Relief from TRACTOR TROUBLES

A Guide for CHECKING CONDITIONING ADJUSTING PREVENTIVE MAINTENANCE

Circular 574

UNIVERSITY OF ILLINOIS · COLLEGE OF AGRICULTURE EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS
INTELLIGENT Year-Round Care will prevent most of the troubles a tractor operator encounters.

This simple outline, describing the things a farmer himself can do to keep his tractor working smoothly, is intended to supplement the TRACTOR INSTRUCTION BOOK, which should be read thoroughly and referred to frequently. Further information will be found in Circular 499, TRACTOR REPAIR AND MAINTENANCE, which will be sent on request.

Good care by the owner, tho essential, does not take the place of expert checking by an implement dealer every two or three years. About 80 percent of the repairs needed on a tractor are located in places that can be seen only by dismantling it, and expert help is needed for this work.

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RELIEF FROM TRACTOR TROUBLES

THE FIRST STEP in conditioning a tractor for the season's work is to clean it thoroughly and give it a general inspection.

1. Use the instruction book.

2. Inspect accessible parts for breakage and wear, and order repairs as soon as possible.

3. Tie a shipping tag to each part that is to be repaired or replaced.

Much of the detailed checking for which directions are given here may have to be repeated several times during the year.

ENGINE

Compression

1. Check the compression of each cylinder by cranking the engine slowly by hand. All cylinders should have equal compression. Compression is lost past valves, rings, and spark plugs.

2. To check loss of compression past the valves, put 1/4 pint of oil in the cylinder thru the spark-plug hole. Replace plug and gasket and crank the engine slowly by hand.

3. In replacing spark plugs, do not mash the copper gasket too tightly.

Valves

1. If the cylinder head has been removed, valve tappets must be adjusted again after 10 days of use. Before adjusting, tighten the cylinder-head bolts evenly, using a tension wrench. Adjust valves twice a year, using thickness gage. See instruction book.

2. To get both valves of a cylinder in position for adjusting, turn the engine until the impulse starter clicks after the intake valve closes. This will put the piston on compression dead center.

3. If valves are stuck, loosen with kerosene. Sticking may be caused by improper lubrication, overheating, deposits on valve stem, or improper valve-tappet adjustment.

4. Make certain that the valve lubricating system is working.

5. Replace valve cover gasket if it is damaged.


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Clutch

1. Check the clutch pedal for proper travel.
2. Locate the adjustment for taking up wear and adjust the clutch if necessary. Also adjust the pulley brake.
3. See whether there is oil on the clutch plates resulting from overlubrication of bearings.
4. Look for wear in the bearings supporting the clutch shaft and in the clutch throw-out bearing.

COOLING SYSTEM

Radiator

1. Check cap of pressure radiator to see that it makes a perfect seal.
2. Check radiator and hose connections for leaks and faulty gaskets. The radiator hose should be checked several times each year.
3. Drain and flush the radiator.
4. Remove lime deposits from the radiator, using the method recommended in the instruction book. Light accumulations, however, can usually be removed by putting a solution of washing soda in the radiator. To 2 gallons of hot water add all the soda that will dissolve in it. Pour this solution into the radiator and fill radiator with water. Drain and flush the radiator after 24 hours of operation.
5. See that radiator overflow pipe is open.
6. Clean all dirt and refuse from bottom radiator fins to prevent motor from overheating.
7. Check radiator curtain or shutter to see that it is working properly, and lubricate the moving parts.

Water Pump

1. Consult instruction book to see whether the pump is being lubricated with the proper grease. Grease in the cooling system causes deterioration of rubber hose connections.
3. Check water-pump packings.
1. Check the wear on fan bearings. Excessive wear causes the fan to become loose and may result in breakage and damage to the radiator.

2. Check the tension of the fan belt. It should have about one inch of slack.

3. Check condition of fan belt and clean off any grease or oil.

**Thermostat**

1. Remove thermostat and housing and check to see that it is working properly. It may stick as a result of breakage or lime accumulation.

