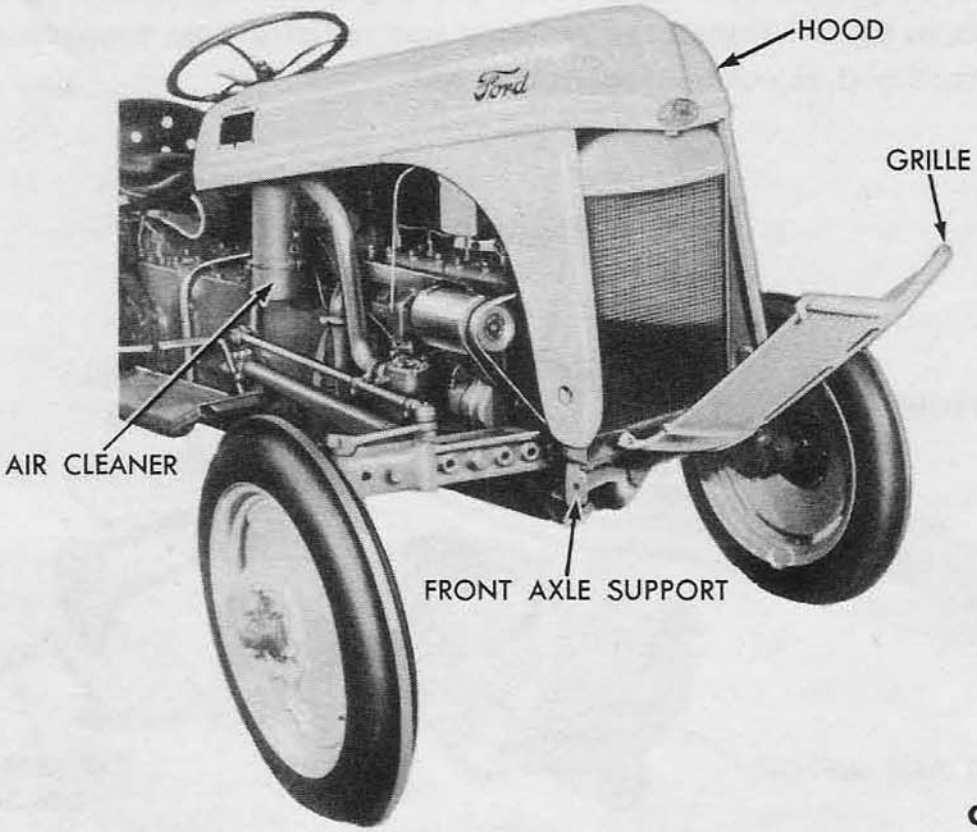


Fig. 35—Hood Removal

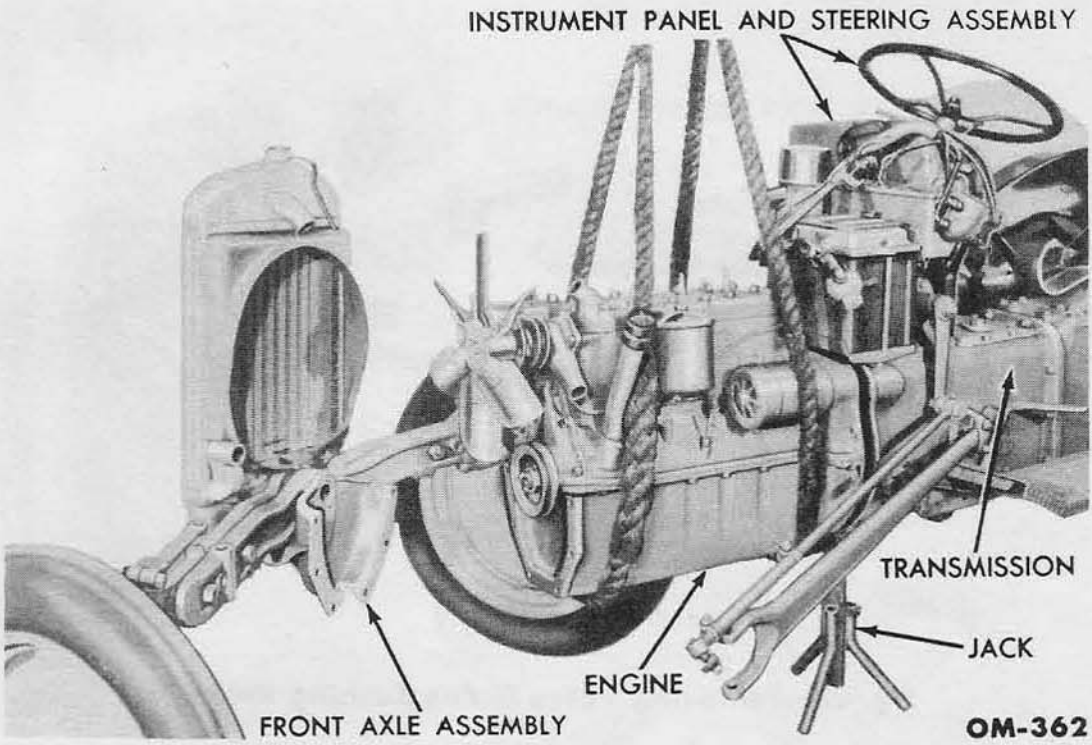


Fig. 36—Installing Engine

b. Remove Engine. Support the tractor under the transmission housing. Drain the radiator and the engine block. Drain the crank case. Remove the radiator hose. Disconnect the drag link and radius rod from one end of the front axle (fig. 36). Remove the six bolts that secure the front axle support to the engine assembly. Remove the two head nuts which hold the electrical conduit. Disconnect and label the generator and coil electrical leads. Remove the distributor cap and starter relay from the engine assembly. The electrical connections may then be hung on the dash assembly. Remove the choke and governor control rods. Remove the air line from the air cleaner to the carburetor. Remove the oil pressure gauge line. Disconnect the muffler from the exhaust manifold. Support the engine (fig. 36), and remove the cap screws which fasten the engine to the transmission. Slide the engine assembly ahead to disengage the clutch shaft. Remove the engine.

c. Install Engine. Engage the clutch shaft spline, and slide the engine in place. Secure the transmission to the engine assembly. The throttle spring is installed under one of the cap screws that secure the transmission to the engine block as shown in fig. 52. Connect the generator, starter, and distributor leads. Secure the electric conduit to the engine. Attach the front axle support to the engine. Connect the drag links and radius rods. Connect the choke and governor linkages. Install the oil pressure gauge line. Connect

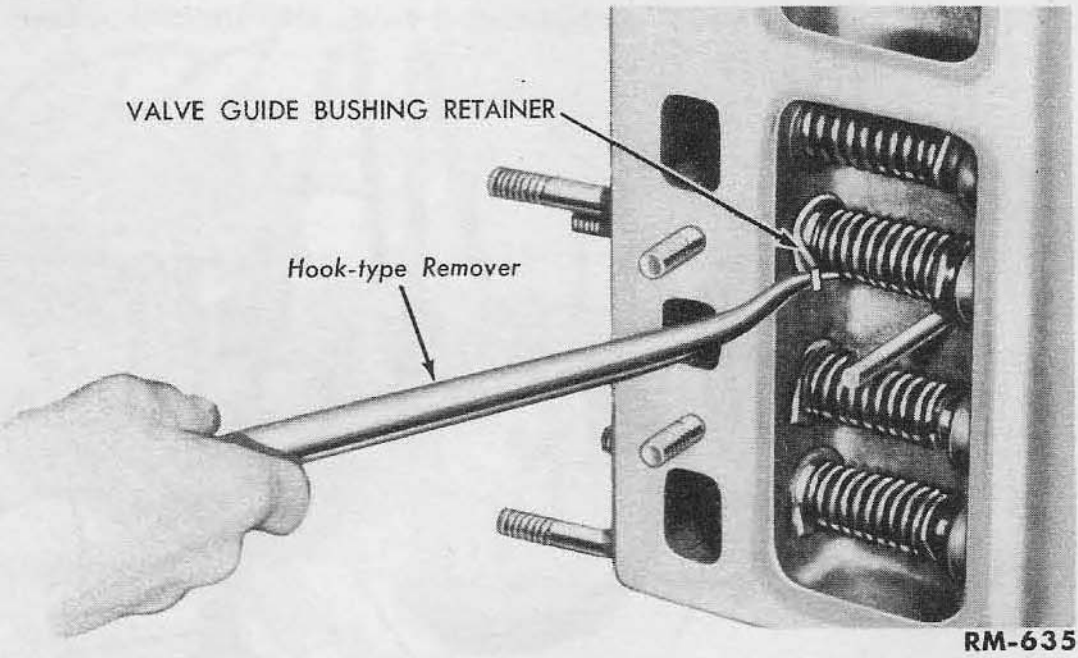


Fig. 37—Removing Valve Guide Bushing Retainer

the muffler to the exhaust manifold. Install the air line from the air cleaner to the carburetor. Install the radiator and hoses. Fill the radiator and crank case.

d. Install Hood. Place the pad on top of the radiator if it has been removed. Place the hood assembly in position on the tractor. Install, but do not tighten, the four screws which secure the hood to the instrument panel. Install the cap screws which secure the hood to the front axle support. Install the hinge cap screw in the grille. Install the intake air connection. Tighten the screws which secure the instrument panel to the hood. Connect the gasoline line to the carburetor.

332. CYLINDER HEAD AND VALVE REPLACEMENT.

Te remove the cylinder head and valves, it is necessary to remove the hood as outlined in section 331.

a. Remove Cylinder Head. Disconnect the battery cable. Disconnect and tag the generator and coil leads. Remove the distributor cap and the starter relay (figs. 53 and 36). Remove the two head nuts which secure the electrical conduit. The electrical conduit may be hung on the dash assembly. Remove the spark plugs. Remove the two cap screws that mount the oil filter. Remove the cylinder head nuts. Remove the cylinder head.

b. Remove Valve. Disconnect the choke and throttle rod from the carburetor. Remove the air line from the air cleaner to the carburetor. Disconnect the muffler from the exhaust manifold. Loosen

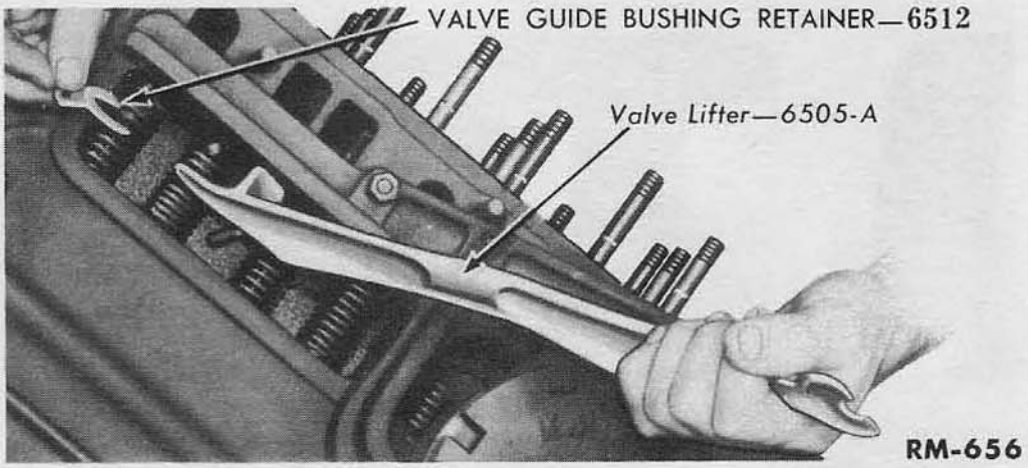


Fig. 38—Installing Valve Guide Bushing Retainer

the fan belt tension adjustment, and slip the belt off the generator pulley. Remove the carburetor and manifold as an assembly. Remove the valve covers. Crank the engine until the valve to be removed is closed. Remove the retainer with a hook-type remover (fig. 37). Remove the valve assembly.

c. Install Valve. Crank the engine until the push rod is at the bottom of its travel. Place the valve assembly in the engine. Compress the valve spring and insert the retainer as shown in fig. 38.

Turn the engine several revolutions and stop it so that the valve is in the closed position. Check the valve clearance with a thickness gauge (fig. 39). The correct clearance between the exhaust valve stem and the push rod is 0.014 to 0.016 inch. The correct clearance between the intake valve stem and the push rod is 0.010 to 0.012 inch. Grind the end of the valve stem to secure the correct clearance. The ends of the valve stems must be ground smooth and square. Install the valve covers. Be sure that the manifold and block are smooth and clean before installing the new manifold gaskets. Install the manifold and carburetor assembly. Install the fan belt on the generator, and adjust the tension as outlined in section 361. Connect the choke and throttle rods to the carburetor. Install the air line from the air cleaner to the carburetor. Connect the muffler to the exhaust manifold.

d. Install Cylinder Head. Make sure there is no foreign material either in the cylinders or on the surface of the cylinder head or block. Position a new head gasket on the cylinder block. Install the cylinder head on the cylinder block. Install and tighten the cylinder head nuts from 50 to 55 pounds feet. When tightening nuts, start from a centrally located nut, and tighten alternately each way. Mount the electrical conduit. Connect the generator, coil, and starter relay

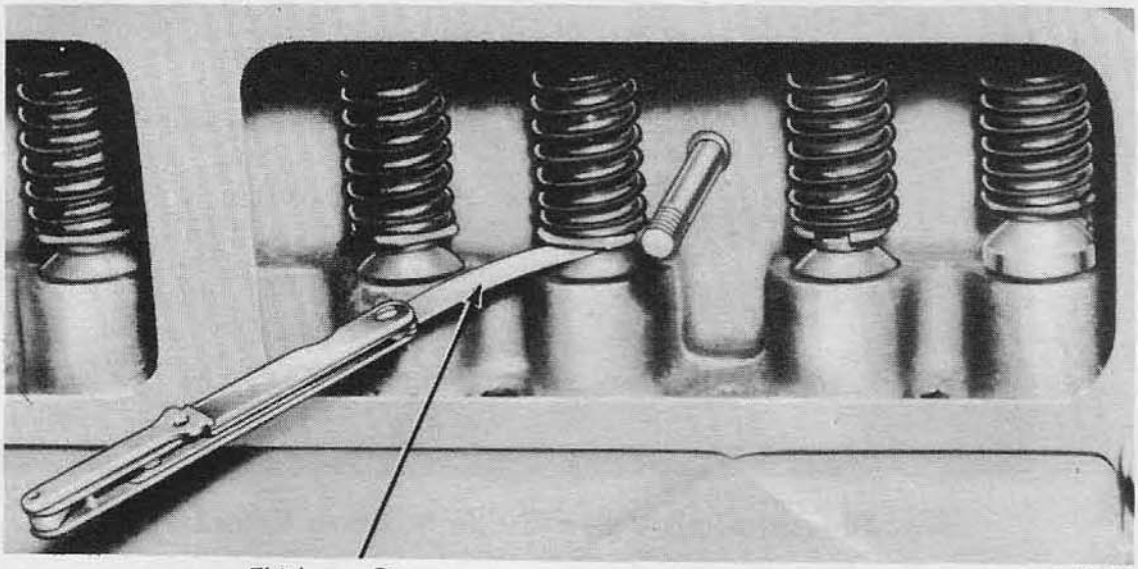


Fig. 39—Checking Clearance Between Valve Stem and Push Rod

electrical leads. Install the distributor cap. Install the spark plugs, using 24 to 28 pounds-feet torque. Mount the oil filter on the engine. Install the hood as outlined in section 331.

333. CONNECTING ROD AND PISTON REPLACEMENT.

The conecting rod and piston are removed as an assembly.

a. Remove Connecting Rod and Piston Assembly. Remove the cylinder head as outlined in section 332. Remove the oil pan as outlined in section 334. If desired, the front axle may be removed to obtain easy access to the engine. Remove the connecting rod nuts. Remove the bearing cap and lower half of the insert bearing. Push the rod and piston assembly up with a hammer handle, and remove the upper half of the insert bearing. Remove the piston and connecting rod from the top of the cylinder block.

