

Operator's Instructions

for

CATERPILLAR

Reg. U. S. Pat. Off.

R4 TRACTOR

Effective with
Tractor
6G1 - up

CATERPILLAR TRACTOR CO.

PEORIA, ILLINOIS, U. S. A.

Track-Type Tractors . . . Road Machinery

. . . Diesel Engines

THERE IS A "CATERPILLAR" DEALER NEAR YOU

Foreword

“Caterpillar” products are a combination of advanced engineering, skilled manufacturing, and the finest materials metallurgical science can select. Thousands of satisfying, economical working hours are built into each machine.

Whether or not the owner derives the maximum of service from his machine depends largely on the care exercised in its operation and maintenance. This book is written to give the operator essential information regarding the day-to-day operation, lubrication and adjustment of the machine. Careful adherence to these instructions will result in assured economy.

A great many “Caterpillar” owners depend upon their dealer for service other than the care and adjustments described in this book. This practice is recommended because our dealers are equipped with factory-trained servicemen, tools designed and built by “Caterpillar”, and stocks of genuine “Caterpillar” parts. Moreover, they are kept closely informed by the factory regarding advanced methods of servicing “Caterpillar” products — thus, in all ways, they are equipped to render the best of service.

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Lubricating Instructions

Detailed instructions regarding the lubrication of this machine are given on the folded LUBRICATION CHART. Careful attention to these instructions and the proper selection of the lubricants to be used will add much to performance, reliability, economy and long life of your machine.

It is important to use the correct lubricant for each application in the machine—taking into account the current outside temperature and the temperature range which is likely to be encountered before refilling again.

All oil companies have adopted the S.A.E. (Society of Automotive Engineers) viscosity number system—which classifies oils in terms of viscosity or fluidity. The oils with the lower numbers are lighter, and flow more readily than do the oils with higher numbers. The S.A.E. number refers only to the viscosity of the oil, and has reference to no other characteristic or property.

In preparing to refill with fresh oil, any compartment should be drained when it is warm—it is best to drain after the machine has run for some time. Most of the sediment will then be in suspension, and therefore, will drain readily.

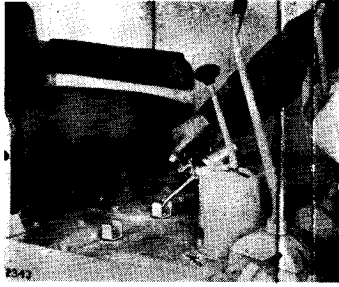
The following recommendations give the types and viscosities of lubricants best suited for use in your machine for various operating temperatures.

Crankcase Lubricating Oil: Use either straight mineral or Superior All-Purpose Lubricating Oil of an S.A.E. No. 20 grade in the engine crankcase and air cleaner at temperatures above freezing. S.A.E. No. 10 Oil should be used below freezing to provide better circulation and to make cranking of the engine easier. S.A.E. No. 30 Oil may be used in **extremely hot** weather.

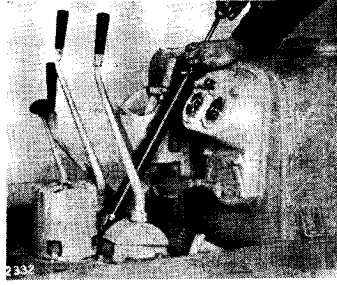
In sub-zero operation, it is advisable to dilute oils, except that used in the air cleaner, with kerosene so that they will be fluid enough to insure free circulation at all times. However, evaporation of the kerosene from the crankcase oil under steady operation makes replenishment essential for proper fluidity. This should be done before stopping; then operate the tractor a few minutes to mix the kerosene and oil.

Below is a table showing the maximum quantity of kerosene which should be added at one time:

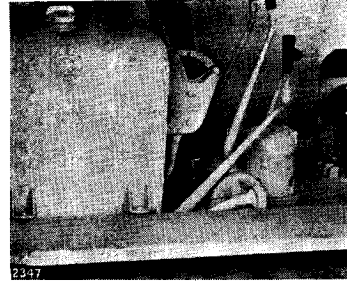
S.A.E. No. 10 Lubricating Oil	—10% kerosene
S.A.E. No. 20 Lubricating Oil	—15% kerosene
S.A.E. No. 80 Transmission Oil	—10% kerosene
S.A.E. No. 90 Transmission Oil	—15% kerosene



① STEERING CLUTCH RELEASE BEARINGS — Fill oil cups with crankcase lubricating oil every 10 hours.



② FLYWHEEL CLUTCH SHIFT COLLAR — Fill oil cup with transmission oil every 20 hours (with engine stopped).



③ TRANSMISSION—Check oil level every 20 hours. Oil in bevel gear compartment.

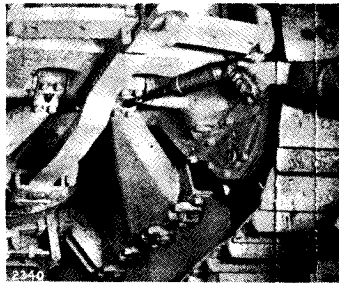


LUBRICATION CHART

CATERPILLAR

REG. U.S. PAT. OFF.

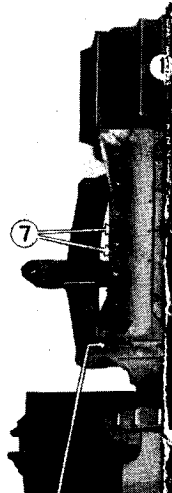
R4 TRACTOR



⑦ TRACK ROLLER FRAME INNER BEARING—Fill bearing every 20 hours with semi-fluid lubricant.

NOTE: Use brush supplied in tool equipment to remove dirt from fittings before lubricating, and to clean around air cleaner, breathers, and inspection covers before removing. Lubricate all miscellaneous points not equipped with fittings every 60 hours. Use crankcase lubricating oil.

DO NOT LUBRICATE TRACKS.



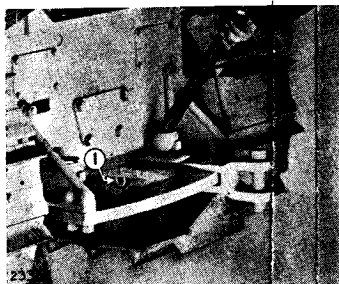
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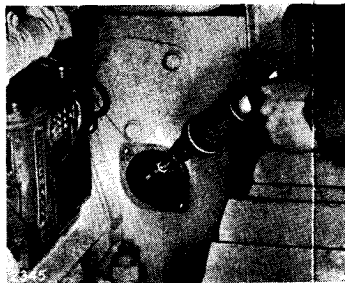
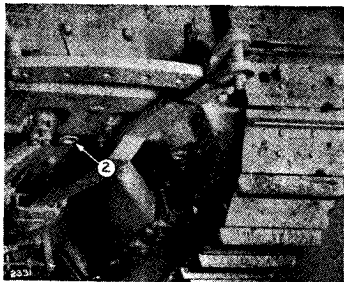
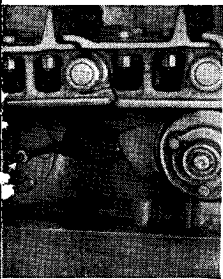
⑧ FINAL DRIVE—Check oil level every 120 hours. Fill with transmission oil until oil is level with top of filler elbow. Drain (1), wash, and refill with fresh oil every 900 hours.

⑨ TRACK ROLLER FRAME OUTER BEARING—Fill bearing every 20 hours with semi-fluid lubricant.

⑩ TRACK CARRIER ROLLER—See page seven of Lubricating Instructions.

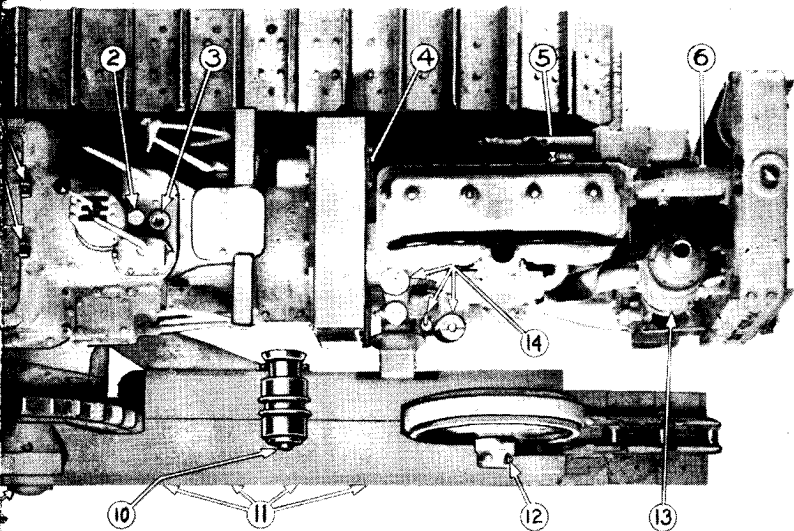
⑪ TRACK ROLLER BEARING—See page seven of Lubricating Instructions.





120 hours. Fill with transmission oil to oil level plug. Drain (2), wash, and refill with fresh oil every 900 hours. The oil level plug adjusts itself to level in speed change compartment.

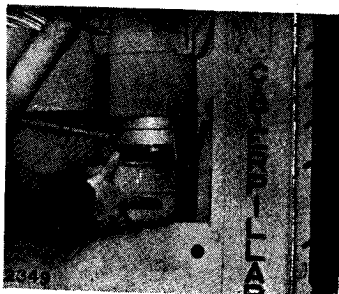
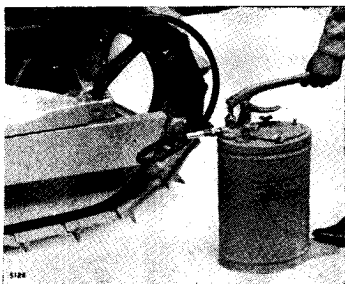
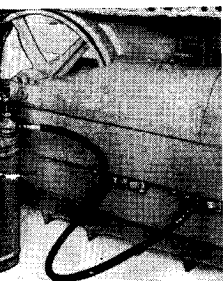
④ FLYWHEEL CLUTCH PILOT BEARING—Fill bearing with semi-fluid lubricant every 240 hours.



ROLLER—See page seven of Lubricating Instructions.

⑫ FRONT IDLER—See page seven of Lubricating Instructions.

⑬ AIR CLEANER—Wash and refill cup with lubricating oil every 5 to 60 hours and wash filter screens every 60 to 240 hours, depending upon amount of dust.



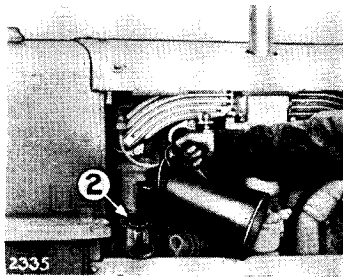
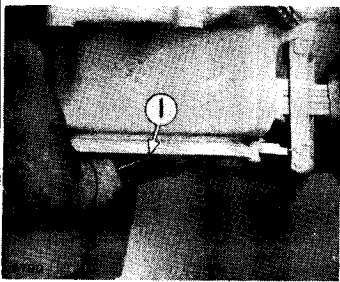


⑤ **MAGNETO**—Fill oil well in coupling cover with crankcase lubricating oil every 240 hours.

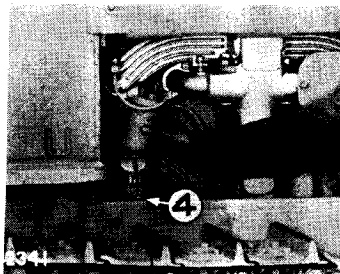
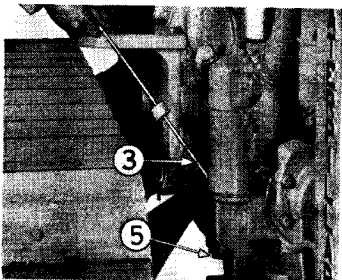


⑥ **FAN** — Fill bearing every 240 hours with semi-fluid lubricant.

SEE LUBRICATION GUIDE ON REVERSE SIDE



⑭ **LUBRICATING OIL SYSTEM**—When burning gasoline drain crankcase (1) and remove oil filter drain plug (5) while hot, and refill (2) with fresh Superior All-Purpose lubricating oil every 240 hours (when extremely dusty, or when using straight mineral lubricating oil every 120 hours). Replace inner filter element at each oil change as instructed in the topic, **CRANKCASE LUBRICATING OIL FILTER**. If engine is not equipped with lubricating oil filter, and Superior All-Purpose oil is being used, crankcase should be drained every 60 hours when air is dusty; otherwise every 120 hours. When using straight mineral lubricating oil and the engine is not equipped with lubricating oil filter, crankcase should be drained every 30 hours when air is dusty; otherwise every 60 hours. Start the engine and run for two minutes to pump oil through filter. Stop engine and add oil if needed to bring to full mark (3) on gauge. Wash breather element every 240 hours and remove breather drain plug (4) at each oil change. Pour ¼ pint (0.12 liter) oil through element and replace. Check oil level every 10 hours. When burning "tractor fuels", follow the instructions in the topic, **CRANKCASE LUBRICATION** contained in the Special Instructions in the back of this book.



This is a guide to facilitate lubrication of your machine. The numbers listed under "operation" correspond to the numbers and related pictures shown in the lubrication chart on the reverse side. These operations are listed in the order of hourly intervals for each type of lubricant.

SEMI-FLUID LUBRICANT

Operation	Hourly Interval	Additional
7 Track Roller Frame Inner Bearings	20	
9 Track Roller Frame Outer Bearings	20	
4 Flywheel Clutch Pilot Bearing	240	
6 Fan	240	

TRANSMISSION OIL

Operation	Hourly Interval	Additional
2 Flywheel Clutch Shift Collar	20	
3 Transmission	Check every 120	Wash and every 900
8 Final Drive	Check every 120	Wash and every 900

STRAIGHT MINERAL OR SUPERIOR ALL-PURPOSE LUBRICATING OIL

Operation	Hourly Interval	Additional
13 Air Cleaner	Wash and refill every 5 - 60	Wash screen every 60 hours
1 Steering Clutch Release Bearings	10	
14 Lubricating Oil System	Check every 10	Drain and at intervals indicated in lubrication chart. Wash bearings every 240
5 Magneto	240	

CHASSIS LUBRICANT

Operation	Hourly Interval	Additional
10 Track Carrier Rollers	See page seven of Lubricating Instructions	
11 Track Rollers		
12 Front Idlers		

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Care

Naturally, any precautions taken to house the tractor or to cover it with a tarpaulin, or to warm it before starting, will cause more rapid oil distribution and contribute to quicker starting. The engine should always be allowed to idle at not less than half throttle for several minutes after starting to assure adequate lubrication before operating on normal load.