**AIR CLEANER AND FUEL SYSTEM**

**Air Cleaner**

1. Air cleaners frequently become clogged with vegetative matter, such as soybean fuzz, which collects on the filter screen and restricts air flow thru the cleaner. This clogging may cut engine power as much as 20 percent. Remove air cleaner and air pipe, wash out thoroughly with kerosene, and put back on the tractor. The cleaner should usually be washed twice a year.

2. Check hose connections between cleaner and carburetor for leaks or loose connections. Repeat this check every few days. Dirt entering the engine causes very rapid wear.

**Crankcase Breather Pipe**

1. If filler pipe to the crankcase has a small filter cap, wash and oil the cap every time the air cleaner is serviced.

2. Check crankcase ventilator or breather pipe with a wire to make certain it is not stopped up. Clogging of crankcase breather causes sludge to accumulate in crankcase and may cause loss of all oil from the engine in a short time.

**Fuel Tank, Filter, and Fuel Pump**

1. Remove fitting from bottom of fuel tank and wash dirt out of tank. Also clean vent hole in fuel-tank cap.

2. Blow thru copper tubing to clean it out.

3. Remove screen from fuel filter and clean it. Be sure that the gasket, when replaced, will prevent leaking.
4. Remove fuel pump and check valves for corrosion.
5. Check springs in base of pump for rusting or breakage.
6. If pump is old, dismantle it and install a new diaphragm.
7. Replace pump and check its operation.

**Carburetor**

1. Remove filter screen where fuel line is attached to carburetor, and clean it.
2. Check fuel level in float chamber, using a short piece of rubber tubing and a glass tube. See instruction book or tractor dealer for proper fuel level.
3. If fuel level is high, remove bowl from carburetor and check float for wear or breakage.
4. Remove float fuel cut-off valve and inspect for wear. There may be a shoulder worn on the valve where the valve seats. Also inspect float and hinge pin for wear. Replace worn parts with new ones.
5. Recheck fuel level to see whether it is still incorrect. Too high a level may double fuel consumption. If level is not correct, have your dealer make the necessary adjustments.
6. See that all gaskets are airtight.

**Carburetor Adjustment**

1. Before adjusting the carburetor, remove needle valve and examine for wear.
2. Check idling speed. The engine should idle faster in cold weather or when burning distillate. Adjustment is made by means of either a small screw on the throttle lever or a screw at top of carburetor. To increase idling speed, set throttle lever at idle position and turn screw in.
3. After the engine has warmed up, check idling fuel adjustment. This is a needle valve near the top of the carburetor. Turn it in until the engine smokes or runs irregularly, and then open it until the engine stops smoking and runs freely (this adjustment does not supply fuel when the engine is pulling a load). See the instruction book.
4. Check main or load fuel adjustment. With engine warmed up and throttle lever open all the way, close needle valve slowly until motor begins to miss or pop. Then open the valve about \( \frac{1}{4} \) turn; this usually gives very close to the correct adjustment.
5. Check the engine under load. If engine is doing belt work, follow the procedure outlined in the preceding paragraph. From the ¼ turn position, the load fuel needle may be closed or opened slightly to give the most power and fuel economy.

6. When the tractor is pulling a load in the field, check preliminary adjustment as follows: stop tractor travel and close the load fuel needle valve slightly from the ¼-turn position and try the tractor again.

7. A slight turn one way or the other from the ¼-turn position should give full tractor power. Mark this setting.

**ADJUSTMENTS FOR BURNING FUELS**

**For Gasoline**

1. Gasoline evaporates completely at about 385° F. Do not have the heat of the intake manifold and cooling motor too high, or loss of power will result.

2. Keep temperature of water in radiator around 180° F.

3. Set manifold heat adjustment in the cold position and remove metal shield if present.

4. Use cool type of spark plug. Check plug name and number with instruction book or implement dealer.

5. In cool or cold weather use radiator curtain or shutter to maintain proper water temperature.

**For Distillates and Tractor Fuels**

1. Distillates or tractor fuels require temperatures of 495° to 540° F. to evaporate completely and therefore require special heat-regulating attachments on the engine to assure vaporization of fuel. Keep the proper engine temperature in order to reduce crankcase dilution from unburned fuel.

