

# MAINTENANCE MANUAL

6x4 Transporter

DIAMOND T MOTOR CAR CO.



## CONTRACT NUMBERS

DA-W-398-QM-4

DA-W-398-QM-165

## Serial Numbers

9800001-9801202

9810001-9810133

Section One: CARE AND OPERATION

Section Two: SHOP MAINTENANCE

DIAMOND T MOTOR CAR COMPANY

FACTORIES: CHICAGO, ILLINOIS, U. S. A.

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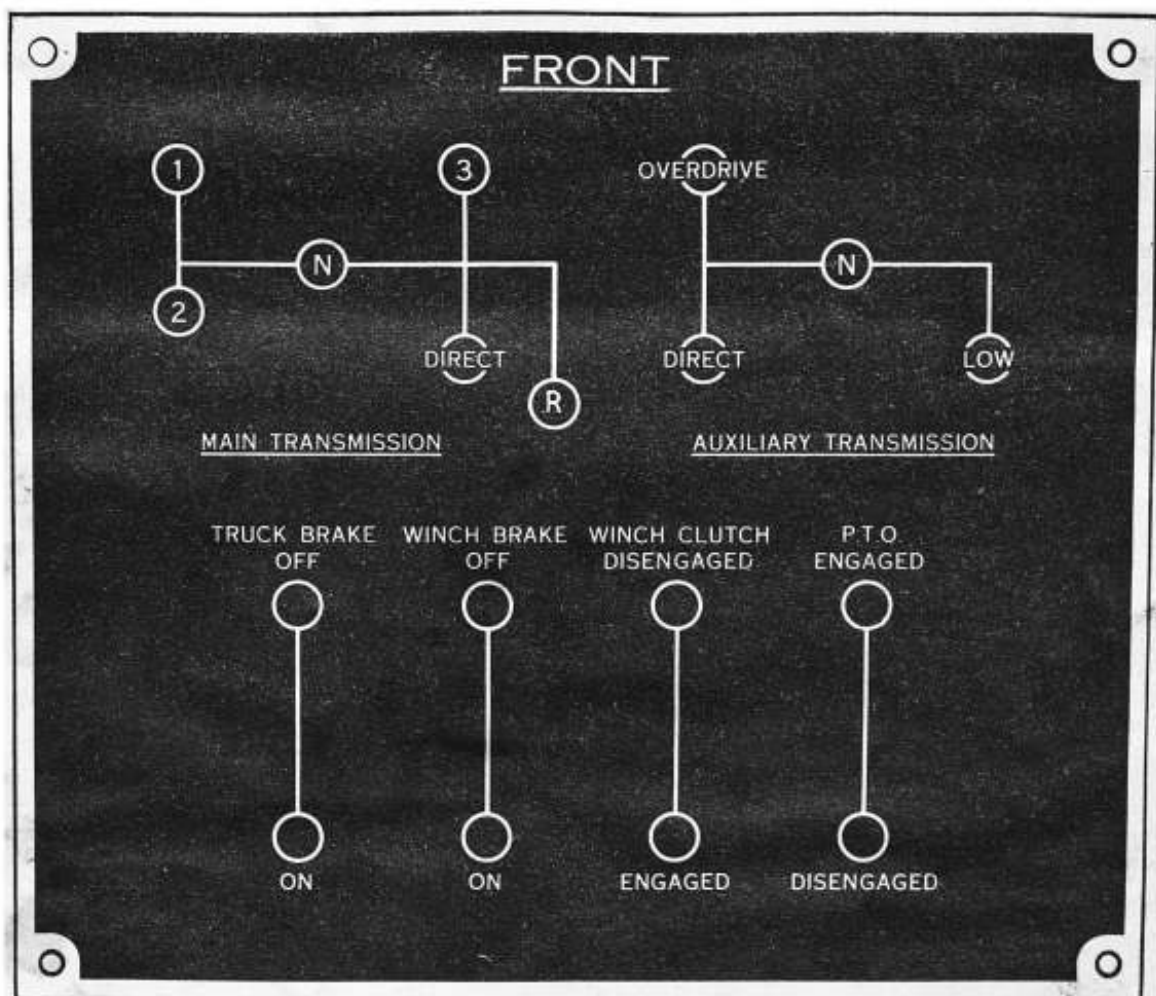
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# SECTION ONE

## CARE and OPERATION

### INSTRUCTION PLATES AND SERIAL NUMBERS

Special instructions governing the operation of units appear on plates mounted in the cab. Serial numbers of the engine, chassis, and power take-off are given on plates mounted on the units as indicated below the illustrations which follow.



