

Operator's Manual



TD-24

Crawler Tractor

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Ave.

Chicago 1, Illinois, U.S.A.



CONTENTS

	Pages
Introduction.....	2 to 6
Specifications	7
Diesel Fuel Specifications.....	8
Description.....	9, 10
Tools Shipped with Tractor	11
Instruments and Controls	12 to 14
"Before Starting" Instructions.....	15, 16
Preparing for Each Day's Work.....	17
Operating Precautions.....	18
Operating the Diesel Engine.....	19, 20
Operating the Tractor.....	21 to 24
Cold Weather Operation	25, 26
Hot Weather Operation.....	26
Periodic Inspections.....	27, 28
Checking Mechanical Problems	29 to 37
Lubrication.....	38 to 48
Lubricating Oil Filters.....	49, 50
Hydraulic System	50, 51
Air Cleaner.....	51, 52
Gasoline Strainer	53
Starting Carburetor	53, 54
Cooling System.....	55 to 58
Engine Clutch	58, 59
Valve Clearance Adjustment.....	60
Brakes.....	61 to 63
Diesel Fuel System	64 to 71
Ignition System.....	72 to 76
Electrical System.....	77 to 83
Track Assemblies	84, 85
Storing and Housing.....	86 to 88
Special Attachments	89 to 99

INTRODUCTION

Assembled in this manual are operating suggestions and maintenance instructions for the International TD-24 Crawler Tractor, which has been designed and built to withstand severe usage with a minimum of maintenance, and to operate smoothly and easily with maximum safety for the operator.

While the material in this manual has been prepared in sufficient detail to be of maximum assistance to less experienced operators, the "oldtimers" will find much information and many illustrations of considerable help. Therefore, before operating the tractor, we suggest that even the experienced operator review the entire manual.

If you should need any information not

given here, or require the services of a trained mechanic, we urge you to use the extensive facilities offered by the International Industrial Power distributor or dealer in your locality. They are kept informed on the latest methods of servicing tractors and are equipped to provide prompt, high class service in the field or in an up-to-date service station. They carry stocks of essential IH parts, and are backed by the full facilities of a conveniently located International Harvester district office or parts depot.

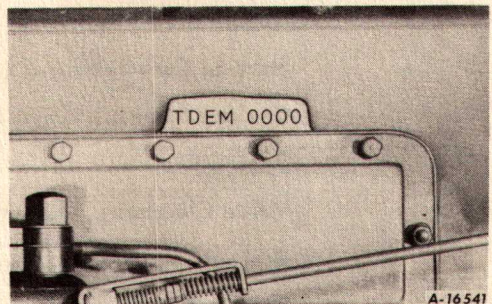
When in need of parts, always specify your tractor and engine serial numbers. We suggest that you write these numbers in the spaces provided below for ready reference when parts are required.

Tractor Serial No. TDE _____
(On plate at upper left corner of dash)

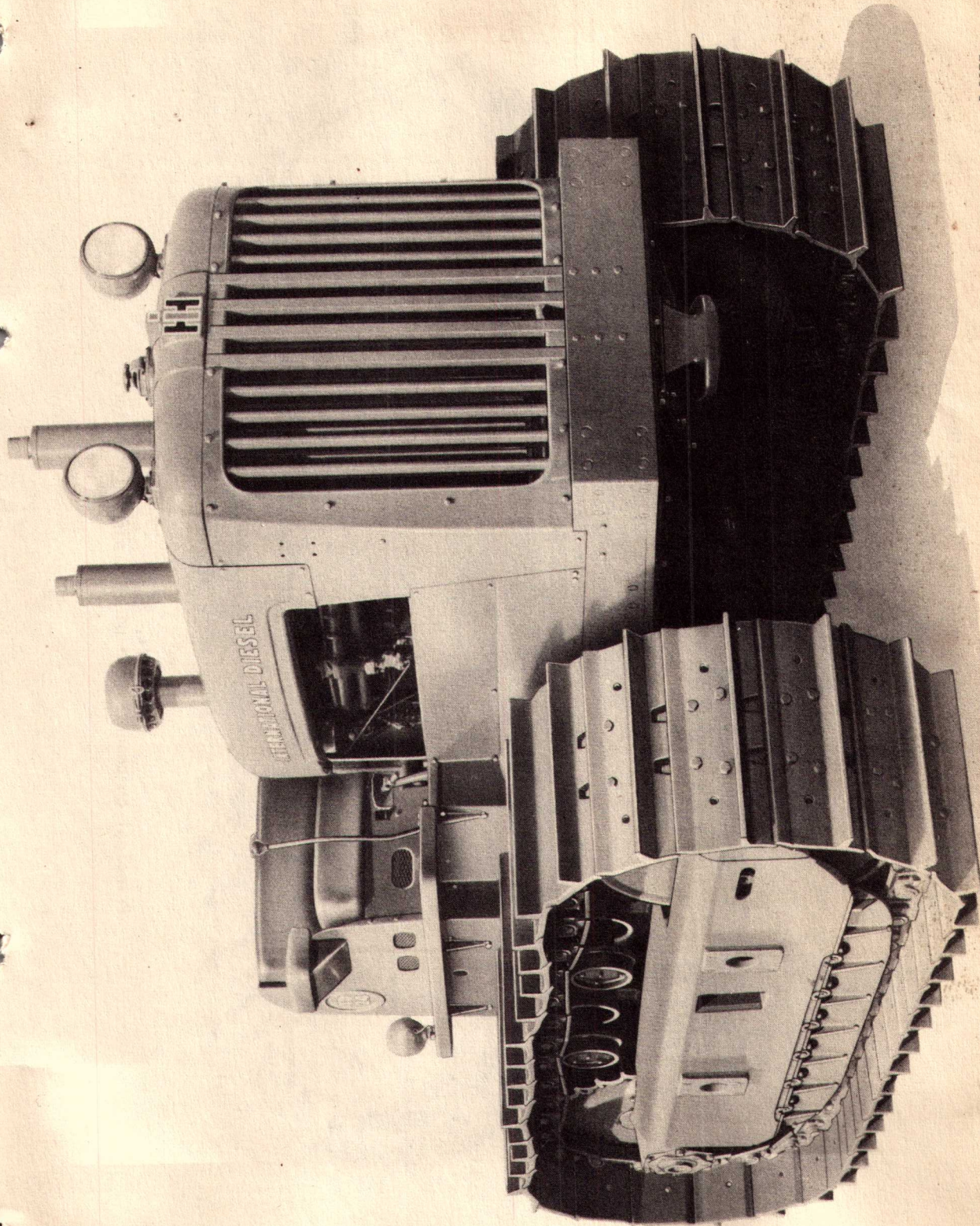


Tractor Serial Number

Engine Serial No. TDEM _____
(On left side of crankcase)

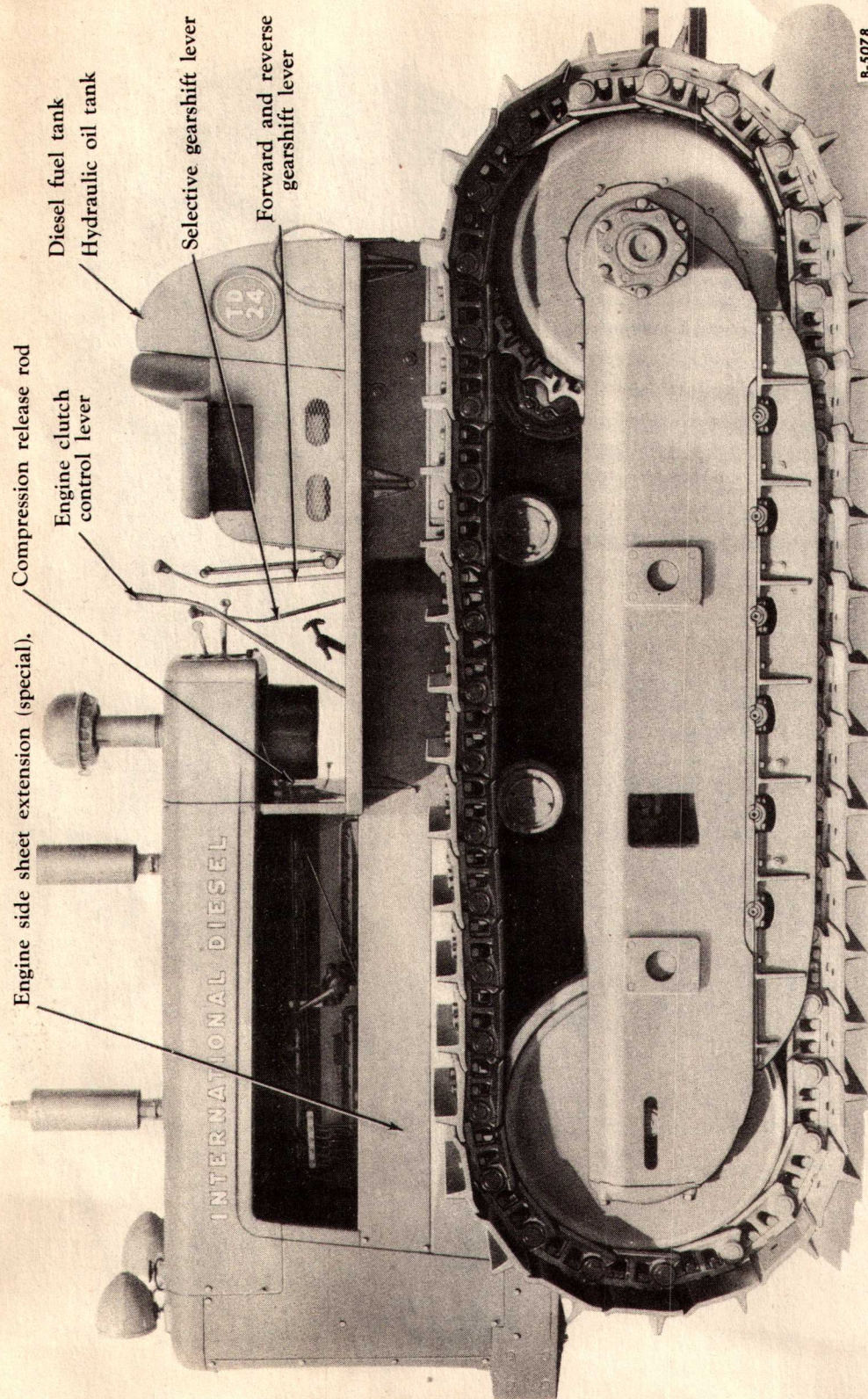


Engine Serial Number

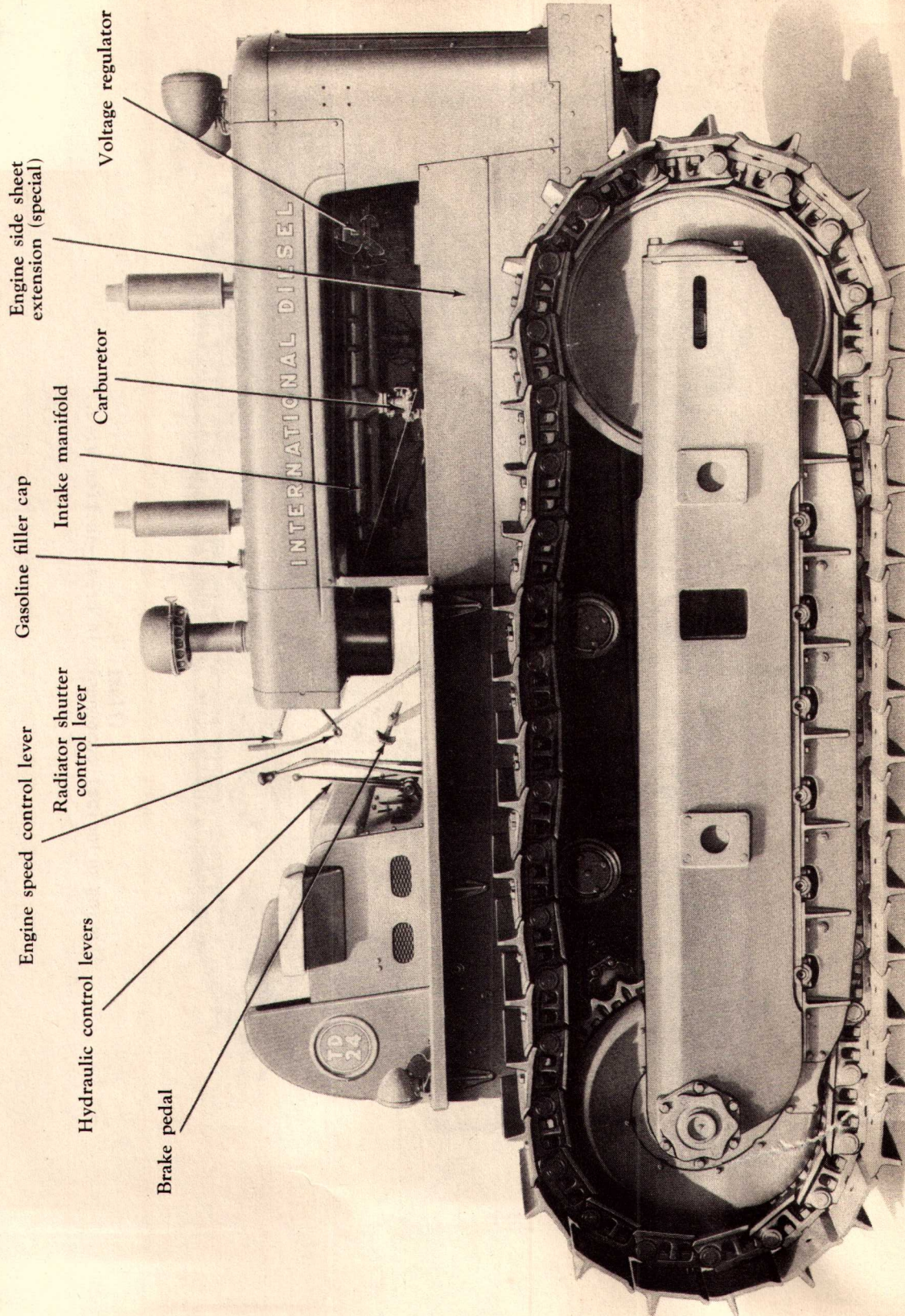


B-5077

Illustr. 1
Tractor equipped with mufflers, head and rear lamps, crankcase guard, pull hook, roller shields, and engine side sheet extension.

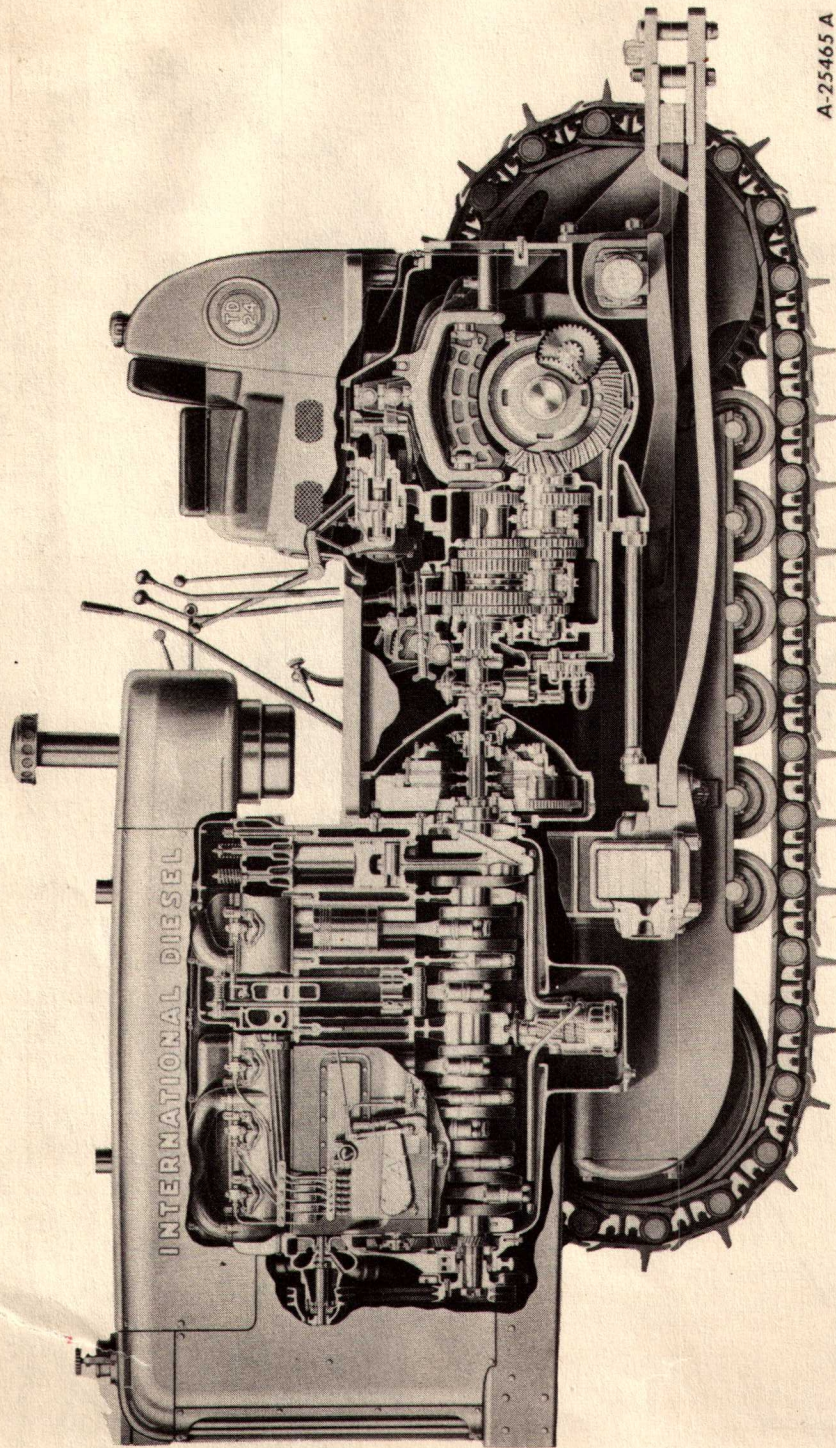


Illustr. 2
Principal components seen on left side of tractor.



B-5076

Illustr. 3
Principal components seen on right side of tractor.



Illustr. 4
Showing principal components in cross-section view.

SPECIFICATIONS

ENGINE

Type	Diesel, 4 cycle, valve-in-head
Cylinders	6
Bore	5-3/4 inches
Stroke	7 inches
Engine speed--	
Full load	1375 \pm 10 r.p.m.
High idle	1525 \pm 30 r.p.m.
Low idle	500 \pm 50 r.p.m.
Fuel injection pump	I H
Carburetor, IH Type C-12 (updraft)	1-1/4 inches
Distributor gap	0.018 to 0.024 inch
Spark plug gap	0.035 to 0.040 inch
Valve clearance--	
Engine hot	0.023 inch
Engine cold	0.025 inch

ENGINE CLUTCH

Heavy duty, double plate, over-center, dry disc 16 inches

STEERING

Two-range planet power drive for each side of tractor. Pivot brakes, 1 for each track, operated hydraulically. Joint application of pivot brakes through foot pedal and mechanical linkage.

TRANSMISSION

Forward Speeds		Reverse Speeds	
1st, low range . .	1.6 m.p.h.	1st, low range . .	1.6 m.p.h.
1st, high range . .	2.0 m.p.h.	1st, high range . .	2.0 m.p.h.
2nd, low range . .	2.4 m.p.h.	2nd, low range . .	2.4 m.p.h.
2nd, high range . .	3.1 m.p.h.	2nd, high range . .	3.1 m.p.h.
3rd, low range . .	4.0 m.p.h.	3rd, low range . .	4.0 m.p.h.
3rd, high range . .	5.2 m.p.h.	3rd, high range . .	5.1 m.p.h.
4th, low range . .	6.2 m.p.h.	4th, low range . .	6.0 m.p.h.
4th, high range . .	7.8 m.p.h.	4th, high range . .	7.7 m.p.h.

TRACK

Tread (center to center of tracks)	80 inches
Ground contact length (regular track frame)	104-1/2 inches
Track shoe width.	22 inches

DIMENSIONS

Length (over-all).	182-1/4 inches
Width (over-all)	102 inches
Height (to top of air cleaner cap)	95-1/4 inches
Drawbar height (above ground line)	17-1/4 inches
Drawbar lateral swing (at pin).	39-1/4 inches

CAPACITIES (U.S. Measure)

Diesel fuel tank	85 gallons
Gasoline tank (starting)	2-1/8 gallons
Cooling system	37 gallons
Crankcase oil pan	7-1/2 gallons
Transmission	48 gallons
Sprocket drive (each side)	2-1/4 gallons
Hydraulic control system	4 gallons
Air cleaner oil cup	9-1/2 pints

DIESEL FUEL SPECIFICATIONS

The best guide to follow when selecting fuel for use in International diesel engines is the set of fuel specifications prepared and recommended by the builder.

Most refiners now market fuel oil designated as diesel fuel to distinguish it from burner fuel. Although similar to burner fuel, the diesel fuel is usually made from the straight run distillates, while the burner fuel may contain sufficient quantities of the lower ignition, catalytic-cracked distillates to make it unsatisfactory for use in the International diesel engine.

Some refiners are marketing one grade of fuel for use in both diesel and burner applications. This fuel, when within the specifications shown below, can be safely used. However, maintaining the quality and suitability of these fuels for International diesel engines is definitely the responsibility of the supplier.

Diesel fuel for high speed diesel engines is now obtainable in the U.S.A. in two grades, namely No. 1-D (light fuel) and No. 2-D (heavy fuel).

No. 2-D fuel gives the most satisfactory performance in International diesel engines when the physical properties are within the limits of the following specifications:

Gravity - minimum 30 API
Flash point - minimum..... 125°F., or legal
pour point - 10° lower than minimum
anticipated temperature
 d point - preferably no more than
 ° higher than pour point
 r and sediment..... None
 r residue (10% re-
 duum) 0.25% maximum
 (by weight) 0.02% maximum
 fillation
 initial boiling point, minimum 325° F.
 50% boiling point, minimum 475° F.
 End boiling point, minimum 610° F.
 End boiling point, maximum 725° F.
 sulphur by weight 0.5% maximum
 cetane number 40 minimum
 Copper strip corrosion..... 3 hr. at 212° F.
 color 3 NPA maximum

When No. 2-D fuel conforming to the above specifications is not available, the No. 1-D (light) fuel may be used. However, this lighter fuel has a lower heat content and lower viscosity. Its use may result in loss of power and/or increased fuel consumption and shortened injection pump life. However, No. 1-D fuel may be required in sub-zero weather in order for the pump to maintain an adequate flow of fuel.

Fuels lighter than kerosene will not give satisfactory performance in International diesel engines. Although some fuels meet the No. 2-D specifications, their composition may be such that unsatisfactory engine wear and excessive deposits may result unless high additive lubricating oil is used. Knowledge of the fuels in your area and the types of crankcase oils required for satisfactory performance with these fuels will avoid service problems. When in doubt, see your International Industrial Power distributor or dealer.

Water and sediment will tend to clog the filters. If water passes through them it will corrode the pump plungers and other highly finished parts in the pump and nozzles, thus greatly shortening their lives. The fuel must be free from water, sediment and residue.

Buy clean fuel and keep it clean. Store fuel in tanks equipped with hose and nozzle because the fuel is then less likely to become contaminated. Do not use funnels, cans and drums because they are difficult to keep clean. Handle the fuel as little as possible.

Always fill the engine fuel tank at the end of each day to reduce condensation. Drain the water trap daily.

Following these rules will pay dividends.

DESCRIPTION

The International TD-24 is a full track-laying tractor powered by a 6 cylinder, diesel engine. The principal components of the tractor are the engine, engine clutch, transmission, planet power drives, sprocket drives, track frame and suspension assemblies, and hydraulic controls.

Engine

Engine power is supplied by a 6 cylinder, 4 cycle, valve-in-head diesel engine. Features of this engine are: a counterbalanced 7 bearing Tocco-hardened crankshaft, replaceable cylinder sleeves, precision bearings, full-flow "no-drain-back" pressure lubrication system, and closed cooling system with thermostatic controls.

Transmission and Clutch

The synchromesh transmission is mounted on the front of the heavy steel rear main frame. Dry sump pressure lubrication eliminates the power loss of gears churning in oil. Two filter strainers clean the oil. The transmission is a 4 speed gear box, with separate lever for forward and reverse. The planet power drive provides an instant high-low range shift for each transmission gear. The transmission is coupled by universal joints to an enclosed 16 inch, 2 plate, hand operated, over-center clutch attached to the flywheel.

Planet Power Drive

The hydraulically controlled planet power drive arrangement gives the tractor finger-tip ease of steering. Hydraulic pressure for the steering control is developed by an engine driven hydraulic pump. The pressure is stored in an accumulator with a heavy spring piston, enabling the pump to run without load most of the time. When pressure in the accumulator falls, due to use of the steering control levers, the pressure regulator will open and allow the hydraulic pump to rebuild the pressure in the accumulator.

The high-low range planet power drive units are in effect 2 compact heavy duty independent transmissions which can be shifted instantly on-the-go under full engine power.

The planet power drive consists of a drive bevel gear bolted to a center hub, and on each side are bolted housings containing the planetary cluster gears. These cluster gears mesh with the high and low range sun gear assemblies and discs. Also the sprocket drive pinion shaft gears mesh with the planetary cluster gears and are splined to the drive pinion shafts for distribution of power.

The pivot brake disc assembly is held in place on the sprocket drive pinion shaft by a splined shaft and hub, and is used in braking or holding the tractor in a firm position, or for use when making a right or left pivot turn.

The 3 brake discs on each side are actuated by finger-tip hydraulic control, there being 1 control lever with 3 different positions for each side. With the 2 levers all the way forward the high range brake discs are applied; with both levers in the middle position the low range brake discs are in action; and with levers all the way back the tractor is stopped with both pinion shaft brakes engaged.

Instant shift up of 1 gear is made by pushing both steering levers forward from the middle position. Shift down 1 gear is made by pulling both levers back to the middle position.

To change to a pivot turn it is merely necessary to pull the lever (in middle position) back slightly when a "feathering" action takes place; and to change to a full pivot turn pull the lever all the way back.

To make a gradual turn with both tracks pulling, the lever (on the side toward which it is desired to turn) is placed in the middle position with the other lever forward. The outside track will then travel 27% faster than the inside track, making a gradual turn.

The spiral bevel gears, planetary cluster gears and brake discs are located in a large compartment in the tractor rear main frame. Planetary gears are amply lubricated by pressure and splash.

DESCRIPTION

Engine Speed Control

The engine speed control lever secures governed speeds from 500+50 r.p.m. (low idle) to 1525 \pm 30 r.p.m. (high idle). With the engine operating at 1375 r.p.m. full load speed, the traveling speed range is from approximately 1-1/2 to 8 m.p.h. forward, and from 1-1/2 to 8 m.p.h. in reverse. The synchromesh transmission makes possible a quick change from forward to reverse by disengaging the engine clutch and shifting the left-hand lever: forward to go ahead, and backward for reverse.

Track Frames

The track frames are 1 piece welded steel construction. Regular tracks have 6 lower rollers and 2 upper idlers on each side. The large bearings and the new type seals allow high tractor traveling speeds and long periods between track roller lubrication. A series of saucer-like bellville springs in

an enclosed cylinder permits the front idlers to recoil under heavy shock but holds them in position against full load track pull when the tractor travels in reverse.

Sprocket drive gears are mounted on sleeves independent of the track frame pivot shaft. Shock loads on the track frames, therefore, do not affect gear alignment. Track frames are relieved of leverage loads and track alignment is maintained by the same arrangement that has been so successful on smaller sizes of International crawler tractors.

Sprocket Drives

The sprocket drives consist of sprocket drive gears and pinions which provide a fixed gear reduction and transmit power out to the tracks. Gears and sprockets are roller bearing mounted on sleeves. Sprockets are reversible, making it possible to use both sides of the teeth.

ORIENTATION

Throughout this manual the use of the terms "left" and "right," and "front" and "rear," must be understood to avoid confusion when following instructions. Left and right indicate the left and right sides of the

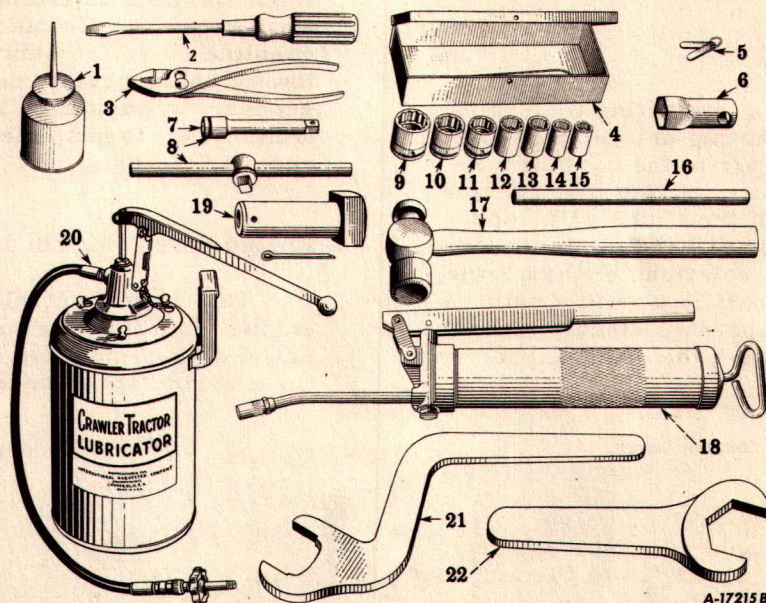
tractor when facing forward from the operator's compartment. The front of the tractor is the radiator end; the rear of the tractor is the fuel tank end.

DESCRIPTION

TOOLS SHIPPED WITH THE TRACTOR

The general service tools shown here are shipped with the tractor. These tools may be ordered individually, or as a kit 263 292 R91 (less bucket lubricator) from your International Industrial Power distributor or dealer.

1. Oil can.
2. Screwdriver, 5 inch, wood handle.
3. Combination slip joint pliers.
4. Socket wrench set carrying case.
5. Breaker point and spark plug gauge.
6. Spark plug wrench, 31/32 inch.
7. Socket wrench, "T" handle extension, 5-1/2 inch.
8. Socket wrench, "T" handle.
9. Hex socket wrench, 1-1/8 inch.
10. Hex socket wrench, 1 inch.
11. Hex socket wrench, 7/8 inch.
12. Hex socket wrench, 13/16 inch.
13. Hex socket wrench, 3/4 inch.
14. Hex socket wrench, 5/8 inch.
15. Hex socket wrench, 9/16 inch.
16. Spark plug wrench handle.
17. Ball peen hammer, 1-1/2 lb., size 2.
18. Lever type hand lubricator, 15 oz.
19. Drawbar stop pin with 3/16 x 2 inch cotter pins (2).
20. Bucket type lubricator, 25 lb.
21. High and low range brake adjusting wrench.
22. Track adjusting wrench.



Illust. 5
Tools shipped with tractor.

DESCRIPTION

INSTRUMENTS AND CONTROLS

The operator of this tractor should thoroughly familiarize himself with the instruments and controls provided for operation. There are important differences between various tractors; therefore, regardless of previous experience with other machines, the operator should fully understand what each control is for and how to use it, before starting to operate this tractor.

Starter Button

Pressing this button completes the electrical circuit between the battery and the starting motor, causing the starting motor to crank the engine. Release the pressure on this button as soon as the engine starts. Never operate the starting motor more than 30 seconds at a time. If the engine fails to start in 30 seconds, allow the starting motor to cool 2 or 3 minutes and repeat the starting operations.

Choke Control Rod

The choke aids in starting the engine when it is cold. Pulling out the choke restricts the flow of air to the carburetor, giving a rich mixture. Avoid overchoking, as excessive use of the choke will flood the engine and make it hard to start. After the first few revolutions of the engine, push the choke in half way or to a point where the engine operates steadily. As the engine warms up push the choke all the way in.

Primer Button (If Used)

In cold weather the engine starts easier if primed. A few strokes of the primer button, which sprays raw gasoline directly into the intake manifold, is usually sufficient. The number of strokes will depend on the atmospheric temperature.

Radiator Shutter Control Rod (If Used)

This control rod is used to regulate the radiator shutter attachment, which is closed tight when starting, opened wide in normal operation, or set in any intermediate position (page 97).

Compression Release Rod

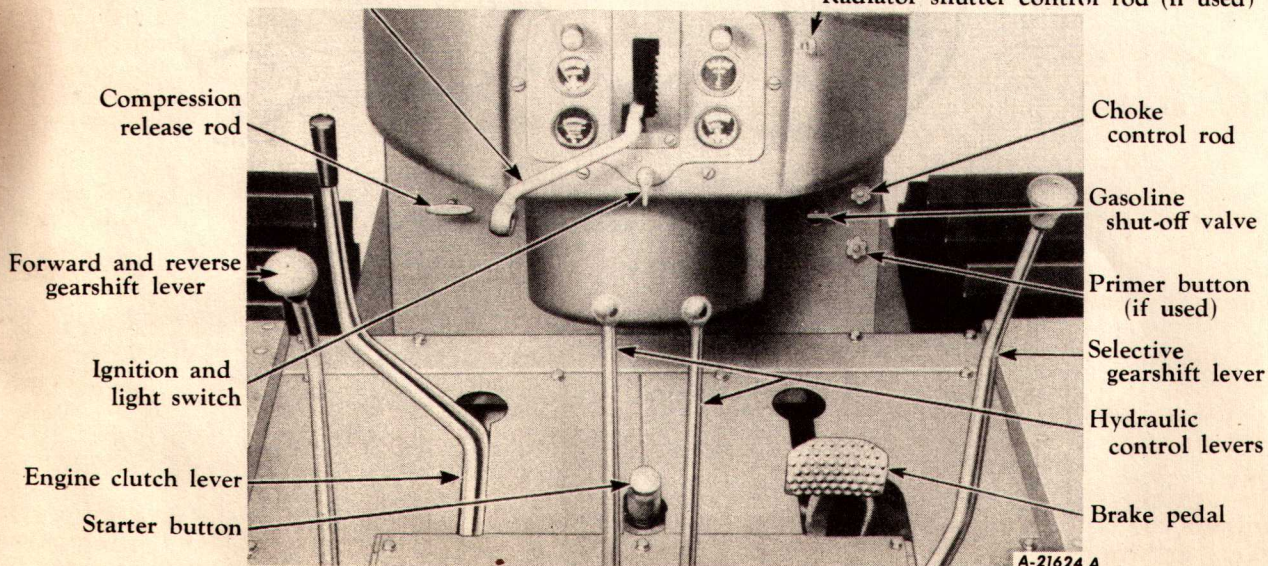
This control rod is used to convert the engine from gasoline to diesel fuel operation when starting, or from diesel to gasoline when stopping. To place the engine in the gasoline cycle for starting, pull the rod back toward the operator; be sure the rod latches securely in position. To switch the engine from diesel to gasoline operation, push the rod all the way in.

