WAR DEPARTMENT TECHNICAL MANUAL

TM 9-774

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

WAR DEPARTMENT

31 January 1944

WAR DEPARTMENT
Washington 25, D. C., 31 January 1944

TM 9-774, Snow Tractor M7 and 1-ton Snow Trailer M19, is published for the information and guidance of all concerned.

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SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

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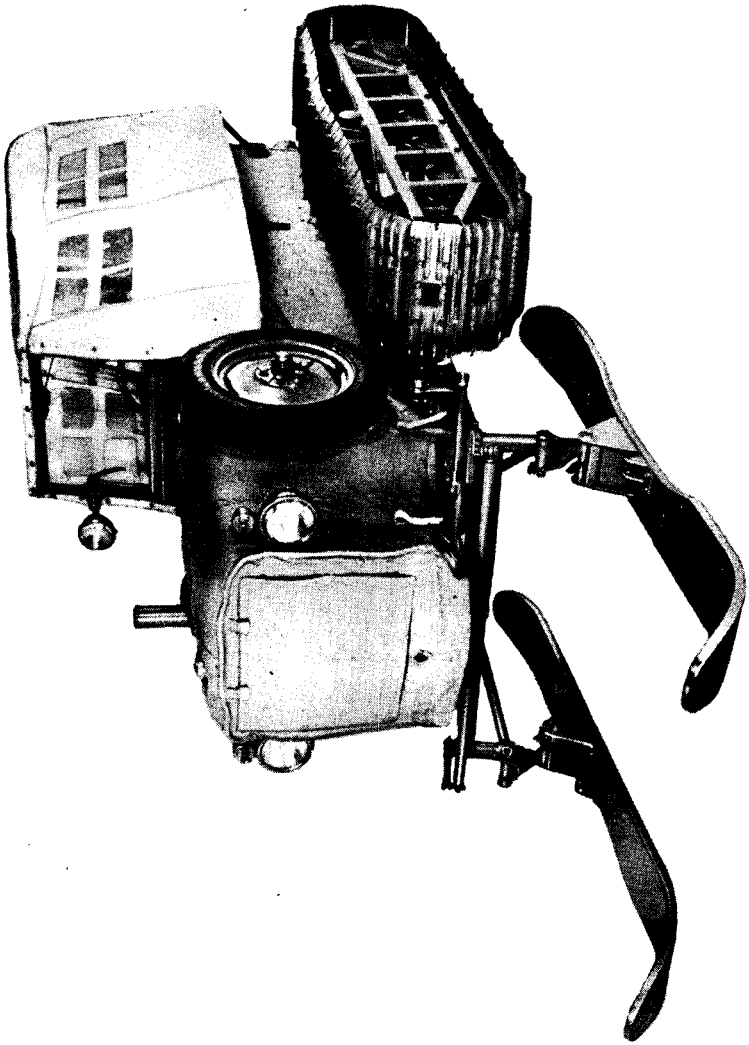

Figure 1—Snow Tractor M7—Left Front View

CONTENTS

PART ONE—VEHICLE OPERATING INSTRUCTIONS

PART TWO—VEHICLE MAINTENANCE INSTRUCTIONS

PART ONE—VEHICLE OPERATING INSTRUCTIONS

Section I

INTRODUCTION

1. SCOPE.

a. This technical manual* is published for the information and guidance of the using arm personnel charged with the operation and maintenance of this materiel.

b. In addition to a description of the Snow Tractor, M7 (Allis Chalmers) and Snow Trailer, 1-ton, M19 (Allis Chalmers), this manual contains technical information required for the identification, use, and care of the materiel. The manual is divided into two parts: Part One, section I through section IX, contains vehicle operating instructions. Part Two, section X through section XXVII, contains vehicle maintenance instructions for using arm personnel charged with the responsibility of doing maintenance work within their jurisdiction.

c. In all cases where the nature of the repair, modifications, or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed so that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

*To provide operating instructions with the materiel, this technical manual has been published in advance of complete technical review. Any errors or omissions will be corrected by changes or, if extensive, by an early revision.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

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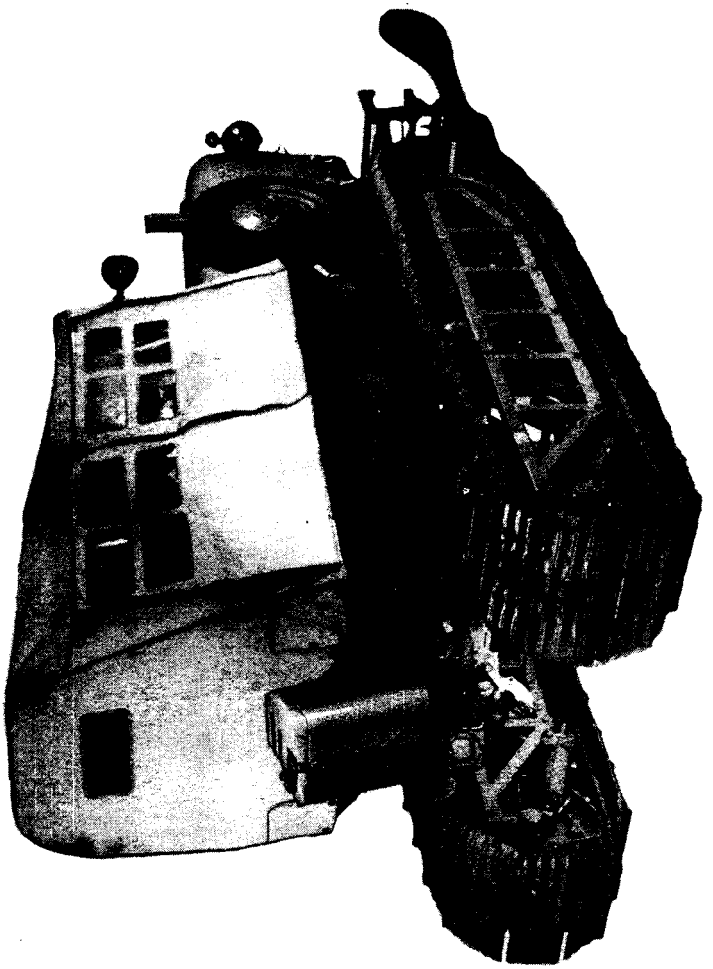

Figure 2—Snow Tractor M7—Right Rear View

INTRODUCTION

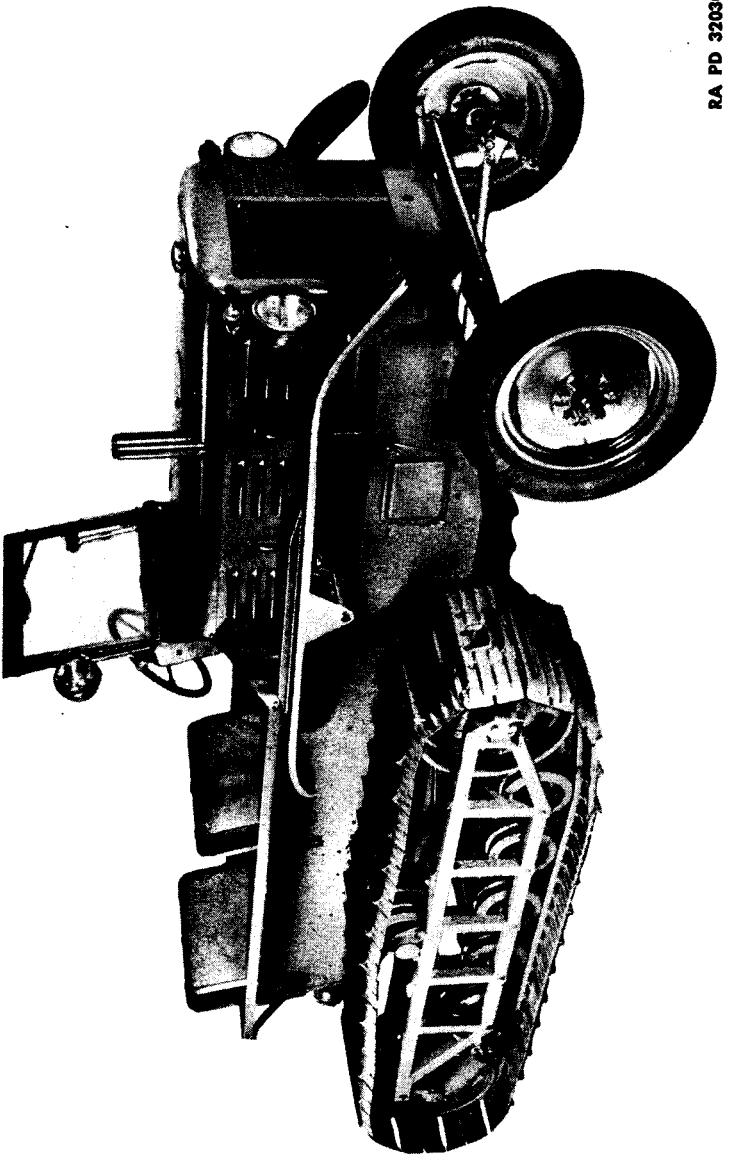

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Figure 3—Snow Tractor M7—Right Front View (Less Top)

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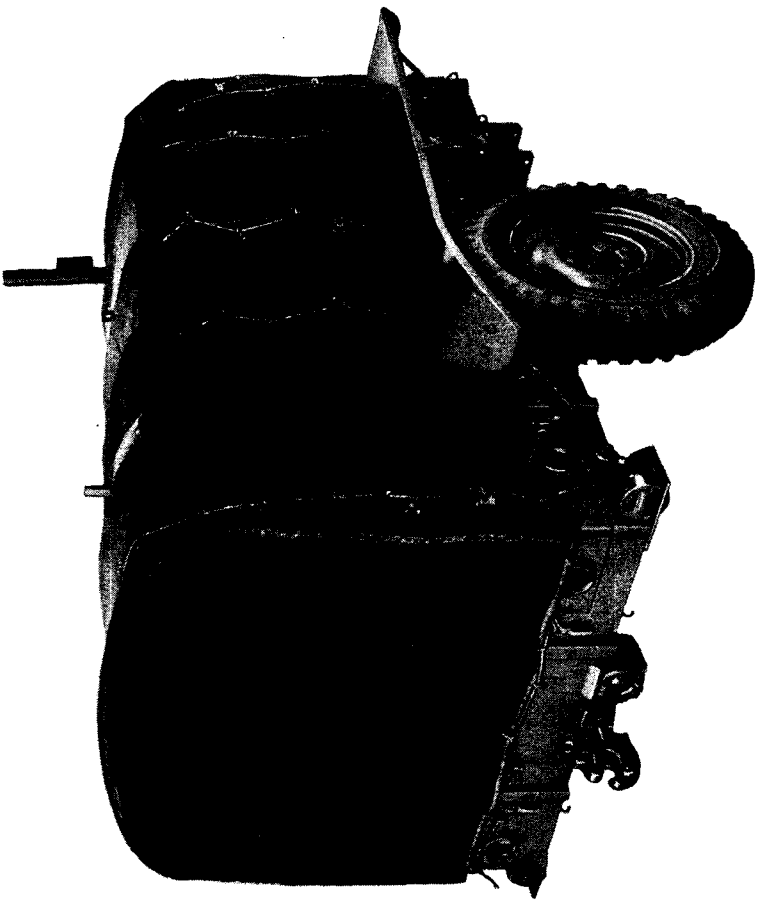

Figure 4—1-ton Snow Trailer M19—Right Rear View

Section II

SNOW TRAILER, 1-TON, M19

2. DESCRIPTION AND TABULATED DATA.

a. Description. The trailer is a combination unit which may be used as a wheeled trailer or as a sled for travel over snow (figs. 4 and 5). By removing reversible insulated canopy and canopy support assembly, it may also be used as a flat trailer (fig. 6). Hooks are provided under frame for lashing tarpaulin over load when used in this manner. The trailer can be used as a heated litter conveyance by installing canopy support, insulated canopy, and trailer body heater (fig. 7). The trailer can be used as a mobile cold weather heating and starting unit for aircraft engines by installing the aircraft ground heater unit type D-1, power plant unit type C-13, and auxiliary pot heater attached to skids into the canopy covered body (figs. 8 and 9). Litters are to be folded and suspended from trailer roof by the straps provided. Trailer is equipped with two dome lights inside canopy support, combination service and blackout taillights, and selector switch for operation of taillights. The power (6 volts) for lights and body heater is supplied from prime mover. Drawbar is equipped with a spring-loaded eye for attaching to prime mover. Rear of trailer is equipped with a pintle and outlet receptacle for attaching another M19 1-ton trailer.

b. Data.

Weight (with insulated canopy)	640 lb
Load capacity	2,000 lb
Over-all dimensions:	
Length	134¼ in.
Width (on wheels)	73½ in.
Width (on skis with wheels in transport)	73½ in.
Width (on skis, wheels removed from vehicle)	64½ in.
Height	63 in.
Frame only:	
Length	95 in.
Width	52 in.
Cargo space:	
Length	91¼ in.
Width	46¼ in.
Height (at center	40½ in.
(at sides)	39 in.
Canopy (weight)	60 lb

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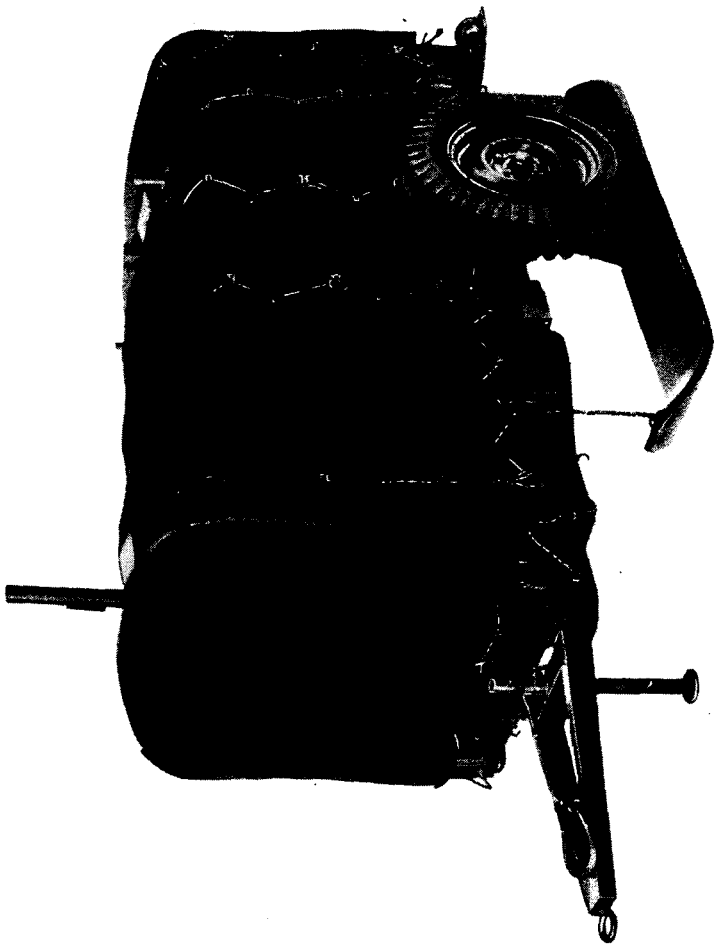

Figure 5—1-ton Snow Trailer M19—Left Front View

SNOW TRAILER, 1-TON, M19

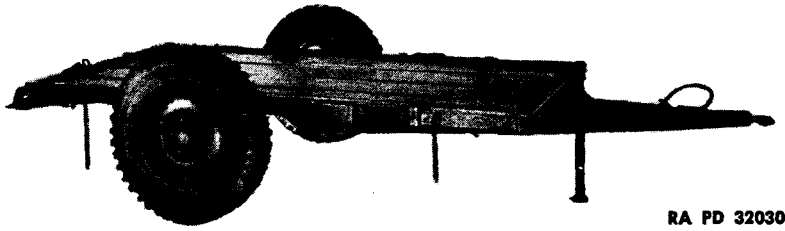

Figure 6—1-ton Snow Trailer M19—Right Front View (Less Canopy and Support)

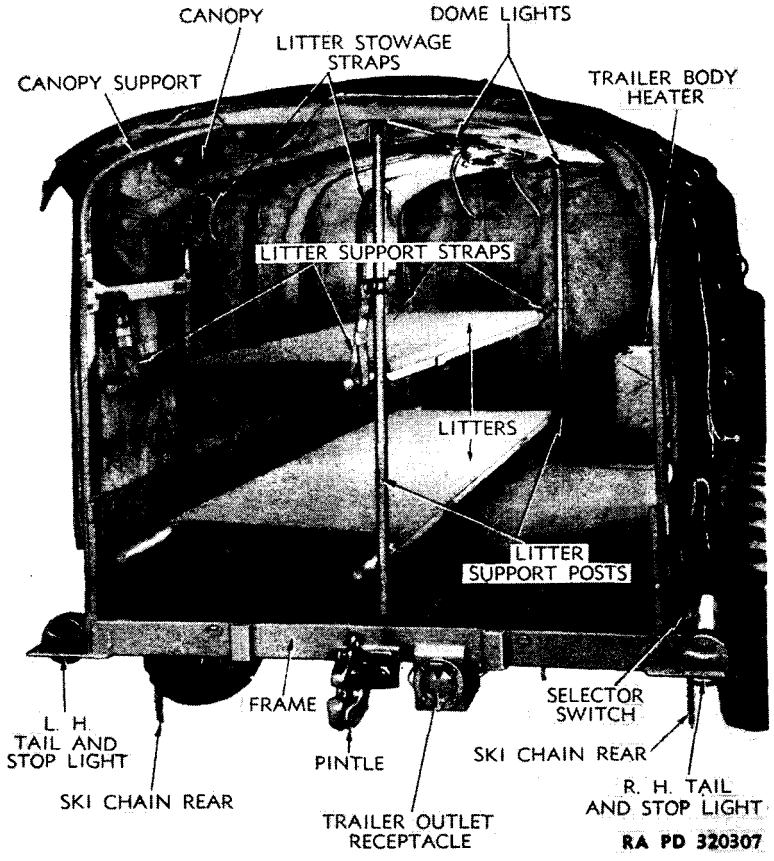

Figure 7—Litters and Body Heater Installed

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

Skis:
- Length ..... 70 in.
- Width ..... 12 in.

Wheels:
- Type ..... Military
- Tire size ..... 6:00-16—6-ply
- Tread ..... 58 in.

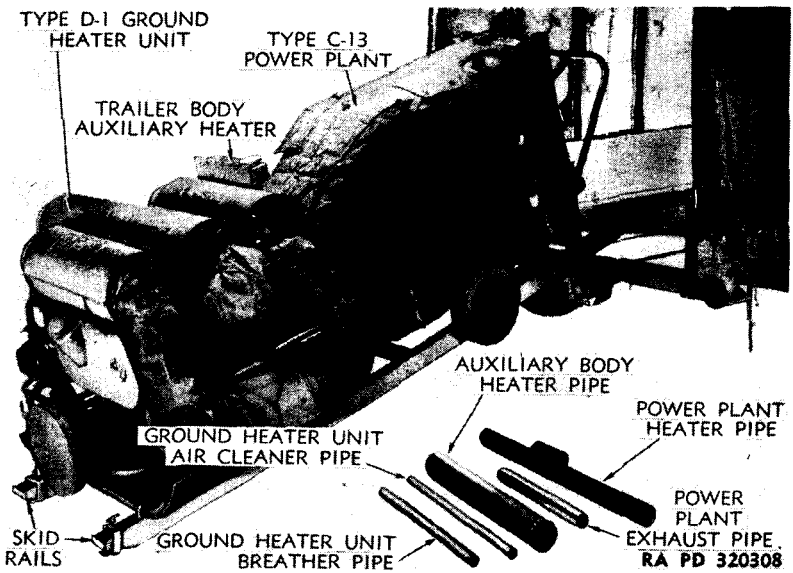

Figure 8—Installing Aircraft Engine Heater and Booster Unit

Body heater:
- Type and model ..... (Hunter) Model UH-5 6-Volt
- Fuel ..... Gasoline
- Fuel tank capacity ..... 5 gal
- Heating capacity ..... 14,000 Btu per hour

Body auxiliary heater:
- Type and model ..... (Evans) Model 204333
- Fuel ..... Gasoline
- Fuel tank capacity ..... 2 gal
- Heating capacity ..... 6,000 Btu per hour

3. OPERATION.

a. Connecting Trailer to Prime Mover. Back prime mover up to front of trailer drawbar cautiously until drawbar hitch eye engages pintle hook of prime mover. See that pintle hook is secure. If trailer is not loaded, raise up on drawbar enough to pull pin from front parking leg of trailer at rear crosspiece of drawbar. Pull parking leg up

through drawbar until pin can be inserted in bottom hole of leg. If trailer is loaded, a jack will be needed to lift drawbar. Remove cable plug from clip on drawbar and insert plug into receptacle at rear of prime mover. For daytime operation, turn selector switch at right rear corner of trailer frame just ahead of taillight so that screwdriver slot of switch points to "S" on switch face. This will make trailer service stop light operate with prime mover service stop light.

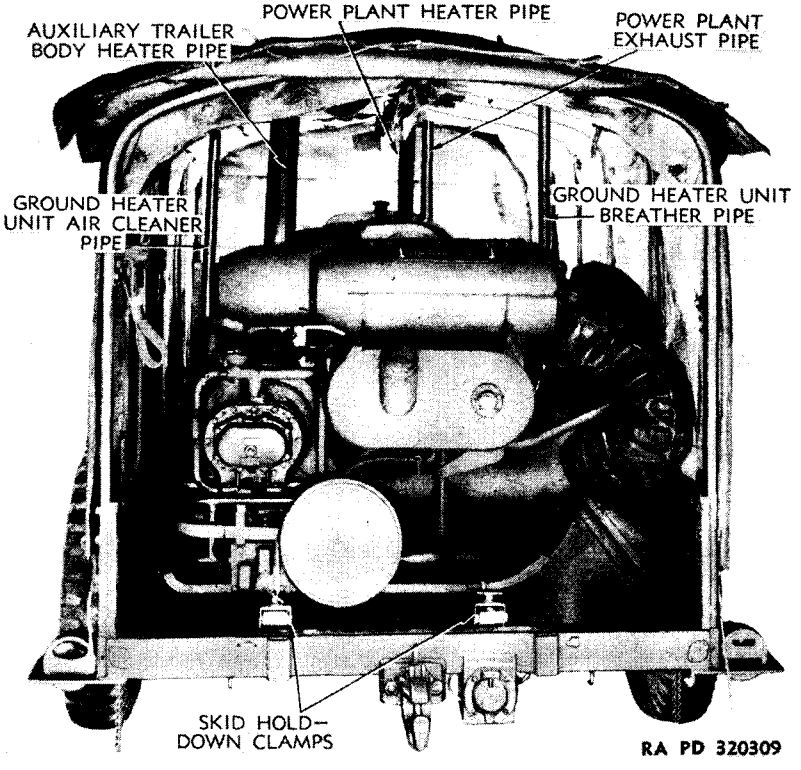

Figure 9—Aircraft Engine Heater and Booster Unit Installed

b. Loading or Unloading. When loading or unloading trailer which is not hooked to prime mover, block up under rear of trailer frame to prevent trailer from tipping up. If trailer is on skis, hook ski chains taut while loading and unloading to prevent trailer from tipping forward or backward. Equalize load over axle of trailer if possible.

c. Insulated Canopy and Canopy Support. To use trailer as a flat rack vehicle proceed as follows:

(1) Unlash canopy ropes from canopy support hooks.

(2) Unlash both ends of canopy and fold up over top.

(3) Fold sides of canopy up over top from each side.

(4) Roll canopy toward front of support and remove.

(5) Unsnap eight clips holding canopy support to frame.

(6) If trailer body heater is installed, remove exhaust tube, unsnap from base, slide toward rear of trailer to clear exhaust outlet, disconnect heater cable from receptacle in right front of trailer frame, and lift out heater.

(7) Disconnect dome light plug at front of trailer.

(8) Lift canopy support assembly from trailer.

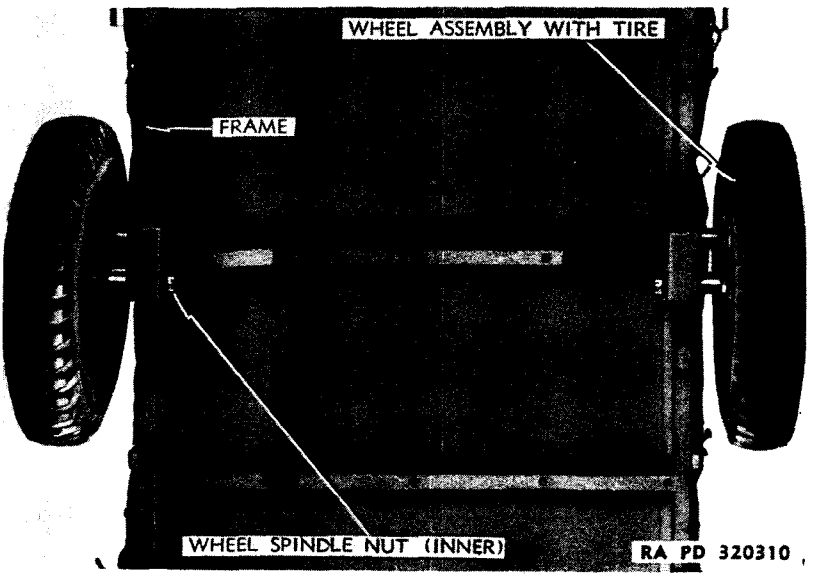

Figure 10—Bottom View Snow Trailer Wheel Bracket

d. Use of Wheels and Skis.

(1) GENERAL. Wheels can be used in maximum snow depth of 6 inches. Skis will operate in snow down to a minimum depth of 1½ inches. When the wheels are in use on trailer, the skis are carried in transport on sides of trailer where they act as mudguards. When skis are in use on trailer, the wheels are carried on sides of trailer above the skis. Chains are provided at each side of vehicle to hold skis away from tires when skis are in transport position, and to limit the upward travel of ends of skis when skis are in use.

(2) CHANGING FROM WHEELS TO SKIS. Jack up side of trailer on which ski is to be installed. Remove cotter pin and castle nut from inner end of wheel spindle under trailer body (fig. 10). Pull wheel and spindle assembly from spindle support. Unhook chain at each end of ski. Remove two bolts from ski transport bracket (fig. 11). Turn

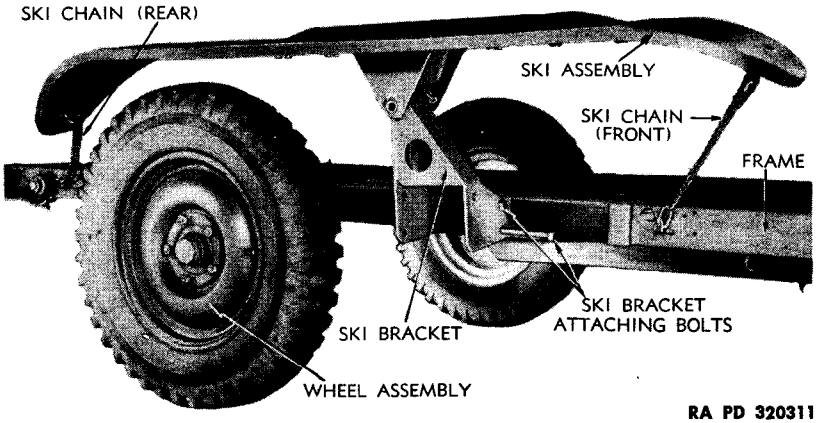

Figure 11—Ski Assembly on Transport Bracket

ski right side up with longer curved end of ski toward front of trailer. Install ski assembly under trailer with transport holes in offset of ski bracket toward center of trailer and inside of frame. Install the two long bolts through outer holes of ski support bracket and holes in ski and wheel bracket assembly on frame (fig. 12). Install nut and lock washer on each bolt. Hook chains onto skis so there will be approximately 3½ inches of slack in each with trailer and ski level. Insert wheel spindle into upper spindle support. Install castle nut and cotter pin on wheel spindle under trailer body. Remove jack. Repeat for other side.

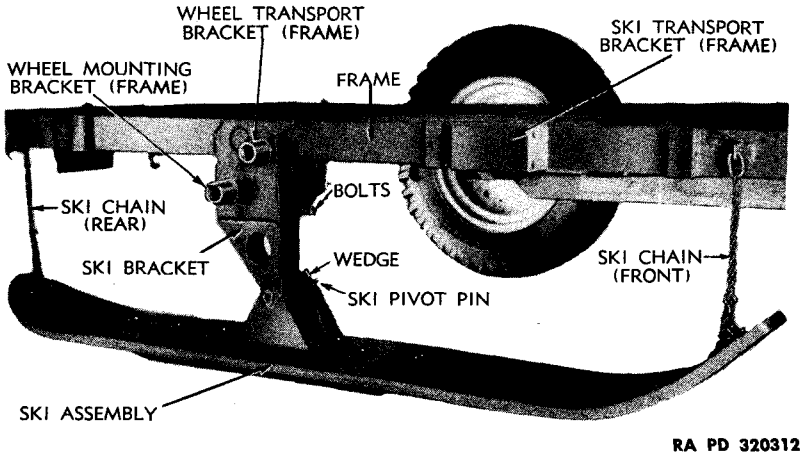

Figure 12—Ski Assembly Installation

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

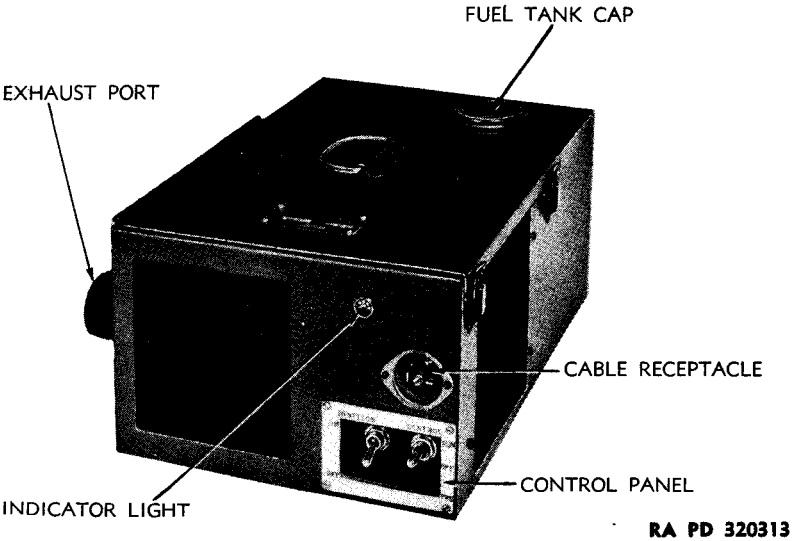

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Figure 13—Trailer Body Heater

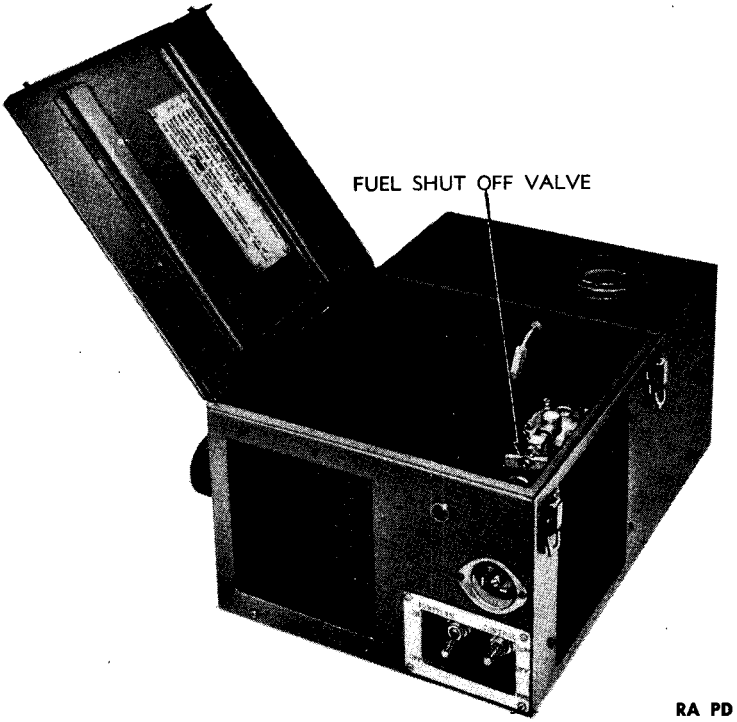

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Figure 14—Trailer Body Heater Controls

(3) CHANGING FROM SKIS TO WHEELS. Reverse above procedure. When hooking ski chains for transport position, hold ski level with trailer, and hook chains tight.

e. Selector Switch and Dome Light Switches. The selector switch on right rear side of trailer frame has two positions marked "S" and "BO." When switch screwdriver slot is pointing toward "S" the service stop and service taillights are operative. When switch screwdriver slot is pointing toward "BO" the blackout stop and taillights are operative.

(1) The dome light switches are on each dome light. These are operative when dome light wire is plugged into the receptacle at right front corner of trailer frame, and when trailer cable plug is connected with prime mover rear receptacle.

f. Parking Trailer. When parking trailer (especially when loaded), if prime mover is to be unhooked from trailer, lower parking leg of trailer and insert pin in uppermost hole available. Block up under rear of trailer frame to guard against trailer tipping backward when uncoupled. Chock wheels to prevent rolling. Pull electric plug from receptacle and place in clip. Unlock pintle on prime mover. Drive away from trailer. Trailer should be unhooked from prime mover on level ground if possible.

4. AUXILIARY EQUIPMENT.

a. Trailer Body Heater.

(1) DESCRIPTION. The trailer body heater (fig. 13) is a Hunter model UH-5, 6-volt, using gasoline for fuel. The heater blower fans are connected to an electric motor inside heater. The source of power for operation of the heater is the 6-volt battery of the prime mover through trailer electrical system. One fan circulates the air over combustion chamber and delivers the heated air into body of trailer. The other fan circulates the air for combustion through the combustion chamber and out exhaust port. The exhaust port of heater connects with the exhaust pipe at side of trailer body which delivers exhaust gases to atmosphere. The heater is controlled by means of switches (fig. 14). Heater assembly is clipped to heater base in right front corner of trailer body. CAUTION: *Never operate heater while trailer is in a closed building, because of exhaust gases.*

(2) OPERATION OF HEATER.

(a) To Turn Heater On. Be sure heater exhaust line to atmosphere is connected. Connect heater cable by inserting plug into receptacle on right front corner of trailer frame (trailer must be hooked to the prime mover). Snap ignition toggle switch to "ON" position. This starts igniter in operation. Snap control switch to "PREHEAT." After 30 seconds in "PREHEAT" position, snap control switch to "RUN" position. This starts the fuel pump and fans operating, and combustion in the combustion chamber. NOTE: *In extremely cold weather leave switch in "PREHEAT" position approximately 1 minute before snapping control switch to "RUN" position.* When heater has started, snap ignition switch to "OFF."

(b) To Turn Heater Off. Snap control toggle switch to "OFF" position.

(c) Gasoline Tank. When filling heater gasoline tank (capacity 5 gal) DO NOT fill to capacity. Leave approximately a one-half inch space from the top of the tank. Always use a strainer funnel and avoid spilling gasoline while filling tank.

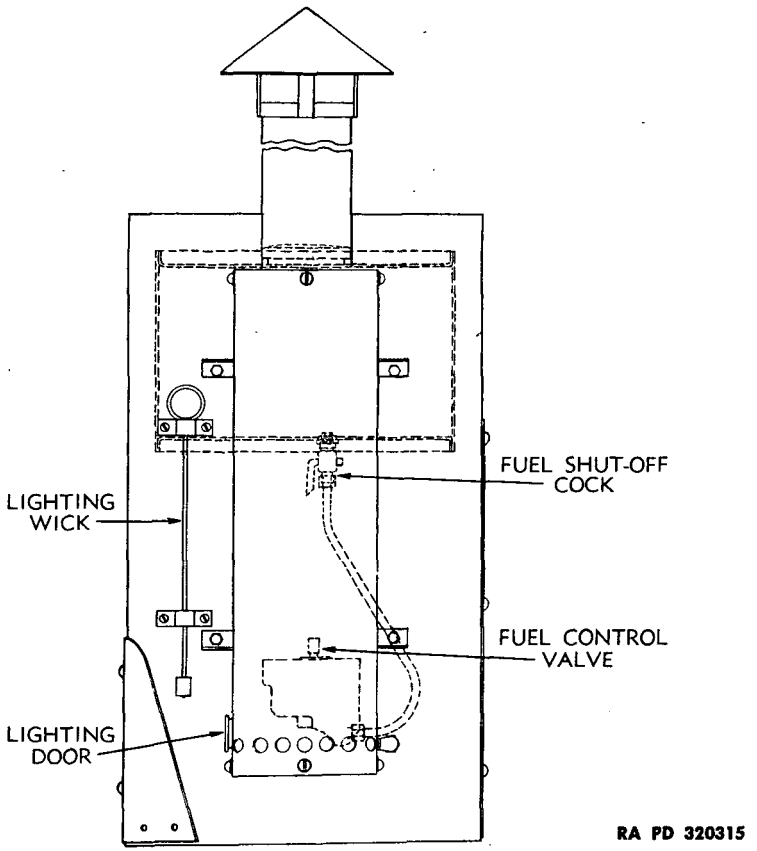

Figure 15—Diagram of Auxiliary Heater Controls

b. Trailer Body Auxiliary Heater.

(1) DESCRIPTION. The trailer body auxiliary heater (Evans, Model 204333) consists of a burner assembly with stack, a fuel control assembly, a fuel tank and the necessary fuel lines and shut-off valve for operation of the heater. These assemblies are mounted on a suitable bracket, which is attached to the skid rails for mounting the Type C-13 Power Plant and Type D-1 Ground Heater, when units are installed in trailer body. The auxiliary heater is used for stand-by heat when above units are in trailer.

(2) OPERATION (fig. 15).

(a) To Start Heater. Be sure stack is in place and secure. Open tank outlet cock "A," turn stem "B" at top of fuel control counterclockwise until it snaps up. After a 30-second delay period for fuel to reach burner, dip igniter wick "C" into fuel tank. Replace fuel tank cap before lighting wick with a match. Remove window "D" in heater body, and ignite fuel in burner with lighting wick. Extinguish lighting wick. Close burner door. Replace wick in brackets.

(b) To Shut Off Heater. Close fuel cock "A." Push stem "B" down, and turn clockwise until locked. Heater will then extinguish automatically.

5. LUBRICATION.

a. General. There are no pressure lubrication fittings on trailer. The wheels should be removed, and wheel bearings washed and repacked with proper lubricant at 6,000-mile intervals. The skis require no lubrication. The pintle, drawbar eye, and parking leg require a few drops of engine oil weekly.

b. Lubrication of Wheel Bearings. Remove wheel hub cap by turning counterclockwise. Remove cotter pin from wheel spindle castle nut. Remove nut by turning counterclockwise. Remove washer and outer bearing cone. Remove wheel. Wash bearings and wheel hub with dry-cleaning solvent to remove old lubricant. Inspect oil seal for damage. Pack wheel hub and bearings with lubricant (see Lubrication Guide, fig. 24). Install wheel on spindle, install outer bearing, washer and nut. Tighten nut tight and back off two castellations on nut. Install cotter pin. Install hub cap.

Section III

TRACTOR DESCRIPTION AND TABULATED DATA

6. DESCRIPTION.

a. General. This tractor is of the half-track type, and may be used for either highway or snow travel as the front axle can be equipped with either wheels or skis. It has six forward speeds and two reverse speeds, and because of its relatively low center of gravity, the tractor can easily climb slopes which may be as steep as 45 degrees, depending on the traction available, and the load being pulled.

b. Engine. Power is supplied by a 4-cylinder, liquid-cooled, 4-cycle, L-head, gasoline engine (Willys Model MB) with a maximum rated horsepower of 63 at 3,900 revolutions per minute.

c. Steering. Steering is accomplished by means of an automotive-type steering gear connected to the front wheels or skis, whichever are being used.

d. Seats. The body is divided into two compartments, with seating room for the driver in front compartment and for one passenger in the rear compartment. White seat cushions and back cushions with padded springs, are provided.

e. Equipment. Equipment on the tractor includes battery and electrical ignition and lighting system, electric cranking motor and generator, speedometer, fire extinguisher, engine preheater, and mechanical brakes. Tools are carried in canvas bag in tool box under the rear seat.

f. Tractor and Engine Numbers. Engine serial number prefixed by the letters "MB" will be found on front upper corner of the right side of cylinder block (viewing engine from flywheel end). Tractor number will be found on the Nomenclature Plate located on right-hand side of driver's compartment.

7. TABULATED DATA.

a. Vehicle Specifications.

Wheelbase (with wheels) ..... 81 in.
Length, over-all (with skis) ..... 3 ft 7½ in.
Length, over-all (with wheels) ..... 10 ft 11 in.
Width, over-all (with skis) ..... 5 ft 3 in.
Width, over-all (with wheels) ..... 5 ft 3 in.
Height, over-all (with skis) ..... 5 ft 3½ in.
Height, over-all (with wheels) ..... 5 ft 4 in.
Wheel size ..... 4:00 x 15 in.
Tire size ..... 4 ft 15 in.
Tire type ..... Rib type

TRACTOR DESCRIPTION AND TABULATED DATA

Tread (center to center) (with wheels)
- Front ..... 51 11/16 in.
- Rear ..... 45 in.

Tread (center to center) (with skis)
- Front ..... 40 in.
- Rear ..... 45 in.

Crew ..... 2 men
Weight of vehicle—empty ..... 2,620 lb
Weight of vehicle—with personnel ..... 3,120 lb
Ground pressure (skis) ..... 1.1 psi
Ground pressure (tracks on snow) ..... 3/4 psi
Ground contact area (with skis) ..... 3348 sq in.
Ground clearance (with skis) ..... 12 3/4 in.
Ground clearance (with wheels) ..... 13 3/4 in.
Pintle height ..... 15 3/4 in.
Kind and grade of fuel (Octane rating) ..Gasoline—68 Octane (min)
Approach angle (with skis) ..... 40 degrees
Approach angle (with wheels) ..... 60 degrees
Departure angle (with wheels or skis) ..... 60 degrees

b. Performance.

Maximum allowable speed (with auxiliary transmission in low range)
- 1st gear ..... 4 mph
- 2nd gear ..... 7 mph
- 3rd gear ..... 10 mph
- Reverse gear ..... 3 mph

Maximum allowable speed (with auxiliary transmission in high range)
- 1st gear ..... 15 mph
- 2nd gear ..... 26 mph
- 3rd gear ..... 41 mph
- Reverse gear ..... 11 mph

Minimum turning radius (right) ..... 15 ft
(left) ..... 15 ft
Fording depth ..... 30 in.
Towing facilities (front) ..... Loop under each side of frame
(rear) ..... Pintle
Maximum drawbar pull ..... 1,000 lb
Maximum grade ascending ability ..... 75 per cent
Maximum allowable engine speed ..... 4,000 rpm
Miles per gallon (at 20 mph without load) 15
Cruising range (at 20 mph without load) 160

c. Capacities.

Transmission capacity ..... 3/4 qt
Auxiliary transmission capacity ..... 3/4 qt
Differential case capacity ..... 1 1/4 qt
Fuel tank capacity ..... 10 1/2 gal
Cooling system capacity ..... 3 gal
Crankcase capacity ..... 5 qt

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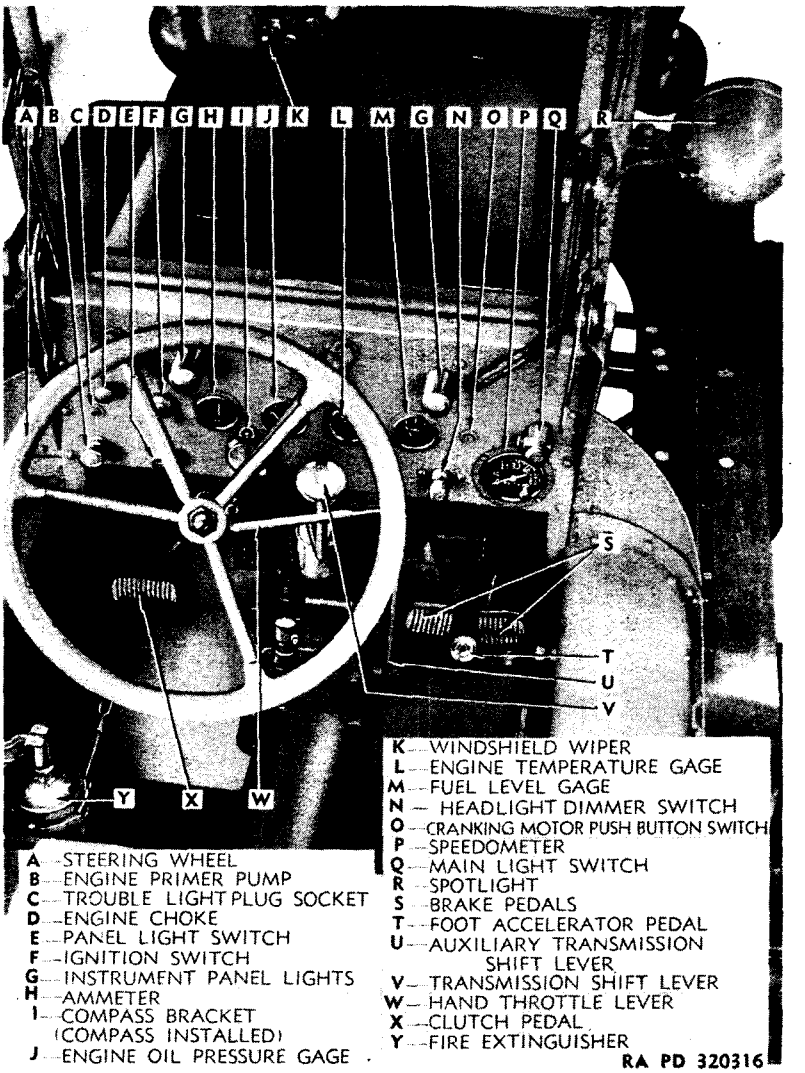

Figure 16—Operator's Controls

Section IV

TRACTOR DRIVING CONTROLS AND OPERATION

8. INSPECTION OF NEW TRACTOR.

a. Make a complete inspection for any shortage or damage which may have occurred while in transit or storage. Check tools and equipment in or with the tractor against the list given in section IX to make sure nothing is missing.

9. INSTRUMENTS AND CONTROLS (fig. 16).

a. The following instruments are provided to register the operations of various units of the tractor so that the operator can tell by observing them if these units are functioning properly. It is very necessary for operator to locate and know the use of these instruments before starting the engine, and to make it a habit to glance at these instruments often while operating vehicle. If any of them register abnormally, stop the tractor and engine, and investigate before damage or breakdown results.

(1) ENGINE OIL PRESSURE GAGE. An electrically operated gage, mounted on instrument panel, indicates the engine oil pressure in pounds per square inch. Normal pressure reading with engine at operating temperature and operating speed is 40 pounds.

(2) ENGINE TEMPERATURE GAGE. An electrically operated gage, mounted on instrument panel, which indicates the temperature of the engine coolant in degrees Fahrenheit. The normal temperature is 160°F to 180°F.

(3) FUEL LEVEL GAGE. An electrically operated gage, mounted on instrument panel, indicates the approximate level of fuel in the fuel tank.

(4) AMMETER. The ammeter, mounted on instrument panel, indicates the amount of charge (+) or discharge (—) of current to or from the battery.

(5) SPEEDOMETER. The speedometer registers the speed of travel in miles per hour and also total miles traveled.

b. The following controls are necessary for the proper operation of the vehicle:

(1) MAIN LIGHT SWITCH. This switch is mounted on right-hand side of instrument panel above speedometer, and controls all lights on vehicle and trailer (if any are used). When switch is pulled out one notch, only the blackout lights are operative. When latch but-

ton on left side of main light switch is depressed, the switch can be pulled out to second notch, which is the position of main light switch for use of all service lights. Depress latch button again to pull switch to last notch. With main light switch in last notch, only the service stop lights are operative for daytime driving. Push main light switch all the way in to turn off all lights.

(2) HEADLIGHT DIMMER SWITCH. Switch is mounted on instrument panel to left of speedometer. This switch operates only when service headlights are turned on. Push switch in each time it is desired to raise or lower headlight beam.

(3) CRANKING MOTOR PUSH-BUTTON SWITCH. This switch is located on instrument panel to right of fuel gage. Depress this switch to operate cranking motor.

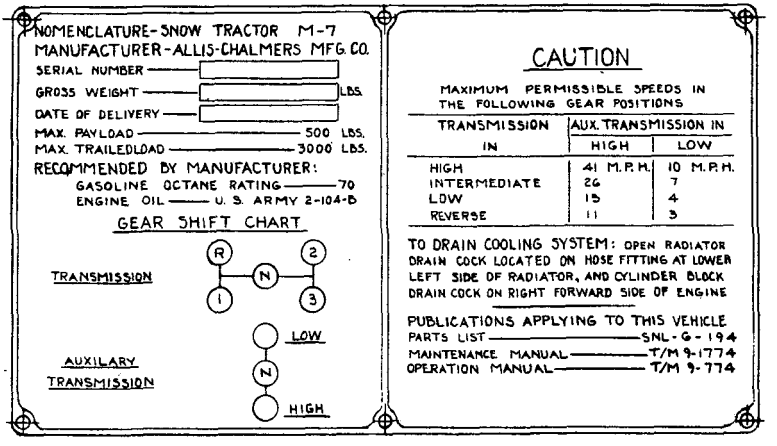

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Figure 17—Shifting Lever Diagram

(4) IGNITION SWITCH. Ignition switch is mounted on instrument panel to left of ammeter. Swing handle to left to turn on switch. This also renders gages and windshield wiper switch operative. Switch is off when handle is straight down.

(5) ENGINE CHOKE. Located to left of ignition switch on instrument panel. Pull out to close, push in to open.

(6) TROUBLE LIGHT PLUG SOCKET. This socket is mounted on instrument panel below engine choke. Insert jack plug of trouble light cord into this socket to make connection.

(7) ENGINE PRIMER PUMP. Primer pump is located on instrument panel below trouble light socket. This pump is used in cold weather to make starting of engine easier.

(8) PANEL LIGHT SWITCH. Panel light switch is located beneath ignition switch on instrument panel. Pull out to turn on panel lights.

Push in to turn off. This switch operates only when service headlights are turned on.

(9) COMPASS BRACKET. Located on instrument panel below ammeter and engine oil pressure gage. Compass is carried in this bracket when operating vehicle.

(10) WINDSHIELD WIPER. Windshield wiper, mounted at top of windshield can be operated by hand or by electricity. Switch for windshield wiper motor is mounted on motor. This switch is inoperative unless ignition switch is "ON."

(11) STEERING WHEEL. The automotive-type steering wheel is of conventional design, used to steer the vehicle in the usual manner.

(12) CLUTCH PEDAL. Depress pedal to disengage clutch. Release pedal to engage clutch. Do not make a practice of "riding" clutch pedal because it causes excessive wear on clutch plate and throw-out mechanism.

(13) TRANSMISSION SHIFTING LEVER. Refer to shifter diagram plate (fig. 17), and paragraph 12 a (3).

(14) BRAKE PEDALS. Each rear track is braked individually, if desired, to help in making sharp turns. Depress both pedals at once to stop vehicle.

(15) HAND THROTTLE LEVER. Pull down to open. Push up to close.

(16) FOOT ACCELERATOR PEDAL. Depress to open. Release to close.

(17) SPOTLIGHT SWITCH. Spotlight switch is on spotlight. This switch is inoperative unless main light switch is second notch out.

(18) AUXILIARY TRANSMISSION SHIFT LEVER. Push forward for high range, and pull back for low range. Refer to auxiliary shifter diagram plate, figure 17, and paragraph 12 a.

10. BEFORE-OPERATION SERVICE.

a. Perform the services in paragraph 22 (Before-operation Service of Inspection and Preventive Maintenance Section), before attempting to start the engine.

11. STARTING ENGINE.

a. Start Engine.

(1) Make sure main transmission gearshift lever is in neutral position.

(2) Pull choke button all the way out.

(3) Depress clutch pedal.

(4) Turn on ignition switch.

(5) Pull hand throttle lever down one notch.

(6) Press cranking motor push button switch to crank engine.

(7) As soon as engine starts, release push button switch, and push choke in enough to keep engine running. Allow engine to warm up, and release clutch pedal slowly. Continue to push in on choke button as engine shows evidence of too rich a mixture. Allow engine to warm up enough so that it will run smoothly with choke all the way

in. Allow at least a 5-minute warm-up period before attempting to move vehicle.

(8) If engine has been stopped for only a short while and is still warm, *do not* use choke, as it will result in flooding engine.

(9) When the atmospheric temperature is zero or below, it may be necessary to use the engine primer pump (par. 17), or the engine preheater (par. 16).

12. OPERATION OF THE VEHICLE.

a. Starting the Vehicle.

(1) For daytime driving, turn on service stop lights by pulling the main light switch all the way out (par. 9 **b** (1)).

(2) Disengage clutch by depressing clutch pedal.

(3) Move main transmission shift lever to the left, and pull back into first gear (fig. 17). Shift auxiliary transmission lever back for low, or forward for high, depending on load to be moved. NOTE: *Never attempt to shift auxiliary transmission with vehicle in motion.* If auxiliary transmission shifting lever is in the low range position, that is, back toward driver's seat, the forward travel speed will be very slow. If no load is being pulled, shift auxiliary transmission shifter lever to forward position for high range.

(4) Depress accelerator slightly to speed up engine.

(5) As engine speed increases, gradually and smoothly release clutch pedal. As clutch engages and vehicle starts to move, put slightly more pressure on accelerator so that engine will not stall.

(6) When vehicle speed is sufficient to shift to a higher gear, depress clutch pedal and decrease pressure on accelerator at the same time. Move transmission shifter lever to neutral position, to right and forward for second gear. Engage clutch and accelerate engine as explained under step (5) above. Repeat operations to shift to high, and when clutch is disengaged, pull straight back on transmission shifting lever to high gear position. Proceed with engagement of clutch. Increasing of vehicle speed is explained in step (5) above.

(7) The transmission gears should always be shifted to the next lower speed before engine begins to labor, or before vehicle speed is reduced appreciably. Shifting to lower speed is accomplished as follows: Depress clutch pedal quickly; increase engine speed and shift to next lower gear; release the clutch slowly and accelerate. NOTE: *It is advisable to use the same transmission gear going down a long hill as would be required to climb the same hill.*

(8) The vehicle must be brought to a complete stop before attempting to shift into reverse. To do so, depress clutch pedal to disengage clutch, then shift transmission lever to the left, and forward toward instrument panel (fig. 17). Release clutch pedal slowly and accelerate as load is picked up.

b. Stopping Vehicle.

(1) Remove foot from accelerator pedal, and apply brakes by pressing down on both brake pedals simultaneously. When vehicle

speed has been reduced to approximately 5 miles per hour, disengage clutch, and move transmission shift lever to neutral position. When vehicle has come to a complete stop, release clutch and brake pedals if on level ground.

(2) If vehicle is to be stopped on an incline, hold with brake, or if parked on an incline, chock tractor and trailer (if used) so that no damage will be done by vehicle moving away by itself. Push the main light switch all the way in.

13. STOPPING THE ENGINE.

a. To stop engine, reduce to idling speed, and turn ignition switch to "OFF" position.

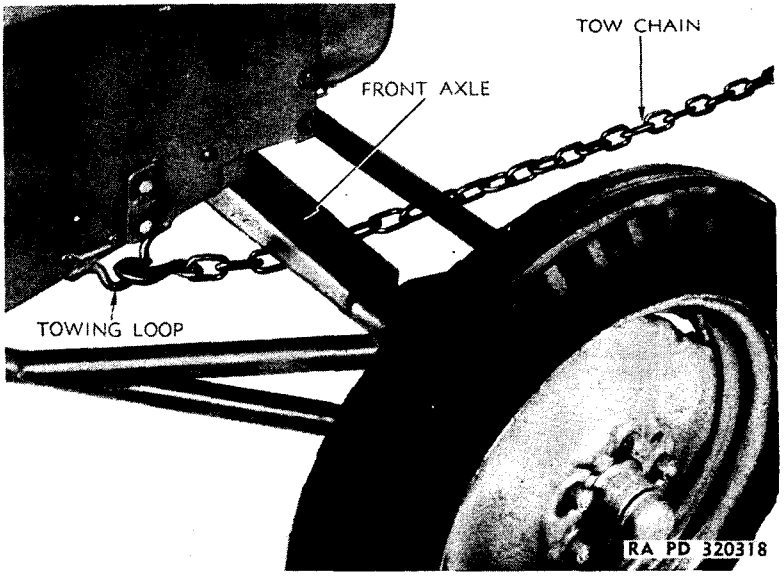


Figure 18—Tow Chain Hooked to Front of Vehicle

14. TOWING THE VEHICLE.

a. Towing Vehicle to Start.

