CATERPILLAR
REG. U.S. PAT. OFF.

Instruction Book

for

"CATERPILLAR"

TWENTY

TRACTOR

Effective with
Tractors No. L-1
PL-1

Caterpillar Tractor Co.

Executive Offices: San Leandro, California. U. S. A.

Sales Offices:
Peoria, Illinois San Leandro, California

Factories:
Peoria, Illinois Minneapolis, Minnesota San Leandro, California

Products:
"Caterpillar" Combines "Caterpillar" Road Machinery
"Caterpillar" track-type Tractors

NOTES

Foreword

This instruction book is divided into two parts. The first part gives instructions relative to the driving and daily care of the tractor, and must be carefully read by every operator. The second part gives detailed instructions regarding repairs. It can be considered a reference book to be consulted when necessary, since repairs are only made when occasion arises.

After a long period of use and before beginning another such period, it is wise to put the tractor in the best possible condition. Certain special tools have been made for this class of work. They are not furnished with each tractor since their use is required only at intervals. These tools are available to any "Caterpillar" user through his dealer. Their use has been described and illustrated in this book.

When making repairs replace all locks, lock washers, lock wires, cotter pins and gaskets with new ones. A great deal of unnecessary work and trouble will thereby be eliminated.

The use of "right" and "left" means right and left of the tractor as the operator looks forward, from seat toward radiator. Cylinders, connecting rods, etc., are numbered 1, 2, 3, 4 from front to rear.

Words in the book in CAPITAL LETTERS such as RADIATOR, TIMING GEAR HOUSING, etc., are key words and may be found in the index. To avoid repetition of instructions, these key words are used to refer to the place in the book where information on the particular operation may be found. For example: To remove the fan the RADIATOR must be removed. Find RADIATOR in index and refer to page given.

NOTES

NOTES

Preparing Tractor for Use

Regardless of the conditions under which the tractor is received, the first duty of anyone newly charged with its care and operation is to give the tractor a detailed inspection.

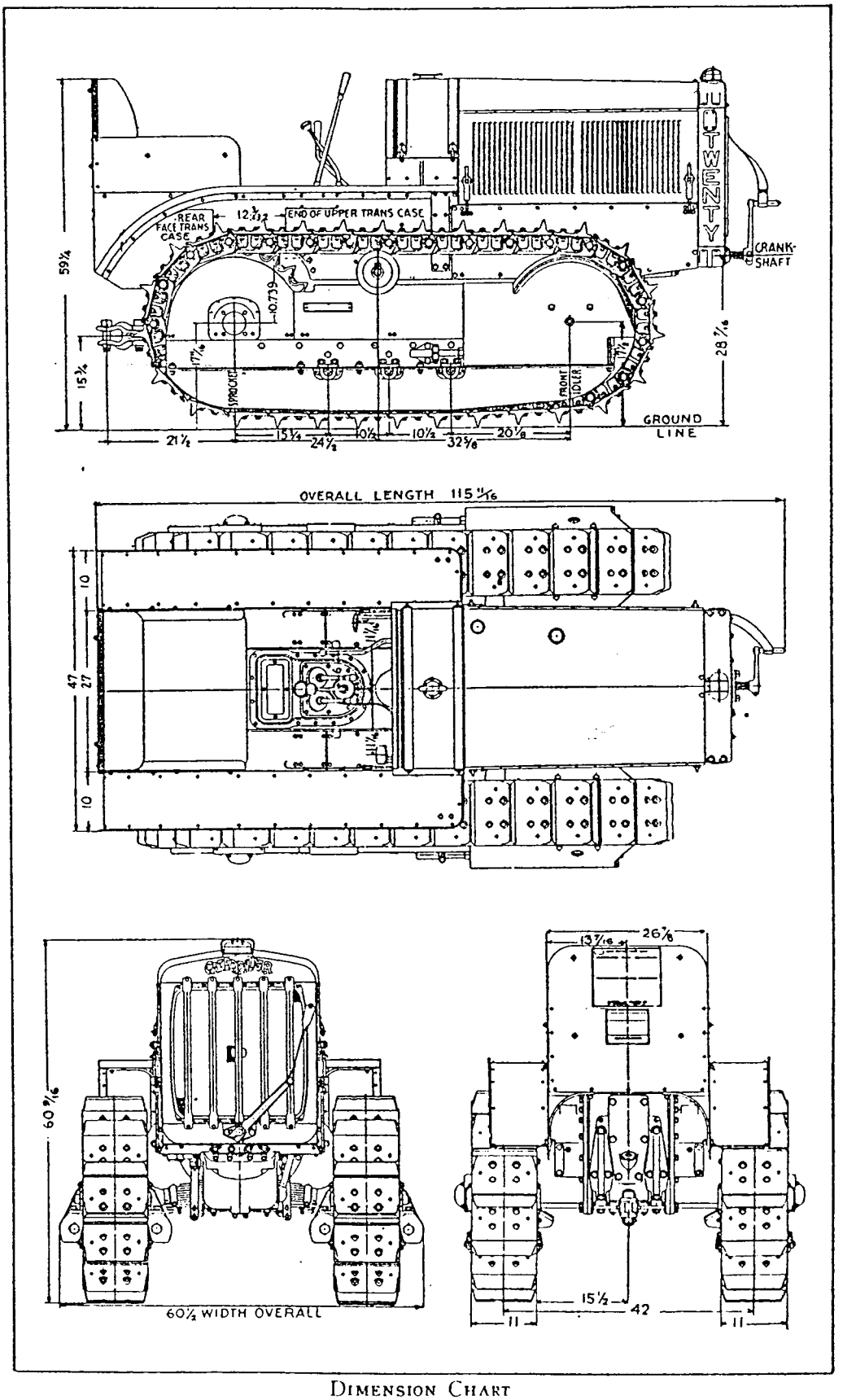
Fill the fuel tank, taking care that no dirt, water or other foreign substances are admitted with the fuel. If the presence of any such substances is suspected, the fuel should be strained.

Fill the radiator with clear water, or with the proper anti-freeze compound if temperatures below freezing are likely to be encountered. Water without lime or other alkaline impurities should be used.

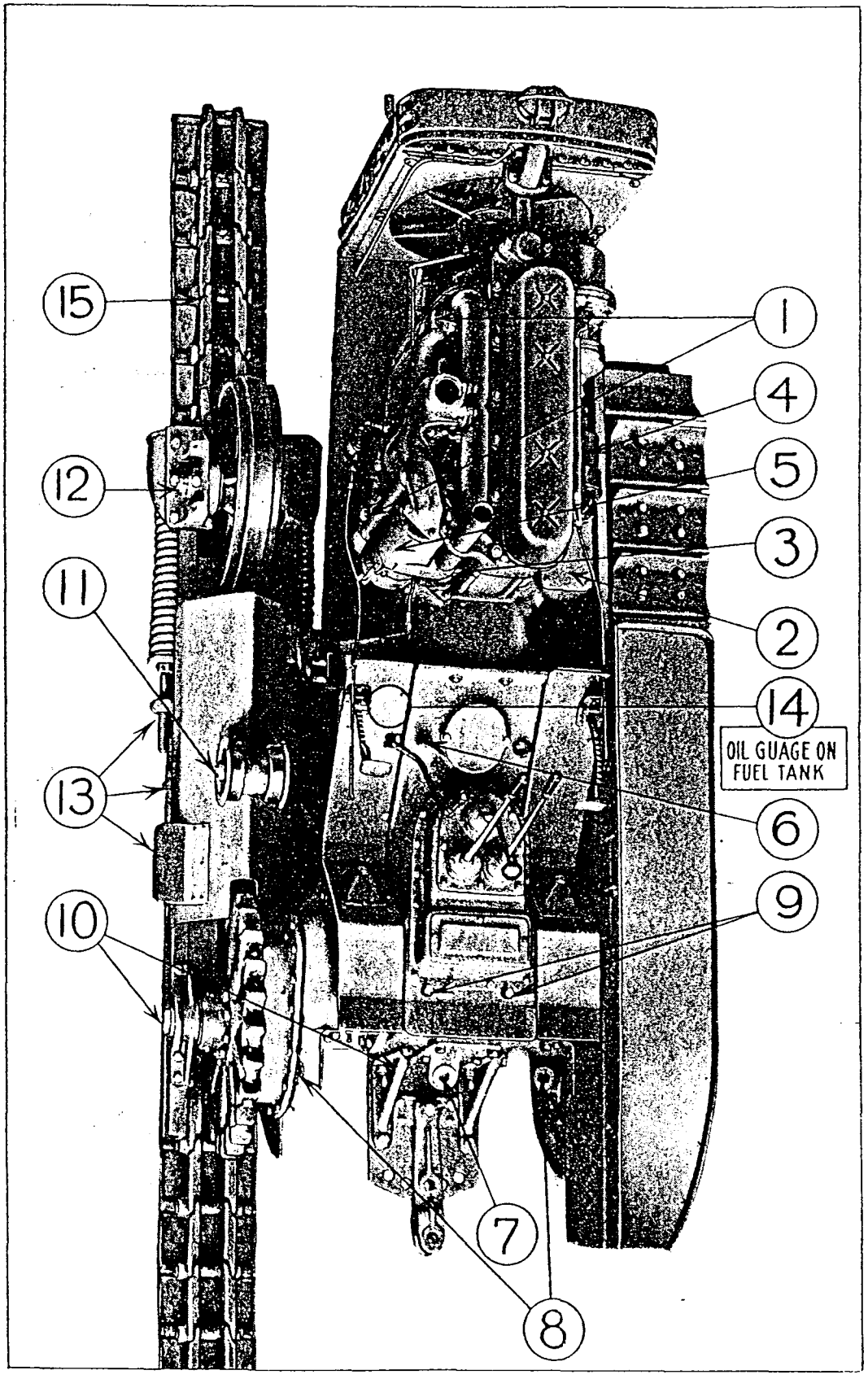
Examine the oil level in the crank case, transmission case and final drive gear cases to determine the amount of lubricant in each and supply any deficiency as outlined under LUBRICATION. Lubricate the entire tractor.

Specifications

ENGINE	Bore, 4"; stroke, 5½"; R.P.M., 1100. Firing order—1-3-4-2.
FUEL	Gasoline. (In countries where gasoline is unobtainable or where its price is unduly high in comparison with other locally obtainable fuels, distillate, kerosene, alcohol, etc., can be used. Information regarding the use of such fuels furnished by dealer on request.) Fuel tank of 25 U. S. Standard gallons capacity.
TRACK	Width of standard track shoe 11". Special shoes may be obtained for special purposes.
RATINGS	Drawbar horsepower, 20. Belt horsepower, 25.
SPEEDS	1st . . . . . 1.8 M.P.H. 3rd . . . . . 3.6 M.P.H. 2nd . . . . 2.6 M.P.H. Reverse . . 2.0 M.P.H. Note—Tractors built prior to L-1329 and PL-1670 have second speed of 3.07 M.P.H. Tractors built prior to L-1370 and PL-1670 have third speed of 4.67 M.P.H.
DIMENSIONS	Shown on page 13.
NET WEIGHT	(Approximate)—7,522 lbs.
SHIPPING WEIGHT	(Approximate)—7,740 lbs.



DIMENSION CHART



"Caterpillar" Twenty Lubrication Chart

LUBRICATION

Chart Ref. No.	Name	Points of Lubrication	Kinds of Lubricant	ATTENTION REQUIRED
1	CRANK CASE	1	Crank Case Oil	Keep oil level to full mark on oil level gauge. Check daily. Drain, wash and refill with fresh oil every thirty hours under dusty conditions, otherwise every sixty hours. If tractor is equipped with oil filter, drain, wash and refill oil filter case with fresh oil. When refilling run engine idle three minutes, then examine oil level and fill to full mark again.
2	OIL FILTER	1	Crank Case Oil	Drain, and wash oil filter case with gasoline or kerosene before removing filter elements. Remove elements and wash thoroughly in gasoline or kerosene every hundred and twenty hours. Replace felts yearly. NOTE: Oil filter instructions apply to tractors below L-1732 and PL-3217.
3	BREATHER	1	Used Crank Case Oil	In cold or damp weather remove drain plug in base each time crank case oil is changed. Wash filter every thirty days. To wash, remove entire breather and shake in gasoline or kerosene. After washing pour about one-quarter of a pint of oil through the hair and let drain before replacing on tractor.
4	MAGNETO	1	Light Crank Case Oil	Fill oil pocket on drive end of magneto. Let oil settle two minutes and refill. Do this every fifty hours.
5	AIR CLEANER	1	Used Crank Case Oil	At intervals varying from twice a day to once a week, depending upon amount of dust in air, change oil in container and refill to circular mark. Wash filter every thirty days. To wash, remove entire cleaner from tractor and shake in gasoline or kerosene. After washing pour about one-half of a pint of oil through filter and let drain before replacing on tractor. Fill container to circular mark before operating tractor.
6	FLYWHEEL CLUTCH SHIFT COLLAR	1	Semi-Fluid Grease	Two turns of grease cup twice daily with clutch in engaged position. (On tractors L-1 to L-350, inclusive, give two turns of grease cup twice daily; also remove inspection cover once daily and with clutch fully released apply a few drops of oil on shaft at front of sliding collar.)
7	TRANSMISSION CASE	1	Transmission Oil	Check oil level daily. Fill until oil runs from oil level plug hole in right hand side of transmission case. Oil in front case adjusts itself to same level as rear case. Drain, wash and refill with fresh oil every ninety days.
8	FINAL DRIVE GEAR CASES	2	Transmission Oil	Check oil level daily. Fill until oil runs from filler hole. Drain, wash and refill with fresh oil every three hundred hours.

Chart Ref. No.	Name	Points of Lubrication	Kind of Lubricant	ATTENTION REQUIRED
9	STEERING CLUTCH RELEASE YOKE BEARINGS	2	Crank Case Oil	**Oil twice daily.** Fill cups while tractor is standing still. Allow oil to drain out of cups before operating tractor. (On tractors L-1 to L-340 inclusive these bearings were equipped with grease fittings. Give two turns of grease cup twice daily or two turns of pressure grease gun handle twice daily).
10	TRACK ROLLER FRAME BEARINGS	4	Semi-Fluid Grease	**Fill bearings daily.**
11	TRACK CARRIER ROLLERS	2	Semi-Fluid Grease	**Fill bearings daily.**
12	FRONT IDLERS	2	Semi-Fluid Grease	**Fill bearings daily.**
13	TRACK ROLLERS	6	Semi-Fluid Grease	**Fill bearings daily.**
14	OIL PRESSURE GAUGE			**A sudden drop in pressure indicates bearings are not receiving oil.** If pressure fails to show, stop engine immediately and determine cause. Operating pressure when engine is warm, 25 pounds.
15	TRACK—			**Do not lubricate.**
	MISCELLANEOUS POINTS		Crank Case Oil	Oil once every two weeks as a rust preventive. (All joints of the control system not equipped with grease fittings, and flywheel clutch links and pins.)

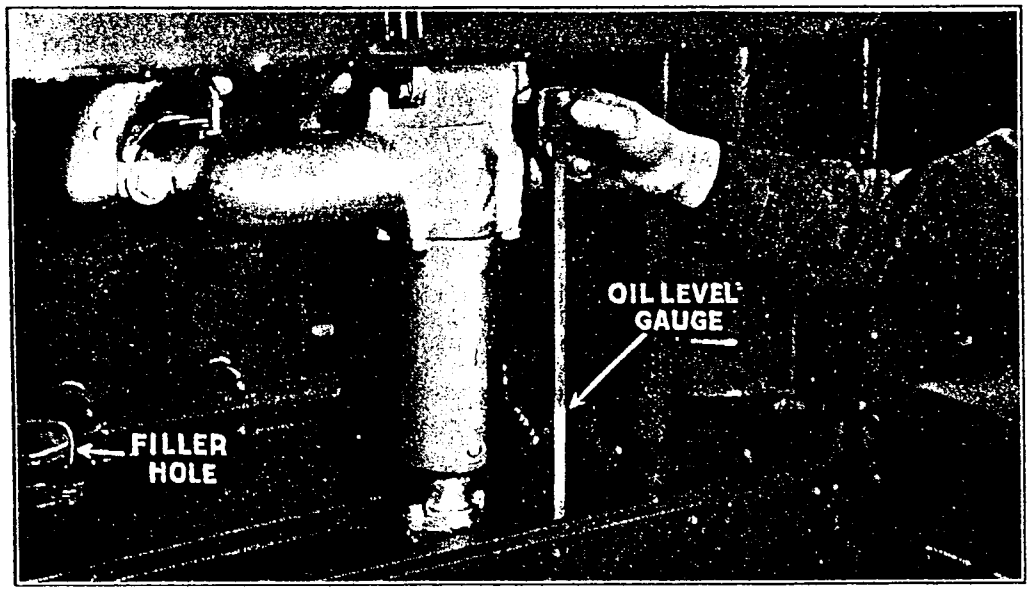


CHART REFERENCE NO. 1. CRANK CASE OIL LEVEL GAUGE

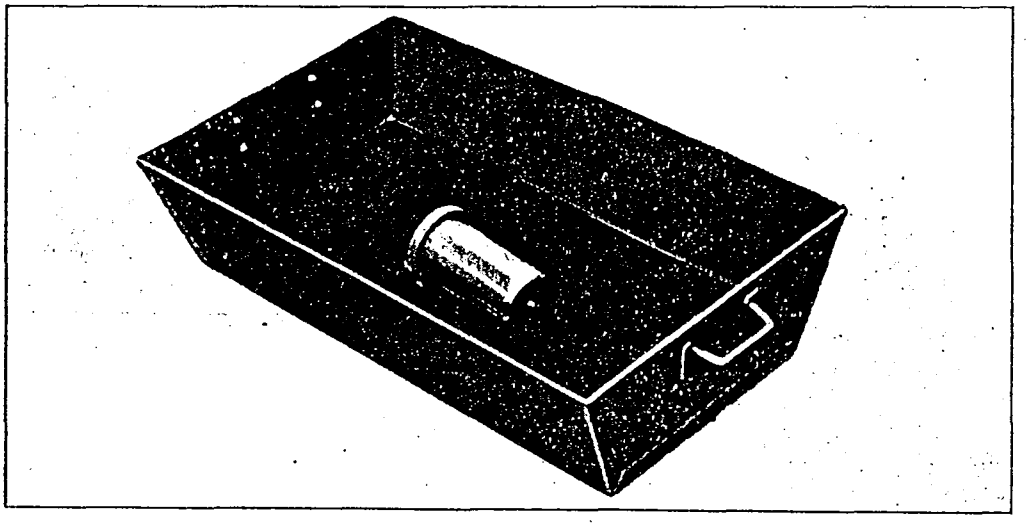


CHART REFERENCE No. 3. WASHING THE BREATHER

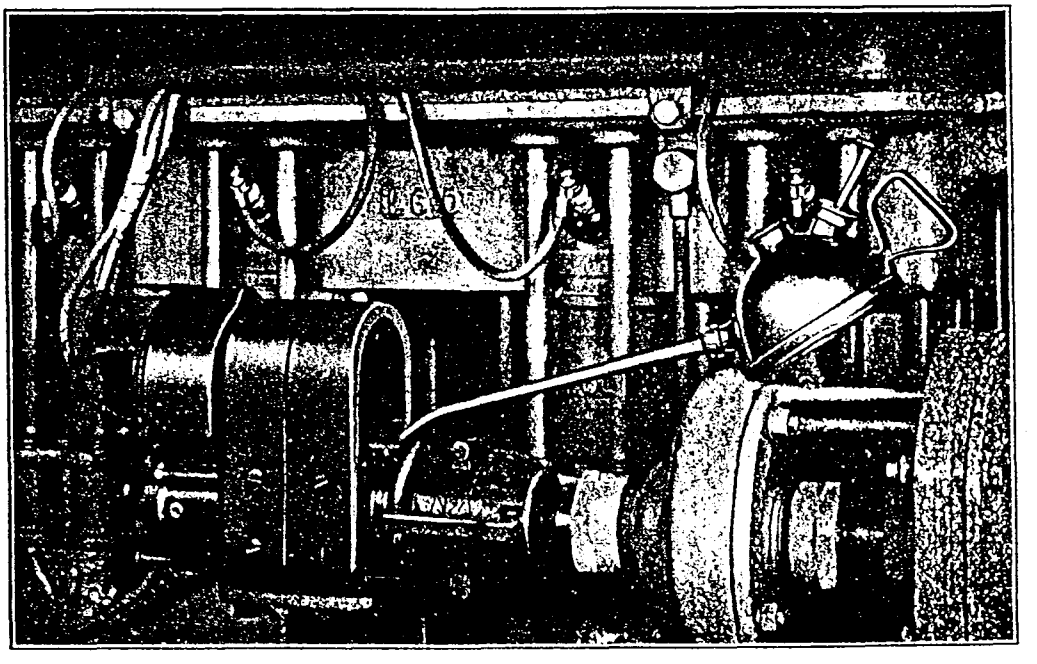


CHART REFERENCE No. 4. OILING THE MAGNETO

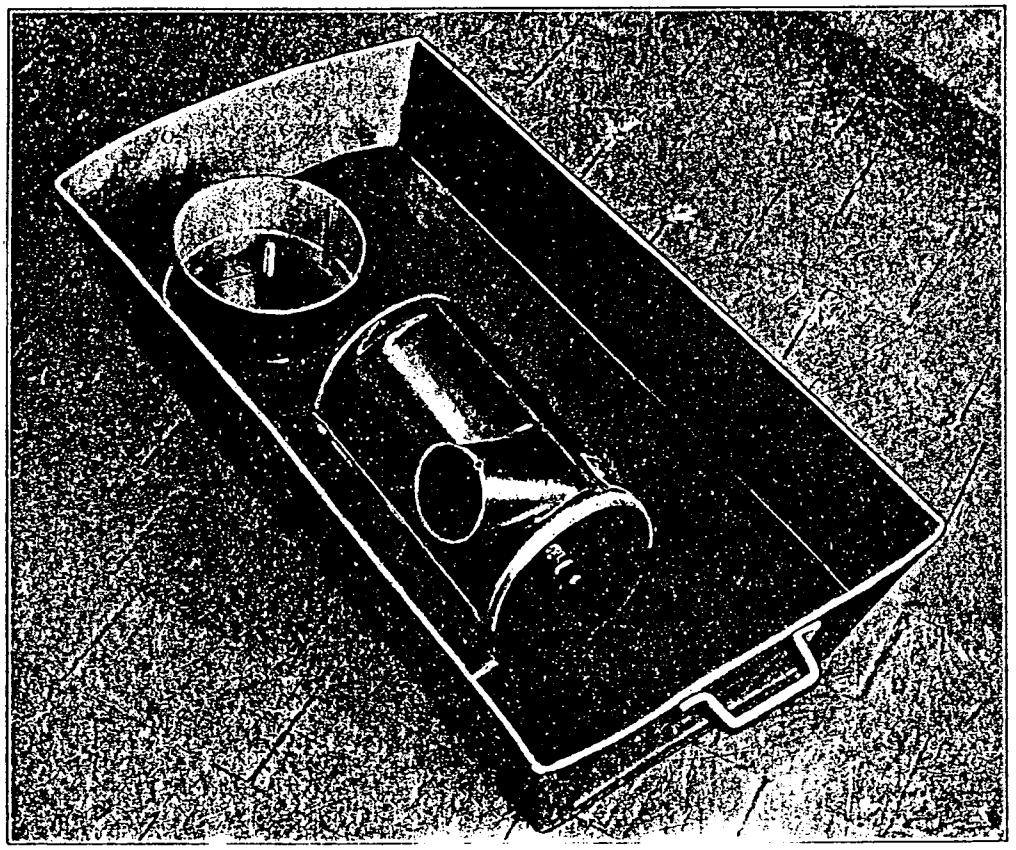


CHART REFERENCE No. 5. WASHING AIR CLEANER

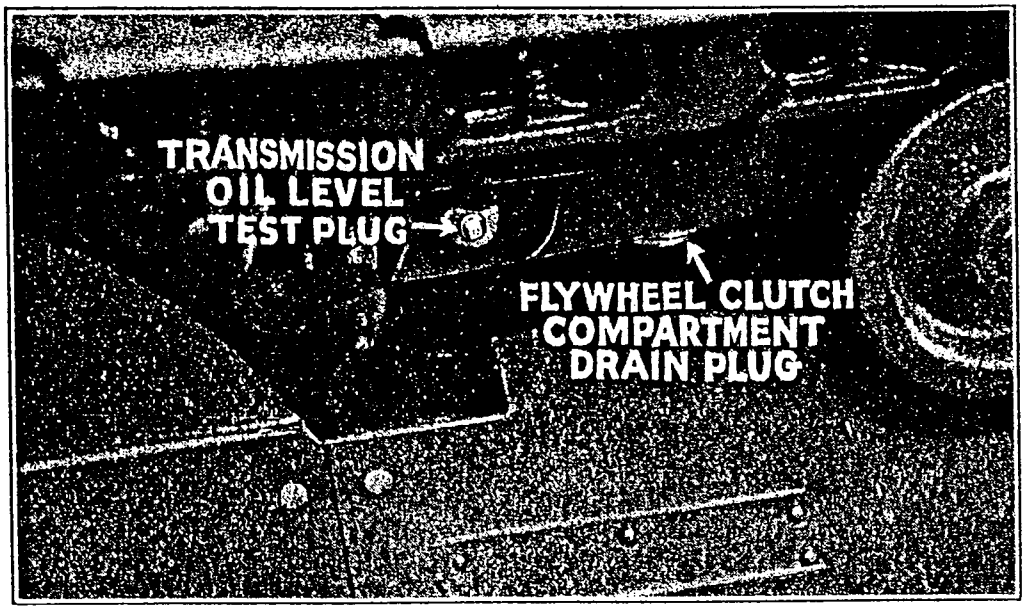


CHART REFERENCE No. 7. TRANSMISSION OIL LEVEL TEST PLUG

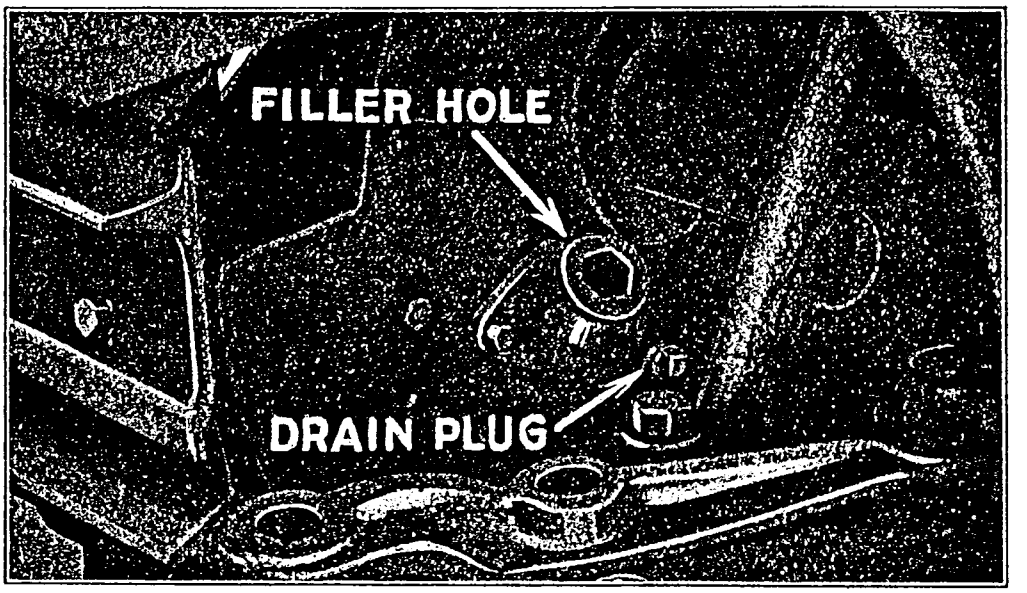


CHART REFERENCE NO. 8. FINAL DRIVE GEAR CASE FILLER HOLE AND DRAIN PLUG

CHART REFERENCE NOS. 7 AND 10. TRANSMISSION OIL FILLER HOLE AND TRACK ROLLER FRAME INSIDE BEARINGS

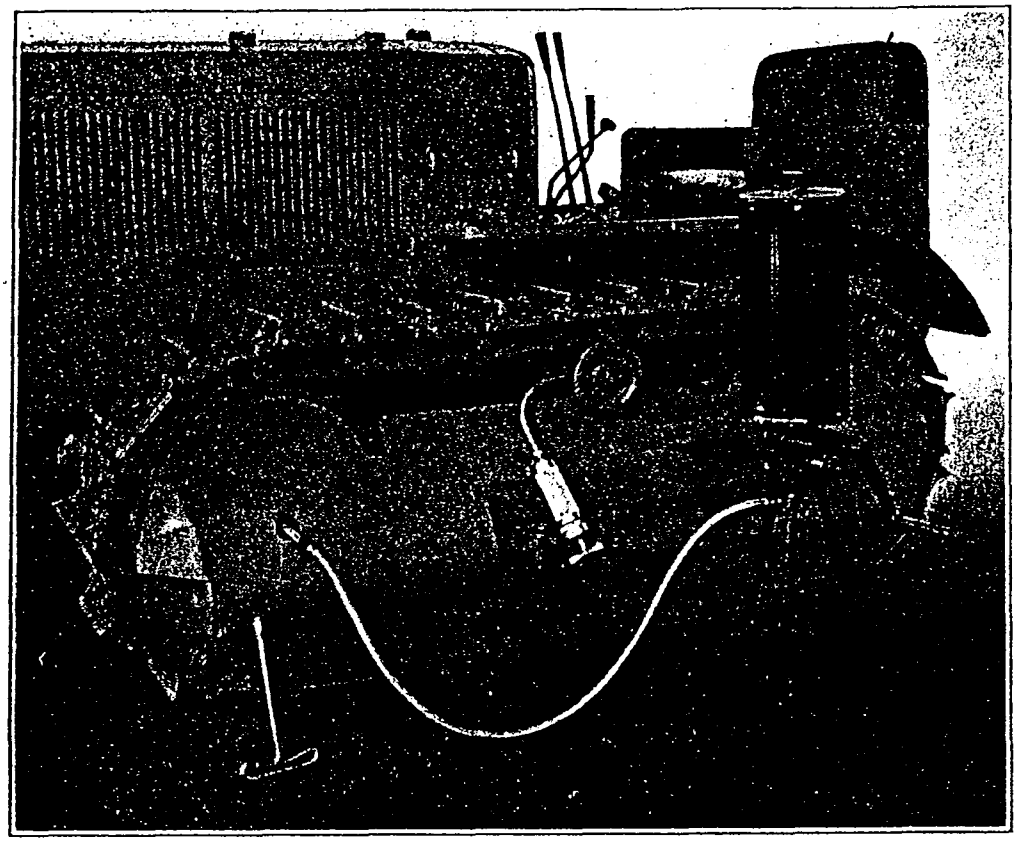


CHART REFERENCE NOS. 11, 12 AND 13. TRACK CARRIER ROLLERS, FRONT IDLERS AND TRACK ROLLERS

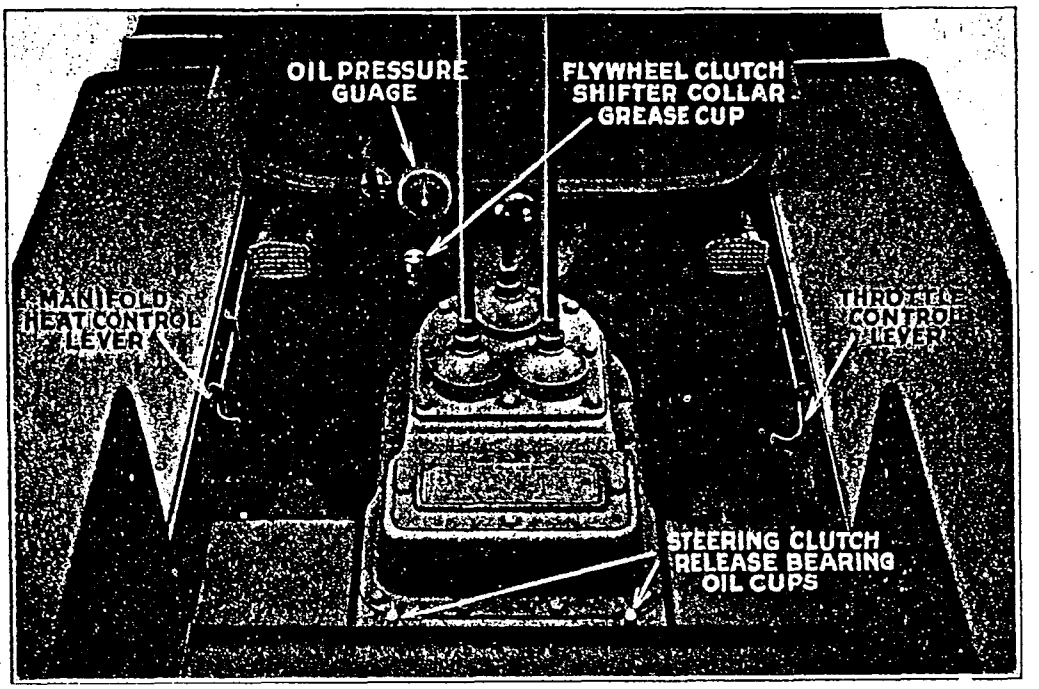


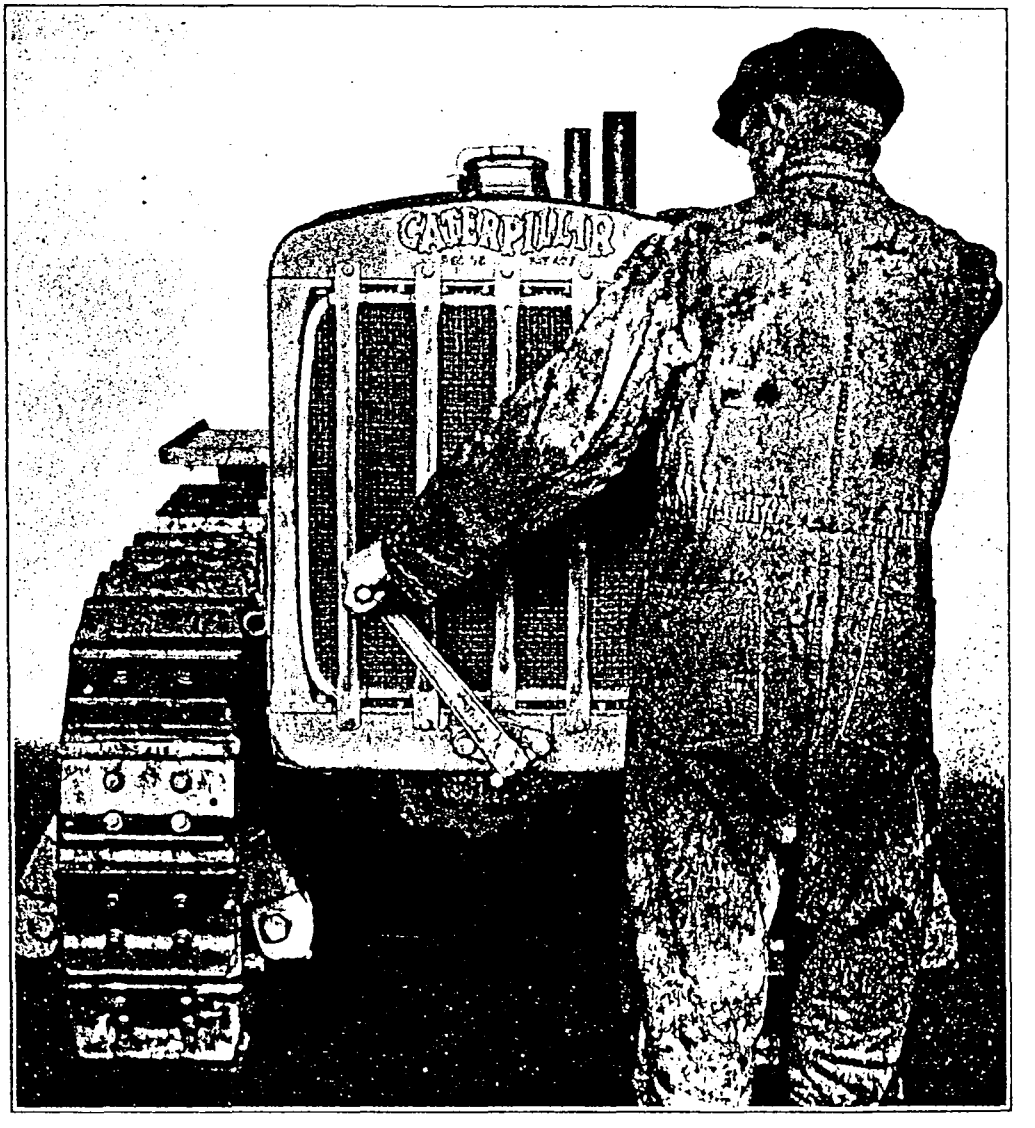
CHART REFERENCE NOS. 6, 9 AND 14. STEERING CLUTCH CONTROL OIL CUPS, OIL PRESSURE GAUGE AND FLYWHEEL CLUTCH SHIFTER COLLAR GREASE CUP

General Operating Instructions

Operate new tractor under light load for first sixty hours.

STARTING THE ENGINE

1. Gear Shift Lever. In neutral position.
2. Spark. No spark lever is provided. The engine operates on set spark, which is retarded for starting by action of impulse starter. It is not necessary to set impluse starter. See that the key on ignition switch is in place and turned so that it cannot be pulled out. Otherwise the ignition circuit will be grounded and no current will go to the spark plugs.
3. Throttle. Pull throttle control lever to rear about one-third of the way. Do not materially change this setting and do not start the tractor until the engine has been running long enough to warm up.



CORRECT POSITION FOR CRANKING ENGINE

4. Priming. Depress plunger on top of carburetor to introduce fuel to carburetor fuel bowl. If the engine is cold, or has been idle for some time, its starting will be made easier by priming the cylinders. A tablespoonful of gasoline in each priming cup is ample.

5. Cranking the Engine. The engine is started from the front of the tractor by a crank. It should not be necessary to spin the engine to start it, and no effort should be made to do so. Stand with your right hand on the left hand side of the radiator, the starting crank in your left hand, in such a position that it may be pulled over the top quarter of its circle. In this position the operator is out of harm's way should the engine backfire.

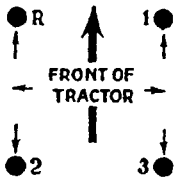
DRIVING THE TRACTOR

Always be sure that oil and water are circulating properly before operating tractor.

To shift gears, throttle engine down to idling speed, disengage flywheel clutch by pushing clutch lever as far forward as possible, bringing the transmission gears to a stop; then, carefully feel gear shift lever into proper position for speed desired.

The positions are as follows:

First.....Right Front
Second.....Left Rear
Third.....Right Rear
Reverse.....Left Front
Neutral.....In Central Position (the only position where lever may be moved sidewise freely).



Gear shift lever is held in position by a lock and must be moved a short distance sidewise before the shift can be made.

When the proper gears are engaged, pull throttle control lever all the way back. Carefully engage flywheel clutch until slack is taken up between tractor and load. Then pull clutch lever back sharply so that it locks the clutch in engaged position.

STEERING

Steering is accomplished through the use of the steering clutches which are operated by hand levers.

1. Release the steering clutch on side of tractor toward which turn is to be made, by pulling back on steering clutch hand lever on that side.
2. Apply the foot brake on the same side, the amount of pressure depending on the shortness of turn desired. Pressure should be so regulated that turn will be made evenly and smoothly, and not as a series of jerks.
3. Just before turn is completed, release brake.
4. Engage the released clutch quickly but gently. Do not let it snap back into position.

With a load, the effect of disengaging the steering clutch is more pronounced, and, except for sharp right-angle turns, the use of the foot brakes is not necessary and is not advised.

The brakes are used not only to assist in steering, but to retard the motion of the tractor, or to hold it in position. One or both foot pedals may be used for this purpose. Each brake pedal is equipped with a ratchet which can be used to lock brake as desired.

To stop tractor temporarily:

1. Reduce engine speed by partly closing throttle.
2. Disengage flywheel clutch by pushing forward as far as possible on lever.
3. Disengage gears by moving shifter lever to neutral position. Re-engage clutch lever. Engine should not be allowed to idle with gears in mesh and clutch disengaged.
4. Further reduce engine speed by closing hand throttle.
5. Stop engine by turning ignition switch to either right or left. This grounds magneto.

To stop tractor at end of run:

Proceed as above, but do not use ignition switch to stop engine. Instead, turn off fuel by means of a valve located under the fuel tank. In a few moments carburetor bowl will be sucked dry of fuel, and engine will die without any fuel remaining in cylinders to condense and dilute lubricating oil.

If temperature is below freezing, or if there is any chance of freezing weather before the tractor will be started again, the radiator must be drained or made frost-proof by use of proper anti-freeze mixture. If anti-freeze mixture is added, run engine a few minutes so new supply will be thoroughly mixed with the liquid in cooling system.

DAILY INSPECTION

Before each day's run, the tractor should be given a general inspection. Loose or damaged parts, any shortage of parts or materials, and any conditions which might interfere with proper functioning of any part should be attended to at once.

Such means as may be available to keep tractor clean should be used.

Each day the tractor must be supplied with fuel and water and all parts lubricated as directed under LUBRICATION.

Drain fuel strainer.

Further Operating Instructions

The foregoing paragraphs have been devoted to General Operating Instructions which are necessary for the day to day operation of tractor. The following paragraphs will give more detailed instructions on the various mechanisms together with care which is necessary at intervals other than daily.

TO WASH TRANSMISSION

Proceed as follows:

(a) Remove drain plug at bottom of bevel gear compartment when oil is warm. Allow time for complete drainage and replace plug. Plug can be removed by use of spark plug wrench.

(b) Fill transmission case with gasoline or kerosene to usual oil level. Start engine and with steering clutches released allow the transmission to operate in low gear for a few minutes.

(c) Remove drain plug and allow all of the gasoline or kerosene to drain out before replacing plug and installing fresh oil. Be sure to replace gasket on plug. Use transmission oil.

TO WASH CRANK CASE

Remove the drain plug from bottom of the oil sump when oil is warm; remove crank case side doors and squirt gasoline or kerosene over the interior of case and allow to drain thoroughly.

Replace drain plug and refill as directed under LUBRICATION.

OIL FILTER CLEANING

(Applicable to tractors below L-1732 and PL-3217)

Remove throttle control rod. Remove filter cover.

Drain filter case by removing plug in bottom, using small end of spark plug wrench. Wash out filter case with gasoline or kerosene before removing elements.

Each filter element is held in place by a long hex headed cap screw. Loosening these cap screws permits elements to be lifted out. Wash elements in gasoline or kerosene and allow to drain and dry before replacing.

DO NOT LUBRICATE THE TRACK

Under no circumstances should lubricant be used on the track.

The tightness between links is caused by their assembly in a hydraulic press and not to a lack of clearance between track pins and bushings. This tightness will disappear in the normal operation of the tractor.

MANIFOLD HEAT CONTROL

The heat around the intake manifold is controlled by the manifold heat control lever which is attached to left hand fender, just to the left of driver.

For cool weather, or winter operation, greater economy will be obtained by pulling lever to the rear about half the distance of ratchet. The lever should always be pulled to the rear as far as possible when starting, and, as the engine warms up, gradually pushed toward the front. Try to keep manifold at a constant temperature, both summer and winter, by use of the control.

It will require a little experimenting on the part of operator to locate the point where tractor will operate most economically. To find this point, run tractor a full day with lever set in a certain notch. Keep track of fuel consumption and notice the way tractor pulls. The next day try it in a different notch. In this way the proper point will be found for the existing temperature. As the weather changes, the lever may be set a notch back or forward so that manifold temperature will remain practically constant.

CARBURETOR ADJUSTMENT

Turn screw "G" open one turn from closed position. Turn screw "A" open one-half turn from closed position. Start and allow motor to warm up, after which refine adjustments as follows:

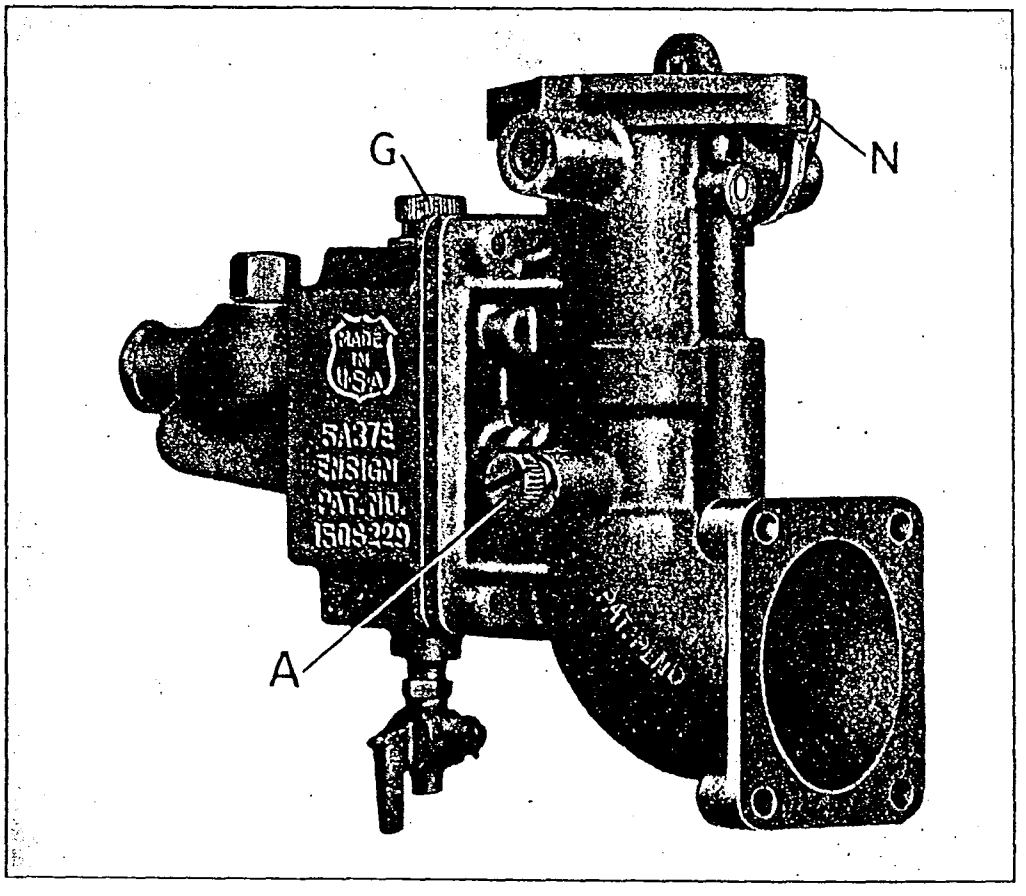
Idle adjustment with throttle closed: Turn screw "A" in to make richer, and out to make leaner. Turn screw "N" left, or out, to decrease idling speed; right, or in, to increase idling speed.