Engine Speed Control Lever

This lever controls the speed of the engine from low idle to maximum. When set in a given position it maintains a uniform engine speed under variable loads.

Engine speed control lever

Radiator shutter control rod (if used)



Illust. 6
Operating controls.

DESCRIPTION

INSTRUMENTS AND CONTROLS - Continued

Move the lever upward to increase the speed.

Ignition and Light Switch

To start the engine, turn the switch clockwise and hold in position approximately 5 seconds after the engine starts; then release the switch. To operate the lights, turn the switch counterclockwise. The first position is for all lights including the head, tail and dash lights; the second position is for the head and tail lights only; the third position is for head lights only.

Gearshift Levers

The forward and reverse gearshift lever is on the left side of the operator. To go ahead shift this lever forward and for reverse shift it backward. It is always used regardless of the speed selected. The selective gearshift lever is on the right side of the operator. It has 4 speed positions. Using these levers in conjunction with the hydraulic control unit (which is equipped with high and low speed ranges) makes 8 forward speeds and 8 reverse speeds available.

Engine Clutch Lever

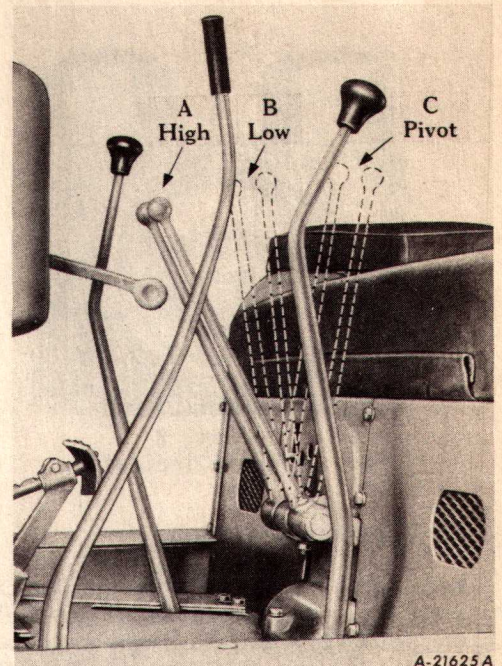
This lever is used to engage and disengage the engine from the transmission. Always completely disengage the engine clutch when shifting gears. Disengage the engine clutch by pushing the lever all the way forward.

Brake Pedal and Lock

The brake pedal is used for slowing down or for stopping the tractor. It has a locking device for use when parking the tractor on a slope. To lock the brake, push the pedal down and lift up the lock lever, which engages a pawl and ratchet. To unlock, push down on the pedal and release the lock.

Hydraulic Controls

The two hydraulic control levers apply the brake discs of the planet power drive mechanism and thus steer the tractor and determine the high or low speed range. Each of the 2 levers functions in 3 positions as shown in *Illust. 7* -- "A" (forward) controls the high range brake disc and sun gear; "B" (middle position) controls the low range brake disc and sun gear; "C" (backward) controls the pivot brake disc and hub. Only 1 of the brake discs on each side is



Illust. 7
Hydraulic controls.

applied at any time; the other 2 are turning free.

The high speed range is in operation when both levers are in the forward position "A." The low range is secured when both levers are in the middle position "B."

To make a gradual right turn with the levers in high range position, pull the right-hand lever into the low range position. To make a gradual right turn with the levers in low range, push the left-hand lever into high range. For a left-hand turn, reverse this procedure.

To make pivot turns, the levers are first placed in the low range position "B" and then the lever is pulled back into the "C" position on the side toward which the turn is to be made. However, when the lever is pulled back slightly a "feathering" action starts, enabling the operator to make a gradual or full pivot turn; this feathering action continues until the "C" or pivot position is reached.

Heat Indicator

This instrument indicates the temperature of the liquid in the cooling system. The indicator hand should be in the high side of the "RUN" range when engine is operating.

DESCRIPTION

INSTRUMENTS AND CONTROLS - Continued



Illust. 8
Fuel pressure indicator.

Fuel Oil Pressure Indicator

This indicator, located on the injection pump, registers the pressure of the fuel oil from the primary pump through the final fuel filter to the injection pump. With the engine operating (either gasoline or diesel cycle) the pointer should be in the white area or "OPERATING RANGE." If the pointer remains in the red or "CHANGE FILTER" area, the auxiliary or final filter element needs replacement.

Engine Oil Pressure Indicator

The indicator hand should be in the white area when the engine is operating. If the hand is not in the white area, stop the engine immediately and investigate the cause of the oil pressure failure or refer to your

International Industrial Power distributor or dealer before operating the tractor.

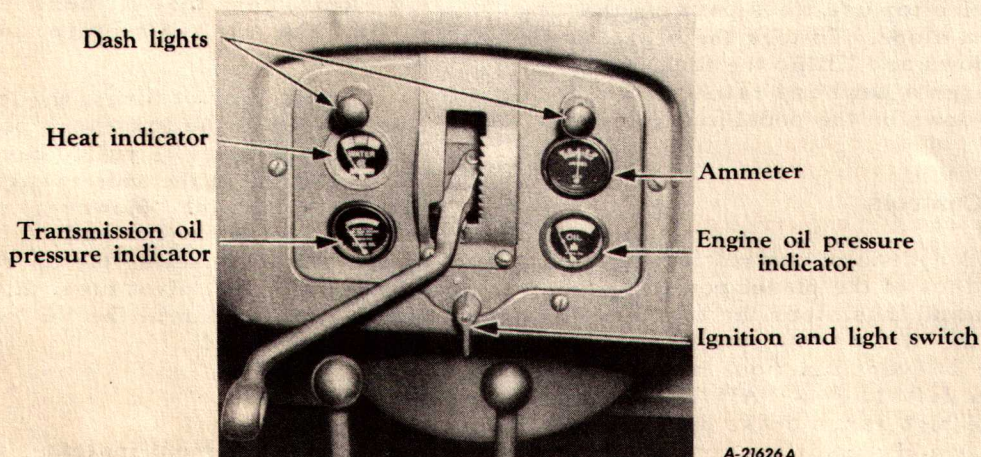
Transmission Oil Pressure Indicator

The indicator hand should register pressure in the white area for normal operation. (The indicator will not register pressure when the engine clutch is disengaged.)

When the engine is first started the indicator hand will move into the red area; as the oil in the transmission warms up, the hand will gradually enter the white area. If the hand remains in the red area after the oil has warmed up, the transmission and planet power drive oil filters should be cleaned. If the hand still remains in the red area or fails to register pressure, stop the engine and refer to your International Industrial Power distributor or dealer before operating the tractor.

Ammeter

This instrument indicates the charging rate of the generator or the rate at which the battery is being discharged. The ammeter should show charge whenever the engine is operating at a speed faster than low idle speed. If it shows discharge continuously while the engine is operating at any speed above the idle speed, the cause should be investigated to avoid completely discharging the battery and possible damage to the generator.



Illust. 9
Instrument panel.

OPERATION

BEFORE STARTING A NEW TRACTOR

Inspection

Make a complete inspection of the tractor for any shortage or damage which may have occurred while being shipped. Make sure that all component units are securely and properly mounted.

Lubrication

Lubricate the entire tractor. Refer to "LUBRICATION" on pages 38 to 48.

1. Check the oil levels of the engine crankcase, air cleaner oil cup, fuel injection pump, hydraulic system, and all gear cases, to see that they are filled to the correct levels with the proper grades of oil for the prevailing temperature. Refer to specifications of lubricants on pages 40 and 42.

2. The transmission and planet power drive oil filters should be removed and cleaned. Refer to Note 2, in the "LUBRICATION GUIDE" on pages 42 and 43.

3. The hydraulic oil filters should be removed and cleaned. Refer to "HYDRAULIC SYSTEM" on page 50.

4. The lubrication procedure above is necessary only in starting a new tractor or one that has been idle for a long time. For procedure in starting a tractor that has been removed from storage, refer to page 88.

5. Tractors shipped to destinations in the United States of America, Canada, and Mexico have all the lubricant compartments filled with oil at the factory. The lubricant in the crankcase, air cleaner, and fuel injection pump is for preservative purposes only and is not suitable for use in regular service. The original oil should be drained from the crankcase, air cleaner, and fuel injection pump and be replaced with the proper grade for the prevailing temperature.

6. Tractors for export shipment have all oil drained from the crankcase, air cleaner, and fuel injection pump.

7. As a precautionary measure, it is advisable to lubricate the front idlers and the track rollers and idlers on a new tractor after each 16 hours of operation, and, depending on the amount of lubricant required, gradually increase the lubrication interval to that specified in the "Lubrication Guide" on pages 42 and 43.

8. For further information refer to "LUBRICATION" on pages 38 to 48.

Breaking - In Speed

Operate a new tractor with a light load for the first 30 to 36 hours at a governed speed from 1450 to 1500 r.p.m.

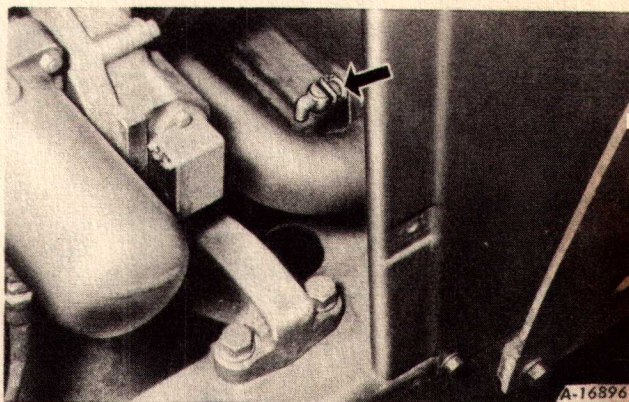
Fuel System

Check to see that you have an adequate supply of fuel in both the gasoline and diesel fuel tanks; also that fuel tank shut-off valves are open. Be sure that all fuel is dependable quality, clean, and free from water. For further information refer to "FUEL SYSTEM" on pages 65 to 71.

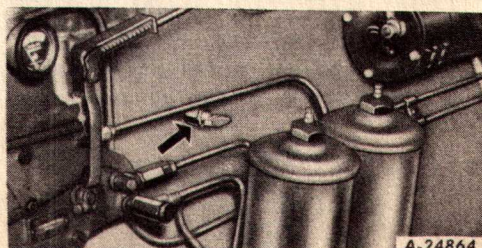
Cooling System

1. Check to see that the drain cocks on the lower right side of the radiator and the left side of the crankcase are closed.

2. Be sure that the radiator is filled with



Illust. 10
Radiator draincock.



Illust. 11
Crankcase draincock.

OPERATION

BEFORE STARTING A NEW TRACTOR - Continued

clean water. Use soft or rain water and rust preventive if possible. Be sure radiator cap is on tight.

3. Check the tension of the fan belts. The tension is correct when the belts can be depressed by the thumb $3/4$ to 1 inch, midway between the pulleys. If the tension is not correct, adjust (page 57).

4. If the tractor is to be operated in freezing temperatures, refer to "COLD WEATHER OPERATION" on page 25.

5. For further information refer to "COOLING SYSTEM" on pages 55 to 58.

Electrical System

1. Be sure the terminals are clean and bright on the 2 disconnected battery cables at the starting motor. Connect the short cable (negative) to the starting motor and the longer cable (positive) to the solenoid.

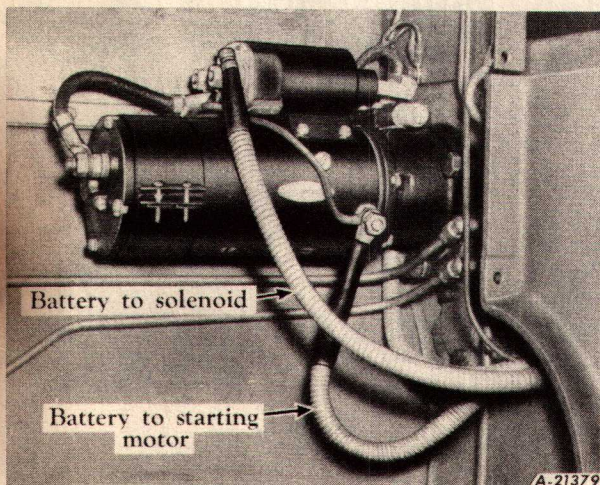
2. Check to see that the distributor is securely mounted in place and was not dam-

aged or cracked in shipment. Check the spark plug cables to make sure they are securely connected in the distributor cap and at each spark plug.

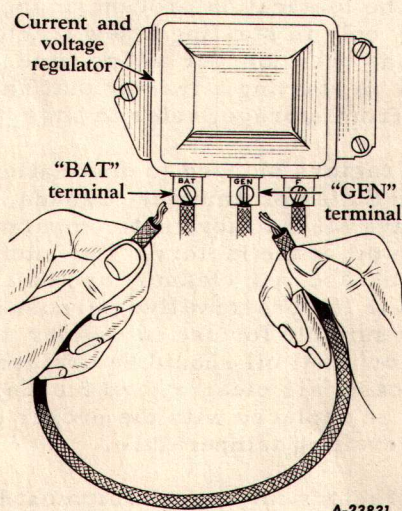
3. Check to see that all electrical terminals are clean and securely fastened.

4. Service the batteries as instructed on the tag attached. Check the level and specific gravity of the electrolyte in the batteries (page 82).

5. **POLARIZING THE GENERATOR.** Do not start the engine until the generator has been polarized. After all cables and wires have been connected, correctly polarize the generator to the batteries by placing a jumper lead momentarily across the "BAT" and "GEN" terminals of the regulator. This allows a momentary surge of current to flow through the generator and to polarize it correctly. Failure to do this may result in severe damage to equipment, since reversed generator polarity can cause the relay contact points to vibrate, arc and burn, can run the battery down, and possibly can seriously damage the generator.



Illustr. 12
Battery cables connected to starting motor and solenoid.



Illustr. 13
Polarizing the generator.

OPERATION

PREPARING FOR EACH DAY'S WORK

Lubrication

1. Change oil in the air cleaner oil cup.
2. Be sure the oil in the crankcase is up to "FULL" level mark on the bayonet gauge.
3. Check for any leakage from the lubricant compartments.
4. For complete lubrication requirements refer to "LUBRICATION" on pages 38 to 48.

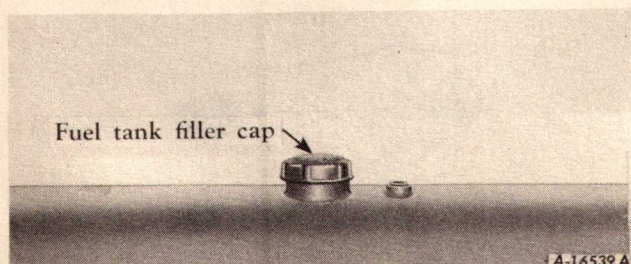
Cooling System

1. Remove the radiator cap and check to see that the water comes up to a level slightly below the filler opening.

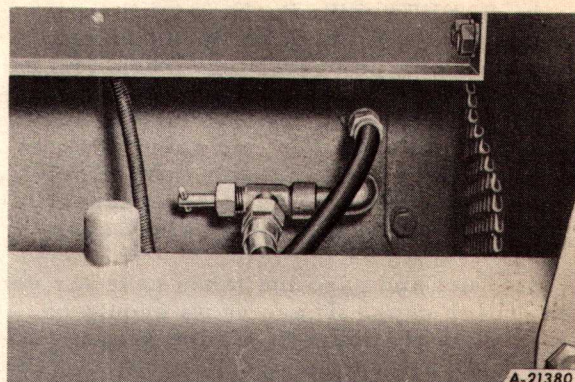
NOTE: In moderate temperatures (above 32° F.) the engine should never be started unless the cooling system is properly filled with water. In lower temperatures refer to "COLD WEATHER OPERATION" on page 25.

Fuel System

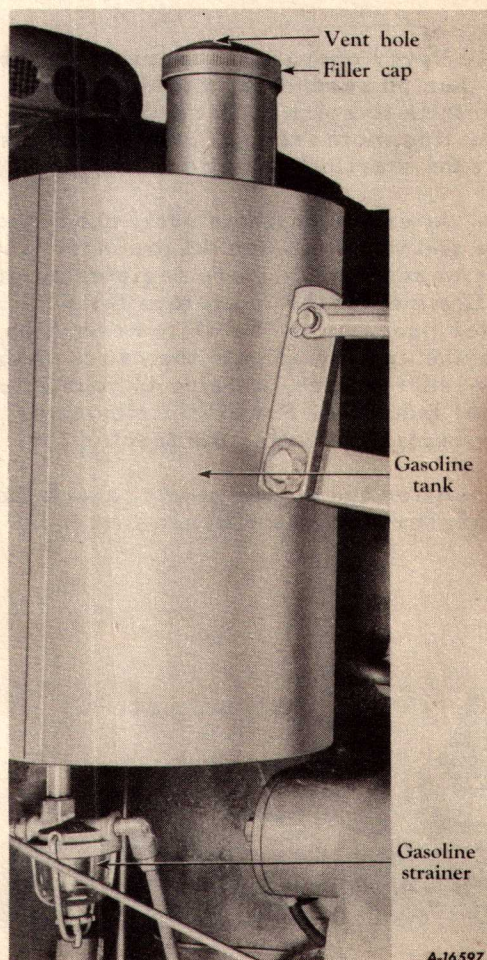
1. Lift the seat cushion and check to see that the diesel fuel shut-off valve is open.
2. Check to see that the gasoline shut-off valve is open (Illustr. 6).
3. Check to see that there is an adequate supply of fuel in the fuel tanks. Fuel tanks should be filled at the end of each day's operation to prevent moisture from collecting in the tanks.
4. Be sure to use a well known grade of clean fuel. Keep the containers or drums clean at all times. Carefully strain all fuel.
5. In order to be safe from contaminated fuel, do not use the last few gallons out of each drum or storage tank, but pour this into a separate storage tank and save it until the tank is filled. This fuel is allowed to settle and can then be used down to the last few gallons; the remainder should not be used for fuel.



Illustr. 14
Diesel fuel tank filler cap.



Illustr. 15
Diesel fuel shut-off valve
(seat cushion removed).



Illustr. 16
Gasoline tank.

OPERATION

OPERATING PRECAUTIONS

1. **SAFETY FIRST.** Never fill the gasoline tank when near an open flame or when the engine is operating. When pouring in fuel, keep the funnel and container in contact with the metal of the fuel tank to avoid the possibility of an electric spark igniting the gas. Never light matches near gasoline, as the air within a radius of several feet is permeated with a highly explosive vapor.

2. Fuel and gasoline tanks have air vents in the filler caps. These vents should be kept open at all times to assure proper flow of the fuels.

3. If difficulty is experienced in starting on gasoline in cold or damp weather, the spark plugs should be removed and any condensation wiped off. At the same time check the spark plug gap, which should be 0.035 to 0.040 inch. After drying the spark plugs reinstall them in the engine and start as usual.

4. Never operate the starting motor more than 30 seconds at a time. If the engine fails to start in 30 seconds, allow the starting motor to cool 2 or 3 minutes and repeat the starting operations.

5. After the engine starts, check the engine and transmission oil pressure indicators to see that they are registering pressure. If either of the indicators fails to register properly in the white area, stop the engine and investigate the cause of the oil pressure failure, or refer to your International Industrial Power distributor or dealer before operating the tractor.

6. After the engine starts, check the fuel pressure indicator to see that it is

registering the proper pressure. If it is not, service the diesel fuel system as described on *pages 65 to 67*.

7. Never operate the engine under load until it is thoroughly warmed up. Never operate the engine at more than the regular governed speed. Excessive speeds are harmful.

8. When putting the tractor in motion, always engage the engine clutch gradually so the engine will start the tractor without jerking. This is particularly necessary when going up a steep hill or climbing out of a ditch, or if the tractor is hitched to a heavy or difficult load.

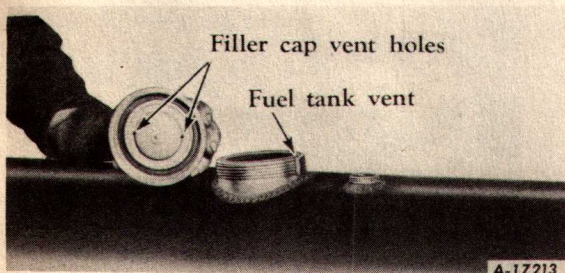
9. Do not ride the brake pedal, as this will result in excessive wear on the linings.

10. Be sure to clean the air cleaner (*page 51*) and replace the lubricating oil filter elements at regular intervals (*page 49*).

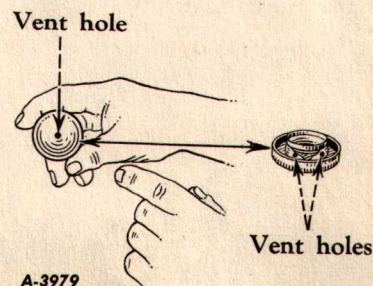
11. Remove and clean the filter elements of the transmission and planet power drive oil filters, and of the hydraulic oil filter (pressure line), as specified in the "LUBRICATION GUIDE" on *pages 42 and 43*.

12. Never pour cold water into the radiator if the engine is very hot, unless conditions make it absolutely necessary. Under such conditions start the engine and let it idle while slowly pouring the water into the radiator.

13. Always take the tractor out of gear when parking the tractor. When parking for any length of time on a hill or slope, be sure to lock the brake with the brake pedal lock.



Illustr. 17
Air vent holes in diesel fuel
filler cap and tank neck.



Illustr. 18
Air vent holes in gasoline filler cap.

OPERATION

OPERATING THE DIESEL ENGINE

FOUR PRINCIPAL STEPS OF INTERNATIONAL DIESEL ENGINE OPERATION

The instructions on operating the International diesel engine can be summarized in four steps:

1. Starting the engine on the gasoline cycle.
2. Changing over to the diesel cycle.
3. Changing back to gasoline operation for a short time before stopping the engine to facilitate the next starting.
4. Leaving the compression release rod in the diesel position after stopping the engine on gasoline to permit the starting valves to cool on their seats.

How the Starting System Works

Here's how the simple gasoline starting system works: Pulling the compression release rod out to the starting position accomplishes 4 things:

1. Opens the starting valves leading to the auxiliary chambers, which reduces the engine compression ratio to a ratio suitable for gasoline.
2. Switches electricity to the spark plugs in the auxiliary chambers.
3. Opens the gasoline shut-off valve in the carburetor.
4. Closes the valves in the air intake manifold, which directs the air from the air cleaner through the carburetor.

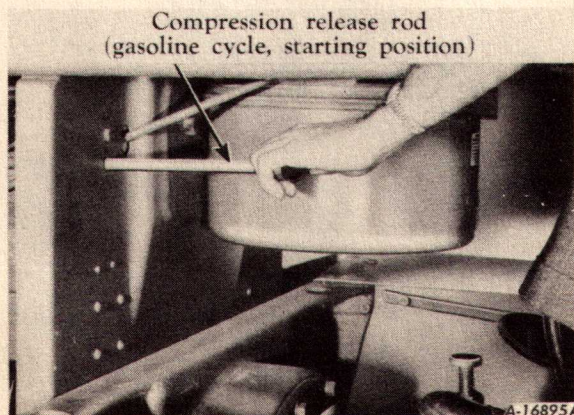
With the compression release rod and the engine speed control lever in the starting positions the engine is ready to be started on gasoline.

After a brief warm-up by operating on gasoline, the operator converts the engine to diesel operation simply by pushing the com-

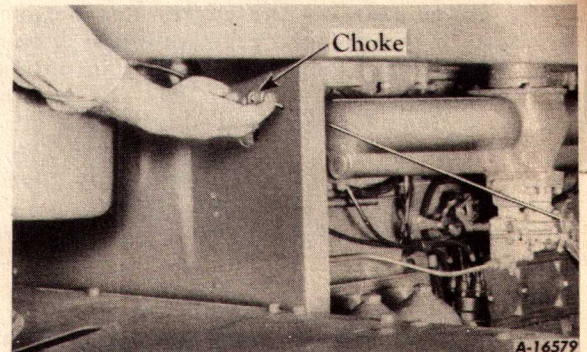
pression release rod in to the diesel position, and advancing the engine speed control lever part way.

Starting the Engine on Gasoline

1. Open the diesel fuel shut-off valve.
2. Open the gasoline shut-off valve. To prevent leakage when the valve is in the open position, be sure to screw the valve out until the seat on the stem is tight against the stop.
3. Place the transmission gearshift levers in neutral position and disengage the engine clutch by pushing the clutch lever all the way forward.
4. Pull the compression release rod out to the starting position. Be sure the rod is securely latched.
5. Pull the engine speed control lever down into the starting (shut off) position. (This lever should remain in the shut off position until the engine is switched to



Illust. 19
Pulling out compression release rod.



Illust. 20
Pulling out choke rod.

OPERATION

OPERATING THE DIESEL ENGINE - Continued

diesel operation, to prevent flooding with fuel oil.)

6. Pull the choke rod out part way. In cold weather pull the choke rod out all the way; also give the primer button (if so equipped) as many strokes as may be necessary.

7. Turn the ignition switch clockwise and hold in this position. Step on the starter button. When the engine starts, release the starter button but continue to hold the switch for five seconds after the engine starts; then release the switch. **CAUTION:** Never operate the starting motor more than 30 seconds at a time. If the engine fails to start in 30 seconds, allow the starting motor to cool 2 or 3 minutes and repeat the starting operations.

8. After the engine starts, push the choke rod in to a point where the engine operates steadily. As the engine warms up, gradually push the choke all the way in.

9. After the engine starts, check the engine oil pressure indicator, the fuel oil pressure indicator, and the transmission oil pressure indicator, to see that the indicator hands are in the white area. If the indicators do not register correctly, stop the engine and inspect the oil system to find the cause of the oil pressure failure. Refer to "Oil Pressure Indicators" on page 14.

10. If difficulty is experienced in starting the engine, refer to "CHECKING MECHANICAL PROBLEMS" on page 29, or "COLD WEATHER OPERATION" on page 25.

4. The engine will now operate as a diesel unless there is air in the fuel injection system. To vent air from the diesel system refer to page 71.

5. The engine may operate noisily when diesel operation begins but the noise will be eliminated as the engine warms up.

6. The engine speed control lever should not be fully advanced until after the engine has been operating a few minutes, to secure thorough distribution of the lubricating oil.

NOTE: The carburetor and distributor are automatically "cut out" and the auxiliary combustion chamber is closed, isolating the spark plugs, when the compression release rod is pushed in to the diesel position.

Stopping the Engine

1. Make sure that the gasoline shut-off valve is open.

2. Place the engine speed control lever in the starting position and at the same time pull the compression release rod all the way out to the starting position.

3. Operate the engine on gasoline until the exhaust is clear.

4. Stop the engine by pushing the compression release rod in to the diesel position. (Do not move the engine speed control lever.) Allow the compression release rod to remain in the diesel position so the starting valves will cool on their seats.

5. Close the gasoline shut-off valve.

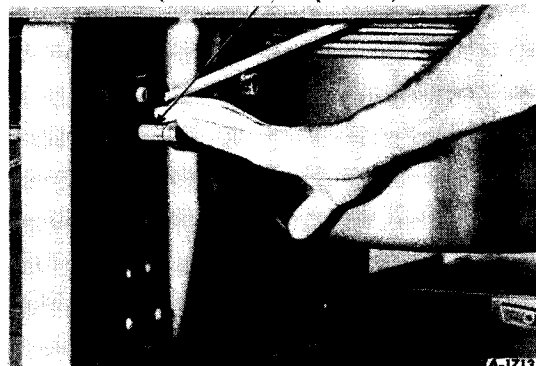
Switching to Diesel Operation

1. After starting the engine and before switching to the diesel cycle, operate it on gasoline with the choke all the way in until the exhaust becomes clear. This will clean the spark plugs for the next starting.

2. Allow the engine to operate on gasoline for about 1 minute (2 or 3 minutes in cold weather) before switching over to diesel operation.

3. Push the compression release rod all the way in to the diesel position, then immediately push the engine speed control lever upward about 3 notches or enough to prevent the engine from stalling.

Compression release rod
(in diesel cycle position)



Illustr. 21
Pushing in compression release rod.

OPERATION

OPERATING THE TRACTOR

Before attempting to operate the tractor, be thoroughly familiar with the location and function of all the instruments and controls. Refer to *pages 12 to 14*.

CAUTION: After the tractor is in motion, extreme care should be taken to prevent accidents and personal injuries. Before dismounting from the tractor, push the engine clutch lever forward, then place the transmission gearshift lever in neutral.

Disengage the Engine Clutch

When the engine has been started and thoroughly warmed up, disengage the engine clutch by pushing the clutch lever all the way forward. Keep the clutch disengaged until ready to put the tractor in motion.

Advance the Engine Speed Control Lever

Set the engine speed control lever in the desired position (pulled upward to advance the engine speed).

Set the Forward and Reverse Gearshift Lever

Move the forward and reverse gearshift lever (to the left of the operator) to the de-

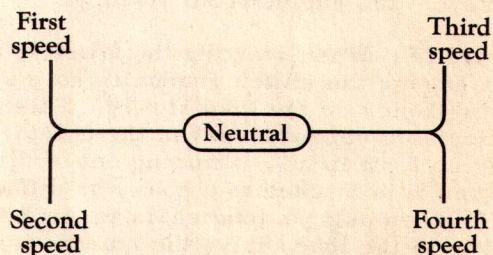
sired position. To go ahead shift this lever all the way forward, and for reverse shift it all the way backward (*Illust. 22*).

Set the Selective Speed Gearshift Lever

Move the selective speed gearshift lever (to the right of the operator) to any one of the 4 speed positions (*Illust. 23*).

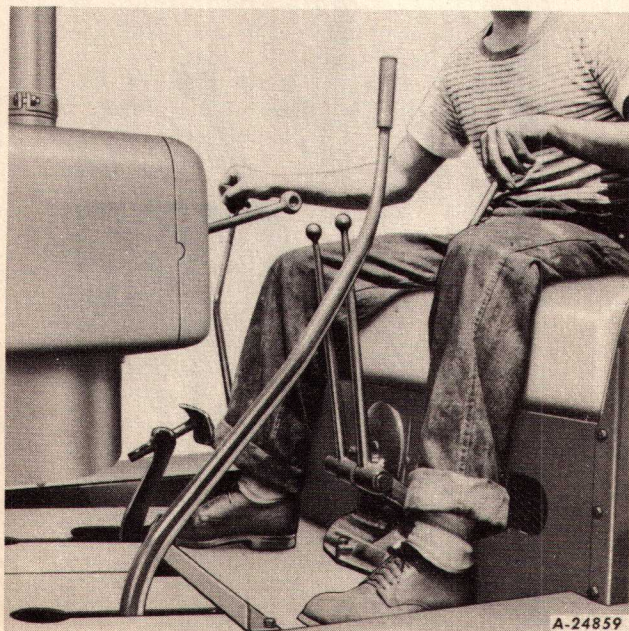
Set the Hydraulic Control Levers

Move both hydraulic control levers to the high range position (forward, *Illust. 24*) or to the low range position (middle, *Illust. 25*).

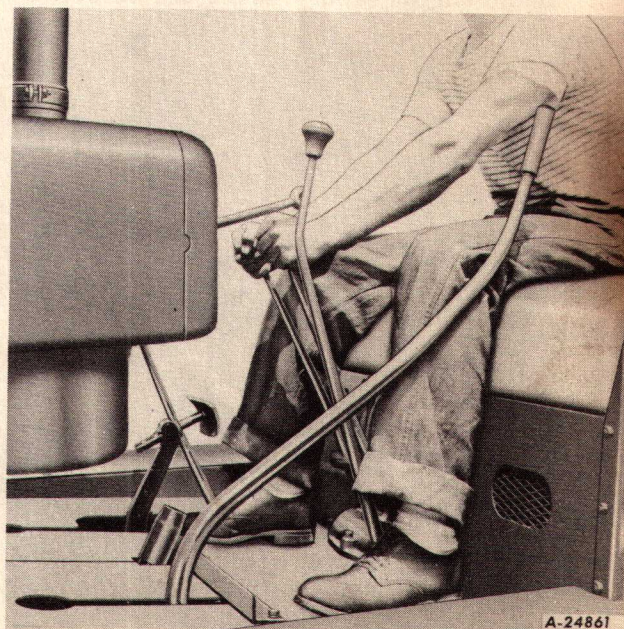


A-17214

Illust. 23
Four positions of selective speed gearshift lever.



Illust. 22
Engine clutch disengaged and forward and reverse gearshift lever shifted to reverse.



Illust. 24
Hydraulic control levers in high range position.

OPERATION

OPERATING THE TRACTOR - Continued

Eight Speeds Available

The 4 speeds of the synchromesh transmission (controlled by the selective speed gearshift lever) and the high and low speed ranges of the planet power drive mechanism (controlled by the hydraulic control levers) provide 8 speeds for both forward and reverse travel (controlled by the forward and reverse gearshift lever).

Engaging the Engine Clutch

After selecting the speed desired, gradually pull back on the clutch lever until full over-center engagement is felt. At the same time advance the engine speed control lever to prevent the engine from stalling.

NOTE: When starting the tractor, always engage the clutch gradually so the engine will pick up the load slowly. This is particularly necessary when the tractor is going up a steep hill, climbing out of ditches, or when it is hitched to a heavy or difficult load. When using a long chain to hitch the tractor to the load, drive the tractor forward slowly until all slack is taken out of the chain.

Shifting Gears

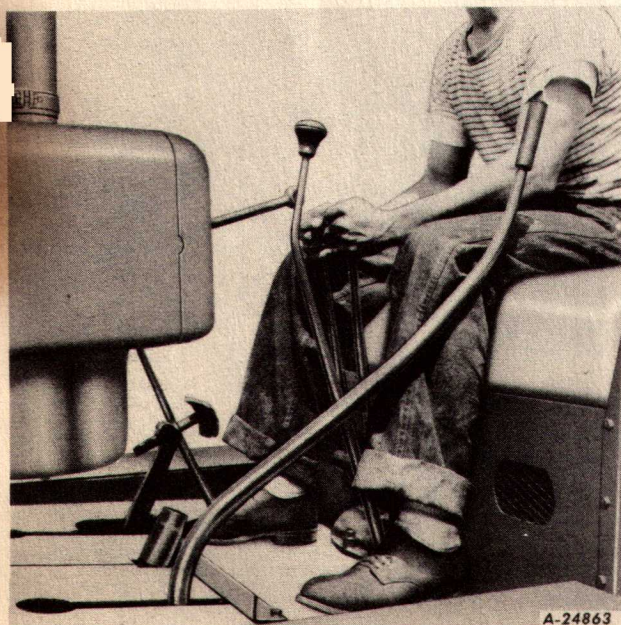
If the engine labors under the selected

speed, with the engine speed control lever in full load position and with hydraulic control levers in high range, shift the hydraulic levers to low range. If the engine labors with the hydraulic levers in low range, shift the synchromesh transmission gears to a lower speed (disengage the engine clutch and shift with the selective gearshift lever).

