

TM 10-1623

R DEPARTMENT TECHNICAL MANUAL

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TRACTOR (WHEELED),
WAREHOUSE, CASE
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WAR DEPARTMENT 15 AUGUST 1945

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WAREHOUSE, CASE
V.A.I.W. (GASOLINE)**



WAR DEPARTMENT (15 AUGUST 1945)

WAR DEPARTMENT
Washington 25, D.C., 15 August 1945

TM 10-1623, TRACTOR (WHEELED), WAREHOUSE, CASE, VIAW (GASOLINE), is published for the information and guidance of all concerned.

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For Explanation of symbols, see FM 21-6

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PART ONE – INTRODUCTION

Section I – General:

NOTE: THE CONTENTS OF THIS MANUAL PERTAIN TO BOTH VAIW-3 AND VAIW-4 MODELS, EXCEPT WHEN OTHERWISE SPECIFIED.

1. SCOPE:

a. These instructions are published for the information and guidance of the personnel to whom this tractor is assigned. They contain information on the operation and maintenance of the tractor as well as descriptions of the major units and their functions in relation to the other components of the tractor. They apply only to the VAIW Tractor and are arranged in four parts: Part One, Introduction; Part Two, Operating Instructions; Part Three, Maintenance Instructions; and Part Five, Repair Instructions.

b. Technical manuals and other publications applicable to the material covered by this manual are listed in the reference section at end of the book.

2. RECORDS:

Using personnel will make use of the following maintenance forms and records in the performance of prescribed operations.

a. W.D., A.G.O. Form No. 6, "Duty Roster." This form provides the basis for a control system whereby preventive maintenance services may be performed at regular intervals without withdraw-

ing too many tractors from use at any given time. It may be adapted to serve as a record of the maintenance and lubrication activities of an organization.

b. W.D. Form No. 48, "Driver's Trip Ticket and P.M. Service Record." This form, properly executed, will be furnished the driver when his tractor is dispatched on non-tactical missions. The driver and the official user of the tractor will complete in detail appropriate parts of this form. The reverse side of the form contains the driver's preventive maintenance service reminder schedule.

c. W.D., A.G.O. Form No. 461, "Preventive Maintenance Service and Technical Inspection Work Sheet for Wheeled and Half-Track Vehicles." This form will be used for all 48-hour and 192-hour maintenance services and all technical inspections.

d. W.D., A.G.O. Form No. 468, "Unsatisfactory Equipment Report." This form will be used to report unsatisfactory conditions found in equipment upon receipt thereof.

e. A.G.O. Form No. 478, "Modification Work Order." This form will be used whenever a modification is made on the equipment.

Section II – Description and Data:

3. DESCRIPTION:

a. General Information:

(1) EQUIPMENT:

4-speed transmission
Operator's platform
Electric starter and lights
Foot operated clutch and brakes

Engine temperature and oil gage
Variable speed governor with hand and foot control
Front bumper
Muffler (spark arresting)
Front and rear fenders with running board
Upholstered seat with backrest
Automatic coupler

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

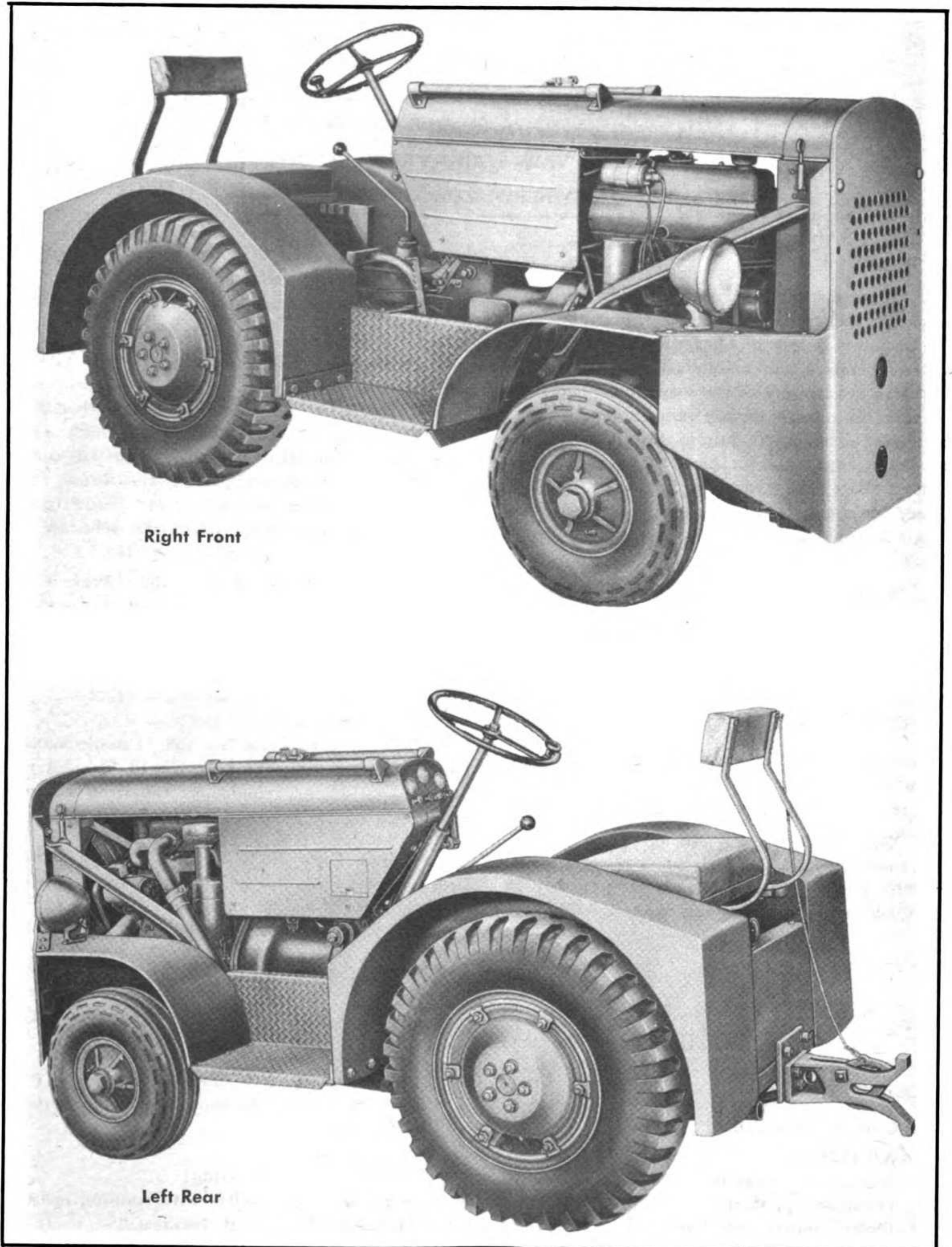
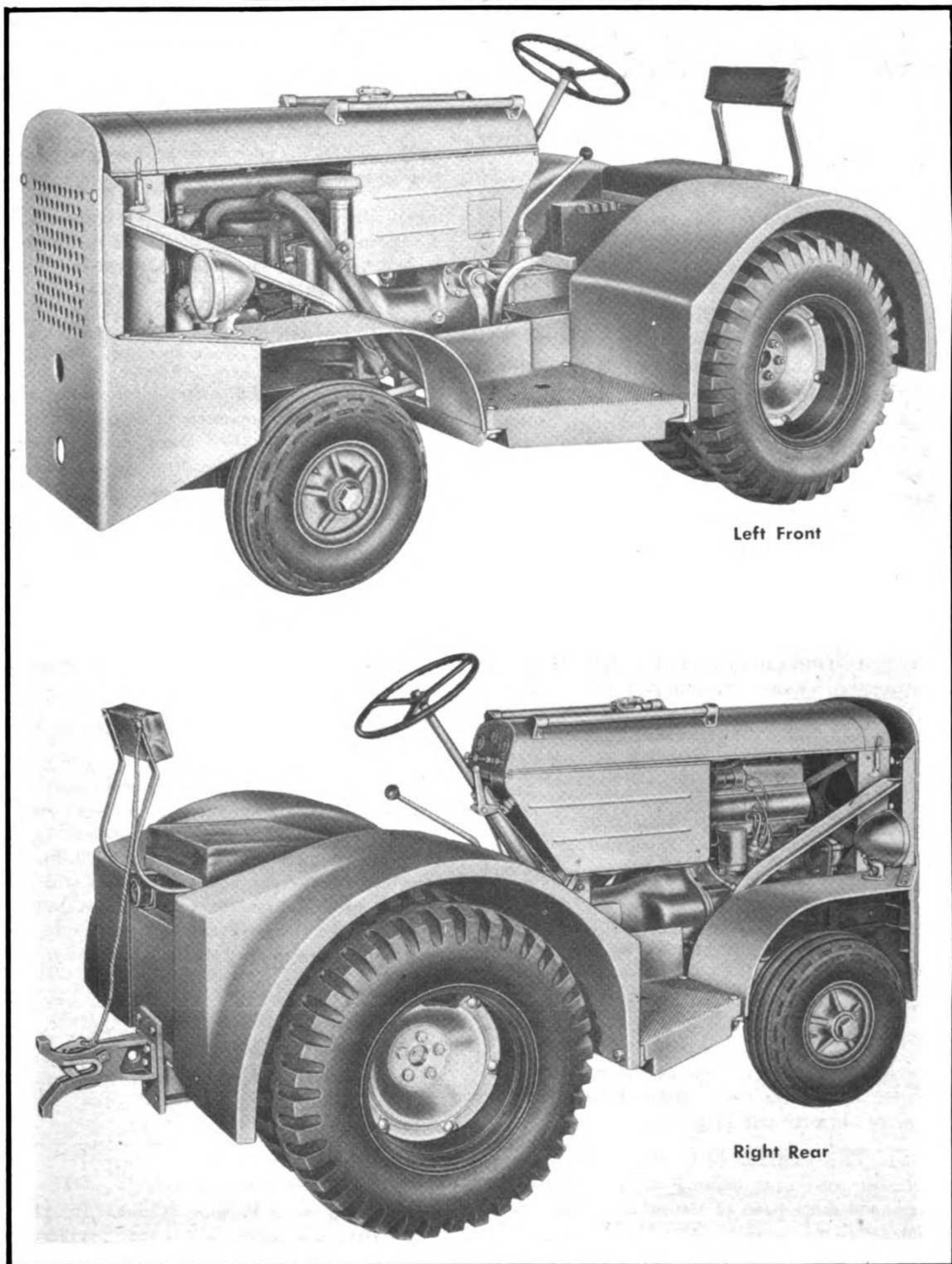


Figure 1 — VAIW-3 Tractor

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)



Left Front

Right Rear

Digitized by **Google** **Figure 2 — VAIW-4 Tractor** Original from UNIVERSITY OF CALIFORNIA

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

- (2) **ENGINE:** Four-cylinder, valve-in-head, 3¼" bore, 3¾" stroke, 124 cu. in. displacement. Full Load R.P.M. 1800. Replaceable wet sleeves. Inserts on exhaust valve seats.
- (3) **PISTONS:** Cast; three compression rings; one oil ring.
- (4) **PISTON PINS:** Hardened steel, full floating type with snap retainer rings.
- (5) **CRANKSHAFT:** Three main bearings, precision and replacement type.
- (6) **CONNECTING RODS:** Drop forged, heat-treated steel; crank end, precision-replacement type bearings; piston end, bronze bushing.
- (7) **LUBRICATION:** Pressure lubrication to main bearings, connecting rod bearings, camshaft bearings, and rocker arm shaft. Other parts of engine lubricated by splash. Bayonet type oil gage. Crank case capacity—4 quarts.
- (8) **COOLING SYSTEM:** High capacity impeller pump. Pump and fan shaft special alloy steel, mounted on ball bearings. 16" four-blade fan, driven by V-belt. Thermostat temperature regulator. Radiator capacity—13 quarts.
- (9) **DUSTPROOF CONSTRUCTION (Engine):** Oil type air cleaner. Double seal at front end of crankshaft. Heavy gasket on valve cover. Felt washer on bayonet oil gage. Oil filler and breather cap located on valve cover. Oil seals on all projecting shafts.
- (10) **IGNITION:** Distributor and coil type. Automatic spark advance. Dustproof and waterproof distributor.
- (11) **GOVERNOR:** Variable speed, flyball type, sensitive and positive in operation. Either hand or foot control permits speed changes throughout entire range.
- (12) **FUEL TANK:** Capacity—9¼ gallons. Protectoseal filler cap.
- (13) **BEARINGS:** Tapered roller bearings installed throughout transmission, differential, front wheels and rear axle shafts.
- (14) **TRANSMISSION CASE:** Heavy one-piece unit construction containing all gears, shafts, bearings, and other parts of transmission and differential.
- (15) **DIFFERENTIAL:** Spiral bevel ring gear

- and driving pinion, and three bevel pinions with heavy duty side gears.
- (16) **GEARS:** Drop forged and hardened; all alloy steel.
- (17) **SPEEDS:** Four forward, one reverse; selective sliding gear type.
- (18) **BRAKES:** Disk type, 6" diameter, self-energizing in forward and reverse motion; operated by foot pedal having a ratchet lock to hold brakes in engagement for parking.
- (19) **CLUTCH:** Single 11" diameter plate; dry type; spring loaded. Foot operated.
- (20) **FRONT AXLE:** Structural steel welded frame, ball pivot mounted in rear, spring pivot mounted in front. 34½" tread, center to center. Spindles and steering arms drop forged, heat treated. Front wheels one piece casting, mounted on tapered roller bearings.
- (21) **REAR AXLE HOUSING:** Rear axle live type final drive, mounted on tapered roller bearings. Wheel tread 33¼", center to center.
- (22) **STEERING GEAR:** Worm and worm wheel type, located in torque tube which provides oil bath.
- (23) **DRAWBAR:** Automatic coupler type.

b. Identification Information:

The VAIW-3 Model is a four-wheel tractor (Figure 1) with maximum drawbar pull of 3000 lbs. The VAIW-4 Model has dual rear wheels (Figure 2) with maximum drawbar pull of 4000 lbs. Identification features of both models are the front bumper grille, automatic coupler, cast iron rear fenders, and cushioned seat with back-rest. Both models are also equipped with electric starter, lights and horn.

4. TABULATED DATA:

a. General:

(1) **ENGINE SPECIFICATIONS:**

Cylinders	4
Bore	3¼"
Stroke	3¾"
Compression Ratio	5:1
Compression Pressure (Crank) .	105 Lbs.
Displacement	124 Cu. In.
Engine Speed (Full Load)	1800 R.P.M.

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

Spark Plugs025" Gap
Valve Clearance, Intake and
Exhaust (Engine Cold) .012"
Carburetor (Updraft)7/8" Venturi

b. Performance:

(1) ROAD SPEEDS AT 1800 R.P.M.

	VAIW-3	VAIW-4
1st Gear	2.62 MPH	2.04 MPH
2nd Gear	4.53 MPH	3.52 MPH
3rd Gear	5.81 MPH	4.52 MPH
4th Gear	13.88 MPH	10.80 MPH
Reverse	3.63 MPH	2.81 MPH

(2) WHEELS AND TREADS:

Front Wheels (for pneumatic,
multiple rib tires) Size 6:00-9"
Rear Wheels (for pneumatic,
combat, all service tires) Size 7:50-16"
Tread (front), Center to Center 34 1/2"
Tread, (rear), Center to Center 33 1/4"
Front Wheel Toe-in..... 1/8"

(2) MAXIMUM DRAWBAR PULL (Dead Load)

	VAIW-3	VAIW-4
1st Gear	3000 Lbs.	4000 Lbs.
2nd Gear	1900 Lbs.	2500 Lbs.
3rd Gear	1500 Lbs.	1800 Lbs.
4th Gear	250 Lbs.	400 Lbs.

(3) GENERAL DIMENSIONS:

Wheelbase 54 1/4"
Overall Length 105"
Overall Width 44"
Overall Height 51 1/2"
Ground Clearance 6"
Drawbar Height (Fixed Type) 12"
Turning Radius..... 8 1/2'
Turning Clearance 9'

c. Capacities:

- (1) Fuel Tank 9 1/4 Gals.
- (2) Cooling System 13 Qts.
- (3) Crankcase 4 Qts.
- (4) Transmission Differential
Rear Axle Housing 5 1/2 Gals.
- (5) Torque Tube Housing 7 Pts.

Section III - Tools and Spare Parts:

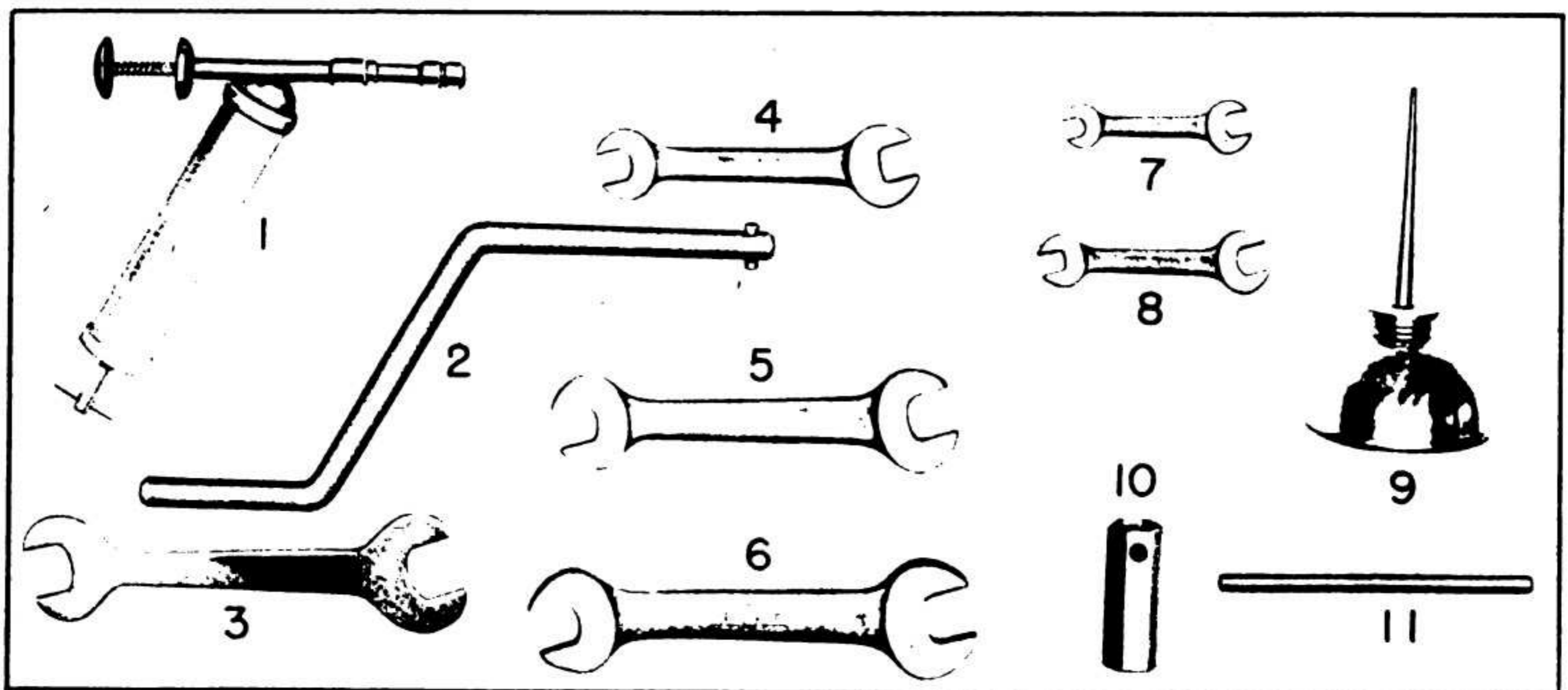


Figure 3 - Tools Furnished with Tractor

- | | | | |
|----------------|-----------------------------------|-----------------|--------------------------------|
| 1. No. 5950 | GREASE GUN | 7. No. 723-A | 3/8 - 1/2" DOUBLE END WRENCH |
| 2. No. VTA-714 | STARTING CRANK | 8. No. 725-A | 7/16 - 9/16" DOUBLE END WRENCH |
| 3. No. VT-2549 | WRENCH | 9. No. 14-AA | OIL CAN |
| 4. No. 729 | 5/8 - 3/4" DOUBLE END WRENCH | 10. No. VT-3538 | SPARK PLUG WRENCH |
| 5. No. 732 | 13/16 - 1" DOUBLE END WRENCH | 11. No. VT-2341 | SPARK PLUG WRENCH HANDLE |
| 6. No. 34-A | 15/16 - 1-1/16" DOUBLE END WRENCH | | |

5. TOOLS:

α. Figure 3 shows the tools supplied with the tractor to be issued to the using organizations. These tools are packed in the tool compartment of the tractor.

6. SPARE PARTS:

α. Figure 4 shows the spare parts supplied for each tractor to be issued to the using organizations. Most of these parts may be stored in the tool compartment of the tractor.

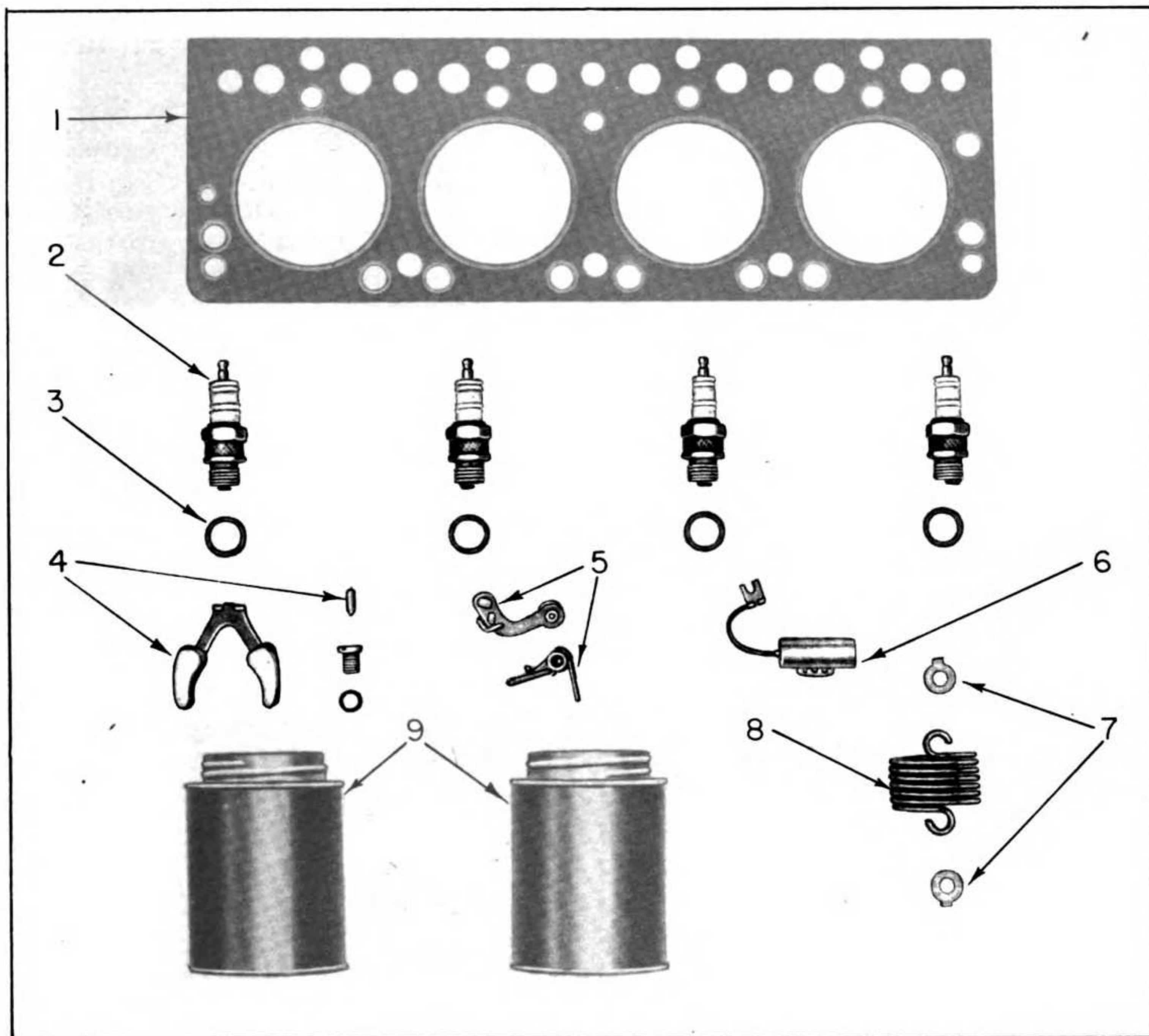


Figure 4 — Spare Parts

- | | | |
|-------------|------------|---------------------------------------|
| 1. | VT-3312 | CYLINDER HEAD GASKET |
| 2. | VT-3618 | SPARK PLUGS |
| 3. | VT-4020 | SPARK PLUG GASKETS |
| 4. | VTA-698 | FLOAT VALVE, SEAT AND GASKET ASSEMBLY |
| 5. | IGP-3028FS | DISTRIBUTOR SERVICE CONTACT SET |
| 6. | IGW-3139 | DISTRIBUTOR CONDENSER ASSEMBLY |
| 7. | EB-108 | STARTING MOTOR LOCK WASHERS |
| 8. | EBA-405 | STARTING MOTOR DRIVE SPRING |
| 9. | VT-3589 | OIL FILTER REPLACEMENT ELEMENT |
| (NOT SHOWN) | | FIRE EXTINGUISHER — EXTRA EQUIPMENT |

PART TWO – OPERATING INSTRUCTIONS

Section IV – General:

7. SCOPE:

α. Part Two contains information for the guidance of the personnel responsible for the operation

of this tractor. It contains information on the operation of the tractor together with the description and location of the controls and instruments.