#### SHIFTING PLATE

Located in middle of cowl inside cab.

**- WARNING -**

BUZZER OPERATION IS AN INDICATION THAT THE TRUCK MUST IMMEDIATELY BE BROUGHT TO A STOP AND THE CAUSE OF THE LOSS OF BRAKE AIR PRESSURE DETERMINED.

**AIR BRAKE PRESSURE ALARM**

Located over the windshield inside cab.

**TO DRAIN COOLING SYSTEM**

TO COMPLETELY DRAIN THE COOLING SYSTEM, OPEN PET COCKS AT:

- (1) RADIATOR BOTTOM TANK, LEFT SIDE.
- (2) WATER PUMP OUTLET FITTING.
- (3) LEFT SIDE OF CYLINDER BLOCK.

**COOLING SYSTEM DRAIN****NOMENCLATURE** TRUCK, PRIME MOVER, 6X4

MAKE AND MODEL DIAMOND-T MODEL 980

SERIAL NUMBER

VEHICLE WEIGHT, UNLOADED. LBS.

VEHICLE WEIGHT, LOADED NOMINAL 45,000 LBS.

MAXIMUM TOWED LOAD 115,000 LBS.

DATE OF DELIVERY

**RECOMMENDED BY MANUFACTURER**

TIRE INFLATION PRESSURE 80 LBS. PER SQ. IN.

S.A.E. GRADE OF OIL FOR SUMMER USE 30

S.A.E. GRADE OF OIL FOR WINTER USE 10

CHECK VISCOMETER FREQUENTLY AS A GUIDE TO CORRECT OIL VISCOSITY

**CHASSIS PLATE**

Located on left side of cowl under hood.

**WARNING**

BOTH VALVES IN THIS COMPARTMENT MUST BE FULLY OPEN TO USE FUEL FROM TANK ON THIS SIDE OF TRUCK AND VALVES ON OPPOSITE SIDE MUST BE CLOSED TIGHT.

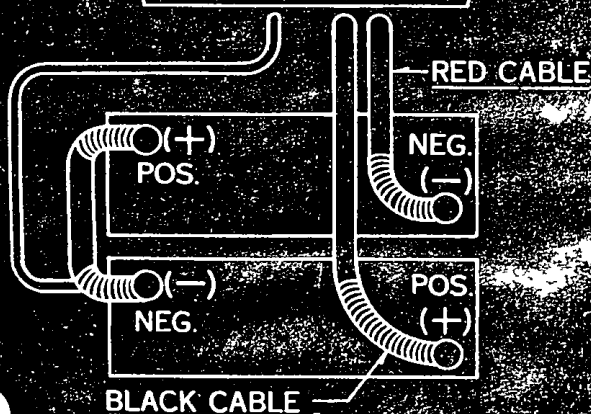
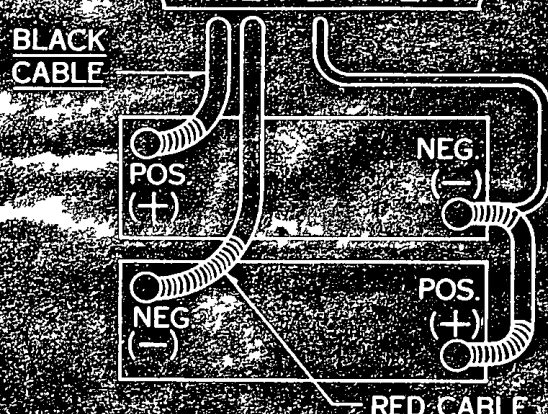
SET FUEL LEVEL GAUGE SWITCH TO INDICATE TANK IN USE.