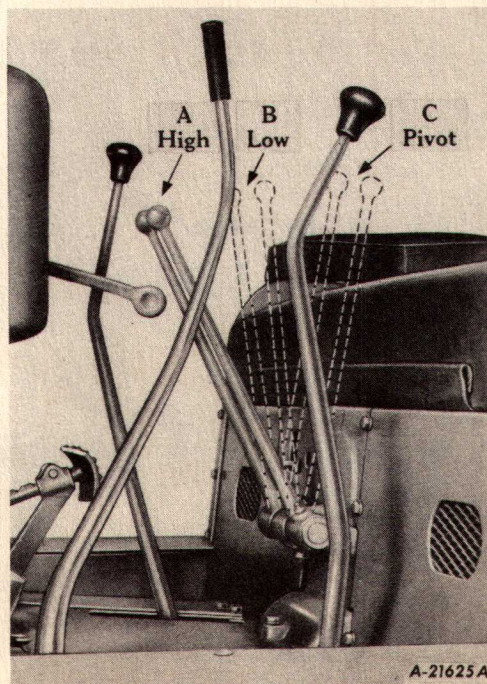
When the tractor is operating with the hydraulic control levers in low range, shifting to high range can be done instantly by pushing both hydraulic levers all the way forward (*Illust. 24*).

If gears do not mesh readily in the synchromesh transmission when shifting from one speed to another, hold the gearshift lever in position with a slight pressure. In synchromesh transmissions there may be a momentary delay before gears synchronize. Never force the lever into the selected gear; a moment's hesitation will eliminate unnecessary gear clashing.

To change from forward to reverse travel (or reverse to forward) disengage the engine clutch and shift the forward and reverse gearshift lever to the desired position (*Illust. 22*).



Illust. 25
Hydraulic control levers in
low range position.



Illust. 26
Positions of hydraulic control
levers when steering.

OPERATION

OPERATING THE TRACTOR - Continued

Regulating Engine Speed

The engine governor maintains constant engine speed under variable loads with the engine speed control lever set at a given position.

The rated or full load governed speed is 1375 ± 10 r.p.m.; high idle speed is 1525 ± 30 r.p.m.; and low idle speed is 500 ± 50 r.p.m.

Steering the Tractor

Steering the tractor is accomplished by manipulating the 2 hydraulic control levers. These levers apply the brake discs of the planet power drive mechanism and thus steer the tractor. Each of the 2 levers functions in 3 positions as shown in *Illust. 26* -- "A" (forward) controls the high range brake disc and sun gear; "B" (middle position) controls the low range brake disc and sun gear; "C" (backward) controls the pivot brake disc and hub. Only 1 of the brake discs on each side is applied at any time; the other 2 are turning free.

To make a gradual left turn with the levers in high range position, pull the left-hand lever into the low range position. To make a gradual left turn with the levers in

low range, push the right-hand lever into high range (*Illust. 27*). To make gradual right turns reverse this procedure.

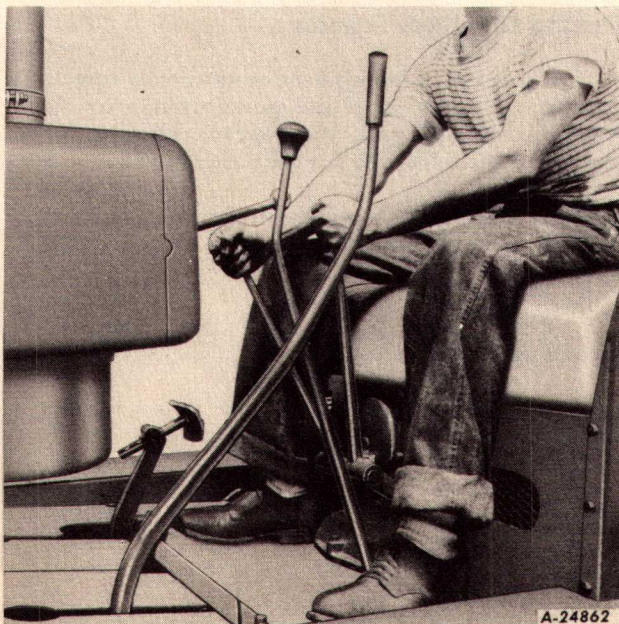
To make a pivot turn, first slow down the tractor. With the control levers in either the high range or low range, pull back the lever to the "C" position (*Illusts. 26 and 28*) on the side toward which the turn is to be made. When the lever is pulled back slightly from the low range position, a "feathering" action starts, enabling the operator to make a gradual or full pivot turn; this feathering action continues until the "C" or pivot position is reached.

Steering Down Grade

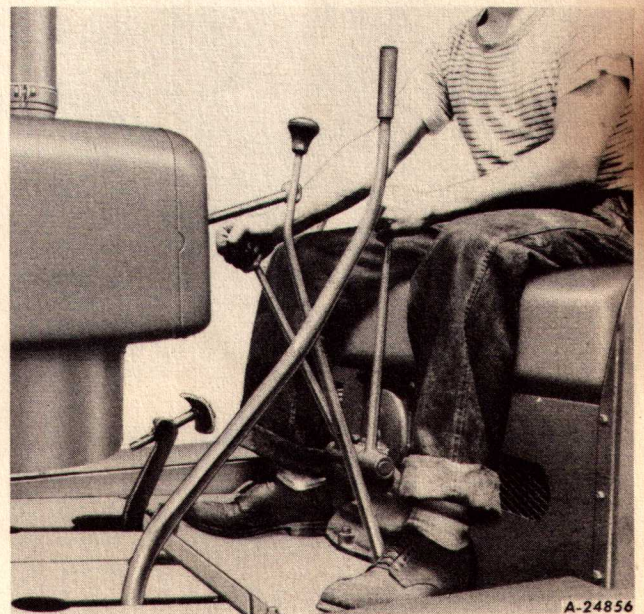
When going down grade, steering is handled in the same manner as when traveling on level ground with or without a load.

Operating Over an Obstruction

When driving over a log or ditch bank, use the engine clutch to slow down the tractor, then proceed slowly forward at an angle until the tractor balances on top of the obstruction. Then slowly proceed over and down. If the load is light it may be necessary to use the foot brake.



Illust. 27
Making gradual left turn.



Illust. 28
Making pivot left turn.

OPERATION

OPERATING THE TRACTOR - Continued

Stopping the Tractor

Push the engine clutch lever all the way forward to disengage the engine, and move the gearshift levers to neutral. If necessary, apply the foot brake to halt the tractor.

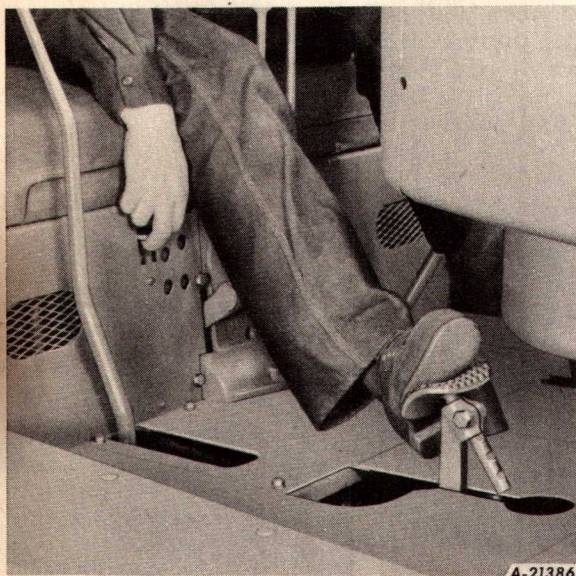
If the tractor is to be parked on a slope where there is possibility of rolling, apply the foot brake and lock as described below. During extremely cold weather secure the tractor with blocks instead of locking the brakes, as condensation of moisture may cause the brake discs to freeze to the linings.

Locking the Foot Brake

To lock the foot brake push the pedal down and lift up the lock lever (*Illust. 29*). This engages the pawl in the ratchet and locks the pedal.

Locking Both Tracks

When both hydraulic control levers are



Illust. 29
Engaging the foot brake lock.

pulled simultaneously all the way back (*Illust. 30*) the braking action "locks" both tracks; this is useful when operating a logging winch, etc. **CAUTION:** Never pull both hydraulic control levers all the way back to stop the tractor unless the tractor is moving very slowly. Use the foot brake to slow down or stop the tractor.



Illust. 30
Both hydraulic control levers pulled all the way back to "lock" both tracks.

Towing Disabled Tractor

At times it may be necessary to tow the tractor. However, if the power train or the tracks are damaged, the tractor should be transported to avoid further damage.

1. Attach towing cable to the front of the tractor or in an emergency to the draw-bar.
2. Be sure the brakes are released before towing the tractor.
3. Never tow the tractor when tracks are damaged.

OPERATION

COLD WEATHER OPERATION

If the tractor is to be operated in temperatures of 32° F. or lower, observe the following precautions:

Radiator Shutter (If Used)

If the tractor is equipped with a radiator shutter and heat indicator, close the shutter when starting and regulate it as required to hold the indicator hand in the high side of the "RUN" range.

Fuel System

Use only a high test winter grade gasoline for starting. Always keep the supply in a tightly closed container to prevent the more volatile portion from evaporating.

If the engine is equipped with a primer, prime the engine before starting, using 4 to 5 strokes of the primer.

Fill the fuel tanks at the end of the day's operation to prevent moisture from collecting in the tanks.

Lubrication

Follow closely the lubrication instructions on pages 39 to 48. Be sure to use the specified grades of lubricants.

Batteries

Check the specific gravity of the battery electrolyte at frequent intervals and keep as fully charged as possible. The efficiency of the battery decreases sharply with lowering temperatures and becomes practically nil at minus (-) 40° F. Do not attempt to start the tractor if the batteries have been chilled to minus (-) 20° F., unless the batteries have been heated. Immersion in warm water to within an inch or 2 of the top of the battery cases is a satisfactory means of warming the batteries.

Ignition

If difficulty is experienced in starting, remove the spark plugs and wipe them off to remove any condensation. Then check the gap of the spark plugs, which should be 0.035 to 0.040 inch.

Cooling System

1. When the temperature is likely to be 32° F. or lower, there is danger of the water freezing in the cooling system. To prevent freezing, use one of the recommended antifreeze solutions shown in the table on the following page.

2. Before filling with antifreeze, drain and clean the cooling system as follows:

a. Remove the radiator cap. Open the radiator and crankcase drains. Allow the system to drain and then close the drains.

b. Fill the cooling system with a solution of 10 pounds of ordinary washing soda mixed with 148 U.S. quarts of water (the cooling system capacity).

c. Leave off the radiator filler cap and operate the engine until the water is hot, then drain and flush with clean water.

3. Refill and check the radiator, water pump, all gaskets, and hose connections. If any leaks are found, make repairs.

4. After the cooling system has been cleaned and flushed, and leaks repaired, drain thoroughly. See that the drains are not plugged and that the water drains out completely.

5. Close the drains and fill the cooling system with antifreeze and water (refer to the antifreeze chart and instructions in the following section).

Antifreeze Solutions

1. Use only one type of antifreeze. Do not use a mixture of solutions, as it will be difficult to determine how much protection the mixture gives.

2. Never use honey, salt, kerosene, fuel oil, glucose or sugar, calcium chloride, or any alkaline solution as an antifreeze.

OPERATION

COLD WEATHER OPERATION - Continued

3. Do not use denatured alcohol as an antifreeze if other materials are available because it boils at 173° F. However, if it is necessary to use alcohol, check the solution frequently with a hydrometer to be sure you have adequate protection for the prevailing temperature.

4. The table below shows the quantity of antifreeze to be used for various temperatures. (The capacity of the cooling system is approximately 148 U.S. quarts.)

Freezing Point (Fahrenheit)	Quarts of Antifreeze Required		
	Ethylene Glycol	Distilled Glycerine	Denatured Alcohol
10°	37	49	45
0°	49	59	55
-10°	59	70	64
-20°	67	75	74
-30°	74	87	85
-40°	80	...	96
-50°	86	...	107
-60°	92	...	116
-70°	96

5. IF NO ANTIFREEZE IS AVAILABLE
--Drain the cooling system completely after operation. Before refilling, cover the radiator completely, start the engine, and fill the system immediately with water. This will prevent the radiator from freezing during the warm-up period. NOTE: Even though the engine must be started before the cooling system is filled, never operate the engine

more than a few seconds without a full radiator. Be sure to have water convenient to put into the radiator; never drive the tractor to the source of the water. Operating the engine without coolant will cause cylinder head failure and overheat the piston rings.

Tracks Frozen to Ground

If the tractor has been left out during cold weather and the tracks have become frozen to the ground, do not attempt to jerk them free with the power of the engine. Start the tractor slowly and if the tracks do not loosen easily pry them loose. If necessary use a blow torch, being careful about fire hazards. To prevent the tractor from freezing to the ground the tractor can be driven onto planks for parking.

Operating in Water and Snow or Dust

When operating the tractor in deep water or thawing snow lubricate the track rollers about every 60 hours. This will flush out any water that might have been forced past the seals into the lubricant.

When operating the tractor in water or extremely dusty conditions, water or dust may enter the engine clutch compartment through the hole in the flywheel housing. To avoid this insert a 3/4 inch countersunk pipe plug. If the pipe plug is left in, remove after every 60 hours of operation to allow any oil accumulation to drain out.

HOT WEATHER OPERATION

Fuel System

Keep the gasoline and fuel tanks well filled to avoid condensation of moisture within the tanks. Be sure the vents in the tank filler caps are open and the caps are on tight.

Lubrication

Follow closely the lubrication instructions on pages 39 to 48. Be sure to keep oil up to the proper level in the crankcase oil pan.

Batteries

Inspect the batteries frequently to see

that the electrolyte is at the correct level and of the correct specific gravity.

Cooling System

To prevent overheating in hot weather, make the following checks:

1. Check the tension of the fan belt frequently.
2. Check the coolant level frequently and be sure the radiator filler cap is on tight.
3. Clean and flush internal parts of the cooling system frequently.
4. Keep external parts of the radiator clear of insects and dirt.

PREVENTIVE MAINTENANCE

PERIODIC INSPECTIONS

Periodical preventive inspection and maintenance are extremely important as the surest means of keeping your tractor in proper working order. Prompt detection and

correction of minor irregularities will prevent failures and avoid expense. Make inspections at the intervals outlined below.

AFTER EVERY 10 HOURS OF OPERATION

Point of Inspection	Remarks
Diesel fuel water trap	Drain off water and sediment.
Engine crankcase oil level	If low, fill to "FULL" mark on gauge.
Fuel injection pump oil level	If low, fill to level cock.
Air cleaner oil cup	Clean and refill to level bead.

AFTER EVERY 60 HOURS OF OPERATION

Flexible rubber connection between air cleaner and manifold.	Inspect for loose fit or damage.
Fan belts	Check tension; replace when necessary (<i>page 57</i>).
Radiator and connections	Inspect for leaks and loose connections; if antifreeze is used check its value.
Radiator fins	Clean spaces (<i>page 57</i>).
Engine clutch compartment drain plug (in flywheel housing, if used).	Remove plug and drain accumulation.
Tracks	Check slack (<i>page 84</i>).
Lubrication points	(See "LUBRICATION GUIDE" on pages 42 and 43).

AFTER EVERY 120 HOURS OF OPERATION

Air cleaner tray assembly (under severe dust conditions it may be necessary to service more frequently).	Remove and clean (<i>page 51</i>).
Hydraulic system	Check system for leaks.
Battery solution	Check amount and specific gravity (<i>page 82</i>).
Lubrication Points	(See "LUBRICATION GUIDE" on pages 42 and 43).

AFTER EVERY 240 HOURS OF OPERATION

Hydraulic pressure line filter	Clean filter element (<i>page 50</i>).
Crankcase breather	Remove and clean; replace element if necessary (<i>page 38</i>).
Gasoline strainer and sediment bowl.	Take apart and clean (<i>page 53</i>).
Spark plugs	Remove and clean; check gap (<i>page 75</i>).
Distributor contact points.	Check gap (<i>page 73</i>).

Continued on next page

PREVENTIVE MAINTENANCE

PERIODIC INSPECTIONS - Continued

AFTER EVERY 240 HOURS OF OPERATION - Continued

Point of Inspection	Remarks
*Lubricating oil filters	Replace filter elements (page 49).
*Engine crankcase	Drain and change oil (see "LUBRICATION GUIDE" on pages 42 and 43).

*When operating under extreme dust conditions, low engine temperatures, intermittent load operation with long standby periods, or excessively heavy loads where high temperatures are the rule, also when using diesel fuel with high sulphur content, shorter oil change periods are recommended.

Lubrication points (See "LUBRICATION GUIDE" on pages 42 and 43).

AFTER EVERY 480 HOURS OF OPERATION

Diesel fuel water trap	Take apart and clean (page 66).
Carburetor fuel line screen	Remove and clean (page 54).
Cooling system	Clean (page 56).
Engine valves.	Check for clearance (page 60).
Engine clutch lever	Check for over-center engagement (page 59).
Engine clutch pedal	Check for free movement (page 93).
Brake pedal	Check for free movement (page 61).
Lubrication points.	(See "LUBRICATION GUIDE" on pages 42 and 43).

AFTER EVERY 960 HOURS OF OPERATION

Air cleaner complete (under severe dust conditions it may be necessary to service more frequently) Remove and clean (page 52).

Lubrication points. (See "LUBRICATION GUIDE" on pages 42 and 43).

PERIODICALLY

Hydraulic suction line filter	Clean filter element (page 51).
Diesel fuel filter	Replace element when necessary (page 66).
Primary pump filter screen	Remove and clean (page 68).
Generator and starter commutators.	Clean (pages 78 and 79).
Battery terminals.	Clean terminals and posts with steel wool or brush. (Do not grease terminals.)
Wiring	Check for worn, cracked or frayed insulation, broken wires, loose or corroded connections.
Flywheel housing	Remove plug from housing bottom to drain any oil or dirt accumulation.

PREVENTIVE MAINTENANCE
CHECKING MECHANICAL PROBLEMS
(ENGINE SECTION)

Problem	Probable Cause	Probable Remedy
ENGINE WILL NOT TURN	<p>A--Starting motor inoperative.</p> <p>(1) Batteries faulty.</p> <p>(2) Cables and terminals faulty.</p> <p>(3) Starting switch defective.</p> <p>(4) Starting motor defective.</p> <p>(5) Starting motor commutator dirty or worn.</p> <p>B--Crankcase oil too heavy for operation in extreme low temperature.</p> <p>C--Internal seizure.</p>	<p>A--</p> <p>(1) Recharge or replace batteries if necessary.</p> <p>(2) Inspect cables and terminals for incorrect connections or any faults which may cause shorting. Replace cables if necessary.</p> <p>(3) Replace starting switch.</p> <p>(4) *</p> <p>(5) Clean commutator (<i>page 79</i>). worn or out-of-round repair. *</p> <p>B--Use grade of oil specified in "LUBRICATION GUIDE" on pages 42 and 43.</p> <p>C--Attempt to crank engine with spark plugs removed, clutch disengaged, and compression release rod in starting position. If engine does not turn easily internal damage is indicated. *</p>
ENGINE TURNS BUT WILL NOT START	<p>A--Gasoline fuel system faulty.</p> <p>(1) No gasoline in tank.</p> <p>(2) Shut-off valve closed.</p> <p>(3) Strainer screen clogged.</p> <p>(4) Water in the gasoline.</p> <p>(5) No gasoline at carburetor.</p> <p>B--Batteries low in charge and do not crank engine fast enough.</p> <p>C--Ignition system faulty.</p> <p>(1) Ignition circuit broken.</p> <p>(2) Spark plugs wet or fouled.</p> <p>(3) Spark plug insulators cracked or broken.</p> <p>(4) Ignition cut-out switch inoperative.</p>	<p>A--</p> <p>(1) Fill small tank with gasoline.</p> <p>(2) Open shut-off valve.</p> <p>(3) Clean strainer (<i>page 53</i>).</p> <p>(4) Drain gasoline tank, strainer and carburetor.</p> <p>(5) Clean strainer screen of carburetor (<i>page 54</i>). Clean fuel line from gasoline tank to carburetor. Check vent holes in gasoline tank filler cap.</p> <p>B--Charge batteries.</p> <p>C--</p> <p>(1) Check cables from distributor cap to ignition coil and spark plugs for incorrect wiring or loose connection.</p> <p>(2) Remove spark plugs, wipe off moisture and dry plugs. Remove carbon. Check gap, which must be 0.035 to 0.040 inch.</p> <p>(3) Replace.</p> <p>(4) Remove manifold front end cover. Disconnect cables from switch terminals. Connect cables together. Attempt to start engine. If engine starts, switch in manifold or cable is inoperative and should be inspected. CAUTION: Do not switch to diesel cycle when attempting to check ignition cut-out switch with cables connected together.</p>

*Continued
on next page*

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE
CHECKING MECHANICAL PROBLEMS - Continued

Problem	Probable Cause	Probable Remedy
ENGINE TURNS BUT WILL NOT START <i>Continued</i>	<p>C--Ignition system faulty - <i>Continued</i>. (5) No spark from distributor.</p> <p>D--Carburetor choked too much.</p> <p>E--Compression release rod in diesel position.</p> <p>F--Air intake restricted or exhaust system clogged.</p>	<p>(5) Remove distributor cap from distributor and crank engine to see if distributor rotor turns. (a) If distributor rotor does not turn remove distributor (<i>page 74</i>). (b) If rotor turns but engine does not start, remove a spark plug cable from spark plug. Hold cable terminal 1/4 inch from cylinder head and crank engine. If spark appears, plugs may be fouled or need replacement. If no spark appears, check breaker points in distributor (<i>page 73</i>).</p> <p>D--Open the choke. Wait a few minutes before attempting again to start engine.</p> <p>E--Pull compression release rod into gasoline (starting) position.</p> <p>F--Service the air cleaner and clean the exhaust system.</p>
ENGINE MISSING AND BACKFIRING (Gasoline Cycle)	<p>A--Water in the gasoline.</p> <p>B--Air leaks around intake manifold.</p> <p>C--Firing order incorrect.</p> <p>D--Distributor not correctly timed to engine.</p> <p>E--Starting valves not properly seated.</p>	<p>A--Drain gasoline tank, strainer and carburetor.</p> <p>B--Tighten manifold stud nuts.</p> <p>C--Check spark plug cables for incorrect installation at spark plugs and distributor cap.</p> <p>D--Check and adjust timing (<i>page 74</i>).</p> <p>E--*</p>
ENGINE WILL NOT OPERATE AS A DIESEL ENGINE	<p>A--Injection pump does not deliver fuel. (1) Fuel tank empty, or shut-off valve closed. (2) Fuel supply system air-bound. (3) Fuel filters clogged. (4) Fuel lines clogged or injection nozzles inoperative.</p> <p>B--Compression release mechanism not functioning. (1) Starting valves warped. (2) Starting control linkage out of adjustment. (3) Butterfly valves in manifold not functioning.</p>	<p>A-- (1) Fill fuel tank or open shut-off valve. (2) Vent the fuel system (<i>IH page 71 - Bosch page 90</i>). (3) Replace filter elements (<i>IH pages 66 and 67 - Bosch page 89</i>). (4) *</p> <p>B-- (1) * (2) Check linkage for broken parts, missing cotters and pins. Adjust. * (3) Remove manifold end covers, and operate compression release lever to see if butterfly valves are functioning.</p>

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE
CHECKING MECHANICAL PROBLEMS - Continued

Problem	Probable Cause	Probable Remedy
ENGINE WILL NOT OPERATE AS A DIESEL ENGINE	C--Injection pump not correctly timed. D--Water in diesel fuel. E--Controls not in correct position.	C--Retime pump to engine (<i>page 71</i>). D--Drain entire diesel fuel system including water trap and filter. Refill with diesel fuel, and vent system. E--Set controls as outlined in "STARTING THE ENGINE" on page 19.
ENGINE DOES NOT IDLE PROPERLY (Diesel Cycle)	A--Injection pump control lever shaft sticky, sluggish, or stuck. B--Injection pump plunger spring broken, or plunger stuck. C--Injection pump plunger and bushing worn. D--Surging at any idle speed. E--Injection nozzles faulty.	A-- B-- C-- D-- E--Remove, and repair or replace. *
LOSS OF CRANKCASE OIL PRESSURE	A--Low oil level. B--Oil pressure indicator or line defective. C--Main or connecting rod bearings worn. D--Dirt in regulating valve, or regulating valve spring broken. E--Oil pump worn. F--Camshaft bearings worn excessively. G--Oil diluted or not as specified. H--Oil leaks. I--Oil filters clogged.	A--Add sufficient oil to bring up to specified mark on level gauge. B--Replace. * C--Replace. * D--Clean, or replace spring. * E--Remove, and repair or replace. * F--Install new bearings. * G--Change oil regularly using correct grade. H--See "A" of "Excessive Crankcase Oil Consumption" (<i>page 33</i>). I--Change filter elements.

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE
CHECKING MECHANICAL PROBLEMS - Continued

Problem	Probable Cause	Probable Remedy
LACK OF COM- PRESSION	A--Valve clearance incorrect. B--Valves sticking. C--Valves warped. D--Valve spring broken. E--Cylinder head gasket worn. F--Worn pistons, sleeves, piston rings, and sticking piston rings. G--Starting valves warped.	A--Adjust valve clearance (<i>page 60</i>). B--Clean valve guides and stems. Grind valves if necessary.* C--Replace. * D--Replace. * E--Replace. * F--Replace. * G--Replace. *
ENGINE DOES NOT DEVELOP FULL POWER, AND UNEVEN OPERATION	A--Injection nozzle valves dirty or sticking. B--Insufficient air to engine. C--Air leaks around intake manifold. D--Injection pump not operating properly, or not timed correctly. E--Poor fuel. F--Valve action faulty. G--Worn piston rings and pins, or sleeves. H--Exhaust restricted. I--Intermittent fuel delivery. J--Lack of engine compression.	A--Remove, and clean or replace. * B--Service the air cleaner (<i>pages 51 and 52</i>). C--Tighten manifold stud nuts or install new gasket. D--* E--Use good grade Diesel fuel. F--Adjust valve clearance (<i>page 60</i>). If valves are burned or warped, replace.* G--* H--Remove restriction. I--Follow steps under "A" and "C" of "Engine Will Not Operate as A Diesel Engine" (<i>pages 30 and 31</i>). J--See "Lack of Compression" above.
SMOKY EXHAUST	A--Poor fuel. B--Injection pump not correctly timed. C--Injection nozzles not functioning properly. D--Engine overloaded. E--Injection pump governor not correctly adjusted. F--Worn or sticking oil control rings or worn cylinder sleeves. G--Incorrect lubricant.	A--Use good grade Diesel fuel. B--Retime pump to engine (<i>page 71</i>). C--Opening pressure incorrect, or nozzles leak. * D--Reduce load. E--* F--Replace. * G--Use grade of lubricant specified in "LUB- RICATION GUIDE" on pages 42 and 43.

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE

CHECKING MECHANICAL PROBLEMS - Continued

Problem	Probable Cause	Probable Remedy
ENGINE OVERHEATS	A--Insufficient water in the cooling system.	A--Check level of water in radiator and add water if necessary. Check for leaks. NOTE: Do not pour cold water in an overheated engine or possible cracking of the cylinder head may result.
	(1) Radiator cap loose. (2) Hose connections loose. (3) Water pump leaks.	(1) Tighten radiator cap. (2) Tighten hose connections. (3) *
	B--Fan belts slipping.	B--Check belt tension and adjust (page 57).
	C--Cooling system clogged.	C--Flush out radiator and engine (page 56).
	D--Dirt and trash on outside of radiator core.	D--Clean all dirt and trash from between the radiator tube fins with air or water pressure.
	E--Thermostats inoperative.	E--Remove and replace if necessary.
	F--Lack of lubricating oil.	F--Add sufficient oil to bring up to specified mark on level gauge.
	G--Engine overloaded.	G--Reduce load.
	H--Water pump defective.	H--Repair or replace. *
EXCESSIVE CRANKCASE OIL CONSUMPTION	I--Lubricating oil filters clogged.	I--Replace filter elements.
	A--Oil leaks.	A--Check and service where necessary-- at valve covers, side plates, dust seal at rear of oil pan, crankcase front cover, oil seals at front and rear of crankshaft, oil pan, oil filters and oil pressure indicator tube.
	B--Worn valve guides, worn piston rings, sleeves, pistons, and clogged oil control rings.	B--Excessive smoke coming from the breather pipe on the side of the crankcase or a smoky exhaust indicates that an excessive amount of oil is being used. *
	C--Incorrect lubricant.	C--Use grade of lubricant specified in "LUBRICATION GUIDE" on pages 42 and 43.
	D--Engine overheated.	D--See "Engine Overheats" above.
	E--Excessive oil poured into crankcase, because gauge was read from wrong side, or too soon after stopping the engine.	E--Read gauge correctly and carefully.

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE

CHECKING MECHANICAL PROBLEMS INDICATED BY ENGINE NOISES

Noise	Probable Cause	Probable Remedy
A--Sharp rap at idling speed.	A--Loose piston pin. The pin at fault can be found by short-circuiting spark plugs on gasoline cycle until the noise stops.	A--Replace pin.*
B--Flat slap when advancing engine speed under load.	B--Piston slap.	B--Replace piston and sleeve. *
C--Metallic knock when idling and retarding engine speed, but disappears under load.	C--Worn or loose connecting rod bearings. The bearings at fault can be found by short-circuiting spark plugs on gasoline cycle until the noise stops.	C--Replace bearings. *
D--Constant rapid clicking.	D--Incorrect valve clearance.	D--Adjust valve clearance (page 60).
E--Combustion knock in one or two cylinders.	E-- (1) Leaky injection nozzle valve. (2) Poor fuel, and water in the fuel. (3) Incorrect injection pump timing. (4) Improper engine temperature.	E-- (1) Replace nozzle valve. * (2) Drain entire Diesel system and refill with good grade of clean Diesel fuel. Remove and clean water trap. (3) Retime pump to engine (page 71). (4) Keep temperature within work range of heat indicator.

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE
CHECKING MECHANICAL PROBLEMS - Continued
(CHASSIS SECTION)

Problem	Probable Cause	Probable Remedy
CLUTCH SLIPS OR DRAGS	A--Clutch not correctly adjusted. B--Dirt or oil in clutch assembly. C--Clutch inoperative.	A--Adjust clutch (<i>page 59</i>). B--Remove clutch and clean. C--*
TRANSMISSION GEARS HARD TO SHIFT	A--Transmission oil too heavy. B--Gears burned. C--Gear shifter forks out of alignment or damaged. D--Shifting controls worn. E--Transmission parts damaged.	A--Drain and fill with oil specified in "LUBRICATION GUIDE" on pages 42 and 43. B--* C--* D--* E--*
TRANSMISSION GEARS WILL NOT SHIFT	A--Gearshift lever or lever forks faulty. B--Sliding gears stuck on splines. C--Engine clutch drags.	A--* B--* C--Refer to "Engine Clutch Slips or Drags" above.
TRANSMISSION GEARS SLIP OUT OF MESH	A--Gears not fully engaged. B--Gears damaged.	A--Push or pull gearshift lever as far as it will go. If shift lever movement is correct, shift fork assembly is at fault. * B--*
HYDRAULIC SYSTEM WILL NOT FUNCTION	A--Hydraulic system leaks. B--Hydraulic pump inoperative. C--Hydraulic housing defective. D--Brake pistons defective. E--Oil pressure too low in hydraulic system. F--Air in hydraulic system.	A--Inspect for leaks and tighten all connections; fill system with oil specified in "LUBRICATION GUIDE" on pages 42 and 43. B--* C--* D--* E--Add oil specified in "LUBRICATION GUIDE" on pages 42 and 43. F--Bleed all air from hydraulic system (<i>page 51</i>).
ENGINE OPERATES BUT TRACTOR WILL NOT MOVE	A--Brakes locked. B--Engine clutch not correctly adjusted. C--Transmission faulty. D--Planet power drive inoperative. E--Hydraulic system leaks.	A--Release brake pedal from latching pawl. B--Adjust clutch (<i>page 59</i>). C--* D--* E--Inspect for leaks and tighten all connections; fill system with oil specified in "LUBRICATION GUIDE" on pages 42 and 43.
ROLLERS OR IDLERS WILL NOT TURN	A--Insufficient lubricant. B--Internal seizure. C--Mud packed between rollers and idlers.	A--Follow specifications of "LUBRICATION GUIDE" on pages 42 and 43. B--* C--Thoroughly clean entire track assembly.

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE
CHECKING MECHANICAL PROBLEMS - Continued

Problem	Probable Cause	Probable Remedy
TRACTOR WILL NOT TURN	A--Hydraulic sequence valve inoperative. B--Steering controls inoperative. C--Brakes not correctly adjusted. D--Lack of oil in hydraulic system. E--Planet power drive inoperative.	A--* B--* C--Adjust brakes (pages 61 to 63). D--Fill system with oil specified in "LUBRICATION GUIDE" on pages 42 and 43. E--*
TRACTOR WILL NOT MAKE SHORT (PIVOT) TURN	A--Pivot brake worn or not correctly adjusted. B--High and low range brakes dragging. C--Steering controls inoperative. D--Hydraulic system inoperative. E--Brakes not correctly adjusted.	A--Adjust (page 61) or replace. * B--Adjust high and low range brakes (pages 61 to 63). C--* D--* E--Adjust brakes (pages 61 to 63).
TRACTOR CREEPS TO ONE SIDE	A--Track loose on one side. B--Track or frame out of line. C--Brakes not correctly adjusted. D--Brake disc scored.	A--Adjust track tension (page 84). B--* C--Adjust brakes (pages 61 to 63). D--*
TRACK CHAIN COMES OFF DURING OPERATION	A--Rocks in track assembly. B--Track chain loose. C--Track spring plates broken; front idler worn or misaligned.	A--Clean rocks and dirt from track. B--Adjust track tension (page 84). C--*
TRACK CHAIN LOOSE	A--Track not correctly adjusted. B--Sprocket worn. C--Track spring plates broken. D--Track links or bushings worn.	A--Adjust track tension (page 84). B--* C--* D--*
EXCESSIVE TRACK WEAR	A--Sprocket damaged. B--Front idler misaligned. C--Track tension incorrect. D--Track rollers or idlers do not turn.	A--* B--* C--Adjust track tension (page 84). D--Refer to "Rollers or Idlers Will Not Turn" on (page 35).
TRACTOR LOSES POWER	A--Track chains too tight. B--Engine does not develop full power. C--Hydraulic system inoperative. D--Engine clutch drags.	A--Adjust track tension (page 84). Tight track chains will cause tractor to lose up to 75 percent of horsepower. B--* C--* D--Adjust clutch (page 59).