Section V – Service Upon Receipt Of Equipment:

8. BEFORE STARTING THE NEW ENGINE:

α. Pre-Lubricate Cylinder Walls:

To pre-lubricate the cylinder walls before starting the engine, remove the spark plugs and pour one teaspoonful of crankcase oil into each cylinder; replace the spark plugs and turn the engine several revolutions to distribute the oil over the cylinder walls. This assures sufficient lubrication for the pistons and cylinders immediately after the engine starts. This procedure is necessary only when the engine is new or when it has been idle for a month or more. The following instructions are given to assist in performing this procedure:

(1) **SPARK PLUGS:** Use the socket wrench furnished with the tools for removing and installing the spark plugs, rather than pliers, open end, or adjustable wrenches. (Figure 5)

(2) **IGNITION CABLES:** When attaching the ignition cables, note that the firing order of the

engine is 1-3-4-2. Attach No. 1 cable to No. 1 cylinder, No. 3 cable to No. 3 cylinder, etc.

(3) **IGNITION CABLE HOLDER:** The ignition cable holder (Figure 6), which fits over the spark plug ends, is provided to prevent the cable terminal shells from "shorting out" on the push rod guides of the engine. The holder must be kept in place at all times. Also, see that the metal spark plug cover is in place to aid in preventing dirt and moisture from collecting around the cables and plugs.

9. SERVICE PROCEDURES FOR NEW TRACTOR:

The following procedures, as outlined herein, must be followed before putting the VAIW Tractor in operation.

α. Lubrication:

(1) **SPECIAL LUBRICATION FOR NEW ENGINE:** To protect the new engine parts from any

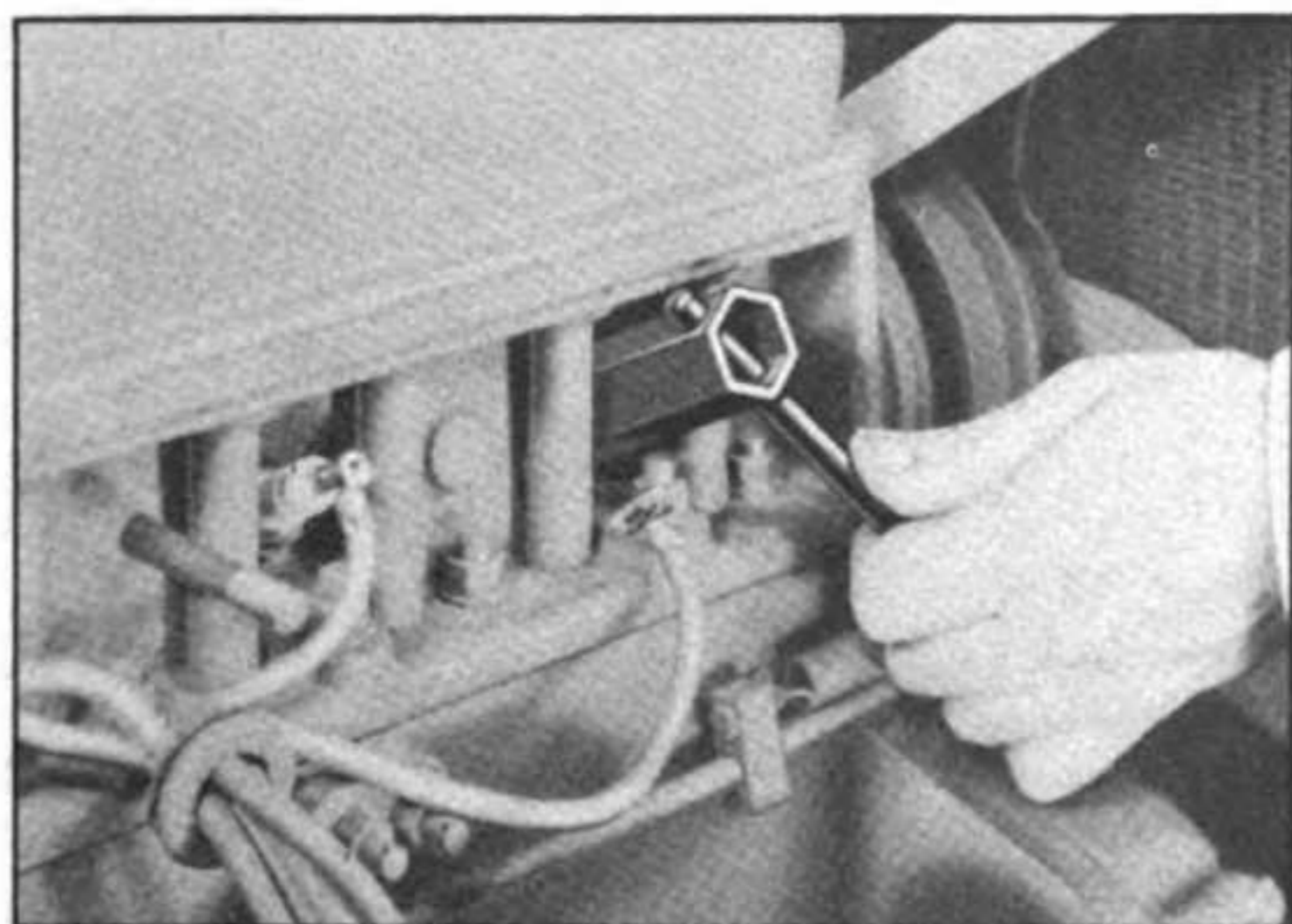


Figure 5 – Installing Spark Plugs with VT-3538 Spark Plug Wrench

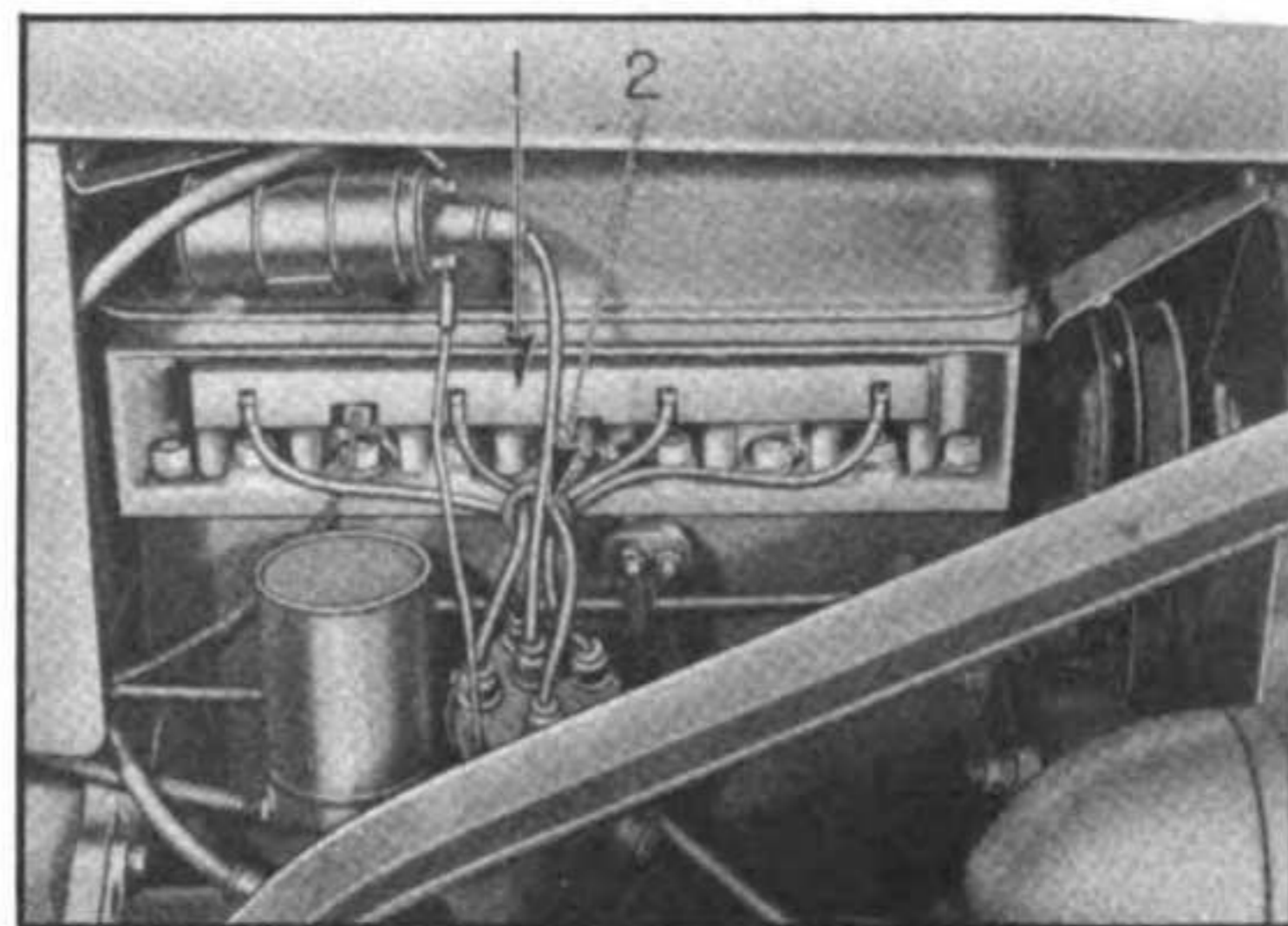


Figure 6 – Right Side of Engine

1. IGNITION CABLE HOLDER
2. IGNITION CABLES

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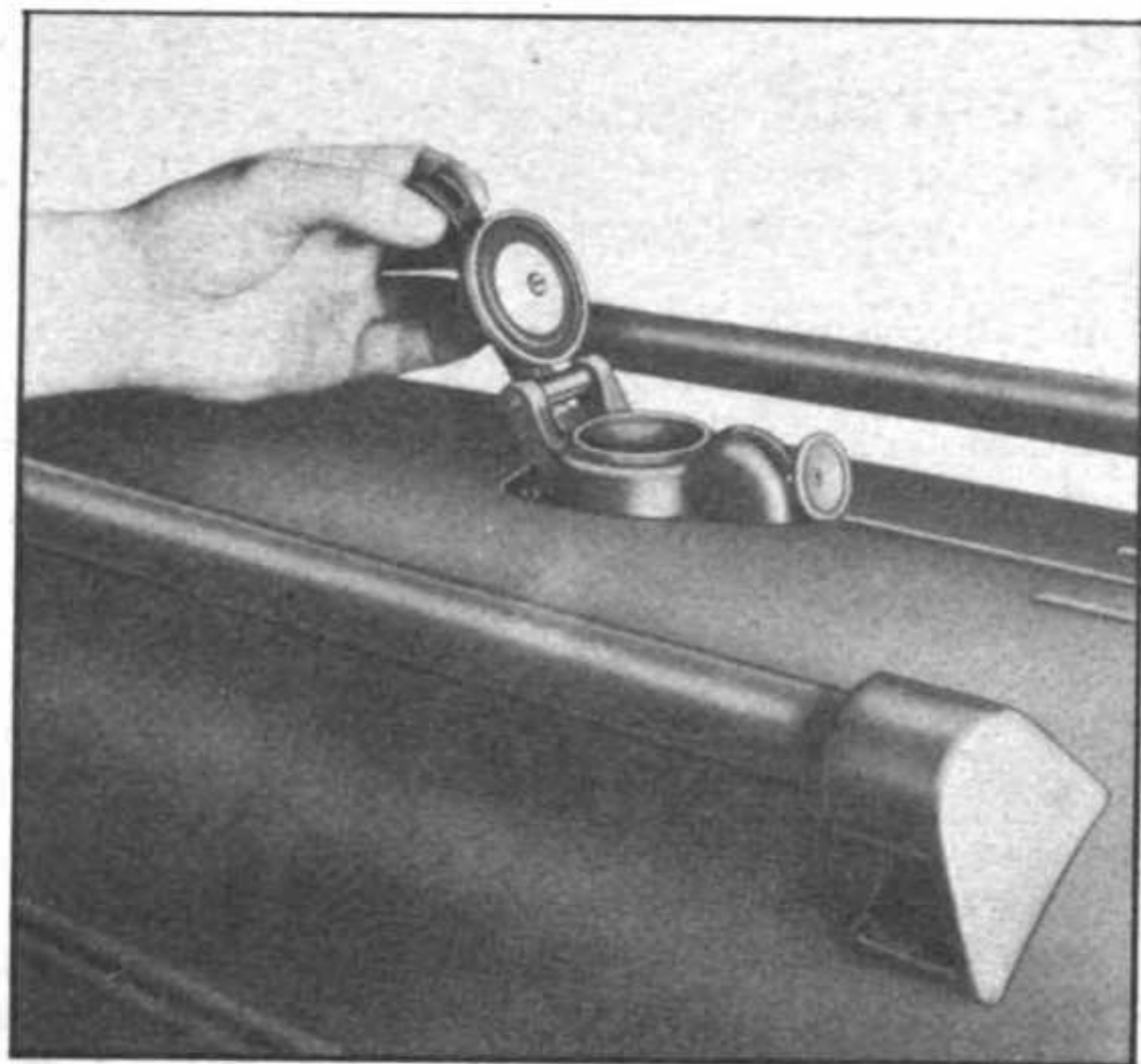


Figure 7 — Protectoseal Filler Cap

possible undo friction, it is necessary to mix one pint of light oil (SAE 10) with each five gallons of gasoline during the first forty-eight hours of operation.

(2) **LUBRICATE ENTIRE TRACTOR:** Lubricate the entire tractor in accordance with the Lubrication Order (Figure 12), Section XI. Complete information on lubricant specifications will also be found in Section XI.

NOTE: Engine may be operated for the first twenty-four hours with original oil as received from factory. When drained, this will act as a flush to the engine, removing all foreign particles.

b. Cooling System:

(1) **CLOSE DRAINS:** See that the drain cap on the lower radiator pipe and the drain on the left hand side of the engine block are closed tightly. (Figure 17)

(2) **FILL RADIATOR:** Fill the radiator with clean, soft water, taking care to leave sufficient space for expansion. When the tractor is to be operated in freezing temperature, 0° Cent. (32°F., or lower), anti-freeze solution must be put in the radiator. See Section VIII for further details pertaining to operating tractor under unusual conditions.

c. Fuel System:

(1) **FILLING FUEL TANK:** Close the fuel line valve under the fuel tank and fill the tank with clean gasoline, observing safety precautions for

grounding static electricity. Use care so as not to allow any dirt or foreign substances to enter the fuel. Now, remove the drain plug from the bowl of the carburetor (Figure 8), open the fuel line valve, and allow a small amount of gasoline to flow through to clean out the line and the carburetor bowl; then replace the drain plug.

d. Pneumatic Tires:

(1) **OVER-INFLATED FOR SHIPMENT:** When the tractor is shipped from the factory, tires are over-inflated to facilitate rigid blocking in the freight cars.

(2) **DEFLATE BEFORE OPERATING:** Before operating the tractor under its own power, the tires must be deflated to the following recommended air pressures:

FRONT TIRES	Lbs. Per Sq. In.
6:00-9, 4-Ply	35
REAR TIRES	
7:50-16, 6-Ply	40

e. Battery:

(1) **BATTERY ELECTROLYTE LEVEL:** Remove battery caps (Figure 9), and inspect electrolyte. If it is low, replenish with distilled water to a level $\frac{3}{8}$ " above the plates.

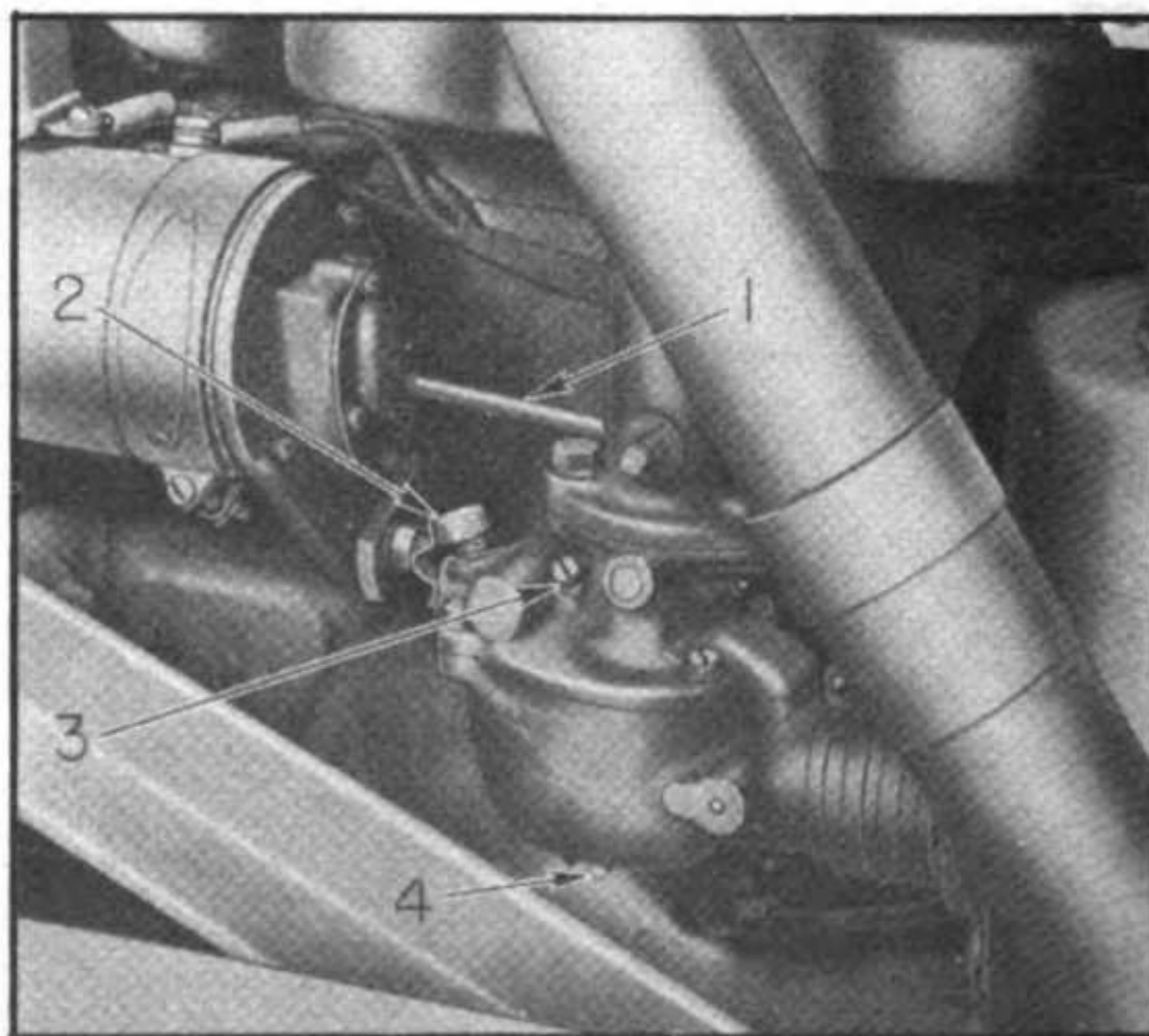


Figure 8 — Carburetor

- 1. THROTTLE LEVER ROD
- 2. POWER JET NEEDLE
- 3. IDLE JET NEEDLE
- 4. DRAIN PLUG

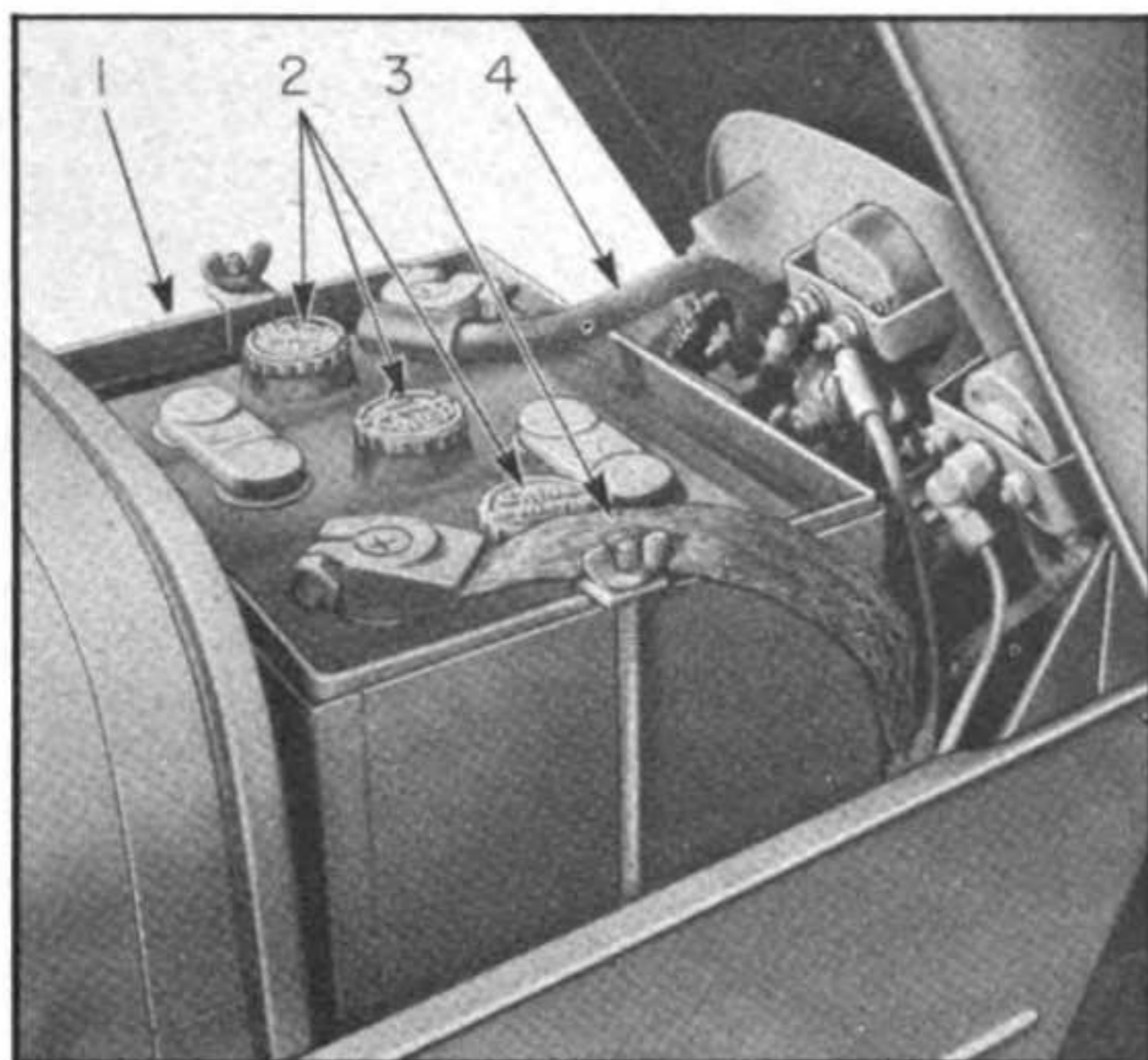


Figure 9 — Battery

1. BATTERY HOLD-DOWN CLAMP RING
2. BATTERY CELL CAPS
3. POSITIVE (+) TO GROUND STRAP
4. NEGATIVE (-) TERMINAL TO STARTER BUTTON CABLE

10. PURPOSE OF RUN-IN TEST:

α. When a new tractor is first received by the using organization, it is necessary for second echelon personnel to determine whether or not the tractor will operate satisfactorily when placed in service. For this purpose, inspect all assemblies, tools, and important parts of the tractor to see if they are in place and correctly adjusted. In addition, they will perform a run-in test of at least two hours, as directed in AR 850-15, paragraph 25, table III, according to procedures in paragraph 12.

11. CORRECTION OF DEFICIENCIES:

α. Deficiencies disclosed during the course of the run-in test will be treated as follows:

- (1) Correct any deficiencies within the scope of the maintenance echelon of the using organization before the tractor is placed in service.
- (2) Refer deficiencies beyond the scope of the maintenance echelon of the using organization to a higher echelon of correction.
- (3) Bring deficiencies of serious nature to the attention of the supply organization.