**FUEL VALVE INSTRUCTION PLATE**

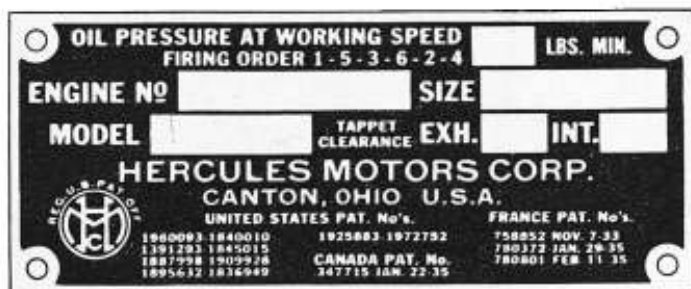
Located on inside of battery compartment doors.

**- WARNING -**

ON THIS TRUCK LIGHTS AND ACCESSORIES ARE CONNECTED ONLY TO ONE BATTERY. ACCORDINGLY BATTERIES SHOULD BE CHECKED PERIODICALLY AND WHEN NECESSARY, CABLES ON BATTERIES IN THE COMPARTMENT ON THIS SIDE OF THE TRUCK REPOSITIONED AS SHOWN BELOW.

**FOR LAMP LOAD ON OUTER BATTERY****FOR LAMP LOAD ON INNER BATTERY****BATTERY CABLE HOOK-UP**

Located on right battery compartment door.

**ENGINE PLATE**

Located on right side of cylinder block.  
(Engine number also stamped on a boss at the upper front corner on the manifold side.)

**FUEL LEVEL PLATE**

Located on dash.

**ENGINE STOP**

Located on dash.

**PUBLICATION PLATE**

Located on left side of cowl under hood.

**PRIMING PUMP**

Located on dash.

## MAIN UNIT SERIAL NUMBERS AND TYPE DESIGNATIONS

**Frame** — Serial number stamped on right side rail over the front spring rear hanger.

**Front Axle** — The front axle serial number is stamped on the top of the axle bed.

**Rear Axles** — The rear axle serial number is stamped on the rear face of the banjo, close to the deck. The serial numbers for both rear axle differential carriers are located on a boss at the top of the housing.

**Auxiliary Transmission** — The auxiliary transmission serial number is stamped on a plate on the left side of the case.

**Transmission** — The transmission serial number is located on a plate on the left side of the case.

**Electrical Accessories** — Generator, starting motor, starter switch, fuel cut-off switch and solenoid switch have plates designating model and manufacturing data. Generators also carry serial number on plate.

**Steering Gear** — Identification number is stamped on top of gear housing.

**Battery** — Type designation is stamped on cell connecting bar.

**Air Compressor** — Plate shows model and manufacturing data.

**Fuel Injector Pump** — Plate gives serial number.

**Governor** — Plate shows serial number.

**Auxiliary Transmission Control** — Plate on right side gives serial number.

## GENERAL DRIVING INSTRUCTIONS

Good driving is perhaps the most important requisite for long and satisfactory service of any automotive vehicle. A real driver is more than a machine with one hand on the transmission lever and the other on the steering wheel. He must be able to think and feel his truck. He must recognize any unnatural condition such as vibrations, scrapings, knocks, clicks, sluggishness, etc.

The following instruments, described later in this section, are provided to assist the driver in noticing unusual conditions and to give warning before trouble develops.

Fuel Gauge  
Fuel Pressure Gauge  
Ammeter

Viscometer  
Speedometer  
Tachometer

Temperature Gauge  
Oil Pressure Gauge  
Front Battery Ammeter

Air Pressure Buzzer  
Air Pressure Gauge

### PRELIMINARY —

Before starting engine, check as follows:

1. See that there is sufficient oil in the crankcase and fuel in the fuel tank to cover the day's requirements. Watch for leaks in the fuel and oil lines.
2. The radiator must have sufficient water and the fan belts must be properly adjusted.
3. The tires must be properly inflated—80 lbs. pressure.
4. Check lights, horn and air brake equipment.