(1) Attach the tow chain, rope, or cable, to frame eyes which are located just behind front axle on under side of tractor frame (fig. 18), one on each side.

(2) Place both transmission and auxiliary transmission levers into high gear position.

(3) Turn on ignition switch, pull out choke, and depress clutch pedal.

(4) As vehicle is set in motion by towing, engage clutch slowly, and depress accelerator slightly at time engine starts to turn.

(5) When engine starts, push choke in part way, and depress clutch pedal to keep engine running.

(6) Proceed to warm-up engine as described in paragraph 11 a.

b. Towing Disabled Vehicle. If vehicle has a "seized" differential or final drive, it will be necessary to remove final drive chains before towing vehicle.

Section V

TRACTOR AUXILIARY EQUIPMENT CONTROLS AND OPERATION

15. FIRE EXTINGUISHER.

a. Description. A 1-quart carbon tetrachloride fire extinguisher is part of the equipment with each tractor. It is carried in a bracket on left side of driver's compartment (fig. 16).

b. Operation. After removing the extinguisher from the bracket, grasp handle (while holding body of extinguisher), and turn handle counterclockwise to unlock. Point nozzle of extinguisher at base of flame, and operate like a pump. After use, be sure extinguisher is properly refilled. Remove filler plug. Pour in one quart of carbon tetrachloride. Replace plug. Lock handle down. Seal filler plug and handle with wire seal.

16. ENGINE PREHEATER AND ENGINE HOOD INSULATED COVER.

a. Engine Preheater.

(1) GENERAL DESCRIPTION. The preheater is a combination gasoline burner and water-tube boiler. The gasoline for the burner is supplied from a special tank located under the engine hood. A float bowl on side of heater maintains the gasoline from the reservoir to the combustion chamber. Air is admitted to the combustion chamber by opening a door on bottom of heater. Proper draft is attained by extending the telescopic flue above the engine hood of the engine. The heat of combustion is applied to the water-tube boiler which is connected to the engine coolant jackets. Coolant circulates through the heater, carrying heat into the engine. The direct radiation of heat from the heater also warms the engine compartment.

(2) OPERATION.

(a) Preparation for Lighting. When operating the preheater, the vehicle should be parked on reasonably level ground. Before lighting, be sure to have the flue pipe in operating position (fig. 19). First release top section of flue from locking hook by pressing down on top rim of flue and turning top clockwise; then raise upper and middle tubes as far as they will go, locking each tube to the one under it by turning the higher tube counterclockwise with one hand while the tube below is held with the other. CAUTION: *Where gasoline is used as fuel there is always danger of fire if it is carelessly handled. Do not operate the burner if there are any gasoline leaks in fuel line, etc. Always have fire extinguisher at hand when lighting burner.*

(b) Lighting. Loosen both wing nuts securing preheater lighting door on right lower engine side plate. Raise rear end of door from stud,

and let door hang by front top corner (fig. 20). Open fuel shut-off valve, by turning counterclockwise, as far as it will go. Pull down on end of lower door latch lever (fig. 20), allowing bottom door assembly to drop down. This automatically drops the wick control into operating position, and gasoline will begin to feed to the burner (fig. 21). Remove lighting torch from lower door assembly, and open folded handle to its extended position. Push catch on lighting tube cover assembly toward

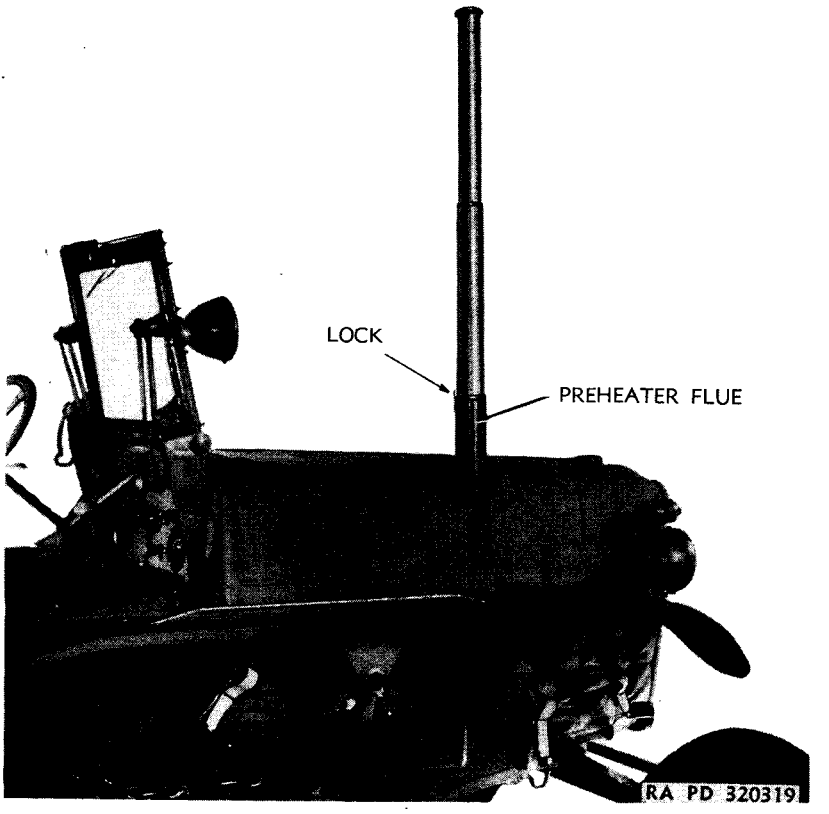


Figure 19—Preheater Flue Extended

engine to open cover (fig. 21). Insert the lighting torch into the lighting tube, hooking the asbestos tape over the lighting tube on the side toward the wick control, so that it dips into the gasoline in the burner (fig. 21). When the asbestos is soaked with gasoline, remove the torch and light it. Hang the burning torch back inside lighter tube. It will ignite the gasoline in burner. Allow it to burn this way for a minute of two, then remove torch, and close the lighting tube cover. Do not close the lower door assembly, as doing this will extinguish the fire. While the heater is burn-

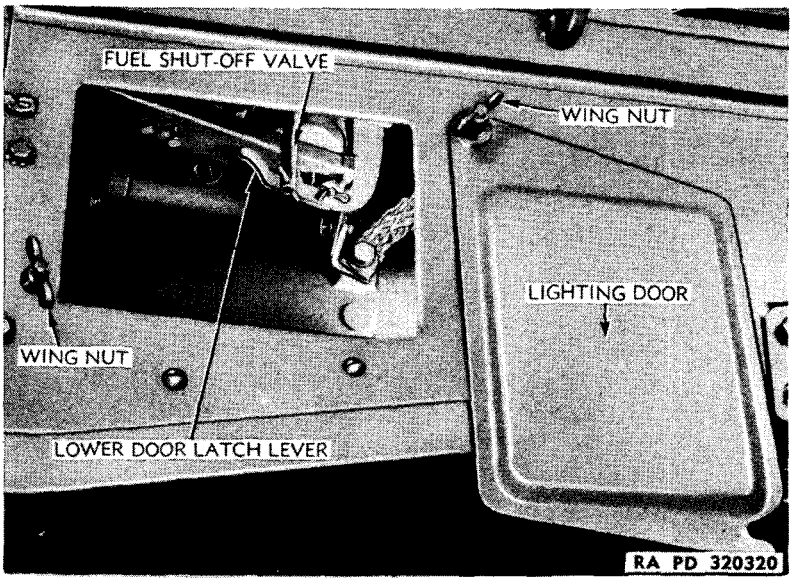


Figure 20—Bottom of Engine Preheater

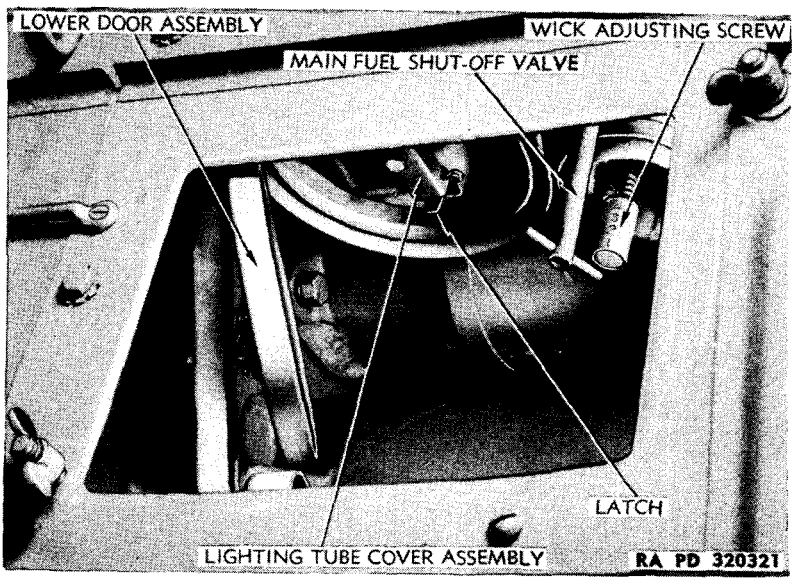


Figure 21—Bottom Cover of Preheater Open

ing, this lower door assembly is always left open. Lighting tube cover must be closed, as shown in figure 21. Extinguish and fold up the lighting torch, and store it in the clips of the lower door assembly from which it was removed.

(c) Adjustment of Fire. A wick is used to control the rate of flow of fuel into the burner. Extending below the small cylinder which houses the wick, will be found an adjusting screw (fig. 21). This screw has Nos. 1 to 4 stamped on it, and can be turned with the fingers to raise or lower the wick. Raising the wick, by turning the screw clockwise, reduces the fuel flow rate; turning the screw counterclockwise lowers

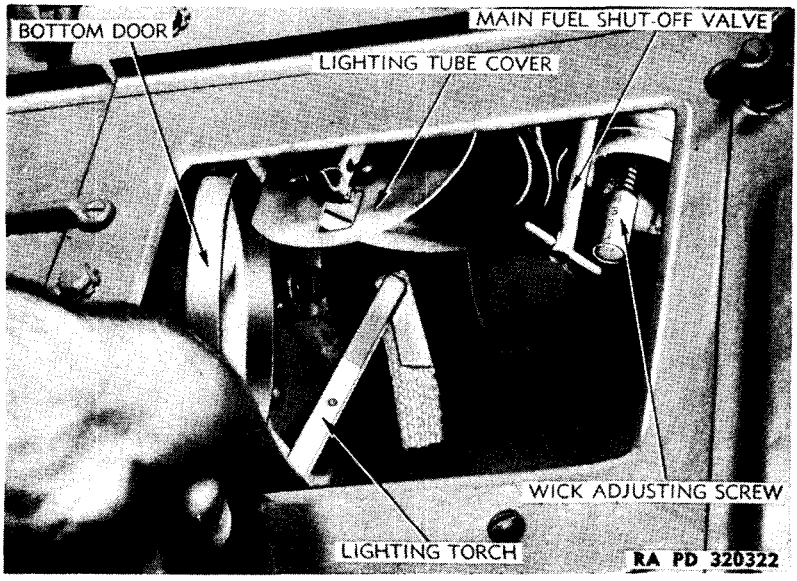


Figure 22—Inserting Preheater Lighting Wick

the wick, and increases the fuel flow. The position of the screw can be determined by the numbers visible below the preheater housing. When all the way down, for high fire, Nos. 1 to 4 are visible (fig. 20). When all the way up, no numbers are visible, and the fire will go out. For use in below zero weather the screw should be turned all the way down. If the burner smokes heavily when in this position, raise screw a little. Never operate the preheater with the screw turned up so far that a low smoky fire is obtained, as this will cause carbon to form on burner. Close the body preheater lighting door on lower right engine side plate.

(d) Extinguishing Fire. To shut off heater, shut the bottom door assembly and fasten latch, then close the fuel shut-off valve by turning clockwise as far as it will go. When the bottom door assembly is closed, the wick control screw which extends below the preheater housing is automatically raised. This lifts the wick out of the gasoline, and

stops the feeding of fuel. At the same time, closing the bottom door assembly shuts off the air supply to the burner, smothers the fire, and prevents water from entering preheater when the vehicle is in motion. Do not drive the vehicle with bottom door assembly open. *After extinguishing the fire, do not attempt to relight until the burner has cooled, or if it is necessary to relight, do so at once, holding the torch with pliers so that fingers are not below lighting tube, as a flash of flame may be thrown downward.* After extinguishing fire, the telescopic flue should be returned to its original lowered position by unlocking tubes. Hook top ring of flue under hook by pressing down and turning counterclockwise.

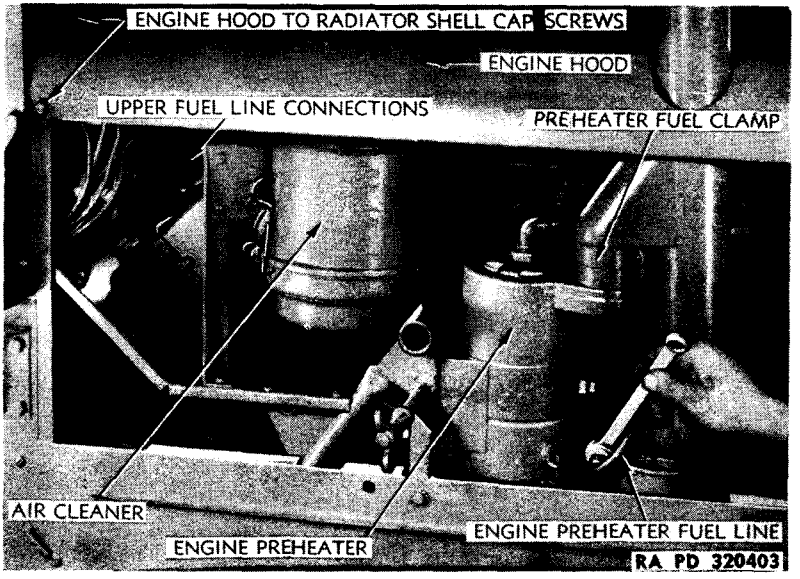


Figure 23—Disconnecting Preheater Fuel Line

When flue is lowered, any soot accumulations on inside will automatically dislodge, and will fall out bottom of flue. If heater is in continuous use, the flue should be lowered and raised quickly every 24 hours to remove soot.

b. Insulated Engine Hood Cover. An insulated engine compartment or hood cover is furnished with each vehicle, and is to be used when operating in below freezing weather, and in conjunction with engine preheater described in paragraph 16 **a.** A radiator grille flap is provided to cover the radiator grille opening, and should be closed down and secured by the four snap fasteners provided on front of cover for this purpose when the engine preheater is in use. After extinguishing the engine preheater, this flap can be opened to admit any desired amount of cooling air to the radiator by securing it with the two buckle straps located at the front of the cover.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

17. ENGINE PRIMER PUMP.

a. Description. The engine primer pump, located at left lower corner of instrument panel, is for use as an aid to starting engine when temperature is not cold enough to warrant use of engine preheater.

b. Operation. Perform steps under paragraph 12. If engine does not start immediately, pull out on primer pump handle. With engine turning over with cranking motor, push in slowly on primer handle. Engine should start at once.

Section VI

COLD WEATHER OPERATION

18. GENERAL INSTRUCTIONS.

a. Purpose. Operation of automotive equipment at subzero temperatures presents problems that demand special precautions and extra careful servicing from both operation and maintenance personnel, if poor performance and total functional failure are to be avoided.

b. Gasoline. Winter grade of gasoline is designed to reduce cold weather starting difficulties; therefore, the winter grade motor fuel should be used in cold weather operation.

c. Storage and Handling of Gasoline. Due to condensation of moisture from the air, water will accumulate in tanks, drums, and containers. At low temperatures, this water will form ice crystals that will clog fuel lines and carburetor jets, unless the following precautions are taken:

(1) Strain the fuel through filter paper, or any other type of strainer that will prevent the passage of water. CAUTION: *Gasoline flowing over a surface generates static electricity that will result in a spark unless means are provided to ground the electricity. Always provide a metallic contact between the container and the tank to assure an effective ground.*

(2) Keep tank full, if possible. The more fuel there is in the tank, the smaller will be the volume of air from which moisture can be condensed.

(3) Add ½ pint of denatured alcohol, grade 3, to the fuel tank each time it is filled. This will reduce the hazard of ice formation in the fuel.

(4) Be sure that all containers are thoroughly clean and free from rust before storing fuel in them.

(5) If possible, after filling or moving a container, allow the fuel to settle before filling fuel tank from it.

(6) Keep all closures of containers tight to prevent snow, ice, dirt, and other foreign matter from entering.

(7) Wipe all snow or ice from dispensing equipment and from around fuel tank fill cap before removing cap to refuel vehicle.

d. Effect of Low Temperatures on Metals. Inspect the vehicle frequently. Shock resistance of metals, or resistance against breaking, is greatly reduced at extremely low temperatures. Operation of vehicles on hard, frozen ground causes strain and jolting which will result in screws breaking, or nuts jarring loose.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

19. SPECIFIC INSTRUCTIONS.

a. Lubrication.

(1) TRANSMISSION AND DIFFERENTIAL.

(a) Universal gear lubricant, SAE 80, where specified, is suitable for use at temperatures as low as —20°F. If consistent temperature below 0°F is anticipated, drain the gear cases while warm, and refill with Grade 75 universal gear lubricant, which is suitable for operation at all temperatures below 0°F. If Grade 75 universal gear lubricant is not available, SAE 80 universal gear lubricant diluted with the fuel used by the engine, in the proportion of one part fuel to six parts universal gear lubricant, may be used. Dilute make-up oil in the same proportion before it is added to gear cases.

(b) After engine has been warmed up, engage clutch and maintain engine speed at fast idle for 5 minutes, or until gears can be engaged. Put transmission in low (first) gear, and drive vehicle for 100 yards, being careful not to stall engine. This will heat gear lubricants to the point where normal operation can be expected.

(2) CHASSIS POINTS. Lubricate chassis points with general purpose grease, No. 0.

(a) Steering Gear Housing. Drain, if possible, or use suction gun to remove as much lubricant as possible. Refill with universal gear lubricant, Grade 75, or, if not available, SAE 80 universal gear lubricant diluted with fuel used in the engine, in the proportion of one part fuel to six parts SAE 80 universal gear lubricant. Dilute make-up oil in the same proportion before it is added to the housing.

(b) Oilcan Points. For oilcan points where engine oil is prescribed for above 0°F, use light lubricating, preservative oil.

b. Protection of Cooling System.

(1) USE ANTIFREEZE COMPOUND. Protect the system with antifreeze compound (ethylene-glycol type) for operation below +32°F. The following instructions apply to use of new antifreeze compound.

(2) CLEAN COOLING SYSTEM. Before adding antifreeze compound, clean the cooling system, and completely free it from rust. If the cooling system has been cleaned recently, it may be necessary only to drain, refill with clean water, and again drain. Otherwise the system will be cleaned with cleaning compound.

(3) REPAIR LEAKS. Inspect all hose, and replace if deteriorated. Inspect all hose clamps, plugs, and pet cocks, and tighten if necessary. Repair all radiator leaks before adding antifreeze compound. Correct all leakage of exhaust gas or air into the cooling system.

(4) ADD ANTIFREEZE COMPOUND. When the cooling system is clean and tight, fill the system with water to about ⅓ capacity. Then add antifreeze compound, using the proportion of antifreeze compound to the cooling system capacity indicated in table on page 37. Protect the system to at least 10°F below the lowest temperature expected to be experienced during the winter season.

COLD WEATHER OPERATION

ANTIFREEZE COMPOUND CHART

(for 11-quart capacity cooling system)

Temperature	Antifreeze Compound (ethylene-glycol type)
+10°F	3 qt
0°F	3¾ qt
—20°F	4¾ qt
—30°F	5½ qt
—40°F	6 qt

(5) WARM THE ENGINE. After adding antifreeze compound, fill with water to slightly below the filler neck; then start and warm the engine to normal operating temperature.

(6) TEST STRENGTH OF SOLUTION. Stop the engine, and check the solution with a hydrometer, adding antifreeze compound if required.

(7) INSPECT WEEKLY. In service, inspect the coolant weekly for strength and color. If rusty, drain and clean cooling system thoroughly, and add new solution of the required strength.

(8) CAUTIONS.

(a) Antifreeze compound is the only antifreeze material authorized for ordnance materiel.

(b) It is essential that antifreeze solutions be kept clean. Use only containers and water that are free from dirt, rust, and oil.

(c) Use an accurate hydrometer. To test a hydrometer use one part antifreeze compound and two parts water. This solution will produce a hydrometer reading of 0°F.

(d) Do not spill antifreeze compound on painted surfaces.

c. Electrical Systems.

(1) GENERATOR AND CRANKING MOTOR. Check the brushes, commutators, and bearings. See that the commutators are clean. The large surges of current which occur when starting a cold engine require good contact between brushes and commutators.

(2) WIRING. Check, clean, and tighten all connections, especially the battery terminals. Care should be taken that no short circuits are present.

(3) COIL. Check coil for proper functioning by noting quality of spark.

(4) DISTRIBUTOR. Clean thoroughly, and clean or replace points. Check the points frequently. In cold weather, slightly pitted points may prevent engine from starting.

(5) SPARK PLUGS. Clean and adjust or replace, if necessary. If it is difficult to make the engine fire, reduce the gap 0.005 inch less than that recommended for normal operation (par. 80). This will make ignition more effective at reduced voltages likely to prevail.

(6) TIMING. Check carefully. Care should be taken that the spark is not unduly advanced or retarded.

(7) BATTERY.

(a) The efficiency of batteries decreases sharply with decreasing temperatures, and becomes practically nil at —40°F. Do not try to start the engine with the battery when it has been chilled to temperatures below —30°F until battery has been heated, unless a warm slave battery is available. See that the battery is always fully charged, with the hydrometer reading between 1.275 and 1.300. A fully charged battery will not freeze at temperatures likely to be encountered even in Arctic climates, but a fully discharged battery will freeze and rupture at +5°F.

(b) Do not add water to a battery when it has been exposed to subzero temperatures unless the battery is to be charged immediately. If water is added, and the battery not put on charge, the layer of water will stay at the top and freeze before it has a chance to mix with the acid.

(8) LIGHTS. Inspect the lights carefully. Check for short circuits and presence of moisture around sockets.

(9) ICE. Before every start, see that the spark plugs, wiring, or other electrical equipment are free from ice.

d. Starting and Operating Engine.

(1) INSPECT CRANKING MOTOR MECHANISM. Be sure that no heavy grease or dirt has been left on the cranking motor throw-out mechanism. Heavy grease or dirt is liable to keep the gears from being meshed, or cause them to remain in mesh after the engine starts running. The latter will ruin the cranking motor and necessitate repairs.

(2) USE OF CHOKE. A full choke is necessary to secure the rich air-fuel mixture required for cold weather starting. Check the butterfly valve to see that it closes all the way and otherwise functions properly.

(3) CARBURETOR AND FUEL PUMP. The carburetor, which will give no appreciable trouble at normal temperatures, is liable not to operate satisfactorily at low temperatures. Be sure the fuel pump has no leaky valves or diaphragm, as this will prevent the fuel pump from delivering the amount of fuel required to start the engine at low temperatures when turning speeds are reduced to 30 to 60 revolutions per minute.

(4) AIR CLEANERS. At temperatures below 0°F do not use oil in air cleaners. The oil will congeal and prevent the easy flow of air. Wash screens in dry-cleaning solvent, dry, and replace. Ice and frost formations on the air cleaner screens can cause an abnormally high intake vacuum in the carburetor air horn hose, resulting in collapse.

(5) FUEL SYSTEM. Remove and clean sediment bulb, strainers, etc., daily. Also drain fuel tank sump daily to remove water and dirt.

e. Chassis.

(1) BRAKE BANDS. Brake bands, particularly on new vehicles, have a tendency to bind when they are very cold. Always have a blow torch handy to warm up these parts, if they bind prior to moving, or attempting to move the vehicle. Parking the vehicle with the brake released will eliminate most of the binding. Precaution must be taken, under these circumstances, to block the wheels or otherwise prevent movement of the vehicle.

(2) SPEEDOMETER CABLE. Disconnect the oil-lubricated speedometer cable at the drive end when operating the vehicle at temperatures of —30°F and below. The cable will often fail to work properly at these temperatures, and sometimes will break due to the excessive drag caused by the high viscosity of the oil with which it is lubricated.

20. OPERATING TRACTOR OVER SNOW.

a. When to Use Wheels or Skis. Wheels can be used in a maximum snow depth of 6 inches. When snow depth is more than 6 inches, skis should be used; however, skis will operate over snow with a minimum depth of 1 inch. When frequent bare spots are encountered, wheels and skis can be used together in combination. Tractor will ford swamp or mud bottoms with wheels only, or in a combination of wheels and skis.

b. Traveling over Snow. Proceed slowly and cautiously on new trails to avoid striking hidden obstructions which might cause damage. Use slow speeds and low gears to prevent excess track slippage and undue excavation of snow from under the tracks. When vehicle becomes "set" in snow in such a manner that under body of vehicle rests on snow, pack additional snow under front of tracks and ahead of track, remove snow from under body of vehicle, and proceed cautiously until out of danger. Use individual brakes to aid in turning only when necessary. Avoid crevasses, heavy underbrush, and creek beds which have become "bridged over," to prevent vehicle from dropping through and becoming set. It may become necessary, at times, when towing trailer, to disconnect trailer from tractor and break trail with the tractor only. Then return for trailer.

Section VII

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

21. PURPOSE.

a. To insure mechanical efficiency it is necessary that the vehicle be systematically inspected at intervals each day it is operated and weekly, so that defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. The services set forth in this section are those performed by driver or crew, before-operation, during-operation, at-halt, and after-operation and weekly.

b. Driver preventive maintenance services are listed on the back of "Driver's Trip Ticket and Preventive Maintenance Service Record," W.D. Form No. 48, to cover vehicles of all types and models. Items peculiar to specific vehicles, but not listed on W.D. Form No. 48, are covered in manual procedures under the items to which they are related. Certain items listed on the form that do not pertain to the vehicle involved are eliminated from the procedures as written into the manual. Every organization must thoroughly school each driver in performing the maintenance procedures set forth in manuals, whether they are listed specifically on W.D. Form No. 48, or not.

c. The items listed on W.D. Form No. 48 that apply to this vehicle are expanded in this manual to provide specific procedures for the accomplishment of the inspections and services. These services are arranged to facilitate inspection and conserve the time of the driver, and are not necessarily in the same numerical order as shown on W.D. Form No. 48. The item numbers, however, are identical with those shown on that form.

d. 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 usually an external visual inspection to determine if the unit is damaged beyond safe or serviceable limits. The term "good condition" is explained further by the following: 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 usually an external visual inspection to see if it is in its correctly assembled position in the vehicle.

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

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

e. 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.

22. BEFORE-OPERATION SERVICE.

a. This inspection schedule is designed primarily as a check to see that the vehicle has not been damaged, tampered with, or sabotaged since the After-operation Service was performed. Various combat conditions may have rendered the vehicle unsafe for operation, and it is the duty of the driver to determine if the vehicle is in condition to carry out any mission to which it is assigned. This operation will not be entirely omitted, even in extreme tactical situations.

b. Procedures. 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. Examine snow tractor and trailer, and their accessories and special equipment, for injury caused by tampering or sabotage, collision, falling debris, or shell fire since parking. Look within engine compartment for evidence of these conditions, and for loose or damaged engine accessories or drive belts, loose fuel, oil, or coolant lines, or disconnected control linkage. If wet, dry ignition parts.

(2) ITEM 2, FIRE EXTINGUISHERS. Be sure extinguisher is full, nozzle clean, and mountings secure.

(3) ITEM 3, FUEL, OIL, AND WATER. Check supply of fuel, oil, and coolant, and add as necessary to bring to proper levels. Include engine heater fuel supply. NOTE: *Any appreciable drop in levels since After-operation Service should be investigated, and cause corrected or reported to designated authority.* During freezing weather when antifreeze solution is in use, if any appreciable addition of water is needed, antifreeze value should be tested by second echelon, and added if necessary. Be sure spare fuel can is full and securely mounted.

(4) ITEM 4, ACCESSORIES AND DRIVES. During cold weather, light engine heater according to instructions (par. 16). Inspect heater and other accessible accessories, such as carburetor, generator, regulator, cranking motor, oil filter, fan and water pump, air cleaner, and engine heater for looseness, damage, or leaks. Be sure drive belt is in good condition, and adjusted to have approximately ½-inch finger-pressure deflection.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

(5) ITEM 6, LEAKS, GENERAL. Look on ground under vehicle for evidence of fuel, oil, water, or gear oil leaks. Trace leaks to their source, and correct or report them to higher echelon.

(6) ITEM 7, ENGINE WARM-UP. Start engine, noting any tendency toward difficult starting. Observe action of cranking motor, particularly whether it has adequate cranking speed, and engages and disengages without unusual noise when in operation. Set hand throttle so that engine runs at fast idle, and during warm-up proceed with the following Before-operation Services. NOTE: *If oil pressure is not evident in 30 seconds, stop engine and investigate.* After engine starts and has reached minimum operating temperature, shut off engine heater.

(7) ITEM 8, CHOKE AND PRIMER. When starting engine, check operation of choke. As engine warms up, reset choke as required for engine to run smoothly and to prevent overchoking and oil dilution. If primer was used note if it operated effectively, and inspect pump and lines for leaks.

(8) ITEM 9, INSTRUMENTS.

(a) Oil Pressure Gage. Gage should indicate 40 pounds pressure at normal operating speed, and 10 pounds minimum at idle speed.

(b) Ammeter. Ammeter should show high charge for short period after starting, until generator restores to battery the current used in starting, then slight positive (+) reading above 10 miles per hour with lights and accessories off.

(c) Engine Temperature Gage. Reading should increase gradually during warm-up to normal temperature (160°F to 170°F). Maximum safe operating temperature is 200°F. NOTE: *Do not move vehicle until engine temperature has reached 135°F.*

(d) Fuel Gage. Gage should register approximate amount of fuel in tank. Ordinarily, tank will have been filled after operation, and gage should read "FULL."

(9) ITEM 10, WINDSHIELD WIPER. Test wiper to see that it operates; that motor, wiper blade, and arm are in good condition and secure; that arm operates through full stroke, and that blade contacts glass evenly.

(10) ITEM 11, GLASS. Clean windshield glass and curtain windows, and inspect for damage.

(11) ITEM 12, LAMPS (LIGHTS) AND REFLECTORS. Inspect all tractor and trailer lights for looseness and damage. Clean lenses. If tactical situation permits, open and close all switches to see if lamps respond properly.

(12) ITEM 13, WHEEL AND FLANGE NUTS. Examine all tractor and trailer wheel mounting and flange nuts to be sure they are present and secure. Be sure skis are properly stowed. If in use, examine skis for damage and secure attachment, and be sure wheels are securely mounted on provided brackets.

(13) ITEM 14, TIRES AND TRACKS. Inspect all tractor and trailer tires for damage and under-inflation. Remove objects lodged in treads and carcasses. Examine tracks for looseness or damage, and remove all

foreign matter from between track blocks, or which may be lodged in drive chains and bogie assemblies. See if track and drive chain tension is satisfactory. Track tension spring should be 2 1/16-inch over-all length. Drive chain should have no slack.

(14) ITEM 15, SPRINGS AND SUSPENSIONS. Examine track adjustment springs and bogie suspension units for looseness and damage. Look particularly for broken assembly welds on both tractor and trailer axle units.

(15) ITEM 16, STEERING LINKAGE. Inspect steering gear case for excessive leaks. See that all steering units and connecting linkages are in good condition and secure.

(16) ITEM 18, TOWING CONNECTIONS. Examine tractor and trailer pintle hooks and all tow loops for looseness and damage.

(17) ITEM 19, BODY AND COVERS. Examine both tractor and trailer bodies, top covers, frames, and curtains for looseness and damage. See that cover fastenings are secure. Look for broken sheet metal welds.

(18) ITEM 20, DECONTAMINATOR. Make sure decontaminator is fully charged and securely mounted.

(19) ITEM 21, TOOLS AND EQUIPMENT. Be sure all items of both tractor and trailer on-vehicle tools and standard and special equipment are present, serviceable, and properly stowed or mounted.

(20) ITEM 22, ENGINE OPERATION. Before vehicle is put in motion, be sure engine has reached minimum operating temperature (135°F) and idles smoothly. Accelerate and decelerate, and listen for any unusual vibration or noise. Note any unsatisfactory operating characteristics or excessive exhaust smoke.

(21) ITEM 23. DRIVER'S PERMIT AND FORM NO. 26. Driver must have his operator's permit on his person. Check to see that standard accident report Form No. 26, Operator's Manual, Lubrication Guide and W.D., A.G.O. Form 478 are present in vehicle, legible, and properly stowed.

(22) ITEM 25, DURING-OPERATION CHECK. The During-operation Services and observation on both tractor and trailer start as soon as the vehicles are put in motion as follows.

23. DURING-OPERATION SERVICE.

a. While tractor and trailer are in motion, listen for any unusual noise such as rattles, knocks, squeals, or hums that may indicate trouble. Be on the alert for indications of trouble in tractor cooling system, and smoke from any part of vehicle. Watch for overheated components such as generator, brakes, or clutch, and for vapor from fuel leaks, exhaust gas, or other signs of trouble. Any time brakes are used, gears shifted, or vehicles turned, consider this a test and note any unusual or unsatisfactory performance. Watch tractor instruments constantly. Notice promptly any unusual instrument indications that may signify possible trouble in system to which instrument applies.

b. Procedures. During-operation Service consists of observing items listed below according to the procedures following each item, and

investigating any indications of serious trouble. Notice minor deficiencies to be corrected or reported at earliest opportunity, usually at next scheduled halt.

(1) ITEM 27, FOOT BRAKES. Pedal should have ¾-inch free travel before meeting resistance. Brakes should stop vehicle effectively with normal pedal pressure, and return to "OFF" position when foot pressure is released. Test right and left brake separately to see if each functions properly.

(2) ITEM 28, CLUTCH. Clutch should not grab, chatter, or squeal during engagement, or slip when fully engaged under load. Pedal should have 2- to 2½-inch free travel before meeting resistance.

(3) ITEM 29, TRANSMISSIONS. Gears should shift smoothly, operate quietly, and not creep out of mesh during operation.

(4) ITEM 31, ENGINE AND CONTROLS. Driver must be on the alert for deficiencies in engine performance, such as lack of usual power, misfiring or stalling, unusual noise or vibrations, indications of overheating, or excessive exhaust smoke. Observe if engine responds to all controls, and if controls are excessively loose or binding.

(5) ITEM 32, INSTRUMENTS.

(a) Oil Pressure Gage. Gage should indicate 40- to 50-pound pressure at normal operating speed, and 10-pound minimum at idle.

(b) Ammeter. Ammeter should show high charge for short period after starting, until generator restores to battery the current used in starting, then slight positive (+) reading above 10 miles per hour with lights and accessories off.

(c) Engine Temperature Gage. Reading should increase gradually during warm-up to normal temperature (160°F to 170°F). Maximum safe operating temperature is 200°F.

(d) Fuel Gage. Gage should continue to register approximate amount of fuel in tank at all times ignition switch is "ON."

(e) Speedometer. Speed indicator should register vehicle miles per hour, and odometer should register accumulating mileage.

(6) ITEM 33, STEERING GEAR. Note any indication of looseness or binding, pull to one side, wandering, shimmy, wheel tramp, or unusual noise.

(7) ITEM 34, RUNNING GEAR. Be on the alert for any abnormal noise or operating characteristics of tracks and drive chains, wheels or skis, and suspension units; both on tractor and trailer at all times when vehicles are in motion.

(8) ITEM 35, BODY AND TRAILER. Note any indications of tractor or trailer body looseness, shifting of load or special trailer equipment, and loose top or curtain fasteners.

24. AT-HALT SERVICE.

a. At-halt Services may be regarded as minimum maintenance procedures, and should be performed under all tactical conditions even though more extensive maintenance services must be slighted or omitted altogether.

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

b. Procedures. At-halt Services consist of investigating any deficiencies noted during operation, inspecting items listed below according to the procedures following the items, and correcting any deficiencies found. Deficiencies not corrected should be reported promptly to the designated individual in authority.

(1) ITEM 38, FUEL, OIL, AND WATER. Check the fuel, engine oil, and coolant supply to see that it is adequate to operate the vehicle to the next stop. Remove radiator pressure cap cautiously. (Do not entirely remove until steam has escaped.) When refueling, use safety precautions for grounding static electricity. Gas tank filler-cap vent must be open, radiator pressure-cap valve must be free, and caps must be replaced securely. Leave sufficient space in fuel tank and radiator for expansion. If engine is hot, fill radiator slowly while engine is running at a fast idle.

(2) ITEM 39, TEMPERATURES, HUBS, BRAKE HOUSINGS, TRANSMISSIONS, AND AXLE HOUSING. Place hand cautiously on all tractor and trailer wheel hubs, and tractor brake housings, to see if they are abnormally hot. Examine transmission and differential housings for overheating and excessive oil leaks.

(3) ITEM 40, AXLE VENT. See that differential housing vent is present, secure, and not clogged.

(4) ITEM 41, PROPELLER SHAFT. Examine shaft and universal joints for looseness or damage. Remove any objects wound around shaft or joints. Investigate any unusual noise or vibration noted during operation.

(5) ITEM 42, SPRINGS AND SUSPENSIONS. Inspect tractor track tension springs, bogie frame, drive sprockets, wheels and support rollers, and both tractor and trailer axles for looseness, damage, or excessive wear. Look particularly for broken assembly welds.

(6) ITEM 43, STEERING LINKAGE. Examine steering gear case for excessive oil leaks, and all rods, arms and joints for looseness and damage. See that steering column and wheel are secure. Investigate any unusual noise or unsatisfactory characteristics noticed during operation.

(7) ITEM 44, WHEEL AND FLANGE NUTS. See that all tractor and trailer wheel rim, mounting, and flange nuts are present and secure.

(8) ITEM 45, TIRES AND TRACKS. Inspect tractor and trailer tires for damage and under-inflation. Remove objects lodged in treads or carcasses. Inspect tracks for damage. See that track tension spring is adjusted to 2 1/16-inch over-all length, and remove objects lodged between track blocks. Examine both tractor and trailer ski equipment, whether in use or on stowage brackets, for damage, and be sure they are secure.

(9) ITEM 46, LEAKS, GENERAL. Look around engine and on ground beneath tractor for excessive fuel, oil, or coolant leaks. Trace any leaks to source, and correct or report them.

(10) ITEM 47, ACCESSORIES AND BELTS. Examine all accessible units for looseness or damage. Be sure drive belt is in good condition, and has ½-inch finger-pressure deflection.

(11) ITEM 48, AIR CLEANER. If dusty or sandy conditions have been encountered, remove oil reservoir from carburetor air cleaner, and

examine for excessive dirt. Be sure air cleaner and ducts are in good condition, and all connections secure.

(12) ITEM 50, TOWING CONNECTIONS Examine tractor and trailer pintle hooks and all tow loops for looseness and damage.

(13) ITEM 51, BODY AND COVERS. Examine both tractor and trailer bodies, top covers, frames, and curtains for looseness and damage. See that cover fastenings are secure. Look for broken sheet metal welds.

25. AFTER-OPERATION AND WEEKLY SERVICE.

a. After-operation Service is particularly important, because at this time the driver inspects his vehicles to detect any deficiencies that may have developed, and corrects those he is permitted to handle. He should report promptly to the designated individual in authority the results of his inspection. If this schedule is performed thoroughly, the vehicles should be ready to roll again on a moment's notice. The Before-operation Service, with a few exceptions, is then necessary only to ascertain whether the vehicles are in the same condition in which they were left upon completion of the After-operation Service. The After-operation Service should never be entirely omitted, even in extreme tactical situations, but may be reduced to the bare fundamental services outlined for the At-halt Service, if necessary.

b. Procedures. When performing the After-operation Service the driver must remember and consider any irregularities noticed during the day in the Before-operation, During-operation, and At-halt Services. The After-operation Service consists of inspecting and servicing the following items. Those items of the After-operation that are marked by an asterisk (*) require additional weekly services, the procedures for which are indicated in subparagraph (b) of each applicable item.

(1) ITEM 55, ENGINE OPERATION. Test engine for satisfactory performance and smooth idle. Accelerate and decelerate engine, and note any tendency to miss or backfire. Listen for any unusual noise or vibration that may indicate worn or inadequately lubricated parts, loose mountings, incorrect fuel mixture, or faulty ignition. Note any unusual exhaust smoke. Investigate and correct or report any deficiencies noted during operation.

(2) ITEM 56, INSTRUMENTS. Check all pertinent instruments to be sure they are operating properly, and continue to register or indicate correct performance of the units to which they apply. Inspect them for looseness or damage. Stop engine.

(3) ITEM 54, FUEL, OIL, AND WATER. Fill fuel tanks. (Note whether fuel gage indicates full.) Check crankcase oil and coolant supply, and add as necessary to bring to correct level. NOTE: *Do not overfill fuel tanks or radiator; allow room for expansion.* In freezing weather if any appreciable amount of coolant is necessary have antifreeze value checked, and add sufficient to protect cooling system against freezing. Use care in removing pressure radiator cap. Do not entirely remove until steam has escaped, and do not add coolant while engine is too hot. Fill spare fuel can, if supply has been used.

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

(4) ITEM 57, WINDSHIELD WIPER. Test wiper to see that it operates; that motor, wiper blade, and arm are in good condition and secure; whether arm operates through full stroke, and that blade contacts glass evenly.

(5) ITEM 58, GLASS. Clean windshield glass and curtain windows, and inspect for damage.

(6) ITEM 59, LAMPS (LIGHTS) AND REFLECTORS. Inspect all tractor and trailer lights for looseness and damage. Clean lenses. If tactical situation permits, open and close all switches to see if lamps respond properly.

(7) ITEM 60, FIRE EXTINGUISHER. Examine extinguisher for looseness or damage, and see that nozzle is clean. If extinguisher has been used, report for refill or replacement.

(8) ITEM 61, DECONTAMINATOR. Inspect for looseness or damage and full charge; if used, report for refill or exchange.

(9) ITEM 62, *BATTERY.

(a) Inspect battery to see if it is clean, secure, and not leaking. Vent caps should be finger-tight.

(b) Weekly. Clean all dirt from top of battery. If terminal connections or posts are corroded, clean them thoroughly, and apply fresh, thin coating of grease. Tighten terminal bolts if loose. Check electrolyte level, and if necessary add distilled or clean water to correct level, ½ inch above plates. Battery should be secure, and not bulging or leaking electrolyte; carrier should be secure, clean, free of corrosion, and well painted. Tighten loose mountings cautiously.

(10) ITEM 63, ACCESSORIES AND BELT. Examine all accessible engine accessories such as carburetor, generator, regulator, cranking motor, oil filter, air cleaner, and engine heater units for looseness or damage. See that fan and generator drive belt is in good condition and adjusted to ½-inch finger-pressure deflection. Investigate any deficiencies in accessories or drive belt noticed during operation.

(11) ITEM 65, AIR CLEANER. Inspect carburetor air cleaner for looseness or damage. Examine oil in reservoir for correct level and excessive dirt. Add oil to bead level. When operating in sandy or dusty conditions, clean and service as often as necessary.

(12) ITEM 67, ENGINE CONTROLS. Examine all controls for damage, excessive wear, and adequate lubrication.

(13) ITEM 68, *TIRES OR SKIS, AND TRACKS.

(a) Inflate tractor tires to 18 pounds and trailer tires to 35 pounds (maximum) cool. Inspect them for damage and excessive wear. Remove objects lodged in treads or carcasses. See that valve caps are present and finger-tight. Examine skis for damage and secure mountings.

(b) Weekly. Replace badly worn or otherwise unserviceable tractor and trailer tires. Serviceable tires which show abnormal wear should be rotated to other wheel positions. Apparent mechanical defects causing such wear should be reported for attention by higher echelon.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

(14) ITEM 69, SPRINGS AND SUSPENSIONS. Inspect tractor track tension springs, bogie frame, drive sprockets, wheels and support rollers, and both tractor and trailer axles for looseness, damage, or excessive wear. Look particularly for broken assembly welds.

(15) ITEM 70, STEERING LINKAGE. Examine steering gear case for excessive oil leaks, and all rods, arms, and joints for looseness and damage. See that steering column and wheel are secure. Investigate any unusual noise or unsatisfactory characteristics noticed during operation.

(16) ITEM 71, PROPELLER SHAFT. Examine shaft and universal joints for looseness or damage. Remove any objects wound around shaft or joints. Investigate any unusual noise or vibration noted during operation.

(17) ITEM 72, *AXLE VENT.

(a) See that differential housing vent is present, secure, and not clogged.

(b) Weekly. Remove and clean out axle vent passage.

(18) ITEM 73, LEAKS, GENERAL. Look in engine compartment and under tractor for fuel, oil, coolant and gear oil leaks. Also look at brake housing flanges for excessive oil seepage. Trace any leaks found to source, and correct or report them to designated authority.

(19) ITEM 74, GEAR OIL LEVELS. Check oil level in transmission and differential, and report if low. Inspect housings for excessive leaking at seals or gaskets. NOTE: *Proper oil levels are from lower edge of filler hole, to ½ inch below, when cool.*

(20) ITEM 77, *TOWING CONNECTIONS.

(a) Inspect tractor and trailer rear pintle, and towing connections for looseness, damage, and excessive wear. See that latching mechanism operates properly and locks securely.

(b) Weekly. Tighten all towing device mountings and assembly nuts securely. Check locking mechanism for proper operation. Examine pintle hooks, springs and drawbars for damage.

(21) ITEM 78, BODY AND COVERS. Examine both tractor and trailer bodies, top covers, frames, and curtains for looseness and damage. See that cover fastenings are secure. Look for broken sheet metal welds.

(22) ITEM 82, *TIGHTEN.

(a) Tighten any tractor or trailer external assembly or mounting nuts or screws, where inspection has indicated the necessity.

(b) Weekly. Tighten all tractor and trailer wheel or ski mountings, tractor rear axle flanges, universal joint companion flanges, engine mountings, steering arms, towing connections, or any other mounting or assembly nuts or screws indicated by inspection as necessary on a weekly or mileage basis.

(23) ITEM 83, *LUBRICATE AS NEEDED.

(a) Lubricate tractor and trailer items such as hinges and latches, control linkage, frictional joints, or clevises, and any point where inspection indicates the necessity, according to Lubrication Guide instructions.

FIRST ECHELON PREVENTIVE MAINTENANCE SERVICE

(b) Weekly. Lubricate all points on tractor and trailer indicated on Lubrication Guide, figures 24 and 25, as needing attention on a weekly or mileage basis.

(24) ITEM 84, *CLEAN ENGINE AND VEHICLES.

(a) Clean dirt and grease from inside cab, engine compartment, and exterior of engine. Wipe off excess dirt and grease from entire exterior of both tractor and trailer.

(b) Weekly. Wash tractor and trailer when possible. If not possible, wipe off thoroughly. Inspect paint or camouflage pattern for rust or bright spots which might cause reflections. See that all vehicle markings (unless covered for tactical reasons) are legible. CAUTION: *When vehicles are driven into water for washing, care must be taken to see that water or dirt does not get into wheel bearings, gear cases, or brakes, or on electrical units or wiring.*

(25) ITEM 85, *TOOLS AND EQUIPMENT.

(a) Check both tractor and trailer tool and equipment on vehicle stowage lists, paragraphs 28 to 33, figures 31 through 34, to be sure all items are present. See that they are in good condition, and properly mounted or stowed.

(b) Weekly. Clean all tools and items of standard or special tractor and trailer equipment, of rust, dirt, or excessive grease. Apply preservatives where necessary and possible. See that tools with cutting edges are sharp and properly protected, and that all items are properly and securely mounted or stowed.

Section VIII

TRACTOR LUBRICATION

26. LUBRICATION GUIDE.

a. War Department Lubrication Guide No. 208 (figs. 24 and 25) prescribes lubrication services charged to operating and organizational maintenance personnel. The figure references around the border of these illustrations refer to localized lubrication illustrations that facilitate location of lubrication points.

b. A Lubrication Guide is placed on, or is issued with, each item of materiel and is to be carried with it at all times. In the event the materiel is received without a Guide, the using arm should immediately requisition a replacement from the Commanding Officer, Fort Wayne Ordnance Depot, Detroit 32, Michigan.

c. Lubrication instructions on the Guide 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 Lubrication Guide are for normal operating conditions. Reduce these intervals under extreme conditions, such as prolonged operation in sand or dust, or immersion in water, 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 grades of lubricants by maintaining a close check on operation of the vehicle during the approach to change-over periods, especially during initial action. 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 consistently in the next higher or lower range,** unless malfunctioning occurs sooner, due to lubricants being too thin or too heavy.

27. DETAILED LUBRICATION INSTRUCTIONS.

a. Lubrication Equipment.

(1) Each vehicle is supplied with lubrication equipment adequate to maintain the materiel. Clean this equipment both before and after use.

(2) Operate lubrication guns carefully and in such manner as to insure a proper distribution of the lubricant.

TRACTOR LUBRICATION

b. Points of Application.

(1) Lubrication fittings, grease cups, oilers and oil holes are readily identifiable on the vehicle. Be sure to wipe clean such lubricators and the surrounding surface before lubricant is applied.

(2) Where relief valves are provided, apply new lubricant until the old lubricant is forced from the vent. Exceptions are specified in notes on the Lubrication Guide.

c. Cleaning. Use SOLVENT, dry-cleaning, or OIL, fuel, Diesel to clean or wash all parts. Use of gasoline for this purpose is prohibited. After washing, dry parts thoroughly before applying lubricant.

d. Lubrication Notes on Individual Units and Parts. The following instructions supplement those notes on the Lubrication Guide which pertain to lubrication and service of individual units and parts.

(1) AIR CLEANERS. Daily, check level and refill engine air cleaner oil reservoir to bead level with used crankcase oil or OIL, engine, SAE 30 above +32°F and SAE 10 from +32°F to 0°F. From 0°F to −40°F, use OIL, hydraulic or FLUID, shock absorber, light. Below −40°F, remove oil and operate dry. Every 1,000 miles, daily under extreme dust conditions, remove air cleaners, wash all parts, and refill.

(2) VENTS. Differential vents must be cleaned and kept open. Inspect each time oil is checked and each time vehicle is operated under extremely dirty or muddy conditions.

(3) CRANKCASE. Daily, check level and refill to "FULL" mark with OIL, engine, SAE 30 above +32°F or SAE 10 from +32°F to 0°F. Below 0°F, refer to OFSB 6-11. Every 1,000 miles, remove drain plug from bottom of crankcase and completely drain case. 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 recheck oil level. Be sure pressure gage indicates oil is circulating.

(4) OIL FILTERS. Every 1,000 miles, remove drain plug from oil filter to drain sediment. Every 6,000 miles, or more often if filter becomes clogged, remove filter element, clean inside of case, and install new element. After renewing element, run engine a few minutes, recheck crankcase oil level, and fill to "FULL" mark with the correct grade of OIL, engine.

(5) GEAR CASES (TRANSMISSION, AUXILIARY TRANSMISSION, AND DIFFERENTIAL). Weekly, check level with vehicle on level ground, and if necessary, add lubricant to plug level at all times. Every 6,000 miles, drain and refill. Drain only after operation when gear lubricant is warm. Refill with LUBRICANT, gear, universal SAE 90 above +32°F, SAE 80 from +32°F to 0°F, or grade 75 below 0°F.

(6) WHEEL BEARINGS. Remove bearing cone assemblies from hub. Wash bearings, 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 1/16 inch 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 im-

No. 208

WAR DEPARTMENT LUBRICATION GUIDE

ORDNANCE DEPARTMENT

TRACTOR, SNOW, M7
TRAILER, 1 TON, SNOW, M19

SNL G-194, G-195.

For detailed instructions, refer to TM 9-774.

Clean fittings before lubricating. Lubricate after washing.

Clean parts with SOLVENT, dry-cleaning or OIL, fuel, Diesel. Dry before lubricating.

Requisition replacement Guide from the Commanding Officer, Fort Wayne Ordnance Depot, Detroit 32, Michigan.

Reduce intervals under severe operating conditions.

NOTE— See Reverse Side for lubrication of TRAILER and Additional CHASSIS Points

Lubricant • Interval

FIG. 26 — Drag Link CG 1

Tie Rod OE 1
Flush with oil can

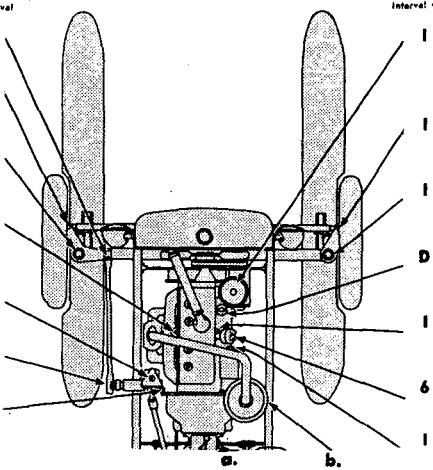
King Pin OE 1
Flush with oil can

FIG. 27 — *Crankcase Drain* 1
Drain and refill Cap. 5 qt. (See Note)

FIG. 26 — Steering Gear Fill GO 1

FIG. 26 — Drag Link CG 1

Steering Gear Level 1
Check level



Interval • Lubricant

1 *Oil Filter* — FIG. 27
Drain sediment
Every 6,000 miles, renew element
(See Note)

1 OE Tie Rod
Flush with oil can

1 OE King Pin
Flush with oil can

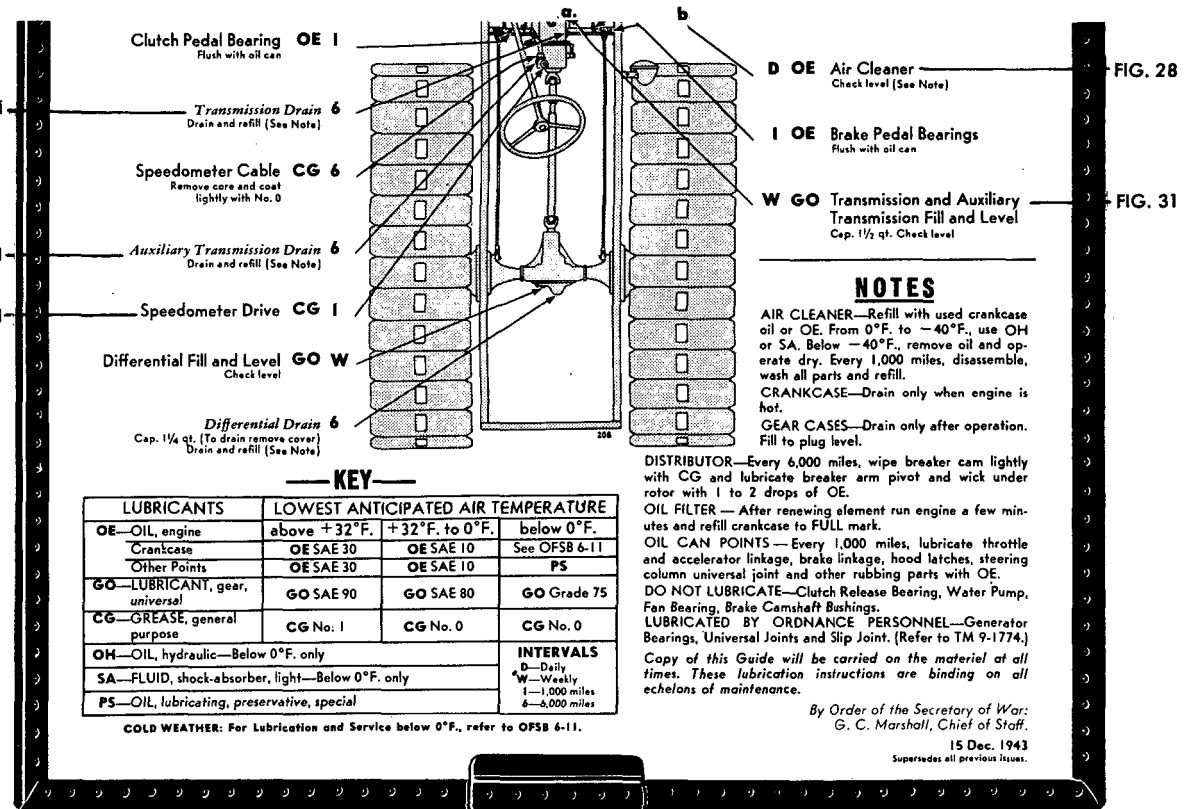
D OE Crankcase Fill and Level — FIG. 27
Check level

1 OE Distributor Shaft — FIG. 28
6 to 8 drops

6 OE Distributor (See Note) — FIG. 28

1 OE Starter — FIG. 28

RA PD 333550



—KEY—

LUBRICANTS	LOWEST ANTICIPATED AIR TEMPERATURE		
	above +32°F.	+32°F. to 0°F.	below 0°F.
OE—OIL, engine			
Crankcase	OE SAE 30	OE SAE 10	See OFSB 6-11
Other Points	OE SAE 30	OE SAE 10	PS
GO—LUBRICANT, gear, *universal*	GO SAE 90	GO SAE 80	GO Grade 75
CG—GREASE, general purpose	CG No. 1	CG No. 0	CG No. 0
OH—OIL, hydraulic—Below 0°F. only			
SA—FLUID, shock-absorber, light—Below 0°F. only			
PS—*OIL, lubricating, preservative, special*			

INTERVALS
D—Daily
W—Weekly
1—1,000 miles
6—6,000 miles

COLD WEATHER: For Lubrication and Service below 0°F., refer to OFSB 6-11.