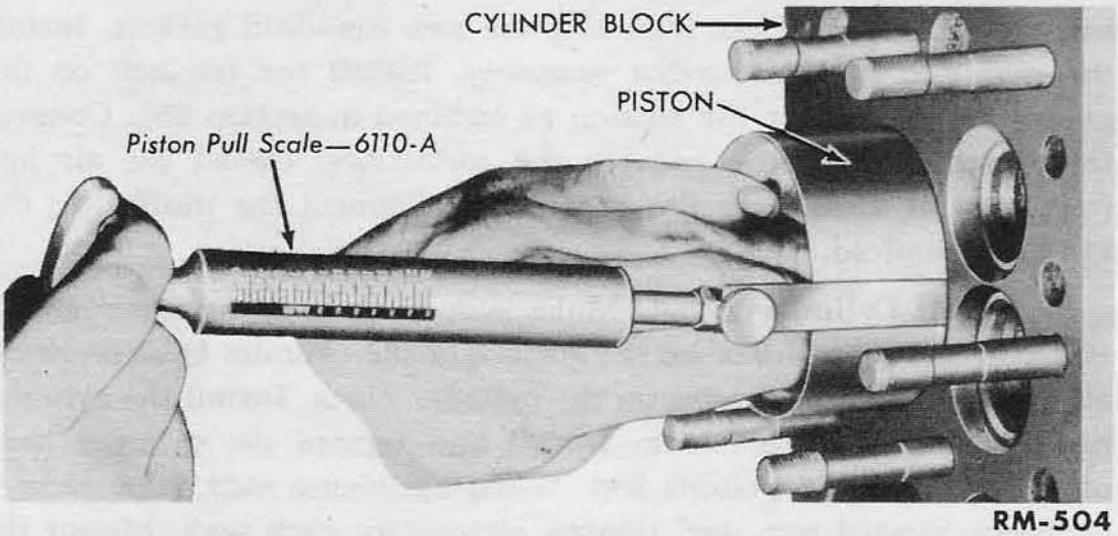


Fig. 40—Fitting Piston to Cylinder Bore

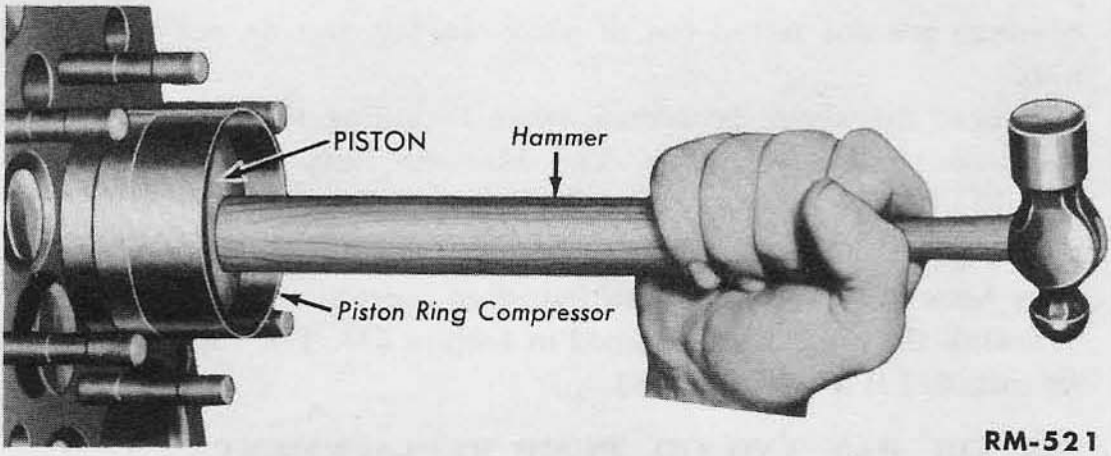


Fig. 42—Installing Connecting Rod and Piston Assembly

b. Fitting Pistons. To check the clearance of a piston in a cylinder bore, use a thickness gauge ½ inch wide and long enough to cover the entire length of the piston. Attach the gauge to a tension scale. Place the gauge on the side of the piston bore (fig. 40), and push the piston in the cylinder so that the side of the piston, which is 90 degrees (right angle) from the piston pin hole, is against the thickness gauge. Withdraw the gauge and observe the reading on the tension side. The thickness of the gauge to be used and the pounds pull for various combinations of pistons and cylinder bores are shown in fig. 41.

Cylinder Bore and Piston Combination	Steel Piston	
	Gauge Thickness	Pull Pounds
New Steel Sleeve—New Piston	0.003	5-8
Worn Steel Sleeve—New Piston	0.004	5-8
Worn Steel Sleeve—Worn Piston	0.005	5-8

Fig. 41—Dimensions for Fitting Piston in Cylinder Bore

c. Install Connecting Rod and Piston Assembly. Place the No. 1 connecting rod and piston assembly in the No. 1 cylinder with the oil squirt hole in the connecting rod facing toward the front of the engine and the number on the camshaft side of the engine. Install a piston ring compressor on the piston rings, and tap the piston down into the cylinder with the handle end of a hammer (fig. 42).

Place one-half of the connecting rod insert bearing in the connecting rod and the other half in the connecting rod bearing cap. Coat the connecting rod insert bearing with a light film of oil. Carefully position the connecting rod on the crankpin, and install the bearing cap on the connecting rod, making sure the number on the bearing cap is toward the camshaft side of the engine. Use care that the insert

bearings are not jarred out of place. Install, but do not tighten, the nuts.

Repeat the above procedure when installing the other connecting rod and piston assemblies. The Marsden nuts (self locking nuts) should be tightened from 45 to 50 pounds-feet.

CAUTION: ***These self locking nuts should be discarded after they have been removed and installed twice.***

Install the oil pan as outlined in section 334. The front axle should be installed if it was removed.

334. OIL PAN AND OIL PUMP REPLACEMENT.

The oil pump can be removed only after the oil pan has been removed.

a. Remove Oil Pan. Drain the engine crankcase. Support the tractor under the transmission housing. Remove the pin from the forward end of both radius rods. Remove the bolts holding the front axle support to the oil pan. Remove the cap screws which secure the transmission housing to the oil pan. Remove the pan-to-engine-block cap screws and lower the pan out of the tractor.

b. Remove Oil Pump. Remove the front main bearing cap nuts. Pull the oil pump assembly off the studs.

c. Install Oil Pump. Install the main insert bearings and the main bearing cap and pump assembly. The correct torque on the main bearing nuts is from 75 to 80 pounds-feet. Replace the lock wires in the main bearing nuts.

d. Install Oil Pan. Raise the pan in position, check to see that the gaskets are in place, then install the cap screws. All the cap screws and bolts should be installed before starting to tighten any of them. Install the pins in the radius rods.

335. CLUTCH REPLACEMENT AND ADJUSTMENT.

Before removing the clutch, the hood must be removed as outlined in section 331.

a. Remove Clutch. Disconnect the radius rod from the front axle. Disconnect the drag links from the steering arms. Support the tractor under the transmission and engine. Disconnect the battery leads. Remove the two cylinder head nuts which secure the electrical conduit. Disconnect and label the generator and coil electrical leads. Remove the distributor cap and starter switch from the engine assembly. The electrical connections may then be hung on the dash assembly. Remove the choke and governor control rods. Remove the air line from the air cleaner to the carburetor. Remove the oil pressure gauge line. Disconnect the muffler from the exhaust manifold.

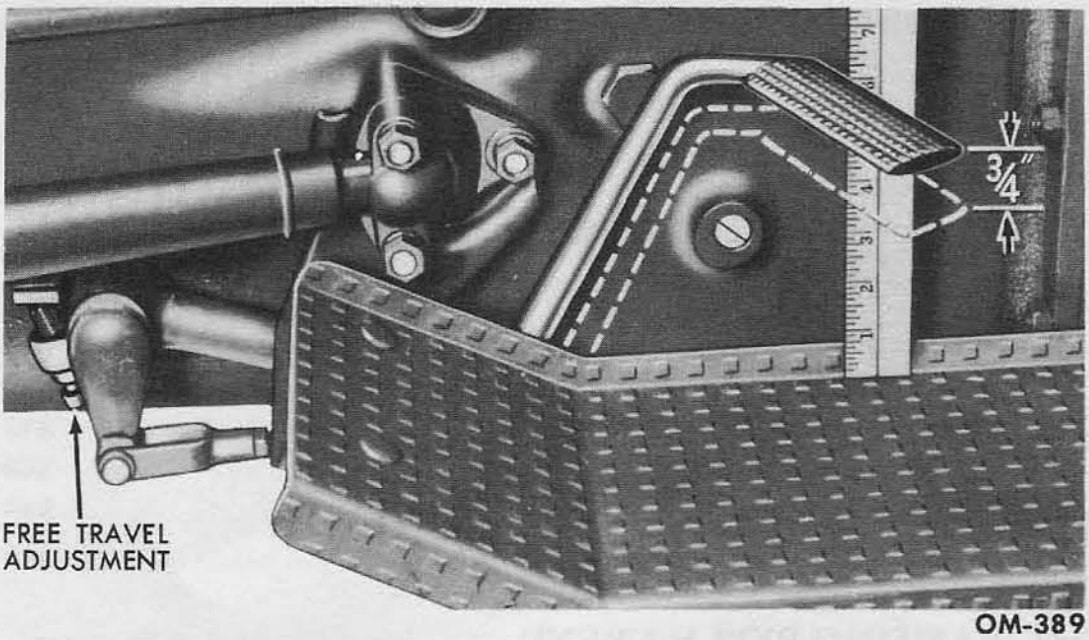


Fig. 43—Clutch Pedal Free Travel Adjustment

Remove the cap screws which secure the engine to the transmission. Roll the rear end assembly away from the engine. Remove the cap screws that secure the clutch assembly to the flywheel.

b. Install Clutch. Install the clutch assembly on the flywheel. Roll the rear end assembly up to the engine assembly. Engage the clutch shaft spline and roll the assembly into place. Secure the transmission to the engine assembly. Install the throttle spring. Secure the electrical conduit to the engine, and connect the electrical leads. Connect the choke and governor linkages. Install the oil pressure gauge line. Connect the muffler to the exhaust manifold. Connect the battery leads. Install the air line from the air cleaner to the carburetor. Install the hood as outlined in section 331.

c. Remove Clutch Linkage. Disconnect the engine from the transmission as outlined above. Drive the pin out of the fork and clutch release shaft. Remove the release shaft. Remove the clutch pedal by disconnecting the brake tie rod and removing the left wheel brake pedal. Remove the brake shaft and clutch pedal.

d. Install Clutch Linkage. Install the clutch release shaft and fork. Rivet the fork to the shaft. Place the clutch pedal on the brake shaft, and insert it into the transmission housing. Mount the left brake pedal. Connect the brake tie rod. Install the transmission on the engine as outlined in section 331.

e. Adjust Clutch Pedal Free Travel. The clutch pedal should be adjusted to have ¾ inch free travel. The adjustment screw is located on the clutch pedal. Fig. 43 shows the method of adjusting and measuring the clutch pedal free travel.

Chapter IV

FUEL and EXHAUST SYSTEMS

341 MANIFOLD REPLACEMENT.

Remove the clamp that attaches the manifold to the exhaust pipe. Loosen the fan belt tension adjustment and slip the belt off the generator pulley. Remove the carburetor as outlined in section 344. Remove the manifold.

Make sure there is no foreign material either on the manifold or block surfaces. Position new gaskets on the block. Install the manifold on the block. Install the belt on the generator, and adjust the belt tension as outlined in section 361. Install the clamp that attaches the muffler to the exhaust manifold. Mount the carburetor as outlined in section 344.

342. AIR CLEANER REPLACEMENT AND SERVICE.

The air cleaner is essential for long engine life, and the cleaner should receive frequent service. Poor air cleaner service results in inefficient cleaning and allows foreign material to collect in the cleaner which restricts the air flow. Restricted air flow through the cleaner will increase fuel consumption because it gives the same results as running with the choke partly closed.

a. Remove Air Cleaner. Remove the air line from the air cleaner to the carburetor. Remove the four screws which secure the intake air connection to the hood. Remove the cup from the bottom of the air cleaner. Remove the two bolts which secure the cleaner to the battery rack, and lift off the cleaner. The disassembled air cleaner is shown in fig. 44.

b. Install Air Cleaner. Mount the air cleaner in position, and secure it with two bolts to the battery rack. Mount the intake air connection to the hood, securing it with four screws. Install the air

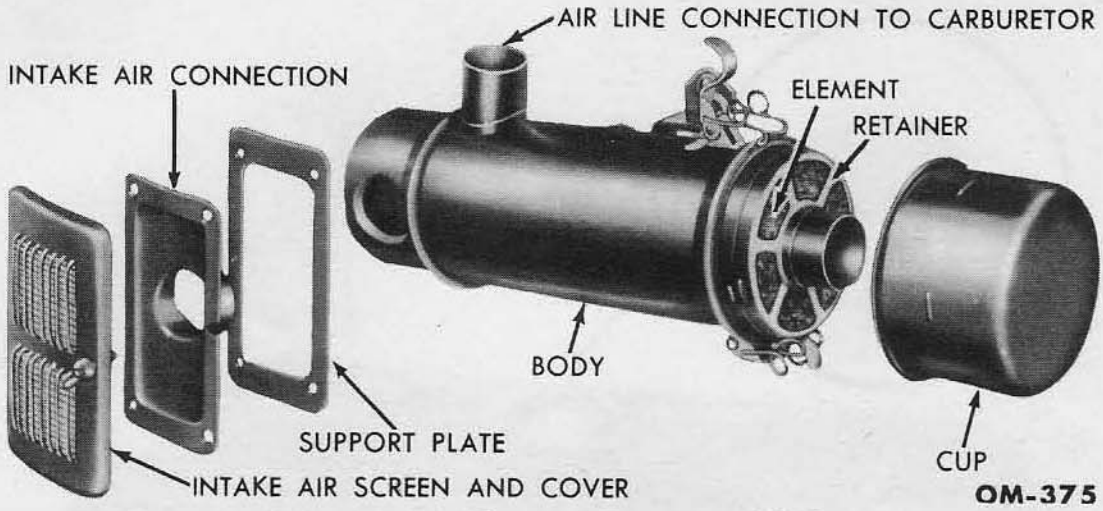


Fig. 44—Air Cleaner, Disassembled

line from the air cleaner to the carburetor. Clean the air cleaner cup. Fill the cup with clean oil to the indicated level, and install the cup.

c. Service. Daily cleaning of the air cleaner cup is usually sufficient under most field operations. Under very dirty conditions, it may be necessary to service the cleaner several times each day. Routine cleaner service consists of cleaning the cup and the lower end of the cleaner body. Fill the cup to the indicated level with clean oil of the same weight used in the engine crankcase. When operating in sub-zero temperature, it is desirable to thin the cleaner oil with a little kerosene or gasoline. Clean the intake air cleaner as required. The engine breather cap (fig. 22) should be washed when giving the air cleaner routine cleaning.

The routine service of the cleaner will allow dust deposits to accumulate in the body of the cleaner. Semi-annually, the cleaner should be removed from the tractor and thoroughly cleaned.

With a screw driver, pry the element retainer from the cleaner body. Remove the lower section of the element and wash it thoroughly in gasoline. Place the lower section of the element in the cleaner body, and install the element retainer. If the heavy deposits cannot be removed, the cleaner body should be replaced.

343. FUEL TANK REPLACEMENT AND CLEANING.

The use of clean fuel prevents fuel system failures. Always refill the gasoline tank at the end of the day's operation. This removes the moisture laden air from the tank, and thereby reduces the condensation of water.

a. Removal. Disconnect the fuel line, and drain the gasoline with the shut-off valve opened to the reserve position. Remove the hood as outlined in section 331. Remove the tank from the hood assembly.

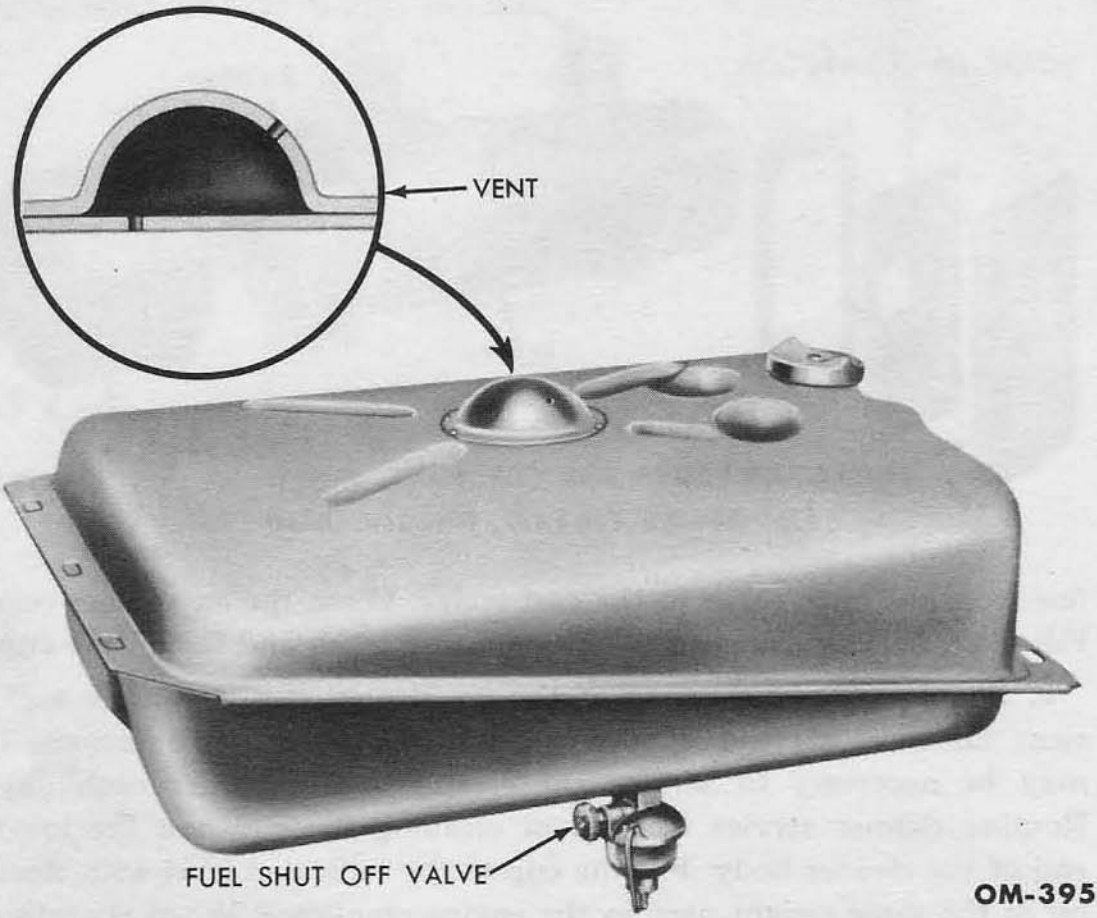


Fig. 45—Fuel Tank

b. Cleaning. It is advisable to remove the fuel shut-off valve, by unscrewing the assembly, when cleaning the gasoline tank. Clean the sediment bowl, screws, and valve passages as required. Clean the fuel line to remove any foreign material.

c. Installation. Screw the fuel shut-off valve into position in the gasoline tank. Mount the tank in the hood assembly. Install the hood as outlined in section 331.