Transmission Oil: Use a pure mineral transmission oil that will flow freely and will not channel at existing operating temperatures. For temperatures above 32° F., (0° C.) use either S. A. E. No. 90 or 140 oil. Below freezing, 32°F., (0°C.) an oil of lower viscosity—S.A.E. No. 80—will be required.

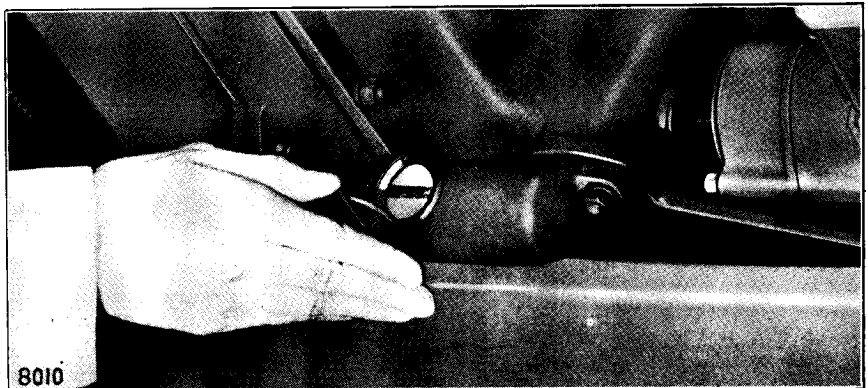
Track Rollers, Track Carrier Rollers and Idlers: For temperatures above freezing, use "Chassis Lubricant." For temperatures below freezing, if fluid "Chassis Lubricants" are not available, S.A.E. No. 80 or No. 90 transmission oil may be used. In sub-zero weather, crankcase lubricating oils have proved to be very satisfactory.

"Chassis Lubricants" are stringy, tacky, semi-fluid lubricants. These lubricants should be just fluid enough that they can be handled in the standard volume compressor at the prevailing atmospheric temperature.

Later tractors beginning with 6G1107 are equipped with sealed center thrust track rollers; tractors beginning with 6G1331 are equipped with both track rollers and idlers having sealed center thrust construction, making it necessary to lubricate the track rollers, track carrier rollers and idlers only every 120 hours under normal operating conditions. The track rollers and track carrier rollers on all tractors below 6G1107, as well as the front idlers of all tractors below 6G1331 should be lubricated every 20 hours under normal operating conditions.

When operating in deep mud or water the same care and frequency of lubrication should be given machines equipped with sealed center thrust rollers as is recommended in the topic, OPERATING IN DEEP MUD OR WATER.

HOUR METER



8010

COVER ON HOUR METER RAISED TO OBSERVE DIAL READING

Later tractors are equipped with an "Hour Meter." It does not keep pace with the clock but it does count the revolutions of the engine. The dial advances one number each time the crankshaft has turned as many thousands of revolutions as are made in an hour at normal operating speed.

The "Hour Meter" tells more accurately than the clock or calendar when to service your tractor. All time intervals given in the lubrication chart are for hours of engine operation.

DO NOT LUBRICATE THE TRACKS

Under no circumstances should the track be lubricated. The stiffness noted in a new machine between the links is not caused by a lack of clearance between the track pins and bushings, and will disappear as the tracks wear in.

◆

Operating Instructions

PREPARING TRACTOR FOR USE

The first duty of anyone charged with the care and operation of a tractor is to give it a detailed inspection and to lubricate it as directed under the topic, LUBRICATING INSTRUCTIONS.

Fill the cooling system with clean, soft water, or with the correct anti-freeze solution if temperatures below freezing are likely to be encountered. Water used in the cooling system should be soft, or as free as possible from scale forming minerals. If it is impossible to obtain soft water, it is advisable to treat the available water with some commercial water "softener."

Open the main fuel tank valve. Fill the tank with gasoline, taking care that no dirt, water, or other foreign substances are admitted with the fuel. If the presence of dirt, water, or other foreign substance is suspected, strain the fuel. The small fuel tank can be used for an auxiliary supply of fuel.

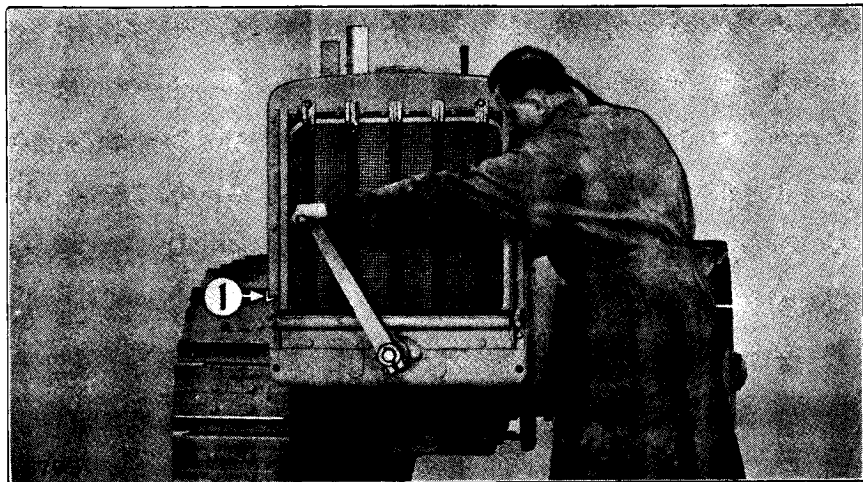
After the first few hours of operation, tighten all the nuts, bolts, and cap screws that hold together parts having copper-asbestos gaskets between them. This applies especially to the cylinder head stud nuts. When the cylinder head stud nuts are tightened the cylinder head gasket is squeezed together and causes the valve clearance to change. After the cylinder head stud nuts are tightened be sure to adjust the valve clearance as instructed in the topic, VALVE CLEARANCE ADJUSTMENT.

STARTING THE ENGINE

Open the fuel tank shut-off valve. Disengage the flywheel clutch by pushing the control lever forward and see that the gear shift lever is in the neutral position. Move the throttle control lever about half way back. Move the manifold heat control lever to "heat on" position. Turn the ignition switch ON and pull the choke control rod forward. Grasp the crank in the left hand and engage the ratchet by pushing the crank in with the right hand. Stand with the right hand resting on the left side of the radiator and pull the crank over the top part of its circle. Repeat until the engine starts. **Do not spin the crank** as this may cause the impulse starter to release and the engine to backfire. Temperature and altitude will change the length of time necessary to crank with the choke on. Actual experience in starting will determine this interval. After the engine starts engage the flywheel clutch and allow the engine to run until it warms up. Be sure that the cooling system has been filled and that the lubricating oil pressure gauge is registering the correct pressure. When the engine is warm the operating pressure should be approximately 30 pounds on earlier machines. On later machines the gauge should register in the "Operating Range."

The spark is retarded for starting by the action of the impulse starter in the magneto. After starting, the impulse starter releases and the engine operates with the spark set at the correct advance position.

If the engine is cold, starting will be easier if the cylinders are primed. A tablespoonful of gasoline in each priming cock is ample. See the topic, OPERATING IN COLD WEATHER.



CORRECT POSITION FOR CRANKING THE ENGINE
1—Choke control rod.

Avoid over-choking or over-priming the engine when starting it. If the engine is flooded from either of these causes it should be cranked several times with the choke OFF to dissipate the excess fuel.

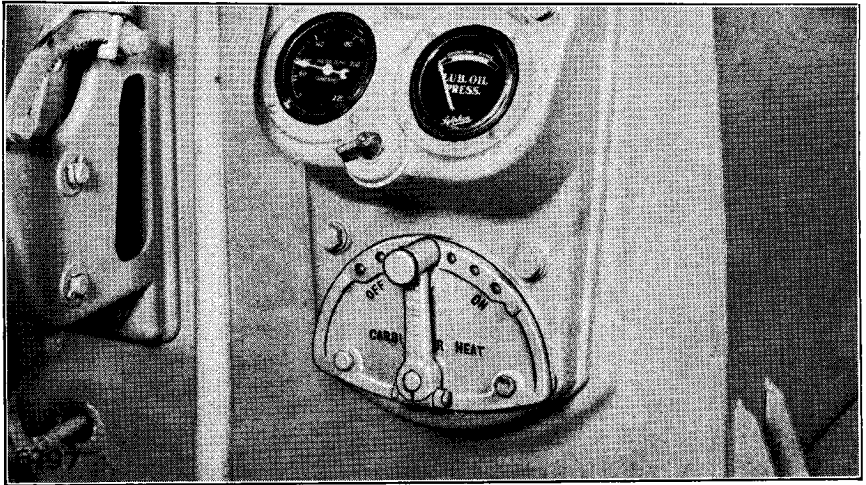
If, after following the procedure outlined in the previous paragraphs, the engine fails to start when cranked a few times, make an inspection at the various points where difficulty may arise. Be sure that the carburetor contains gasoline. If in doubt, open the drain valve on the carburetor float bowl. If the fuel is not reaching the carburetor, operate the fuel pump priming lever. If the glass bowl on the fuel pump is not full, inspect the fuel tank for shortage. If there is fuel in the tank, inspect the fuel line and screens to see if they are clogged. See the topic, CARE OF THE FUEL SYSTEM. See that the magneto is functioning. Check as outlined under the topic, MAGNETO.

MANIFOLD HEAT CONTROL

A certain amount of heat applied to the inlet manifold is beneficial when warming up a cold engine, or when operating in cold weather. This heat is derived from the exhaust gases and the amount diverted around the inlet manifold is controlled by the position of the hot air valve located in the hot air valve body between the two manifolds.

When starting a cold engine move the lever to heat ON position. Allow it to remain in this position until the engine is thoroughly warmed up, then gradually move toward heat OFF position, until the engine gives the best performance.

Too much heat on the manifold is indicated by loss of power on full loads and by sluggish acceleration. Very little or no heat is required during operation in warm weather, especially with heavy loads. In cold weather and especially with light loads some heat can be used advantageously all through the day's operation. Adjust the heat control lever to the point where the engine pulls the best and accelerates quickly and smoothly to the opened throttle.



MANIFOLD HEAT CONTROL LEVER

DRIVING THE TRACTOR

Operate a new tractor under light load for the first sixty hours.

When the engine has run long enough to warm up, move the throttle control lever to the idling position. Disengage the flywheel clutch by pressing the clutch control lever forward as far as it will go. This applies the clutch brake. Continue to press forward on the lever until the clutch stops turning. Carefully move the gear shift lever into position for the speed desired.

The clutch lever controls the locking mechanism that holds the sliding transmission gears in position. Thus the gears cannot be shifted out of mesh or into mesh when the clutch is engaged. Always shift gears completely into mesh.

After putting gears in mesh, pull the throttle control lever all the way back. Carefully engage the flywheel clutch until the slack is taken up between the tractor and the load, then pull the clutch lever back firmly until it snaps over center.

STEERING THE TRACTOR

The tractor is steered by hand levers that operate the steering clutches and by pedals that control the steering clutch brakes. Release the steering clutch on the side toward which the turn is to be made by pulling back on that steering clutch lever. Apply the brake on the same side by pressing down on the pedal just hard enough to turn at the desired angle. Both controls should be handled smoothly so that the turn will be made evenly and not as a series of jerks. Just before the turn is completed, release the brake. Then engage the steering clutch by releasing the control lever quickly but gently.

With a load behind the tractor it is seldom necessary to use the brakes in steering, except for sharp turns since the load acts as a brake. The brakes may also be used to hold the tractor back when going down grade. A flat rod mounted on the right side plate locks the right brake pedal to hold the tractor on slopes or when doing stationary work.

Steering down grade: When going down grade with the tractor pulling the load, steer in the usual manner. If the load is pushing the tractor, the operation of the steering clutches and the brakes is reversed.

For example, to turn to the right under these conditions, release the steering clutch on the left, but do not apply the brake. This allows the left track to travel faster while the right hand track is held back by the engine which acts as a brake.

The pedals must be in the fully released position during normal operation of the tractor. **Keep the feet off the pedals except when it is necessary to use the brakes.**

OPERATING OVER AN OBSTRUCTION

The fact that the steering clutches are controlled by entirely separate levers may be used to advantage in running over an obstruction, such as a log or a ditch bank. Both the clutches may be released slightly until the tractor balances on top of the obstruction, then engage one clutch gradually so that the tractor moves forward at an angle, over and down. If the tractor is being operated without load it may be necessary to use the foot brakes.

OPERATING IN DEEP MUD OR WATER

If the tractor must be operated for any length of time in deep mud or water, certain precautions are required. See that the plugs are in place under the steering clutch compartments. Lubricate the track rollers, track carrier rollers, and front idlers every 5 hours. Inspect the oil in the final drives frequently for mud or water. Drain, wash, and refill the final drive cases as often as the oil shows the presence of any mud or water. See the topic, LUBRICATING INSTRUCTIONS.

STOPPING THE TRACTOR

For a temporary stop, that is, to stop the tractor and allow the engine to run, proceed as follows: Disengage the flywheel clutch and move the throttle control lever to the idling position. Shift the transmission gears into neutral and engage the flywheel clutch.

STOPPING THE ENGINE

Move the throttle control lever to the idling position and turn the ignition switch to the OFF position. To prevent the possible leakage of fuel and the attendant fire hazard, close the fuel tank shut-off valve.

If the tractor must stand without shelter for any considerable period, cover the exhaust pipe to exclude rain or snow.

When the temperature is below freezing, or there is a possibility of freezing weather before the engine is started again, the cooling system must be drained or filled with anti-freeze solution. See the topic, OPERATING IN COLD WEATHER.