High speed adjustment: Turn screw "G" out to make richer, and in to make leaner.

Should it be necessary to replace either the float or the float valve assemblies, the following must be observed:

First: Be sure the float is placed in the bowl right side up. Letters "T O P" on the lever indicate the upper side.

Second: Be sure the top of the cork, when in its upper position, is on a level with the line marked on the inside of the bowl. To set the float, bend the lever.



CARBURETOR ADJUSTMENTS

MAGNETO ADJUSTMENT

Adjustment of breaker points should be checked every thirty days of operation. If pitted, file carefully, using one of the special contact point files sold for this purpose. Make sure that the surfaces remain flat and true, and match evenly when they come together after file is removed. File no more than is necessary to obtain result desired. The correct gap between breaker points is twelve thousandths of an inch (.012"). A combination wrench-gauge is supplied with each magneto.

To check the gap of the breaker points remove wires from spark plugs, take the removable half of impulse starter cover off, and turn the remaining half to a position beneath impulse starter. Remove the breaker box cover. Crank the engine over slowly until impulse starter ratchet engages, then release ratchet by depressing the exposed end. The crank can now be turned over until the shoe of the movable breaker point is on the flat of cam without impulse starter re-engaging. In this position the gap can be measured and adjusted.

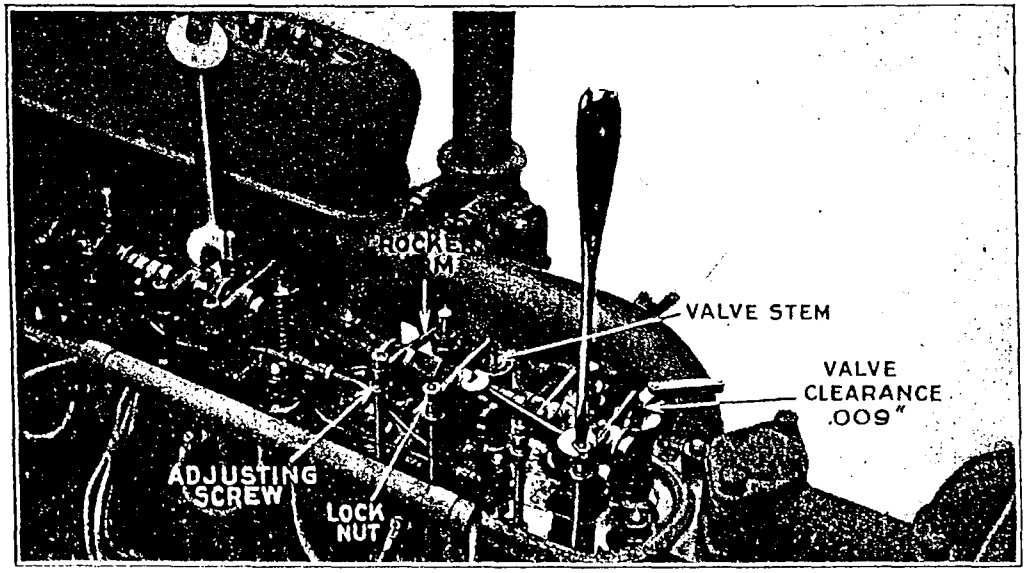
If magneto does not function, take it to nearest magneto service station, which can be located by referring to list in tool box or by consulting your "Caterpillar" dealer.

A magneto coupled to engine may be tested by removing one cable from a spark plug and holding eyelet terminal 1/8" away from hex part of spark plug while engine crank shaft is rotated.

VALVE CLEARANCE ADJUSTMENT

Valve clearance adjustment should be made when engine is hot.

Turn crank until valve closes and valve push rod is at its lowest position. Loosen lock nut on adjusting screw on rocker arm and turn screw until there is .009" clearance between the top of the valve stem and end of rocker arm. This clearance may be measured with a Feeler Gauge. Recheck adjustment after lock nut is tightened.



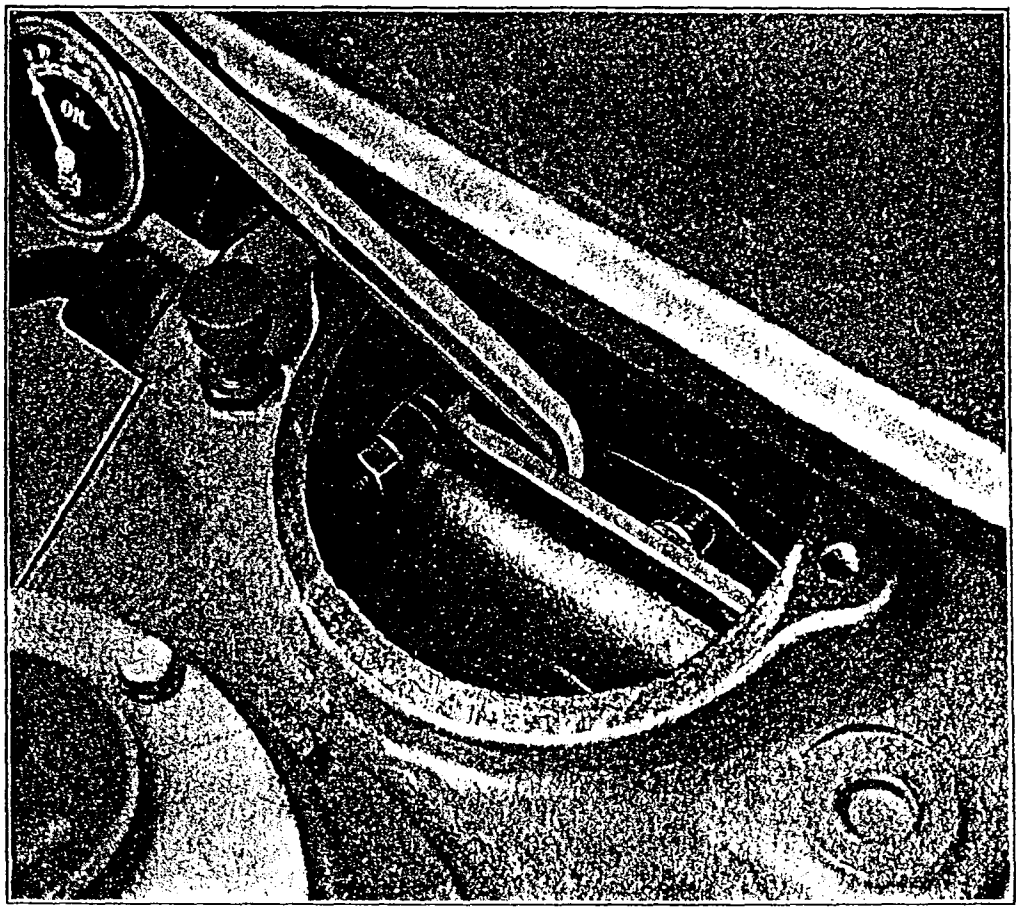
VALVE CLEARANCE ADJUSTMENT

FLYWHEEL CLUTCH ADJUSTMENT

Remove cover from opening to flywheel clutch compartment.

To tighten flywheel clutch, hold lock pin out, turn pressure plate to the right the desired distance, and permit lock pin to drop in the nearest retaining hole. There are fifteen of these retaining holes, spaced about 1¾" apart.

To test clutch adjustment, pull clutch lever to engaged position. Lever should go into this position with a distinct snap, but should not require an extremely hard pull.



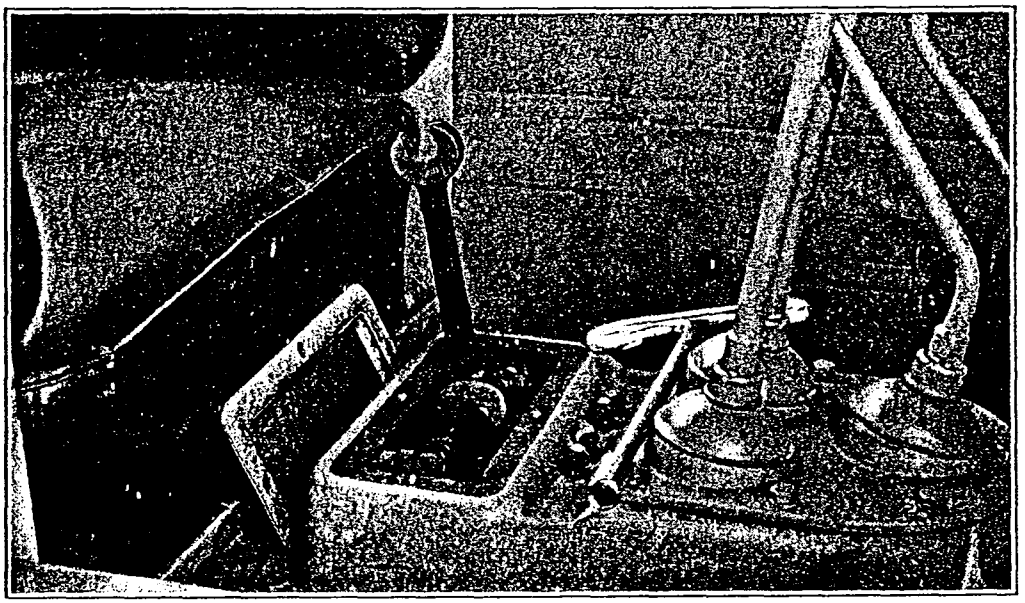
FLYWHEEL CLUTCH ADJUSTMENT

CLEANING FLYWHEEL CLUTCH

Should flywheel clutch facings become sticky, with resultant difficult operation of the clutch, pour gasoline or kerosene into flywheel clutch compartment until one-third full. Engage gears and allow engine to run with clutch disengaged for three to five minutes. Remove plug and drain gasoline or kerosene from case. Leave clutch disengaged, over night if possible, to allow clutch facings to dry.

STEERING CLUTCH CONTROL ADJUSTMENT

To adjust steering clutch control, remove clutch lever inspection cover. Loosen lock bolt holding steering clutch yoke adjusting screw. Turn adjusting screw inward, toward center of tractor, to loosen adjustment; outward to tighten. Normal wear of steering clutches tends to tighten adjustment, which must be loosened occasionally. Adjustment is properly made when the top of each lever has about 3" free motion.



ADJUSTING STEERING CLUTCH CONTROL

CLEANING STEERING CLUTCHES

The steering clutches are designed to operate entirely without oil. Should oil work into them from bevel gear or final drive compartments, causing clutches to slip, they should be washed.

To wash, drain oil from transmission case and final drive gear cases. Pour into each steering clutch compartment about one and one-half gallons (U. S. Std.) of gasoline or kerosene. On earlier models it will be necessary to close holes under steering clutches with plugs whittled from soft wood. Operate tractor back and forth without disengaging steering clutches to wash grease and oil from the outside of the clutches and from the inside of compartments. Drain this bath and replace covers or plugs. This procedure prevents the possibility of dirt and grease from the compartment being washed in between the clutch discs.

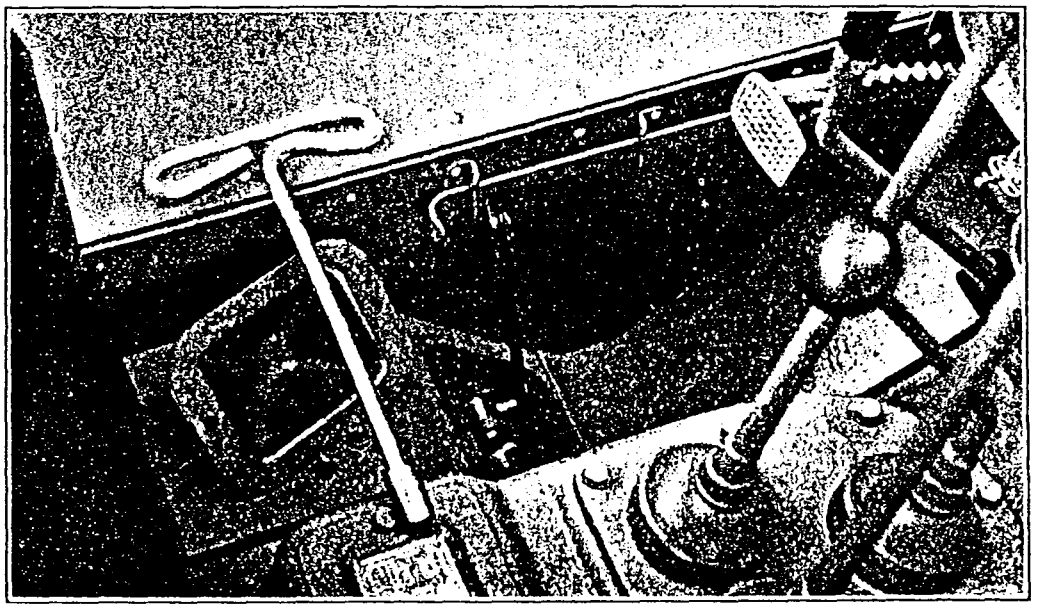
Fill steering clutch compartments a second time with gasoline or kerosene, and tie back both steering clutch levers so clutches are disengaged With engine running and gears in low speed, allow clutches to revolve for five minutes. Then remove covers or plugs from drain holes and drain off the gasoline or kerosene. Keep clutches disengaged for several hours, if possible, until the gasoline or kerosene has had plenty of time to drain from between the clutch plates. Refill transmission and final drive cases as directed under LUBRICATION.

STEERING CLUTCH BRAKE BAND ADJUSTMENT

To adjust brake bands, remove brake inspection covers. These covers are located on each side between front and rear foot plates.

Turn brake band adjusting nut farther onto its thread to tighten brake. Adjustment should be made so that foot pedal may be depressed to within about one inch of the gas tank.

It should not be tight enough so band will drag on drum when in released position.

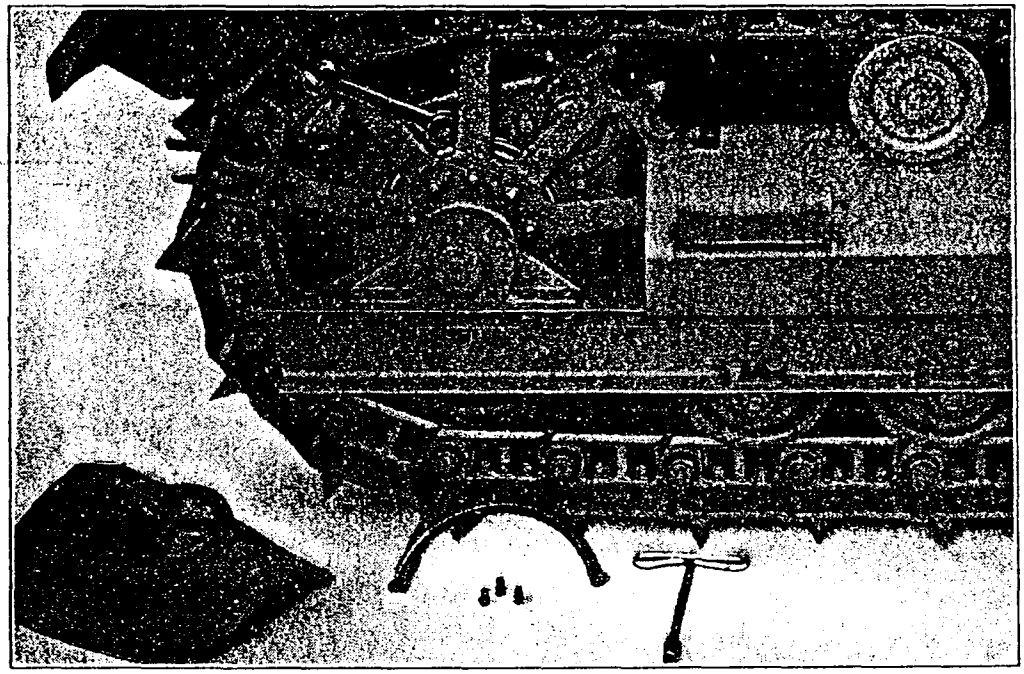


ADJUSTING STEERING CLUTCH BRAKE BAND

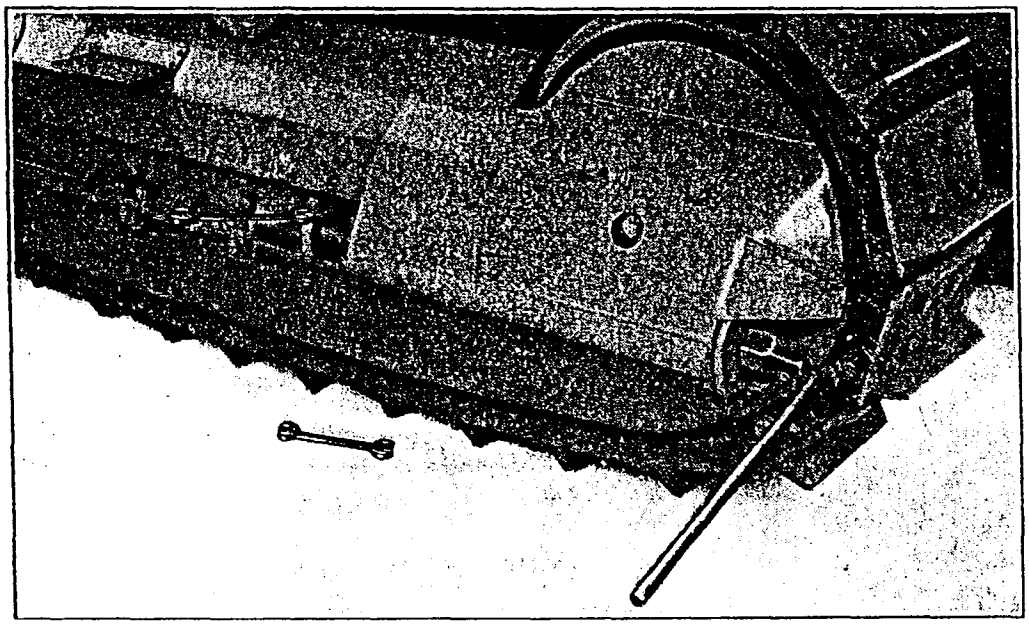
SPARK PLUG ADJUSTMENT

The condition of spark plugs should be examined every thirty days of operation. The points should not be set closer than 1/64", and should not be permitted to exceed 1/32".

Cable connections should be tight and clean. Replace cracked cables promptly.



SPROCKET HUB PACKING GLAND ADJUSTMENT



TRACK ADJUSTMENT

SPROCKET HUB PACKING GLAND ADJUSTMENT

Remove sprocket guard and final drive pinion outer bearing cover. Remove three capscrews holding sprocket hub dust guard to final drive case and lift out guard. Tighten packing gland adjusting nuts just enough to stop any oil leaks.

No adjustment is necessary on tractors below L-919 and PL-708.

TRACK AND FRONT IDLER ADJUSTMENT

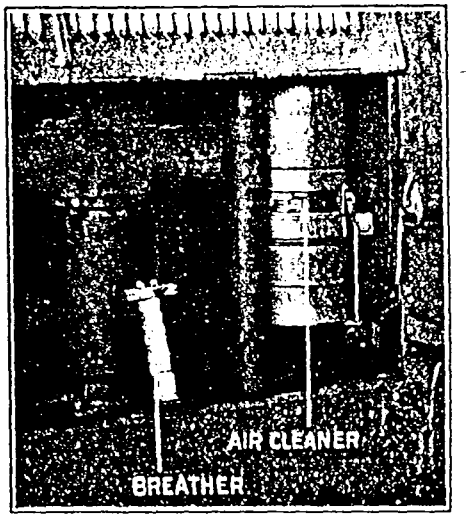
Track adjustment is correct when track may be raised about 1½" above track carrier roller.

To adjust tracks, loosen adjusting bolt clamps and screw adjusting bolts in or out as required.

The length of each front idler recoil spring should be 23 1/16". Adjust length of springs by turning large nut at rear of each spring. Check position of front idlers to be sure they are in line with tracks. There should be an equal amount of clearance between the inner edges of the track rails and the idler rims. By looking through the spaces between the track shoes at the front of the idlers, and by observing how the tracks feed onto them, it is possible to determine the amount of clearance present.

BREATHER

To remove, reach behind air cleaner with left hand, grasp top of breather and unscrew.



BREATHER REMOVED

OPERATION IN DEEP MUD OR WATER

The tractor should not be operated continuously in deep mud or water. However, should such operation be temporarily necessary, special attention is required. See that the covers over drain holes under steering clutches are in place. On earlier models the covers have small drain holes punched through them. Close holes with plugs whittled from soft wood.

OPERATION 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 ditch bank. Both clutches may be released slightly, so that they slip a little, until the tractor balances on top of the log or obstruction, then engage one clutch so that the tractor eases obliquely over and down. If the tractor is being operated without a load, it may be necessary to use the foot brakes.

OPERATION DOWN HILL

When descending a steep grade, with the engine under compression, the use of the steering clutches is opposite to that normally employed. For example, if it is desired to make a turn toward the right, down a steep grade, the steering clutch on the left hand, or outer side of curve, is released. The engine, being connected to right hand track, acts as a brake, retarding its progress, while the track on the outside of turn is free to travel faster, thus describing the circle or turn desired.

OPERATION IN COLD WEATHER

When a "Caterpillar" Tractor is to be operated in extremely cold weather, as in ice-road logging, or snow removal, certain special precautions are necessary to prevent damage to various parts.

A "Caterpillar" engine may be operated in temperatures as low as 20 degrees F. with plain water in radiator, if a curtain is used over radiator to cut down circulation of air. When starting engine, let it run two minutes before filling radiator, then fill quickly and be sure that the water is circulating. Always drain radiator when shutting down for the night, if there is any possibility that the temperature may fall below 32 degrees F. before morning.

When tractor is to be operated in temperatures considerably below freezing, some liquid must be used in radiator which will not freeze at lowest temperature to be encountered. This anti-freeze liquid may be a solution of alcohol or glycerine in water. The alcohol solution is cheapest in first cost, but very subject to evaporation, while glycerine evaporates very slowly. Whatever solution is used, it must be inspected at least once a day to be sure that it has not changed in strength and so lost its capacity for frost resistance. What is commonly sold under the name "saw oil" may also be used. This is a very light grade of oil that will circulate properly in the cooling system even at a low temperature.

When a tractor is to be operated in temperatures below freezing, lighter oil should be used in all parts of the tractor. Crank case oil is divided into three classes, for use in temperatures above freezing, temperatures between freezing and 0° F., and temperatures below 0° F.

Transmission oil is divided into two classes, for use in temperatures above and below freezing. Consult your dealer for information as to what particular grade of oil of any particular manufacturer should be used.

It will be found to be real economy to provide some sort of warm storage whenever it is at all possible. The contractor who is moving from one job to another can usually equip himself with a portable garage in which a kerosene stove may be kept burning over night.

An engine which has been standing for some time in a very low temperature may start more readily if it is warmed. A gasoline blow torch may be used, or a torch made of rags wrapped on a stick and saturated with kerosene. However, this cannot be done without some injury to the paint. The liquid in the cooling system may be drained, warmed and replaced. Keep fire away in warming alcohol solution.

Another method of warming the interior of cylinders is as follows: turn engine over until pistons are all equi-distant from tops of cylinders. Remove spark plugs and squirt a spoonful of gasoline on top of each piston. Then apply a lighted match to spark plug hole, keeping hand and face out of way of resulting spurt of flame. This operation should be repeated several times for each cylinder. Sometimes the cylinder in which exhaust valve is open will not ignite easily, in which case it may be necessary to burn out other cylinders and then turn engine over enough to close that valve. This heating action will, of course, be most effective if cooling system is empty.

The carburetor bowl may be warmed just before engine is to be started by wrapping it in cloth and applying boiling water. Fire should not be used on carburetor, due to possibility of an explosion.

If gasoline available for priming engine is lacking in volatile units, and so does not vaporize readily, it may be necessary in extremely cold weather to use ether for priming. However, this will be necessary only rarely if cylinder walls and intake manifold are warmed as above outlined.

If the engine crank case contains very light oil, and has been standing longer than over night, there will be a possibility that the oil may have drained away from cylinder walls to such an extent that damage may result when the engine is started, before fresh oil has reached these surfaces. In such case, it will be well to remove spark plugs and squirt a few tablespoonfuls of oil on top of each cylinder. The engine should then be turned over several times to allow this oil to work down between pistons and cylinder walls. This procedure will also improve engine compression and thus facilitate starting.

The lubricating oil on cylinder walls of a tractor engine that has stood over night in a low temperature will be so thick that engine will turn over quite hard the first few revolutions, until this oil is loosened up. For that reason it is well to turn a very cold engine over by hand a few times before priming it. Such action will also have the additional ad-

vantage of determining whether any bronze bushing is frozen tight, and if any water is frozen in pump where it might cause breakage.

OPERATION UNDER DUSTY CONDITIONS

To reduce to a minimum the amount of dust taken into the air cleaner, the air cleaner inlet pipe should be extended by installing air cleaner inlet pipe extension supplied with the tool equipment of the tractor. To make this installation, first place bolt ⅜ x 2½" through hole in extension pipe, leaving nut loose. Insert extension in inlet pipe until bolt rests on top of inlet pipe. Tighten nut on bolt until extension is firmly held in inlet pipe.

An air cleaner inlet pipe hood is available for use where conditions are such that there is a possibility of the air cleaner becoming clogged with leaves, straw, or other objects of considerable size.

CARE OF COOLING SYSTEM

Construction of cooling system is such that removal of a drain plug under radiator will drain entire system if tractor is standing level, or tipped to right. When draining radiator in cold weather, be sure tractor is not tipped to left, as in that position water will remain in lower water manifold and breakage from freezing may result. After draining, crank the engine a few turns to prevent possibility of any water collecting and freezing in water pump. The drain plug should not be replaced until cooling system is to be refilled.

Some water contains minerals which, under the action of heat, may form scale in cylinder water jackets and radiator. If scale is present in circulation system it should be treated as follows:

(a) Drain cooling system completely.

(b) Dissolve common washing soda in enough water to fill cooling system in the proportion of one and one-quarter pounds of soda to each gallon of boiling water.

(c) Fill radiator with this solution and allow it to circulate through cooling system for one full day of work.

(d) Drain cooling system and flush out with clean water to remove particles of scale which may have become disengaged but not completely dissolved.

DIFFICULT STARTING

Before an engine will start, it is essential that fuel reach the cylinders (in form of vapor mixed with the proper proportion of air), be compressed, and be fired by a spark.

If engine does not start after priming, it can reasonably be assumed that ignition or compression is at fault. If it starts when primed, but stops after a few revolutions, it indicates that ignition and compression are all right and that fuel either is not reaching the cylinder or has not the proper proportion of air.

Fuel may not be reaching the cylinders because of sediment in fuel strainer or lines. Be sure fuel is getting to carburetor. The carburetor may be out of adjustment. There may be water in the fuel. Air leaks above the carburetor at throttle valve shaft, intake manifold or valve stem guides may be making the mixture too lean.

The ignition system may be short circuited. Switch key off or out. Wires may be broken or disconnected. The spark plugs may be dirty or have moisture condensed on the points. The gap of the points may be too wide.

Poor compression may be traced to insufficient valve clearance, carbon on valve seats, valves need grinding, valve stems stuck in guides, piston rings worn or stuck in slots, imperfect film of oil between piston and cylinder walls due to overpriming, use of too light an oil, or engine standing idle a long time.

STATIONARY DRIVE ATTACHMENT

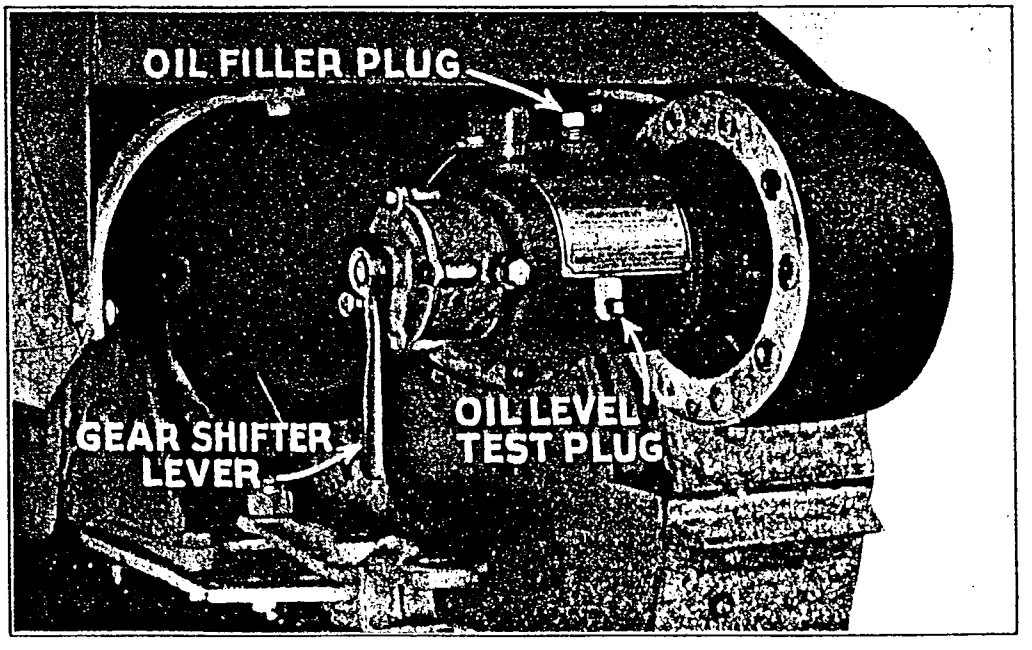
When operating stationary drive attachment, the bearings on upper transmission shaft will not receive lubrication as when tractor is in motion, due to the fact that the lower transmission shaft does not revolve. Therefore, to insure that these bearings receive proper lubrication, it is very important that the following instructions be carried out at least twice a day:

(a) Disengage flywheel clutch and shift gears into "high."

(b) Release both steering clutches and engage flywheel clutch for two or three minutes, to allow oil to be well splashed about in transmission case.

(c) Disengage flywheel clutch, let go of steering clutch levers and shift gears to neutral.

Transmission oil is used to lubricate the stationary drive. Remove

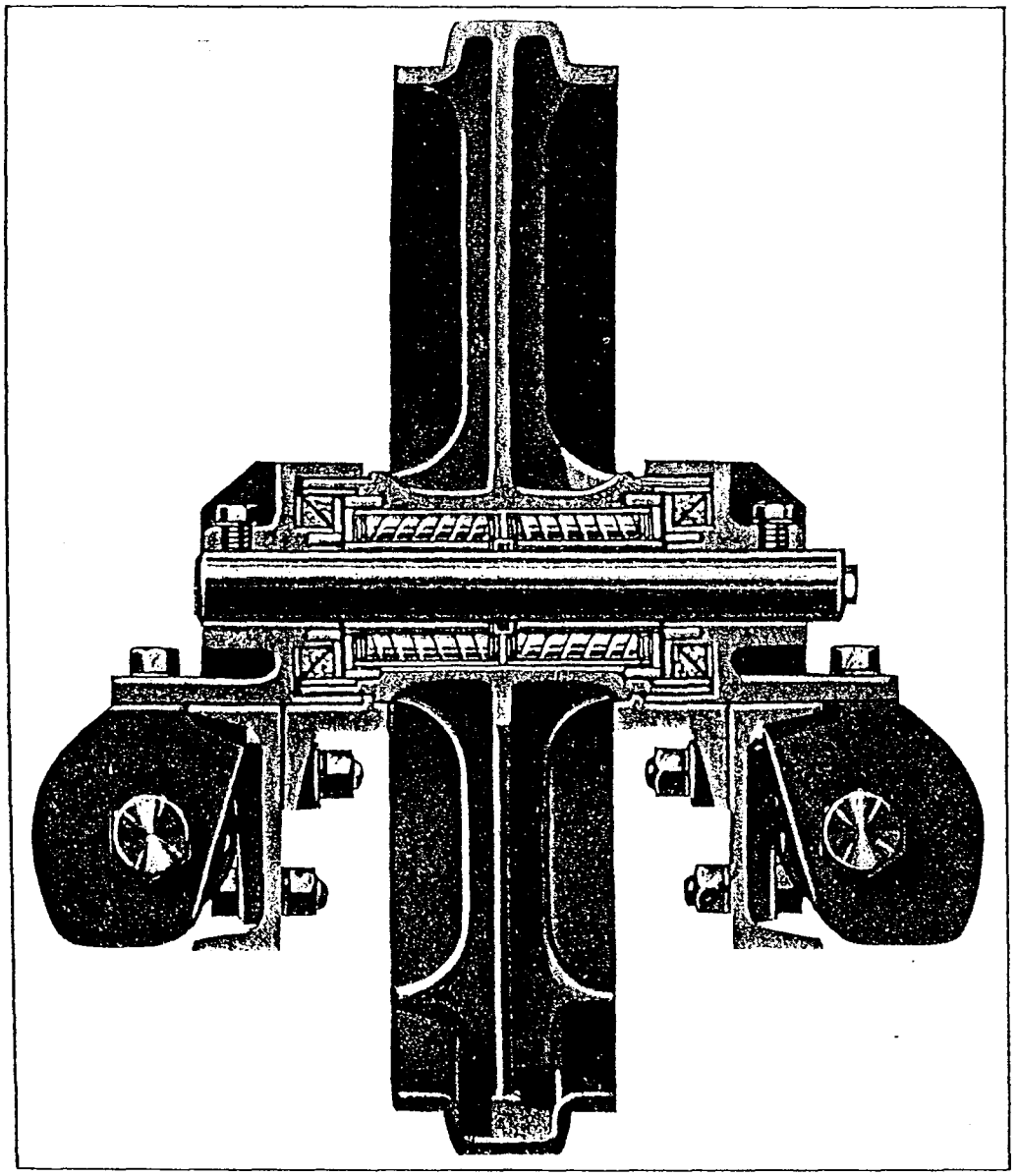


STATIONARY DRIVE ATTACHMENT

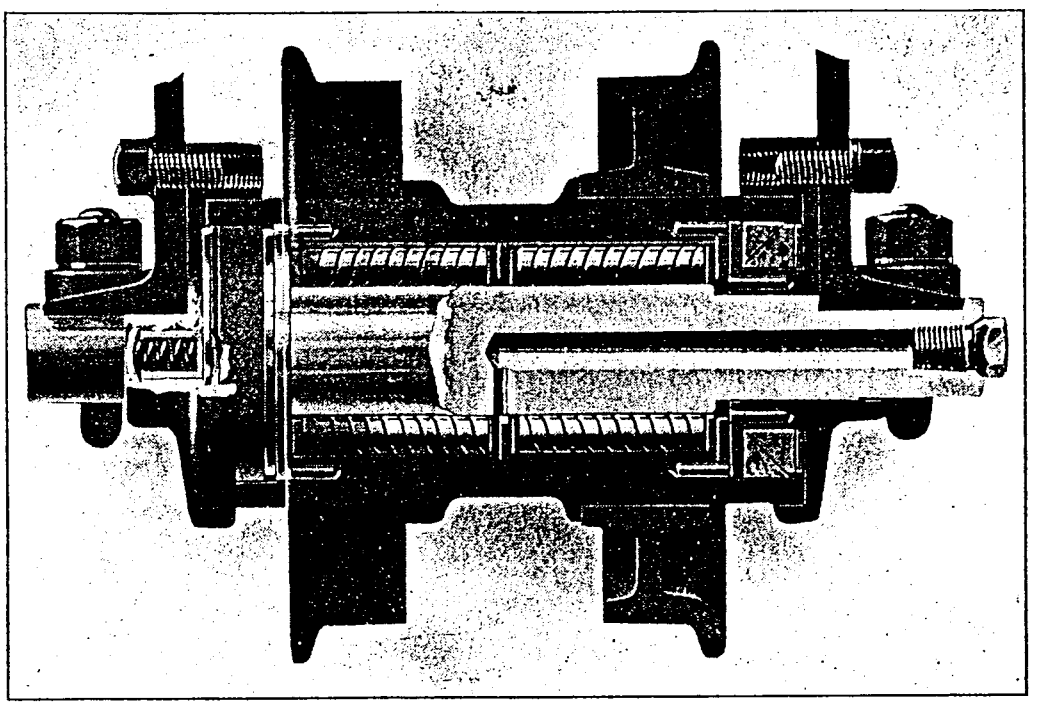
plug in top of housing and pour oil through hole until it reaches level of testing plug hole which will be found in rear of housing.

When stationary drive attachment is in place on tractor, pour oil for tractor transmission in filler hole at side of stationary drive housing.

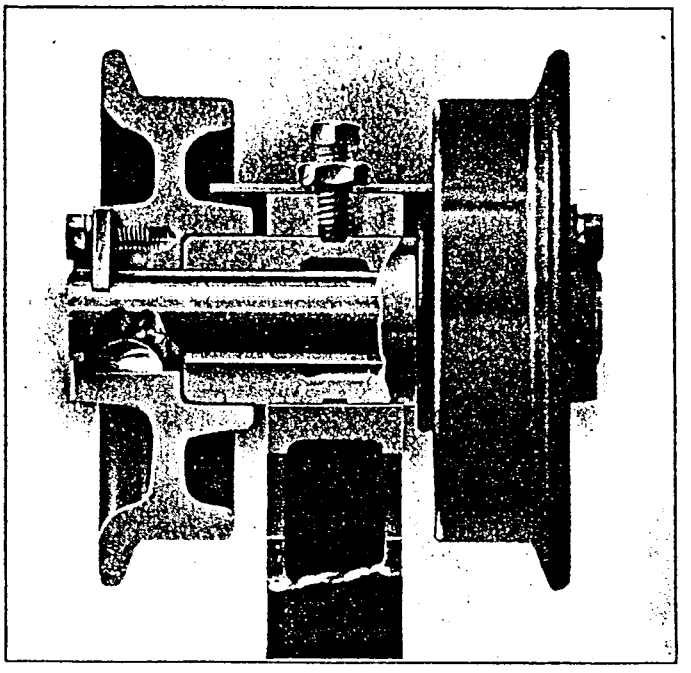
The illustrations on these pages are sectional views which show the construction of the various units. With a better understanding of the working parts and how they are put together, the operator will be in a better position to intelligently care for the tractor.