344. CARBURETOR REPLACEMENT AND ADJUSTMENT.

A correctly adjusted, clean carburetor is necessary for efficient tractor operation.

a. Removal. Disconnect the choke and governor control rods. Disconnect the air line from the air cleaner. Remove the carburetor from the manifold.

b. Cleaning. Remove the main adjustment needle (fig. 48). Remove the four screws that secure the carburetor body to the carburetor throttle body (fig. 46). Thoroughly clean all passages in the carburetor. Be sure that the drain screen washer remains within the main air intake drain.

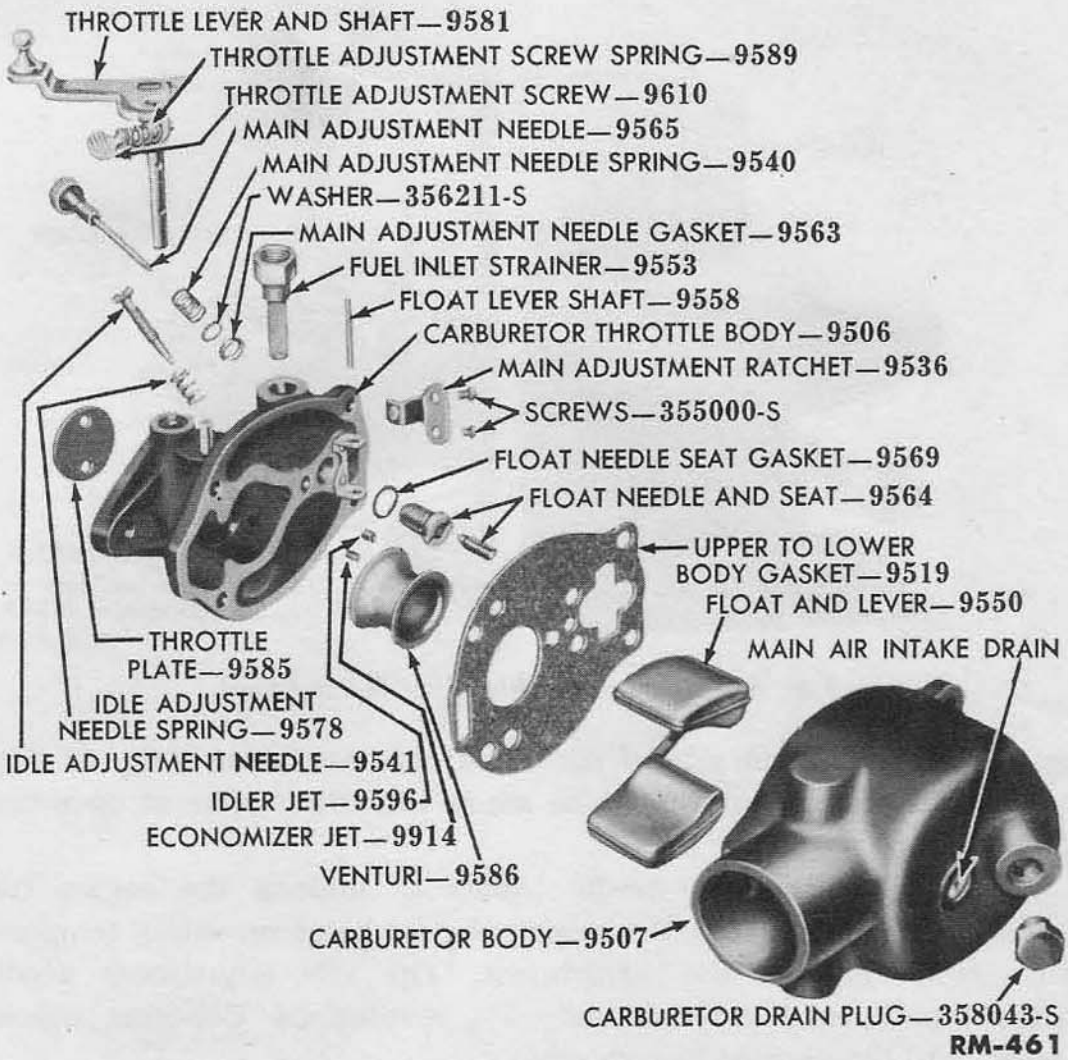


Fig. 46—Carburetor, Disassembled

c. Float Adjustment. Bend the float lever until the float is positioned as shown in fig. 47.

d. Installation. Mount the carburetor on the manifold, securing with two studs. Connect the air line to the carburetor. Connect the choke and governor rods.

e. Carburetor Adjustment. The carburetor adjustments are: main adjustment needle, throttle adjustment screw, and idle adjustment needle.

The main adjustment needle should be opened 1¾ turns from the closed position. A field method of checking this adjustment is to open the throttle quickly with the engine under partial load. The engine should respond immediately to the increased throttle setting. If the engine "coughs," or hesitates, open the main adjustment needle about ⅛ turn more and repeat the check.

When the hand throttle is in the idle speed position, the engine should be running about 400 R.P.M. The engine speed may be determine as outlined in section 345. The throttle adjustment screw

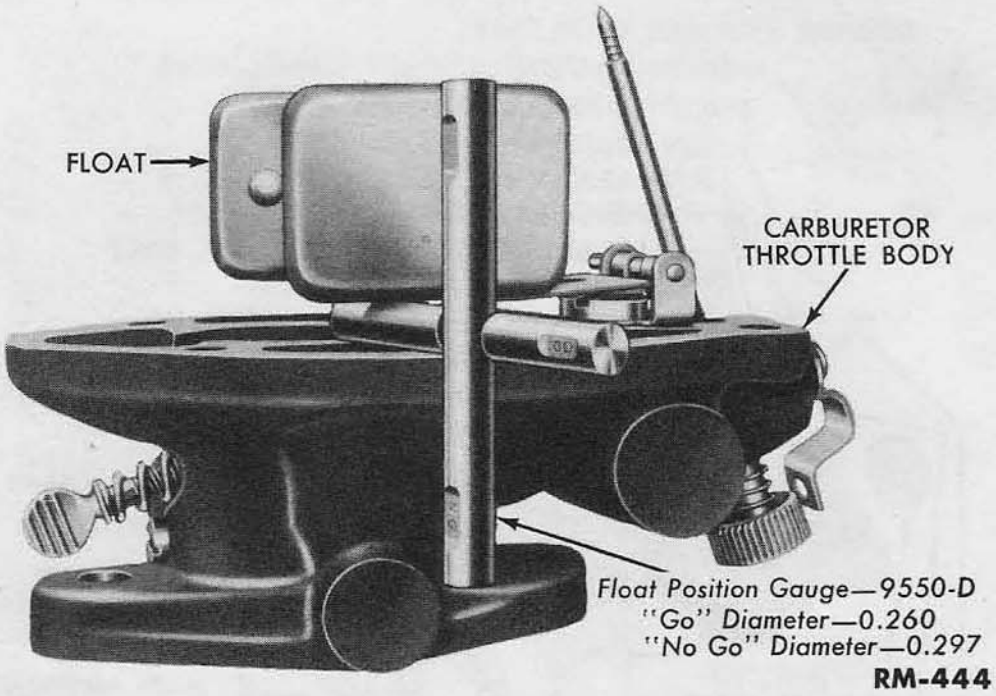


Fig. 47—Correct Position for Float Level

is located on the left side of the carburetor, as shown in fig. 48. The idle speed adjustment should be made with the engine at operating temperature.

The idle adjustment needle assists in making the engine run smoothly at idle speed. The engine should be at operating temperature when making the adjustment. The idle adjustment needle should be opened approximately 2½ revolutions. Continue adjustment until the engine idles smoothly.

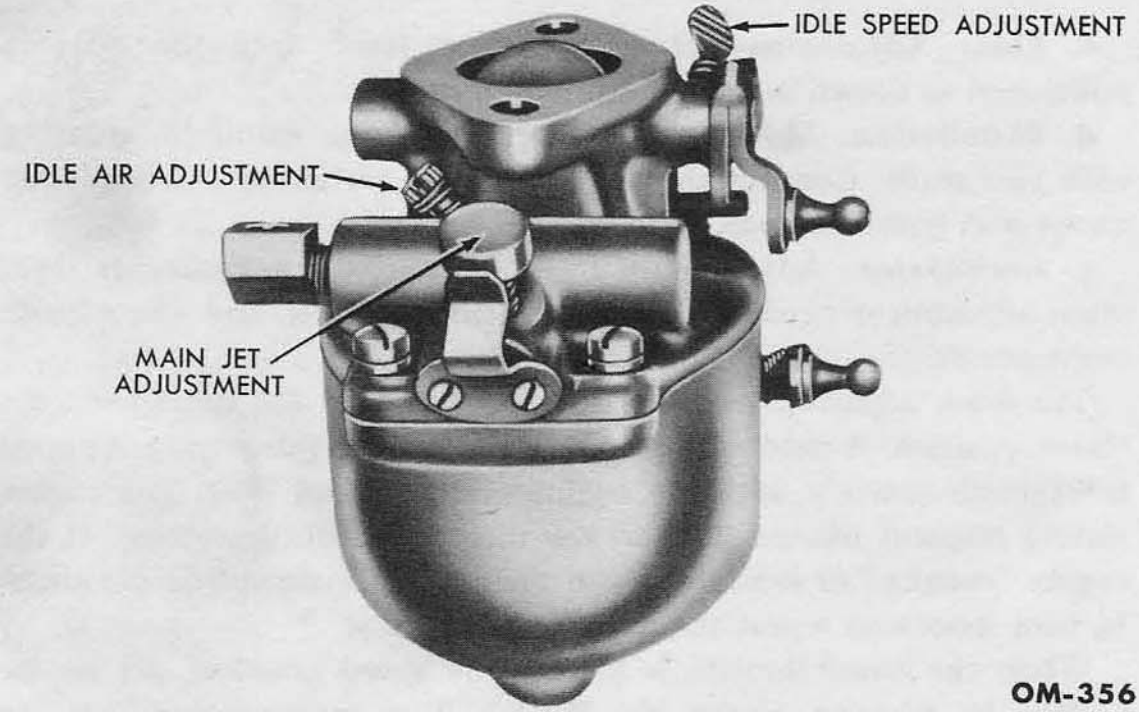


Fig. 48—Carburetor, Assembled

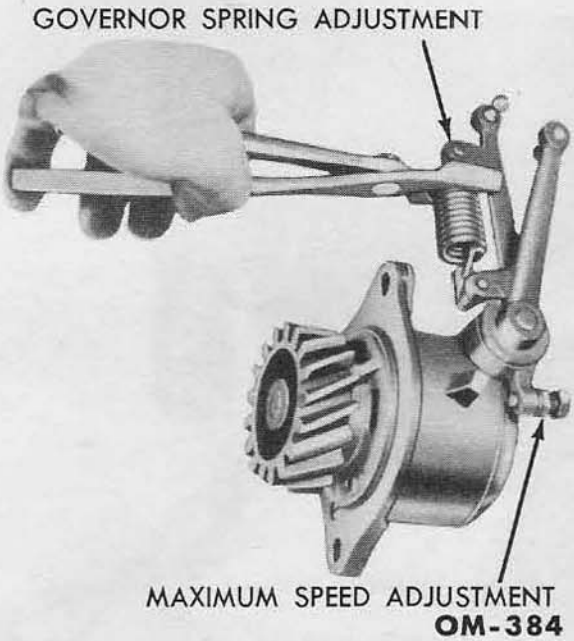


Fig. 49—Governor Spring Adjustment

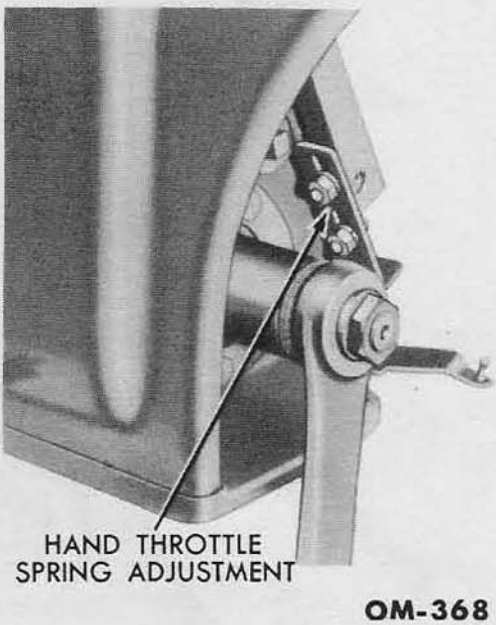


Fig. 50—Hand Throttle Spring Tension Adjustment

345. GOVERNOR AND LINKAGE REPLACEMENT.

The governor changes throttle setting as required, to maintain a given engine speed under varying engine loads.

a. Remove Governor. Disconnect the two rods from the governor arms. Disconnect the oil line. Remove the governor from the engine assembly.

b. Install Governor. Mount the governor on the engine, and connect the two rods and the oil line.

c. Governor Linkage Adjustment. The governor spring should be a snug fit and should have no end play or preload. The spring may be adjusted by bending the loop on the spring with a pair of pliers as shown in fig. 49.

The hand throttle is held in position by the spring tension. The spring tension may be adjusted by raising the stationary spring seat. This adjustment is located on the right side of the steering gear as shown in fig. 50.

To adjust the maximum speed stop and the governor linkage, the engine must be started. Bring the engine to top speed, and, with a tachometer, read the R.P.M. of the power take-off shaft (fig. 51). Engine speed is equal to 2.75 times the power take-off speed. Follow the subpar. below which applies.

(1) *ENGINE SPEED OVER 2200 R.P.M.* Manipulate the maximum speed adjustment to give a top speed of from 2000 to 2200 R.P.M. as shown in fig. 49. Lengthen the governor rod so that when the governor arm strikes the maximum speed adjustment, the throttle lever is in the last notch on the quadrant.

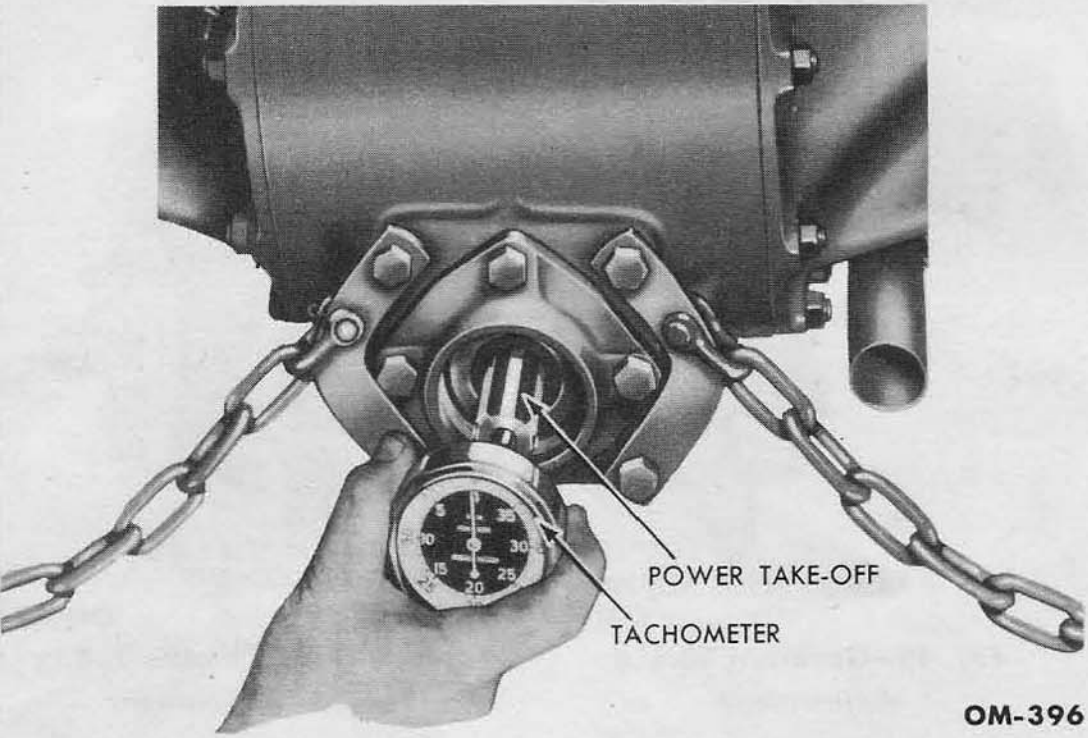


Fig. 51—Measuring Speed of Power Take-off Shaft

(2) *ENGINE SPEED UNDER 2000 R.P.M.* Shorten the governor rod to secure an engine speed of from 2000 to 2200 R.P.M. when the throttle lever is in the maximum speed position (fig. 52). It may be necessary to back off the maximum speed adjustment to adjust the governor rod (fig. 49). Adjust the maximum speed adjustment after the governor rod has been adjusted.

346. MUFFLER ASSEMBLY REPLACEMENT.

Remove the clamp holding the exhaust pipe to the manifold. Remove the nut on the tail pipe support.

Install the tail pipe support. Clamp the exhaust pipe to the manifold.