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE

CHECKING MECHANICAL PROBLEMS OF ELECTRICAL GENERATING SYSTEM

Problem	Probable Cause	Probable Remedy
AMMETER SHOWS NO CHARGE WITH ENGINE OPERATING	A--Connections loose or corroded. B--Ammeter inoperative. C--Generator inoperative. D--Relay inoperative.	A--Clean and tighten connections. B--Turn on bright lights; if ammeter shows no discharge, ammeter probably is inoperative. * C--Place jumper lead from "GEN" terminal on relay to upper radiator tank; if no flash, generator is inoperative. * D--*
AMMETER SHOWS NO CHARGE UNTIL HIGH SPEED	A--Relay adjusted to operate at too high closing voltage.	A--*
AMMETER SHOWS EXCESSIVE CHARGE	A--Batteries run down. B--Batteries faulty. C--Generator field grounded. D--Voltage control unit defective. E--Generator field shorted.	A--Recharge batteries. B--Replace batteries. C--Check for external ground and correct. D--Replace. * E--Replace generator. *
AMMETER SHOWS DISCHARGE WITH ENGINE OPERATING	A--Generator belts loose. B--Short circuits. C--Generator inoperative. D--Relay inoperative.	A--Tighten belts. B--* C--Place jumper lead from "GEN" terminal on relay to upper radiator tank; if no flash, generator is inoperative. D--*
AMMETER POINTER FLUCTUATES RAPIDLY	A--Shorted or loose connections. B--Generator defective. C--Generator drive belts loose. D--Low idling speed.	A--Check for shorted circuits and tighten connections. B--* C--Adjust belts; replace if necessary. D--Adjust idling speed. *
AMMETER SHOWS HEAVY DISCHARGE WITH ENGINE NOT OPERATING	A--Relay contacts stuck.	A--Disconnect cable from "BAT" terminal on relay; if ammeter returns to zero, relay contacts are stuck. *

* Consult Your International Industrial Power Distributor or Dealer

PREVENTIVE MAINTENANCE

LUBRICATION

The life and performance of a tractor depend on the care that is given, and proper lubrication is probably the most important maintenance service. Thorough lubrication service performed at definite intervals and according to an established routine will aid greatly in prolonging the life of the tractor and in reducing operating expense. In the "LUBRICATION GUIDE" on the following pages the recommended intervals between lubrication periods are approximate, being based on average operating conditions. The type of work being done, and the load, ground and weather conditions are all factors to consider in frequency of lubrication.

Lubrication of Tractors Exported

When tractors are packed for export, all oil is drained from the crankcase, air cleaner, and fuel injection pump. Before starting to operate the tractor, give complete lubrication service. Refer to "LUBRICATION GUIDE" on the following pages.

Keep Lubricants Clean

It is important that the lubricants, pressure-gun, lubricators and containers be kept clean and free from foreign matter and that each lubrication point be wiped before the pressure-gun or lubricator is applied.

LUBRICATING SYSTEM FOR THE ENGINE

Description

The engine of this tractor is equipped with a pressure type lubricating system which assures positive lubrication of the working parts of the engine. A gear type pump located in the sump of the crankcase oil pan forces the lubricating oil through the oil filters and then through rifle drilled passages in the crankcase and engine block, also through the crankshaft and connecting rods and other passages.

Positive lubrication of the engine working parts is assured under all operating conditions, whether on level ground or on slopes, because the oil pump has 3 sets of gears. The upper or main set takes the oil from the sump and delivers it under pressure to all working parts. The purpose of the 2 sets of auxiliary gears is to pump oil from the front and rear of the oil pan to the sump

when the tractor is operating at an extreme angle of tilt.

Radial fin type filters maintain clean engine oil in the tractor by effectively filtering all of the oil used for engine lubrication before it is distributed to the working parts. In addition, effective sealing and a screen on the oil pump intake help keep the oil free from harmful impurities.

Oil Filler Screen

At regular intervals remove the oil strainer screen from the oil filler and clean the screen.

Crankcase Breather

The crankcase breather, located in the push rod chamber on the right side of the crankcase, has a double metal crimp element. Clean the element after every 240 hours of operation, or more often when operating under unusual dust or dirt conditions. If necessary, replace with a new breather element.

Oil Pump Screen

The gear type oil pump in the crankcase oil pan has a screen attached to the oil intake to stop large dirt particles from entering the lubrication system. This screen should be cleaned whenever the oil pan is removed.

Oil Filters

The engine is equipped with full-flow type oil filters designed to remove all harmful foreign particles from the oil before it is distributed to the engine. To obtain full benefit from the filters, the elements should be replaced with new ones each time the oil in the crankcase is changed. **CLEANING THE OLD ELEMENTS IS NOT SATISFACTORY.**

The oil filters keep the oil free from harmful contamination for 240 hours of operation under normal operating conditions. However, it may be necessary to replace the filter elements after shorter periods under extreme dust conditions, low engine temperatures, intermittent load operation with long standby periods, excessively heavy loads where high oil temperatures are the rule, or when diesel fuel is used with high sulphur content.

PREVENTIVE MAINTENANCE

LUBRICATION - Continued

Oil Level Gauge

Do not operate the engine for any length of time with the crankcase oil below the "LOW" mark on the bayonet oil level gauge.

To check the oil level with the bayonet gauge, unscrew and remove the gauge, wipe it clean and insert it in the crankcase until it rests on top of the threads. Do not screw the gauge onto the threads. Remove the gauge again and read the oil level.

NOTE. The gauge has readings on both sides; one side is used if the engine has been stopped, and the other side if the engine is operating. Be sure to use the correct side. If the engine has just been stopped, allow 5 to 10 minutes for the oil to drain down into the oil pan before taking the

reading, otherwise the reading might not show the true amount of oil in the crankcase and more oil than necessary might be poured into the filler.

Engine Oil Pressure Indicator

The engine oil pressure indicator shows pressure of the oil circulating through the engine. Under all operating conditions the oil pressure should hold the indicator in the white section. If the indicator does not register, stop the engine at once and inspect the oil system to find the cause of failure. If unable to find the cause, consult your International Industrial Power distributor or dealer before operating the engine. **ALWAYS LOOK AT THE ENGINE OIL PRESSURE INDICATOR IMMEDIATELY AFTER STARTING THE ENGINE.**

LUBRICATING SYSTEM FOR THE TRANSMISSION, PLANET POWER DRIVE, SPROCKET DRIVES, ETC.

Transmission Oil Pump

The gear type transmission oil pump furnishes pressure lubrication to the transmission gears and bearings, also to the planet power drive.

Transmission Oil Filters Transmission Oil Pressure Indicator

The transmission oil pressure indicator shows the pressure of the oil circulating through the transmission and planet power drive. The transmission oil filters should be cleaned when the transmission oil pressure indicator hand remains in the red area after the transmission oil is warmed to operating temperature and the engine is at full throttle and the engine clutch is engaged. If the indicator fails to register pressure, stop the engine and refer to your International Industrial Power distributor or dealer before operating the tractor.

Sprocket Drive Housings

The oil in the sprocket drive housings should be changed at least once a year. However, do not operate the tractor more than 960 hours without changing oil in the sprocket drive housings.

Water Pump

The water pump is the packless type, with a reservoir in the pump body which is filled with chassis lubricant. Check after every 240 hours of operation by removing the filler and level plug, and maintain the lubricant level.

Clutch Compartment

When operating the tractor in water or extremely dusty conditions, water or dust may enter the engine clutch compartment through the hole in the flywheel housing. To prevent this, insert a 3/4 inch countersunk pipe plug. If the pipe plug is left in, remove it after every 60 hours of operation to allow any oil accumulation to drain out.

Hydraulic System

The hydraulic system has 2 filters. The filter on the pressure line should be serviced after 240 hours of operation, and the filter on the suction line should be serviced after 1920 hours. See *Illusts. 35 and 36.*

PREVENTIVE MAINTENANCE

LUBRICANT SPECIFICATIONS

Diesel Engine Crankcase Oils

Motor oil (MO), for use in the crankcase, air cleaner and injection pump, should be well refined petroleum oil free from water and sediment. It should also be free from fatty oils, acids, soaps, resins, or substances which might injure the surfaces or cause corrosion on any metals used in the engine.

Heavy-duty type is the term used for motor oil possessing oxidation stabilizing, anticorrosive and anti-sludging properties necessary to make it generally suitable for high speed diesel engines. This is additive type oil. The term "heavy-duty" as used here does not pertain to the viscosity rating or "weight" of the oil.

Heavy-duty type crankcase oils provide the most satisfactory engine lubrication and should be used in International diesel engines with present day diesel fuels. The quality of the base oil and the amount and type of additives used in these oils determine their suitability for use in high speed diesel engines under severe operating conditions, and also determine the degree of their suitability for use with diesel fuels containing sulphur or other injurious products.

Heavy-duty oils which meet the requirements of Military Specifications MIL-O-2104 Engine Oil are recommended as minimum performance level crankcase oils for use in International diesel engines. In general, the sulphur content of the fuel used in a diesel engine determines the minimum performance level of the crankcase oils.

Oils meeting MIL-O-2104 requirements are expected to give acceptable results in International diesel engines under all conditions with diesel fuels having sulphur content not exceeding 0.4%.

When diesel fuels having sulphur content higher than 0.4% are used, higher additive content in the crankcase oil may be required to reduce the objectionable engine deposits and wear caused by the combustion products from these fuels.

At present there are, in most areas in the U.S.A., crankcase oils available which will give acceptable results in International diesel engines with fuels having sulphur content up to 1.0%. Most refiners produce and market one or more of these crankcase oils which have additive content considerably above that of the MIL-O-2104 qualified oils. These higher additive oils should be used where fuels with a

sulphur content over 0.5% are used. Your fuel supplier should know the sulphur content of his fuel.

It has never been the policy of the International Harvester Company to publish approved lists of lubricants or to guarantee oil performance in service. The responsibility for the quality of the lubricant, its performance under the conditions of operation, and its compatibility with the diesel fuels used, must remain with the supplier of the lubricant. High speed diesel fuels and lubricants should be procured from a reliable source. When in doubt consult your International Industrial Power distributor or dealer.

No special procedure is required when heavy-duty oils are used from the start, other than to have the engine thoroughly "run in."

Changing to heavy-duty oils. If the engine has been operated for some time on regular or premium type oils and it is desired to change to heavy-duty oils, the engine should be serviced as follows:

1. If possible, drop the crankcase pan and thoroughly clean the interior of the engine of all sludge and deposits. If this is not possible, drain the original oil while hot, replace the filter elements, refill with the new oil and run 5 to 10 hours before draining. Repeat this operation one or more times depending on the cleanliness of the engine.
2. Never use so-called "conditioning" oils or "flushing" oils unless these are recommended by the supplier of the heavy-duty oils that are to be used in the engine.

Motor oil (MO) for use in the transmission and planet power drive should be high quality and of recognized manufacture for the protection of your tractor. SAE-50, SAE-30, and SAE-30 thinned with kerosene in cold weather, are used as recommended in the "Lubrication Guide" on the following pages.

Universal gear lubricant (UGL) is used for sprocket drives, track rollers and idlers, and should conform to Military Specifications MIL-L-2105.

Chassis lubricant (CL) is used as pressure-gun grease in all temperatures.

High temperature melting point grease (HT) is used for the clutch pilot bearing.

Magneto grease (MG) is used for the distributor and the ignition cut-out switch.

PREVENTIVE MAINTENANCE

SELECTING THE PROPER LUBRICANTS

Lubricants for Crankcase, Air Cleaner and Fuel Injection Pump

During cold weather the selection of motor oils for use in the crankcase, air cleaner and fuel injection pump should be based on the lowest anticipated temperature for the day, to make starting easier. For hot weather operation the selection should be based on the highest anticipated temperature. Refer to "LUBRICATION GUIDE" on the following pages.

Changes in Temperature. It is not necessary to change oil during operation to the next lower grade when the temperature falls into another temperature range (as specified in the "LUBRICATION GUIDE" on the following pages), unless starting difficulties are experienced. For example, SAE-20 oil can be used instead of SAE-10 in temperatures below 32°F. if no starting difficulty is experienced. However, when the air temperature is rising, change to the next higher grade should be made promptly. SAE-10 and 10-W oils should not be used under continuous loads in air temperatures above 45°F.

Lubrication When Shipped. Tractors shipped to destinations in the United States of America, Canada, and Mexico have all the lubricant compartments filled with oil at the factory. The lubricant in the crankcase, air cleaner and fuel injection pump is for preservative purposes only and is not suitable for use in regular service. The original oil should be drained from the crankcase, air cleaner and fuel injection pump and be replaced with the proper grade for the prevailing temperature.

Thinning the Crankcase Oil. When using lighter grades of lubricating oils there may be a tendency for the oil in the crankcase to gradually become thicker; in this case it is desirable in cold weather to add two quarts of kerosene to the crankcase between specified oil changes, to maintain easy cranking. Kerosene is preferable for thinning motor oil because some diesel fuels do not have a low pour point.

Change After Every 240 Hours. Change oil in the crankcase after every 240 hours of operation, or more frequently under operating conditions such as extreme dust conditions, low engine temperatures, intermittent load operation with long standby periods, excessively heavy loads where high oil temperatures are the rule, or when diesel fuel is used with high sulphur content. Drain the

crankcase while the oil is warm so it will drain freely and completely.

After changing oil, the engine should not be operated at high speed or under load until the new oil has ample time to reach all bearings.

After changing to a lighter grade of oil, the engine should be operated at least 5 to 10 minutes without load so that the lighter oil is worked into the bearings and onto the cylinder walls.

Lubricants for Transmission, Planet Power Drive, Sprocket Drives, etc.

Various grades of lubricant are recommended for the transmission and drives, straight or diluted with kerosene, depending on the prevailing temperatures. Refer to the key to specifications of lubricants at the top of the "LUBRICATION GUIDE" on the following pages.

CAUTION: When filling the planet power drive in the rear main frame, remove all objects from breast pockets so as to prevent their falling into the frame.

The oil in the transmission and drive housings should be changed at least once a year; however, do not operate the tractor more than 960 hours without changing.

If the oil in the transmission and planet power drive has been thinned with kerosene for operation in cold weather, the oil should be changed before the weather becomes hot.

Whenever the oil in the transmission and planet power drive is changed, wash out the housings with kerosene before refilling with oil. First drain the old oil from these housings, then fill the housings to the proper level with kerosene. Operate the tractor in low gear for several minutes. Remove the drain plugs from these housings and allow time for complete drainage of the kerosene. Refill with the proper lubricant.

In the track rollers and idlers use lubricant as specified in the "LUBRICATION GUIDE" on the following pages, depending upon the prevailing air temperature.

RECOMMENDED INTERVALS

Intervals of time between lubricating services are based on average operating conditions. Under unusually severe conditions of operation reduce the intervals of time between services.

10 hours of operation or daily service.
60 hours of operation or weekly service.
120 hours of operation or bi-weekly service.
240 hours of operation or monthly service.
960 hours of operation or seasonal service.

ITEM NO. Point of Lubrication Lubricant Hours

1 Power take-off coupling . CL 240
(If used.)

2 Water pump housing . . . UGL 240
Maintain level.

3 Engine support CL 60

4 Fuel injection pump
Open oil level cock; if no oil appears, bring up to the level cock with oil specified in "KEY" above.
Remove oil drain plug and drain pump housing; refill to level cock with oil specified in "KEY" above each time crankcase oil is drained.
MO 10
MO Note 1

5 Front idler UGL 120
(On each side.) Remove pipe plug; fill with bucket lubricator until oil oozes past oil seal. Replace plug. Refer to "KEY" above for oil to use. See Note 4.

6 Track roller UGL 120
(On each side.) Remove plug; fill with bucket lubricator until oil runs out of vent hole. Refer to "KEY" above for oil to use. See Note 4.

7 Distributor
Breaker arm pivot
Apply one drop SAE-10; and also on felt wick under rotor.

Grease cup
Turn cap down one turn; keep cup filled with CL.

Breaker arm rubbing block
Pick a small quantity of IH magneto grease back of block.

KEY TO SPECIFICATIONS OF LUBRICANTS			
LUBRICANT AND APPLICATION (MIL-O-2104)	CAPACITY	ANTICIPATED AIR TEMPERATURE	
		Above : 50°F. : 50°F. to 45°F. : 45°F. to 30°F. : 30°F. to 10°F. : 10°F. to -10°F.	
MO—Motor oil			
Crankcase	30 quarts	SAE-50	SAE-30
Air cleaner	9½ pints	SAE-50	SAE-30
Fuel injection pump	1 pint	SAE-50	SAE-30
Hydraulic system	4 gal.	SAE-10W	SAE-10W
Transmission	48 gal.	SAE-50	SAE-30
UGL—Universal gear lubricant			
Front idler	3¼ pints	Universal gear lubricant	Universal gear lubricant
Track roller	1 pint	SAE-140 (MIL-L-2105)	SAE-90 (MIL-L-2105)
Track idler	½ pint		
Sprocket drive	9 quarts		

CL—Pressure-gun grease—Use as chassis lubricant, all temperatures.

HT—High temperature melting point grease—Use for engine clutch pilot bearing.

MG—Magneto grease—Use for distributor and for ignition cut-out switch.

960 MG Ignition cut-out switch
Remove manifold cover and apply a trace of magneto grease to contact points.

240 CL Generator drive
Maintain lubricant to level of lower plug.

120 MO Generator
Apply 8 to 10 drops SAE-20 to each of 2 oil cups.

240 Hydraulic oil filter
(Pressure line.) Clean filter and magnetic plug in kerosene or Diesel fuel.

26 Crankcase drain plug
Remove drain plug and drain while oil is still warm. Clean plug. Refill with oil specified in "KEY" above.

27 Crankcase oil filler

28 Crankcase oil level gauge
Gauge has readings on both sides; one side is used with engine operating and other side with engine stopped; be sure to use correct side. Unscrew and remove gauge; wipe clean and insert in crankcase until it rests on top of threads. Do not screw gauge onto threads. Remove gauge again and read oil level for accurate check with engine stopped. Wait for oil to drain down into crankcase pan. Bring up to correct level with oil specified in "KEY" above.

29 Engine oil filters base drain plug

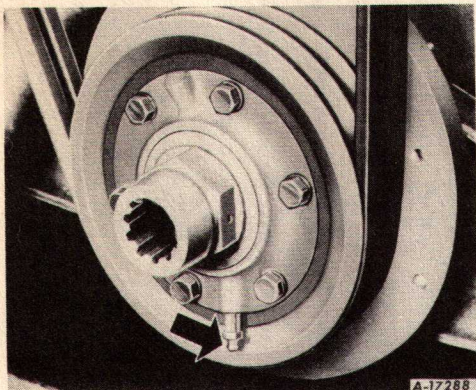
30 Engine oil filter case drain plugs

Engine oil filters
Change filter elements when crankcase oil is changed.

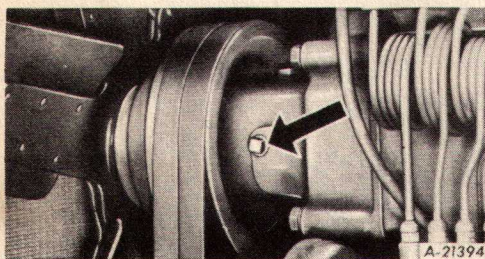
8-4467 8

PREVENTIVE MAINTENANCE

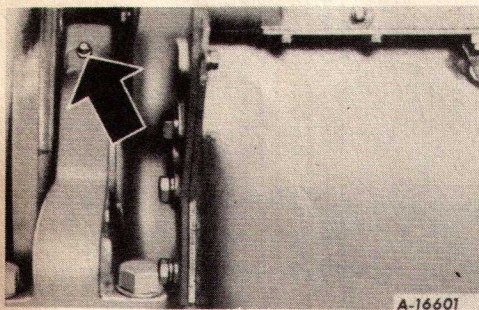
Lubrication Point Illustrations



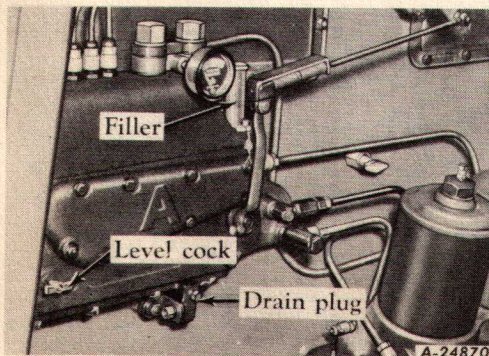
Item 1 - Power Take-Off coupling (if used).



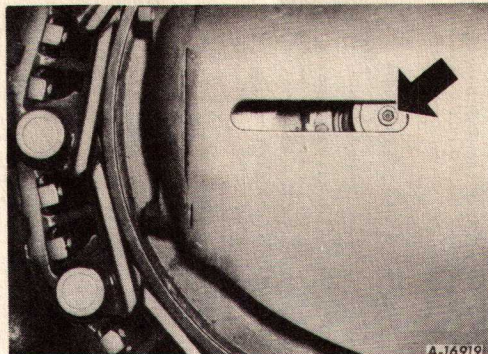
Item 2 - Water pump.



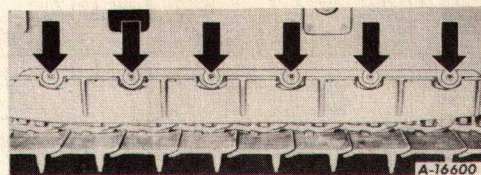
Item 3 - Engine support.



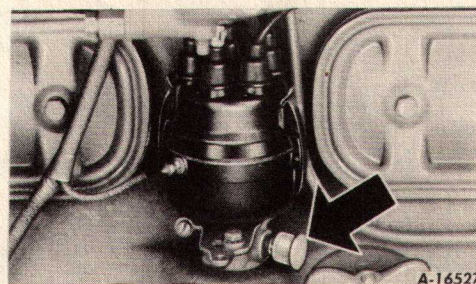
Item 4 - Fuel injection pump.



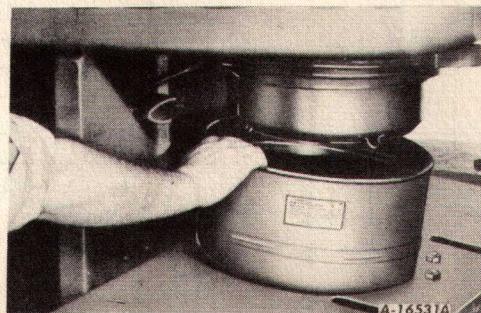
Item 5 - Front idler.



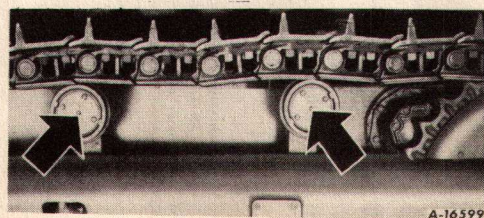
Item 6 - Track rollers.



Item 7 - Distributor.



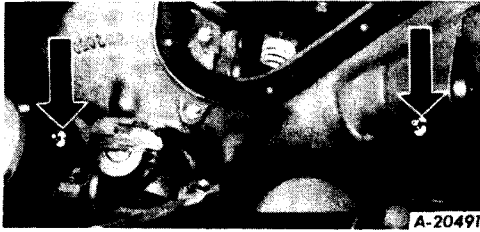
Item 8 - Air cleaner.



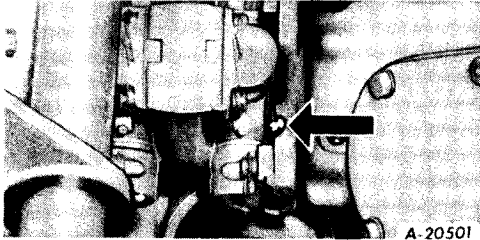
Item 9 - Track idlers.

PREVENTIVE MAINTENANCE

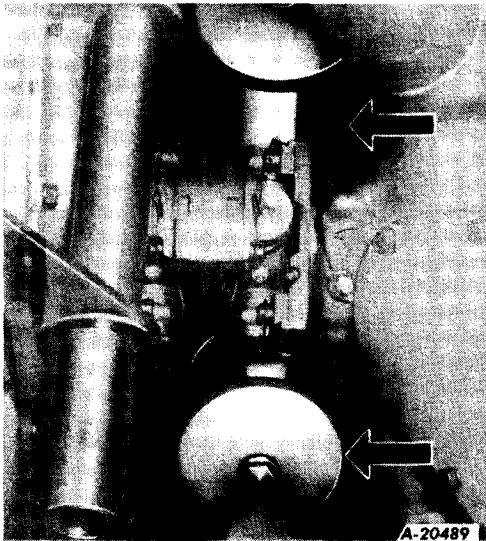
Lubrication Point Illustrations



Item 10 - Clutch release shaft bearing.



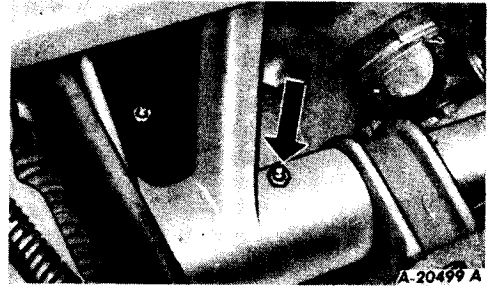
Item 11 - Clutch pilot bearing.



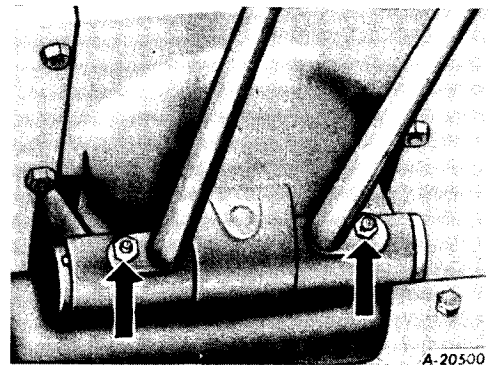
Item 12 - Transmission and planet power drive oil filters.



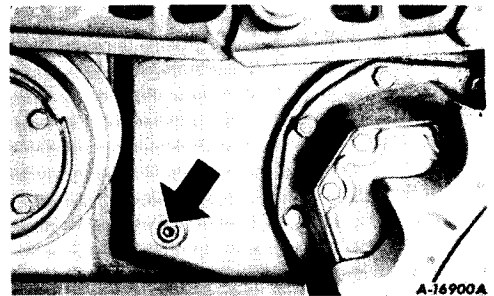
Item 13 - Transmission and planet power drive filter drain plug.



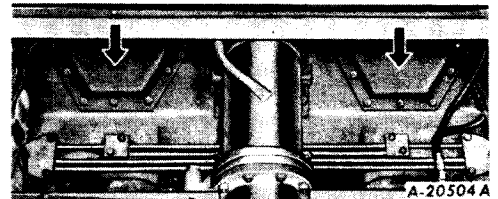
Item 14 - Clutch lever shaft.



Item 15 - Hydraulic control levers.



Item 16 - Transmission and planet power drive housing level plug.



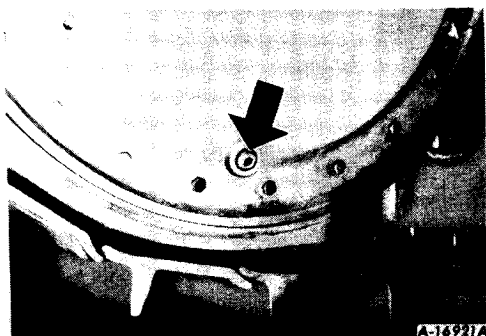
Item 17 - Transmission and planet power drive housing filler plates.



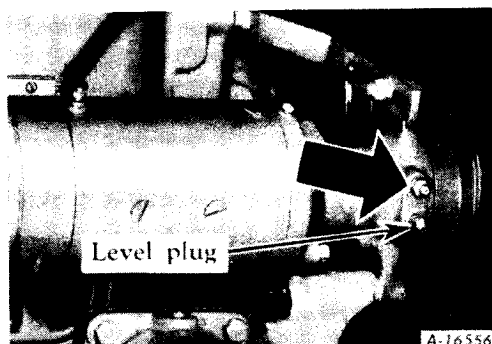
Item 18 - Transmission and planet power drive housing drain plug.

PREVENTIVE MAINTENANCE

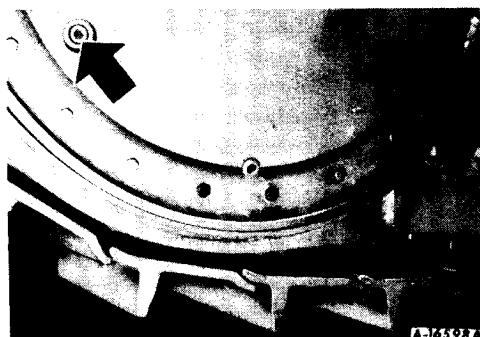
Lubrication Point Illustrations



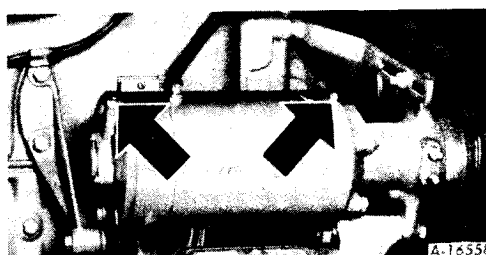
Item 19 - Sprocket drive drain plug.



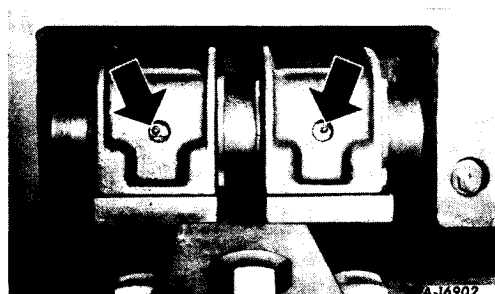
Item 23 - Generator drive.



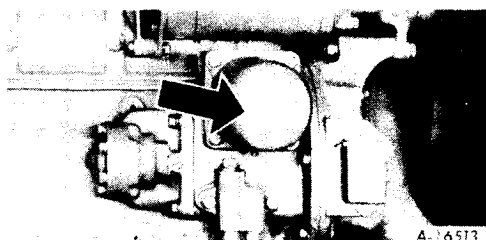
Item 20 - Sprocket drive fill and level plug.



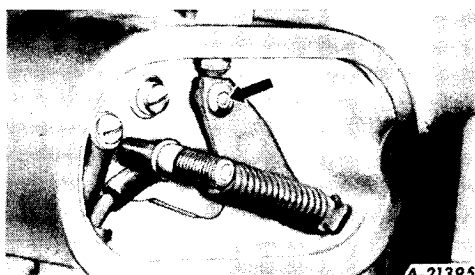
Item 24 - Generator.



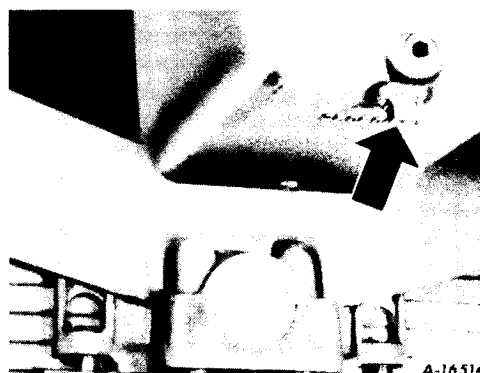
Item 21 - Track frame diagonal braces.



Item 25 - Hydraulic oil filter (pressure line).



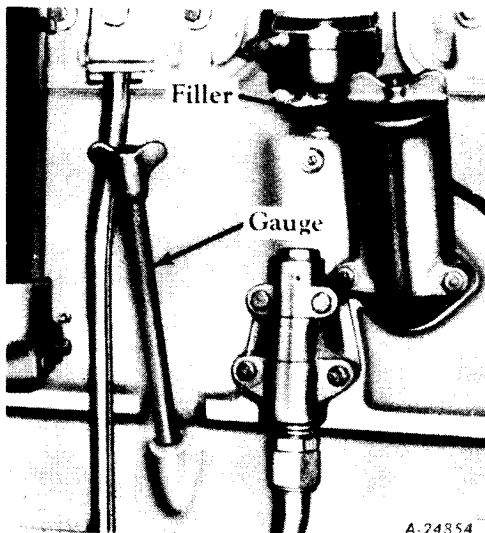
Item 22 - Ignition cut-out switch.



Item 26 - Crankcase drain plug.

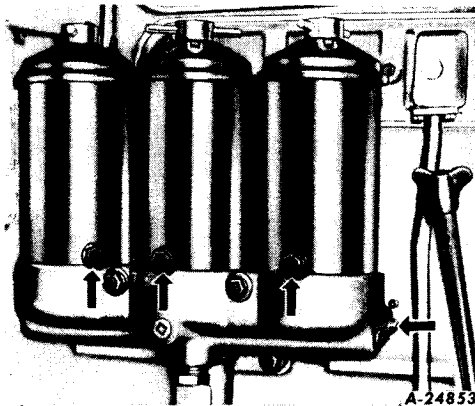
PREVENTIVE MAINTENANCE

Lubrication Point Illustrations



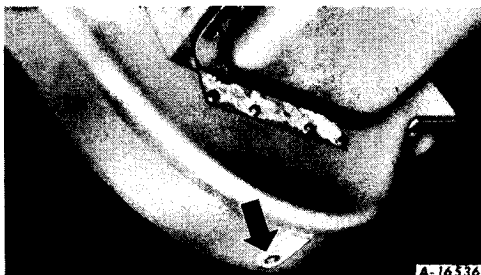
Item 27 - Crankcase oil filler.

Item 28 - Crankcase oil level gauge.

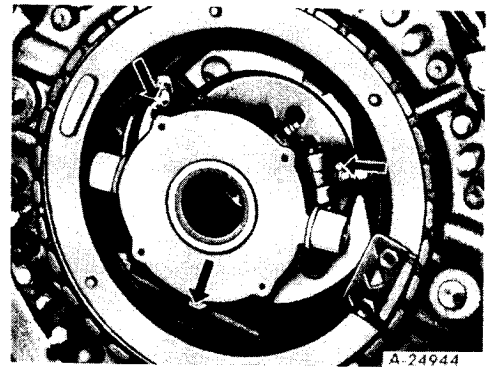


Item 29 - Drain plug of engine oil filters base.

