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**TM 9-783B**

**WAR DEPARTMENT**

*U.S. Dept. of Army*

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**TECHNICAL MANUAL**

**MEDIUM TRACTOR M1**

**(ALLIS-CHALMERS HD-7W)**

**DECEMBER 22, 1942**

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DESCRIPTION AND TABULATED DATA

RA PD 17676

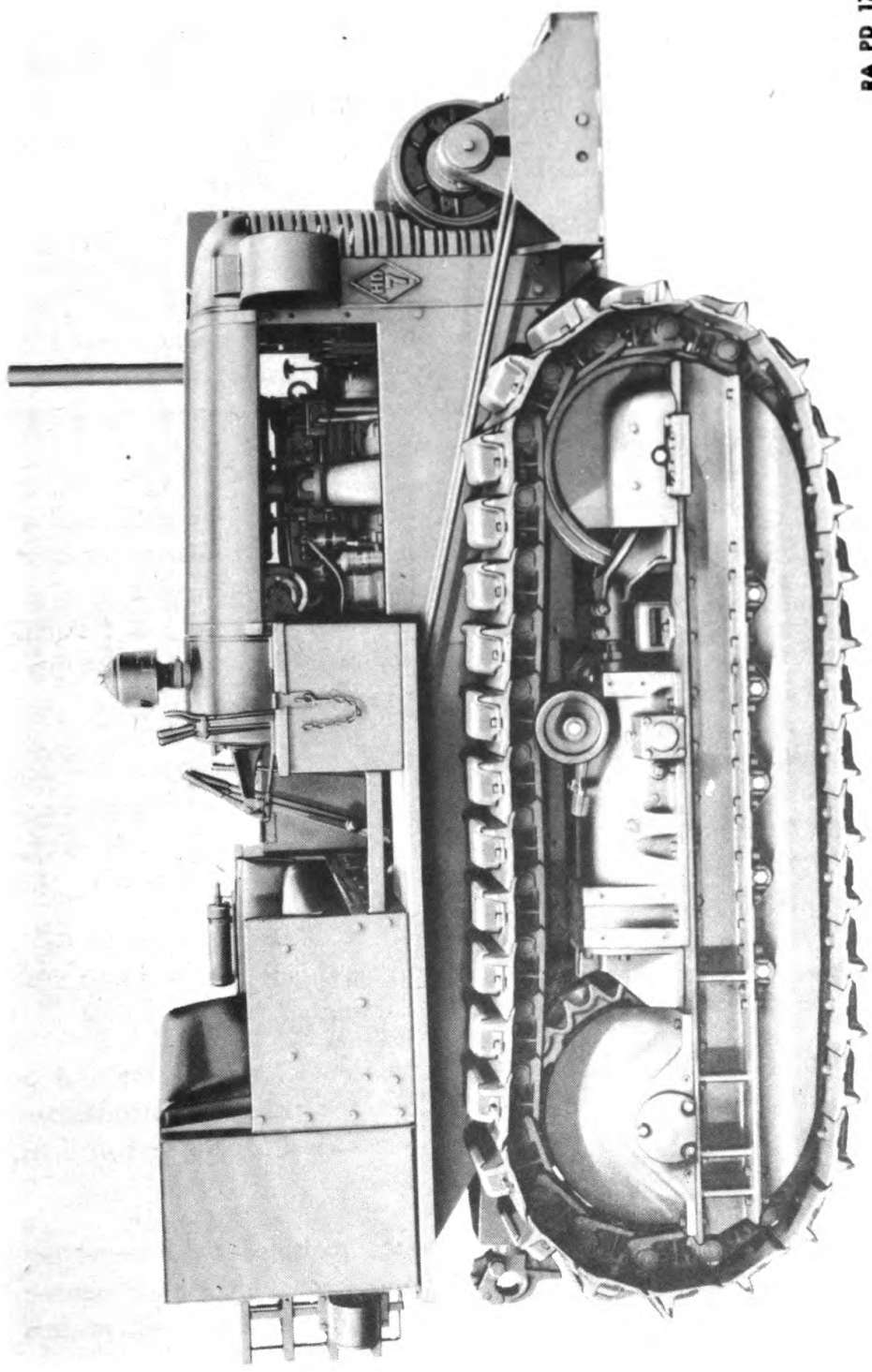
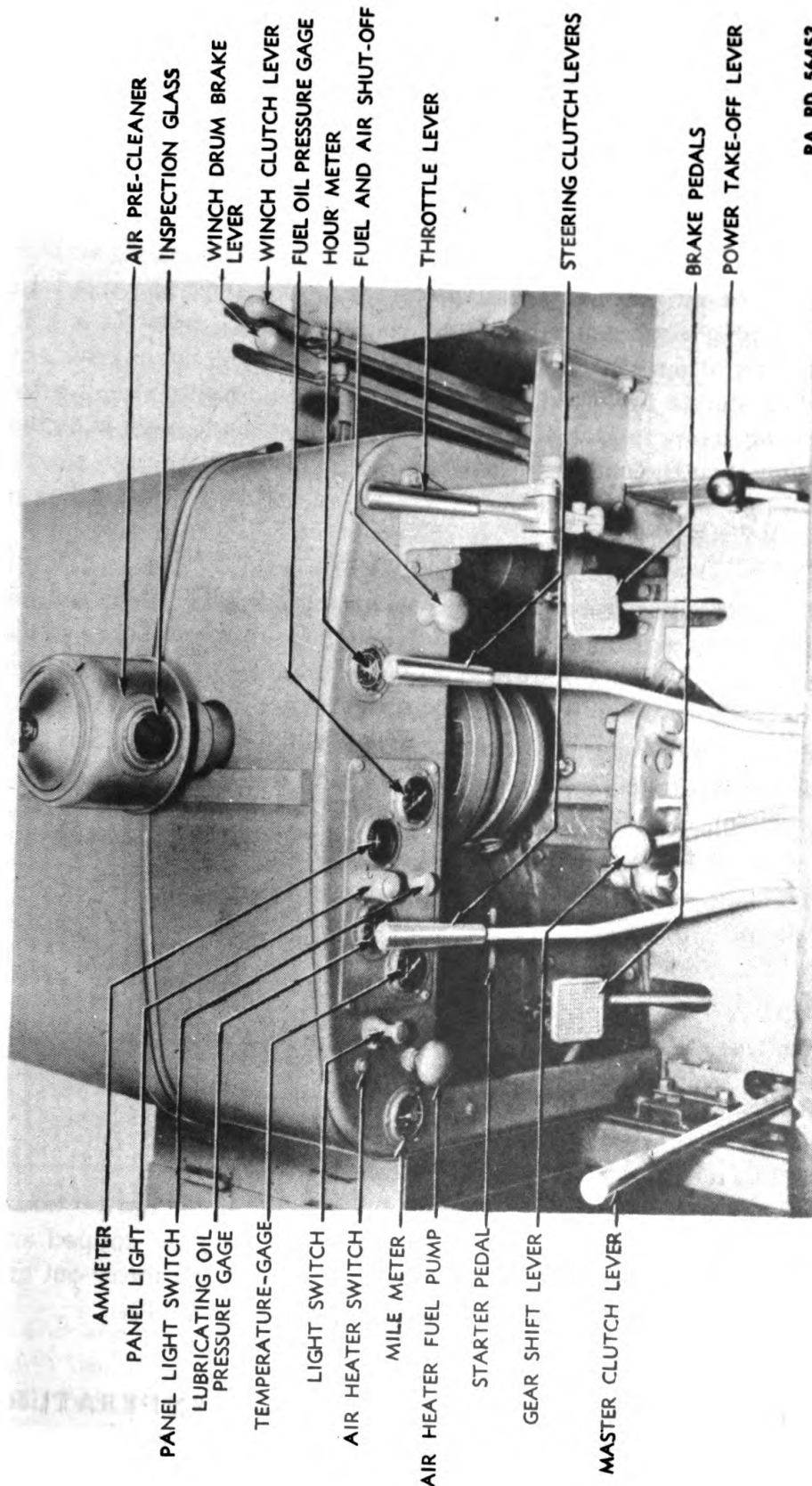