### STARTING ENGINE —

#### Precautions — Read Before Starting Engine

— The following precautions, if followed, will help eliminate operating difficulties and abnormal wear:

1. Filters—keep them clean—they are the guardians of your engine—dirty filters cause rapid wear and low engine power output.
2. Fuel Oil—keep it clean—do not use dirty containers to handle it—insist on the fuel being clean and acid free when you get it.
3. Lubricating Oil—keep it clean—drain crankcase often. Use best brands obtainable, regardless of cost, the best is none too good. Avoid oils having additives detrimental to alloy bearings.
4. Do not allow oil level to fall much below the 4/4 mark on the bayonet gauge. As the lubricating oil is the medium for removing the friction heat in the bearings, the larger the volume, the more heat can be absorbed.
5. Do not run engine at any time without lubricating oil or cooling solution (water or anti-freeze mixture).
6. Do not use oil, fuel oil or kerosene in the cooling solution or as a cooling medium as these will be detrimental to the synthetic rubber water pump seal.
7. Never run engine with water or anti-freeze solution boiling. This allows lubrication to break down and may seriously damage engine.
8. Do not put cold water in an overheated engine. It may crack cylinder head, block, etc. An overheated engine shows negligence in operation.
9. Do not allow air cleaners to become clogged

or to operate without all connections being tight. Keep clean oil in them up to the proper level. These units protect your engine from undue wear only when they are given intelligent care.

10. Do not attempt starting engine until lubricating oil, water and fuel supply has been checked and the engine properly prepared for starting.

11. Do not run engine at high speed without load, as this will cause undue wear and shorten the engine's life.

12. Do not idle engine for long periods as it is not only detrimental to the engine but also increases operating costs as you are using fuel without any benefit.

13. Do not use engine as a brake in intermediate or low gear in automotive service. The high engine speeds possible when using low or intermediate gear descending steep grade will turn the engine much faster than the speed for which it is designed and damage will result unless vehicle speed is held to that used in same gears on the level.

14. Never allow engine to run without oil pressure showing on the gauge or with viscosity so low the pointer is in the low register of the Visco Meter. Damage from lack of lubrication will result.

15. Do not operate fuel injection pump with one or more lines shut off or blocked. The high pressure may ruin the pump.

16. Do not attempt to make repairs or adjustments to the fuel injection equipment unless you are familiar with it. It is far less expensive to take to the nearest authorized service station.

17. Correct fuel nozzle pressure is essential to efficient operation. Check them often.

18. Do not allow fuel in tank to run low as it may allow fuel transfer pump line to uncover long enough to fill the lines with air and cause the engine to stop, resulting in lost time taken for repriming.

19. Loss of power, erratic running and poor performance often results from air in the fuel injection system. Be sure there are no leaks in fuel lines and filters which will allow this condition to exist. Vent cocks on top of filters are for bleeding off any air which may accumulate from bubbles in the fuel and very minor leaks, therefore it is essential to bleed

these often until the operator is sure air is not entering the fuel system.

20. Remember dirt, grit, water, lint or any foreign matter in both the fuel and lubricating oils is detrimental to the engine and it is your duty as an operator to see that it does not get into the engine.

21. Never run starting motor longer than 30 seconds at one time without a rest period of at least one minute before allowing it to run again. Failure to follow this procedure may result in a burnt out starting motor.

22. Diesel engines will run in either direction, therefore, it is essential that the engine should never be stalled on a grade where a reverse motion of the vehicle will cause the engine to start backwards. Same also applies to other applications where stalling may cause engine to start backwards. When this happens, which is seldom, stop engine with stop control before damage can occur.

### Starting and Operating Suggestions —

1. Fuel and lubricating oil should meet specifications.

2. An S.A.E. 30 oil is a good grade to start with, from this the proper grade can be determined by means of the Visco Meter.