12. RUN-IN TEST PROCEDURES:

α. Preliminary Service:

(1) **FIRE EXTINGUISHER:** See that the portable extinguisher is present and in good condition. Test it momentarily for proper operation and mount it securely.

(2) **FUEL, OIL, AND WATER:** Fill fuel tank. Inspect crankcase oil and coolant supply; add oil and coolant as necessary to bring to correct levels. Allow room for expansion in fuel tank and radiator. During freezing weather, test value of anti-freeze and add as necessary to protect cooling system against freezing.

CAUTION: If there is a tag attached to filler cap or steering wheel concerning engine oil in crankcase, follow the instructions on tag before driving the tractor.

(3) **FUEL FILTER:** Inspect sediment bowl for leaks, damage, secure mountings, and connections. Drain bowl to see if any appreciable amount of dirt or water is present. If so, remove bowl and element and clean in SOLVENT, dry cleaning. Also, drain accumulated dirt or water from bottom of fuel tank. Drain only until fuel runs clean.

(4) **BATTERY:** Make hydrometer and voltage test of battery and add clean water to bring electrolyte $\frac{3}{8}$ " above the plates.

(5) **AIR CLEANER:** Examine air cleaner to see if it is in good condition and secure. Remove element and wash thoroughly in SOLVENT, dry cleaning. Fill oil cup to proper level with fresh oil and reinstall securely. Be sure cup and gaskets are in good condition and that the air horn connection is tight.

(6) **ACCESSORIES AND BELT:** See that accessories such as carburetor, generator, distributor, fan, and oil filter are securely mounted. Make sure that fan and generator drive belt is in good condition and adjusted to have $\frac{1}{2}$ " finger-pressure deflection.

(7) **ELECTRICAL WIRING:** Examine all accessible wiring and conduits to see if they are in good condition, securely mounted, and properly supported.

(8) **TIRES:** See that the front tires are properly inflated to 35 lbs., and that the rear tires are 40 lbs. See that stems are in correct position and all valve caps are present and finger-tight. Inspect for damage and remove any obstructions lodged in treads and carcasses.

(9) **WHEEL AND FLANGE NUTS:** See that all wheel mounting and axle flange nuts are present and secure.

(10) **FENDERS AND BUMPER-GRILLE:** Examine fenders and front bumper-grille for looseness or damage.

(11) **TOWING CONNECTIONS:** Examine automatic coupler for looseness or damage. See that the latch operates properly and locks securely.

(12) **BODY:** Inspect attachments, hardware, seat, grab rails, and hood to see that they are in good condition, correctly assembled, and securely mounted or fastened. Examine body paint for rust or shiny surfaces that might cause glare. See that the tractor markings are legible.

(13) **LUBRICATION:** Perform a complete lubrication service of the tractor if not already accomplished (Paragraph 9). Inspect all gear case oil levels and add as necessary to bring to proper levels. Change only if condition of oil indicates the necessity or if gear oil is not of proper grade for existing atmospheric temperatures.

(14) **SPRING AND SUSPENSION:** Inspect front spring to see that it is in good condition and correctly assembled, secure, and that bushings and shackle pins are not excessively loose or damaged.

(15) **STEERING LINKAGE:** See that the steering arm rods and connections are in good condition and secure and that the adjusting sleeve is mounted securely and not leaking.

(16) **CHOKER:** Examine choke to be sure it opens and closes fully in response to operation of choke button.

(17) **ENGINE WARM-UP:** Start engine and note if starting motor action is satisfactory and if engine has any tendency toward hard starting. Set governor control lever to run engine at fast idle during warm-up. As warm-up progresses, re-set choke button so that engine will run smoothly, preventing over-choking and oil dilution.

(18) **INSTRUMENTS:**

(a) *Oil Pressure Gage:* Immediately after engine starts, observe if oil pressure is satisfactory, (normal pressure during idle will show a reading of 8 to 10 lbs.). Stop engine if pressure is not indicated within 30 seconds.

(b) *Ammeter:* Ammeter should show positive (+) charge with engine at fast idle, and at slower

speeds, with lights on, it may show discharge (-). Any unusual drop or rise in reading must be investigated.

(c) *Temperature Gage:* Engine temperature should rise gradually during warm-up period to normal operating range (160°F. to 180°F.).

(19) **HORN:** See that the horn is in good condition and secure. If tactical situation permits, test horn for proper operation and tone.

(20) **LAMPS (LIGHTS):** Clean lenses and inspect all units for looseness or damage. If tactical situation permits, open and close light switch to see if lights respond properly.

(21) **LEAKS; GENERAL:** Look under tractor and within engine compartment for indications of fuel, oil, or coolant leaks. Trace to source any leaks found and correct or report them to designated authority.

(22) **TOOLS AND EQUIPMENT:** Inspect tools to be sure all items are present. See that they are serviceable and properly mounted or stored.

b. **"Run-In" Test:**

Perform the following procedures, steps (1) to (10) inclusive, during the run-in test of the tractor.

(1) **DASH INSTRUMENTS AND GAGES.** Do not move tractor until engine temperature reaches 135°F. Also, observe readings of ammeter and oil temperature to be sure they are indicating the proper function of the units to which they apply.

(2) **BRAKES:** Test service brakes to see if they stop tractor effectively without side-pull, chatter, or squealing; and observe if pedal has 1/8" free travel. Parking brake lock should hold tractor on reasonable incline, leaving ample brake pedal travel in reserve.

CAUTION: Avoid long application of brakes until disks become evenly seated to plates.

(3) **CLUTCH:** Observe if clutch operates smoothly without grab, chatter, or squeal on engagement, or slippage (under load) when fully engaged. See that the pedal has 1 1/2" to 2" free travel before meeting resistance.

CAUTION: Do not ride clutch pedal at any time, and do not engage and disengage new clutch severely or unnecessarily.

(4) **TRANSMISSION:** Gear shift mechanism should operate efficiently and smoothly, and gears

Section V—Service Upon Receipt Of Equipment

should operate without excessive noise and not slip out of mesh.

(5) **STEERING:** Observe steering action for binding or looseness, and note any excessive pull to one side, wander, shimmy, or wheel tremble. See that steering column and wheel are secure.

(6) **ENGINE:** Be on the alert for any abnormal engine operating characteristics or unusual noise, such as lack of pulling power or acceleration, back-firing, stalling, overheating, or excessive exhaust. Observe if engine responds properly to all controls.

(7) **UNUSUAL NOISE:** Be on the alert throughout the run-in test for any unusual noise from body and attachments, running gear, suspension, or wheels that might indicate looseness, damage, wear, inadequate lubrication, or under-inflated tires.

(8) **HALT TRACTOR AT THIRTY MINUTE INTERVALS FOR SERVICES:** (Step (9) and (10) below.)

(9) **TEMPERATURES:** Cautiously hand-feel each brake housing and wheel hub for abnormal temperatures. Examine the transmission, torque tube, and differential housings for indications of over-heating and excessive lubricant leaks at connections, seals, or gaskets.

(10) **LEAKS:** With engine running, and fuel, engine oil, and cooling system under pressure, look within engine compartment and under tractor for indications of leaks.

c. Completion of Run-In Test:

Upon completion of run-in test, correct or report any deficiencies noted. Report general condition of tractor to designated individual in authority.

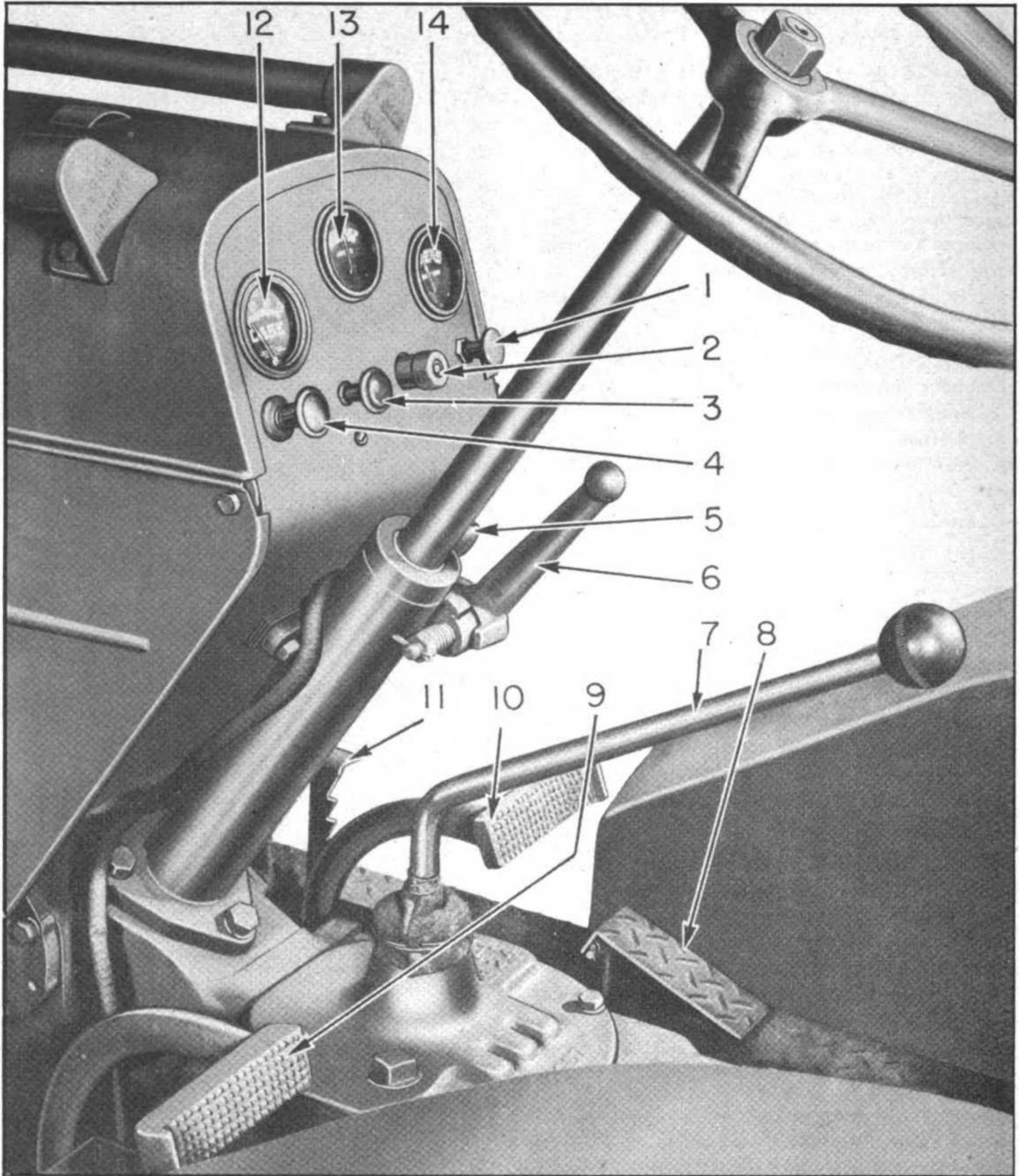


Figure 10 — Controls and Instruments

- | | |
|---------------------------|-----------------------------|
| 1. IGNITION BUTTON | 8. ACCELERATOR |
| 2. STARTER BUTTON | 9. CLUTCH PEDAL |
| 3. LIGHT BUTTON | 10. BRAKE PEDAL |
| 4. CHOKE BUTTON | 11. BRAKE PARKING LOCK |
| 5. HORN BUTTON | 12. OIL PRESSURE GAGE |
| 6. GOVERNOR CONTROL LEVER | 13. AMMETER |
| 7. GEAR SHIFT LEVER | 14. ENGINE TEMPERATURE GAGE |

Section VI - Controls and Instruments:

13. CONTROLS:

a. Ignition Switch Button:

The ignition switch is operated by a button located to the extreme right on the instrument panel (1, Figure 10). To operate, in starting engine pull button outward closing contact circuit from battery to coil.

b. Starter Button:

The starting motor is operated by a button located on the instrument panel (2, Figure 10). When the button is depressed, contact is made with the battery and starter motor.

c. Light Button:

The light switch is controlled by a button on the instrument panel (3, Figure 10). When the button is pulled completely out, contact is made with battery for illumination of lights. In the event the use of the lights has weakened the battery, recharging can be accomplished more readily by pulling button to second position (Figure 47) during daytime driving.

d. Choke Button:

The choke button is located to the extreme left on the instrument panel (4, Figure 10). It regulates the fuel mixture in the carburetor and is used to aid in starting when engine is cold. It is to be pulled out just far enough to allow the engine to run smoothly during the warm-up. It must be pushed in as soon as normal engine operation has been reached.

e. Horn Button:

The horn button is located at the extreme lower right on the instrument panel (5, Figure 10). When button is depressed, contact is made with battery for sounding horn.

f. Governor Control Lever:

The governor control lever is located to the right of the steering column (6, Figure 10). This lever is used when a desired motor revolution is required in starting engine and also as a hand feed in the event of starting a load on an incline when the right foot of the operator is on the brake pedal. To increase the engine revolution, push the lever downward.

g. Gear Shift Lever:

The gear shift lever is located in the center of the transmission case directly below the steering

wheel (7, Figure 10). The gear shift lever permits the selection of transmission speeds (gear ratios). The transmission has four speeds forward, and one reverse. These speeds are indicated by a diagram on the transmission cover to the right of the gear shift.

h. Foot Accelerator:

The accelerator pedal is located on the right hand floor plate (8, Figure 10). The accelerator pedal controls the traction or road speed of the tractor by regulating the governor control rod, thereby regulating the throttlefly, which controls the amount of fuel and air passing through the carburetor.

i. Clutch Pedal:

The clutch pedal is located to the left of the steering column and to the front of the left floor plate (9, Figure 10). Depressing the clutch pedal disengages the engine from the transmission, thereby enabling the operator to make the selection of gear desired.

j. Brake Pedal:

The brake pedal is located to the right of the steering column ahead of the foot accelerator (10, Figure 10). By depressing the brake pedal, the pressure plates are forced against the brake linings, thereby binding the rotation of the differential to the transmission case, halting the movement of the tractor.

k. Parking Brake Lock:

The parking brake lock is located to the front of the brake pedal (11, Figure 10). When use of the parking brakes is required, depress brake pedal and engage notch of the brake lock with the floor plate.

l. Automatic Coupler:

The coupler located at the rear of the tractor (Figure 11) is of cast steel construction so designed that it will work automatically when the tractor is backed against the tongue of the load. The load may be connected at any angle up to sixty degrees from the center line of the tractor. To disconnect coupler, back the tractor enough to take the load off the catch, then pull catch upwards by means of the attached rope. After the tractor moves forward far enough to clear the tongue of the load, the coupler catch may be released.

14 INSTRUMENTS:**a. Oil Pressure Gage:**

The oil pressure gage is located to the upper left of the instrument panel (12, Figure 10). The gage consists of a dial and indicator. When engine is in operation, a low or zero reading is an indication that proper lubrication is not being supplied to all moving parts of the engine.

b. Ammeter:

The ammeter is located in the upper center of the instrument panel (13, Figure 10). It consists of a dial and indicator; reading of charge and discharge. This is an electrical device which indicates the amperage out-put of the generator. When no electrical equipment is in use, the generator should show a reading on the charge side of the dial.

c. Engine Temperature Gage:

The engine temperature gage is located to the upper right of the instrument panel, (14, Figure 10). It consists of a dial and indicator which is connected to the water jacket of the engine. This

instrument is a constant indicator of the water temperature in the engine.

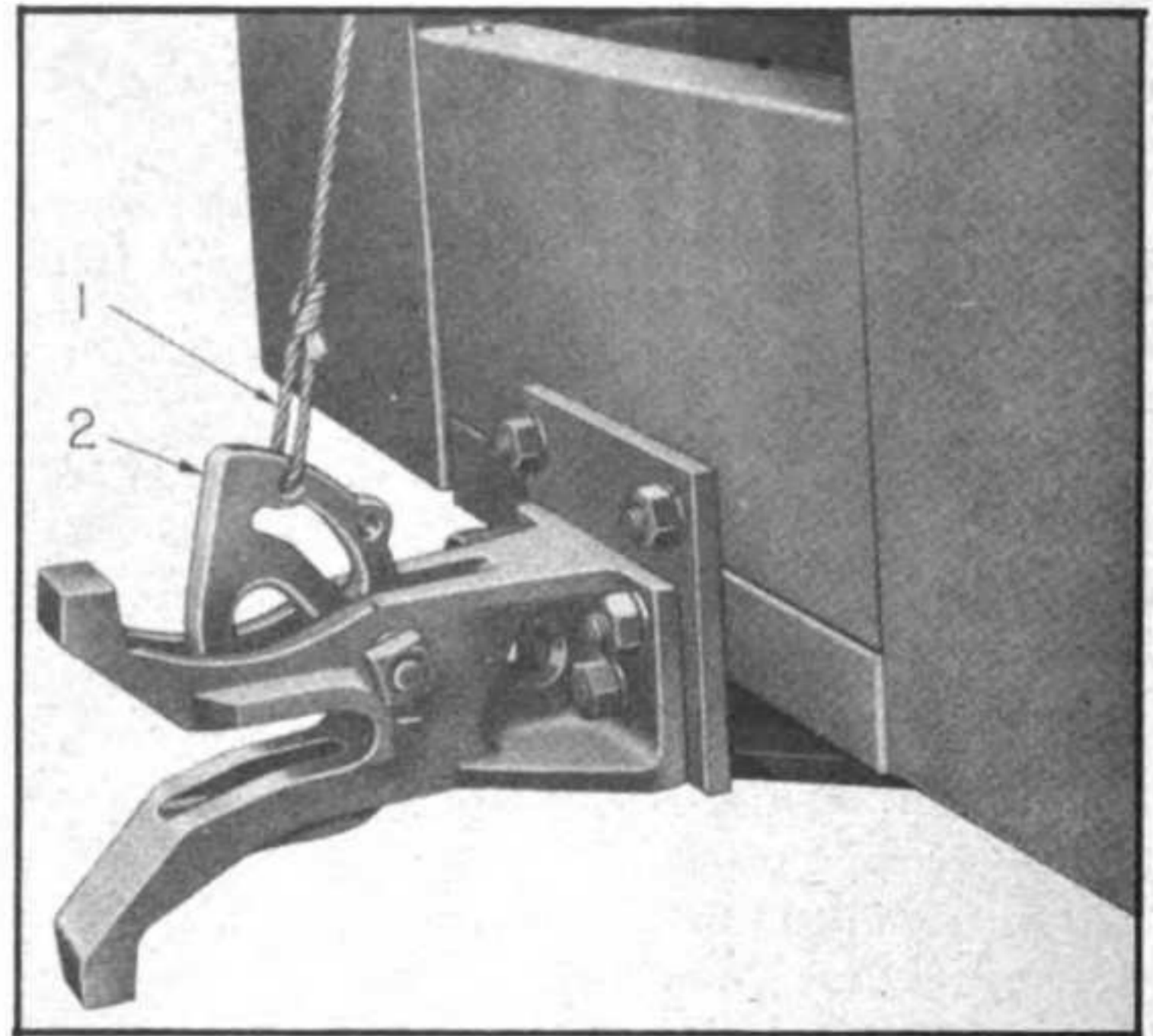


Figure 11 — Automatic Coupler

1. CONTROL ROPE
2. SPRING LOAD CATCH

Section VII – Operation Under Usual Conditions:

15 ENGINE IN OPERATION:

a. Starting the Engine:

Place the gear shift lever in neutral (7, Figure 10), advance the governor control lever (6, Figure 10) one-third of open position (push downward on lever to advance) holding the choke control button all the way out, pull the ignition switch control button out, depress the starting switch button (2, Figure 10) and release it immediately when the engine starts. In cold weather, disengage the clutch by pushing the pedal forward and holding it in this position until the engine is running. Doing this relieves the starter of unnecessary work, for when the clutch is engaged the transmission gears will be turning in the cold lubricant. Following this practice will save the starter and battery from unnecessary loads.

b. Use Choke Sparingly:

After the engine starts, the choke must be adjusted so the engine turns without missing. As the engine warms up, the choke rod must be gradually pushed all the way inward. Do not use the choke to regulate the fuel mixture, except for starting the engine and never operate the engine under load with choke rod partly out.

c. Watch Oil Pressure:

Immediately after the engine starts, observe the oil pressure gage to see if it is registering pressure. If it is not, stop the engine and inspect the oil system to learn the cause of this failure. (Pressure during idle is approximately 8 to 10 lbs.)

d. Carburetor Adjustments:

Although the carburetor has been adjusted at the factory before shipment, varying conditions present such as altitude, temperature, and grade of fuel may necessitate changing the carburetor adjustment. Three adjustments are provided: Power Needle Adjustment, Idle Adjusting Needle, and Idle Stop Screw Adjustment.

(1) **Power Needle Adjustment:** While vehicle is under full load, turn the needle clockwise until engine begins to lope. Then turn needle back approximately one-half turn or until engine operates smoothly. See Figure 28 for location of needle.

(2) **Idle Adjusting Needle:** Adjustment must be made when the engine is warm. Tighten screw and start engine. While engine is operating, turn screw counter-clockwise until engine runs smoothly. See Figure 28 for location of needle.

(3) **Idle Stop Screw Adjustment:** The idle stop screw adjustment is located behind the intake manifold and secured to the throttle shaft on the side of the carburetor nearest the engine. While the engine is warm, turn screw clockwise until the desired engine idling speed is obtained.

16. DRIVING THE TRACTOR:

a. Selecting Gear:

With the engine running, push the clutch pedal forward in disengaged position. Move the gear shifting lever to the position of speed desired. The positions for the different speeds are shown on the gear shift cover. When starting the tractor, speed up the engine with the foot accelerator and engage the clutch gradually by slowly releasing the pressure on the foot pedal. Do not engage the clutch suddenly, allowing the tractor to jerk into the load; it is of no advantage when starting with a heavy load. Any gear may be selected for starting; and with operating familiarity, gears may be shifted while the tractor is in motion.

b. Caution:

Do not drive tractor with foot resting on the clutch pedal, as this will cause undue wear on the clutch facings and throwout bearing.

c. Running-In Period:

This tractor must not be loaded to full capacity until it has had a reasonable running-in period.

17. TO STOP TRACTOR:

The engine must be throttled down before disengaging the clutch and applying the brakes to stop the forward motion of the tractor. Disengage the clutch by pressing down firmly on the clutch pedal, apply brakes, and move the gear shift lever to neutral position. If the tractor is parked on an incline, or if it is necessary to set brakes, the brake lock must be used.

18. TO STOP ENGINE:

Retard the governor control lever by pushing the lever all the way forward and shut off the ignition switch button by pushing it all the way in. If the tractor is to remain idle for any length of time, the fuel tank shut-off valve must be closed.

Section VIII - Operation Under Unusual Conditions:

19. FREEZING TEMPERATURES:

a. Cooling System:

The cooling system must be protected by using an anti-freeze solution in the radiator. Ethylene Glycol, or similar anti-freeze solutions, which do not evaporate at high temperatures, or alcohol base solutions, will be satisfactory. Flush the system thoroughly and inspect the hose connections before putting in these solutions. Solutions containing salts such as sodium chloride, magnesium chloride, or calcium chloride must not be put in radiators because of their corrosive action on metal.

b. Lubrication:

Lubrication oils must be changed to a lighter body as recommended in tables given in Section XI. Chassis grease must be of lighter body, one that will flow readily to insure positive lubrication. The engine oil pan must be inspected daily to be sure that any water due to condensation has not frozen in the bottom of the pan. This can be accomplished by unscrewing the drain plug in the pan; if the oil flows freely, it is very likely there is no condensation. Engine oil must be changed as recommended in tables given in Section XI.

c. Change of Engine Oil:

Engine oil must be changed to a lighter viscosity as recommended in the table given in Section XI.

d. Gasoline Sediment Bowl:

In freezing temperatures, the sediment bowl must be removed, drained, and cleaned at each engine oil change to remove sludge and water caused by condensation of vapor.

20. UNUSUALLY WARM TEMPERATURES:

a. Cooling System:

The winter time anti-freeze solution must be drained from the radiator and cylinder block (see Figure 17). Thoroughly flush out the radiator and cylinder block before adding clear, soft water. When tractor is operated constantly during warm temperature, the water content must be inspected frequently to insure a level well above the core of the radiator.

b. Change of Engine Oil:

Engine oil must be changed to a heavy viscosity, as recommended in Section XI.

21. DRY, DUSTY CONDITIONS:

a. Breather and Oil Filler Cap:

It is absolutely necessary that the oil filler cap be in place at all times to insure that impurities, in no way, enter the engine. When the tractor is used during dry, dusty conditions, the cap must be cleaned daily by dipping it several times in a small amount of SOLVENT, dry cleaning to remove any moisture or oil which may clog the filter.

b. Oil Bath Air Cleaner:

The air cleaner is connected to the air horn of the carburetor; its purpose being to prevent dirt and abrasive material from entering the engine and causing excessive wear to parts. Keep the cup of the cylinder filled to the baffle plate with SAE 10 oil, and change oil at least every eight hours when tractor is being used in extremely dusty conditions. Keep the hose clamps which connect to the carburetor tight at all times to prevent entrance of dirt into the air stream.