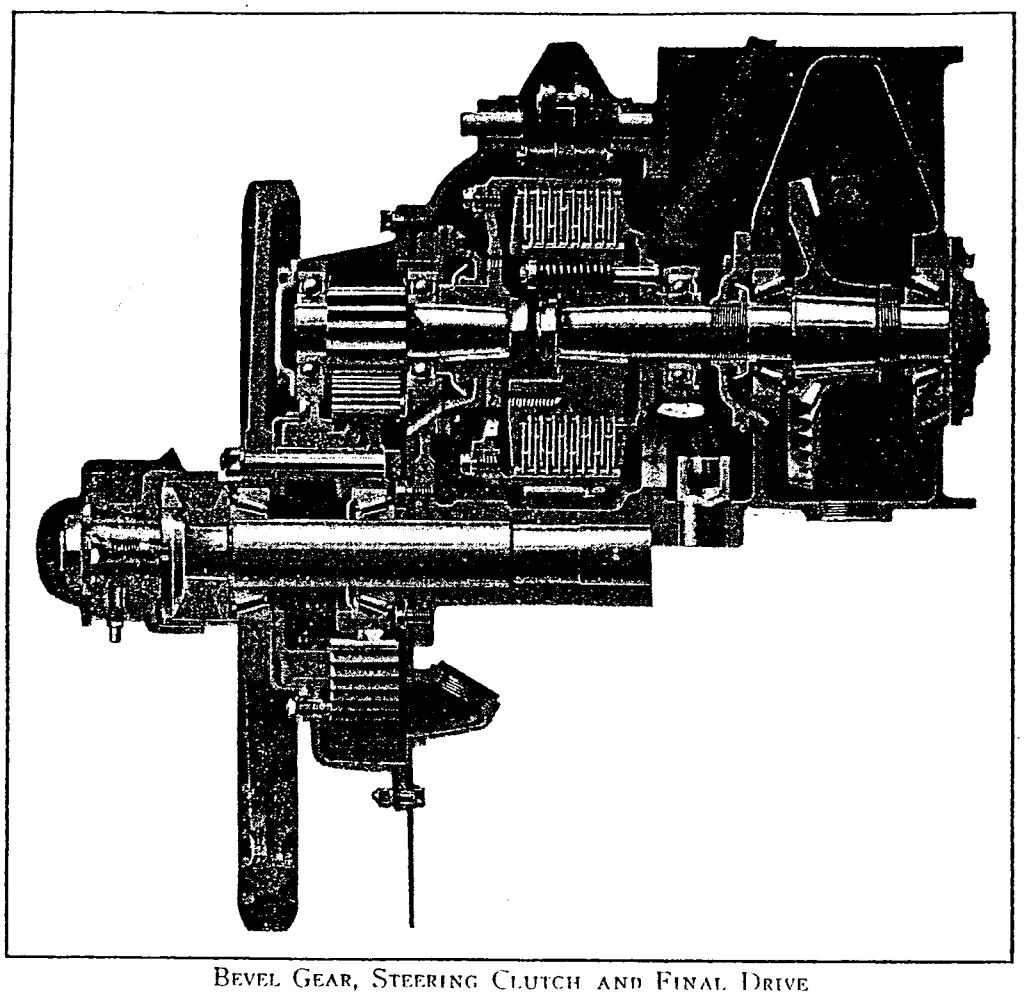
FRONT IDLER



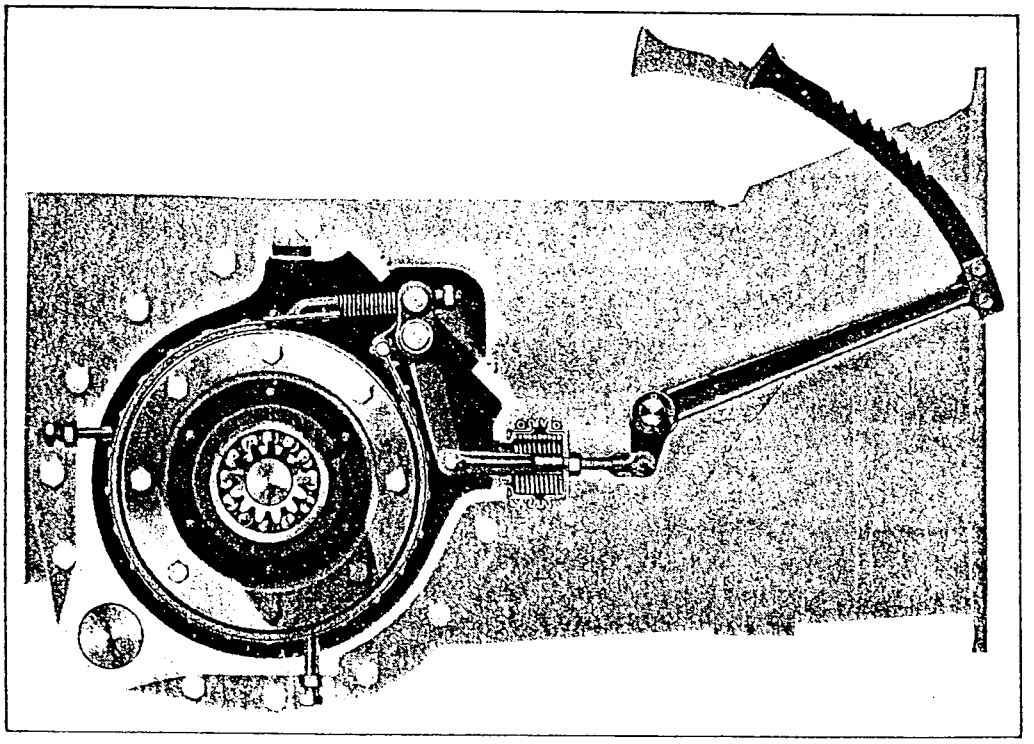
TRACK ROLLER



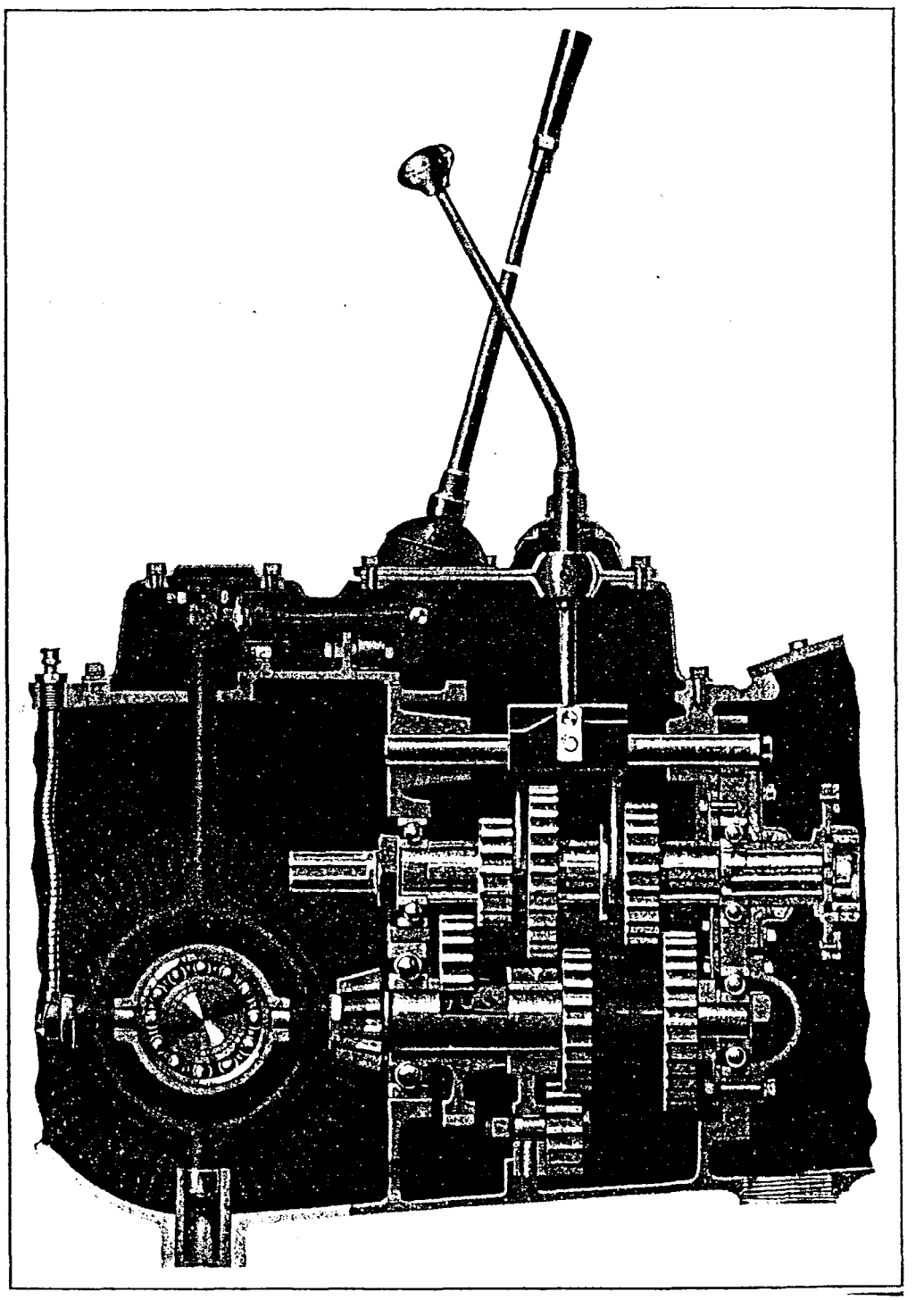
TRACK CARRIER ROLLER



BEVEL GEAR, STEERING CLUTCH AND FINAL DRIVE
EFFECTIVE WITH TRACTORS L-1687, PL2518 AND UP

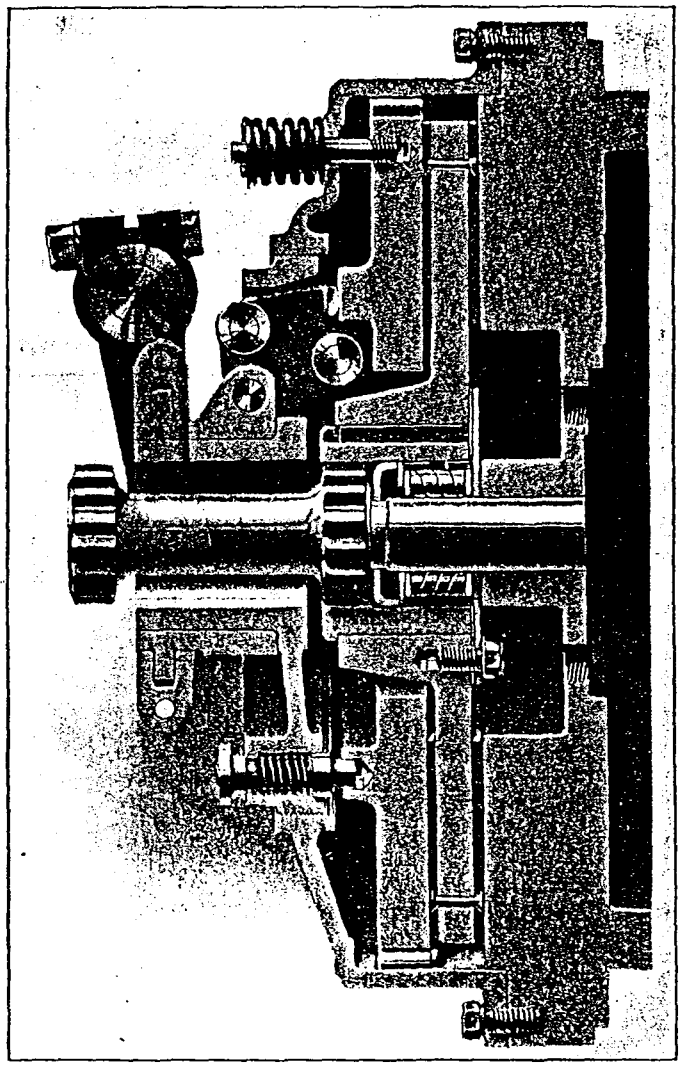


STEERING CLUTCH, BRAKE AND BRAKE CONTROL

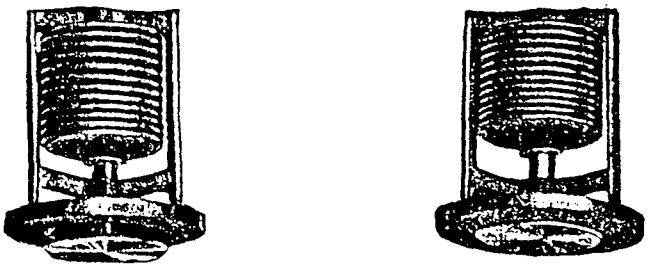


TRANSMISSION CHANGE SPEED GEARS, GEAR SHIFTER MECHANISM AND STEERING CLUTCH CONTROLS

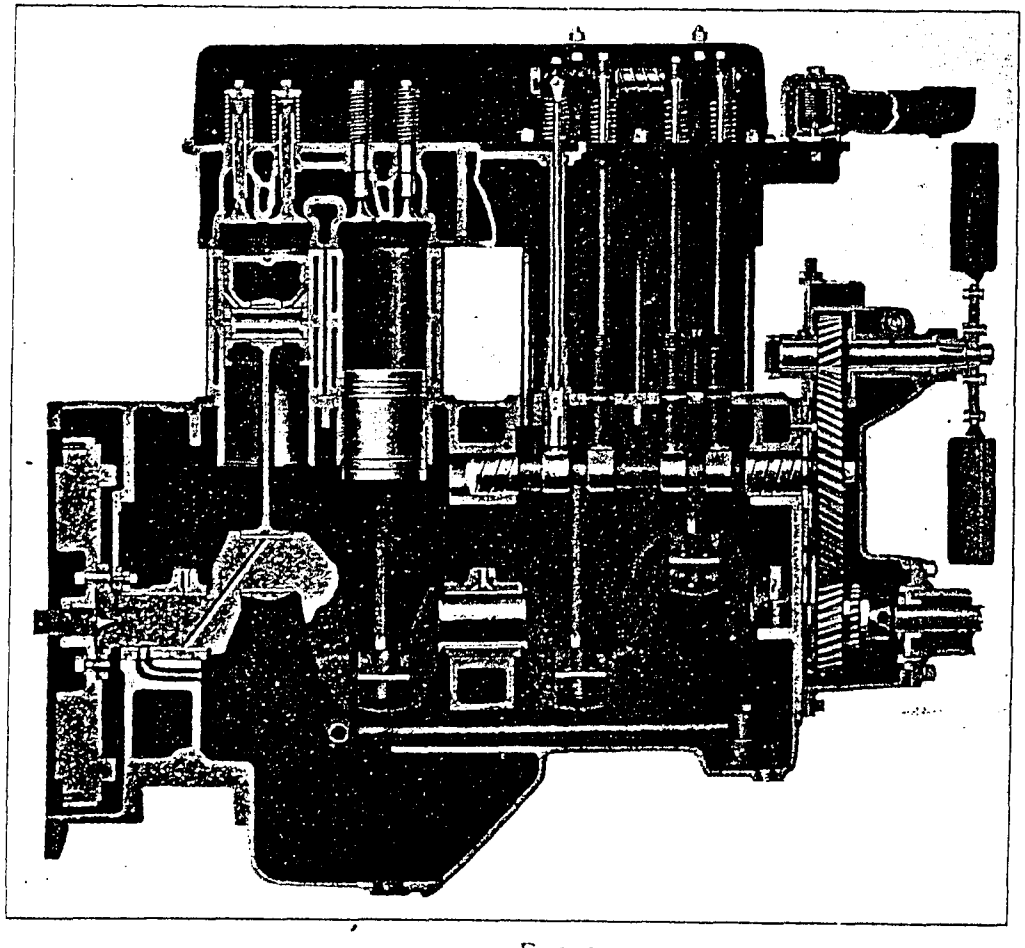
EFFECTIVE WITH TRACTORS L-1901 AND PL 2861



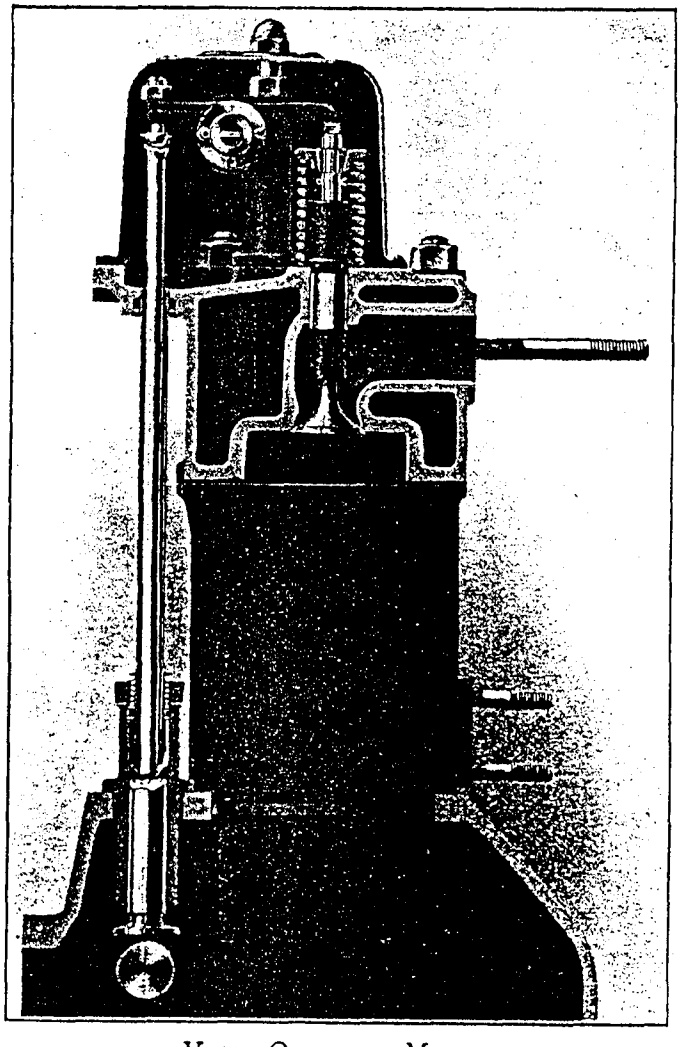
FLYWHEEL CLUTCH



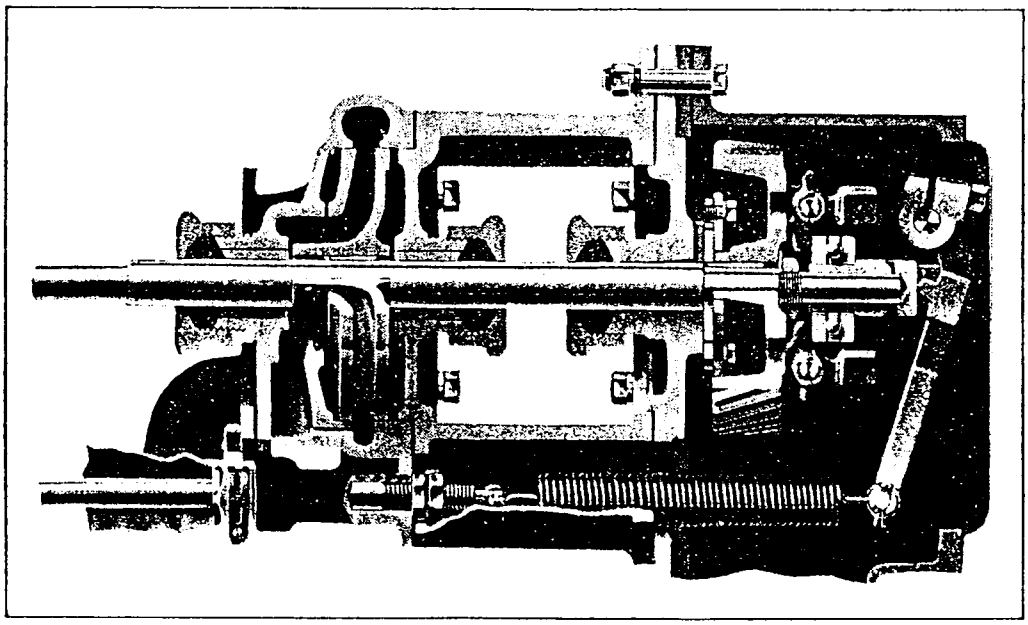
THERMOSTAT



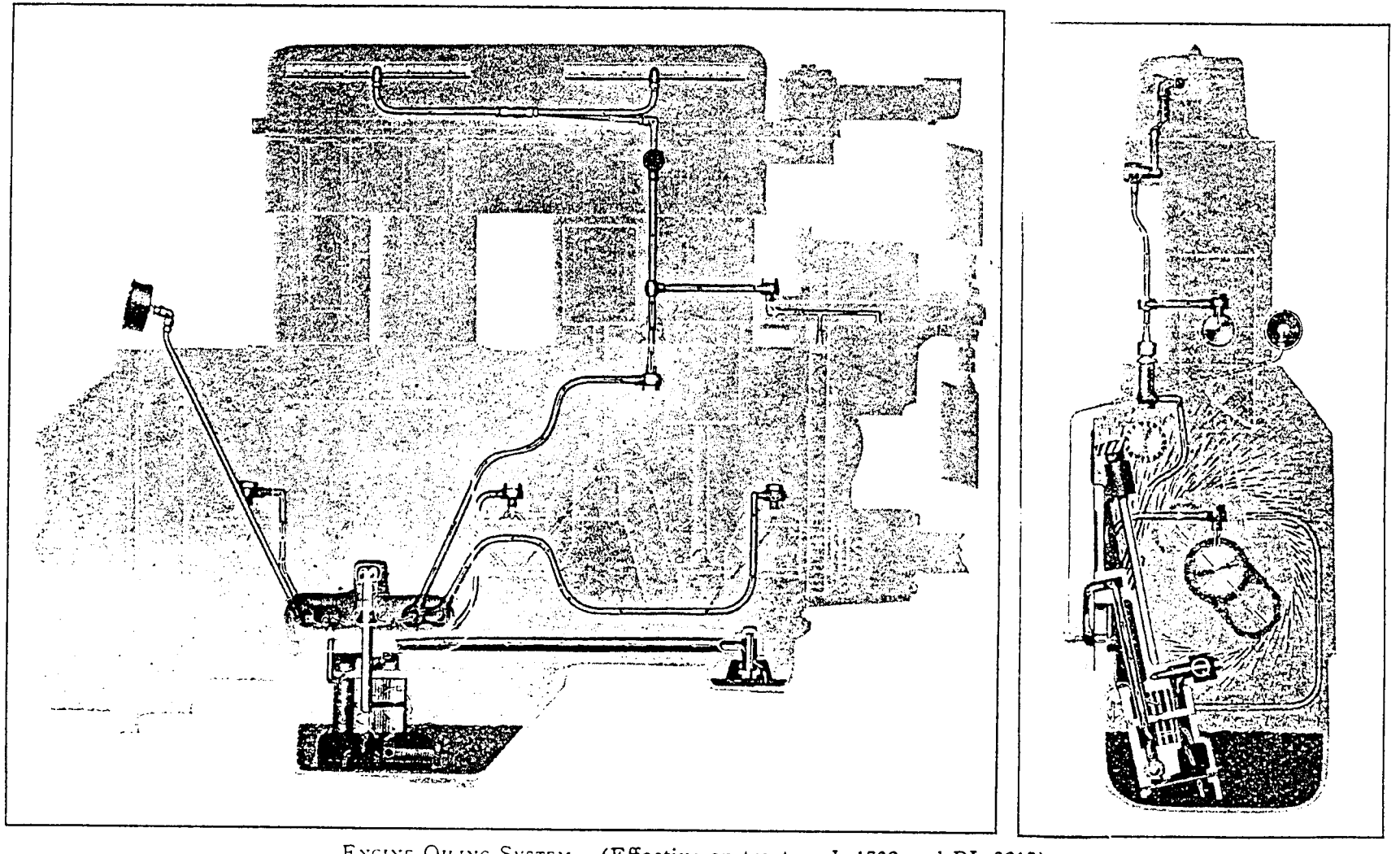
ENGINE



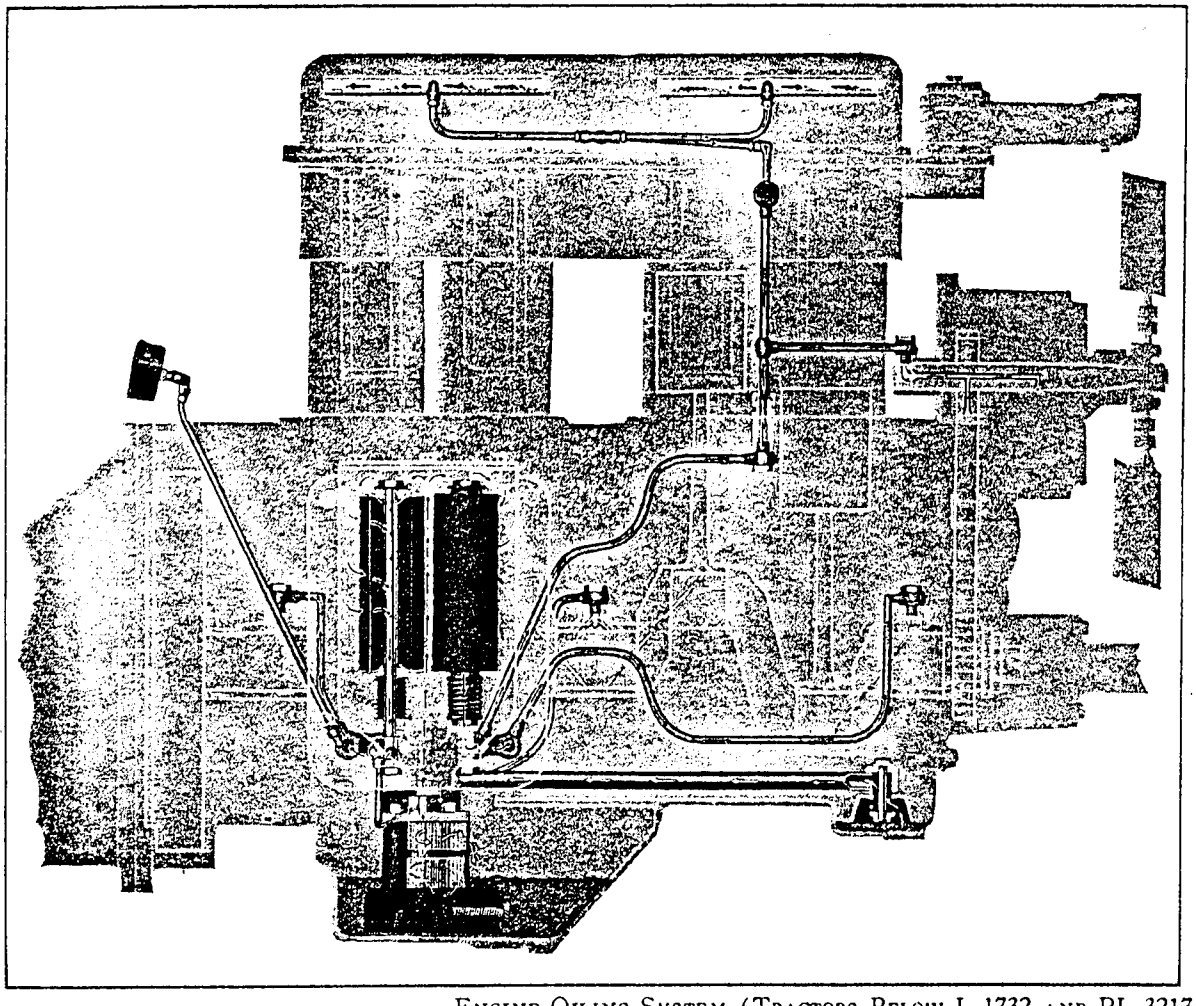
VALVE OPERATING MECHANISM

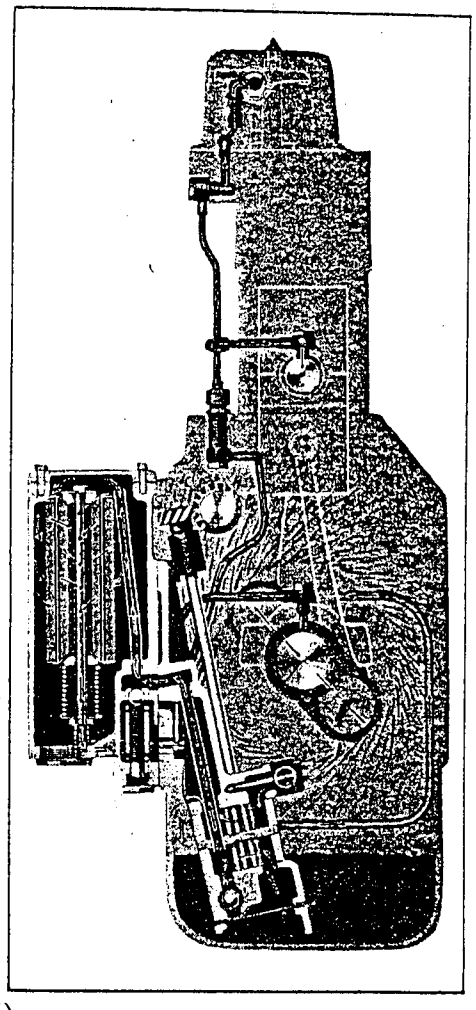


WATER PUMP AND GOVERNOR MECHANISM



ENGINE OILING SYSTEM. (Effective on tractors L-1732 and PL-3217)





ENGINE OILING SYSTEM (TRACTORS BELOW L-1732 AND PL-3217)

Pages *preceding* this sheet are for Operators.

Pages *following* this sheet are for Servicemen.

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Pages *following* this sheet are for Servicemen.

Instructions for Dismantling and Repair

HOOD

To remove hood, loosen hold-down clamps at bottom of each door of hood. Remove two cap screws holding hood to top of radiator. Hood and doors may then be lifted off as a unit.

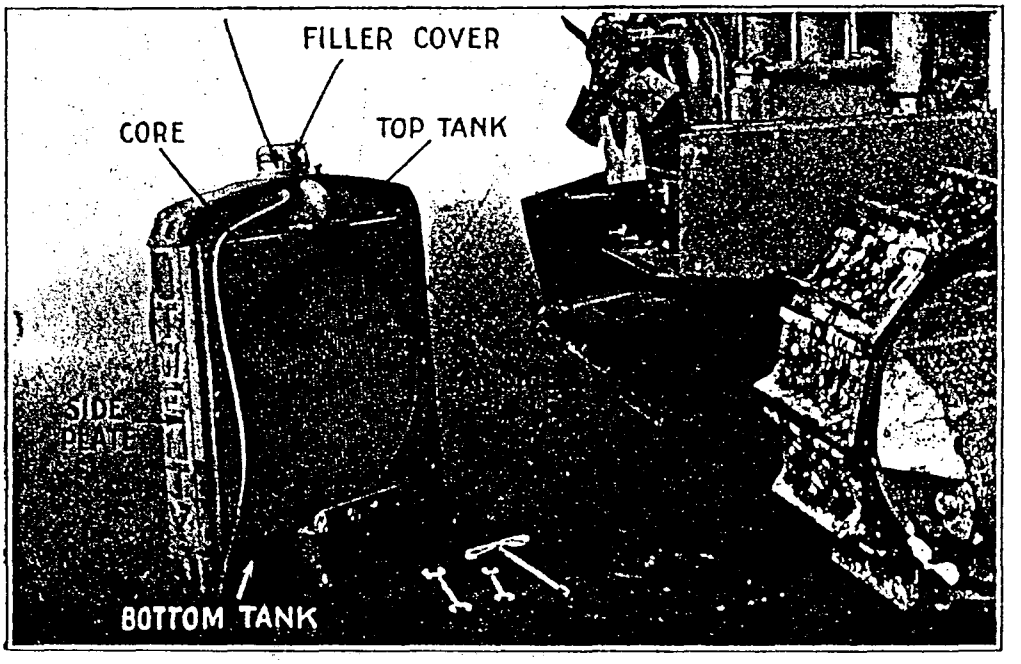
To remove doors from hood, drive out hinge rod which makes this connection. Use a ¼" rod or a nail to start it, then grasp exposed end with pliers or wrench, and drive out.

RADIATOR

To remove radiator, remove HOOD. Remove cap screw holding clip over lower end of radiator overflow pipe, on left side of radiator. Bend overflow pipe to rear enough to withdraw lower end of pipe from hole in engine lower guard plate.

Remove four cap screws holding hood side plate and lower guard plate to radiator on each side of engine. Remove four bolts on left side which hold lower guard plate to angle iron on left side of engine and swing these plates a few inches to one side.

Remove nuts from studs in lower side of crank case, on right side, which hold angle iron of lower guard plate to engine; also remove upper bolt at rear end of right hand hood side plate. This last operation permits front end of side plate and lower guard plate to drop down, exposing two cap screws on front end of water pump inlet pipe. Remove these two cap screws, also two cap screws connecting radiator upper tank to radiator inlet pipe. Remove nuts from studs holding radiator bottom tank to timing gear housing. Radiator may now be removed.

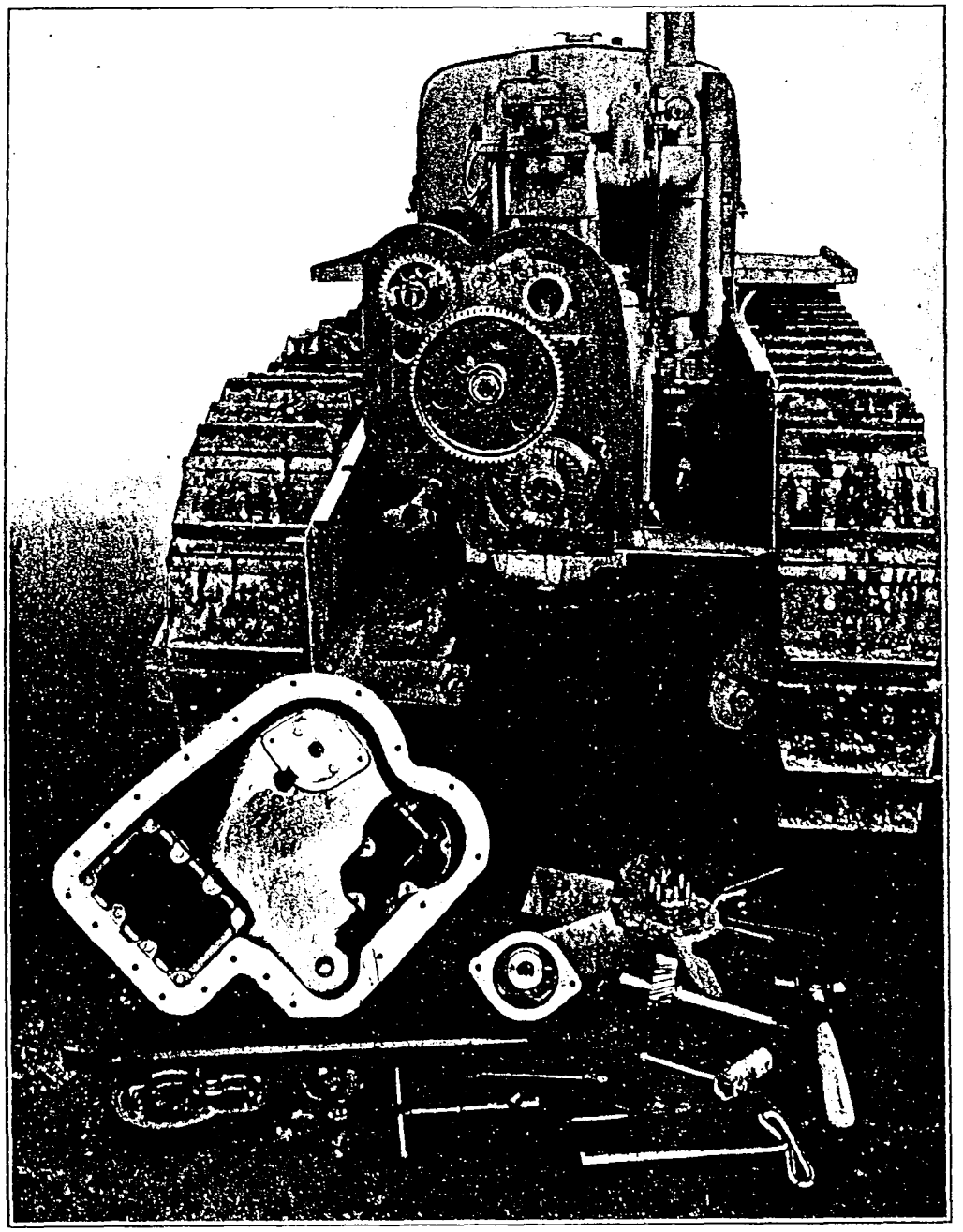


RADIATOR REMOVED

Two persons can lift it off easily—or it may be handled by one person by using a rope sling over a rafter or tree limb.

To dis-assemble radiator, remove guard assembly, fan shield plates and radiator side plates. Then remove cap screws holding radiator core to top and bottom tanks.

Before replacing radiator, loosen cap screws holding radiator inlet pipe to cylinder head, so front end of inlet pipe will drop slightly. This will make it easier to replace bottom of radiator on studs without damage to gasket located between radiator and inlet pipe.



TIMING GEAR HOUSING AND FAN REMOVED

TIMING GEAR HOUSING

To remove timing gear housing, remove RADIATOR. Disconnect carburetor control lever from carburetor control rod. Disconnect governor spring from governor spring lever. By means of throttle control ratchet, pull governor spring as far as possible to rear, where it will be out of the way while working on other parts.

With small end of spark plug wrench, remove screw holding oil line to fan gear housing. In replacing timing gear housing be sure that the two copper washers on this connection are not damaged.

Remove two nuts from studs extending through rear of timing gear housing plate on either side of fan gear housing. Remove bolts and cap screws holding timing gear housing to housing plate and crank case.

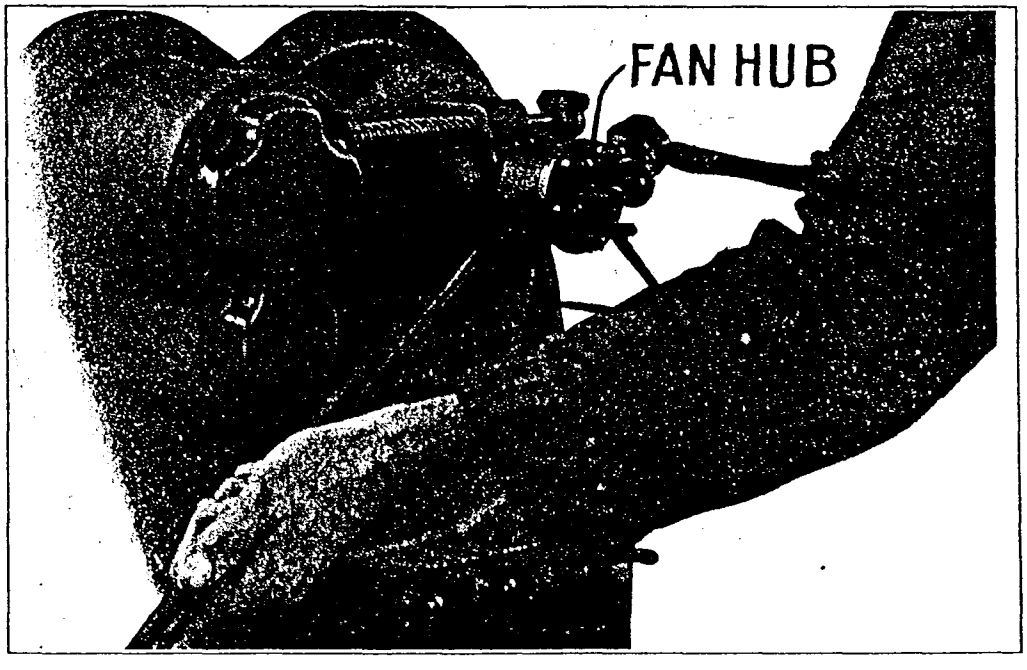
Remove timing gear housing and fan assembly complete by pulling straight forward.

Before timing gear housing is replaced, be sure that oil hole in governor sliding sleeve is on top of sleeve.

FAN

To remove fan, remove RADIATOR. With cold chisel, loosen lock holding six nuts on studs in fan spider. Remove nuts. Fan may then be pulled off of studs.

To remove fan shaft, remove fan hub assembly from front end of fan shaft. Remove hex nut on end of fan shaft, also spacer just behind nut. Fan hub is held in place on shaft by tapered fit and Woodruff key. Use



REMOVING FAN HUB

pinch bar to pry on one side of hub, between hub and timing gear housing, tapping other side of hub with hammer. This will loosen hub and permit its removal. Woodruff key should then be removed. Remove TIMING GEAR HOUSING. Remove two cap screws holding fan gear housing assembly to inner face of timing gear housing, and lift fan gear housing from fan gear. Fan gear and shaft may then be lifted from timing gear housing.

Fan gear is held on shaft with Woodruff key and press fit. Should it be necessary to remove gear, replace it so that oil hole in gear lines up exactly with oil hole in shaft.

In re-assembling, note that Woodruff key should also engage notch in timing gear thrust washer, directly in front of gear, and put fan gear housing in place before replacing fan. In replacing timing gear housing, be sure oil hole in governor sliding sleeve is on top.

CRANK SHAFT GEAR

To remove this gear, remove TIMING GEAR HOUSING. Loosen lock and remove starting crank jaw.

Install special gear puller, placing spacer between center screw and end of crank shaft. Place cold chisel or similar tool between cam shaft gear and accessory shaft gear, to keep crank shaft from turning under pull of wrench. When a good strain is taken with wrench on center screw, strike end of screw sharp blow with hammer to loosen gear on shaft.

To remove crank shaft thrust washer, located behind crank shaft gear, loosen locks and remove four cap screws from thrust plate. Thrust washer may then be pried off of shaft without removing key.

If new thrust washer is installed be sure that it is thinner than the spacing washers between the thrust plates.

When replacing crank shaft gear, be sure that "O" mark on rim of gear matches with "O" mark on cam shaft gear.

Put key in keyway in shaft, to hold thrust washer in place while gear is being driven home. Start gear on shaft carefully, being sure it is square and will mesh properly with key. Drive it home with babbitt hammer. When starting crank jaw is replaced, replace lock.

ACCESSORY SHAFT GEAR

To remove this gear, remove TIMING GEAR HOUSING.

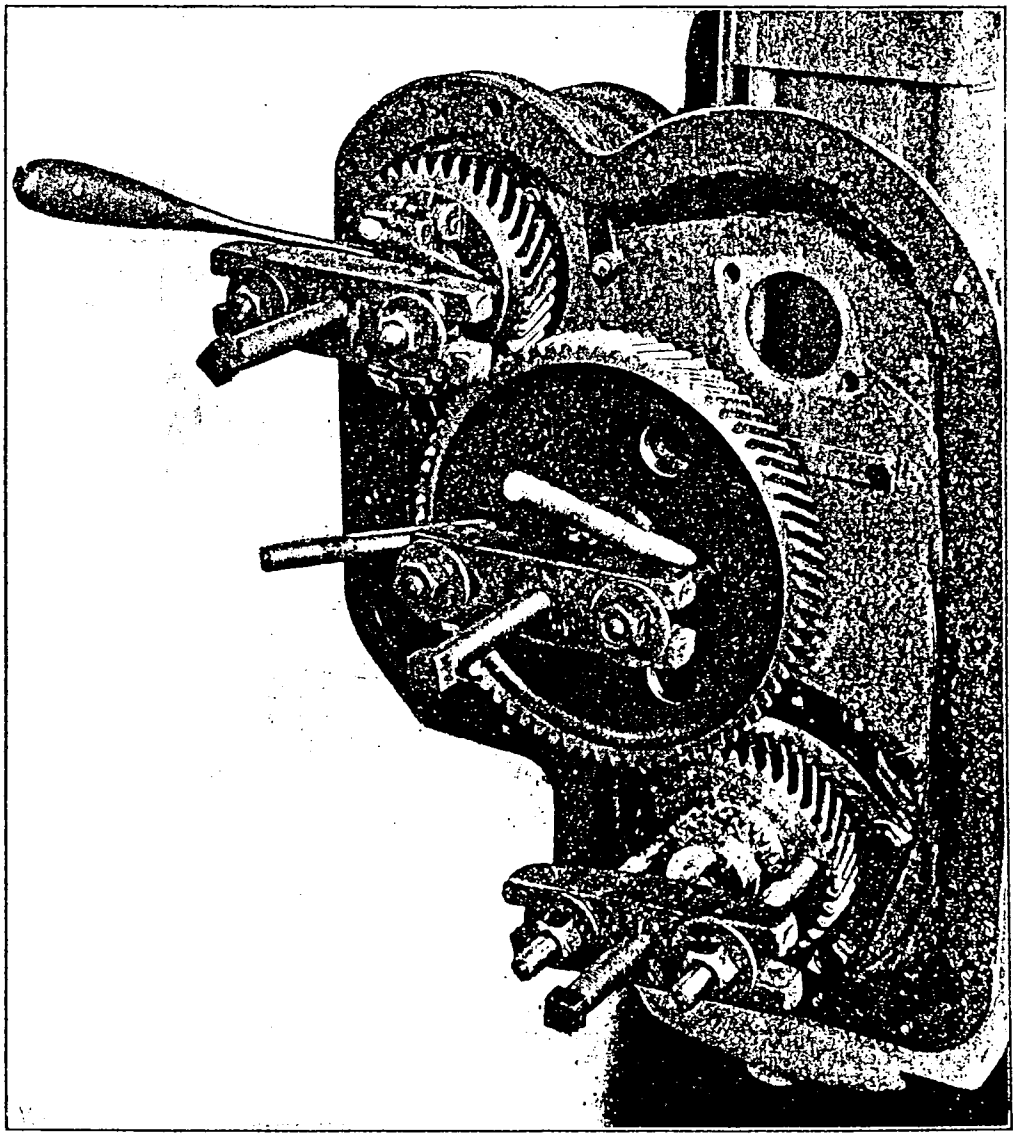
Remove governor sliding collar from end of shaft. Loosen lock on nut holding gear on shaft and use small end of spark plug wrench to remove nut. Gear is held on shaft by press fit and key, and must be pulled off.

Place heads of ½" x 5" machine bolts through holes in gear, with puller over bolts. Wedge bolt heads to one side of holes, so they will stay in place when strain is taken. Be careful not to lose key in shaft.

To remove bronze thrust washer behind accessory shaft gear, loosen locks on two cap screws holding thrust plate in place, and remove cap screws and plate. Be careful not to lose small spacer washers located between plates. Thrust washer is slotted for gear key, so will come off without removal of key.

Gear may be replaced on shaft by tapping with hammer. Do not tap hard, as blows are carried by shaft to tapered pin in pump impeller, which may shear under heavy blows.

Accessory shaft gear may also be removed from rear, by removal of ACCESSORY SHAFT ASSEMBLY.



USING SERVICEMAN'S TOOL TO REMOVE TIMING GEARS

CAM SHAFT GEAR

To remove this gear, remove TIMING GEAR HOUSING.

Loosen lock and remove nut. Use special puller.

Place heads of 5/8" x 5" machine bolts through holes in gear, with puller over bolts. Wedge bolt heads to one side of holes, so they will stay in place when pull is made.

When replacing cam shaft gear, be sure that "O" mark on rim matches with "O" mark on rim of crank shaft gear.

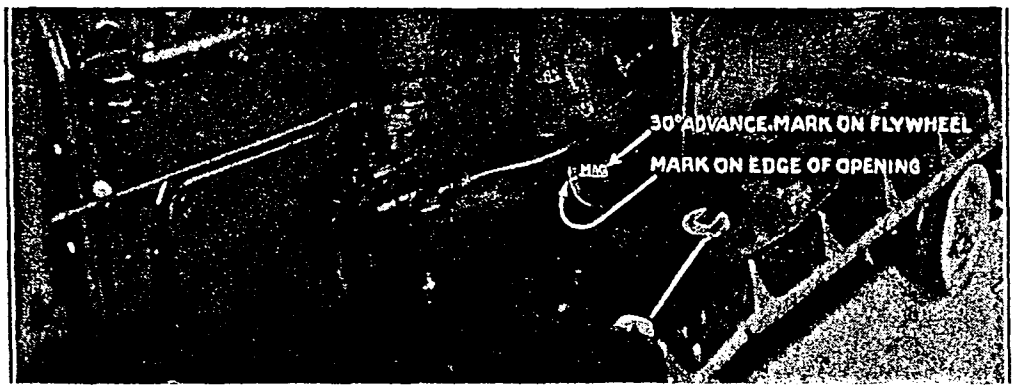
MAGNETO TIMING

Remove left hand hood side plate, rocker arm cover and cover from starter motor opening, on forward side of flywheel case, left side of engine (or remove starter, if one is on engine). Check breaker point gap, as described under MAGNETO ADJUSTMENT.

Turn crank over until piston in cylinder number one is on top center of compression stroke. Top center can be located by lining up the mark "TC 1&4," or on earlier models the mark—"C"—with the mark on the edge of the starter hole opening. The compression stroke can be determined by observing the position of the valves. The intake and exhaust valve should be closed on cylinder No. 1 and the exhaust valve open on cylinder No. 4.

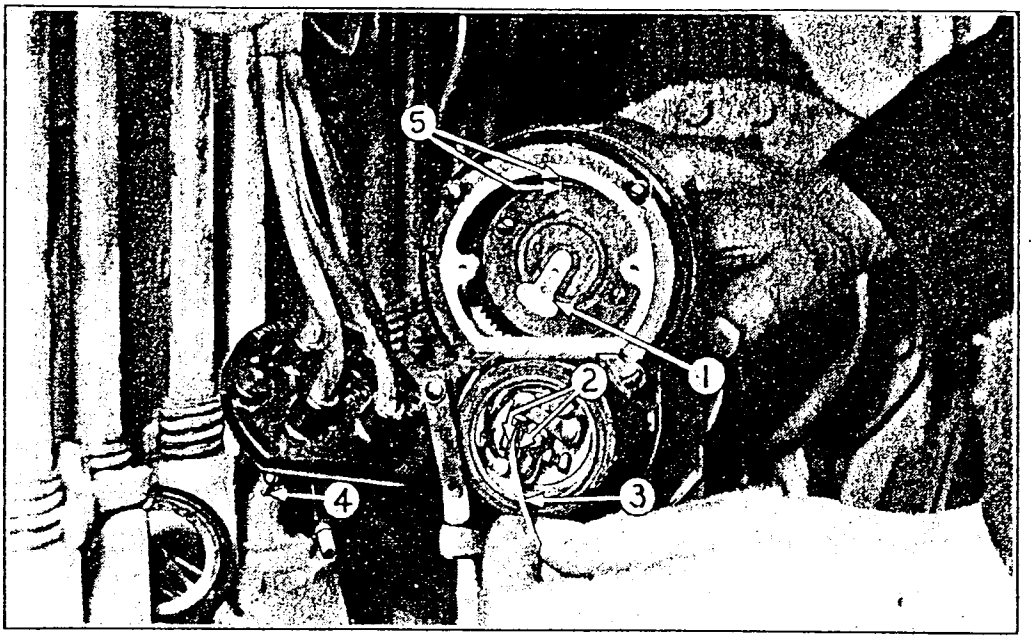
Another mark—"Mag."—or on earlier models a punch mark will be found on the flywheel 30° to the left of the first one. Depress ends of impulse starter pawls and turn flywheel by means of fan a little past this mark and then return to it. This is done to take up any backlash which might be present in the timing gears or magneto coupling. The crank of No. 1 cylinder will now be 30° ahead of top center on compression stroke which is the firing point for that cylinder. In this position the distributor disc conducting segment should be in contact with the carbon brush which is connected by wire to the spark plug of cylinder No. 1, and the breaker points should be just separating.