DAILY CARE

A daily check of the tractor should be made to see if there are any loose nuts, bolts, cap screws, or parts worn to such an extent that they are no longer serviceable. The capscrews of the track roller end collars and the equalizer spring clip nuts are typical of points which should be checked frequently and kept tight since these parts are subjected to continued pounding. Particular attention should also be given to keeping the gasketed joints of the final drive cases drawn up tight to prevent leakage

and possible damage to parts through excessive movement. If corrective steps are taken immediately upon discovery of loose or worn parts, fewer enforced stops and more economical operation will result.

Dirt should not be allowed to accumulate on the tractor. A few minutes spent daily in keeping it clean are well repaid in improved appearance, and greater ease and safety in operation.

Each day the cooling system should be checked, and if necessary, additional water or anti-freeze added.

Lubricate parts as directed under the topic, LUBRICATING INSTRUCTIONS.

The fuel tank should be filled full at the end of the day's run. This will drive out moisture laden air, which if allowed to remain, will not only condense and cause water to accumulate in the fuel system but also may eventually cause the tank to rust. Open the drain valve on the fuel tank every 120 hours before the tractor is started and allow the accumulated water and sediment to drain. See the topic, CARE OF THE FUEL SYSTEM.

OPERATING IN COLD WEATHER

Crankcase: As the atmospheric temperature becomes lower, the crankcase oil must be of a lower viscosity in order to correctly lubricate the bearings, pistons, and the cylinder walls. See the topic, LUBRICATING INSTRUCTIONS.

Transmission, Final Drive, Track Rollers, Track Carrier Rollers, and Idlers: Like the crankcase oil, the correct viscosity of the oil to use in the transmission, final drive, track rollers, track carrier rollers, and idlers varies with the atmospheric temperature. See the topic, LUBRICATING INSTRUCTIONS.

Cooling System: The tractor may be operated in atmospheric temperature as low as 20°F. (-7°C.) with water in the radiator if the following precautions are taken. When stopping for the night, drain the cooling system by removing the plug in the bottom of the radiator and the drain valve at the left side of the engine block. This will drain the entire system if the tractor is level. After draining, crank the engine a few times to prevent water freezing in the water pump. The drain should be left open until the cooling system is refilled.

When the engine is started, use a curtain over the radiator and allow the engine to run two minutes, then fill the radiator quickly so that the water pump will function before the water can freeze in the lower part of the cooling system. Use a curtain as needed to keep the water up to the normal operating temperature, by partially or entirely covering the radiator while working. The curtain is available from your dealer as an attachment.

When the temperature is below 20°F. (-7°C.) sufficient anti-freeze solution should be used in the cooling system to prevent freezing. Commercial solutions are available for this purpose, or alcohol or glycerin may be used. Whatever liquid is used, it should be tested daily and kept up to correct strength for the existing temperature.

Starting the Engine: In extremely low temperatures, starting will be made easier if the tractor can be kept in warm storage or by following these suggestions: Under all circumstances, the engine should be turned

a few revolutions to loosen the oil on the bearings and the cylinder walls. If the engine seems locked when attempting to turn with the starting crank, investigate to see if the water pump impeller is frozen tight. If it is frozen, warm the pump body to melt the ice.

Warming the carburetor and the cylinders may be found necessary under the most extreme conditions. Warm the carburetor by wrapping it with a cloth and applying boiling water. Warm the cylinders by draining, heating and replacing the liquid in the cooling system. When warming the anti-freeze solution keep the flame away as some of these solutions are inflammable. Avoid getting the solution hot and, even with a warm solution, pour it into the cold cylinder block very slowly to prevent any damage by sudden expansion.

Sometimes moisture, or fuel which has not vaporized, collects on the spark plugs. They may be dried out by removing and pouring gasoline over the electrodes. Ignite the gasoline and allow it to burn.

Priming with a mixture of half ether and half gasoline, and allowing the engine to stand several minutes so the mixture can vaporize, will materially assist the starting. Ether, being more volatile than gasoline, vaporizes more rapidly and thus produces a combustible mixture at a lower temperature.

STORAGE

Engine: If the tractor is to be stored or left standing for a long period of time there is a probability that the lubricating oil will drain away from the cylinder walls and pistons. When this happens, the pistons and cylinders may be scored when the engine is started, before fresh oil has reached these surfaces. This condition will cause poor compression and will make starting difficult. The oil film, therefore, should be renewed periodically when the tractor is idle. This can be done by running the engine once every week for a few minutes, or until the oil is thoroughly warm. This will circulate the oil and prevent rusting from condensation. If it is not convenient to start the engine, remove the spark plugs once every month and pour about one-quarter pint (0.12 liter) of oil into each cylinder, then crank the engine several revolutions to distribute the oil. Replace the spark plugs. Thereafter, crank the engine once a week, between the monthly oiling intervals, to maintain the oil film on the cylinder walls and pistons.

The oil film should also be renewed immediately before starting the engine when taking it out of storage.

Final Drive: Allowing the tractor to stand idle for lengthy periods may permit the cork gasket on the final drive seals to become lightly stuck to the chromium plated washer on which it operates. When this occurs the gaskets may be damaged when the tractor is operated, causing the seals to leak. To prevent this condition occurring, the tractor should be driven backward and forward, at a time when starting the engine to renew the oil film on the cylinder walls and piston rings.

Cooling System: If the temperature is likely to go below freezing, the cooling system should either be drained, or it should be filled with the correct amount of anti-freeze solution. If the cooling system is drained, a tag should be attached to the radiator cap to prevent the engine's being started and run for any length of time without water in the cooling system.

Maintenance Instructions

The foregoing paragraphs have been devoted to instructions which are necessary for day-to-day operation of the tractor. The following topics give detailed instructions regarding the care and adjustment of the various assemblies.

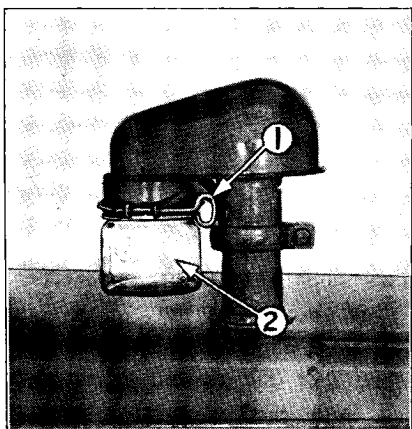
CARE OF THE AIR CLEANER

The air cleaner does its work efficiently only as long as the oil in the cup is thin enough to spray into the filter section and wash back the dust collecting there. For this reason, the air cleaner should be inspected frequently and serviced promptly.

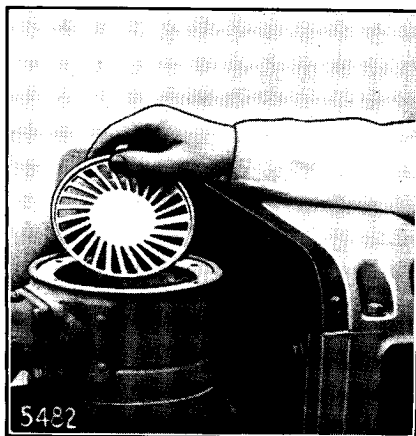
The interval between oil changes and cleaning will vary with the weather and the working conditions. During the hot dusty months, and on jobs where dust conditions are severe, it may be necessary to service the air cleaner every 5 hours. In cold, damp weather, and on jobs where there is little or no dust, this operation may be necessary only every 60 hours. However, dependence should not be placed in visible detection of dust, or lack of dust, in the air as a basis for servicing the air cleaner. The high efficiency of the pre-cleaner prevents the larger dust particles from entering the air cleaner, but it does not exclude the finer ones. For this reason the oil in the air cleaner may become saturated with dust, due to its fineness, much more rapidly than in instances where dust is more apparent.

The fine particles of dust become suspended in the oil, lowering its cleaning efficiency, without leaving any noticeable sediment in the cup. Consequently, the best guide to follow in servicing the air cleaner is the appearance of the oil which will become increasingly cloudy. The air cleaner cup should be removed, washed and refilled at a time between 5 to 60 hours when the oil shows evidence of being murky or cloudy.

Care of The Pre-Cleaner: Remove and empty the glass jar before it becomes three-fourths full by loosening the screw clamp that holds it in place (on earlier tractors the jar is screwed in position on the pre-cleaner). Inspect the fins in the pre-cleaner regularly and when dirty remove entire pre-cleaner and wash in a non-inflammable cleaning fluid.



PRE-CLEANER
1—Screw clamp. 2—Jar.



REMOVING BACKFIRE PLATE

To Wash Backfire Plate: Occasionally remove the pre-cleaner, hood, and air cleaner dome and lift the backfire plate out of its position in the top of the cleaner body. Wash in a cleaning fluid and replace. Be sure the gasket is in place and all connections are air tight before replacing hood.

To Wash Air Cleaner Screens: Unscrew the wing nuts and take off the oil cup. Inspect the screens in the air cleaner at periods between 60 to 240 hours depending upon severity of dust conditions and wash if necessary. Remove the clamp band and slip the lower screens off the air inlet pipe, one at a time, and shake in a pan of kerosene or some non-inflammable cleaning fluid. When a screen is found that is perfectly clean, there is no need to remove the screens above it. Only six screens are removable. Inspect the inside of the air inlet pipe each time the oil cup is removed and if dirt is starting to accumulate, it should be cleaned. Replace the screens so the frame cross arms of each pair are facing each other and the screens are held firmly together by the clamp band.

When refilling the oil cup, care should be taken that both the inner and outer sections of the cup are filled to the oil level bead. Fill to the level bead only, as a higher oil level does not increase efficiency; in fact it prevents proper oil spray action in the air cleaner.

Never attempt to change the oil in the air cleaner cup when the engine is running. Doing so will permit dirty oil being held in the screens by intake action to contaminate the fresh oil and also cause an abnormally high oil level.

At least once a year—more often in dusty conditions—the entire air cleaner should be removed from its support in order to thoroughly flush out the fixed screens in the upper part of the filter body. To facilitate cleaning, first remove the oil cup, removable screens, air cleaner dome, and backfire plate. Wash all parts thoroughly and when reassembling, make certain that all connections are air tight.



ALIGNING AIR CLEANER SCREENS

CARE OF THE COOLING SYSTEM

Water used in the cooling system should be soft, or as free as possible from scale forming minerals. If it is impossible to obtain soft water, it is advisable to treat the available water with some commercial water "softener."

The cooling system should be drained occasionally to remove dirt and sediment which accumulates. Open the radiator drain valve and remove the plug in the left side of the engine block. This will drain the entire system if the engine is level. This should be done at the end of the day's run, when all foreign material is in suspension and will easily drain with the liquid.

Late tractors beginning with 6G876 have a pressure operated overflow control located on the back side of the radiator top tank. Dirt, rust, and lime deposits will, if in large enough quantities, prevent proper seating of the seal resulting in a loss of water through the overflow. To prevent this condition occurring, the overflow control should be removed periodically and all parts should be thoroughly cleaned.

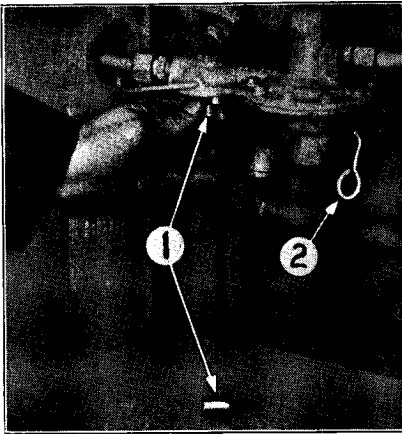
The cooling system should be washed out occasionally. To do this, run the engine until the liquid in the cooling system is at operating temperature, and the loose foreign material is stirred up. Then stop the engine and drain as quickly as possible before the sediment has time to settle. Close the drain and pour in kerosene equal to about one-tenth the capacity of the cooling system and fill the remainder with a solution of one-half pound (226.8 grams) of washing soda to each gallon (3.8 liters or .8 Imp. Gal.) of water. Run the engine for about one-half hour, and again drain and flush the system with clean water.

In more obstinate cases, if the above treatment does not prove effective, an acid solution may be used; but acid must be used with extreme care, and only after other means have proven ineffective. **Immediately** after the system has been washed with the soda solution described, fill the cooling system with a solution of five parts hydrochloric (commercial muriatic) acid, one part formaldehyde and forty-eight parts water and allow it to remain in the system for a few hours at operating temperature. The formaldehyde should first be mixed with the water, then the acid added to the solution. Drain immediately after stopping the engine and thoroughly flush the system with clean water to which has been added a handful of washing soda, which acts as a neutralizing agent.

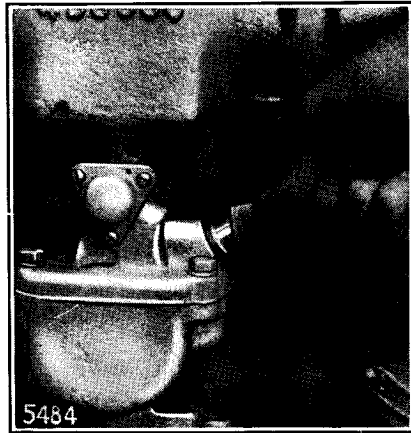
After using the acid treatment, the cooling system should be drained and flushed the second time at the end of the day's run.

CAUTION: The acid solution is also a solvent of the metals of which radiators are made, therefore, great care must be exercised to avoid continuing the operation beyond the point where the scale is dissolved. It is highly important that no trace of the acid be left in the cooling system.

CARE OF THE FUEL SYSTEM



SEDIMENT BOWL FILTER
1—Filters. 2—Priming lever.



CARBURETOR SCREEN

The capacity of the main fuel tank is 32 U. S. Standard gallons (122 liters or 27.0 Imp. Gal.). The capacity of the auxiliary tank is 2 U. S. Standard gallons (7.6 liters or 1.7 Imp. Gal.).

Use every precaution to keep the fuel clean. The best method is to use an underground storage tank. If this is not possible, see that the filling cans, funnels, pumps, hose, and the storage barrels are clean before the refueling process is begun.