Section IX – Demolition to Prevent Enemy Use:

NOTE: Destroy identical parts on each and every tractor to prevent repair and operation through cannibalization.

22. (METHOD 1) TO DESTROY TRACTOR ENGINE THROUGH LACK OF LUBRICANT:

Remove crankcase drain plug to drain lubricant from crankcase. Remove coolant from cooling system by opening drain plugs. Then start engine and accelerate to full speed with governor control lever, and leave in operation. Results of this procedure will be extensive damage to engine, preventing re-use without a complete overhaul.

23. (METHOD 2) TO DESTROY TRACTOR ENGINE AND GEARS THROUGH LACK OF LUBRICANT:

Jack up one rear wheel of tractor. Remove drain plugs from crankcase, torque tube, transmission, and rear axle housing to drain lubricant from these units. Also, remove coolant from cooling system by opening drain plugs. Start engine, set transmission in high gear, and accelerate engine to full speed with governor control lever. Results of this procedure will be extensive damage to engine, transmission, and final drive gears.

24. (METHOD 3) TO DEMOLISH ENGINE PARTS WITH HAMMER:

If large, heavy hammer or weight is available, demolish distributor, starting motor, ignition coil, air cleaner, generator, manifold, carburetor, etc., by striking with forceful blows. Engine block may also be destroyed by this method if hammer is large enough.

25. (METHOD 4) TO DESTROY ENGINE AND GEARS BY USE OF SAND:

If sand is available, start engine and pour a considerable amount of sand into engine lubricant filler hole and leave engine in operation. To make this method more effective by also destroying transmission and final drive gears, jack up one rear wheel of tractor, set transmission in a high gear, and pour sand into torque tube and transmission lubricant filler holes as well as in engine. By leaving engine in operation, this will cause considerable destruction to engine and gears.

26. (METHOD 5) TO DESTROY TRACTOR BY FIRE:

Open fuel tank filler cap. Remove or destroy sediment bowl underneath tank to allow gasoline to flow out of tank onto tractor parts and the ground. Step back at least twenty feet, ignite oil soaked waste, and throw to saturated tractor. Immediately get as far away as possible, as tractor will become inflamed and possible fuel tank explosion will occur within a few seconds. Tractor will either be damaged by explosion or engine and torque units will become warped due to the intense heat from the ignited gasoline. In either event, all wiring, insulation, etc. will be extensively destroyed.

PART III – MAINTENANCE INSTRUCTIONS

Section X – General:

27. SCOPE:

α. Part III contains information for the guidance of the personnel of the using organizations responsible for the maintenance (1st and 2nd echelon) of this tractor. It contains information needed

for the performance of the scheduled lubrication and preventive maintenance service, as well as descriptions of the major systems and units and their functionings in relation to other components of the tractor.

Section XI – Lubrication:

28. LUBRICATION ORDER:

α. War Department Lubrication Order No. 6005 (Figure 12) prescribes lubrication maintenance for the VAIW Tractor.

b. A Lubrication Order is placed on or is issued with each tractor and is to be carried with it at all times. In the event a tractor is received without an Order the using arm shall immediately requisition a replacement from the Warehouse Equipment Parts Division, Columbus ASF Depot, Columbus, Ohio.

c. Lubrication instructions on the Order are binding on all echelons of maintenance and there shall be no deviations, except as indicated in subparagraph d below.

d. Service intervals specified on the Order are for normal operating conditions. Reduce these intervals under extreme conditions such as excessively high or low temperatures, prolonged periods of high speed operation, continued operation in sand or dust, immersion in water or exposure to moisture; any one of which may quickly destroy the protective qualities of the lubricant.

e. Lubricants are prescribed in the "Key" in accordance with three temperature ranges; above +32°F, +32°F to 0°F, and below 0°F. Determine the time to change the grade of lubricants by maintaining a close inspection on the operation of the tractor during the approach to change-over periods. Be particularly observant when starting the engine. Sluggish starting is an indication of thickened lubricants and the signal to change to grades prescribed for the next lower temperature range. Ordinarily, it will be necessary to change grades of lubricants only when air temperatures are consistent-

ly in the next higher or lower range, unless malfunctioning occurs sooner due to lubricants being too thin or too heavy.

f. Figures 13 through 15 are localized views of the lubrication points that apply to the VAIW Tractor. The localized views are keyed to the Lubrication Order to facilitate proper lubrication.

29. DETAILED LUBRICATION INSTRUCTIONS:

α. Lubrication Equipment:

Each tractor is supplied with lubrication equipment for adequate lubrication maintenance. Be sure to clean this equipment both before and after use. Operate the lubricating gun carefully and in such a manner as to insure a proper distribution of the lubricant.

b. Points of Application:

Lubricant fittings, grease cups, and oilers are readily accessible. Such lubricators and the surrounding surfaces must be wiped clean before lubricant is applied.

c. Cleaning Fluid:

Use only SOLVENT, dry cleaning to clean or wash all parts. CAUTION: *Use of gasoline for this purpose is prohibited.* After washing, dry all parts thoroughly before applying lubricant.

d. Lubrication Notes on Individual Units and Parts:

The following instructions supplement those notes on the Lubrication Order which pertain to lubrication and service of individual units and parts of the VAIW Tractor.

(1) AIR CLEANER. At specified interval, inspect level and refill engine air cleaner oil reservoir to top of baffle plate with SAE 30 above +32°F, SAE 10 from +32°F to 0°F. From 0°F to -40°F use a

No. 6005
WAR DEPARTMENT LUBRICATION ORDER
WASHINGTON 25, D.C., 17 JULY 1944

TRACTOR, WAREHOUSE
(J. I. CASE MODEL VAIW)

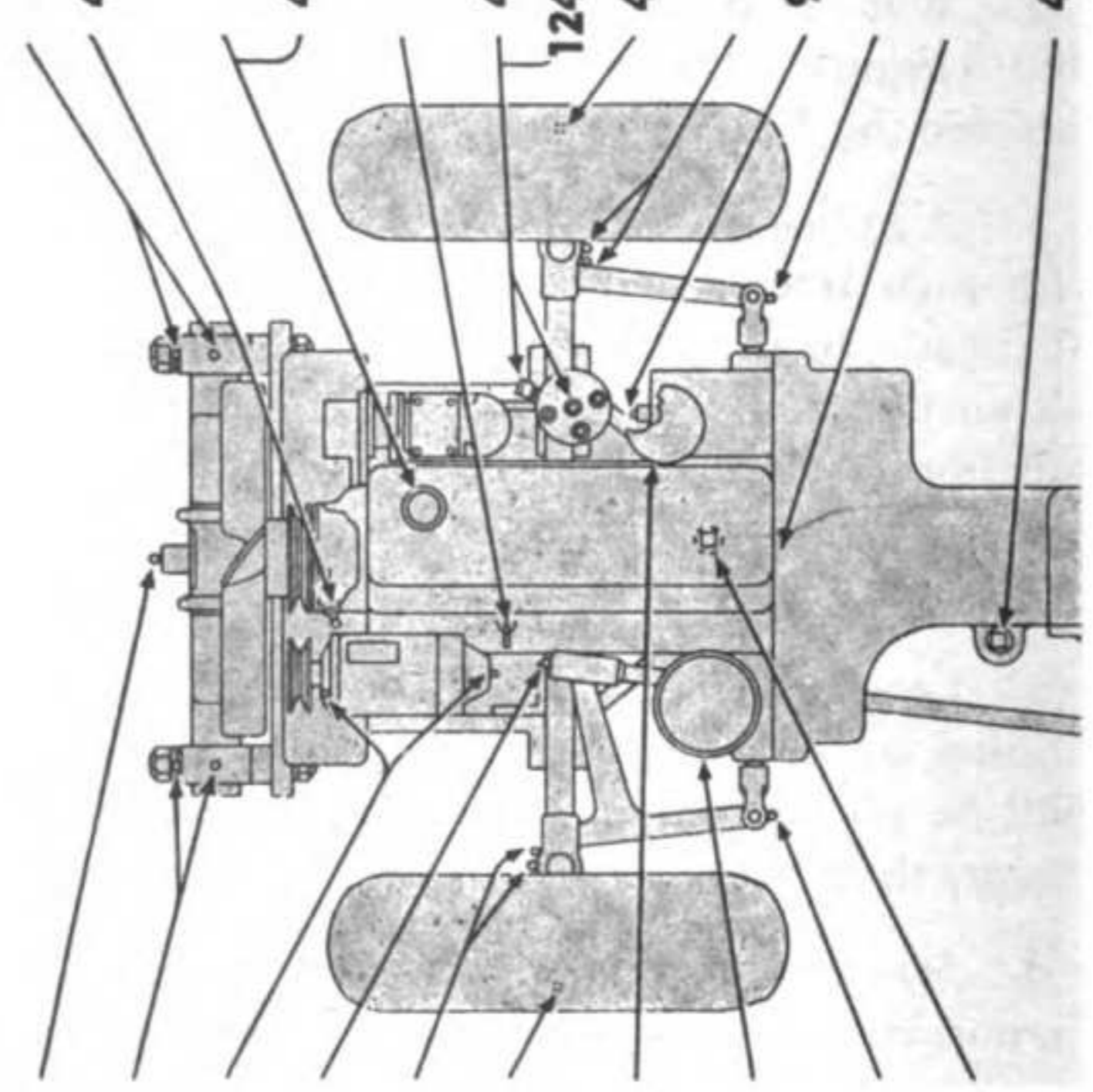
For detailed instructions, refer to TM 10-1623.

Clean fittings before lubricating. Lubricate after washing.
Clean parts with SOLVENT, dry cleaning OIL, fuel, Diesel or Kerosine. Dry before lubricating.

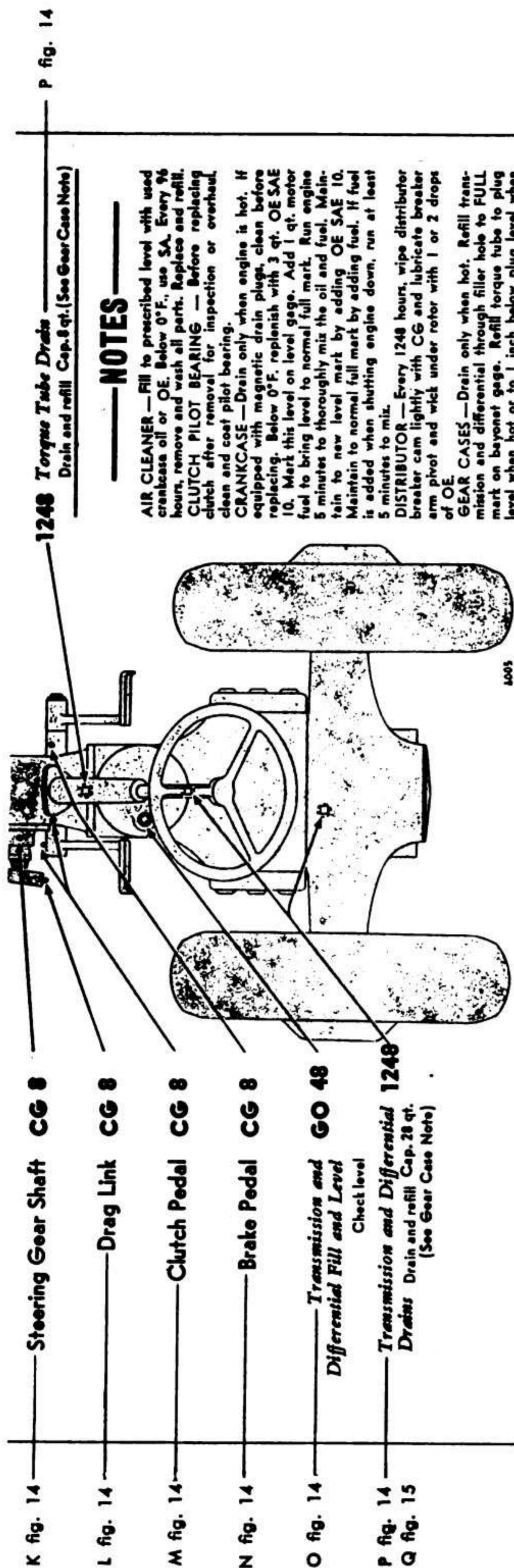
Requisition replacement Lubrication Orders from the Warehouse Equipment Parts Division, Columbus ASF Depot, Columbus, Ohio.

Reduce intervals under severe operating conditions.

Figure	Part	Lubricant	Operating Hours	Notes
A fig. 13	Pivot Pin	CG 8		
B fig. 13	Spring Shackle	CG 8	8	CG Spring Shackle — B fig. 13
C fig. 13	Generator	OE 96	48	CG Water Pump — R fig. 15
D fig. 13	Drag Link	CG 8	48	OE Crankcase Fill — S fig. 15
E fig. 13	King Pin	CG 8	8	OE Crankcase Breather Wash and oil — T fig. 15
F fig. 13	Wheel Bearings	WB 48	48	8 Crankcase Level Check level — U fig. 15
G fig. 13	Oil Filter	(See Note)	48	WB Distributor Shaft Turn cup down, 1 full turn, refill as required (See Note) — F fig. 13
H fig. 13	Air Cleaner	OE 8	8	CG King Pin — V fig. 15
I fig. 14	Tie Rod	CG 8	96	OE Starting Motor — W fig. 15
J fig. 14	Crankcase Drain	48	8	CG Tie Rod — X fig. 15
				CG Clutch Pilot Bearing (See Note) — Y fig. 15
				GO Torque Tube Fill and Level Check level — Y fig. 15



Section XI—Lubrication



- K fig. 14 — Steering Gear Shaft **CG 8**
- L fig. 14 — Drag Link **CG 8**
- M fig. 14 — Clutch Pedal **CG 8**
- N fig. 14 — Brake Pedal **CG 8**
- O fig. 14 — Transmission and Differential **GO 48**
Differential Fill and Level
Check level
- P fig. 14 — Transmission and Differential **1248**
Drains Drain and refill Cap. 28 qt.
(See Gear Case Note)
- Q fig. 15

1248 Torque Tube Drains
Drain and refill Cap. 8 qt. (See Gear Case Note)

NOTES

AIR CLEANER—Fill to prescribed level with used crankcase oil or OE. Below 0°F., use SA. Every 96 hours, remove and wash all parts. Replace and refill.
CLUTCH PILOT BEARING—Before replacing clutch after removal for inspection or overhaul, clean and coat pilot bearing.
CRANKCASE—Drain only when engine is hot. If equipped with magnetic drain plugs, clean before replacing. Below 0°F., replenish with 3 qt. OE SAE 10. Mark this level on level gage. Add 1 qt. motor fuel to bring level to normal full mark. Run engine 5 minutes to thoroughly mix the oil and fuel. Maintain to normal level mark by adding OE SAE 10. If fuel is added when shutting engine down, run at least 5 minutes to mix.
DISTRIBUTOR—Every 1248 hours, wipe distributor breaker cam lightly with CG and lubricate breaker arm pivot and wick under rotor with 1 or 2 drops of OE.
GEAR CASES—Drain only when hot. Refill transmission and differential through filler hole to FULL mark on bayonet gage. Refill torque tube to plug level when hot or to 1 inch below plug level when cold. If equipped with magnetic drain plugs, clean before replacing.
OIL FILTER—Every 48 hours, while crankcase is being drained, remove element, clean inside of case and install new element.
OIL PUMP SCREEN—Every 1248 hours, remove oil pump screen, wash in SOLVENT, dry cleaning and replace.
STARTING MOTOR—Every 96 hours, lubricate starter bearing with OE. Every 1248 hours, remove starting motor and clean, but do not lubricate Bendix drive.
WHEEL BEARINGS—Every 48 hours, lubricate through fitting. Every 1248 hours, remove, clean and repect.
OIL CAN POINTS—Every 48 hours, lubricate Clutch and Brake Linkage, Throttle and Governor connections and other rubbing surfaces with OE.
DO NOT LUBRICATE—Clutch Release Bearing

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 17 July 1944.

BY ORDER OF THE SECRETARY OF WAR:
G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

KEY

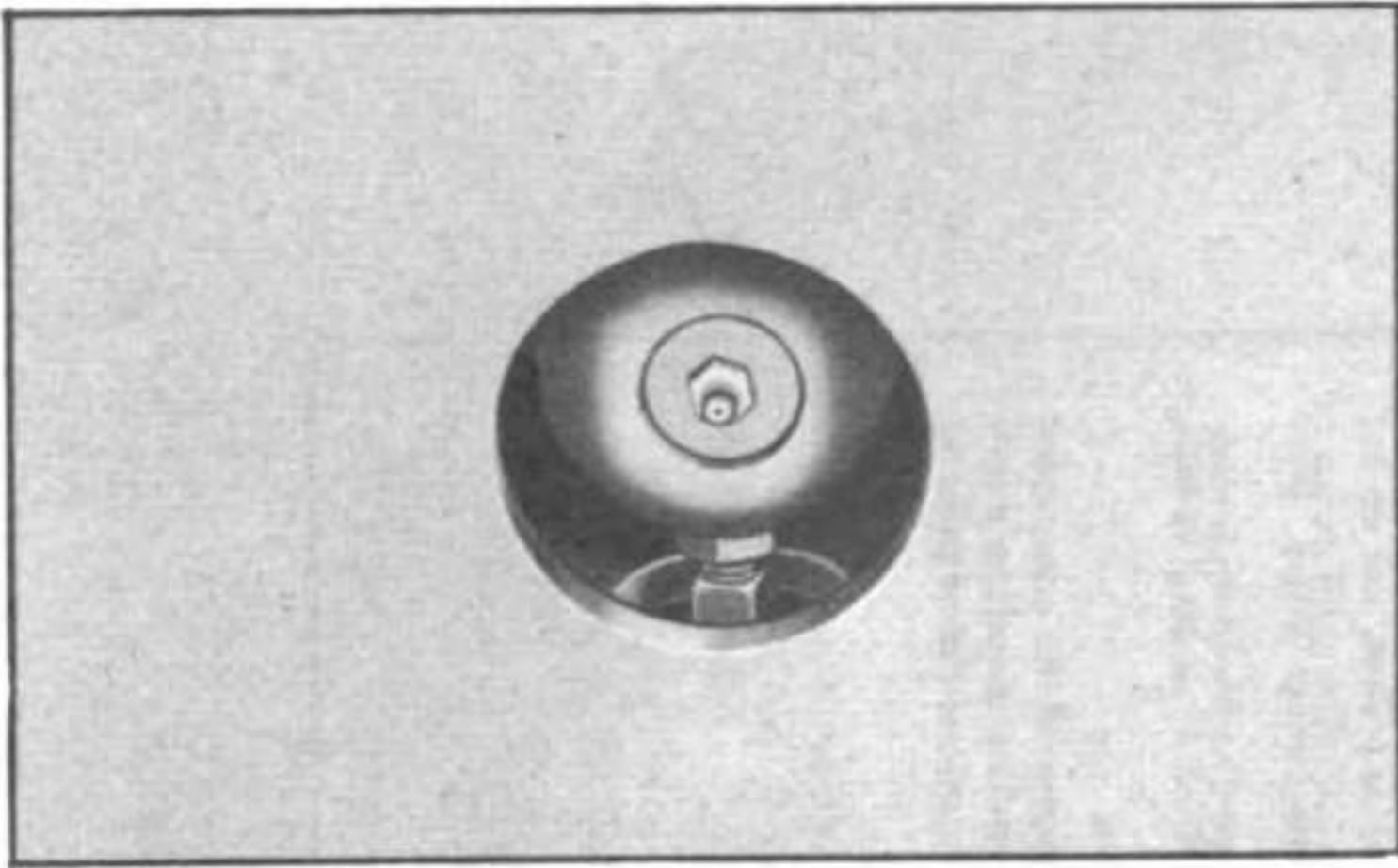
LUBRICANTS	LOWEST ANTICIPATED AIR TEMPERATURE
OE—OIL, engine	above +32°F. to 0°F. below 0°F.
Crankcase	SAE 30 See Note
Other Points	SAE 30 PS
GO—LUBRICANT, gear, universal	SAE 90 Grade 75
CG—GREASE, general purpose	No. 1 No. 0
WB—GREASE, general purpose, No. 2—All temperatures	No. 0
SA—FLUID, shock-absorber, light	
PS—OIL, lubricating, preservative, special	

No. 6005 [NOT TO BE REPRODUCED in whole or in part without permission of the Office of The Quartermaster General.]

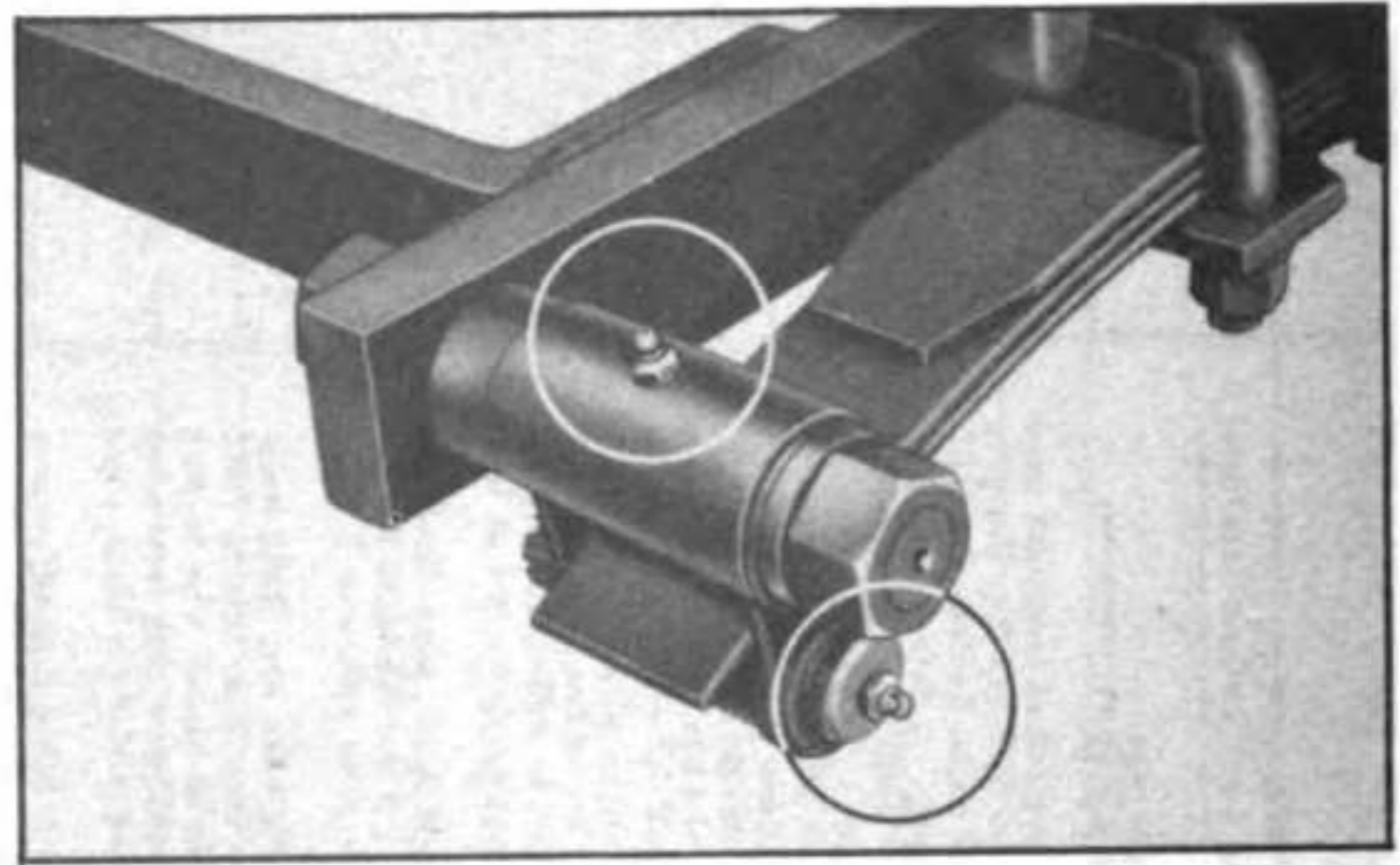
Date based on inspection of Pilot Model
 Location—Install Lubrication Order No. 6005 on right side of Hood.
 Mounting Surface Finish—Smooth dull painted metal.