NOTES

AIR CLEANER—Refill with used crankcase oil or OE. From 0°F. to −40°F., use OH or SA. Below −40°F., remove oil and operate dry. Every 1,000 miles, disassemble, wash all parts and refill.

CRANKCASE—Drain only when engine is hot.

GEAR CASES—Drain only after operation. Fill to plug level.

DISTRIBUTOR—Every 6,000 miles, wipe breaker cam lightly with CG and lubricate breaker arm pivot and wick under rotor with 1 to 2 drops of OE.

OIL FILTER — After renewing element run engine a few minutes and refill crankcase to FULL mark.

OIL CAN POINTS — Every 1,000 miles, lubricate throttle and accelerator linkage, brake linkage, hood latches, steering column universal joint and other rubbing parts with OE.

DO NOT LUBRICATE—Clutch Release Bearing, Water Pump, Fan Bearing, Brake Camshaft Bushings.

LUBRICATED BY ORDNANCE PERSONNEL—Generator Bearings, Universal Joints and Slip Joint. (Refer to TM 9-1774.)

Copy of this Guide will be carried on the materiel at all times. These lubrication instructions are binding on all echelons of maintenance.

By Order of the Secretary of War:
G. C. Marshall, Chief of Staff.

15 Dec. 1943
Supersedes all previous issues.

Figure 24—Chassis Lubrication Chart, Snow Tractor M7

RA PD 333550B

No. 208

WAR DEPARTMENT LUBRICATION GUIDE

ORDNANCE DEPARTMENT

TRACTOR, SNOW, M7
TRAILER, 1 TON, SNOW, M19

SNL G-194, G-195.

For detailed instructions, refer to TM 9-774.

Lubricant • Interval

Steering Column Bearing — OE 1
Flush with oil can

Track Support Roller — CG 6
Disassemble, clean and repack

Drive Chain — OE 1
Clean and oil

Drive Sprocket Bearings — CG 6
Disassemble, clean and repack

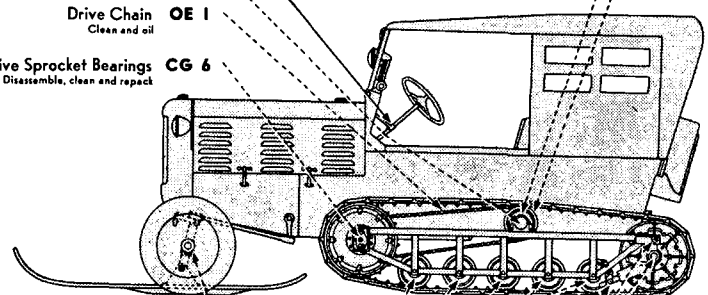
Requisition replacement Guide from the Commanding Officer, Fort Wayne Ordnance Depot, Detroit 32, Michigan.

NOTE—See Reverse Side for lubrication of CHASSIS

Interval • Lubricant

6 WB — Final Drive Outer Bearing
Disassemble, clean and repack

6 WB — Final Drive Inner Bearing
Disassemble, clean and repack



6 CG — *Track Idler Bearing*
Disassemble, clean and repack

1 CG — Idler Arm Pivot — FIG. 29
Lubricate 2 points each side of chassis

6 CG — Track Release Plunger — FIG. 29
Disassemble, clean and repack

Wheel Bearings — WB 6
Remove, clean and repack

Bogie Wheel Bearings — CG 6
Disassemble, clean and repack

LEFT SIDE OF VEHICLE

RA PD 333551

TRACTOR LUBRICATION

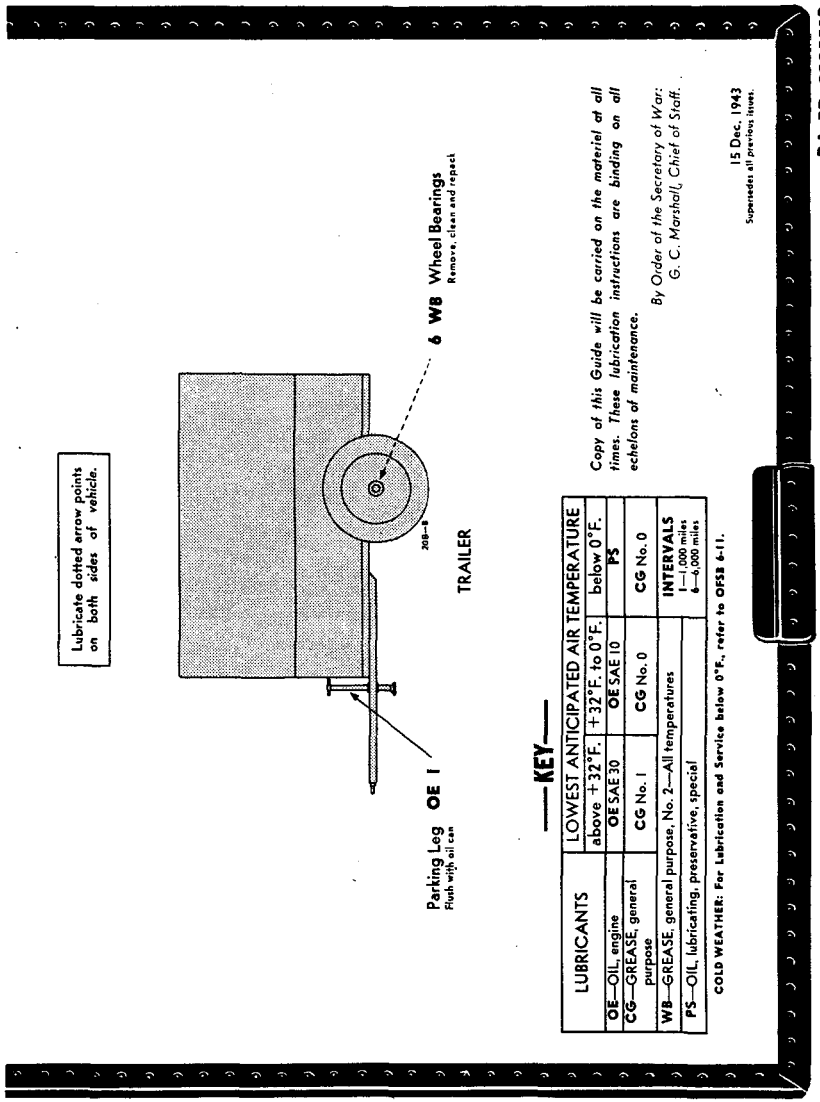


Figure 25—Chassis Lubrication Chart, Snow Tractor M7 and Snow Trailer M19

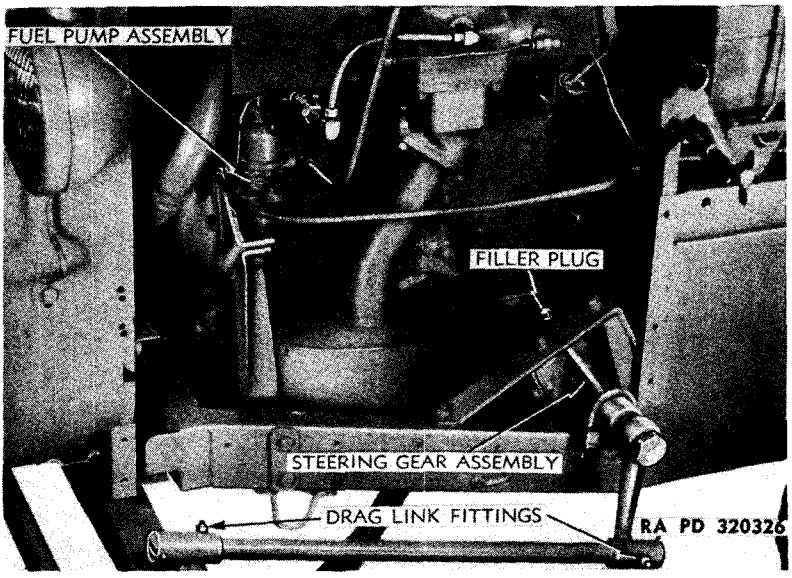


Figure 26—Lubrication Points on Drag Link and Steering Gear Housing

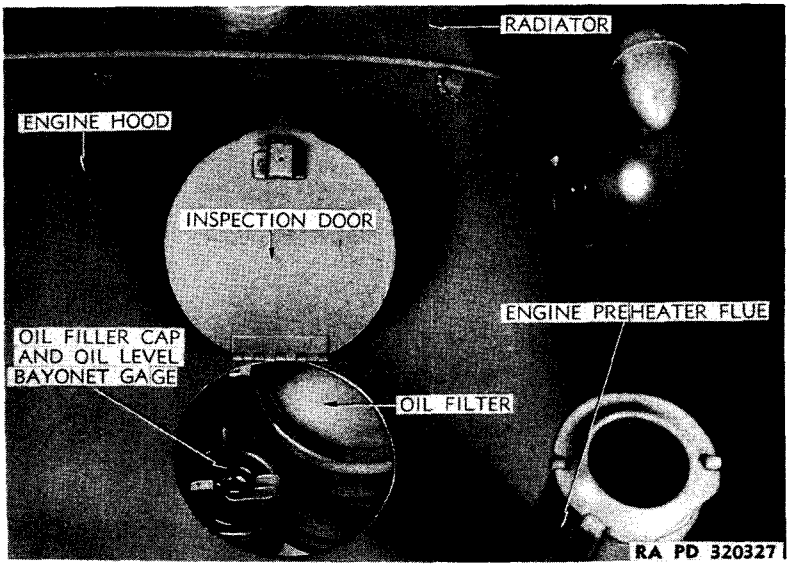


Figure 27—Engine Oil Filler Cap

mediately reassemble and replace wheel. Do not fill hub or hub cap. The lubricant in the bearing is sufficient to provide lubrication until the next service period. Any excess might result in leakage into the drum. Adjust bearings in accordance with instructions in paragraph 110.

(7) DISTRIBUTOR. Every 1,000 miles, lubricate distributor shaft with 6 to 8 drops of OIL, engine, SAE 30 above +32°F, SAE 10 from +32°F to 0°F, or OIL, lubricating, preservative, special, below 0°F. Every 6,000 miles, wipe the distributor breaker cam lightly with GREASE, general purpose, No. 1 above +32°F and No. 0 below

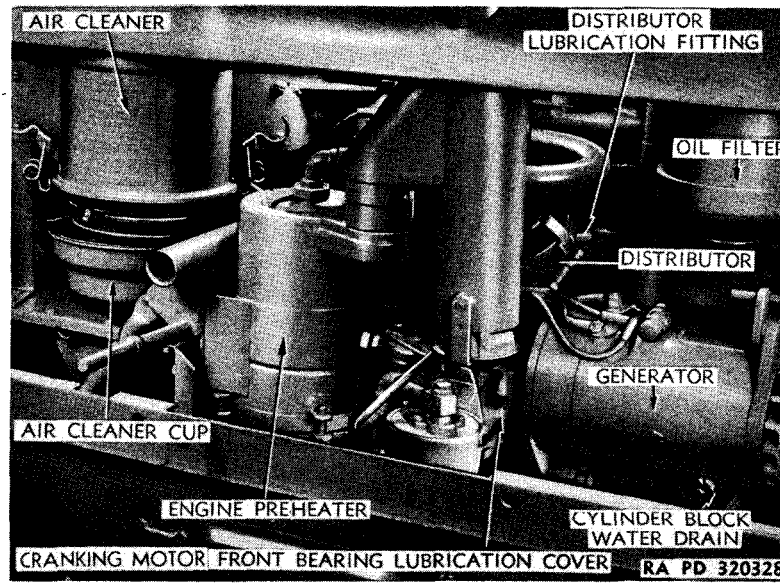


Figure 28—Air Cleaner, Water Drain, Distributor, and Cranking Motor Lubrication Points

+32°F. Also lubricate the breaker arm pivot and wick under rotor with 1 to 2 drops of OIL, engine, SAE 30 above +32°F, SAE 10 for +32°F to 0°F, or OIL, lubricating, preservative, special, below 0°F.

(8) OILCAN POINTS. Every 1,000 miles, lubricate throttle and accelerator linkage, brake linkage, hood latches, steering column universal joint, and other rubbing parts with OIL, engine, SAE 30 above +32°F, SAE 10 +32°F to 0°F, or OIL, lubricating, preservative, special, below 0°F.

(9) POINTS NOT TO BE LUBRICATED. These points are the clutch release bearing, water pump, fan bearing, and brake camshaft bearings.

(10) POINTS TO BE SERVICED AND/OR LUBRICATED BY ORDNANCE MAINTENANCE PERSONNEL ONLY.

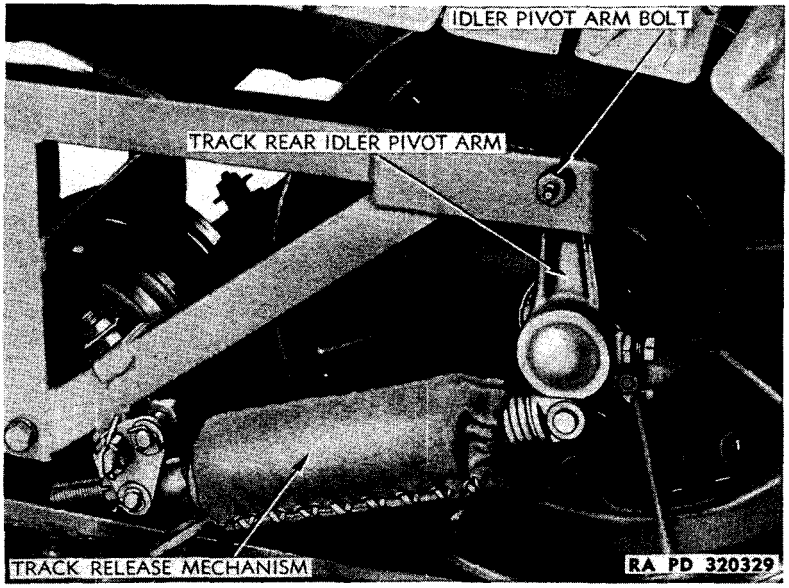


Figure 29—Lubrication on Rear Idler Pivot

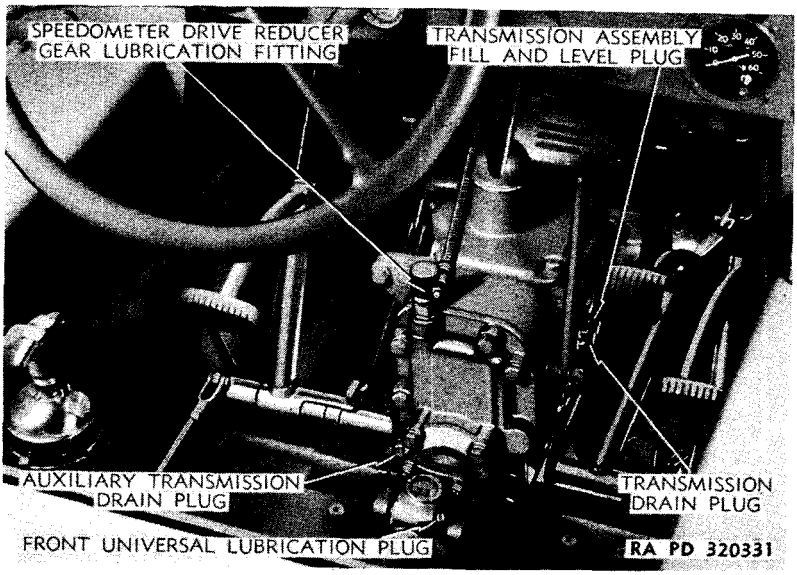


Figure 30—Lubrication Fitting on Transmissions and Front Universal

TRACTOR LUBRICATION

(a) Cranking Motor. Every 6,000 miles, remove cranking motor and clean Bendix drive. While cranking motor is disassembled, wash the bushings and soak them in OIL, engine, SAE 30 above +32°F, or SAE 10 below +32°F.

(b) Other Points (Generator Bearings, Universal Joints and Slip Joint). Every 6 months, or when vehicle is taken out of service, disassemble units, clean bearings, and repack with GREASE, general purpose, No. 1 above +32°F or No. 0 below +32°F.

(11) REPORTS AND RECORDS.

(a) Reports. Report unsatisfactory performance of materiel to the ordnance officer responsible for maintenance.

(b) Records. A record of lubrication may be maintained in the Duty Roster (W.D., A.G.O. Form No. 6).

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

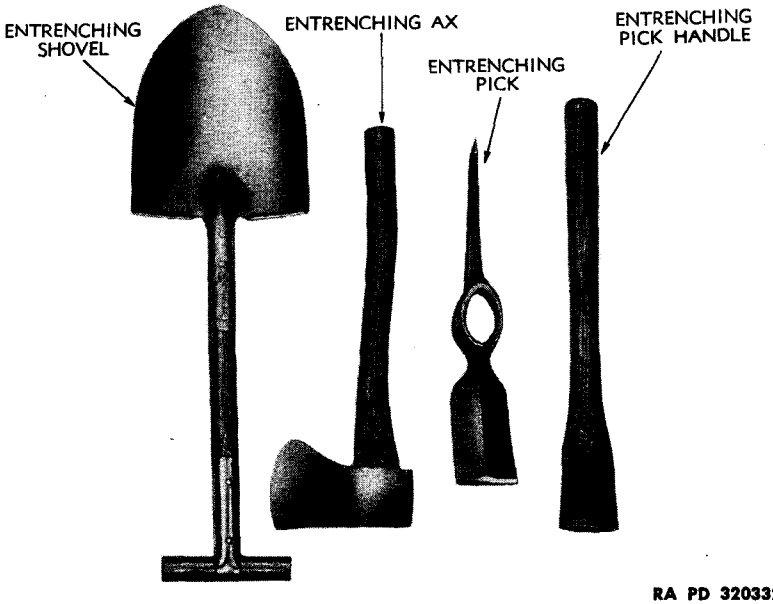


Figure 31—Pioneer Tools

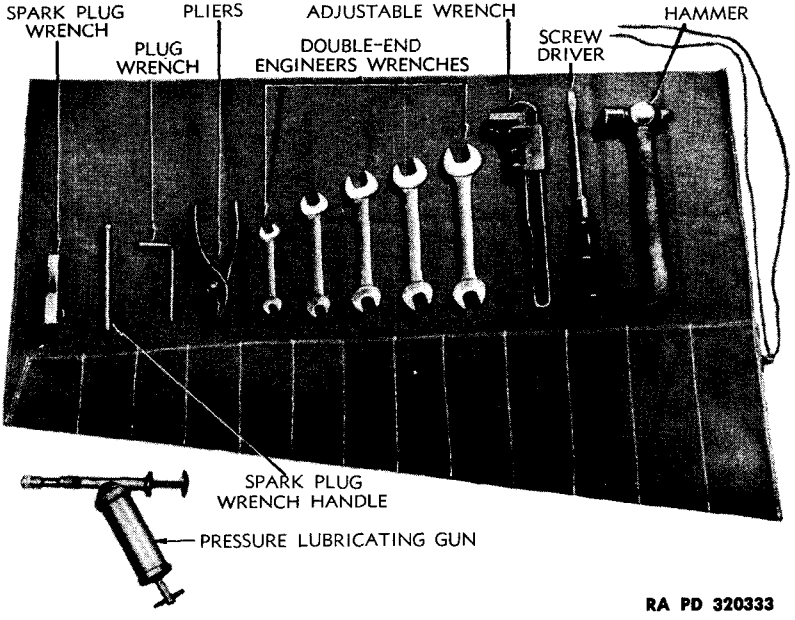


Figure 32—Vehicle Tools

Section IX

TRACTOR TOOLS AND EQUIPMENT STOWAGE

28. DESCRIPTION.

a. The items listed in the following paragraphs are furnished as standard equipment with each tractor when tractor is shipped. This equipment is packed in a box and placed in same box with tractor. A tool box and brackets are provided on the tractor to carry this equipment. After tractor is removed from box, the tools and equipment must be removed from the box in which they are shipped, and placed in tool box and brackets on tractor, before tractor is put into operation.

29. PIONEER TOOLS.

Tool	Number Carried	Where Carried
Ax (entrenching)	1	Tool box
Handle, mattock	1	Tool box
Mattock, pick (entrenching)	1	Tool box
Shovel (entrenching)	1	Tool box

30. VEHICULAR TOOLS.

Handle, wrench, spark plug	1	Tool box
Hammer, machinist's, ball peen 16-oz. (41-H-523)	1	Tool box
Pliers, combination, slip joint, 6-in. (41-P-1650)	1	Tool box
Screwdriver, common 6-in. blade (41-S-1104)	1	Tool box
Wrench, adjustable, auto type, 11-in. (41-W-448)	1	Tool box
Wrench, drain plug	1	Tool box
Wrench, engineer's, open-end, 3/8 x 7/16 (41-W-991)	1	Tool box
Wrench, engineer's, open-end, 1/2 x 19/32 (41-W-1003)	1	Tool box
Wrench, engineer's, open-end, 9/16 x 11/16 (41-W-1005-5)	1	Tool box
Wrench, engineer's, open end, 5/8 x 25/32 (41-W-1008-10)	1	Tool box
Wrench, engineer's, open-end, 3/4 x 7/8 (41-W-1012-5)	1	Tool box
Wrench, spark plug	1	Tool box

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

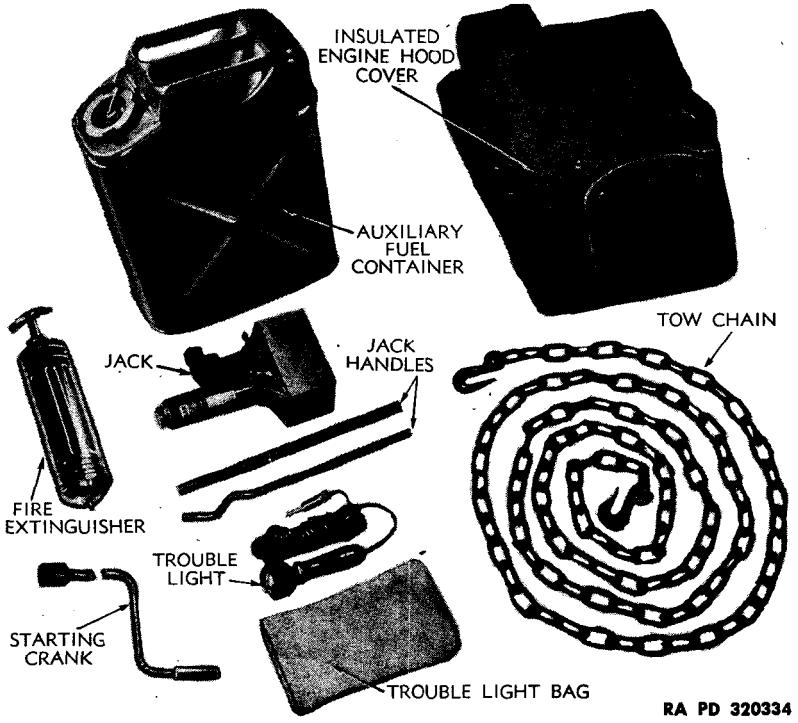


Figure 33—Vehicle Equipment

31. VEHICLE EQUIPMENT.

Tool	Number Carried	Where Carried
Bag (for tools)	1	Tool box
Bag (inspection lamp)	1	Tool box
Chain, tow	1	Tool box
Container, 5 gal.	1	In bracket on rear of tractor
Cover, hood	1	Only carried when in use over engine hood
Crank, starting	1	Tool box
Extinguisher, fire	1	On left side of body in driver's compartment
Gun, grease	1	Tool box

TRACTOR TOOLS AND EQUIPMENT STOWAGE

Tool	Number Carried	Where Carried
Handle, jack	1	Tool box
Jack, hydraulic	1	Tool box
Light, inspection	1	Tool box

32. VEHICLE SPARE PARTS.

Container, service kit	1	Tool box
Condenser, distributor	1	Tool box
Contact set, distributor	1	Tool box
Blade, windshield wiper	1	Tool box
Half-links, drive chain	8	Tool box
Metering rod, carburetor, high altitude	1	Tool box
Spark plugs	4	Tool box
Wedge, spindle pivot	2	Tool box
Wick, preheater lighting	1	Tool box

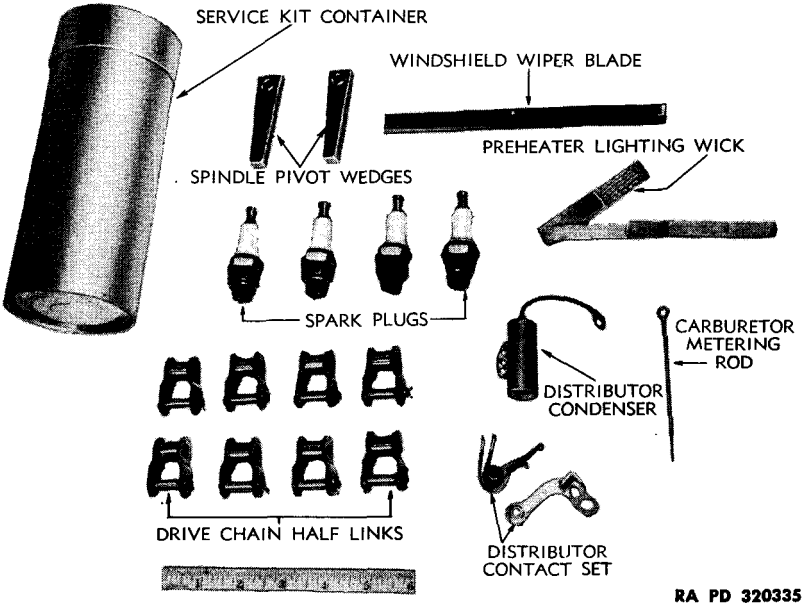


Figure 34—Vehicle Spare Parts

33. CARE OF EQUIPMENT.

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

PART TWO—VEHICLE MAINTENANCE INSTRUCTIONS

Section X

MWO AND MAJOR UNIT ASSEMBLY REPLACEMENT RECORD

34. DESCRIPTION.

a. Every vehicle is supplied with a copy of A.G.O. Form No. 478 which provides a means of keeping a record of each MWO completed or major unit assembly replaced. This form includes spaces for the vehicle name and U.S.A. Registration Number, instructions for use, and information pertinent to the work accomplished. It is very important that the form be used as directed, and that it remain with the vehicle until the vehicle is removed from service.

35. INSTRUCTIONS FOR USE.

a. Personnel performing modifications or major unit assembly replacements must record clearly on the form a description of the work completed, and must initial the form in the columns provided. When each modification is completed, record the date, hours and/or mileage, and MWO number. When major unit assemblies, such as engines, transmissions, transfer cases, are replaced, record the date, hours and/or mileage, and nomenclature of the unit assembly. Minor repairs and minor parts and accessory replacements need not be recorded.

36. EARLY MODIFICATIONS.

a. Upon receipt by a third or fourth echelon repair facility of a vehicle for modification or repair, maintenance personnel will record the MWO numbers of modifications applied prior to the date of A.G.O. Form No. 478.

Section XI

NEW VEHICLE RUN-IN TEST

37. PURPOSE.

a. When a new or reconditioned vehicle is first received at the using organization, it is necessary for second echelon personnel to determine whether or not the vehicle will operate satisfactorily when placed in service. For this purpose, inspect all accessories, subassemblies, assemblies, tools, and equipment to see that they are in place and correctly adjusted. In addition, they will perform a run-in test of at least 50 miles as directed in AR 850-15, paragraph 25, table III, according to procedures in paragraph 39 below.

38. CORRECTION OF DEFICIENCIES.

a. 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 vehicle is placed in service.

(2) Refer deficiencies beyond the scope of the maintenance echelon of the using organization to a higher echelon for correction.

(3) Bring deficiencies of serious nature to the attention of the supplying organization.

39. RUN-IN TEST PROCEDURES.

a. **Preliminary Service.**

(1) FIRE EXTINGUISHER. See that 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 tanks. Check crankcase oil and coolant supply; add oil and coolant as necessary to bring to correct levels. Allow room for expansion in fuel tanks and radiator. During freezing weather, test value of antifreeze, 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 instructions on tag before driving the vehicle.*

(3) BATTERY. Make hydrometer and voltage test of battery, and add clean water to bring electrolyte ½ inch above plates.

(4) AIR CLEANER. Examine carburetor air cleaner to see if it is in good condition and secure. Remove element and wash in dry-cleaning solvent. Fill reservoir to correct level with engine oil, and reinstall securely. Be sure all gaskets are in good condition, and air horn connection is tight.

(5) ACCESSORIES AND BELT. Examine accessories, such as carburetor, generator, regulator, cranking motor, oil filter, and engine

heater units to see if they are securely mounted, and that heater unit does not leak fuel or coolant. Make sure fan and generator drive belt is in good condition, and adjusted to have ½-inch finger-pressure deflection.

(6) ELECTRIC WIRING. Examine all accessible wiring and conduits to see if they are in good condition, securely connected, and properly supported.

(7) TIRES OR SKIS, AND TRACKS.

(a) Tires. See that tires are properly inflated to 18 pounds, cool; that stems are in correct position, and all valve caps present and finger-tight. Inspect tires for damage, and remove objects lodged in treads or carcasses.

(b) Skis. Examine skis for damage and loose runners. See if mounting mechanism is in good condition and secure. If not in use, see that skis are properly mounted on carrying brackets.

(c) Tracks. Inspect tracks for looseness or damage. Be sure track tension spring is adjusted to 2 1/16-inch over-all length. Track drive chain should have no slack.

(8) WHEEL AND FLANGE NUTS. See that all wheel mounting and axle flange nuts are present and secure. If front wheels are not in use, see that they are properly mounted on carrying brackets.

(9) TOWING CONNECTIONS. Examine tow loops and pintle hook for looseness and damage. See that pintle operates properly and latches securely.

(10) BODY AND COVERS. Inspect body for looseness and damage. See that all attachments and mountings are secure. Examine seats, windshield, engine cover and fasteners, top cover and frame, to see if they are in good condition, correctly and securely assembled, and mounted. Be sure top and engine cover fasteners hold these units satisfactorily.

(11) LUBRICATE. Perform a complete lubrication of the vehicle, covering all intervals, according to the instructions on the Lubrication Guide, paragraph 27, except gear cases, wheel bearings, and other units covered in preceding procedures. Check all gear case oil levels, and add as necessary to bring to correct level. Change only if condition of oil indicates the necessity, or if gear oil is not of proper grade for existing atmospheric temperature. NOTE: *Perform items (12) to (15) during lubrication.*

(12) SPRINGS AND SUSPENSIONS. Examine track adjustment coil springs, suspension frame, bogie wheels, support roller, front axle assembly, and brackets, to be sure they are in good condition, correctly and securely assembled, or mounted. Look particularly for broken bogie frame, and front suspension welds.

(13) STEERING LINKAGE. Examine steering shaft, universal joint, all arms, rods, and connections to see that they are in good condition and secure, and that gear case is securely mounted, and not leaking excessively.

NEW VEHICLE RUN-IN TEST

(14) PROPELLER SHAFT. Inspect shaft and universal joints to see if they are in good condition, correctly assembled, alined, and secure, and that joints are not throwing excessive grease.

(15) AXLE VENT. Be sure rear axle housing vent is present, secure, and not clogged.

(16) CHOKE AND PRIMER. Examine choke to be sure it opens and closes fully in response to operation of choke button. If primer is used in starting engine, note if its action is satisfactory, and check for fuel leaks at primer pump or connections.

(17) ENGINE WARM-UP. Start engine and note if cranking motor action is satisfactory, and engine has any tendency toward hard starting. Set hand throttle to run engine at fast idle during warm-up. During warm-up, reset choke button so that engine will run smoothly, and to prevent overchoking and oil dilution. NOTE: *During freezing weather light engine heater according to instructions, paragraph 4.* After engine reaches normal operating temperature, shut off heater.

(18) INSTRUMENTS.

(a) Oil Pressure Gage. Immediately after engine starts, observe if oil pressure is satisfactory. (Normal operating pressure, hot, at running speed is 40 lb, at idle speed, 10 lb). Stop engine if pressure is not indicated in 30 seconds.

(b) Ammeter. Ammeter should show slight positive (+) charge. High charge may be indicated until generator restores to battery the current used in starting.

(c) Temperature Gage. Engine temperature should rise gradually during warm-up period to normal operating range, 160°F to 170°F.

(d) Fuel Gage. Fuel gage should register "FULL" if tank has been filled.

(19) ENGINE CONTROLS. Observe if engine responds properly to controls, and if controls operate without excessive looseness or binding.

(20) WINDSHIELD WIPER. Inspect wiper to see if all units are in good condition and secure, if arm operates properly through full stroke, and if blade contacts glass evenly and firmly.

(21) GLASS. Clean windshield glass and curtain windows, and inspect for damage.

(22) LAMPS (LIGHTS) AND REFLECTORS. Clean lenses and inspect all units for looseness and damage. If tactical situation permits, open and close all light switches to see if lamps respond properly.

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

(24) TOOLS AND EQUIPMENT. Check tools and on vehicle stowage lists, section IX, to be sure all items are present, and see that they are serviceable and properly mounted or stowed.

b. Run-in Test. Perform the following procedures, steps (1) to (11) inclusive, during the road test of the vehicle. On vehicles which have been driven 50 miles or more in the course of delivery from the supplying to the using organization, reduce the length of the road test

to the least mileage necessary to make observations listed below. CAUTION: *Continuous operation of the vehicle at speeds approaching the maximums indicated on the caution plate should be avoided during the test.*

(1) DASH INSTRUMENTS AND GAGES. Do not move vehicle until engine temperature reaches 135°F. Maximum safe operating temperature is 200°F. Observe readings of ammeter, oil, temperature, and fuel gages to be sure they are indicating the proper function of the units to which they apply. Also see that speedometer registers the vehicle speed, and that odometer registers accumulating mileage.

(2) FOOT BRAKES. Test service brakes, apply pedals together, evenly, to see if they stop vehicle effectively, without side pull, chatter, or squealing, and observe if pedals have ¾-inch free travel before meeting resistance. Test right and left brakes separately to see if they function properly.

(3) CLUTCH. Observe if clutch operates smoothly without grab, chatter, or squeal on engagement, or slippage (under load) when fully engaged. See that pedal has 2- to 2½-inch 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 until driven and driving disks have become properly worn in.*

(4) TRANSMISSIONS. Gearshift mechanism should operate easily and smoothly; gears should operate without unusual noise, and not slip out of mesh.

(5) STEERING. When front wheels are in use, observe steering action for looseness or binding, and note any excessive pull to one side, wander, shimmy, or wheel cramp. See that column, bracket, and wheel are secure. Any erratic or exceptionally difficult steering action when skis are mounted, should be investigated.

(6) ENGINE. Be on the alert for any abnormal engine operating characteristics or unusual noise, such as lack of pulling power or acceleration, backfires, misfiring, stalling, overheating, or excessive exhaust smoke. Observe if engine reponds properly to all controls.

(7) UNUSUAL NOISE. Be on the alert throughout road test for any unusual noise from body and attachments, running gear, suspensions, or wheels, that might indicate looseness, damage, wear, inadequate lubrication, or underinflated tires. If skis are in use, make applicable observations listed above.

(8) HALT VEHICLE AT 10-MILE INTERVALS FOR SERVICES IN STEPS (9) AND (10) BELOW.

(9) TEMPERATURES. Cautiously hand-feel each brake housing, front wheel hub (when in use), track sprocket, idler, bogie, and support roller hubs, for abnormal temperatures. Examine rear axle and transmission cases for indications.

(10) LEAKS. With engine running, and fuel, engine oil, and cooling systems under pressure, look within engine compartment and under vehicle for indications of leaks.

NEW VEHICLE RUN-IN TEST

c. Vehicle Publications and Reports.

(1) PUBLICATIONS. See that vehicle technical manuals, Lubrication Guide, Standard Form No. 26 (Driver's Report-Accident, Motor Transportation) and W.D. A.G.O. Form No. 478 (MWO and Major Unit Assembly Replacement Record), are in the vehicle, legible, and properly stowed. NOTE: *U.S.A. registration number and vehicle nomenclature must be filled in on Form No. 478, for new vehicles.*

(2) REPORTS. Upon completion of the run-in test, correct or report any deficiencies noted. Report general conditions of the vehicle to designated individual in authority.

Section XII

SNOW TRAILER, 1-TON, M19

40. ELECTRICAL SYSTEM.

a. Description. The electrical group of the trailer consists of the plug (to connect to tractor), main cable, dome light, and body outlet receptacles, dome lights, selector switch, right and left stop and taillight assemblies, and outlet receptacle (at rear of trailer), with the necessary wires and cables for operation of the above. The main wire loom is threaded through the tubular frame of trailer, on right side and across rear to left tail and stop light.

b. Selector Switch.

(1) DESCRIPTION. The selector switch, mounted on right side of trailer frame just ahead of right tail and stop light, is provided to regulate the trailer tail and stop lights separately from the prime mover. There are two positions marked on switch. The switch is covered against dirt by a small hinged cover.

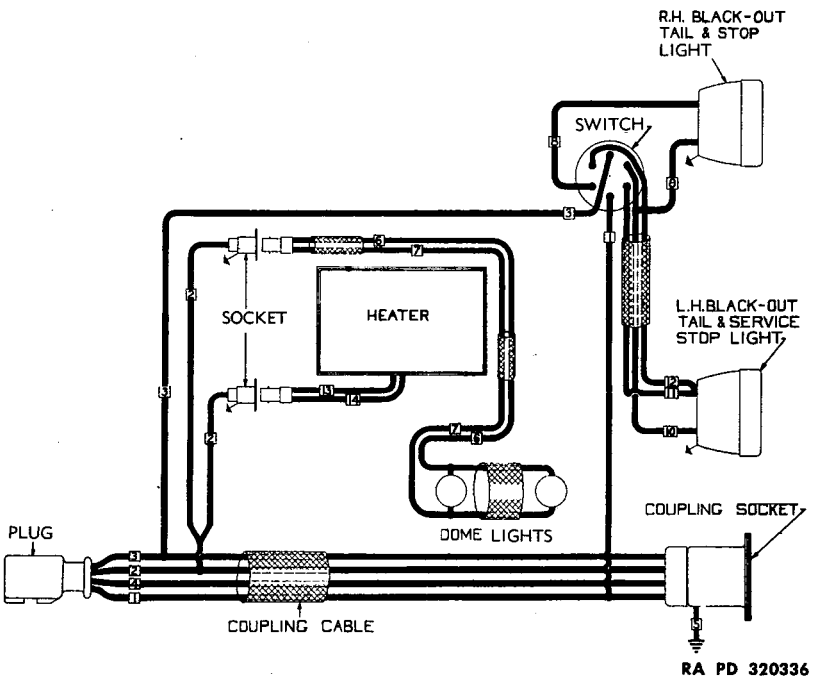


Figure 35—Trailer Wiring Diagram

(2) REPLACEMENT OF SELECTOR SWITCH. Remove three screws and lock washers holding selector switch to trailer frame. Disconnect wires from switch. Connect wires to replacement switch as they are disconnected from old switch, or refer to wiring diagram (fig. 35). Install switch, with hinge of cover to top, on frame with three screws and lock washers.

c. Trailer Outlet Socket.

(1) DESCRIPTION. The trailer outlet receptacle, located to right of pintle, is the same type as used on the tractor. It is for the purpose of connecting another M19 trailer in tandem.

(2) REPLACEMENT OF TRAILER OUTLET RECEPTACLE. Follow procedure outlined under paragraph 91 b for replacement.

d. Dome Light and Body Heater Receptacles.

(1) DESCRIPTION. The dome light and body heater receptacles are located on trailer frame at right-front corner. They are the plug-type receptacle.

(2) REPLACEMENT OF RECEPTACLES. Remove two screws and lock washers holding receptacle to trailer frame. Pull receptacle out of frame so that wires are exposed. Remove small screw holding insulated plug in receptacle. Pull plug from body of receptacle. Loosen countersunk screws in plug. Pull wires from plug. Reverse above for installation of replacement receptacle.

e. Dome Lights.

(1) DESCRIPTION. There are two dome lights, attached to the bows of trailer canopy support by clamps, in trailer body. The dome light switches are on the lights (one on each light).

(2) REPLACEMENT OF DOME LIGHT LAMP. Remove two screws holding lens door to light body, and remove door assembly. Remove lamp. Reverse procedure to install new lamp.

(3) REPLACEMENT OF DOME LIGHT ASSEMBLY. Remove two screws holding lens door to light. Remove door assembly. Remove two nuts and washers holding reflector and switch assembly to clamp bolts. Let reflector assembly hang on switch wires. Loosen removing nuts and washer on clamp screws enough so clamps can be rotated over bow. Disconnect ground wire from clamp bolt and wire from switch. Replace light using reverse procedure to above. Refer to wiring diagram (fig. 35).

f. Stop and Taillight Assemblies.

(1) DESCRIPTION. The right-hand tail and stop light is of the blackout-tail-and-stop-light type. The left-hand tail and stop light is the service tail and stop light and blackout taillight combined. Each light assembly is bolted to a bracket at rear corners of trailer frame.

(2) REPLACEMENT OF SEALED BEAM LAMP-UNITS. Loosen two nuts at rear of light, and raise from bracket. Remove two screws holding lens door to light body. Pull out defective sealed beam lamp-unit. Replace sealed beam lamp-unit with reverse procedure to above.

(3) REPLACEMENT OF LIGHT ASSEMBLY. Disconnect wire plugs from rear of light. Loosen nuts holding light assembly to bracket, and lift off light assembly.

g. Wiring.

(1) DESCRIPTION. The main wiring of the trailer consists of two wire looms, one from trailer supply plug to selector switch and trailer outlet receptacle, one from selector switch to left-hand service tail and stop light. A covered opening at each rear corner of trailer frame allows for installation of these looms.

(2) REPLACEMENT OF WIRE LOOMS. Remove selector switch (step **b** (2) above), dome light and body heater receptacles (step **d** (2) above), and trailer outlet receptacle (par. 91 **b**). Remove two small covers at rear corners of trailer frame. Remove plugs from tail and stop light assemblies, and remove plugs from wires. Remove two loom slips from drawbar. Secure a flexible wire to wire terminals at trailer outlet receptacle. Have one man pull on main loom at center of drawbar, at same time "feeding" wires around corner of frame through dome light receptacle opening in frame, while the other man watches wires at right rear opening of frame so they do not catch. This will remove rubber grommet at front of frame and underside of frame loom as it is exposed at front center hole of frame. Connect flexible wire to replacement loom. This wire will assist greatly in threading loom back through frame. Use same procedure on loom from selector switch to left tail and stop light assembly. Reverse procedure to connect wires to units, and install units and covers. Disconnect trailer plug from removed loom, and connect to replacement loom. See wiring diagram (fig. 35).

41. FRAME.

a. Description. The trailer frame is of the tubular-steel, all-welded type. The drawbar assembly is bolted to the front underside of frame. The wheel brackets, ski brackets, light brackets, and trailer outlet receptacle bracket are integral with frame. The pintle is bolted to rear of frame. The floorboard and floorboard strips are bolted to frame.

b. Replacement of Frame.

(1) REMOVAL.

(a) Remove canopy and support (par. 3 **c**).

(b) Remove wheel assemblies (par. 3 **d** (2)).

(c) Remove pintle assembly by removing two bolts.

(d) Remove electrical units and wires (par. 40 **g** (2)).

(e) Remove heater and heater base by removing six screws.

(f) Remove drawbar assembly (step **c** below).

(g) Remove all nuts and washers from bolts holding floorboard to frame. Remove bolts and two screws (one over each wheel bracket). Remove floorboard and floorboard strips.

(2) INSTALLATION. Reverse above procedure to install trailer frame.

SNOW TRAILER, 1-TON, M19

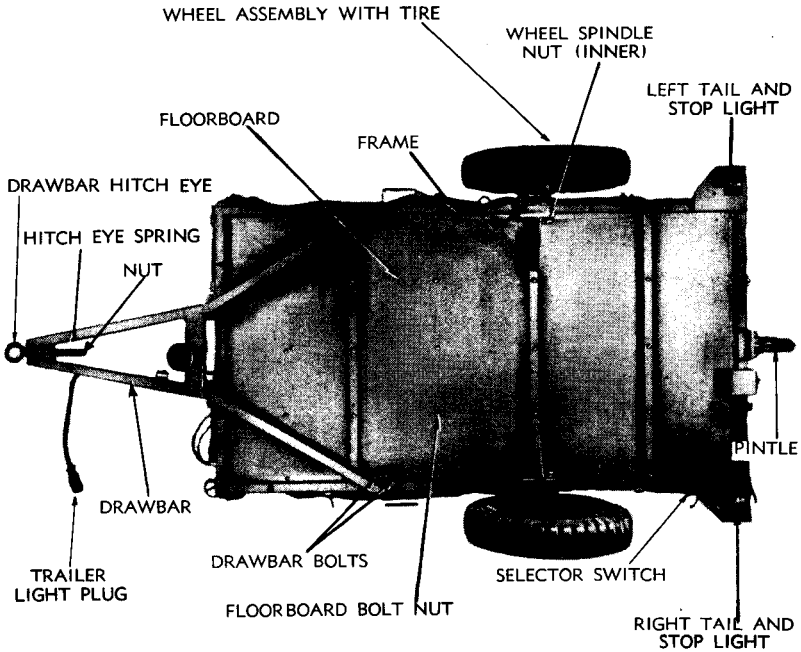


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Figure 36—Trailer, Bottom View

c. Replacement of Drawbar.

(1) REMOVAL. Block up under front corners of trailer frame to take weight of trailer from parking leg. Remove two cap screws and clips holding wire loom to drawbar. Remove eight bolts, nuts, and lock washers holding drawbar assembly to frame (fig. 36). Remove drawbar assembly. Remove cotter pin and castle nut from drawbar hitch eye. Remove spring, washer, and hitch eye. Remove parking leg by pulling out pin. Remove screw holding parking leg pin attaching chain to drawbar.

(2) INSTALLATION. Install replacement drawbar, using reverse procedure of removal.

d. Replacement of Pintle Assembly. Remove two bolts, nuts, and lock washers holding pintle assembly to rear of trailer frame. Remove pintle. Install replacement pintle assembly, using reverse procedure.

Section XIII

SECOND ECHELON PREVENTIVE MAINTENANCE

42. SECOND ECHELON PREVENTIVE MAINTENANCE SERVICES.

a. Regular scheduled maintenance inspections and services are a preventive maintenance function of the using arms, and are the responsibility of commanders of operating organizations.

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

(2) FIRST ECHELON PARTICIPATION. The drivers should accompany their vehicles and assist the mechanics while periodic second echelon preventive maintenance services are performed. Ordinarily the driver should present the vehicle for a scheduled preventive maintenance service in a reasonably clean condition; that is, it should be dry and not caked with mud or grease to such an extent that inspection and servicing will be seriously hampered. However, the vehicle should not be washed or wiped thoroughly clean, since certain types of defects, such as cracks, leaks, and loose or shifted parts or assemblies are more evident if the surfaces are slightly soiled or dusty.

(3) If instructions other than those contained in the general procedures in subparagraph (4) or the specific procedures in subparagraph (5) which follow, are required for the correct performance of a preventive maintenance service, or for correction of a deficiency, other sections of the vehicle Operator's Manual pertaining to the item involved, or a designated individual in authority, should be consulted.

(4) GENERAL PROCEDURES. These general procedures are basic instructions which are to be followed when performing the services on the items listed in the specific procedures. NOTE: *The second echelon personnel must be thoroughly trained in these procedures so that they will apply them automatically.*

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

(b) 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.

(c) The general inspection of each item applies also to any supporting member or connection, and usually includes a check to see

whether or not the item is in good condition, correctly assembled, secure, or excessively worn. The mechanics must be thoroughly trained in the following explanations of these terms.

1. The inspection for "good condition" is usually an external visual inspection to determine if the unit is damaged beyond safe or serviceable limits. The term "good condition" is explained further by the following: 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 usually an external visual inspection to see whether or not it is in its normal assembled position in the vehicle.

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

4. "Excessively worn" will be understood to mean close to, or beyond, serviceable limits, and likely to result in a failure if not replaced before the next scheduled inspection.

(d) 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:

1. Adjust. Make all necessary adjustments in accordance with the pertinent section of the vehicle operators manual, special bulletins, or other current directives.

2. Clean. Clean units of the vehicle with dry-cleaning solvent to remove excess lubricant, dirt, and other foreign material. After the parts are cleaned, rinse them in dry-cleaning solvent, and dry them thoroughly. Take care to keep the parts clean until reassembled, and be certain to keep dry-cleaning solvent away from rubber or other material that it would damage. Clean the protective grease coating from new parts, since this material is not usually a good lubricant.

3. Special lubrication. This applies either to lubrication operations that do not appear on the vehicle lubrication chart and to items that do appear on such charts but should be performed in connection with the maintenance operations if parts have been disassembled for inspection or service.

4. Serve. This usually consists of performing special operations, such as replenishing battery water, draining and refilling units with oil, and changing the oil filter cartridge.

5. Tighten. All tightening operations 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. Do not overtighten, as this may strip threads

or cause distortion. Tightening will always be understood to include the correct installation of lock washers, lock nuts, and cotter pins provided to secure the tightening.

(e) 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 week if possible. All available time at halts, and in bivouac areas, must be utilized, if necessary, to assure that maintenance operations are completed. When limited by the tactical situation, items with special services in the columns should be given first consideration.

(f) The numbers of the preventive maintenance procedures that follow are identical with 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 vehicle are not included in the procedures in this manual. 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.

(5) SPECIFIC PROCEDURES. The procedures for performing each item in the 1,000-mile (monthly) and 6,000-mile (6-month) maintenance procedures are described in the following chart. Each page of the chart has two columns at its left edge corresponding to the 6,000-mile and the 1,000-mile 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 number appears perform the operations indicated opposite the number.

ROAD TEST

MAINTENANCE	
6,000 Mile	1,000 Mile
1	1
3	3

NOTE: *When the tactical situation does not permit a full road test, perform those items which require little or no movement of the vehicle. When a road test is possible, it should be for preferably 4, and not over 6 miles.*

Before-operation Inspection. Perform this inspection as outlined in paragraph 22.

Dash Instruments and Gages.

OIL PRESSURE GAGE. Oil pressure should be 40 to 50 pounds at normal operating engine speed, and 10 pounds (minimum) at a slow idle (400 rpm), engine warm.

AMMETER. Ammeter should show high charge for short period after starting, until generator restores to batteries the current used in starting, and positive (+) reading above 10 to 12 miles per hour with lights and accessories off.

ENGINE TEMPERATURE GAGE. Gage should show gradual increase during warm-up; normal operating coolant temperature is 160°F to 170°F. CAUTION:

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
		Do not move vehicle until coolant temperature reaches 135°F. FUEL GAGE. With ignition switch at "ON" position, fuel gage should register approximate amount of fuel in tank. SPEEDOMETER. While vehicle is in motion, speedometer should register vehicle miles per hour, and odometer should record total accumulated mileage.
4	4	**Windshield Wiper.** Test operation of wiper motor. See that blade contacts glass evenly, and operates through its full range without indication of loose motor or arm mountings.
5	5	**Brakes (Braking Effect, Feel, Side Pull, Noise, Chatter, Pedal Travel).** Apply foot pedals together sufficiently to stop vehicle in minimum safe distance and observe their effectiveness, any pull to one side, any unusual noise, or chatter. Pedals should have about ¾-inch free travel before meeting resistance. Apply right and left brake separately by use of relative foot pedal, to test their efficiency.
6	6	**Clutch (Free Travel, Drag, Noise, Chatter, Grab, Slip).** Pedal free travel should be 2 to 2½ inches before meeting resistance. Test clutch for drag when shifting into low gear. Clutch should stop transmission entirely while vehicle is stationary, and shift should be made without clashing. Note any unusual noise when pedal is depressed which may indicate defective or dry release bearing. With transmission in gear, note any tendency of clutch to chatter or grab when engaged, or slippage when fully engaged under load. NOTE: *Never allow pedal free play to become less than ¾ inch.*
7	7	**Transmissions (Lever Action, Vibration, Noise).** Shift through entire range of both transmissions. Note whether levers move easily, if gears operate quietly and do not slip out of mesh during operation, and if there is any unusual vibration.
8	8	**Steering (Free Play, Bind, Wander, Shimmy, Side Pull, Column and Wheel).** With vehicle in motion, move steering wheel fully in both directions, and observe whether there is any indication of looseness or binding. When wheels are mounted, note any tendency of vehicle to wander, shimmy, or pull to one side. If skis are in use, observe if abnormal effort is required to steer tractor. See that steering column and wheel are in good condition and secure.
9	9	**Engine (Idle, Acceleration, Power, Noise, and Governed Speed).** Observe engine operating characteristics as follows: IDLE. Engine should idle smoothly without stalling.

MAINTENANCE 6,000 Mile	MAINTENANCE 1,000 Mile	
		UNUSUAL NOISES. Listen for knocks and rattles as the engine is accelerated and decelerated, and while it is under both light and heavy loads.
		ACCELERATION AND POWER. Operate the engine at various speeds in all gear ratios, noting if the vehicle has normal pulling power and acceleration. Note any tendency to stall while shifting. A slight ping during fast acceleration is normal. Continued or heavy ping may indicate early timing, or heavy accumulation of carbon.
		GOVERNED SPEED. With the vehicle in a low gear, slowly depress the accelerator to the toeboard, and by observing the speedometer reading, see if the vehicle reaches, but does not exceed, the governed speed specified on the caution plate.
10	10	**Unusual Noises (Attachments, Cab, Body, Wheels or Skis).** Be on the alert during road test for any noise that may indicate loose or damaged attachments mounted on tractor, loose cab mountings, floor plates, doors, windshield, or hardware. Listen particularly for indications of loose track, and wheel or ski mountings. With trailer connected and in motion, have assistant listen for any unusual noise on trailer from attachments, axles, suspension units, wheels, or skis.
13	13	**Temperatures (Brake Housings, Hubs, Axles, and Transmissions).** At completion of run, feel brake housings and all hubs of both tractor and trailer for abnormally high or low temperatures. Cautiously, feel axle and transmissions for overheating.
14	14	**Leaks (Engine Oil, Water, Fuel).** Inspect engine compartment and under vehicle for oil, fuel, and water leaks.
		MAINTENANCE OPERATIONS
		Raise Tractor—Block Safely
16	16	**Gear Oil Level and Leaks.** Remove plugs and inspect rear axle and transmission to see if lubricant is at proper level, in good condition, and not leaking excessively at seals or gaskets. Add oil as necessary. NOTE: *Safe level is from lower edge of filler holes to ½ inch below.* If change of lubricant is due, or condition warrants, drain and refill units according to instructions in Lubrication Guide, paragraph 27.
17	17	**Unusual Noises (Engine, Belt, Accessories, Transmissions, Transfer, Shafts and Joints, Axles, and Track Bearings).** With engine running, observe as follows:
		ENGINE, BELT, AND ACCESSORIES. Accelerate and decelerate the engine momentarily, and listen for any unusual noise in these units that might indicate dam-

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile

aged, loose, or excessively worn engine parts, drive belt, or accessories. Also be sure to locate and correct or report any unusual engine noise heard during the road test.