2. Maintain radiator water temperature around 200° F. at all times. When necessary, use the radiator curtain or shutter to maintain this temperature.

3. Set manifold heat regulator in hot position and use heat shield.

4. For the new volatile tractor fuel, set the heat control halfway between the hot and cold positions.

5. Use hot type of spark plug. Check name and number in instruction book or with implement dealer to be sure plugs are the correct type.
IGNITION

Magneto

1. The magneto is a complicated piece of equipment. Have any necessary repair work done by your dealer serviceman. Magnets on present-day magnetos seldom if ever need recharging. Some magnetos require no lubrication or checking for two or three years. See instruction book for directions.

2. Lubricate magneto as directed in the instruction book. Bearings require only a few drops of oil; do not overlubricate.

3. If distributor cap or front cover of magneto can be removed, inspect breaker points for corrosion and burning. Dress down with a breaker-point hone if necessary.

4. If distributor cap uses carbon brushes, remove carbon dust with a cloth and gasoline or other dry-cleaning fluid. Inspect distributor cap for cracks.

5. Reset breaker-point clearance according to instruction book. Points set too close cause poor idling; set too far apart they may cause a poor spark on heavy loads.

6. Keep spark-plug wires free from oil and dirt.

7. The impulse starter is usually automatic in action and needs little attention. See instruction book.

8. Oil impulse starter according to directions. If it becomes sluggish from dust or from stiff oil in cold weather, wash it out with kerosene as directed.

Magneto Trouble and Checking

1. Most magneto trouble occurs in the coil, breaker points, condenser, distributor, or spark-plug wires. To test the magneto, remove the wire from a spark plug and hold it 1/4 inch from plug or engine. A good strong spark will jump this gap.

2. If the magneto produces a thin blue spark or no spark at all, first check spark-plug wires for poor insulation and damage from oil and make any necessary repairs.

3. If spark is still not good, remove distributor cap and—
   a. Wipe breaker points with a cloth on a knife blade and inspect for burning or corrosion. Clean and reset.
   b. If brushes are used, wipe out carbon dust on distributor and rotor with a gasoline-soaked cloth.
   c. Assemble cover and check spark again.

4. If spark is still poor, have magneto checked by dealer.
Timing the Magneto

Every tractor owner should be able to retime a magneto if it has been removed for repairs. The magneto-drive mechanism cannot get out of time when the magneto is removed, but the spark-plug wires may not be connected to the cylinders in the proper firing order. The magneto may be timed in two ways, depending upon the length of the spark-plug wires. Consult instruction book or use the following directions:

1. To time the magneto if the No. 1 and No. 2 spark-plug wires will reach all magneto terminals:
   a. Bolt magneto to engine with the bolt in center of slotted hole. See instruction book for exact position.
   b. Take the wire from cylinder No. 1 at crank end of engine, and push it into any one of the magneto distributor terminals.
   c. Insert the other wires around the distributor in the direction in which rotor (distributor arm) travels and in the firing order of the engine.
   d. Crank the engine, using choke to supply fuel. It may be necessary to spin the engine slowly. Do not spin faster than the impulse starter will click or the engine may kick.
   e. If engine does not start, move all plug wires on the magneto ahead one terminal and crank again, being careful not to choke the engine too much. It should start on one of the four or six combinations.

2. To time the magneto if the spark-plug wires reach only to definite magneto terminals:
   a. Remove the No. 1 spark plug; hold thumb over opening and crank engine until the piston moves up and completes pushing the gas out past thumb. At this point cylinder No. 1 will be at the end of the compression stroke and ready to fire.
   b. Turn magneto shaft until the distributor rotor arm points to the terminal marked No. 1.
   c. Bolt magneto to the engine—see "a" under No. 1 above.
   d. Insert the No. 1 wire in the No. 1 terminal and connect up other wires in order of firing and in the direction in which the rotor arm travels.

Distributor (Auto) Type Ignition

This is a simpler type of ignition which uses a storage battery for current. The ignition coil is mounted separately.