Figure 5—Right Side of Medium Tractor M1

# OPERATING INSTRUCTIONS AND CONTROLS



RA PD 56453

Figure 11—Operator's Controls

**OPERATING INSTRUCTIONS AND CONTROLS**

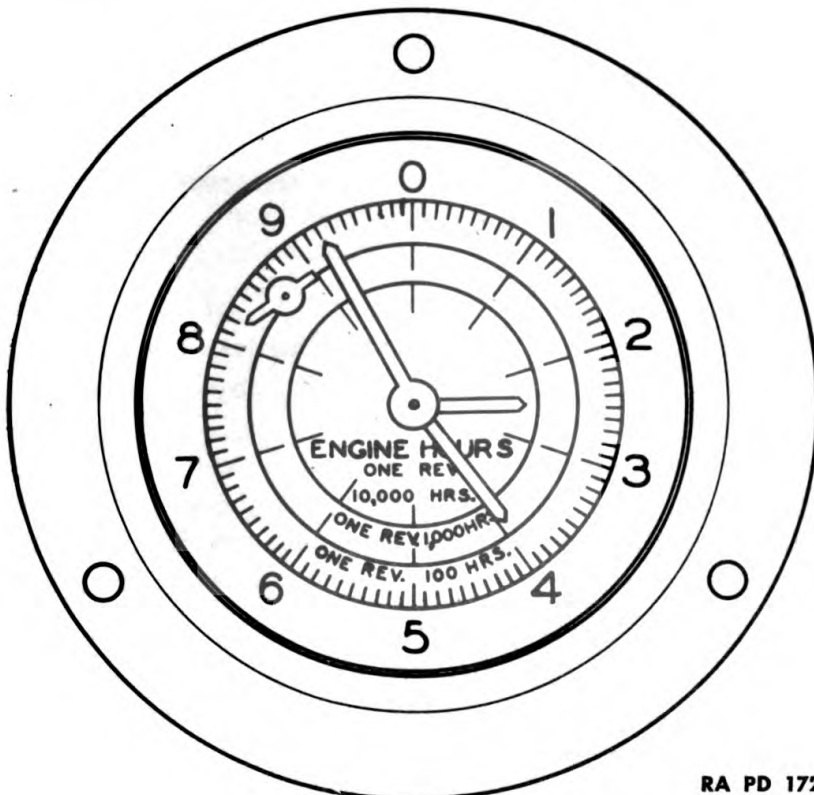
**23. HOUR METER (fig. 17).**

a. **Description.** This meter is electrically operated. A small automatic pressure switch is closed by oil pressure as soon as the engine is started and the oil pressure reaches 5 pounds. The small hand at the top left of the dial will then start rotating. This hand is to indicate when the meter is operating.

**b. How to Read Hour Meter.**

(1) The three hands in the center of the dial record the number of hours the tractor has operated and are of three different lengths. Total hours are determined by reading the number each hand has passed in the same way as we look at a clock to see which number the hour hand, the minute hand, and the second hand have passed and thereby tell the time.

(2) The shortest hand requires 1,000 hours of operation for it to pass each numeral or 10,000 for a complete revolution. As shown in illustration, it stands between "2" and "3," which indicates over 2,000 hours of operation. This indicates that the first numeral in the number of hours operated will be "2," followed by three other numerals indicated by the position of the other two hands which in turn show how many hours more than 2,000 that the tractor has operated.



RA PD 17214

**Figure 17—Hour Meter**

## LUBRICATION

### 29. REPORTS AND RECORDS.

a. **Reports.** If lubrication instructions are closely followed, proper lubricants used, and satisfactory results are not obtained, a report will be made to the ordnance officer responsible for the maintenance of the materiel.

b. **Records.** A complete record of lubrication servicing will be kept for the materiel.

### 30. SUPPLEMENTARY LUBRICATION ILLUSTRATIONS.

a. Figures 21 to 25 show the location of lubrication fittings and the way in which various points are lubricated.

## PAINING

c. **PRIMER**, synthetic, rust-inhibiting, for bare metal, should be used on metal as a base coat. Its use and application is similar to that outlined in paragraph (b) above.

d. The success of a job of painting depends partly on the selection of a suitable paint, but also largely upon the care used in preparing the surface prior to painting. All parts to be painted should be free from rust, dirt, grease, kerosene, oil, and alkali, and must be dry.

### 45. PAINTING METAL SURFACES.

a. If metal parts are in need of cleaning, they should be washed in a liquid solution consisting of  $\frac{1}{2}$  pound of SODA ASH in 8 quarts of warm water, or an equivalent solution, then rinsed in clear water and wiped thoroughly dry. Wood parts in need of cleaning should be treated in the same manner, but the alkaline solution must not be left on for more than a few minutes and the surfaces should be wiped dry as soon as they are washed clean. When surface of the tractor is in fair condition and only marred in spots, the bad places should be touched with ENAMEL, synthetic, olive-drab, lusterless, and permitted to dry. The whole surface will then be sandpapered with PAPER, flint, No. 1, and a finish coat of ENAMEL, synthetic, olive-drab, lusterless, applied and allowed to dry thoroughly before the materiel is used. If the equipment is in bad condition, all parts should be thoroughly sanded with PAPER, flint, No. 2, or equivalent, given a coat of PRIMER, synthetic, refinishing, and permitted to dry for at least 16 hours. They will then be sandpapered with PAPER, flint, No. 00, wiped free from dust and dirt, and a final coat of ENAMEL, synthetic, olive-drab, lusterless, applied and allowed to dry thoroughly before the materiel is used.

### 46. PAINT AS A CAMOUFLAGE.

a. Camouflage is now a major consideration in painting ordnance vehicles, with rust prevention secondary. The camouflage plan at present employed utilizes three factors: color, gloss, and stenciling.

(1) **COLOR**. Vehicles are painted with ENAMEL, synthetic, olive-drab, lusterless, which was chosen to blend in reasonably well with the average landscape.

(2) **GLOSS**. The new lusterless enamel makes a vehicle difficult to see from the air or from relatively great distances over land. A vehicle painted with ordinary glossy paint can be detected more easily and at greater distances.

(3) **STENCILING**. White stencil numbers on vehicles have been eliminated because they can be photographed from the air. A blue-drab stencil enamel is now used which cannot be so photographed. It is illegible to the eye at distances exceeding 75 feet.

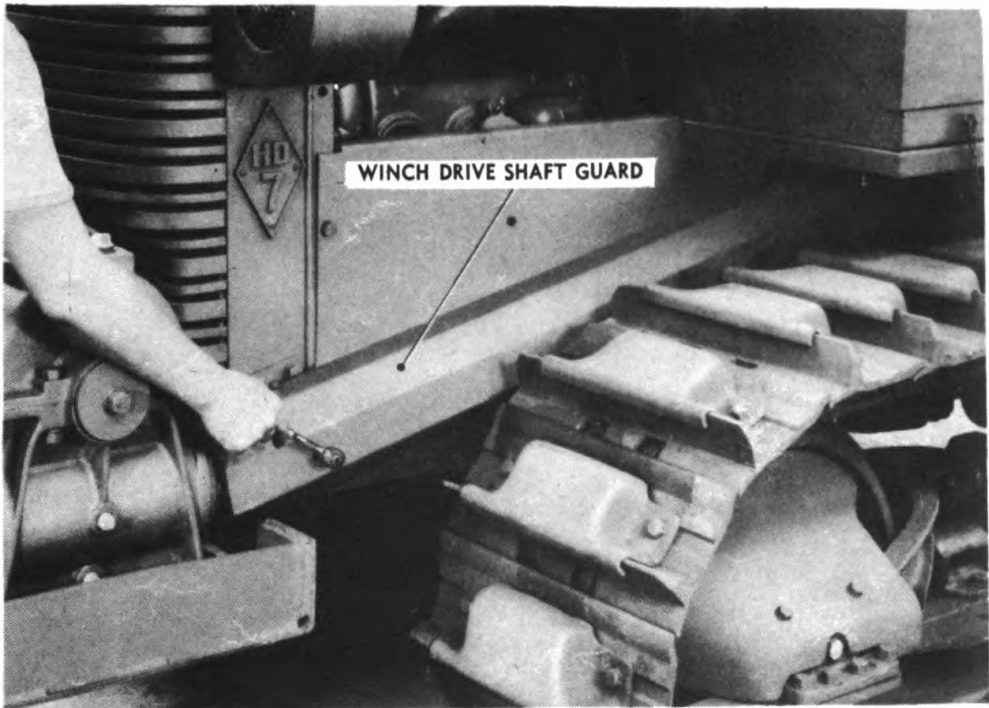
**STANDARD TOOLS AND EQUIPMENT**

List of Equipment	Where Carried
PREHEATER, engine (1) .....	In box
SCREWDRIVER (1) .....	In tool box
TOOL, valve lifter and injector removal (1) .....	In tool box
WASHER, lock, 3/8-in. (for attaching seat back cushion) (4) .....	In box
WRENCH, engine cranking (1) .....	In tool box
WRENCH, fan adjusting (1) .....	In tool box
WRENCH, fuel pump, and PUMP, water (1) .....	In tool box
WRENCH, hex., plug (1) .....	In tool box
WRENCH, hex., 1/2-in. (1) .....	In tool box
WRENCH, injector nut (1) .....	In tool box
WRENCH, socket, track bolt (1) .....	In tool box
WRENCH, square plug (1) .....	In tool box
WRENCH, track adjusting (1) .....	In tool box
WRENCH, water pump drain (1) .....	In tool box