TRANSMISSION, PROPELLER SHAFTS AND JOINTS, AXLES, AND TRACK BEARINGS. With the transmission in an intermediate gear, operate these units at a constant, moderate speed by use of the hand throttle, and listen for any unusual noise that might indicate damaged, loose, or excessively worn unit parts. Also observe all propeller shafts for vibrations and run-out, and for vibrations in the other units which may indicate looseness or unbalance. Rotate tractor and trailer wheels (if mounted) and note any run-out or noise that may indicate loose or damaged bearings. Also be sure to locate, correct, or report any noise noted during road test.

18	18

Cylinder Head and Gasket. Look for cracks or indications of oil, coolant, or compression leaks around studs, cap screws, and gasket. CAUTION: *Cylinder head should not be tightened unless there is definite evidence of leaks.* If tightening is necessary, use torque-indicating wrench, and tighten head nuts and cap screws in the proper sequence (fig. 45). Tighten cap screws to 65 to 70 foot-pounds, nuts to 55 to 60 foot-pounds.

	19

Valve Mechanism (Clearances, Cover Gasket). Adjust tappet clearances only when necessary as indicated by valve noise or faulty engine performance.

19	

ADJUST. Adjust the clearance to 0.014 inch (cold), on both the exhaust and intake valves. Make sure lock nuts are secure when clearances are last checked. Replace unserviceable valve cover gaskets.

22	22

Battery (Cables, Hold-downs, Carrier; Record Gravity and Voltage). Clean battery; inspect for leaks; test and record specific gravity and voltage on each cell. Reddish-brown discoloration of electrolyte may indicate overcharge due to improper regulator action. Inspect cables, bolts, and nuts for good condition. Lightly grease and tighten terminals, posts, and bolts. Tighten hold-downs. If carrier is corroded, remove battery, clean, and repaint carrier. Make a high-rate discharge test according to instruction with test instrument, and record on back of Form No. 461. A true test cannot be made if specific gravity is below 1.225. If difference in reading between cells of each battery is more than 30 percent, report. Fill to correct level with distilled or pure water.

	20

Spark Plugs. Inspect installed plugs to see that insulators are in good condition and wiped clean. Make sure there are no leaks around insulators or gaskets.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

MAINTENANCE		
6,000 Mile	1,000 Mile	
		NOTE: *When faulty performance indicates need, remove plugs and inspect broken insulators, excessive carbon, burned electrodes, and wide gaps.* Replace unserviceable plugs. Correct gap to 0.030 inch. Report excessive deposits or damaged insulators as these conditions may indicate incorrect heat range.
20		SERVE. Clean deposits from electrodes and insulators, and inspect for cracks. Use cleaner if available; if not, install new or reconditioned plugs. Adjust gap to 0.030 inch. After completing item 21, install plugs, using new gaskets. Do not overtighten.
21		**Compression Test.** With all plugs out, place gage in spark plug hole and with throttle wide open, rotate engine with cranking motor. Test each cylinder. (There should not be over 20 pounds variation between cylinders.) Record reading on W.D. AGO Form No. 461. Normal compression pressure is 119 pounds.
23	23	**Crankcase (Leaks, Oil Level).** With engine idling, observe crankcase, valve covers, timing gear covers, and clutch housing for oil leaks. Stop engine, and after oil has drained into crankcase, see if oil registers "FULL" on bayonet gage. Add oil to proper level. When an oil change is due, or condition warrants, drain and refill according to Lubrication Guide, paragraph 27. Do not start engine until item 24 is completed.
24	24	**Oil Filters, and Lines.** Inspect oil filters and lines for good condition, secure mounting, and leaks.
	24	SERVE. Drain filter sediment bowl.
24		SERVE. If filter element change is due or condition warrants, service filter according to Lubrication Guide, paragraph 27.
25	25	**Radiator (Core, Shell, Mountings, Hose, Cap and Gasket, Antifreeze Record, Overflow Pipe).** Inspect all applicable items to see if they are in good condition, secure, and not leaking. Be sure overflow pipe is not kinked or clogged. Examine condition of coolant to see if it is contaminated to the extent that cooling system should be cleaned. If cleaning is necessary, proceed only according to current directives covering proper procedure, using recommended cleaner neutralizer and inhibitor materials. Clean all insects, dirt, or grease deposits from core air passages, and inspect for bent cooling fins. CAUTION: *Use only a suitably shaped piece of wood or blunt instrument to straighten fins.* If antifreeze is in use, test its protective value, and record in space provided on back of work sheet Form No. 461.
25		TIGHTEN. Carefully tighten all loose radiator mountings, water connections, and hose clamps.
26	26	**Water Pump, Fan, and Shroud.** Inspect pump to see if it is in good condition, secure, and not leaking.

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
		Examine shaft for end play or bearing looseness. Inspect fan to see if it is in good condition, and that blades and hub are secure. Loosen drive belt, and examine fan for hub or bearing wear. Leave drive belt loose until adjustment is made (item 29). TIGHTEN. Carefully tighten water pump, fan and shroud, and assembly and mounting nuts.
27	27	**Generator, Cranking Motor, and Switch.** Inspect generator, cranking motor, and cranking motor switch to see that they are in good condition, securely mounted, and that wiring connections are clean and secure.
27		Remove generator and cranking motor inspection covers, and examine commutators and brushes to see if they are in good condition and clean; if brushes are free in brush holders, and have sufficient spring tension to hold them in proper contact with commutators; and if brush connection wires are secure and not grounding.
27		CLEAN. Blow out commutator end of generator and cranking motor with compressed air. If commutators are dirty, clean only with flint paper 2/0 (do not use emery) placed over end of suitable wood block and again blow out with air.
27		TIGHTEN. Carefully tighten cranking motor mounting bolts securely.
29	29	**Drive Belt and Pulleys.** Examine drive belt for evidence of fraying condition, excessive wear, and deterioration. Inspect drive pulleys and hubs to see if they are in good condition and securely mounted. ADJUST. Set adjustment so drive belt has ½-inch finger-pressure deflection.
31	31	**Distributor (Cap, Rotor, Points, Shaft, Advance Units).** Observe if distributor body and external attachments are in good condition and secure. Examine other parts as follows: CAP, ROTOR, AND POINTS. Clean dirt from cap and remove. Inspect cap, rotor, and breaker plate to see if they are in good condition, secure, and serviceably clean. Pay particular attention to cracks in cap and rotor, corrosion of terminals and connections, and to burned rotor bar or contact points. See that points are well alined and adjusted to 0.020 inch when wide open. If inside of distributor is dirty, remove assembly, clean in dry-cleaning solvent, dry thoroughly with compressed air, and lubricate its friction parts very lightly. When cleaning remove wick and lubrication cup, and clean them; reoil and replace after cleaning distributor. If breaker points are pitted, burned, or worn to an unserviceable degree, replace. Also replace condenser if points are pitted, as this may be the cause. When

MAINTENANCE		
6,000 Mile	1,000 Mile	
		cleaning points, use fine file or flint paper 2/0 (never use emery) and blow out filing with compressed air.
		SHAFT. Test shaft by hand-feel for excessive wear in shaft or bushings.
		CENTRIFUGAL ADVANCE. Install rotor on shaft, and test distributor governor by finger-force for normal range of movement permitted by mechanism. Note if it will return to original position when released without hang up or binding.
31	31	SPECIAL LUBRICATION. Lubricate cam surfaces, breaker arm pin, and wick according to Lubrication Guide instructions.
31		ADJUST. Set breaker point gaps to 0.020 inch.
32	32	**Coil and Wiring.** Inspect coil, ignition wiring, and conduits to see if they are in good condition, clean, securely connected, and properly mounted. Inspect all low voltage wiring in engine compartment in like manner.
33	33	**Manifolds and Heat Control.** Inspect manifolds for looseness, damage, or exhaust leaks at gaskets. Look for evidence of cracks or sand holes, usually indicated by carbon streaks. See if heat control valve and bimetal spring are securely assembled and operate freely.
33		TIGHTEN. Carefully tighten all manifold assembly and mounting nuts securely.
34	34	**Air Cleaner.** Inspect carburetor air cleaner to see if it is in good condition, securely mounted and connected, and not leaking. Clean and service according to Lubrication Guide instructions, paragraph 27. Be sure gaskets are in place, and that all joints and air hose connections are tight.
35	35	**Breather Cap.** See that crankcase breather cap is in good condition, secure, and not leaking. Clean and service according to Lubrication Guide instructions, paragraph 27.
36	36	**Carburetor (Choke, Throttle, Linkage).** See if these items are in good condition, correctly assembled, and securely installed; that carburetor does not leak; that control linkage, including choke and throttle shaft, is not excessively worn; if choke valve opens fully when the control is in its released position; if throttle valve opens fully when the accelerator is fully depressed.
38	38	**Fuel Pump (Pressure).** Inspect pump to see if it is in good condition, securely mounted, and not leaking. Remove sediment bowl and screen, and carburetor inlet screen, and wash in dry-cleaning solvent. Be sure gasket is in place and serviceable when bowl is reinstalled.
38		Attach a test gage to pressure side of fuel pump, and after starting engine (in item 39), see that pressure is

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE		
6,000 Mile	1,000 Mile	
		satisfactory. There should be 2½-pound minimum pressure, and 4-pound maximum pressure at idle speed.
39	39	**Cranking Motor (Action, Noise, Speed).** Start engine, observing if general action of cranking motor is satisfactory, particularly that it engages and operates properly without excessive noise, and has adequate cranking speed; and if the engine starts readily. Also, as soon as engine starts, note whether oil pressure gage and ammeter indications are satisfactory.
40	40	**Leaks (Engine Oil, Fuel, and Water).** With engine running, recheck all points of oil, fuel, and cooling systems for leaks. Trace any found to source, and correct or report them to designated authority.
41	41	**Ignition Timing (Advance).** With engine running, and a neon timing light connected, observe if ignition timing is correct. See paragraph 82. Also note whether or not automatic controls advance the timing as engine is accelerated gradually.
41		ADJUST. Adjust ignition timing to specifications in paragraph 82.
42	42	**Engine Idle and Vacuum Test.** Inspect as follows: ADJUST. Connect a vacuum gage to intake manifold, adjust engine to its normal idle speed by means of throttle stop screw, and then adjust the idle-mixture adjusting needle until vacuum gage indicates a steady maximum reading. If these latter adjustments are made simultaneously, time will be saved.
42	42	VACUUM TEST. With the engine running at normal idling speed, vacuum gage should read about 18 to 21 inches, and pointer should be steady. A badly fluctuating needle between 10 and 15 inches may indicate a defective cylinder head gasket or valve. An extremely low reading may indicate a leak in intake manifold or gasket. Accelerate and decelerate engine quickly. If vacuum gage indicator fails to drop to approximately 2 inches as throttle is opened, and then fails to recoil at least 24 inches as throttle is closed, it may be an indication of diluted oil, poor piston ring sealing, or abnormal restriction in carburetor, air cleaner, or exhaust. NOTE: *Above readings apply to sea level. There will be approximately a 1-inch drop for each 1000 feet of altitude.*
43	43	**Regulator Unit (Connections, Voltage, Current, and Cut-out).** Inspect regulator unit to see if it is in good condition, securely mounted, connected, and clean.
43		TEST. Connect a low-voltage circuit tester and observe if voltage regulator, current regulator, and cut-out,

MAINTENANCE 6,000 Mile	MAINTENANCE 1,000 Mile	
		control generator output properly. Follow instructions in vehicle manual, or those which accompany test instrument. Replace if test shows faulty operation. CAUTION: *This test should be made only after regulator unit has reached normal operating temperature.*
47	47	**Tires and Rims (Valve Stems and Caps, Condition, Direction, Matching Spare Carrier).** Inspect both tractor and trailer tires as follows:
		VALVE STEMS AND CAPS. Observe if all valve stems are in good condition and in correct position, and if all valve caps are present and installed securely. Do not tighten with pliers.
		CONDITION. Examine all tires for cuts, bruises, breaks, and blisters. Remove imbedded glass, nails, and stones. Look for irregular tread wear, watching for any sign 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 should be determined, and corrected or reported to proper authority. Wheel positions of tires with irregular wear should be changed to even up wear.
		DIRECTION. Directional tires and non-directional tires should not be installed on same vehicle. Directional tires on all front wheels and trailer wheels will ordinarily be mounted so that "V" of chevrons will point up when viewed from front of vehicle.
		MATCHING. With tires properly inflated, inspect them to see if they are matched according to over-all circumference and type of tread.
		SPARE TIRE CARRIER. See whether or not spare tire carrier is in good condition and secure.
47		TIGHTEN. Tighten all wheel mounting nuts securely.
	47	SERVE. With tractor tires properly inflated to 18 pounds and trailer tires to 35 pounds (cool), check over-all circumference of all tires including spares. Difference must not exceed ¾ inch. NOTE: *Spares must be matched properly, and mounted for use on one of the road wheels at intervals not exceeding 90 days. A convenient time to do this is during these maintenance services.*
		ITEMS SPECIAL TO HALF-TRACKS 106 TO 115
106	106	**Tracks (Guides, Tread Wear).** Inspect tracks to see if they are in good condition, in proper position on sprockets and rollers, and make sure that their guides

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
		are all present, secure, and not excessively worn. Remove objects lodged in tracks or between tracks and suspension units.
106		NOTE: *On 6000-mile service, items 107 to 115 are group services.* Tracks should be removed, and reinstalled after the related items have been completed in best sequence for economy of time and orderly reassembly.
107	107	**Sprockets (Flanges, Bearings, Seals).** Examine axle sprockets and track drive sprockets to see if they are in good condition, secure, or excessively worn, Examine drive chains for damage and excessive wear, be sure they are adjusted to have approximately ½-inch slack midway between drive and track sprockets.
107		CLEAN. Disassemble and clean sprocket hubs and ball bearings. Inspect balls and races to see if they are in good condition.
107		SPECIAL LUBRICATION. After subsequent related items are completed to a point where sprocket bearings are ready for reassembly, lubricate bearings according to Lubrication Guide, paragraph 27. Use new oil seals if necessary.
107		ADJUST. As they are assembled, adjust sprocket bearings according to instructions, paragraph 114.
107	107	TIGHTEN. Draw up all sprocket assembly and mounting nuts securely.
108		**Brake (Housings, Drums).** Remove brake housing flanges. Inspect housings and drums to see if they are in good condition, and if drums are scored or excessively worn.
		TIGHTEN. Draw up all brake support and drum mounting nuts securely.
109		**Brake Shoes (Linings, Anchors, Springs).** Examine linings to see if they are so worn that rivet heads may contact drums within next 1000 miles of operation; that they are in good condition, tightly secured to shoes, and in good wearing contact with drums. See that shoes are in good condition, properly attached to anchors and retracting springs, and if spring tension is sufficient to return shoes to "OFF" position when pressure is released.
		CLEAN. Clean linings thoroughly with wire brush, clean cloth, or compressed air.
		ADJUST. After related items to 114 are completed, adjust brake rods according to instructions, paragraph 121.
110	110	**Idlers (Flanges, Bearings).** Inspect idler wheels to see if they are in good condition, secure, and for excessive leaks at oil seals.
110		CLEAN. Disassemble idler bearings, and clean thor-

MAINTENANCE	
6,000 Mile	1,000 Mile
110		oughly with dry-cleaning solvent. Inspect balls and races to see if they are in good condition and not excessively worn.
110		SPECIAL LUBRICATION. Lubricate according to Lubrication Guide, paragraph 27.
110		ADJUST. Assemble and adjust bearings according to instructions, paragraph 118.
110		TIGHTEN. Draw up all idler wheel assembly and mounting nuts securely.
111	111	**Idler (Shafts, Arms, Adjuster Rods, and Springs).** See that these items are in good condition, correctly assembled, and secure.
112	112	**Bogie Frame.** Inspect frame assemblies to see if they are in good condition and secure. Look particularly for broken assembly welds.
112		TIGHTEN. Draw up all bogie frame assembly nuts, screws, or loose rivets securely.
114	114	**Bogie Rollers: Upper and Lower (Tires, Bearings, and Bolts).** Observe whether the upper rollers and brackets, and the lower rollers and tires, are in good condition, correctly alined with the track, and secure. See that the tires are secure on the lower rollers and not excessively worn. Pay particular attention to cuts or gouged spots in the tires, and also see that the lubricant is not leaking excessively from the seals.
114		CLEAN. Remove and clean bogie lower rollers and bearings in dry-cleaning solvent and inspect bolts, balls, and races for damage or excessive wear.
114		SPECIAL LUBRICATION. Lubricate bogie roller bearing according to Lubrication Guide, paragraph 27, and reassemble.
115	115	**Track Tension.** Adjust track tension according to instructions, paragraph 113.
115		At 6000-mile inspection, make above adjustment after reassembly of track and suspension system, after lowering vehicle to ground.
55	55	**Steering Knuckles.** Inspect pivot pins and bushings to see if they are in good condition, secure, and not excessively worn.
57	57	**Steering (Arms, Tie Rod, Drag Link, Gear, Column, Universal Joint, and Wheel).** See if these items are in good condition, correctly and securely assembled and mounted, if steering gear case is leaking lubricant, and if lubricant is at proper level. Pay particular attention to Pitman arm to see if it is securely mounted and not bent out of its normal shape.
57		TIGHTEN. Tighten Pitman arm shaft nut and steering gear case mounting and assembly nuts securely.
60	60	**Front Wheels and Trailer Wheels (Bearings, Seals,**

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE		
6,000 Mile	1,000 Mile	
	60	Rims, and Mounting Nuts). Inspect tractor front wheels and trailer wheels to see if they are in good condition and securely mounted.
		Rotate wheels and note any excessive run-out, or noise that might indicate dry or damaged bearings.
60		CLEAN. Disassemble tractor front wheels and trailer wheels. Clean bearings and hubs in dry-cleaning solvent, and inspect them for excessive wear or damage. Be sure seals are serviceable.
60		SPECIAL LUBRICATION. Lubricate wheel bearings according to Lubrication Guide, paragraph 27.
60		ADJUST. Reassemble and adjust wheel bearings according to instructions, paragraph 117.
61	61	**Front Axle and Trailer Axles.** Inspect these units to see if they are in good condition, correctly and securely assembled, and mounted. Include tractor front axle radius rods, and look particularly for broken assembly welds.
63	63	**Engine Mountings.** Examine front and rear engine mountings to see if they are in good condition and secure.
65	65	**Clutch Pedal (Free Travel, Linkage, Return Spring).** Check pedal free travel; should be 2 to 2½ inches before meeting resistance. Examine to see if pedal is securely mounted to shaft, if clutch operating linkage is in good condition, secure, and not excessively worn at friction joints. See if return spring has proper tension to bring pedal to correct released position.
65		ADJUST. Adjust clutch pedal free travel to 2 to 2½ inches.
66	66	**Brake Pedals (Free Travel, Linkage, Return Spring).** See that pedals operate freely, and have ¾-inch free travel. Examine brake linkage to see if it is in good condition, secure, and not excessively worn; and see that return spring has sufficient tension to return pedals to "OFF" position when foot pressure is released.
71	71	**Transmissions (Mountings, Seals, Linkage).** Note if transmission cases are in good condition, securely mounted, and inspect for lubricant leaks at seals and gaskets. Examine control linkage and shaft mechanism for damage or excessive wear.
71		TIGHTEN. Tighten mountings securely.
73	73	**Propeller Shaft (Joints, Alinement, Flanges).** See if these items are in good condition, correctly and securely assembled and mounted; if universal joints are properly alined, and not excessively worn; and if there are excessive lubricant leaks.
73		TIGHTEN. Draw up all universal joint and companion flange nuts securely.
75	75	**Rear Axle (Pinion End-play, Seals, and Vent).**

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

MAINTENANCE		
6 000 Mile	1,000 Mile	
		Examine axle housing to see if it is in good condition and not leaking. Inspect pinion shaft for end-play, and seals for leaks.
		CLEAN. Clean out vent passage.
79	79	**Body Mountings.** Inspect all tractor and trailer body mountings to see if they are in good condition and secure. Tighten loose mounting nuts or screws securely.
80	80	**Frame (Side and Cross Members).** Inspect both tractor and trailer frames, brackets, side rails, and cross members to see if they are in good condition, secure, and correctly alined. If the frame appears to be out of line, report condition.
81	81	**Wiring, Conduit, and Grommets.** Observe these items on both tractor and trailer to see if they are in good condition, properly supported, connected, and secure.
82	82	**Fuel Tank, Fittings, and Lines.** Inspect fuel tank to see if it is in good condition and securely mounted. Examine cap for defective gasket or plugged vent. See that filler neck is in good condition, and that cap fits securely; include engine heater fuel system.
82		Remove fuel tank drain plug, and drain off accumulated water and dirt in bottom of tank. Drain only until fuel runs clear. Use necessary precautions against fire.
84	84	**Exhaust Pipes and Muffler.** Examine exhaust pipe to see if it is securely attached to exhaust manifold, that gasket or packing does not show visible evidence of leakage, and that the other end of exhaust pipe is clamped securely to muffler. Inspect muffler to see if it is in good condition and securely mounted. Check tail pipe to see if it is securely clamped to muffler, properly supported, and unobstructed at its outer end. See that drain holes in muffler are at lowest point and not clogged.
85	85	**Vehicle Lubrication.** If due, lubricate all points of vehicle in accordance with instructions in vehicle Lubrication Guide, current lubrication bulletins or directives, and the following instructions: Use only clean lubricant. Keep all lubricant containers and dispensers covered, except when withdrawing lubricant. Lubrication of items on the "Preventive Maintenance Service and Technical Inspection Work Sheet" that are marked with an "L" (special lubrication symbol) should be omitted on this vehicle lubrication service with the exception of the external lubrication cup of the distributor. This will avoid duplication, and in some cases, overlubrication. If lubrication fittings, vents, or plugs are found to be missing or damaged, they should be replaced immediately. Clean hole in which new fitting is to be installed; install fitting, and

MAINTENANCE 6,000 Mile	MAINTENANCE 1,000 Mile	
		then lubricate the unit. Open any clogged lubrication passages or pressure fitting holes, until lubricant is properly delivered. The correct "COLD" oil level in axles and transmission is from ½ inch below, to lower side of filler plug hole. CAUTION: *Do not fill to overflowing.* Reinstall all drain and filler plugs securely. Make sure that any required gaskets are in good condition and in place on the reinstalled plugs. Do not apply more than the specified amount of lubricant to generator, cranking motor, distributor, or water pump. Wipe off excess lubricant that may drip onto brakes and rubber parts, or detract from vehicle's appearance.
		LOWER VEHICLE TO GROUND
89	89	**Tractor-to-Trailer Wiring and Connections.** Check all wiring and connections to see that they are in good condition, clean, and securely fastened to clips, springs, and brackets so that they will not chafe or interfere with working parts.
91	91	**Lamps (Lights) (Head, Tail, Stop, and Blackout).** Operate all tractor and trailer switches, and note if lights operate properly. (Include stop and blackout lights). See if dimmer switch controls headlight beams properly, and if beams are aimed so as not to blind oncoming traffic. Examine all tractor and trailer lights to see if they are in good condition and securely mounted, and if lenses are dirty.
91		ADJUST. Adjust lamp-unit beams.
92	92	**Safety Reflectors.** See if safety reflectors are all present, on both tractor and trailer, in good condition, clean, and secure.
93	93	**Front Tow Loops.** See that tow loops on front of tractor, under frame, are present and secure.
94	94	**Hood and Fasteners.** Inspect hood and hood straps and fasteners to see if they are in good condition, and that hold-down straps will fasten securely.
96	96	**Bodies.** Inspect tractor and trailer bodies, hardware, glass, seats, tops and frames, curtains and fasteners, floorboards, and stowage compartments, to be sure applicable items are in good condition, correctly assembled or stowed, and secure.
98	98	**Circuit Breakers.** See that circuit breakers are clean, securely mounted, and properly connected.
101		**Pintle Hooks.** Examine pintles on tractor and trailer to see if they are in good condition and securely mounted to frame. Test pintle and latch to see if they operate properly, are adequately lubricated, and if lock pin is present and securely attached by chain. Pay particular attention for broken spring or worn drawbar.
103	103	**Paint and Markings.** Examine paint of entire tractor

MAINTENANCE	
6,000 Mile	1,000 Mile

and trailer to see if it is in good condition, paying particular attention to any bright spots in finish that might cause glare or reflection. Inspect vehicle markings and identification for legibility. Include identification plates and their mountings if furnished.

104 | 104 **Radio Bonding (Suppressors, Filters, Condensers, and Shielding).** See if all bonding connections are in good condition, clean, and secure, and note if all items are securely mounted. NOTE: *Any irregularities, except cleaning and tightening, should be reported to signal corps personnel.*

ITEMS SPECIAL TO TRAILER

124 | 124 **Tow Hitch.** Inspect tongue and lunette to see if they are in good condition and securely assembled and mounted.

127 | 127 **Landing Gear.** Inspect front support leg to see if it is in good condition and secure; if pins are present and secured by chains.

TOOLS AND EQUIPMENT

131 | 131 **Tools (Vehicle and Pioneer).** Examine standard vehicle and pioneer tools to see if all items are present (see on vehicle stowage lists, pars. 28-33) in good condition, clean, and properly and securely stowed. See that all trailer items of special heater or ambulance equipment is in correct position and secure.

132 | 132 **Fire Extinguisher.** See if it is in good condition, securely mounted, and fully charged. The charge may be determined on gas-type extinguisher by weighing with a scale, and on liquid-type by shaking. Also be sure nozzle is free from corrosion.

133 | 133 **Decontaminator.** Check to see that decontaminator is in good condition, securely mounted, fully charged, and nozzle free and clean.

134 | 134 **First Aid Kit (if specified).** See if it is in good condition, and that all of its items are present and properly packed. Report any deficiencies immediately.

135 | 135 **Publications and Form No. 26.** The tractor, trailer, and equipment manuals, Lubrication Guides, and Standard Form No. 26 (Accident Report Form) should be present, legible, and properly stowed.

137 | 137 **Tow (Chains, Cables, Bar, Rope, Snatch Blocks).** See if the provided towing devices are in good condition, clean, and properly stowed. Tow chains or cables should be properly protected against rust when not in use. If snatch blocks are furnished, check to see that they operate freely.

139 | 139 **Spare Fuel Can and Bracket.** See that fuel can and

SECOND ECHELON PREVENTIVE MAINTENANCE

MAINTENANCE	
6,000 Mile	1,000 Mile
141	141
142	142

bracket are in good condition and secure; that can is not leaking, and that cap fits properly and is secured by chain.

Modifications (FSMWO'S Completed). Inspect vehicle to determine if all Modification Work Orders have been completed and entered on W.D., A.G.O. Form 478. Enter any replacement of major unit assemblies at time of this service.

Final Road Test. Make a final road test, rechecking applicable items 2 to 15 inclusive; also be sure to recheck the transmission and axle to see that the lubricant is at the correct level and not leaking. Confine this road test to the minimum distance necessary to make satisfactory observations. NOTE: *Correct or report to designated authority all deficiencies found during final road test.*

Section XIV

TROUBLE SHOOTING

43. GENERAL.

a. This section contains trouble shooting information and tests which can be made to help determine the causes of some of the troubles that may develop in tractors used under average climatic conditions (above 32°F). Each symptom of trouble given under the individual unit or system is followed by a list of possible causes of the trouble. The tests necessary to determine which one of the possible causes is responsible for the trouble are explained after each possible cause.

44. ENGINE.

a. Engine Will Not Turn.

(1) CRANKING MOTOR INOPERATIVE. See paragraph 45.

(2) INCORRECT OIL VISCOSITY. Drain and refill with proper grade of oil.

b. Engine Turns But Will Not Start.

(1) INOPERATIVE FUEL SYSTEM. Open fuel valves, remove outlet line at the fuel pump, and, with the ignition switch "OFF," turn the engine with the cranking motor. If free flow of fuel is not evident, fuel is not reaching carburetor. See paragraph 48.

(2) INOPERATIVE IGNITION SYSTEM. Turn on ignition switch. Remove a cable from a spark plug, hold cable terminal ¼ inch from the cylinder casting, and crank the engine. If a spark does not jump the ¼-inch gap, the ignition is inadequate. See paragraph 46.

(3) SLOW CRANKING SPEED. See paragraph 45.

c. Engine Does Not Develop Full Power.

(1) IMPROPER IGNITION. See paragraph 46.

(2) ENGINE TEMPERATURE TOO HIGH. See paragraph 50.

(3) IMPROPER VALVE ADJUSTMENT. Check clearance and adjust if necessary (par. 58).

(4) IMPROPER FUEL. See paragraph 7 for fuel specifications.

(5) PREIGNITION. If the proper octance fuel is being used, and the ignition system is functioning satisfactorily, spark plugs of improper heat range may be a cause of trouble; otherwise, internal engine troubles would be indicated. Notify higher authority.

(6) AIR LEAKS AT CARBURETOR OR MANIFOLD FLANGES. With engine running at 800 revolutions per minute, apply a small amount of oil at carburetor gaskets and manifold flanges. If oil is sucked in, there is evidence of a leak. Notify higher authority.

(7) LOW ENGINE COMPRESSION OR IMPROPER VALVE TIMING. If the engine does not develop full power with fuel reaching the combustion chamber, adequate ignition and sufficient oil in the engine lubricating system, low compression or improper valve timing would be indicated. Notify higher authority.

d. Engine Misfires.

(1) FAULTY IGNITION SYSTEM. See paragraph 46.

(2) LOW ENGINE COMPRESSION.

(3) INCORRECT CARBURETOR ADJUSTMENT. Adjust carburetor par. 68 b (3)).

(4) CLOGGED FUEL TANK CAP VENTS. Open vents or replace cap.

(5) RESTRICTED FUEL FLOW. See paragraph 48.

(6) WATER IN FUEL. Remove drain plug at the bottom of the carburetor and inspect for water.

e. Excessive Oil Consumption.

(1) OIL VISCOSITY TOO LOW. Drain and refill with proper grade of oil.

(2) EXTERNAL OIL LEAKS. Inspect for external oil leakage at oil line connections.

f. Engine Will Not Stop.

(1) DEFECTIVE IGNITION SWITCH. See paragraph 46 a (1).

(2) OVERHEATED COMBUSTION CHAMBERS. Check engine temperature gage for evidence of high temperature. Remove obstructions from the radiator air intake grille or core passages between fins.

45. STARTING SYSTEM.

a. Cranking Motor Will Not Operate.

(1) BATTERY RUN DOWN. Test battery with a hydrometer (par. 84 c). If this test indicates that the battery will not retain a charge, or is too low to recharge quickly if vehicle is towed to start, replace the battery (par. 84 e). If battery tests satisfactorily, clean and tighten all battery connections.

(2) CRANKING MOTOR SWITCH INOPERATIVE OR WIRING FAULTY. If the panel lights burn, indicating that current is reaching the instrument panel, disconnect the connector on cranking motor solenoid feed wire at panel. Touch above wire to opposite post of cranking motor

push-button switch. If cranking motor still does not operate, replace the cranking motor push-button switch.

(3) CRANKING MOTOR SOLENOID SWITCH INOPERATIVE. Tighten terminal connections on solenoid switch. If the solenoid switch is still inoperative, connect battery cable terminals of switch with jumper cable. If this causes cranking motor to crank engine, replace solenoid switch.

(4) CRANKING MOTOR INOPERATIVE. If the cranking motor push-button switch, the solenoid switch and battery are found to be in working order, connect positive lead of voltmeter to cranking motor terminal, and voltmeter negative lead to ground. Depress cranking motor switch and observe voltmeter reading. If reading is obtained and cranking motor will not function, replace the cranking motor (par. 87 c).

b. Cranking Motor Operates and Engages Flywheel But Will Not Turn Engine.

(1) TRANSMISSION IN GEAR. Shift to neutral.

(2) BATTERY RUN DOWN. See paragraph 47.

(3) BENDIX GEAR DAMAGED OR STUCK. Replace cranking motor (par. 87 c).

c. Slow Cranking Speed.

(1) HIGH ELECTRICAL RESISTANCE (LOOSE OR CORRODED TERMINALS, WRONG SIZE CABLES OR WIRE, FAULTY CRANKING MOTOR OR SWITCHES. See subpar. a (2) through (4) above.

(2) ENGINE OIL TOO HEAVY. Use proper grade of oil.

(3) CRANKING MOTOR WORN OUT (EXCESSIVELY NOISY). Replace cranking motor (par. 87 c).

46. IGNITION SYSTEM.

a. Improper Ignition.

(1) IGNITION SWITCH OR WIRING FAULTY. If engine runs unevenly, there may be an intermittent open circuit in the ignition switch or wiring. With engine running, move switch handle slightly and observe if engine runs unevenly or stops. If switch is not faulty, move wires connected to switch to see if open circuit is in the wires. Replace switch if it is found to be at fault (par. 81 c).

(2) FAULTY DISTRIBUTOR. If no change in the engine operation is noticed after determining that the ignition switch and wires are not at fault, stop engine, and determine if the points in the distributor are badly burned or out of adjustment. If the points are faulty, replace the points (par. 79 d), or replace the distributor assembly (par. 79 c and e).

(3) IGNITION COIL OR CONDENSER FAULTY. If the ignition coil is suspected to be at fault, replace the ignition coil with an ignition coil known to be in good condition (par. 81 b). Proceed in a like manner in case of a defective condenser.

(4) SPARK PLUGS FAULTY. Uneven operation at idle speed, misfiring at high speed, or loss of power, may be caused by faulty spark plugs. Short out spark plugs, one at a time, with an insulated-handle

screwdriver, by placing screwdriver bit against cylinder head casting and top terminal of the spark plug being tested. If spark plug thus shorted is in good operating condition, there will be a definite drop in the running of the engine. If spark plug being tested is faulty, there will be no difference in the running of the engine. Replace faulty spark plug.

47. BATTERY AND GENERATING SYSTEM.

a. Battery Run Down.

(1) FAULTY BATTERY. Test battery (par. 84 c).

(2) EXCESSIVE USE OF ELECTRICAL ACCESSORIES WHEN GENERATOR IS NOT OPERATING. Replace battery (par. 84 e).

(3) SWITCHES LEFT ON WHEN NOT IN USE. Turn switches off when not in use.

(4) CIRCUIT BREAKER FAULTY. If the ammeter on the instrument panel shows a heavy discharge when the generator is not running and all switches are off, disconnect the battery lead marked "B" on the regulator. If the condition is corrected, the regulator breaker contact points are stuck. If the ammeter on the instrument panel does not show charge until generator is running at high speed, the regulator circuit breaker is adjusted to operate at too high a voltage. In either of those cases, replace the regulator (par. 86 c).

(5) REGULATOR INOPERATIVE. Start the engine and observe ammeter on the instrument panel. If no charging rate is indicated, connect the battery and armature terminals, marked "B" and "A," together on the regulator, using a short piece of insulated wire. Hold jumper wire across the two terminals, and watch the ammeter. If reading is obtained, the regulator is not connecting the generator to the battery. If this test does not reveal the trouble, connect the battery and field terminals together with the jumper wire. If a reading is obtained, the regulator is not allowing current to reach the generator field coils, preventing charge. If excessive charge is experienced, and the battery and circuits test properly, the trouble is caused by improper regulator adjustment. In either case, the regulator is inoperative, and must be replaced.

(6) GENERATOR INOPERATIVE. If regulator tests have been made and no charge is obtained, connect a test voltmeter between armature terminal marked "A" on regulator and ground (frame). This test will show if generator is charging. If no voltage reading is shown, leave the voltmeter connected and connect the battery and field terminals marked "B" and "F" together with the jumper wire. A flash will be seen, and the test voltmeter will show a reading when the jumper wire is connected, if the circuit is complete. Check the ammeter on the instrument panel. If a charge is shown, the trouble has been corrected by flashing the fields, which has increased the magnetism or properly polarized the field coil shoes. If no reading is obtained on the voltmeter, inspect the terminals at the generator for loose or broken connections. If no trouble is observed in the connections or leads, the generator is inoperative, and must be replaced.

b. Ammeter Does Not Show Charge.

(1) GENERATOR CIRCUIT BREAKER OPEN. Reset generator circuit breaker.

(2) AMMETER INOPERATIVE. If the ammeter fails to register a charge, turn on all lights and see if a discharge is shown. If no discharge is observed, connect a new ammeter temporarily to the leads in the instrument panel. If a reading is obtained, the ammeter is faulty. If no reading is obtained, test wiring from ammeter to shunt for open circuit.

(3) REGULATOR INOPERATIVE. (par. 47 a (5)).

(4) GENERATOR INOPERATIVE. (par. 47 a (6)).

(5) LOOSE OR CORRODED CONNECTIONS. Clean and tighten connections.

(6) GENERATOR GROUND STRAP LOOSE OR BROKEN. Inspect ground strap. Tighten or replace.

c. Ammeter Shows Excessive Charge.

(1) CURRENT REGULATOR IMPROPERLY ADJUSTED. (subpar. a (5) above).

(2) BATTERIES RUN DOWN. TEST BATTERIES (par. 84 c). Recharge or replace.

(3) BATTERIES SHORTED INTERNALLY. Test batteries and replace if faulty (par. 84 e).

d. Ammeter Shows Discharge with Engine Running.

(1) GENERATOR NOT OPERATING. (par. 47 a (6)).

(2) REGULATOR CIRCUIT BREAKER CUT-IN VOLTAGE TOO HIGH. (subpar. a (4) above).

(3) SHORTED CIRCUITS.

(4) GENERATOR DRIVE BELTS LOOSE OR BROKEN. Tighten or replace belts (par. 76 b).

e. Ammeter Shows Heavy Discharge with Engine Stopped.

(1) SHORTED CIRCUITS.

(2) REGULATOR CIRCUIT BREAKER POINTS STUCK. (subpar. a (4) above).

(3) AMMETER HAND STICKING OR AMMETER BURNED OUT. Replace (par. 93 b).

f. Ammeter Hand Fluctuates Rapidly.

(1) GENERATOR DRIVE BELTS LOOSE. Tighten or replace belts (par. 76 b).

(2) GENERATOR GROUND STRAP LOOSE OR BROKEN. Tighten or replace ground strap.

(3) REGULATOR CIRCUIT BREAKER CUT-IN VOLTAGE TOO LOW OR CONTACTS BURNED. See step (5) below.

(4) REGULATOR LOOSE, NOT PROPERLY GROUNDED, OR VIBRATING AGAINST OTHER EQUIPMENT. Tighten regulator on mountings, inspect ground straps, and relieve interference.

(5) GENERATOR OR REGULATOR FAULTY. If ammeter needle fluctuates rapidly, while generator is running, test all regulator and generator

mountings to see if they are tight, and inspect for broken ground straps. If ground straps and mountings are satisfactory, the condition is caused by incorrect setting of regulator circuit breaker, worn generator brushes, faulty generator drive belts, or regulator bumping against other equipment. If inspection reveals that the generator drive belts are properly adjusted (par. 76 **b**), and there is no interference with the regulator, connect a jumper wire between battery terminal marked "B" and armature terminal marked "A" on the regulator. If the fluctuation stops with the jumper wire connected, indicating that the regulator circuit breaker points have been vibrating, replace the regulator (par. 86 **c**). If fluctuation continues, indicating that the generator is at fault, replace the generator (par. 85 **c**).

48. FUEL SYSTEM.

a. Fuel Does Not Reach Carburetor.

(1) LACK OF FUEL. Check gage on instrument panel and replenish fuel.

(2) FUEL VALVES NOT TURNED ON. Turn on fuel valves.

(3) CLOGGED GAS TANK VENTS. Open gas tank vents.

(4) INOPERATIVE FUEL PUMP. Clogged fuel filter or lines. Remove the fuel filter, and check fuel flow from the tanks. If the fuel does not flow freely at filter, clean lines back to fuel tanks. Service fuel filter (par. 67 **d**). If fuel flows freely through filter, but does not reach carburetor, the fuel pump is inoperative.

b. Fuel Does Not Reach Cylinders.

(1) INOPERATIVE PRIMER PUMP. Remove one of the primer lines from the intake manifold, and operate the primer pump to see if fuel enters the manifold.

(2) PRIMER PUMP STRAINER CLOGGED. Clean or replace (par. 67 **d**).

(3) THROTTLE NOT OPENING. Adjust throttle (par. 68 **b**).

(4) CARBURETOR JETS CLOGGED. Replace carburetor (par. 68 **c**).

(5) LOW FUEL PUMP PRESSURE. Install a fuel pump pressure gage (41-G-500) in the outlet side of the fuel pump. Pressure should read 2½ pounds.

49. ENGINE OILING SYSTEM.

a. Low or No Oil Pressure.

(1) LACK OF OIL. Replenish oil supply.

(2) CLOGGED OIL LINES OR INOPERATIVE OIL PUMP. Remove oil pressure relief valve, crank engine with cranking motor, and observe if oil is discharged from relief valve opening. If no oil is discharged, notify higher authority.

(3) LEAKING OIL LINES OR FITTINGS. Tighten or replace.

(4) PRESSURE GAGE INOPERATIVE. If the gage registers no pressure or insufficient pressure, ground the lead wire at the engine unit; if the gage indicates full pressure, replace the engine unit (par. 94 **c**).

50. COOLING SYSTEM.

a. Overheating.

(1) COOLING LIQUID IN RADIATOR LOW. Fill radiator (par. 72 **a**).

(2) THERMOSTAT INOPERATIVE. Replace thermostat (par. 74 **b**).

(3) WATER PUMP INOPERATIVE. Replace pump (par. 73 **b**).

(4) INCORRECT IGNITION TIMING. Reset ignition timing (par. 82).

(5) FAN BELT SLIPPING OR BROKEN. Adjust or replace belt (par. 76 **b**).

(6) RADIATOR CLOGGED. Reverse-flush. NOTE: *Proceed only according to current directives, using recommended cleaner neutralizer and inhibitor materials.*

b. Loss of Cooling Liquid.

(1) LOOSE HOSE CONNECTIONS. Tighten.

(2) DAMAGED HOSE. Replace hose.

(3) FAULTY WATER PUMP. Replace (par. 73 **b**).

(4) LEAKY RADIATOR. Replace (par. 75 **b** and **c**).

(5) FAULTY CYLINDER HEAD GASKET. Replace gasket (par. 61).

(6) DAMAGED OR FAULTY ENGINE CYLINDER BLOCK OR HEAD. Notify higher authority.

51. LIGHTING SYSTEM.

a. All Lights Will Not Burn.

(1) FAULTY OR DISCHARGED BATTERY. See paragraph 84 **c**.

(2) LOOSE OR CORRODED TERMINALS. Clean and tighten connections.

b. All External Lights Will Not Burn.

(1) FAULTY OR DISCHARGED BATTERY. See paragraph 84 **c**.

(2) LOOSE OR CORRODED TERMINALS. Clean and tighten connections.

(3) FAULTY LIGHTING SWITCH OR SHORT CIRCUITS. Turn on main light switch and instrument panel light switch. If battery, connections, and wiring are satisfactory, the panel lights will burn, indicating that current is reaching the instrument panel. If all external lights fail to operate, turn off main lighting switch. Push main light switch from one contact to another, slowly. If the switch and wiring connections inside the panel, and the connections on the back of the panel are satisfactory, some of the lights will burn. When the faulty circuit is contacted with the switch, the circuit breaker will kick out, indicating a short. Test that circuit for trouble, and correct. If no short exists and all external lights do not function, loose wiring connections or a faulty main lighting switch are indicated. Inspect for loose connections, or replace switch.

c. All Internal Lights Will Not Burn.

(1) BATTERY DISCHARGED. See paragraph 84 **c**.

(2) LOOSE OR CORRODED TERMINALS. Clean and tighten connections.

d. All Lights Burn Dim.

(1) BATTERY DISCHARGED OR LOOSE OR CORRODED TERMINALS. See paragraph 84 c.

(2) LOOSE CONNECTIONS IN INSTRUMENT PANEL FEED WIRES CAUSING HIGH RESISTANCE. Tighten connections.

e. One or More Lamp-units Burn Out Continually.

(1) GROUND STRAPS OR CONNECTIONS LOOSE OR BROKEN. Clean and tighten all connections; replace broken ground straps.

(2) BATTERY GROUND CABLE LOOSE OR BROKEN. Tighten or replace cable.

(3) GENERATOR REGULATOR IMPROPERLY ADJUSTED. See paragraph 47.

f. Individual Lights or Circuits Inoperative.

(1) LAMP BURNED OUT. Replace lamp (pars. 88 a through e).

(2) LOOSE CONNECTIONS AT LIGHT. Tighten connections.

(3) BROKEN WIRING TO UNIT. Replace wiring or report to higher authority.

52. CLUTCH.

a. Clutch Drag. Idle the engine at approximately 800 revolutions per minute. Push the clutch pedal to the fully released position, and allow time for the clutch to stop. Shift the transmission into first or reverse gear. If the shift cannot be made without a severe clash of the gears or if, after engagement of the gears, there is a jumping or creeping movement of the tractor with the clutch still fully released, the clutch is at fault.

(1) EXCESSIVE PEDAL CLEARANCE. Adjust clutch linkage (par. 99).

(2) WARPED OR CRACKED DRIVING OR DRIVEN PLATES. Replace damaged parts (par. 100).

(3) DAMAGED OR WORN DRIVE SPLINE OR BEARING. Disassemble and replace damaged or worn parts (par. 101).

(4) METAL TRANSFER OR BONDING OF CLUTCH FACINGS. Replace damaged plates (par. 100).

b. Clutch Slips.

(1) IMPROPER ADJUSTMENT OF CLUTCH RELEASE LEVER ROD. Adjust clutch linkage (par. 99).

(2) LOSS OF SPRING LOAD CAUSED BY EXCESSIVE HEAT OR BROKEN SPRINGS. Notify higher authority.

(3) DIRT IN CLUTCH CAUSING BINDING OF DRIVEN PLATE. Disassemble and clean out (par. 100).

(4) CLUTCH DRIVEN PLATE FACINGS WORN. Replace driven plates (par. 100).

c. Complete Failure of Clutch to Engage or Release.

(1) DISCONNECTED CLUTCH LINKAGE OR BINDING OF CLUTCH LINKAGE. Inspect linkage. Replace or connect parts.

(2) BROKEN OR DAMAGED CLUTCH PLATES. Replace damaged plates (par. 100).

(3) DAMAGED CLUTCH SPINDLE OR BEARING. Replace damaged parts.

(4) EXCESSIVE PEDAL FREE PLAY. Adjust pedal free play (par. 99).

53. PROPELLER SHAFT.

a. Backlash.

(1) WORN OR DAMAGED UNIVERSAL JOINT CROSS BEARING. Replace.

(2) LOOSE BOLTS AT UNIVERSAL JOINT COMPANION FLANGES. Tighten bolts.

(3) UNIVERSAL JOINT COMPANION FLANGES LOOSE ON TRANSMISSION OUTPUT SHAFT. Tighten flange bolts.

b. Vibration in Propeller Shaft.

(1) WORN OR DAMAGED UNIVERSAL JOINTS. Replace (par. 103 b and c).

(2) LOOSE BOLTS AT UNIVERSAL JOINT COMPANION FLANGES. Tighten flange bolts.

54. TRANSMISSION AND FINAL DRIVE ASSEMBLY.

a. Lubricant Leakage.

(1) LOOSE FILLER OR LEVEL PLUG. Tighten.

(2) LOOSE DRAIN PLUGS. Tighten.

(3) DAMAGED GASKET AT TRANSMISSION COVER. Replace gasket.

b. Track Will Not Move on One Side (engine running and transmission in gear).

(1) BROKEN FINAL DRIVE SHAFT OR DRIVE CHAIN. Replace final drive unit (par. 116 b and c), or final drive chain (par. 115 c).

(2) TOOTH STRIPPED ON FINAL DRIVE SHAFT SPROCKET. Replace final drive unit (par. 116 b and c).

(3) BROKEN FINAL DRIVE ASSEMBLY PARTS. Notify higher authority.

c. Difficult Shifting (severe gear clash).

(1) INCORRECT CLUTCH LINKAGE ADJUSTMENT. Adjust (par. 99).

(2) CLUTCH DRAGGING. Adjust pedal clearance.

(3) BINDING OF TRANSMISSION GEARSHIFT LEVER. Free up.

(4) DAMAGED TRANSMISSION PARTS. Notify higher authority.

d. Backlash.

(1) WORN OR DAMAGED FINAL DRIVE ASSEMBLY. Notify higher authority.

(2) WORN OR DAMAGED TRANSMISSION PARTS. Notify higher authority.

TROUBLE SHOOTING

55. TRACKS AND TRACK FRAME ASSEMBLY.

a. Bogie Wheel Tire Wear.

(1) DAMAGED TRACK. Replace track (par. 113 **c** and **d**).

b. Track Release Spring.

(1) WEAK SPRINGS. Replace track release mechanism (par. 120 **b**).

c. Thrown Tracks.

(1) IMPROPER TRACK TENSION. Adjust track tension (par. 113 **b**).

(2) ROCK BETWEEN TRACK AND IDLER. Clean out.

(3) MISALINEMENT OF IDLER WHEEL. Tighten bracket bolts.

d. Inoperative Track Supporting Roller.

(1) MUD BETWEEN ROLLERS AND TRACK. Remove mud.

(2) BEARINGS SEIZED. Replace final drive assembly (par. 115 **b** and **c**).

e. Inoperative Idler Wheel.

(1) BEARINGS SEIZED. Replace wheel assembly (par. 118).

Section XV

ENGINE

56. DESCRIPTION AND TABULATED DATA.

a. Description. The engine is a Willys model MB, gasoline, 4-cylinder, L-head type unit (fig. 37). The engine is pressure lubricated to all internal moving parts and is liquid-cooled.

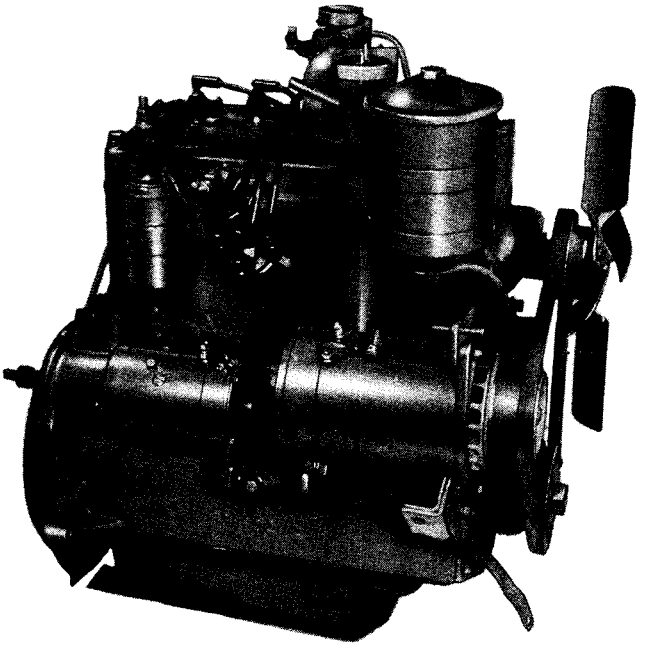

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Figure 37—Engine, Right Front View

b. Tabulated Data.

(1) GENERAL.

Make and model	Willys MB
Type	Gasoline
Number of cylinders	4
Bore	3⅛ in.
Stroke	4⅜ in.
Number of cycles	4
Piston displacement	134.2 cu in.
Compression ratio	6.48 to 1
Horsepower (maximum brake)	63 at 3,900 rpm
Compression pressure	111 lb at 185 rpm
Firing order	1-3-4-2
Cylinder head screw tightness	65-75 lb-ft
Cylinder head stud nut tightness	60-65 lb-ft
Intake valve tappet clearance (cold)	0.014 in.
Exhaust valve tappet clearance (cold)	0.014 in.
Over-all length	27 in.
Over-all height	28 in.
Over-all width	23 in.

(2) DIRECTION OF ROTATION OF ACCESSORIES (viewed from flywheel end).

Crankshaft	Counterclockwise
Cranking motor	Clockwise
Generator	Counterclockwise
Water pump	Counterclockwise
Oil pump (looking down on shaft)	Counterclockwise
Distributor (looking down on shaft)	Counterclockwise

(3) FAN BELT.

Type	"V"
Angle of "V"	42 degrees
Length outside	44⅛ in.
Width	1 1/16 in.

(4) OIL PUMP.

Type	Planetary gear
Driven from camshaft	Gear

57. ENGINE TUNE-UP.

a. For best performance and dependability, the engine should have a periodic tune-up every 2,000 miles. The following procedure is recommended when performing this operation.

(1) SPARK PLUGS. Remove the spark plugs and clean. Adjust the electrodes to 0.030-inch gap.

(2) BATTERY. Check battery terminals, ground cable, and ground straps, at front engine support and at cylinder head, for clean and tight connections.

(3) DISTRIBUTOR POINTS. Remove distributor cap and inspect points.

(4) IGNITION TIMING. Check ignition timing (par. 82).

(5) VALVE TAPPET CLEARANCE. Check valve tappet clearance. See paragraph 58.

(6) CARBURETOR ADJUSTMENT. Start engine, and allow to run until thoroughly warmed up; then set carburetor idle screw so that engine will idle at 400 revolutions per minute (vehicle speed approximately 5 mph). Adjust low speed idling screw so that engine will idle smoothly.

58. VALVE ADJUSTMENT (fig. 38).

a. Correct valve tappet clearance is important to insure correct operation of the engine. Too much valve tappet clearance causes ex-

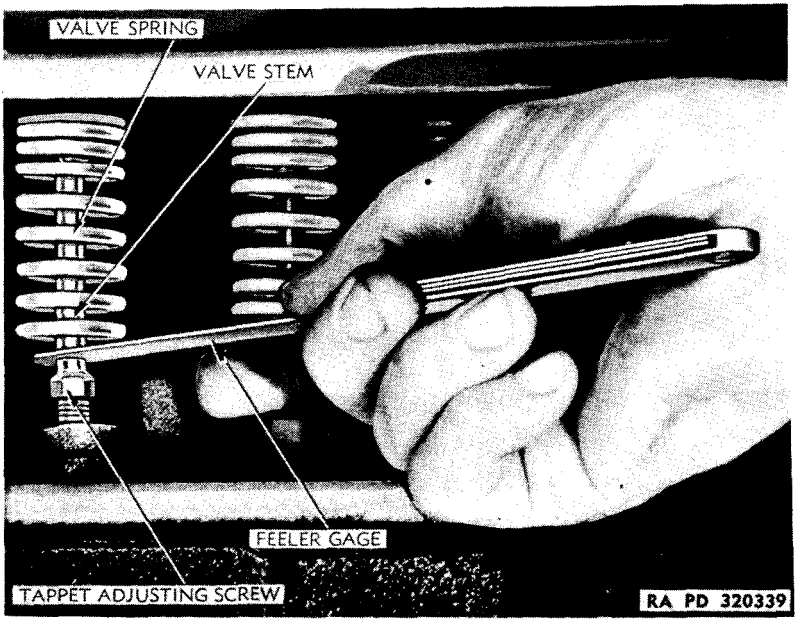

Figure 38—Checking Valve Tappet Clearance, using thickness gage (41-G-400)

cess of wear on all parts of the valve operating mechanism, and also tends to retard valve opening and advance valve closing. Too little valve tappet clearance will cause a loss of compression, missing, and, eventually, burning of the valves and valve seats.

b. Adjustment Procedure.

(1) Remove left wheel (or ski) from transport bracket at side of hood.

(2) Remove left engine hood side plate.

(3) Remove muffler assembly (par. 59 **d**).

(4) Disconnect lower end of crankcase ventilator valve line.

(5) Remove cap screw holding crankcase ventilator assembly to valve cover, and remove ventilator assembly.

(6) Remove rear cap screw holding valve cover and gasket to cylinder block. Remove valve cover and gasket.

(7) Adjust valve tappet clearance to 0.014 inch, cold or hot, on both exhaust and intake valves by turning counterclockwise on tappet adjusting screw to decrease clearance or clockwise to increase clearance. The valves of any one cylinder will both be in position to adjust when the rotor arm of distributor is directly pointing to the cap segment for that cylinder.

(8) Adjust valve tappet clearance on each cylinder in above manner, by turning engine over with starting crank.

(9) Cement new gasket to valve door.

(10) Remove all particles of old gasket from cylinder block.

(11) Install valve door and gasket, being sure gasket is not damaged in installation.

(12) Install valve cover rear cap screw with copper gasket.

(13) Install crankcase ventilator assembly and new gasket onto valve cover with long cap screw and copper gasket.

(14) Connect ventilator line.

(15) Replace muffler assembly (par. 59 **d**).