Check timing and if not correct loosen two screws in adjustable coupling, depress ends of impulse starter pawls and rotate magneto



FLYWHEEL AND STARTER HOLE TIMING MARKS

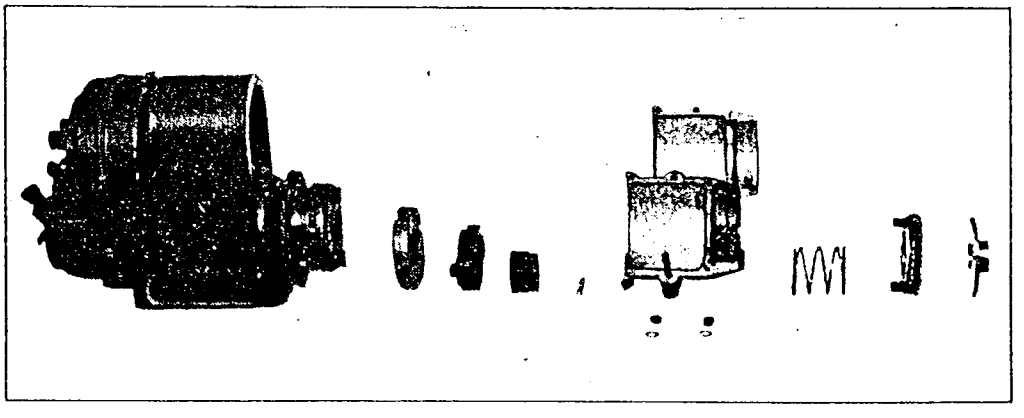
TIMING MARKS (EARLY MODELS)



TIMING MAGNETO

1—Distributor disc segment. 2—Breaker points. 3—Thin strip of paper. 4—This carbon brush connected by wire to spark plug of cylinder No. 1. 5—White line should line up with point.

armature until distributor conducting segment and breaker points are in proper position. A thin piece of paper may be inserted between the breaker points to assist in determining position when breaker points separate. When the paper can just be pulled through without tearing, the breaker points will be separated about .002". With the breaker points in this position the white line on the distributor disc should line up with the pointed screw in top inside surface of magneto housing.



MAGNETO COUPLING PARTS

IMPULSE STARTER

After magneto has been removed from tractor, remove floating disc and round nut. Retaining cup, driving cup and spring may then be removed. To replace the spiral spring slip its outer end into hook on the inside of the driving cup, insert the inner end of the spring in the notch in the hub of the magneto member, place the parts thus partially assembled between the palms of the hands and by rotating the hands, wind the spiral spring until the two projections on the driving cup engage the stops on the magneto member. TIME MAGNETO.

MAGNETO

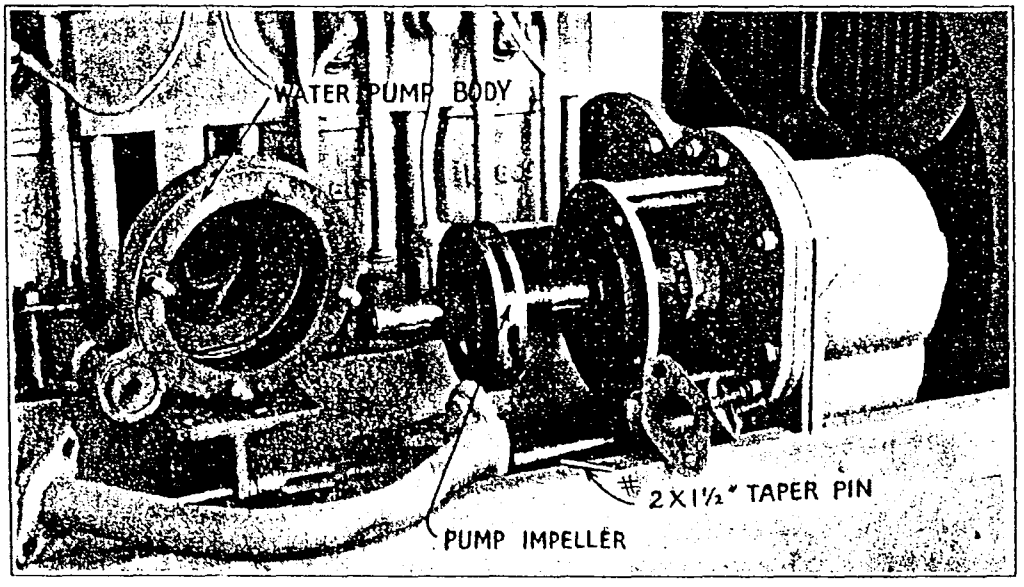
To remove the magneto, release two clamping springs on impulse starter cover, and take out two long screws that hold halves of starter cover together. One-half of cover should be removed. Disengage coupling by loosening two screws that clamp adjustable collar to knurled hub. Remove the cap screws that hold magneto to magneto bracket. Remove wires from spark plugs and cap screws which hold conduit to cylinder head. The magneto, spark plug wires, and conduit may now be removed.

WATER PUMP

To remove water pump, remove MAGNETO and drive hub, disconnect the throttle control rod from the governor control rod, remove water outlet pipe and elbow of inlet pipe and remove nuts from four studs which hold water pump body and bracket in assembly.

Loosen packing nuts at each end of water pump. Water pump body can now be removed to rear over end of accessory shaft.

To remove impeller, drive out tapered pin which extends through accessory shaft and hub of impeller. Pry impeller to rear along shaft until it clears key on shaft, after which it may be removed over rear end of shaft.



WATER PUMP IMPELLER REMOVAL

Water pump bracket may be removed next, sliding to rear along shaft. If new impeller is installed hole must be drilled and reamed for #2x1½" tapered pin.

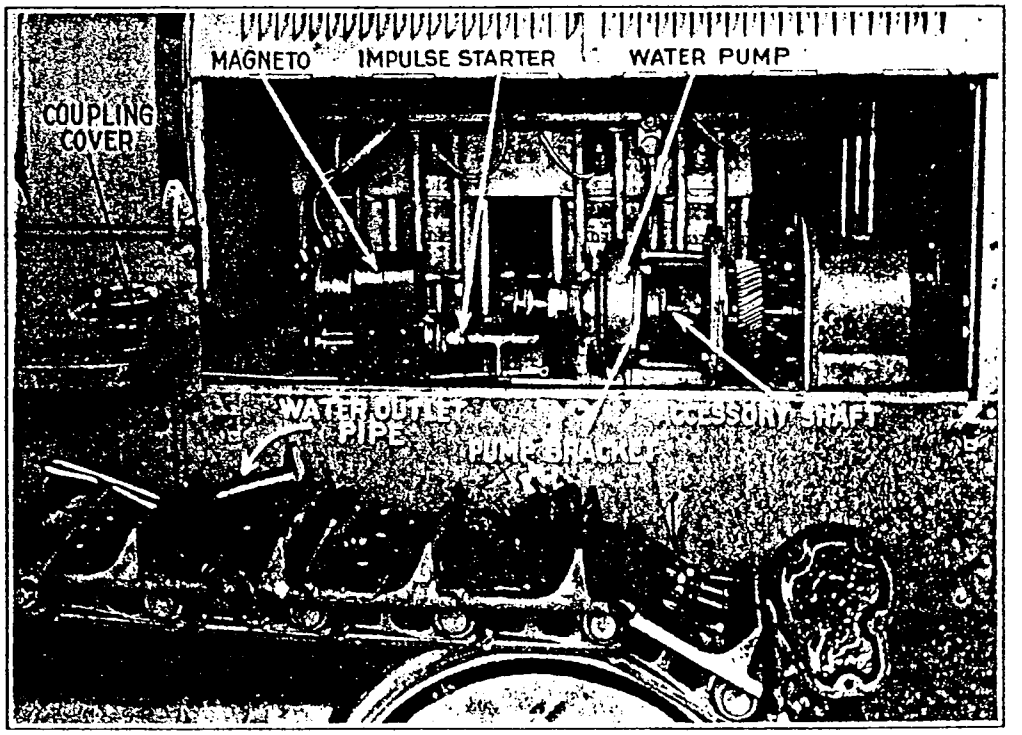
ACCESSORY SHAFT ASSEMBLY

To remove this assembly, remove MAGNETO. Disconnect throttle control rod from governor control rod.

Remove water pump outlet pipe and elbow of inlet pipe. Remove three bolts, also nuts from two studs, holding pump bracket to timing gear housing plate. Lift rear end of accessory shaft upward, outward, and rearward, revolving slightly so accessory shaft gear will disengage from cam shaft gear. Entire assembly may then be lifted out. Remove accessory shaft gear from shaft. To remove shaft from pump assembly, dis-assemble as described under WATER PUMP.

When installing new shaft, hole must be drilled for tapered pin holding impeller in place. Drill and ream for a #2 x 1½" tapered pin. Be sure that the hole is exactly the same distance from front end of shaft as is hole in old shaft.

When re-assembling, be sure to place governor sliding sleeve with oil hole on top, so that it will receive proper lubrication.



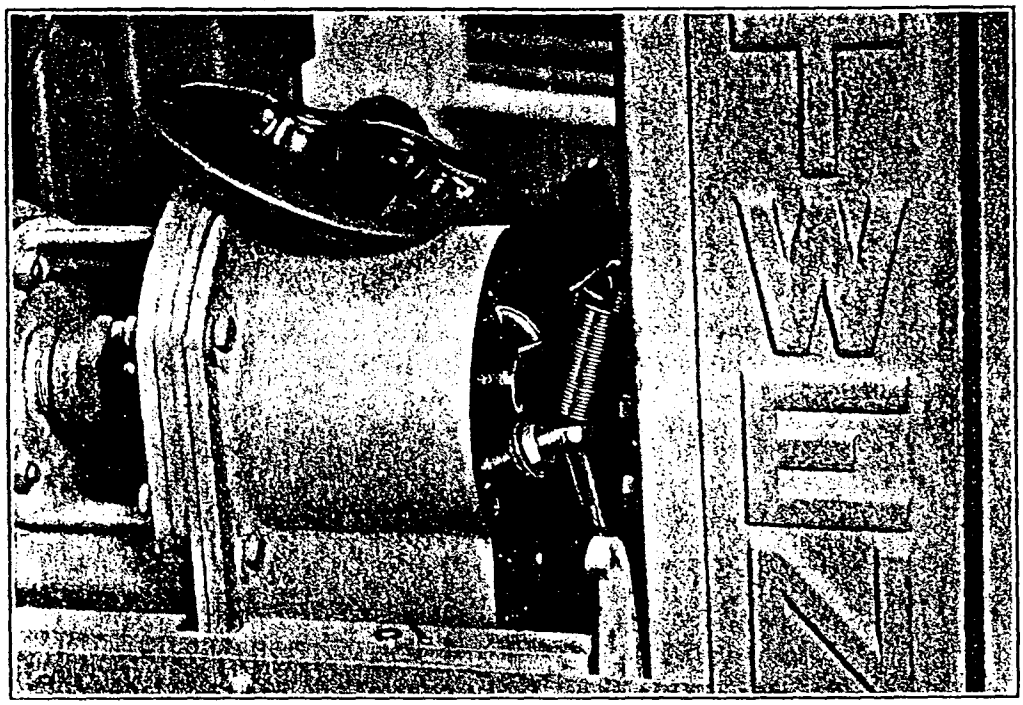
ACCESSORY SHAFT REMOVAL

GOVERNOR

The governor adjustment should not be changed unless it has been determined that the engine is not operating at rated speed. To check governed speed, count revolutions of sprocket, which should be thirty-two revolutions per minute in intermediate gear with load. Note: On tractors L-1 and PL-1 to L-1328 and PL-1669 incl. the sprocket speed should be thirty-eight R.P.M. in intermediate with load.

If adjustment should be necessary, proceed as follows: disconnect carburetor control rod from carburetor control lever on the left side of engine and disconnect governor control rod from throttle control rod on the right side of engine. Remove cover of governor compartment on timing gear housing and disconnect governor lever from spring. The adjusting rod, with spring attached, may be pulled forward until adjusting nuts, which are locked to rod, are clear of governor compartment.

The adjustment on rod is made by straightening out lock between nuts and then screwing nuts to the desired position. To increase speed, screw nuts toward governor spring, and away from it to decrease speed.



GOVERNOR ROD REMOVED FOR ADJUSTMENT

FUEL TANK

When removing tank to work on other parts of the tractor, remove tank and saddle as a unit.

To remove tank only, drain tank. Remove HOOD. Disconnect rear end of, and remove, fuel line.

Unscrew square shoulder at top of globe valve stem in fuel line, which will permit removal of valve handle.

Remove nuts from studs at each end of fuel tank bands and remove bands. Tank may then be lifted from cradle.

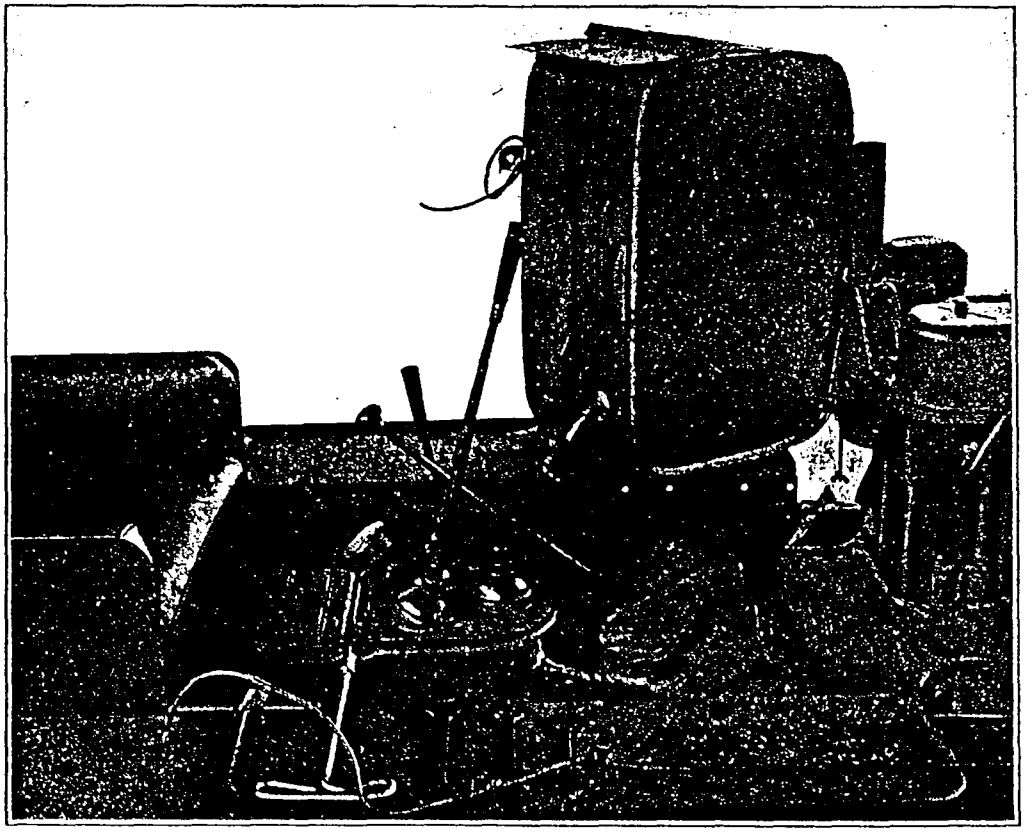
In re-connecting fuel line, be sure threads in packing nuts are started straight.

FUEL TANK AND SADDLE

To remove fuel tank and saddle, remove HOOD, disconnect grounding wire from magneto end cap and withdraw wire to rear through hole in fuel tank saddle. Disconnect both ends of oil pressure line running from bottom of oil filter to oil pressure gauge and withdraw to rear. Disconnect rear end of fuel line, remove bolt holding heat control lever to its bracket on left hand front corner of fuel tank saddle.

Remove front fender braces. Remove seven bolts at each end of tank saddle, holding saddle in place. Lift tank and saddle up and off.

In replacing, be sure that lower edge of saddle is placed between the upper edges of rear engine plate and front floor plate.

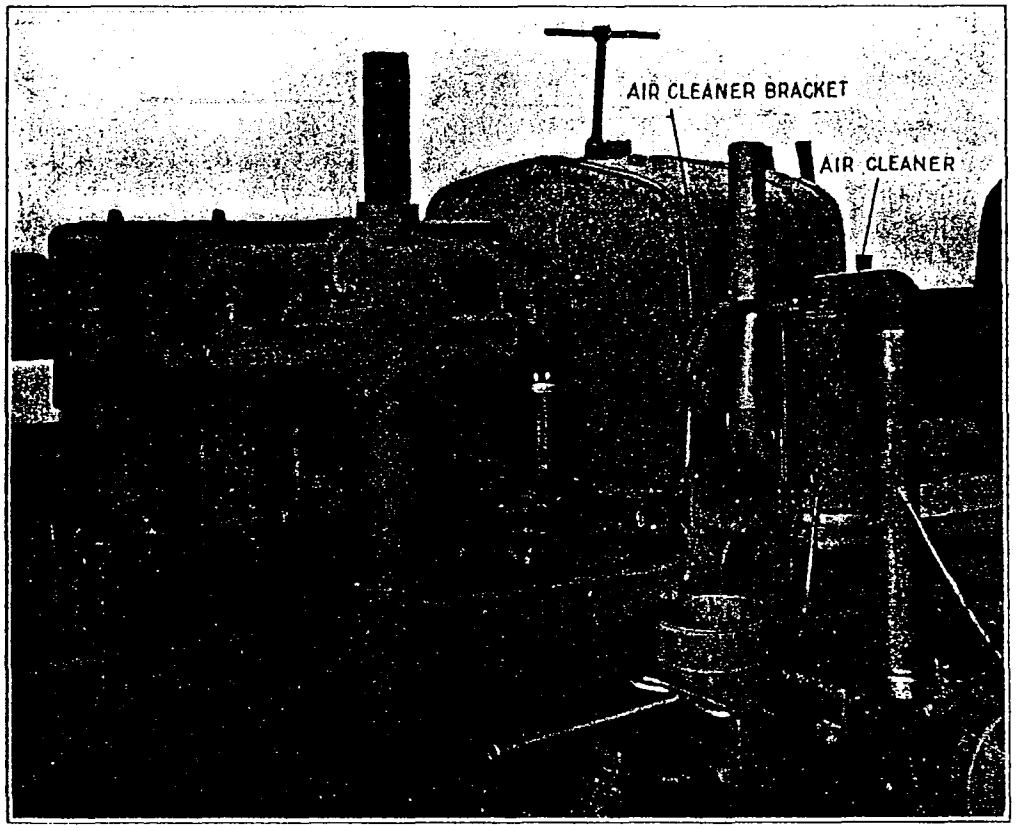


FUEL TANK AND SADDLE REMOVED

AIR CLEANER

To remove air cleaner, remove HOOD, remove oil container from bottom of cleaner, remove two cap screws holding bottom of cleaner to breather base (3/8" T handle wrench) and remove nut holding top support of cleaner to cylinder head (5/8" T handle wrench).

Lift cleaner straight up and off, slipping outlet pipe out of rubber hose.

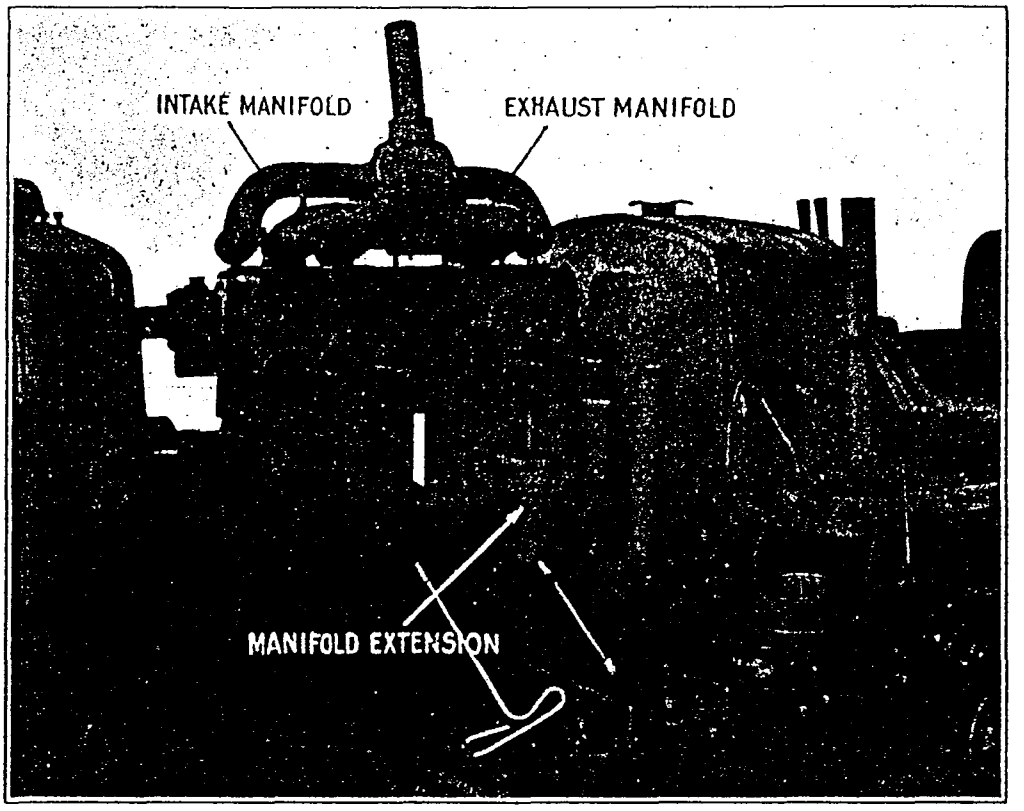


AIR CLEANER REMOVED

MANIFOLDS

To remove manifolds, remove HOOD and AIR CLEANER. Remove heater control upper rod.

Disconnect front end of fuel line from carburetor. Remove four 3/8" nuts holding manifold extension to bottom of manifold, and allow carburetor and manifold extension to rest on oil level gauge. Remove four 1/2" nuts from studs holding manifolds to cylinder head. Withdraw manifold from studs.



MANIFOLDS REMOVED

CYLINDER HEAD—PUSH RODS—TUBES

To remove cylinder head, remove MANIFOLDS.

Remove rocker arm cover, held in place by four nuts. Should gasket stick to cover, loosen it carefully so that gasket remains on head.

Remove rocker arms, disconnect oil line connections, and remove two nuts holding each rocker arm assembly to cylinder head. Remove push rods. Remove two cap screws holding ignition wire conduit to cylinder head. Remove four cap screws holding radiator inlet pipe to head and to radiator. Be careful not to drop thermostat. Remove cap screw holding oil feed line to right hand side of cylinder head.

Remove twelve 5/8" nuts from studs holding cylinder head and cylinders to crank case. Pry each end of head up, to loosen it from gaskets on cylinders. When head has been raised about 1/2", remove push rod tubes, springs and washers.

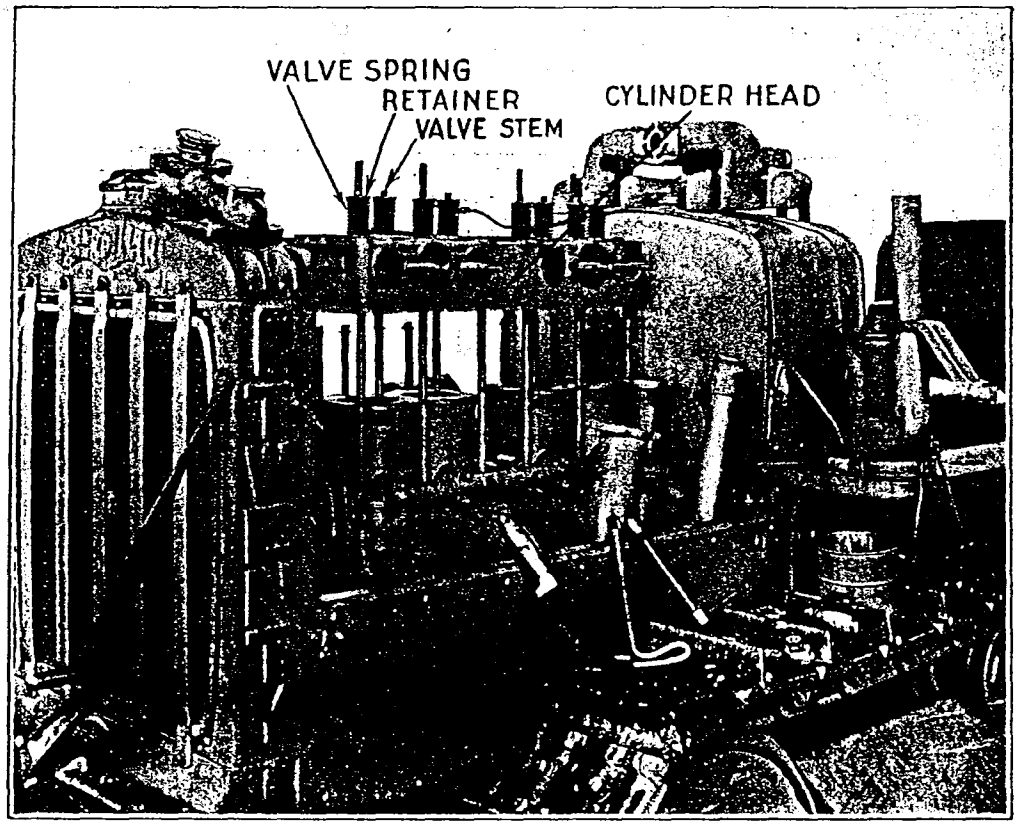
Lift head up and off.

In each gasket, there is only one water hole for each cylinder, while in the cylinder and head there are several openings. These extra open-

ings are only for use in coring these castings. Do not cut additional holes in the gaskets. To do so will cause improper water circulation and may cause engine to heat.

Replace all cylinder head nuts finger tight, then tighten them uniformly, giving one turn of wrench to each nut in succession, until all are tight.

After rocker arms are replaced, ADJUST VALVE CLEARANCE.



REMOVING CYLINDER HEAD

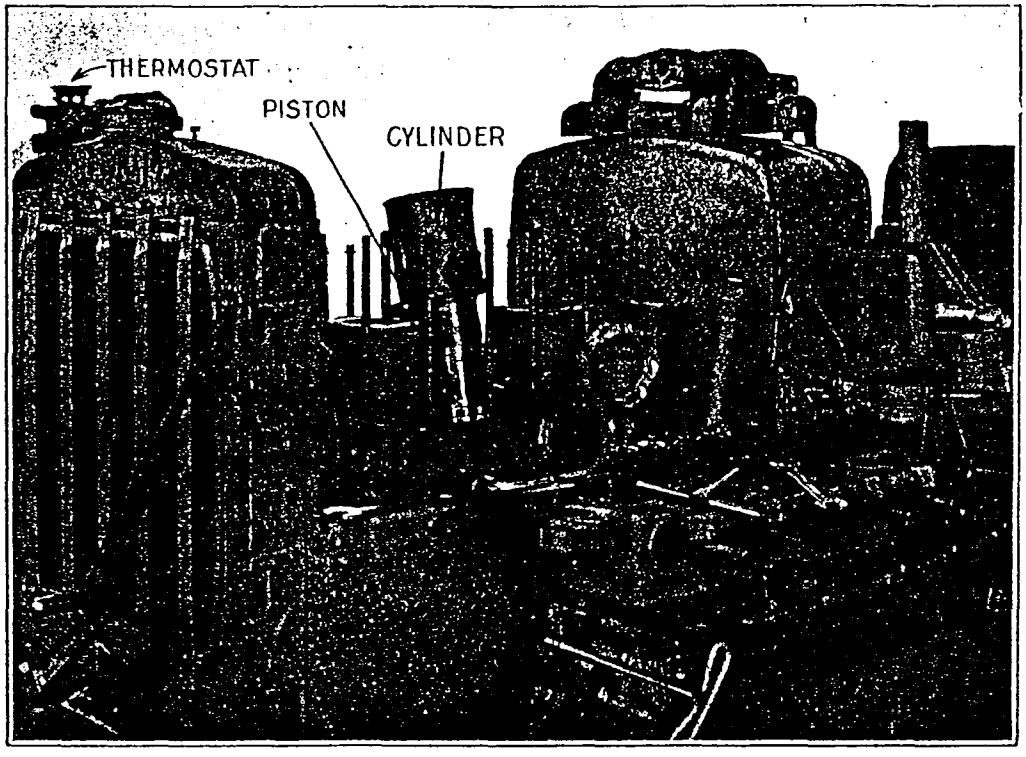
CYLINDERS

To remove cylinders, remove CYLINDER HEAD. Remove lower water manifold, on left side of cylinders. The cylinders may then be lifted out one at a time.

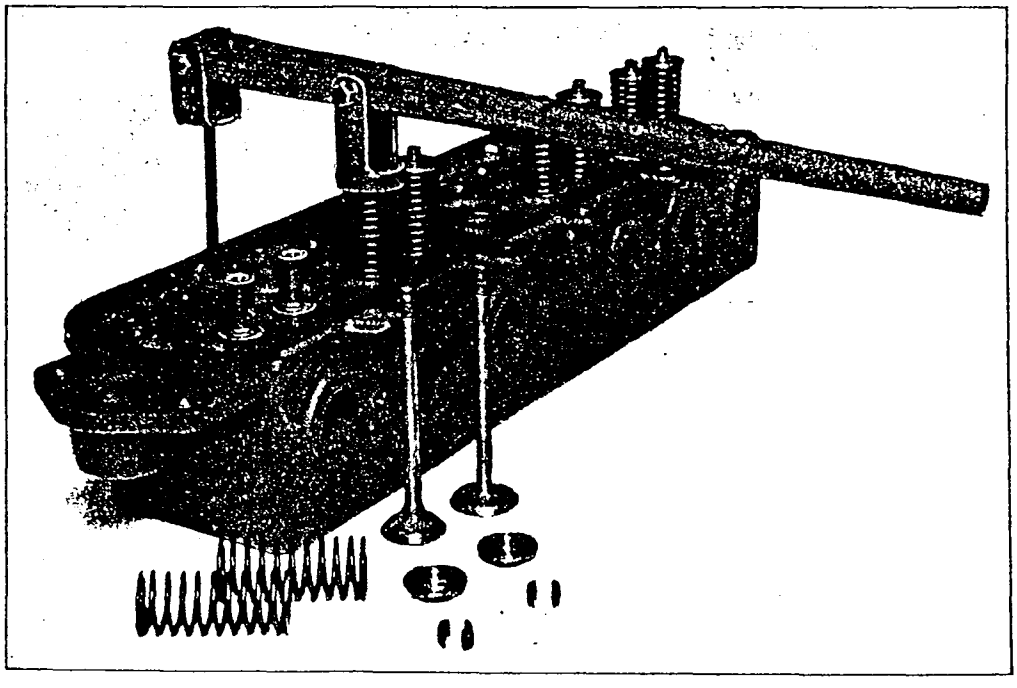
VALVE SPRING AND VALVE

To remove valve spring and valve, remove CYLINDER HEAD. If valve spring remover is not available, jaws of monkey-wrench in tool equipment can be used to depress spring so that valve spring retainer locks can be removed.

Remove cotter pin from each valve stem. Be sure to replace these pins when valves are replaced.



REMOVING CYLINDER



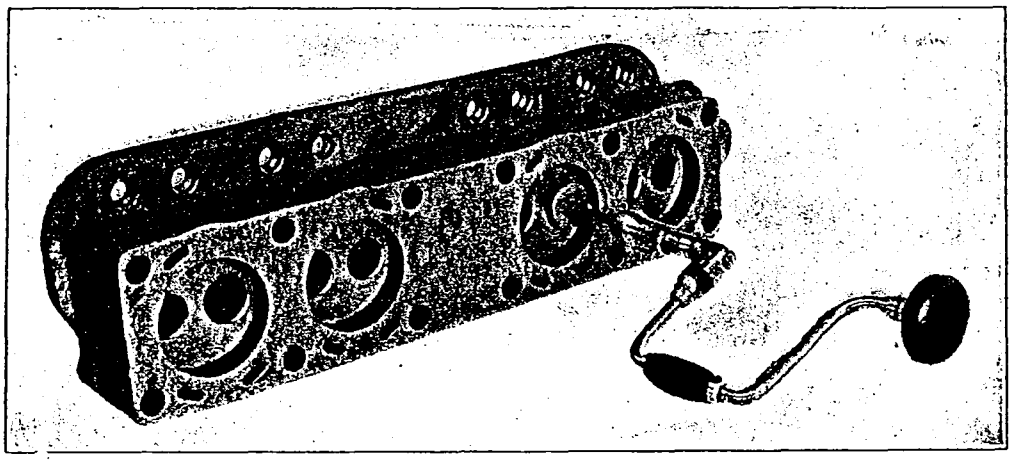
REMOVING VALVE SPRINGS AND VALVES

VALVE GRINDING

Remove CYLINDER HEAD and VALVE SPRINGS.

Place a small coil spring between valve head and valve guide to hold valve about ½" away from cylinder head.

Use valve grinding tool, furnished with tool equipment, in a carpenter's brace.



VALVE GRINDING

Use a good grade of grinding compound, and rotate valve first in one direction and then the other, allowing spring to lift valve from its seat at each change of rotation. Grind until all spots have been removed and a smooth seat has been obtained on both valve and seat. This can be checked, after valve and seat have been thoroughly cleaned, by placing about eight pencil marks equally spaced around face of valve and of seat, and then rotating valve in seat about one-quarter of a turn. If these marks rub out evenly, valve may be considered properly ground. It is advisable to use a finer grade of grinding compound for finishing to obtain a better and smoother seat. Wash all parts thoroughly with gasoline and lubricate valve stems before assembling. Be sure that valves are assembled in seats in which they were ground.

If new valve stem bushings are used, they must be reamed to fit valve after they have been pressed into place. It will be noted that the valves are marked 1 to 8, from front to rear, and that the valve seats are marked on the cylinder head to correspond. When grinding, valves should be kept in this order.

It is not advisable to use valve reseater except as a last resort.

VALVE LIFTERS

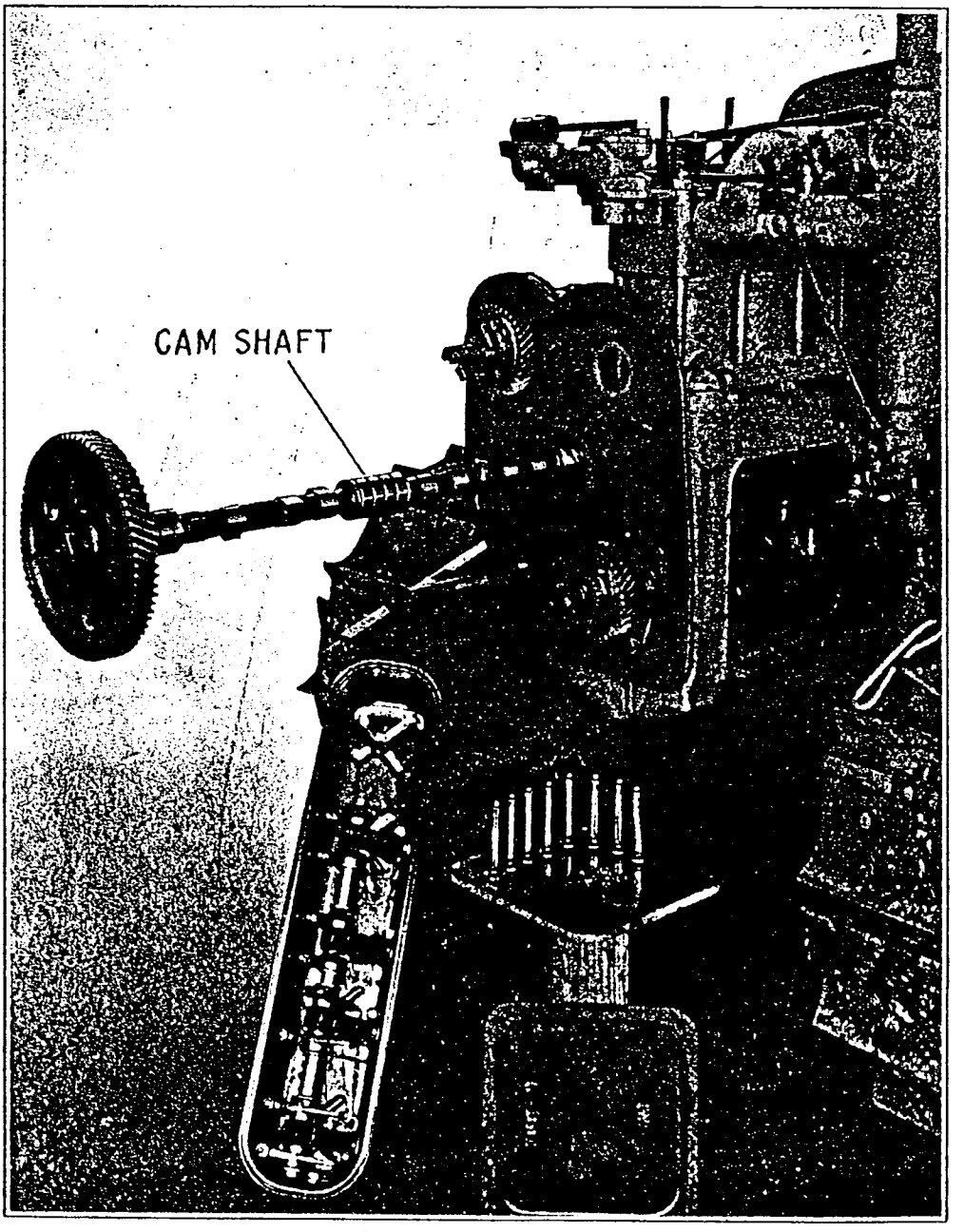
To remove valve lifters, remove CYLINDER HEAD and PUSH ROD TUBES. Remove nut holding valve lifter guide yoke. Guides and valve lifters may then be withdrawn.

Dirt should be thoroughly cleaned away from around guides before they are removed.

CAM SHAFT

To remove this assembly, remove TIMING GEAR HOUSING.

Loosen locks and remove four cap screws which hold cam shaft thrust plate to front of crank case. These cap screws are reached through hole in cam shaft gear, using ⅜" T handle wrench. Timing gears may be revolved by using pinch bar in starting crank jaw. When these four cap screws are removed, cam shaft may be drawn forward about ½". Remove rocker arms to take pressure from valve lifters. Remove air cleaner oil container and both left hand crank case side covers.



CAM SHAFT REMOVAL

The cam shaft can be withdrawn a little at a time, revolving it so that the cams face downward as they pass the various valve lifters, which will have to be lifted one at a time with the fingers to permit the cams and the oil pump gear and center and rear cam shaft bearings to pass.

All cam shaft gears are marked with an "O" on the rim in the same place relative to the keyway. When installing new gear or shaft, be sure this mark is on outer face of gear.

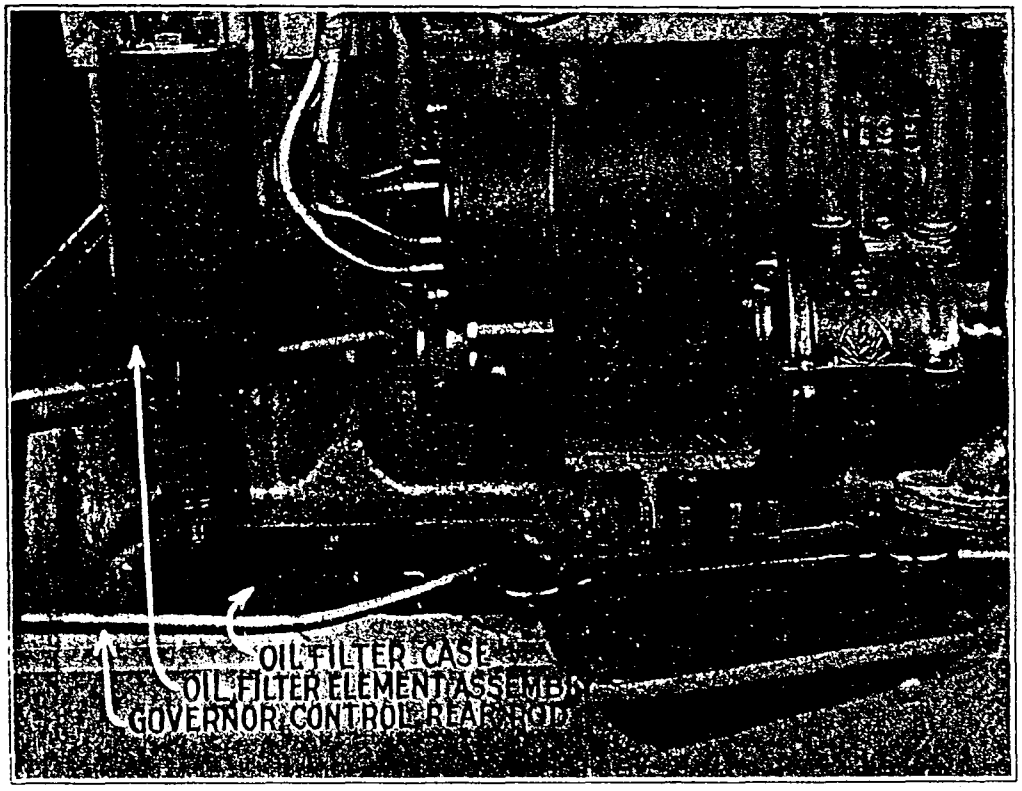
Cams are so located that exhaust valve closes 10° past top center.

The valve lifters and cam shaft may be replaced by reversing the above operations. The valve lifters should be inserted one at a time, just ahead of the end of the shaft as it is moved into place.

OIL FILTER

Applicable to Tractors below L-1732 and PL-3217

To remove oil filter, remove left hand hood side plate and left hand rear crank case side cover. Loosen locks and remove cap screws holding oil pump to oil filter. Remove right hand hood side plate. Disconnect and remove throttle control rod. Disconnect oil line leading from bottom of oil filter to pressure gauge. Remove six cap screws holding oil filter to crank case. Filter may now be lifted off.



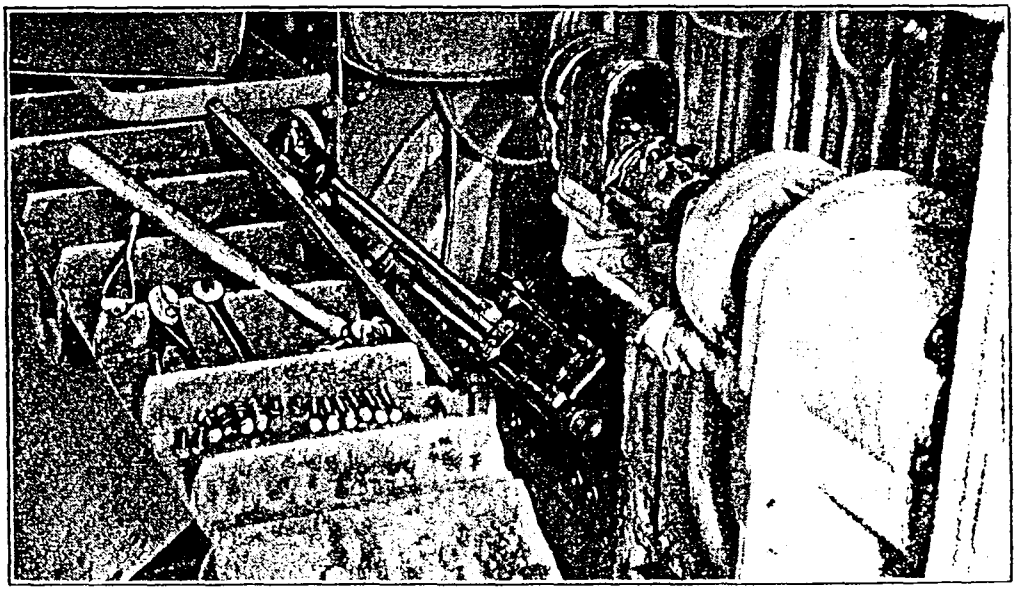
Oil Filter Element Removed
(Applicable to tractors below L-1732 and PL-3217)

OIL PUMP

To remove oil pump, remove left and right hood side plates. On tractors equipped with oil filters removal of pump and filter will be facilitated by running left hand track onto a 6" block to raise front of engine. Remove left hand front and rear side covers. Remove cap screw in rear of oil pump suction tube and two nuts which secure clamp on front end of tube. Lift out clamp and pull rear end of tube to left away from oil pump.

Disconnect and remove throttle control rod. Disconnect pressure gauge oil line from bottom of right rear cover and disconnect center crank shaft bearing oil line from right hand side of case. Turn crank shaft so rear connecting rod bearing is about 30° from bottom left side of case. Remove six cap screws holding right rear side cover to case and cover or filter and pump may be lifted out by tipping to right.

On tractors below L-362 remove oil filter. Oil pump may then be lifted out. Check oil pressure after pump is replaced.



OIL PUMP REMOVED

OIL PRESSURE ADJUSTMENT

Remove left rear side door of crank case. Oil pressure adjustment is made by turning a knurled nut near bottom of crank case on front side of oil pump. Turning nut clockwise increases pressure; anti-clockwise decreases pressure. Adjustment should not be changed until it has been very definitely determined that any change in reading of oil pressure gauge is not caused by broken oil line, loose bearings, dirty oil filter elements, etc.

Note that in cold weather, oil gauge may not register for a few minutes until oil line from filter to gauge is warm; also that gauge pressure will be higher when oil is cool and thick than when it is thoroughly warmed up.

Gauge should read 25 lbs. to 28 lbs. when engine is thoroughly warm.

In base of oil filter on tractors so equipped is located a by-pass valve, which will function if neglect of oil filter elements allows them to become so clogged that they will no longer allow oil to pass. This by-pass valve is set at the factory at a pressure five pounds higher than that normally required to force oil through the filter. It should never need any attention, and no attempt should be made to change its adjustment without first consulting the dealer's Service Department.