The sediment bowl filter and carburetor screen should be kept clean.

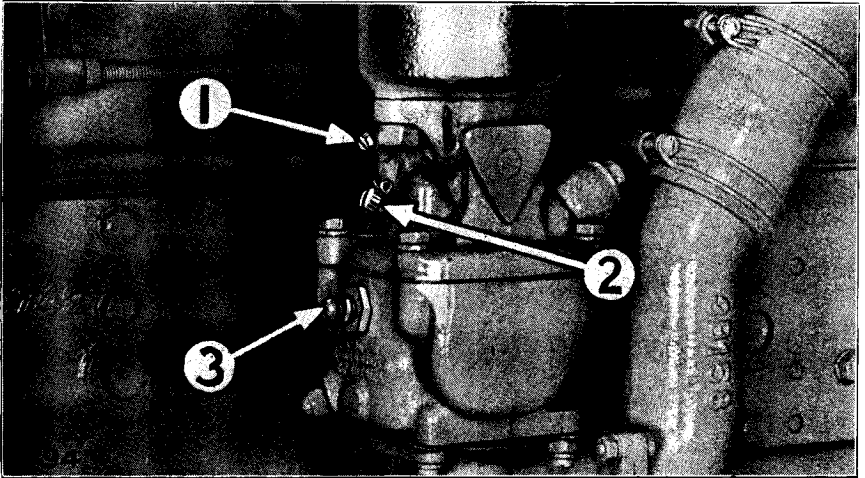
Sediment Bowl and Filters: The sediment bowl collects water and sediment that may be in the fuel. To remove the collected water and sediment, close the main fuel line valve under the main fuel tank and remove the bowl by unscrewing the nut that clamps it to the body of the fuel pump. Unscrew the edge-type filters and shake them in kerosene or some non-inflammable washing fluid. When the bowl is replaced see that the gasket is clean, is in the correct position and is not broken.

Carburetor Screen: To remove the screen turn the fuel control valve lever to the OFF position and close the fuel tank shut-off valve. Then unscrew the union body plug screw that holds the union body in place and lift off the body. The screen can then be lifted off the union body plug and cleaned. When the union body is replaced, see that the gasket is clean, is in the correct position and is not broken.

CARBURETOR ADJUSTMENT

To obtain an approximate adjustment turn the high speed adjusting screw one turn from the closed position. Turn the idling speed screw one and one-quarter turns from the closed position.

A more accurate adjustment can be obtained by turning the high speed adjusting screw out slightly to make the mixture richer. Adjust this screw to the point that will give the lowest fuel consumption without loss of power. Turn the idling screw in to make the mixture richer.



CARBURETOR ADJUSTMENT

1—Idling speed control. 2—Idling adjustment. 3—High speed adjustment.

Adjust this screw to the point where the engine will idle regularly. Turn the idling speed control screw out to decrease the idling speed or turn it in to increase it.

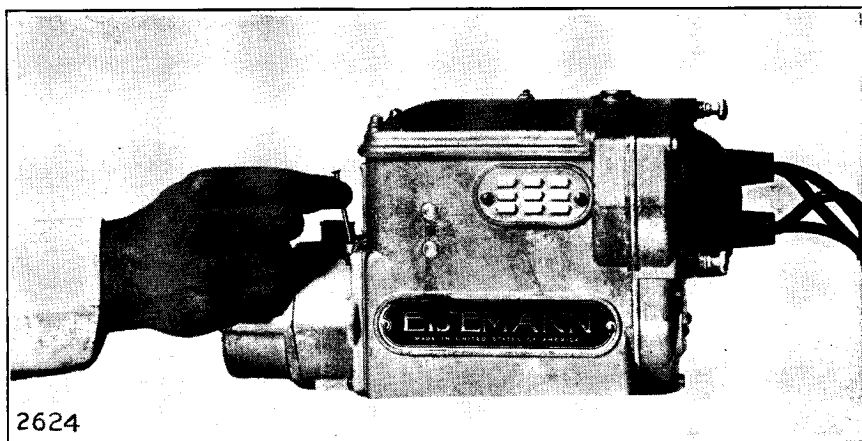
FUEL PUMP DIAPHRAGM

The diaphragm in the fuel pump should be replaced once a year. Consult your dealer or a representative of the pump manufacturer regarding this replacement. The fuel pump is readily removed from the engine. Close the fuel tank shut-off valve and disconnect the fuel lines. Remove the cap screws that hold the pump to the crankcase and lift off the fuel pump.

MAGNETO

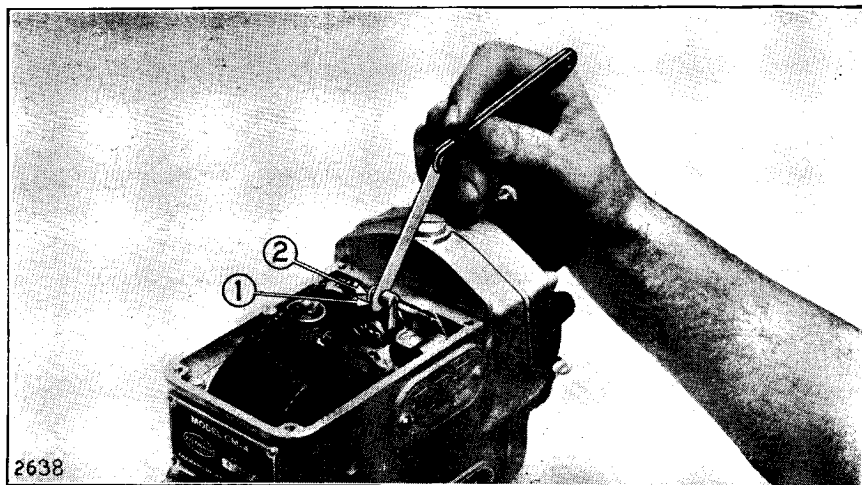
Two different magnetos have been used on R4 tractors: The Eisemann CT-4 and the Eisemann CM-4. While somewhat different in appearance, they require the same care and these instructions apply equally well to both magnetos.

Cleaning: Approximately every 1200 hours of operation, remove the distributor plate. Avoid striking the brushes against the edge of the housing. Wipe the carbon dust off the distributor plate and disc with a clean cloth moistened with gasoline. Wipe dry before operating the magneto. See that the carbon brushes are clean and slide freely in their sockets.



RELEASING IMPULSE STARTER PAWL

Once a year flush out impulse starter with kerosene to remove gummy oil. To do this remove the four screws which fasten the coupling cover to the magneto housing. Slide the cover away from the magneto. Pour the kerosene on the catch plate and pawls. Avoid drenching the body of the impulse starter, as the compression spring on the inside is packed with grease and kerosene might wash out the grease. After flushing, install the cover and fill the oil well with fresh crankcase lubricating oil. Keep the louvers clean in the ventilator plates to permit the necessary air circulation. There are three of these plates, one on each side of the magneto housing and one in the bottom of the gear cover plate.

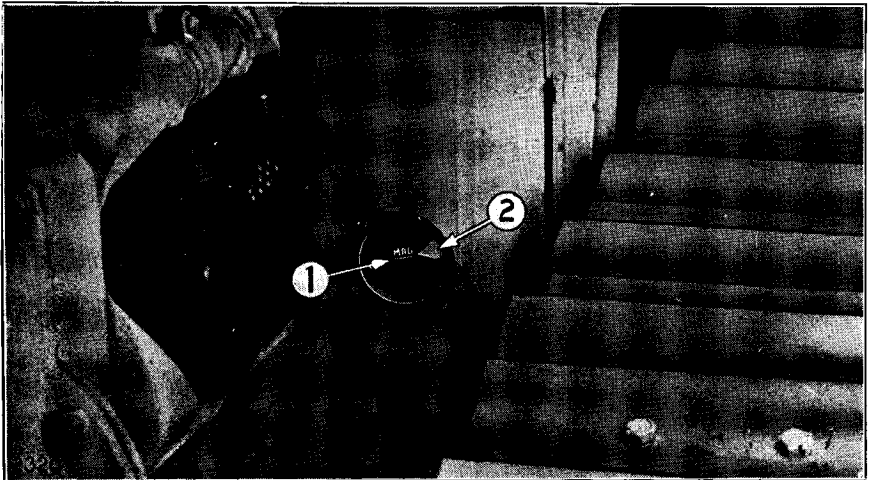


CHECKING CONTACT POINTS
1—Thickness gauge. 2—Adjustable contact point.

Checking and Adjusting Contact Points: Every 1200 hours remove the top cover and check the contact point opening. This should be .020 inch (0.51 mm.) when the bumper block is on the highest elevation of the cam. To check the adjustment it is necessary to release the impulse starter pawl. This is done by removing the plug screw in the coupling cover and inserting a nail or stiff wire in the hole as the engine is cranked slowly. The nail depresses the short end of the pawl and releases it from the catch plate.

Testing: A magneto may be tested when coupled to the engine by removing a cable from a spark plug and holding the terminal $\frac{1}{8}$ inch (3.2 mm.) away from the metal part of the plug while the engine is being cranked. If no spark passes from the cable to the plug body when the ignition switch is in ON position, and the engine has been cranked two revolutions, repeat the test with another cable. Then if no spark occurs, remove distributor plate and examine brushes. Clean the distributor plate and disc as described under the heading, CLEANING. Check contact point opening as described under the heading, CHECKING AND ADJUSTING CONTACT POINTS. Install the distributor plate and repeat the test. If the difficulty is not overcome, remove the magneto and take it to the nearest Eisemann Service Station for testing. See the list of Eisemann Service Stations accompanying the tool equipment or consult your dealer. The complete magneto including the cables and the spark plugs should be given to the Service Station to insure a complete check. Do not disconnect the cables from the magneto but remove as a whole by following the directions in the next paragraph.

Removing: Take out the two screws that hold two-piece coupling cover together. Disconnect the ground wire from the top cover. Remove the spark plug cover and disconnect the cables from the spark plugs and remove the ignition wire conduit. Remove the magneto by taking out the cap screws holding it to the support bracket.



MARKS FOR TIMING MAGNETO

1—Mark on face of flywheel. 2—Pointer on housing.

Timing: First check the opening of the contact points as described under the heading, CHECKING AND ADJUSTING CONTACT POINTS.

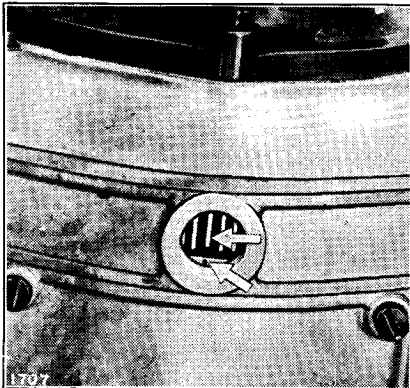
Remove the spark plug from No. 1 cylinder. Hold a finger over the spark plug opening and turn the crank slowly, until a rush of air is noted coming from the cylinder. The rush of air indicates that the piston is coming up on the compression stroke.

Remove the inspection cover from the left side of the engine on the forward side of the flywheel, and continue to turn the crank until the mark MAG is directly opposite the mark on the edge of the opening. The crank of No. 1 cylinder will be 30° ahead of top center on the compression stroke, which is the correct firing point of the magneto.

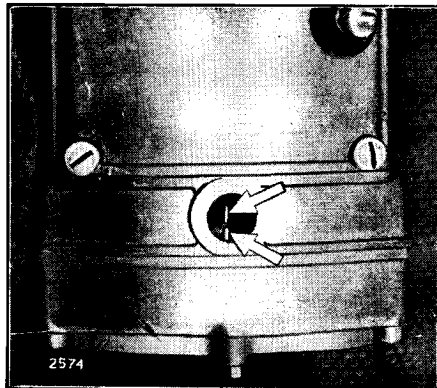
With a screw driver, remove the inspection plug from the top of the magneto housing. This will expose part of the distributor gear. If the timing is correct, the short tooth on the gear will be exactly opposite a vertical mark that is cast in the housing or pointer lines up with stationary mark. This setting indicates that the distributor disc conducting segment is in line with the brush that is connected by a cable to the spark plug of No. 1 cylinder, and also, that the contact points are just barely separated.

If the timing is not correct, proceed as follows: Remove the two screws that hold the coupling cover in position. With a screw driver loosen the two screws in the adjustable drive hub sufficiently to permit the rotor of magneto to be turned. Release the impulse starter pawl and turn the rotor until the short tooth on the distributor gear is directly opposite the cast mark in the housing or pointer lines up with stationary mark.

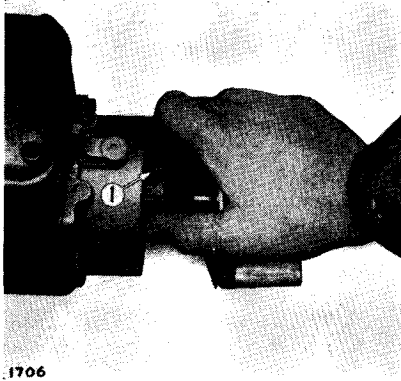
After the magneto is timed replace the adjustable drive hub with care to avoid changing the magneto timing. Replace the hub in such a position that there is .015 inch (0.38 mm.) clearance between it and floating



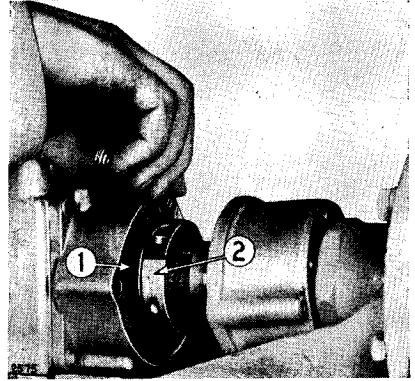
CT-4 TIMING MARKS
Inspection plug removed from top of magneto to show short tooth and stationary mark.



CM-4 TIMING MARKS
Inspection plug removed from top of magneto to show pointer and stationary mark.



TURNING MAGNETO ROTOR
1—Adjustable drive hub clamp screws.



CHECKING DRIVE HUB
1—Floating disc. 2—Adjustable drive hub.