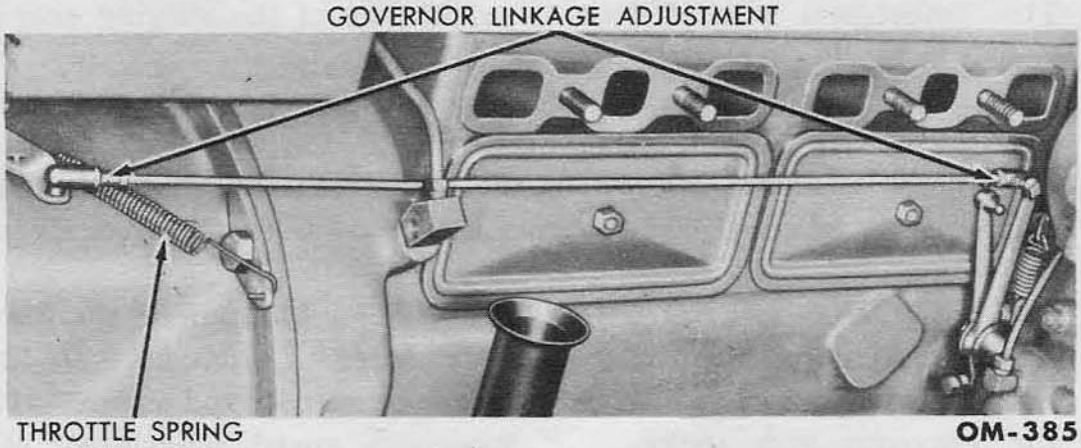


Fig. 52—Governor Linkage Adjustment

Chapter V

COOLING SYSTEM

351. RADIATOR REPLACEMENT.

Remove the hood as outlined in section 331. Drain the cooling system. Remove the radiator hose connections. Remove the radiator.

Install the radiator and hose connections. Replace the hood as outlined in section 331.

352. WATER PUMP REPLACEMENT.

Drain the cooling system. Loosen the fan belt tension. Remove the water pump hose connection. Remove the four cap screws that secure the fan to the pulley. Remove the three cap screws that mount the water pump assembly on the engine. Remove the water pump assembly. Remove the fan.

Position the fan in the shroud. Mount the water pump on the engine. Secure the fan to the pulley with the four cap screws. Set the fan belt tension as outlined in section 353. Install the hose connection, and refill the cooling system.

353. FAN AND SHROUD REPLACEMENT.

Remove the radiator as outlined in section 351. Remove the shroud from the radiator. Remove the fan from the water pump assembly.

Install the fan on the water pump assembly. Install the shroud on the radiator. Install the radiator as outlined in section 351.

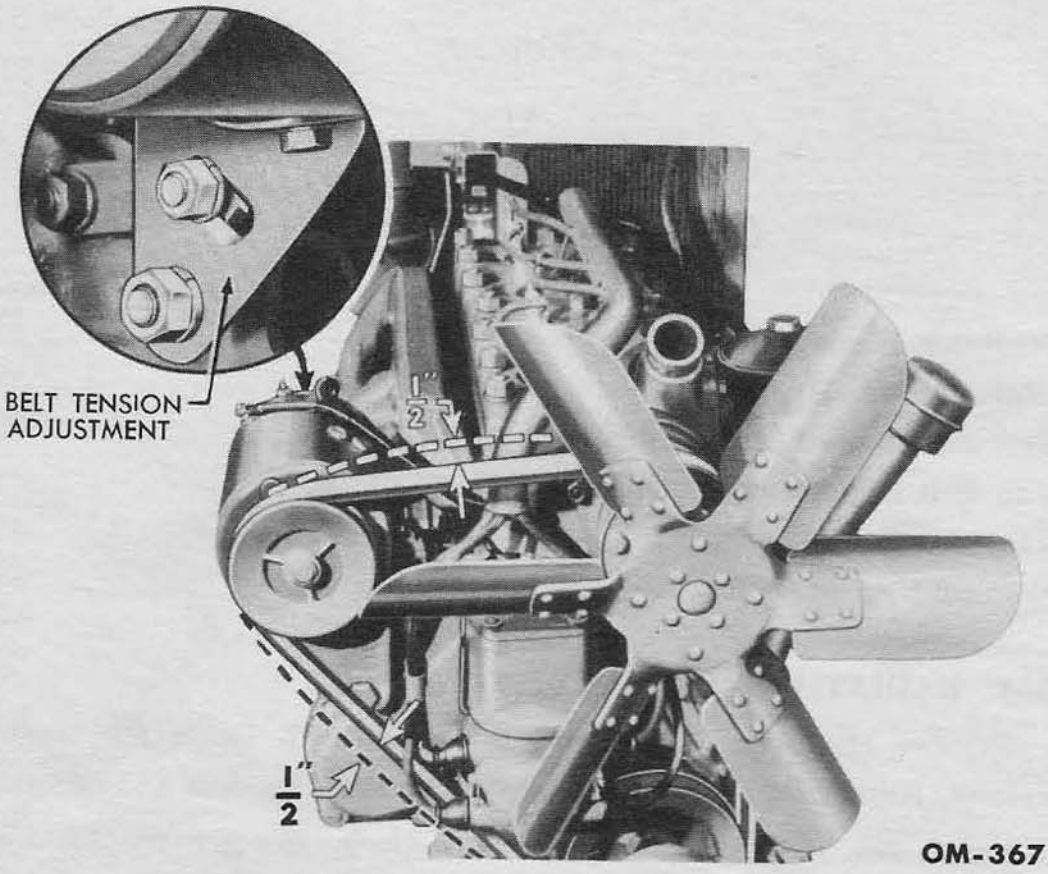


Fig. 53—Fan Belt Adjustment

354. FAN BELT REPLACEMENT AND ADJUSTMENT.

The fan belt may be removed and installed without removing any assemblies. Fan belt tension may be adjusted by changing the position of the generator. This adjustment is shown in fig. 53. This figure also shows the correct tension adjustment on the fan belt.

355. THERMOSTAT REPLACEMENT.

Remove the upper radiator hose connection. Press the thermostat out of the hose.

Before installing a thermostat, try its operation in hot water. It should start to open at 160° F. to 165° F. and be fully open at 190° F. to 200° F. The replacement thermostat may be pressed into the hose. Be sure to install the thermostat in the correct position with the bi-metal spiral on the bottom. Install the hose on the engine.

356. COOLING SYSTEM PROTECTION.

It is necessary to protect the tractor cooling system when the air temperature is below 32° F. The radiator may be filled with alcohol

or ethylene glycol anti-freeze. The following chart gives the amount of anti-freeze required to protect the Ford tractor cooling system at various temperatures. The system has a capacity of 12 quarts.

NOTE: ***Do not use a calcium chloride solution as an anti-freeze. It will corrode the cooling system.***

ANTI-FREEZE CHART

Temperature	Alcohol (Denatured 90%-180 Proof)	Ethylene Glycol
20°F.	5½ pts.	4¼ pts.
10°F.	8½ pts.	7 pts.
0°F.	11¼ pts.	8½ pts.
−10°F.	12½ pts.	11¼ pts.
−20°F.	15½ pts.	12½ pts.
−30°F.	17 pts.	16¾ pts.

Chapter VI

ELECTRICAL SYSTEM

361. GENERATOR AND BRUSH REPLACEMENT.

To replace the generator brushes, it is necesary to disconnect the armature lead from the end plate (fig. 54). Remove the two cap screws from the end plate. Remove the end plate.

CAUTION: ***Do not lose the end plate locating dowel (fig. 54.).***

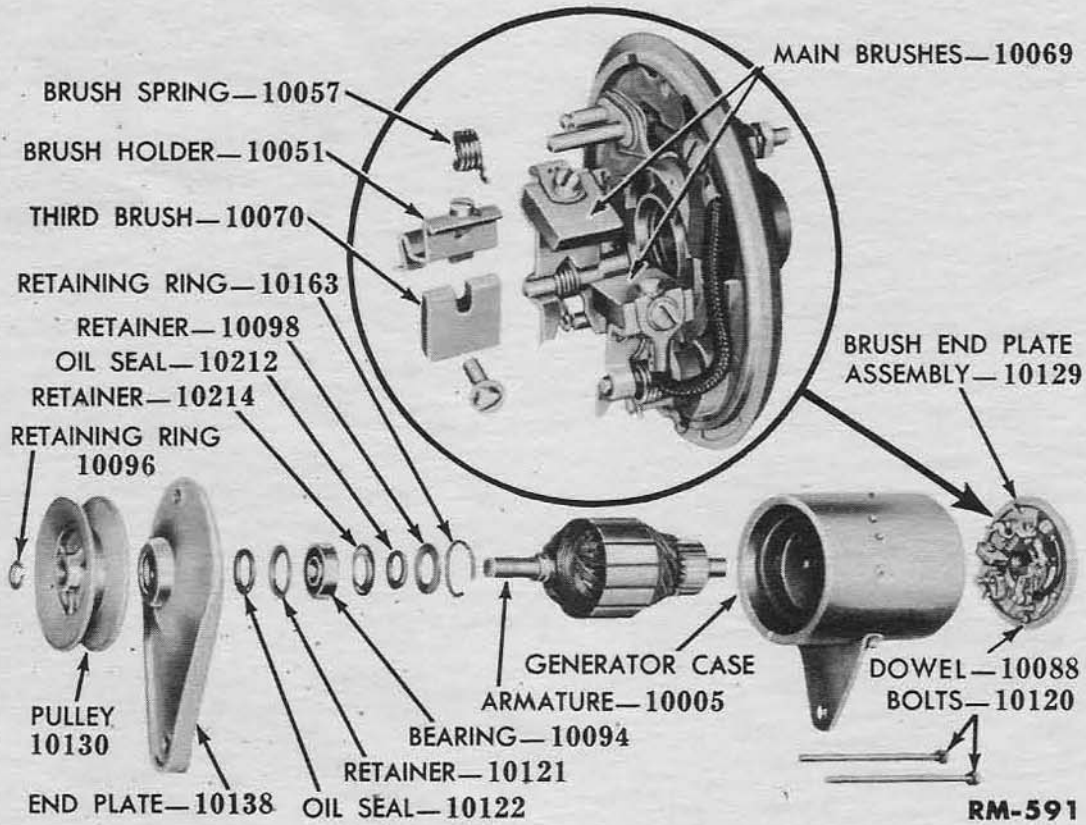


Fig. 54—Generator Assembly

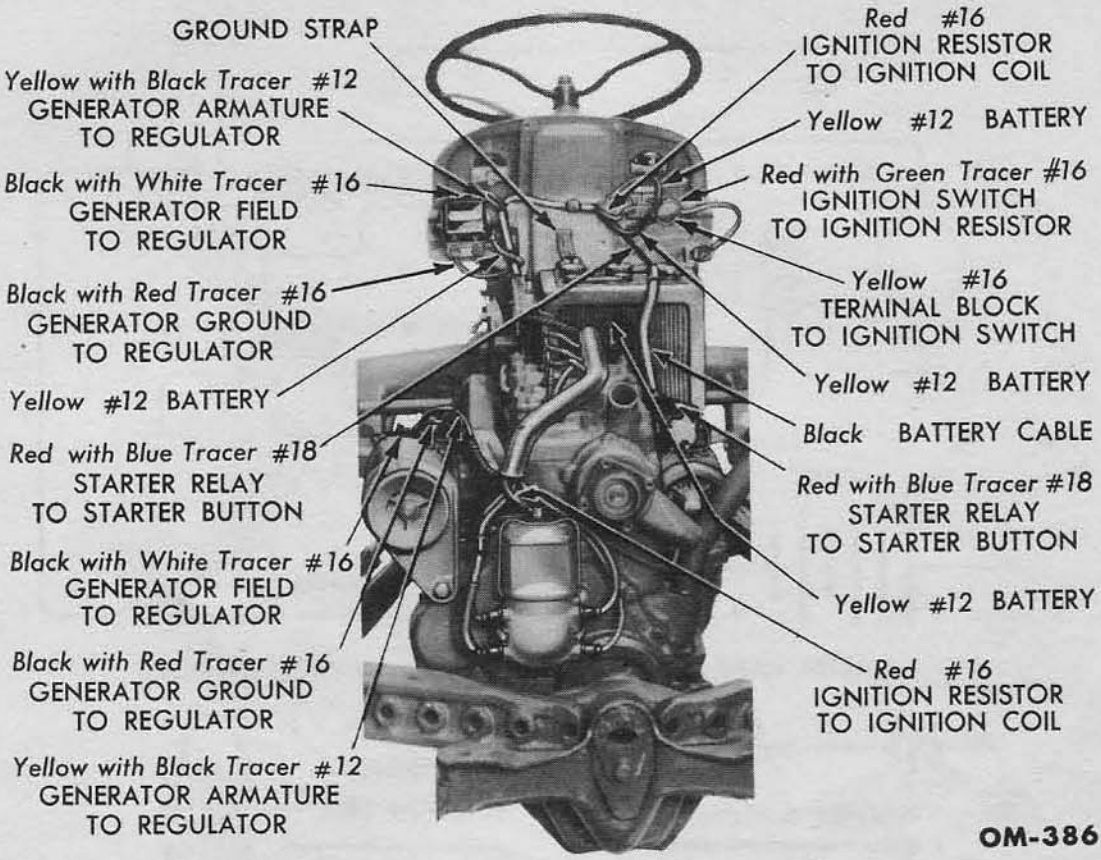


Fig. 55—Electrical System

Inspect the generator commutator and if rough, it should be turned down and the mica undercut. Dirty commutators should be cleaned with carbon tetrachloride.

Replace the brushes on the end plate assembly. Install the end plate assmbly with the locating dowel in the recess on the bottom side of the case. Install the two cap screws. Connect the armature lead.

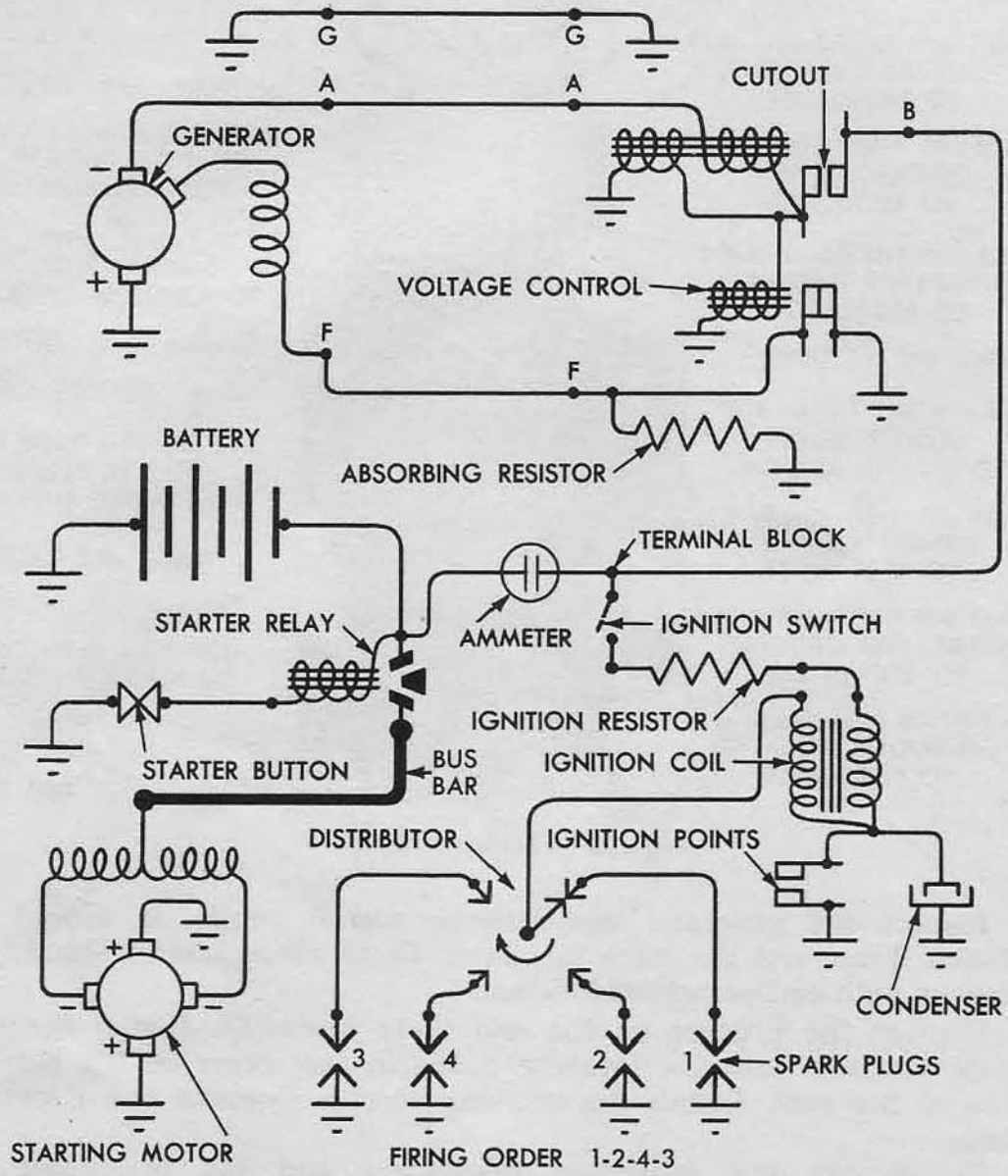
To remove the generator, disconnect and tag the generator electrical leads. Remove the bolt from the fan belt tension adjustment. Remove the generator from the engine.

Mount the generator on the engine assembly (fig. 55). Place the belt on the generator pulley, and install the bolt in the belt tension adjustment. Adjust the belt tension as outlined in section 354. Connect the generator electrical leads (fig. 55).