Figure 12 — Lubrication Order

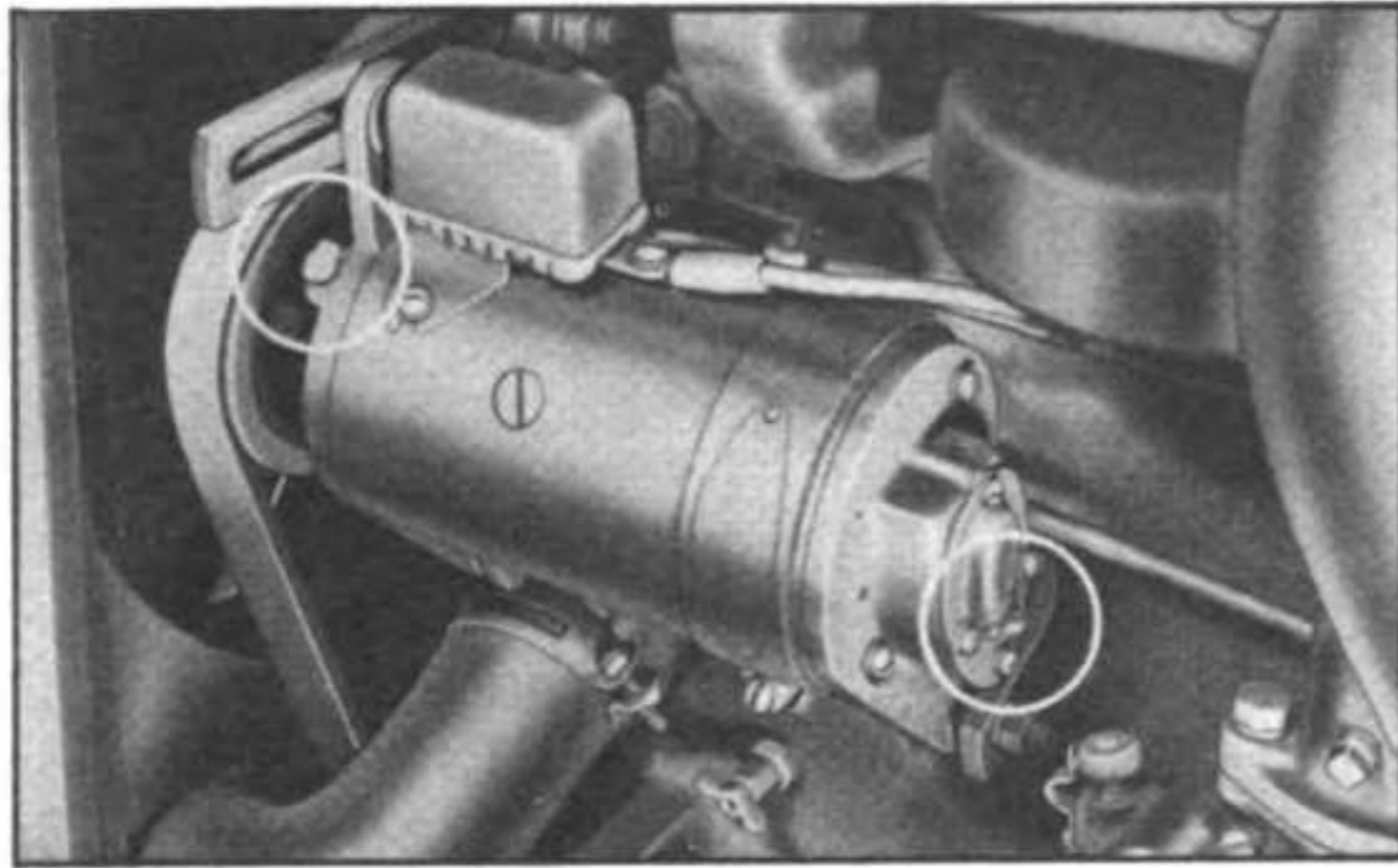
Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)



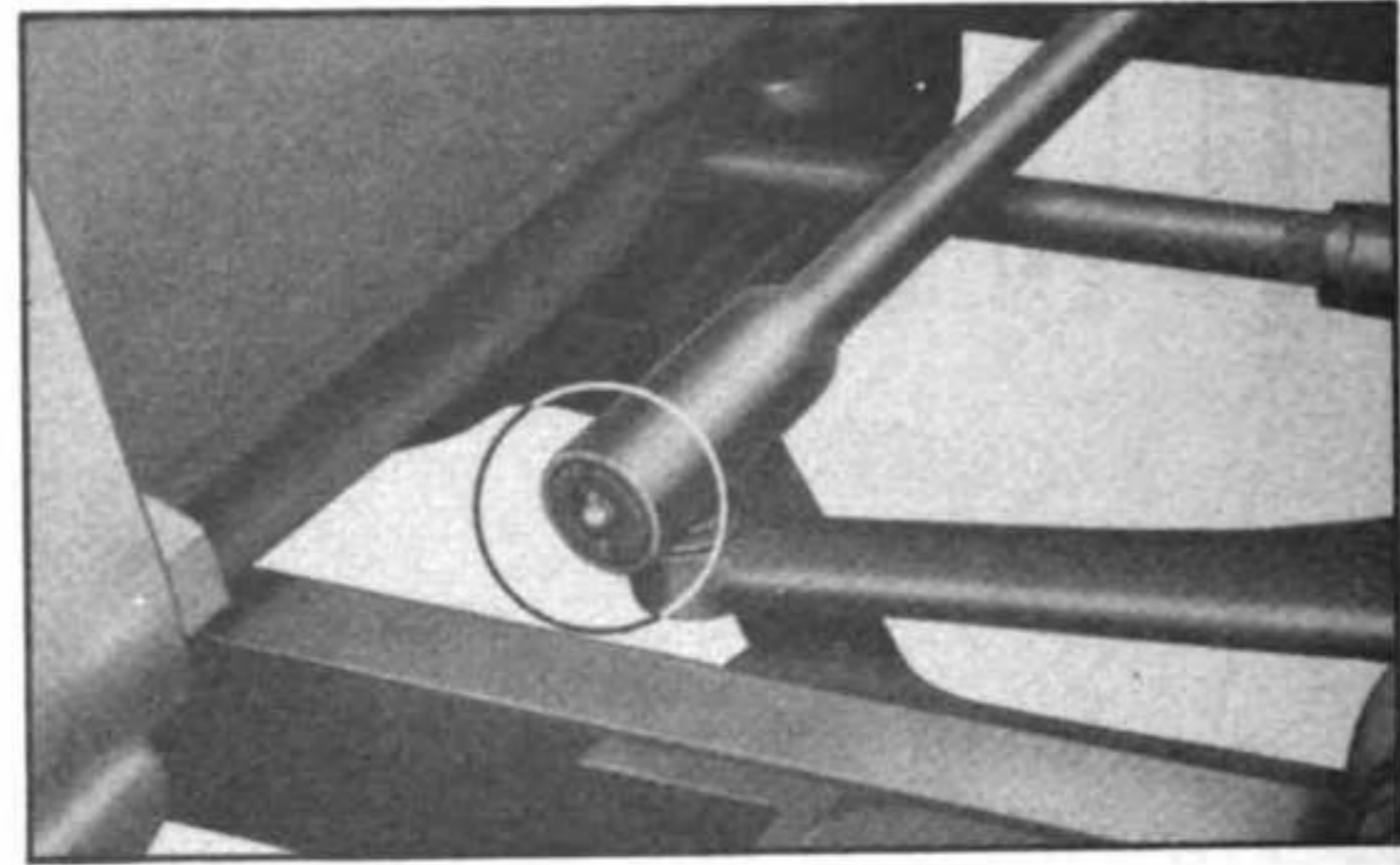
A — PIVOT PIN



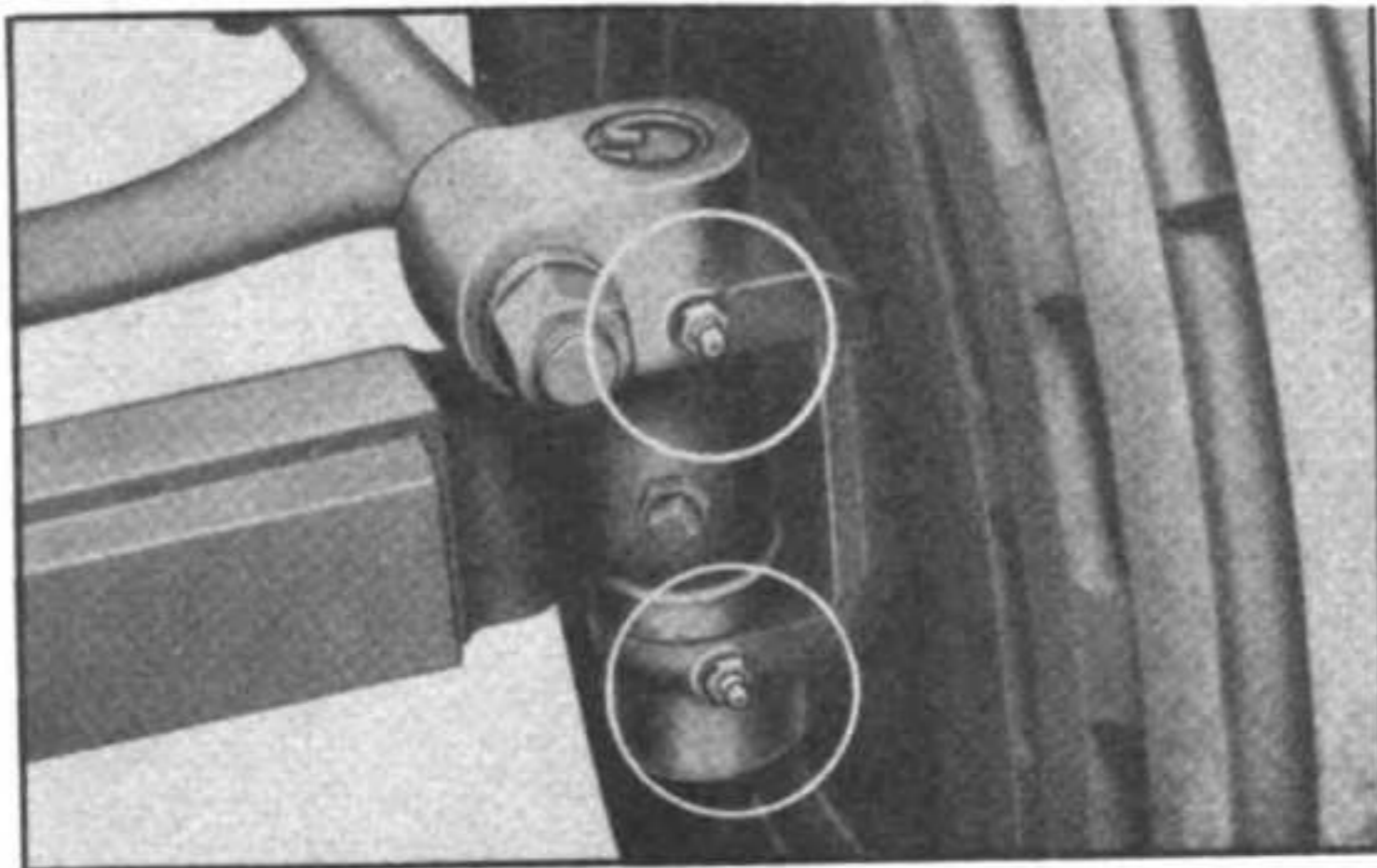
B — SPRING SHACKLE (R.H. Shown)



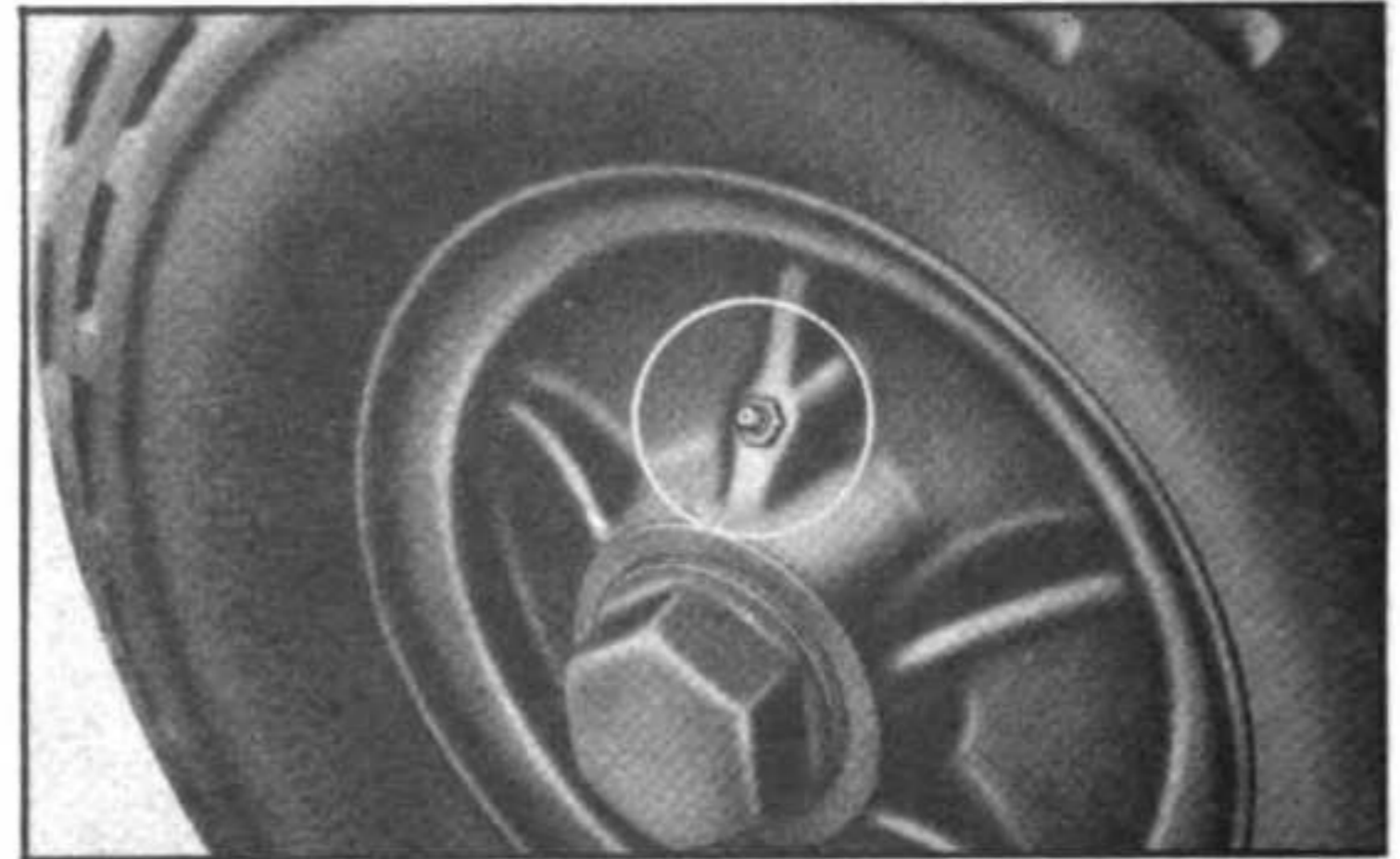
C — GENERATOR



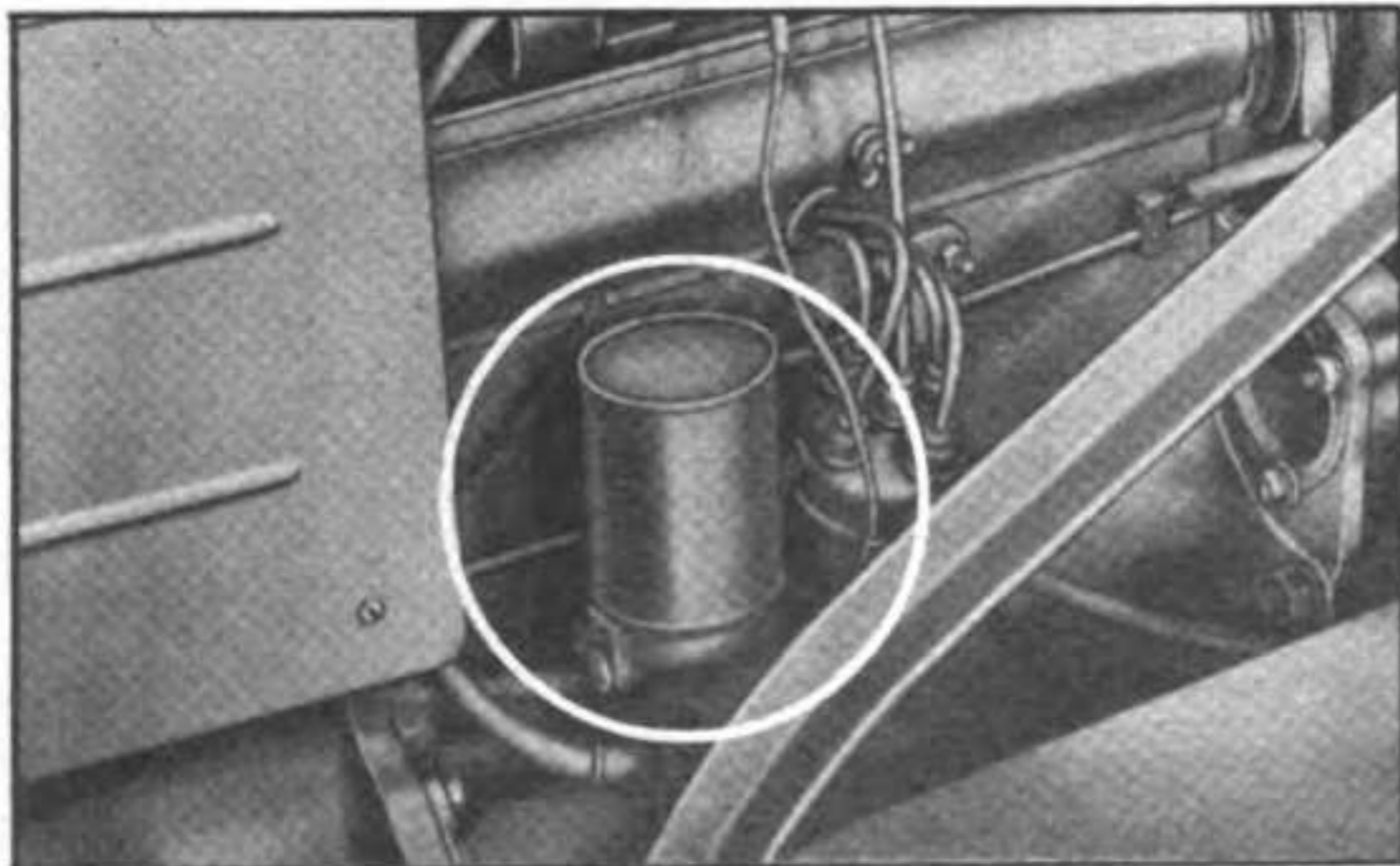
D — DRAG LINK (Front)



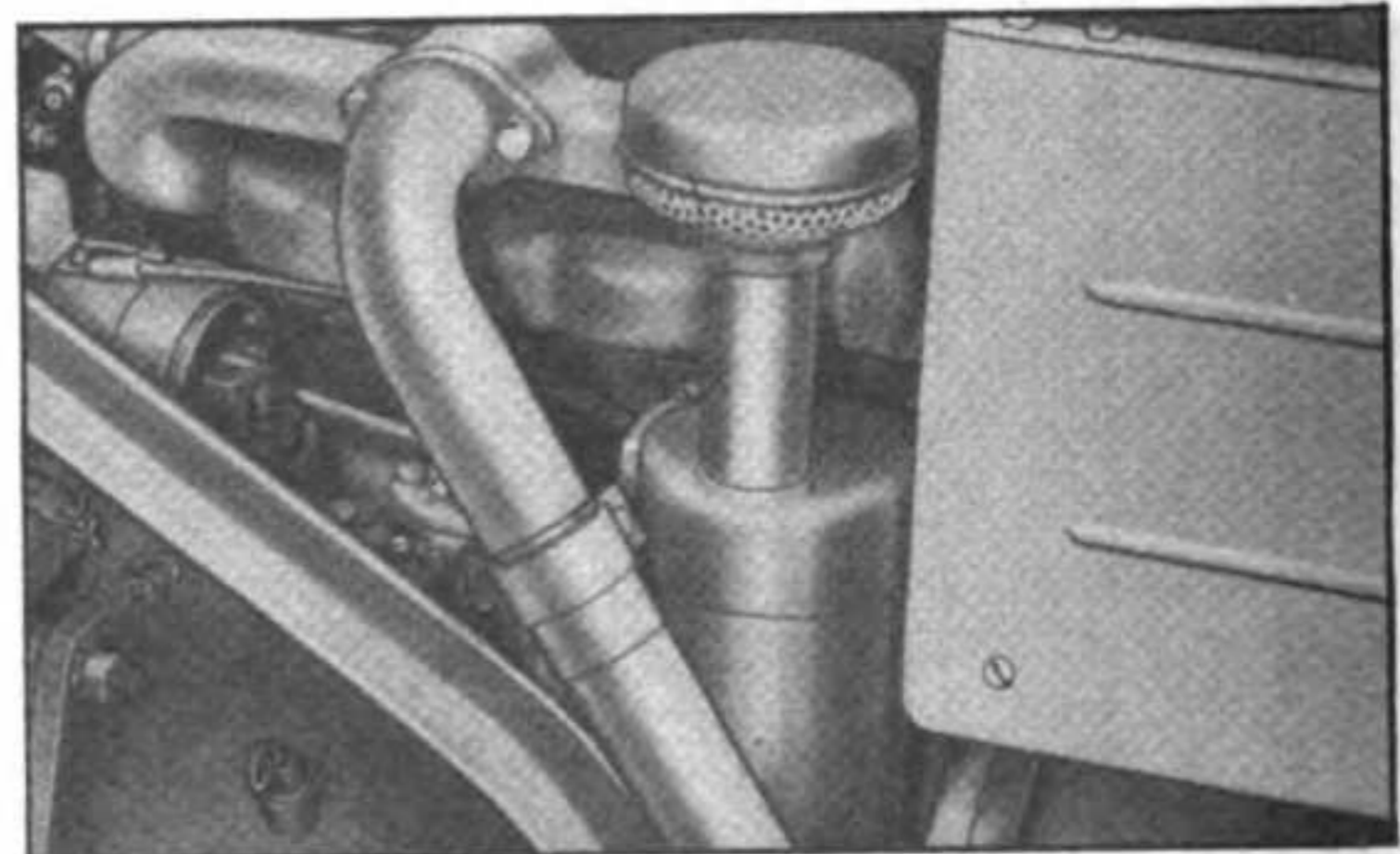
E — KING PIN (L.H.)