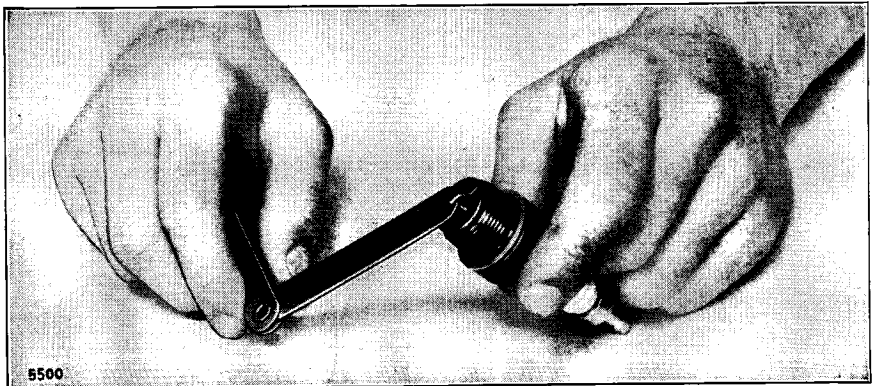
disc. Use the thickness gauge supplied in the tool equipment to check this clearance. When tightening the adjustable drive hub, pull down evenly on both screws, so that the notches fit correctly.

If the spark plug cables have been removed from the distributor plate, be sure they are replaced in the correct sockets. The socket at the lower left hand corner of the plate is marked "1" and the cable leading to No. 1 cylinder should be placed there. Place No. 3 cable in the upper left socket, No. 4 cable in the upper right socket, and No. 2 cable in the lower right socket.

SPARK PLUG ADJUSTMENT

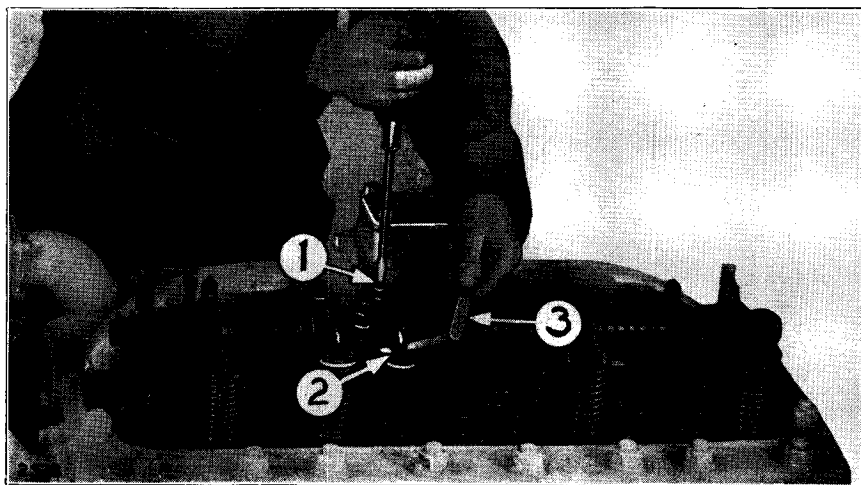
The spark plugs should be examined often enough so that the gaps may be kept at approximately .025 inch (0.64 mm.). Measure this gap with the thickness gauge furnished in the tool equipment. To make this adjustment, bend the outer electrode.

The side electrode of a spark plug will wear in a curved or arched manner, at a point immediately above the center electrode, after some service. For this reason, a round wire gauge, obtainable from spark plug manufacturers, should be employed to determine proper gap for used spark plugs.



SPARK PLUG ADJUSTMENT

VALVE CLEARANCE ADJUSTMENT



VALVE CLEARANCE ADJUSTMENT

1—Adjusting screw. 2—Measure clearance at this point. 3—Valve clearance gauge.

The initial valve clearance adjustment should be made after the first 120 hours of operation. Thereafter the valve clearance should be checked and adjusted if necessary after every 240 hour operating interval.

Both the inlet and exhaust valves should be adjusted for a clearance of .012 inch (0.25 mm.). This adjustment should be made when the engine is hot. By "hot" is meant the temperature the engine will have attained 10 minutes after it has been stopped after having run for several hours. If the adjustment is not completed before the engine has been stopped 20 minutes, it should be started again in order to warm it.

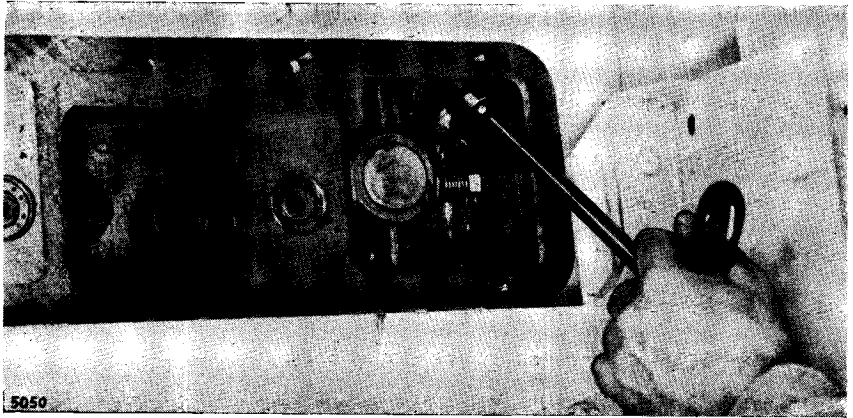
To Adjust: Crank the engine until the valve closes and the push-rod is at its lowest point. Loosen the adjusting screw nut on the valve rocker. Turn the screw to obtain the correct clearance between the top of the valve stem and the end of the valve rocker. Measure this clearance with the thickness gauge supplied in the tool equipment. Recheck the adjustment after the adjusting screw nut is tightened.

STEERING CLUTCH BRAKE ADJUSTMENT

Keep the brakes adjusted just tight enough so the tractor will turn correctly when the steering clutch is released and the brake pedal is depressed about three-fourths of the way to the floor plate. The band should be entirely free from the drum when the pedal is in the released position.

To Adjust: Turn the adjusting nut in a clockwise direction to tighten the brakes. The adjusting nut should be turned sufficiently each time to allow the spring to seat firmly on the nut. A spring mounted on the tang of the brake band keeps the nut from jarring out of engagement. The spring engages the nut at each 1/6 turn.

Loosen the lock nut on the support screw on the under side of the transmission case below the brake drum. Apply the brake to draw the brake band tightly around the drum. Turn the support screw up tight



STEERING CLUTCH BRAKE ADJUSTMENT

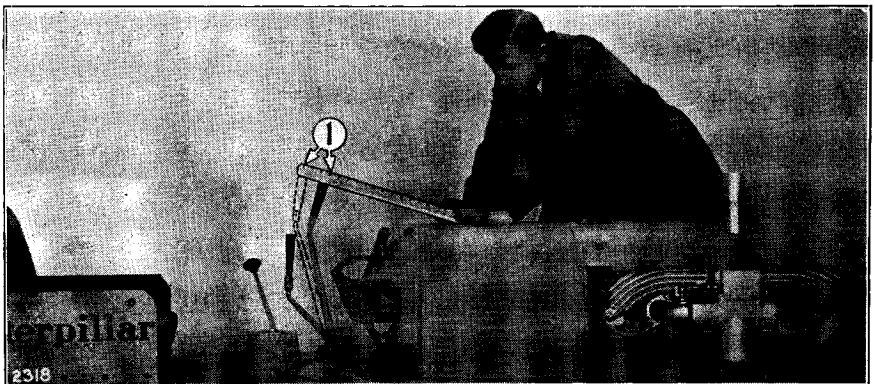
against the band and then back off $1\frac{1}{2}$ turns and tighten the lock nut. This screw supports the brake band and maintains the correct clearance between the lining and the drum. The band should be entirely free from the drum when the pedal is in the released position.

PACKING NUT ADJUSTMENT

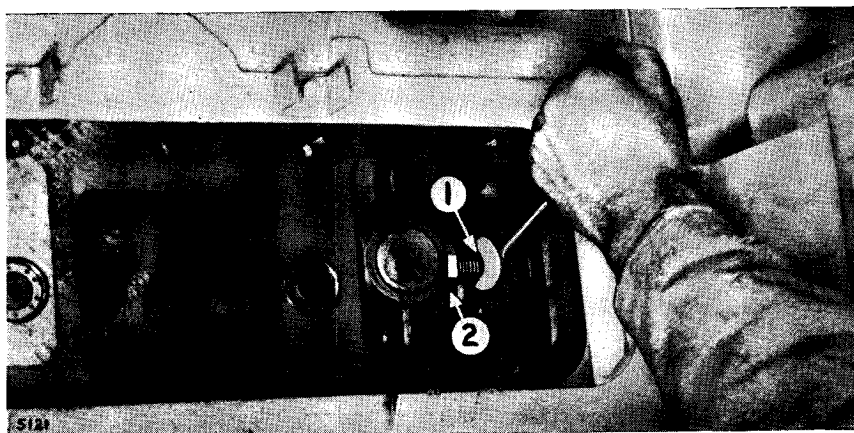
Tighten the water pump packing nut by turning it in the direction the shaft turns until the leak stops. Then back off $1/6$ turn to prevent binding and scoring the pump shaft.

STEERING CLUTCH CONTROL ADJUSTMENT

The adjustment must be kept at a point that will allow 3 inches (7.6 cm.) free motion at the top of the steering clutch levers. To adjust, remove the inspection plate on the transmission top cover and loosen the lock nut on the adjusting screw. Turn the screw "out" or away from the center of the tractor to increase the clearance. The normal wear of the clutch discs tends to close up this clearance.



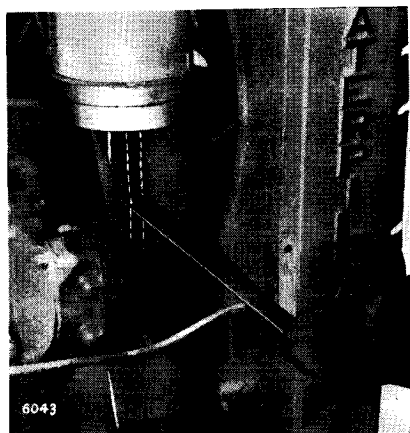
CHECKING ADJUSTMENT OF STEERING CLUTCH CONTROLS
1—There should be at least 3 inch (7.6 cm.) free motion at this point.



STEERING CLUTCH CONTROL ADJUSTMENT
1—Adjusting screw. 2—Lock nut.

FAN BELT ADJUSTMENT

To adjust the fan belt, loosen the lock screw which clamps the front rim of the fan pulley to the hub. Screwing the rim away from the radiator will tighten the belt. Be sure the lock screw is lined up with the slot in the hub before it is tightened. The adjustment is correct when the belt can be easily pushed inward a distance of approximately 1 inch (2.5 cm.). If the fan belt is operated too loose, it will slap against the pulleys, causing unnecessary wear to the belt and possibly slipping to the extent that the engine will overheat. If the belt is too tight, unnecessary stresses are placed upon the fan bearings and belt, which might shorten the life of both.

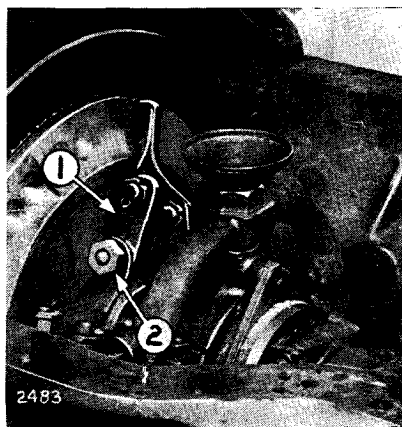
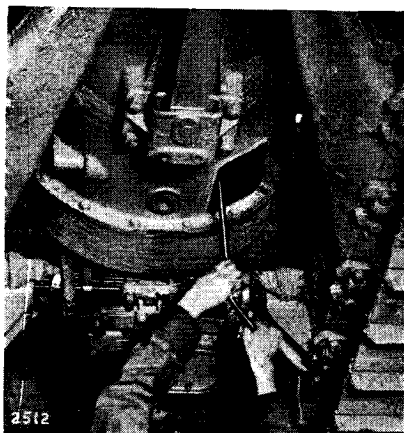


CHECKING FAN BELT TENSION
1—Correct adjustment allows approximately 1 inch (2.5 cm.) slack at this point.



FAN BELT ADJUSTMENT
1—Lock screw. 2—Adjusting rim.

FLYWHEEL CLUTCH ADJUSTMENT



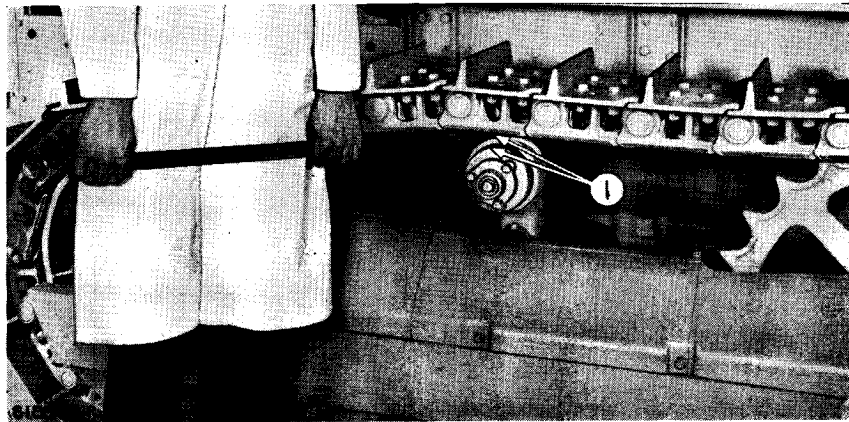
FLYWHEEL CLUTCH ADJUSTMENT

1—Adjusting collar. 2—Clamp bolt.

To test the adjustment, pull the clutch lever to the engaged position. The lever should go into position with a distinct snap, and should require a reasonably hard pull. To tighten, disengage the clutch and remove the inspection cover from the bottom of the flywheel clutch compartment. Loosen the nut on the adjusting collar clamp bolt with the transmission gears engaged, turn the collar a few degrees in a clockwise direction until the desired snap is obtained. Tighten the clamp bolt and test the adjustment. Replace the inspection cover and disengage the transmission gears.