362. BATTERY AND RACK REPLACEMENT.

Remove the two wing nuts from the battery cover. Remove the battery cover. Disconnect the battery leads. Remove the battery.

Remove the air cleaner as outlined in section 342. Loosen the clamps around the electrical harness on the right end of the battery rack. Remove the tool box. Remove the four cap screws which secure the rack. Remove the battery rack.



KEY

CIRCUITS	COLOR	SIZE
GENERATOR ARMATURE TO REGULATOR	*Yellow with Black Tracer*	*12*
GENERATOR FIELD TO REGULATOR	*Black with White Tracer*	*16*
GENERATOR GROUND TO REGULATOR	*Black with Red Tracer*	*16*
REGULATOR TO TERMINAL BLOCK	*Yellow*	*12*
RESISTANCE BLOCK TO STARTER RELAY	*Yellow*	*12*
BATTERY CABLE	*Black*	
TERMINAL BLOCK TO IGNITION SWITCH	*Yellow*	*16*
IGNITION SWITCH TO IGNITION RESISTOR	*Red with Green Tracer*	*16*
IGNITION RESISTOR TO IGNITION COIL	*Red*	*16*
STARTER RELAY TO STARTER BUTTON	*Red with Blue Tracer*	*18*

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Fig. 56—Schematic Wiring Diagram

To install the rack, place it in position and secure with the cap screws. The ground strap fits under the upper left cap screw. Install the tool box. Clamp the electrical harness in position on the right end of the battery rack. Mount the air cleaner as outlined in section 342.

To install the battery, slide it into the rack. Connect the ground strap to the positive terminal of the battery (largest terminal). Connect the battery cable to the negative battery terminal. Secure the battery cover in position with the wing nuts.

363. STARTING MOTOR REPLACEMENT.

Disconnect the battery lead. Remove the top nut from the starting motor electrical terminal. Remove the two screws that attach the starter relay to the starting motor. Lay the electrical leads to one side, Remove the two cap screws from the end of the starting motor. Remove the starting motor.

To install the starting motor, place it in position on the engine, securing it with two cap screws. Mount the starter relay on the starting motor. Connect the electrical strap to the starting motor terminal. Connect the battery lead.

364. DISTRIBUTOR AND BREAKER CONTACTS REPLACEMENT.

The distributor assembly must, at all times, deliver a correctly timed and strong spark to each cylinder.

a. Remove Distributor. Disconnect the electrical lead from the coil. Spring the coil clip forward and lift off the coil. Remove the coil gasket. Loosen the fan belt as outlined in section 354. Release the distributor cap clips. Remove the two cap screws that support the distributor. Lift off the distributor.

b. Breaker Contacts Replacement and Adjustment. Remove the breaker contact spring screw and washer (fig. 57). Remove the cotter pin that secures the breaker contact arm to the plate assembly, and lift out the breaker contact. Remove the two cap screws and lock washers that secure the stationary breaker contact to the plate assembly, and lift out the breaker contact.

Install new breaker contacts by reversing the above procedure.

Turn the distributor shaft until the rubbing block on the breaker arm is resting on the high point of the cam. Loosen the stationary contact lock screw (fig. 57). Turn the eccentric adjustment screw and, using a thickness gauge between the contacts, set the gap to between 0.014 inch and 0.016 inch. Tighten the two lock screws. Turn

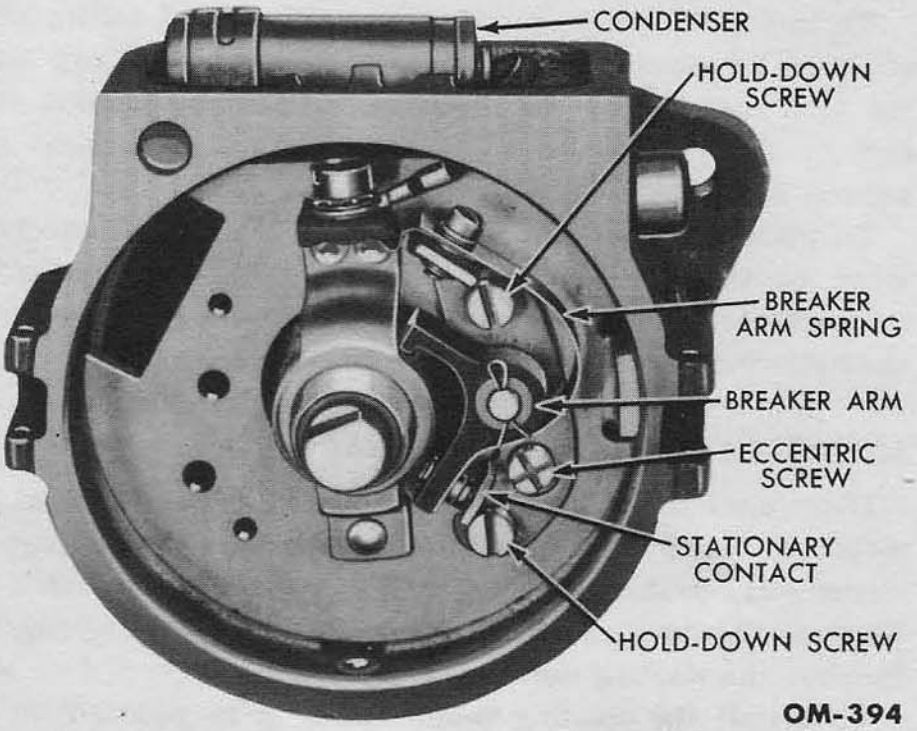

Fig. 57—Breaker Contacts

the shaft so that the contacts are closed, and observe whether or not contact is made squarely. If it is necessary to align the contacts, bend or twist the bracket which holds the stationary contact. It will be necessary to readjust the gap after this correction.

c. Adjust Basic Timing. Be sure that the contact gap is correct, as described above. Place a scale against the tang on the wide side of the distributor shaft, and rotate the shaft until the scale is ¼ inch from the rear side of the small mounting hole (fig. 58). With the distributor shaft in this position, the contacts should be just starting to open. Move the adjustment plate on the left side of the distributor down to advance the timing, or up to retard the timing. If the proper timing is not attained in the first attempt, turn the distributor shaft back at least ¼ turn to eliminate backlash, then repeat the check.

d. Install Distributor. Assemble and mount the distributor on the engine front cover plate. The tang on the drive cam is off-center, and can be installed in only one way. Clip the distributor cover in place. Install the coil gasket and coil. Connect the coil terminal lead. Adjust the fan belt tension as outlined in section 354.

365. AMMETER AND IGNITION SWITCH REPLACEMENT.

Disconnect the leads at the battery. To remove the ammeter, disconnect the electrical lead and pull it out of the ammeter clamp. Tag the lead for identification. Remove the two nuts on the ammeter clamp. Remove the ammeter.

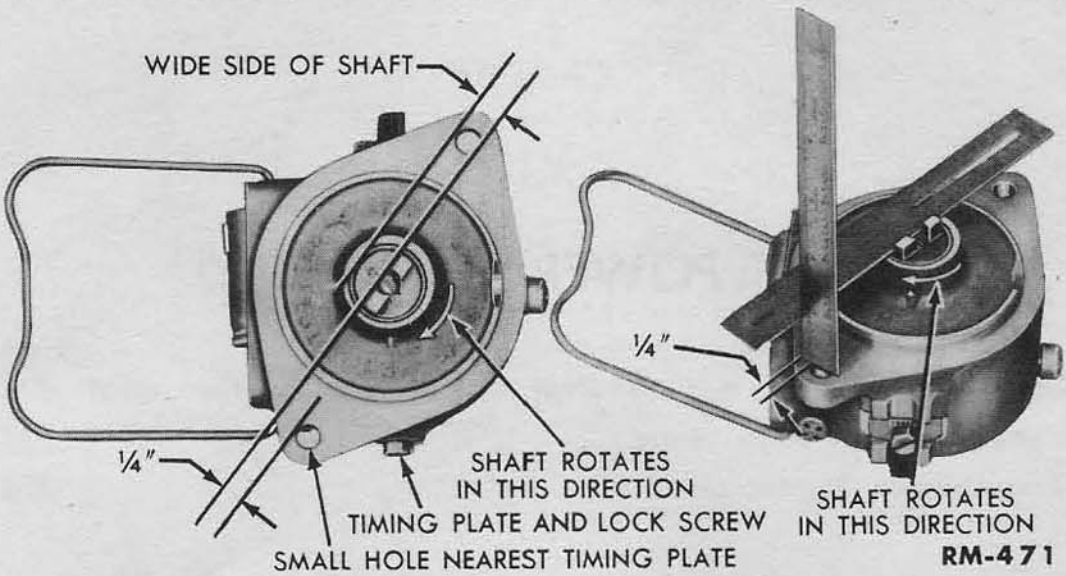

Fig. 58—Timing Adjustment

Install the ammeter in the instrumental panel, and secure it with the clamp. Thread the wire through the ammeter clamp, and connect it to the terminal (fig. 55.)

To remove the ignition switch, disconnect and tag the two wires at the terminals which lead to the switch (fig. 55). Remove the ignition switch clip. Remove the switch.

Install the switch in the instrument panel, and secure it with the clip. Connect the two wires to the terminals (fig. 55). Connect the battery cable.

366. CONDUIT REPLACEMENT.

Conduit wiring must be replaced when the insulation breaks down.

a. Remove Conduit. Disconnect the battery cable. Remove the nuts that hold the conduit to the cylinder head. Disconnect the wires from the spark plugs, generator, and the secondary wire from the coil. Unsnap the two clips that hold the distributor cap to the distributor, and remove the cap, wires, and conduit from the engine.

b. Disassembly. Remove the wires from the distributor cap, and pull them out of the conduit.

c. Assembly. Note the numbers on the wire ends. Insert them in their proper positions in the conduit (figs. 55 and 56), and connect the other end of the wires to the corresponding numbers on the distributor cap. Make sure all the wires are in their proper terminals and seated firmly in the terminal sockets.

d. Install Conduit. Position the conduit on the cylinder head and install the nuts. Connect the spark plug wires to the spark plugs, and connect the secondary wire to the coil. Connect the generator wires. Install the distributor cap and secure it with the two clips. Connect the battery cable.

Chapter VII

POWER TRAIN

371. DRIVE PINION, DIFFERENTIAL, AND REAR AXLE ASSEMBLY REPLACEMENT.

Before removing the drive pinion, differential, and rear axle assembly, remove the hydraulic pump as outlined in section 383, and the hydraulic unit as outlined in section 382.

a. Remove Assembly. Remove the cover plate from both sides of the center housing. Remove the nut from the tail pipe support. Remove the pin from the forward end of the brake tie rod. Support the tractor under the transmission housing and under the center housing with separate supports (fig. 59). Remove the bolts that secure the center housing to the transmission housing. Roll the rear end assembly away from the tractor. Support the rear end assembly and remove the wheels. If desired, fenders and lower links may be removed.

b. Install Assembly. Install the rear wheels. Slide the drive shaft on the drive pinion spline. Install the transmission gasket. Engage the main transmission shaft spline with the drive shaft. Bolt the transmission to the center housing. Install the hydraulic pump as outlined in section 383. Install the hydraulic unit as outlined in section 382. Connect the brake tie rod to the brake cross shaft by installing the pin. Install the inspection plates on the sides of the center housing. Be sure the power take-off lever is engaged when installing the left inspection plate. Install the tail pipe support. Install the fenders and lower links if they were removed.

c. Check Rear Axle Shaft End Clearance. Proper rear axle shaft end clearance is obtained by increasing or decreasing the number of rear axle bearing adjusting shims, located between the brake backing plate and the bearing cup retainer.

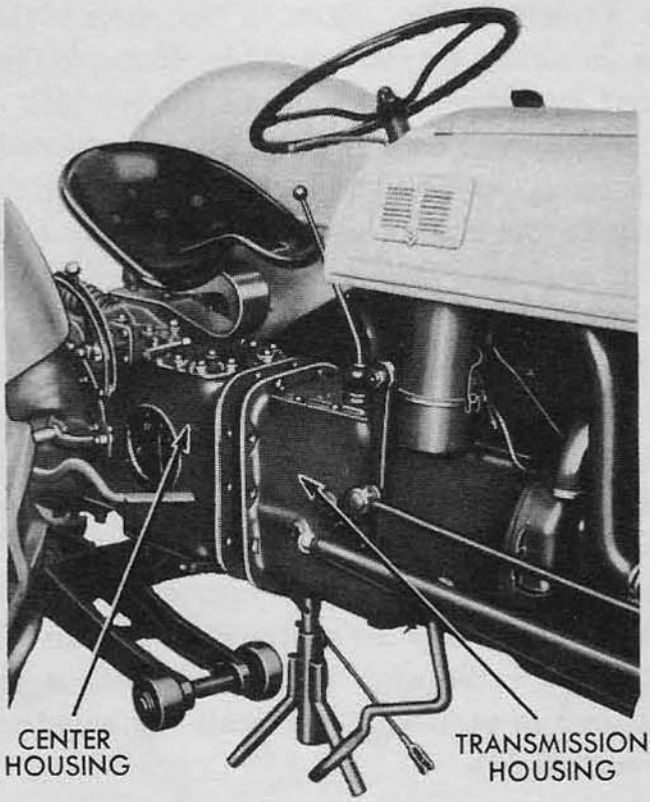

Fig. 59—Aligning Transmission Housing and Center Housing

To check the axle shaft clearance, jack up the tractor so that both rear wheels are clear of the ground. With the tractor out of gear, it should be possible to turn one rear wheel and cause the other rear wheel to rotate in the opposite direction.

If both rear wheels rotate in the same direction, there is insufficient clearance and additional shims should be installed.

Check excessive axle shaft end play by attempting to move a wheel in and out. If any motion is apparent, excessive end play exists, and shims should be removed to correct the condition.

372. POWER TAKE-OFF REPLACEMENT.

Drain the oil from the transmission and center housing. Remove the four cap screws on the power take-off bearing housing. Pull the power take-off assembly out of the rear end of the tractor.

Insert the power take-off in the tractor, and install the cap screws. Refill the transmission with oil.

373. TRANSMISSION REPLACEMENT.

Before removing the transmission, remove the steering assembly as outlined in section 321, and remove the muffler as outlined in section 346.

a. Remove Transmission. Remove the step plates. Remove the forward pin in the brake tie rod assembly. Remove the power take-off shaft as outlined in section 372. Remove the left side inspection plate from the center housing. Support the engine assembly. Support the transmission housing. Remove the cap screws which secure the transmission housing to the engine assembly. Roll the rear end assembly away from the engine. Place a support under the center housing. Remove the transmission from the center housing.

b. Install Transmission. Slide the drive shaft on the drive pinion spline. Install the transmission gasket. Engage the main transmission shaft spline with the drive shaft. Bolt the transmission to the center housing. Engage the clutch shaft in the clutch, and secure the transmission to the engine assembly. Install the left inspection plate on the center housing. Be sure the power take-off lever is engaged. Install the power take-off assembly as outlined in section 372. Connect the brake tie rod. Install the step plates and radius rods. Install the muffler as outlined in section 346. Install the steering gear assembly as outlined in section 321.