**55. CARE OF EQUIPMENT.**

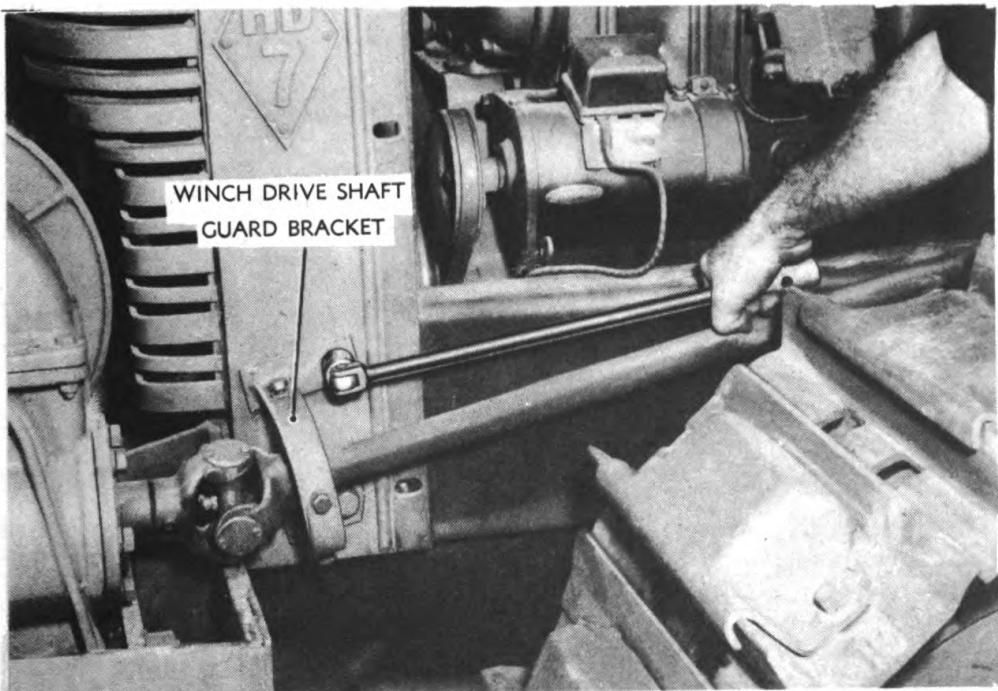
a. An accurate record of all tools and equipment should be kept in order that their location and condition may be known at all times. Items becoming lost or unserviceable should be immediately replaced. All tools and equipment should be cleaned and in proper condition for further use before being returned to their location.

# ENGINE



RA PD 56460

**Figure 35—Removing Winch Drive Shaft Guard**



RA PD 56461

**Figure 36—Removing Cap Screws from Winch Drive Shaft Guard Bracket**

**ENGINE**

tween front engine support and engine support bracket. Then raise front of engine and add one more shim to each side. Install the 2 bolts with lock washers holding front engine support and shims to engine support bracket.

**(4) CONNECT CLUTCH ASSEMBLY TO FLYWHEEL.**

• **WRENCH**, engine cranking                      **WRENCH**, socket,  $\frac{9}{16}$ -in.

Working through master clutch inspection, cover holes in transmission above clutch, slide master clutch assembly against flywheel, lining up holes in master clutch backplate with holes in flywheel, and install the 12 cap screws with lock washers holding master clutch to flywheel ( $\frac{9}{16}$ -in. wrench). **NOTE:** The engine will have to be turned while installing these cap screws with engine cranking wrench.

**(5) CONNECT MASTER CLUTCH CONTROL ROD.**

**WRENCH**,  $\frac{3}{4}$ -in.                                      **WRENCH**,  $1\frac{5}{16}$ -in.

Install the yoke pin and cotter pin holding master clutch control rod to sublever on left side of transmission case. Adjust master clutch and clutch brake as outlined in section 17. Insert clutch throw-out bearing grease tube through hole in transmission case (fig. 44), and install lock nut ( $1\frac{5}{16}$ -in. wrench).

**(6) INSTALL INSPECTION COVERS.**

**WRENCH**,  $\frac{3}{4}$ -in.

Install master clutch cover using 4 cap screws and lock washers holding cover to transmission case and install the 2 cover plates with 4 cap screws holding each cover plate to spacer assembly (fig. 115).

**(7) CONNECT OIL GAGE LINE.**

**WRENCH**, open-end,  $\frac{7}{8}$ -in.

Connect oil pressure gage line to fitting in cylinder block beneath blower (fig. 36).

**(8) CONNECT FUEL LINES (figs. 61 and 66).**

**WRENCH**, open-end,  $\frac{7}{8}$ -in. (2)

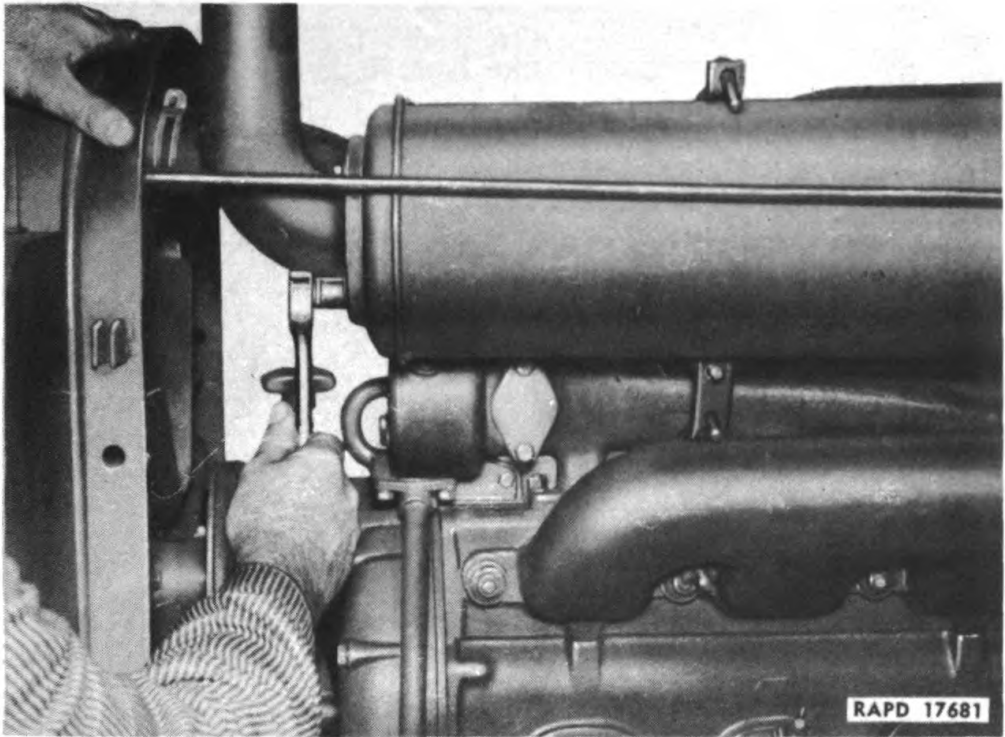
Connect inlet fuel line to fuel pump. Install and connect outlet fuel line to fuel pump and to lower coupling on second stage filter. Install and connect outlet fuel line at top of second stage filter to third stage fuel filter on right side of engine. Connect the return fuel line to fitting underneath right side of cowl. Connect fuel oil pressure gage line to top of third stage filter.

**(9) CONNECT FUEL AND AIR SHUT-OFF ROD.**

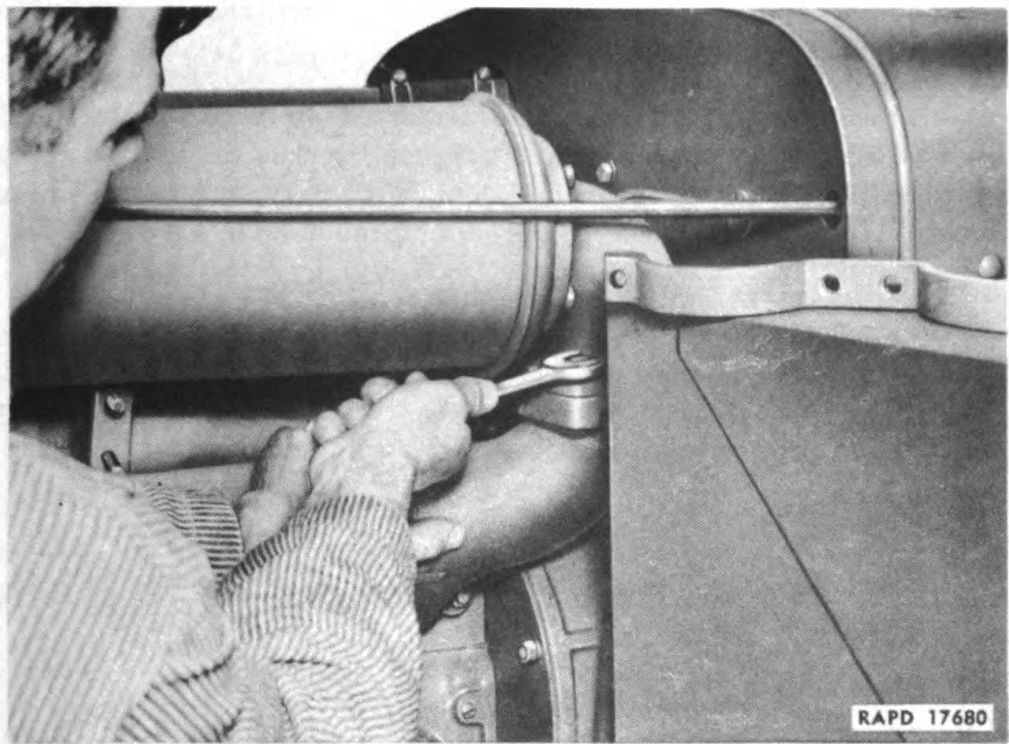
**PLIERS**

Connect fuel and air shut-off rod at long shut-off lever at rear of engine with yoke pin and cotter pin (fig. 41).