TRACK ADJUSTMENT

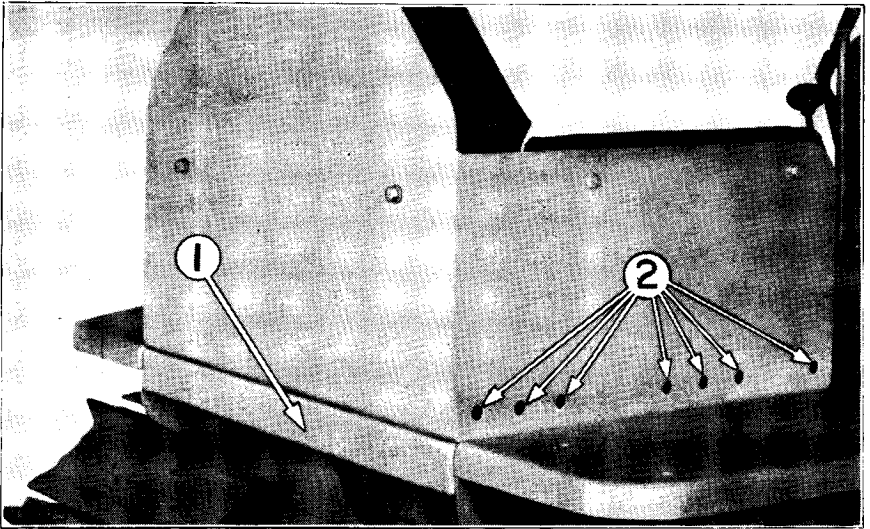
The track adjustment is correct when the tracks may be raised from $1\frac{1}{2}$ to 2 inches (3.8 to 5.1 cm.) above the track carrier roller. To adjust the tracks on tractors 7G784 and above, remove the cover immediately behind the front idler; on tractors before 7G784, remove the cover



CHECKING TENSION OF TRACK

1—It should be possible to raise track $1\frac{1}{2}$ to 2 inches (3.8 to 5.1 cm.) at this point.

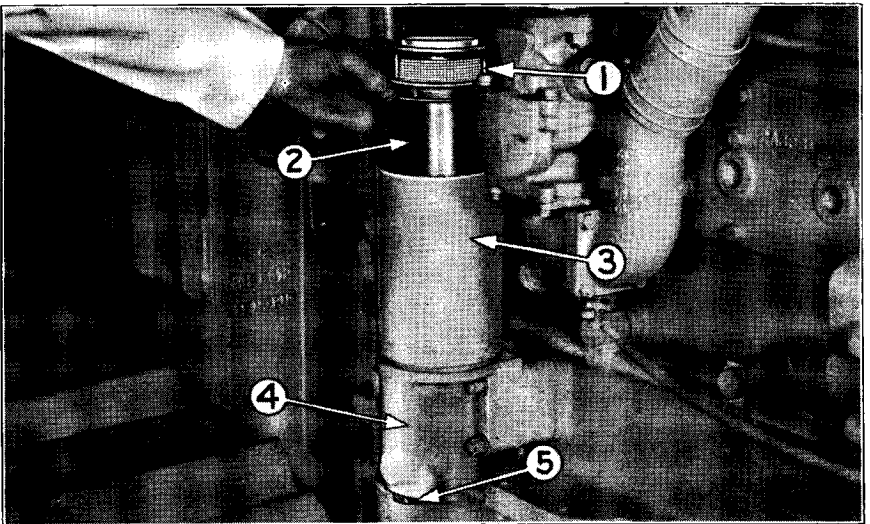
SEAT ADJUSTMENT



SEAT ADJUSTMENT
1—Spacer. 2—Holes for seat adjustment.

The seat may be adjusted to various positions, away from or toward the controls, by means of holes in the sides of the seat and the supporting spacer. The same range of adjustments possible with the spacer in place may also be obtained with the seat at a lower level by removing the spacer.

CRANKCASE LUBRICATING OIL FILTER



CRANKCASE LUBRICATING OIL FILTER
1—Inner element. 2—Outer element. 3—Housing. 4—Sludge compartment.
5—Drain plug.

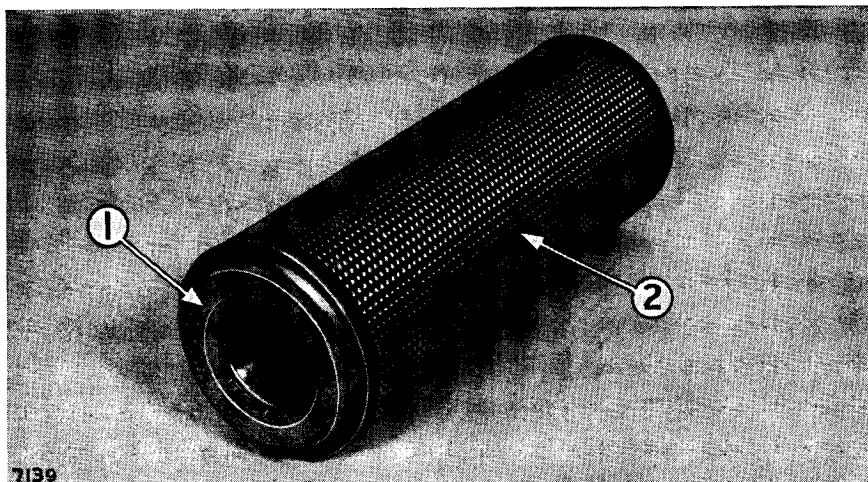
Late machines are equipped with crankcase lubricating oil filters. While the oil is draining from the crankcase remove the drain plug from the oil filter base. Then loosen the clamp bolt and remove the cover and clamp bolt as a unit.

Lift out the inner and outer filter elements. Remove the inner element and discard it.

Wash the cover, outer filter element, housing and sludge compartment with kerosene or some non-inflammable washing fluid, and allow them to drain.

Reinstall the outer element, and a new inner filter element. Then replace the cover and tighten the clamp bolt.

Always install a new inner filter element each time the lubricating oil is changed.



LUBRICATING OIL FILTER INNER ELEMENT

1—Cork seals. 2—Perforated metal cover containing absorbent filter material.

WASHING THE CRANKCASE

It will be found advantageous to occasionally wash or flush the crankcase to remove foreign substances that have a tendency to accumulate there.

To Wash: At a time when it is necessary to change the oil in the crankcase, remove the drain plug from the bottom of the oil sump and drain the old oil while the engine is hot. Replace the drain plug and pour one gallon (3.8 liters or .8 Imp. Gal.) of flushing oil into the crankcase. Run the engine for three minutes, noting that the oil gauge shows pressure. Then drain the flushing oil from the crankcase. Refill the crankcase with fresh oil. The flushing oil may be used again if the foreign matter is allowed to settle and then removed. **If sludge is noticeable when draining the crankcase the oil pump screen should be inspected and cleaned if necessary.** This screen can be removed by taking off the oil pan bottom cover and removing the cap screws that hold the screen to the lower part of the oil pump.

WASHING THE TRANSMISSION

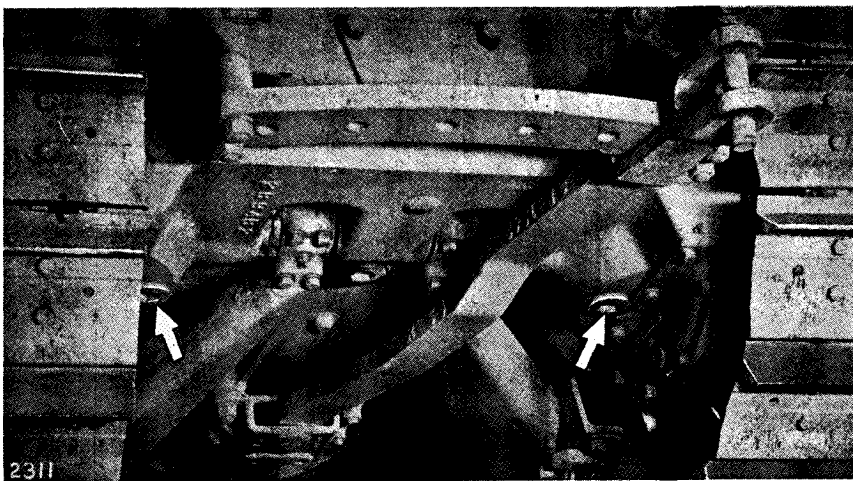
Remove the drain plug from the transmission case, after a run when the oil is warm. This drains the speed change gear compartment and the bevel gear compartment. Replace the plug and fill to the proper level with

kerosene or some non-inflammable washing fluid. Drive the tractor back and forth for five minutes if it is convenient, otherwise start the engine and put the gears into the highest speed. Tie back the steering clutch levers and engage the flywheel clutch. Allow the gears to run five minutes, then shift the gears back to the neutral position. Stop the engine and again remove the drain plug. After all the washing fluid has drained, replace the plug and fill with fresh transmission oil to the correct level.

WASHING THE FINAL DRIVE CASES

Remove the drain plugs from both the cases after a run when the oil is warm, and allow the old oil to drain. Replace the plugs and fill the cases to the level of filler hole with kerosene or some non-inflammable washing fluid. Drive tractor back and forth for five minutes. After all the washing fluid has drained, replace the plugs and fill with fresh transmission oil to the correct levels.

DRAINING THE STEERING CLUTCH COMPARTMENTS



STEERING CLUTCH COMPARTMENT DRAIN PLUGS

The steering clutches are designed to operate dry. Oil is used only to lubricate the release bearings. **This oil, and any seepage from the adjoining compartments should be drained every sixty hours of operation by removing the plugs in the bottom of the case.** Failure to observe proper draining periods may result in the clutches slipping or difficulty in steering the tractor. The drain plugs should be replaced to keep out dirt and moisture during operation.

DRAINING THE FLYWHEEL CLUTCH HOUSING

The clutch plates are designed to operate dry. The plug on the bottom of the flywheel housing, directly under the flywheel clutch should be removed every 60 hours to drain any oil that may have seeped into the compartment from the engine, transmission, shift collar or pilot bearing. If oil from these points is allowed to accumulate, the clutch plates may become sticky and cause difficult operation of the clutch.

Special Instructions

for

“CATERPILLAR”

R4 TRACTOR

equipped for

Burning “Tractor Fuels”



OPERATING ON “TRACTOR FUELS”

This tractor is designed to give very satisfactory performance on even the lower grades of gasoline. It may be equipped with special attachments which enable it to burn the better grades of “tractor fuels” very satisfactorily. Your “Caterpillar” dealer can give you full information concerning these special attachments.

The preceding instructions which govern the operation of this tractor on gasoline, also apply to operation on “tractor fuels” with the following exceptions and additions :

FUELS

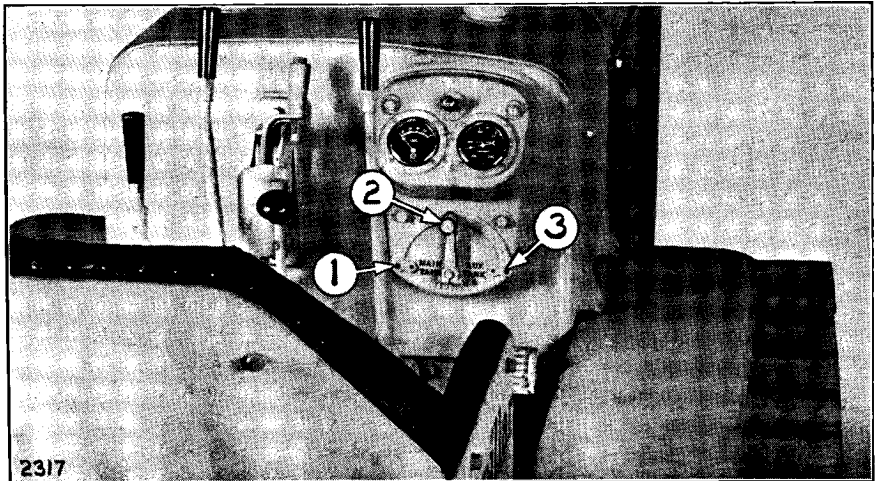
“Tractor Fuel” is the name commonly used to designate the group of spark ignition engine fuels that vaporize less readily than gasoline. Such fuels are often called kerosene, stove oil, lamp oil, distillate, etc., or by numerous trade names. They vary considerably in price, energy content, vaporizing ability, and the like, and short tests under actual operating conditions may be necessary to select the available fuel that gives the greatest economy and smoothness. Your “Caterpillar” dealer will gladly furnish you information concerning the fuels available in your territory and will help you to secure the most satisfactory performance from your tractor.

PREPARING THE TRACTOR FOR USE

On tractors equipped to burn "tractor fuels", be sure that the fuel control valve lever on the instrument bracket is in the OFF position. In this position both gasoline and "tractor fuel" are shut off. Then fill the main fuel tank with "tractor fuel" and the auxiliary tank with gasoline, taking care that no dirt, water, or other foreign substances are admitted with the fuel. If the presence of any such substances is suspected, the fuel should be strained.

STARTING THE ENGINE

On tractors equipped to burn "tractor fuels": Turn the fuel control valve to the AUX. TANK position. This allows gasoline to flow into the carburetor for starting purposes. Disengage the flywheel clutch by pushing the control lever forward, and see that the gear shift lever is in neutral position. Move the throttle control lever about half way back. Turn the ignition switch ON and pull the choke control rod forward. Grasp the crank in the left hand and engage the ratchet by pushing the crank in with the right hand. Stand with the right hand resting on the left side of the radiator and pull the crank over the top part of its circle. Repeat until the engine starts. **Do not spin the crank** as this may cause the impulse starter to release and the engine to backfire. After the engine starts, engage the flywheel clutch and allow the engine to run until it warms up. Be sure that the cooling system has been filled and that the lubricating oil pressure gauge is registering the correct pressure. When the engine is warm the operating pressure should be approximately 30 pounds on earlier machines. On later machines the gauge should register in the "Operating Range."