Chapter VIII

HYDRAULIC SYSTEM

381. HYDRAULIC SYSTEM OPERATION.

The hydraulic system is used on the Ford tractor to obtain automatic control of the implements. The constant draft control and position control use many of the same parts.

a. Ram Cylinder. The ram cylinder and piston are used to support the lower links. Fig. 60 shows the ram cylinder. When there is no oil in the ram cylinder, the links are in the lowered position. The links are in the raised position when the ram cylinder is full of oil. Inter-

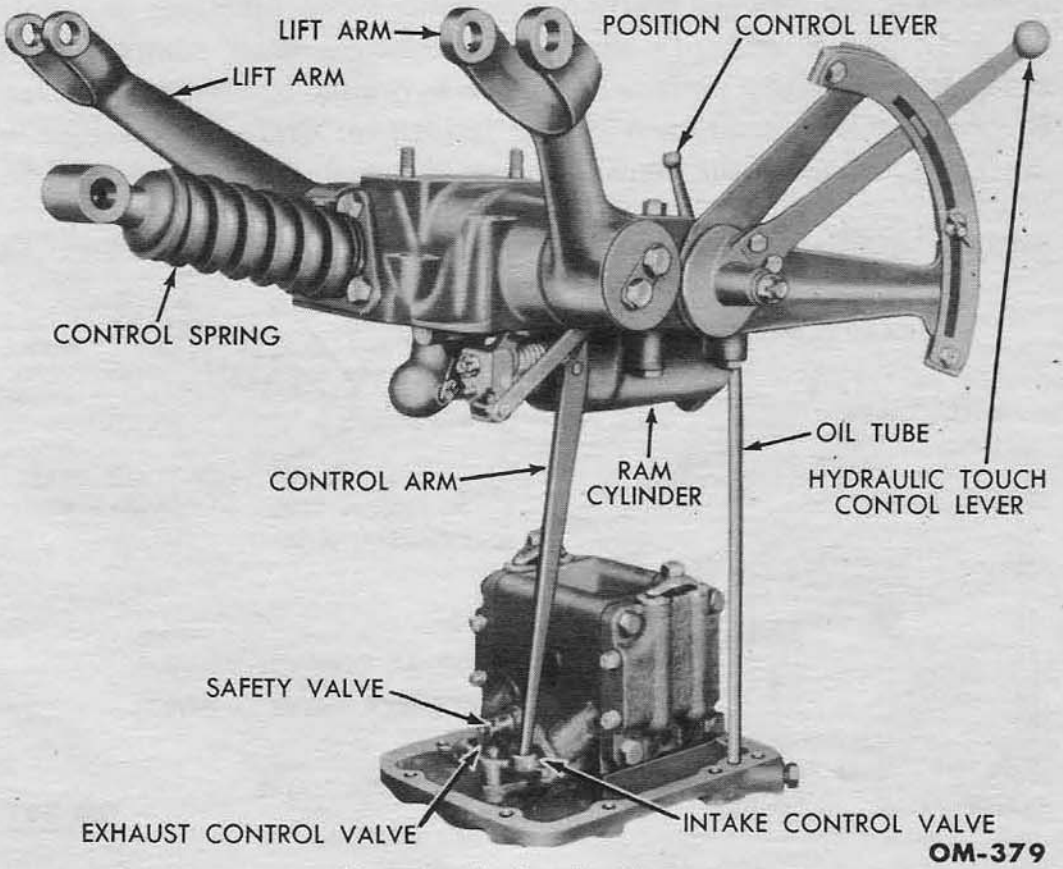

Fig. 60—Hydraulic System

mediate link positions are obtained by filling the ram cylinder with the required amount of oil. When the control valves are in the neutral position with intake and exhaust ports closed, oil is trapped in the ram cylinder and the links are held in position.

b. Oil Flow to Raise the Links. The intake control valve is positioned in the bushing to open the intake ports. When the pump piston is on the suction stroke, oil flows through the intake ports and through the inlet valve into the pump cylinder (fig. 61). The inlet valve closes and the outlet valve opens when the pump is on the discharge stroke. During the discharge stroke, oil flows through the outlet valve, check valve, and into the ram cylinder. The pump continues to pump oil to the ram cylinder as long as the intake ports are open. When the intake ports are open, the exhaust ports are closed.

c. Oil Flow to Lower the Links. For oil to be discharged from the ram cylinder, the exhaust control valve must be positioned to open the exhaust ports (fig. 61). Oil flows from the ram cylinder out the exhaust ports. When the exhaust ports are opened, the intake ports are closed.

d. Constant Draft Control. The constant draft control is illustrated in fig. 61. For constant draft control, the position control lever is placed in the forward position. The control arm functions on points A, B, D, and E (fig. 61) when using constant draft control. Pivot point A is manually positioned by the hydraulic touch control lever. Pivot point B is positioned by the implement draft. An increase in draft will compress the control spring and move point B to the left.

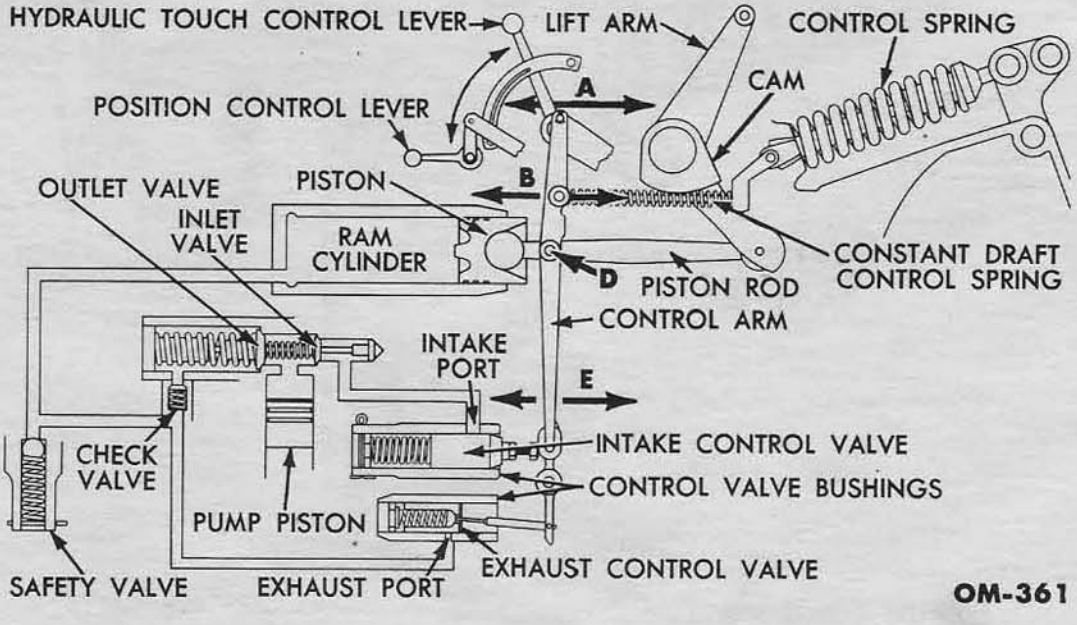

Fig. 61—Constant Draft Control

Point E is mechanically connected to the control valves. Point E can place the control valves in an intake, neutral, or exhaust position. The following subparagraphs list the sequence of events in constant draft control.

(1) *HYDRAULIC TOUCH CONTROL LEVER LOWERED.* When the hydraulic touch control lever is lowered, point A is moved to the left, B is momentarily stationary, and E moves to the right. The movement at E opens the exhaust ports. As oil flows out of the ram cylinder, the implement lowers and enters the soil. When the implement enters the soil, the control spring is compressed. As the control spring compresses, points B and E are moved to the left. The implement will continue to enter the soil until point E has moved into the neutral position to close the exhaust ports.

(2) *HYDRAULIC TOUCH CONTROL LEVER RAISED.* When the hydraulic touch control lever is raised, point A is moved to the right, B is momentarily stationary, and E moves to the left. The movement at E opens the intake ports and oil is pumped to the ram cylinder. As the implement raises, the draft is decreased and the control spring expands. As the control spring expands, points B and E are moved to the right. The implement will continue raising until point E is in the neutral position and the intake ports are closed.

(3) *TRANSPORT POSITION.* When the hydraulic touch control lever is moved to the top of the quadrant, point A is moved to the right, B is momentarily stationary, and E moves to the left. The movement at E opens the intake ports and oil is pumped to the ram cylinder. In transport position, the control spring is fully expanded, but E may not be in the neutral position. The skirt on the piston contacts D and moves points D and E to the right until the control valves are in the neutral position.

(4) *FRONT WHEELS CROSS A RIDGE.* When the tractor front wheels cross a ridge, the implement tends to operate deeper in the soil. The increased depth increases the draft. Increased draft will further compress the control spring and move points B and E to the left. The movement at E opens the intake ports, and oil is pumped into the ram cylinder. As the implement raises, the draft decreases, the control spring expands, and points B and E move to the right until the control valves are in the neutral position. The implement has, in this manner, been automatically repositioned.

(5) *FRONT WHEELS ENTER A DEPRESSION.* When the tractor front wheels enter a depression in the soil surface, there is a tendency to raise the implement out of the soil. When the implement tends to raise, the draft is decreased and the control spring expands.

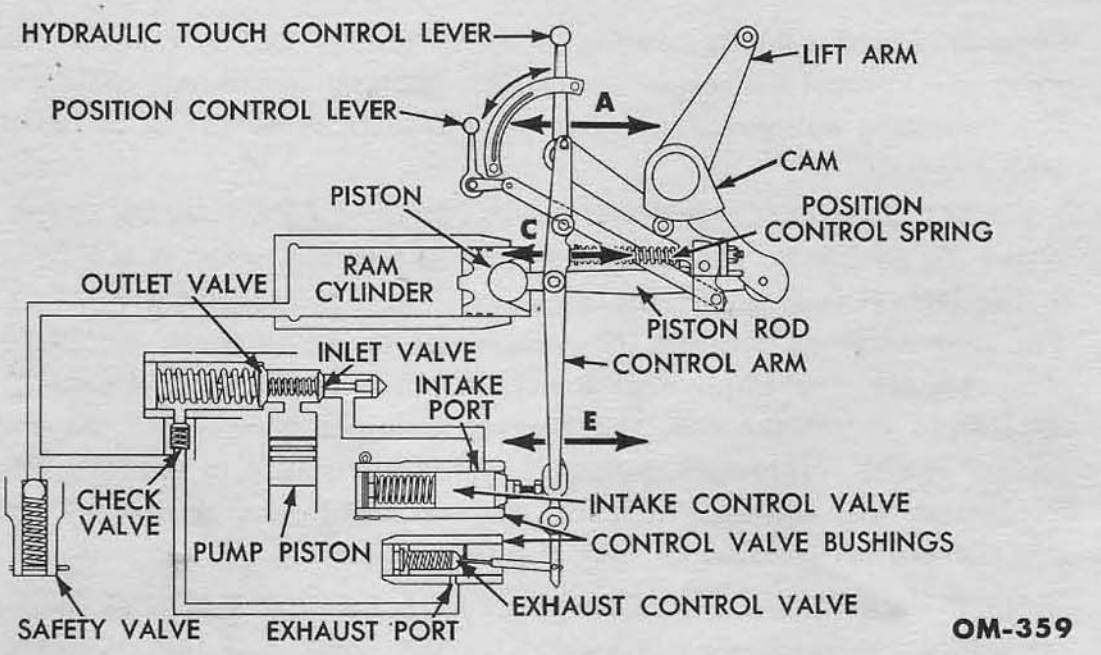

Fig. 62—Position Control

The expanding control spring moves points B and E to the right. The exhaust ports are opened and oil is bled out of the ram cylinder. The implement lowers and the draft is increased. As the draft increases, the control spring is again compressed and points B and E move to the left until the control valves are in the neutral position. The implement has again been automatically repositioned.

(6) *VARIATION IN SOIL TEXTURE.* Variations in soil texture will change slightly the draft on an implement. If the draft tends to increase, the action of the hydraulic system is the same as outlined in subpar. (4). If soil variation tends to decrease the draft, the action of the hydraulic system is similar to subpar. (5). When necessary, the operator may easily make small adjustments with the hydraulic touch control lever.

e. Position Control. The position control is illustrated in fig. 62. For position control operation, the position control lever is placed in the vertical position. When using position control, the control arm functions on points A, C, and E (fig. 62). Pivot point A is manually positioned by the hydraulic touch control lever. Pivot point C is positioned by the cam on the lift arm assembly. A lowering of the lift arms will move point C to the left. Point E can position the control valves in an intake, neutral, or exhaust position. The following subpars. list the sequence of events in position control.

(1) *LOWERING POSITION CONTROL LEVER.* When the position control lever is lowered, point A moves to the left, C is momentarily stationary, and E moves to the right, opening the

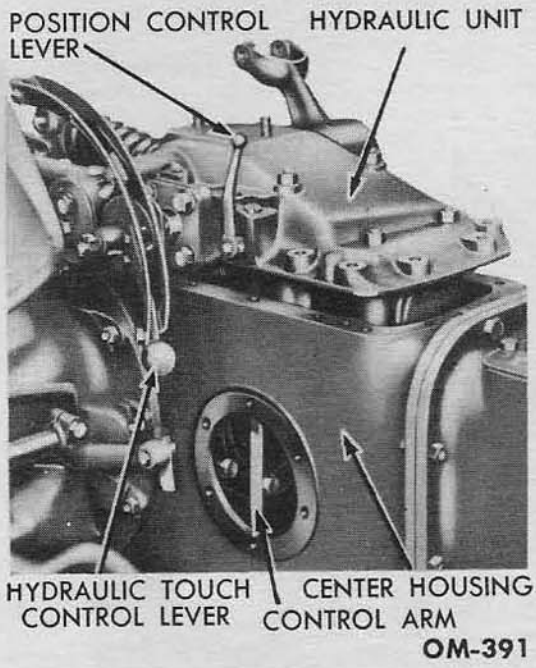

Fig. 63—Hydraulic Unit Replacement

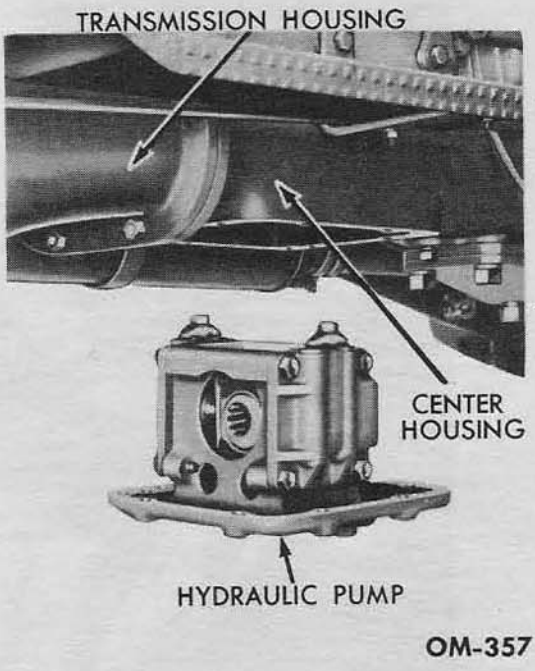

Fig. 64—Hydraulic Pump Replacement

exhaust port. As oil bleeds out of the ram cylinder, the links are lowered. As the links lower, the cam moves points C and E to the left until the control valves are in the neutral position.

(2) *RAISING HYDRAULIC TOUCH CONTROL LEVER.* When the hydraulic touch control lever is raised, point A moves to the right, C is momentarily stationary, and E moves to the left. The intake ports open and oil is pumped into the ram cylinder. As the links are raised, the cam allows points C and E to move to the right until the control valves are in the neutral position.

382. HYDRAULIC UNIT REPLACEMENT.

Remove the tractor seat. Disconnect the lift arms from the lift rods by removing the cotter and clevis pins. Disconnect the control spring from the yoke by removing the cotter pin and yoke. It is not necessary to drain the oil. Remove the cap screws which secure the hydraulic unit to the center housing. The lift arms must be in the lowered position before it is possible to lift the hydraulic unit vertically out of the center housing as shown in fig. 63. Care must be taken not to damage the control arm while removing the hydraulic unit.

To install the unit, remove the inspection plate on the right side of the center housing, and place a gasket on the center housing. The lift arms must be in the lowered position before lowering the hydraulic

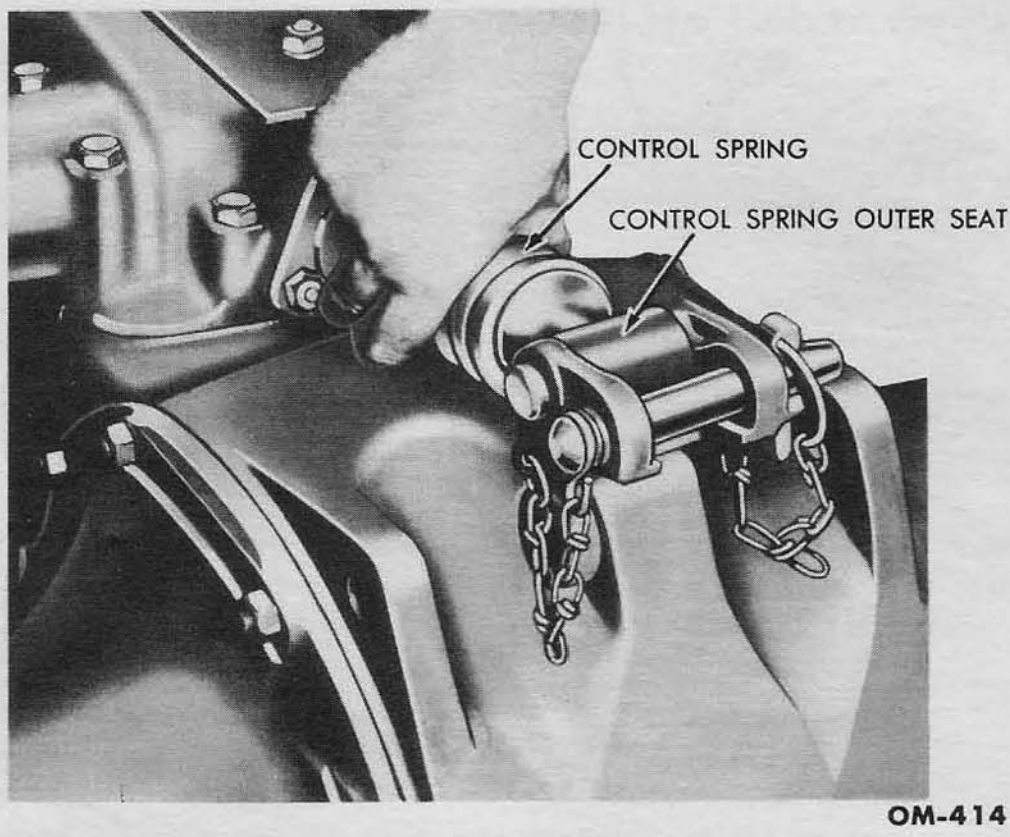

Fig. 65—Control Spring Adjustment

unit into the center housing. As the hydraulic unit is being lowered, carefully fit the control arm into the socket in the control valve arm (fig. 60). Before securing the unit, move the hydraulic touch control lever,and check to determine whether the control valves follow the lever movement without binding. After the hydraulic unit is in position, insert the cap screws, and install the inspection plate. Attach the lift rods to the lift arms. Attach the control spring to the yoke. Install the tractor seat.

383. HYDRAULIC PUMP REPLACEMENT.

Drain the oil from the transmission and hydraulic system. Remove the power take-off shaft as outlined in section 372. Remove the cap screws and lower the hydraulic pump out of the center housing.

To install the hydraulic pump, remove the inspection plate on the right side of the center housing. Insert the pump into the center housing (fig. 64). Make sure the control arm enters the socket on the control valve arm (fig. 60). Install the pump base cap screws, but do not tighten. Install the power take-off shaft as outlined in section 372. Tighten the pump base cap screws before filling the transmission with oil.