3. Fill cooling system with clean water (if in locality where water has a large percentage of dissolved minerals or is alkaline—use rain water) Allow sufficient time for water to seek lowest level, then complete filling.

4. Be sure the batteries are hooked up properly before pressing the starter button.

5. Turn engine over three or four times by hand to be sure there is nothing sticking or water has not seeped into cylinder, as the starting motor has sufficient power to bend or break certain parts should anything be out of place.

6. Be sure all fuel line connections are tight and the fuel system properly primed.

7. Always follow starting instructions outlined below to eliminate difficulties.

**Starting the Engine — Save Your Batteries.** The batteries furnished will crank the engine against compression for about six periods of 30 seconds each with a recuperation or rest of one minute between each period of cranking. Hand cranking, or electric starter cranking with nozzle holders removed during tests for fuel oil delivery to nozzles will conserve the battery charge.

If the atmospheric air temperature is 50° F. or over the following instructions should enable anyone to readily start the engine. If air temperature is below 50° F. see cold weather starting instructions.

When starting a new engine or starting engine after a long period of shut down follow these suggestions:

1. Fill the fuel tank with suitable fuel oil.

2. Fill cooling system with clean pure water or if atmosphere is below freezing and engine is to stand or operate in these temperatures, use anti-freeze solution.

3. Fill crankcase with suitable lubricating oil to the 4/4 or full mark on the oil gauge rod.

4. Leave nozzles out of engine while hand cranking to relieve compression.

5. Turn engine over by means of hand crank three or four times to start oil circulation and distribute the oil already on the surfaces. This hand cranking also prevents possibilities of damage due to water having accumulated in the cylinders. The clearance between the cylinder head and piston top is so small that a small amount of water in the cylinder would cause serious damage or wreckage if engine were rotated rapidly as with electric starter.

6. Air or gas binding or lock in the fuel injection system is the most general cause of failure to start or hard starting if proper fuel is used. Air binding or lock is caused mainly from leaky fuel lines, check valves, or running out of fuel. Gas binding or lock is caused by heating of the fuel to a point higher than that at which the particular fuel used begins to throw off gaseous vapors. To eliminate either of these difficulties the following procedure should be followed:

Loosen the check valve fitting and by using the hand priming pump pull the fuel from the tank and force it through the small filter located between the transfer pump and the injection pump. It is best to leave vent cock on top of filter to rear of injector open until all the air is out of the system up to this point, then close vent cock and pump fuel into the injection pump until a solid stream of oil comes through the opening created by loosening the check valve fitting. Then tighten this connection.

(a) Place governor stop control lever in wide open or full load position.

(b) Be sure stop control is not in shut off position.

(c) Install nozzle holders firmly in place, if these were removed for any reason.

(d) Loosen fuel line nut at the nozzle holder end.

(e) Remove side cover (inspection plate) or plug of fuel pump.

(f) Work the fuel pump plunger up and down by means of a screwdriver until clear fuel with no air bubbles flows freely, then tighten nut. Continue the same operation with all six lines being sure the stop control rod is not in "shut off" position. Turn the engine by hand so the fuel pump cam of the plunger being operated is on the low side to obtain full benefit of the complete plunger stroke.

(g) Replace side cover (inspection plate) on fuel pump. Any time this fuel pump inspection cover is removed for any purpose great care must be exercised to insure its proper replacement as well as to insure against any dirt getting into the fuel pump.

7. In addition to the procedure just described



check the lubrication of fuel injection pump, generator, starter, governor, air compressor, fan, water pump, and any other accessories. Check air cleaners to make sure there are no obstructions, that they are properly installed, and are clean, and that they are properly filled with oil.

8. Check entire electrical system to be sure there are no loose connections and all component parts are properly connected together.

9. See that no loose bars, tools, parts, etc., are lying in or on any part of the engine as they could cause serious damage to engine or bodily injury to anyone near.

10. Start engine by operating the starting button. If atmospheric temperature is 50° F. or above, and if all of the foregoing instructions have been properly followed and the proper grade and type of fuel oil has been used, the engine will start at once.

11. Allow engine to run for several minutes before load is applied to enable engine to properly warm up and insure proper lubrication.