F — WHEEL BEARINGS



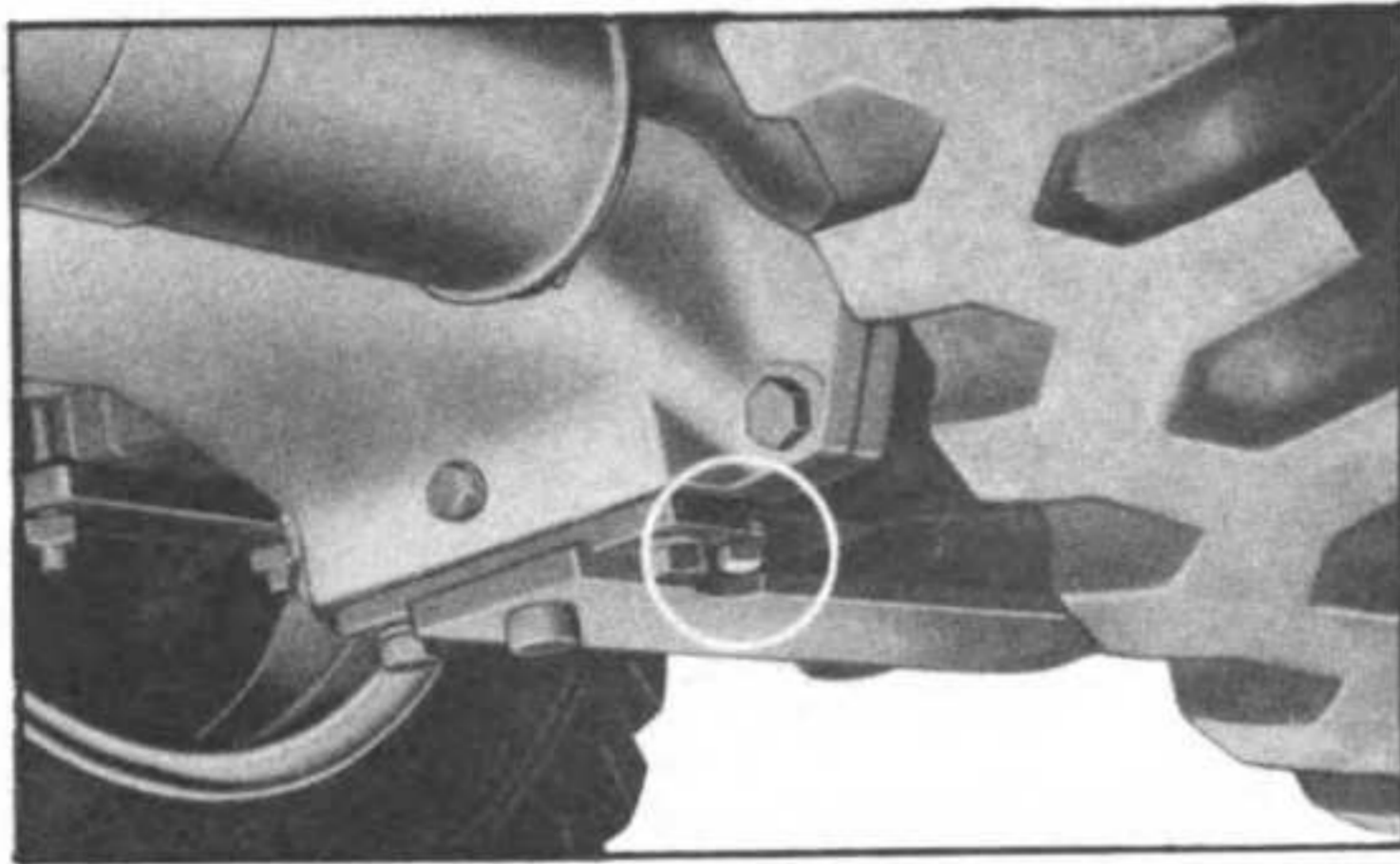
G — OIL FILTER



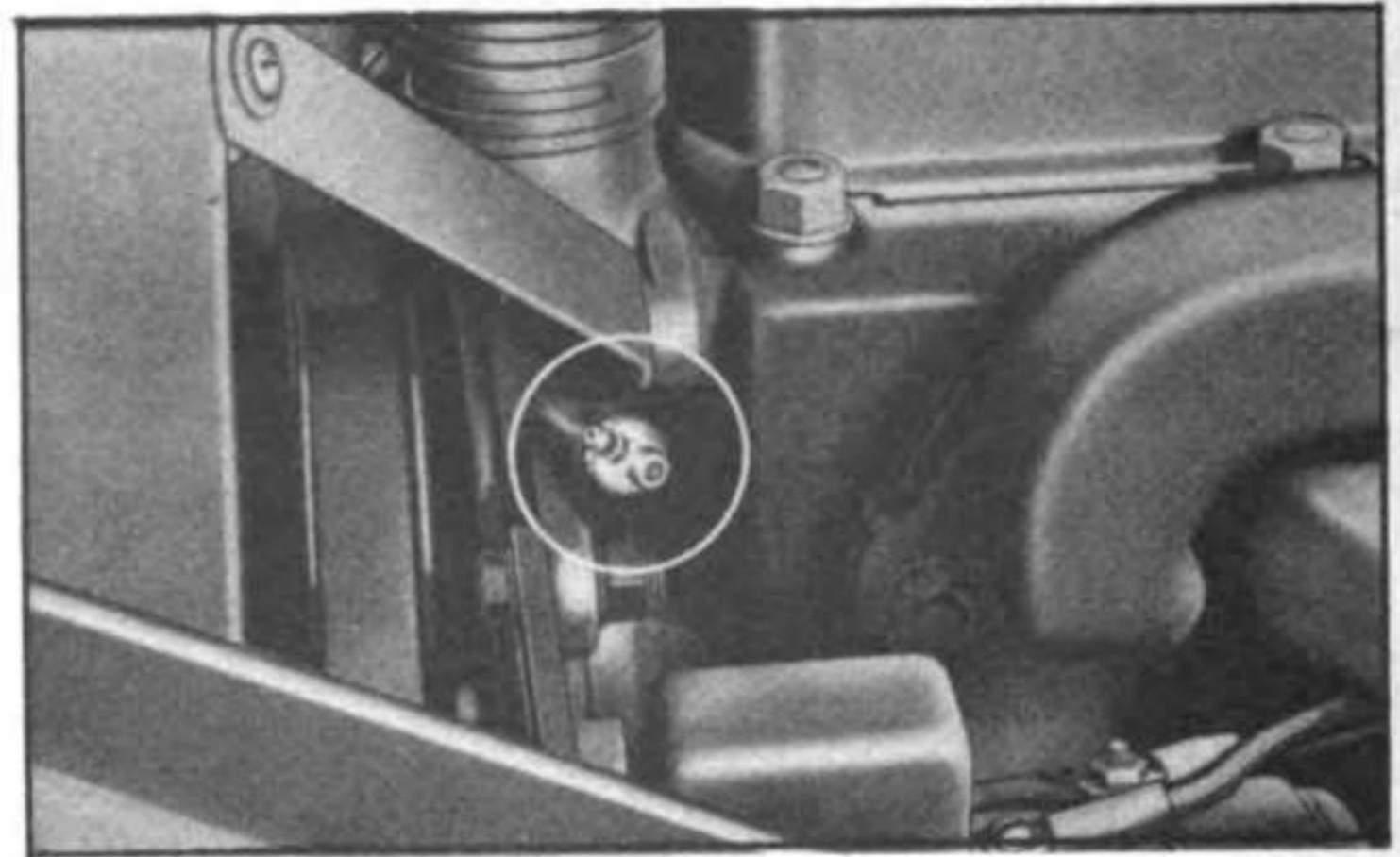
H — AIR CLEANER

Figure 13 — Localized Lubrication Points

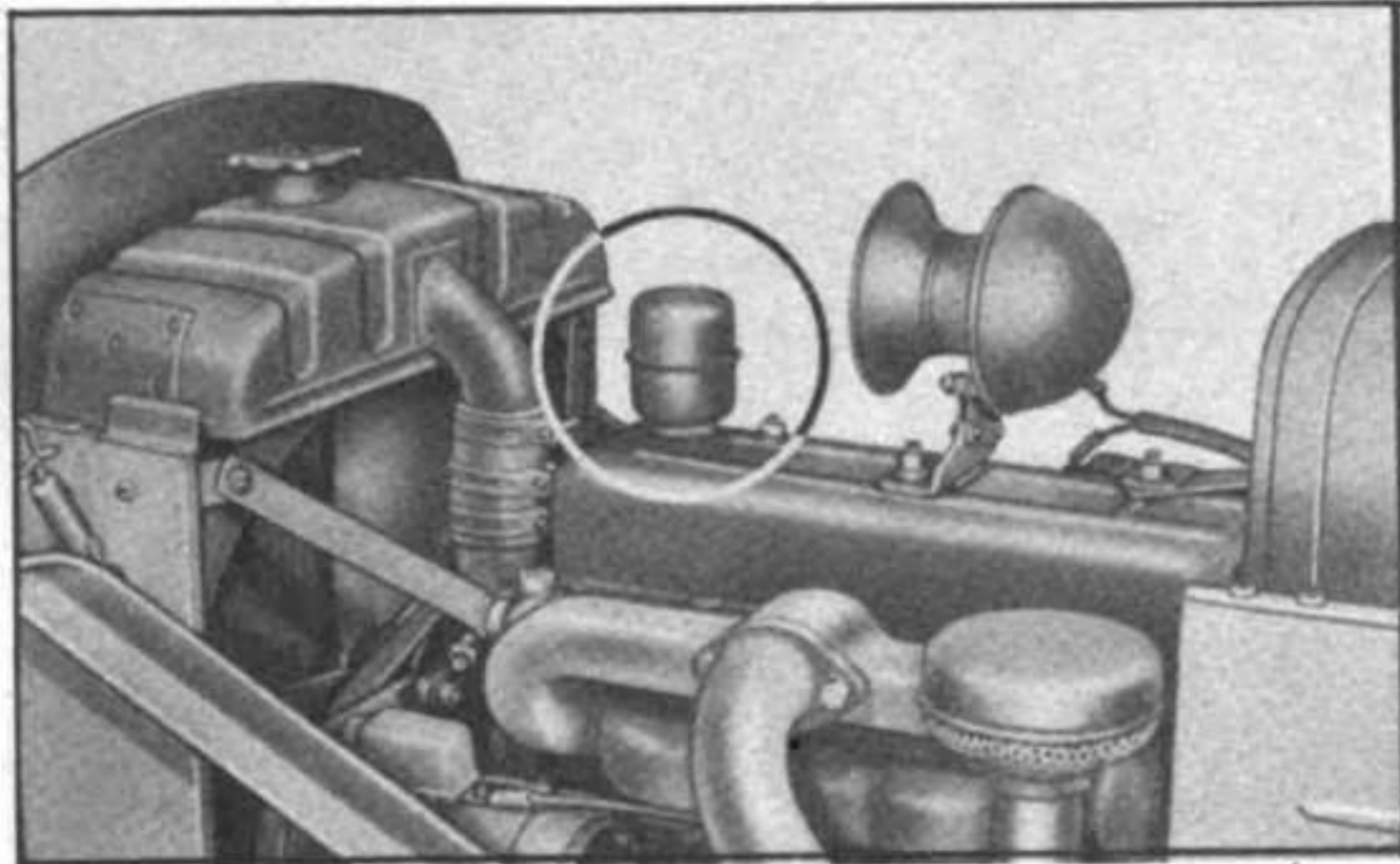
Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)



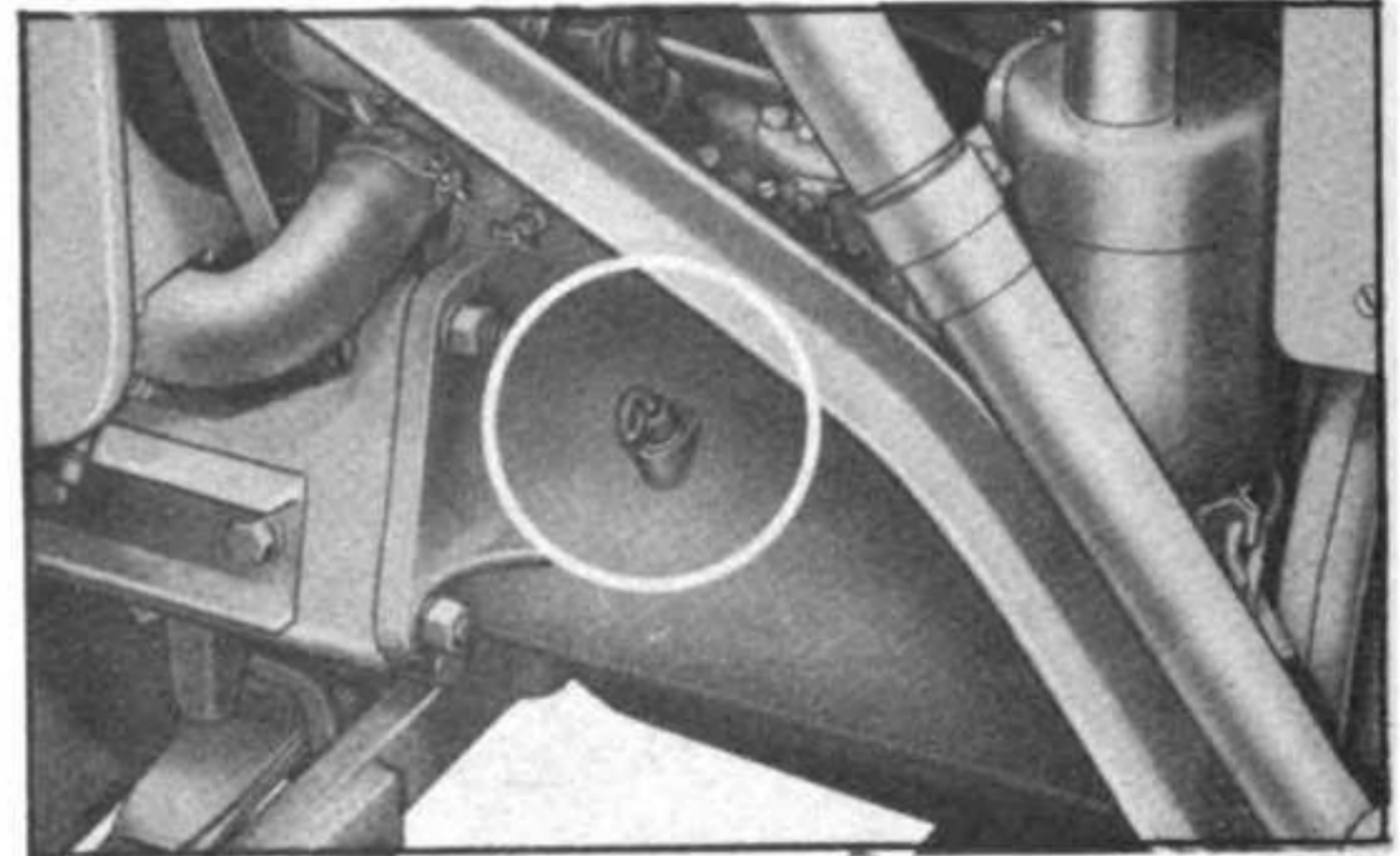
Q — DIFFERENTIAL DRAIN



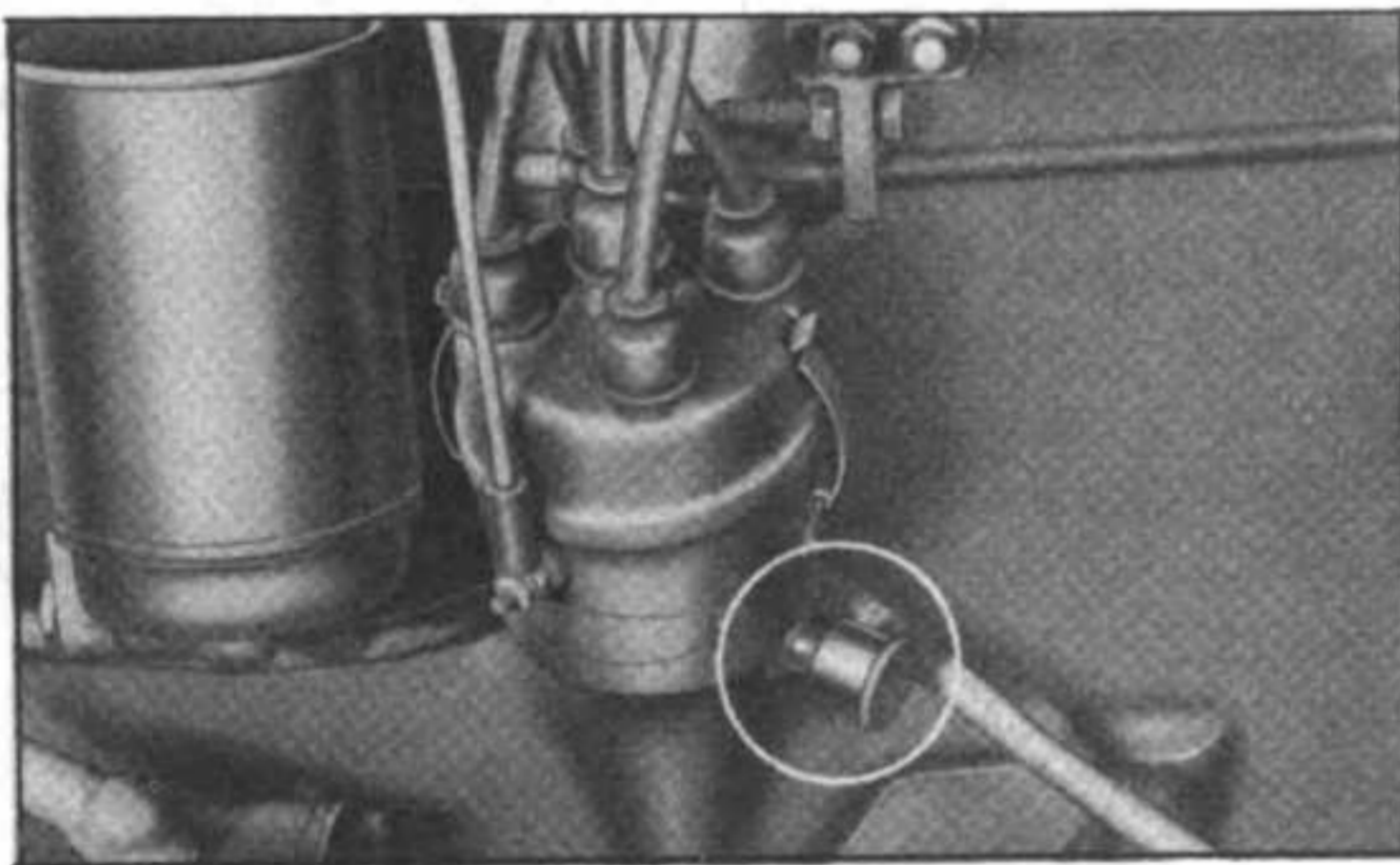
R — WATER PUMP



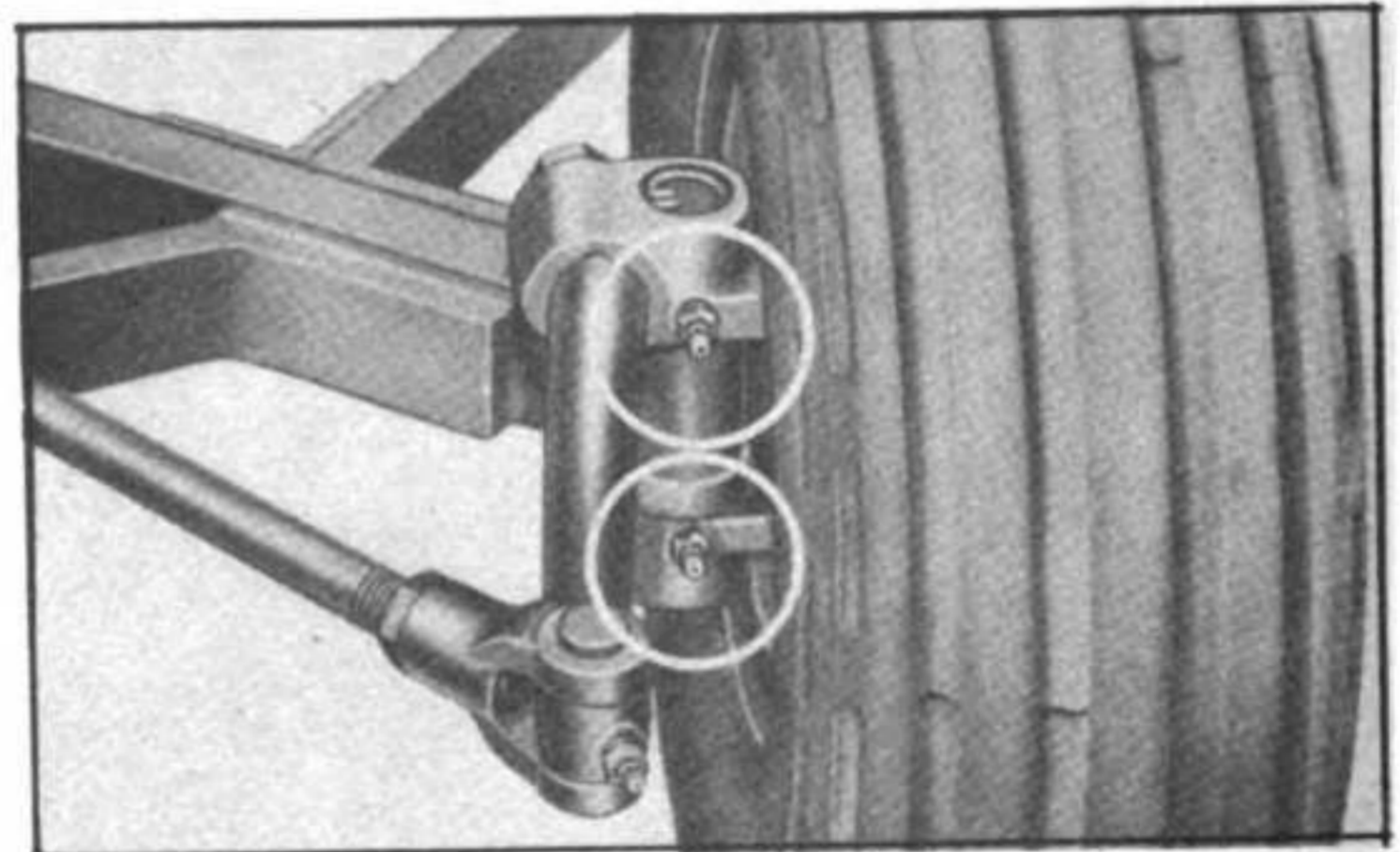
S — CRANKCASE FILL AND BREATHER



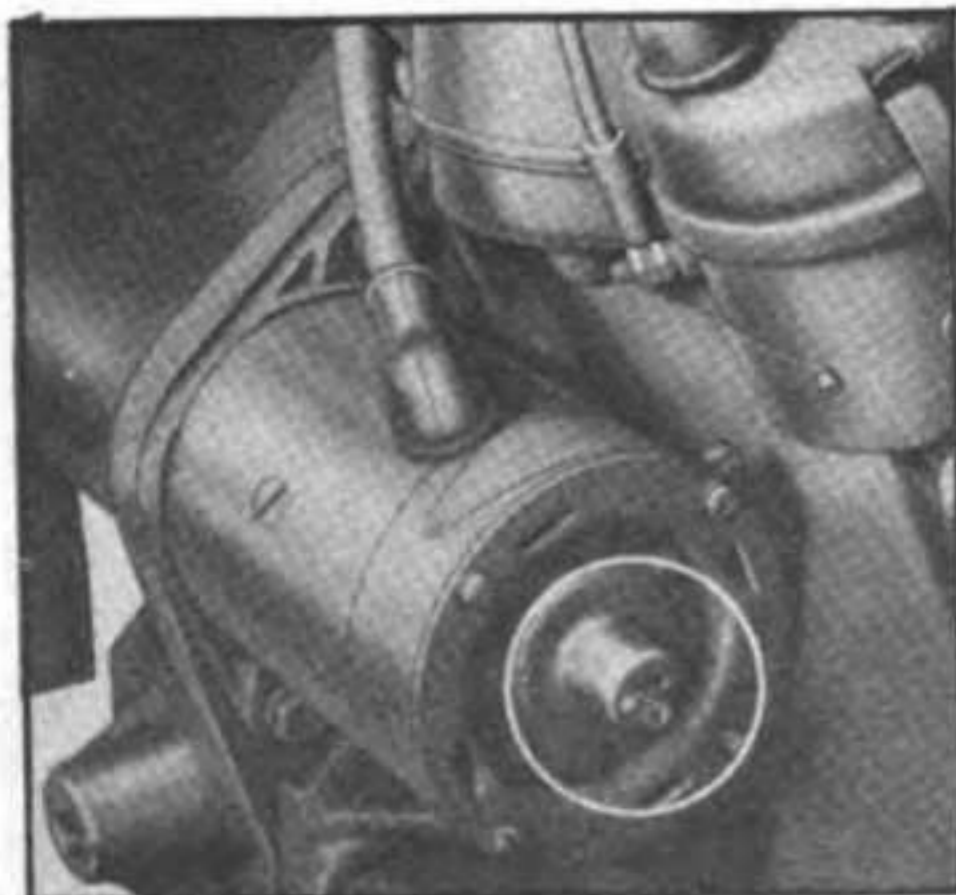
T — CRANKCASE LEVEL



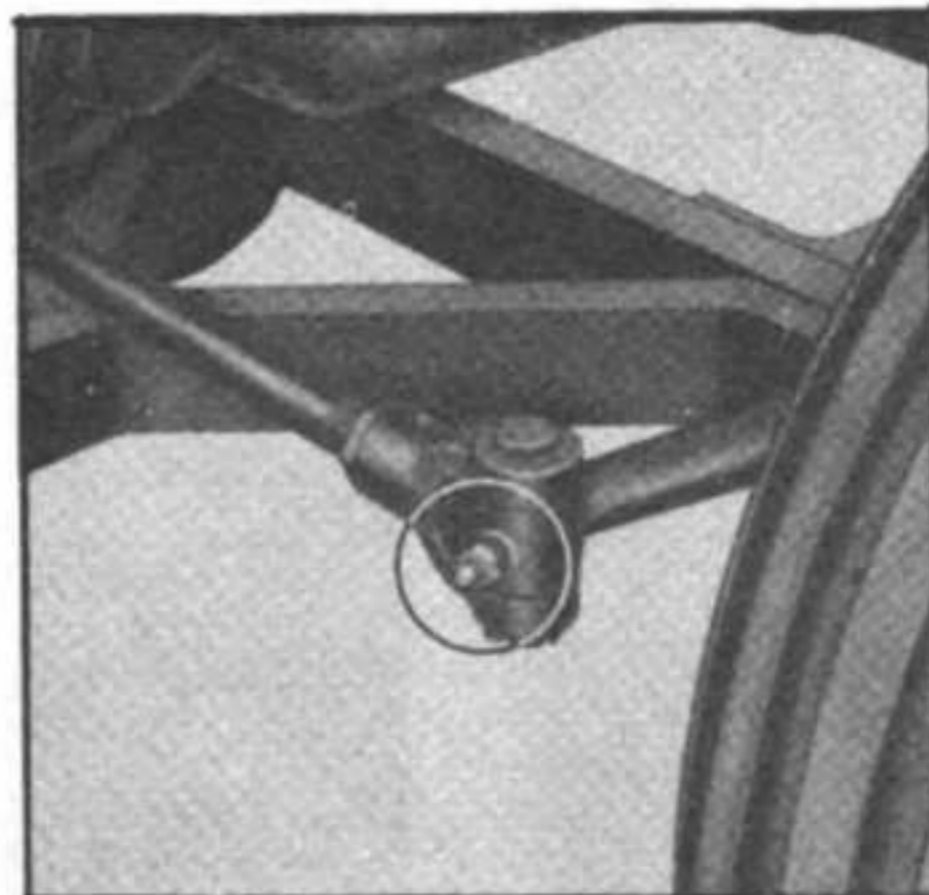
U — DISTRIBUTOR SHAFT



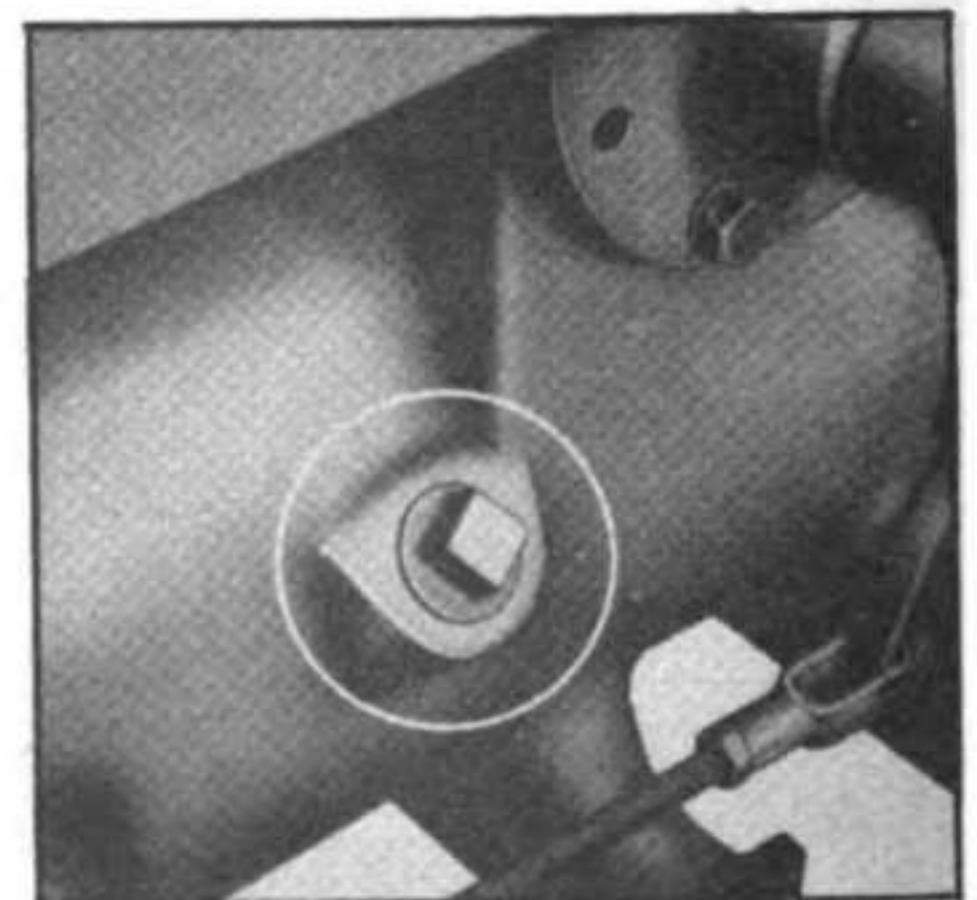
V — KING PIN (R.H.)