CONNECTING ROD BEARING ADJUSTMENT

Connecting rod bearings should be inspected and tested for wear after each ninety days of tractor operation. Bearings should be tested when warm so that oil is thin. Bearings of a force feed lubricated engine should not be adjusted tight. The connecting rod bearings should have at least .003" clearance, and never more than .012".

The same number of shims should be removed from each side of the bearing. When shim is removed, file babbitt tips level with remaining shims.

When it becomes necessary to renew a bearing, the connecting rod and cap should be sent to dealer for re-babbitting, as he is equipped to re-bore the bearing at exact right angle to the cylinder bore. These bearings are bored round, and should require no scraping during re-assembly in the engine. In an old engine in which the crank shaft has been re-ground, accurate record should be kept of the new size of the crank pin bearings so that the connecting rods can be properly re-bored to fit. Be sure that the connecting rods and caps are re-assembled on the proper bearing. Rods and caps are numbered from 1 to 4. Numbers are stamped on left side of bearings.

CONNECTING RODS AND PISTONS

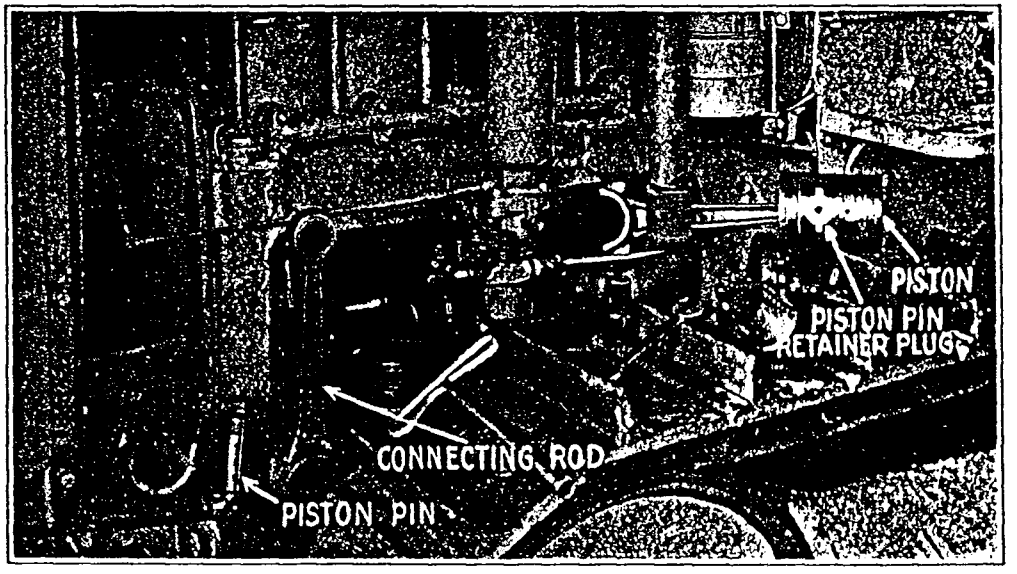
To remove connecting rods and pistons, remove left hand hood side plate and left hand crank case door opposite rod and piston to be removed.

If rod No. 3 or No. 4 is to be removed, remove carburetor manifold extension and air cleaner outlet elbow. Remove cotter pins and nuts from connecting rod bolts, using double opening socket wrench. Remove lower half of bearings, including bolts. Revolve crank shaft until bearing stands in front of door. Pry end of connecting rod off of crank shaft and pull rod toward but not through door. Turn crank shaft until crank pin is on side away from door. Rod and piston No. 3 or No. 4 may be removed intact by lowering rod into bottom of oil sump, revolving it so that it will pass edge of sump.

Rod and piston No. 1 or No. 2 will have to be dis-assembled. Lower until aluminum plug in side of piston is visible below bottom of cylinder. Insert heavy nail or small rod through hole in center of one plug, and drive opposite plug out of side of piston. Piston pin may then be withdrawn. Should it be too snug to pull out with fingers, turn piston around, drive out other plug, and tap pin out. Be careful not to mar inside of bronze bushing in upper end of rod, nor pin bearing in piston. After piston pin is removed, push piston back into cylinder far enough to clear top of connecting rod, and remove rod. Withdraw piston after connecting rod is removed.

When replacing rods, be sure that each goes in the right position, and always place numbers on left side of bearing. Be sure to replace the same number of shims that were removed, unless bearing is being adjusted.

In replacing piston, place rings so that openings in the rings are staggered around the piston. Oversize pistons may be obtained from your dealer. To install oversize pistons supplied by the factory to the dealer, the cylinder must be reground to 4.030" diameter.



CONNECTING ROD AND PISTON REMOVAL

PISTON RINGS

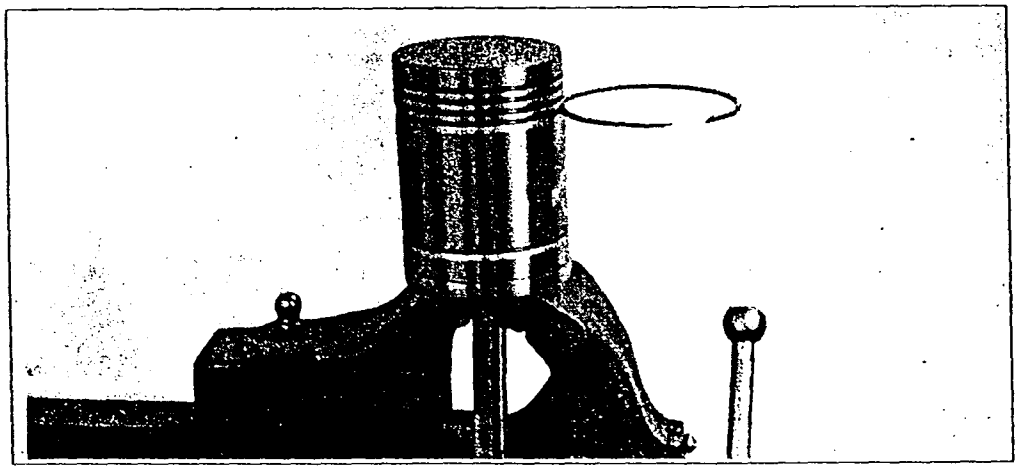
To remove piston rings, remove PISTON. Rings may be removed from piston by using four strips of steel 1/16" thick x ½" x 6" long. Pry top ring out of groove at lap. Insert steel strips between next ring and piston, distributing them equi-distant, after which ring can be slipped off without dropping into top groove. The rest of rings may be removed similarly. When replacing, install bottom ring first, sliding it down over steel strips until it is over its groove. Then withdraw strips, allowing ring to drop into groove. If old rings are being replaced, do not mix them; return each ring to its original groove.

Fitting new piston rings requires care and accuracy. The three most important points to be considered are: fit of ring in cylinder, to obtain proper lap clearance; fit of ring in piston groove; and, fit of ring on piston when compressed to enter cylinder.

Ring should be fitted near bottom of cylinder as a cylinder that has worn will be smaller near bottom than near top.

To fit ring for lap clearance, enter it squarely in cylinder. If it will not enter, file a small amount from ends and try it in cylinder again. Repeat this until ring can be entered squarely and show a gap of .007" for lower ring, graduating up to .014" for top ring, as top ring will get hottest and expand most. Be careful not to file off too much at one time. When fitting rings from bottom of cylinder, a small hand mirror will be a great aid in determining lap clearance.

The ring grooves in piston should be thoroughly cleaned. This can be done with a piece of fine (No. 000) sandpaper on a square stick. Never use emery cloth or a file. A scraper made of a broken piston ring is the best way. Be careful not to damage sharp edges of grooves. Roll ring around groove to which it is to be fitted to be sure that it does not bind at any point. The clearance between side of ring and groove should not exceed .002". In case ring is too wide, which rarely happens, it is best to secure a new one. The ring can, however, be thinned down evenly, if care is taken, by rotating it on a flat surface, using a mixture of fine carborundum and oil as a grinding medium. Or a piece of fine emery cloth



FITTING PISTON RING TO PISTON

tacked on to a flat board can be used. Press down evenly all around. Wash ring thoroughly in gasoline or kerosene before trying it on the piston.

Oversize piston rings may be obtained from your dealer.

PISTON PINS

To remove piston pins, remove PISTONS.

If several pins are removed at the same time, be careful that they are returned to the same pistons from which they came.

Oversize pins may be obtained from your dealer. When they are installed, the bearings in connecting rod and piston should be reamed to 1.5075" diameter.

To test piston pin bearings for looseness, place piston on its head; hold one finger inside piston so it touches both piston and connecting rod, and try to rock connecting rod. Finger will detect any looseness. Side play should not be mistaken for looseness.

CRANK SHAFT BEARING ADJUSTMENT

Crank shaft bearings should be inspected and tested for wear after each ninety days of tractor operation. Bearings should be tested when warm so that oil is thin. Bearings of a force feed lubricated engine should not be adjusted tight. The crank shaft bearings should have at least .003" clearance and never more than .012" clearance.

When a bearing is found which has more than .012" clearance, remove cap and take out as many shims as is necessary to secure a minimum clearance of .003". The same number of shims should be removed from each side to keep bearing square. When shims are peeled off, file babbitt tips level with remaining shims.

When it becomes necessary to renew all main bearings, the caps and cradles should be sent to the nearest dealer for rebabbitting and reboring. The bearings when thus rebored are round and should require very little scraping during reassembly in engine. When the renewal of one or two main bearings is required, it will be necessary to scrape the rebabbitted bearings into line with the remaining bearing or bearings.

When the crank shaft of an old engine has been reground, an accurate record should be kept of the new size so that the babbitt bearings can be rebored to fit.

CRANK SHAFT BEARING

To remove crank shaft bearing, disconnect oil line from top of bearing. Be careful not to put a short bend in any oil line. Remove cotter pins and nuts from studs holding bearing cap in place. When rear bearing is removed, remove one cap screw from rear side of bearing cap. Oil line to rear bearing is short and stiff, therefore, its lower end should also be loosened. Lift off bearing cap. When center bearing cap is removed, mark it plainly so that it will be replaced in same position; i. e., with same end front.

Revolve shaft, pressing down on one edge of bottom half of bearing, which will revolve to a position on top of shaft, where it may be lifted off. If only one bearing is to be removed, it may be necessary to loosen other bearings before lower half can be removed. When removing lower

half of front or center bearing, be sure to mark so it will be replaced in same position; i. e., with same end front.

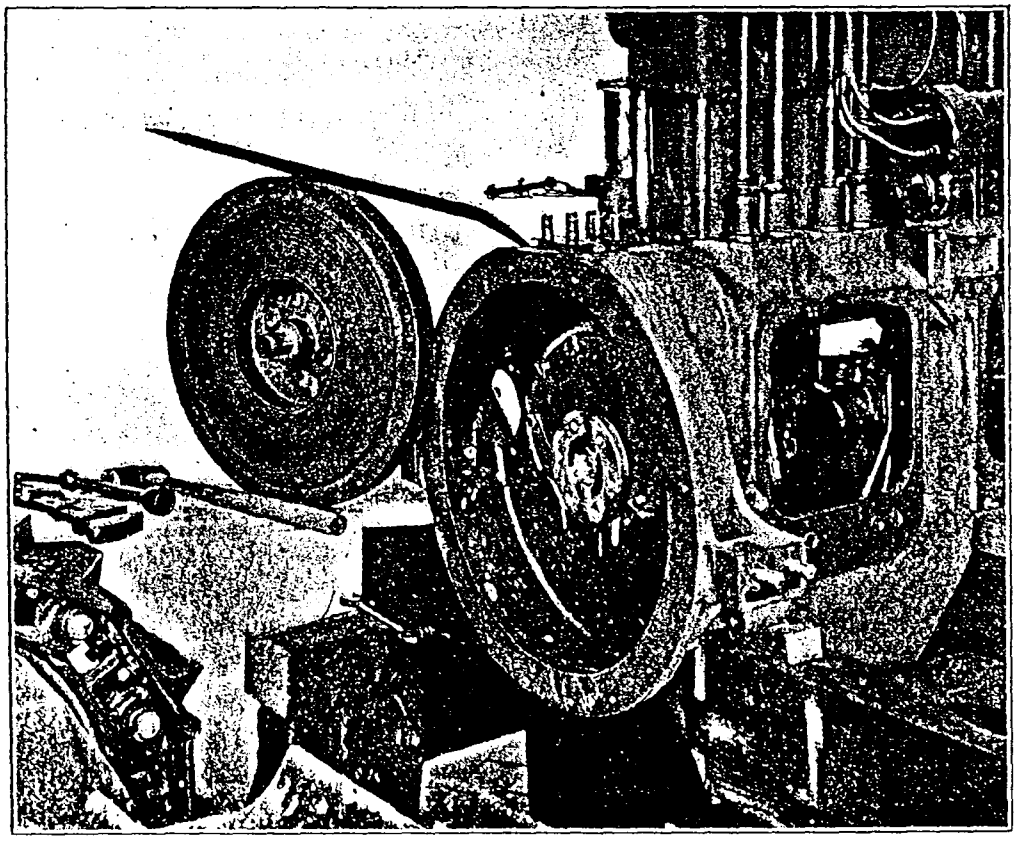
When replacing bearings, be sure same number of shims are used as before, unless bearing is being re-adjusted.

FLYWHEEL

To remove flywheel, disconnect CRANK CASE and TRANSMISSION CASE, and remove FLYWHEEL CLUTCH.

Remove three cap screws holding starter cover to left side of flywheel compartment. (Or remove starter if installed.) Loosen locks and remove six cap screws holding flywheel to rear end of crank shaft. Insert pinch bar through starter opening, and pry between front side of flywheel and crank case. Hold flywheel so it does not fall from crank case when it loosens from crank shaft. Tip top of flywheel to rear to get a good hand hold, and lift out.

Flywheel must be replaced in same position on crank shaft as before removal, otherwise the timing marks on the flywheel will not be in proper relation to the crank shaft and the engine cannot be timed properly by their use. On one edge of front face of flywheel a small "O" is stamped. Replace flywheel so this "O" is visible over lower edge of starter hole when front and rear pistons are at top center.



FLYWHEEL REMOVED

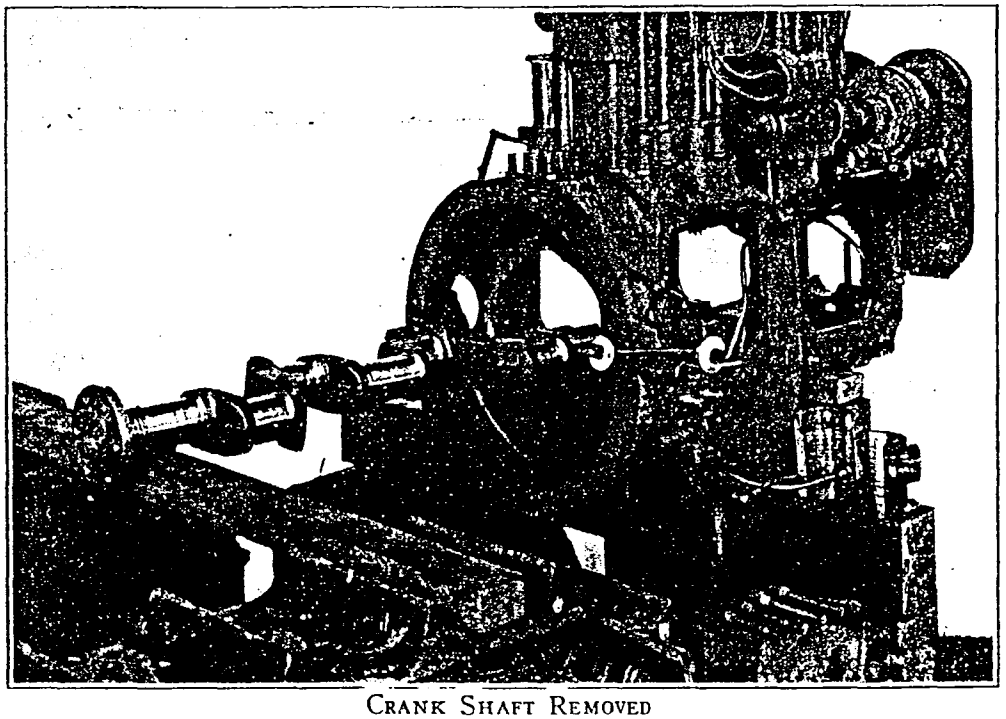
CRANK SHAFT

Extra material required if chain block is not available:

1 screw jack. 1 block 3" x 4" x 36".

12 blocks 4" x 4" x 18" in addition to those required in disconnecting crank case and transmission case.

To remove crank shaft, disconnect CRANK CASE and TRANSMISSION CASE. Remove FYWHEEL CLUTCH.



CRANK SHAFT REMOVED

Before radiator is removed, rear end of crank case should be supported by a 3" x 4" x 36" block placed in slot in bottom of crank case which normally holds equalizer spring, and securely supported at each end. This is necessary because with radiator removed, rear end of engine will overbalance front end, when supported by blocks under oil sump used when disconnecting cases. With this block in position, raise front end of crank case until blocking under oil sump can be removed; then lower until engine is level. See that all blocking is secure.

Remove CRANK SHAFT GEAR and thrust washer; PISTONS, CONNECTING RODS, CRANK SHAFT BEARINGS and FLYWHEEL.

Loosen locks and remove eight cap screws holding crank case rear end cover. Remove rear and center crank shaft bearing studs. Place two nuts on upper end of stud, and with two wrenches draw them tightly together. With wrench on each nut, to keep them from slipping, pull on lower nut to loosen stud. After stud is loosened, one wrench may be used to remove it.

Crank shaft may then be withdrawn to rear.

In replacing crank shaft bearings, be sure same number of shims are used as were in bearing before removal, unless bearing is to be adjusted for wear. Always have same thickness of shims on each side.

CRANK CASE—TRANSMISSION CASE

Special equipment needed:

12 4" x 4" x 18" wooden blocks.
3 2" x 4" x 84" wooden blocks.
1 2" x 4" x 28" wooden block.
4 2" x 4" x 12" wooden blocks.
4 1" x 4" x 12" wooden blocks.
1 heavy jack or 1-ton chain block.

A screw jack is better than ratchet jack, as it can be regulated more exactly.

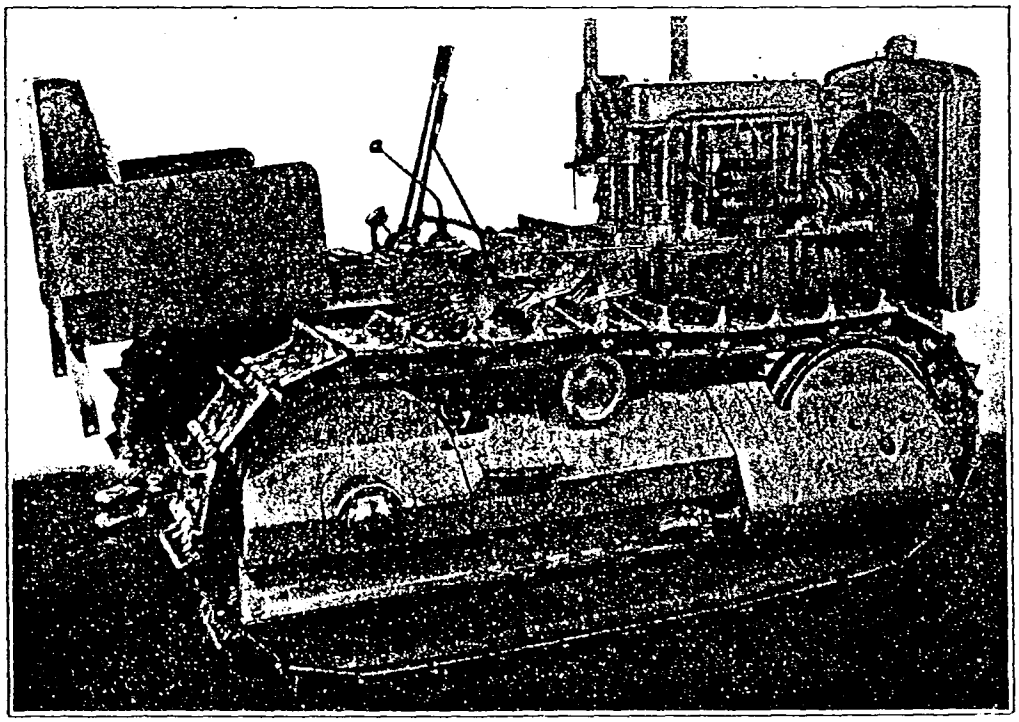
To separate crank case from transmission case, remove HOOD, hood side plates, engine lower guard plates, FUEL TANK and SADDLE and track FENDERS. Tractor will then appear as illustrated.

With long bar or jack under end of equalizer auxiliary spring, raise spring until strain is removed from spring shackles. Remove pins holding shackles to their brackets. Remove nuts from bottom of equalizer spring clips. Raise engine until clips and three upper leaves of spring can be removed.

Place 4" x 4" x 18" blocks in crib shape under crank case, just ahead of equalizer spring. If working on soft ground, two 2" x 12" planks should be used to give a solid foundation.

Place a block behind each track, so tractor cannot roll backward while engine is being raised and blocked.

Place 2" x 4" x 28" block under transmission case and on top of track roller frame diagonal braces. Build block cribbing up as engine is raised, to avoid damage in case the jack slips.



READY TO SEPARATE CRANK CASE AND TRANSMISSION CASE

Securely block engine and transmission case in position illustrated, so that lower rear edge of crank case is high enough to pass over top of equalizer spring, when spring is moved to rear with track roller frames and transmission case. Use 2" x 4" x 84" pieces to brace engine at either side, so that it will not tip sidewise when disconnected from transmission case.

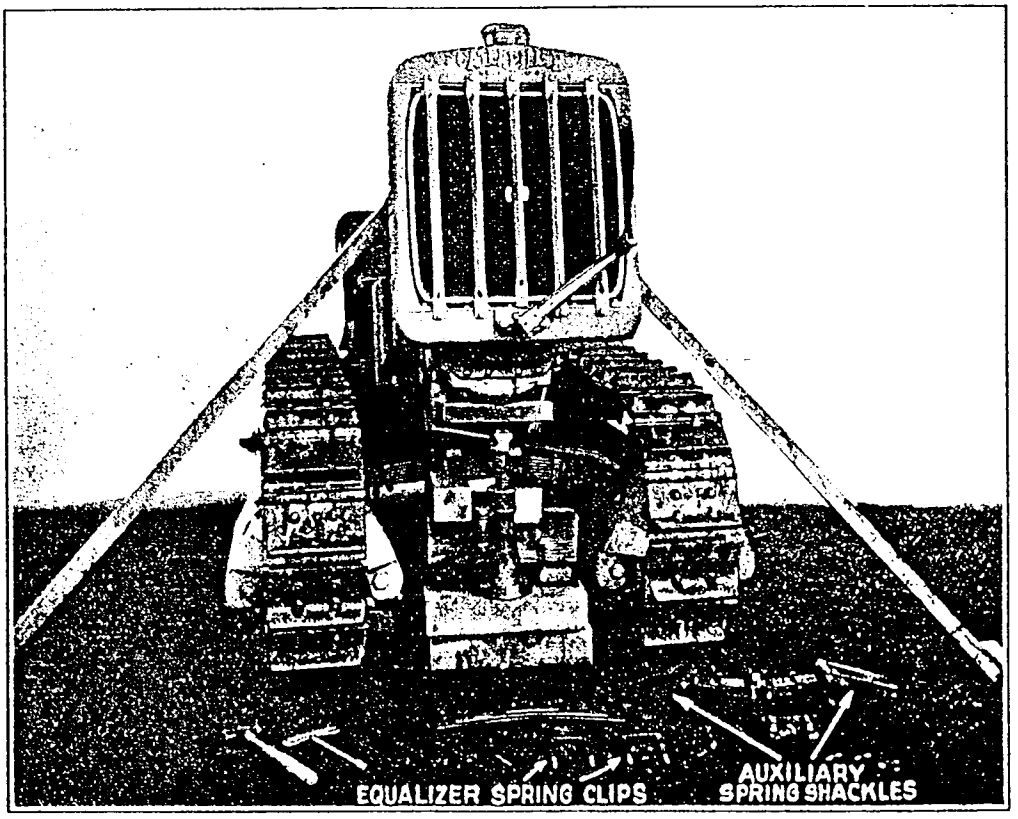
If chain block is used to raise engine, wooden blocking should be used to hold it in position afterward. In passing lifting chain around engine, be sure to use blocks at sides of crank case to protect magneto and manifolds from damage.

When engine is raised and blocking is all in position, loosen and remove ten bolts and four cap screws holding crank case and transmission case together. Remove bolts from bottom half first, then bolts and cap screws from top half.

Remove grease cup and brass hex nut from upper end of flywheel clutch shifter fork collar grease tube, and tap end of tube so it drops into transmission case.

Insert third piece of 2" x 4" x 84" or similar long pry behind boss on side of front end of transmission case, and force track to rear, carrying transmission case with it. Good holds can be secured by alternating between two sides of tractor.

The flywheel clutch is connected to front end of upper transmission shaft by a toothed coupling which will withdraw as cases separate. Be-

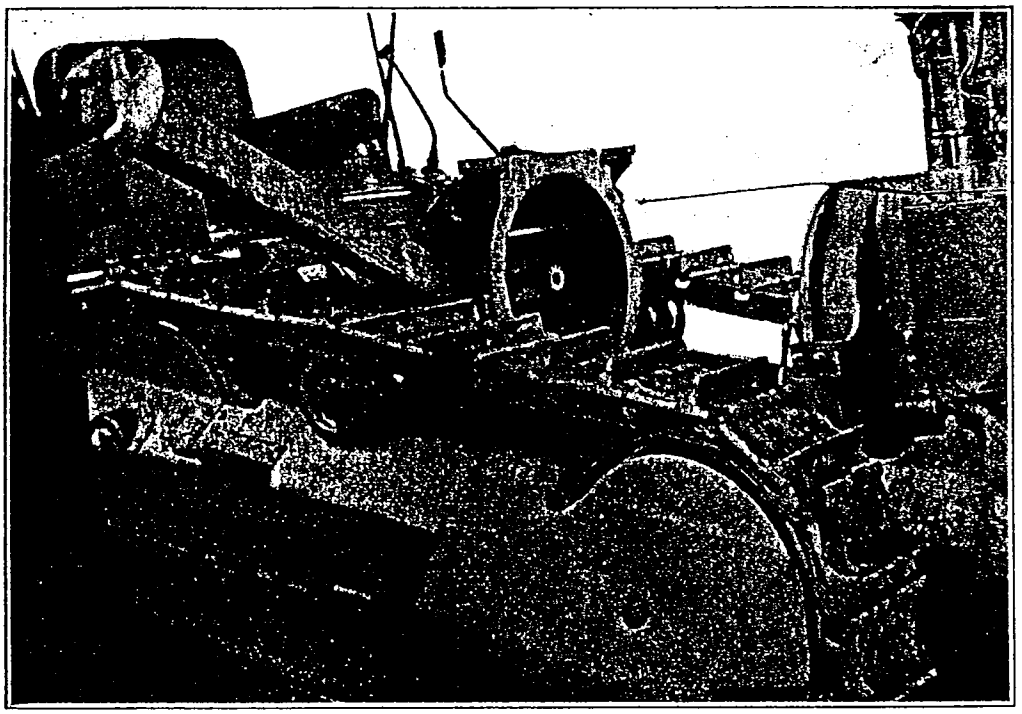


ENGINE BLOCKED UP PREPARATORY TO SEPARATING CRANK CASE AND TRANSMISSION CASE

cause the teeth of this coupling will drag somewhat as they are withdrawn, care will have to be taken that engine is not pulled off its blocking when transmission case is moved to rear. As soon as the two cases have separated a half inch, insert pinch bar and pry them still farther apart. Alternate use of long pry on tracks and pinch bar between cases until cases are separated three or four inches, when coupling will be entirely loosened. Before moving transmission farther to rear, be sure engine is blocked so securely that there is no danger of its falling.

If new crank case or transmission case is to be installed, proceed to remove various unit assemblies as described under section covering each.

In re-connecting crank case and transmission case, place coupling in its flange at front end of upper transmission shaft. Opening in center of clutch collar is so nearly the size of coupling that it will easily guide the front end of coupling into place.



SEPARATING CRANK CASE AND TRANSMISSION CASE

FLYWHEEL CLUTCH SHIFTER FORK

To remove this fork, remove FUEL TANK and SADDLE, left hand track FENDER and left hand FRONT FLOOR PLATE.

With 2" x 4" x 6' or other long pry, lift track up from track carrier roller and insert 2" x 4" x 6" block between track and top of roller. Shift gears to low or reverse, engage flywheel clutch and with starting crank move tractor an inch or two ahead or back until opening through track links lines up with clutch lever shaft. Shift gears to neutral.

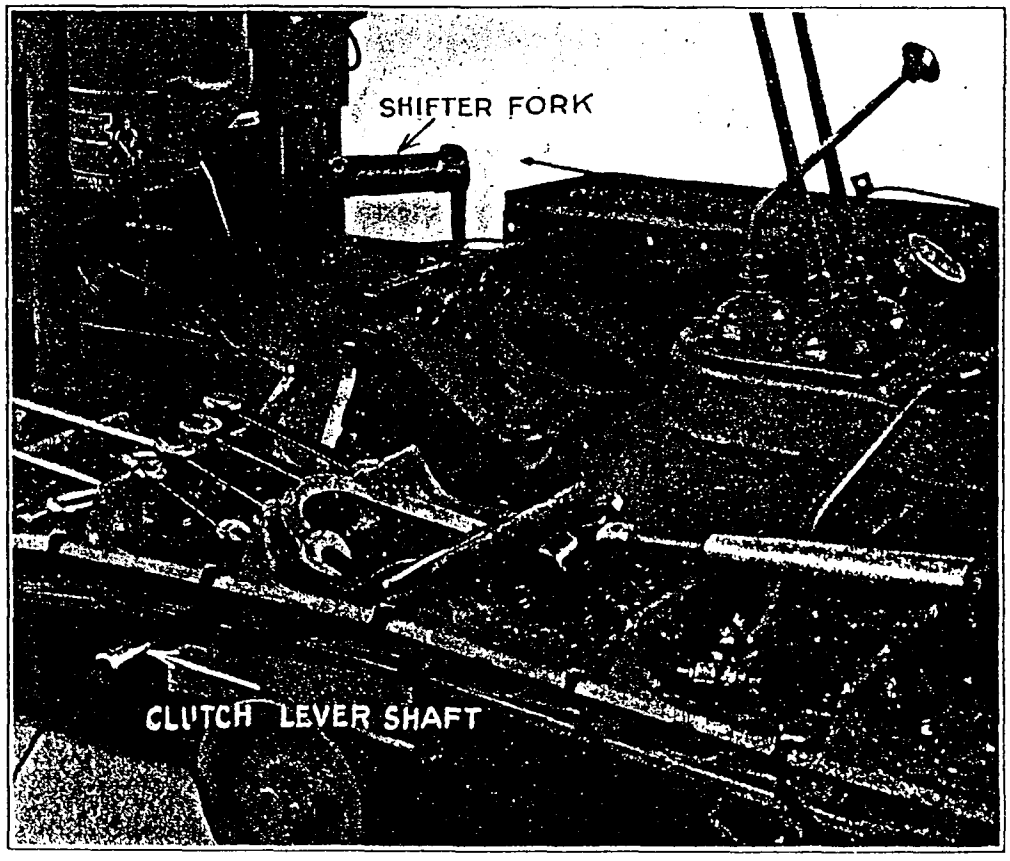
Move flywheel clutch with starting crank until none of the clutch springs are in front of hole in cover; also until flywheel clutch adjusting pin is in lower portion of clutch.

Loosen two bolts clamping shifter fork to clutch lever shaft, using curved ½" S.A.E. wrench illustrated. With pinch bar as a pry, withdraw clutch lever shaft from transmission case several inches, until bolt clamping clutch lever to shaft is easily loosened. Remove lever and withdraw shaft. Remove bolt from right hand side of shifter fork. Fork may then be twisted until it lies on its left side, fingers to rear, and so withdrawn.

Note that a Woodruff key is placed between clutch lever shaft and left hand end of shifter fork. This key will drop out when shaft is withdrawn, but can be caught with fingers. Should it drop to bottom of transmission case it can easily be picked up by inserting hand and arm on either side of clutch shifter collar. Usually key will be found to right of shifter collar.

When re-assembling, replace bolt and nut in shifter fork after replacing fork in transmission case. Be sure fork is properly engaged with collar. Insert shaft into fork until left hand end is flush with outside of transmission case and in such position that keyway for Woodruff key is visible through opening in top of fork. Place key in keyway and tap into position.

Insert left hand below right front floor plate and revolve shaft, moving key to the rear, while other hand is held under shaft to hold key in place. When key is exactly on bottom of shaft, and so lines up with its slot in shifter fork, press shaft to left so key enters slot. Tap shaft to left until it extends 1⅜" outside of transmission case.



FLYWHEEL CLUTCH SHIFTER FORK REMOVED

Replace clutch lever on shaft, with its Woodruff key, so it stands 1/8" away from side of case when shifter fork is moved to left as far as it will go on its collar. This will allow shifter fork to play slightly on the collar, instead of being tight against side of case.

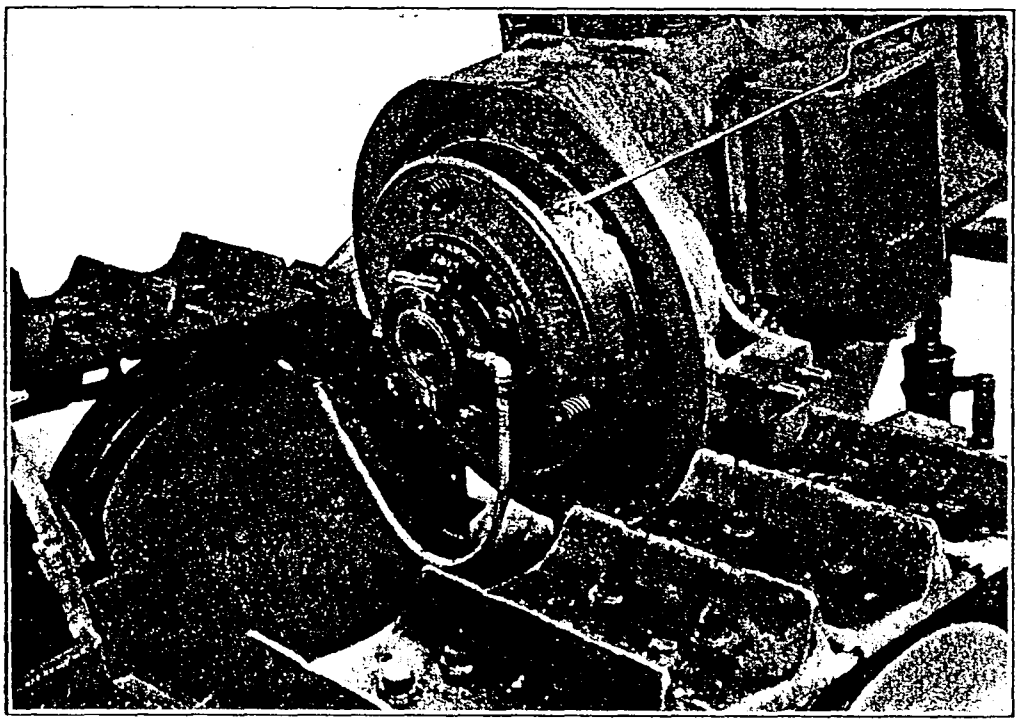
FLYWHEEL CLUTCH SHIFTER FORK COLLAR AND GREASE TUBE

To remove this collar, remove FLYWHEEL CLUTCH SHIFTER FORK.

Remove grease cup from outer end of shifter fork collar grease tube, on top of transmission case. Remove brass lock nut just under grease cup. With end of wooden hammer handle, tap and loosen end of tube projecting through case.

Revolve shifter fork collar with hand, until loose end of tube may be withdrawn from case. Disconnect other end of tube from collar. Remove two bolts holding halves of collar in assembly.

In replacing collar, put bolts in so that both nuts come on same side of collar as grease tube elbow. Elbow should point downward and slightly to rear. In replacing brass lock nut on end of tube, be sure it turns freely on threads, so that tube is not twisted. Should tube show any tendency to twist, hold it with wrench on hex shoulders, just below hole in case.



READY TO REMOVE FLYWHEEL CLUTCH

FLYWHEEL CLUTCH

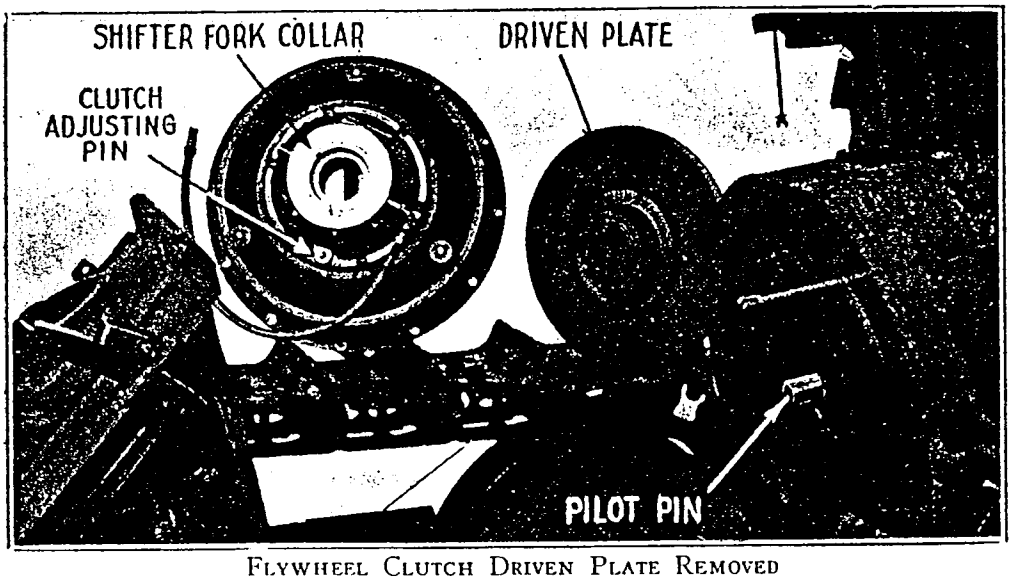
To remove flywheel clutch, disconnect CRANK CASE and TRANSMISSION CASE. Be sure that blocking is secure. Remove twelve cap

screws from rim of clutch housing. Entire clutch assembly may now be removed. Insert pinch bar behind teeth of driving plate, and pry against rear face of crank case. Be careful that inner or driven plate does not drop to ground, but either comes off with rest of clutch or remains in place on pilot pin in center of flywheel.

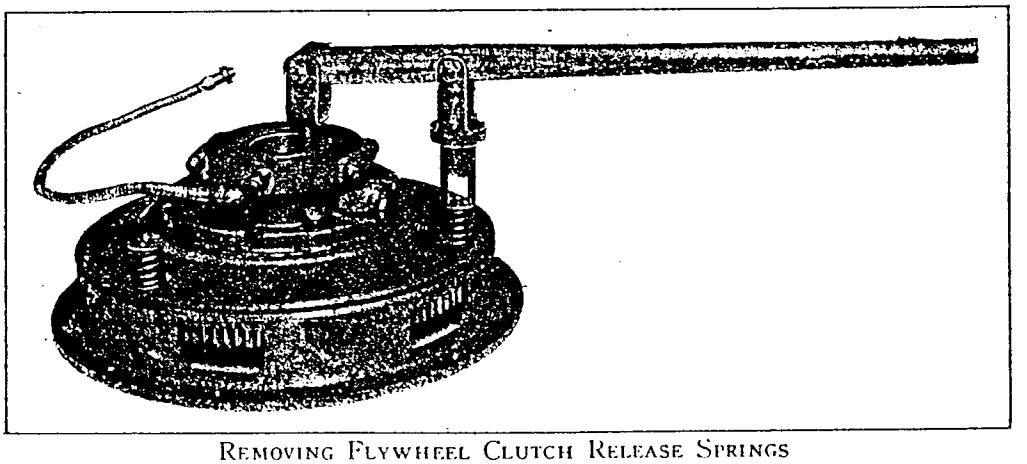
To remove driving plate, use spring remover to depress springs. Note that the three driving plate studs will fit their holes properly in only one position. This plate and housing should be marked so that their reassembly will be simplified.

To remove adjusting plate assembly, remove three pins between clutch release cams and links. The shifter fork collar assembly may then be lifted off. The adjusting plate assembly may be unscrewed from housing. Note how many turns are required to remove it, so it may be replaced in approximately the same adjustment.

To remove roller bearing in center of driven plate, loosen locks and remove four cap screws. Lay driven plate on its face. Insert clutch coupling in its seat, place block of wood, bronze or soft steel on upper end, and drive bearing down and out. Hub in center of driven plate may be pressed or driven out after bearing is removed.



FLYWHEEL CLUTCH DRIVEN PLATE REMOVED

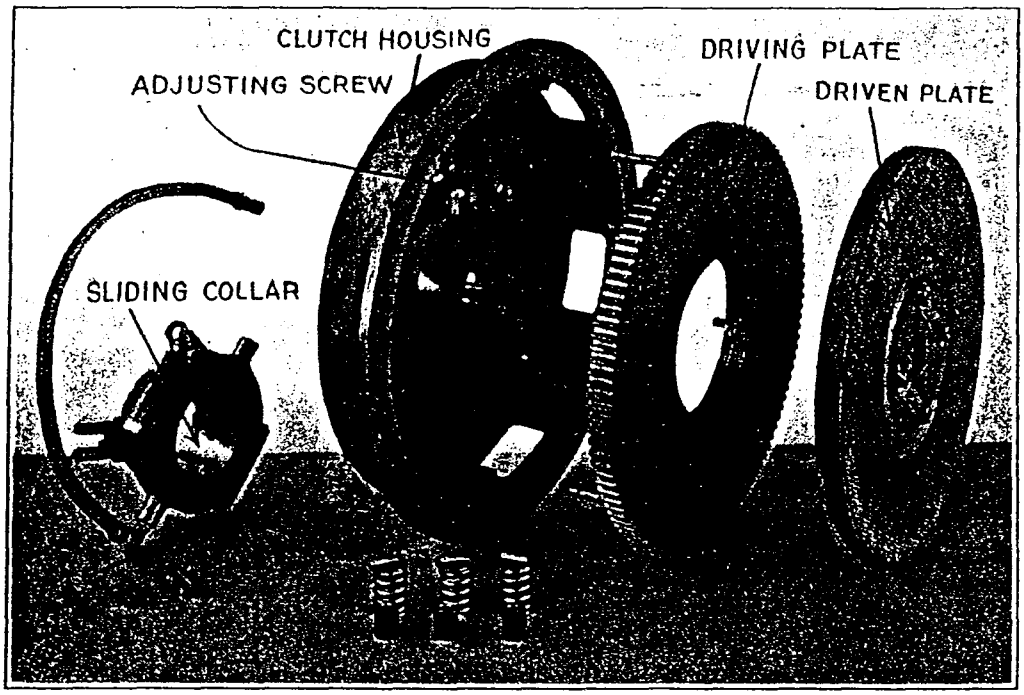


REMOVING FLYWHEEL CLUTCH RELEASE SPRINGS

FLYWHEEL CLUTCH RE-LINING

Remove FLYWHEEL CLUTCH.

Re-lining is simply a matter of disassembling, cutting off old lining and installing new. Be sure rivets are of proper length, and that rivet heads are set well below surface of lining. Renew pilot pin bearing if it shows a great amount of wear. This bearing is manufactured with .007" play, which amount of looseness should not be mistaken for wear.



FLYWHEEL CLUTCH DISASSEMBLED

FLYWHEEL CLUTCH BRAKE

When flywheel clutch lever is pressed as far forward as possible, shifter fork collar is pressed to rear against a ring of composition material. This ring is riveted to coupling flange on upper transmission shaft assembly, and acts as a brake to keep that assembly from revolving while gears are being shifted.

It should not be necessary to renew brake except when flywheel clutch is re-lined, at which time it will be easily accessible. However, if a sticky clutch forces continued use of this brake, it may require re-facing sooner. This may be accomplished by removing FLYWHEEL CLUTCH SHIFTER FORK and COLLAR. The old brake facing may then be removed.

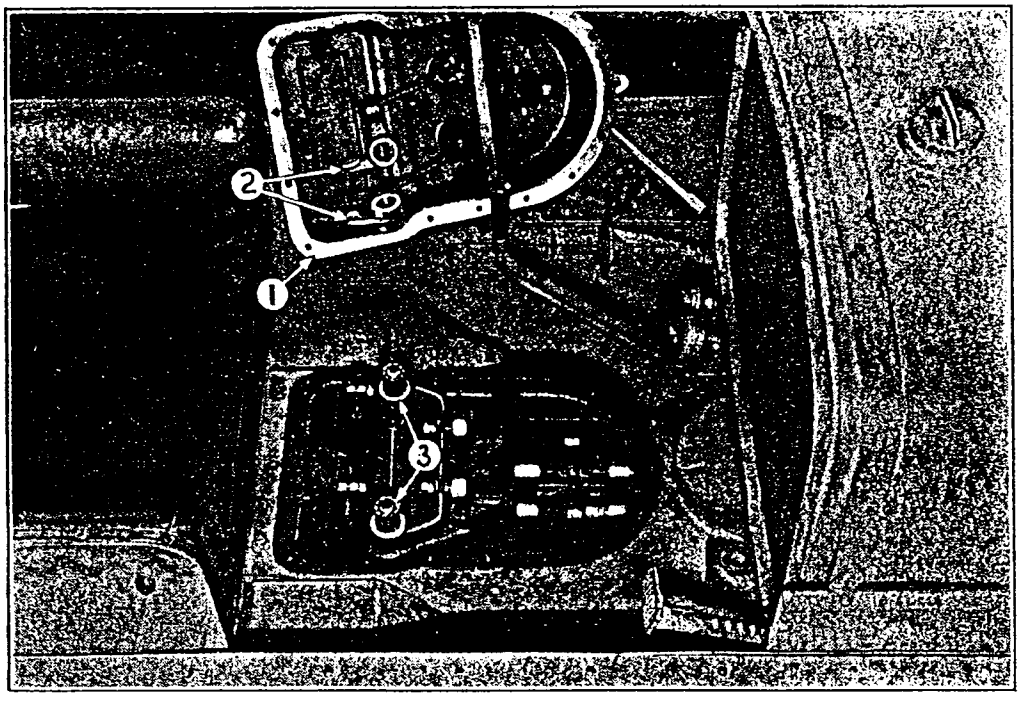
Before new facing can be installed, it will be necessary to split it in one place so that it can be slipped over coupling. To rivet facing in such cramped quarters will not be easy, but can be done. As an alternative, four #8-32 or #10-24 countersunk head machine screws with suitable nuts and lock washers may be used.