(16) Replace engine hood side plate.

(17) Replace wheel (or ski) on transport bracket.

59. INTAKE AND EXHAUST SYSTEMS.

a. Description. The intake and exhaust manifold are bolted together in such a manner that it is necessary to remove both as a unit, and then separate them. It is not necessary to separate the two manifolds to install new manifold to cylinder block gaskets, but they must be separated to install intake to exhaust manifold gasket. The intake manifold has two spray nozzles (one at each end) for the engine primer pump. There is also a fitting in the center of the manifold where the crankcase breather line is connected. The muffler assembly is bolted directly to the exhaust manifold outlet.

b. Removal of Manifold Assembly.

(1) REMOVE MANIFOLD BODY HEATER. Remove engine hood side plates and engine hood. Remove three cylinder head cap screws holding heater to engine (fig. 39). Remove five screws holding upper part of heater to lower parts. Remove one screw holding rear end plate of heater to top of heater. Remove one bolt holding heater outlet to dash, and one screw holding outlet to under part of heater. Maneuver top part of heater out toward radiator and remove (fig. 40). Remove remaining three parts of heater.

(2) REMOVE CARBURETOR. Loosen two hose clamp screws on carburetor air intake elbow and remove elbow. Loosen two clamp screws to disconnect choke assembly from carburetor. Remove pin from carburetor control rod. Disconnect fuel line at elbow fitting on

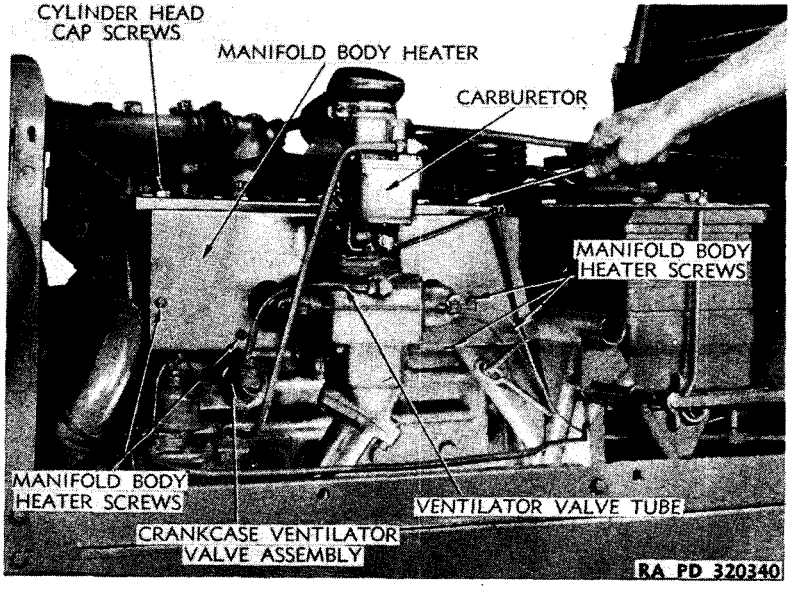

Figure 39—Removing Cylinder Head Cap Screw

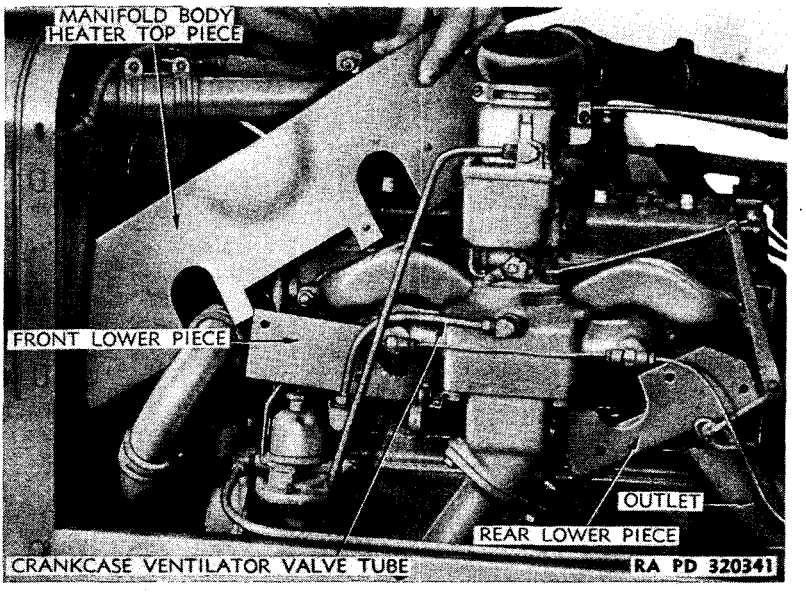

Figure 40—Removing Top of Heater

carburetor. Remove two nuts from studs holding carburetor to intake manifold (fig. 41). Remove carburetor, diffuser assembly, and gaskets.

(3) REMOVE MANIFOLD ASSEMBLY. Disconnect muffler from manifold by removing one bolt and one cap screw. Leave muffler resting on engine bottom guard. Disconnect engine primer line at tee fitting on rear of intake manifold. Disconnect crankcase ventilator tube at both ends and remove tube. Remove seven nuts holding manifold to cylinder block (fig. 42). Remove two convex washers from two center bottom studs. Remove manifold assembly and gasket.

c. Installation of Manifold Assembly.

(1) INSTALL INTAKE AND EXHAUST MANIFOLD. Install new gasket onto manifold studs. Install manifold assembly onto studs. Install convex washer onto each of the two lower studs nearest center (where manifold attaching flanges separate) with the raised side out. Install seven nuts and tighten evenly. Install engine crankcase ventilator tube. Connect engine primer line. Install new gasket between manifold and muffler. Install muffler with one cap screw in front, and one bolt and nut in rear.

(2) INSTALL CARBURETOR. Install one carburetor gasket, diffuser assembly, and another carburetor gasket onto intake manifold studs. Install carburetor. Install two nuts and lock washers. Install carburetor air intake elbow and tighten clamps. Install carburetor control rod pin. Connect fuel line. Connect choke assembly and tighten clamp screws, being sure choke button is all the way in, and that choke valve is wide open.

(3) INSTALL BODY HEATER. Maneuver top part of heater into place. Position rear piece of heater, and install top screw holding rear piece to top piece. Install rear lower piece of heater. Install screws and lock washers. Install bolt holding bottom of rear piece to dash, with nut and lockwasher. Install front lower piece. Install screws and lock washers. Install engine hood and hood side plates.

d. Replacement of Muffler Assembly.

(1) REMOVAL. Remove ski or wheel from carrying position on left side of tractor. Remove left engine hood side plate. Remove six bolts and seven cap screws holding lower engine side plate, and remove lower side plate. Disconnect fuel line at front of fuel pump. Remove one cap screw and one bolt holding muffler assembly to manifold (fig. 43). Remove muffler assembly and gasket.

(2) INSTALLATION. Use new gasket when installing muffler. Do not use lock washers under cap screw or nut when installing. Connect fuel line. Install lower engine side plate with lock washers under each cap screw. Install engine hood, using toothed lock washers under cap screws. Install removed ski or wheel in transport position.

60. OIL FILTER.

a. General. The oil filter should be dismounted, cleaned, and the filter element replaced at the time of the first oil change. The element should be changed at every fourth oil change after that. Always use new gaskets throughout when changing oil filter element.

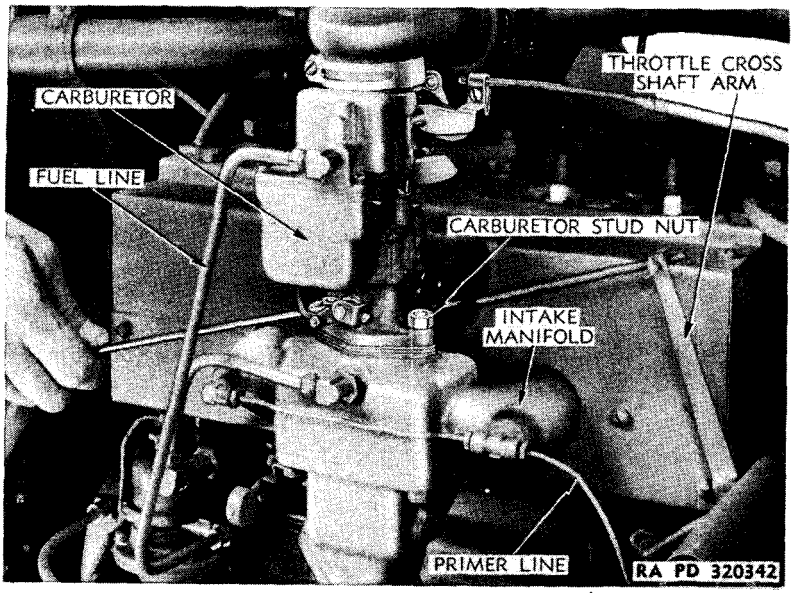

Figure 41—Removing Carburetor

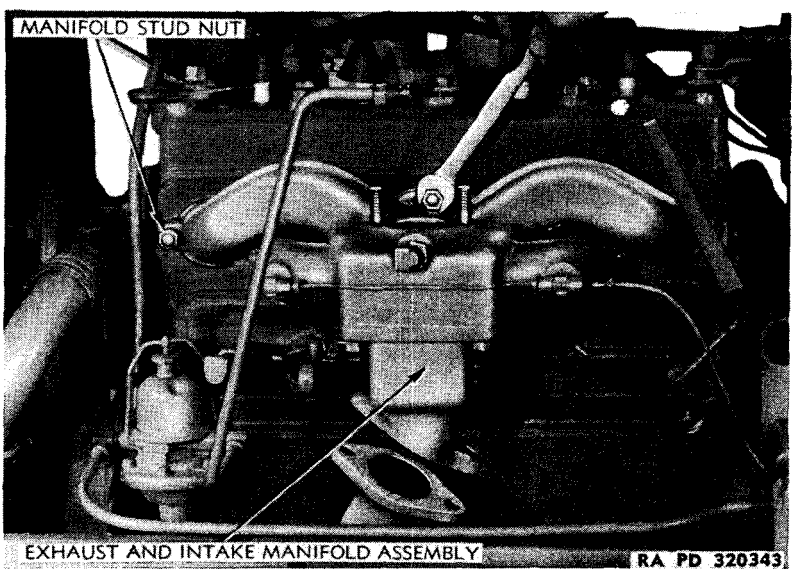

Figure 42—Removing Manifold

b. Replacement of Oil Filter Element. Remove the engine hood side plates and the engine hood. Loosen top nut on filter and remove cover assembly. Lift out old element (fig. 44). Clean out filter body. Install new element. Replace cover assembly with new gaskets. Replace engine hood and engine hood side plates.

61. CYLINDER HEAD GASKET REPLACEMENT.

a. Remove Engine Hood and Drain Radiator. Remove engine hood side plates and engine hood. Drain radiator by opening drain cock at the bottom left inside corner of radiator.

b. Remove Oil Filter Assembly. Remove oil filter and bracket assembly by removing three nuts holding bracket to cylinder head. Remove bolt from top of radiator brace. Lay assembly over onto generator.

c. Remove Carburetor Air Intake Pipe. Remove carburetor air intake pipe by loosening three hose clamps (one at each end of pipe, and one connecting ventilator hose from engine oil filter tube), and two nuts holding pipe support to cylinder head. Remove bolt holding headlight loom clip to pipe support. Remove spark plug cables from spark plugs.

d. Remove Upper Radiator Hose and Spark Plugs. Remove the upper radiator hose. Remove the spark plugs. Disconnect the engine preheater outlet hose and the engine temperature gage wire at the temperature gage sending unit adapter on right side of cylinder head.

e. Remove Air Cleaner Bracket. Loosen two bolts holding oil bath air cleaner to inner bracket. Remove three rear cylinder head stud nuts which hold air cleaner bracket and battery ground cable to cylinder head. Lay bracket back out of the way.

f. Remove Cylinder Head and Gasket. Remove three cylinder head cap screws attaching manifold body heater to cylinder head, and six screws holding top of heater to bottom parts of heater. Maneuver top of heater out toward front. Remove remaining cylinder head nuts and cap screws. Remove cylinder head assembly after loosening by lifting head straight up. Remove cylinder head gasket.

g. Install Cylinder Head Gasket. Clean carbon from cylinder head, cylinder block, and top of pistons. Install new cylinder head gasket.

h. Install Cylinder Head. Lower cylinder head into position on gasket, being sure not to injure gasket. Install top of heater with six screws and three cylinder head cap screws through heater top, cylinder head, cylinder head gasket, and start into cylinder block to position head and gasket. Install oil filter assembly and radiator brace. Install three cylinder head stud nuts, but do not tighten. Install bolt, nut, and lock washer in upper end of radiator brace. Install air cleaner bracket with two nuts. Install carburetor air intake pipe with two nuts. Install remaining cylinder head nuts and cap screws. Tighten cylinder head nuts and cap screws evenly and in the sequence shown in figure 45. See paragraph 56 **b** (1) for tightness of cylinder head stud nuts and cap screws.

i. Install Upper Radiator Hose, Tighten Hose Clamps, and Install Spark Plugs. Install upper radiator hose. Tighten three hose

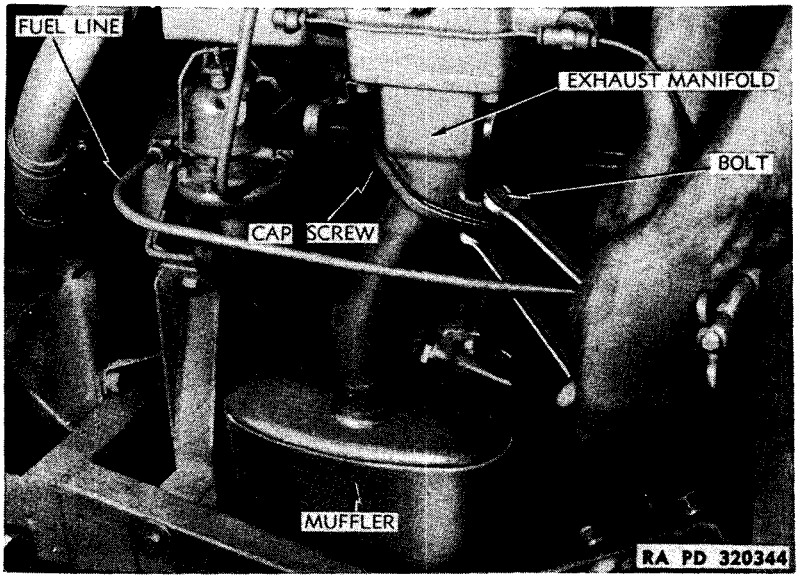

Figure 43—Removing Muffler Assembly

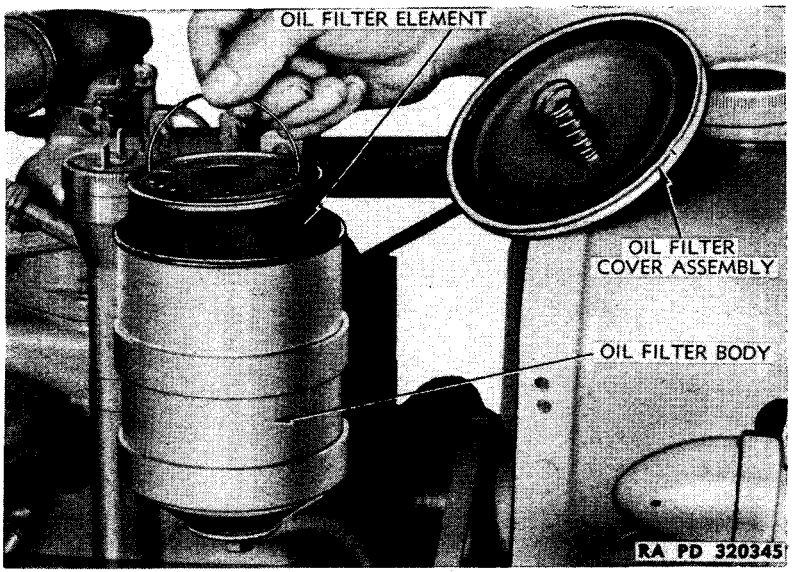

Figure 44—Removing Oil Filter Element

clamps on carburetor air intake pipe. Clean, adjust, and install spark plugs. Install spark plug cables (fig. 64).

j. Fill Radiator, Connect Battery, and Test. Close radiator drain cock. Fill cooling system. Connect battery ground cable to rear center cylinder head stud with nut and flat washer. Install bolt holding headlight loom clip to air intake pipe support bracket. Start engine, and warm up to test for leaks. Install engine hood and engine hood side plates.

62. REMOVAL OF ENGINE.

a. Remove Radiator Assembly, Engine Preheater, Cranking Motor, and Front Axle Assembly. Remove radiator assembly (par. 75). Remove engine preheater (par. 77 a). Remove cranking motor (par. 87 c). Remove front axle assembly (par. 107 b).

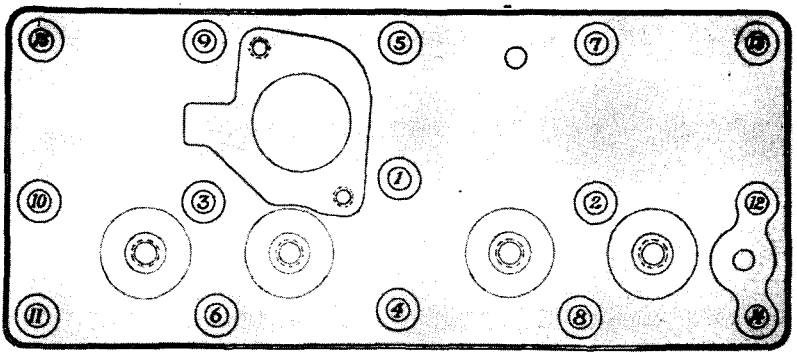

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Figure 45—Cylinder Head Tightening Chart

b. Disconnect Throttle Controls, Wires, and Lines. Disconnect foot accelerator rod from throttle cross shaft at right rear corner of engine by removing cotter pin and flat washer (fig. 46). Disconnect hand throttle rod from throttle cross shaft arm by removing cotter pin and flat washer on left side of engine (fig. 47). Disconnect fuel line at primer tee fitting under battery support and at fuel pump. Push line back into driver's compartment out of the way (fig. 47). Disconnect oil pressure gage wire from sending unit on left side of engine (fig. 47). Disconnect one wire from ignition coil (fig. 46), one wire from engine temperature gage sending unit (fig. 46), and battery ground cable from cylinder head rear stud (fig. 48). Disconnect positive battery cable at battery post, and four wires from generator (fig. 48). Disconnect primer line from tee fitting on intake manifold. Disconnect choke assembly from carburetor by loosening two clamp screws. Disconnect carburetor air intake pipe at each end of large hose, and remove hose. Remove cylinder head nuts holding headlight wire loom brackets, and lay loom assembly back on cowl. Loosen two bolts on air cleaner arm

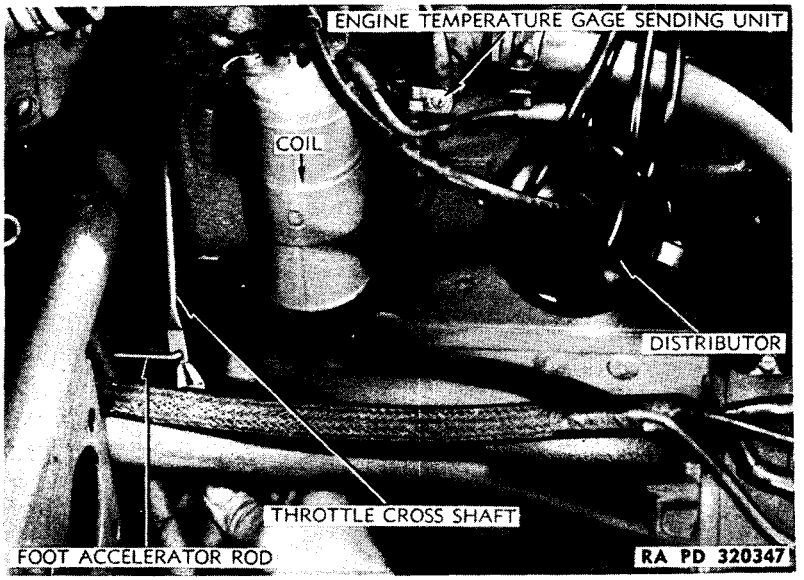


Figure 46—Disconnecting Accelerator Rod

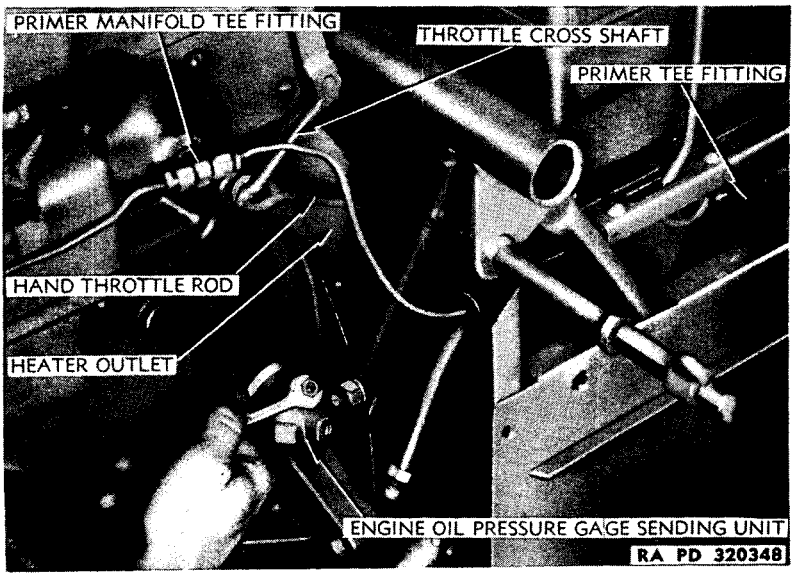


Figure 47—Disconnecting Oil Gage Wire

and bracket nearest engine. Remove two cylinder head nuts holding bracket to cylinder head. Lay bracket and magnetic cranking motor switch back on cowl.

c. Disconnect Engine. Remove engine bottom guard (par. 127 **b**). Remove six screws holding transmission and clutch housing lower guard, to rear engine support angle. Remove two bolts from ends of rear engine support angle (fig. 49). Remove two lower bolts holding rear engine support angle to clutch housing. Remove support angle.

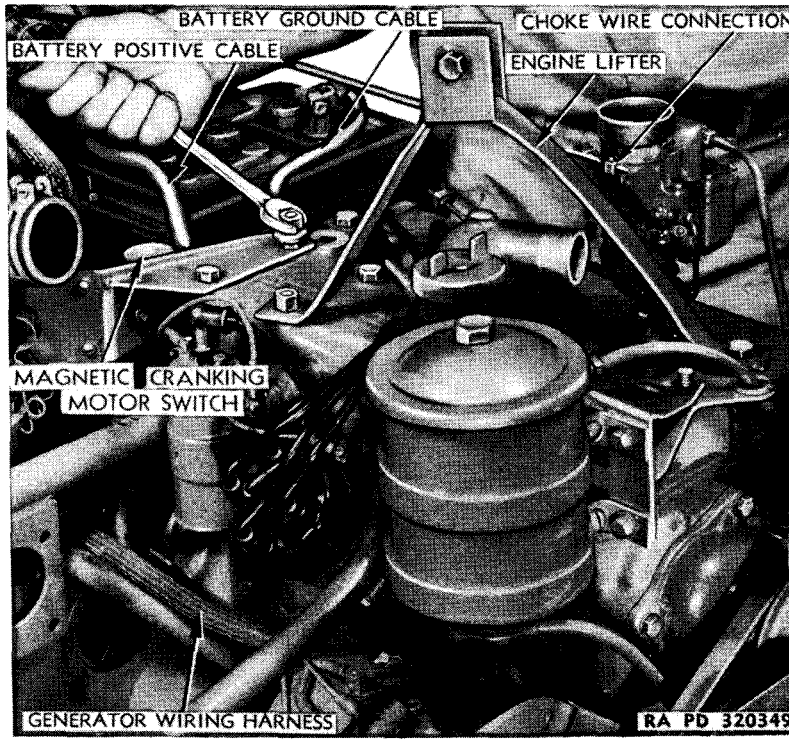


Figure 48—Disconnecting Battery Ground Cable

Remove bolt holding manifold body heater outlet to dash. Remove cotter pins and nuts from two front engine supports, and remove bolts (fig. 50). Install engine lifter on front cap screw on left side of engine, and first nut from rear on right side of engine.

d. Remove Engine. Take weight of engine on chain hoist. Remove six remaining bolts from engine and clutch housing. Pull engine ahead slightly so engine rear plate can be rotated to clear steering gear bracket brace and wheel carrier support brace (fig. 51). Pull engine ahead off splines, and lift out engine (fig. 52). Remove chain hoist and engine lifter. Remove six cap screws (by loosening equally), holding clutch assembly to flywheel. Remove clutch assembly and driven disk.

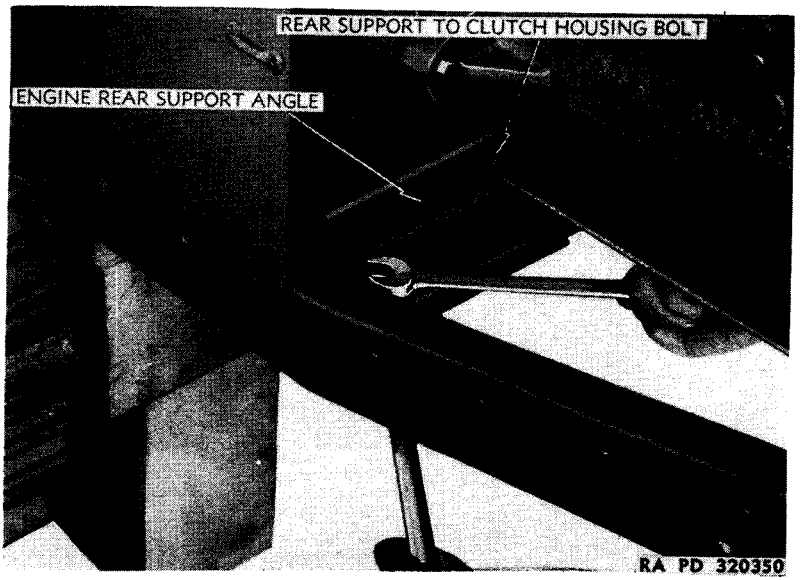


Figure 49—Removing Bolt from Engine Rear Support Angle

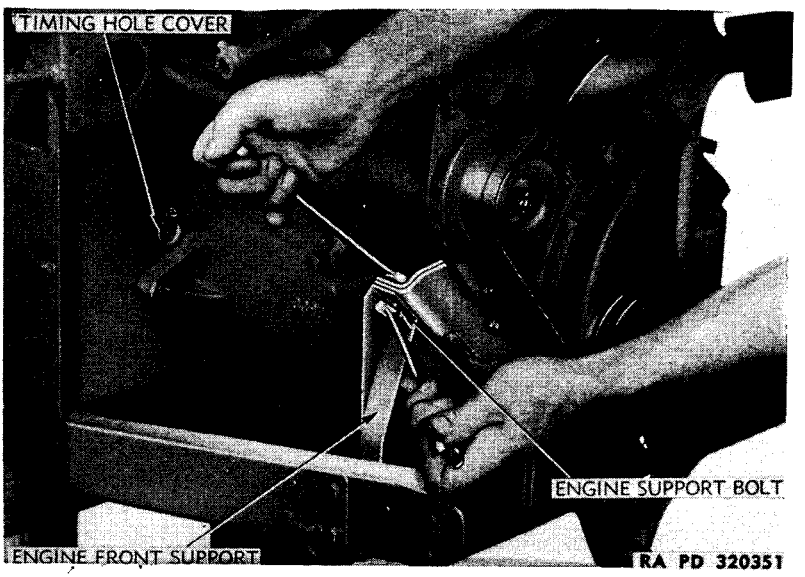


Figure 50—Removing Nut from Front Engine Support Bolt

ENGINE

63. INSTALLATION OF ENGINE.

a. Install Clutch Assembly. Install clutch assembly as outlined under paragraph 100.

b. Install Engine. Install engine lifter. Lift engine with chain hoist. Lower engine into position in tractor frame so that splines of clutch disk are in line with splines of clutch shaft. Start clutch disk onto clutch shaft, and push engine back until rear plate of engine strikes steering gear bracket brace. Maneuver plate to clear this brace and wheel support brace. Push engine back against clutch housing and sup-

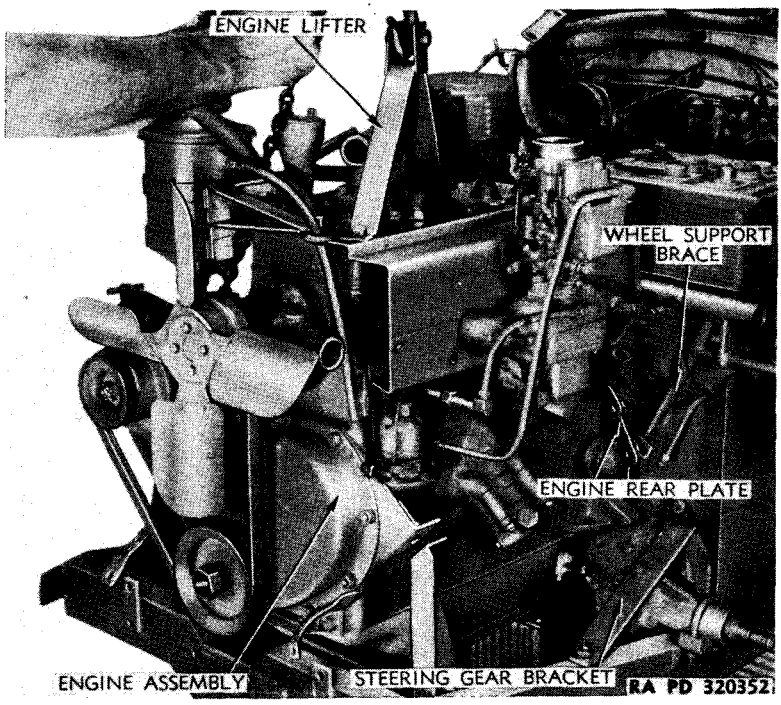


Figure 51—Sliding Engine Ahead

port plate. Line up holes in engine "legs," rear support plate, support plate, and clutch housing. Install the two long dowel bolts through these legs. NOTE: *The hand throttle bracket lower hole will be over left bolt.* Install nut and lock washer on each, but do not tighten.

c. Connect Engine. Install rear engine support angle with the two bottom clutch housing bolts. Install remaining clutch housing bolts with nuts and lock washers. Install bolt, nut, and lock washer in each end of engine rear support angle. Install two engine front support bolts with castle nuts. Tighten all engine mounting bolts. Install cotter pins

in engine front support bolts. Remove chain hoist and engine lifter. Install air cleaner bracket on rear of cylinder head and air cleaner.

d. Connect Wires, Lines, and Controls. Install headlight loom brackets on cylinder head. Install carburetor air intake hose, being sure all joints are airtight. Tighten hose clamps. Connect choke wire assembly to carburetor, being sure choke button is all the way in, and choke valve is wide open when set screws are tightened. Connect engine primer line to tee fitting on intake manifold. Connect wire to ignition coil rear terminal. Connect engine temperature gage wire to sending unit in cylinder head. Connect battery ground cable to cylinder head

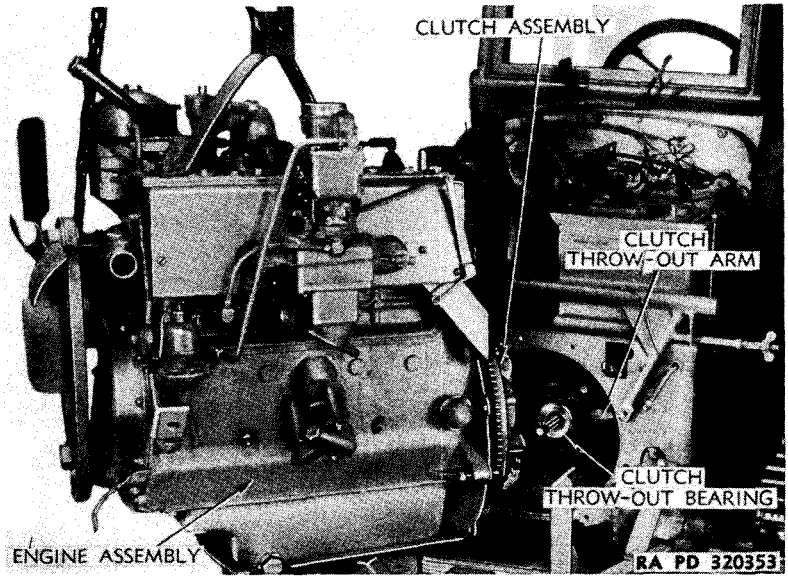


Figure 52—Engine Removed

rear center stud. Connect four wires to generator. Connect battery positive cable to battery post. See wiring diagram (fig. 69) for correct connections. Connect both ends of fuel lines. Connect throttle control rods.

e. Install Engine Preheater, Cranking Motor, Radiator Assembly, and Front Axle Assembly. Install six screws with lock washers in front end of transmission and clutch housing bottom guard. Install engine bottom guard (par. 127 **i**). Install engine preheater (fig. 77). Install cranking motor (par. 87 **c**). Install radiator assembly (fig. 75 **c**). Install front axle assembly (par. 107 **c**).

ENGINE

64. REPLACEMENT OF OIL PAN GASKET.

a. Remove Front Axle Assembly (par. 107 **b**).

b. Remove Engine Bottom Guard (par. 127 **b**).

c. Remove six screws holding transmission and clutch housing bottom guard to engine rear support angle.

d. Remove Engine Rear Support Angle. Remove two bolts holding engine rear support angle to tractor frame. Remove two bolts holding engine rear support angle to clutch housing. Remove support angle.

e. Remove Engine Oil Pan. Drain engine oil. Remove the cap screws holding engine oil pan to cylinder block. Remove engine oil pan.

f. Installation of Oil Pan. Clean old gasket from cylinder block and oil pan. Cement new gasket to oil pan. Install oil pan to cylinder block with cap screws and lock washers. Install engine rear support angle with four bolts, nuts, and lockwashers. Install engine bottom guard with 14 screws and lock washers. Install six screws and lock washers holding transmission and clutch housing lower guard to engine rear support angle.

g. Install Front Axle Assembly (par. 107 **c**).

h. Fill engine with proper amount and grade of oil. See Lubrication Guide (fig. 24). Run engine and test for leaks.

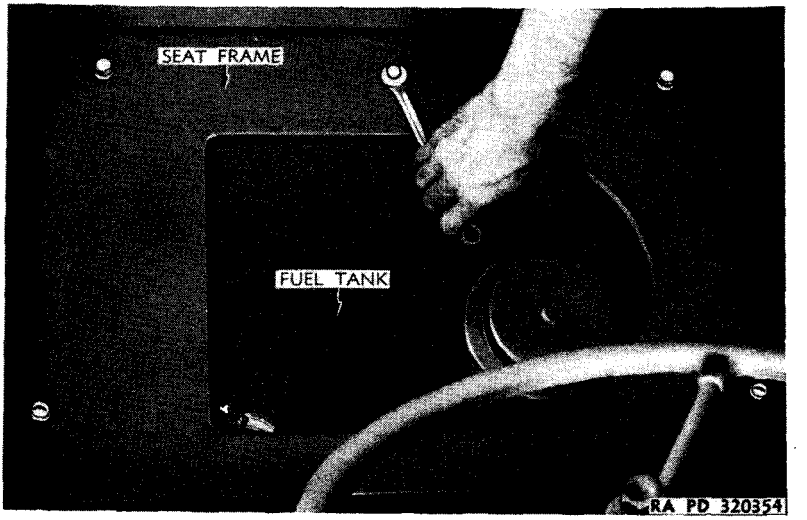


Figure 53—Removing Cap Screw from Seat Support

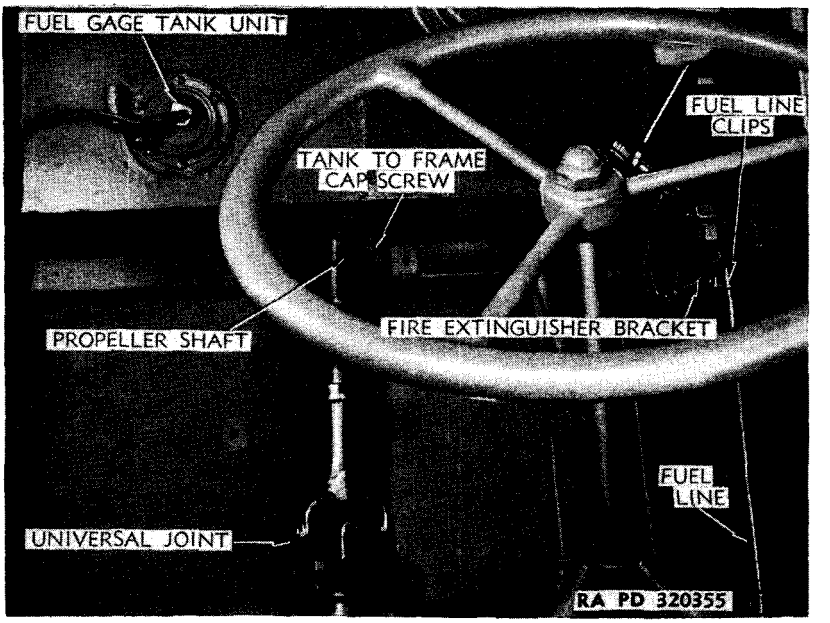


Figure 54—Disconnecting Fuel Line

Section XVI

AIR CLEANER AND FUEL SYSTEM

65. DESCRIPTION OF FUEL SYSTEM.

a. Description. The fuel system in this section consists of the fuel supply tank, fuel pump, and carburetor. The fuel is drawn from the tank, and delivered to the carburetor by the fuel pump.

66. FUEL TANK AND LINES.

a. Description. The fuel tank is located under the driver's seat and has a capacity of 10½ gallons. The filler cap is reached by removing the front seat cushion.

b. Sediment Sump. A drain plug is located in bottom of sediment sump which is reached from underneath tractor when it becomes necessary to flush or drain fuel tank.

c. Removal of Fuel Tank.

(1) DISCONNECT FUEL GAGE WIRE AND LINE. Remove front seat cushion. Remove two bolts and three cap screws holding seat frame to tractor frame (fig. 53). Remove fire extinguisher by unlatching clamp and pulling extinguisher from bracket. Remove six bolts holding extinguisher bracket and filler blocks to the body. Remove bracket and blocks. Disconnect fuel line at tank (fig. 54). Loosen two fuel line clips holding fuel line to body, and raise fuel line up out of the way. Disconnect fuel gage wire at tank unit.

(2) DISCONNECT PROPELLER SHAFT. Remove six bolts holding propeller shaft guard to front floorboard (nuts on these bolts will be reached from underneath tractor). Remove four bolts from front universal flange and rear flange on auxiliary transmission.

(3) REMOVE FUEL TANK. Remove two cap screws holding front of fuel tank to frame cross member (fig. 54). Slide fuel tank toward transmission to uncover rear universal joint. Remove four nuts and lock washers from rear universal joint U-bolts (fig. 55). Remove U-bolts. Remove universal joint needle bearing assemblies, being careful not to lose needles. Remove fuel tank and propeller shaft assembly from tractor. Remove fuel tank front bracket spacer, if used. NOTE: *A spacer was used on a few of the first tractors.* Straighten sleeve cap tangs on front universal rear yoke, and pull front universal joint assembly from splines of propeller shaft. Pull propeller shaft through opening in fuel tank.

(4) INSTALLATION OF FUEL TANK. Insert propeller shaft through opening in fuel tank from the rear with spline end leading, slide yoke of front universal joint onto splines with arrows on shaft and yoke in line. Position yoke cap and seal. Bend tangs of cap in against yoke to hold cap. Install antisqueak straps in place on floorboard. Place fuel tank and propeller shaft assembly in tractor with splined end of propeller shaft toward auxiliary transmission. Lubricate needle bearings before assembling (par. 27). Install needle bearing assemblies, U-bolts, lock washers, and nuts to connect propeller shaft rear universal joint to differential yoke. Use a "C" clamp, if necessary, to press needle bearing assemblies together so that when U-bolts are tightened the outer

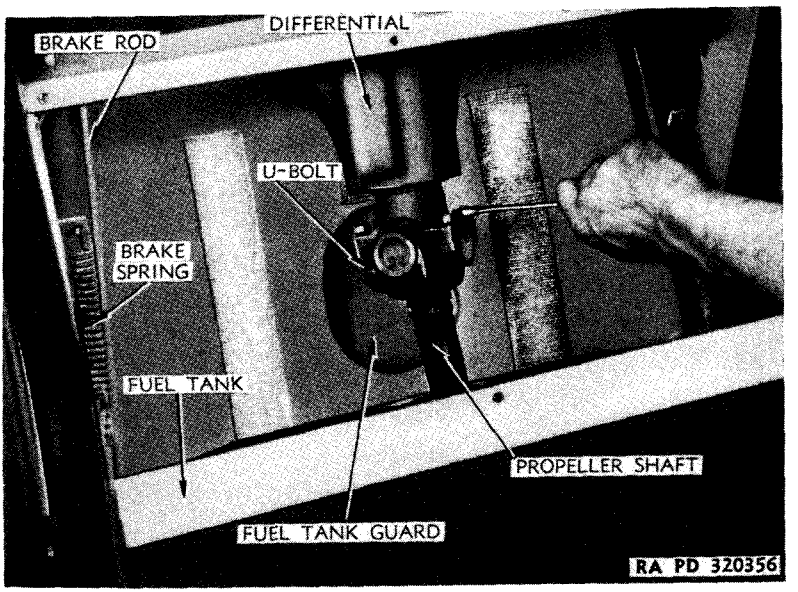


Figure 55—Disassembly of Universal Joint

ends of needle bearings are inside projections on differential yoke (fig. 55). Slide fuel tank into position toward rear of tractor, install fuel tank front spacer between front fuel tank bracket and frame (if used). Install two cap screws and lock washers in front bracket, but do not tighten.

(5) CONNECT FUEL GAGE WIRE AND LINE. Place fuel line under two clips holding fuel line to body, and connect to fuel tank. Tighten bolts in clips holding fuel line to body. Install fire extinguisher bracket and filler blocks with six bolts, lock washers, and nuts. Install fire extinguisher into bracket, and fasten clamp. Connect fuel gage wire to fuel tank unit. Install seat frame. Install three cap screws through seat frame, fuel tank flange, and into frame cross member, using a flat washer and lock washer on each cap screw. Install two bolts at front

of seat frame, using a flat washer under head of each bolt. Tighten all attaching bolts and cap screws. Place seat cushion in place.

(6) CONNECTING PROPELLER SHAFT. Connect propeller shaft universal joint flange to auxiliary transmission rear flange with four bolts, lock washers, and nuts. Install propeller shaft guard with six bolts, flat washers, lock washers, and nuts. Use flat washers on bolts which go through floorboard on under side.

(7) FUEL LINES. Be sure fuel lines are clean and undamaged, and that there are no leaks at connections. See that connections are not cross-threaded on assembly. Replace any leaky or damaged lines or fittings.

67. FUEL PUMP.

a. Description. The fuel pump is mounted on the left side of the engine between the fuel tank and carburetor. It draws fuel from the supply tank, and pumps it into the carburetor float bowl as it is required by the engine. The pump is operated by a rocker arm on the pump, contacting an eccentric on the engine camshaft. Normal fuel pressure is from 1½ to 2½ pounds.

b. Removal of Fuel Pump. Remove engine left hood side plate, and lower engine side plate. Disconnect two fuel lines from pump elbow fittings. Remove two cap screws and lock washers holding pump to cylinder block. Lift off pump and gasket by pulling out on pump until rocker arm clears cylinder block.

c. Installation of Fuel Pump. Cement new fuel pump to cylinder block gasket onto opening in cylinder block. Install fuel pump with two cap screws and lock washers. Connect both fuel lines to pump. Operate pump by hand to test for leaks. Install lower engine side plate and engine hood side plate.

d. Fuel Pump Filter. Clean filter screen every 500 miles. To remove, loosen thumb nut holding clamp of sediment bowl (fig. 26) and remove bowl. Lift strainer from center tower; clean, and replace. Clean sediment from bowl base. Reinstall bowl, using a new gasket.

68 CARBURETOR.

a. Description. The Carter carburetor (model WO-5398) is the plain-tube type with a throttle-operated accelerator pump and economizer device. Since carburetion is dependent upon both compression and ignition, it should always be checked last in an engine tune-up. The carburetor is a precision instrument designed to deliver the proper fuel and air ratio for all speeds of the engine. By proper cleaning and replacing of all worn parts, the carburetor will function correctly.

b. Carburetor and Control Adjustment.

(1) ACCELERATOR LINKAGE. Adjust accelerator linkage so that accelerator pedal touches floorboard when the carburetor throttle valve is wide open. Tighten all lock nuts after making adjustment.

(2) HAND THROTTLE LINKAGE. Hand throttle is properly adjusted when throttle lever is in closed position, and the pin in lower end of throttle cross arm just clears front end of loop in control rod.

(3) CARBURETOR ADJUSTMENT. There is a throttle stop screw on throttle valve arm nearest the cylinder head. This screw adjusts the idling speed of the engine. Turn in clockwise to increase, and counterclockwise to decrease idling speed. Adjust engine idling speed to approximately 400 revolutions per minute. The idle mixture adjustment screw is located on front side of carburetor under carburetor bowl. Turning this screw in cuts off air, making the idling mixture richer, turning it out admits more air, making the mixture leaner. Engine must be at operating temperature when this adjustment is made. Turn adjusting screw all the way in, and back out ½ turn. This is usually the required setting to make engine idle evenly.

c. Replacement of Carburetor.

(1) REMOVAL OF CARBURETOR. Remove engine hood (par. 125 **b**). Loosen clamp screws in hose clamps connecting air intake elbow to top of carburetor, and remove elbow. Loosen two clamp screws holding choke assembly to carburetor. Remove cotter pin holding carburetor control rod to throttle cross shaft arm. Disconnect fuel line at elbow fitting on carburetor. Remove two nuts holding carburetor to intake manifold. Lift off carburetor, diffuser assembly, and gaskets (fig. 41).

(2) INSTALLATION OF CARBURETOR. Install new gasket onto intake manifold. Install diffuser assembly with chutes down, and install another new gasket. Install carburetor and two nuts to hold carburetor. Connect fuel line to elbow on carburetor. Connect carburetor control rod. Connect carburetor choke control, being sure to hold choke valve closed and choke button tight against dash when tightening clamp screws. Install air intake elbow, and tighten screws in clamps, being sure there are no air leaks in connections when installed. Start engine, check for leaks, and adjust carburetor (subpar. **b** (3) above). Install engine hood (par. 125 **c**).

69. PRIMER PUMP.

a. Description. The primer pump located on the instrument panel is a piston-type pump, with plunger and leathers, to aid in starting engine in cold weather. Fuel is drawn through a line connecting it to the fuel tank, and pumping it through another line to the primer manifold on intake manifold.

b. Replacement of Primer Pump.

(1) REMOVAL OF PRIMER PUMP. Disconnect suction and discharge lines from pump. Pull out plunger, hold plunger and unscrew knob. Do not lose small lock washer in knob. Remove nut holding pump to panel and remove pump from panel toward front of tractor.

(2) INSTALLATION OF PRIMER PUMP. Install pump through rear of panel with offset part of pump to top. Install retainer nut against panel. Install knob, with small lock washer inside of knob, onto plunger and tighten. Connect suction and discharge lines to pump. Operate pump a few times to test for leaks.

AIR CLEANER AND FUEL SYSTEM

70. AIR CLEANER (OIL BATH).

a. Description. The oil bath air cleaner is mounted on two brackets at right rear corner of engine, and connected to the carburetor. Its purpose is to filter all dust from air before the air is delivered to engine. An oil cup is suspended at the lower end of the air cleaner, and is filled to a specified level with engine oil. As the air is drawn through the cleaner, a portion of this oil is whipped up into screen mats in the main body of the cleaner. The dust in the air collects on these oily screen mats as the air is drawn through them and, as a result, only clean air reaches the engine. The oil dripping back into the cup from the screen mats carries the dirt with it, and deposits it in the cup. The cup must be removed daily and oil level inspected. A broken hose, loose clamp, or a leak of any kind between the air cleaner and the engine will defeat the purpose of the cleaner; therefore, care should be taken to see that all connections are tight.

b. Removal of Air Cleaner Assembly. Remove engine hood (par. 125 **b**). Remove two rear bolts (fig. 23). Loosen hose clamp on carburetor intake hose. Loosen two front bolts holding air cleaner to bracket attached to engine. Remove air cleaner assembly.

c. Air Cleaner Service.

(1) DAILY SERVICE. Remove cup and inspect. If oil has reached "CAUTION LEVEL," clean cup and refill to "NORMAL OIL LEVEL" with clean motor oil of same grade as used in engine.

(2) ADDITIONAL SERVICE. When engine crankcase oil is changed, remove air cleaner from tractor (subpar. **b** above). Remove oil cup, unscrew wing bolt in bottom of air cleaner, and remove element from air cleaner and wash in kerosene or gasoline. Dry element with air. Replace element in air cleaner, and secure with wing bolt. Fill oil cup to "NORMAL OIL LEVEL" with clean motor oil of the same grade as used in engine, and install on air cleaner. Install air cleaner on tractor (subpar. **d** below).

d. Installation of Air Cleaner Assembly. Place air cleaner on tractor in position. Install two bolts in rear bracket, and tighten bolts in both brackets. Connect carburetor intake hose, and tighten clamp. For service see subparagraph **c** above.

Section XVII

COOLING SYSTEM

71. DESCRIPTION OF SYSTEM.

a. The cooling system of the engine consists of the water passages in cylinder block and head, thermostat assembly, radiator assembly, water pump, and cooling fan, as well as the necessary lines, pipes, and hose for the circulation of the engine coolant.

72. FILLING AND DRAINING SYSTEM.

a. Filling. Close drain cocks; one at left lower corner of radiator on outlet elbow, and one on right side of engine cylinder block behind generator. Fill cooling system with clean water or, during cold weather, with antifreeze solution. Do not overfill the system when antifreeze solution is being used, because the solution expands when heated, and an appreciable amount might be lost through overflow. The solution should be ½ inch below the bottom of radiator filler neck. Should cooling solution be lost from the system and the engine overheats, *do not* add solution immediately, but allow the engine to cool, as cold solution poured into hot engine may cause severe damage.

b. Draining. Loosen radiator cap to break any vacuum in system. Open drain cock on radiator outlet elbow at lower left-hand corner of radiator, and drain cock on right side of cylinder block behind generator.

73. WATER PUMP AND FAN ASSEMBLY.

a. Description. The water pump, of the centrifugal-impeller type, pumps the engine cooling liquid through the engine cooling system. The water pump double-row ball bearing is integral with shaft. The spring-loaded seal in pump prevents coolant from leaking around pump shaft. The fan pulley is pressed onto front of water pump shaft. The cooling fan is bolted to the fan pulley. The pump and fan assembly is driven by a pulley on the engine crankshaft by means of a V-belt. This belt also drives the generator.

b. Replacement of Water Pump Assembly.

(1) Drain cooling system (par. 72 **b**).

(2) Loosen hose clamps on pump inlet and at lower radiator connection. Remove lower radiator hose and elbow assembly.

(3) Loosen fan belt by raising up on generator adjusting arm and pushing generator assembly toward engine cylinder block.

(4) Remove fan blade assembly by reaching between fan blade assembly to fan pulley. Lower fan blade assembly to bottom of fan shroud.

(5) Remove four cap screws holding water pump assembly to cylinder block.

(6) Remove water pump assembly and gasket.

(7) Clean any particles of old gasket from cylinder block.

(8) Cement new gasket to replacement water pump housing.

(9) Install water pump assembly with four cap screws and tighten evenly.

(10) Install lower hose and elbow assembly. Tighten hose clamps.

(11) Install fan blade assembly onto fan pulley.

(12) Fill cooling system (par. 72 a) and test for leaks.

(13) Pull generator away from cylinder block until adjusting arm locks.

74. THERMOSTAT.

a. Description. The thermostat, located in water outlet casting on top of cylinder head, is provided to assist in quick engine warm-up by restricting flow of cooling liquid until temperature of liquid opens valve.

b. Replacement of Thermostat.

(1) Drain cooling system (par. 72 b). Remove the engine hood assembly (par. 125 b).

(2) Remove cap screws holding water outlet casting to cylinder head. Loosen hose clamp on end of hose at outlet casting.

(3) Raise up on outlet casting and pull from hose.

(4) Lift thermostat assembly from engine cylinder head.

(5) Clean all old gasket particles from outlet casting and cylinder head.

(6) Install new thermostat in cylinder head.

(7) Cement new gasket to water outlet casting.

(8) Install outlet casting into radiator hose, and lower into position over thermostat. Install cap screws with lock washers and tighten evenly.

(9) Tighten hose clamp. Fill cooling system (par. 72 a), and check for leaks.

(10) Install engine hood assembly (par. 125 c).

75. RADIATOR ASSEMBLY.

a. Description. The radiator is designed to cool the water under all operating conditions; however, the radiator core must be kept free

from corrosion and scale in addition to the maintenance of other cooling units, to obtain satisfactory service. At least every 6,000 miles, remove the radiator and clean it inside and out in a cleaning solution. At the same time examine core for leaks or damaged tubes. Excessive oil in the cooling system may indicate a leaky cylinder head gasket, or a porous head or block. After the radiator and cooling system have been cleaned and flushed out, it is advisable to use a corrosion inhibitor. Rust and scale may eventually clog up water passages in both the radiator and water jacket of the engine unless a corrosion inhibitor

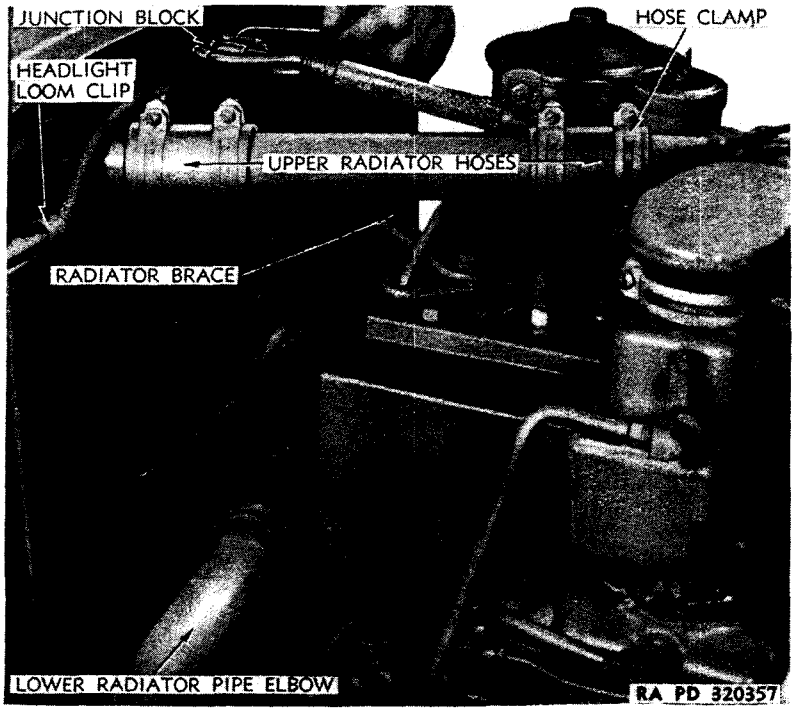


Figure 56—Disconnecting Wires from Junction Block

is used. This condition is aggravated in some localities by the water available. Emergency repairs in case of damage by puncture may be made. If a tube is not completely severed, cut it or break it off with a pair of pliers. With pliers strip fins from tube above and below break for ½ inch, or necessary distance to enable bending of the tube around itself, and flatten, both above and below the break, thereby stopping the flow of water. The cap is of the pressure-type which prevents evaporation and loss of cooling solution. A pressure of 3¼ to 4¼ pounds makes the engine more efficient by running at a slightly higher temperature. Vacuum in the radiator is relieved by a vacuum valve opening at ½- to 1-pound vacuum.

b. Removal.

(1) Remove engine hood. See paragraph 125 b.

(2) Remove right and left lower hood side plates. See paragraph 125 b.

(3) Disconnect wires from junction block on radiator shroud (fig. 56).

(4) Drain cooling system. See paragraph 72 b.

(5) Loosen rear upper hose clamp screw.