W — STARTING MOTOR



X — TIE ROD (R.H.)



Y — TORQUE TUBE FILL

Figure 15 — Localized Lubrication Points

Section XI—Lubrication

hydraulic oil or shock absorber light. Below -40°F remove oil and operate dry. At specified interval remove air cleaner and wash all parts. CAUTION: *Keep all connections clean and tight.*

(2) **BREATHER:** At specified interval, remove crankcase breather cap, wash thoroughly, dry and replace.

(3) **CLUTCH PILOT BEARING:** When clutch is disassembled for any other purpose, clean, remove, and repack.

(4) **CRANKCASE:** At specified interval, inspect level and refill to "FULL" mark with oil, SAE 30 above $+32^{\circ}\text{F}$, or SAE 10 from $+32^{\circ}\text{F}$ to 0°F . Below 0°F , replenish with three quarts SAE 10. Mark this level on level gage. Add one quart of engine fuel to bring level to normal "FULL" mark. Run engine five minutes to thoroughly mix the oil and fuel. Maintain to new level mark by adding SAE 10. Maintain to normal "FULL" mark by adding fuel. If fuel is added when shutting engine down, run at least five minutes to mix. At specified interval remove plug from oil pan and completely drain engine. Drain only when engine is hot. After thoroughly draining, replace drain plug and refill crankcase to "FULL" mark on gage with correct lubricant to meet temperature requirements. Run engine a few minutes and reinspect oil level. Do not inspect oil level while engine is running. CAUTION: *Be sure pressure gage indicates oil is circulating.*

(5) **DISTRIBUTOR:** At specified interval, wipe distributor breaker cam lightly with GREASE, general purpose, No. 1, above $+32^{\circ}\text{F}$. or No. 0, below $+32^{\circ}\text{F}$., and lubricate breaker arm pivot and wick under rotor with 1 to 2 drops of OIL, engine, SAE 30 above $+32^{\circ}\text{F}$.; SAE 10 from $+32^{\circ}\text{F}$. to 0°F .; OIL, lubricating, preservative, special, below 0°F .

(6) **GEAR CASE:**

(a) *At specified interval:* Inspect level with tractor on the ground, and if necessary add lubricant to within $\frac{1}{2}$ " of bayonet gage mark when cold, or to bayonet mark when hot. At specified interval, drain and refill. Drain only after operation when gear lubrication is warm.

(b) *Transmission Case and Torque Tube:* Add approximately one pint of LUBRICANT, gear, universal, through filler plug opening whenever tractor has been immobile for 30 days or longer, or whenever the tractor has been overhauled and re-

assembled. This service should be performed in addition to the periodic inspecting of lubricant levels and drain. Refill with LUBRICANT, gear, universal SAE 90 above $+32^{\circ}\text{F}$., SAE 80 from $+32^{\circ}\text{F}$. to 0°F ., or grade 75 below 0°F .

(7) **OIL FILTERS:** At specified interval, if the filter becomes clogged, remove the filter element, clean the inside of case, and install new element. After renewing element, run engine a few minutes. Reinspect crankcase oil level and fill to "FULL" mark with correct grade of OIL, engine.

(8) **WHEEL BEARINGS:** Remove bearing cone assembly from hub. Wash bearing cones, spindle, and inside of hub, and dry thoroughly. Do not use compressed air. Inspect bearing races and replace if damaged. Wet the spindle and inside of hub and hub cap with GREASE, general purpose, No. 2, to a maximum thickness of $\frac{1}{16}$ " only to retard rust. Lubricate bearings with GREASE, general purpose, No. 2, with a packer or by hand, kneading lubricant into all spaces in the bearing. Use extreme care to protect the bearings from dirt and immediately reassemble and re-install wheel. Do not fill hub or hub cap. The lubricant in the bearings is sufficient to provide lubrication until the next service period. Adjust bearings.

(9) **OIL CAN POINTS:**

(a) At specified interval, lubricate throttle and governor linkage, hood hinges, hood latches, brake rods and clutch rods, pintle hook, and other rubbing surfaces with OIL, engine, SAE 30 above $+32^{\circ}\text{F}$., SAE 10 from $+32^{\circ}\text{F}$. to 0°F ., or OIL, lubricating, preservative, special, below 0°F .

(b) At specified interval, lubricate generator and starter motor with same oil as in (a) above.

(10) **POINTS REQUIRING NO LUBRICATION SERVICE:** Clutch release bearing.

e. Reports and Records:

If lubrication instructions are carefully followed, proper lubricants used, and satisfactory results are not obtained, make a report to the designated individual in authority. Complete record of lubrication servicing in the Duty Roster (W.D. A.G.O. Form No. 6).

Section XII: Preventive Maintenance Services:

30. GENERAL INFORMATION:

a. To insure mechanical efficiency, it is necessary that the tractor be systematically inspected at regular intervals. Certain scheduled maintenance services will be performed at these designated intervals. The services set forth in this section are those performed by the driver before, during, and after operation, and those performed by organizational maintenance personnel at 48-hour and 192-hour intervals.

b. The general inspection of each item applies also to any supporting member or connection, and generally includes a check to see if the item is in "good condition," "correctly assembled," "secure," or "excessively worn."

(1) The inspection for "good condition" is an external visual inspection to determine if the unit is damaged beyond safe or serviceable limits, not bent or twisted, not chafed or burned, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut.

(2) The inspection of a unit to see that it is "correctly assembled" is an external visual inspection to see if it is in its normal assembled position in the tractor.

(3) The inspection of a unit to determine if it is "secure" is an external visual examination, a wrench, hand-feel, or a pry-bar check for looseness. Such an inspection includes any brackets, lock washers, lock nuts, cable clips, locking wires, or cotter pins used in assembly.

(4) "Excessively worn" means worn close to, or beyond, serviceable limits, and likely to result in a failure if not replaced before the next scheduled inspection.

31. FIRST ECHELON PREVENTIVE MAINTENANCE SERVICES:

a. Driver's preventive maintenance services are listed on the reverse side of Driver's Trip Ticket and Preventive Maintenance Service Record, W.D. Form No. 48, to cover vehicles of all types and models. The items listed on W.D. Form No. 48 that apply to the VAIW Tractor, are expanded in this manual to provide specific procedures for accomplishment of the inspections and services. Certain items on W.D. Form No. 48 that do not apply to this tractor are omitted. The services are

arranged to facilitate inspection and conserve the time of the driver. The item numbers, however, are identical with those shown on W.D. Form No. 48.

b. Any defects or unsatisfactory operating characteristics beyond the scope of first echelon to correct must be reported at the earliest opportunity to the designated individual in authority.

c. Before-Operation Service:

This inspection schedule is designed primarily as a check to see that the tractor has not been tampered with or damaged since the last After-Operation Service. It is the duty of the driver to determine whether or not the tractor is in condition to carry out any mission to which it is assigned. This service will not be entirely omitted, even in extreme tactical situations.

Before-Operation Service consists of inspecting items listed below according to the procedure described and correcting or reporting any deficiencies. Upon completion of the service, results should be reported promptly to the designated individual in authority.

(1) **ITEM 1, TAMPERING AND DAMAGE:** Inspect for any injury to the tractor and items of equipment. Inspect for any damage that may have occurred from sabotage or presence of booby traps. Raise the hood and look for signs of tampering or sabotage, such as loosened or damaged accessories or drive belts. Dry the spark plugs, distributor, and wiring if they are wet, to facilitate starting.

(2) **ITEM 2, FIRE EXTINGUISHER:** See that it is fully charged, securely mounted and not damaged, and look for evidences of leakage.

(3) **ITEM 3, FUEL OIL AND WATER:** Inspect the amount of fuel in the tank, noting any indication of leaks or tampering. Add fuel if necessary. Inspect level and condition of coolant. During period when anti-freeze is used, have hydrometer test made of coolant. Add anti-freeze with water, if required. *NOTE: Any appreciable change in levels since the last operation service should be investigated, and reported to the designated authority.*

(4) **ITEM 4, ACCESSORIES AND DRIVES:** Inspect accessories, such as carburetor, generator, governor control rod, starting motor, distributor, oil filter, fan, and water pump. Make certain these

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items are in good condition, and that the fan belt adjustment provides ½" finger pressure deflection.

(5) **ITEM 6, LEAKS; GENERAL:** Inspect under the tractor and in the engine compartment for any indication of fuel, oil, water, or transmission oil leaks. Inspect the cooling system for indication of leaks, paying particular attention to radiator core and connecting hose. Inspect the fuel system for indication of leaks. Trace all leaks to the source, and correct or report them to the designated authority.

(6) **ITEM 7, ENGINE WARM-UP:** Start engine and note any tendency toward hard starting. Observe action of starting motor, particularly if it has sufficient cranking speed, and engages and disengages without unusual noise when in operation. Advance the governor control lever one-third of open position, (push down on lever to advance), with the choke control button out. (NOTE: If oil pressure is not evident in 30 seconds, stop engine and investigate.) As engine warm-up progresses, readjust choke button position inward to smooth out engine performance and prevent crankcase dilution.

(7) **ITEM 8, CHOKE:** For description on operation of choke, see Item 7, Engine Warm-up.

(8) **ITEM 9, INSTRUMENTS:**

(a) *Oil Gage:* Inspect the gage to see whether it indicates properly. Normal pressure during idle should show a reading of 8 to 10 lbs.

(b) *Ammeter:* Ammeter indicator should show "Charge" (+) with engine at fast idle, and at slower speeds with lights on, it may show "Discharge" (—). Any unusual drop or rise in readings must be investigated. Any unusual or extreme deviation from the normal readings is an indication that the generator brushes or armature are out of adjustment and require attention.

(c) *Engine Temperature Gage:* Reading should increase gradually during warm-up period to normal operating range. Maximum safe operating temperature is 200°F. Extremely low temperature after a reasonable warm-up period may indicate existing trouble that should be investigated and corrected.

(9) **ITEM 10, HORN:** If tactical situation permits, inspect operation of horn by pressing horn button. If sound is not emitted, inspect horn and wiring for defects.

(10) **ITEM 12, LAMPS (LIGHTS):** Within the limits permitted by the tactical situation, inspect the operation of the light switch to see that the two headlights and tail-light operate properly. Inspect to see that the lamps (lights) are secure, and that the lenses are clean and not broken.

(11) **ITEM 13, WHEEL AND FLANGE NUTS:** Inspect the rear wheel bolting flange nuts, and rim clamp nuts to see that they are secure. Front wheel spindle nuts can be inspected by first removing the hub caps.

(12) **ITEM 14, TIRES:** Normal maximum air pressure for front 6:00x9 tires is 35 lbs. and 7:50 x16 rear tires is 40 lbs. Inspect tires for damage, and remove any imbedded objects from treads and casings.

(13) **ITEM 15, SPRING AND SUSPENSION:** Inspect the front spring to see if it has abnormal sag, broken or shifted leaves, loose U-bolts or shackles. Inspect the shackle mounting pins to see that they are secure.

(14) **ITEM 16, STEERING LINKAGE:** Inspect the steering gear and linkage to see that they are in condition for safe operation. Pay particular attention to the ends of the steering arms to make certain the yoke pins are secure and that ball socket joints are tight. Also, inspect linkage for possible bends causing steering interference.

(15) **ITEM 17, FENDERS AND BUMPER:** See that the fenders and front bumper-grille are secure and not damaged.

(16) **ITEM 18, TOWING CONNECTIONS:** Inspect automatic coupler for looseness or damage. Examine to be sure it operates freely and locks securely. Inspect control rope for weakness which may result in breakage.

(17) **ITEM 19, BODY:** Inspect side sheets and hood for looseness and damage. Make certain latch holds hood in place.

(18) **ITEM 21, TOOLS AND EQUIPMENT:** See that the tools belonging to the tractor are present, serviceable, and properly stowed in the tool box.

(19) **ITEM 22, ENGINE OPERATION:** If the engine has not yet reached the minimum operating temperature of 110°, normal operating temperature may be assumed when the engine will operate under load with the choke fully released, and when

the oil pressure indicates approximate normal operating pressure, during engine acceleration. Gradually accelerate engine several times after it has reached normal operating temperature, and note any unusual noises or unsatisfactory operating characteristics which indicate trouble.

(20) **ITEM 23, DRIVER'S PERMIT:** Operator must make sure that driver's permit is in his possession, and that the Lubrication Order and a copy of this manual are present with the tractor, and that they are legible and safely stored.

(21) **ITEM 25, DURING-OPERATION CHECK:** The during-operation service is to start immediately, as soon as the tractor is put in motion.

d. During-Operation Service:

While the tractor is in motion, the driver (or crew) are to listen for any unusual sounds that may be a sign of trouble, such as rattles, knocks, squeals, or hums. He should look for steam from the radiator, and smoke from any part of the tractor, and should know and be on the alert for the odor of an overheated generator, overheated brakes, overheated clutch, boiling coolant, fuel vapor from a leak in the fuel system, exhaust gas, or other signs of trouble. Every time the brakes are used, gears shifted, or tractor turned, the driver is to consider it a test, and note any unsatisfactory or unusual performance. A good driver will inspect the instruments constantly, and notice promptly if any instrument indicates that some unit may be operating improperly. The procedures of the During-Operation service consist of observing the following items according to preceding description, stopping the tractor if serious trouble develops, and noting minor deficiencies to be corrected or reported at the earliest opportunity.

(1) **ITEM 27, FOOT AND PARKING BRAKES:** The foot brakes must operate smoothly and effectively, without pulling the tractor to one side, leaving ample reserve of pedal travel available. Cause of brake failure to hold tractor may be due to burned-out linings, wet or greasy facings, or ill adjusted brake rods. Make sure the brake lock is fully released when tractor is in motion. When the tractor is parked, and the parking lock brake engaged, it must hold the tractor on a reasonable incline, leaving a reserve pedal travel available.

(2) **ITEM 28, CLUTCH:** See that clutch does not grab or chatter during engagement, or slip when fully engaged. Clutch pedal must have 1½

to 2" free travel before clutch begins to disengage. Excessive gear clashing is an indication that the clutch is not properly disengaging, and this may be due to an improper adjustment of the clutch rod.

(3) **ITEM 29, TRANSMISSION:** Gears must be shifted with reasonable ease, operate quietly, and not creep out of mesh when in operation.

(4) **ITEM 31, ENGINE AND CONTROLS:** The driver must be on the alert for deficiencies in engine performance, such as lack of usual power, misfiring, unusual noise, stalling, indications of engine overheating, or unusual exhaust smoke. Notice if the engine responds to the governor control, and see that the controls are in proper adjustment.

(5) **ITEM 32, INSTRUMENTS:** Observe the readings on all instruments frequently during operation to see that they are indicating properly.

(a) *Temperature Gage:* See that the gage reads in normal range, 160°F to 180°F. Excessive engine heat may indicate trouble, and must be investigated immediately.

(b) *Oil Pressure Gage:* The oil pressure gage must show a normal pressure of 12 to 14 pounds while the tractor is in operation. In case of any unusual drop in oil pressure, stop the tractor immediately. Report trouble to proper authorities for correction. Lack of oil pressure may indicate insufficient oil, leaks, loose bearings, or a defective oil pump, and may result in premature wear, or may damage the engine to the extent of failure.

(c) *Ammeter:* During operation, the ammeter must show a charge reading of approximately two amperes (+) (without electrical devices in use.) A discharge reading may indicate a faulty generator or cut-out.

(6) **ITEM 33, STEERING GEAR:** See if there is an excessive pulling to either side (except that due to crown of road) or excessive wandering or shimmy of the tractor. If these conditions exist, it may be due to low tire pressure, excessive wear, loose parts, maladjustment, loose bearings, or improper wheel alignment.

(7) **ITEM 34, RUNNING GEAR:** Listen for any unusual noise from wheels, axles, or suspension units that might indicate looseness or damage or under-inflated tires.

(8) **ITEM 35, BODY:** Note any noise and abnormal conditions that may indicate loose side sheets or hood.

Section XII—Preventive Maintenance Services**e. After-Operation Service:**

When performing the After-Operation servicing, the driver or crew must remember and consider any irregularities noticed during the day in the Before-Operation service and During-Operation service. Any units that require inspection or service while they are still at operating temperatures should be inspected as soon as possible after parking the tractor and before any interruptions allow the units to cool. The After-Operation service should never entirely be omitted, even in the extreme tactical situations. The procedure of the After-Operation service consists of inspecting the following items according to the procedure described herewith, and correcting any deficiencies.

- (1) **ITEM 54, FUEL, OIL, AND WATER:** Inspect coolant level, and replenish as necessary, taking care to leave sufficient space for expansion. Fill fuel tank, observing safety precautions for grounding static electricity. Bring engine oil to proper level. If an unusual amount of oil or coolant is required by engine, inspect for leaks and report the condition. **NOTE:** During period when anti-freeze is in use, have hydrometer test made of coolant.
- (2) **ITEM 55, ENGINE OPERATION:** Inspect to see that the engine idles satisfactorily. Accelerate and decelerate the engine, and note any tendency to miss or back-fire, or any unusual engine noise or vibration that might indicate defective parts, loose mountings, incorrect fuel mixture, or faulty engine operating characteristics noted during operation.
- (3) **ITEM 56, INSTRUMENTS:** Inspect all instruments to see that they are securely mounted, properly connected, and undamaged.
- (4) **ITEM 57, HORN:** Inspect the horn to see that it is securely mounted, and properly connected. Test for sound.
- (5) **ITEM 59, LAMPS (LIGHTS):** Observe whether the lights are properly illuminated when switch is at the *on* position, and are not illuminated when switch is at the *off* position. Inspect lenses for dirt or damage. Clean or replace if necessary.
- (6) **ITEM 60, FIRE EXTINGUISHER:** Inspect for looseness or damage and full charge. If extinguisher has been in use or valves open, report for refill or exchange.
- (7) **ITEM 62, BATTERY:** Inspect the battery to see that it is clean, secure, and not leaking. Caps and vents must be clean and secure.
- (8) **ITEM 63, ACCESSORIES AND BELTS:** Inspect carburetor, generator, starter, fan, oil filter, and water pump for loose connections or mountings. Inspect adjustment of fan and drive belt. Belt must deflect $\frac{1}{2}$ " finger pressure; loose or un-serviceable belt must be reported to proper authority.
- (9) **ITEM 64, ELECTRIC WIRING:** Inspect all ignition wiring to see that it is securely connected, clean, and not damaged.
- (10) **ITEM 65, AIR CLEANER AND BREATH-ER CAP:** Remove the air cleaner cup from the air cleaner to see that the oil is at the correct level, and not excessively dirty. Excessive dirt in the oil may be felt with the fingers. If the oil is excessively dirty, clean cup and refill with fresh oil. If operating in sandy or dusty territory, remove breather cap and clean in solvent. **NOTE:** *To keep abrasive dirt out of the engine the air cleaner and breather cap must be kept clean and properly serviced at all times. Remove air cleaner cup, wash in SOLVENT, dry cleaning, refill with clean oil, and reinstall securely. Be sure all joints and connections are secure.*
- (11) **ITEM 66, FUEL FILTER:** Inspect sediment bowl for looseness, damage, or fuel leaks.
- (12) **ITEM 67, ENGINE CONTROLS:** Inspect governor control rods and linkage from governor control lever to governor, and from governor to carburetor to be certain that they are free in action and performing properly.
- (13) **ITEM 68, TIRES:** Remove foreign matter, such as nails, glass, or stones, from tires. Inspect tires for signs of low pressure, abnormal tread wear, position of valve stems, and presence of valve caps. Correct deficiencies noted, and replace missing valve caps.
- (14) **ITEM 69, SPRING AND SUSPENSIONS:** Inspect the front spring to see whether it has abnormal sag, broken or shifted leaves, or loose or broken U-bolts or shackles.
- (15) **ITEM 70, STEERING LINKAGE:** Inspect the steering linkage to see whether parts are bent, loose or inadequately lubricated. Also inspect steering gear housing and knuckles for looseness.

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(16) **ITEM 73, LEAKS; GENERAL:** Inspect in the engine compartment and beneath the tractor for indications of fuel, oil, and water leaks. Inspect rear axle flanges and drain plugs in rear axle transmission and torque tube for indications of lubricant leaks. Trace all leaks to their source, and correct or report them.

(17) **ITEM 74, GEAR OIL LEVELS:** Inspect the torque tube and transmission units for lubricant level. See that oil in the torque tube is to the filler plug and the transmission oil to the full mark on the dip stick. This must not be done until these items have cooled at least enough to permit the hand to be placed on them. Hot or foamy lubricant will not give a true lubricant-level indication.

(18) **ITEM 76, FENDERS AND BUMPER-GRILLE:** Inspect these items to see that they are in good condition and secure.

(19) **ITEM 77, TOWING CONNECTIONS:** Inspect automatic coupler for looseness or damage. Examine to be sure it operates freely and locks securely. Examine control rope for possibility of being frayed or broken.

(20) **ITEM 78, BODY, LOAD, AND TARPS:** Carefully inspect side sheets and hood for damage or loose connections.

(21) **ITEM 82, TIGHTEN: WHEEL, RIM, AXLE DRIVE FLANGE, AND SPRING U-BOLT NUTS:** Tighten rear wheel rim clamps if loose. Also, tighten rear wheel mounting nuts, and front spring U-bolt nut if loose. Report any damaged wheels, rims, rings, flanges, or missing nuts and studs.

(22) **ITEM 83, LUBRICATE AS NEEDED:** Lubricate all items such as shackles, hinges, latches, and other points that are lubricated by the driver, if inspection indicates that it is necessary.