1. Parts and directions for servicing the distributor are the same as given above for the magneto. See instruction book also.
2. Lubricate the starting motor and generator as directed. Unless trouble develops, these parts need no other attention except at regular overhaul periods. Have your dealer serviceman check if trouble develops.

3. Storage-battery care is extremely important. Keep terminals tight and free from corrosion. A coating of vaseline on the terminals reduces corrosion. IMPORTANT: If the battery is removed or disconnected, short the generator (see instruction book) or remove the generator drive belt.

4. Inspect wiring to lights and switches for loose connections and breaks in insulation.

5. Keep battery filled with distilled water and charged at all times. A battery discharges in about 30 days if left standing in hot weather.

6. Check all light bulbs.

**Spark Plugs**

1. Spark plugs are designed for definite engine temperature ranges and fuels, and the correct plug must be used. To determine the correct plug, consult instruction book or dealer. The porcelain of a plug which is suited to an engine will have a toasted brown color when used. The wrong type of plug may cause much engine trouble.

2. Gasoline plugs must be of the cold running type in order to prevent preignition and cracking of the porcelain.

3. Distillate plugs must be of the hot running type in order to vaporize the fuel and prevent fouling the plug.

4. Inspect plugs for proper type and have them tested and cleaned. This is best done by the dealer. Sand-blasting may injure some porcelain plugs.

5. Adjust spark-plug gap opening, using a round gage wire. Bend the outside electrode to adjust. See instruction book for correct setting.

6. Replace plug and copper gasket and screw the plug in firmly but not too tight. A clean firm seat is necessary to transfer the heat away from the plug. A poor seat may cause plug failure due to overheating.

7. Remove plugs and reset the gap every 200 hours of operation. Too wide a gap causes hard starting or missing under load and puts a strain on the magneto coil.
TRANSMISSION

Checking and repairing a tractor transmission requires special training and shop equipment and should not be attempted by the tractor owner.

1. When the transmission leaks oil past the shafts extending from the housing, the packing or gaskets need tightening or renewing. Consult instruction book for directions.

2. Jack up each rear wheel and check the play in the gears by rocking the wheel back and forth. Too much play indicates undue wear, and the parts should be inspected by the dealer.

3. Lift wheel up and down with a bar to check the play in the axle bearing. Pushing and pulling the wheel vigorously sidewise will also indicate wear in the axle bearing. This type of wear usually makes it difficult to stop oil leakage at these points.

4. Check rear-wheel brakes and adjust if necessary. To test, jack upon wheel, apply brake, and then try to turn the wheel by using a bar to pry with or by pulling on lugs or tires. For high-speed tractors, brakes must be adjusted to hold evenly.

5. Check the belt pulley bearing for wear. On some tractors special lubrication must be supplied for belt work.

6. Check transmission for water accumulation by loosening the drain plug enough to allow the water to leak past.

7. If transmission lubricant has been thinned for winter operation, drain transmission case, wash out with kerosene, and refill with proper grade of oil.

WHEELS

Rear Wheels

1. Check rear wheels for bent or broken spokes, and make certain that the bolts at the hub can be readily loosened for changing the wheel spacings. Tighten the bolts evenly to prevent breakage. Coat inside of clamping collar with rust-preventive grease to insure ease of moving.

2. Tighten all wheel lug bolts to prevent loss of lugs.

3. Reverse rubber tires from one side of the tractor to the other each year to insure even wear.

Front Wheels

1. Inspect wheels for loose or broken spokes, and tighten wheel skid bands. Reverse rubber front tires each year.
2. Remove front wheels and bearings once a year, wash, lubricate, and assemble. Many wheels are now packed with a medium-grade wheel-bearing grease and need no further lubrication for a year. Get instructions from your dealer or auto repair shop on how to pack bearings.

3. Replace felt washer when assembling. If the wheel is packed with wheel-bearing grease, there should be no pressure fittings left on the wheel.

4. Rock wheel back and forth sidewise to check for wear, and tighten if necessary. This should be done several times a year. See instruction book.