FUEL CONTROL VALVE LEVER POSITIONS ON TRACTORS
EQUIPPED TO BURN "TRACTOR FUEL"

1—Main tank position for running with "tractor fuel." 2—Off position for shutting off both gasoline and "tractor fuel." 3—Aux. tank position for starting with gasoline.

The spark is retarded for starting by the action of the impulse starter in the magneto. After starting, the impulse starter releases and the engine operates with the spark set at the correct advance position.

If the engine is cold, starting will be easier if the cylinders are primed. A tablespoonful of priming mixture—half ether and half gasoline—in each priming cock is ample. See the topic, OPERATING IN COLD WEATHER.

The ease with which the engine may be started depends upon the temperature of the atmosphere, the temperature of the engine, and the readiness with which the fuel vaporizes. In warm weather, the engine may sometimes be started directly on "tractor fuel", especially if it has been stopped for only a brief period after having run long enough to become thoroughly warm. When using fuels that are not too far below gasoline in vaporizing ability, the engine can be started on "tractor fuel" after priming the cylinders. With fuels of still lower vaporizing ability it is necessary to start the engine and to allow it to run on gasoline for a considerable period to warm it thoroughly before turning the valve to admit "tractor fuel" to the carburetor. Starting in cold weather can be facilitated by following the suggestions given under the topic, OPERATING IN COLD WEATHER.

Avoid over-choking or over-priming the engine when starting it. If the engine is flooded from either of these causes it should be cranked several times with the choke OFF to dissipate the excess fuel.

If, after following the procedure outlined in the previous paragraphs, the engine fails to start when cranked a few times, make an inspection at the various points where difficulty might arise. Be sure that the carburetor contains gasoline and not "tractor fuel". If in doubt, open the drain valve on the carburetor float bowl and allow all the fuel in the carburetor to drain, then observe the lever on the fuel control valve to be sure that it is in the correct position to admit gasoline to the carburetor. If no fuel flows when the drain valve is opened, inspect the fuel supply in the auxiliary tank. Test the magneto to see if it is functioning properly. Check as outlined under the topic, MAGNETO.

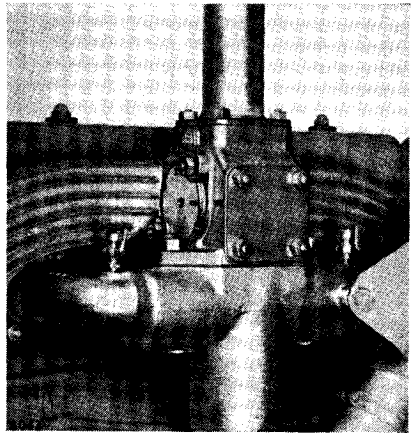
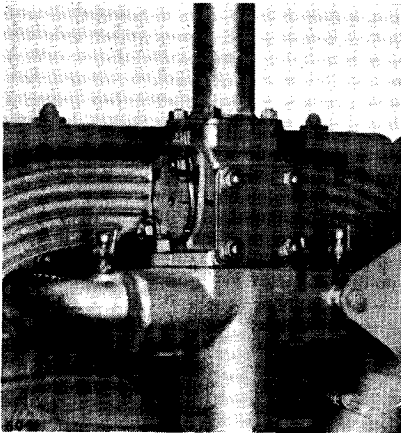
After the engine has started and has run long enough so that the manifolds, and the liquid in the cooling system have been warmed thoroughly, switch the fuel supply from the auxiliary tank to the main tank, by turning the lever on the fuel control valve.

Since the rate of crankcase lubricating oil dilution is excessive when burning "tractor fuel" in an engine that is not sufficiently warm, the operator should never be in any hurry to switch from gasoline to "tractor fuel". For a similar reason, engines should never be run for long periods at idle speeds on "tractor fuel".

NOTE: When operating on "tractor fuels" the temperature indicator should register approximately 190° F. to 200° F. (87.8°C. to 93.3°C.) for best operation.

MANIFOLD HEAT CONTROL

On tractors equipped to burn "tractor fuels", the heat exchange valve is located at the right side of the engine in the hot air valve body between the two manifolds. Gasoline may be used in engines equipped for burning "tractor fuels" during cold weather or on intermittent loads by changing the heat exchange valve to position "1". In this position the exhaust from only two cylinders is diverted around the inlet manifold.



HEAT EXCHANGE VALVE IN "TRACTOR FUELS" MANIFOLD
1—Setting to use gasoline. 2—Setting to use "tractor fuels."

When burning most "tractor fuels" it is necessary that the exhaust from all four cylinders be used to heat the intake manifold. The additional heat can be secured by turning the valve to position "2", or about 90° in a clockwise direction (as viewed from the front of the tractor).

To make this change, remove the two nuts that hold the flange of the valve to the valve body and take out the small locks. Then turn the valve about 90° and replace the locks and the nuts. The spacing of the studs on the body and the notches in the flange of the valve is such that the valve can be installed only in the two positions mentioned.

STOPPING THE ENGINE

When stopping the engine, move the throttle control lever to the idling position and turn the fuel control valve to the OFF position. Allow the engine to burn all the fuel in the carburetor. Then turn the ignition switch OFF. This will make it unnecessary to drain the carburetor of "tractor fuel" when starting on gasoline.

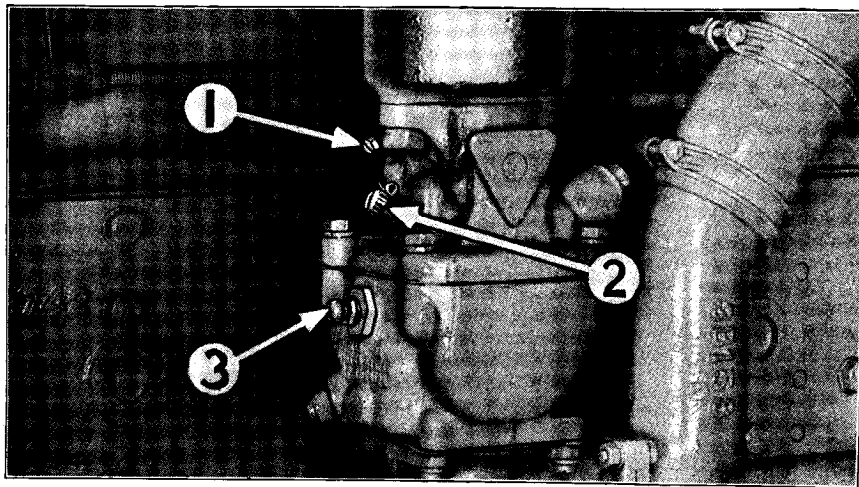
OPERATING IN COLD WEATHER

On tractors equipped to burn "tractor fuels", the radiator curtain is standard equipment. It is adjustable to several different vertical positions. To adjust the curtain loosen the wing nut on the lower right corner of the radiator (as viewed from the front) and turn the left wing nut enough to permit the curtain rod to be hooked into the desired slots. Tighten the right wing nut to maintain the tension on the curtain. Use the radiator curtain to maintain an efficient operating temperature of approximately 190°F. to 200°F. (87.8°C. to 93.3°C.). In extremely cold weather if difficulty is experienced in maintaining this temperature, it will be advisable to install hood side doors and if necessary cover the louvers in the doors with cardboard or some similar material. Side doors are available through your dealer as attachments.

On tractors equipped to burn "tractor fuels", alcohol cannot be used successfully as an anti-freeze due to its rapid evaporation at the normal operating temperature of the engine. Whatever liquid is used, it should be tested daily and kept up to correct strength for the existing temperature.

CARBURETOR ADJUSTMENT

After obtaining an approximate adjustment for starting the tractor with gasoline, allow the tractor to warm up thoroughly. Then switch the fuel supply to "tractor fuel" and refine the adjustment by turning high speed adjusting screw out to richen the mixture. Idling speed adjustment screw should be turned in to make the mixture richer. The idling speed control screw should be turned inward to increase the idling speed or out to decrease it.

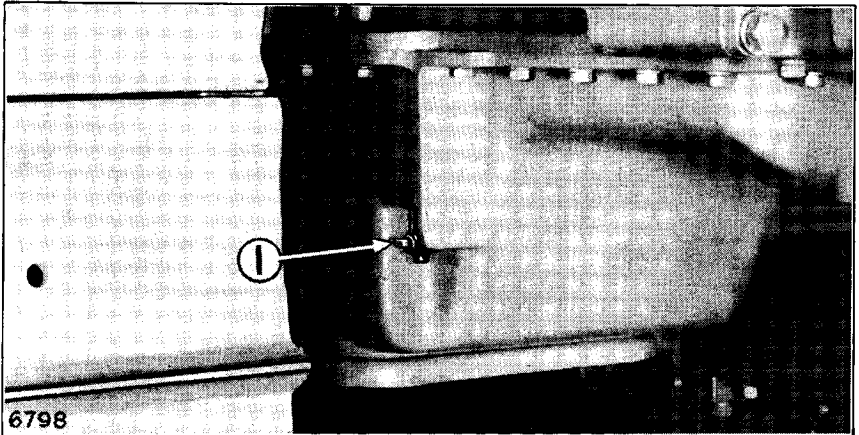


CARBURETOR ADJUSTMENT

1—Idling speed control. 2—Idling adjustment. 3—High speed adjustment.

Adjust until engine gives lowest fuel consumption without loss of power at high speed, and idles regularly without emitting black smoke from the exhaust. This adjustment will usually be found slightly rich for starting on gasoline, but for the brief warming up periods this may be disregarded.

CRANKCASE LUBRICATION



1—CRANKCASE DRAIN COCK.

On any tractor if a low grade fuel is being used which may cause a high rate of crankcase dilution, open the drain cock on the lower right side of the oil pan every 10 hours which will drain the crankcase to a point halfway between the FULL and LOW marks on the gauge. Then refill to the FULL mark on the gauge with fresh oil. Drain the crankcase completely about every 30 hours depending upon the rate of dilution.

Machines Equipped With Lubricating Oil Filters: Where the rate of dilution is high, the crankcase lubricating oil should be given the attention outlined above. Otherwise, change the oil every 60 hours.

Regardless of the periods at which it is necessary to change the lubricating oil, the oil filter should be thoroughly washed as outlined in the topic, CRANKCASE LUBRICATING OIL FILTER. However, the inner filter element should be replaced only every 120 hours.

Machines Without Lubricating Oil Filters: If the rate of crankcase dilution is not high, the lubricating oil should be changed every 30 to 60 hours depending upon the amount of dust encountered during operation.

Special Instructions
for
"CATERPILLAR"
R4 TRACTOR
equipped with
Electric Starting



There are several factors that must be considered to obtain a lasting, efficient operation from the electric starting and lighting system. The battery should be kept well charged. Test frequently and keep all connections of the electrical system clean and tight to prevent current losses.

The magneto should be kept clean and the contact points properly adjusted and the spark plugs should be inspected frequently for proper gap and should be cleaned if necessary. Likewise, the proper inlet and exhaust valve clearance should be maintained. Refer to the topic, VALVE CLEARANCE ADJUSTMENT.

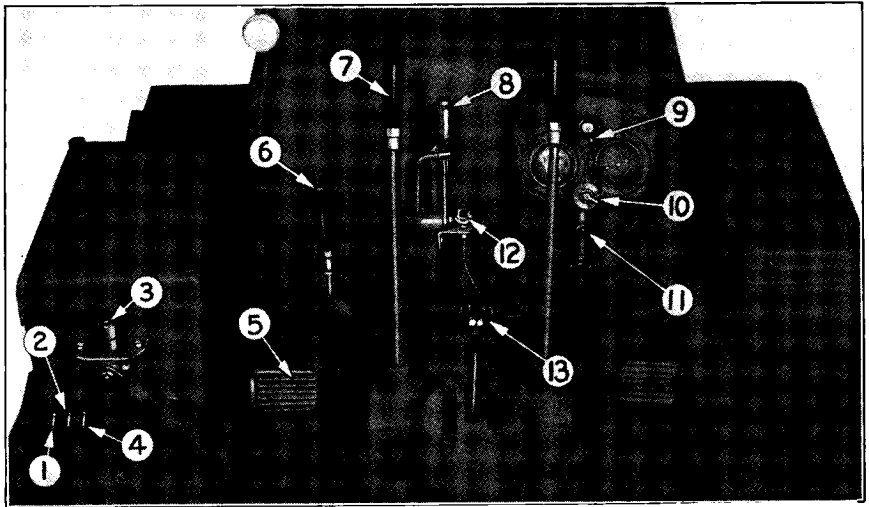
The generator and cranking motor brushes and brush holders should be kept clean and in satisfactory operating condition.

For information on these subjects, refer to the related topics contained in this book.

STARTING THE ENGINE

Open the fuel tank shut-off valve. Disengage the flywheel clutch by pushing the control lever forward and see that the gearshift lever is in the neutral position. Move the throttle control lever about half-way back; then move the manifold heat control lever to "heat on" position. Refer to the topic, MANIFOLD HEAT CONTROL. Turn the ignition switch ON and pull out on the choke control. Then press on the starter switch to allow the starting motor to crank the engine. **Do not allow the starting motor to crank the engine for more than approximately 30 seconds at any one time.** Longer cranking periods without rest periods of approximately two minutes to allow the starting motor to cool, may cause it to fail. The rest periods between cranking intervals also allow the battery to build up strength.

If poor starting motor performance is experienced, be sure the battery, starting motor cables and starter switch are in good condition before deciding the starting motor is at fault. Defective cables, loose or corroded connections or defective starter switch contacts may cause the starting motor to function improperly.



1—Extra Switch. 2—Spotlight Switch. 3—Starter Switch. 4—Headlight Switch. 5—Brake Pedal. 6—Flywheel Clutch Control Lever. 7—Steering Clutch Control Lever. 8—Throttle Control. 9—Dashlight Switch. 10—Ignition Switch. 11—Manifold Heat Control Lever. 12—Choke Control. 13—Gear Shift Lever.

Temperature and altitude will vary the length of time it is necessary to crank the engine with the choke ON. Actual experience in starting will determine this interval. After the engine starts, immediately release the starter switch and engage the flywheel clutch and allow the engine to run until it warms up. Be sure the cooling system has been filled and that the lubricating oil pressure gauge is registering the correct pressure. When the engine is warm, the operating pressure should be approximately 30 lbs. on earlier machines. On later machines, the gauge should register in the "Operating Range".