**Usual Routine Way of Starting Engine.** If the engine has been operating recently and nothing has been removed or repaired since it last operated, the following is all that is necessary to start:

1. Check fuel supply.
2. Check lubricating oil in engine base with gauge rod. Be sure oil is to 4-4 or full mark on rod.
3. Check cooling water.
4. Check atmospheric air temperature if engine is cold. If temperature is 50° F. or above nothing special need be done in preparation for starting. If below this temperature see "Cold Weather Starting."
5. Inspect installation to see all is in good order and tight and no loose tools, bars, or parts are lying on engine.
6. Start engine by operating foot switch.
7. Check engine as under "Operating Instructions After Starting."

**Cold Weather Starting**—The increased temperature of the air due to compression is the only means of igniting the fuel sprayed into combustion chamber.

If the iron surrounding this chamber and cylinder is extremely cold and in addition the air entering the cylinder before compression is cold, the resultant temperature may not be sufficient to ignite the mist of fuel. The faster the starter turns the engine the less time is available for the heat of compression to be absorbed by the iron and water.

Two methods are available to increase this temperature.

1. Heat the water or cooling solution.
2. Heat the air before it reaches the cylinder.

One or both of the methods may be necessary, depending upon temperatures of engine and air.

An intake manifold heater is furnished to assist in starting the engine when temperatures are below

50° F. This operates only when the starter is turning over the engine, and the fuel priming pump mounted on the dash is operated. Do not operate hand priming pump unless starter is being used. To do so would result in unburned fuel being pumped into intake manifold.

The starter button should not be depressed for more than thirty seconds at a time because of the heat developed due to the heavy load on the starting motor. It is necessary to stop and allow the starter to cool for several minutes before again turning the engine over.

**Starting Between 32° F. and 0° F.** To obtain maximum cranking speed the oil must not be too heavy. Many experienced operators drain all crankcase oil from engine at end of day's run and heat it before returning it to crankcase when ready to start, when temperatures approach freezing. This is a good practice for the hot oil insures more immediate circulation to the bearings and helps warm the engine. At freezing temperatures, the water or cooling solution should be drained from engine and radiator and heated to near boiling point if water, and as hot as possible if some solution is used. (Beware of fire if alcohol solution is used.) When this is poured into engine the cold iron parts are heated and oil on cylinders thinned down. This operation does not take nearly as long as changing batteries after they are run down and will greatly aid in starting.

**Starting 0° F. and Below.** The heating of water and oil and the use of the manifold heater will be found desirable. Battery output is reduced at these low temperatures so every means should be used to conserve the batteries.

**Operating Instructions After Starting**—After the engine has started an inspection of the whole engine unit should be made to make sure all parts are functioning properly.

1. Look at lubricating oil gauge. If no pressure shows after engine has run 10 or 12 seconds shut down the engine and ascertain what the trouble is. With bearings in good condition and proper grade of oil, the pressure should be 30 to 45 pounds at full engine speed. If the oil is very cold or heavy this pressure may be much higher. As the oil heats up the pressure will reduce.

2. Check water circulation. If no water is flowing, shut down engine and ascertain cause. Never operate with the water boiling as this heat on the cylinder walls breaks down the oil film and also causes considerable water loss due to steaming.

3. Observe engine operation for smoothness, quietness and exhaust condition. If the fuel is up to specifications and has the proper ignition and burning qualities, the engine may still run raggedly because a cylinder or two is firing irregularly due to



being cold. As the engine begins to warm up however all cylinders should fire regularly. If they do not the nut connecting the fuel line to the nozzle holder should be slightly loosened one cylinder at a time and fuel allowed to flow until all air has been expelled. When this nut is loosened, if the engine speed remains the same and the exhaust sounds the same, that cylinder is not firing or is firing irregularly. If after checking this trouble and allowing fuel to flow from the loosened nut a few seconds any cylinder still continues to fire irregularly or not at all, shut down the engine and trace out the trouble. See Section Troubles and Corrections.