If facing is split for installation as above, it should be renewed with a solid piece when crank and transmission cases are separated.

TRANSMISSION CASE TOP COVER

To remove this cover, remove fifteen cap screws holding cover to top of transmission case. Lift cover straight up and off, lifting bell cranks with fingers so they slide off of small roller bearings. Be very careful not to raise bearings off their pins, as they may fall into transmission case.

To replace, lay cover in approximate location. Replace bell cranks on their bearings. Be sure that lower end of gear shift lever enters slots in shifter forks.



TRANSMISSION CASE TOP COVER REMOVED
1—Transmission case top cover. 2—Bell cranks. 3—Bell crank bearings.

GEAR SHIFTER FORKS

(Tractors L-1901, PL-2861 and up)

Remove the ENGINE. Remove the TRANSMISSION CASE TOP COVER. Remove the flywheel clutch shifter fork and shaft. Remove capscrew and take out lock plate securing front ends of shifter fork shafts. Pry the shifter fork locking plungers out of the selector holes in the shafts. The shifter fork shafts may then be pried out or driven out from the rear after removing the transmission case rear cover.

(Tractors below L-1901 and PL-2861)

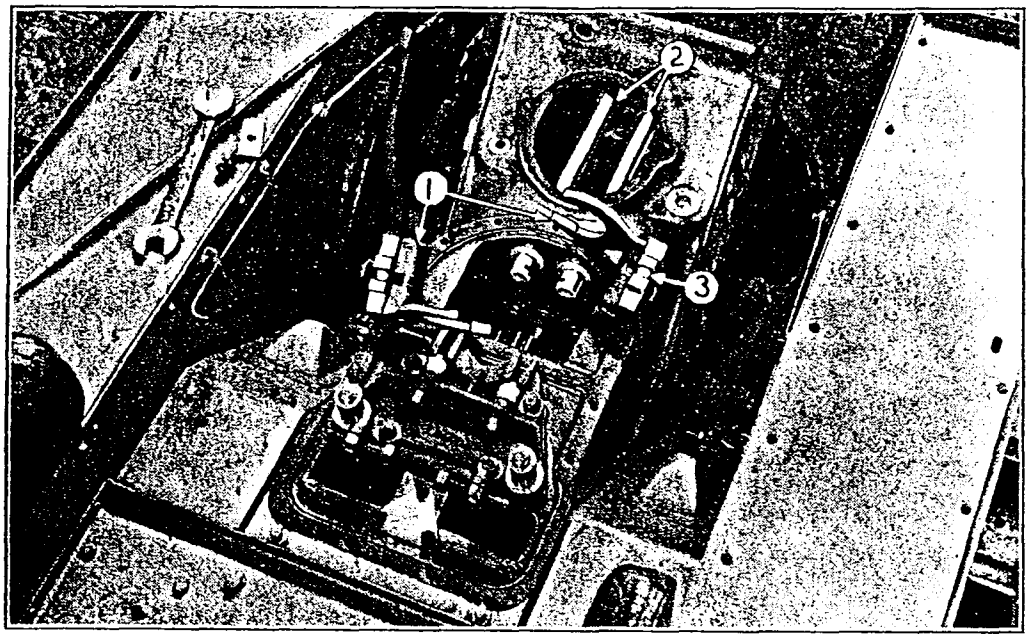
To remove these forks, remove TRANSMISSION CASE TOP COVER and FLYWHEEL CLUTCH SHIFTER FORK.

To remove right hand fork, it will be necessary to remove the engine, after which the procedure will be similar for either fork.

To remove left hand fork, remove gear shifter lever follower pin, which permits removal of centering follower.

Remove centering bracket and interlock plate, both of which are held to shifter shaft by two cap screws. Pry on rear end of shifter shaft, forcing it forward. When rear end of shifter shaft enters bore in transmission case, use valve grinding tool or 6" bolt to force cover over front of shaft out of its seat and into flywheel clutch compartment. Shaft may now be moved far enough ahead to permit removal of shifter fork.

In replacing shifter forks, note that prongs of left hand fork go to rear, while prongs of right hand fork go to front.



GEAR SHIFTER FORKS REMOVED
1—Gear shifter forks. 2—Shifter fork shafts. 3—Shifter fork locking plunger.

FRONT FLOOR PLATES

To remove front floor plates, remove cap screws and bolts holding plates to transmission case and fuel tank saddle. Raise floor plates and remove bolts holding brake pedal pad to brake pedal. Lift brake pedal pad and floor plate off together.

SEAT

To remove seat, remove bolts holding it to each fender, also two cap screws holding front of seat to top of transmission case. If seat is being removed preparatory to working on transmission, it will be most convenient to remove two cap screws in front end of each rear floor plate, removing floor plates with seat.

FENDERS

To remove track fender, remove hood side plate, front fender brace, and remove bolts and cap screws holding fender to front floor plate, transmission case and seat. The fender may then be lifted off.

When removing right fender, disconnect throttle ratchet. When removing left fender, disconnect manifold heat control ratchet.

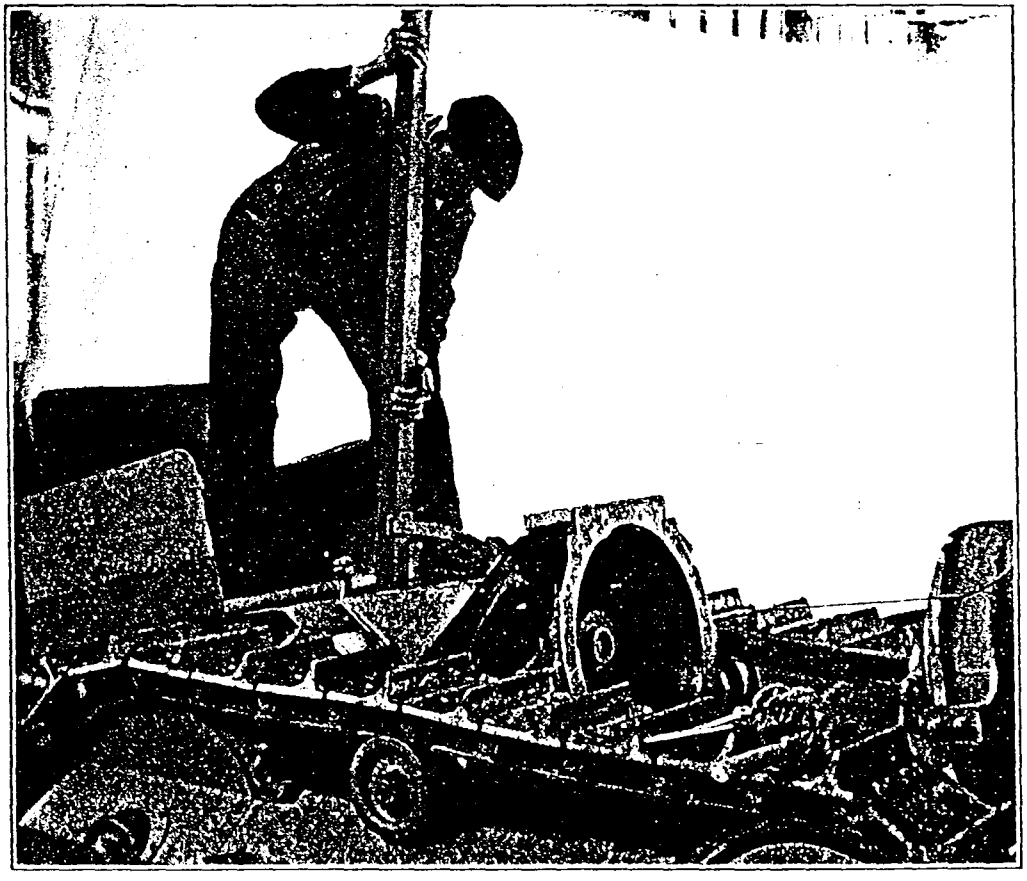
In replacing fender, be sure that brake lever shaft lock is placed in proper position.

SPEED CHANGE GEAR ASSEMBLY

To remove, separate CRANK CASE from TRANSMISSION CASE. Remove FLYWHEEL CLUTCH SHIFTER FORK and GEAR SHIFTER FORKS.

Remove eight nuts from studs holding front cover assembly to transmission case. Insert a long pry through square hole in top of transmission case, and pry forward on rear end of upper transmission shaft to force assembly off studs. Entire assembly may then be lifted out through front end of case.

Note: On earlier models it will be necessary to remove the oil thrower gear bracket retainer pin from the bottom of the transmission case before the change gear assembly can be removed. This pin is located 6" to rear of flywheel clutch compartment drain plug. When replacing the change gear assembly, care should be exercised to enter the pin properly in the hole in the gear bracket.



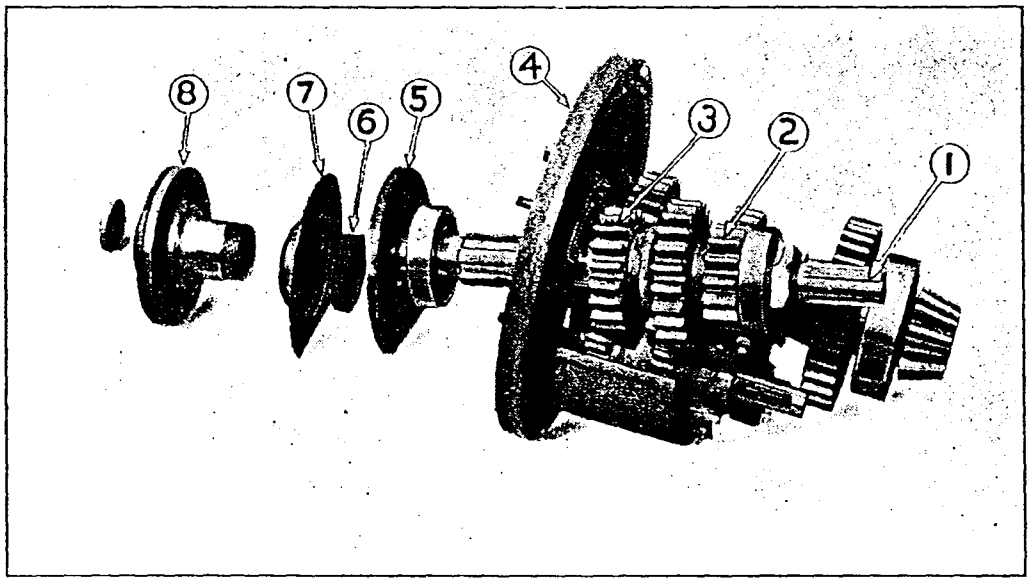
REMOVING SPEED CHANGE GEAR ASSEMBLY

UPPER TRANSMISSION SHAFT

To remove this shaft, remove SPEED CHANGE GEAR ASSEMBLY. Loosen lock and remove large nut from rear end of shaft. With end of bronze rod or soft steel bolt against inner race, drive ball bearing off of shoulder on shaft.

Remove six nuts from studs in front face of front transmission case cover. With block of wood against rear end of shaft, tap shaft to drive assembly off of studs. Remove shaft forward through cover.

To remove front ball bearing, remove cap screw from front end of shaft. Drive coupling flange off front end of shaft. With bronze rod or soft steel bolt against inner race, drive bearing off of shoulder on shaft.



REMOVING UPPER TRANSMISSION SHAFT

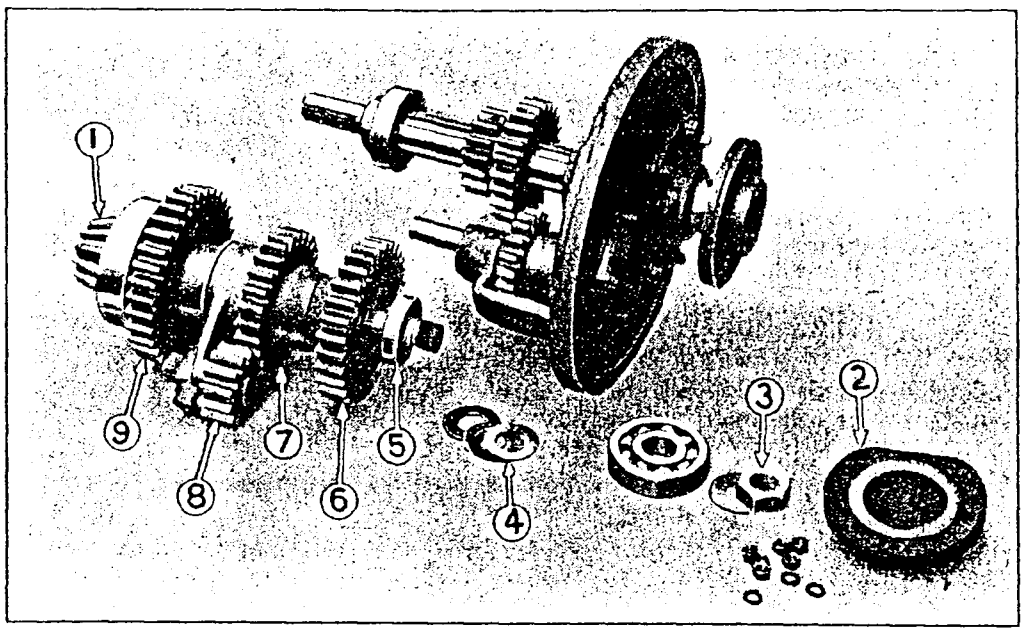
1—Rear end of upper transmission shaft. 2—Low and high sliding pinion. 3—Intermediate and reverse sliding pinion. 4—Transmission case front cover. 5—Bearing retainer. 6—Felt washer. 7—Oil seal cover. 8—Coupling flange.

LOWER TRANSMISSION SHAFT

To remove this shaft, remove SPEED CHANGE GEAR ASSEMBLY. Remove nuts from five cap screws holding cover over front end of shaft. Remove large hex nut from front end of shaft. Inner race of bearing is light press fit on shaft, and it should be possible easily to pry shaft back through bearing. If bearing will not come off easily, remove UPPER TRANSMISSION SHAFT, and remove five cap screws holding bearing retainer.

To remove a tight bearing from shaft, also to remove gears, it will be necessary to use a press such as can be found in most public garages or at dealers. If a press is not easily available, a puller can be made. The three gears are held in place by separate keys, therefore they should not require a heavy pull.

In replacing lower shaft, be sure to put in the same number of shims that were taken out, unless a new bevel pinion is being installed.

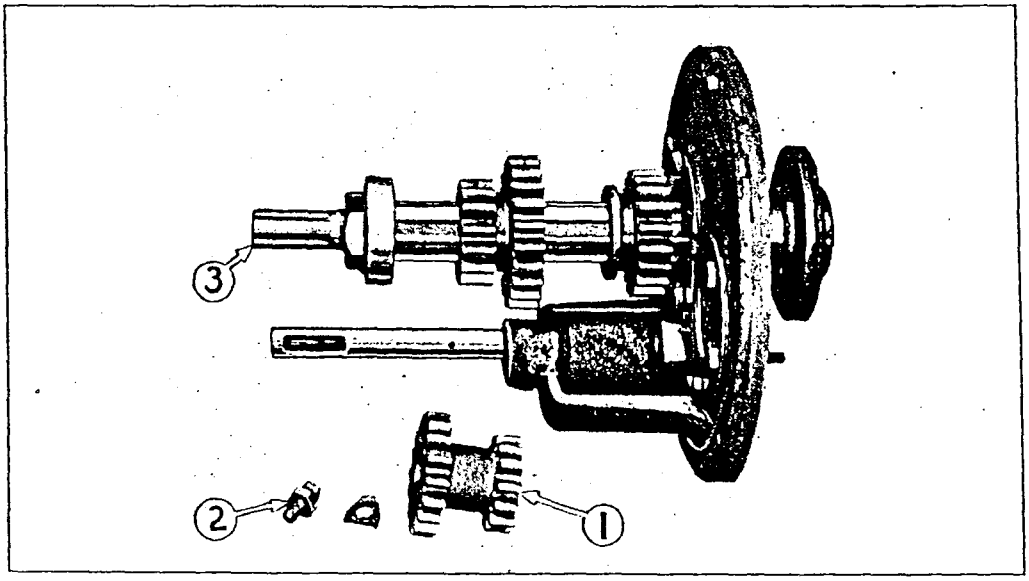


LOWER TRANSMISSION SHAFT REMOVED

1—Lower transmission shaft. 2—Front bearing cover. 3—Retaining nut. 4—Shims. 5—Spacer. 6—Intermediate gear. 7—High gear. 8—Oil thrower gear. 9—Low gear.

REVERSE GEAR AND SHAFT

To remove this unit, remove LOWER TRANSMISSION SHAFT. Loosen lock nut and remove set screw holding reverse gear shaft in position. Use a bronze bar or soft steel bolt and drive shaft out to front or rear. Lift gear out.



REVERSE IDLER GEAR REMOVED

1—Reverse idler gear. 2—Set screw. 3—Upper transmission shaft.

BEVEL PINION

Bevel pinion is removed as part of LOWER TRANSMISSION SHAFT assembly.

The bevel pinion is adjusted at the factory and should not require changing unless a new bevel gear is installed. Adjustment of the bevel pinion is made by adding or removing one or more shims located between front bearing of lower transmission shaft and adjoining spacer. The adjustment is properly made when large ends of teeth on bevel pinion match up evenly with teeth on bevel gear.

STEERING CLUTCH BRAKE BAND

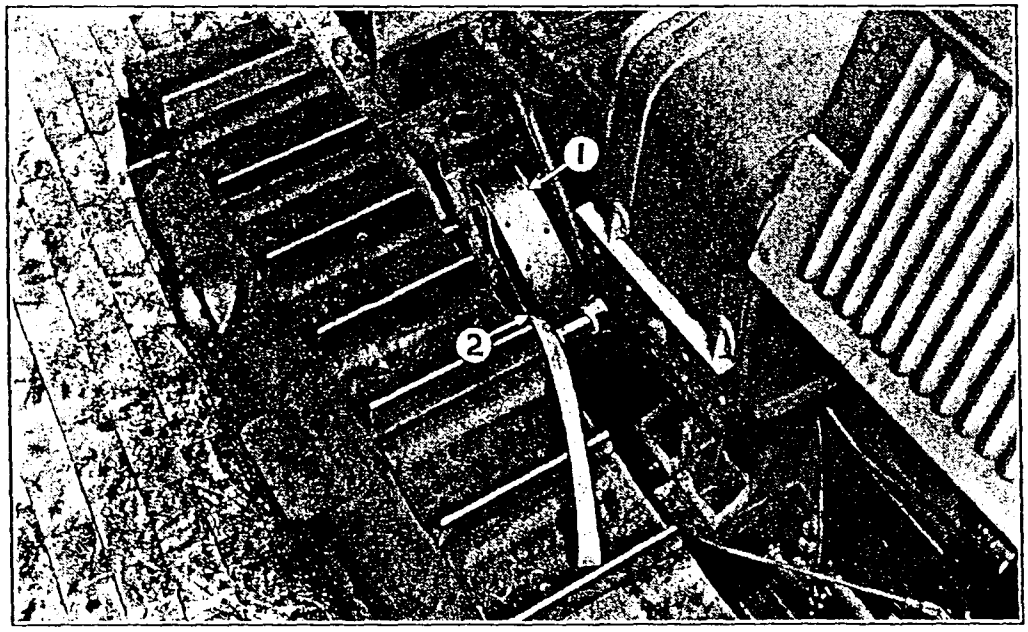
Generally the brake bands may be relined, if necessary, when tractor needs a general overhauling, at which time they may be removed easily with steering clutches. However, a user who is doing a great deal of short turning may find that they will need re-lining sooner. In such case, either band may be removed and replaced as follows:

Remove FENDER, FRONT FLOOR PLATE and remove brake rod and boot. Remove brake adjustment cover, held in place by two cap screws. Remove adjusting nut, brake band spring and brake lever shaft. With pinch bar, pry track above sprocket far enough to permit brake lever shaft to be withdrawn. Raise brake band lever far enough to permit removal of brake lever pin.

Remove brake rod clevis pin, which connects brake rod clevis and brake band lever.

Loosen two set screws in lower side and back of steering clutch case, which are used for adjusting brake band to brake drum. Remove plug in top of gear case by driving inward. Hold fingers below plug to prevent it from dropping to bottom of case.

With pinch bar, lift brake band lever and end of band above gear case to permit removal of brake band end pin and brake band lever.



REMOVING STEERING CLUTCH BRAKE BAND
1—Brake band. 2—Leather strap.

Fasten a leather strap to lower end of brake band with a nail so strap will be drawn around drum as band is removed. Draw upper end of band to rear, as illustrated, so tang extends outside of case.

Start engine and shift gears to reverse. With engine idling as slowly as possible, engage clutch gently to revolve brake drum, meanwhile pulling on brake band, which will be drawn forward out of case. Be careful that the clothing is not caught between moving track shoes. Allow end of band to curve downward, outside of case, so that its proper curvature will be distorted as little as possible.

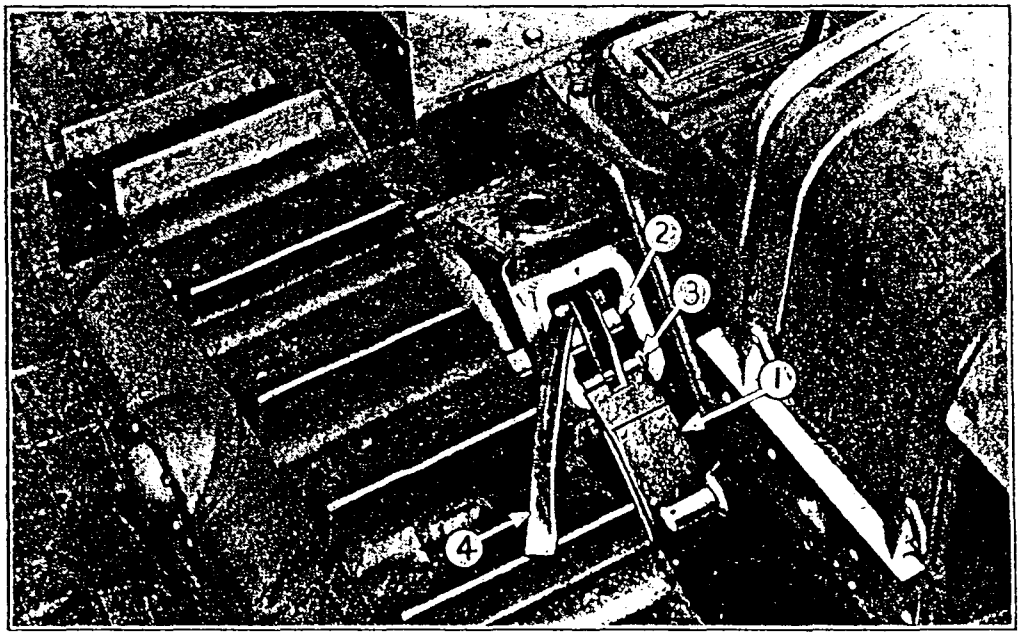
A pinch bar, inserted through plug hole in top of case, will help to keep band in contact with drum.

In re-lining brake band, be sure lining is placed smoothly and evenly, so it will not fold or hump up in service. See that rivet heads are set well below surface of lining.

To replace brake band, after re-lining, reverse above process. With leather strap around drum, pull upper end of band over top of drum, and with gears shifted to low, drive tractor ahead, engine idling slowly, to draw band around drum. After assembly is completed, ADJUST STEERING CLUTCH BRAKE BAND.

Tighten two adjusting screws in lower side and back of steering clutch case, then back away 1½ turns and tighten lock nuts.

When the steering clutch case assembly is dismantled, inspect brake bands to be sure that they are in form of true circles so that they grip drum evenly all around.



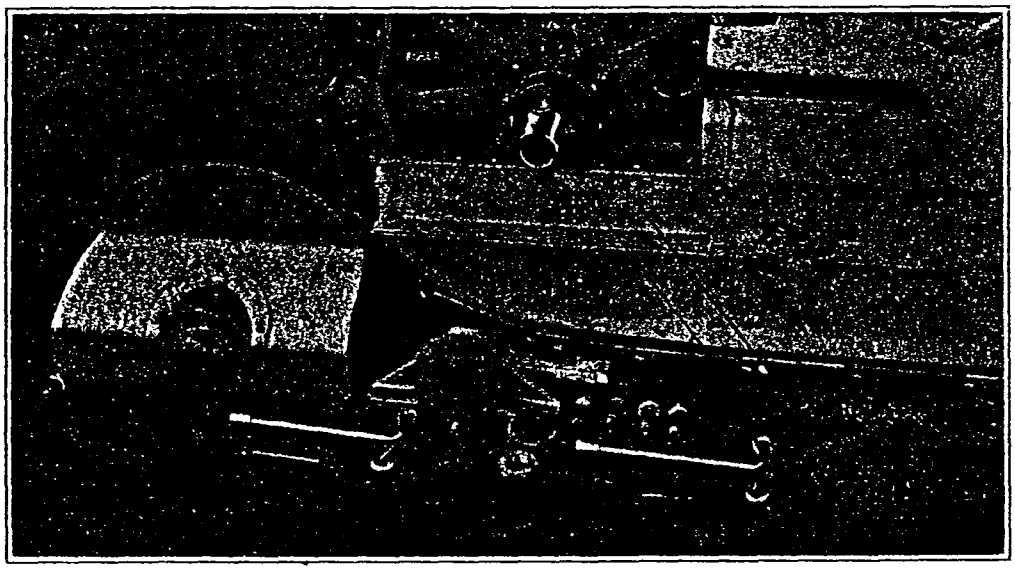
STARTING TO REPLACE BRAKE BAND
1—Brake band. 2—Brake shaft. 3—Nail through end of band and strap. 4—Strap.

Readjustment of brake band, after removal, is made by first setting brake band adjusting nut at outer end of tang. Then screw brake rod into clevis until brake band is tight when pedal is about two-thirds depressed. Set lock nut on brake rod to hold it in position. Make final adjustment with adjusting nut, after tractor is started.

TRACK ROLLER FRAME OUTER BEARING

Place 1" block under sprocket.

Remove sprocket guard; grease pump connection under outer bearing; four bolts holding outer bearing to track roller frame channel; and, remove large nut from end of sprocket shaft. Outer bearing and bearing sleeve may then be removed.



REMOVING SPROCKET HUB BEARING OIL SEALS
Tractors No. L-1 and PL-1 to L-919 and PL-708 Inclusive

SPROCKET HUB BEARING OIL SEALS

Tractors No. L-1 and PL-1 to L-919 and PL-708 Inclusive.

To remove these seals, remove TRACK ROLLER FRAME OUTER BEARING.

Removal of bearing sleeve and Woodruff key will permit removal of sprocket seal plate. This plate is under tension of a spring and may fly off with some force when key is removed.

Remove two retaining screws which hold inner seal in sprocket hub, after which inner seal may be withdrawn.

In replacing the inner seals, be sure that retaining screws properly enter fingers in seal retainer. Surfaces of seals should be lubricated before re-assembly.

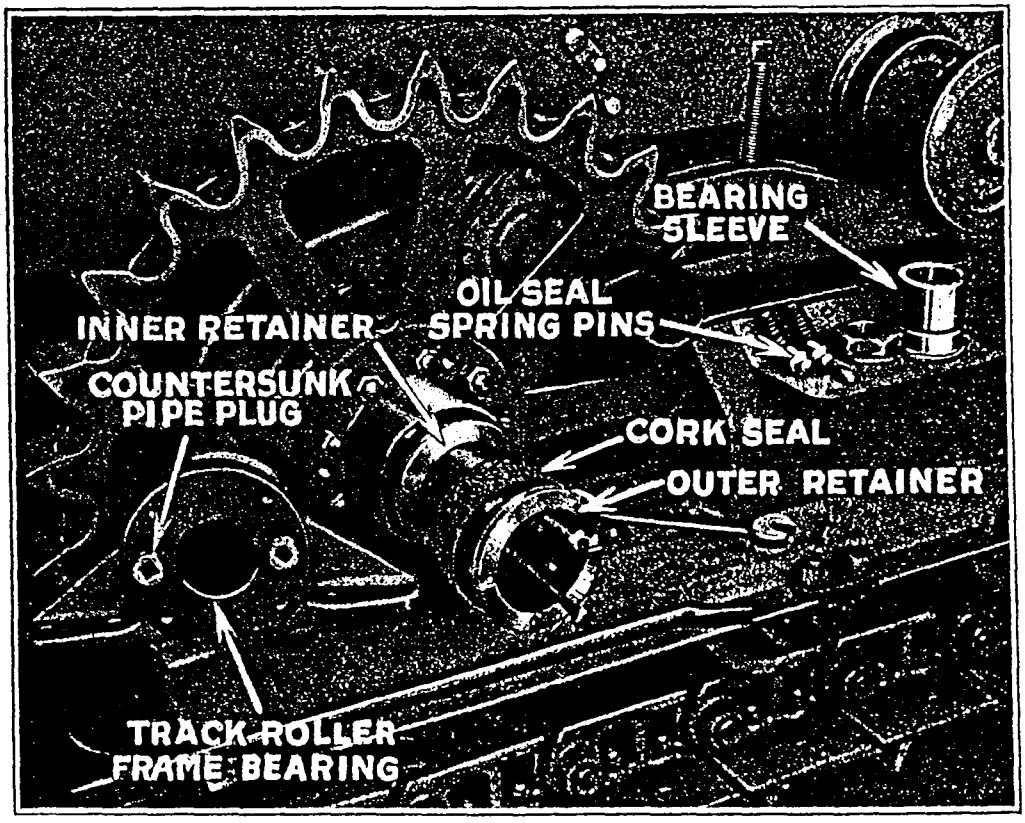
SPROCKET HUB BEARING OIL SEAL

Effective with Tractors No. L-920 and PL-709 Inclusive.

To remove this seal, remove TRACK ROLLER FRAME OUTER BEARING. When this bearing is removed, the oil seal springs and pins will fall out of bearing. Remove bearing sleeve, key, and outside oil seal retainer.

Use special puller to remove inner oil seal retainer. The cork seal will be removed with inner oil seal retainer. Care should be exercised to avoid losing shims that may stick to inner oil seal retainer.

To re-assemble the track roller frame outer bearing, remove countersunk pipe plugs from outer face of bearing. Place outer oil seal retainer so that the recesses are horizontal. As the bearing is being assembled, insert oil seal spring pins, and, with fingers pressing pins, be positive that pins engage in outer oil seal retainer recesses before bolting bearing in place. Insert springs and replace countersunk pipe plugs which hold pins in retainer recesses.



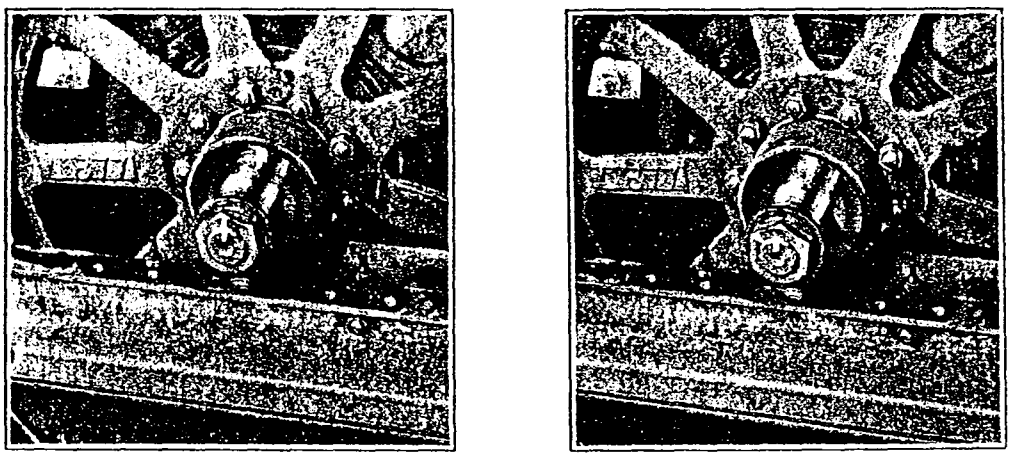
Sprocket Hub Bearing Oil Seal
Effective with Tractors No. L-920 and PL-709 Inclusive

SPROCKET HUB BEARING ADJUSTMENT

Remove TRACK ROLLER FRAME OUTER BEARING and SPROCKET HUB BEARING OIL SEALS. The sprocket hub bearing adjusting shims will be visible after the oil seal assembly is removed.

To readjust the bearing, withdraw six shims. For tractors including and below No. L-919 and PL-708, replace two seal plates, spacer, bearing sleeve, sprocket shaft washer, lock and nut. For tractors including and above No. L-920 and PL-709, replace inner oil seal retainer, bearing sleeve, sprocket shaft washer, lock and nut. Draw nut tight and make a mark across upper half of nut and end of shaft. Replace one shim and again draw nut tight. If mark on nut comes back to same place it indicates that bearing is still too tight. Replace one shim and tighten nut again. Continue to do so until nut lacks 1/6 to 1/8 turn of reaching same mark, indicating that shim last replaced is taking strain of nut. Reassemble other parts, including oil seals.

Oil surfaces of cork seals so they will not stick to inside of hub before lubricant reaches them from within.



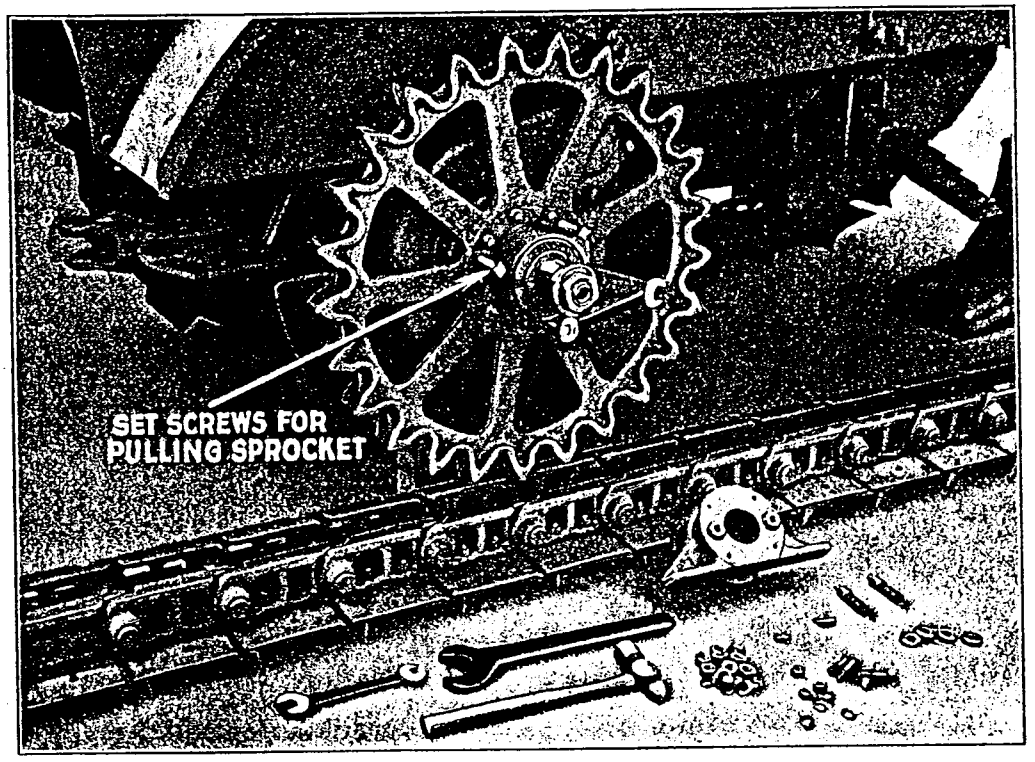
Sprocket Hub Bearing Adjustment

SPROCKET

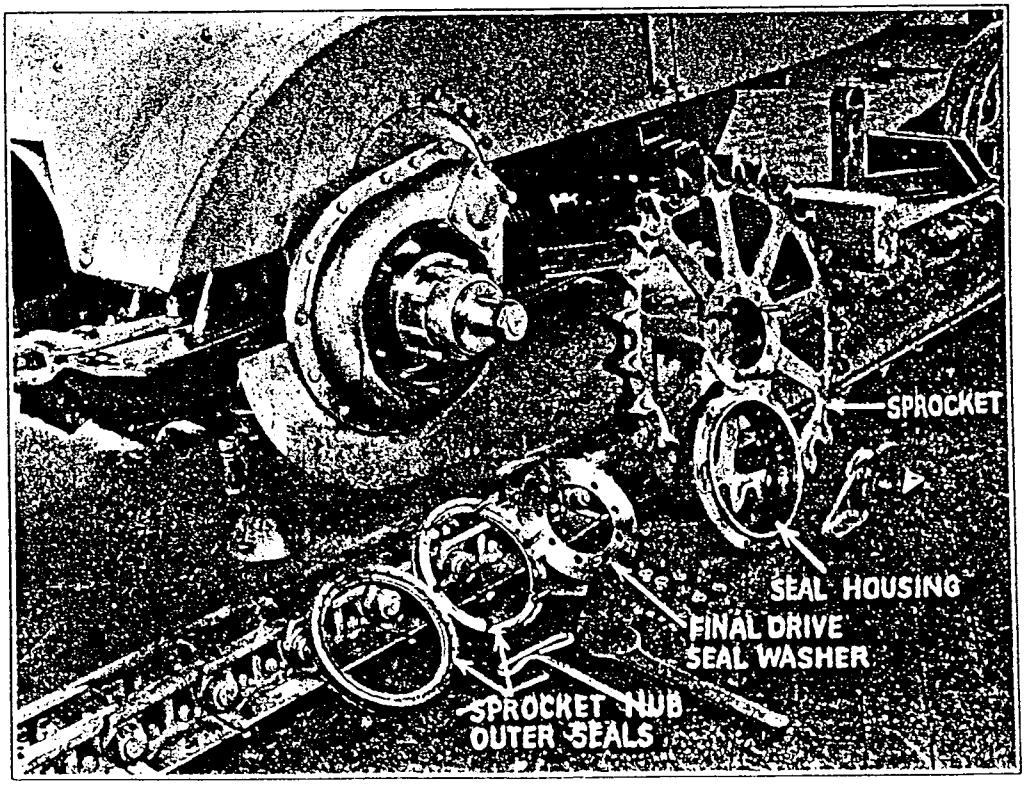
To remove sprocket, remove TRACK ROLLER FRAME, remove nut on outer end of sprocket shaft, remove TRACK ROLLER FRAME OUTER BEARING and replace nut and sleeve. Place 4" x 6" x 12" block between equalizer spring and rear end of roller frame to support weight of engine. Use chain block or jack under drawbar plate, to take weight off of sprocket.

On tractors up to and including L-919 and PL-708, remove from hub the two oil seal retaining screws.

Remove nuts from nine studs holding sprocket on hub. Mark sprocket and hub, so sprocket will be replaced in same position. Insert three 5/8" x 4" set screws (or cap screws with 3" of thread) in threaded holes in sprocket. Turning the screws in will withdraw sprocket from hub.



REMOVING SPROCKET



REMOVING SPROCKET HUB OIL SEALS ON TRACTORS L-1 TO L-256

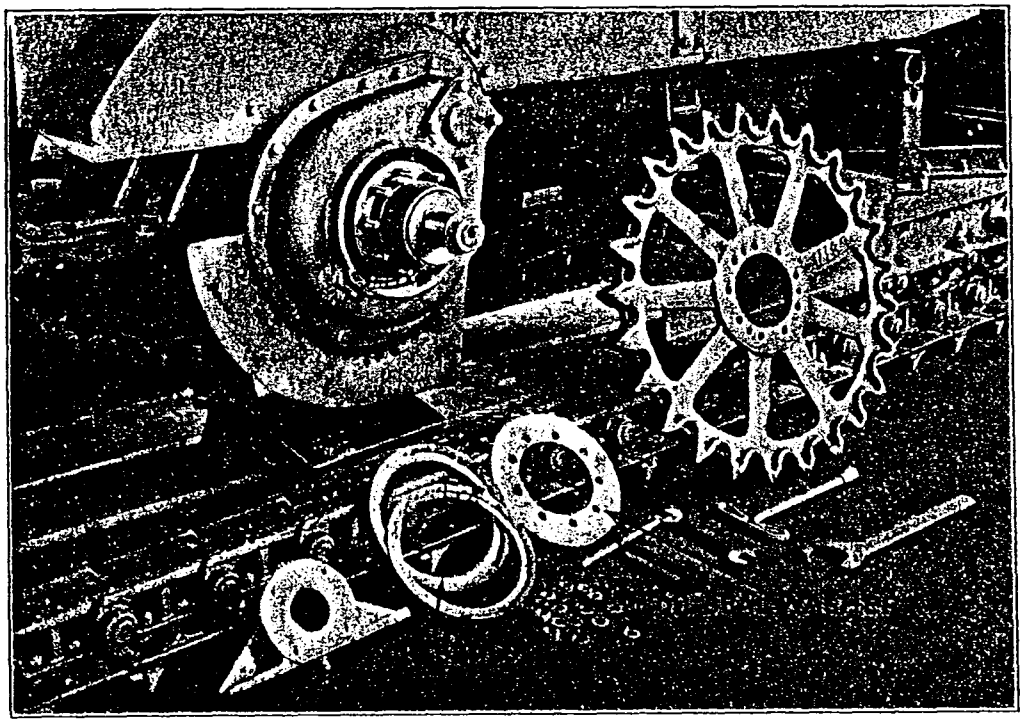
SPROCKET HUB OIL SEALS

Tractors No. L-1 to L-256 Inclusive.

To remove these seals, remove SPROCKET. Remove six nuts from studs holding oil seal housing to final drive gear case. The oil seal housing and seals may be removed as a unit.

Tractors No. L-257 and PL-1 to L-919 and PL-708 Inclusive.

To remove these seals, remove SPROCKET. Withdraw oil seal washer and outer seal. To remove inner seal, remove FINAL DRIVE GEAR CASE after which inner oil seal washer and inner seal may be withdrawn.



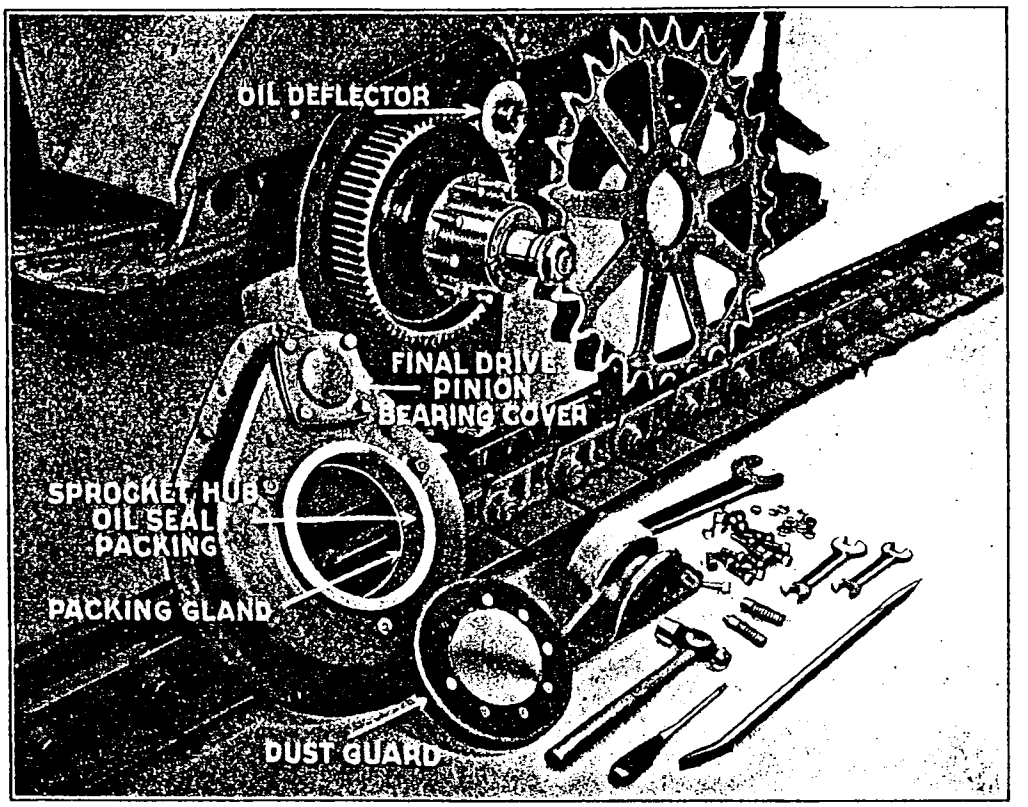
REMOVING SPROCKET HUB OUTER OIL SEAL
On Tractors L-257 and PL-1 to L-919 and PL-708 Inclusive

SPROCKET HUB PACKING GLAND

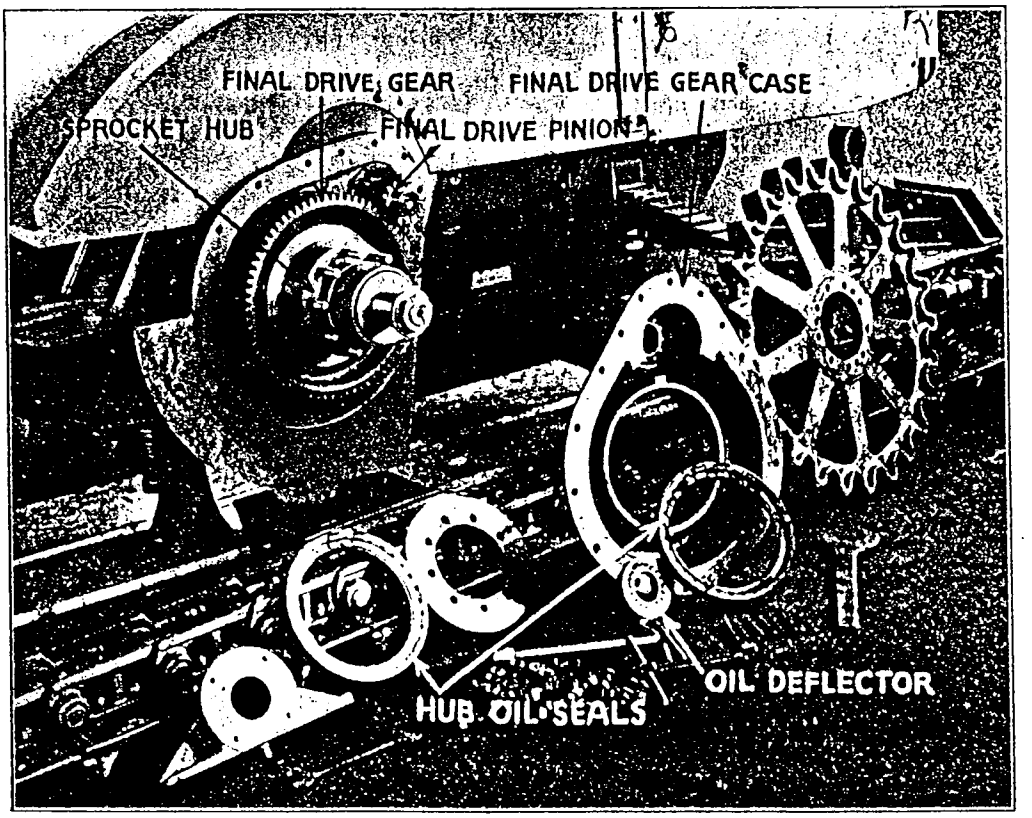
Effective with Tractors No. L-920 and PL-709 Inclusive.