(23) **ITEM 84, CLEAN ENGINE AND TRACTOR:** Clean dirt and trash from floor plates in operator's compartment. Also, remove excessive dirt from exterior of the engine.

(24) **ITEM 85, TOOLS:** Inspect tractor tool list to see that all tools are present, in good condition, and properly stored in the tool compartment.

32. ORGANIZATIONAL MAINTENANCE (SECOND ECHELON):

a. Regular scheduled maintenance inspections and services are a preventive maintenance function

of the using arms and services, and are the responsibility of commanders of operating organizations or installations.

b. Frequency:

The frequency of the preventive maintenance services outlined herein is considered a minimum requirement for normal operation of tractors. Under unusual operating conditions such as extreme temperatures and dusty conditions, it may be necessary to perform certain maintenance services more frequently.

c. Instructions:

If instructions other than those contained in the general procedures in step d below, or the specific procedures in step e below are required for the correct performance of a preventive maintenance service, or for correction of a deficiency, other sections of this manual pertaining to the item involved, or a designated individual in authority should be consulted.

d. General Procedure:

General procedures are basic instructions which are to be followed when performing the services on the items on W.D., A.G.O. Form No. 461 listed in the specific procedures. (The second echelon personnel must be thoroughly trained in these procedures so that they will apply them automatically.)

(1) When new or overhauled sub-assemblies are installed to correct deficiencies, care should be taken to see that they are clean, correctly installed, and properly lubricated and adjusted.

(2) When installing new lubricant retainer seals, a coating of the lubricant should be wiped over the sealing surface of the lip of the seal. When the new seal is a leather seal, it should be soaked in SAE 10 engine oil (warm, if practicable) for at least 30 minutes. Then the leather lip should be worked carefully by hand before installing the seal. The lip must not be scratched or marred.

(3) **SPECIAL SERVICES:** These are indicated by repeating the item numbers in the columns which show the interval at which the services are to be performed, and show that the parts or assemblies are to receive certain mandatory services. For example, an item number in one or both columns opposite a "tighten" procedure, means that the actual tightening of the object must be performed. The special services include—

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(a) *Adjust:* Make all necessary adjustment in accordance with the pertinent section of this manual, special bulletins, or other current directives.

(b) *Clean:* Clean units of the tractor with SOLVENT, dry cleaning to remove excess lubricant, dirt, and other foreign material. After cleaning, rinse parts in clean fluid and dry them thoroughly. Keep the parts clean until reassembled, and be certain to keep cleaning fluid away from rubber or other material which it will damage. Clean the protective grease coating from new parts, since this material is usually not a good lubricant.

(c) *Special Lubrication:* This applies both to lubrication operations that do not appear on the tractor Lubrication Order and to items that do appear on such charts, but which should be performed in connection with the maintenance operations if parts have to be disassembled for inspection or service.

(d) *Serve:* This consists of performing operations such as replenishing battery fluid, draining and refilling units with oil, and changing or cleaning the oil filter or cartridge.

(e) *Tighten:* Tightening should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice. Use torque-indicating wrench where specified. Over-tightening may strip threads or cause distortion. Tightening includes the replacement, correct installation of lock washers, lock nuts, and cotter pins necessary to secure the tightening.

(4) **CONDITIONS:** When conditions make it difficult to perform the complete preventive maintenance procedures at one time, they can sometimes be handled in sections, planning to complete all operations within the 48 hours, if possible.

(5) The numbers of the preventive maintenance procedures that follow are identical to those outlined on W.D., A.G.O., Form No. 461, which is the preventive maintenance service Work Sheet for Wheeled and Half-track Vehicles. Certain items on the work sheet that do not apply to this tractor are not included in the procedures in this bulletin. In general, the numerical sequence of items on the work sheet is followed in the manual procedures, but in some instances there is deviation for conservation of the mechanic's time and effort.

e. Specific Procedures:

The procedures for performing each item in the 48-hour and the 192-hour maintenance procedures

are described in the following chart. Each page of the chart has two columns at the left edge corresponding to the 48-hour and 192-hour maintenance, respectively. Very often it will be found that a particular procedure does not apply to both scheduled maintenances. In order to determine which procedure to follow, look down the column corresponding to the maintenance due, and wherever an item appears, perform the operations indicated opposite the number.

ROAD TEST

192 HRS.	48 HRS.	
		NOTE: Road test will include operation of the tractor, using suitable load weights. Loads carried should be within the limits indicated on the manufacturer's load chart attached to the tractor. The road test should be over a reasonably uneven road and should last not less than 15 minutes nor more than 30 minutes.
1	1	BEFORE OPERATION SERVICE: Perform the "Before Operation Service" as described in paragraph 28c.
3	3	INSTRUMENTS AND GAGES: <i>Oil Pressure Gage:</i> Oil pressure must be between 12 and 14 pounds at normal operating engine speed and 8 to 10 pounds minimum pressure at idle speed. CAUTION: If the gage indicates zero or excessively low oil pressure, stop the engine immediately and investigate the cause. <i>Ammeter:</i> During normal engine operation, the ammeter must show a charge reading of approximately two amperes (+). At low idle, the indicator may point slightly to the discharge side. CAUTION: Should indicator give an abnormal reading to the charge side of the ammeter during normal operation or an abnormal discharge reading upon idling, the condition must be quickly investigated. <i>Engine Temperature Gage:</i> Reading should increase gradually during warm-up to normal operating temperature of 160° to 180°. Should indicator show an abnormally quick rise, or pass beyond the normal reading, it is a direct indica-

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192 HRS.	48 HRS.	
		tion that the radiator core is obstructed, or possibly frozen, if tractor is being operated during low temperatures.
4	4	HORN: If the tactical situation permits, test the horn to see that the signal is normal.
5	5	BRAKES: Apply brakes sufficiently to stop the tractor in minimum distance. Observe effectiveness. Note whether tractor pulls to one side. Observe any unusual noises, pedal travel and feel, or pull-back spring action. <i>Parking Brakes:</i> Stop tractor on reasonable incline; engage parking brake lock ratchet and observe if it holds tractor effectively. Note if brake has ample travel and reserve.
6	6	CLUTCH: The clutch pedal must have a minimum free travel of 1-1/2 to 2" before meeting resistance. Clutch must stop transmission entirely when tractor is stationary so that shift can be made without gear clashing. Any unusual noise, such as chatter or squeal, when clutch is engaged, is an indication that the clutch plate or the release bearing are defective, or the clutch may be out of alignment.
7	7	TRANSMISSION: With the tractor at a stand-still, and the engine operating at fast idle, depress clutch and go through the gears to test free gear movement. Any abnormal resistance to the hand lever is an indication of damaged, excessively worn, or inadequately lubricated parts.
8	8	STEERING: While tractor is in motion, move steering wheel fully in both directions, and observe any indications of looseness or binding. Also, note any tendency of the tractor to wander, shimmy, or to pull to one side. Examine the steering column and steering wheel to see that they are in good condition and secure.
9	9	ENGINE: Observe engine operation characteristics as follows: <i>Unusual Noises:</i> Listen for knocks and rattles as the engine is accelerated and

192 HRS.	48 HRS.	
		decelerated, and while it is under both light and heavy loads. <i>Acceleration and Power:</i> Operate the engine at various speeds in all gears, noting whether the tractor has normal pulling power and acceleration. A slight "ping" may indicate early timing, heavy accumulation of carbon, or low octane fuel. <i>Governor Speed:</i> Accelerate engine to its full governor capacity by depressing the accelerator to the step plate and holding. Observe tachometer reading and note if the engine speed exceeds the specified 2000 RPM.
10	10	UNUSUAL NOISES: Be on the alert continually for unusual noises that would indicate loose wheel mountings, floor plates, hood, or side sheets.
13	13	TEMPERATURES: Place hand cautiously on brake covers and front wheel hubs to see if they are abnormally hot. An overheated brake cover is an indication of a dragging brake or defective, dry, or improperly adjusted bearings. An abnormally cool brake is an indication of an inoperative brake. Cautiously feel the rear axle, transmission, and torque housing for overheating. If gear case is excessively hot, for the distance traveled, it is an indication of an abnormal condition in the unit. This must be corrected or reported to the proper authority.
14	14	LEAKS: Look within the engine compartment and underneath the tractor for engine oil, water, or fuel leaks, and determine their source.
16	16	GEAR OIL LEVEL AND LEAKS: Remove filler plug from torque tube and transmission case to inspect lubricant levels. The proper level for the transmission case is to the full mark on the dip stick; and for the torque tube, the proper level is up to the filler hole. Allow sufficient time for foaming to subside before inspecting levels. Note condition of lubricant. If an oil change is due in these units, or condition of lubricant indicates an oil change is necessary,

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192 HRS.	48 HRS.		192 HRS.	48 HRS.	
		drain and refill units with fresh specified oil. Note any indications of lubricant leaks at oil seals or gaskets.			<i>Adjust:</i> Adjust valve stem clearance if necessary. The proper clearances are .012 inches for both intake and exhaust valves when the engine is cold.
		MAINTENANCE OPERATIONS Raise Tractor — Block Safely			
17	17	UNUSUAL NOISES: With engine running, observe as follows: Engine, Water Pump Belt, and Accessories. Accelerate and decelerate the engine momentarily, and listen for any unusual noises in these units which may indicate damaged, loose, or excessively worn parts. <i>Transmission, Drive Shaft, Rear Wheels, and Bearings:</i> With the transmission in an intermediate gear, operate these units at a constant moderate speed by use of the governor control lever and listen for any unusual noise that might indicate loose, damaged, or excessively worn unit parts. Also observe drive shaft and wheels for vibrations and run-out, and for vibrations in the other units which may indicate looseness or unbalance. The rear wheels should rotate at approximately the same speed. Slow turning wheels may indicate tight brakes or wheel bearings. Also, be sure to locate, correct, or report any noises noted during road test to proper authority.	19		
				20	SPARK PLUGS: Wipe off the installed spark plugs and examine insulation for damage or indications of leakage around insulators or gaskets.
				20	Remove spark plugs and examine to see that they are in good condition. Pay particular attention to broken insulations, excessive carbon deposits, and to electrodes burned thin. Clean deposits from electrodes and insulations, and inspect again for cracks. If a plug cleaner is not available, install new or reconditioned plugs.
				20	<i>Adjust:</i> Adjust plug gaps to .025 inches by bending only grounded electrodes. After completing Item 21, reinstall the plugs, using new gaskets and taking care not to over-tighten them.
				21	COMPRESSION TEST: While spark plugs are removed, test the engine compression. The cylinder pressure should be approximately 90 pounds, with no more than 5 pounds variation between cylinders. Record the reading on the space provided on the back of the form. If pressure in a cylinder is below normal, squirt sufficient engine oil on the piston head to prevent loss of compression temporarily, and reinspect. Low compression brought up to normal by oil seals indicates faulty piston rings, cylinder wear, or damage. Low compression not brought up to normal by this procedure indicates valve or gasket leakage.
18	18	CYLINDER HEAD AND GASKET: Remove engine valve cover and look for cracks or indications of oil, coolant, or compression leaks around studs, cap screws, and gaskets. CAUTION: <i>The cylinder head must not be tightened unless there is a definite indication of looseness or leaks. If tightening is necessary, use torque-indicating wrench, and tighten nuts starting from center, working to outside.</i>	22	22	BATTERY: Inspect battery case for cracks and leaks. Clean top of battery. Inspect terminals, cables, bolts, posts, and hold-down clamps for good condition. Test specific gravity and voltage, and record on W.D., A.G.O. Form No. 461. Specific gravity reading below 1.225 at normal temperature indicates battery must be recharged or replaced. Electrolyte level must be 3/8" above top of plates.
19	19	VALVE MECHANISM: Examine tappet clearance while engine is cold. Valve tappets, rocker arms, shafts, and springs should appear in good condition, correctly assembled and secure. Oil should be delivered properly. Also, make sure that the valve cover gasket is in good condition.			

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

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22		Perform high rate discharge test according to instructions for "condition" test, which accompany test instrument, and record voltage on W.D., A.G.O. Form No. 461. Cell variation should not be more than 30 per cent. NOTE: <i>Specific gravity must be above 1.225 to make this test.</i>			enough to see that the solution penetrates all parts of the system thoroughly. Drain and flush thoroughly with water.
22	22	Bring electrolyte to proper level by adding distilled or clean water. Clean entire battery and carrier. Repair carrier if corroded. Clean battery cable terminals, terminal bolts and nuts, and battery posts, and grease them lightly. Inspect bolts for serviceability. Tighten terminals and hold-downs carefully to avoid damage to battery.	25	25	Tighten: Carefully tighten all loose radiator mountings and hose clamps.
23	23	CRANKCASE: With engine idling, examine crankcase, valve covers, and timing gear cover for oil leaks. Stop engine and inspect oil in the crankcase to see that it is at the proper level: NOTE: <i>If an oil change is due, drain the crankcase, and refill to the proper level with specified oil. Do not start the engine again until Item 24 has been completed.</i>	26	26	WATER PUMP, FAN, AND SHROUD: Inspect pump to see that it is in good condition, secure, and not leaking. Loosen drive belt, examine shaft for end-play, and loose bearings. Leave loose until adjustment is made (Item 29). Examine fan blades to see that they are in good condition, properly secured to the hub, and that the radiator shroud is in good condition.
24	24	OIL FILTER: Inspect the oil filter to see that it is in good condition, secure, and does not leak. Inspect oil filter element, and change if necessary.	27	27	GENERATOR, STARTER, AND SWITCH: See that these items are in good condition, securely mounted, and the wiring connections are free of dirt and secure.
24		Remove the filter element, clean the case, and install a new element, and tighten securely.	27		Remove the generator and starter inspection covers to see that the commutators and brushes are in good condition and not excessively worn. Also, make certain the brushes are free in the holders and have sufficient spring tension to hold them in contact with the commutators, and that the brush connecting wires are secure and not grounding.
25	25	RADIATOR: (CORE, SHELL MOUNTINGS, HOSE, CAP, AND OVERFLOW) Inspect these items to see that they are in good condition, correctly assembled, securely mounted, free of obstruction, and connected. Also, see that there are no leaks. Examine the coolant to see whether it is so contaminated with rust, oil, or other foreign matter that the cooling system must be cleaned. If cleaning is necessary, drain the radiator, taking care to save the drainings if ethylene-glycol anti-freeze is used. Take one gallon of water and one pound of washing soda or one-half pound of soda ash mix. Pour this into the radiator and run the engine long	27		Clean the commutator end of the generator and starter by blowing out with compressed air. If the commutator is dirty or corroded, clean with fine sand paper, (00) only, having sand paper backed with a suitable piece of wood. After buffing commutator, blow out the dust with compressed air, and replace inspection cover.
			27		Tighten: Tighten the starter mounting bolts securely.
			29	29	DRIVE BELT: Observe the water pump and generator drive belt for evidence of worn conditions. See that the belt and hubs are in good condition, and securely mounted.
			29	29	Adjust: Adjust to 1/2" finger deflection.
			31	31	DISTRIBUTOR: Observe whether the distributor body and external attachments are in good condition and secure. Examine other parts of the distributor

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		as follows: Cap, Rotor, and Points: Clean the dirt or dust from the distributor cap and see that the small vent holes are open. Remove the cap, and see that the cap, rotor, and the breaker plate assembly parts are in good condition, correctly assembled, secure, and sufficiently cleaned. Pay particular attention to cracks in the cap and rotor, corrosion of terminals, and connections in these parts, and to burning of the outer ends of the conductor strap of the rotor. Also, see that the breaker points are in good condition and well aligned. Also, make certain that the adjustment, when open, is .020, with the breaker arm in contact with the peak of the lobe on the rotating shaft. If contact points are rough or pitted, smooth with a file before adjustment.			tight and are not leaking around the gaskets. Also, inspect the manifolds for leaks resulting from expansion cracks and sand holes usually indicated by carbon streaks.
31			33		<i>Tighten:</i> Tighten the manifold and exhaust pipe mountings and flange nuts for carburetor to intake manifold.
					AIR CLEANER: Every 96 hours remove the cup from the air cleaner. Clean the element, baffles, and body with SOLVENT, dry cleaning. Refill to its proper level with clean oil, and replace securely. Inspect hose clamps from carburetor horn to air cleaner and make certain that they are tight.
31	31	<i>Shaft:</i> Test shaft by hand-feel for looseness of worn camshaft or bushings.	35	35	BREATHER CAP: See that the breather cap is in good condition, secure, correctly assembled, and that it is not obstructed with dirt or foreign materials.
31	31	<i>Centrifugal Advance:</i> Reinstall the rotor on distributor camshaft and note whether shaft can be rotated by finger force through its normal range of movement, which is permitted by its centrifugal advance mechanism. Note also if it returns to its original position when the fingers are quickly removed from the rotor. Be certain that there is no binding or drag in this mechanism during this check.	35	35	<i>Clean and Service:</i> Remove breather cap, and wash in SOLVENT, dry cleaning until crimp-cut foil has a bright clean appearance. Dry with compressed air and replace securely.
			36	36	CARBURETOR: (CHOKE, THROTTLE, LINKAGE, AND GOVERNOR) See that these items are in good condition, correctly assembled, and securely installed; that the carburetor is free from leaks; that the linkage, including the choke and governor control rod, are not excessively worn; and free in action. <i>NOTE: Make certain that the choke valve opens fully when choke button is in outward position, that the throttle valve opens fully when governor control is open, and that the governor is securely and properly sealed.</i>
31	31	<i>Special Lubrication:</i> Lubricate the distributor by removing grease cup provided on the side, and fill with grease specified on the Lubrication Order.			
32	32	COIL AND WIRING: Examine the coil to see that it is in good condition, clean and properly mounted. All high voltage ignition wire and looms must be in good condition and securely fastened to all support mountings and terminals. See that all connections are tight and free from corrosion. Also, inspect low voltage wires in like manner. <i>NOTE: Do not tighten wiring connections unless actually loose, as overtightening of terminals will cause damage.</i>	37	37	FUEL FILTER AND LINE: Examine the protectoseal filter attached to the fuel cap, and the sediment bowl under the gasoline tank. See that they are in good condition, secure, and that the bowl and line connections are not leaking. Close the fuel shut-off valve, and remove the filter bowl and gasket. Clean the bowl with SOLVENT, dry cleaning. Dry the bowl thoroughly, and reinstall, using new gasket. Remove the line from
33	33	MANIFOLDS: Inspect the intake and exhaust manifolds to see that they are			

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		the carburetor, and inspect for dirt and sediment. Remove protectoseal filter, clean in solvent, and reinstall. Turn on the fuel shut-off valve after assembling, and re-examine for leaks.
39	39	STARTER: Start the engine, observing whether the general action of the starter is satisfactory, particularly whether it engages and operates properly without excessive noises, and has adequate cranking speed.
40	40	LEAKS: Look in the engine compartment and under the tractor for engine oil, fuel, and water leaks; trace all leaks to the source, and report or correct them.
41	41	IGNITION TIMING: With the engine running, and with timing wire connected to the distributor in position for cylinder 1 or 4, hold the point $\frac{1}{4}$ " from the flywheel by first removing the small inspection cover on the left hand side of the bell-housing of the torque tube. (Figure 17). Be certain that the ignition spark jumps to the mark on the flywheel marked D.C. (Dead Center).
41	41	<i>Adjust:</i> If the spark does not strike upon the line marked D.C. on the flywheel, correct by loosening the clamp of the adjusting plate at the base of the distributor and rotate the distributor in the direction necessary to obtain the proper setting. (Detailed adjusting information can be found in Par. 84.)
42	42	ENGINE IDLE: To make adjustment, connect a vacuum gage to the intake manifold. Adjust the engine to its normal idle speed with the governor control stop screw, and adjust the idle mixture adjusting needle until the vacuum gage indicates a steady maximum reading. If this latter adjustment changes the idle speed appreciably, re-set the idle speed, and with engine at fast idle reset the mixture, until both are satisfactory.
42	42	<i>Vacuum Test:</i> With the engine at normal idle speed, the vacuum gage should read approximately 15 to 18

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		inches, and the pointer should be steady. A badly fluctuating needle between 10 to 15 inches may indicate a defective cylinder head gasket or valve. An extremely low reading may indicate a leak in the intake manifold or gasket. Accelerate and decelerate the engine quickly. If the gage indicator fails to drop to approximately two inches as the throttle is opened, and fails to recoil to at least 24 inches as the throttle is closed, it may be an indication of diluted oil, poor piston ring seals, or abnormal restriction in the carburetor, air cleaner, or exhaust.
43	43	REGULATOR UNIT: (CONNECTIONS AND CUT-OUT) See whether it is in good condition, and whether all connections and mountings are secure.
43		<i>Test:</i> Connect the low voltage circuit tester, and observe whether the cut-out controls the generator out-put properly. Follow the instructions which accompany the test instruments. Inspect, if test shows faulty operation.
		CHASSIS, BODY, and ATTACHMENTS
47	47	TIRES AND RIMS: Inspect as follows: <i>Valve Stems and Caps:</i> Observe whether all valve stems are in good condition and in correct position. See that all valve caps are present and securely installed. Do not tighten with pliers. <i>Condition:</i> Examine all tires for cuts, bruises, breaks, and blisters. Remove embedded glass, nails, and stones. Look for irregular tread wear, watching for any signs of flat spots, cupping, feather edges, and one-sided wear. Remove tires worn thin at center of tread (or other unserviceable tires), and exchange for new or retreaded tires. Any mechanical deficiencies causing such conditions must be determined and corrected, or reported to the proper authority. <i>Direction:</i> When original bar type tires are in use, the direction of the bars will always be correct, regardless as to which side the tires are mounted. If directional tires with a "V" chevron are used, the "V" must point upward when viewed from the rear.

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		<p>Matching: With tires properly inflated, inspect them to see if they are matched according to overall circumference and type of tread.</p> <p>Rims: All rims and their lock rings or flanges must be in good condition and secure.</p>			<p>Adjust: After brake housing has been reassembled, adjust the brakes by loosening the three locking screws several turns, but do not remove them. Turn down the three adjusting screws in a clockwise direction until a noticeable drag is present when the wheel is turned by hand. This action forces the primary disk and pressure plate inward, and decreases the clearance at the brake lining. Next, back off the adjusting screws one-fourth to one-half turn. This must leave adequate clearance to assure that the brake will not drag. The screws must be turned down equally, to assure uniform pressure at all three points. When proper adjustment is obtained, tighten the locking screws to lock the pressure plate in place. To take up the free play in the actuating levers, adjust the length of the brake rod so there is no more than 1/8" of free movement at the end of the lever.</p>
47	47	<p>Tighten: Tighten rear wheel lug nuts securely.</p>	49	49	
47		<p>Serve: With rear tires properly inflated to 40 lbs., and front tires to 35 lbs., measure overall circumference of rear tires and front tires respectively, noting that they will not have differences in overall circumference exceeding the 3/4" limits specified in current directories and bulletins. NOTE: <i>After performing the tire-matching service, do not reinstall the front wheels until the front wheel bearing service is completed.</i></p>			
48		<p>REAR BRAKES: With rear tires and brake cover removed, examine brake plates to see that they are in good condition, securely mounted, and are not excessively worn or scored. Remove brake plates and clean all dirt and grease from these parts thoroughly, keeping SOLVENT, dry cleaning away from brake linings.</p>	52	52	<p>REAR WHEELS: Inspect the wheels to see that they are in good condition and secure. Revolve the wheels and listen for indications of damaged bearings. If this condition exists, report to designated authority for servicing by higher echelon. Note if drive flanges and nuts are in good condition.</p>
49	49	<p>REAR BRAKE DISKS: With rear tires and brake cover removed, examine the linings to see whether they are so worn that the rivet heads may contact the pressure plates within the next 48 hours of operation. To inspect the lining, remove the brake rod and the four nuts holding the brake cover to the transmission housing. The brake cover of the pressure plate assembly can now be pulled out for inspection of the brake lining by the motor officer, to determine whether the linings are so worn that they should be replaced. A similar inspection of the brake linings must be made after the tractor has recently been operated in deep water, mud, loose sand, or dirt which may have entered the brake housing.</p>	55	55	<p>STEERING KNUCKLES: Note if the steering knuckles are in good condition and properly secured by the king pins, and whether the king pins and bushings are excessively worn.</p>
		<p>Clean: Clean any dust or dirt from the disks with a wire brush, clean cloth, or compressed air.</p>	56	56	<p>FRONT SPRING: See that the front spring is in good condition, correctly assembled, and secure. Spring clips and bolts must be in place, and spring leaves must not be shifted out of their correct position. Note whether the deflection of spring bolts is normal. Test the hangers and bolts for excessive wear by means of a pry bar.</p>
49			56	56	<p>Tighten: Tighten all spring U-bolts securely and uniformly.</p>
			57	57	<p>STEERING: (ARMS, TIE RODS, DRAG LINK, SEALS, GEAR, COLUMN, AND WHEEL) See that these items are in good condition and securely</p>