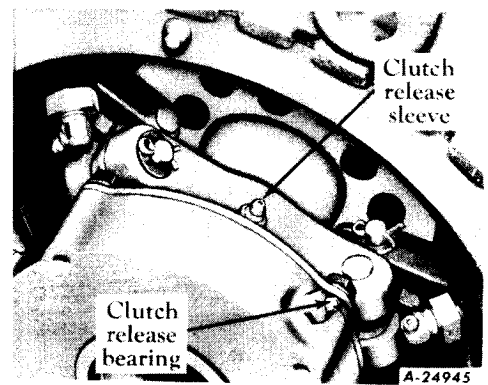
Item 30 - Drain plugs of engine oil filter cases.



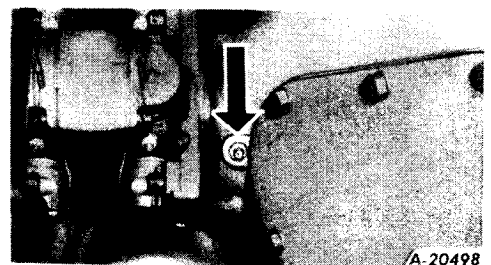
Item 31 - Clutch compartment drain plug.



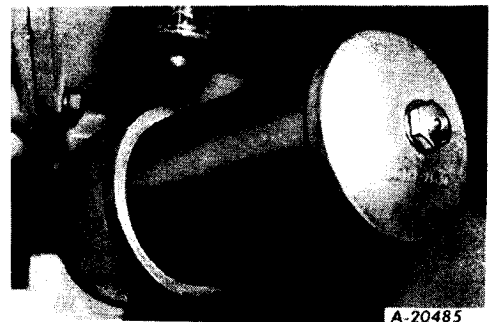
Item 32 - Clutch camshaft bearings.



Item 33



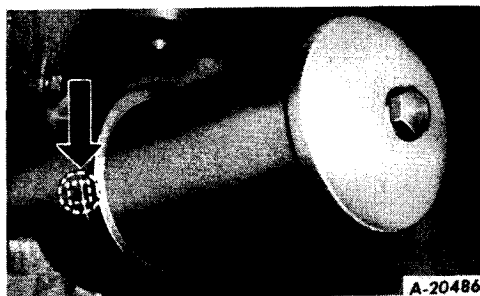
Item 34 - Clutch shaft bearing.



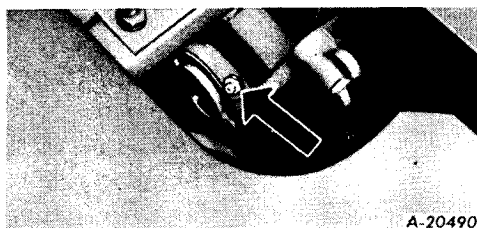
Item 35 - Hydraulic oil filter(suction line).

PREVENTIVE MAINTENANCE

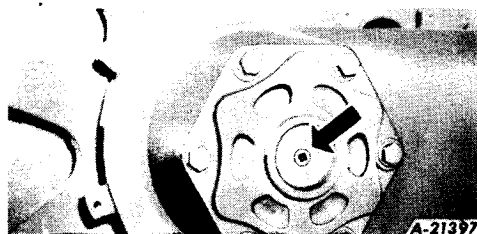
Lubrication Point Illustrations



Item 36 - Hydraulic drain plug.



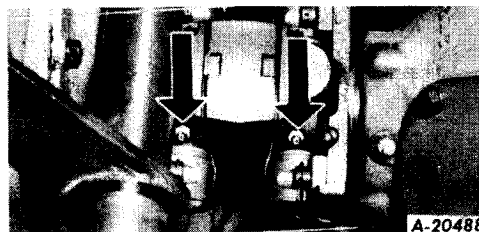
Item 37 - Brake pedal shaft.



Item 38 - Track frame pivot bearing.



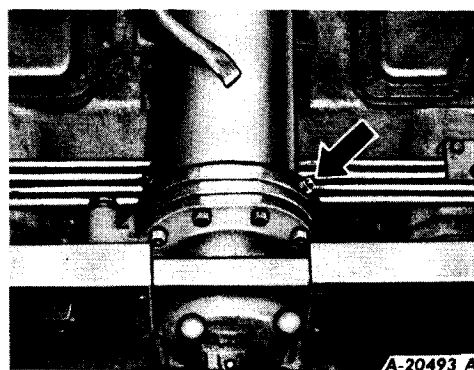
Item 39 - Transmission gearshift pivot.



Item 40 - Clutch universal joint.



Item 41 - Brake operating rod guide.



Item 42 - Hydraulic level and bleeder plug.



Item 43 - Hydraulic filler plug.

MAINTENANCE

LUBRICATING OIL FILTERS

The life of your engine depends upon clean oil being circulated to all bearings. Minute particles of abrasive matter eventually accumulate in the crankcase, and lubricating oil undergoes changes which produce sludge, acids, gums and other harmful by-products. The purpose of the oil filters is to separate and remove the dirt and other foreign substances from the oil to prevent these injurious materials from being circulated to the engine. Keeping dirt and oil impurities away from precision-made engine parts will guard against undue wear, operating troubles and upkeep expense.

The full-flow lubricating oil system of this engine includes a "no-drain-back" feature which eliminates the necessity of pumping the oil up into the filters when starting the engine.

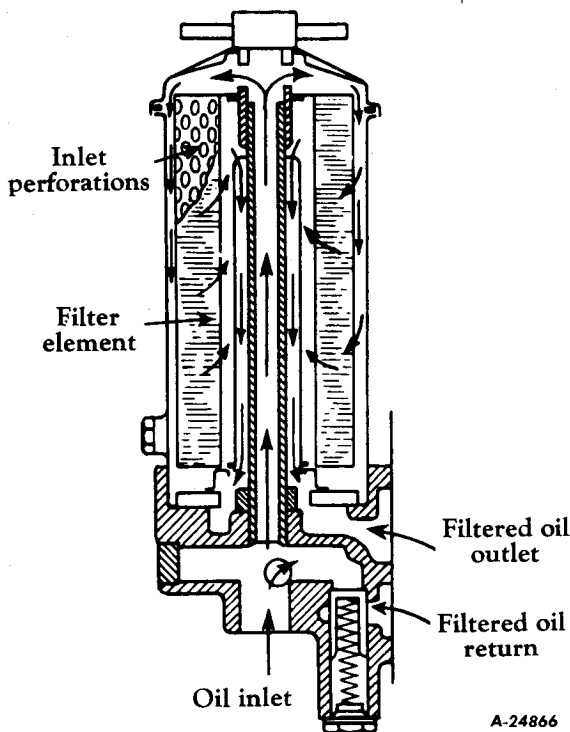
The filter cases are permanently bolted to the filter base, with removable covers at

the tops. This prevents dirt from entering the filter cases while changing the elements.

These oil filters keep the circulating oil free from harmful contamination for 240 hours of operation under normal operating conditions, at which time the crankcase oil should be changed and the inexpensive filter elements replaced. It may be necessary to change oil and replace the filter elements after shorter operating periods under severe operating conditions such as extreme dust conditions, low engine temperatures, intermittent load operation with long stand-by periods, excessively heavy loads where high oil temperatures are the rule, or when diesel fuel is used with high sulphur content. Refer to "LUBRICATION GUIDE" on pages 42 and 43 for the recommended oil to use for the prevailing temperature.

Changing the Filter Elements

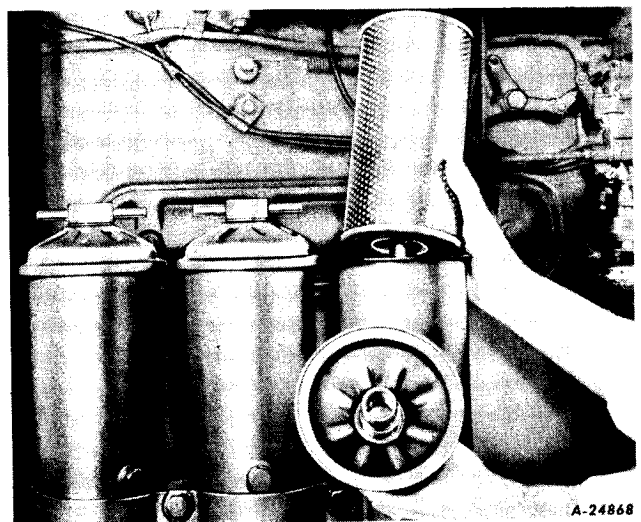
1. Stop the engine.
2. Remove the filter base drain plug and allow the filters to drain completely.
3. Clean off the filter case covers to prevent dirt from dropping into the cases.
4. Unscrew and remove the case covers.
5. Remove the old elements.



Illust. 32

Cutaway view of filter

1. Oil inlet.
2. Replaceable filter element.
3. Perforations to provide inlet for filtration process.
4. Filtered oil outlet.
5. Filtered oil return.



Illust. 33

Lifting cover to change element.

MAINTENANCE

LUBRICATING OIL FILTERS - Continued

6. Install the drain plug in the filter base. Put a little lubricant on the sealing rings on top and bottom of the elements. Install the new filter elements; the ends with the large holes must be up. Use a slight twisting motion when installing the filters so as not to damage the sealing rings.

7. Install the case covers, making sure the gaskets are in place.

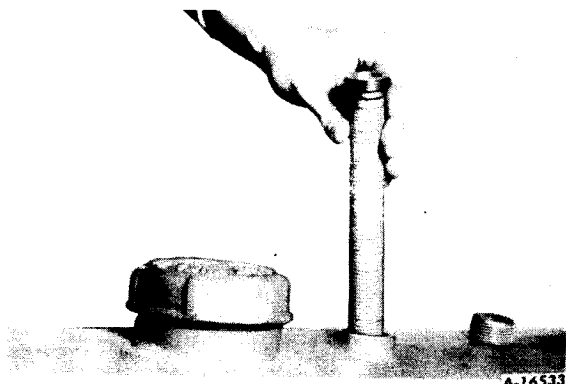
8. Fill the crankcase with the amount and grade of oil specified in the "LUBRICATION GUIDE". When checking the oil level with the bayonet gauge it will be noted that the oil reading is high; this will recede after the engine is started and the filter cases fill up with oil. Start the engine and see that the oil pressure indicator is registering pressure.

HYDRAULIC SYSTEM

The hydraulic pressure that is used to operate the steering and braking mechanism is produced by a gear type pump and is stored in an accumulator with a heavy spring piston. A regulator valve allows the pump to operate without load most of the time.

To fill the hydraulic system, remove the plug from the hydraulic vent tank located on top of the fuel tank. Remove the driver's seat. Then remove the hydraulic system level and bleeder plug located on top of the accumulator (*Item 42, page 48.*) Pour in the hydraulic oil through the filler screen until oil flows from the level and bleeder plug hole free from air. Reinstall the plugs.

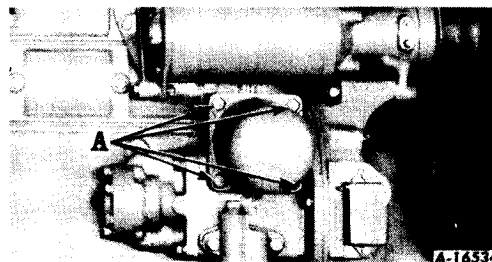
If the hydraulic system becomes air-bound, it will be necessary to bleed the system. With the engine operating and with the clutch disengaged, work the hydraulic control levers back and forth 2 or 3 times. Then loosen the level and bleeder plug just enough to let the air escape. Reinstall the plug.



Illustr. 34
Removing hydraulic system filler screen.

Filler Screen

The screen in the hydraulic filler should be kept clean. If oil does not go down freely when filling the system, remove the screen and clean in kerosene or fuel oil.



Illustr. 35
Pressure line filter.

Pressure Line Filter

After every 240 hours of service the pressure line filter should be cleaned.

1. Remove the cap screws "A" (Illustr. 35) and pull the body straight off.

2. Remove the filter element and clean in kerosene or fuel oil.

3. When reinstalling be sure the seal is in good condition or replace with a new seal.

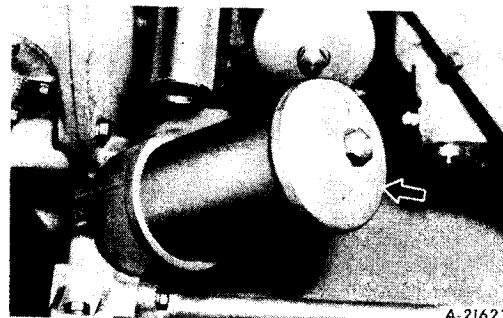
MAINTENANCE

HYDRAULIC SYSTEM - Continued

Suction Line Filter

After every 1920 hours of service the hydraulic system should be drained and the suction line filter cleaned.

1. Remove the right floor plate.
2. Remove the drain plug from the bottom of the filter housing.
3. Remove the filter cover, then lift out the filter element and clean it in kerosene or fuel oil.
4. For the type of oil to use in the hydraulic system, refer to "LUBRICATION GUIDE" on pages 42 and 43.



A-21623

Illustr. 36
Suction line filter.

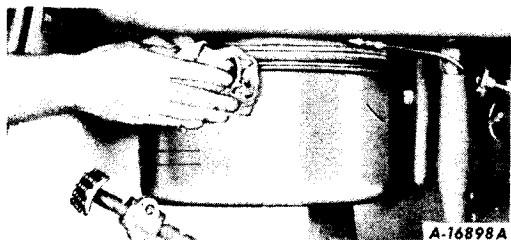
AIR CLEANER

Description

Clean air for combustion is assured by an oil bath type air cleaner. A heavy screen in the air intake cap prevents large particles of dirt, leaves, etc., from entering the air cleaner. The air then passes down through a tube in the center of the air cleaner to the oil cup, where it goes through a bath of oil. As the air passes to the intake manifold, it rises through a series of oil-bathed screens and the fine dust is removed. As the oil from the screens works back down, it carries the dirt with it and the dirt settles in the oil cup.

Clean and Refill Oil Cup Every Day

Service the air cleaner every day or after every 10 hours of operation (more frequently when operating under severe dust conditions).



A-16898A

Illustr. 37
Wiping air cleaner before
removing oil cup.

Before removing the oil cup, clean or wipe any oil or grit from the top bead of the oil cup, the clamping ring and the surface under the clamp, to prevent dust or dirt from entering the air cleaner at this point.

Remove and clean the oil cup. Refill the cup to the oil level bead with the grade of oil used in the crankcase (capacity 9-1/2 U. S. pints).



A-16531A

Illustr. 38
Removing oil cup.

Cleaning the Tray Assembly

The air cleaner is provided with a removable tray held in place by wing nuts. The tray should be removed and cleaned after every 120 hours of operation, or more frequently if conditions require it. Clean the tray with diesel fuel, dry-cleaning solvent or kerosene.

MAINTENANCE

AIR CLEANER - Continued

Cleaning the Air Intake Cap

The dome of the air intake cap serves as a rain shield and the screen prevents chaff and other coarse dirt from getting into the air cleaner. Keep this screen clean and free from all chaff, oil, dust or paint. Clogged holes in the screen will reduce the power of the engine by restricting the flow of air.

When operating under conditions where the air is heavily laden with dust at the air cleaner intake level, or when it is found that very frequent cleaning of the oil cup is necessary, an air pipe extension attachment should be used. (See page 95 for attachment description.)

Washing the Air Cleaner

After every 960 hours of operation or oftener if operating under extremely dusty conditions, remove the air cleaner from the tractor. Disassemble the cleaner and wash the parts thoroughly in diesel fuel, dry-cleaning solvent or kerosene.

Be sure to clean out the air intake pipe; also thoroughly clean out the inside of the main body.

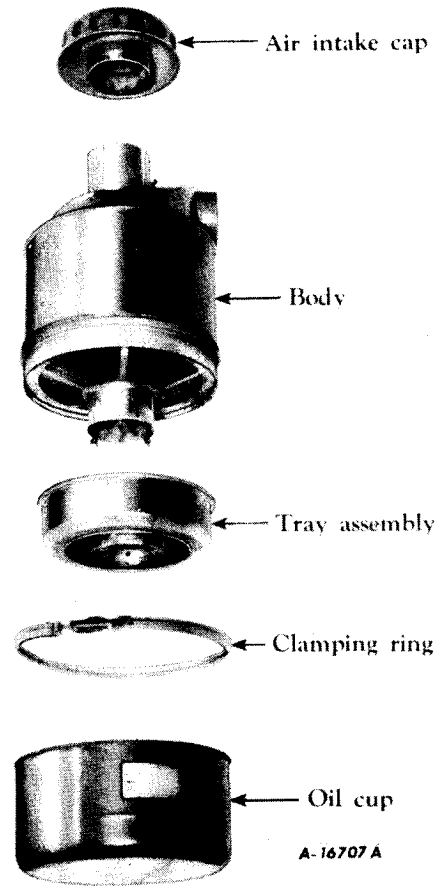
After all the parts have been thoroughly cleaned, install the air cleaner body on the tractor. Make sure that all joints are airtight.

Install the air intake cap.

Fill the oil cup to the proper level with the specified grade of oil and install it on the air cleaner. Be sure it is held securely in place by the cup clamp.

General Precautions

As an added precaution against dirt getting into the engine, frequently inspect the flexible rubber hose connections between the



Illust. 39
Air cleaner taken apart for cleaning.

air cleaner and manifold. If they show any sign of deterioration, replace them. To eliminate strain on the hose connections, be sure the pipes line up.

All joints between the air cleaner, the carburetor, the manifold and the cylinder heads should be tight. All gaskets must be in good condition and the bolts drawn up tight.

MAINTENANCE

GASOLINE STRAINER

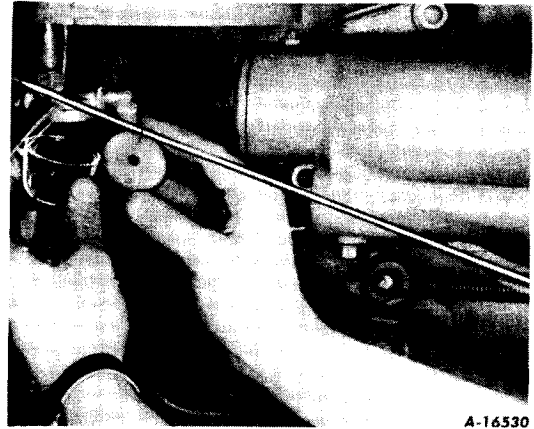
The gasoline strainer under the gasoline tank acts as a combination water trap and sediment bowl. It should be cleaned after every 240 hours of operation.

1. Close the shut-off valve.

2. Loosen the jam nut below the glass bowl and swing the bail aside. The wire screen should come away with the bowl, but if it sticks to the cork gasket it can be removed with the fingers.

3. Clean and wash the bowl and screen in kerosene.

4. When reassembling the strainer, be sure that the cork gasket between the bowl and the top is in good condition and does not leak.



A-16530

Illustr. 40
Cleaning gasoline strainer.

STARTING CARBURETOR

The carburetor is used only in the gasoline starting cycle. The gasoline level is controlled by a float valve mechanism when starting and operating on gasoline. The float valve is locked into its seat shutting off the flow of gasoline to the fuel bowl when the engine is changed over to diesel.

Periodically check the screws which secure the fuel bowl to the carburetor body and see that the screws are kept tight to prevent leakage of air past the gasket.

Present day grades of gasoline have a tendency to form gum. Therefore it is necessary that the gasoline tank and fuel bowl be completely drained of fuel when the engine is to be out of service for more than two weeks. These gum deposits can be dissolved with a mixture of one part alcohol and one part benzol, or with acetone.

Cleaning the Strainer Screen

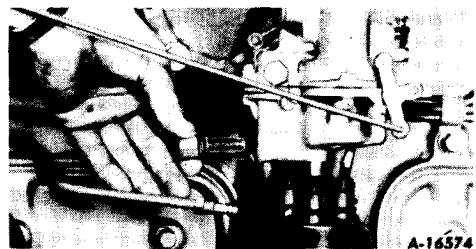
The float valve is protected against dirt and foreign material by a fine mesh

strainer screen. The strainer screen should be removed occasionally and cleaned.

1. Close the gasoline shut-off valve.

2. Disconnect the gasoline supply pipe at the carburetor.

3. Unscrew the strainer screen retainer from the carburetor and wash the screen in kerosene or dry-cleaning solvent.

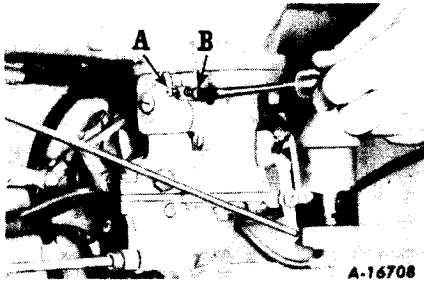


A-16574

Illustr. 41
Removing carburetor strainer screen.

MAINTENANCE

STARTING CARBURETOR - Continued



Illustr. 42
Adjusting idle speed.

Idle Speed Adjustment

In cold weather the idle throttle stop screw should be readjusted to get the correct idle speed. Adjustment should also be made if the carburetor has been removed.

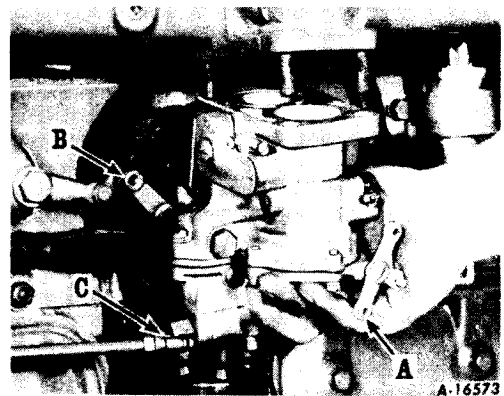
The correct idle speed is attained when the engine operates steadily without missing under no load.

To adjust the idle speed, start the engine and loosen the idle throttle lock screw "A" (Illustr. 42). Turn in the idle stop screw "B" to increase the engine speed and turn out to decrease the engine speed.

When the engine idles at the desired speed, lock the idle throttle stop screw in position with the lock screw.

Removing the Carburetor

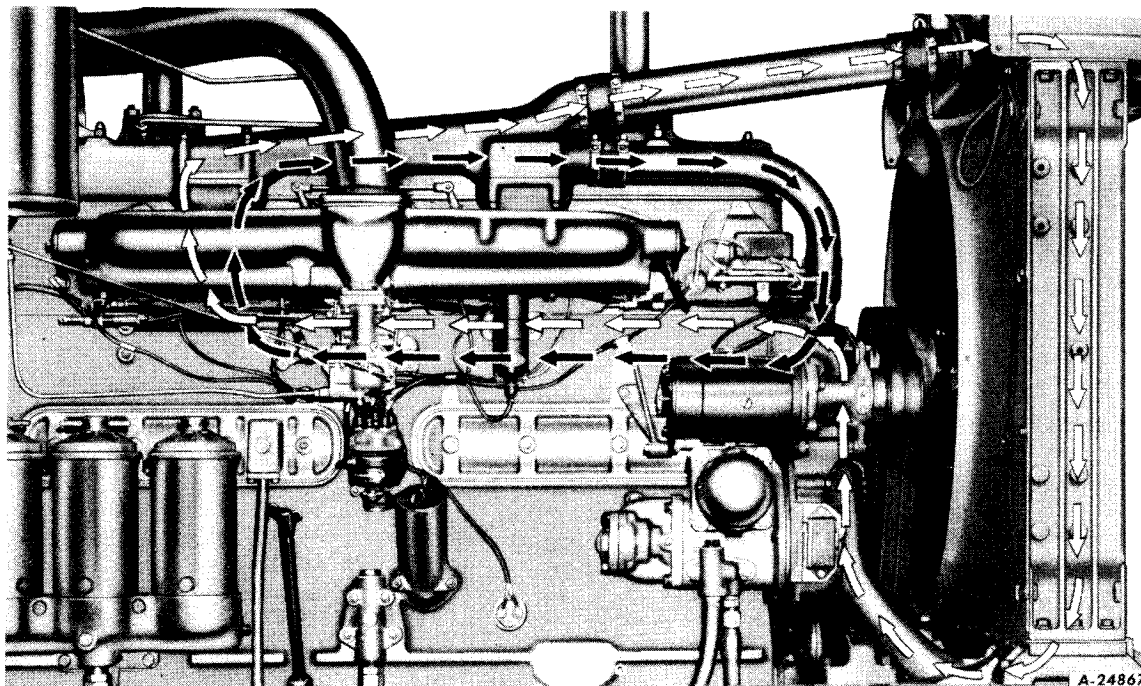
1. Close the gasoline shut-off valve.
2. Disconnect the choke control rod "A" (Illustr. 43) from the choke control on the carburetor.
3. Disconnect the carburetor control rod at point "B."
4. Unscrew the gasoline line from the inlet fitting at point "C."
5. Remove the four cap screws which secure the carburetor to the intake manifold. Remove the carburetor and gasket.
6. Assemble the carburetor on the engine in the reverse order of removal. When installing the carburetor, be sure to use a new gasket.



Illustr. 43
Removing carburetor.

MAINTENANCE

COOLING SYSTEM



Illustr. 44
Circulation of the coolant.

Operation

The cooling system automatically maintains the most desirable engine temperature under all normal conditions of operation. A centrifugal pump circulates the coolant through the engine block, cylinder head and radiator. When the engine is started cold, 4 thermostats of the by-pass type "block off" circulation to the radiator, causing the coolant to circulate only through the cylinder heads and around the cylinders, as indicated by the black arrows (*Illust. 44*). As the engine warms up, the thermostats gradually open. When efficient operating temperature has been reached, the thermostats are wide open and the by-pass is closed, allowing the coolant to circulate through the engine block, cylinder heads and radiator, as indicated by the white arrows. Capacity of the entire cooling system is 37 gallons (U. S. measure).

Cooling System Is Closed Type

This is a closed cooling system of the pressure type, allowing the tractor to operate at extreme angles without loss of water through the overflow pipe. The system is designed to open the valve at the overflow pipe at approximately 4 lb. pressure. The system must have all connections tight at

all times. The radiator cap is designed to hold pressure. If connections are not tight or if the radiator cap is loose, satisfactory pressure will not be maintained, and loss of water and consequent overheating will result.

Maintenance and Rust Prevention

Before the tractor is operated, preventive maintenance procedures must be performed on the cooling system in order to maintain its original efficiency. The water used should be clean and free from alkaline substances. Treatment of the water with rust inhibitor compounds will greatly reduce rusting of the iron in the cooling system. Rust inhibitor compounds are inexpensive and simple to use and should be added to the water in the proportions recommended by their manufacturers.

Thoroughly clean the cooling system, fill it nearly full with clean water, and add the recommended amount of rust inhibitor. Operate the engine to raise the temperature of the coolant, so as to open the thermostats and establish circulation throughout the entire system for complete mixing.

It is recommended that the cooling

MAINTENANCE

COOLING SYSTEM - Continued

system be cleaned at least twice a year. Clean the system before an antifreeze solution is added to the coolant and again after it has been removed.

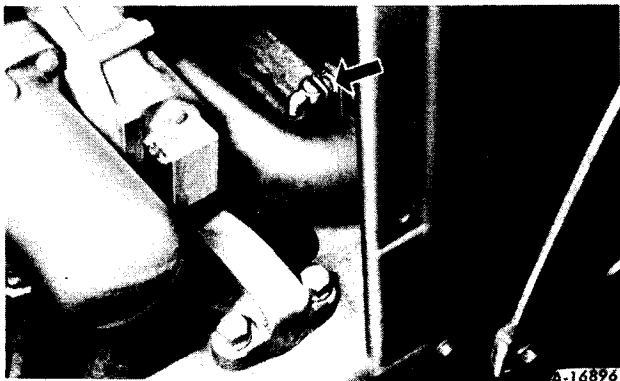
After the danger of freezing temperatures has passed, clean the system and refill with water and rust inhibitor.

The appearance of rust in the radiator or in the cooling solution is an indication that the inhibitor solution has weakened. If this happens, drain the solution, flush out the system and refill.

Filling the Cooling System

The cooling system should be filled to its capacity at all times during operation. To fill an empty system:

1. Close the crankcase and radiator drain cocks.
2. Pour the water (soft or rain water if available) into the radiator to a level slightly below the bottom of the filler opening. This allows for expansion of the coolant under normal operating conditions.
3. Never pour cold water into the radiator if the engine is very hot unless conditions make it absolutely necessary; under such conditions let the engine idle while slowly pouring the water into the radiator.
4. If the tractor is to be operated in freezing temperatures refer to "COLD WEATHER OPERATION" on page 25.



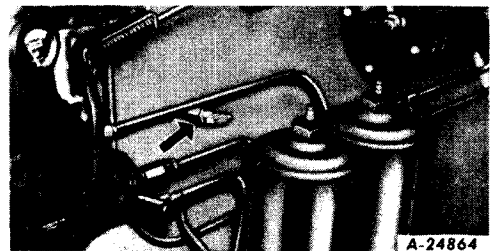
Illustr. 45
Radiator drain cock.

Cleaning and Flushing the Cooling System

1. Drain the cooling system by opening the radiator and crankcase drain cocks. Remove the radiator cap. Allow the system to drain completely, then close the drain cocks.

2. Fill the cooling system with a solution of 10 pounds of ordinary washing soda mixed with 37 gallons (U.S.) of water (cooling system capacity).

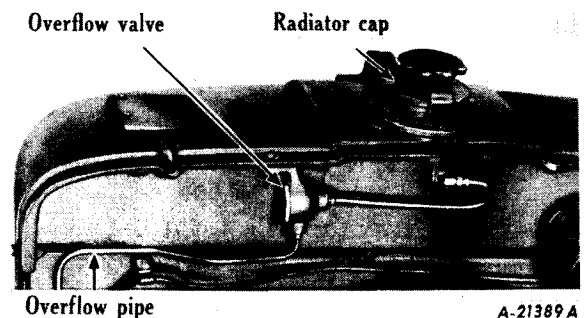
3. Leave off the radiator filler cap and operate the engine until the water is hot. Stop the engine, then drain the system and flush with clean water.



Illustr. 46
Crankcase drain cock.

Overflow Valve

Do not attempt to service the radiator overflow pressure valve. If the valve is faulty, replace it with a new valve of the same type.



Illustr. 47
Radiator cap and overflow valve.

MAINTENANCE

COOLING SYSTEM - Continued

Radiator Fins

Overheating is often caused by bent or clogged radiator fins. When straightening bent fins, be careful not to injure the tubes or to break the bond between the fins and tubes. When cleaning the radiator core, use air or water under pressure to remove insects and dirt. Apply air or water from the engine side of the radiator.

Fan Belts

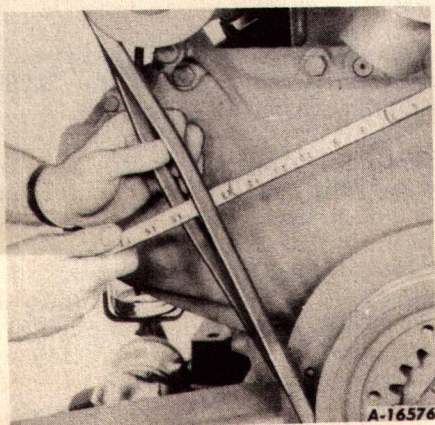
Two continuous type "V" belts drive the fan, water pump and generator assemblies. The belts are driven by a pulley on the crankshaft.

Checking and Adjusting Fan Belt Tension

The fan belts must be checked periodically to assure maintenance of the correct tension. The tension is correct when the belts can be depressed by thumb pressure, $\frac{3}{4}$ to 1 inch, midway between the crankshaft and idler pulleys. If the belts are too tight or too loose, adjust as follows:

1. Loosen the nut (1) (Illustr. 49) on the cap screw that secures the fan belt idler bracket (2) to the slotted bracket brace (3); also loosen the 2 generator mounting nuts (4).

2. Move the idler bracket away from the engine to increase the belt tension or push it toward the engine to decrease the tension.



Illustr. 48
Checking tension of fan belts.

3. When the belt tension is correct, tighten the generator mounting nuts and the nut on the bracket brace.

4. After new belts have been in use approximately 60 hours, check the tension and adjust if necessary. Having the belts tighter than the specified tension results in rapid wear.

Removing the Fan Belts

1. Disconnect the coil-to-distributor cable at the coil end to eliminate any possibility of accidental starting of the engine.

2. Decrease the belt tension as outlined above.

3. Working with 1 belt at a time, remove the belts from the idler pulley.

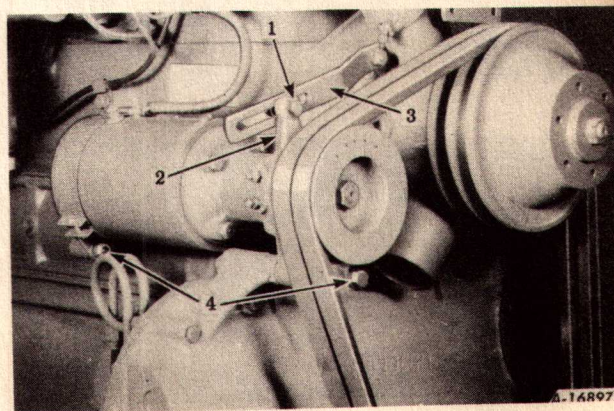
4. Turn the fan by hand and work the belts over the fan blades until the belts can be removed.

Replacing the Fan Belts

The fan belts should be replaced when they become soaked with grease or so badly worn that they do not drive the fan at the proper speed.

When old belts become worn, replace both at the same time with a pair of new belts.

When replacing belts, reverse the procedure outlined above for removing the belts.



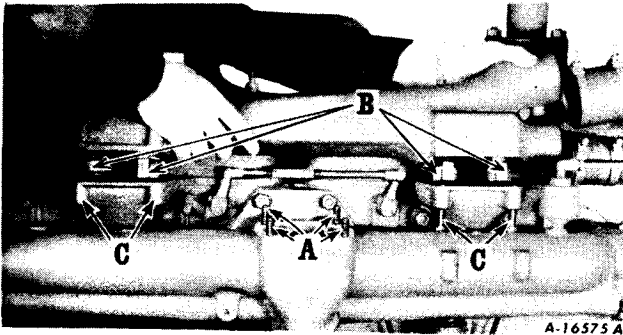
Illustr. 49
Adjusting tension of fan belts.