To remove this seal, remove FINAL DRIVE GEAR CASE. Loosen the oil seal adjusting nuts, and remove the oil seal packing.

To repack this seal, place the packing around in the recess and tap it with a hammer to make it flat and even so that it will slip over the sprocket hub when re-assembling. ADJUST SPROCKET HUB PACKING GLAND.



FINAL DRIVE GEAR CASE REMOVED AND SPROCKET HUB OIL SEAL PACKING GLAND



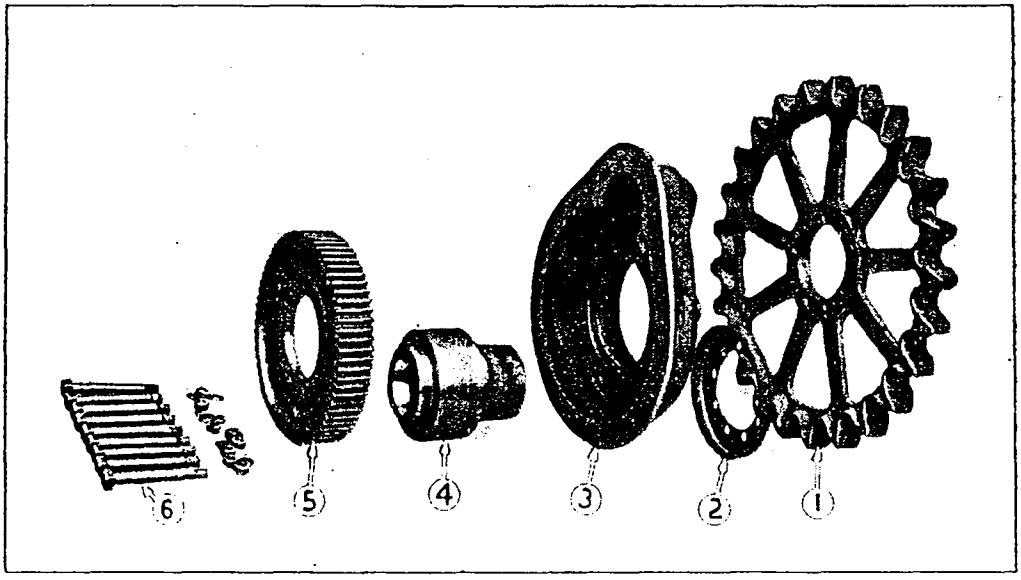
FINAL DRIVE GEAR CASE REMOVED
Also Shows Removal of Sprocket Hub Inner Oil Seal on Tractors L-257 and PL-1 to L-919 and PL-708 Inclusive

FINAL DRIVE GEAR CASE

To remove this case, remove SPROCKET. Remove final drive pinion bearing cover, held to case by four cap screws. Remove sixteen bolts and cap screws holding case to case plate. Case may now be lifted off.

Before replacing case, drive final drive pinion bearing out of case. Use babbitt hammer or bronze rod, and drive only on outer race. Replace oil deflector and bearing after case is in place. Note that oil deflector goes on with small depressions toward gear, so that outer edge stands slightly away from bearing.

Lubricate bearing before replacing, so it will not run dry before regular supply of lubricant reaches it.



FINAL DRIVE UNIT DISASSEMBLED

1—Sprocket. 2—Guard. 3—Final drive gear case. 4—Sprocket hub. 5—Final drive gear. 6—Sprocket hub studs.

FINAL DRIVE GEAR AND SPROCKET HUB

Remove FINAL DRIVE GEAR CASE and SPROCKET HUB BEARING OIL SEALS. Sprocket hub and final drive gear may be withdrawn, pushing sprocket hub outer bearing off shaft ahead of hub. Be careful not to damage adjusting shims.

With babbitt hammer or bronze rod, drive out studs holding gear to hub. Press hub out of gear.

In re-assembling, be sure to start studs so that heads will clear end of hub. Before replacing sprocket, fill space between hub oil seals with proper lubricant; also lubricate sprocket hub bearings so they will not run dry before regular lubricant reaches them.

If new hub is to be installed, remove hub bearing outer races, if they are to be used again. Otherwise install new races in new hub, driving them into place with babbitt hammer or bronze bar.

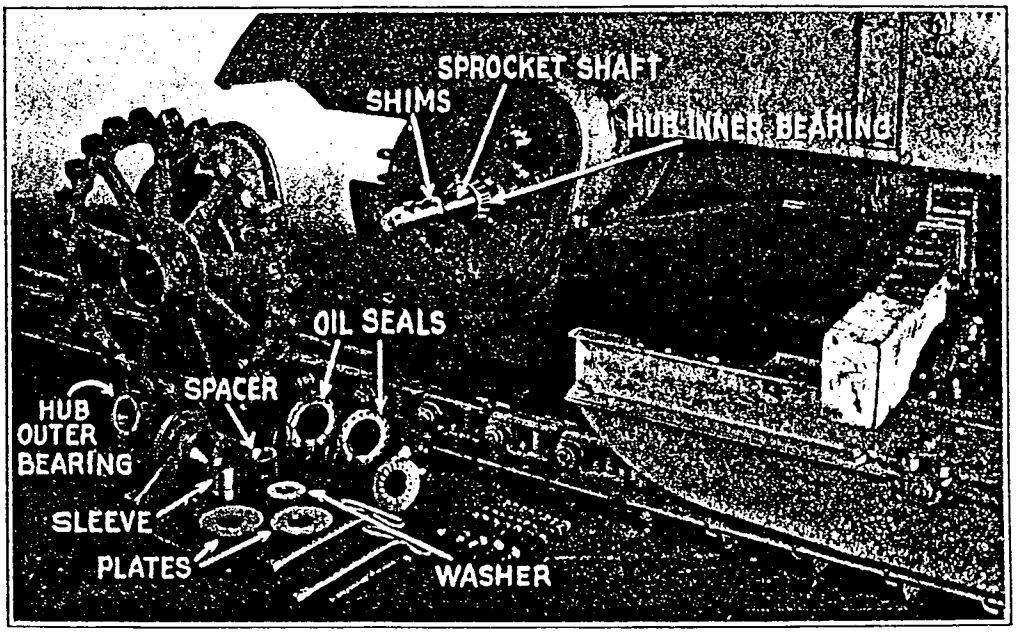
SPROCKET HUB BEARING

To remove sprocket hub bearing, remove TRACK ROLLER FRAME, SPROCKET HUB BEARING OIL SEALS and final drive pinion cover. Remove sixteen bolts and cap screws holding final drive gear case to plate. Pry sprocket and gear case assembly off over end of shaft, carrying outer bearing with it.

Inner race of inner half of bearing should have creeping fit on the shaft. Should it be tight, remove cap screws holding final drive gear case plate and force bearing off ahead of plate.

Bearing outer races may be removed by driving on inner edge of each race with bar inserted through opposite end of hub. Unless races are to be discarded, use bronze bar so that hardened surface of races will not be damaged.

When bearings are replaced, ADJUST SPROCKET HUB BEARING.



REMOVING SPROCKET HUB INNER BEARING

SPROCKET SHAFT

To remove sprocket shaft, remove FINAL DRIVE GEAR CASE. Remove steering clutch case as described under FINAL DRIVE ASSEMBLY. Drive out pin holding sprocket shaft in its seat in clutch case. Shaft may then be pressed or driven from case.

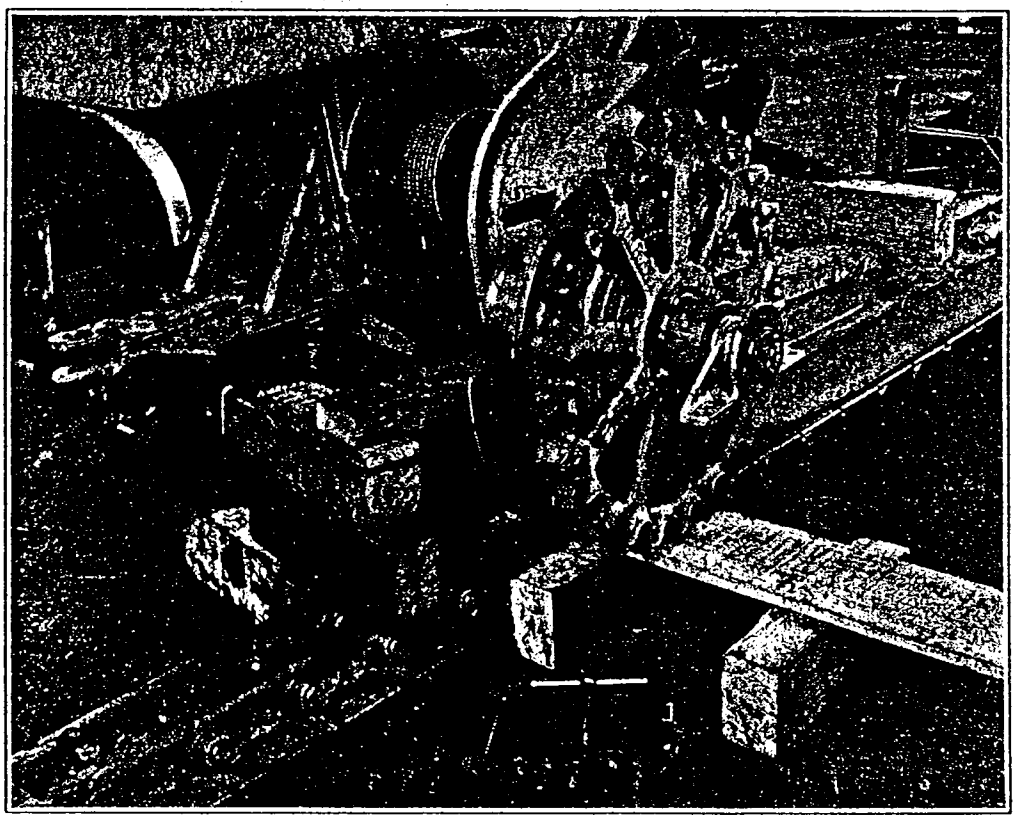
Press outward on inner end of shaft, which will have to move about 3½" before loosening in its seat.

FINAL DRIVE ASSEMBLY

To remove complete final drive assembly (as distinguished from removal of gear case only), remove track FENDER and TRACK ROLLER FRAME.

Caution: Do not remove both final drive assemblies from tractor without blocking up under front end of engine. Tractor supported in front only by equalizer spring may overbalance and fall forward.

Remove pin connecting brake rod and pedal, and turn rod so it will



REMOVING FINAL DRIVE GEAR ASSEMBLY

pass pedal when final drive assembly is withdrawn outward. Remove twelve cap screws holding steering clutch case to transmission case.

If chain block is available, take weight of assembly on block. Otherwise, block up as shown with 2" x 4" x 48" block resting on rear end of track roller frame in front and on short blocks at rear; also with 1" x 8" board resting on track and on blocking outside of track. Arrange blocking so it just takes weight of assembly without tending to lift it higher; i. e., so outer steering clutch drum will slip off of plates without binding.

Entire assembly may now be pulled outward horizontally until outer clutch drum is free of clutch plates.

Before replacing, remove outer SPROCKET HUB BEARING and shims, to be replaced after assembly is in position.

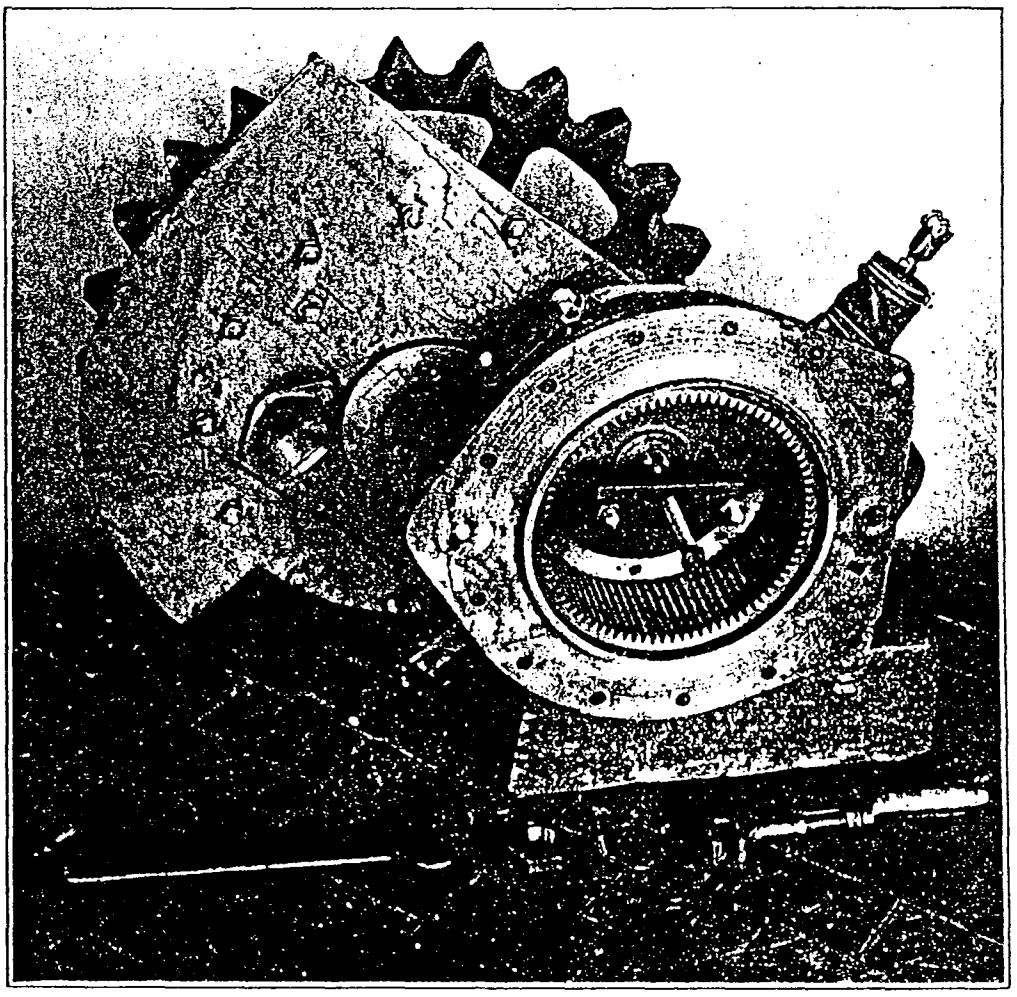
FINAL DRIVE PINION

To remove this pinion, remove FINAL DRIVE ASSEMBLY and remove cover over outer end of pinion. Remove six cap screws holding oil thrower cover to bearing cage. These cap screws are reached by T handle wrench inserted through three holes inside of outer clutch drum.

Loosen lock and remove nut from inner end of pinion shaft. Drum fits over shaft with taper, and may be removed by using special puller. Drum and shaft will be most easily removed from case as soon as tapered fit is loosened, but before they are completely apart.

In re-assembling, be sure that oil drain holes in bearing cage and pinion seal washer match with similar holes in clutch case so that surplus oil will drain from bearing directly downward into final drive gear case. The use of three 3/8" rods with tapered ends will assist in lining up these holes properly.

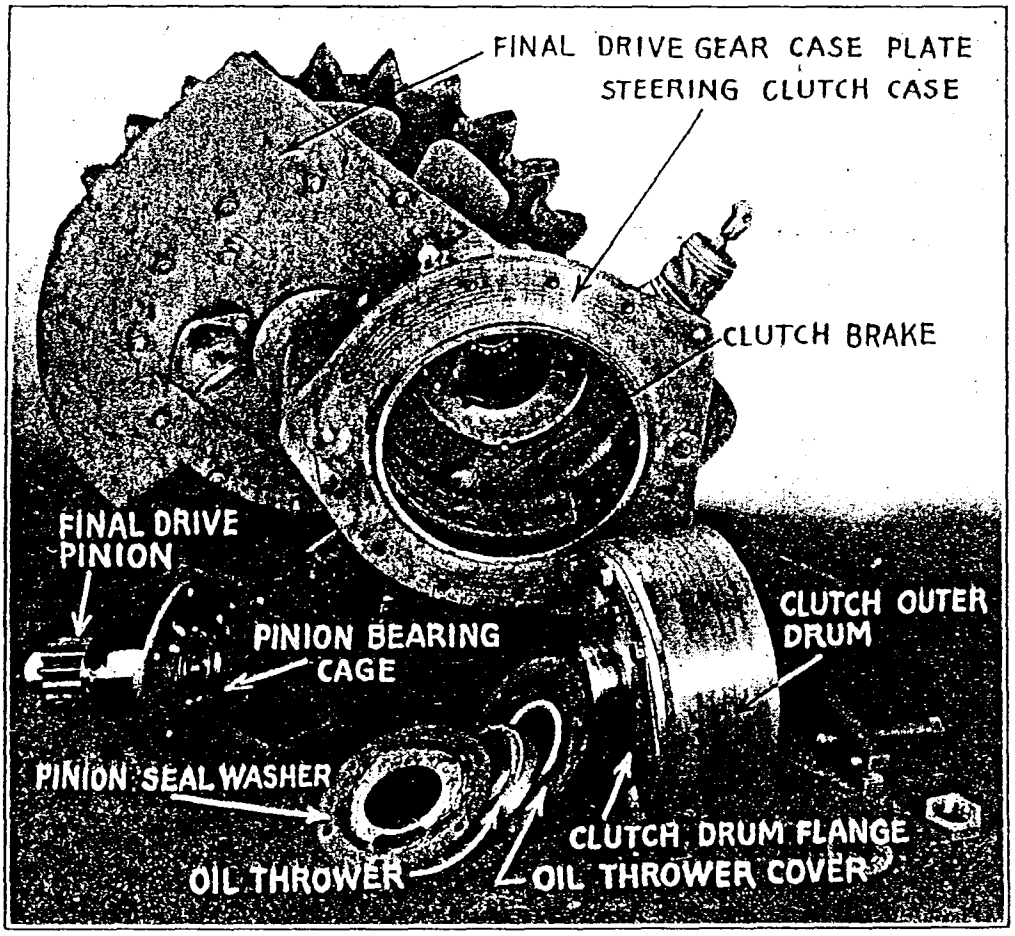
Brake band is held in adjustment with drum by two set screws. If these are loosened, be sure they are properly readjusted, by screwing



REMOVING STEERING CLUTCH OUTER DRUM

them in snug and backing away 1½ turns. Tighten lock washers after adjustment is made.

Lubricate all bearings, during re-assembly, so they will not run dry before the regular supply reaches them.



FINAL DRIVE PINION REMOVED

STEERING CLUTCH

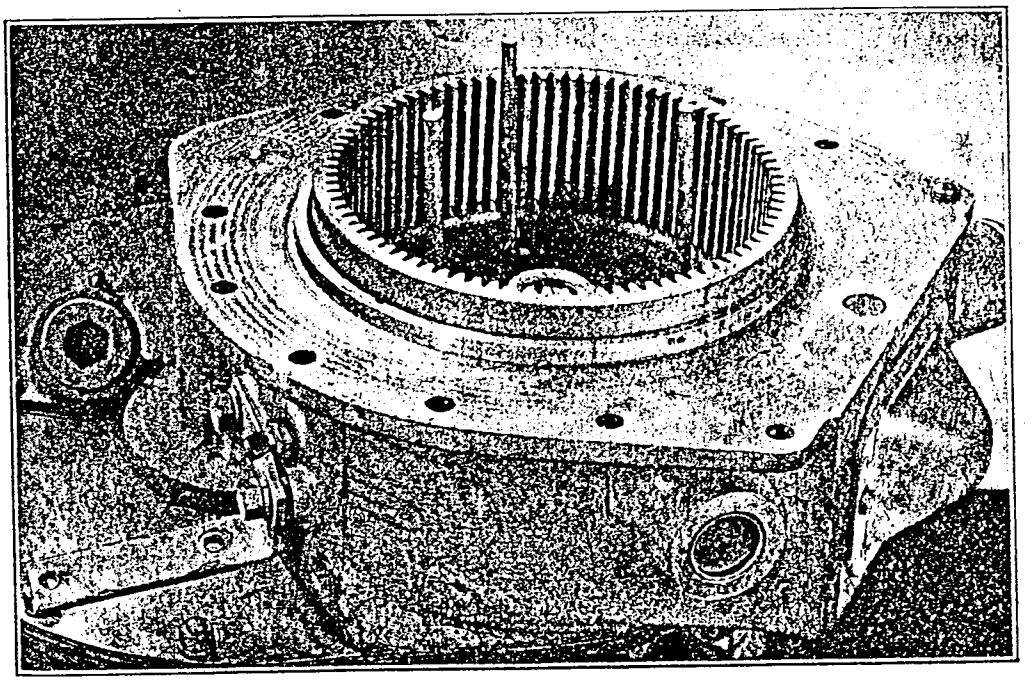
To remove steering clutch, remove FINAL DRIVE ASSEMBLY.

Remove cap screw holding flexible oil tube to steering clutch release yoke screw. This will allow the tube which lubricates the steering clutch release bearing to be removed by slipping upper end out of its telescoping connection. Remove both steering clutch release yoke screws. Remove nut on end of steering clutch shaft. Use special puller to pull clutch assembly.

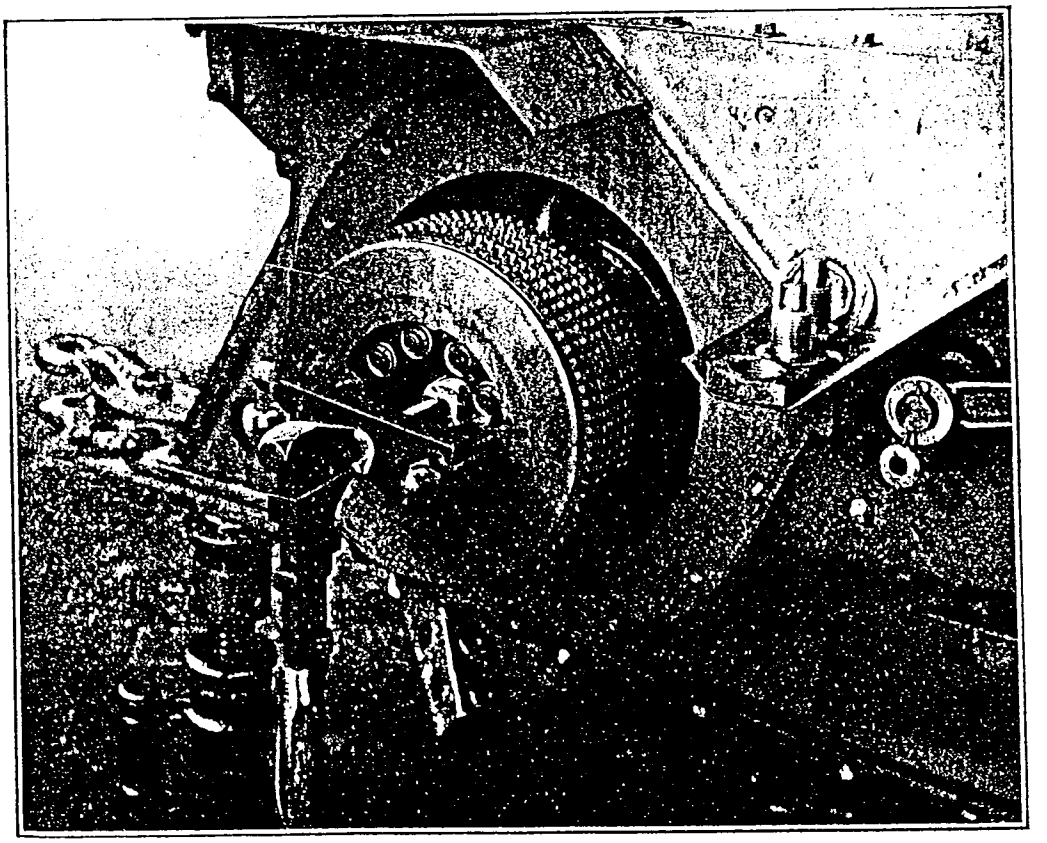
Key between steering clutch inner drum and shaft should come off with drum. If it remains in shaft, it will press on bushing inside of drum, causing springs to loosen and allowing clutch plates to shift out of line.

If clutch plates shift their position, it will be necessary to disassemble the clutch and realign the plates as described below.

Examine bronze bushing to be sure that key has not burred the edge during removal of drum. If a burr is found, remove it with a sharp knife or bearing scraper.

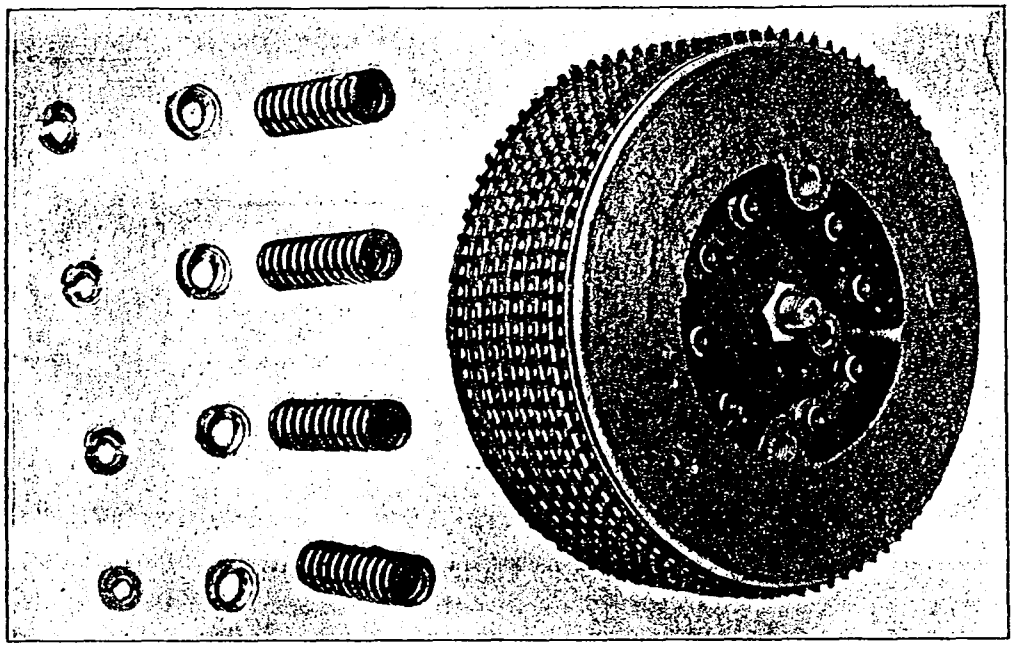


REPLACING STEERING CLUTCH OUTER DRUM

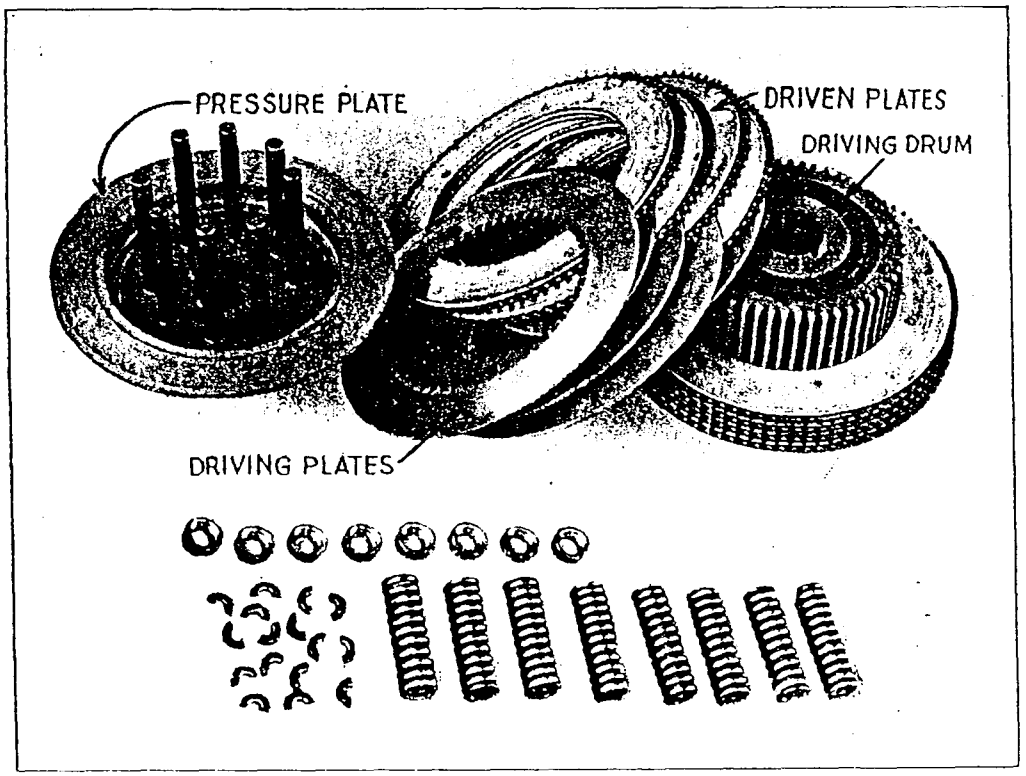


REMOVING STEERING CLUTCH

To disassemble steering clutch, use special service tool, or jaws of a monkey wrench. Depress retainers until locks may be removed, when retainers and springs may be lifted from studs. Pressure plate assembly may then be removed.



READY TO DISASSEMBLE STEERING CLUTCH WITH SERVICEMAN'S TOOL



STEERING CLUTCH DISASSEMBLED

To re-line steering clutches, remove and disassemble. Cut off the old linings and rivet new linings in place. Be sure that both ends of rivets are seated well below surface of lining. Any driving plates whose surfaces are roughened should be replaced with new ones.

In re-assembling clutch, place one driven plate next to inner drum, then driving and driven plates alternately, with driving plate next to pressure plate.

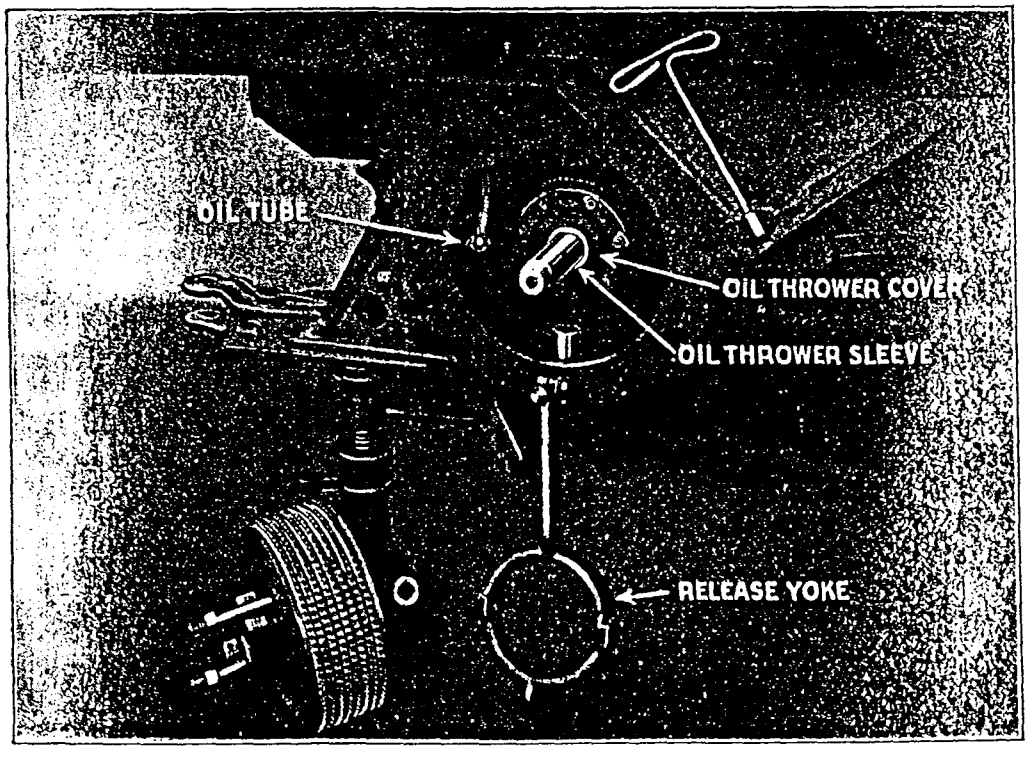
Be very careful that teeth of driven plates line up exactly all around; otherwise, final drive assembly cannot be replaced, as outer drum will not slip on over teeth. It will be helpful, in re-assembling the clutch, to remove the outer clutch drum from its flange, and use it for a guide for the driven plates.

When reassembling release bearing, be sure to have side of bearing marked "Thrust Here" in the proper position. "Thrust" on the inner race is against the nut, and on the outer race is against the bearing cage.

Before replacing clutch assembly on shaft, be sure that key, also keyway in both drum and shaft, are clean. Place drum over shaft, so keyways line up, and tap into place; then drive key into place, replace cork plug over end of key; then replace lock and nut on end of shaft.

STEERING CLUTCH RELEASE YOKE

To remove this yoke, remove STEERING CLUTCH. Remove steering clutch lever inspection cover. Loosen lock bolt holding adjustment screw and turn screw until head is within ½" of top of yoke. Yoke may then be withdrawn downward.

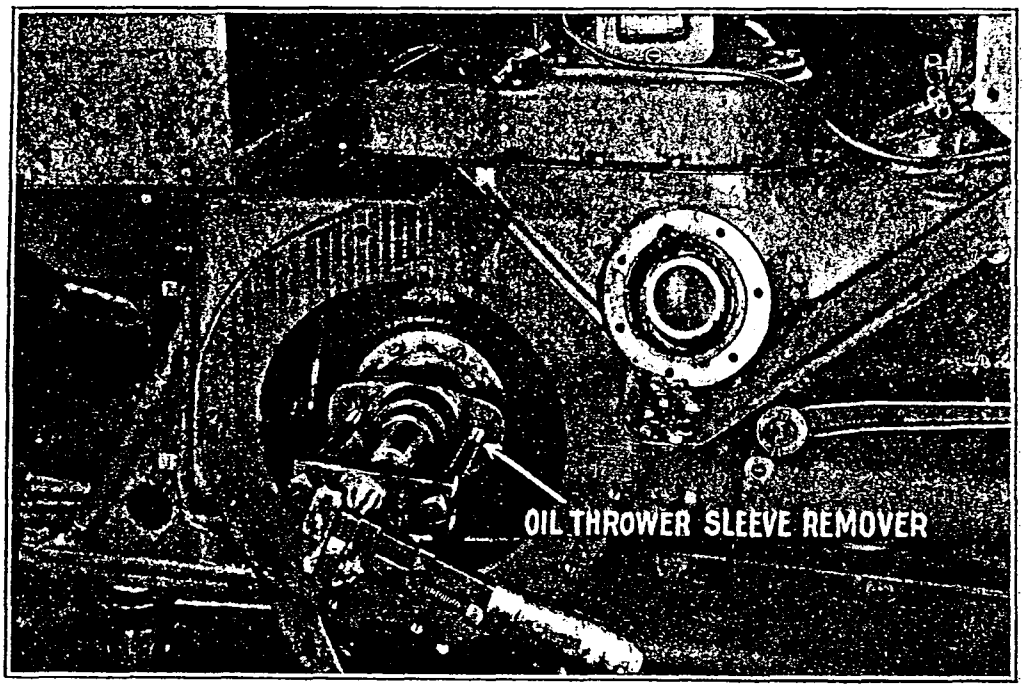


STEERING CLUTCH RELEASE YOKE REMOVED

BEVEL GEAR AND SHAFT

Applicable to Tractors L-1687, PL-2518 and Up

Remove STEERING CLUTCHES and transmission rear cover plate. Remove nuts from studs which hold bearing cages to transmission case. Remove large nut which secures gear to shaft and remove bearing cages. Hydraulic press and gear remover are available at dealers. Use as illustrated, to push gear off shaft, which may then be withdrawn.



Removing Oil Thrower Sleeve

BEVEL GEAR AND SHAFT

Applicable to Tractors Below L-1687 and PL-2518

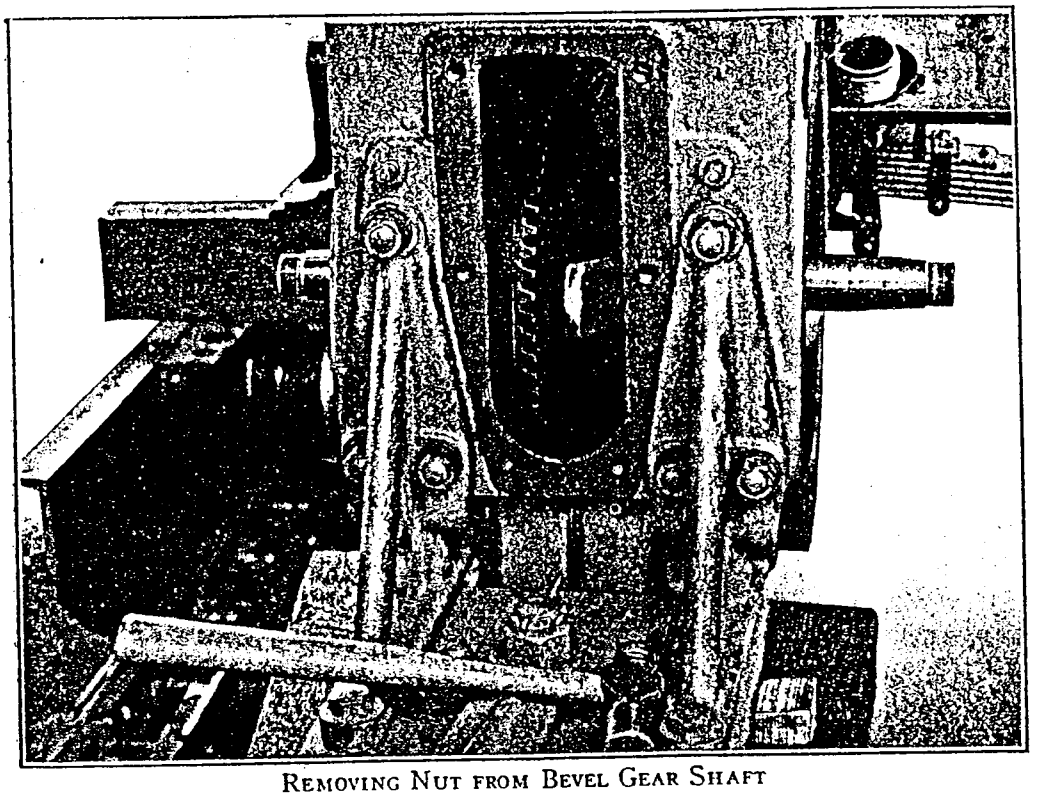
Remove STEERING CLUTCHES.

Remove both bevel gear oil thrower covers. Use special puller to remove oil thrower sleeves. Note that right hand sleeve has right hand thread; left hand sleeve, left hand thread. The two sides of puller are threaded accordingly.

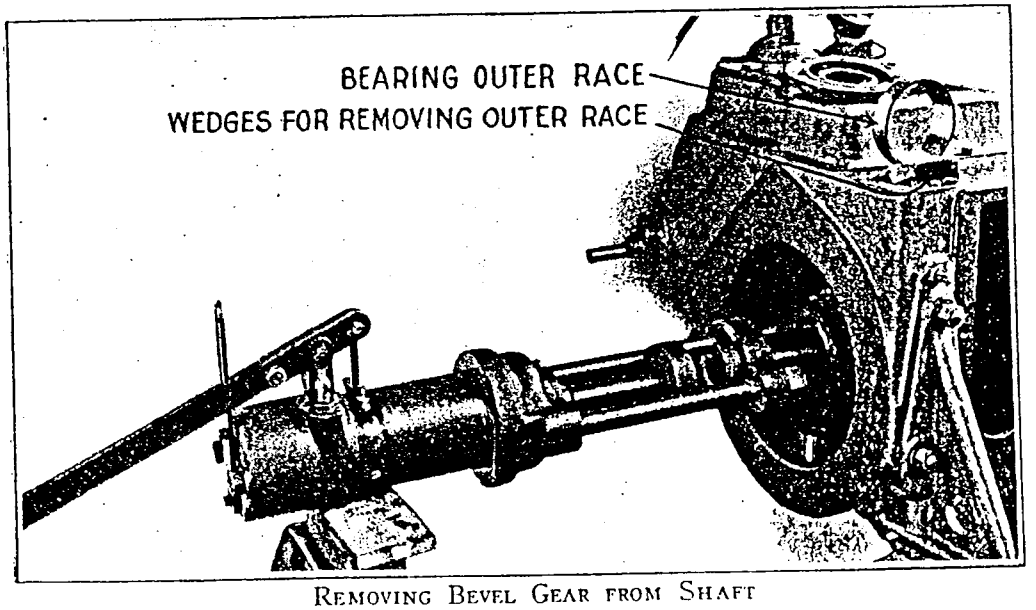
Replace right hand oil thrower cover, and three nuts to hold it in place. Remove transmission case rear cover, above drawbar. Loosen lock on large nut to right of bevel gear. Use special end wrench on nut, turning it off its seat. Use hammer on end of wrench to loosen nut. This will force right hand roller bearing inner race off its seat. When nut is clear off its threads, turn it back on to shaft a few threads. Then strike left hand end of shaft a few sharp blows with babbitt hammer. This will force outer race of right hand bearing clear of case.

Again remove right hand oil thrower cover. Strike right hand end of shaft with babbitt hammer, to drive outer race of left hand bearing out of case. When race is about half way out, bevel gear will strike case. Move shaft and gear to right and insert special curved wedges between rollers and outer race, which may now be driven clear of case.

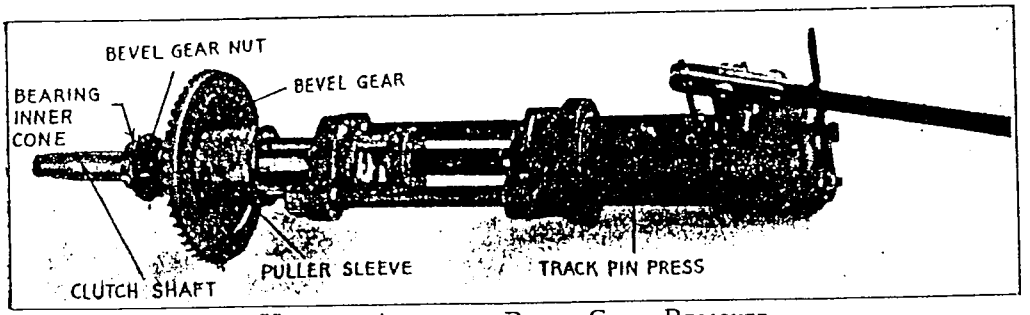
Install hydraulic press and press gear off shaft.