**ENGINE**



**Figure 52—Removing Cap Screws from Muffler**



**Figure 53—Removing Cap Screws from Muffler Elbow**

**FUEL AND AIR SYSTEM**

**d. Second Stage Fuel Filter.**

(1) **DESCRIPTION** (fig. 60). This filter is located back of the cowl and held in 2 mounting bands bolted to the cowl. It is connected to the fuel pump on the inlet side and to the third stage fuel filter on the outlet side. A cotton wound filtering element is used in this filter.

(2) **REMOVAL.**

WRENCH, open-end,  $\frac{9}{16}$ -in.

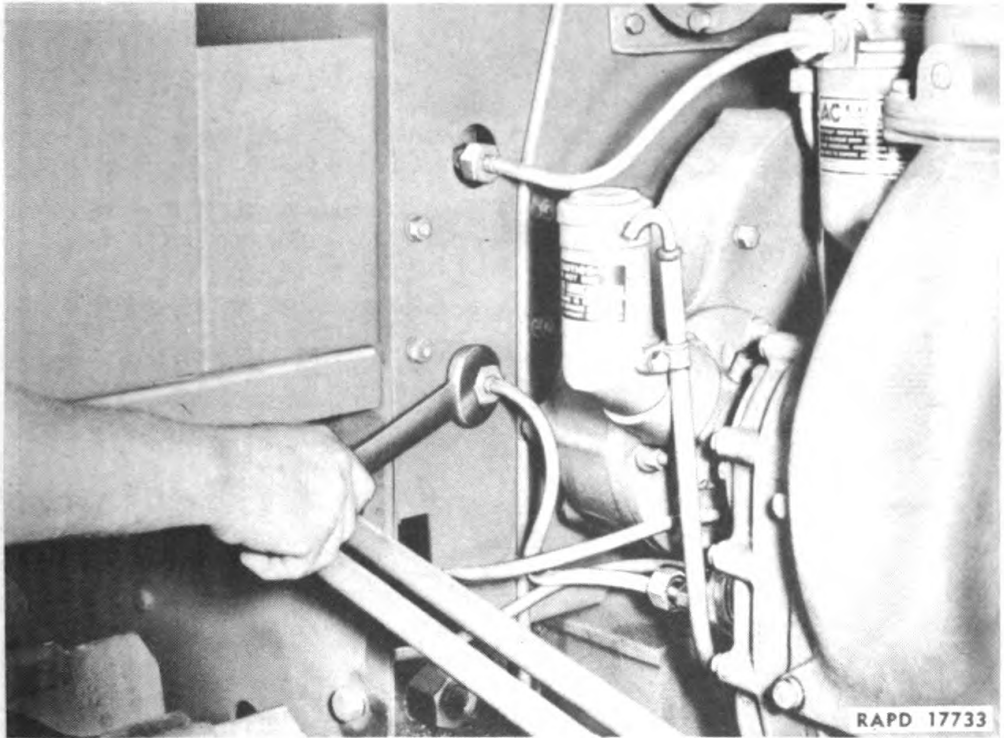
WRENCH, socket,  $\frac{9}{16}$ -in.

WRENCH, open-end,  $\frac{7}{8}$ -in.

(a) *Disconnect Fuel Lines.*

WRENCH, open-end,  $\frac{7}{8}$ -in.

Disconnect both inlet and outlet fuel lines from filter head fittings (fig. 61).



**Figure 61—Disconnecting Fuel Line from Second Stage Fuel Filter**

(b) *Remove Filter from Cowl.*

WRENCH, open-end,  $\frac{9}{16}$ -in.

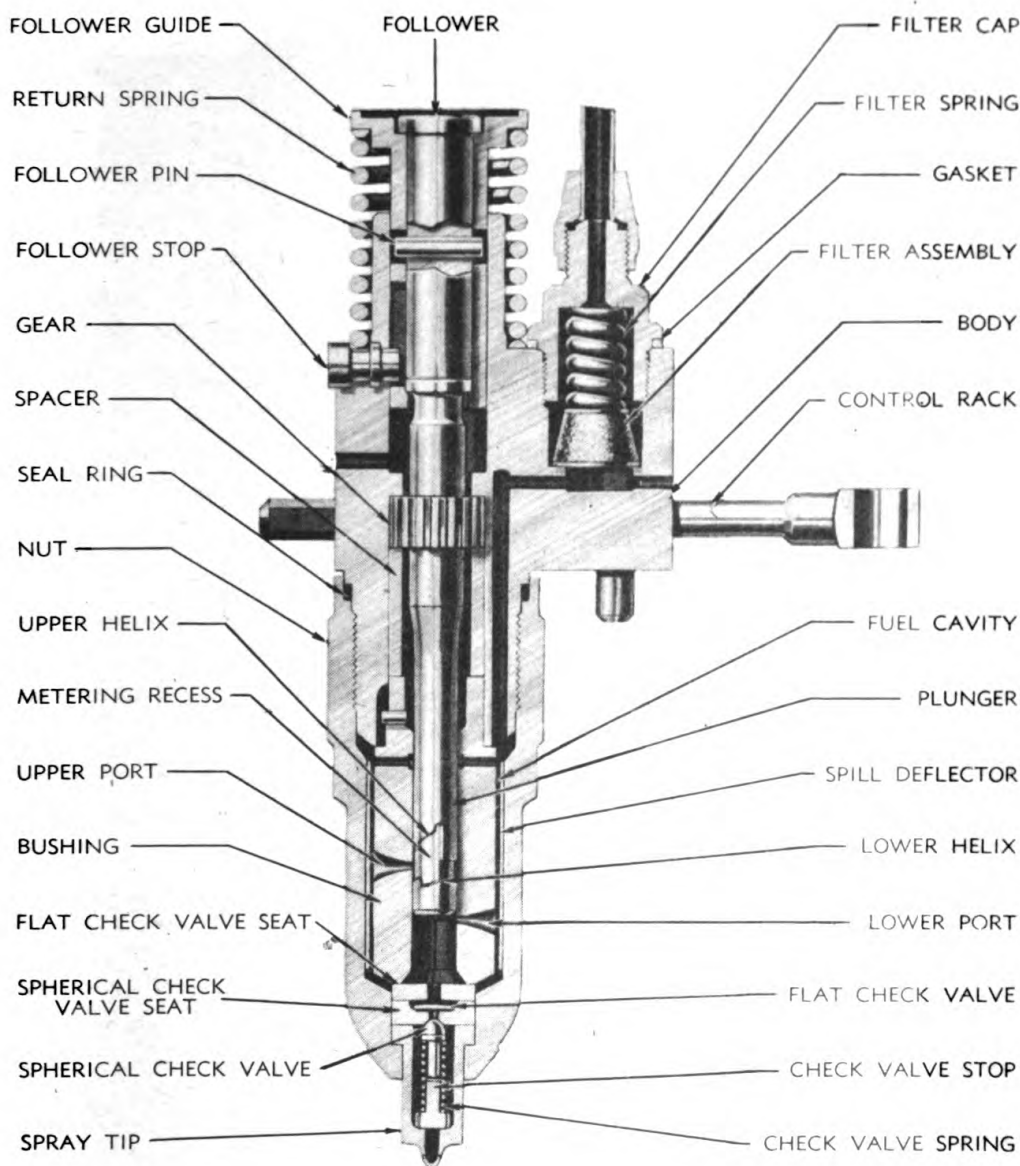
WRENCH, socket,  $\frac{9}{16}$ -in.

Remove the 4 bolts holding filter mounting bands to cowl and remove filter assembly.

(3) **DISASSEMBLY** (fig. 62).

WRENCH, open-end,  $\frac{1}{2}$ -in.

**FUEL AND AIR SYSTEM**



RA PD 17255

**Figure 69—Cross Section of Injector**

**(1) REMOVE HOOD.** Loosen the bolts on the hood hold-down straps at three corners of the hood and pry bolts out of slot. Remove nut from hood bolt inside battery box, and remove the hood (figs. 70 and 71).

**(2) REMOVE ROCKER ARM COVER.** Clean the rocker arm cover thoroughly, and remove the cover by loosening the 2 hand screws that hold it to the cylinder head.

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## FUEL AND AIR SYSTEM

line connections have connector nuts requiring a  $\frac{7}{8}$ -inch open-end wrench. Any time a fuel connection is broken, the engine should be started after the line is connected again and inspection made for leakage of fuel or loss of fuel pressure due to air being drawn into the fuel system through a defective or loose connection.

b. It is important that the clips holding fuel lines to parts of the tractor be installed again in the proper places when lines are replaced. These clips prevent breakage of lines from vibration. Always use a wrench, not pliers, when connecting or disconnecting fuel lines.