4. See that there is an adequate supply of fuel in the tanks and that fuel is being delivered to the fuel pump. The delivery can be checked by slightly loosening the nut connecting the supply pipe to the fuel strainer and if a good quantity of fuel appears it is an indication that the fuel injection pump is being supplied with sufficient fuel. If no fuel or very little appears, shut down the engine and check the supply tanks again. If the fuel supply is adequate, check fuel lines from tank to transfer pump and transfer pump to strainer for leaks from loose connections, broken nuts, and cracked or broken lines. Also check lines for obstructions inside or having been pinched closed or nearly so. If lines are found satisfactory, check transfer pump for broken springs, worn or broken valves or plungers or worn or stuck tappet rollers, followers or wrist pins.

5. Observe Visco Meter for viscosity of lubricating oil. If needle on gauge is in the high section allow engine to run idle until the indicating needle shows the oil is of proper viscosity to insure safe engine operation. If indicating needle drops into the lowest section, stop engine and check trouble. Probably it will be necessary to change oil in engine sump. It may be that oil being used is not of proper grade or quality or quantity or has not been changed recently enough. The Visco Meter is the indicator of the lubricating qualities of the oil lubricating the engine and should be observed often. This instrument should receive attention frequently as it is a most useful instrument. Go by what the needle indicates and give the gauge and instrument good care as it will repay you many times over.

6. Check and see that there are no oil or water leaks.

7. Clean lubricating oil filters often. This will insure maximum efficiency from this unit.

8. Keep all fuel filters clean and give them regular attention. This will eliminate many costly fuel injection pump and nozzle troubles.

9. Observe fan and belt operation. Loose fan belts allow slippage which reduces the efficiency of the fan and wears belts out rapidly. Never allow fan to run without any lubricant but do not over-lubricate

as it will throw off the excess on the surrounding parts.

10. See that the radiator is free of obstructions between fins or tubes as they will obstruct air flow and reduce the cooling efficiency of the radiator unit.

### Stopping the Engine—

1. Stopping is generally effected by pushing in stop button on dash until engine stops.

2. If atmospheric temperature is below freezing and no anti-freeze solution is used, the complete water circulating system should be drained. This includes engine water jackets, water pump, radiator and all water pipes. See Plate mounted in cab.

3. If anti-freeze solution is used the solution should be checked with a hydrometer to make sure the solution will not freeze. It is best to have a solution that will not freeze at temperatures far below those then being experienced.

4. Do not fill batteries with water when shutting down as this makes them more liable to freezing. Fill batteries just before starting up for the day's run.

**Storing Engine for Long Periods—**If engine is to be idle for a month or more, special preparations should be made to properly prepare the engine so that rust will not form on the wearing surfaces or in the fuel system.

**Preparing Fuel Injection Pumps and Nozzles.** Just before the engine is shut down for the last time, heat approximately two quarts of lubricating oil of same quality as used in the crankcase to about 180° to 200° F. This is to reduce the viscosity—the thickness—of the oil so it will flow through the fuel lines. Shut down the engine and disconnect the fuel line from the main tank to the transfer pump. Then place the hot lubricating oil in a container which can be located so the end of the fuel line which has been disconnected from the supply tank can be inserted in the container. Start engine and allow to run until practically all of the oil in the container has been taken into the engine; then shut down engine.

Another method to accomplish the same result is after the engine has been shut down to attach the two or three quart tank pouring about 2 quarts of this heated lubricating oil into it, disconnect the suction line from the tank to the transfer pump either at the pump or at the tank so when the engine is started fuel from the main tank will not be pumped all over the surrounding equipment. Start engine and allow to run until most of the oil in the small tank has passed into the fuel pump. Then shut down engine.

After engine is shut down, tape a small piece of gasket material over the breather hole on the fuel injection pump cover or inspection plate. Fill the fuel pump FULL of good quality acid and moisture free lubricating oil, through the fuel pump oil filler hole. Fill the pump until oil flows out of this oil

gauge hole and then replace cover. This procedure will fill the pump housing with oil, protecting the fuel pump camshaft, tappet assemblies, etc.