REMOVING NUT FROM BEVEL GEAR SHAFT



REMOVING BEVEL GEAR FROM SHAFT



HOW TO ASSEMBLE BEVEL GEAR REMOVER

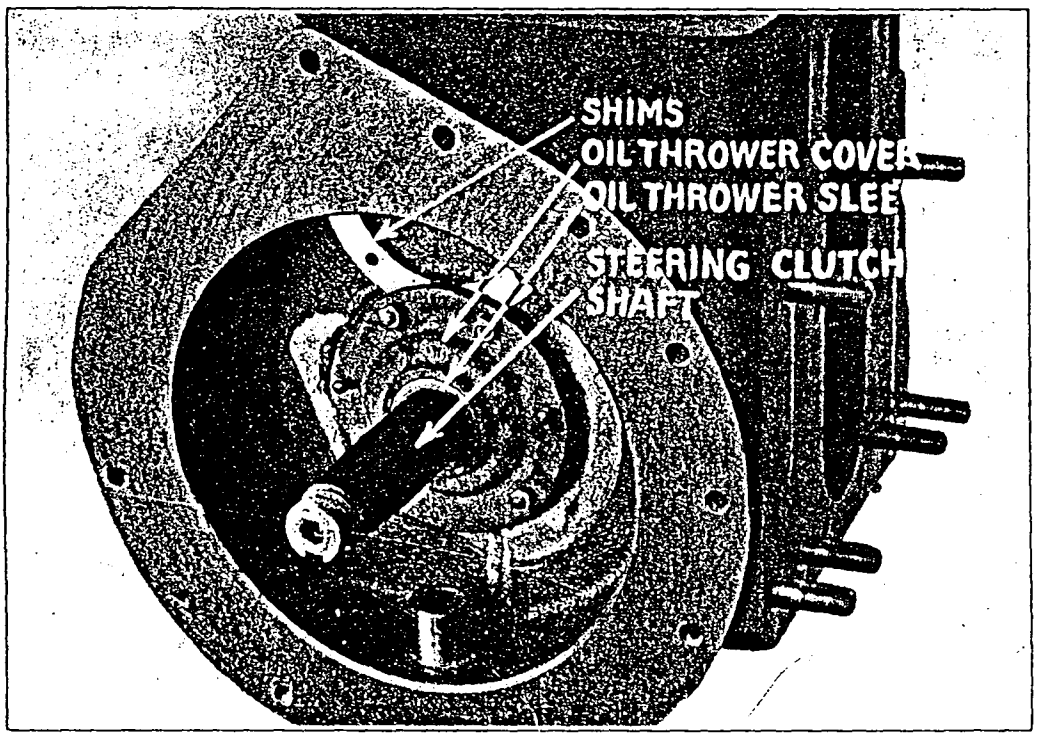
BEVEL GEAR ADJUSTMENT

Two adjustments are necessary on the bevel gear and shaft; one for the bearings and one for the clearance between gear and pinion.

When shaft is being readjusted after having been disassembled, replace same number of shims on each side as were there before.

When shaft has not been disassembled but is to be adjusted for bearing wear, remove oil thrower covers, as described under STEERING CLUTCH SHAFT, thus exposing adjusting shims. Remove .006" shims from each side. Replace and tighten left hand cover. Be sure that nuts holding it are tightened evenly so that cover is equi-distant from transmission case at all points. Then replace right hand cover similarly. Insert edges of as many shims as possible between upper edge of left hand cover and case. Remove left hand cover and put in place one more than the number of shims that were inserted behind edge of cover.

Insert edges of as many shims as possible behind upper edge of right hand cover. Remove cover, and place that many shims under cover. Tighten right hand cover. Test this adjustment by grasping both ends of steering clutch shaft with hands and endeavoring to revolve shaft and



ADJUSTMENT OF BEVEL GEAR AND STEERING CLUTCH SHAFT

gear. Be sure that sliding gears on upper transmission shaft are in neutral. If shaft and gear can be moved through a complete revolution with hands, as described, adjustment is correct. If too tight to be so revolved, place one more shim behind right hand cover and test again.

Should any unevenness in face of gear indicate a high spot which causes gear and pinion to bind at one point, place one more shim under left hand cover, and test again.

Be sure that large ends of gear teeth match evenly with ends of pinion teeth.

BEVEL GEAR AND PINION

To adjust: Remove shims from behind right bearing cage and add these shims behind left bearing cage until a minimum clearance of .005" is secured between bevel gear and pinion. This adjustment can be made without disturbing the bearing adjustment.

The proper clearance is readily discerned by an experienced man. Anyone can check it accurately by running a length of wire solder between the gears and measuring the thinnest part with a pair of micrometers.

TRACK ROLLER

Special equipment necessary for removing roller:

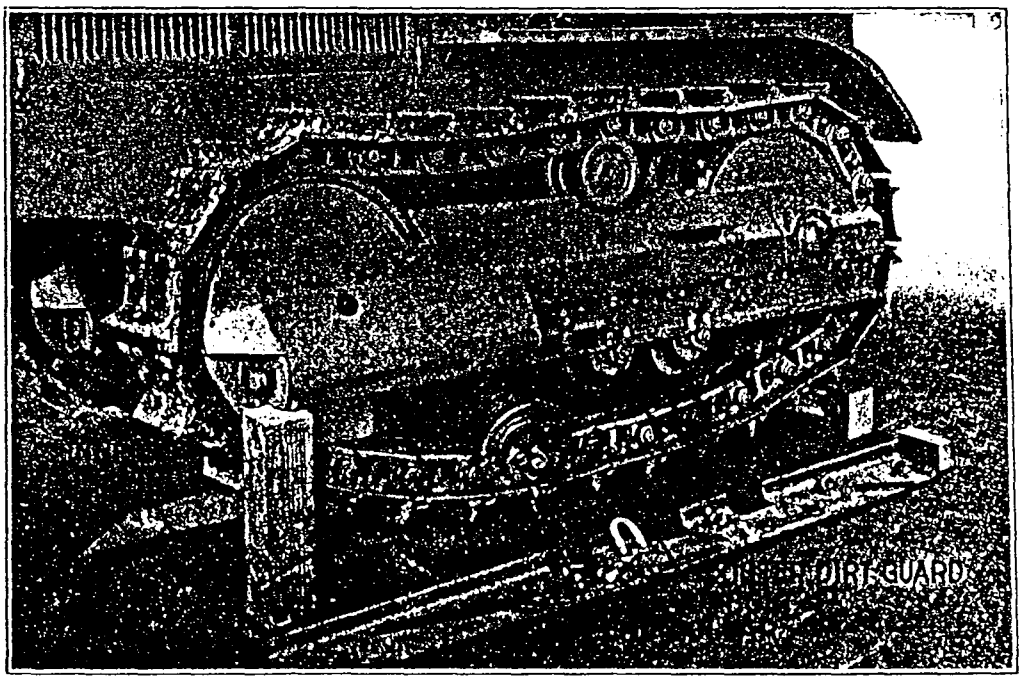
1 block of wood 2" x 3" x 6".
3 blocks of wood 6" x 6" x 16".

To remove roller, remove cap screw holding roller end collar to side channel.

Remove nuts from U bolts which hold track roller shaft to track roller frame. When removing front track roller, it may be necessary to run nut on front idler adjusting bolt ahead several threads to give room for wrench to work.

Remove inside and outside track roller guards. Place 2" x 3" block between sprocket teeth as high as possible under track. Run tractor to rear until block is drawn in between track and top of sprocket. This will draw front idler to rear about an inch, and will permit placing one of the 5/8" nuts, previously removed, flatwise on top of each front idler adjusting bolt between head of bolt and adjoining shaft bearing guide. Run tractor ahead again to remove block from sprocket. This will leave track with about two inches additional slack.

Lay one of the 6" x 6" blocks on floor behind sprocket. and back



REMOVING TRACK ROLLER

tractor until block is under rear track roller. It will be more effective if placed so that it will come under one grouser rather than between grousers. Lay second block on floor just ahead of front idler, and run tractor ahead until it starts to rise over block.

Place third block in slanting position, lower end on ground, upper end under idler shaft bearing guide. Run tractor ahead until third block stands vertical, raising front of track roller frame about six inches. Pry track down to get all possible slack under track rollers.

If a heavy jack or chain block is available, it may be used instead of wooden blocks to raise tractor, but in any case blocks should be used to hold tractor in position, as there is always a chance of injury if jack should slip out while operator has hands beneath tractor.

Further dismantling of this assembly is merely a matter of removing the various parts from the roller hub. Wash all parts in gasoline or kerosene before reassembling.

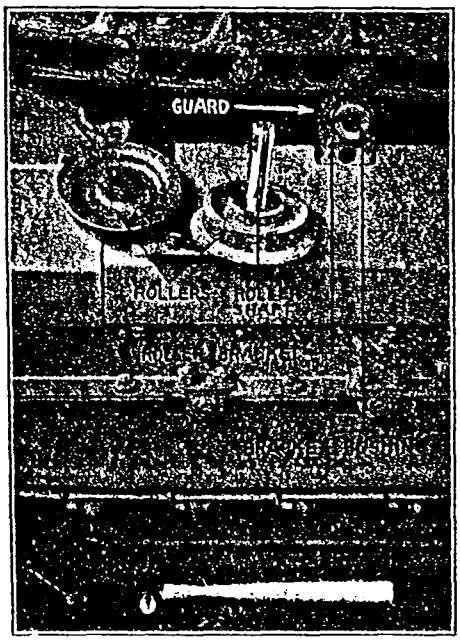
Examine cork seals and replace with new ones if they are not in good condition. When installing new seals, give them a heavy coating of grease before assembling in roller, to prevent them from being damaged before regular grease supply has reached them.

Examine thrust washers and replace any that show much wear. Replace any thrust washer pins that are worn or sheared off.

Examine roller bearings and replace with new ones, including new inner and outer races, if they show much wear. The inner races fit tightly on the shaft, and will have to be removed in a press.

Continued use of badly worn track roller bearings is likely to throw weight of tractor on to hardened thrust washers in either end of hub. This will cause these washers to cut off end of hub, requiring expensive repairs.

Before track roller can be assembled it may be necessary to drive out two pressure spring retainer plugs in each end collar, so that springs can be replaced after roller is in position. If these plugs are driven out, they



REMOVING TRACK CARRIER ROLLER

should be discarded and new ones used, as old ones will be likely to have lost sharp edges which hold them in place.

TRACK CARRIER ROLLER

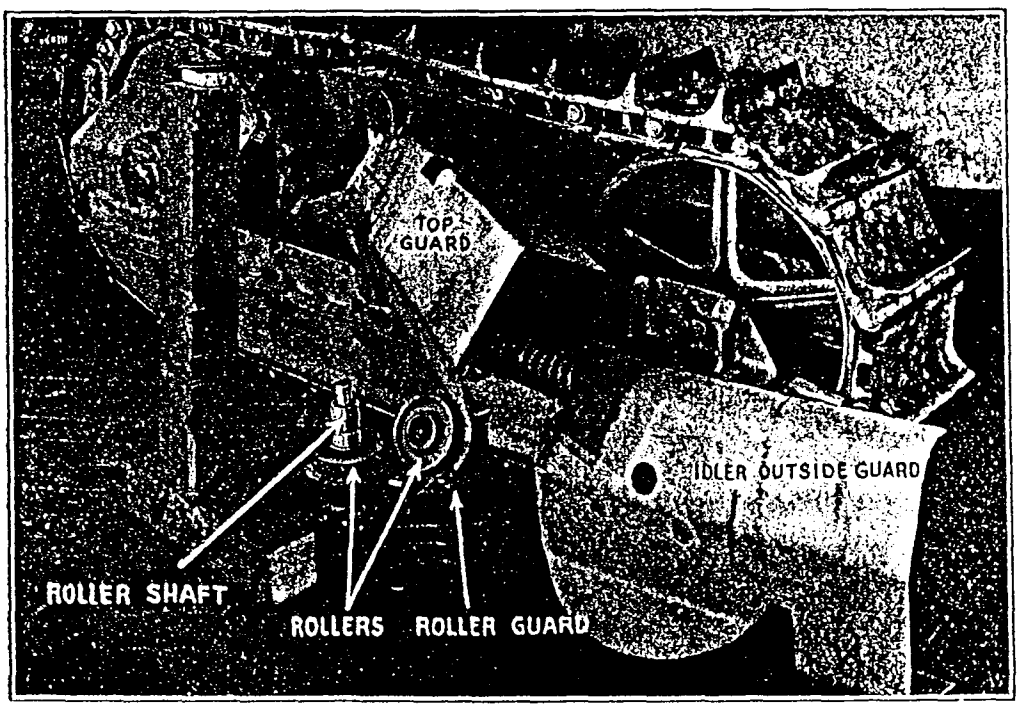
To remove track carrier roller, remove cap screw and lock from inside of roller. Remove inner roller from shaft, by tapping with hammer. Be careful not to drop Woodruff key that is in end of shaft. Withdraw outside roller, also shaft, without further disassembly. The bushing in which shaft turns, and which remains in carrier roller bracket, may be removed by loosening lock nut and set screw in top of bracket, and tapping end of bushing. Drive with wooden block or use babbitt hammer.

TRACK ROLLER FRAME TOP GUARD

To remove top guard, remove front idler outside guard, TRACK CARRIER ROLLER and bushing, and remove grease pump connection.

Remove five bolts holding guard assembly to track roller frame, also cap screw holding top guard to sprocket guard.

Insert pinch bar between track links. Insert block about 34" long under outer end of bar, lifting track as high as possible above guard. Lift guard over roller bracket, swing forward end outward, and remove endwise.

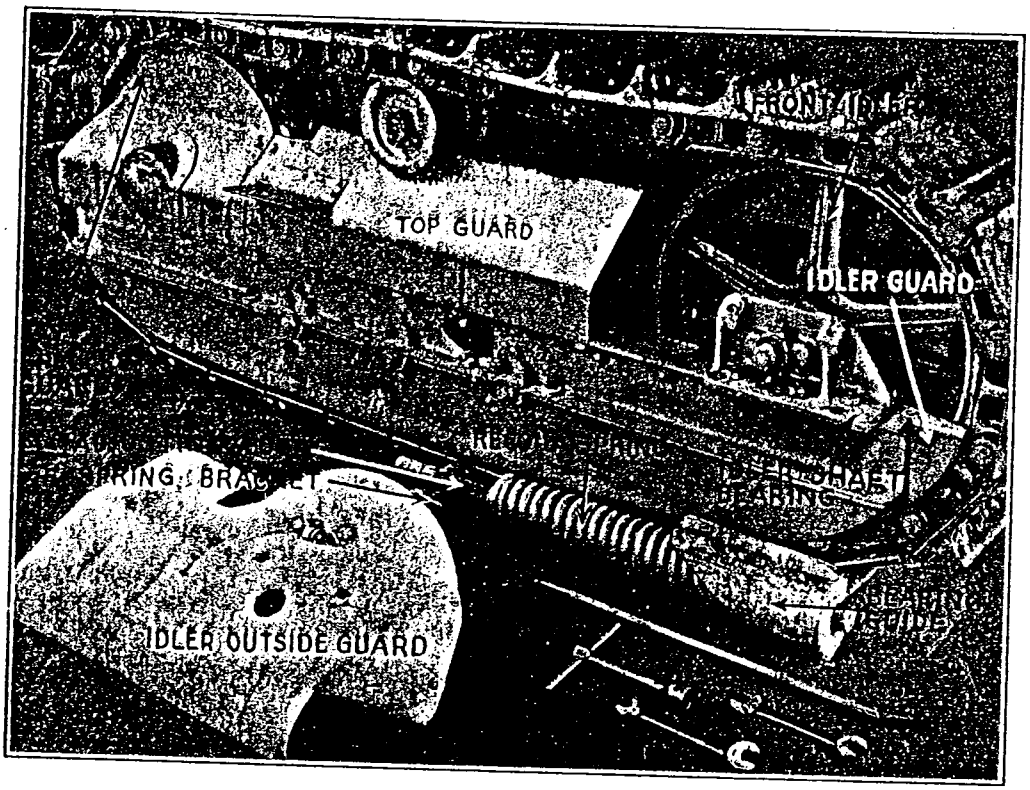


REMOVING TRACK ROLLER FRAME TOP GUARD

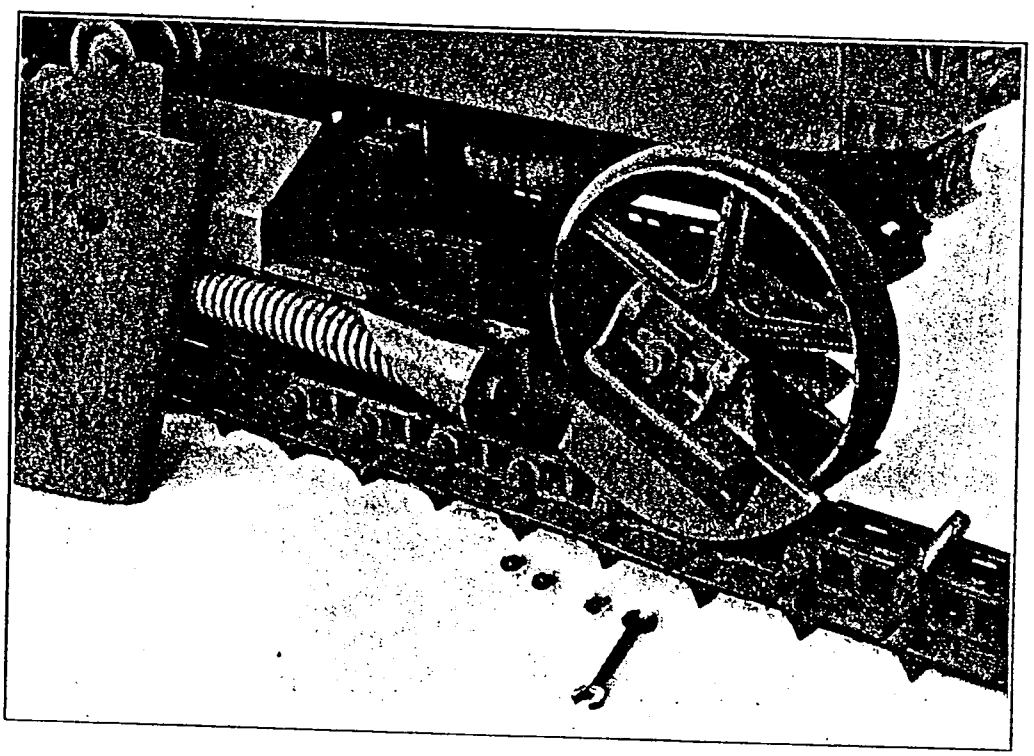
TRACK CARRIER ROLLER BRACKET

To remove this bracket, remove TRACK ROLLER FRAME TOP GUARD.

Loosen nuts on bolts holding bracket to track roller frame top channel. Secure each bolt with wire loop as illustrated in removal of diagonal brace. Nuts may then be removed and bracket lifted off.



TRACK RECOIL SPRING REMOVED



FRONT IDLER REMOVED

Should nuts be rusted on to bolts so bolts turn in channel, it will be necessary to remove track roller outside dirt guard and hold bolt heads with wrench.

TRACK RECOIL SPRING

To remove this spring, remove front idler outside guard.

Loosen three cap screws holding idler shaft guide to idler shaft bearing. If these cap screws appear to be under a strain sidewise, loosen spring bracket bolt and turn adjusting bolt farther into spring bracket.

Next remove nuts from bolts holding idler spring bracket to track roller frame, and finish removing three cap screws holding bearing guide to shaft bearing. Recoil spring assembly may now be removed.

FRONT IDLER SHAFT BEARING

To remove this bearing, place 2" wooden block under front idler. Remove TRACK RECOIL SPRING and remove three bolts in rear side of front idler shaft bearing holding idler guard to shaft bearing.

Loosen set screw holding bearing to shaft and withdraw bearing.

FRONT IDLER

To remove front idler, remove TRACK, front idler guard, and remove six cap screws which hold front idler shaft bearings to guides. The idler may be removed by sliding out to the front.

To disassemble the idler, remove the set screw and slide bearing assembly off of shaft.

To assemble the idler, slide parts on to the shaft in the following order: Idler, roller bearing, inner thrust washer which is held to the hub by dowel pins, outer thrust washer which is held to the front idler shaft bearing by dowel pins, inner cork seal, outer cork seal, pressure plate. Insert springs in holes in the front idler shaft bearing, slip the bearing over the shaft, and lock with set screw.

Caution: Be sure that the bosses on the pressure plate assembly engage with the springs in the front idler shaft bearing.

TRACK ROLLER FRAME SIDE CHANNEL

Place 1" wooden blocks under sprocket and front idler to take weight of tractor from rollers.

If outer side channel is to be removed, remove sprocket guard. Place bar or wooden block in sprocket teeth, move tractor to rear and place nut between front idler adjusting bolt and front idler bearing guide on inner side of track roller frame, as described under TRACK ROLLER.

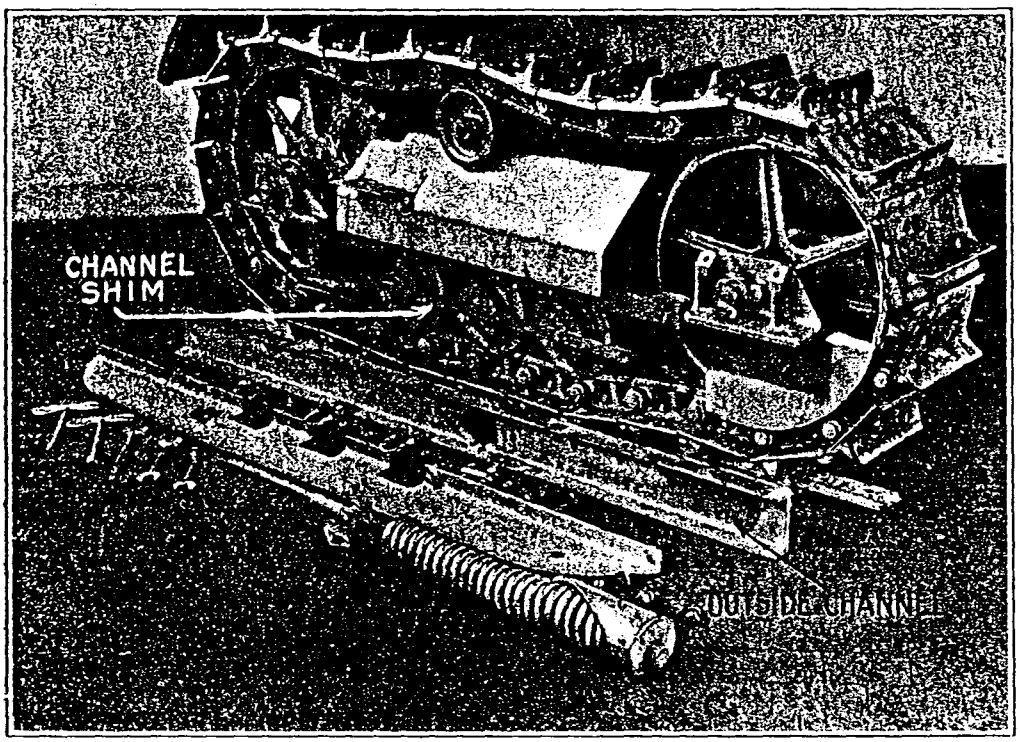
With jack or chain block, take weight of equalizer spring from top of track roller frame.

Remove TRACK RECOIL SPRING, remove track roller outside dirt guard, remove three bolts holding track roller frame top guard to side channel, remove U bolt from outer end of each track roller, remove grease pump connection from bottom of track roller frame outer bearing, remove four bolts holding bearing to side channel, and remove three cap screws holding track roller end collars to side channel.

Remove nuts from eight bolts holding side channel to top channel. Two bolts at each end can be removed. Four bolts in center will slip back against track roller rims but will not come entirely out.

Channel may now be removed.

Inner side channel may be removed substantially as above, except that it will not be necessary to remove sprocket guard.



TRACK ROLLER FRAME OUTER SIDE CHANNEL REMOVED

FRONT IDLER ROLLER BEARINGS

To remove these bearings, place 2" wooden block under idler as illustrated. Remove outer TRACK RECOIL SPRING.

Remove three bolts from inner edge of front idler shaft bearing, holding idler guard to shaft bearing. Loosen set screw holding bearing to outer end of shaft. Remove front idler inside guard.

Loosen set screw at inner end of shaft, which is now ready to be withdrawn except that some tension may exist from recoil spring on inner side of front idler.

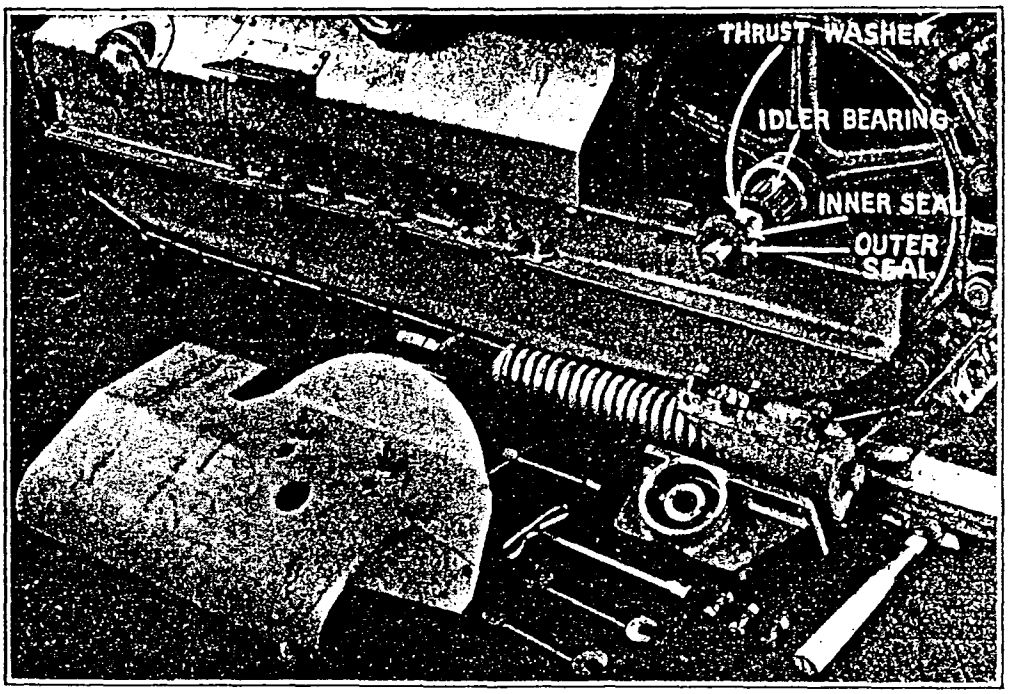
Place 2" x 4" wooden block behind front idler.

Loosen recoil spring bracket bolt and tighten spring adjusting bolt until tension on idler is relieved. With bronze rod or soft steel bolt, tap inner end of idler shaft until it is free of bearing, then withdraw.

When shaft is withdrawn, roller bearings may be withdrawn.

In replacing, be sure that flat steel thrust washers are properly seated on their pins.

When new bearings are installed, new inner and outer races should be used.



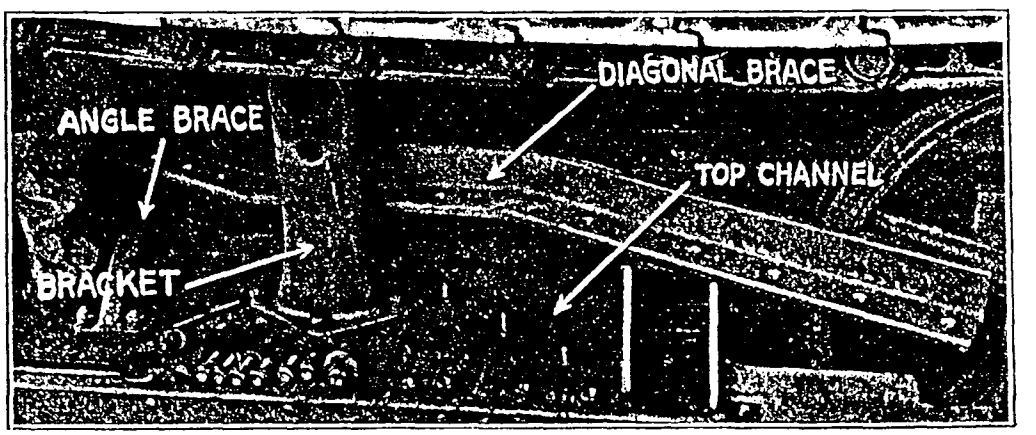
REMOVING FRONT IDLER BEARINGS

TRACK ROLLER FRAME DIAGONAL BRACE

To remove, remove TRACK ROLLER FRAME TOP GUARD.

Remove five bolts holding diagonal brace to track roller frame inside bearing; also two bolts holding it to angle brace. Loop wires around bolts to hold them in place, otherwise track roller dirt guard will have to be removed.

When re-connecting roller frame angle brace to track roller frame inside bearing, put in three vertical bolts first. Then, if two horizontal bolts do not line up exactly, start engine, and with tractor in low gear turn sharply to one side or the other. This will usually bring horizontal bolts into line. It is also sometimes helpful to place a jack between front ends of track roller frames. Do not ream or file these bolt holes. To do so will cause looseness and wear.



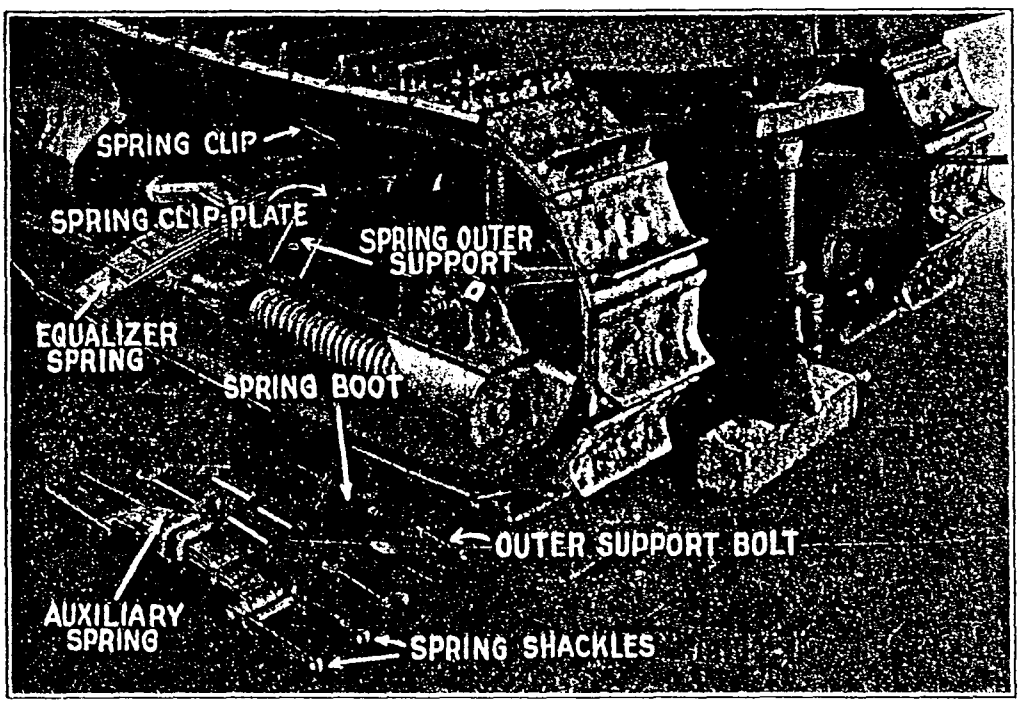
REMOVING TRACK FRAME DIAGONAL BRACE

EQUALIZER SPRING

To remove this spring, remove TRACK ROLLER FRAME TOP GUARD on one side. Remove boot assembly on one side, by removing outer support bolt and loosening buckle beneath leather portion. Loosen buckle on boot at opposite end of spring.

With short jack or long bar, raise one end of auxiliary spring until pin holding auxiliary spring to its bracket can be removed. Allow that end of spring to drop to ground and pin holding other end of spring to bracket can be removed easily. Auxiliary spring is then entirely free of tractor.

With chain block or heavy jack, raise engine 8" or until clips in center of equalizer spring will clear webs on bottom of crank case. Spring may then be withdrawn endwise. A piece 1" x 3" x 48" laid across the track roller frames under the spring will help to hold up inner end of spring while it is pulled out.



REMOVING EQUALIZER SPRING

DRAWBAR

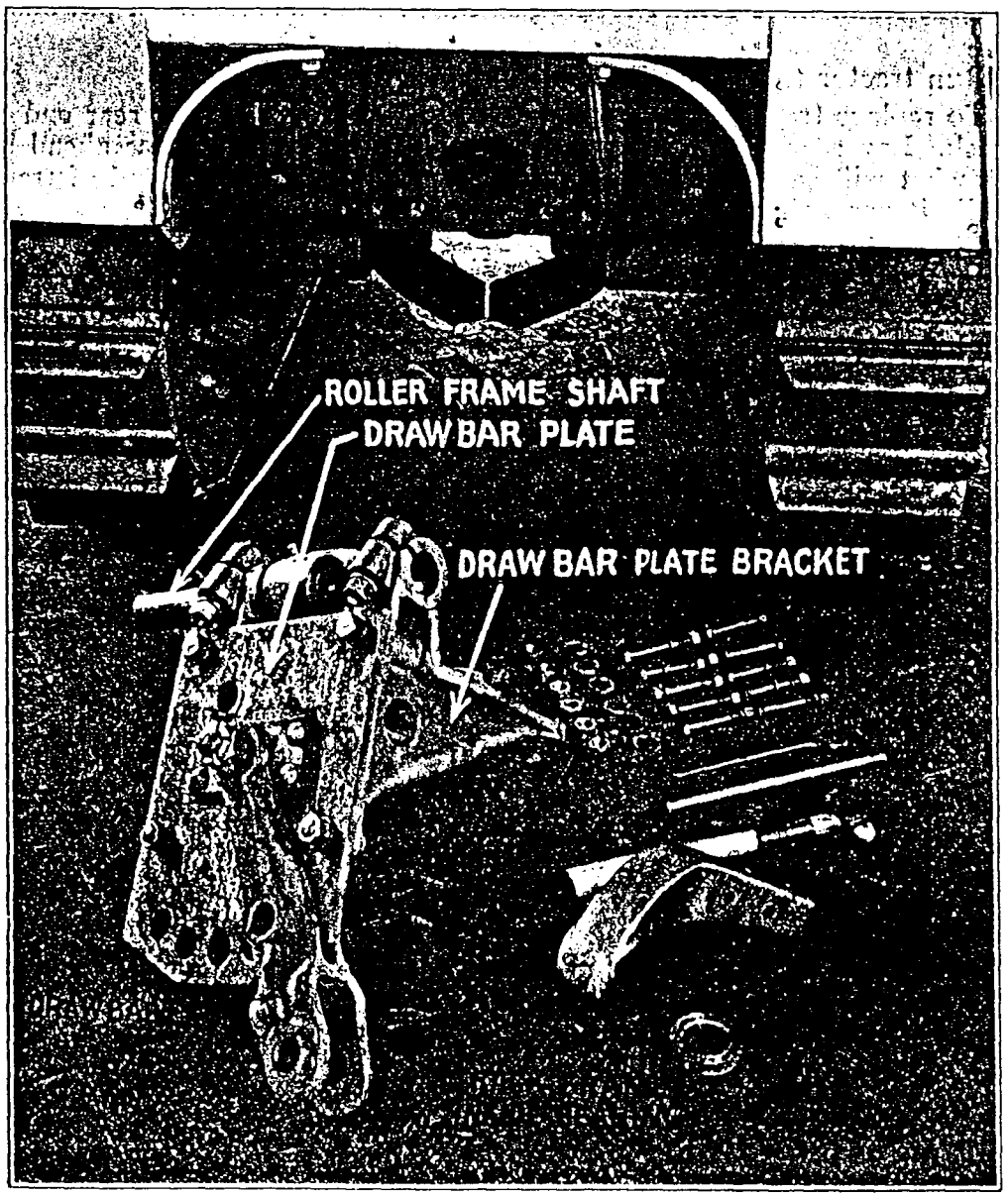
To remove drawbar, remove drawbar bolt, nut and cotter pin.

To remove drawbar plate, remove two bolts and two cap screws holding plate to bottom of brackets.

TRACK ROLLER FRAME INNER BEARINGS

To remove these bearings, remove five bolts holding each bearing to its diagonal brace, and remove six nuts holding drawbar brackets to rear of transmission case. Drawbar assembly and bearings may then be removed from tractor.

To remove bearings from drawbar assembly, loosen bracket clamp bolts and drive track roller frame shaft to one side. Bearings may then be removed.



REMOVING TRACK ROLLER FRAME INSIDE BEARINGS

TRACK

To remove, place track so that master pin, the pin with split cotter pins, is in front of front idler. Remove cotter pin from inner end of track pin. Place wooden block under front of track.

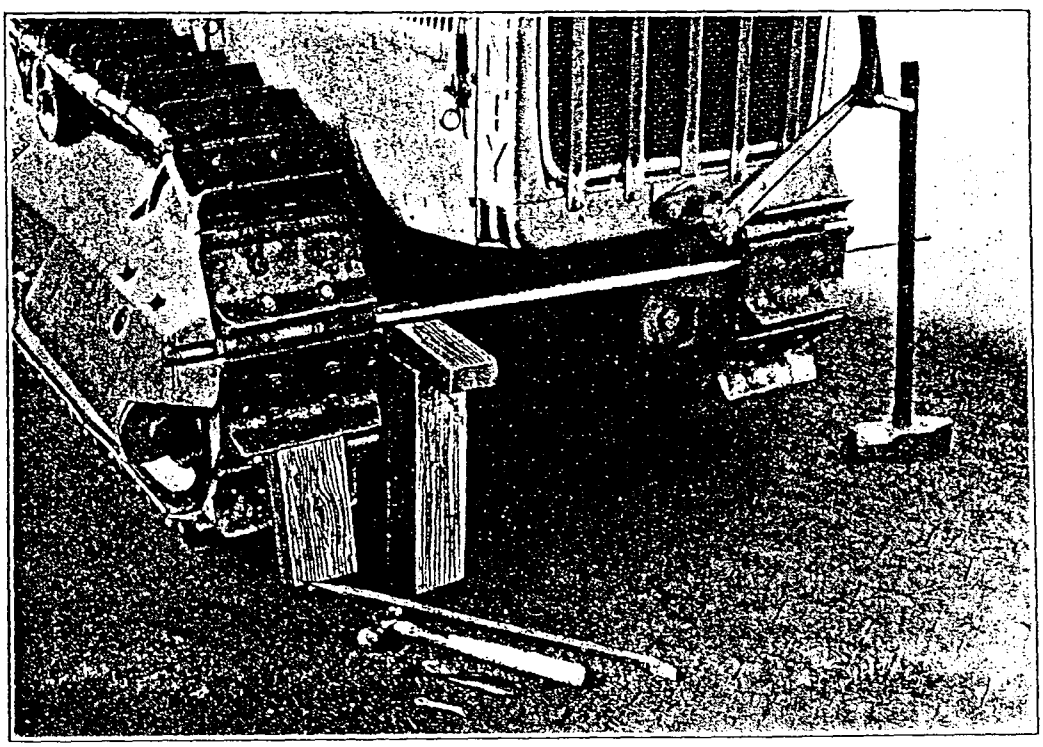
Drive track pin out, using long bar, or short punch if someone is available to hold it. Master pin is slightly tapered, being smaller at notched end, and should always be removed by driving on notched end and replaced by driving on the other end. Small or notched end should always be on inside of track. Use backup bar against the opposite side of track link to absorb shock of sledge hammer blows so link will not be damaged if pin is extra tight.

Save small filler collars located at each end of master track pin bushing.

Run tractor to rear until track drops from sprocket.

To replace track, run tractor to rear until sprocket is near rear end of track. Lay rear four track links on sprocket and run tractor ahead so sprocket will carry track with it. With pinch bar, support end of track while it passes over track carrier roller and front idler.

Place block under front end of track to hold it against front idler. Run tractor forward a few inches until block starts to lift idler from ground. Rear end of track will then engage with front end sufficiently

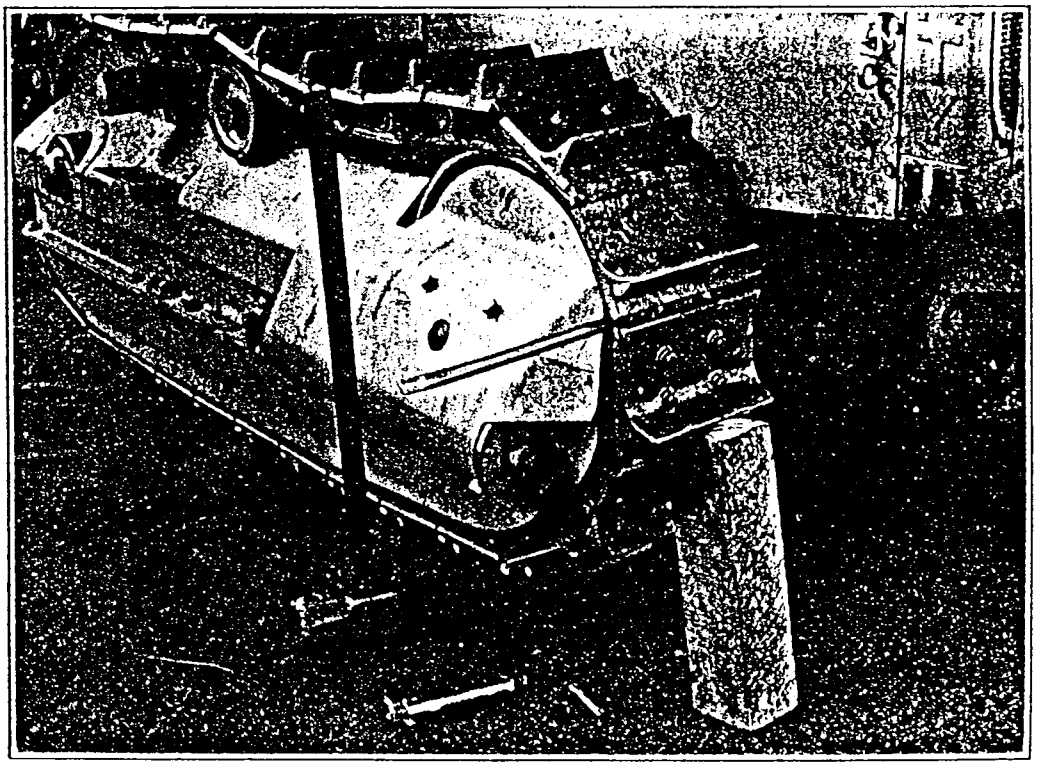


REMOVING MASTER PIN

to insert pinch bar, coupling track together. Place 2" x 2" x 6" block of wood on sprocket teeth just below track and run engine to rear until strain on track draws front idler to rear. Insert nut or bolt head between head of front idler adjusting bolt and adjoining shaft bearing guide. When tractor is again run ahead and block is removed from sprocket, track will have additional slack which will make it easy to draw the two ends together enough to insert master pin.

Be sure to replace the two filler collars. They are easily held in place by applying a little grease. Aways drive the master pin small (notched) end toward the engine. Hold a backup bar against inside of track link to absorb hammer blows. Replace cotter pin.

When pin is in place, remove nut or bolt that was inserted back of head of idler adjusting bolt.



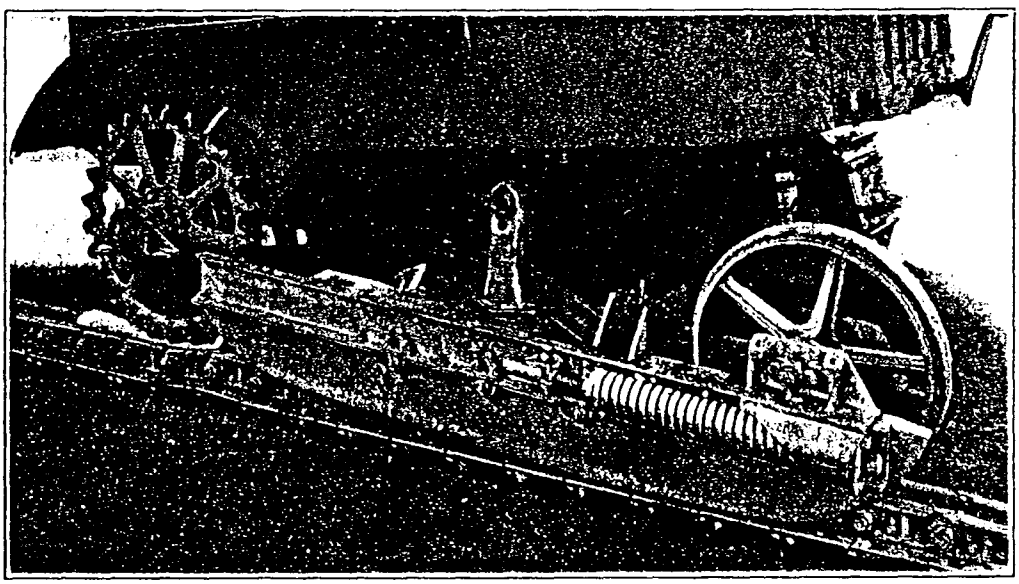
READY TO RE-CONNECT TRACK

TRACK ROLLER FRAME

To remove track roller frame, remove TRACK. Remove front idler outside guard and TRACK ROLLER FRAME TOP GUARD. Remove sprocket guard plate, held in place by five cap screws and one bolt. Remove five bolts from rear end of track roller frame diagonal brace, and remove four bolts holding outer track roller frame bearing to track roller frame. Remove grease pump connection from under track roller frame outer bearing.

Lay a 1" x 3" x 24" block on top of track pin bushings, just behind sprocket. Run tractor to rear until sprocket rests on block, raising track roller frame outer bearing from track roller frame.

With chain block, or with jack under front end of crank case, raise engine until equalizer spring clears top of its support. Roll track roller frame ahead to clear sprocket. It may be tipped outward so track carrier roller bracket will pass end of equalizer spring.



TRACK ROLLER FRAME REMOVED