384. HYDRAULIC SYSTEM ADJUSTMENTS.

The hydraulic pump is of precision manufacture and does not require adjustment.

a. External Adjustments. There are two external adjustments of the hydraulic unit. They may be made with the hydraulic unit either on or off the tractor.

(1) *ADJUSTMENT OF CONTROL SPRING.* Place the hydraulic touch control lever at the top of the quadrant, then turn the outer control spring seat until there is no end play in the spring. The preload on the control spring should be such that it is possible to turn the spring with a thumb and two-finger grip as shown in fig. 65.

(2) *ADJUSTMENT OF FORCE REQUIRED TO MOVE HYDRAULIC TOUCH CONTROL LEVER.* This is accomplished by tightening or loosening the nut on the end of the hydraulic touch control lever shaft (fig. 6). Tightening the nut increases the force required to move the lever. It should be set so that it requires a pull of 4 to 5 pounds on the knob to move the lever.

b. Internal Adjustments. The internal adjustments have been carefully made at the factory. However, it may be necessary to readjust the hydraulic unit after an overhaul. These internal adjustments must be made before the unit is installed on the tractor.

The first step in making the internal adjustments is to check the two external adjustments as outlined above, and adjust if necessary.

(1) Support the unit in a vise in a vertical position with the control spring down as shown in fig. 66.

The lift arms must be supported in the fully raised position as indicated by the marks on the lift arms and housing (fig. 66).

(2) Examine the constant draft spring adjustment nut (fig. 67). If it is a lock nut, it should be tightened until the washer bears against the shoulder. If it is a standard castle nut with a cotter pin, the nut should be adjusted to give the correct length of the constant draft spring, then the cotter pin can be installed. The constant draft spring should be 3.58 inches long (slightly over $3\frac{9}{16}$ inches is satisfactory) as shown in fig. 67.

(3) Examine the top of the quadrant support plate for locating marks as shown in fig. 68.

The quadrant support cap screws should be loosened, locating marks aligned, and the cap screws tightened. If there are no locating marks, remove two cap screws from the quadrant support plate, loosen the two remaining cap screws, and center the slot in the

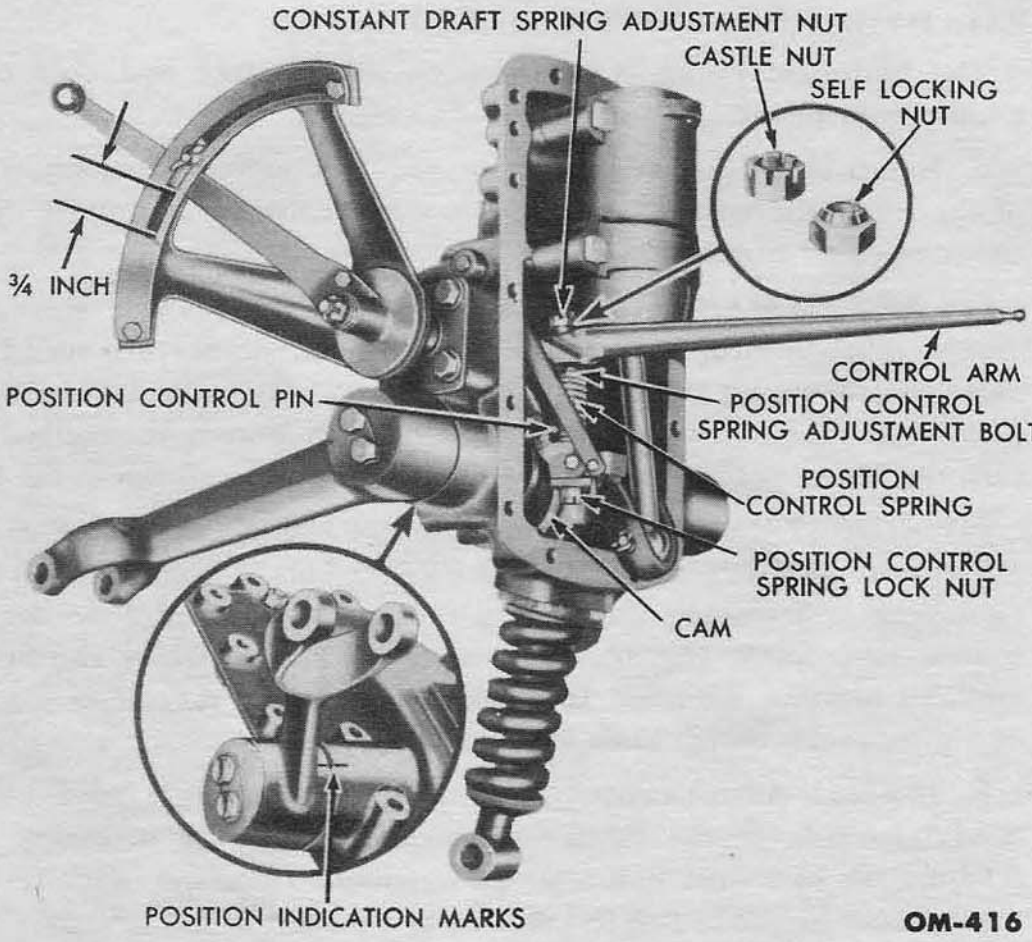

Fig. 66—Hydraulic Unit In Position for Adjustments

quadrant support plate on the cap screws. Replace and tighten the cap screws that support the quadrant.

(4) Place the position control lever in the position shown in fig. 66. Move the hydraulic touch control lever until there is an opening of ¾ inch between the edge of the lever and the top end of the slot in the quadrant as shown in fig. 66.

(5) Make sure that the control arm moves freely and is held in a horizontal position by its own weight as shown in fig. 66. Loosen the position control lock nut, and adjust the length of the position control spring by turning the position control spring adjustment bolt (fig. 66). Adjust the position control spring length until the position control pin contacts the cam, and the position control spring adjustment bolt contacts the control arm, as shown in fig. 66. It will probably be necessary to hold the position control pin in contact with the cam. The position control spring length should be $1^{29}/_{32}$ inches plus or minus $1/16$ inch after the adjustment has been made (fig. 67). Tighten the position control spring lock nut after completing the adjustment.

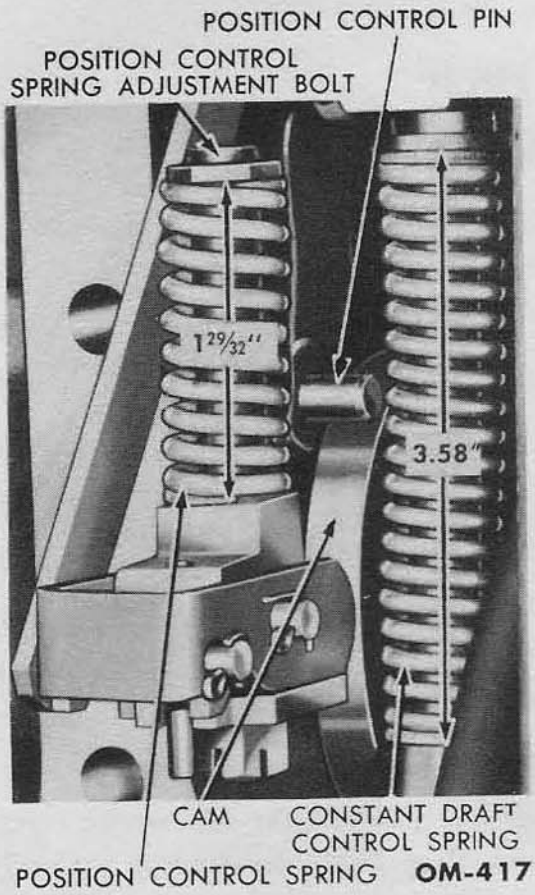

Fig. 67—Constant Draft Control and Piston Control Springs

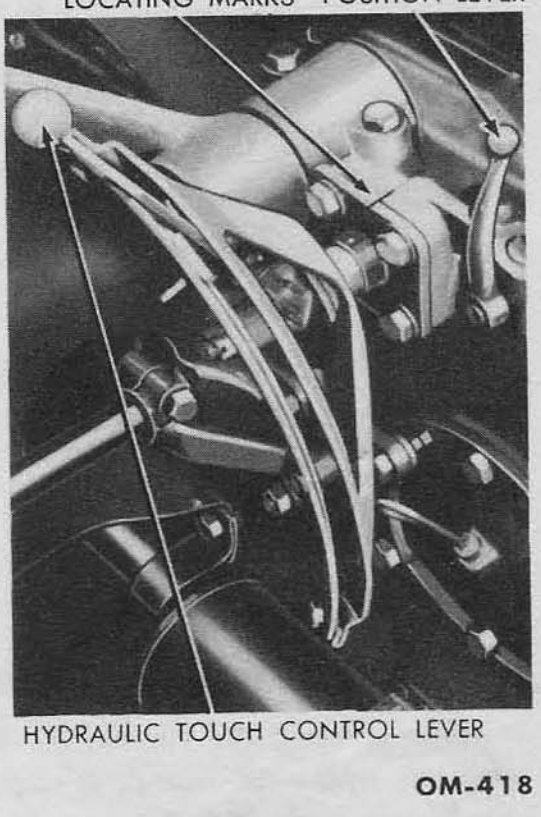

Fig. 68—Quadrant Locking Mark

After the above adjustments have been made, check the position of the hydraulic touch control lever and lift arms to be sure they were not moved while making the adjustments.

(6) Install the hydraulic unit on the tractor as outlined in section 382, but do not install the inspection plate.

(7) Place the position control lever in the forward position, and support the lower links near the raised position. Loosen the four cap screws slightly that support the quadrant in position. Hold the hydraulic touch control lever at the top of the quadrant, and gently tap the quadrant support plate until the intake control valve is completely open. The control valve arm just contacts the face of the hydraulic pump when the intake control valve is open. Care should be taken not to tap the quadrant too far backward as this will compress the constant draft control spring. It is better to have a 1/64 inch clearance between the stop and the face of the pump rather than go too far backward.

(8) Securely tighten the four quadrant support cap screws, and install the inspection plate on the center housing.

Part FOUR
PLOWING INSTRUCTIONS

401. MOUNTING PLOW ON TRACTOR.

After starting the engine, see that the power take-off, which operates the hydraulic pump, is engaged, then back the tractor squarely

Fig. 69—Plow Mounted on Tractor

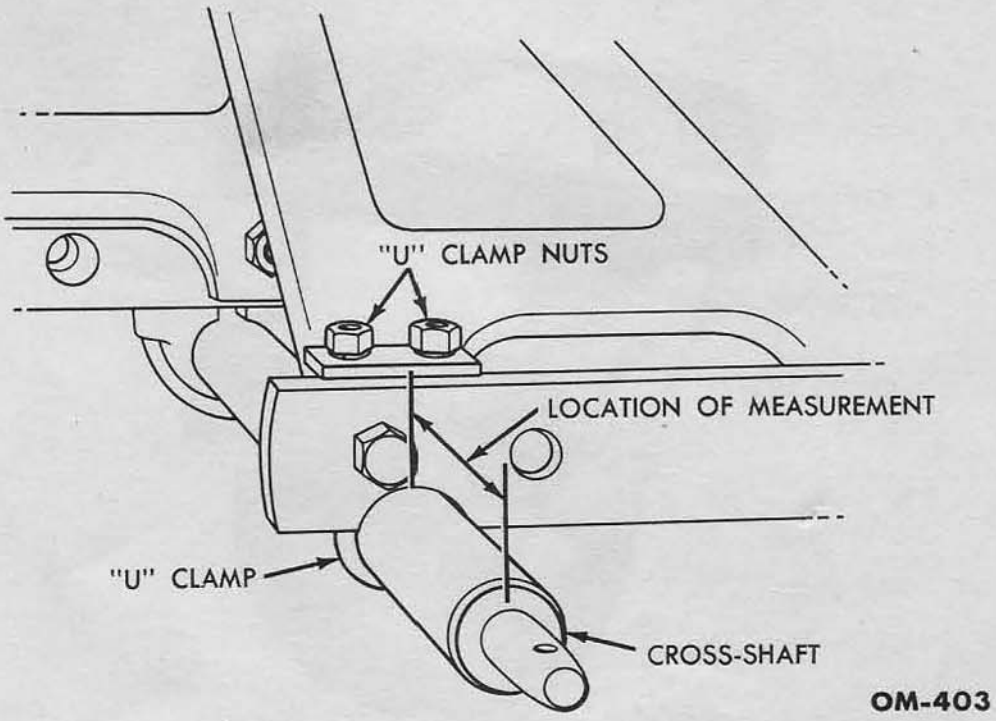

Fig. 70—Measuring Cross-shaft Position

up to the plow. Attach the lower left link to the cross-shaft. Align the lower right link with the leveling crank and attach the link to the cross-shaft. Lay the top link near the attachment pin on the tractor center housing. Ease the tractor forward or backward to align the top link with the yoke. Install the top link pin (fig. 69).

Place the position control lever in the forward position. To raise the plow, move the hydraulic touch control lever to the top of the quadrant. When the plow has cleared the ground, it is ready to be transported (fig. 69).

Reverse the above procedure to detach the plow.

402. LOCATING PLOW ON CROSS-SHAFT.

Loosen the two U clamps securing the cross-shaft to the beams, and slide the cross-shaft to the position required for the model of

Bottom Size	Number of Bottoms	Cross-shaft
12 inch	2	7½ inch
14 inch	2	3½ inch
16 inch	1	8⅞ inch

Fig. 71—Cross-shaft Locating Dimensions

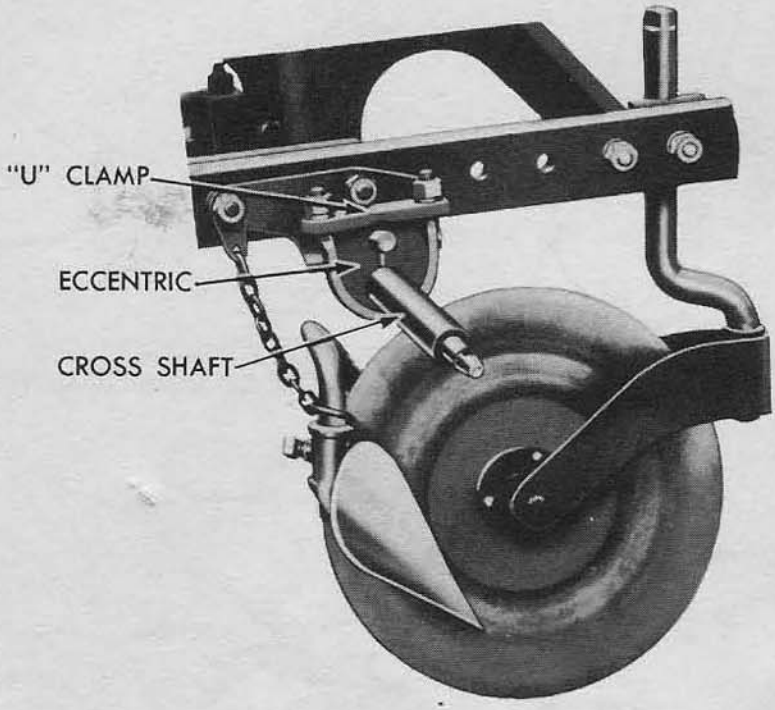

Fig. 72—Adjusting Width of Cut

plow being adjusted. The method of measuring the position is illustrated in fig. 70.

Fig. 71 gives the dimensions for locating the cross-shaft on different model plows.

403. ADJUSTING WIDTH OF CUT.

On a two-bottom plow the width of cut of the rear base is not adjustable. The width of cut must be adjusted on the front base of a two-bottom plow or on any single bottom plow.

A simple method of checking the width of the front furrow is to drive a stake 14 inches from the furrow wall just ahead of the tractor. If the front coulter blade touches it, the width is correct. This width of cut should be 14 inches on a 14-inch plow, and 12 inches on a 12-inch plow. To change the width of the cut, loosen the right U clamp and rotate the eccentric as indicated in fig. 72.

The plow width of cut is automatically maintained by the design of the lower links. If the plow moves to the left, it is rotated clockwise a small amount, and the land suction is slightly reduced (fig. 73), automatically repositioning the plow by a small movement to the right. The same condition applies in reverse if the plow is moved to the right.