MAINTENANCE

COOLING SYSTEM - Continued

Removing the Fan

1. Take out the cap screws from the fan housing sheet on the left side of the radiator and remove the sheet.
2. Remove the cap screws which secure the fan blades to the front of the water pump. Lift out the fan, being careful not to injure the radiator fins.
3. Inspect the fan for wear or damage. If the blades are bent, straighten them before reinstalling the fan.
4. To install the fan, reverse the procedure for removing.



Illustr. 50
Removing thermostats.

Removing the Thermostats

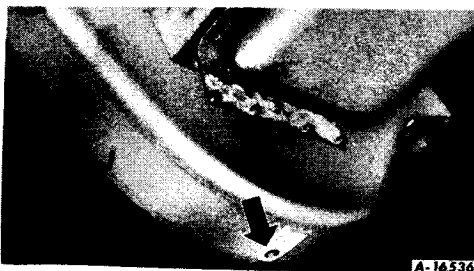
The 4 thermostats can be removed in the following manner:

1. Drain the cooling system.
2. Loosen the hose on the air cleaner pipe and slide the hose onto the pipe; remove the nuts from the studs "A" (Illustr. 50) and remove the pipe.
3. Loosen the hoses on the water outlet header and slide the hoses onto the pipes.
4. Remove the cap screws "C."
5. Raise the water outlet header and remove the thermostats "B."
6. Do not attempt to repair a defective thermostat. They can be tested for operation by putting them in a pan of water. Heat the water and use a thermometer to check if the thermostats open at the correct temperature and close when the water cools.
7. To install thermostats, reverse the procedure for removing.
8. When reinstalling the outlet header, be sure the gaskets are in good condition; if not, replace the gaskets.

ENGINE CLUTCH

Description

The engine clutch is a 16 inch, 2 plate, over-center clutch. The clutch is engaged when the lever is pulled back all the way so that full over-center engagement is definitely felt.



Illustr. 51
Clutch compartment drain.

Maintenance

The engine clutch requires a minimum of attention.

It is very important to observe closely the instructions contained in the "LUBRICATION GUIDE" on pages 42 and 43.

When operating the tractor in water or under very wet conditions or under extremely dusty conditions, water or dust may enter the clutch compartment through the hole in the bottom of the flywheel housing. To avoid this, insert a 3/4 inch pipe plug into this hole. This plug should be removed after every 60 hours of operation to allow any oil accumulation to drain out.

MAINTENANCE

ENGINE CLUTCH - Continued

Operation

1. The clutch is fully engaged when the clutch lever is pulled all the way back and a definite over-center engagement is felt.

2. The clutch should be adjusted when there is noticeable clutch slippage under a load.

Adjustment

1. Remove the right hand floor plates in the operator's compartment.

2. Remove the cover from the clutch housing.

3. Disengage the clutch by pushing the clutch lever all the way forward, then turn the engine until the adjusting ring lock is accessible through the opening.

4. Loosen the nuts on the clutch adjusting ring lock "A" (*Illust. 52*). Clutch lock plate nuts should be loosened until the lock plate is free to move with the adjusting ring. DO NOT attempt to remove nuts completely since stripped threads would result, due to nuts being staked.

5. Turn the adjusting ring in clockwise direction until clutch cannot be pulled over-center. Lock plate will automatically move into unlocked position as adjusting ring is turned clockwise, making it unnecessary to

force lock plate out of position before tightening clutch. Back off adjusting ring one notch at a time until 60 to 65 pounds hand lever pull is obtained. Turn adjusting ring counter-clockwise until lock plate slips into locked position.

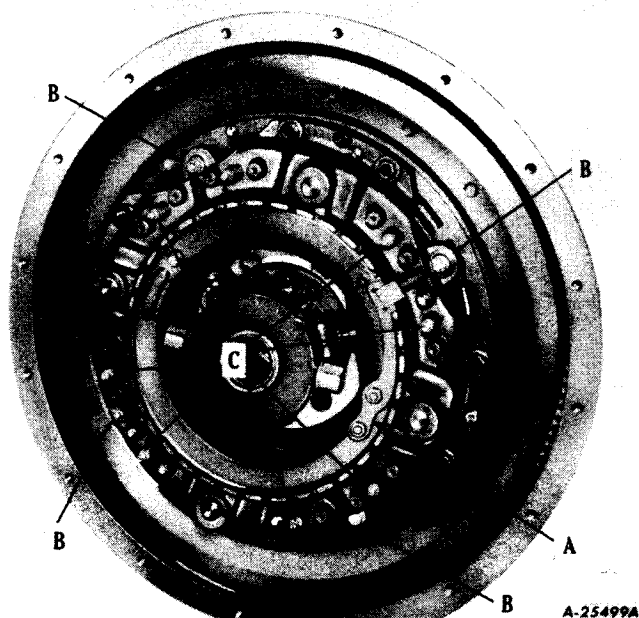
6. When the correct clutch adjustment is obtained, be sure to tighten the nuts on the adjusting ring lock.

7. With engine clutch engaged, if a clearance of more than 1/16 inch exists between the springs and the self-locking nuts located on the outside edge of the back plate "B" (*Illust. 52*), reduce this clearance by turning down the self-locking nuts until 1/16 inch is obtained.

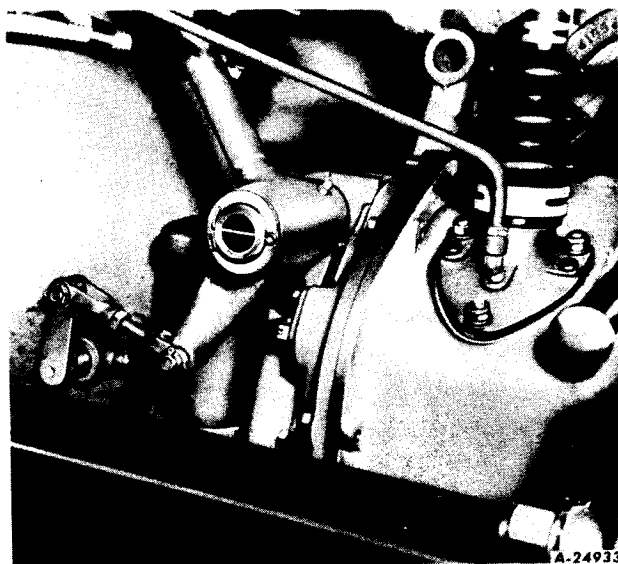
8. Whenever the plate separator adjustment is made, check the length of the 8 pressure plate return springs "C" (*Illust. 52*). Tighten or loosen the lock nuts to obtain a length of 1-3/16 inches from the spring seat to the under side of the lock nut with the clutch engaged.

9. Replace the clutch housing cover and floor plates.

NOTE: The clutch lever may be positioned to suit the operator by adjusting the operating fork length (*Illust. 53*).



Illust. 52 - Engine clutch adjustment.



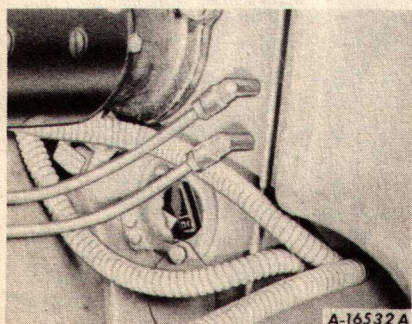
Illust. 53 - Engine clutch control linkage.

MAINTENANCE

VALVE CLEARANCE ADJUSTMENT

Check valve clearance after every 480 hours of operation and adjust the clearance if necessary. A clearance of 0.023 inch is necessary between the valve levers and the valve stems when the valves are closed and the engine is hot. The clearance should be 0.025 inch when the engine is cold.

1. Before checking the valve clearance, disconnect the coil-to-distributor cable from the coil end. This will prevent accidental starting.
2. Pull the compression release rod out to the starting position.
3. Remove the hood sheet.
4. Remove the valve covers.
5. Remove the spark plug from No. 1 cylinder (the cylinder next to the radiator). Place your thumb over the spark plug opening and have the engine cranked slowly until an outward pressure can be felt. Pressure indicates the No. 1 piston is moving toward top dead center of the compression stroke. Continue cranking slowly until the "DC" mark on the flywheel is in line with the pointer as seen through the opening in the flywheel housing. Both valves are now closed on the compression stroke of No. 1 cylinder.



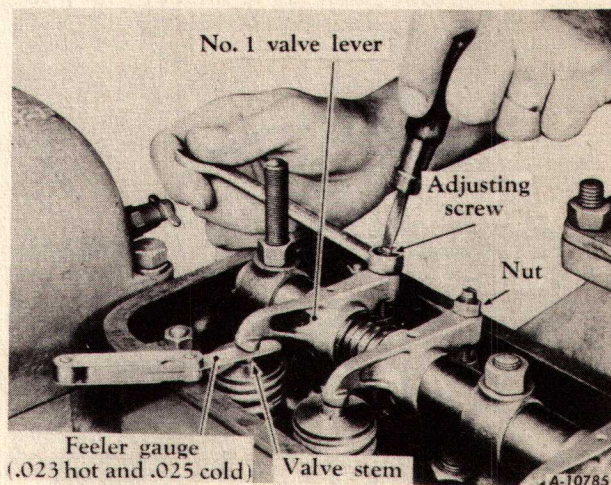
Illustr. 54
Showing "DC" mark on the flywheel.

6. Check the clearance of the No. 1 valves and adjust if necessary as follows: Loosen the adjusting screw lock nut on both the No. 1 intake and exhaust valve levers. Insert the feeler gauge between the valve lever and valve stem. Turn the adjusting screw in or out as necessary to hold the feeler gauge snugly. When the correct clearance is secured, hold the adjusting screw in place with a screwdriver and tighten the lock nut. Adjust both the intake and exhaust valve levers in this manner.

7. Crank the engine $1/3$ revolution at a time and check the clearance of the valves for each cylinder and adjust if necessary. Do this on each set of cylinder valves in succession according to the firing order of the engine which is 1, 5, 3, 6, 2, 4.

8. Install the valve covers. Check to see that the gaskets make oiltight seals. Use new gaskets if necessary.

9. Install the spark plug and cable.
10. Install the hood sheet.
11. Connect the coil-to-distributor cable.



Illustr. 55
Adjusting valve clearance.

MAINTENANCE

BRAKES

There are 3 disc brakes on each side of the spiral drive bevel gear. One brake controls the high range planetary sun gear; the second controls the low range sun gear; and the third controls the sprocket drive pinion shaft. Only 1 of the 3 brake discs on each side is applied at one time; the others are turning free. The brakes are operated through the hydraulic control levers and the pivot brake foot pedal.

Pivot Brake Adjustment - by Adjusting Knob

When the brake pedal travel becomes too great to stop the tractor properly or hold it on a grade, adjustment is made by tightening the pivot brake operating rod adjusting knob. Stop the engine and place both hydraulic control levers in high range position. Tighten the adjusting knob until 1/2 to 1 inch of free pedal travel is secured. The adjusting knob is accessible through an opening in the platform. This method of adjusting may be continued until a major adjustment as described below becomes necessary.

Pivot Brake Major Adjustment

CAUTION: Before removing the brake control housing covers, remove all objects from breast pockets, also secure the brake adjusting wrench, to prevent their falling into the housings.

1. Stop the engine and place both hydraulic control levers in high range position.
2. Remove the pivot brake operating rod adjusting knob.
3. Remove both brake control housing covers (see "CAUTION" above).
4. Loosen but do not remove both pivot brake adjusting screw clamp bolt nuts.
5. Remove both pivot brake countersunk headless plugs (located opposite the pivot brake adjusting screws and accessible through holes in the fender side sheets).
6. Using a wrench with 1/2 inch square drive end, through the plug openings, turn both pivot brake adjusting screws clockwise until they are snugly tightened. Dimensions "A" and "B" (Illust. 56) from the face of the adjusting screw to the face of the fork must be equal after tightening.

This adjustment places the brake linings against the brake discs and also places the pivot brake pistons against the piston cylinder heads.

7. After both pivot brake adjusting screws are snugly tightened, loosen both screws 1/2 to 1 turn counterclockwise. This will provide the proper operating clearance between the brake linings and discs.

8. Tighten the pivot brake adjusting screw clamp bolt nuts.

9. Install the pivot brake countersunk headless plugs.

10. Install the brake control housing covers.

11. Install the pivot brake operating rod adjusting knob and tighten until 1/2 to 1 inch of free pedal travel is secured.

High Range Brake Adjustment

CAUTION: Before removing the brake control housing covers, remove all objects from breast pockets, also secure the brake adjusting wrench, to prevent their falling into the housings.

1. When the high range brakes slip due to brake lining wear, stop the engine and adjust as follows:
2. Remove both brake control housing covers (see "CAUTION" above).
3. Loosen but do not remove both high range adjusting screw clamp bolt nuts.
4. Place both hydraulic control levers in the high range position.
5. With the special brake adjusting wrench provided, turn both high range adjusting screws until the distances between the outer face of each high range spring and a center line through the center holes of each set of tapped holes used for fastening the brake control housing covers shown by dimensions "C" and "D" (Illust. 56) measures 2-5/16 inches.
6. Tighten the high range adjusting screw clamp bolt nuts.
7. Install the brake control housing covers.

MAINTENANCE

BRAKES - Continued

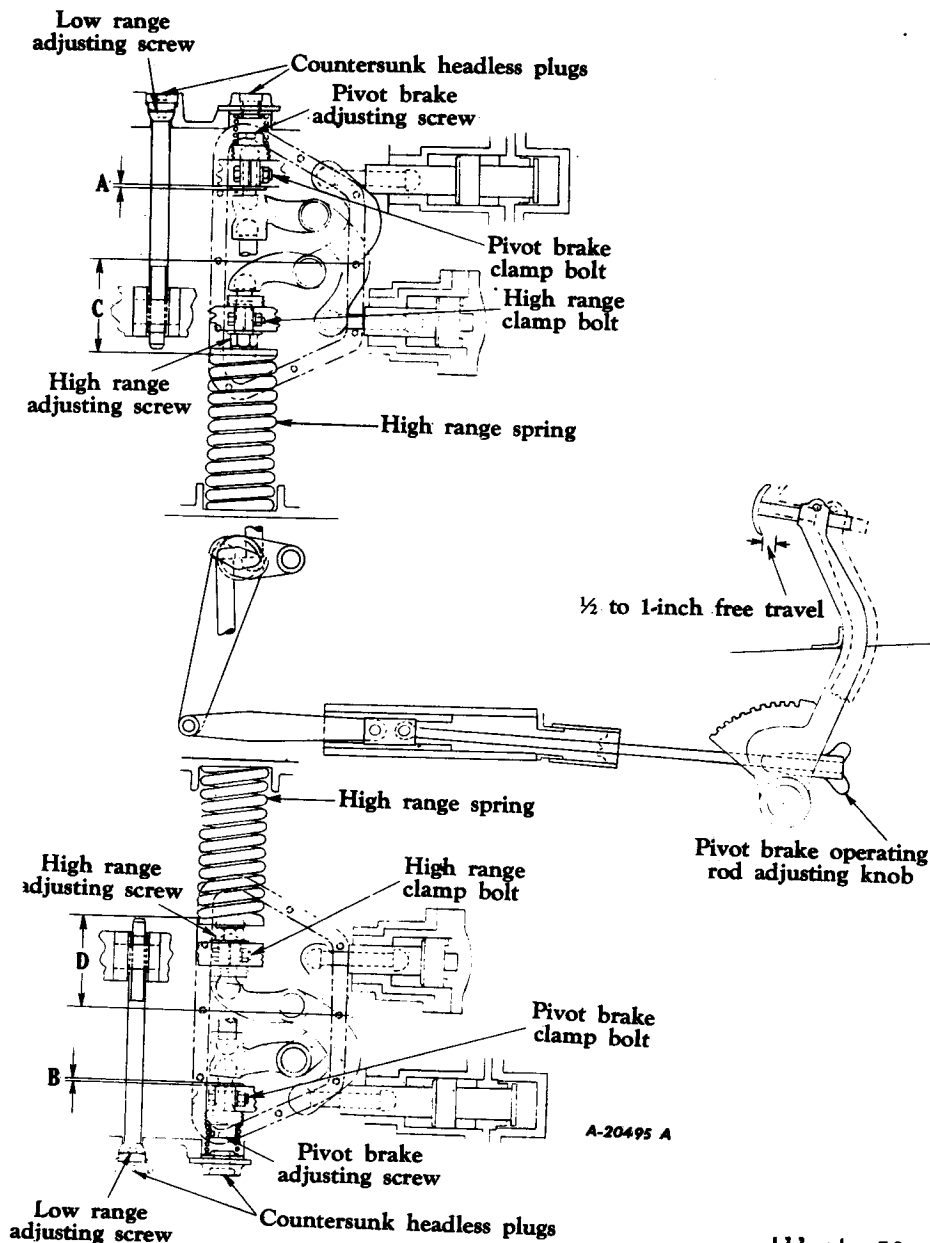
8. Whenever the high range brakes are adjusted, the low range brakes should also be adjusted as below.

Low Range Brake Adjustment

1. After the high range brakes have been adjusted, or when the low range brakes slip due to brake lining wear, adjust the low range brakes as follows:

2. Stop the engine and place both hydraulic control levers in the high range position.

3. Remove the low range countersunk headless plugs on both sides of the tractor. (Hexagon socket locking screws in the plugs must be loosened before plugs can be removed.) These plugs are located just below and toward the rear of the tractor from the pivot brake adjusting screw plugs, and are accessible through openings in the fender side sheets.



Illustr. 56
Adjusting brakes.

MAINTENANCE

BRAKES - Continued

4. Through the plug openings, using a wrench with 1/2 inch square drive end, turn both low range adjusting screws clockwise until they are snugly tightened.

5. Loosen both low range adjusting screws 2-1/2 turns by turning counterclockwise.

6. Install the low range adjusting screw countersunk headless plugs and tighten the hexagon socket locking screws.

Checking and Testing

1. After making the above adjustments, results should be checked by testing the tractor in third gear position (on the right-hand selective gearshift lever) and either forward or reverse position (on the left-hand gearshift lever).

2. Place both hydraulic control levers in the pivot position, with the pivot brake pedal depressed and locked.

3. Operate the engine at not more than half throttle and engage the engine clutch.

4. If the engine speed is excessively reduced upon engaging the clutch, adjustments must be made to provide additional clearance between the high and low range discs and linings as follows:

5. Remove the low range adjusting screw countersunk headless plug from 1 side of the tractor (as previously described). Loosen the low range adjusting screw on this side. Operate the engine and engage the clutch. If no improvement is noted after loosening the screw 2 or 3 turns, tighten the screw to its original position and make the same test adjustment on the other side of the tractor. If neither of these low range adjustments gives improvement, be sure

the low range adjustments on both sides of the tractor are reset as originally and make high range adjustments as follows:

6. Adjust one side of the tractor at a time and reset to its original position any adjustment that does not give improvement.

7. Stop the engine and place both hydraulic control levers in the high range position.

8. Loosen the low range adjusting screw on 1 side of the tractor 3 or 4 turns.

9. Remove the brake control housing cover (see "CAUTION" preceding).

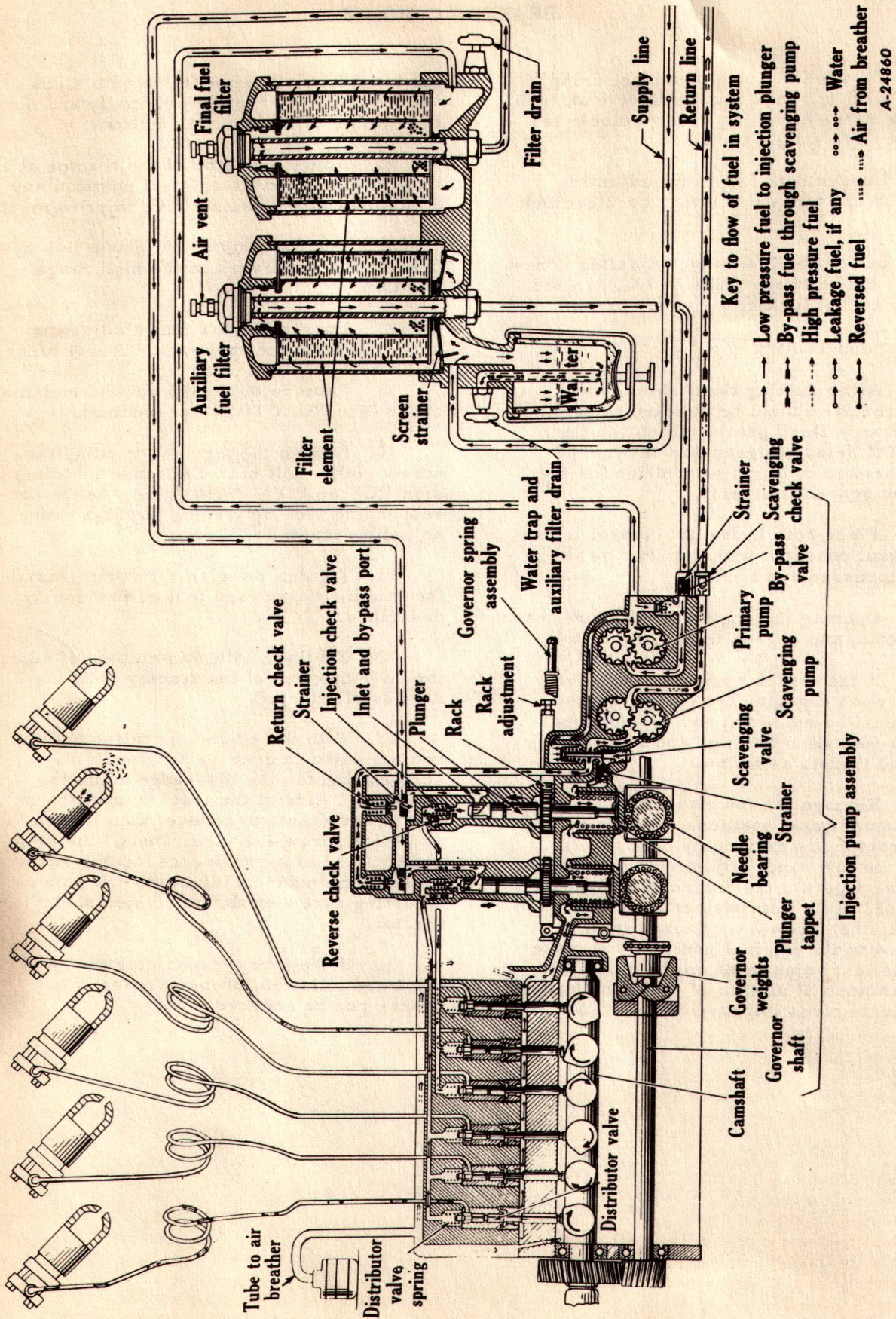
10. Loosen the high range adjusting screw clamp bolt nut. Decrease the dimension "C" or "D" (*Illust. 56*) on the corresponding side by turning the high range adjusting screw 1/2 turn.

11. Tighten the clamp bolt nut, install the housing cover, and test as previously described.

12. Continue with this method of adjusting on both sides of the tractor until the drag is eliminated.

13. With the engine operating and the transmission in gear as previously described, tighten the low range adjusting screw on 1 side of the tractor until the engine speed starts to reduce, then loosen the adjusting screw 1/2 turn. Install the plug and lock the hexagon socket locking screw. In the same manner adjust the low range adjusting screw on the other side of the tractor.

14. If the foregoing adjustments and tests are followed, proper setting of all brakes can be secured.



Illustr. 57
Schematic drawing of diesel fuel system (for tractors equipped with IH twin plunger injection pumps and twin fuel filters).

A-24860

MAINTENANCE

DIESEL FUEL SYSTEM

The diesel fuel system consists of a supply tank, filtering units, and pumping and injection units. This tractor is regularly equipped with an IH twin plunger injection pump, the component parts of which are given below. Every unit of the fuel system is thoroughly engineered for steady, dependable operation. This manual covers the ordinary servicing and adjustments necessary to meet various operating conditions. The operator should avoid tampering with any of the units of fine precision construction. In case any trouble is experienced which cannot be overcome by following the instructions in this manual, refer to your International Industrial Power distributor or dealer.

Components of the Fuel System

This fuel system includes: the fuel tank; water trap; twin fuel filters; twin plunger injection pump with primary and scavenging pumps and built-in governor; injection nozzles; and necessary piping and connections.

Flow of the Fuel

The diesel fuel passes through the system as follows:

1. Fuel flows from the fuel tank by gravity through the water trap to the auxiliary fuel filter.
2. From the auxiliary filter the fuel enters the primary pump through a replaceable close mesh strainer and is forced under pressure through the final fuel filter, then through fine mesh strainers into reservoirs above the plungers in the injection pump. Excess fuel from the primary pump is released by a bypass valve for recirculation through the primary pump.
3. From the injection pump reservoirs the fuel is then forced by the plungers through the distributor valves and fuel lines to the injection nozzles and into the combustion chambers of the engine.
4. Excess and by-passed fuel from the fuel injection pump is returned to the fuel tank.

Diesel Fuel Storage and Care

Diesel fuel should be free from dirt and water. Dirt and water in the fuel affect the life of the filters and pump. If dirt reaches the injection pump, it will act as an abrasive on the closely fitted moving parts, causing rapid wear and shortening the life of the

pump. If water is allowed to pass through the pump, it may cause corrosion and subsequent scoring of parts. Refer to diesel fuel specifications on *page 8*.

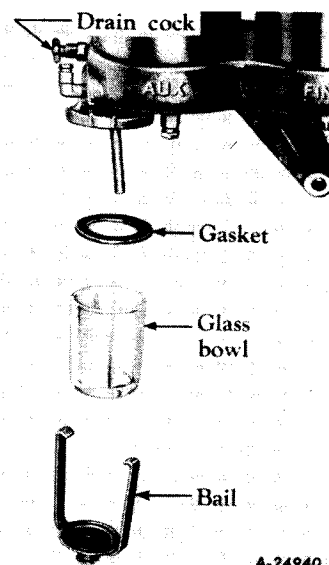
A storage tank provides the best method of supplying fuel on the job. Sediment and water can easily be drained off through a trap, and fuel can be pumped into the tractor tank with a minimum of handling. When conditions require drums for storage, use a pump to draw the fuel rather than a faucet, as the water and foreign materials settle to the bottom of the drum. The suction pipe of the pump should be set at least 3 inches from the bottom of the tank or drum.

When drums are used for storage, they should be placed under cover or in a horizontal (laid down) position if left exposed to rain. Do not disturb the drums after the fuel settles.

The last 3 inches in each drum or tank should not be used, but should be collected into 1 container and allowed to settle. In this manner the sediment and foreign materials can be separated from the fuel and disposed of with no loss of fuel.

Water Trap

The diesel fuel water trap is located below the auxiliary filter, attached to the filter base casting.



Illustr. 58
Diesel fuel water trap
taken apart for cleaning.

MAINTENANCE

DIESEL FUEL SYSTEM - Continued

After every 10 hours of operation, flush the water and sediment from the trap by opening the drain cock in the filter base just above the trap. Do not close the shut-off valve on the fuel line or open any vents when flushing the trap. When all water and sediment has been flushed from the trap, close the drain cock.

After every 480 hours of operation, take the trap apart and clean it. Close the shut-off valve on the fuel line. Loosen the thumb nut under the glass bowl and remove the bail strap. Wash the glass bowl in kerosene to remove all dirt and sediment. Be sure the glass bowl gasket is in the proper place and in good condition. Reassemble the glass bowl and bail strap and tighten the thumb nut by hand. Open the fuel line shut-off valve and vent the fuel system (page 71).

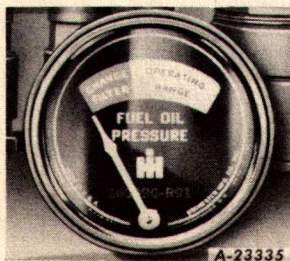
Auxiliary and Final Fuel Filters

The auxiliary and final filters are provided with replaceable filter elements. The life of the filter elements depends upon the amount of dirt, water and sediment that they must remove. These elements cannot be cleaned and should not be disturbed, except when it becomes necessary to replace them. It is important to keep the fuel clean and free from water during storage and handling.

The normal life of the auxiliary filter is approximately 1,000 hours of operation if the water trap is properly serviced to prevent water from entering the fuel system. The final filter element will last indefinitely if proper service is given to the auxiliary filter and water trap.

When To Replace Filter Elements

1. When the fuel pressure indicator located on the fuel inlet fitting of the injection pump (*Illust 59*) shows the indicator in the red or "CHANGE FILTER" area with the



Illust. 59
Fuel pressure indicator.

engine operating (either on gasoline or diesel cycle), it means that 1 or both of the fuel filter elements must be replaced, or that the fuel system is clogged at some point. It may also be accompanied by loss of power or misfiring of the engine.

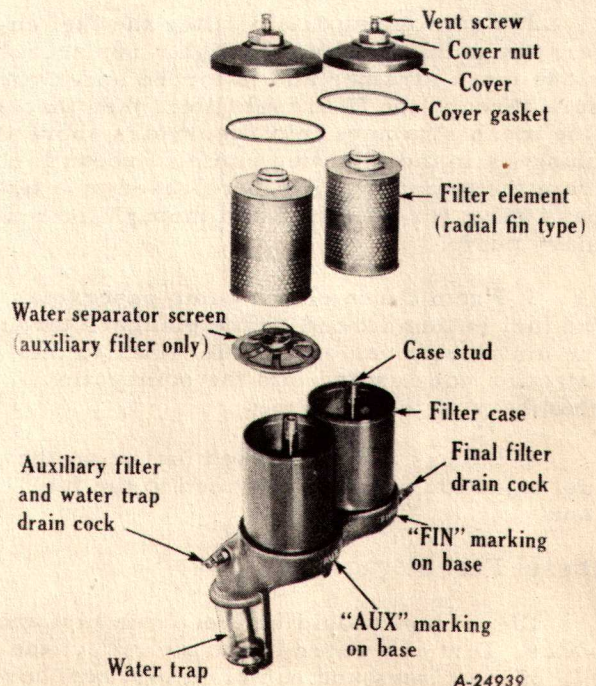
2. Before replacing the filter elements service the water trap. (Refer to preceding section.)

3. If the indicator hand remains in the red area after servicing the water trap, replace the auxiliary fuel filter element and clean the screen in the filter base.

4. Clean the primary pump filter screen. (Refer to page 68.)

5. If the indicator hand remains in the red area after replacing the auxiliary fuel filter element and after cleaning the primary pump filter screen, replace the final fuel filter element.

NOTE: It is advisable to check the auxiliary fuel filter at the drain cock for traces of water every day, or more frequently under severe conditions. If water is found, it indicates that more frequent servicing of the water trap is necessary to obtain full service from the auxiliary fuel filter element.



Illust. 60
Fuel filters disassembled.

MAINTENANCE

DIESEL FUEL SYSTEM - Continued

Precautions When Replacing Filter Elements

1. Cleanliness cannot be overemphasized. In handling new elements, care should be exercised to prevent dirt, water, etc., getting on the elements. Keep new elements in original packages until ready to install.

2. Before loosening the filter cover nuts, clean the outside of the covers and cases thoroughly with kerosene or diesel fuel to prevent dirt or foreign material from entering the cases when the covers are removed.

Replacing the Filter Elements

1. Close the shut-off valve on the fuel line.

2. Open the vent screws on the filter covers and the drain cocks in the base, and allow the fuel to drain.

3. Unscrew the filter cover nuts and lift the filter covers from the cases.

4. Remove the old elements. (The elements may come out with the covers, in which case they can easily be removed from the covers.)

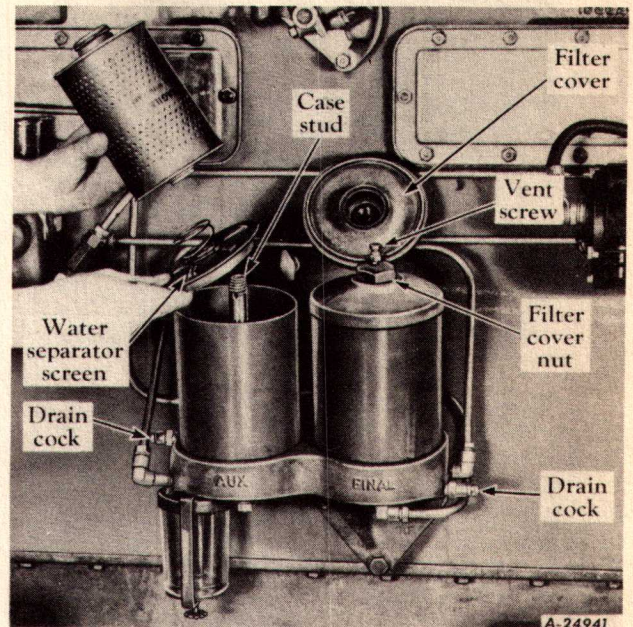
5. **FOR AUXILIARY FUEL FILTER ONLY:** Remove the water separator screen from the bottom of the case and clean the screen thoroughly in diesel fuel or kerosene.

6. Clean the inside of the cases and the base thoroughly with diesel fuel or kerosene.

7. Inspect the inside of the case studs carefully. If dirt is found on the inside of the studs, disconnect the outlet pipes underneath the base and flush out the inside of the case studs with kerosene. Be sure to reconnect the outlet pipes after cleaning the case studs.

8. Inspect the filter cover gaskets and replace if necessary.

9. **FOR AUXILIARY FUEL FILTER ONLY:** Be sure that the water separator screen is in place at the bottom of the case, with the spring up.



Illust. 61
Replacing filter elements.

10. Place the new filter elements in the cases, sliding them down over the studs (the end of the element with the small pilot must be down). Insert the new elements carefully, using a slight twisting motion to prevent damage to the seal rings in the bottom pilots.

11. Install the covers and draw them down tight with the cover nuts. (Note: The cover nuts turn freely in the covers and are held in place by retaining rings.)

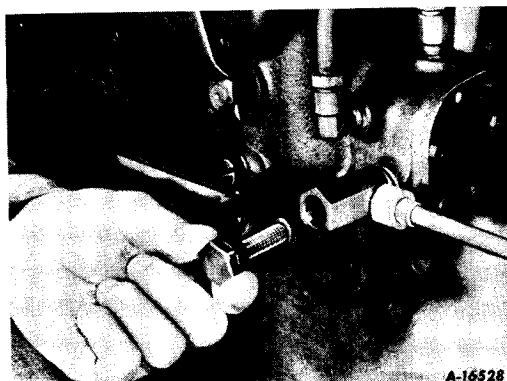
12. Vent the fuel system as described on page 71.

Fuel Injection Pump and Governor

The fuel injection pump and governor are combined in a mechanism of very fine precision construction and adjustment, and will function for long periods of time under hard operating conditions if properly cared for in the matter of lubrication and servicing.