### 68. PRECLEANER.

a. **Description.** The United precleaner, model C-11215, is of the cyclone type. Approximately 85 percent of the dirt entering with air is removed by it before the air reaches the oil bath air cleaner. A glass inspection port makes it easy for the operator to observe the quantity of dirt and dust in the dirt compartment, and enables him to determine readily when it should be emptied from the precleaner. If precleaner becomes damaged, it should be immediately replaced.

#### b. Removal.

WRENCH, open-end,  $\frac{7}{16}$ -in. (2)

Loosen clamp bolt at base of precleaner and lift off precleaner assembly (fig. 81).

c. **Maintenance.** The precleaner should be emptied daily, or oftener,



**Figure 81—Removing Air Precleaner**

**COOLING SYSTEM****(2) LOSS OF WATER.**

Leaks in radiator core.

\*Repair or replace.

Radiator clogged so that water builds up in top tank and is lost through overflow.

Clean and flush.

**c. Maintenance.** The cooling system should be flushed out periodically to remove accumulated loose rust or foreign material. This may be done with clean water or, if necessary, with a cleaning solvent which is not injurious to steel, cast iron, or copper. Follow directions for flushing as given below.

(1) For flushing with clean water, proceed as follows:

(a) Drain the cooling system and disconnect the water bypass tube at the thermostat housing (fig. 89).

(b) Remove the thermostat (par. 74).

(c) After the thermostat has been removed, bolt housing back to the water outlet manifold, and reconnect the water bypass tube.

(d) System may now be flushed. Fill the cooling system, start the engine, then open both drain cocks and, using a hose, keep the radiator filled as the water runs through the system and drains out.

(e) When all the rust, etc., has been flushed from the system, stop the engine, install the thermostat, close the drains, and refill the system.

(2) If a solvent solution is used to clean the cooling system, a different procedure should be followed:

(a) Drain the cooling system.

(b) Close the drains and fill the system with cleaning solution.

(c) Start the engine and run it for about an hour, regulating the radiator shutter to hold the engine temperature at 190 F.

(d) Drain the solution, flush radiator thoroughly, and refill.

(3) If trash or foreign material has gathered at the top of the tubes in the radiator core, back-flushing of the radiator is necessary.

(a) Drain the cooling system and remove radiator cap.

(b) Disconnect the hose from the elbow in which the main drain cock is located.

(c) Insert a water hose inside this hose, and stuff a cloth around it if an adapter is not available for connection.

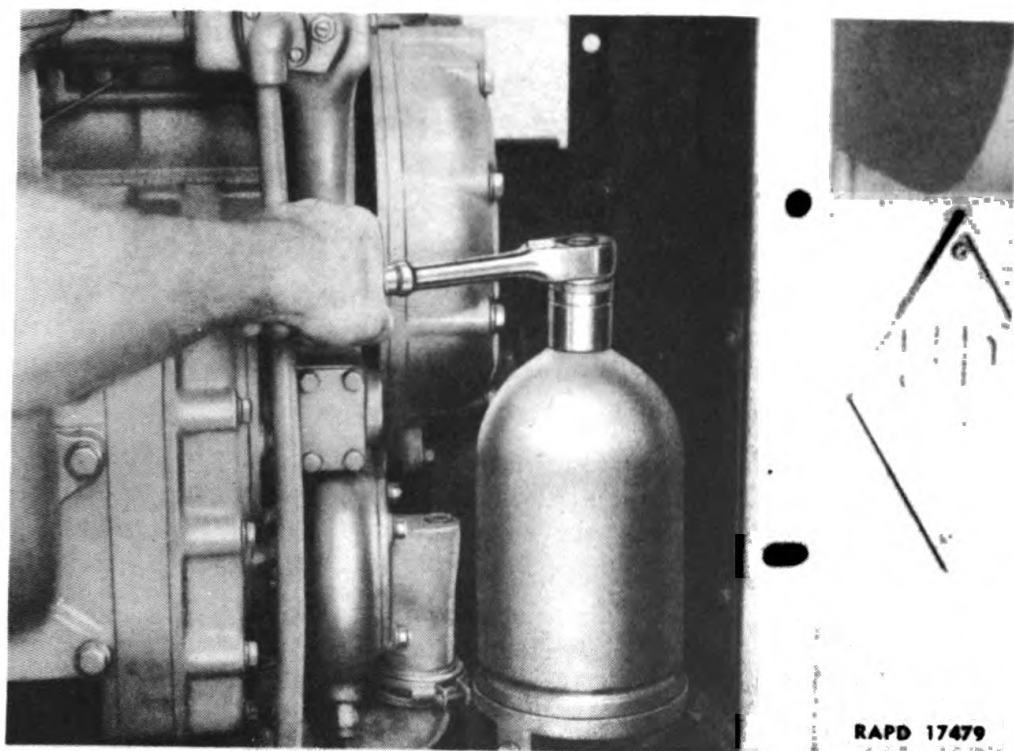
(d) Let water run slowly into radiator through hose until water runs out the top of radiator; then increase the water pressure.

(e) Run water through the radiator in this way long enough to force the obstructions off the top of the tubes and out the radiator filler pipe.

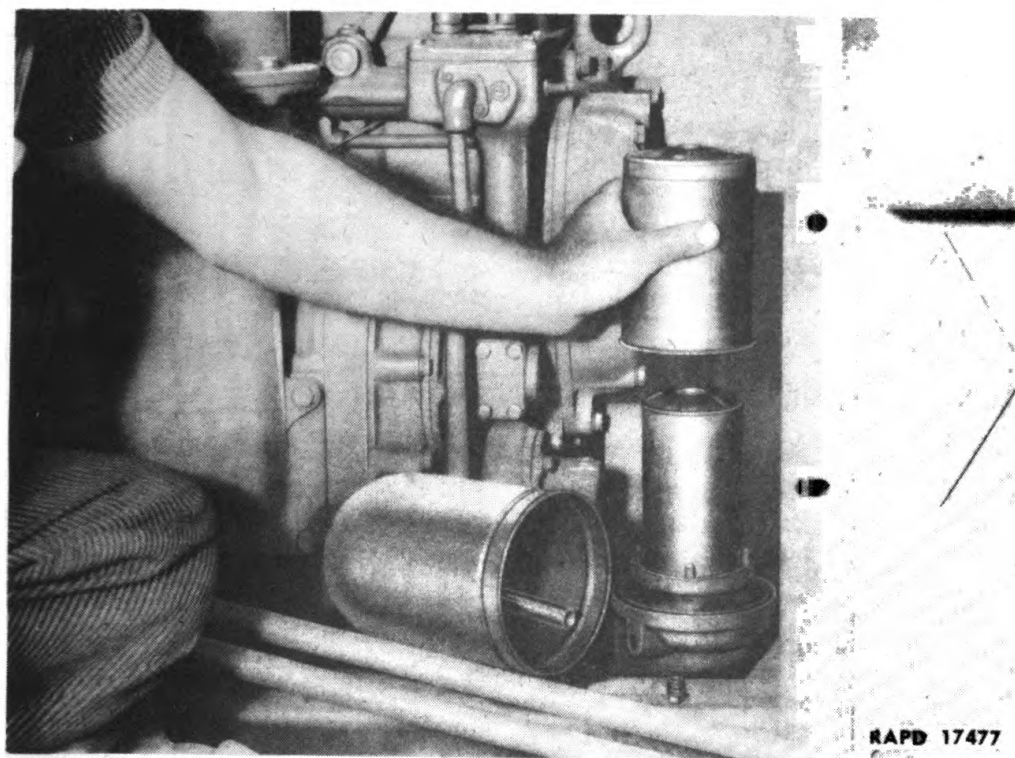
(f) Reconnect the lower hose and refill the cooling system.

\* Corrections not within the scope of operating organization.

**LUBRICATION SYSTEM**



**Figure 94—Removing Lubricating Oil Filter Stud**



**Figure 95—Removing Lubricating Oil Filter Element**

## ELECTRICAL SYSTEM AND EQUIPMENT

end to support the armature. It is used in connection with a Delco-Remy step-voltage control unit, model 5886. The purpose of the generator is to furnish electrical energy for ignition, lights, etc., when the vehicle is in operation and to keep the battery charged. Energy drained from the battery is replaced by the generator. The generator is driven by a V-belt from a pulley on the engine crankshaft.

**b. Operation.** Proper operation of the electrical system depends largely on a well charged battery. The battery will be able to supply enough current to meet the needs of the system only if the generator is serviced regularly and checked at frequent intervals to determine if any adjustments or repairs are necessary. These adjustments or repairs will not be made by the using arms. Minor adjustments may be made without removing generator from tractor. The charging rate of the generator is set at from 4 to 8 amperes when the tractor leaves the factory. This should be sufficient to keep the battery fully charged under ordinary operating conditions. The step-voltage control unit serves to prevent overcharging of the battery.

**c. Lubrication.** The 2 hinge cap oilers should be supplied with 8 to 10 drops of light engine oil after every 100 hours of operation. Do not oil excessively. *Never oil commutator.*

### **d. Trouble Shooting.**

#### **(1) NOISY GENERATOR.**

Probable Cause	Probable Remedy
Loose mounting.	Tighten mounting bolts.
Loose pulley.	Tighten pulley.
Worn bearings.	*Replace bearings.
Dry bearings.	Lubricate.