(6) Loosen hose clamp screw on lower radiator hose where it connects to water pump.

(7) Reach through crank hole in radiator shell with extension and flex socket wrench, and remove two bolts and two cap screws holding radiator support to front of frame (fig. 57). Remove nut holding radiator top brace to front center cylinder head stud. Lift radiator, shell, headlights, and radiator support assembly from tractor as a unit (fig. 58).

(8) Remove two bolts holding radiator support to radiator shell.

(9) Disconnect headlight wires from junction block. Pull wire looms from clips.

(10) Remove radiator and support from shell.

(11) Remove two nuts and washers holding support assembly to radiator. Remove support assembly, antisqueak strip, and filler strip from radiator attaching bolts.

c. Installation.

(1) Install radiator filler strip, radiator antisqueak strip, and radiator support onto radiator attaching bolts. Install nut and lock washer on each bolt.

(2) Install radiator assembly into radiator shell. Install two bolts, nuts, and lock washers holding radiator support to radiator shell.

(3) Thread headlight wire looms through clips on shroud. Connect wires to junction block. See wiring diagram, figure 70.

(4) One man will hold radiator assembly in position while another installs two bolts (one on each side in upper holes of radiator support, and through upper holes in frame bracket, then through engine bonding straps, with head of bolt toward radiator) with nuts and lock washers. Also start two cap screws with a flex socket and long extension through crank hole in radiator shell.

(5) Connect upper and lower hose. Connect headlight loom wires to junction block on fan shroud. See wiring diagram (fig. 70) for correct connections.

(6) Fill cooling system, and test for leaks. Install radiator cap.

(7) Install right and left lower engine side plates (par. 125 c). Install engine hood (par. 125 c).

76. FAN BELT.

a. General. The fan belt is properly adjusted when belt has ½-inch deflection midway between pulleys on water pump and generator.

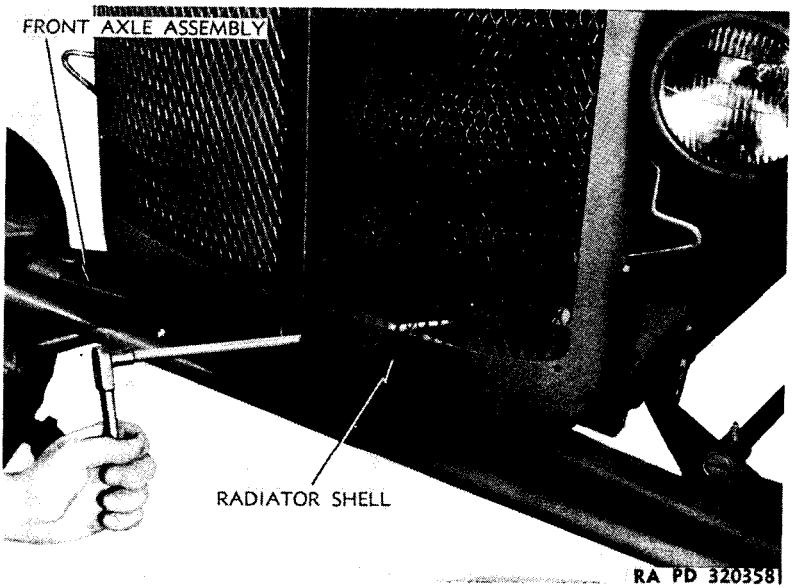


Figure 57—Removing Cap Screw from Radiator Support

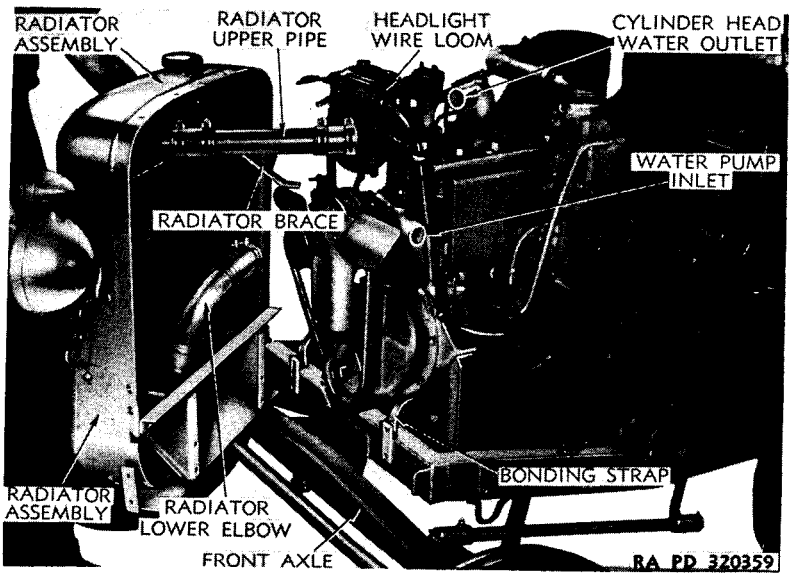


Figure 58—Removing Radiator, Shell, and Support Assembly

b. Adjustment. Adjust fan belt by loosening bolt through generator brace. Pull out on brace and generator, and tighten bolt (fig. 60).

c. Replacement of Fan Belt. Pull up on generator brace (fig. 60), push generator toward engine cylinder block. This will release belt so it can be removed. Replace belt, and pull generator away from cylinder block until arm drops into its original position. Adjust belt tension if necessary (subpar. **b** above).

77. ENGINE PREHEATER REPLACEMENT AND SERVICE.

a. Removal. Remove engine hood (par. 125 **b**). Drain cooling system (par. 72 **b**). Remove four cap screws holding preheater to

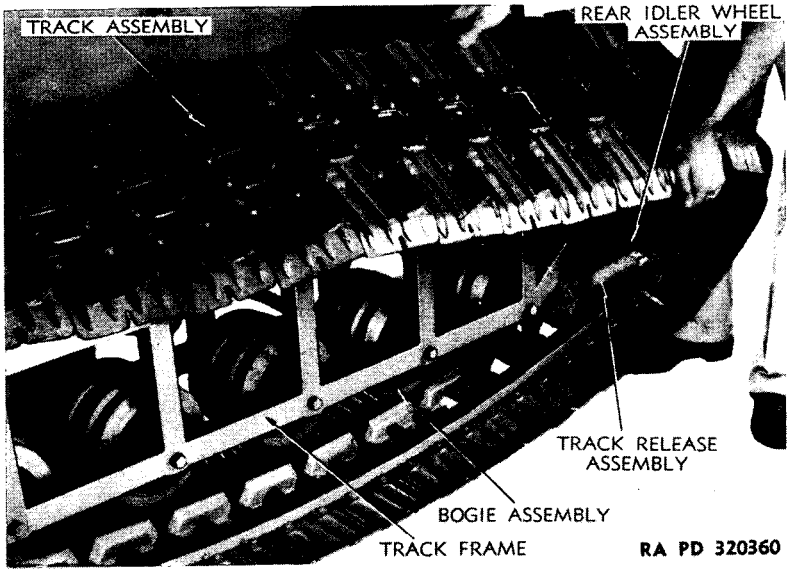


Figure 59—Removing Track

wheel support bracket (fig. 61). Disconnect upper and lower preheater hose by loosening hose clamp screws. Lift out preheater assembly.

b. Installation. Position preheater assembly at side of engine. Connect upper and lower hose. Install preheater against wheel support bracket. Install four cap screws and lock washers. Install engine hood (par. 125 **c**). Fill cooling system (par. 72 **a**). Fill preheater fuel tank with gasoline. Check for water or fuel leaks.

c. Servicing Preheater. Previous to each winter's use, the burner unit should be removed and thoroughly cleaned. Soot can be cleaned off the water unit by loosening the large hexagon nut on top, slipping out the slotted plate, and raising the upper combustion chamber. The fuel tank and fuel line should also be thoroughly cleaned at this time.

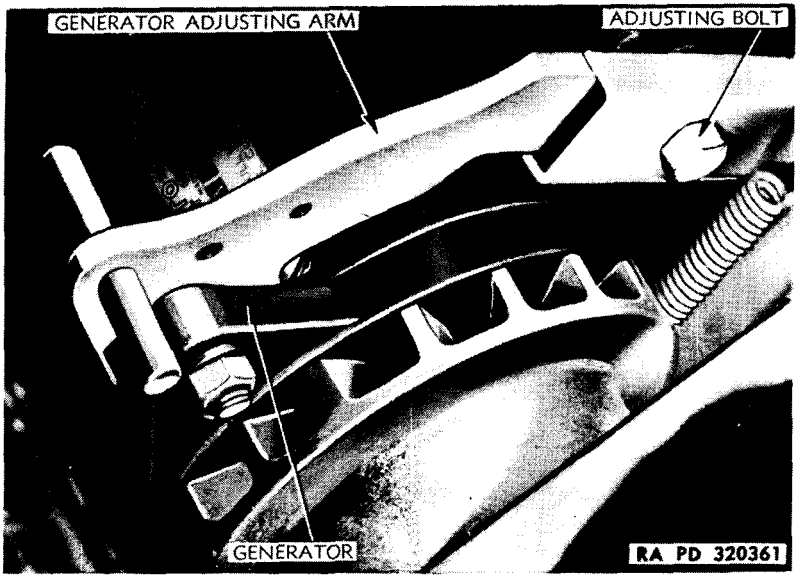


Figure 60—Generator Brace Assembly

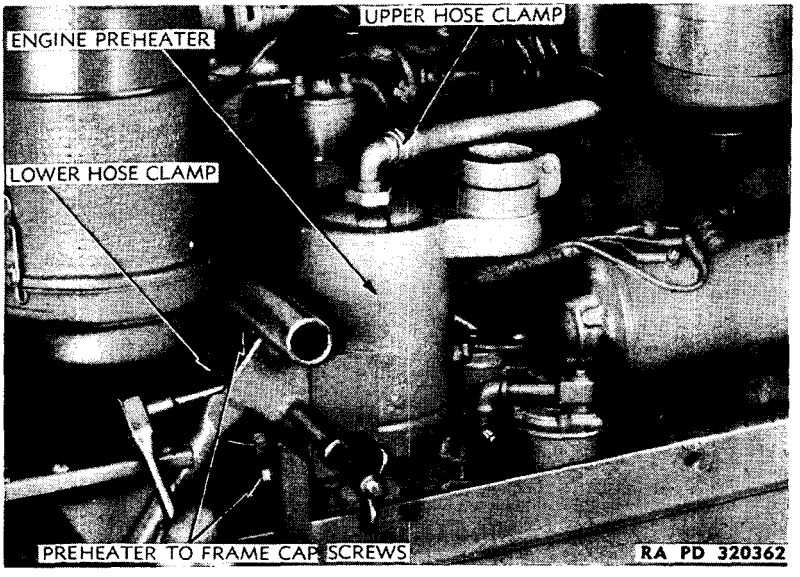


Figure 61—Removing Cap Screws from Preheater

COOLING SYSTEM

The water unit should be checked to be sure it is not clogged with sediment. If necessary, blow it out. The flue pipe should *always* be kept free from heavy accumulations of soot. In case any operating difficulty is encountered during the heating season, the following items should be checked:

(1) IF FIRE GOES OUT.

(a) If the fire goes out, first make sure there is fuel in the tank, that the flue pipe is open, that the wick is set in bottom position (No. 4), and that the gas tank vent is not blocked. Then make sure that there is no stoppage in the fuel line. This might occur if any water got into the gasoline, which would freeze in the line. It might also occur due to collection of dirt or sediment in the fuel line or on the strainer, or possibly due to some foreign material, such as antifreeze solution, getting into the gasoline accidentally. To check the source of the trouble, disconnect the inlet fitting which contains the strainer, located on top of the float chamber. Close the valve until this fitting is disconnected, then open the valve to see if gasoline flows. If the flow is blocked, it will be apparent at once that the trouble is in the fuel line or fuel tank. If so, it will probably be best to disconnect the fuel line entirely, clean it out thoroughly, and drain the tank, refilling with fresh fuel.

(b) If the fuel flows freely from the end of the fuel line, clean the strainer. Then make sure that the float valve is not stuck. If the float is stuck, a light tap on the housing will usually free it. If necessary, the float valve can be removed by taking out four screws which hold it in place, and the float chamber can be drained by removing a plug in the bottom.

(c) If it is found that foreign matter such as water or antifreeze solution has gotten into the wick chamber, the wick can be removed by taking out two screws which hold the cap in position. After removing the cap from the wick housing, lift up on the wick adjusting screw, raising it to the highest position, and the wick can be disengaged from the wick raiser rod by springing it outward and lifting it out of the housing. If the wick should get water on it, it must be dried thoroughly before using again, or a new wick should be put in. When replacing the wick, it must be inserted in the wick chamber so that one side of the wick is on each side of the partition.

(d) The float should maintain the fuel at a level 1⅛ inches above the bottom of the wick housing.

(e) If it is found necessary to remove the float valve or the wick, this can usually be done most readily by taking the entire burner unit out of the vehicle. The burner unit is held in position with four slotted screws and can be taken out by removing these four screws and dropping the burner assembly out of the heater, after disconnecting the fuel line at the strainer. If it does not come out readily, a screwdriver, placed between the lugs from which the screws were removed, can be used to pry the burner set out of the upper assembly.

(f) Make sure that the combustion chamber is properly clamped in position, and that all connections to the flue pipe are tight, as air

leaks reduce the draft and interfere with proper combustion. Also make sure that the flue is open.

(g) If there is an adequate supply of fuel to the heater but nevertheless the fire goes out, it is probably due to a downdraft. A downdraft is usually caused by air blowing into the top of the flue. Be sure that the heater is equipped with a suitable flue cap.

(h) A downdraft can also be produced by suction caused by the wind blowing under the heater.

(i) The fire will also snuff out if there are leaks into the combustion chamber of flue pipe. If the heater is ever taken apart for any reason, it is important that it be properly reassembled with the water unit properly centralized, so that the combustion chamber top fits securely in place. It is also important to be sure that the flue pipe fits all the way down into the collar on the flue box, so that there is no gap between the clamp ring and the flue box proper.

(2) IF FIRE BURNS TOO LOW.

(a) If the fire is too low, the trouble will usually be found to be caused by one of the following:

1. Flue pipe partly blocked by soot.

2. Gasoline flow obstructed by dirty strainer, water in wick, or sticking float.

3. Vehicle parked so that float chamber is very low.

4. Wick not adjusted to lowest position (No. 4).

(3) IF FIRE SMOKES.

(a) If smoke comes from the top of the chimney, it is usually due to one of the following causes:

1. If the vehicle is parked on a very steep downgrade or is tipped far to the right (with the burner end of the heater lower than the float end), excessive fuel may feed to the burner, resulting in smoke from the chimney. This can be corrected by screwing the wick up until the smoking stops.

2. Never turn the wick up to the point at which the fire is so low that it smokes.

3. Never attempt to allow the heater to burn with the door to the lighting tube left open. Burning in this manner will cause the heater to smoke.

4. If the fire smokes shortly after lighting, it may simply be due to allowing too much gasoline to flow into the burner before lighting it. This excess gasoline will eventually burn out, and smoking will stop. If desired, the wick can be turned up to hasten the burning out of the excess gasoline, and as soon as the smoking has stopped, the wick can be again lowered. NOTE: *A light smoke from the chimney does no harm.*

(4) IF BURNER FLOODS.

(a) If gasoline runs out of the overflow tube located in the wick housing, it is caused by the float being stuck in the open position. This

is quite likely to happen the first time the burner is operated, as shipping it on its side or upside down may easily cause the float valve to stick. Frequent light tapping on top of the valve housing will free the stem. If this does not correct the trouble, the float should be removed, and checked to see that it is not crushed and that the float arm is not bent. To determine if the float arm has been bent, the float valve should be held upside down, allowing the weight of the float to be carried by the small spring inserted in the valve stem. When in this position, the lowest point on the float should be ¼ inch above the rim of the cover.

(b) If the heater is operated when the vehicle is parked on a steep downgrade; that is, with the burner lower than the float chamber, gasoline may run from the overflow tube inside of the burner. If this occurs, the vehicle should either be moved to a level position, or the wick should be raised until no fuel overflows.

(c) If the heater is allowed to stand with the fire out, but with the wick in low position and fuel not shut off, gasoline may drip slowly from the overflow tube in the wick housing. When not in use, the bottom covers and the shut-off valve should be closed.

(5) IF CARBON FORMS.

(a) Carbon on the water unit or in the flue pipe is caused when the burner is allowed to smoke for a long time. See subparagraph c (3) above.

(b) Carbon in the burner bowl is caused by operating the burner at an excessively low fire, or by operating with the lighting door left open.

(c) Lead from ethyl gasoline will accumulate in the burner.

(d) Lead or carbon deposits in the burner do no harm unless they become great enough to block the air holes.

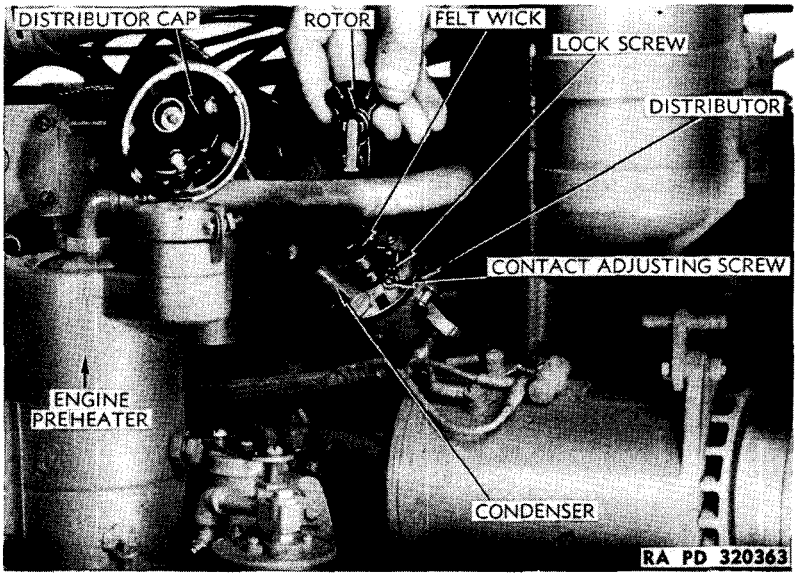


Figure 62—Distributor Cap and Rotor Removed

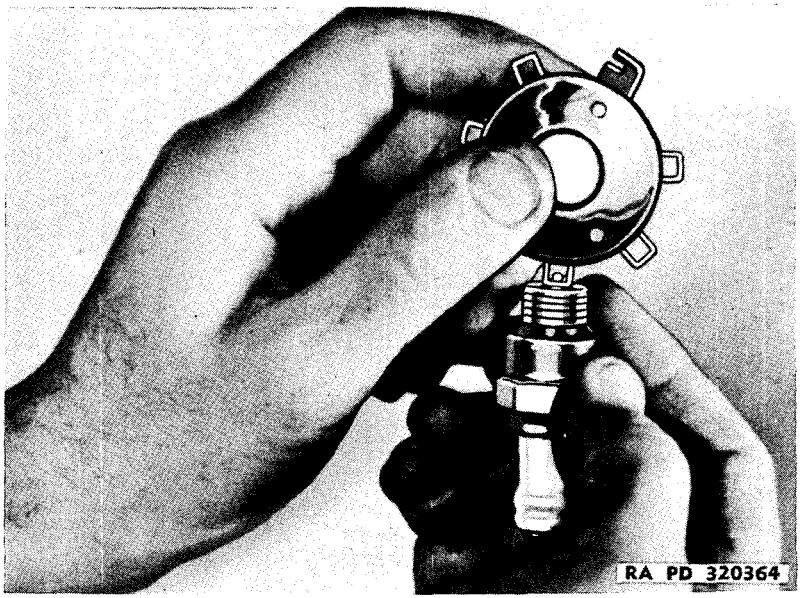


Figure 63—Gaging Spark Plug Gap, using Gage (41-G-350)

Section XVIII

IGNITION SYSTEM

78. DESCRIPTION OF SYSTEM.

a. The ignition system consists of a source of power (battery), the ignition distributor, ignition coil, wiring, and spark plugs. The ignition system, operating through a set of points in the distributor, supplies pulsations of direct current to the ignition coil. The coil converts these to high voltage surges, which are produced at the correct intervals and with the correct timing to the spark plugs. These high voltage surges produce a spark at the spark plug gap which ignites the mixture of air and fuel trapped in the cylinder by the closing of the valves.

79. DISTRIBUTOR.

a. Description. The distributor is mounted on the right-hand side of the engine, and is operated by a coupling on the oil pump shaft, driven by a spiral gear on the camshaft. The centrifugal spark control is fully automatic.

b. Adjustment of Contact Points.

(1) Remove engine hood side plate on right-hand side of vehicle.

(2) Unclip distributor cap and lay up out of the way.

(3) Remove distributor rotor. Turn engine with crank until distributor points are open wide.

(4) Loosen lock screw (fig. 62), and turn adjusting screw to move stationary contact to or from movable contact. Test opening with 0.020-inch feeler gage. Tighten lock screw. Recheck opening again with gage to be sure tightening of lock screw did not change adjustment.

(5) Replace rotor and distributor cap.

(6) Install engine hood side plate.

c. Remove Distributor Assembly. It is best to remove distributor assembly from engine to dress or replace contact points. Perform first two steps under subparagraph b above. Disconnect primary lead from the terminal at side of distributor housing. Note the position of the rotor in relation to the housing. NOTE: *This should be remembered to facilitate reinstalling and timing.* Remove cap screw holding the distributor to the cylinder block. Lift out distributor assembly.

d. Replace Contact Points. Loosen screw holding movable contact arm spring to distributor breaker plate. Remove lock screw from stationary contact. Lift off contacts and install new ones. Tighten movable arm contact spring. Install machinery contact lock screw. Adjust point gap to 0.020 inch. When new contacts are installed, they should

be alined to make contact near the center of the contact surfaces. Bend the stationary contact bracket to be sure of proper alinement, and then recheck the gap. The contact point spring pressure is very important and should be between 17 to 20 ounces. Check with spring scale hooked in the breaker arm at the contact, and pull in a line perpendicular to the breaker arm. Make the reading just as the points separate. This pressure should be within the specified limits; too low a pressure will cause missing at high speeds; too high a pressure will cause excessive wear on the cam, block, and points. Adjust the point pressure by loosening the screw holding the end of the contact arm spring, and slide the end of the spring in or out as necessary. Retighten the screw, and recheck the pressure.

e. Install Distributor Assembly. Insert the distributor in place on engine. When end of shaft enters driving collar on oil pump shaft, rotate distributor shaft back and forth until driving lug (lug on dis-

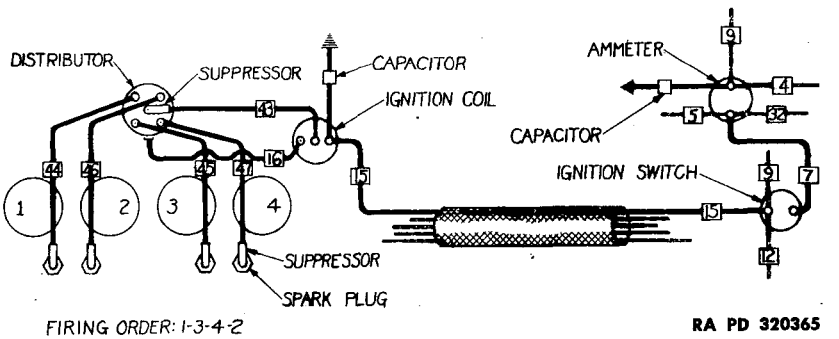


Figure 64—Wiring Diagram (Ignition System)

tributor shaft is off center) on end of shaft enters the slot in coupling, then push distributor assembly down. Install hold-down cap screw. Connect primary wire from coil to distributor. Install distributor cap. Run engine until it is fully warmed up, then recheck timing (par. 82). Install engine hood side plate.

80. SPARK PLUGS AND HIGH TENSION CABLES.

a. Spark Plugs. The spark plugs should be kept clean, and should be tight enough to make good seal only. Too much pressure will distort plug. The spark plugs should be removed from cylinder head periodically, cleaned, and gap adjusted to 0.030 inch with wire gage (fig. 63). When adjusting spark plug gap, make the adjustment by bending the grounded electrode. CAUTION: *Never bend center electrode, as it will damage porcelain insulator. Spark plug terminals must always be tight.*

b. High Tension Cables. The high tension cables must be clean and tight, and free from cracks or breaks in insulation. Refer to wiring diagram, figure 64, when replacing cables to insure installation in proper place.

IGNITION SYSTEM

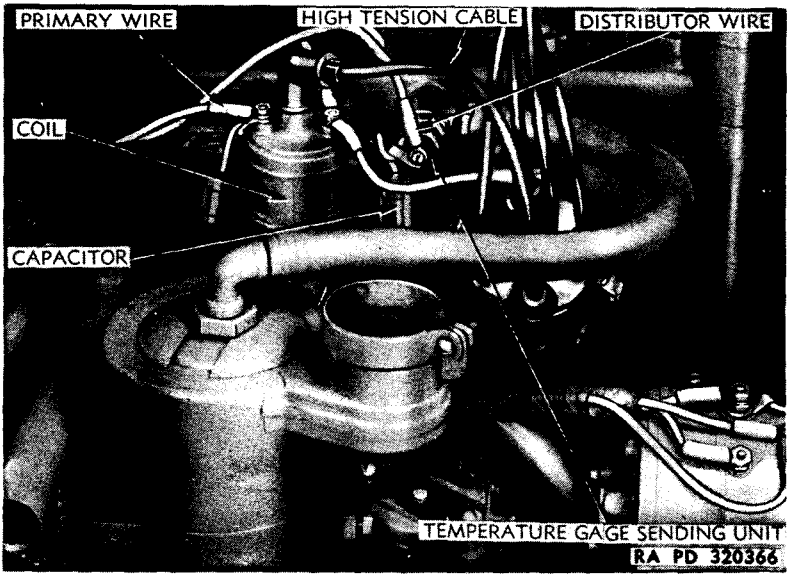


Figure 65—Coil Connections

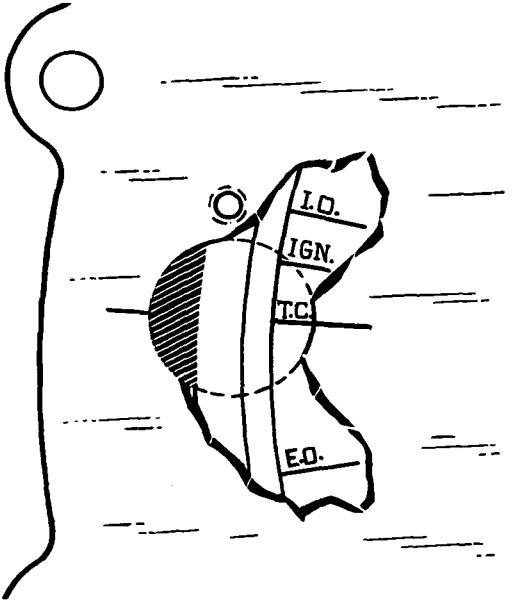


Figure 66—Timing Marks on Flywheel

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

81. COIL.

a. Description. The ignition coil is mounted on studs on right side of engine cylinder block.

b. Replacement of Coil. Remove right hood side plate. Pull high tension wire from center tower of coil (fig. 65). Disconnect wires from other two posts. Disconnect bonding strap from bottom of coil. Remove two nuts holding suppressors and coil assembly to cylinder block. Remove coil. Install replacement coil in reverse order to remove. See figure 64 for correct wiring.

c. Replacement of Ignition Switch. Remove engine hood (par. 125 b). Disconnect wires from back of switch. Remove switch retaining nut from rear side of instrument panel. Remove switch from front of instrument panel. To install, reverse the removal procedure.

82. IGNITION TIMING.

a. Remove all spark plugs from engine, reinstall spark plug in No. 1 cylinder, finger-tight. Turn engine with hand crank until compression is felt on No. 1 piston. Loosen screw holding timing hole cover to flywheel housing beneath cranking motor. Remove No. 1 spark plug. Turn engine slowly until the mark "IGN" on flywheel appears in the center of the timing hole (fig. 66). Remove distributor cap. Distributor rotor should be in position for No. 1 cylinder with contact points just breaking. If necessary to change, loosen clamp screw just below distributor body on front side of distributor. Rotate clockwise or counterclockwise to correct contact point opening. Tighten clamp screw. Install spark plugs and distributor cap. Warm up engine. Recheck timing with neon timing light, using directions with light. Tighten timing hole cover in position.

Section XIX

ELECTRICAL SYSTEM

83. DESCRIPTION OF SYSTEM.

a. The electrical system of the vehicle includes the battery (6-volt), generator, generator regulator, cranking motor, lights, light switches, cranking motor switches, windshield wiper, trailer outlet receptacle, and the necessary wires and cables for operation of the electrical units. The ignition system and instruments are covered in other sections of the manual.

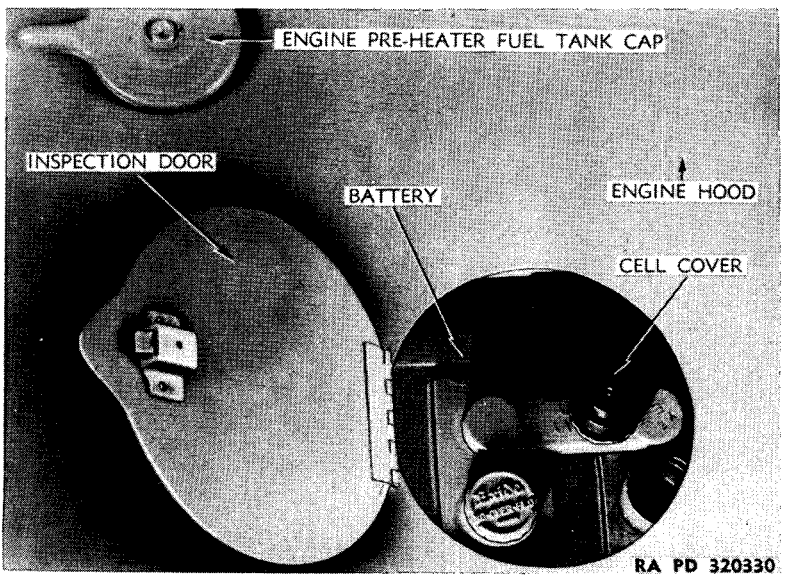


Figure 67—Location of Battery Cell Caps

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

84. BATTERY.

a. Description. The battery is a 6-volt, 15-plate, 116-ampere-hour battery. It is located under engine hood on left side of vehicle. The battery is carried on the battery support, and is held in place by a battery hold-down with two bolts going from battery hold-down to wheel support bracket underneath battery support.

b. Service to Battery. The battery should be checked once a week with a hydrometer; at the same time check the electrolyte level in each cell. Add distilled water, if necessary, to bring solution 3/8 inch above plates. Caps must be in place and securely tightened. Battery fumes or acid coming in contact with any metal parts causes corrosion of these parts. To safeguard against this difficulty, avoid overfilling of battery.

c. Specific Gravity. Test each cell separately with a hydrometer. If readings are below 1.240, the battery is not receiving sufficient charge. In cold weather there is danger of freezing; a battery with a specific gravity reading of 1.225 will freeze at –35°F. If water must be added oftener than every two weeks, the electrical system should be adjusted to decrease the charging rate; otherwise, the battery life will be shortened by overcharging.

d. Hydrometer Readings. The electrolyte temperature affects the hydrometer reading. For each 30 degrees that the electrolyte is above 77°F, add 10 points to the hydrometer reading to get the true specific gravity. For each 30 degrees that the electrolyte is below 77°F, subtract 10 points from hydrometer reading to get true specific gravity.

e. Replacement of Battery. Remove engine hood (par. 125 b). Disconnect battery cables at battery posts. Remove two nuts from hold-down bolts. Remove hold-down. Lift out battery. Install replacement battery. Install battery hold-down with two nuts and lock washers. Clean cable connections. Put a small quantity of grease on battery posts and connections. Connect cables. Install engine hood.

85. GENERATOR.

a. Description. The generator assembly is a 6-volt, air-cooled, 40-ampere, two-brush type, and cannot be adjusted to increase or decrease output, because this is accomplished by the use of a combination three-unit current voltage regulator. The generator assembly is bolted to a bracket on right side of engine, and is driven by the fan belt.

b. Maintenance. Every 100 hours, the cover band should be removed and the commutator and brushes inspected. If the commutator is dirty, it may be cleaned by using flint paper 2/0 against commutator while armature is turning slowly. CAUTION: *Never use emery cloth to clean commutator.* Blow out dust from unit with compressed air after cleaning. If the commutator is rough or pitted, has high mica between the segments, or is out-of-round, generator must be removed so the commutator can be turned down in a lathe and mica undercut. If the brush length is not sufficient to last until next inspection period, the brush should be replaced. No lubrication is required. Every 600 hours, the generator should be removed from the vehicle and replaced

by a new or rebuilt unit. The old unit should be sent to a higher echelon for repair or rebuilding.

c. Replacement of Generator.

(1) REMOVE GENERATOR. Remove right engine hood side plate. Lift up on generator brace and push generator toward engine to loosen tension of fan belt (fig. 60). Disconnect four wires from top of generator (fig. 49). Remove two generator mounting bolts by removing nuts and washers (fig. 28). Lift out generator.

(2) INSTALL REPLACEMENT GENERATOR. Install generator in place on bracket. Install mounting bolts. Install bonding strap on rear mounting bolt. Install flat washers, nuts, and lock washers. Connect wires to generator. See wiring diagram (fig. 69). Install fan belt on generator pulley. Pull out on generator to lock base. Start engine and observe reading on ammeter. Install engine hood side plate.

86. GENERATOR REGULATOR.

a. Description. The regulator unit contains a voltage regulator, current limiting regulator, and circuit breaker. The voltage regulator controls the generator voltage, and does not allow it to rise above a value determined by the voltage regulator setting. This prevents overcharging of the battery. The current regulator controls the maximum generator output of 40 amperes, and does not allow the output to exceed the value determined by the current regulator setting. This prevents damage to the generator due to an overload. The circuit breaker automatically closes the circuit between the generator and battery when the generator voltage rises above that of the battery, and automatically opens the circuit when the generator voltage falls below that of the battery. The terminals of the regulator unit are marked, and care should be used in making connections; otherwise, serious damage may result.

b. Maintenance. After every 100 hours of operation, check connections and mountings to be sure they are tight, and that leads are in good condition. See paragraph 47 b, if ammeter shows no charge, to check location of trouble, and to determine whether regulator or generator is at fault.

c. Replacement of Regulator. Remove right engine hood side plate. Disconnect wires from regulator. Remove bolts holding regulator to battery support. Remove regulator. Install replacement unit in reverse order. Refer to wiring diagram, figure 69, for connecting wires correctly.

87. CRANKING MOTOR AND SWITCHES.

a. General. The cranking motor is similar in construction to the generator, but the design of the parts is different, due to it being necessary for the cranking motor to handle a larger amount of current at short intervals. It is bolted to flywheel housing on right-hand side of engine, and is operated by a push button on instrument panel, which closes circuit of magnetic cranking motor switch. The magnetic crank-

ing motor switch is bolted to air cleaner bracket at rear of cylinder head.

b. Maintenance. Lubricate cranking motor periodically as explained under lubrication (par. 27). Inspect brushes and commutator every 100 hours. Inspect all wires and cables to see that all connections are clean and tight.

c. Replacement of Cranking Motor. Remove engine preheater (par. 77). Disconnect battery cable at cranking motor terminal (fig. 68). Remove cap screw holding cranking motor front support bracket and generator ground strap to cylinder block (fig. 68). Remove two cap screws holding cranking motor to flywheel housing (fig. 68). Pull

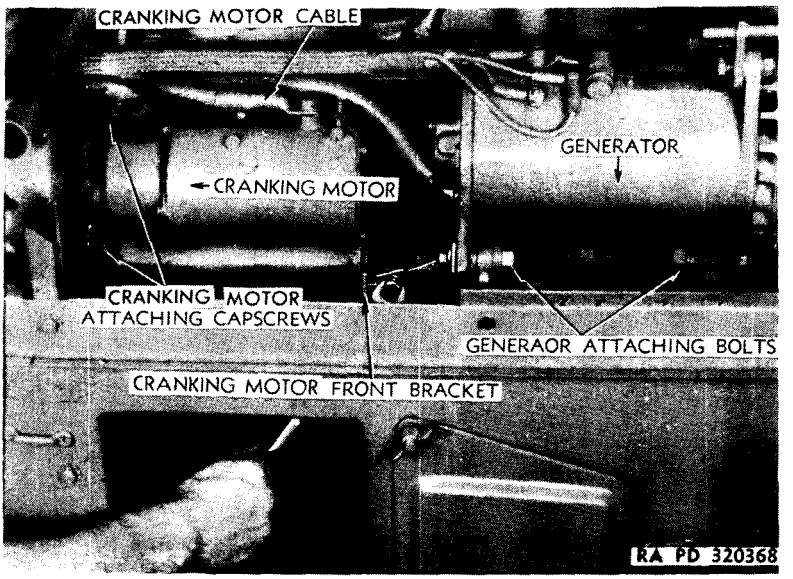


Figure 68—Removing Cap Screw from Cranking Motor Bracket

forward and out on cranking motor to remove. Install replacement cranking motor assembly into hole in flywheel housing, being sure that end of cranking motor shaft enters pilot bushing in clutch housing. Install two cap screws and lock washers holding cranking motor to flywheel housing. Install cap screw with flat washer and lock washer through generator ground strap, and cranking motor front support bracket into cylinder block. Connect battery cable to cranking motor. Install engine preheater (par. 77).

d. Push Button Switch Replacement. Remove right engine hood side plate. Disconnect wires, being sure not to let wires touch each other or surrounding metal parts. Remove nut holding switch on instrument panel. Remove switch. Install new switch, and secure with nut. Connect wires. Replace hood side plate.

e. **Magnetic Switch Replacement.** Remove both hood side plates. Disconnect battery ground cable at battery post. Disconnect all wires from magnetic switch. Remove two bolts holding magnetic switch to air cleaner bracket. Install new switch with above bolts. Connect wires. See wiring diagram, figure 69. Connect battery ground cable. Replace hood.

88. LIGHTS.

a. Headlights.

(1) DESCRIPTION. The headlights are of the sealed-beam type, in which the reflector, lamp, and lens form a sealed unit, and can only be replaced as a unit. The lower-beam filament is positioned slightly to one side of the focal point in the reflector. This results in deflecting the lower beam to the right side to illuminate the side of the road when meeting other vehicles on the highway.

(2) REPLACEMENT OF SEALED BEAM LAMP-UNIT. To replace a burned out sealed beam lamp-unit, remove door clamp screw and remove the door, remove sealed beam lamp-unit, and remove from connector at the rear of the unit. Install a new unit by reversing the above operations. When a sealed beam lamp-unit has been replaced, check the aim of the headlights.

(3) ADJUSTMENT. Headlights are aimed by use of an aiming screen or wall, providing a clear space of 25 feet from the front of the headlights to the screen or wall is available. The screen should be made of a light-colored material, and should have a black center line for use in centering the screen with the vehicle. The screen should also have two vertical black lines, one on each side of the center line at a distance equal to the lamp centers. Place the vehicle on a level floor with the tires inflated to recommended specifications. Set the vehicle 25 feet from the front of the screen or wall so that the center line of the tractor is in line with the center line on the screen. To determine the center line of the vehicle, stand at the rear and sight through the windshield down across cowl and hood. Measure from the floor to the center of the headlight, and mark a horizontal line on the screen 7 inches lower. Turn on the headlight upper beam, cover one light, and check the location of the upper beam on the screen. The center of the hot spot should be centered on the intersection of the vertical and horizontal lines. If aim is incorrect, loosen the nut on the mounting bolt and move the headlight body in the ball and socket joint until the beam is aimed as described, then tighten. Cover the headlight just aimed, and adjust the other in the same manner.

b. Blackout Marker Headlights.

(1) DESCRIPTION. The blackout headlight is based on the principle of polarized light. The lens is so designed that only horizontal light beams are allowed to penetrate or pass through the lens. This means the vertical light beams are blocked by the lens, therefore, light rays cannot be seen from a point above the horizontal.

(2) REPLACEMENT OF LAMP-UNIT. To replace lamp-unit, remove door screw in lower side of rim, remove door by slipping off bottom, and

tilt outward and up from light body. The door and lens are one unit. Replace lamp (Mazda No. 63) and inspect gasket; if damaged, replace and install door.

c. Tail and Stop Lights.

(1) DESCRIPTION. The tail and stop lights consist of two separately sealed units placed in the light body. The upper stop light, or service unit, consists of lens, gasket, reflector, and lamp (21-3 cp. lamp L.H.—R.H. 3 cp.) sealed as a unit. When lamp fails, entire service unit must be replaced. The lower taillight unit consists of lens, gasket, reflector and 3-cp. lamp sealed as a unit. When lamp fails, the unit must be replaced.

(2) REPLACEMENT OF SEALED BEAM LAMP-UNITS. To replace a unit, remove the two screws in light door. Remove door and each unit can then be pulled out of socket in light body.

d. Spotlight.

(1) DESCRIPTION. The spotlight, which is mounted on right side frame of windshield, is of the removable-lamp type, with switch in rear of lamp. The spotlight can only be turned on when service lights are on.

(2) REPLACEMENT OF LAMP. Loosen screw in lens door. Pull off lens door and glass. Replace lamp. Replace lens and door assembly.

e. Panel Lights.

(1) DESCRIPTION. There are two panel lights mounted on instrument panel by three screws each through panel from rear. Both lights are operated by one switch on panel, and can only be turned on when service headlights are on.

(2) REPLACEMENT OF LAMP. Remove two screws holding cover and glass assembly to light. Remove cover assembly. Replace lamp. Replace cover assembly with two screws.

89. LIGHT SWITCHES.

a. Main Light Switch.

(1) DESCRIPTION. The main light switch has four positions. When the switch button is all the way in, all lights are turned off. Pulling the switch out to the first position turns on the blackout headlights, the blackout taillight, and also connects the circuit with a blackout stop light on the right side which is operated through the stop light switch when the brakes are applied. To turn on the service headlights, and service tail and stop lights, it is necessary to push in the lock-out control button and, while holding it in, pull the switch button out to the next position. During the day, to cause the service stop light only to operate upon brake application, pull the knob out to the last position. This should be done whenever the vehicle is used under ordinary driving conditions.

(2) REPLACEMENT. Disconnect battery ground cable. Loosen screw in switch knob. Unscrew knob. Remove cap screw under button latch housing. Pull off latch assembly. Remove nut under housing holding switch to panel. Pull switch from panel. NOTE: *The easiest way to replace wires on new switch is to remove wires from one terminal at a time, and install on same terminal of new switch. Also refer to wiring*

diagram, figure 70. Install switch through panel. Install nut. Install latch assembly. Install knob. Connect battery ground cable, and test switch.

b. Headlight Dimmer Switch Replacement. Disconnect wires from switch. Remove two bolts holding switch to panel. Remove switch. Install new switch in reverse order. See wiring diagram (fig. 70) for correct wire connections.

c. Panel Light Switch Replacement. Remove knob. Remove nut holding switch to panel. Disconnect wires. Replace switch. See wiring diagram (fig. 70).

90. WINDSHIELD WIPER.

a. Description. The windshield wiper is mounted through top frame of windshield, and is operated by an electric motor contained in unit. A wiper arm and blade assembly is clamped on outer end of windshield wiper shaft. The windshield wiper switch is on windshield wiper, and is only operative when ignition switch is closed.

b. Replacement of Windshield Wiper. Loosen set screw holding arm and blade. Remove two bolts holding windshield wiper motor bracket to windshield frame. Remove two bolts holding windshield wiper motor to bracket. Disconnect wire from wiper motor. Install bracket onto replacement unit with spacers, washers, two bolts, nuts and lock washers. Connect wire to motor terminal. Install windshield wiper motor and bracket to windshield with two bolts, nuts and lock washers. Install arm and blade assembly.

91. TRAILER OUTLET RECEPTACLE.

a. Description. The trailer outlet receptacle is of a standard ordnance design, and is located to left of pintle, on bracket at rear of seat, The receptacle has a dustproof cover to close opening of receptacle when not in use.

b. Replacement of Outlet Receptacle. Remove four bolts holding receptacle and cover assembly to seat bracket. Remove cover assembly and rubber seal. Pull receptacle out of bracket. Remove wire cover from receptacle, by removing nut in center of cover. Disconnect wires. Connect wires to replacement receptacle. See wiring diagram (fig. 70). Install wire cover, lock washer, and nut on center bolt. Install receptacle into bracket. Install rubber seal in place (with inside notch at bottom), retainer ring, and two lower bolts, being sure that ground wire is connected to one of lower bolts at rear of bracket. Install cover assembly with two bolts, nuts, and lock washers.

92. WIRING.

a. General. The wiring diagrams (figs. 69, 70, and 71) show the general arrangement of all vehicle electrical circuits, together with units in correct relation to position in which they will be found on vehicle. Regular inspection of all electrical connections avoids failures in the electrical system. When tracing any one particular circuit, refer to proper wiring diagram for wire numbers, which will be found on wire tags.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

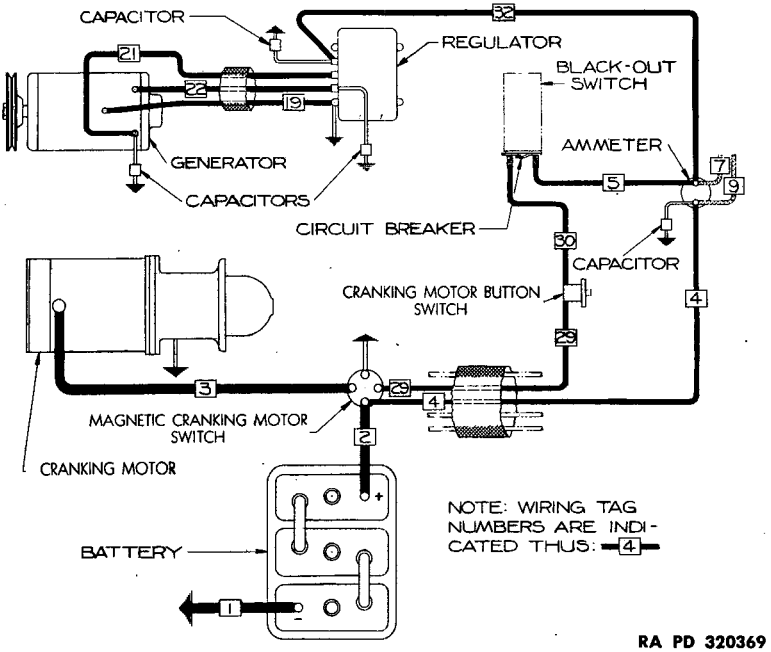


Figure 69—Wiring Diagram (Generating and Starting System)

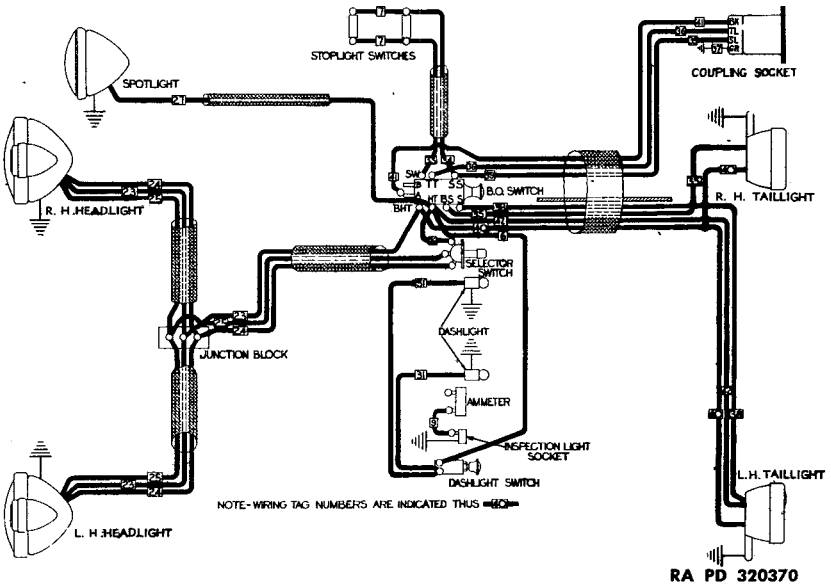


Figure 70—Wiring Diagram (Lighting System)

ELECTRICAL SYSTEM

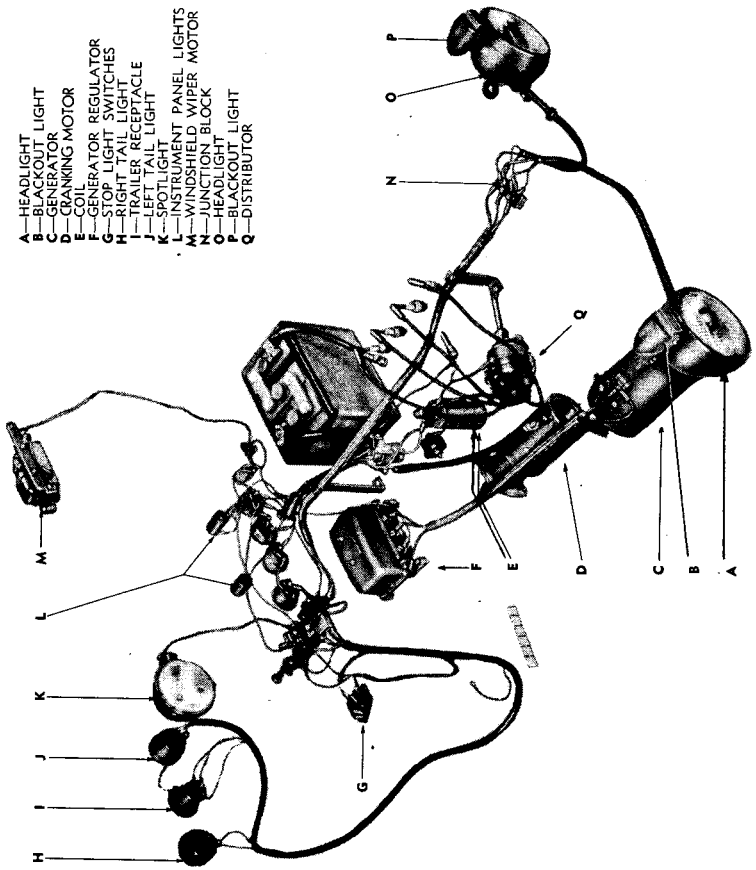


Figure 71—Photo Wiring Diagram (Snow Tractor M7)

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

Section XX

INSTRUMENTS AND GAGES

93. AMMETER.

a. Description. The ammeter is a dial gage which indicates the rate of charge or discharge of electrical energy to or from the battery.

b. Replacement. Remove engine hood (par. 125 b). Disconnect battery ground cable. Disconnect wires from ammeter posts. Remove remaining nuts from ammeter posts. Remove ammeter and bracket. Reverse procedure to install replacement ammeter. See wiring diagram (fig. 72).

94. ENGINE OIL PRESSURE GAGE.

a. Description. The engine oil pressure gage is an electrically operated dial gage, mounted on instrument panel, with an operating unit mounted on left side of engine. The gage hand indicates the pressure in pounds per square inch of the lubricating oil delivered to the

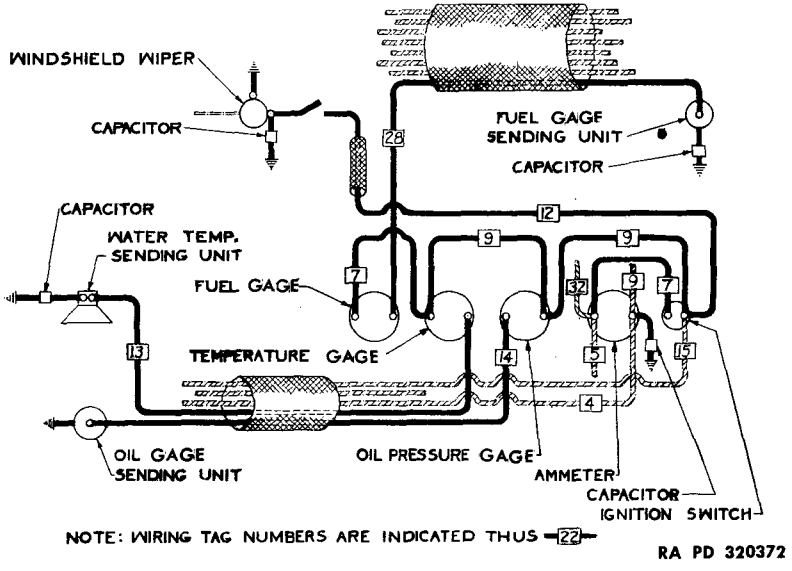


Figure 72—Instrument Wiring Diagram

engine. Normal oil pressure is approximately 40 pounds with engine running at operating speed.

b. Replacement of Gage. Refer to paragraph 93 **b.** Use same procedure to replace oil pressure gage as was used to replace ammeter.

c. Replacement of Sending Unit. Remove left engine hood side plate. Disconnect wire from sending unit (fig. 47). Turn unit counterclockwise to remove from cylinder block. Install new sending unit, using reverse procedure.

95. ENGINE TEMPERATURE GAGE.

a. Description. The engine temperature gage, mounted on instrument panel, is an electrically operated gage, with a thermo unit on right side of engine cylinder head. The gage indicates the temperature of the engine coolant in degrees Fahrenheit.

b. Replacement of Gage. Use same procedure to replace the engine temperature gage as outlined in paragraph 93 **b.**

c. Replacement of Sending Unit. Remove right engine hood side plate. Remove screw holding wire to top of sending unit. Loosen sending unit from adapter by turning counterclockwise. Screw out old unit, and quickly install new unit. Tighten unit. Very little coolant should be lost in this operation. Connect wire. Install engine hood side plate.

96. FUEL LEVEL GAGE.

a. General. The fuel gage is composed of two units, the indicating or panel unit, which is mounted on the instrument panel, and the tank unit, which is mounted in the fuel tank. These units are connected by a single wire. The circuit for this instrument passes through the ignition switch; therefore, the fuel gage operates only when the ignition switch is on. The panel unit is of the balanced-coil type, and is designed so that the operation is not affected by variations in the voltage of the electrical system. The tank unit consists of a resistance wire wound on an insulator, and a contact arm which is moved by the float arm. As the depth of the fuel in the tank varies, the contact arm is moved across the resistance wire, and so varies the resistance. As this resistance is varied, there results a proportionate variation of current in the coils of the panel unit, which is calibrated to accurately indicate the fuel level in the tank with vehicle level. If the gage does not register properly, first check all wire connections to be sure that they are clean and tight. Then make sure that the panel unit is tightened securely to the instrument panel, and that the tank unit is securely attached to the fuel tank. If, after checking all grounds and wire connections, gage does not indicate properly, remove wire from tank gage unit, and ground it to frame while ignition switch is on. Gage should then read "FULL." Remove wire from frame (with ignition switch on) and gage should read "EMPTY." If this is *not* the case, the fuel gage panel unit should be replaced with a new one. If the gage indicates as described, the trouble is probably in the tank unit, and it should be replaced. Be sure gasket is good when replacing. Do not attempt to repair either gage or tank unit; replacement is the only practical procedure.

b. Replacement of Gage. Refer to paragraph 93 b. Use procedure outlined to replace gage.

c. Replacement of Tank Unit. Remove front seat cushion. Remove front seat cushion support by removing three cap screws and two bolts. Disconnect wires from unit. Remove six screws holding unit to fuel tank. Lift out unit. Clean all of old gasket from tank opening. Install replacement unit with new gasket. Reverse procedure for installation of unit.

97. SPEEDOMETER.

a. Description. The speedometer registers the vehicle speed in miles per hour, total miles covered, and the trip mileage. The instrument is driven by a flexible drive shaft connected to gears at rear of auxiliary transmission case.

b. Replacement of Speedometer. Disconnect flexible drive shaft housing from rear of speedometer. Remove two nuts holding speedometer bracket to speedometer. Remove bracket and speedometer. Reverse above procedure to install replacement unit.

c. Replacement of Flexible Drive Shaft. Disconnect flexible drive shaft housing from speedometer and auxiliary transmission hose fitting. Pull down on bottom of flexible drive shaft enough to remove clip.

Section XXI

CLUTCH

98. DESCRIPTION.

a. The clutch assembly is bolted to the flywheel, and is a single-plate, 8-inch, dry-disk type. The driven plate has a spring-center vibration neutralizer.