5. Inspect steering universal joints and other bearings for wear and adjustment.

6. Check mesh of steering gears, and take up any excessive play due to wear.

7. Replenish lubricant in steering-gear housing according to directions.

Tires

1. Check pressure in rubber tires each week and inspect constantly for cuts and bruises.

2. Inspect tires for damage from cuts, punctures, and loosened cleats. Any serious damage should be vulcanized at once, but small cuts can be cleaned with gasoline and filled with tire putty.

3. Maintain proper air pressure in tires.
   a. Inflate 4-ply front tires to 28 pounds.
   b. Inflate 6-ply front tires to 36 pounds. Front tire pressure should be increased when heavy machinery is mounted on the front of the tractor.
   c. Inflate rear tires, all sizes, to 12 pounds.
   d. When plowing, increase pressure of furrow-wheel tire to 16 pounds.
   e. When heavy mounted machinery is used, inflate rear tires to 16 pounds.

4. Check to see that correct weight is being used to prevent tire slippage. New synthetic-rubber tractor tires tend to scuff with wheel slippage, and all types of tires wear rapidly with slippage.

5. Correct tire weight is obtained by using water and antifreeze in tires or by bolting weights on wheels, or in both these ways. Consult instruction book for correct weight to use. A special liquid type of pressure gage must be used with tires containing water. The gage must be rinsed after using.
LUBRICATION

Engine

Water and fuel dilution of the oil, oxidation, sludge, and varnish formation are the main causes of lubrication failures.

1. Oil dilution is lessened by correct temperatures in engine, cooling water, and manifold.

2. Follow any special instructions given for valve lubrication.

3. Drain the oil according to directions; refill with whatever grade of oil experience has proved to be best.

4. Check all parts of engine where there is evidence of oil leaks.

5. Use special water-pump grease when the water pump is fitted with a grease cup.

6. Each time the oil is drained, service oil filter according to instruction book, which usually includes the following steps:
   a. Clean and wash out the base of the filter.
   b. Install a new filter element of the type recommended by the manufacturer.
   c. Make certain that the oil-filter gaskets do not leak.

7. To test oil pressure when the gage fails, remove gage, start engine, hold finger over the end of the pipe, and note the pressure. Gages cannot be repaired. The oil-pump pressure should be checked by the dealer when the tractor is overhauled or when oil consumption is high.

8. Excessive oil consumption may be due to oil leaks, worn bearings, clogged crankcase breather or air cleaner, newly ground valves in an old engine, worn valve guides, high oil pressure, bad rings, piston and cylinder scoring, and the use of carbon remover in an engine that has been used for some time without cleaning.

Transmission

1. Dirt, sand, fine iron scraps, and condensed moisture accumulate in the transmission, causing sludge formation and bearing and gear wear which necessitate a change of lubricant.

2. In a new tractor drain the transmission at the end of the first year. If wear is to be reduced to a minimum, the oil should be changed every year. Flush out transmission case with kerosene.

3. If the tractor is used in cold weather, dilute the oil about one-tenth. Kerosene is an excellent thinner.

4. For warm-weather use drain the diluted oil, wash out the transmission, and refill with summer oil.
GENERAL OPERATION

1. Always consult the instruction book.
2. Use a high-quality lubricant.
3. Keep engine at proper operating temperature and let it idle a few minutes to cool it off before stopping.
4. Maintain a regular lubrication schedule but do not overlubricate.
5. In cold weather loosen the plugs in the oil housings and let the water drain out. Repeat frequently.
6. Wash out filtering screen of air cleaner twice a year.
7. Give oil filter regular care.
8. Keep radiator fins clean.
9. Check tightness of fan belt.
10. Keep tires properly inflated, and use proper wheel weights.
11. Adjust carburetor according to directions, and check float level.
12. Drain fuel from carburetor bowl if engine is not to be used for some time.
13. Check spark-plug gap and adjust clearance every 200 hours.
15. Check front wheels for bearing wear.
16. Keep storage-battery water up to level.
18. Check clutch adjustment once or twice a year.
19. Do not ride with foot on clutch pedal.
20. Operate the tractor at full load by using wider implements or combinations of implements.
21. For light loads, operate in high gear and throttle the engine to the desired speed.
22. Prevent splined axles from rusting by using a rust-preventive grease compound.