#### **(2) EXCESSIVE GENERATOR OUTPUT.**

Generator field grounded.	Locate external ground.
Voltage control unit out of adjustment.	*Adjust.
Voltage control unit defective.	Replace voltage control unit.

#### **(3) NO GENERATOR OUTPUT.**

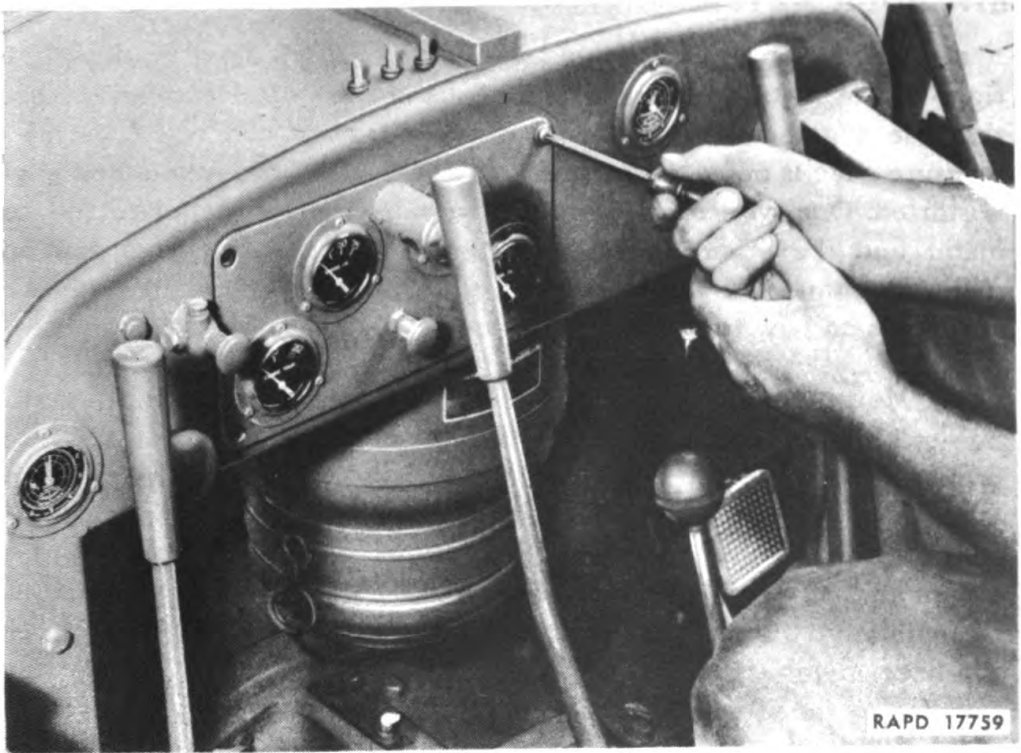
Burned commutator bars.	*Recut commutator.
Worn brushes.	*Replace brushes.
Sticking brushes.	Clean brushes.
Open or short circuit in field or armature.	Replace unit.
Loose belt.	Adjust for 1-inch slack.

#### **(4) LOW GENERATOR OUTPUT AND LOW BATTERY.**

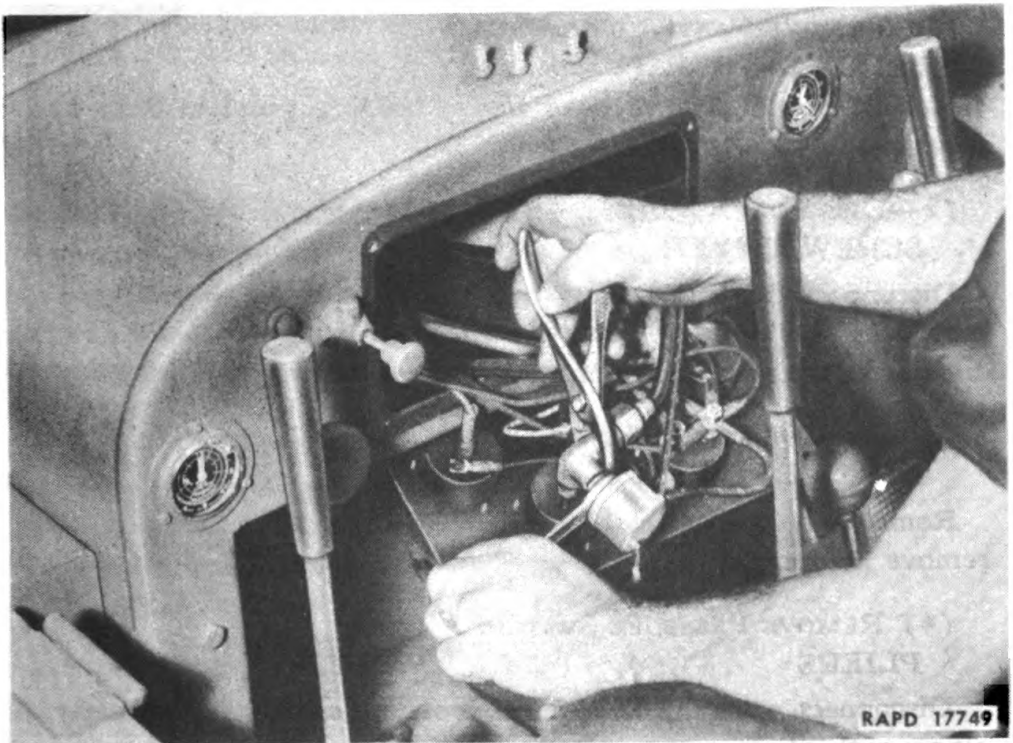
Low brush tension.	*Adjust or replace brush springs.
Brushes sticking.	Clean brushes.

\* Corrections not within scope of operating organization. See next higher authority.

**ELECTRICAL SYSTEM AND EQUIPMENT**



**Figure 104—Removing Screws from Instrument Panel**



**Figure 105—Removing Hour Meter Pressure Switch**

## ELECTRICAL SYSTEM AND EQUIPMENT

### d. Removal of Blackout Light and Lamp.

SCREWDRIVER .

WRENCH, socket,  $\frac{9}{16}$ -in.

WRENCH, open-end,  $\frac{1}{2}$ -in.

WRENCH, socket,  $\frac{3}{4}$ -in.

WRENCH, open-end,  $\frac{9}{16}$ -in.

#### (1) REMOVE HEADLIGHT GUARD.

WRENCH, socket,  $\frac{3}{4}$ -in.

Remove 4 cap screws holding guard to brackets on radiator shell and remove guard. Pull blackout light wire from connector as guard is removed.

#### (2) REMOVE BLACKOUT LIGHT GUARD FROM HEADLIGHT GUARD.

WRENCH, open-end,  $\frac{9}{16}$ -in.

WRENCH, socket,  $\frac{9}{16}$ -in.

Remove outside bolt which secures blackout light guard to headlight guard and remove blackout light guard.

#### (3) REMOVE BLACKOUT LIGHT.

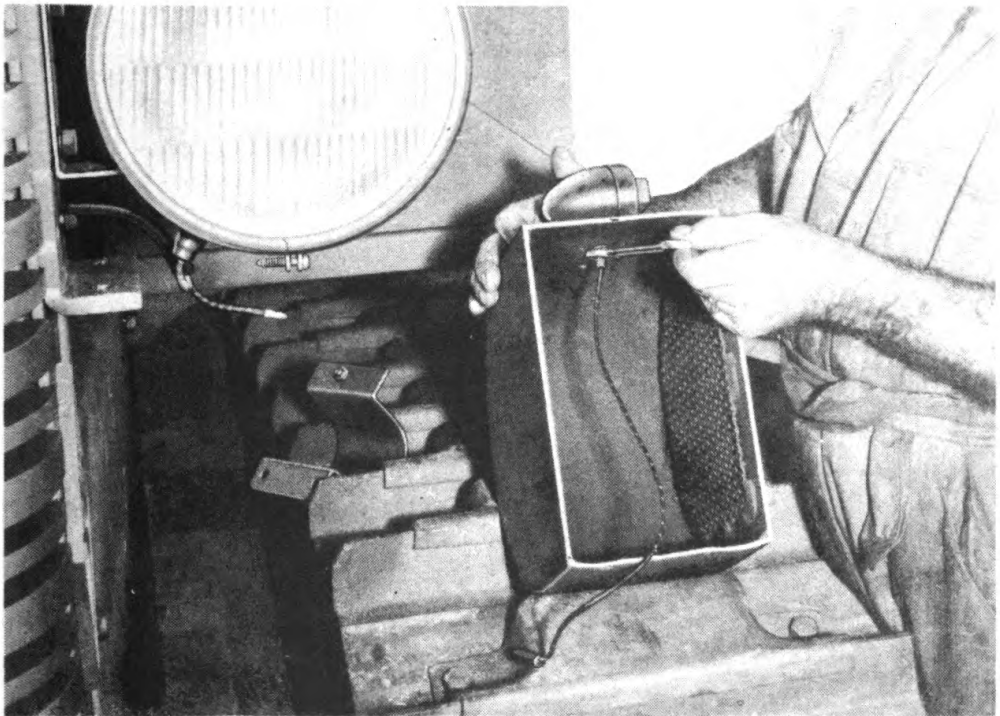
WRENCH, open-end,  $\frac{1}{2}$ -in.