MAINTENANCE

DIESEL FUEL SYSTEM - Continued



Illustr. 62
Primary pump filter screen.

The governor is sealed at the factory and operates in a bath of oil. Its function is to maintain the engine speed selected by the operator and automatically proportion the fuel to the load.

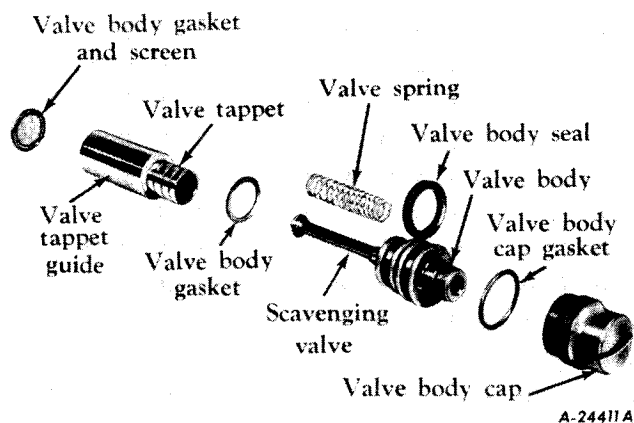
Primary Pump Filter Screen

The primary pump filter screen should be cleaned whenever the auxiliary filter element is changed. Remove the nut and filter screen assembly from the primary pump filter body and wash in kerosene or diesel fuel. Precautions should be taken that no dirt or foreign material enters the filter body when removing or installing the filter screen.

NOTE: When installing the primary pump filter screen, apply a coat of special sealer that will not harden or dissolve when in contact with fuel or lubricating oil, such as Tite-Seal No. 2 or Perma-Tex No. 2 sealer. CAUTION: Put the sealer on the threads only.

Scavenging Valve

Faulty operation of the scavenging valve is indicated by an excessive amount of thinned out lubricating oil in the sump of the injection pump. If either the valve or the tappet is stuck in the open position, removal of the valve cap will show the end of the valve extending beyond the threaded end of the valve body. The valve body and tappet with guide must be removed to determine whether the valve or the tappet is stuck in the closed position. In either case, these parts must be removed, cleaned, and reinstalled.

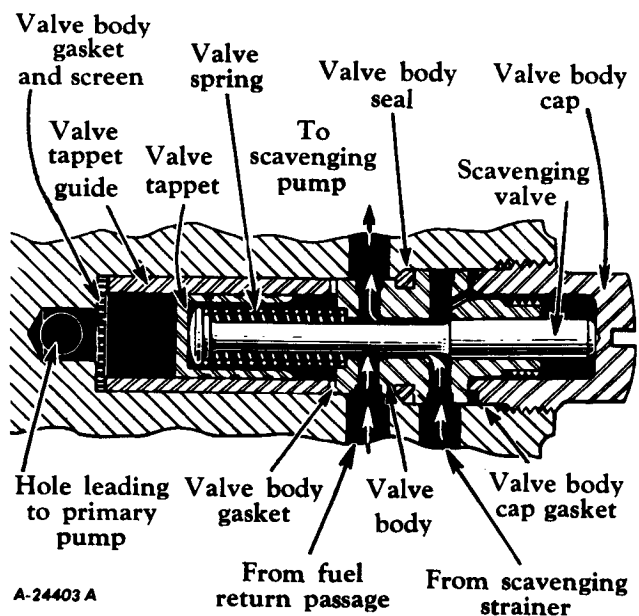


Illustr. 63
Exploded view of scavenging valve.

It is not necessary to remove the injection pump from the engine to make repairs on the scavenging valve, but be sure all exterior parts of the pump are thoroughly cleaned before proceeding.

Removing the Scavenging Valve

Using a wide bit screwdriver, remove the scavenging valve cap. Remove the scavenging valve body by using a 1/8 inch pipe coupling that catches 1 or 1-1/2 threads of the body. Use a 1/4 inch brass rod to withdraw the tappet and tappet guide.



Illustr. 64
Cross section view of the scavenging valve assembly.

MAINTENANCE

DIESEL FUEL SYSTEM - Continued

The valve screen should be removed by using a thin metal scale.

Thoroughly clean all parts of the valve in a dry-cleaning solvent.

Reinstalling the Scavenging Valve

The scavenging valve assembly should be reinstalled as shown in *Illust. 64*.

The valve body seal is not usable a second time as it is damaged by removal. Replace it with a new seal.

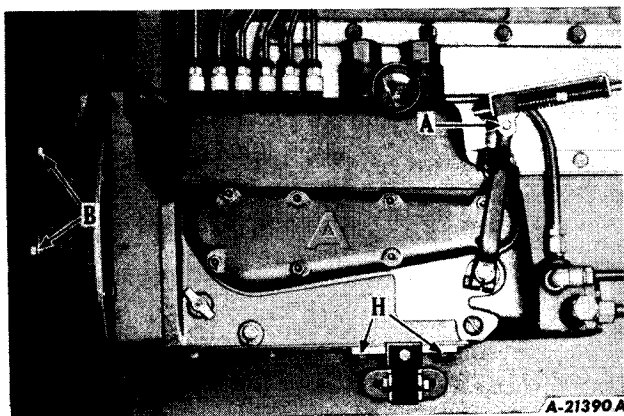
Install the valve cap and tighten with hand pressure on a wide bit screwdriver. Do not use a wrench on the screwdriver, because it will distort the valve assembly.

Scavenging Pump Check Valve

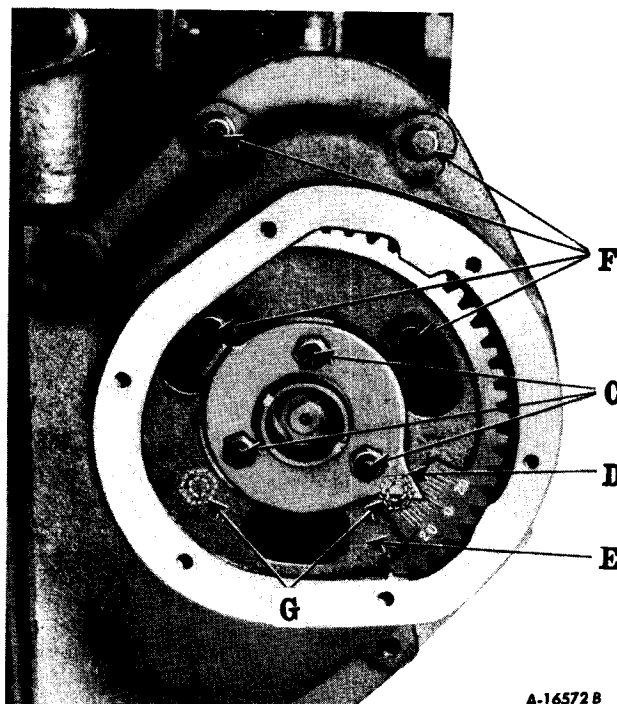
This valve serves to keep the scavenging pump primed at all times and it also serves to prevent self-draining of the fuel lines.

Fuel Injection Pump Adjustment

DO NOT ATTEMPT TO ADJUST THE FUEL INJECTION PUMP OR THE GOVERNOR. In case of unsatisfactory operation of the engine, due to possible trouble in the injection pump, first check over the instructions on the preceding pages for servicing the various units of the whole fuel system. After servicing the other parts of the system without overcoming the trouble, it may be necessary to replace the injection pump or refer to your International Industrial Power distributor or dealer.



Illust. 65
Preparing to remove fuel injection pump.



Illust. 66
Timing indicator and gear of fuel injection pump.

Removing the Fuel Injection Pump

Before disconnecting any fuel lines or fittings from the injection pump, clean the pump and all the connections with kerosene or diesel fuel. After disconnecting fittings or lines, close all the openings with suitable caps or plugs to prevent the entrance of dirt. Whenever disconnecting the fuel injection pipes from the injection pump, always use 2 wrenches, 1 on the discharge fitting of the pump and the other on the nut on the injection pipe.

To remove the injection pump, proceed as follows:

1. Close the fuel shut-off valve (under the operator's seat).
2. Pull the compression release rod out to the gasoline starting position.
3. Disconnect the coil-to-distributor cable from the coil, to avoid starting engine.
4. Drain the diesel fuel from the fuel filter. Drain the lubricating oil from the injection pump housing.

Continued on next page

MAINTENANCE

DIESEL FUEL SYSTEM - Continued

5. Disconnect all fuel lines leading to the injection pump. (Before removing the pump, be sure to disconnect the fuel injection pipes at both ends to prevent grooving the pipe collars.) Install discharge caps on the fittings and cover all open connections to prevent dust and dirt from entering the fuel system. Tape all pipe lines.

6. Disconnect the engine speed control rod at "A" (*Illust. 65*).

7. Remove the 6 cap screws "B" from the injection pump drive cover and remove the cover.

8. Remove the 3 cap screws "C" (*Illust. 66*) which secure the timing indicator "D" and pump gear "E" to the gear hub; then lift off the timing indicator. Take notice of the position of the timing indicator before moving it.

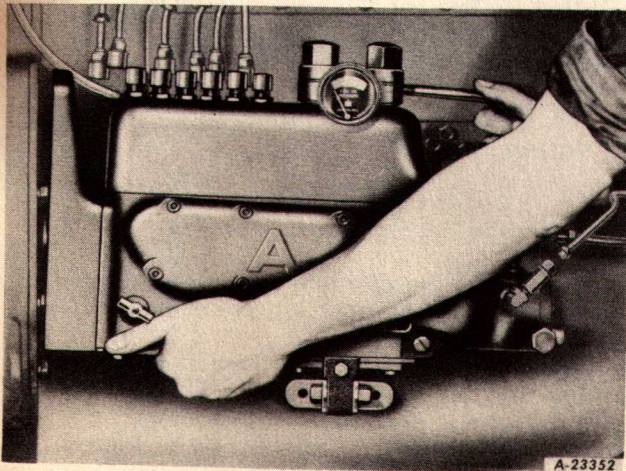
9. Remove the 4 cap screws "F" and the 2 cap screws "G." (Crank the engine to reach the 2 cap screws "G" behind the timing gear.)

10. Remove the 2 cap screws "H" (*Illust. 65*) which secure the pump to the pump bracket. Lift off the complete pump assembly.

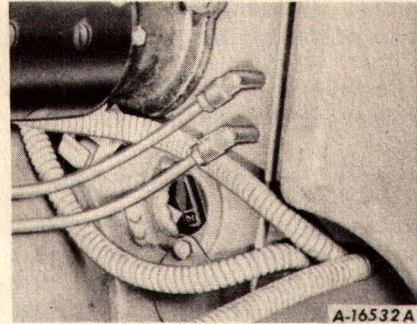
Installing the Fuel Injection Pump

To install the fuel injection pump, proceed as follows:

1. Support the pump gear so it will not bind in the crankcase front cover, and



Illust. 67
Removing fuel injection pump.



Illust. 68
Showing "DC" mark on the flywheel.

crank the engine until the No. 1 cylinder is at top dead center of the compression stroke. This position can be determined by removing the No. 1 spark plug and placing your thumb over the opening and cranking the engine slowly until an outward pressure is felt. Continue cranking slowly until the "DC" mark on the flywheel is in line with the pointer (as seen through the opening in the flywheel housing, *Illust. 68*).

2. Assemble a new gasket to the pump mounting flange. Lift the pump into place against the crankcase front plate, inserting the pump gear hub into the pump gear and lining up the notch in the gear hub with the notch on the front face of the gear.

3. Secure the top of the pump mounting flange to the crankcase front cover with 2 cap screws. Secure the pump bracket to the injection pump with 2 cap screws.

4. Assemble the timing indicator to the gear hub, setting the indicator at "0." Insert and tighten 3 cap screws which secure the indicator and the gear to the hub.

5. Crank the engine and align the large holes in the pump gear with the cap screw holes behind the gear, and insert and tighten the 4 cap screws, as alignment takes place.

6. Assemble the gear cover with a new gasket and secure it to the crankcase front cover with 6 cap screws.

7. Connect the engine speed control rod.

8. Connect the fuel lines. Be sure all connections are clean and tight. **CAUTION:** When reassembling pipe nuts on the fuel lines to the injection pump, turn each nut with a wrench until you can feel the nut solidly con-

MAINTENANCE

DIESEL FUEL SYSTEM - Continued

tact the sleeve. From that point apply 1/6 turn to 1/3 turn with the wrench.

9. Lubricate the pump as specified in the "LUBRICATION GUIDE" on pages 42 and 43.

10. Connect the "coil-to-distributor" cable to the ignition coil. Pull the compression release rod out to the gasoline starting position.

11. Start the engine on gasoline and vent the air from the entire fuel system (refer to "VENTING AIR FROM THE FUEL SYSTEM" following.)

12. Convert to the diesel cycle and note engine operation. If the engine operates unevenly, check and adjust timing (refer to "TIMING THE FUEL INJECTION PUMP" following).

Timing the Fuel Injection Pump

The timing of the fuel injection pump can be adjusted by slots in the pump driving gear where it is bolted to the gear hub, the hub being keyed to the pump shaft.

The adjustment is normally set with the timing indicator on the center mark of the graduations on the pump gear. To be sure of the best operating conditions, the indicator can be tried on either side of the center mark and set at the best operating position.

To change the location of the indicator, loosen the 3 cap screws "C" (*Illust. 66*) which secure the indicator and gear to the gear hub. Turn the gear hub until the indicator is at the desired position; then tighten the cap screws.

To advance the time of fuel injection, turn the gear hub clockwise. To retard the injection, turn the hub counterclockwise.

The correct adjustment is obtained when the engine speed is maximum for a fixed load and engine operation is smooth with a clean exhaust.

Venting Air From the Fuel System

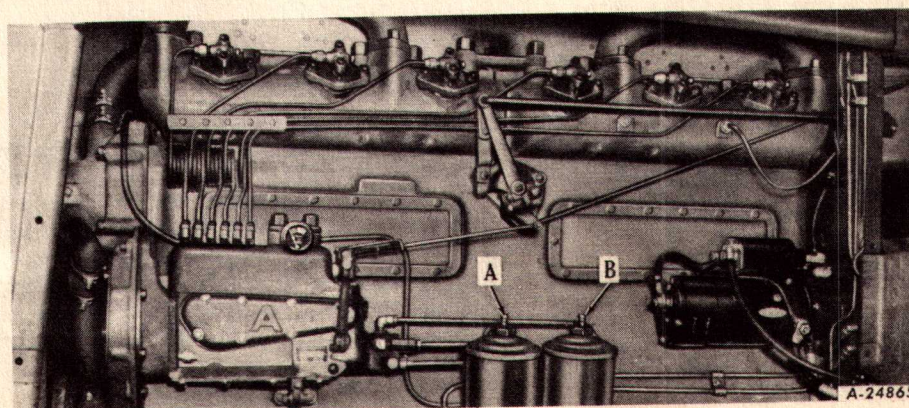
If the fuel filters have been drained, if the fuel pipes have been disconnected, or if air has entered the system for any reason, it will be necessary to vent the system before the engine will operate properly on the diesel cycle. To remove the air it is necessary to vent the system by opening the vents on the fuel filters, as follows:

1. Be sure the shut-off valve under the operator's seat is open and that there is a supply of fuel in the tank.

2. Open the vent "A" (*Illust. 69*) on the auxiliary fuel filter. When fuel flows from the vent free from air, close the vent.

3. Start the engine. With the engine operating on gasoline, advance the engine speed control lever slightly (do not move the compression release rod); open the vent "B" at the top of the final fuel filter. When fuel flows from the vent free from air, close the vent.

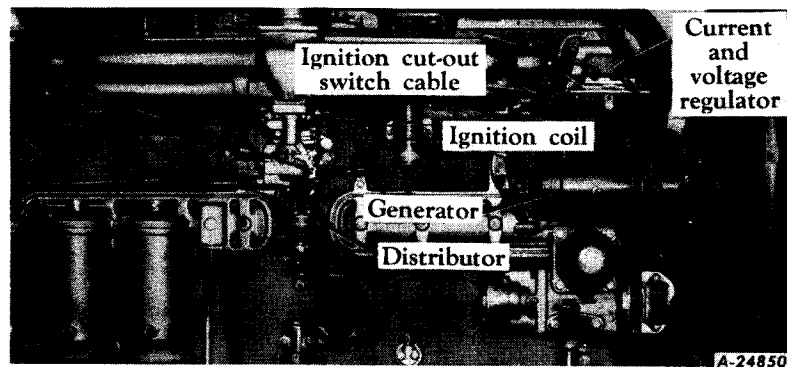
4. Advance the engine speed control lever until white smoke appears in the exhaust. Switch to diesel cycle and work the engine speed control lever back and forth until the air is removed from the injection lines and nozzles.



Illust. 69
Venting air from the diesel fuel system.

MAINTENANCE

IGNITION SYSTEM



Illust. 70
General view of ignition system.

The ignition system is used only for starting the engine on the gasoline cycle. It consists of an ignition cut-out switch and cable located in the front end of the intake manifold; a high tension distributor; an ignition coil mounted above and to the right of the distributor; a condenser located in the distributor; and a spark plug and spark plug cable for each cylinder.

Distributor

The distributor is essentially a high speed switch timed to the engine to distribute a hot spark to each of the cylinders at the proper moment. The ignition coil transforms low voltage current to sufficiently high voltage to jump the gaps at the spark plugs. The high voltage from the coil is distributed to the correct cylinder spark plugs by the distributor cap. The rotor turns counterclockwise when viewed from the top.

The condenser is connected across the distributor contact points. The function of the condenser is to cut off the flow of current when the points are opening.

Lubricating the Distributor

After every 120 hours of operation, turn the grease cup down one turn. The

grease cup should be filled with chassis lubricant. Apply 1 drop of SAE-10 oil to the breaker arm pivot and the felt under the rotor. Apply a light coat of IH magneto grease to the breaker arm rubbing block. **DO NOT OVER LUBRICATE.** Excess oil or grease is liable to get on the contact points and cause them to burn.

Lubricating the Ignition Cut-out Switch

After every 960 hours of operation, remove the manifold end cover and apply a trace of magneto grease to the contact points of the ignition cut-out switch.

Distributor Cap

Both the inside and the outside of the distributor cap should be kept free from dust, moisture and oil deposits. Every 3 or 4 months remove the distributor cap and examine the inside. If any of the above mentioned conditions are present, thoroughly clean the inside and outside of all dirt and wipe dry. The distributor rotor should also be kept clean.

MAINTENANCE

IGNITION SYSTEM - Continued

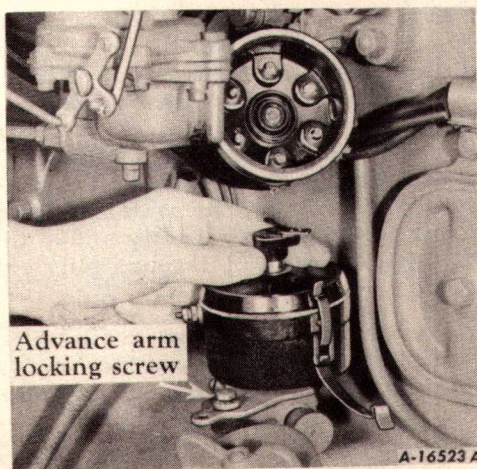
Distributor Contact Points

After every 240 hours of operation, the distributor contact points should be checked for wear and correct gap setting. Clean the points, if necessary, with a few strokes of a fine sharp file. Never use emery cloth or sandpaper to clean points, since particles will embed and cause arcing and rapid burning of the points. If the points are worn or pitted excessively, both points must be replaced with new ones. After dressing both points adjust them for correct gap setting. Adjustment of contact points can be made with the distributor mounted on the engine as follows:

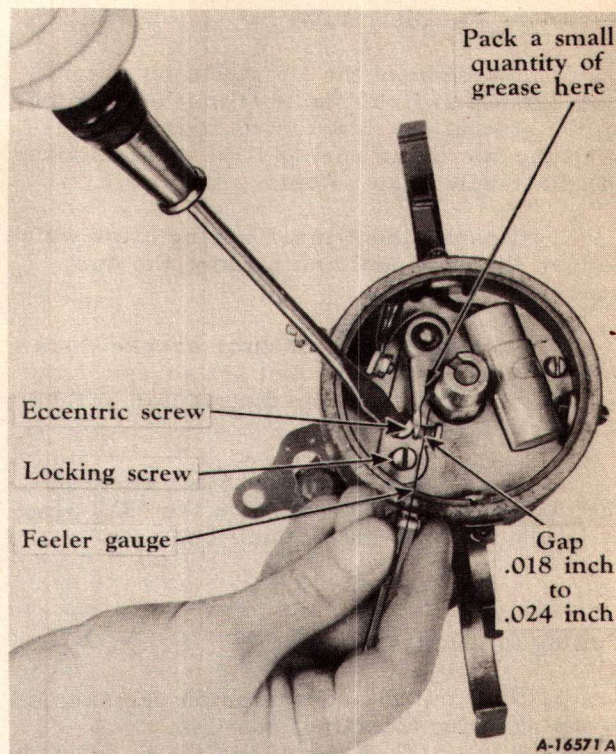
1. Disconnect the coil-to-distributor cable at the coil end. Pull the compression release rod out to the gasoline (starting) position.

2. Remove the distributor cap, rotor and seal (*Illust. 71*). Crank the engine slowly until the breaker arm rests on the high point of the cam lobe.

3. Loosen the breaker arm locking screw and turn the eccentric screw until there is from 0.018 to 0.024 inch gap between the contact points. Be accurate; use a feeler gauge.

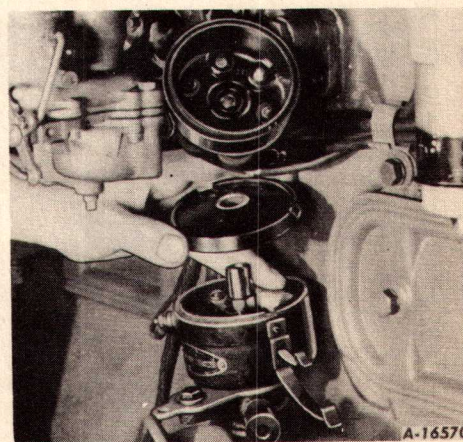


Illust. 71
Removing distributor cap and rotor.



Illust. 72
Adjusting distributor contact points.

4. After adjustment has been made, be sure to tighten the locking screw.



Illust. 73
Removing distributor dust seal.

MAINTENANCE

IGNITION SYSTEM - Continued

Removing the Distributor

1. Disconnect the "distributor to ignition cut-out switch" cable from the terminal on the side of the distributor housing. Unsnap the two outer spring clips and remove the distributor cap. Remove the rotor.

2. Unsnap the 2 inner spring clips which secure the dust seal and remove the dust seal (*Illust. 73*).

3. Loosen the distributor bracket lock nut and distributor bracket set screw (*Illust. 74*). Lift out the distributor bracket and distributor.

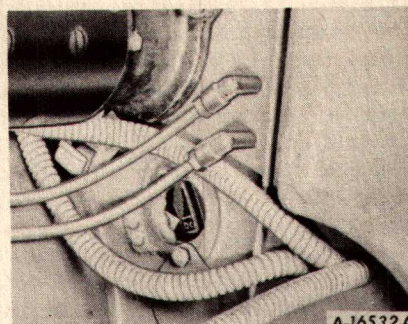
4. To install the distributor, reverse the above procedure. Be sure the "O" ring is in place and in good condition.

Timing the Distributor

1. Pull out the compression release rod to the gasoline (starting) position.

2. Before attempting ignition timing see that the gap between the distributor contact points is 0.018 to 0.024 inch. Points must be clean, free from pits and lined up squarely with each other.

3. Crank the engine until the No. 1 piston (at radiator end) is at the top dead center of the compression stroke. The compression



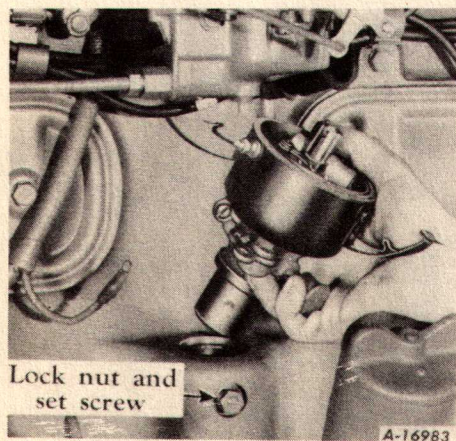
Illust. 75
"DC" mark on flywheel.

stroke can be determined by removing the No. 1 spark plug and placing the thumb over the opening and cranking the engine until an outward pressure is felt. Continue cranking the engine slowly until the "DC" mark on the flywheel is in line with the pointer (as seen through the opening in the flywheel housing, *Illust. 75*).

4. Remove the distributor cap and lift up the distributor. Assemble the distributor in the distributor bracket with the spring clips approximately parallel to the center line of the engine. With the advance arm clamp screw loose, fully advance the spark by rotating the arm counterclockwise to the limit of the slot. Tighten the advance arm to the bracket.

NOTE: The distributor should be timed properly when the spring clips are approximately parallel to the center line of the engine. However, the distributor may be rotated slightly either way for exact timing. Then secure the distributor by tightening the advance arm clamp screw. When the distributor cap is in place, the metal strip on the rotor arm should be directly under the terminal to which the No. 1 spark plug cable is attached.

5. The distributor is now in firing position for the No. 1 cylinder, and the No. 1 spark plug cable must be assembled in the distributor cap in the terminal hole directly above the rotor arm. The firing order is 1-5-3-6-2-4 and the spark plug cables must be assembled in the distributor cap in this order in a counterclockwise rotation (*Illust. 76*).



Illust. 74
Removing distributor and bracket.

MAINTENANCE

IGNITION SYSTEM - Continued

6. To recheck the timing, turn on the ignition switch and slowly crank the engine until the No. 1 piston is again coming up on the compression stroke. Hold the plug end of the No. 1 spark plug cable $1/4$ inch from the cylinder head and continue cranking the engine very slowly until a spark occurs. At this point the "DC" mark on the flywheel should be in line with the pointer. If it is not, the distributor must be reset. If the "DC" mark on the flywheel is below the pointer, move the advance arm on the distributor counterclockwise. If the "DC" mark is above the pointer, move the advance arm clockwise and check the timing again.

7. Timing may also be adjusted with the engine operating on gasoline, with the distributor advance arm loosened. Move the advance arm clockwise or counterclockwise until the best performance is obtained. Be sure to tighten the advance arm clamp screw after adjustment has been made.

8. If the oil pump assembly has been removed from the engine, it will also be necessary to remove the distributor before re-installing the oil pump. Crank the engine until the No. 1 piston is at the top dead center of the compression stroke. Assemble the oil pump in the engine so that the distributor drive slots are approximately parallel with the crankshaft and with the offset toward the engine. Assemble the distributor on the engine and retune the distributor.

Spark Plugs

The spark plugs selected, after careful tests, as best suited for this engine are Champion No. 44, A.C. No. 18, or Auto-Lite No. TT-15, and these should be used ordinarily. Use only a complete set of either type of spark plug.

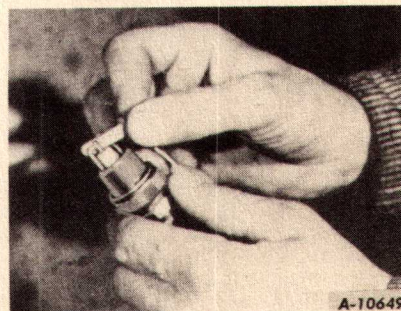
Cleaning Spark Plugs

1. Sand blasting is the recommended method of cleaning spark plugs. Never scrape or clean the insulator with anything which will scratch the porcelain. Scratched porcelain allows carbon and dirt to accumulate much faster.

2. Spark plugs should be removed after every 240 hours of operation, or oftener if necessary, for cleaning and checking the gaps between the electrodes. A gap of 0.035 to 0.040 inch should be maintained (a gauge of this thickness is furnished). When making this adjustment, always bend the outer electrode. Never bend the center electrode, as it may damage the insulator. If the gap between the electrodes is too great, due to improper setting or burning off the ends, the engine will misfire and be hard to start.

3. Always use a spark plug wrench when removing or replacing plugs, to prevent cracking the porcelain.

4. Be sure the spark plug gaskets are in good condition. Replace defective plugs.



Illustr. 76
Cleaning spark plug gap.

MAINTENANCE

IGNITION SYSTEM - Continued

Cables

If spark plug cables are removed for any reason, note the position of each cable on the distributor and replace each in the same position. Connect the cables to the spark plugs and then to the distributor. Connect the No. 1 cylinder spark plug cable to the No. 1 socket on the distributor cap. Advancing counter-clockwise on the distributor cap, connect the next socket with the No. 5 spark plug cable; the next with the No. 3 cable; the next with the No. 6 cable; the next with the No. 2 cable; and the last with the No. 4 cable.

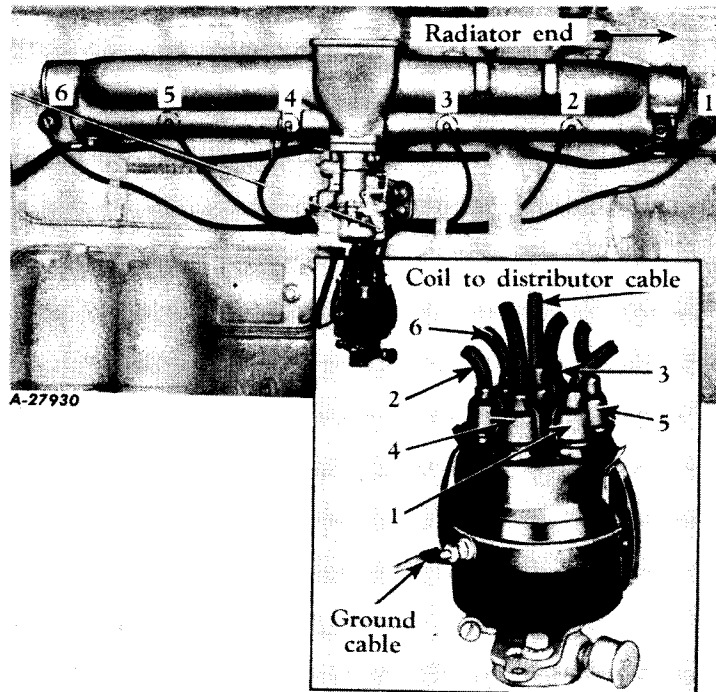
Be sure the cable terminals are pushed all the way into the distributor cap sockets

and that they make good contact, otherwise a green coating will form in the hole.

The ignition cut-out switch cable is attached to the terminal on the distributor housing.

There should be 1/4 inch minimum clearance between the cables and the cylinder heads. Maintaining this clearance will prevent shorting out the spark plugs and the cables will be away from the extreme heat of the cylinder heads. If a cable touches a cylinder head, heat soon causes the rubber to become soft and ruins the cable.

Never allow the cables to become oil-soaked.



Illust. 77
Cables from distributor to spark plugs.
Fitting order is 1-5-3-6-2-4.

MAINTENANCE

ELECTRICAL SYSTEM

The tractor is equipped with a 12 - 24 volt electrical system which includes a generator, voltage and current regulator, ammeter, series-parallel type starting switch, ignition and light switch, oil pressure switch, ignition cut-out switch, ignition coil, distributor, spark plugs and cables, and starting motor with solenoid. The four 6-volt batteries are wired in parallel for normal operating conditions after the engine is started; in starting they are automatically connected in series by the series-parallel starting switch to provide 24 volts for the starting motor. The lighting and ignition cables are contained in a nonmetallic woven braid, oil and waterproof harness; the battery cables are protected in flexible steel tubing. The wiring diagram (*Illust. 81*) can be used as a guide for identifying the various electrical units and for tracing the electrical cables and connections. Be sure all the terminals are clean and securely fastened. Make sure there are no broken wires anywhere in the electrical circuit.

The tractor was shipped with the "left-hand battery positive terminal to solenoid" cable (32) (*Illust. 81*) and the "right-hand battery negative terminal to starting motor" cable (23) disconnected from the solenoid and starting motor. Therefore, before starting the engine, be sure these cables are properly connected -- the short cable (23) to the starting motor and the longer cable (32) to the solenoid.

CAUTION: Before working on any part of the electrical system, disconnect the two battery cables (32 and 23) (*Illust. 81*) from their terminals on the solenoid and starting motor. Do not reconnect these cables until all electrical work has been completed. This will prevent shorting and causing damage to any of the electrical units.

Voltage and Current Regulator

The generator output to the electrical system is controlled automatically by a highly sensitive, factory tested and sealed control device called the voltage and current regulator. It is mounted in a bracket on the right side of the engine above the generator.

There are 3 separate units in the regulator; the cut-out relay, the voltage regulator, and the current regulator.

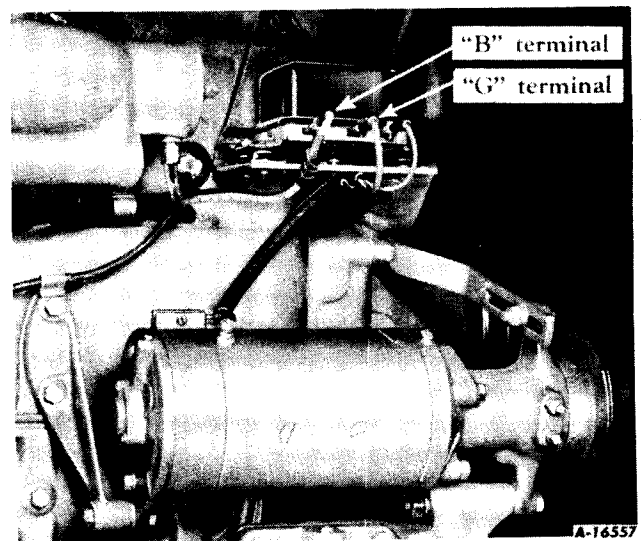
1. The cut-out relay closes the circuit between the generator and the batteries when the generator voltage is sufficient to force a charge into the batteries. The cut-out relay opens the circuit when the generator slows or stops and prevents current from flowing back from the batteries into the generator.

2. The voltage regulator prevents the line voltage from exceeding a predetermined value, thus protecting the batteries and other electrical units in the system from high voltage and excessive voltage surges.

3. The current regulator limits the generator output to a safe level. It is, in effect, a current limiting device which operates when the generator output has increased to its safe maximum and prevents the generator from exceeding this value.

NOTE: Either the current regulator or voltage regulator operates at any one time. The two do not operate at the same time.

When there is indication of trouble that cannot be simply determined and corrected, we recommend that you see your International Industrial Power distributor or dealer. **DO NOT ATTEMPT TO ADJUST OR REPAIR THE REGULATOR UNIT.**



Illust. 78
Voltage and current regulator and generator.