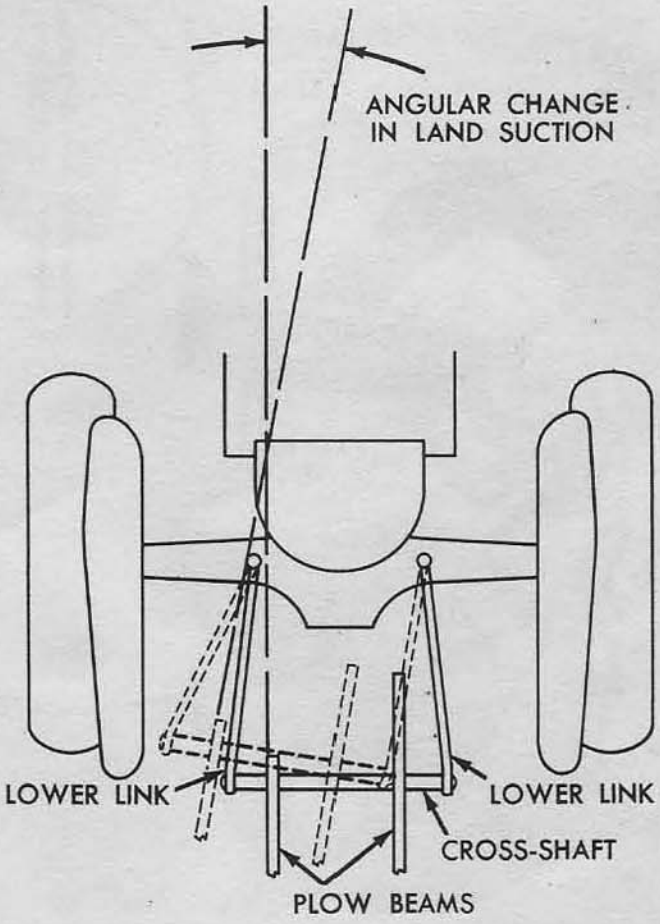

Fig. 73—Maintaining Width of Cut

404. COULTER AND JOINTER ADJUSTMENTS.

Rolling coulters are used to cut trash, plant roots, reduce draft, and to leave a uniform furrow wall. The coulters should be set about ½ the plowing depth on average soils. In soils where plow penetration is difficult, it may be necessary to raise the coulter adjustment. Coulters should be sharp to lessen draft, leave a uniform furrow wall, and reduce the tendency to ride the plow out of the ground. Vertical adjustment is made by loosening the eyebolt and raising or lowering the coulter stem. By slightly loosening the eyebolt and twisting the coulter stem (with plow wrench), it is possible to adjust the horizontal position of the coulter (fig. 74). A rolling coulter should run as near the landside as possible and leave a clean furrow wall. In most cases this is ½ to ¾ inch from the landside, and under no condition should it run inside the landside. In some soils, slightly increasing the coulter width adjustment will aid in scouring. Under all conditions have both coulters on a two-bottom plow set alike.

Jointers are used to turn over a small furrow along the side of the coulter. This is an aid in obtaining clean coverage in a trashy field.

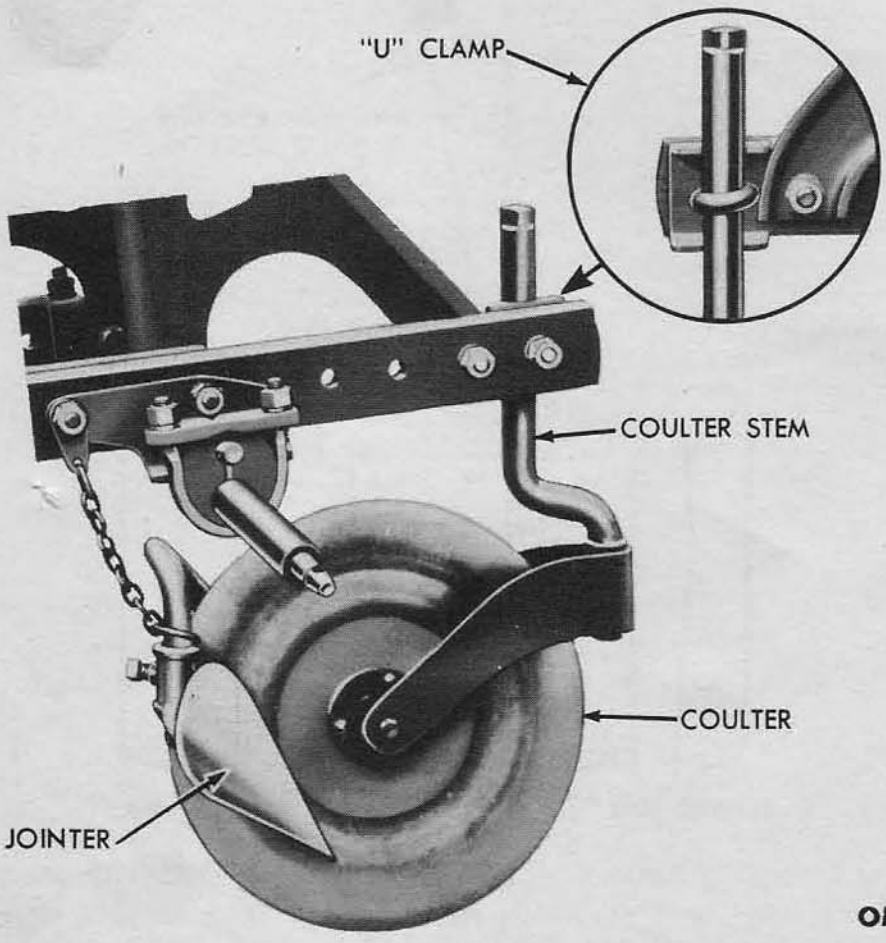

Fig. 74—Coulter and Jointer Assembly

Turn the jointer until the point is slightly touching the coulter blade. The top of the jointer should be approximately ½ inch from the coulter blade. Set the jointer downward until it rolls a slice of soil into the adjacent furrow.

405. REAR FURROW WHEEL.

Moldboard plows have a side thrust that is carried on landsides and a furrow wheel (fig. 70). The furrow wheel acts as a rotary landside and is not intended to carry any weight. Rotary landsides reduce draft because rolling friction is less than sliding friction.

406. PLOW SHARES.

Plow shares are made of different materials to meet the requirements of different soils. The table in fig. 75 will serve as an aid in the selection of plow shares.

Keeping plow shares sharp is very important. About ⅔ of the power required to pull a plow is used in cutting the furrow slice. Dull shares will greatly increase the load and will cause additional

fuel consumption. Dull shares or improperly sharpened shares are the most common causes for poor plow penetration.

Material	Shock Resistance	Wear Resistance	Scouring	Cost	Soils
Cast Iron	Brittle	Very good	Low	Low	Sandy
Forged Steel	Highly resistant	Average	Average	Average	Loam
Soft center	Average	Very good	Very good	Reason-able	Heavy clay

Fig. 75—Plow Share Selection Table

A resharpened plow share should be as near the original shape as possible. It is very helpful to have a new share of the same type to compare with the old share while sharpening. The following procedure is suggested for sharpening steel shares:

(1) Use a clean, well-banked forge fire, and heat ⅓ of the share point to a cherry red temperature. With an anvil and blacksmith hammer, draw the point as near the original shape as possible. Do not continue to work the metal after it has lost its heat.

(2) Heat a 2- or 3-inch length of the cutting edge to a cherry red temperature, and draw it to its original shape, otherwise the share may warp. Continue this step until all of the cutting edge has been sharpened.

(3) Heat the point and set the ground suction at approximately 3/16 inch and the throat clearance at approximately ⅛ inch (fig. 76).

(4) To harden soft center shares, heat the cutting edge and quench by slowly moving it in and out of the tempering brine, water, or oil. Forged steel shares should not be hardened.

Cast iron shares should be sharpened by grinding on the top surface of the cutting edge with an ordinary grinding wheel. Do not grind on the bottom of the cutting edge, as this will result in a sled runner tending to force the plow out of the ground.

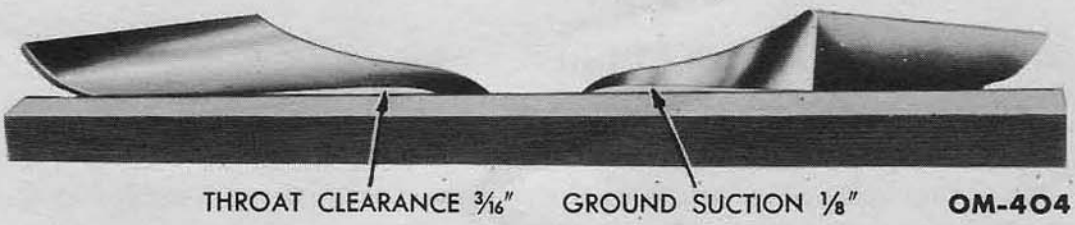

Fig. 76—Ground Suction and Throat Clearance

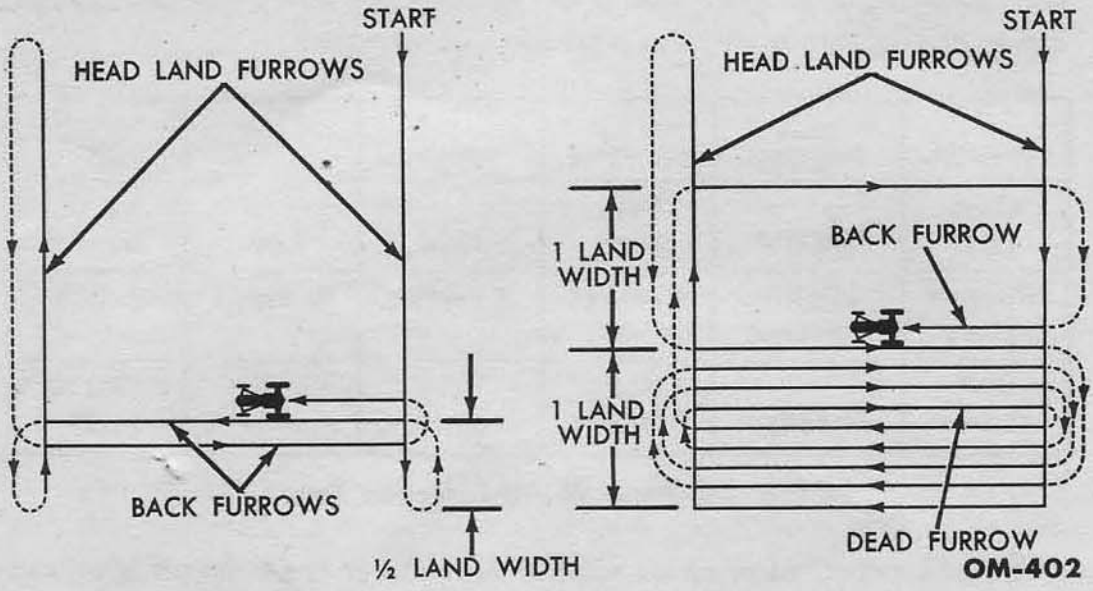

Fig. 77—Two Methods of Opening a Field to be Plowed by Lands

Sharp plow shares should have a sharp cutting edge, correct ground suction, correct throat clearance, and a smooth surface. Only the cutting edge should touch when the share is laid on a flat surface. The Dearborn tractor plow does not need a wing bearing area on the share, as is found on the walking plow.

407. PLOW LUBRICATION.

The Dearborn tractor plow has few points that require lubrication. Use a grease gun daily on the coulter bearings and furrow wheel hub.

Never leave a plow setting in the ground as soil moisture and acids may pit the polished surface, causing scouring trouble. In many areas, it is advisable to coat the plow bottom with used cylinder oil when not using the plow for several hours. If the blow is not to be used for several weeks or months, the bottoms should be coated with heavy grease or a good rust preventive grease.

The plow should be lubricated before being placed in storage.

To remove a plow from storage, lubricate, clean grease from bottoms, and, if necessay, install new shares.

408. PLOWING PROCEDURES.

Good plowing is an art in which many farmers take great pride. Many have developed methods to meet their own needs. The following paragraphs cover some of the common terminology used, together with some accepted plowing methods.

a. Plowing by Lands. Plowing by lands is a method whereby the field is plowed in sections or strips. The following operations are performed when plowing by lands. Fig. 77 shows a procedure for laying out the field.

(1) *HEADLAND FURROWS.* Headland furrows should be marked out when opening up a field. This is a big aid in securing a uniform plowing job. When making headland furrows, the plow should be tilted to the left with the leveling crank to reduce the ridge when back-furrowing. The headland furrow should be turned toward the soil to be plowed. Allow adequate room for turning between fence and headland furrows.

(2) *OPENING A LAND.* Level the plow in the same manner as when plowing a headland furrow. Lower the plow into the soil and drive across the field. Picking a point at the far end of the field and driving toward it is an easy way to plow a straight furrow.

(3) *ENTERING FURROW.* When entering a furrow, it is important to have the tractor in a position so that the plow will take a full cut. The plow should be lowered by pressing the hydraulic touch control lever forward until it reaches the stop as the rear wheels cross the headland furrow.

(4) *LEAVING FURROW.* After finishing a furrow, when the rear wheels cross the headland furrow, raise the plow by returning the hydraulic touch control lever to the top of the quadrant. The turn should not be started until the plow is clear.

(5) *FINISHING A LAND.* When the unfinished land is narrower than the tractor tread, level the plow with the leveling crank. The left front wheel should be driven near the furrow wall. This will leave a narrow strip, which may be neatly finished on the return trip by steering the right front wheel near the furrow wall. Relevel the plow as needed.

(6) *BACK-FURROWING.* Headlands are plowed after the lands have been plowed. Place the plow in the working position and plow along the headland furrow, turning the soil toward the plowed ground. Repeat this operation until the headlands are plowed.

b. Rectangular Plowing. To leave the dead furrow in the center of the field, an opening furrow is plowed around the field. Continue following this furrow until the area is plowed (fig. 78A). One big disadvantage of this method is that square turns must be made on the plowed ground.

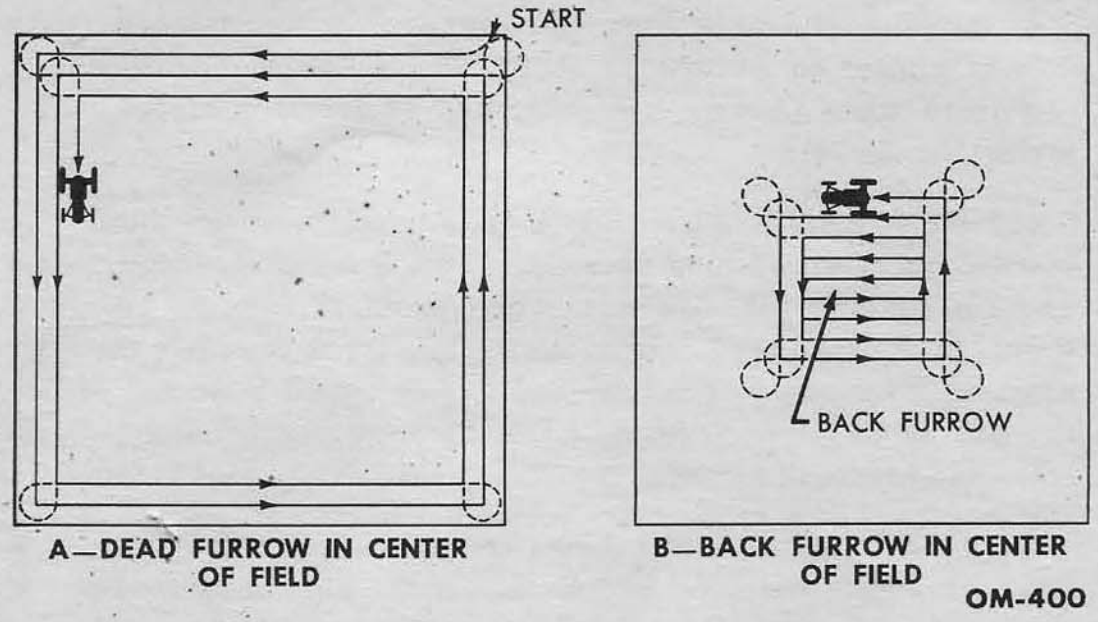

Fig. 78—Rectangular Plowing

To leave the back furrow in the center of the field, the first step is to make several short back furrows in the center of the field (fig. 78B). Plow along these furrows until the area is large enough to plow around the rectangle. Square turns in this method are made on unplowed ground.

c. Contour Plowing. Many soil conserving farmers prefer to plow on the contour. By contour plowing, it is possible, during seed bed preparation, to turn the soil in such a manner as to build up the terrace crown (fig. 79). The short coupled, maneuverable Ford tractor and Dearborn plow are exceptionally well-suited to contour plowing. The hydraulic control prevents lever tugging when crossing unplowed grass waterways.

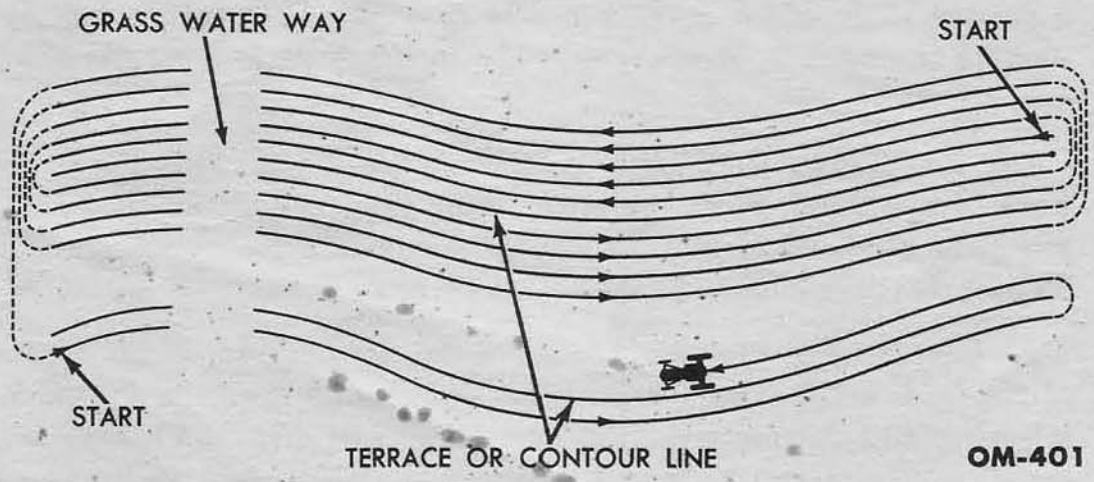

Fig. 79—Contour Plowing