Remove nut holding blackout light on headlight guard and slip it off over wire (fig. 111). Remove blackout light from guard.

#### (4) REMOVE LAMP.

SCREWDRIVER

Remove screw holding lens. Remove lens, push lamp in and turn



RA PD 17763

**Figure 111—Removing Blackout Headlight**

**NONELECTRICAL INSTRUMENTS**

**(1) DISCONNECT CABLE.**

**PLIERS**

Loosen retainer nut holding end of housing to bottom of meter with pliers and unscrew it from meter. Pull cable and housing from meter.

**(2) REMOVE METER FROM DASH.**

**SCREWDRIVER, Phillips head**

Remove the 4 Phillips head screws holding meter to dash and pull meter from dash.

**d. Installation.**

**PLIERS**

**SCREWDRIVER, Phillips  
head**

**(1) INSTALL METER IN DASH.**

**SCREWDRIVER, Phillips head**

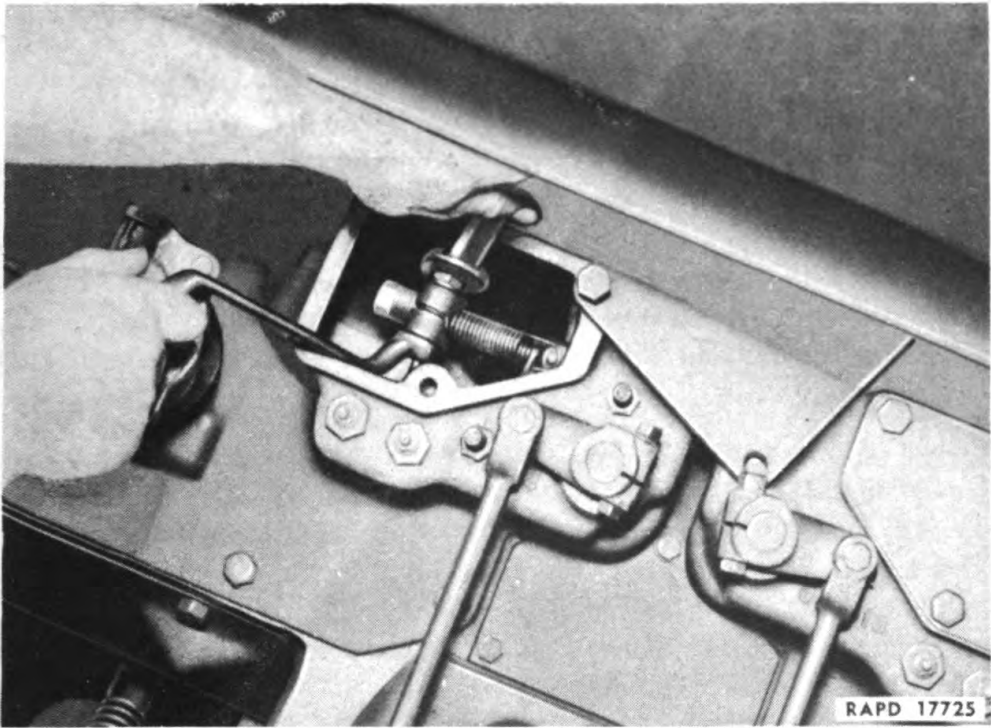
Place meter in hole in dash and install 3 Phillips head screws through flange of meter and into dash.

**(2) CONNECT DRIVE CABLE AND HOUSING.**

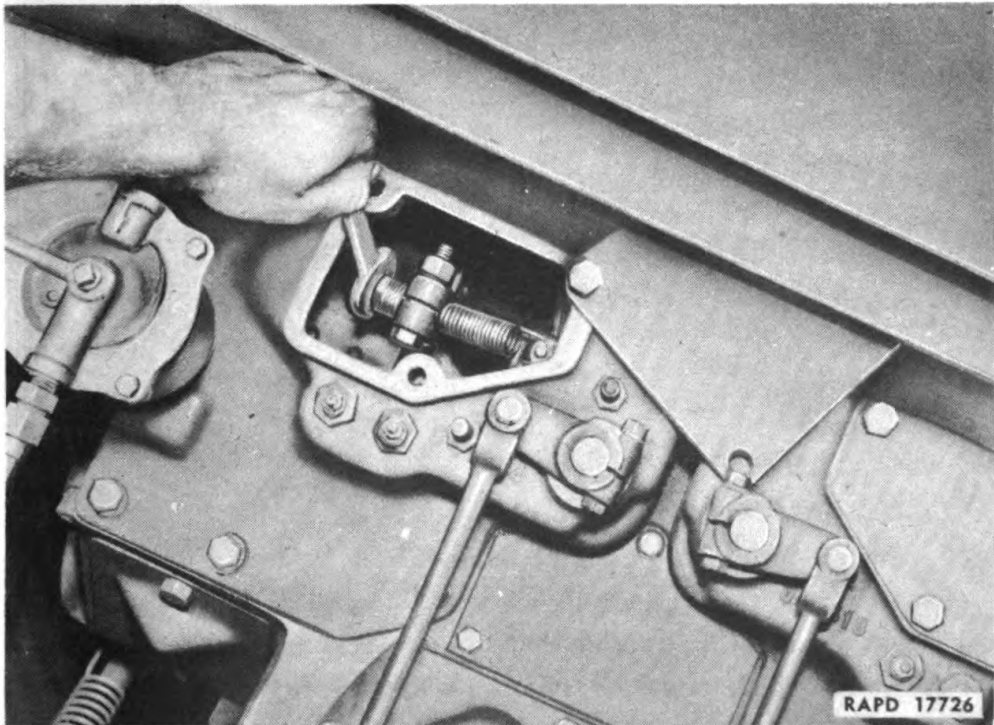
**PLIERS**

The end of drive cable is square and fits into a square socket in meter drive. Insert the cable in meter, hold up cable housing and screw retainer nut on meter. Tighten nut lightly with pliers.

**STEERING CLUTCHES**



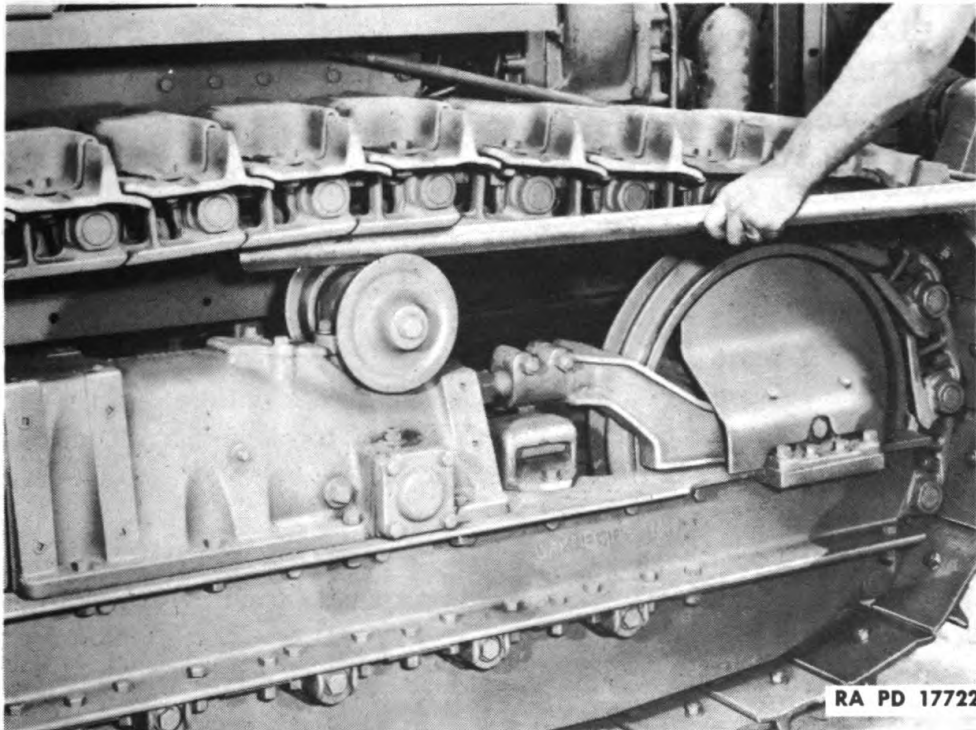
**Figure 119—Loosening Steering Clutch Adjusting Screw Lock Bolt**



**Figure 120—Adjusting Steering Clutch**

**TRACKS AND TRUCK FRAME ASSEMBLY**

back and loosen the track. Track is properly adjusted when it can be lifted about 2 inches off support roller with bar (fig. 127). Drive tractor back and forth a few times after making adjustment. This gives idlers a chance to move out if brackets are binding on truck frame. Then check adjustment again with bar. If driving the tractor back and forth makes no change in track tension, tighten the clamp bolts in track release yoke.