When engine is shut down after either method of filling the fuel system, remove all of the fuel or spray nozzle holders. Remove the fuel nozzle body from the nozzle holder and then remove the valve from the body. Put a coating of vaseline on the valve and return valve to body, then cover the outside of the body with vaseline. Reassemble body and holder.

**Preparing Engine.** Before putting the nozzles and holders back in their place take a pump type oil can with a long narrow spout with a tip that will fit into the 7/32", or larger hole of the spray nozzle sleeve, and give it six or eight squirts per cylinder, then turn engine over slowly a few times to distribute the oil.

**BEFORE STARTING** remove spray nozzles and turn engine over with starting motor to blow excess oil out.

Drain the entire engine and water circulating system thoroughly.

Leave the lubricating oil in the engine base.

Disconnect the wires leading to the batteries and remove the batteries, storing them preferably at some place where they can be charged periodically, as batteries lose their charge rapidly if not in use.

Cover ends of air inlet and exhaust pipe so moisture cannot reach valve ports and cylinders; store the engine where it will not be exposed to the elements such as sun, rain, snow, hail, etc., and preferably where it can be kept warm and dry.

Every two weeks the engine should be cranked over by hand eight or ten revolutions to redistribute the oil film over the wearing surfaces. This will prevent rusting of the wearing surfaces inside of the engine.

As the fuel injection pump and nozzle assemblies are built to such close limits they require very close attention when storing with the engine.

**Preparing Engine For Starting After Long Shut-down.** If engine has been stored as given in the previous chapter it will be necessary to follow the following procedure to prepare it for starting again:

1. Drain entire fuel system of lubricating or special oil. Open the drain on the bottom of the main fuel supply tank and allow all water and sediment in tank to drain, then reconnect the tube.

2. Check all fuel supply lines from main supply tank to fuel filter to make sure connections are tight and lines are open with no obstruction or "pinched" places.

3. Remove nozzle holders and wipe vaseline from outside surface of each nozzle. Do not wipe the vaseline off the valve in the valve body. Prime pumps and lines as described.

4. When priming the fuel lines from pump to

nozzles connect the nozzles to the fuel lines and test as described later.

5. If nozzles do not function properly clean as described hereafter.

6. Turn engine by hand three or four revolutions to spread the lubricating oil on the walls and bearings and start oil circulation.

7. Install fuel or spray nozzles and connect lines tightly.

8. Drain lubricating oil filters of all water and sediment.

9. Fill cooling system with clean water or anti-freeze solution.

10. Follow instructions as given for "Starting Engine First Time."

11. After engine is running follow instructions as given for "Operating Instructions After Engine Is Started."

## ALTITUDE OPERATION

The starting and operation of Diesel engines encounters certain difficulties at higher altitudes. These difficulties are not commonly noticeable until 3000 feet is reached. Above this altitude it is necessary to make certain changes in the engine to facilitate starting, to increase power output and to eliminate incomplete combustion; these will be taken up separately in paragraphs to follow:

While the engine has lost only about 10% at 3000 feet, at 6000 feet this loss is about 21%. From these figures one can readily see that no difficulty will be encountered in the first 3000 feet but that some provision should be made to help eliminate or overcome part of the power loss and hard starting. A small part of this loss may be recovered by the following methods.

Since the air is lighter, a longer period is required to effectively burn the fuel oil, the injection pump timing should be advanced about 1° per 1000 feet over the standard timing, unless the compression ratio is increased, in which case the timing can remain the same as originally set. This will help starting and combustion, resulting in a little better power.

Due to the air at higher altitudes being lighter the cylinders do not fill as well as at sea level, therefore the compression pressures are lower, causing harder starting and poor combustion. This can be helped by changing the combustion chamber liners so as to get a higher compression of the lighter air entering the cylinders.

It is also necessary to reduce the amount of fuel entering the cylinder as with the original setting and smaller amount of oxygen the combustion is incomplete and a smoky exhaust results.

It is sometimes desirable to follow the starting methods as outlined under "Cold Weather Starting."