STORING THE TRACTOR

1. Store in a dry place and run up on boards.
2. Clean thoroughly with kerosene and a stiff brush.
3. Drain the crankcase, flush with kerosene, and refill with new oil (use a rust-preventive oil if obtainable). Operate engine for 2 minutes to distribute the oil thru the engine.
4. Drain radiator and engine block, and leave drains open.

5. When engine has cooled, remove spark plugs and put \( \frac{1}{4} \) pint of rust-preventive engine crankcase oil or regular crankcase oil in each cylinder. Turn engine by hand a few times to distribute the oil. Then replace the plugs.

6. Remove valve cover if possible and cover rocker arms, springs, and valve stems with rust-preventive crankcase oil or regular crankcase oil to prevent the rusting or sticking of these parts.

7. Drain fuel from tanks and carburetor, and leave drains open.

8. Put fresh lubricant in all bearings.

9. Stop end of engine exhaust pipe and crankcase breather pipe with a rag to keep moisture from valves, cylinders, and crankcase.

10. Jack up tractor to take weight from rubber tires.

11. Inspect tires for needed repairs.


**REMOVING TRACTOR FROM STORAGE**

After a tractor has been stored for any length of time, it will need careful attention before it is ready to be used.

1. Remove rags from exhaust and crankcase breather pipes.

2. If a rust preventive oil was used in the crankcase for winter storage, drain this out and put in the proper grade of crankcase oil. If regular oil was used for storage, remove any accumulated water from the crankcase by loosening drain plug slightly to allow drainage until the oil begins to seep out.

3. Take out spark plugs and pour \( \frac{1}{4} \) cup of light oil thru spark-plug openings into each cylinder. Do not replace plugs in engine.

4. Remove valve cover, thoroly lubricate valve stems and rocker arms, and press each valve down by hand to determine whether it is working freely.

5. Crank the engine by hand for 25 to 50 revolutions to distribute the fresh oil thruout the engine.

6. Replace spark plugs and valve cover.

7. Lubricate all the working parts of the tractor.

8. Loosen drain plugs in bottom of transmission housing enough to allow any water that has accumulated in the housing to drain out.


10. Crank the engine and allow it to run at \( \frac{1}{4} \) speed for 3 to 5
minutes. (CAUTION: It is best to move the tractor outside the storage room immediately to avoid danger from exhaust gas.)

11. If rubber tires are used, restore correct air pressure.

RULES FOR SAFE OPERATION

1. Be sure gear shift lever is in neutral before cranking the engine.

2. Always engage the clutch gently, especially when going up hill or pulling out of a ditch.

3. When making an emergency stop on a highway or driving to and from fields, be sure to brake both wheels at same instant.

4. Always ride on seat or stand on platform of tractor—never ride on drawbar of tractor or drawn implement.

5. When tractor is hitched to a stump or heavy load, always hitch to drawbar—never take up slack of chain with a jerk.

6. Be extra careful when working on hillsides. Watch out for holes or ditches into which a wheel may drop and cause the tractor to overturn.

7. Always keep tractor in gear when going down steep hills or grades.

8. Always drive at speeds slow enough to insure safety, especially over rough ground or near ditches.

9. Reduce speed before making a turn or applying brakes—the hazard of overturning is four times as great when speed is doubled.

10. Always stop power take-off before dismounting from tractor.

11. Never dismount from the tractor when it is in motion.

12. Never permit persons other than the driver to ride on the tractor when it is in operation.

13. Never stand between the tractor and drawn implement when moving tractor backward or forward in hitching. Use an iron hook to handle drawbar whenever possible.

14. Do not put on or remove pulley belt while pulley is in motion.

15. Be careful when removing the radiator cap if a pressure cooling system is used or if motor is overheated.

16. Never refuel tractor while motor is running or is extremely hot.

17. When tractor is attached to a power implement, be sure that all power take-off line shielding is in place.

A careful operator is the best insurance against accidents