99. CLUTCH PEDAL ADJUSTMENT.

a. Adjust clutch connecting link (fig. 73), so clutch pedal travels 2½ to 3½ inches before clutch release bearing contacts clutch release fingers. Remove left-hand toeboard by removing screws. Remove cotter pin and clevis pin from clevis on clutch adjusting link; turn clevis counterclockwise to increase free pedal play, and clockwise to decrease. After adjusting, replace clevis pin and cotter pin. Install toeboard.

100. REPLACEMENT OF CLUTCH DISK.

a. **Removal of Clutch Driven Disk.** Remove engine (par. 62). Mark both the pressure plate and the flywheel so that clutch assembly can be reinstalled in the same position. Remove six cap screws holding the clutch assembly to the engine flywheel. Loosen cap screws in sequence, a little at a time, so as to prevent distortion of the clutch bracket.

b. **Installation of Clutch Driven Disk.** Put a small amount of light grease in the clutch shaft bushing. Install driven plate, with short end of hub toward the flywheel. Install clutch pressure plate assembly over clutch driven plate, and start six cap screws with lockwashers to hold clutch assembly to flywheel. Install a clutch pilot arbor, or a clutch shaft, to aline driven disk, leaving arbor in place while tightening the pressure plate cap screws. Tighten cap screws in sequence a little at a time so as to prevent distortion of the clutch bracket. Install engine (par. 63). Adjust clutch pedal free play (par. 99).

101. REPLACEMENT OF CLUTCH SHAFT PILOT BEARING.

a. **Removal.** Remove engine (par. 62). Insert pilot bearing puller through bushing, and pull out old bushing.

b. **Installation.** Install new bushing into bore of flywheel, and tap into wheel so that outer end of pilot bushing is flush with face of flywheel. Install engine (par. 63).

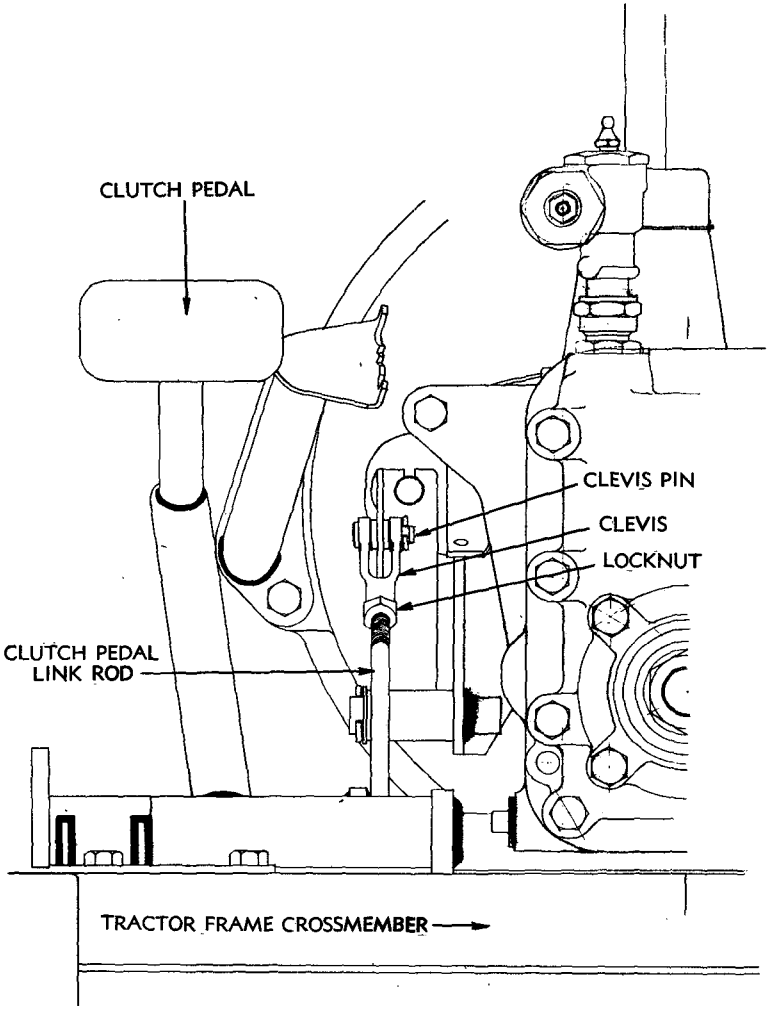


Figure 73—Clutch Pedal Link Adjustment

CLUTCH

102. REPLACEMENT OF RELEASE BEARING.

a. Removal. Remove auxiliary transmission and transmission assembly as a unit (par. 104 **b**). Unhook spring from clutch release bearing carrier. Pull carrier and bearing from shaft. Press bearing carrier from bearing.

b. Installation. Press bearing onto carrier with smooth polished face away from carrier. Install carrier assembly onto throw-out bearing carrier tube. Hook return spring. Install transmission and auxiliary transmission assembly as a unit (par. 104 **c**). Adjust clutch pedal free play (par. 99).

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

Section XXII

PROPELLER SHAFT, TRANSMISSION, AUXILIARY TRANSMISSION, AND DIFFERENTIAL

103. PROPELLER SHAFT.

a. Description. The splined slip joint at one end of the shaft allows for variations in distance between the auxiliary case and the differential unit. The slip joint is marked with arrows at the spline and the sleeve yoke. NOTE: *Note markings to facilitate proper assembly so the yokes of the universal joints at front and rear of the shaft are in the same plane when assembled (fig. 74).* The propeller shaft is equipped with the U-bolt type joint at the rear, where it is attached to the rear axle. The front universal joint is the snap-ring type. These universal joints are the needle-bearing type, and are so designed that correct assembly is a very simple matter. No hand fitting or special tools are required. The journal trunnion and needle-bearing assemblies are the only parts subject to wear, and when it becomes necessary to replace these parts, the propeller shaft should be removed from the vehicle to facilitate replacement. The propeller shaft is enclosed in a tunnel through tractor fuel tank.

b. Removal. Refer to removal of fuel tank (par. 66 c).

c. Installation. Refer to installation of fuel tank (par. 66 c (4)).

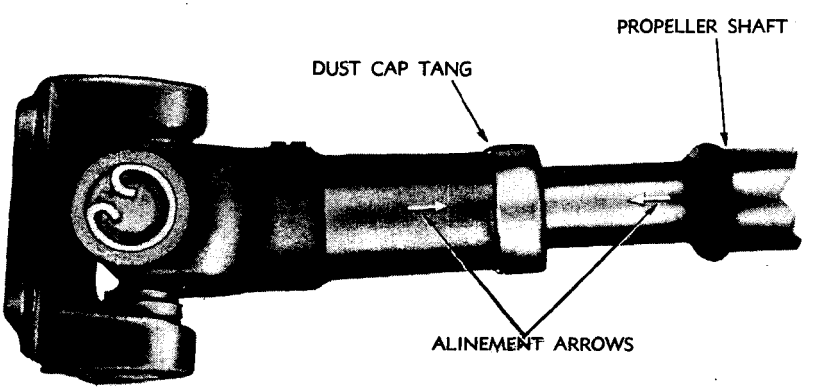


Figure 74—Markings on Propeller Shaft Slip Joint

PROPELLER SHAFT, TRANSMISSION, AUXILIARY TRANSMISSION, AND DIFFERENTIAL

104. TRANSMISSION AND AUXILIARY TRANSMISSION.

a. Description.

(1) TRANSMISSION. The transmission is of the three-speed, synchromesh type with synchronized second and high-speed gears. For shifting instructions, see diagram (fig. 17). The transmission is bolted to the rear face of the flywheel bell housing with four screws, and is supported on the center frame cross member.

(2) AUXILIARY TRANSMISSION. The auxiliary transmission is of the over-drive and under-drive type driven by the main transmission shaft. For shifting instructions, see diagram (fig. 17). The auxiliary transmission is bolted to the rear of the transmission. Both units use the same oil supply. The propeller shaft front universal joint bolts to output shaft flange of auxiliary transmission. The speedometer drive is included in auxiliary transmission.

b. Removal (as a unit). Transmission and auxiliary transmission are to be removed as a unit. Remove fuel tank (par. 66 c). Remove one screw from top side of floorboard on each side of transmissions. Remove four cap screws holding transmission to clutch housing (fig. 75), and remove floorboard bracket on right-hand side of transmission. Remove two cap screws from transmission support bracket under transmission. Remove inspection hole cover from top of clutch housing; disconnect clutch pedal spring and clutch adjusting link at clevis end by removing pin from clevis. Reach through inspection hole in clutch housing, and hold clutch throw-out lever and lever link. Disconnect outside clutch linkage from lever link by moving it forward and down; continue to hold clutch throw-out lever, and lever link, move transmission back from clutch housing about 1 inch, and remove lever link by moving it forward and to the left to disconnect it from clutch throw-out lever. Continue to hold clutch throw-out lever, move transmission slowly toward back of tractor until clutch shaft is out of clutch housing. Move clutch throw-out lever from back of clutch throw-out bearing as transmission is being moved back, allowing clutch throw-out bearing to be removed with transmission. Remove clutch throw-out lever from clutch housing after transmission has been removed.

c. Installation (as a unit). Transmission and auxiliary transmission are to be installed as a unit.

(1) Enter clutch shaft through back of clutch housing. Move transmission forward until clutch shaft hits clutch plate, shift both transmissions into high gear with shift levers, turn universal joint flange to line splines on clutch shaft with splines in clutch hub, and push forward on transmission while turning universal joint flange so clutch shaft will enter clutch hub when splines are in line. After clutch shaft enters clutch hub, move transmission forward to within 1 inch of the clutch housing.

(2) Install clutch throw-out lever through inspection hole in clutch housing (fig. 76). NOTE: *Make certain the lever is back of clutch throw-out bearing and in place on ball on front of transmission.* Install lever link through hole in clutch housing to the left of the transmission,

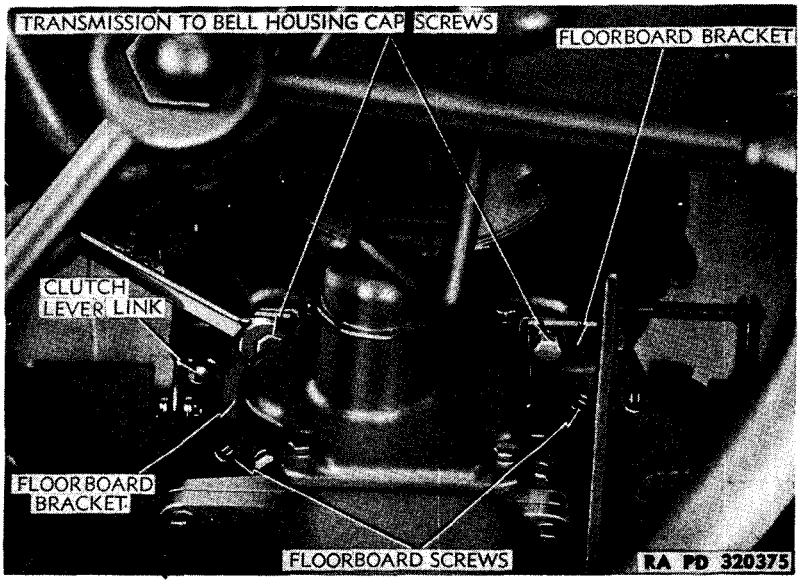


Figure 75—Removing Cap Screw from Clutch Housing

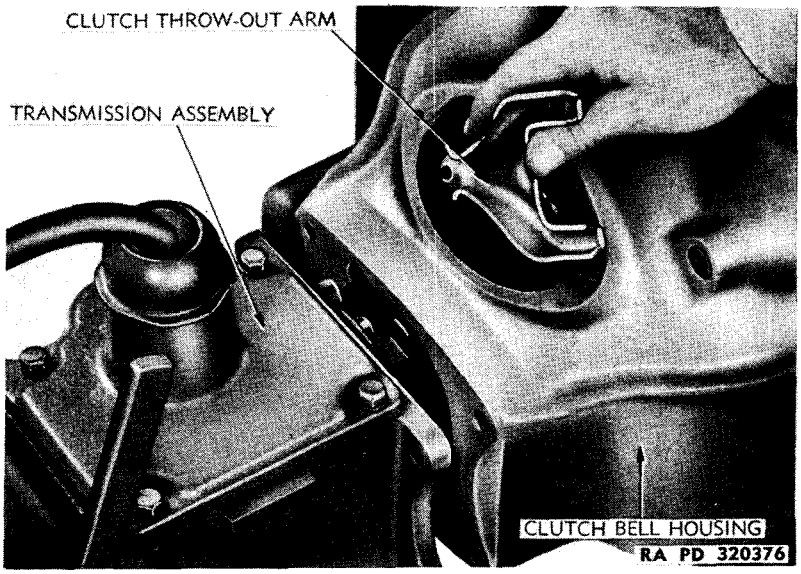


Figure 76—Installing Clutch Throwout Lever

and connect to clutch throw-out lever (fig. 78). Hold lever link and clutch throw-out lever in place with hand through inspection hole in clutch housing. Move transmission forward until tight against clutch housing. Continue to hold lever link and clutch throw-out lever, and connect outside clutch linkage to lever link. Install cap screws through linkage bracket and transmission flange, and bolt to clutch housing. Remove hand from inspection hole. Install remaining two cap screws holding transmission to clutch housing with floorboard bracket on right top cap screw.

(3) Install two cap screws through transmission support bracket under transmission. Put screw through top of floorboard on each side of transmission. Connect clevis end of clutch adjusting link to clutch link. Connect clutch spring to engine support. Adjust clutch pedal free travel if necessary (par. 99). Install fuel tank (par. 66 c (4)).

105. DIFFERENTIAL.

a. Description. The differential drive is of the hypoid-type, having a ratio of 4.88 to 1 (8-tooth drive pinion, 39-tooth bevel gear). A cover is used on the rear of the gear carrier housing to permit inspection and flushing of the differential assembly. It is necessary to use a hypoid gear lubricant. See Lubrication Guide (fig. 24). Various types of hypoid lubricants must not be mixed. If the brand is changed, it is best to drain and flush the differential housing before installing new lubricant.

b. Removal of Differential Housing Cover. Remove first floorboard back of differential by removing four nuts, lock washers, flat washers, and bolts. Remove 10 cap screws holding cover to differential housing. Remove cover (fig. 79). To install, reverse the removal procedure, using a new gasket and cementing it to differential housing. Fill with lubricant to the proper level. See Lubrication Guide (fig. 24).

c. Removal of Differential Assembly.

(1) Remove track and frame assemblies (par. 119 b).

(2) Remove fuel tank (par. 66 c).

(3) Remove brake return springs from brake control rods and brackets (fig. 80). Remove cotter pin from each brake control rod at brake cam lever.

(4) Remove four bolts holding first floorboard back of differential. Remove floorboard.

(5) Remove four bolts holding differential assembly to frame, and lower differential assembly down from tractor and remove.

d. Installation of Differential Assembly.

(1) Place differential assembly under tractor. Install four bolts, nuts, and lock washers holding differential assembly to frame.

(2) Install first floorboard back of differential and secure with four bolts, flat washers, lock washers, and nuts. Install floorboard under fuel tank and fuel tank guard, and bolt in place with nine bolts, flat washers, lock washers, and nuts.

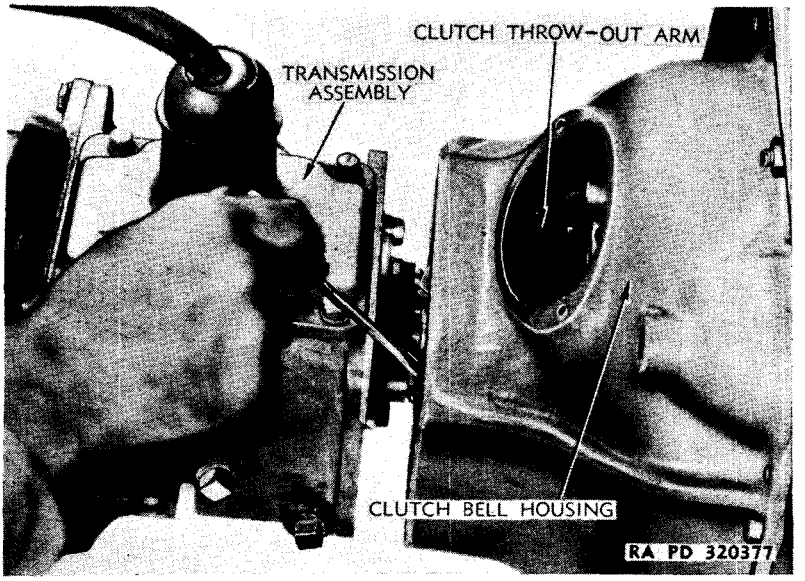


Figure 77—Holding Bearing Carrier Ahead to Install Arm

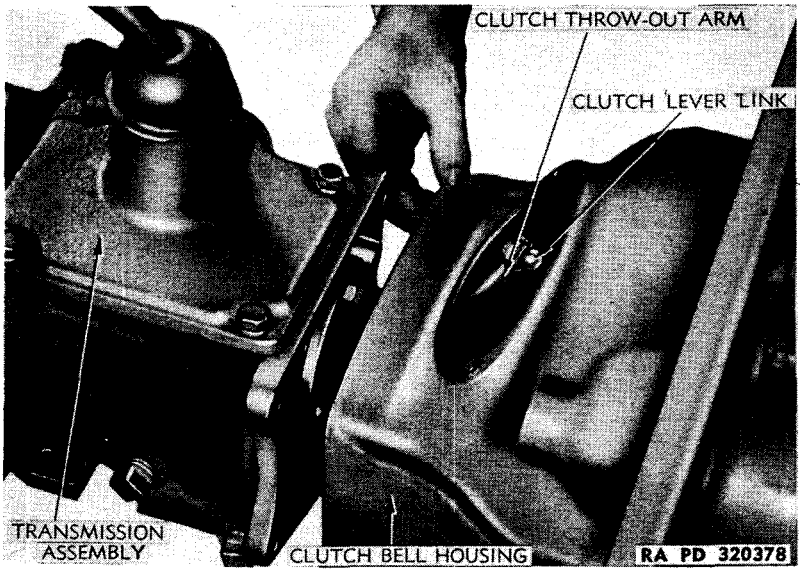


Figure 78—Installing Lever Link

PROPELLER SHAFT, TRANSMISSION, AUXILIARY TRANSMISSION, AND DIFFERENTIAL

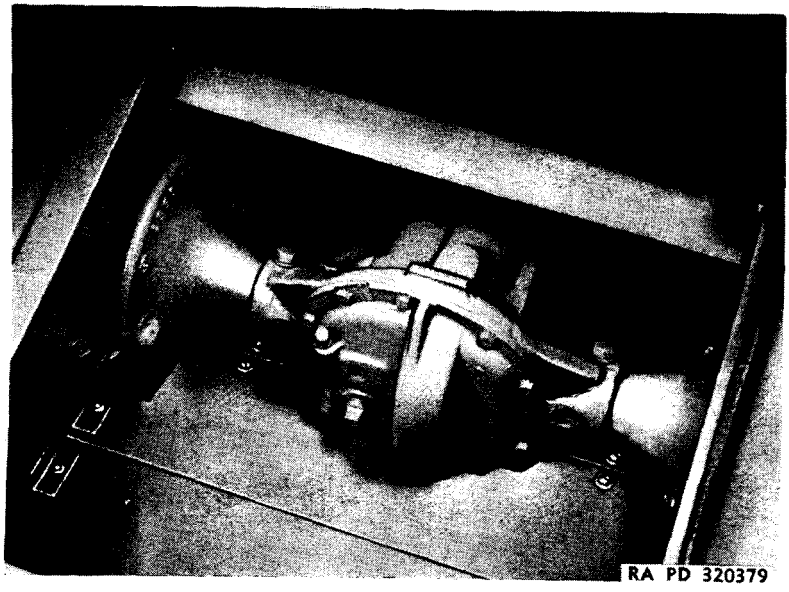


Figure 79—Differential Cover

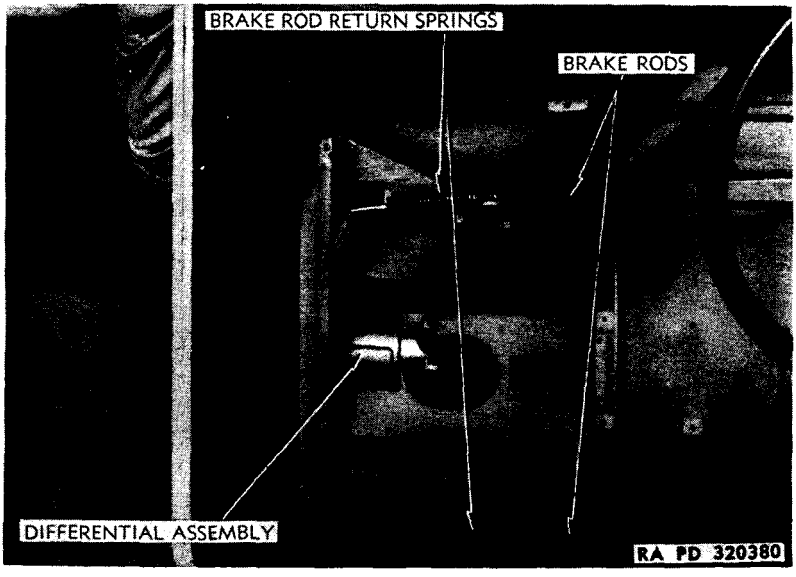


Figure 80—Unhooking Brake Rod Return Spring

(3) Connect brake control rods to brake cam levers, and secure with cotter pins.

(4) Connect brake return springs to brake control rods and brackets.

(5) Install fuel tank assembly (par. 66 c (4)).

(6) Install track and track frame assemblies (par. 119 c).

Section XXIII

STEERING GEAR, STEERING COLUMN, AND FRONT AXLE ASSEMBLIES

106. DESCRIPTION.

a. The steering mechanism of the tractor is of the automotive type, consisting of a steering column, steering gear assembly, drag link, front axle assembly, front wheel assemblies, and having additional provision on front axle spindles for attaching skis for travel over snow. Wheels can be removed as an assembly with wheel spindles, and carried in transport on a special bracket, while skis are being used, or wheels and skis may be used simultaneously for certain conditions of travel over snow where bare spots are encountered. Skis are carried on wheel transport bracket when not in use. The drag link is of the adjustable ball-and-socket type with a pressure lubrication fitting on each end. The drag link connects the steering gear assembly arm with left front axle spindle arm. A tie rod connects the arms of front axle spindles, and has an adjustment at left end to correct wheel alinement. The ski pivot pins and wheel spindles are held in position on front axle spindles by means of wedges. The front axle spindle bushings require no lubrication. The wheel assemblies and steering gear assembly do require lubrication. The front axle assembly is pivoted to underside of tractor frame at two points. A universal joint connects steering gear assembly and steering column shaft due to mounting position of column. This universal joint requires no lubrication. The steering gear assembly is adjustable for wear.

107. FRONT AXLE ASSEMBLY.

a. Description. The front axle assembly is a welded tubular-steel unit. A steering spindle is mounted in each end of axle assembly through oilless type bushings.

b. Removal. Jack up front of tractor and block up frame even with front of tracks (fig. 81). Lower tractor onto blocks and remove jack. Remove large nut and lock washer from steering gear section shaft. Pull steering gear arm from section shaft. Remove cotter pin from front axle pivot pin and rear radius rod pivot pin. Remove collars and washer. Pull forward on front axle until front axle drops from pin, and rear of radius rod drops from cross angle socket. Remove front axle assembly from under tractor (fig. 82).

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

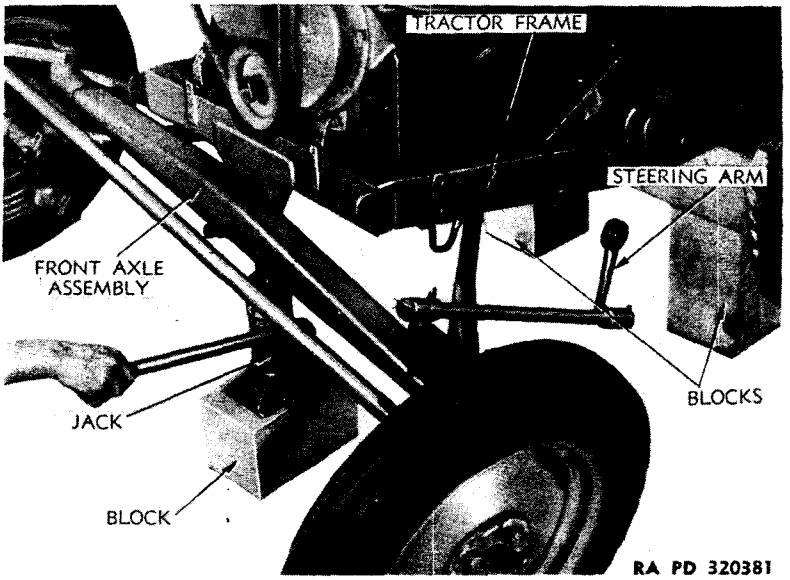


Figure 81—Blocking Up Tractor

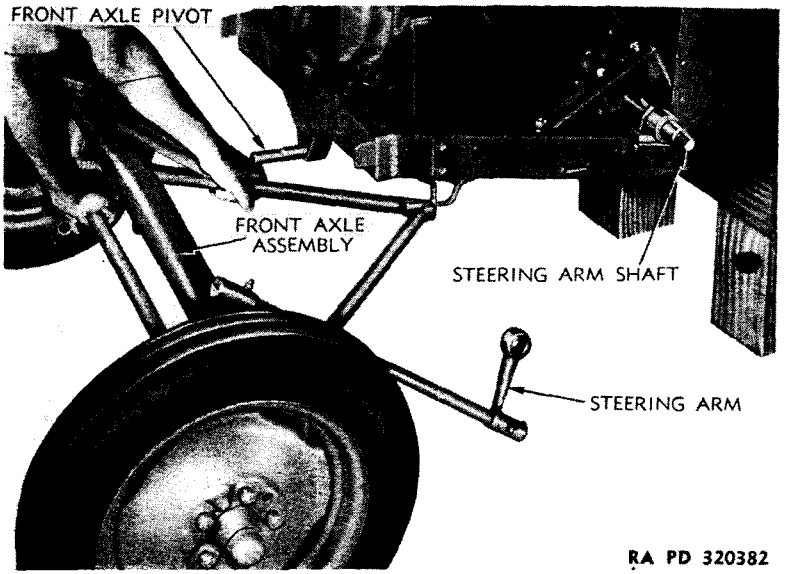


Figure 82—Front Axle and Wheel Assembly Removed

c. **Installation.** Position front axle assembly under tractor. Place flat washer on radius rod pivot pin under engine. Raise assembly, and install onto radius rod pivot pin and front axle pivot pin. Install spring washer, collar, and cotter pin onto radius rod pivot pin. Install collar and cotter pin on front axle pivot pin. Center steering gear by turning steering wheel as far to the right as possible. Then rotate wheel in the opposite direction, and note the total number of turns. Turn wheel back just half this number, thus placing the gear in mid-position. Center front wheels and install steering arm. Install lock washer and nut to hold arm. Jack up under front of tractor, and remove blocks. Remove jack.

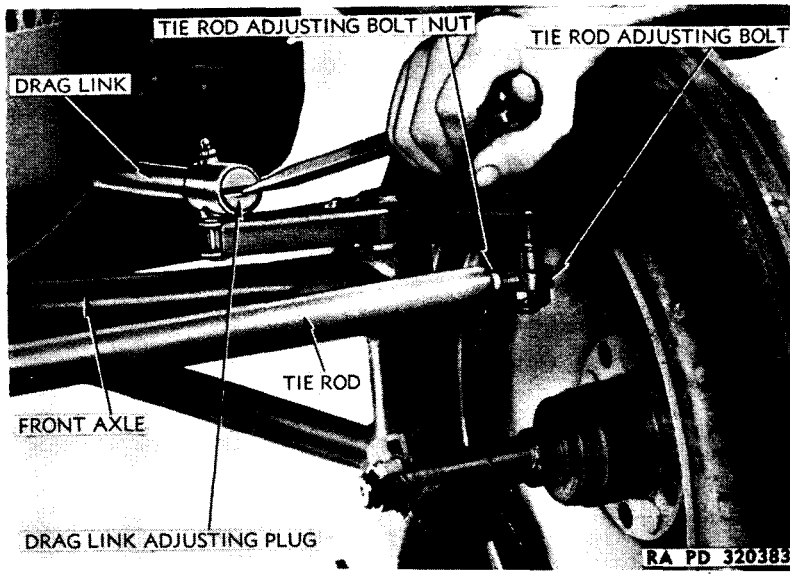
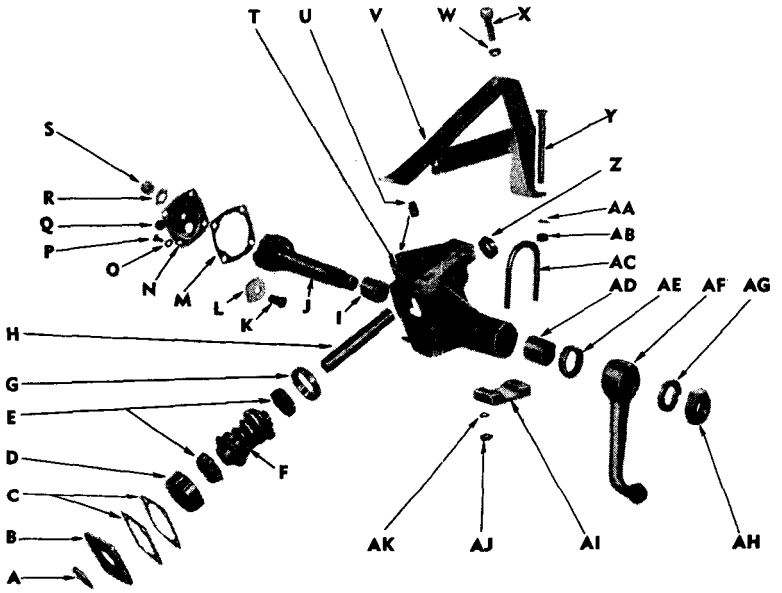


Figure 83—Removing Tie Rod Front Adjusting Plug

d. **Drag Link.**

(1) REMOVAL. Remove cotter pin from each end. Unscrew adjusting plugs and remove (fig. 83). Remove spring and ball socket. Lift drag link from place, being sure not to lose inner ball sockets.

(2) INSTALLATION. The drag link is the ball-and-socket type. At front or axle end, the spring and safety plug are assembled between rod (bottom of socket) and ball seat. At the steering gear end, spring and safety plug are installed between ball seat and end plug. When removing springs and seats for any reason, make sure they are reassembled as above, because this method of assembly relieves road shock from both directions. To adjust ball joint at axle end, screw in plug firmly against the ball, then back off ½ turn, and lock with new cotter pin inserted through hole in tube and slot in adjusting plug. To adjust ball



A—EXPANSION PLUG
B—WORM COVER
C—WORM COVER SHIMS
D—LOWER BEARING CUP
E—WORM THRUST BEARINGS
F—WORM
G—UPPER BEARING CUP
H—WORM SHAFT
I—ROLLER SHAFT BUSHING
J—ROLLER SHAFT
K—ROLLER SHAFT ADJUSTING SCREW
L—ROLLER SHAFT THRUST PLATE
M—ROLLER SHAFT COVER GASKET
N—ROLLER SHAFT COVER
O—GEAR TOOTHED LOCK WASHER
P—CAP SCREW
Q—LEVEL PLUG
R—LOCK PLATE
S—LOCK NUT
T—HOUSING
U—FILLER PLUG
V—BRACKET
W—LOCKWASHER
X—CAP SCREW
Y—CAP SCREW
Z—OIL SEAL
AA—LOCK WASHER
AB—NUT
AC—U-BOLT
AD—ROLLER SHAFT BUSHING
AE—OIL SEAL
AF—STEERING GEAR BALL ARM
AG—LOCK WASHER
AH—NUT
AI—FILLER BLOCK
AJ—NUT
AK—LOCK WASHER

RA PD 320384

Figure 84—Steering Gear Assembly—Disassembled

joint at steering Pitman arm, screw in end plug firmly against the ball, then back off one full turn and lock with new cotter pin inserted through hole in tube slot in adjusting plug. Ball joints must be tight enough to prevent end play, and yet loose enough to allow free movement.

e. Tie Rod.

(1) ADJUSTMENT. Adjust tie rod to correct wheel alinement by removing cotter pin and nut from left steering arm (fig. 83). Disconnect tie rod from arm by springing down on tie rods. Loosen lock nut on adjustment bolt. Turn bolt clockwise to increase toe-in of wheels, and counterclockwise to decrease. Connect tie rod to arm, and check wheel

alinement with wheel alining fixture. When adjustment is correct, install cotter pin and nut on arm. Tighten lock nut on tie rod. The wheels are correctly adjusted when they are parallel (no toe-in or toe-out).

(2) REPLACEMENT OF TIE ROD. Remove cotter pin and nut from steering arm at each end of tie rod. Remove tie rod assembly. Install in reverse order. Aline wheels (subpar. e (1) above).

f. Front Axle Spindles and Arms.

(1) REPLACEMENT OF FRONT AXLE SPINDLE ARM. Disconnect front end of drag link from left spindle arm. Disconnect left end of tie rod from spindle arm. Loosen two lock nuts on spindle arm set screws.

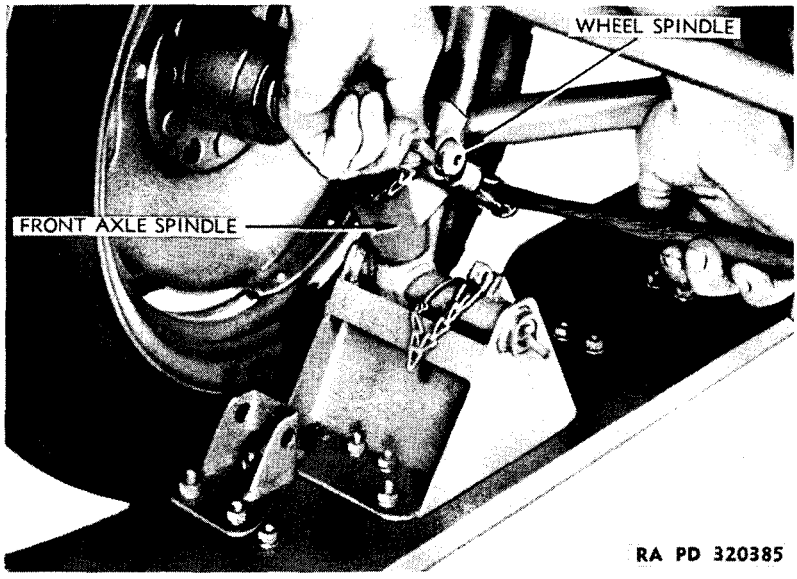


Figure 85—Removing Wheel Spindle Wedge

Remove set screws. Lift off spindle arm. Replace spindle arm. Install set screws, and tighten lock nuts. Connect tie rod and drag link. NOTE: *Replacement of right front axle spindle arm is the same as above, with the exception of disconnection of drag link.*

(2) REPLACEMENT OF FRONT AXLE SPINDLES. Remove spindle arm from front axle spindle to be removed (step (1) above). Raise front of tractor enough to remove ski or wheel assembly and spindle. Remove wheel assembly or ski assembly from spindle (par. 112). Remove thrust washer from spindle shaft. Disconnect and remove wedge chain fasteners from spindle. Install thrust washer onto replacement spindle. Attach wedge chains. Install spindle. Install spindle arm (step (1) above). Install ski or wheel assembly (par. 112). Lower tractor. Check wheel or ski alinement (subpar. e (1) above).

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

108. STEERING GEAR ASSEMBLY (fig. 84).

a. Description. The steering gear assembly is a double-roller, integral-housing type with external mesh adjustment. In lubrication of the unit, avoid the use of graphite, white lead, or heavy solidified oil. Due to the mounted position of the steering gear, it will be necessary to remove assembly to adjust.

b. Removal. Remove left engine hood side plate. Remove left lower engine side plate (par. 125). Drive pin from lower yoke of universal joint and worm shaft at top of gear assembly. Pull up on steering wheel to disconnect universal joint. Remove steering arm nut and lock

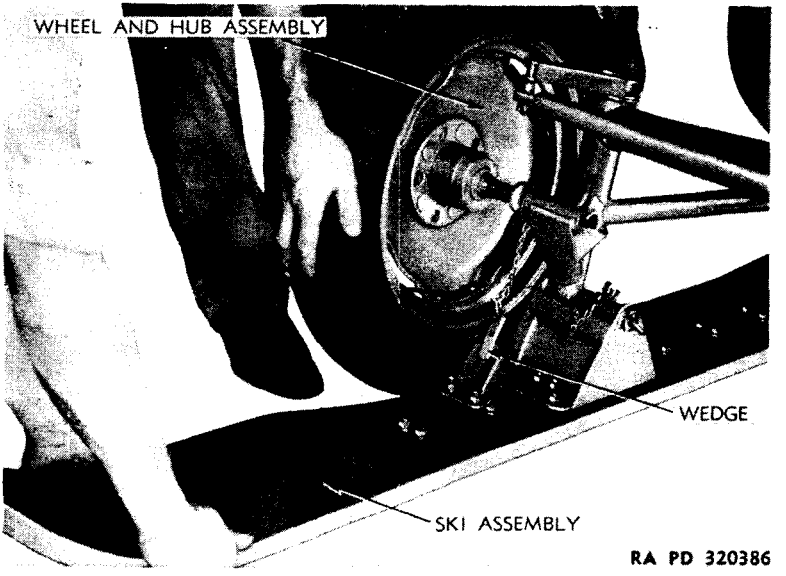


Figure 86—Removing Wheel Assembly

washer. Pull arm from splines. Remove two nuts from housing U-bolt. Remove U-bolt and wood filler block. Remove two cap screws from housing and bracket. Maneuver gear assembly toward engine, and rotate up and out over bracket.

c. Adjustment.

(1) WORM BEARING ADJUSTMENT. Remove four worm cover cap screws and cover. Remove one shim. Replace cover and try bearing adjustment. Repeat above until worm bearing play is gone and shaft will turn without binding.

(2) MESH ADJUSTMENT OF WORM AND ROLLER. Turn worm shaft midway of its full travel. Hold worm shaft in this position. Rotate steering arm shaft back and forth to check for backlash. Movement of shaft should not exceed 1/32 inch. If more than that, remove lock nut and lock plate from external adjusting screw. Turn screw in

(clockwise) just enough to correct backlash. Install lock plate and lock nut. Lubricate assembly (par. 27). CAUTION: *Never attempt to correct mesh adjustment without first adjusting worm bearings.*

d. Installation.

(1) Maneuver steering gear assembly in under bracket from top and engine side. Bolt in place with two cap screws and lock washers through bracket. Place wood filler block between steering gear assembly and bracket on side of frame. Install U-bolt over steering gear assembly, through wood filler block, and bracket on frame. Install lock washer and nuts on U-bolt.

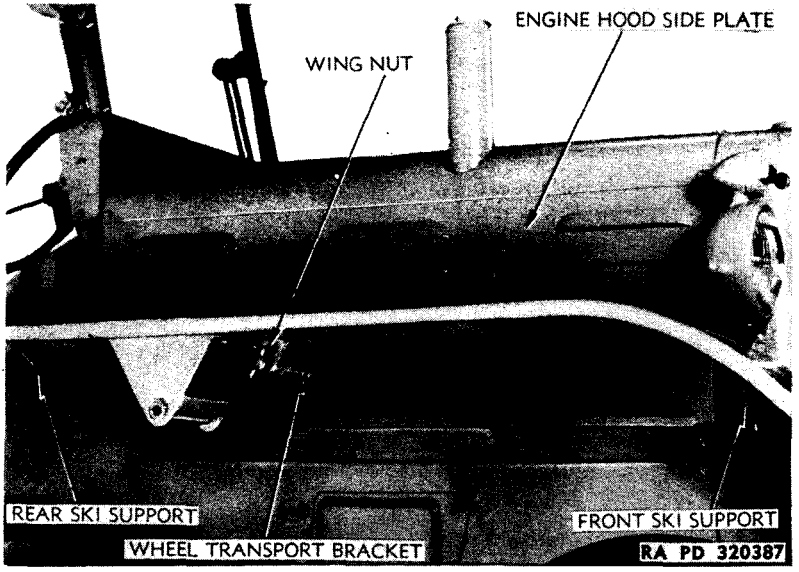


Figure 87—Right Ski in Transport Position

(2) Connect steering shaft universal joint and drive pin through universal joint and worm shaft. Rivet ends of pins.

(3) INSTALL STEERING ARM ON SHAFT. When installing the steering arm, the steering gear should be in its mid-position with the front wheels or skis in the straight-ahead position (par. 107 c). Install nut and lock washer on shaft.

(4) Install lower engine side plate (par. 125). Install engine hood side plate.

109. STEERING COLUMN ASSEMBLY.

a. Description. The steering column of tractor consists of the steering wheel, steering wheel shaft, universal joint, and steering shaft bracket, which also supports hand throttle levers.

b. Removal. Remove left engine hood side plate. Remove left lower engine side plate (par. 125). Drive pin from steering gear worm shaft and universal joint lower yoke. Remove two bolts, nuts and lock washers holding steering shaft bracket to instrument panel support. Remove cotter pin and flat washer from hand throttle arm at quadrant. Pull up on column assembly to disconnect universal joint from worm shaft, and remove steering column.

c. Installation. Place assembly in tractor. Install universal joint on steering gear worm shaft. Drive pin through hole in universal joint and worm shaft, and rivet pin on both ends. Connect hand throttle arm to quadrant, place flat washer on arm, and secure with cotter pin. Bolt

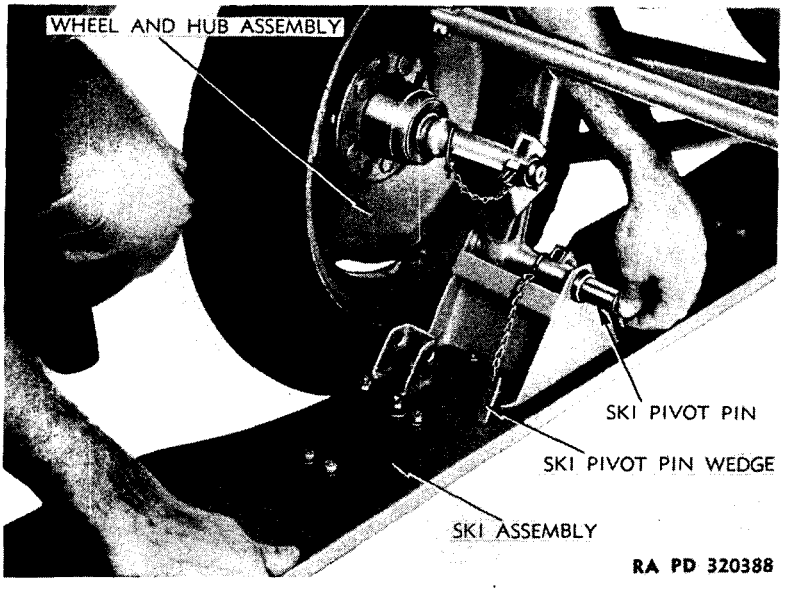


Figure 88—Installing Ski Pivot Pin

steering shaft bracket to dash with two bolts, nuts, and lock washers. Install lower engine side plate (par. 125). Adjust tension collar on hand throttle shaft so that spring has slight tension, but is easy to operate.

110. WHEELS.

a. Description. The front wheels are of the drop-center rim, demountable-hub type. The front wheel hubs are mounted on adjustable tapered roller bearings. The bearings are mounted on a removable spindle shaft. See paragraph 112 for removal and installation.

b. Disassembly. Remove hub cap by prying out, or tapping out. Remove cotter pin, nut, and washer. Remove outer bearing. Remove shaft. Remove seal and inner bearing.

c. **Assembly.** Reverse above procedure to assemble wheel and hub. Adjust bearings to free rolling fit with no binding. See paragraph 27 for lubrication.

d. **Removal and Installation.** See paragraph 112.

111. SKIS.

a. **General.** The ski support bracket and transport bracket are bolted to the skis with carriage bolts. The heads of the bolts are countersunk in the bottom of the ski. When installing new skis or brackets the parts should be assembled and all the nuts tightened. Then fill holes over heads of the bolts with plastic wood, even with bottom of

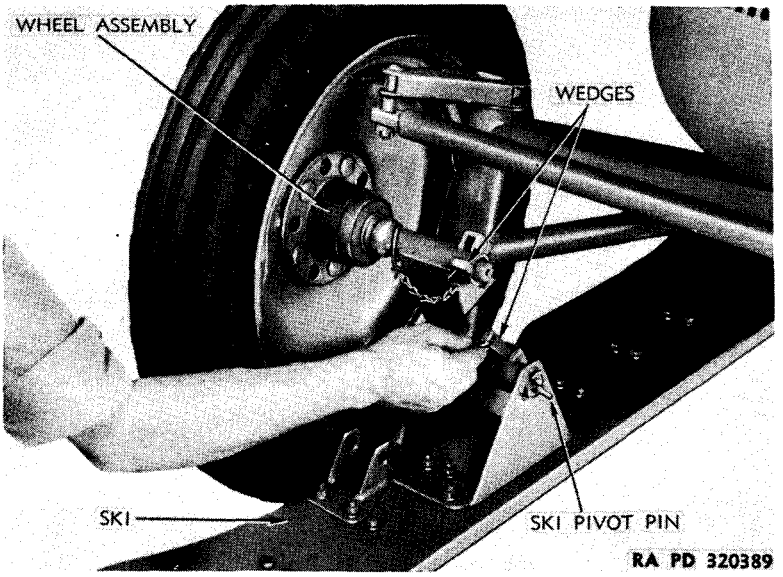


Figure 89—Installing Ski Pivot Pin Wedge

ski. Runners are bolted to skis with countersunk stove bolts. When installing keel to ski make sure it fits in recess in bottom of ski. Bolts must be put in with nuts on top of ski.

b. **Removal and Installation.** See paragraph 112.

112. INTERCHANGING OF WHEELS AND SKIS.

a. **Wheels.** The front wheel hub and spindle assembly is removable from front axle as a unit by tapping out wedge (fig. 85), and pulling spindle from socket (fig. 86). When not in use the wheels are carried on sides of vehicle by inserting spindle into hole in carrier at side of hood so that carrier stud protrudes through hole between hub bolts. Secure with wing nut. If skis are in use on front axle and wheels

are to be installed, remove wheels from transport position. Have another man lift on front of ski on side where wheel is to be installed, and slip wheel spindle into place, being sure to line up wedge slot in spindle with slot of axle so that wedge can be installed. Let weight of vehicle onto wheel. Tap wedge tight. Tap wedge from ski pivot pin, and remove pivot pin (fig. 89) and ski. Repeat for other side.

b. Skis. The skis in transport are carried on side of tractor (fig. 87) (in same manner as wheels) by inserting pivot pin through ski bracket from side toward tractor when ski is held in an inverted position with long end of ski toward front of tractor. Slide onto carrier stud so that rear end of ski is in clip bracket on side of body, and front end of ski rests on radiator bracket. Secure with wing nut. Tractor does not have to be jacked up in front to put on skis when wheels are in operating position. Install ski. Install pivot pin. Install wedge (fig. 89). Raise front end of ski, and remove wheel. Wheels and skis may be used simultaneously if occasion demands.

Section XXIV

TRACK, FINAL DRIVE, AND TRACK FRAME ASSEMBLY

113. TRACK.

a. Description. The tracks are of the endless-belt, rubber-covered, steel-shoe type. Steel cables are inlaid in each of the two rubber belts for reinforcement. These cables secure track shoe clips to endless belt. The track shoes and track guides are riveted to the clips. The track shoes are rubber-covered to prevent icing. There are two cleats on each shoe to provide greater traction.

b. Adjustment.

(1) For most efficient operation, the tracks should be correctly adjusted at all times. The track tension spring (small rear spring) on spring release mechanism maintains the correct track tension when properly adjusted.

(2) Adjust upper adjustment nut by opening nut lock, loosening lock nut, and turning adjustment nut clockwise to shorten track tension spring length, or counterclockwise to lengthen measurement of track tension spring (fig. 90). The correct measurement of length of track tension spring is 2 1/16 inches, measured from track release spring seat to face of plunger, as shown in figure 91. NOTE: *The track release spring cover was removed in this illustration to show measurement only, and does not have to be removed to adjust track tension. Rule can be inserted inside end opening of cover.*

(3) As track wears and is readjusted, the track tension adjusting bolt will be raised up against track frame. To restore the adjustment for further use, proceed as follows:

(a) Remove cotter pin from track release bolt castle nut.

(b) Loosen upper track adjustment bolt nut so that lock nut is flush with end of bolt, and adjusting nut and nut lock are up against lock nut. Loosen track release bolt castle nut by turning nut counterclockwise until next cotter pin hole in bolt lines up with slots in nut. This returns track tension release bolt to its full length of adjustment. Repeat for other side of track, and install cotter pins. NOTE: *The same length of track release bolt should protrude through nut on each side of track frame to insure alinement of wheel with frame.*

(4) Reset track tension adjustment after above change in length of track release spring bolt.

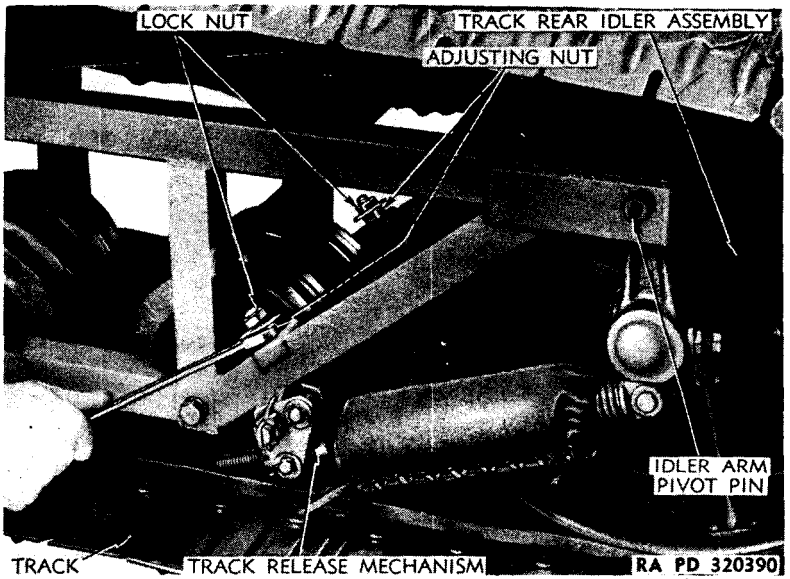


Figure 90—Adjusting Track Tension

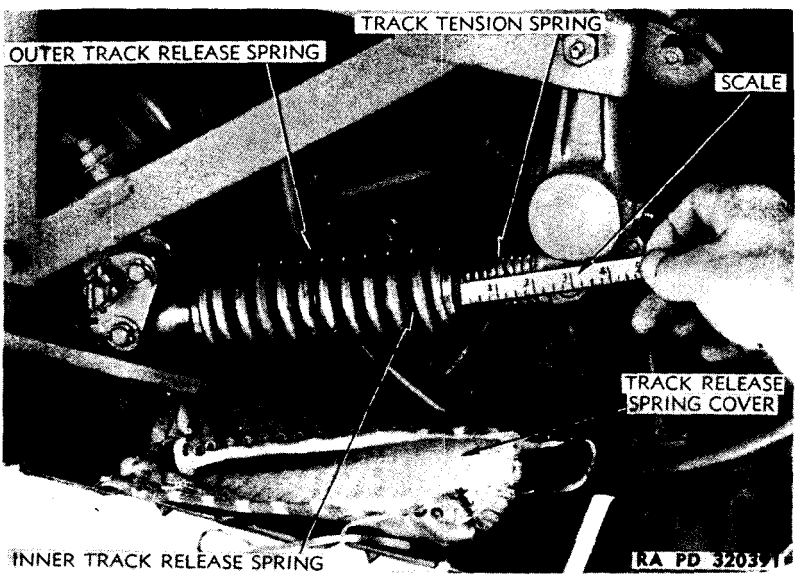


Figure 91—Measuring Track Tension Spring

(5) After track tension adjustment is correct, tighten track tension adjustment bolt lock nut, and bend nut lock to hold. After a short road test, the track tension adjustment should be rechecked, and corrected if necessary. NOTE: *This is especially necessary when installing a new track, as the short road test allows track to become "seated" on wheels.*

c. Removal of Track.

(1) JACK UP TRACTOR. Place short length of 2- x 4-inch wood between rear track frame stop, and stop bracket on body. Place jack under brake housing on side of tractor from which track is to be removed. Tractor should be raised so that bottom of track clears ground about 2 inches. Block up under tractor frame midway between front of brake housing and track frame front bumper for safety.

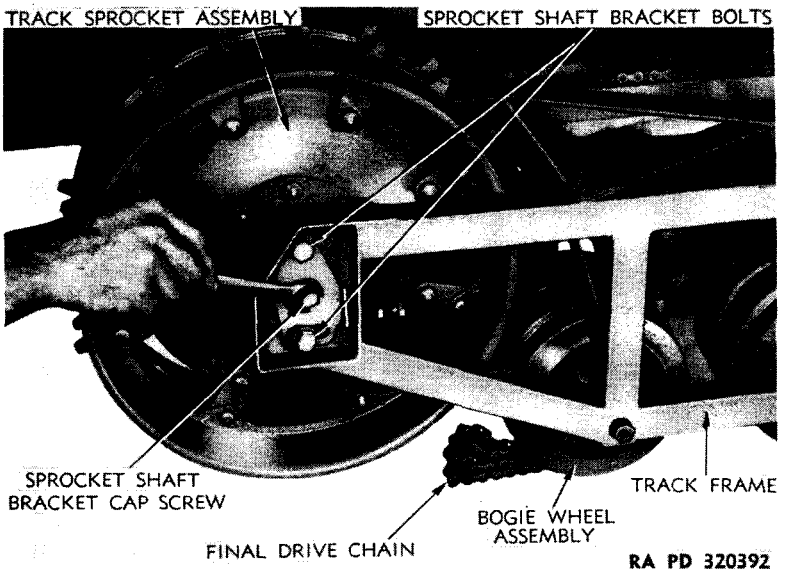


Figure 92—Removing Sprocket Shaft Cap Screw

(2) REMOVE TRACK. Remove cotter pin from track release spring bolt on each side of track frame. Turn castle nut on each release spring bolt clockwise as far as it will go to completely compress release spring. Remove cotter pin and pin from lower end of idler wheel pivot arm on each side of frame. This allows idler pivot arms to move forward when release mechanism drops down. Force track up and out over rear idler wheel to remove (fig. 59).

d. Installation of Track.

(1) INSTALL TRACK. With tractor blocked up as in subparagraph c, slide lower side track assembly under bogie wheels, and hook front end over sprocket wheel. Have one man hold front of track over sprocket while others lift rear of track up and over support roller and rear idler wheel.

(2) CONNECT TRACK RELEASE MECHANISM. When track is in place, pry back on rear track idler, and connect track release mechanism to lower end of idler wheel pivot arms. Install pin and cotter pin in each arm. Turn track release spring bolt nuts counterclockwise until nearest cotter pin hole in bolt lines up with slots in nut. Install cotter pins. Remove blocks and jack.

(3) ADJUST TRACK TENSION. Adjust track tension as outlined in paragraph 115 b.

114. TRACK SPROCKET ASSEMBLY.

a. Description. The track sprocket is a rubber-tired wheel having two integral hardened sprockets on the outer circumference which en-

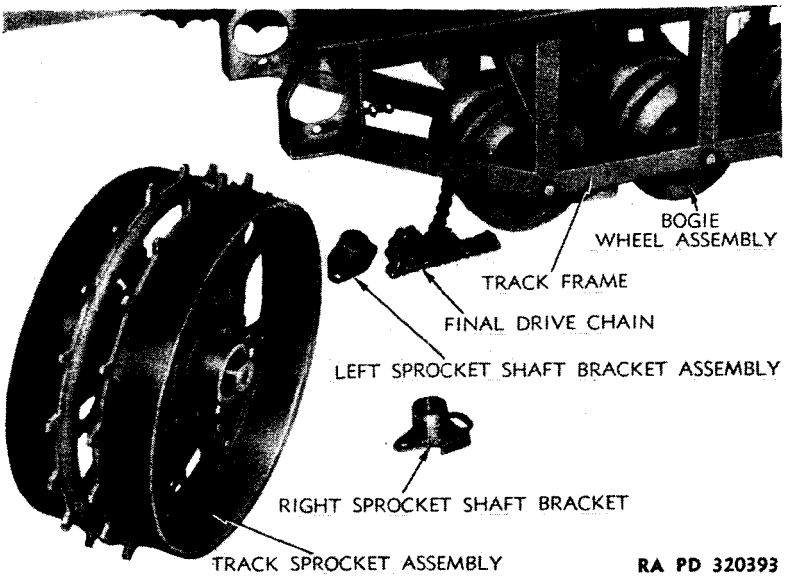


Figure 93—Track Sprocket Assembly Removed

gage the driving bars of the track. A chain sprocket is bolted to the hub of track sprocket, and is driven by a roller chain from the final drive assembly.

b. Removal of Track Sprocket Assembly.