**Figure 127—Testing Track Adjustment**

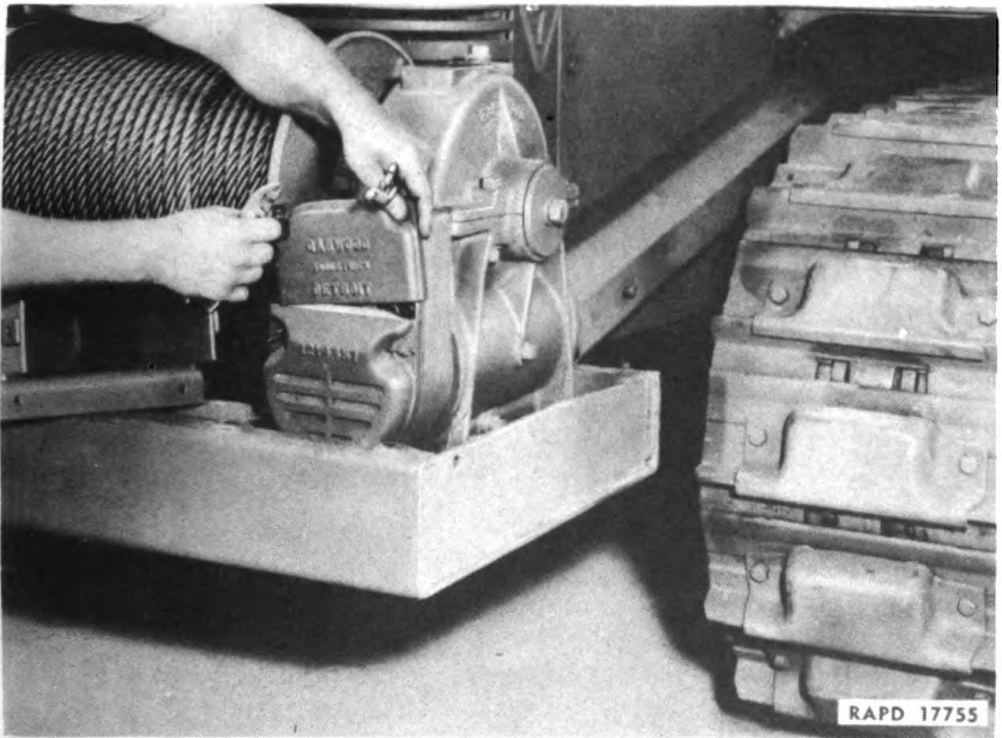
(3) **CHECK TRACK ALINEMENT.** Observe if inside of track rail is rubbing on either flange of front idler. If it is, the idler should be alined. Some of the shims between front idler brackets and track release yoke should be removed from side on which rail is rubbing and added to side on which rail is not wearing until idler is in alinement and there is clearance between each flange and inside of rail.

(4) **ALINE FRONT IDLER.**

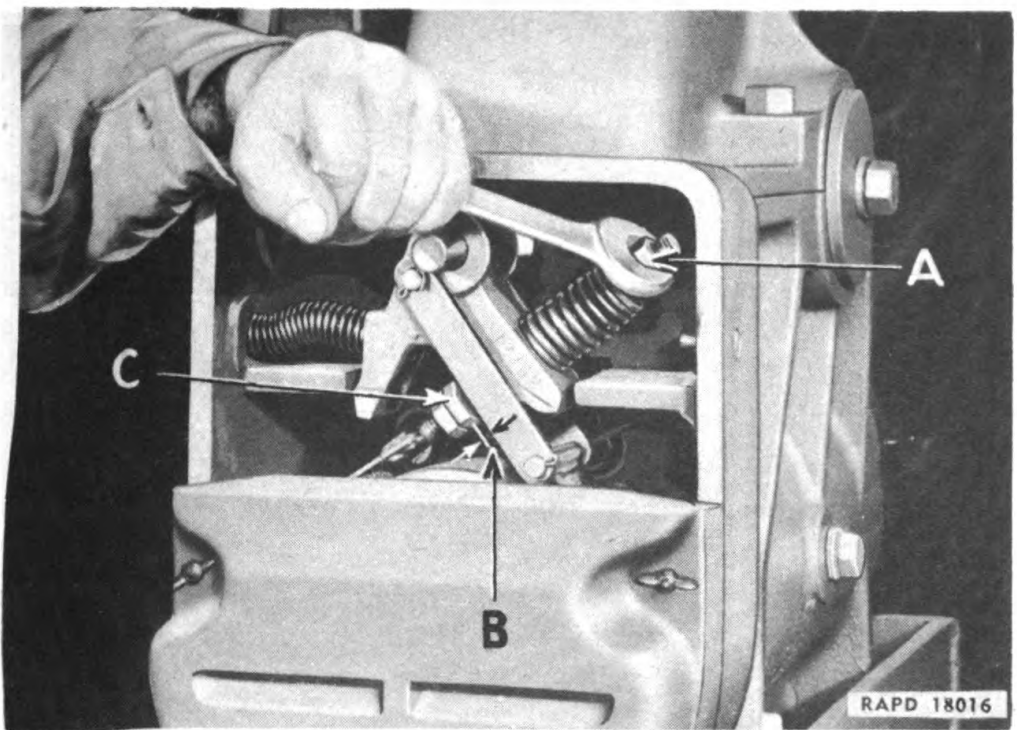
**WRENCH**, socket,  $\frac{3}{4}$ -in.

Remove 2 cap screws from each guard and lift off idler guard. Remove 2 cap screws from each idler bracket holding track release yoke to brackets. Change correct amount of shims from one side to the other to aline front idler. Install cap screws in idler bracket and install idler guard.

**WINCH AND POWER TAKE-OFF**



**Figure 132—Removing Winch Worm Brake Cover**



**Figure 133—Adjusting Winch Worm Brake**  
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**STORAGE AND SHIPMENT**

**125. PLACING VEHICLES IN DEAD STORAGE.**

a. **Definition.** Vehicles in dead storage are those that will not be required for service over an indefinite period exceeding 30 days.

**b. Engine.**

(1) **CRANKCASE.** The crankcase will be drained while the engine is still warm. The oil will be drained from the engine by removing drain plugs from the crankcase. The oil screen will be removed, cleaned, and reinstalled in the engine. Drain plugs will then be reinstalled in the engine. Fill crankcase with  $\frac{1}{2}$  charge of OIL, lubricating, preservative, medium. Run engine for 15 minutes at approximately 1,000 revolutions per minute. Leave preservative in crankcase.

(2) **FUEL SYSTEM.** The fuel tank will be drained and the fuel system purged with a mixture prepared as shown below, a quantity of which will remain in the system when the engine is shut down for storage. Proceed as follows:

(a) Prepare a mixture of 20 percent OIL, lubricating, preservative medium, and 80 percent Diesel fuel.

(b) Drain and clean fuel filters and fuel tanks.

(c) Place approximately 2 gallons of the fuel oil mixture in tanks and run engine at normal speed until the 2 gallons of fuel oil mixture are nearly exhausted. Leave the remaining oil in the fuel system.

(3) **CYLINDERS.**

(a) The cylinder wall, piston heads, and valves will be treated with OIL, lubricating, preservative, medium.

(b) *Remove Injectors.* The engine will be cranked by hand until each piston is placed on bottom center and the inside of that cylinder will be sprayed through injector opening in head with approximately  $\frac{1}{8}$  pint (2-oz) of OIL, lubricating, preservative, medium. Following the above, the crankshaft will be rotated by hand at least two complete revolutions and the cylinder space above each piston will be resprayed with approximately  $\frac{1}{16}$  pint (1-oz) of the OIL, lubricating, preservative, medium. Do not rotate the crankshaft after this treatment.

(c) *Injector.* The injectors will be removed and cleaned while the valves and cylinders are being treated with the Preservative. Clean injectors in SOLVENT, dry-cleaning. Dry thoroughly and dip in preservative. After the corrosion preventive treatment is completed, coat the injector holes with the preservative and install the injectors in the engine. Care must be taken not to damage the injectors. Diesel engine injectors will remain in the engine during shipping and storage.

**Section XXV**

**REFERENCES**

	Paragraph
Standard nomenclature lists . . . . .	130
Explanatory publications . . . . .	131
Training films and film strips . . . . .	132

**130. STANDARD NOMENCLATURE LISTS.**

- a. Cleaning and preserving and lubricating materials, recoil fluids, special oils, and miscellaneous related items . . . . . **SNL K-1**
- b. Tractor, heavy, M1, w/winch (Allis-Chalmers HD-10W) (Diesel) . . . . . **SNL G-98**
- c. Tractor, medium, M1 (Allis-Chalmers HD-7W) . . **SNL G-125**  
Current Standard Nomenclature Lists are as tabulated here.  
An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index" . . . . **OPSI**

**131. EXPLANATORY PUBLICATIONS.**

- a. **Automotive Materiel.**
- b. Cleaning, preserving, lubricating, and welding materials and similar items issued by the Ordnance Department . . . . . **TM 9-850**  
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Motor transport . . . . . **FM 25-10**  
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Tractor, medium, M1 (Allis-Chalmers HD-7W) (winch, Gar Wood) (without engine) . . . . . **TM 9-1870A**
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