If the engine is cold, starting will be easier if the cylinders are primed. A tablespoonful of gasoline in each priming cock is ample. See the topic, OPERATING IN COLD WEATHER.

Avoid over-choking or over-priming the engine when starting it. If the engine is flooded from either of these causes, it should be cranked several times with the choke OFF to dissipate the excess fuel.

If, after following the procedure outlined in the previous paragraph, the engine fails to start, make an inspection at the various points where difficulty may arise. Be sure that the carburetor contains gasoline. If in doubt, open the drain valve on the carburetor float bowl. If fuel is not reaching the carburetor, operate the fuel pump priming lever. If the glass bowl on the fuel pump is not full, inspect the fuel tank for shortage. If there is fuel in the tank, inspect the fuel line and screens to see that they are not clogged. See the topic, CARE OF THE FUEL SYSTEM. See that the magneto is functioning. Check as outlined under the topic, MAGNETO.

GENERATOR AND STARTING MOTOR

Cleaning: Approximately every 1200 hours, the inspection cover should be removed and a check made of the commutator. If it is glazed or darkened, polish with "00" sandpaper. Reverse the sandpaper to clean the contact surface of the brushes. Make certain all trace of sand particles is removed from the commutator, brushes and brush holders by blowing out with air or by an equally effective method.

Brush Replacement: Brushes should be inspected and replaced if badly worn. When a new brush is installed, seat it properly with the contour of the commutator by using "00" sandpaper. Remove all sand particles and make certain the connections are all tight. A poor connection in the charging circuit will cause the generator to build up excessive voltage which may result in burned field or armature windings. A poor connection of the generator field circuit will cause a low voltage.

Starting Motor Drive: If difficulty is experienced with the starting motor drive failing to engage with the flywheel gear, most probably dirt in the drive or gear teeth is responsible. To correct, remove the starting motor from the flywheel housing; then take off the starting motor drive housing. Carefully clean the end of the armature shaft of any accumulations of dirt or grease. Wash the spiral upon which the gear operates; also the springs, gear teeth, and drive housing.

Before installing the drive, lubricate the threaded sleeve with a few drops of light oil; also the housing bushing. Then reassemble and install.

When washing the starting motor drive, the pinion teeth should be inspected and if chipped or damaged, the pinion should be replaced. Likewise, other parts of the starting motor drive showing evidence of being badly worn should be replaced to prevent possible difficulty during operation.

General Reconditioning: Approximately every 4000 hours, the generator and starting motor should be removed so that they may be completely disassembled, washed and have all parts replaced that show evidence of being unsatisfactory for reason of wear. It is suggested that this cleaning and reconditioning be entrusted to an automotive electrical service station that is an authorized dealer of the manufacturer.

CARE OF THE BATTERY

Every 60 hours, the following attention should be given the battery to insure high efficiency and maximum operating life:

The battery should be tested with a hydrometer and kept within a margin of safety to a specific gravity of 1.275 to 1.300. A dangerously low point of charge is indicated by a hydrometer reading of 1.150 which will permit the battery to freeze. A specific gravity of 1.250 will permit the battery to withstand temperatures as low as -30°F. , without freezing.

Water that escapes by evaporation should be replaced with distilled water or "approved water" (water free from impurities by analysis). The level should be maintained $\frac{3}{8}$ " above the top of the separators or insulators. Do not overfill or underfill the cells of the battery as either has a detrimental effect on battery life.

Always test a battery for degree of charge before adding water, otherwise, it will be necessary to operate the tractor for a short period to charge it; thus allowing the water to mix with the electrolyte.

If when making weekly tests the battery shows evidence of becoming gradually undercharged, it should be removed and completely recharged.

Check to determine the reason for the battery becoming undercharged. Inspect the starter switch, battery terminals and other points in the wiring. A faulty starter switch, loose connection, or worn insulation may be the reason. Also check for an improperly functioning voltage regulator. Refer to the topic, VOLTAGE REGULATOR.

Keep the top of the battery clean and dry to prevent current losses. Also keep the battery hold-down connections tight.

The battery terminal should be kept clean and tight and corrosion prevented by covering the terminals lightly with vaseline.

If the battery is properly cared for as outlined and instructions given in the topic, OPERATING IN COLD WEATHER, are followed, little difficulty should be experienced in starting the engine with the cranking motor at lower temperatures.

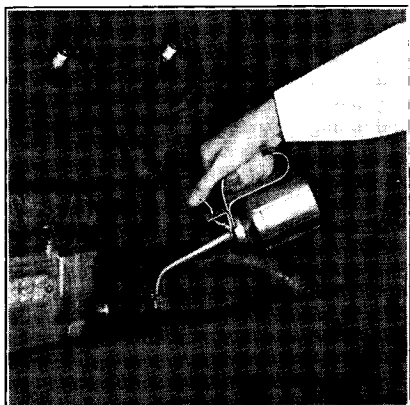
VOLTAGE REGULATOR

The voltage regulator is properly adjusted at the factory and should not be changed except in case of failure when both the regulator and generator should be taken to an automotive electrical service station that is an authorized dealer of the generator manufacturer where the output of the generator can be checked and the regulator adjusted accordingly.

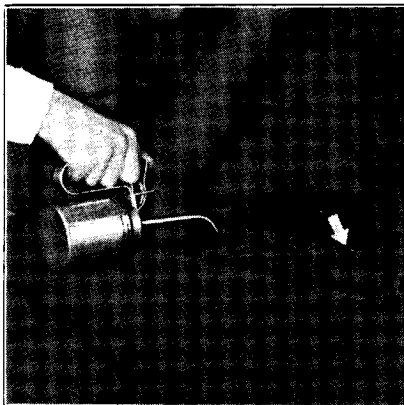
If the ammeter does not show a high charging rate, it is not an indication that the equipment is at fault unless the battery shows a low reading when checked with the hydrometer. The regulator permits a heavy flow of current from the generator to the battery only when the battery is low. As the battery becomes charged, the ammeter reading decreases proportionately until at full charge, no ammeter reading is evident.

If the hydrometer reading is low and no charge is evident on the ammeter, check the entire system for loose connections or broken wires. If all connections are satisfactory, check the generator for worn, broken or poorly seating brushes; also check the commutator to determine whether it is glazed or darkened. Refer to the topic, GENERATOR AND STARTING MOTOR.

LUBRICATION OF GENERATOR AND STARTING MOTOR



STARTER LUBRICATION



GENERATOR LUBRICATION

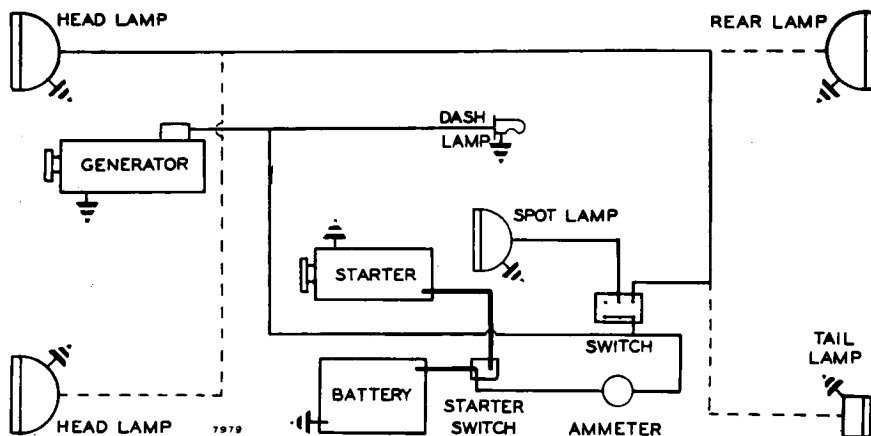
Clean the dirt from the oil cups before lubricating to keep the dirt out of the bearings. Every 120 hours, lubricate the starting motor and generator bearings with two or three drops of S.A.E. No. 30 lubricating oil.

Never put oil or grease on the commutator.

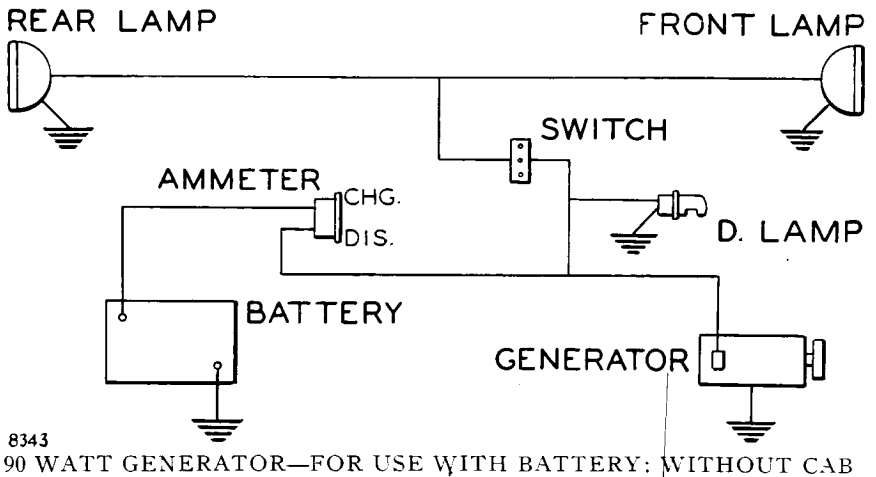
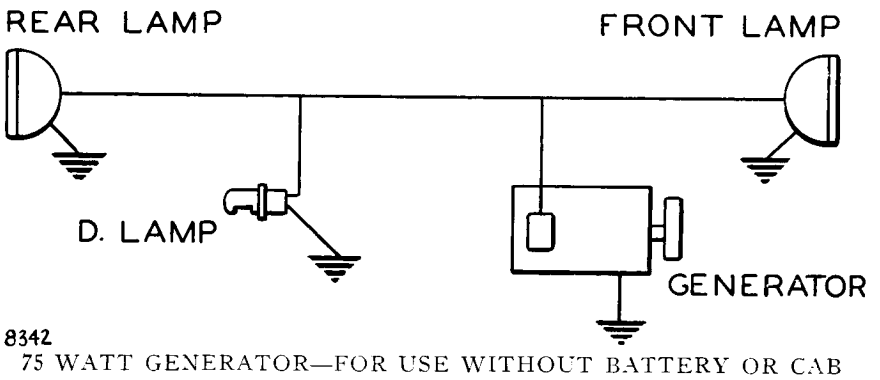
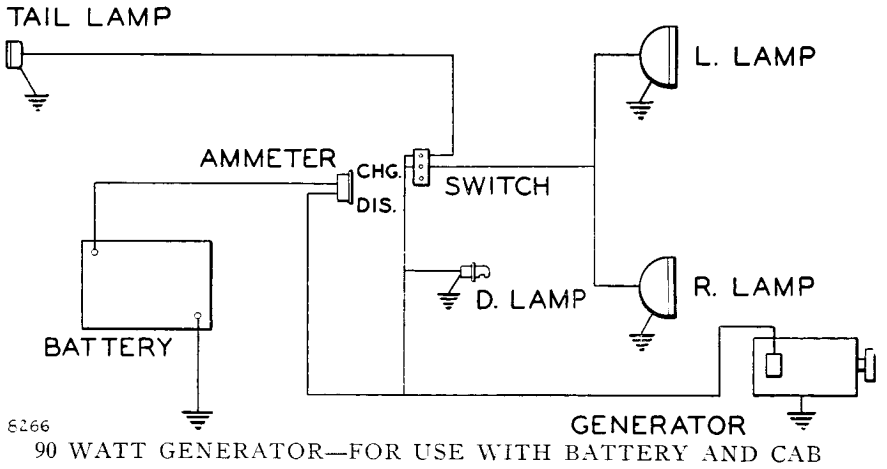
Some generators have bearings packed with high melting point lubricant, making lubrication necessary only when the generator is disassembled for cleaning or repair.

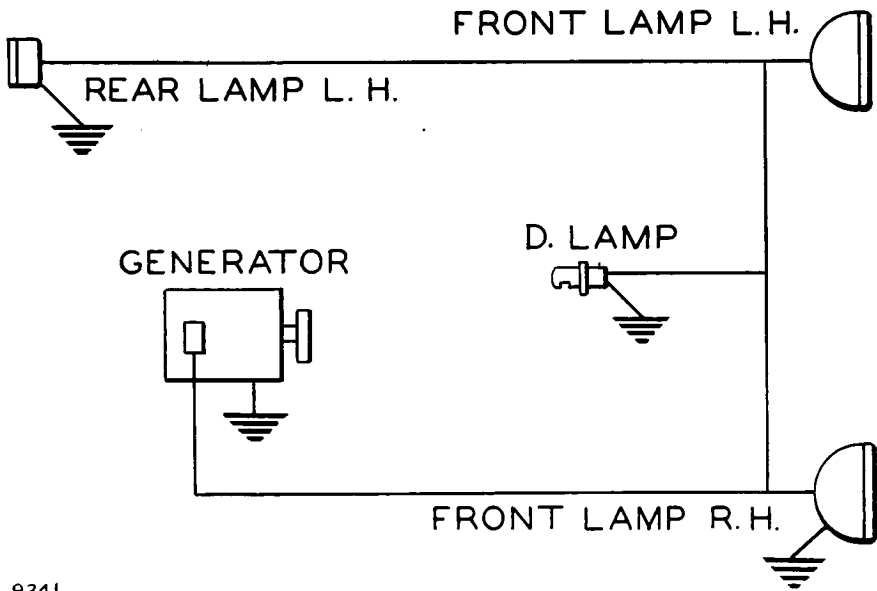
WIRING DIAGRAMS

These diagrams, covering lighting system arrangements for use with and without battery and cab, and electric starting, are furnished so that when it becomes necessary to disturb the electrical equipment for purpose of repair or replacement, reassembling may be accomplished without difficulty.



90 WATT GENERATOR—STARTER 6 VOLT—FOR USE WITH OR WITHOUT CAB





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75 WATT GENERATOR—FOR USE WITH CAB; WITHOUT BATTERY