(1) REMOVE TRACK ASSEMBLY (par. 113 c).

(2) DISCONNECT FINAL DRIVE CHAIN (par. 115 c).

(3) REMOVE TRACK SPROCKET ASSEMBLY. Remove two bolts and one cap screw from bracket on each end of sprocket shaft (fig. 91). Remove sprocket shaft bracket and spacer assembly from each end of sprocket shaft (fig. 92). Remove track sprocket assembly.

c. Replacement of Bearings. Remove track sprocket assembly (subpar. **b** above). Press or drive sprocket shaft from sprocket hub and bearings. Reach through hub on one side, and place soft punch against inner race of opposite bearing. Drive out bearing and seal. Repeat for other bearing and seal. Pack new bearings with lubricant (par. 27). Tap a bearing into hub at each side as far as they will go. Install new oil seals, with lip of seal toward bearing, into each side of hub. Push shaft through bearings and hub. Install track sprocket assembly (par. 114 **c**).

d. Replacement of Final Drive Chain Driven Sprocket. Remove track sprocket assembly (subpar. **b** above). Remove eight bolts

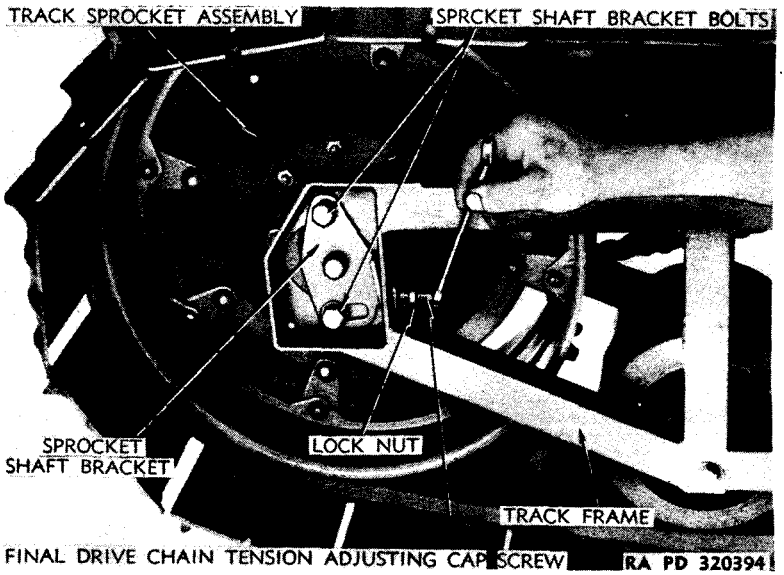


Figure 94—Adjusting Chain Tension

holding final drive chain driven sprocket to track sprocket hub. Remove chain sprocket. Install new sprocket with eight bolts, nuts, and lock washers. Install track sprocket assembly (subpar. **e** below).

e. Installation of Track Sprocket Assembly.

(1) INSTALL SPROCKET ASSEMBLY. Install track sprocket assembly into frame with final drive chain sprocket toward tractor. Install bracket and spacer assembly onto each end of sprocket shaft, being sure dowel in bracket engages recess in sprocket shaft, and that chain adjusting cap screw projection is toward rear of tractor. Install shaft cap screw and lock washer through bracket into ends of shaft. Install four bolts, flat washers on two lower bolts, lock washers, and nuts holding sprocket shaft brackets to track frame.

(2) Adjust final drive chain tension (par. 115 **b**).

(3) Install track assembly (par. 113 **d**).

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

115. FINAL DRIVE CHAIN ASSEMBLY.

a. Description. The final drive chain is of the ¾-inch pitch, single-roller type, requiring no lubrication. The chain is equipped with a connector link to allow for removal or installation of chain assembly.

b. Adjustment of Chain Tension. Loosen upper and lower bolts holding track sprocket shaft brackets to track frame on each side enough to allow brackets to move. Loosen lock nut on chain adjusting cap screw. Turn cap screw clockwise to tighten final drive chain, or counterclockwise to loosen (fig. 94). The chain is properly adjusted

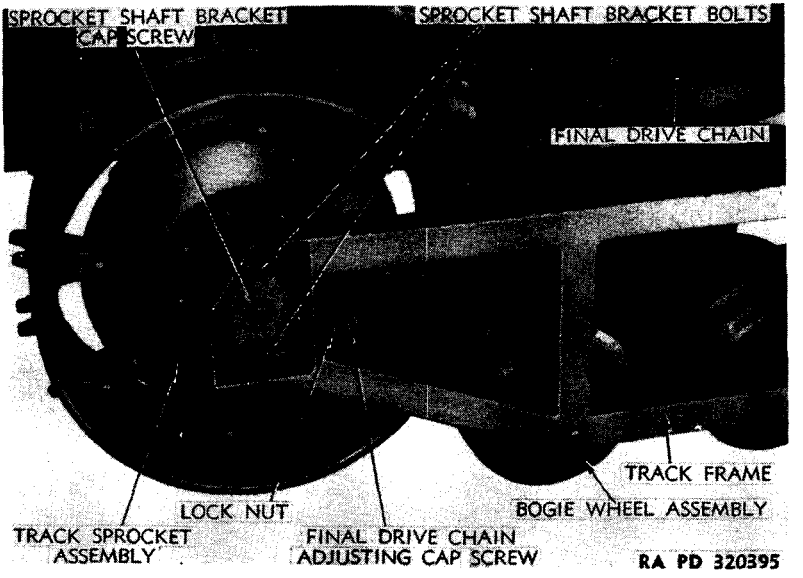


Figure 95—Removing Connector Link (Track Removed to Show Location Only)

when it can be deflected ¼ inch midway between sprockets. Both adjustment cap screws must be turned same distance in or out so as not to affect alinement of track sprocket with frame. Tighten lock nut on adjusting cap screws, and tighten sprocket shaft bracket bolts.

c. Replacement of Final Drive Chain. Loosen final drive chain. Roll vehicle until connector link is just to rear of track sprocket and above track frame. Reach under top of track, and remove two cotter pins from connector link. Remove bar from connector link by tapping on pins. Remove connector link (fig. 95). Remove chain assembly. Install new chain in reverse order to above. Adjust chain tension (subpar. b above).

TRACK, FINAL DRIVE, AND TRACK FRAME ASSEMBLY

116. FINAL DRIVE AND TRACK SUPPORT ROLLER ASSEMBLY.

a. Description. The final drive and track support roller assembly includes the brake drum, final drive shaft, brake housing cover assembly, inner track frame support bracket, final drive chain drive sprocket, track support roller assembly, and outer track frame support bracket.

b. Removal.

(1) Remove track and track frame assembly as a unit as explained in paragraph 119 b.

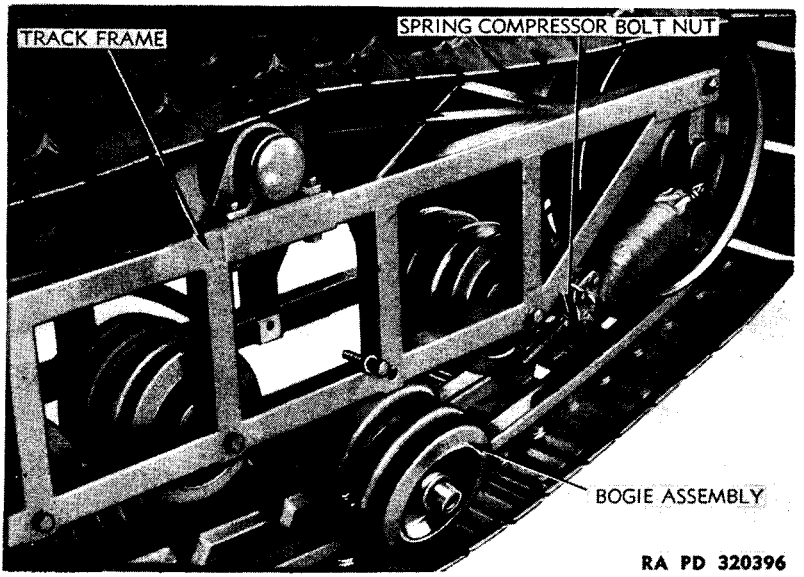


Figure 96—Bogie Wheel Assembly

(2) Remove cotter pin from track release spring bolt on each side of track frame. Tighten castle nuts clockwise as far as they will go to compress track release springs. Remove pin from lower end of each track idler pivot arm to allow track release mechanism to drop.

(3) Disconnect final drive chain (par. 115 c).

(4) Remove four bolts holding final drive assembly to track frame. Raise up on top of track, and remove final drive assembly by lifting out between track frame and track.

c. Installation.

(1) Raise up on top of track. Install final drive assembly onto top of track frame. Install four bolts, nuts and lock washers holding final drive assembly to track frame.

(2) Connect final drive chain (par. 115 c).

(3) Adjust final drive chain tension (par. 115 b).

(4) Connect track release mechanism to rear track idler pivot arms with pins and cotter pins. Return castle nuts to their original position on track release spring bolts. Install cotter pins.

(5) Adjust track tension (par. 113 b).

(6) Install track and track frame assembly as a unit (par. 119 c).

117. BOGIE WHEEL ASSEMBLY.

a. Description. The bogie wheel assemblies on vehicle are 10 in number. The six front bogie wheel assemblies (three on each side) have longer shafts than the four rear bogie wheel assemblies (two on

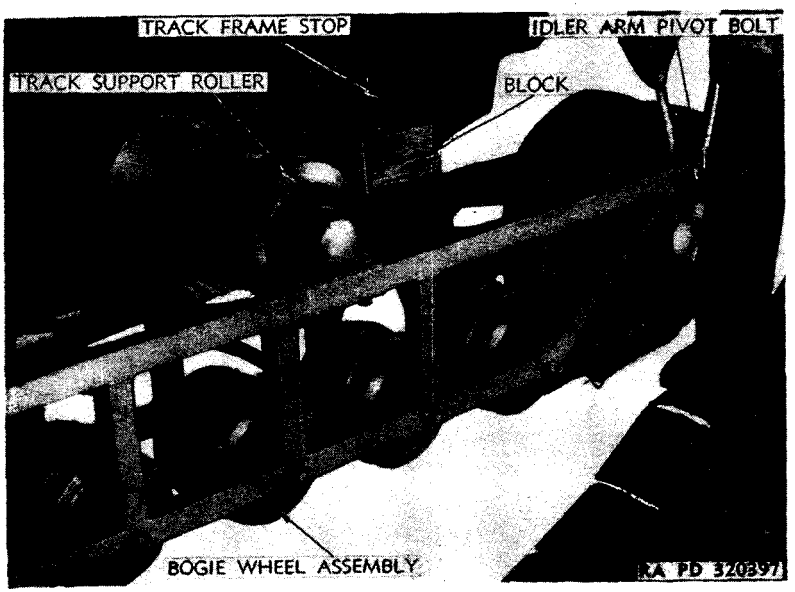


Figure 97—Removing Nut from Idler Pivot Bolt

each side) because of the design of the track frame. Each bogie wheel is equipped with rubber tire and a steel track guide flange, and is bolted to ends of bogie wheel hub. The bogie wheel assemblies are equipped with ball bearings and oil seals. The bogie wheel assemblies are prepacked with lubricant, and must be disassembled to repack.

b. Removal of Bogie Wheel Assembly.

(1) RELEASE TRACK TENSION. Perform all steps except lifting off track assembly (par. 113 c). This allows track to sag enough so that bogie wheel assemblies can be removed between under side of track frame and track.

(2) REMOVE BOGIE WHEEL ASSEMBLY. Remove cap screw and lock washer from outer end of first bogie wheel assembly to be re-

moved. Remove inner shaft cap screws. The cap screws on bogie wheel assemblies at either side of the one being removed may have to be loosened to allow bogie wheel assembly to drop down. When wheel assembly drops down it also releases shaft lock at inner end of wheel shaft. Remove bogie wheel assembly as shown in figure 96.

c. Replacement of Bearings.

(1) Push or tap bogie wheel shaft from bearings and hub. This will also release outer and inner bearing spacers. Reach through hub with a soft punch, and tap out bearing on one end of hub. This will also remove oil seal. Reach into hub, and remove intermediate bearing spacer. Tap out remaining bearing and seal.

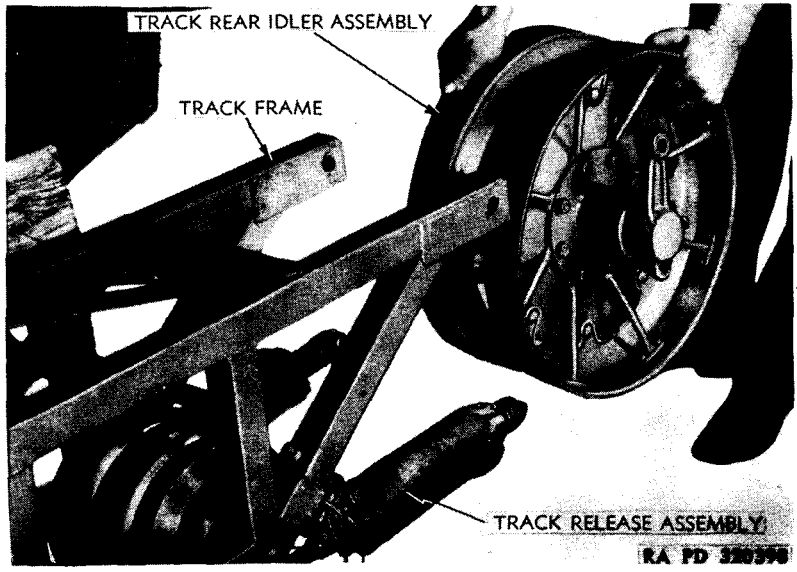


Figure 98—Removing Track Idler Assembly

(2) Pack new bearings with lubricant (par. 27). Install a bearing into one end of hub. Install new oil seal with lip toward bearing. Install intermediate bearing spacer into hub. Install remaining bearing and seal. Install shaft through bearings and hub. Install inner and outer bearing spacers onto their respective ends of shaft.

d. Installation of Bogie Wheel Assembly.

(1) INSTALL BOGIE WHEEL ASSEMBLY. Insert bogie wheel assembly under track frame with notched end of shaft toward tractor. Rotate shaft until notch in inner bearing spacer and shaft are up. Install shaft lock over inner end of shaft so that one tang engages notch in spacer and shaft, and lower tang is toward tractor. Raise assembly into place.

Install cap screw and lock washer on each end of shaft. Tighten any other bogie wheel shaft cap screws it was necessary to loosen to remove wheel assembly just installed.

(2) CONNECT TRACK RELEASE MECHANISM AND ADJUST TRACK. Perform all steps necessary under paragraph 113 **d**.

118. REAR TRACK IDLER ASSEMBLY.

a. Description. The rear track idler assembly is a rubber-tired wheel with steel guide flanges at center to guide track. The idler wheel assembly is mounted on ball bearings, and the shaft is connected to track frame with pivot arms to lower end of which the track release

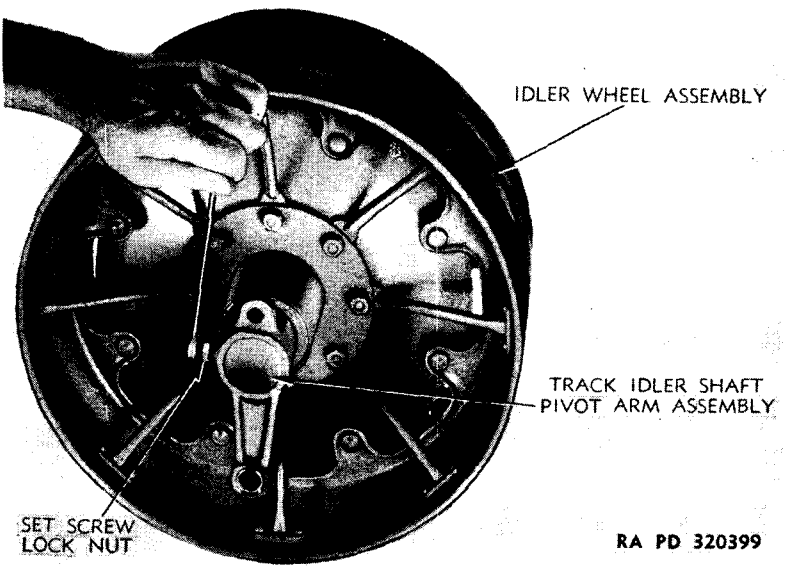


Figure 99—Removing Pivot Arm Set Screw

mechanism is connected. The track release mechanism allows idler wheel assembly to move forward if any unusual strain occurs on track, releasing track tension and preventing damage.

b. Removal of Track Idler Assembly.

(1) REMOVE TRACK ASSEMBLY (par. 113 **c**).

(2) REMOVE TRACK IDLER ASSEMBLY. Remove cotter pin and nut from track idler assembly pivot bolts (fig. 97). Remove pivot bolt from each side of track frame. This will also release flat washers and pivot arm bushing spacer. Remove track idler wheel assembly (fig. 98). Loosen track idler pivot arm set screw lock nuts. Remove set screws (fig. 99). Remove pivot arms from shaft.

c. Replacement of Track Idler Bearings. Replace bearings in same manner as outlined under replacement of sprocket assembly bearings (par. 114 c).

d. Installation of Track Idler Assembly.

(1) INSTALL IDLER PIVOT ARMS. Line up set screw hole in each idler pivot arm with hole in idler shaft. Install set screw, with lock nut on screw, into arm and shaft. Tighten set screws and lock nuts. Install bushing spacer into bushing. Position idler assembly in track frame. Insert a flat washer between outer end of idler arm bushing as pivot pin is pushed into arm. Install another flat washer and castle nut. Repeat for other arm. Tighten pivot bolt nut, and install cotter pin through each bolt.

(2) INSTALL TRACK ASSEMBLY. See paragraph 113 d.

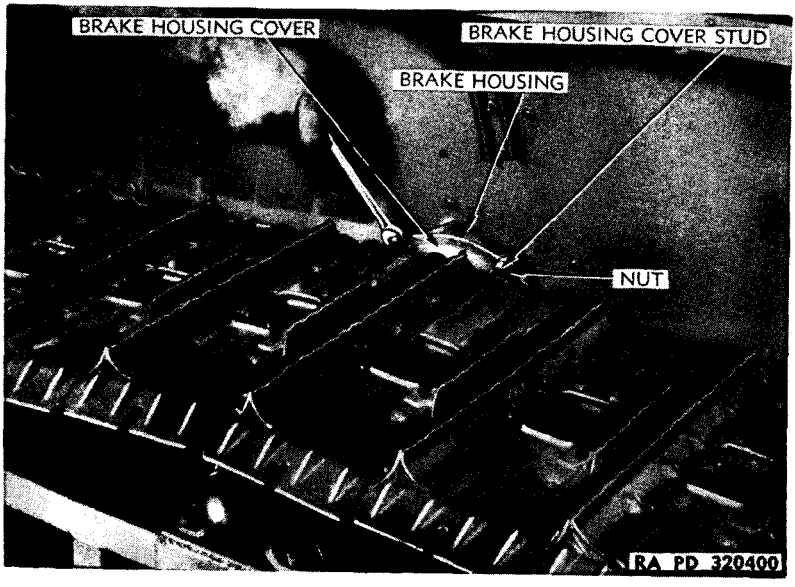


Figure 100—Removing Nut from Brake Housing Cover

119. TRACK AND TRACK FRAME ASSEMBLY.

a. General. The track and track frame assembly as a unit can be removed to replace brakes, or to replace track frame.

b. Removal (as a unit).

(1) JACK UP TRACTOR. Place jack under tractor frame just ahead of brake housing on side of tractor from which track and track frame assembly is to be removed. Jack up tractor until center bogie wheel just clears track. Block up under brake housing for safety.

(2) REMOVE UNIT. Remove six nuts and lock washers holding brake housing cover to brake housing (fig. 100). Have a man at each end of track pull unit straight away from tractor until final drive shaft clears brake housing (fig. 100).

c. Installation (as a unit).

(1) INSTALL TRACK AND TRACK FRAME ASSEMBLY. With tractor blocked up as in above paragraph, line up end of final drive shaft with center of brake housing. Slide assembly straight toward tractor until shaft contacts splines of differential bevel gear. It may be necessary to place jack under tractor and remove blocking so that tractor can be raised or lowered to center shaft in housing so it will enter splines of differential. Push unit into place, being sure large hole in outer circumference of brake housing cover is at bottom. Install nuts and lock washers on the six studs.

(2) REMOVE JACK AND BLOCKING. Remove blocking (if not already removed). Lower tractor and remove jack.

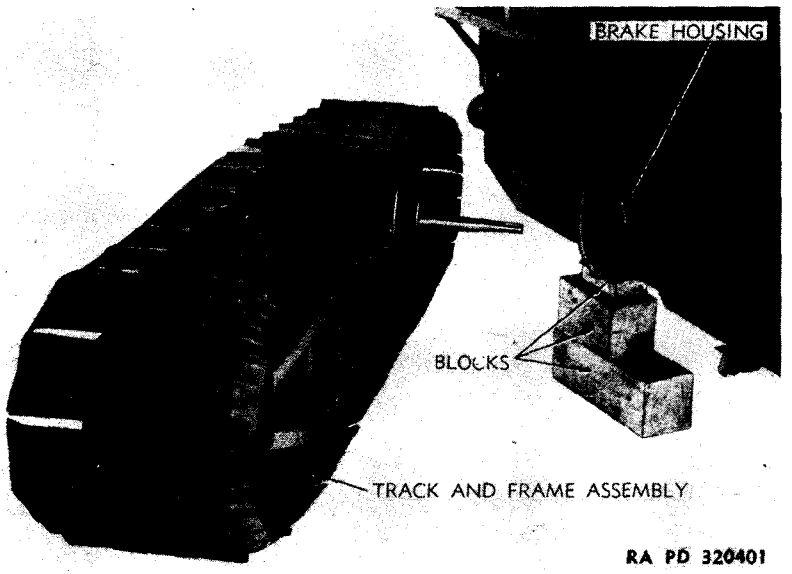


Figure 101—Track and Track Frame Assembly Removed

120. TRACK FRAME.

a. Description. The track frame is of an all-welded, square, tubular-steel type. Rubber bumpers at front inner side of track frame and track stops at rear inner side of track frame control upward movement of frame when going over rough terrain.

b. Replacement of Frame.

(1) REMOVAL. To remove track frame perform all steps under removal of track (par. 113 b), removal of track sprocket (par. 114 b), removal of track idler (par. 118 b), and removal of bogie wheel assemblies (par. 117 b). Remove four bolts holding track frame to final drive brackets. Remove frame assembly. Remove four bolts holding front frame bumper and rear frame stop to frame. Remove lock nut,

nut lock, and nut from each track tension adjusting bolt. Remove cotter pin and nut from track release mechanism bell crank pivot bolt on each side of frame. Remove bolt, and remove track release mechanism from each side of track frame.

(2) INSTALLATION. Install track tension adjusting bolt of track release mechanism up through hole in track frame, and install track release bell crank pivot bolt with thread of bolt to outside of track frame. Install nut and cotter pin. Repeat for other track release mechanism. Install nut, nut lock, and lock nut on each track tension adjusting bolt. Install rubber track frame bumper and bracket onto inside front of track frame with two bolts, nuts, and lock washers. Install track frame rear stop with two bolts, nuts, and lock washers. Install bogie wheel assemblies (par. 117 **d**), track sprocket assembly (par. 114 **e**), and rear track idler assembly (par. 118 **d**). Position track frame assembly under final drive. Connect assembly to final drive brackets with four bolts, nuts, and lock washers. Install and connect final drive chain (par. 115 **c**). Install track assembly (par. 113 **d**).

Section XXV

BRAKES

121. BRAKES.

a. Description. The brakes are of the interchangeable, two-shoe, internal expanding type, operated by means of brake pedals in driver's compartment to right of driver, through brake rods to brake operating cams in brake housings. Each of the two brakes is individually connected to a separate brake pedal. Brakes can be applied together by putting foot on both pedals at once to stop vehicle, or operated separately to aid in turning.

b. Brake Adjustment. Brake adjustment is made at front end of brake rods in driver's compartment by removing cotter pin and pin from clevis and brake pedal arm, loosening lock nut, and turning clevis clockwise to tighten brake or counterclockwise to loosen brake. Install clevis pin, and test pedal for free play. The correct free play of pedal is 2 to 2¾ inches before starting to apply brakes. When correctly adjusted, tighten lock nut, and install cotter pin in clevis pin. Repeat for other brake.

c. Replacement of Brake Shoes.

(1) Remove track and track frame assembly as a unit (par. 119 **b**).

(2) Remove cotter pin, cup washer, and shims from brake shoe anchor pin at rear of housing. Pull shoes from brake anchor pin and brake operating cam (fig. 101). Remove brake shoe return spring.

(3) Install new brake shoes into position. Install shims and cup washer. Add or remove shims as necessary to install cotter pin. Install cotter pin. Install brake shoe return spring. Operate brake pedal to test free movement of shoes. Remove cotter pin and brake pin from brake rod clevis in driver's compartment which controls brake shoes being installed, so that brake operating cam will be returned to its lowest point.

(4) Install track and track frame assembly as a unit (par. 119 **c**).

(5) Adjust brakes (subpar. **b** above).

d. Replacement of Brake Controls and Linkage. Remove accelerator pad and accelerator bracket from right toeboard. Remove right and left toeboards. Remove cotter pin and clevis pin from each brake rod clevis to disconnect brake control rods. Remove lower transmission guard. Remove cotter pin and clevis pin from clutch adjusting link. Remove four bolts holding clutch pedal and brake pedals to frame cross member. Remove clutch and brake pedal assemblies from under side of tractor. To remove brake control rods, remove fuel tank (par. 66 **c**), remove cotter pin and clevis pin from each brake rod clevis, and unhook return spring on each brake rod. Remove cotter pin and

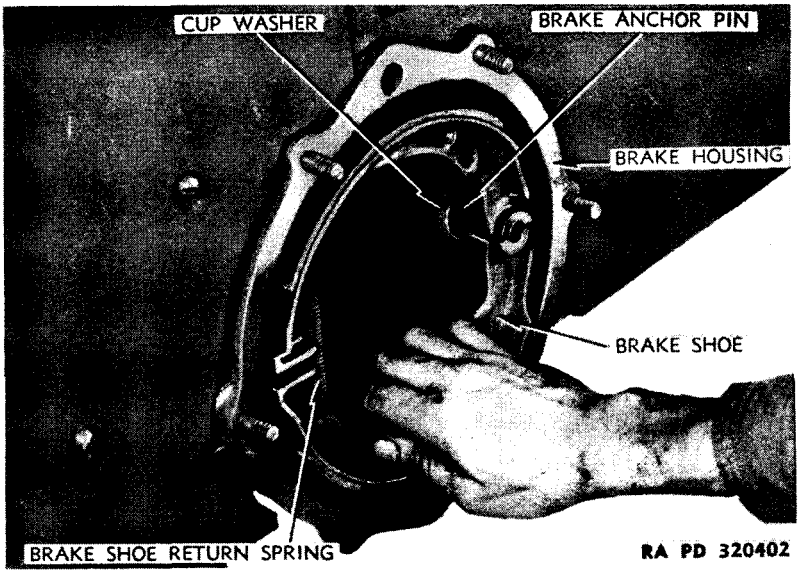


Figure 102—Removing Brake Shoes

flat washer from rear end of brake rods. Remove brake rods. To remove brake operating cam levers, disconnect brake control rods. Remove nut and lock washer holding lever to brake operating cam. To remove brake operating cam, remove track and track frame assembly as a unit (par. 119 **b**). Remove fuel tank (par. 66 **c**), disconnect brake control rods, remove nut and lock washer holding cam lever to brake operating cam. Remove cam lever, and remove brake shoe assemblies. Remove brake operating cam. Reinstall each assembly by reversing the removal procedure.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

Section XXVI

TRACTOR FRAME AND BODY COMPONENTS

122. SEATS AND FLOORBOARDS.

a. Description. The seat frames, seat backs, and floorboards are of plywood. The front seat frame fastens to brackets over the fuel tank, and has a removable padded spring cushion held in place by lugs. The seat back is bolted to the sides of the body, and has cushions of hair padding. The rear seat cushion and frame can be tipped up out of the way when not in use. The back of the rear seat forms the rear part of the body. The floorboards are in sections, and fasten to brackets attached to frame and body of tractor.

b. Replacement of Seats. To remove either seat back, remove all bolts holding assembly to body and lift out. On the rear seat back it will be necessary to first remove both taillights and brackets, and trailer coupling socket with bracket. Also remove spare gasoline carrier assembly. To install, reverse the removal procedure.

c. Replacement of Floorboards. To remove the front or center floorboard, remove fuel tank (par. 66 c). Then remove all bolts holding floorboards to frame and body. To remove three rear floorboards, remove bolts, clips, and brackets holding floorboards to body. To install, reverse the removal procedure.

123. TOP AND SIDE CURTAINS.

a. Description. The canvas top and side curtains button to the windshield and body with buttons and straps, and completely enclose the body compartment.

b. Installation of Top and Side Curtains. Install one top bow on each seat back, with lower ends of bows in bow sockets. Place top in position on bows. Button front end of top to top of windshield frame. Fasten rear of top with straps to back of rear seat. Pull top tight with rear straps. Button three-cornered side curtain with slot for spotlight to right side. Button other three-cornered side curtain to left side of windshield, side of body, and canvas top. Place other four side curtains in position and button to top. Interlock side curtains together with straps, and fasten bottom of side curtains to body with straps.

c. Removal of Top and Side Curtains. To remove, reverse the installation procedure.

TRACTOR FRAME AND BODY COMPONENTS

124. WINDSHIELD AND FRAME ASSEMBLY.

a. Description. The windshield and frame assembly provides for lowering entire assembly down over hood, and also for opening and closing windshield for ventilation.

b. Removal. Remove screws from each side of windshield adjusting brackets at top. Bend down lip on left-hand outer end of hinge at top. Open windshield sufficiently to clear the frame, and slide assembly out of hinge to left.

c. Installation. To install, reverse the removal procedure.

125. ENGINE HOOD AND SIDE PLATES.

a. Description. The engine hood and side plates are the cover and sides for enclosing the engine compartment.

b. Removal. Remove ski or wheel from each side of engine hood. Remove engine hood cover (if used). Remove hood side plates by unlatching and lifting off. Disconnect lower end of engine preheater fuel line (fig. 23), and drain fuel from tank. Disconnect upper end of fuel line at tank, and remove fuel line. Remove 14 cap screws from engine hood. Loosen preheater flue clamp screw at bottom of flue. Lift off engine hood. To remove lower engine side plates, remove cap screws holding side plates to tractor frame and body (fig. 103).

c. Installation. To install, reverse the removal procedure.

126. PINTLE.

a. Description. The pintle is an automatic hook coupler, bolted to the rear of the tractor frame for towing purposes.

b. Removal. Remove two cap screws and lock washers holding pintle to frame. Remove pintle.

c. Installation. To install, reverse the removal procedure.

127. ENGINE SUPPORTS AND GUARDS.

a. Description. The engine is supported at the front by two upright brackets connected to the frame and engine, and at the rear by a removable cross member of frame and a sheet metal engine rear panel which is also a support for front of battery support. There are metal guards under the engine, transmission, and fuel tank to prevent snow from entering these compartments, and to prevent damage to these parts when tractor becomes "set" in deep snow.

b. Removal. Remove lower engine guard (par. 127 **h**). Remove lower engine side plates (par. 125 **b**). Place a jack under front of engine and take weight of engine on jack. Remove nuts, lock washers, and bolts holding each engine support to frame. Remove engine mounting nuts and bolts from upper end of supports. Remove supports. NOTE: *There is a spacer between left-hand support and frame; be sure it is in place when replacing support.*

c. Installation. To install, reverse the removal procedure.

d. Removal of Engine Rear Support. Remove front axle assembly (par. 107 b). Remove lower engine guard and transmission guard (subpar. h below). Remove nut and lock washer from bolt at each end of support. Remove two nuts, lock washers, and bolts holding support to engine and clutch housing.

e. Installation of Engine Rear Support. To install, reverse the removal procedure.

f. Removal of Engine Rear Panel (sheet metal). Remove engine (par. 62). Remove steering gear (par. 108 b). Remove two nuts, lock

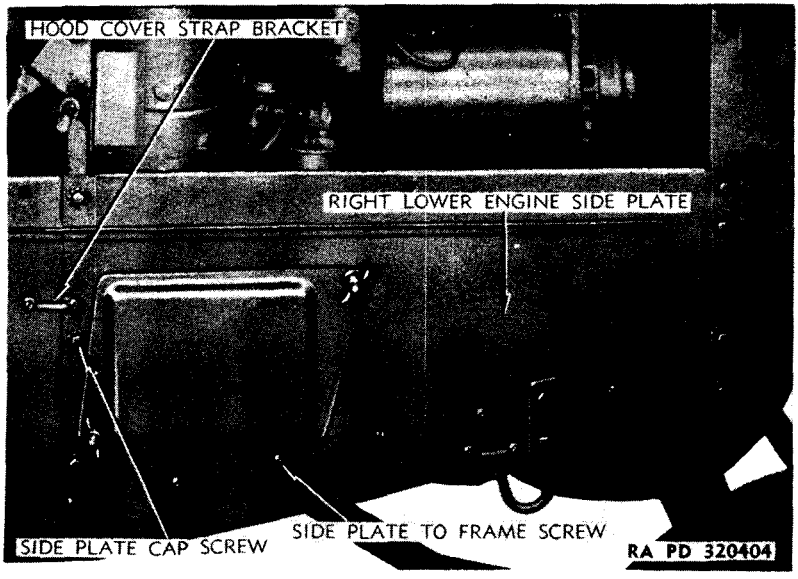


Figure 103—Lower Engine Side Plate

washers, and bolts holding engine rear panel to tractor frame. Remove nuts, lock washers, and bolts holding engine rear panel to battery support. Place a jack under clutch housing to hold in place. Remove engine rear panel.

g. Installation of Engine Rear Panel. To install, reverse the removal procedure.

h. Replacement of Engine and Transmission Guards. Remove screws holding guards to tractor frame and frame cross member (fig. 104). Reverse removal procedure to install.

i. Replacement of Fuel Tank Guard. Remove fuel tank (par. 66 c). Remove nuts, lock washers, and bolts holding fuel tank guard to center floorboard. Reverse removal procedure to install.

TRACTOR FRAME AND BODY COMPONENTS

128. INSTRUMENT PANEL.

a. Description. The instrument panel is located in the front of the driver's compartment and in full view of the driver. This panel contains the various switches and instruments needed for the operation of the vehicle.

b. Removal. Remove engine oil gage (par. 94 **b**). Remove engine temperature gage (par. 95 **b**). Remove fuel level gage (par. 96 **b**). Remove ammeter (par. 93 **b**). Remove speedometer (par. 97 **b**). Remove main light switch (par. 89 **a** (2)). Remove headlight dimmer switch (par. 89 **b**). Remove cranking motor push button switch (par.

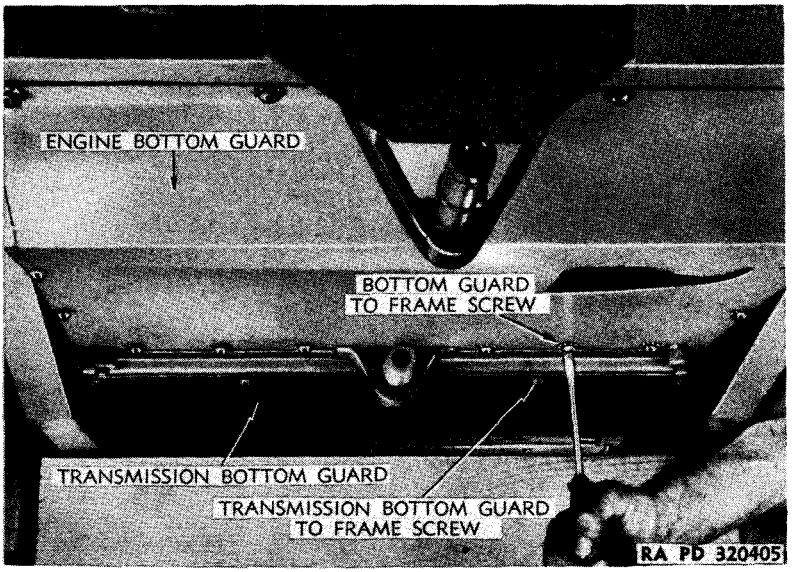


Figure 104—Removing Screw from Engine Bottom Guard

87 **d**). Remove ignition switch (par. 81 **c**). Remove engine choke (par. 59 **b**). Remove trouble light plug socket. Remove engine primer pump assembly (par. 69). Remove panel light switch (par. 89 **c**). Remove panel lights (par. 88 **e**). Remove compass bracket. Pull windshield wiper and spotlight wires from instrument panel. Remove two bolts holding steering shaft bracket to windshield support. Remove bolts and screws holding instrument panel to battery support and windshield support and body.

c. Installation. Reverse the removal procedure to install.

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

129. BATTERY SUPPORT.

a. Description. The battery support is located between the instrument panel and engine, and supported on the rear engine panel and instrument panel.

b. Removal. Remove battery (par. 84 **e**). Remove oil bath air cleaner (par. 70). Remove generator regulator (par. 86 **c**). Remove instrument panel (par. 128 **b**). Remove nut, lock washer, and bolt holding headlight loom bracket to battery support. Lay wire out of the way. Pull wires running to rear of tractor from right side of battery support. Remove bolts and screws holding battery support to rear engine panel and other body parts.

c. Installation. Reverse removal procedure to install.

Section XXVII

SHIPMENT AND TEMPORARY STORAGE

130. GENERAL INSTRUCTIONS.

a. Preparation for domestic shipment of the vehicles is the same as preparation for temporary storage or bivouac. Preparation for shipment by rail includes instructions for loading and unloading the vehicles, blocking necessary to secure the vehicles on freight cars, number of vehicles per freight car, clearance, weight, and other information necessary to properly prepare the vehicles for rail shipment. For more detailed information, and for preparation for indefinite storage, refer to AR 850-18.

131. PREPARATION FOR TEMPORARY STORAGE OR DOMESTIC SHIPMENT.

a. Vehicles to be prepared for temporary storage or domestic shipment are those ready for immediate service, but not used for less than 30 days. If vehicles are to be indefinitely stored after shipment by rail, they will be prepared for such storage at their destination.

b. If the vehicles are to be temporarily stored or bivouacked, take the following precautions:

(1) LUBRICATION. Lubricate the vehicles completely (par. 27).

(2) COOLING SYSTEM. If freezing temperature may normally be expected during the limited storage or shipment period, test the coolant with a hydrometer, and add the proper quantity of antifreeze compound, to afford protection from freezing at the lowest temperature anticipated during the storage or shipping period. Completely inspect the cooling system for leaks.

(3) BATTERY. Check battery and terminals for corrosion and if necessary, clean and thoroughly service battery (par. 84).

(4) TIRES. Clean, inspect, and properly inflate all tires. Replace with serviceable tires, all tires requiring retreading or repairing. Do not store vehicles on floors, cinders, or other surfaces which are soaked with oil or grease. Wash off immediately any oil, grease, gasoline, or kerosene which comes in contact with the tires under any circumstances.

(5) ROAD TEST. The preparation for limited storage will include a road test of at least 5 miles, after the battery, cooling system, lubrication, and tire services have been made, to check on general condition of the vehicles. Correct any defects noted in the vehicle operation, before the vehicles are stored, or note on a tag attached to the steering wheel, stating the repairs needed, or describing the condition present. A written report of these items will then be made to the officer in charge.

(6) FUEL IN TANKS. It is not necessary to remove the fuel from the tanks for shipment within the United States, nor to label the tanks under Interstate Commerce Commission Regulations. Leave fuel in the tanks except when storing in locations where Fire Ordinances, or other local regulations, require removal of all gasoline before storage.

(7) EXTERIOR OF VEHICLE. Remove rust appearing on any part of the vehicle exterior with flintpaper. Repaint painted surfaces whenever necessary to protect wood or metal from deterioration. Exposed polished metal surfaces which are susceptible to rust, such as winch cables, chains, and, in the case of track-laying vehicles, metal tracks, should be coated with a protective medium-grade lubricating oil. Close firmly all cab doors, windows, and windshields. Vehicles equipped with open-type cabs with collapsible tops will have the tops raised, all curtains in place, and the windshield closed. Make sure tarpaulins and window curtains are in place and firmly secured. Leave rubber mats, such as floor mats, where provided, in an unrolled position on the floor, and not rolled or curled up. Equipment, such as pioneer and truck tools, tire chains, and fire extinguishers, will remain in place in the vehicle.

(8) INSPECTION. Make a systematic inspection just before shipment or temporary storage, to insure all the above steps have been covered, and that the vehicles are ready for operation on call. Make a list of all missing or damaged items, and attach it to the steering wheel. Refer to Before-operation Service (par. 22).

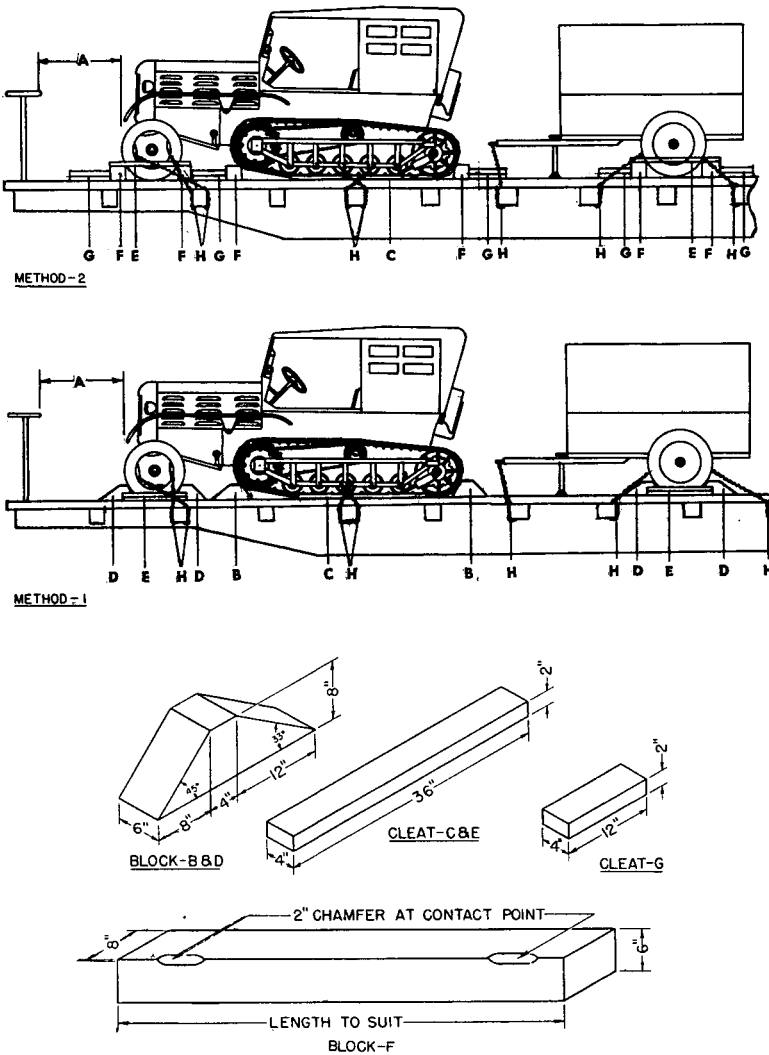
(9) ENGINE. To prepare the engine for storage, remove the air cleaner from the carburetor. Start the engine, and set the throttle to run the engine at a fast idle. Pour 1 pint of medium grade, preservative lubricating oil (Ordnance Department Specification AXS-674), of the latest issue in effect, into the carburetor throat, being careful not to choke the engine. Turn off the ignition switch as quickly as possible after the oil has been poured into the carburetor. With the engine switch off, open the throttle wide, and turn the engine five complete revolutions by means of the cranking motor. If the engine cannot be turned by the cranking motor with the switch off, turn it by hand, or disconnect the high-tension lead and ground it before turning the engine by means of the cranking motor. Then reinstall the air cleaner.

(10) BRAKES. Release brakes and chock the wheels or tracks.

c. Inspections in Limited Storage.

(1) Vehicles in limited storage will be inspected weekly for condition of tires and battery. If water is added when freezing weather is anticipated, recharge the battery with a portable charger, or remove the battery for charging. Do not attempt to charge the battery by running the engine. If freezing temperature is expected, add the proper quantity of antifreeze compound to cooling system to afford protection from freezing.

SHIPMENT AND TEMPORARY STORAGE



RA PD 330819

Figure 105—Blocking Requirements for Securing Tractor and Trailer on Railroad Car

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

132. LOADING AND BLOCKING FOR RAIL SHIPMENT.

a. Preparation. In addition to the preparation described in paragraph 131, when ordnance vehicles are prepared for domestic shipment, the following preparations and precautions will be taken:

(1) EXTERIOR. Cover the body of the vehicle with a canvas cover supplied as an accessory.

(2) TIRES. Inflate pneumatic tires from 5 to 10 pounds above normal pressure.

(3) BATTERY. Disconnect the battery to prevent its discharge by vandalism or accident. This may be accomplished by disconnecting the positive lead, taping the end of the lead, and tying it back away from the battery.

(4) BRAKES. The brakes must be applied and the transmission placed in low gear, after the vehicle has been placed in position with a brake wheel clearance of at least 6 inches ("A," fig. 105). The vehicles will be located on the car in such a manner as to prevent the car from carrying an unbalanced load.

(5) All cars containing ordnance vehicles must be placarded "DO NOT HUMP."

(6) Ordnance vehicles may be shipped on flat cars, end-door box cars, side-door box cars, or drop-end gondola cars, whichever type car is the most convenient.

b. Facilities for Loading. Whenever possible, load and unload vehicles from open cars under their own power, using permanent end ramps and spanning platforms. Movement from one flat car to another along the length of the train is made possible by cross-over plates or spanning platforms. If no permanent end ramp is available, an improvised ramp can be made from railroad ties. Vehicles may be loaded in gondola cars without drop ends by using a crane. In case of shipment in side-door box cars, use a dolly-type jack to fit the vehicles into position within the car.

c. Securing Vehicles (Tractor).

(1) METHOD 1 (fig. 105). Locate four blocks "B"; one to the front, and one to the rear, of each track. Nail the heel of each block to the car floor, using five 40-penny nails to each block. That portion of the block under the track will be toenailed to the car floor with two 40-penny nails to each block. Locate two cleats "C," one on each side of the vehicle on the outside of each track. Nail each cleat to the car floor with three 40-penny nails. Locate four blocks "D"; one to the front, and one to the rear, of each wheel. Nail the heel of each block to the car floor, using three 40-penny nails, and nail that portion of the block under the tire with two 40-penny nails before cleats "E" are applied. Locate four cleats "E," against the outside face of each wheel. Nail the lower cleat to the car floor with three 40-penny nails, and the top cleat to the lower one with three 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "H" through the holes in the wheels, and then through the stake pockets. Pass also the same number of strands of wire between the track frame and the nearest stake pockets. Tighten all wires enough to remove slack. When

a box car is used, this strapping must be applied in a similar fashion, and attached to the floor by the use of blocking or anchor plates. This strapping is not required when gondola cars are used.

(2) METHOD 2 (fig. 105). Locate four blocks "F"; one to the front, and one to the rear, of the front wheels; and one to the front and one to the rear of the tracks. These blocks are to be at least 8 inches wider than the over-all width of the vehicle at the car floor. Locate sixteen cleats "G" against blocks "F" to the front and to the rear of each wheel and each track. Nail the lower cleat to the car floor with three 40-penny nails, and the top cleat to the cleat below with three 40-penny nails. Locate two cleats "C," one on the outside of each track; and two cleats "E," one on the outside of each wheel. Nail each cleat on the outside of each track to the car floor with three 40-penny nails. Nail each cleat on the outside of each wheel to the top of each block "F" with two 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "H" through the holes in the wheels and then through the stake pockets. Pass also the same number of strands of wire between the track frame and the nearest stake pockets. Tighten all wires enough to remove slack. When a box car is used, this strapping must be applied in a similar fashion, and attached to the floor by the use of blocking or anchor plates. This strapping is not required when gondola cars are used.

d. Securing Vehicles (Trailer). In blocking the two wheels of the trailer use the same procedure shown in Method 1 or Method 2 above, for blocking and securing the front wheels of the tractor. In addition, extend the parking leg to the car floor and pass four strands, two wrappings, of No. 8 gage, black annealed wire "H" through the attaching eye of the trailer, and then through the stake pockets on each side of the railroad car. Tighten both guy wires enough to remove slack. When a box car is used, this strapping must be applied in a similar fashion, and attached to the floor by the use of blocking or anchor plates. This strapping is not required when gondola cars are used.

e. Shipping Data.

	Tractor	Trailer
Length over-all	13 ft 7½ in.	11 ft 2¼ in.
Width over-all	5 ft 3 in.	6 ft 1½ in.
Height	5 ft 4 in.	5 ft 3 in.
Shipping weight	2,620 lb	640 lb
Approximate floor area	72 sq ft	69 sq ft
Approximate volume	382 cu ft	360 cu ft
Bearing pressure (lb per sq ft)	37	10

REFERENCES

STANDARD NOMENCLATURE LISTS

Tractor, snow, M7 (T26E4)	SNL G-194
Trailer, 1-ton, snow, M19 (T48)	SNL G-195
Cleaning, preserving and lubrication materials, recoil fluids, special oils, and miscellaneous related items	SNL K-1
Soldering, brazing, and welding materials, gases, and related items	SNL K-2
Tool sets—motor transport	SNL N-19
Interchangeability chart of organizational tools for combat vehicles	SNL G-19
Current Standard Nomenclature Lists are listed above. An up-to-date list of SNL's is maintained in the index to Ordnance Publications	ASF Cat. ORD 2 OPSI

EXPLANATORY PUBLICATIONS.

General

List of publications for training	FM 21-6
Military motor vehicles	AR 850-15
Operations in snow and extreme cold	FM 31-15
Standard military motor vehicles	TM 9-2800

Related Technical Manuals.

Ordnance maintenance: Snow tractor M7	TM 9-1774
Ordnance maintenance: Engine and engine accessories for ¼-ton 4x4 truck (Ford and Willys)	TM 9-1803A
Ordnance maintenance: Power train, chassis and body for ¼-ton 4x4 truck (Ford and Willys)	TM 9-1803B

Maintenance and Repair.

Automotive electricity	TM 10-580
Automotive brakes	TM 10-565
Automotive lubrication	TM 10-540
Basic maintenance manual	TM 38-250
Cleaning, preserving, lubricating, and welding materials and similar items issued by the Ordnance Department	TM 9-850
Driver's manual	TM 10-460
Electrical fundamentals	TM 1-455
Fuels and carburetion	TM 10-550
Motor transport	FM 25-10

REFERENCES

Motor vehicle inspections and preventive maintenance services	TM 9-2810
Maintenance and care of pneumatic tires and rubber treads	TM 31-200
The internal combustion engine	TM 10-570
The motor vehicle	TM 10-510
Protection of Materiel.	
Camouflage	FM 5-20
Chemical decontamination materials and equipment	TM 3-220
Decontamination of armored force vehicles	FM 17-59
Defense against chemical attack	FM 21-40
Explosives and demolitions	FM 5-25
Military chemistry and chemical agents	TM 3-215
Storage and Shipment.	
Registration of motor vehicles	AR 850-10
Storage of motor vehicle equipment	AR 850-18
Ordnance storage and shipment chart, Group G-Major items	OSSC-G
Rules governing the loading of mechanized and motorized army equipment, also major caliber guns, for the United States Army and Navy, on open top equipment, published by Operations and maintenance Department of Association of American Railroads.	

SNOW TRACTOR M7 AND 1-TON SNOW TRAILER M19

INDEX

INDEX

INDEX

INDEX

TB 9-774-1

WAR DEPARTMENT TECHNICAL BULLETIN

TRACTOR, SNOW, M7: LIST OF EQUIPMENT

Ref: TM 9-774: Snow Tractor M7 and 1-ton Snow Trailer M19, 31 January 1944

War Department, Washington 25, D. C., 18 August 1944

1. The list of equipment contained in this technical bulletin supersedes the list of equipment (vehicle stowage list) in TM 9-774.

2. The following list of equipment is for information only and must not be used as a basis for requisition. When requisitioning equipment, refer to OSP&E of SNL G-194.

3. TRACTOR, SNOW, M7.

Quantity Per Vehicle	Name	Stowage Location
	a. Accessories and Equipment, Miscellaneous	
1	BAG, canvas (for inspection lamp)	In tool box under rear seat
1	BAG, tool	In tool box under rear seat
1	CHAIN, tow, 14 ft	In tool box under rear seat
1	CONTAINER, 5 gal liquid	In mounting bracket at rear of body
1	COVER, hood	On hood
1	CRANK, starting, assembly	In tool box under rear seat
1	EXTINGUISHER, fire (CCL_4) and bracket	Bracket mounted to left of driver's compartment
1	GUN, lubr pressure, 3 oz	In tool box under rear seat
1	JACK, hydraulic, assembly (Consisting of: 1 JACK, hydraulic, w/handle 1 PEDESTAL 4 SCREW, wood, No. 10 x 1 in., rd. hd.)	In tool box under rear seat
1	LAMP, inspection	In inspection lamp canvas bag
1	LUBRICATION ORDER, War Dept. No. 208	In chart holder behind front seat
1	MANUAL, operators', TM 9-774	In tool box under rear seat
	b. Spare Parts, Vehicular.	
1	KIT, service (Consisting of: 1 BLADE, windshield wiper	In tool box under rear seat

Quantity Per Vehicle	Name	Stowage Location
	1 CONTAINER, service kit	
	1 CONDENSER (distributor)	
	4 KEY, spindle pivot	
	8 LINK, offset connecting, ¾ in. pitch	
	4 PLUG, spark	
	1 ROD, high altitude carb metering	
	1 SET, distributor contact service	
	1 WICK, preheater lighting)	
1	*SKI, L.H. assembly	On bracket at left side of hood
1	*SKI, R.H. assembly	On bracket at right side of hood

c. Tools, Pioneer.

1	AX, w/handle	In tool box under rear seat
1	MATTOCK, pick, w/handle	In tool box under rear seat
1	SHOVEL	In tool box under rear seat

d. Tools, Vehicular.

1	HAMMER, machinist ball peen, 16 oz	In tool bag
1	HANDLE, spark plug wrench	In tool bag
1	PLIERS, combination, 6 in	In tool bag
1	SCREWDRIVER, common, 6 in	In tool bag
1	WRENCH, adjustable, 11 in	In tool bag
1	WRENCH, drain plug	In tool bag
1	WRENCH, engrs, dble hd, ⅜- x 7/16-in	In tool bag
1	WRENCH, engrs, dble hd, ½- x 19/32-in	In tool bag
1	WRENCH, engrs, dble hd, 9/16- x 11/16-in	In tool bag
1	WRENCH, engrs, dble hd, ⅝- x 25/32-in	In tool bag
1	WRENCH, engrs, dble hd, ¾- x ⅞-in	In tool bag
1	WRENCH, spark plug	In tool bag

[A.G. 300.5 (18 Aug 44)]

By order of the Secretary of War:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

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

Distribution: As prescribed in paragraph 9a, FM 21-6: Armies (10); Corps (10); Sv C (10); Dept (10); D (2); R 1 (2); IC 9 (3); Tech Sv (2); Arm & Sv Boards (2); ROTC (1); P, C, or Stas (1); Gen & Sp Sv Schools (10); Ord Decentralized Sub-O (3); PE's "Mark for Ord O" (5); H & R Points (5); Ord Dist Off (5); Ord Reg Off (3); Ord Dist Br O (3); Ord Estabs (5).

IC 9: T/O & E 9-57; 9-257; 9-417; 9-417-S-PC.

*The spare skis or the front wheels may be mounted on the brackets on the hood sides.