MAINTENANCE

ELECTRICAL SYSTEM - Continued

Circuit Breakers

Circuit breakers are installed on the engine side of the dash panel above the starting motor (*Illust. 80*), as a safety precaution against short circuiting and overloading. When the electrical system is overloaded, the circuit breakers will automatically disconnect the circuit in 30 to 45 second intervals with a clicking sound until the overload is removed. When the clicking sound is heard, stop operations and investigate the cause of the overload. If unable to find the cause, see your International Industrial Power distributor or dealer.

Ignition and Light Switch

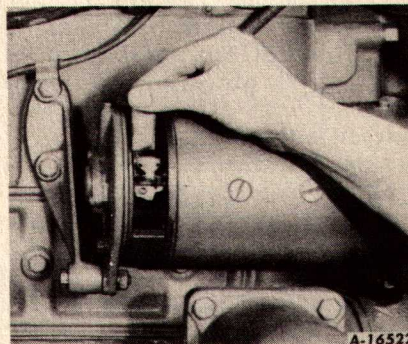
The combination ignition and light switch is located directly under the engine speed control lever on the instrument panel. The switch has 5 positions: In counter-clockwise rotation the first position is ignition for starting; the second is the OFF position; the third is for all lamps including head, tail and dash lamps; the fourth is for the head and tail lamps only; and the fifth is for head lamps only.

Generator

The generator is sealed against dirt. It is hinge-mounted to the right side of the crankcase and is driven by 2 "V" belts from the fan and water pump pulley. The generator is shunt wound and has a maximum rated output of 12 to 13 amperes with the output controlled by the voltage and current regulator.

NOTE: Do not operate the generator until the battery charging circuit is connected. The generator will burn out if operated with any wires of the charging circuit disconnected or broken. If it is necessary to operate the generator without the batteries, remove the cable from the "F" terminal on the generator frame.

CAUTION: Any time the cables have been disconnected from and reconnected to the generator, it is necessary to repolarize the generator by placing a jumper lead momentarily across the "B" and "G" terminals of the voltage and current regulator.



Illust. 79
Cleaning generator commutator.

Cleaning the Generator Commutator

If the commutator is dirty or slightly burred, it can be polished by holding a piece of No. 00 sandpaper against the commutator with a wood stick, moving it back and forth across the commutator while the armature is slowly revolving. **NEVER USE EMERY OR CARBORUNDUM CLOTH.** Blow all dust from the commutator after the polishing operation is finished. If the commutator is worn, rough or out-of-round, it is advisable to take the unit to your International Industrial Power distributor or dealer and have the commutator reconditioned.

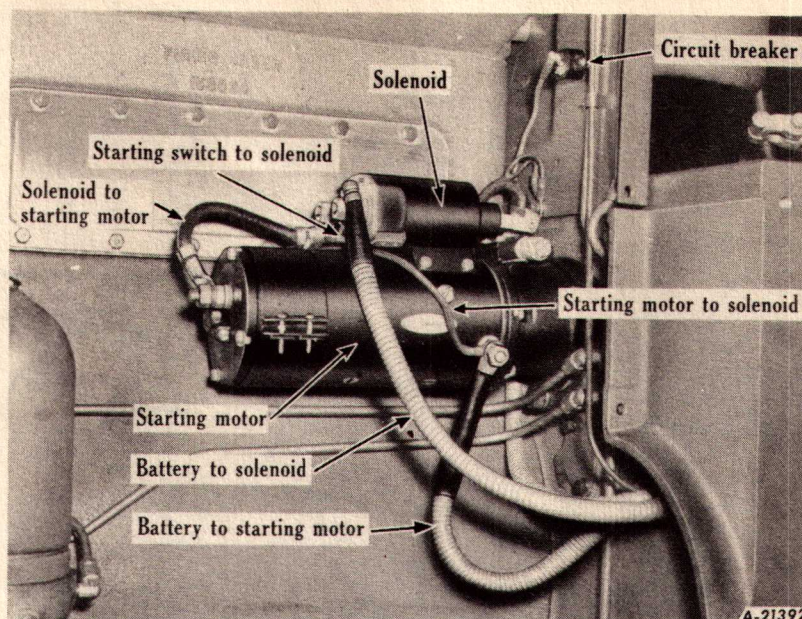
Lubricating the Generator

Follow the lubricating instructions for the generator outlined in the "LUBRICATION GUIDE" on pages 42 and 43. Do not lubricate excessively, since excessive oiling may cause the oil and grease to gum on the commutator and will result in a reduction of the generator output.

NOTE: NEVER OIL THE COMMUTATOR

MAINTENANCE

ELECTRICAL SYSTEM - Continued



Illustr. 80
Starting motor, solenoid and cables.

Starting Motor

The starting motor is mounted to the rear engine support. It requires no lubrication, since it is equipped with oilless type bearings. However, at any time the starting motor is disassembled for repair or service, the bearings should be supplied with a few drops of light motor oil.

At regular intervals remove the starting motor commutator cover and inspect the commutator. To clean the commutator, pull the compression release rod out to the gasoline starting position and disconnect the coil-to-distributor cable from the coil end. Depress the starter button and, with the starting motor operating, hold a piece of No. 00 sandpaper against the commutator with a wood stick to clean off dirt and discoloration. NEVER USE EMERY OR CARBORUNDUM CLOTH. Blow all dust from the commutator compartment after cleaning.

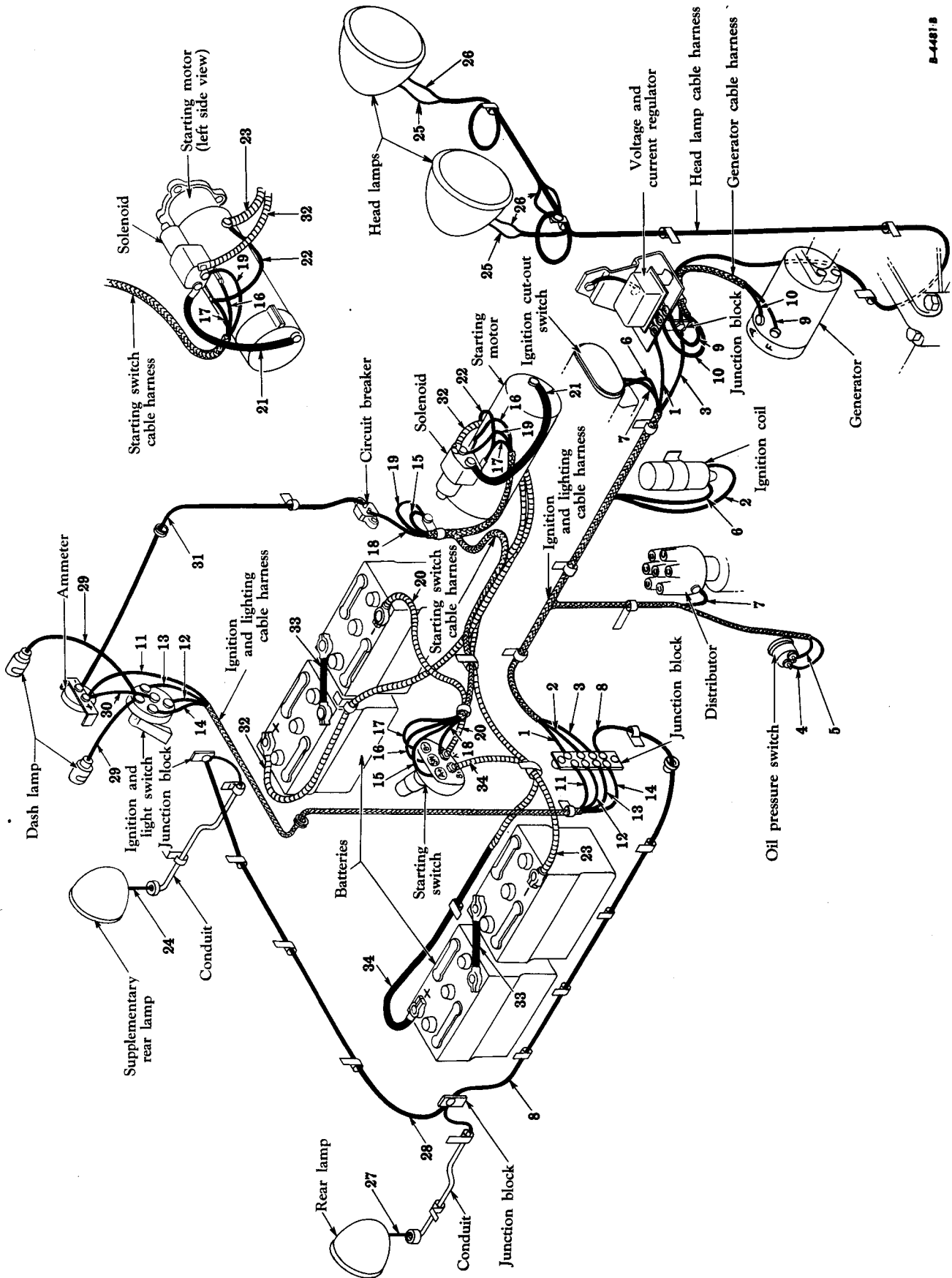
Removing the Starting Motor

If it is necessary to remove the starting motor from the engine, proceed as follows:

1. Disconnect the "battery to solenoid" cable and the "solenoid to ground" cable from the solenoid.
2. Disconnect the "battery to starting motor" cable from the starting motor.
3. Disconnect the 2 "starting switch to solenoid" cables from the solenoid.
4. Disconnect the "solenoid to ground" cable from the solenoid.
5. Remove the cap screws which secure the starting motor to the engine rear support.
6. Lift the complete starting motor forward and away from the engine.

To install the starting motor, reverse the procedure for removal.

MAINTENANCE



B-4481.8

Illustr. 81 - Wiring diagram.

MAINTENANCE

ELECTRICAL SYSTEM - Continued

REFERENCE LIST FOR ILLUSTR. 81

1. Junction block to "BAT" terminal of voltage and current regulator - natural with black and red cross tracers.
2. Junction block to primary of ignition coil (negative side) - natural with red tracer.
3. Junction block to junction block - black.
4. Oil pressure switch to splice on item No. 1 - natural with black and red cross tracers.
5. Oil pressure switch to splice on item No. 2 - natural with red tracer.
6. Primary of ignition coil (positive side) to manifold ignition switch - black.
7. Distributor to manifold ignition switch - black.
8. Rear light feeder cable.
9. "F" terminal of generator to "F" terminal of voltage and current regulator - natural with red tracer.
10. "A" terminal of generator to "GEN" terminal of voltage and current regulator - natural with black and red cross tracers.
11. Junction block to ammeter - natural with black and red cross tracers.
12. Junction block to ignition terminal on ignition and light switch - natural with red tracer.
13. Junction block to head light terminal on ignition and light switch - black.
14. Junction block to rear light terminal on ignition and light switch - black with red tracer.
15. A+ terminal on starting switch to ground - black.
16. SW terminal on starting switch to solenoid - green.
17. B- terminal on starting switch to solenoid - natural with red tracer.
18. A- terminal on starting switch to circuit breaker - red.
19. Solenoid to ground - black.
20. Battery to A- terminal on starting switch.
- 21 - 22. Cables furnished with starting motor.
23. Battery to starting motor.
24. Junction block to supplementary rear lamp - seal brown with black and red tracer.
25. Junction block to head lamps - seal brown with black tracer.
26. Head lamps to ground - black.
27. Junction block to rear lamp - black.
28. Junction block to junction block - seal brown with black and red tracer.
29. Cable furnished with dash lamp.
30. Ammeter to ignition and light switch - black.
31. Ammeter to circuit breaker.
32. Battery to solenoid.
33. Battery to battery.
34. Battery to B+ terminal on starting switch.

MAINTENANCE

ELECTRICAL SYSTEM - Continued

Storage Batteries

1. **REGISTRATION CARD.** (Not for export.) A registration card is furnished with the batteries. This card should be filled in and given to your International Industrial Power distributor or dealer for registration.

2. **BATTERIES FOR EXPORT.** Complete instructions are included with batteries.

3. **KEEP TERMINALS CLEAN.** Battery cable terminals must be clean and tight. Use hot water for removing terminal corrosion and for cleaning top of battery. Brighten terminal contact surface with wire wool, apply a light coat of vaseline, and reassemble. Be sure terminals are clamped tightly and that the batteries are fastened securely in the battery boxes.

4. **KEEP VENTS OPEN.** Keep vent holes in battery filler caps open.

5. **KEEP UP ELECTROLYTE LEVEL.** The electrolyte in each cell should be 3/8 inch above the separators. Keep the electrolyte up to this level at all times, to prevent battery failure. When the electrolyte falls below this level, pure distilled water should be added. Never use hydrant water or any water which has been in a metal receptacle. Keep pure distilled water in a glass jar on hand for battery use only. To put water in a cell, use a clean syringe. When adding water to the batteries in temperature near the freezing point (32° F.), always operate the engine long enough to mix the water and the electrolyte, or damage to the batteries from the water freezing will result.

6. **KEEP BATTERIES FULLY CHARGED.** The batteries must be maintained at full or nearly full charge to operate the starting motor satisfactorily. The specific gravity of the electrolyte indicates the strength of the battery charge and its ability to crank the engine. The following table illustrates a typical range of specific gravity readings (at 80° F. or corrected to 80° F.) with respect to the condition of the battery charge:

1.280 sp. gr.	Fully charged
1.250 sp. gr.	75% charged
1.220 sp. gr.	50% charged
1.190 sp. gr.	25% charged
1.160 sp. gr.	Very little useful capacity
1.130 sp. gr.	Discharged

Specific gravity reading of at least 1.250 at 80° F., or corrected to 80° F., should be maintained (see par. 7 following). If the specific gravity falls below this figure, the generator charging rate should be increased or the batteries should be recharged with standard auxiliary battery recharger.

7. **VARIATION OF ELECTROLYTE SPECIFIC GRAVITY WITH THE TEMPERATURE.** The specific gravity reading of the electrolyte will vary with the temperature. For instance, fully charged batteries reading 1.280 at 80° F. will read 1.268 at 110° F. or 1.312 at 0° F. When checking specific gravity to determine the condition of the battery charge or to adjust the charging rate of the generator, if the temperature is extremely high or low, the hydrometer reading at the actual electrolyte temperature should be corrected to standard reading at 80° F. by referring to the table following:

Read the thermometer in the electrolyte. Read the hydrometer. At the top of the table which follows, find the column headed by the temperature nearest to the electrolyte temperature; find in that column the figure nearest the observed specific gravity reading and trace horizontally across to the 80° F. column. The figure in the 80° F. column is the true electrolyte specific gravity and should form the basis for any adjustment.

0° F	20° F	40° F	80° F	100° F	110° F	120° F
1.251	1.243	1.236	1.220	1.213	1.209	1.205
1.261	1.253	1.246	1.230	1.223	1.219	1.215
1.271	1.263	1.256	1.240	1.233	1.229	1.225
1.281	1.273	1.266	1.250	1.243	1.239	1.235
1.291	1.283	1.276	1.260	1.252	1.249	1.245
1.301	1.294	1.286	1.270	1.262	1.258	1.255
1.312	1.304	1.296	1.280	1.272	1.268	1.265

8. PRECAUTIONS FOR CHECKING AND MAINTAINING SPECIFIC GRAVITY.

a. Inspect the batteries once a week or more often to maintain the correct specific gravity. **NOTE:** After operating approximately 40 hours, if it is found that the water has evaporated more than 2 ounces (an average size hydrometer full) from each cell of the batteries, this is a sign that the batteries are being over-charged. **DO NOT NEGLECT THIS SIGN.** Have your International Industrial Power distributor or dealer adjust the electrical charging rate. Delay may seriously damage the batteries.

MAINTENANCE

ELECTRICAL SYSTEM - Continued

b. Specific gravity readings should not be made immediately after water has been put into the batteries; take readings either before the water is added or after the batteries have been on charge for some time.

c. All cells should show approximately the same specific gravity reading. Wide variation indicates something wrong. See your International Industrial Power distributor or dealer.

d. The specific gravity reading of the electrolyte in a fully charged battery **SHOULD NOT EXCEED** the value specified by the manufacturer. If the specific gravity of a battery seems excessively high, refer to your International Industrial Power distributor or dealer.

e. Acid or electrolyte should never be added except by a skilled battery man. Under no circumstances add any special battery "dopes", solutions or powders.

9. **EFFECT OF LOW TEMPERATURES ON BATTERY PERFORMANCE.** Battery capacity is greatly reduced by cold, as cold has a decided numbing effect on the electrochemical action in the battery. The following comparison indicates the reduction in cranking power of a fully charged battery when the temperature of the electrolyte drops from 80° F. to 32° F. and to 0° F.

80° F.	100%
32° F.	65%
0° F.	40%

10. **COMPARISON OF POWER REQUIRED TO CRANK ENGINE AT DIFFERENT TEMPERATURES.** The power required to crank the engine is greatly increased by cold, as indicated in the following chart. The comparison is based on atmospheric temperatures of 80° F., 32° F., and 0° F., and crankcase lubrication with SAE-20.

80° F.	100%
32° F.	165%
0° F.	250%

11. **DANGER OF BATTERIES FREEZING WHEN NOT FULLY CHARGED.** It is important to keep the batteries close to full charge in cold weather operation, to avoid the danger of freezing. The electrolyte of a battery will start to freeze (first ice crystals begin to appear in the electrolyte, although it does not freeze solid until a lower temperature is reached) approximately as indicated below (specific gravity readings corrected to 80° F.):

1.250 sp. gr.	Freezes at - 60° F.
1.200 sp. gr.	Freezes at - 15° F.
1.150 sp. gr.	Freezes at + 5° F.
1.100 sp. gr.	Freezes at + 20° F.

12. **BATTERY VOLTAGE.** With the batteries fully charged and on charge at the normal rate, the average cell voltage at 80° F. ranges between 2.5 and 2.7 volts; at 100° F. it ranges between 2.4 and 2.6 volts.

MAINTENANCE

TRACK ASSEMBLIES

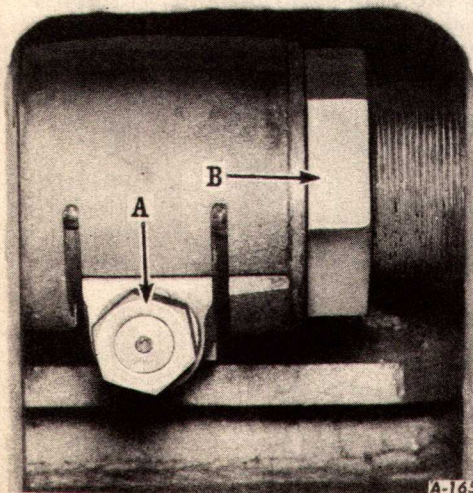
If the track chain is too loose, it may have a tendency to climb the sprocket when backing the tractor.

When the track adjustment is either too tight or too loose, it causes undue wear on the track links, pins, bushings and bearings, and also on the front idler bearings.

Checking Slack in Track Chain

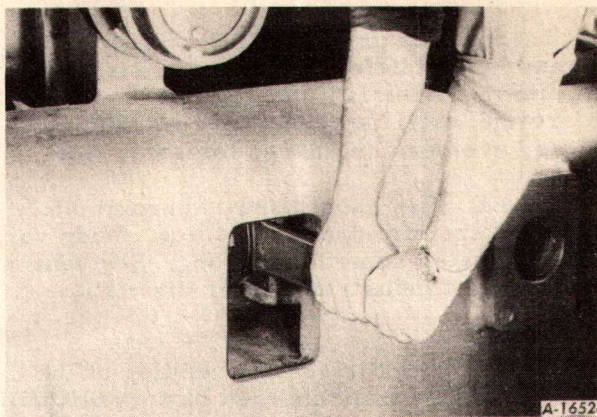
To check the slack in the track chain, the chain must be pulled tight everywhere except along the top, between the 2 track idlers. This can be accomplished by placing a wooden block approximately 1 foot in height under the foremost track shoe lug. With the engine running, put the tractor in low gear and engage the engine clutch just enough so the sprocket drive tightens the chain along the ground and around the sprocket. After locking the brake and stopping the engine, stand on top of the track chain midway between the 2 track idlers. Your weight will pull the chain tight around the front idler. All the slack should now be in the top center part of the track chain.

Place a straightedge along the top of the track lugs between the 2 idlers. With a ruler, measure the clearance between the bottom of the straightedge and the top of the track shoe lug nearest to the midway point between the 2 track idlers. This clearance should be $\frac{3}{4}$ to 1 inch. If clearance is more or less than this, track tension should be adjusted.



A-16568

Illustr. 82
Track tension adjuster nut and lock bolt.



A-16524

Illustr. 83 - Adjusting track chain tension.

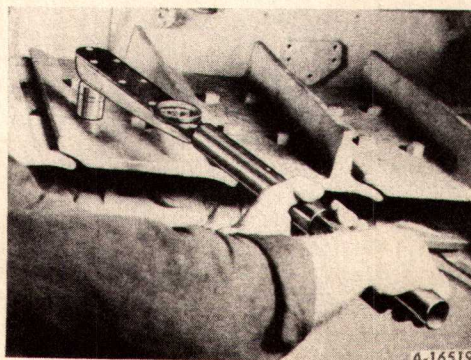
Adjusting Track Chain Tension

The track spring assembly (which consists of a series of saucer-like bellville springs in an enclosed cylinder) permits the front idler to recoil under heavy shock, but holds it in position against a full-load track pull with the tractor in reverse.

If adjustment is necessary, loosen lock bolt "A" (Illustr. 82). Turn the adjuster nut "B" counterclockwise as viewed from the rear or sprocket end; this pushes the front idler forward, tightening the track chain. Turn the adjuster nut clockwise to loosen the track chain. After correct adjustment has been obtained, tighten lock bolt "A."

Tightening Track Shoe Bolts

On a new unit, check track shoe bolts after every 8 hours of operation until it becomes evident that the bolts have taken a "set." This can be determined when the bolts retain a tightness of 440 to 490 ft.-lb. The bolts used for attaching the track shoes to the tracks are heat-treated alloy bolts and they will withstand considerable tightening

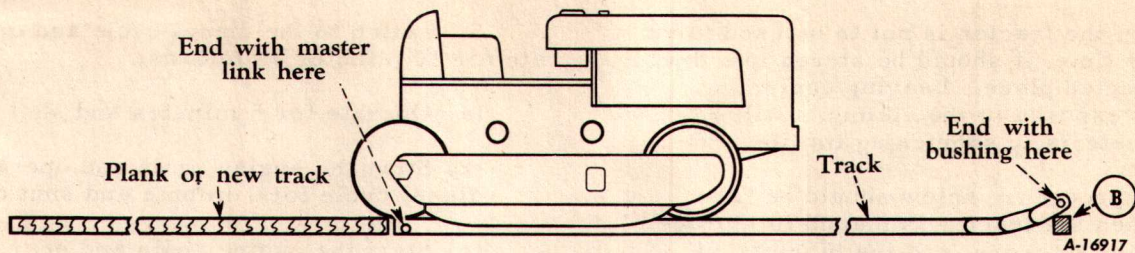


A-16519

Illustr. 84 - Tightening track shoe bolts.

MAINTENANCE

TRACK ASSEMBLIES - Continued



Illustr. 85 - Removing the track.

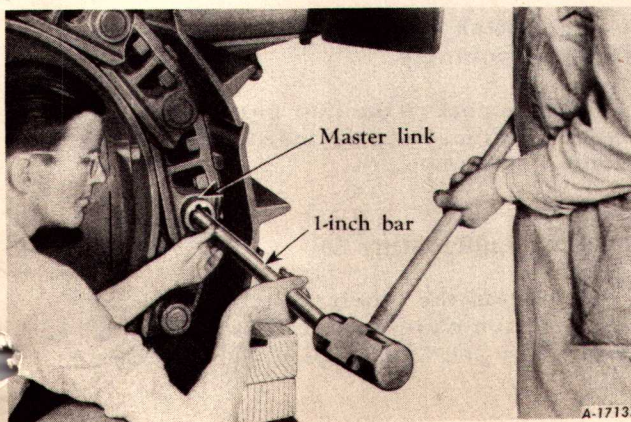
strain. (Common bolts should not be used.)

While tightening the bolts, it is well to strike the head of the bolt several sharp hammer blows; then retighten. As a safety measure we recommend the use of goggles to protect the eyes while striking the bolts.

Removing the Track

To remove the entire track from the tractor, drive the tractor forward until the track link master pin is in the front of the front idler (Illustr. 86). The tractor should be level when removing the track chain. Loosen the tension in the track chain as described under "Adjusting Track Chain Tension."

Remove the track link master pin by removing the master pin lock wire and driving out the master pin (Illustr. 86). Drive the tractor backward until it is at the end of the track. Place a plank flush against the rear of the track when the track is flat on the ground, as shown in (Illustr. 85). The plank should be approximately the same thickness as the track, narrow enough to fit between the track frame shields, and long enough so the entire tractor can rest on the plank. Back the tractor off the tracks and onto the plank.



Illustr. 86
Driving out track link master pin.

NOTE: If it is desired to replace the old track with a new one, remove the old track as previously mentioned and place the new track (instead of a plank) flush against the rear of the old track when the track is flat on the ground.

Installing Track Chain

When installing the track chain, place the track flush against the plank. The end with the bushing should be in the position shown in Illustr. 85. Drive the tractor forward onto the track until the sprocket is slightly ahead of the rear end of the track. Put a crowbar through the master pin hole and pull the track up around the sprocket and forward over the track idlers and the front idler as the tractor is driven forward.

CAUTION: Drive the tractor forward in low speed with the engine speed control lever in the idle position, and ride the brakes so the tractor does not travel too fast.

Place a block (about 8 to 10 inches high) under the lug of the shoe on the last link of the track at "B" (Illustr. 85) to hold the track against the idler. Engage the engine clutch and apply just enough power in the forward speed to take the slack out of the bottom part of the track. Then, install the master pin and lock wire. Adjust the tension in the track chain as described above.

Track Roller Lubrication

It is important that the track rollers have the proper lubrication (refer to "LUBRICATION GUIDE" on pages 42 and 43).

Drawbar Clevis Pin Lock

The drawbar clevis pin lock prevents the clevis pin from working upward when pulling a load. To lift the clevis pin, turn the locking wedge downward (toward the pin head) and hold it in this position while lifting the pin.

MAINTENANCE

STORING AND HOUSING

When the tractor is not to be used for a period of time, it should be stored in a dry and protected place. Leaving equipment outdoors exposed to the elements will result in materially shortening its life.

The procedure below should be followed when the tractor is placed in storage for 30 days or more, and the lubrication precautions should be repeated every 6 months thereafter. We also recommend caution in starting an engine that has been in storage (see instructions on the following page).

Cleaning

Thoroughly wash or clean the tractor.

Lubricating

Completely lubricate the tractor. Refer to "LUBRICATION GUIDE" on pages 42 and 43.

Draining Diesel Fuel

Drain the diesel fuel tank, water trap, and fuel filters. Open the air vents to secure complete drainage. Close the vents.

Applying Flushing Oil

On Engines Equipped with IH Fuel Injection Pumps

1. Disconnect the fuel return pipe at the injection pump, then connect a suitable tubing to the pump to allow excess fuel or flushing oil to drain into a container.
2. Pour 4 gallons of flushing oil into the fuel tank. Use high quality recommended flushing oil. In emergencies a flushing oil mixture of half kerosene and half good grade light lubricating oil may be used.
3. Open the air vent on the auxiliary fuel filter. When oil appears, close the vent.
4. Start the engine and operate on gasoline, with the engine speed control lever slightly advanced. Open the vent on the final fuel filter; when oil appears, close the vent.

5. Switch to the diesel cycle and operate for 10 minutes as follows:

- (a) Operate for 5 minutes and shut down.
- (b) Start the engine again and operate on diesel cycle for 1 minute and shut down.
- (c) Start the engine again and operate on diesel cycle for the remaining 4 minutes and then shut down.

6. Reconnect the fuel line. CAUTION: The engine must not be operated after the flushing operation.

Applying Flushing Oil

On Engines Equipped with Bosch Fuel Injection Pumps

1. Disconnect the fuel return pipe at the injection pump, then connect tubing to the pump to allow excess fuel or flushing oil to drain into a container.
2. Disconnect the fuel pipe from the water trap to the fuel supply pump. Connect a suitable tubing to the inlet side of the supply pump to lead to a container of high quality recommended flushing oil. In emergencies a flushing oil mixture of half kerosene and half good grade light lubricating oil may be used. About 2 gallons of flushing oil will be required to flush the engine.
3. Start the engine and operate on gasoline with the engine speed control lever slightly advanced. Open the air vent on the fuel filter until oil appears, then close the vent.
4. Switch to the diesel cycle and operate for 10 minutes.
5. Reconnect the fuel pipes. CAUTION: The engine must not be operated after the flushing operation.

Checking Lubricating Oil

1. Drain the lubricating oil from the fuel injection pump and refill with new oil as specified in the "LUBRICATION GUIDE."

MAINTENANCE

STORING AND HOUSING - Continued

2. Drain the lubricating oil filter cases and base. Remove the lubricating oil filter elements. If any evidence of rust is found on the center studs, clean thoroughly. Replace the filter elements with new ones.

Draining Water

Drain all water from the cooling system.

Draining Fuel

Drain all gasoline from the gasoline tank, strainer bowl, and carburetor.

Drain the diesel fuel tank.

Slushing the Engine

Slush the engine with SAE-50 lubricating oil as follows:

1. Remove the spark plugs and pull the compression release rod back to the gasoline (starting) position so that the starting valves are open. Spray about 1 ounce SAE-50 lubricating oil through the spark plug opening in each cylinder, using an air gun

attached to an oil can. Replace the spark plugs and push the compression release rod in to the diesel position.

2. Remove the valve covers and spray oil over the rocker arm and valve assemblies. Replace the covers.

Storing Batteries

Remove batteries and store in a warm place. Batteries must be fully charged at time of storage. See that the electrolyte is kept at the proper level; check at least once a month. Batteries should never be allowed to run down below 3/4 full charge while in storage.

Covering Engine Openings

Put metal covers over the tops of the exhaust pipes. Remove the air cleaner cap and put a metal cover over the pipe. Plug the crankcase breather pipe. Do this so moisture, dirt, etc., will not enter the engine.

MAINTENANCE

STARTING ENGINES THAT HAVE BEEN IN STORAGE

1. Remove the spark plugs and put the compression release rod in the gasoline (starting) position. Pour a mixture of half gasoline and half SAE-10 motor oil into each cylinder (2 tablespoonfuls per cylinder is sufficient).

2. Remove the valve covers and flush the valves and valve operating mechanism with the same mixture.

3. Install the batteries, making sure all connections are clean and tight.

4. Turn the engine rapidly with the starting motor until the excess oil has been blown out of the spark plug holes. (This operation will loosen any tight piston rings and wash old gummy oil from the valves and pistons.)

5. Flush out the crankcase with kerosene and fill it with the proper grade of lubricating oil as specified in the "LUBRICATION GUIDE."

6. Drain the oil from the fuel injection pump and refill to the proper level with lubricating oil as specified in the "LUBRICATION GUIDE."

7. Before starting the engine, be sure the filters have new elements.

8. Remove the coverings and plugs from the exhaust pipes, air cleaner and breather pipes.

9. Install the spark plugs. Check the gaps, which should be 0.035 to 0.040 inch.

10. Fill the cooling system.

11. Fill the fuel tanks, then open the gasoline and diesel fuel shut-off valves.

12. Vent the fuel system (page 71). Operate the engine slowly. Observe if any of the valves are sticking. If they are, pour a small quantity of diesel fuel, dry-cleaning solvent, or kerosene on the valve stems until the valves become free.

13. Assemble the valve covers.

14. Check the lubricants in the transmission, hydraulic system and final drive housings.

15. Do not accelerate the engine rapidly or operate at high speed immediately after starting.

SPECIAL ATTACHMENTS

Special attachments are available to meet varied operating conditions; they make International equipment even more adaptable to specific requirements. You can depend on these attachments being soundly engineered to the tractor on which they will be used.

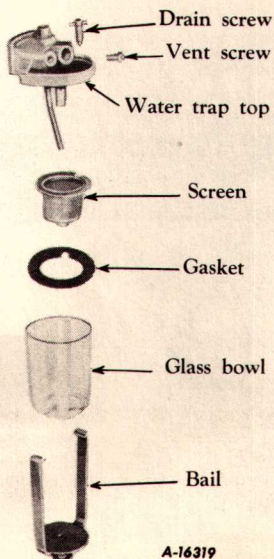
The following pages contain information on the operation and care of these attachments which you are urged to read and study to be assured of more satisfactory service. Instructions for assembling attachments are contained in separate manuals.

DIESEL FUEL SYSTEM FOR TRACTORS EQUIPPED WITH BOSCH FUEL INJECTION PUMPS

Various components of this fuel system are the same as in the system using the IH fuel injection pump. Reference will be made to the instructions and illustrations given for the IH set-up when the information also applies to the Bosch.

This fuel system includes: the fuel tank, water trap, fuel filter; Bosch fuel injection pump with supply pump and governor unit; injection nozzles; and necessary piping and connections. Fuel passes through the system as follows:

1. Fuel flows from the fuel tank by gravity into the water trap.
2. The supply pump draws the fuel from the water trap and forces it through the fuel filter.
3. From the fuel filter the fuel passes into the fuel injection pump, where it is metered and forced through the fuel lines to the injection nozzles and into the combustion chambers of the engine.



Illust. 87
Fuel strainer and water trap.

Servicing the Water Trap

Proper servicing of the diesel fuel water trap is of vital importance. If the fuel filter becomes waterlogged the fuel will not flow freely. The trap should be drained after every 10 hours of operation, or more frequently if excessive water is found. The trap is located on the fuel line and is drained by opening the drain screw on top of the trap. (The water trap in the fuel filter base must also be drained.)

The water trap should be cleaned after every 480 hours of operation.

1. Close the fuel shut-off valve on the fuel inlet line.
2. Loosen the thumb nut under the bowl. Remove the bail strap and the bowl.
3. Loosen the gasket and pull the screen off the tube. Wash the screen and the bowl in kerosene.
4. Reassemble the screen and gasket. The gasket must be in good condition and in its proper place.
5. Reassemble the bowl and strap and tighten the thumb nut.
6. After draining or cleaning the water trap, it is necessary to vent the system.
7. In case there is not sufficient clearance to remove the bowl as above, it may be necessary to remove the entire water trap from the bracket first.

Servicing the Fuel Filter

The fuel filter element cannot be cleaned, and it should not be disturbed, except when necessary to replace it. The life of the element depends on the amount of dirt, water,

Continued on next page

SPECIAL ATTACHMENTS

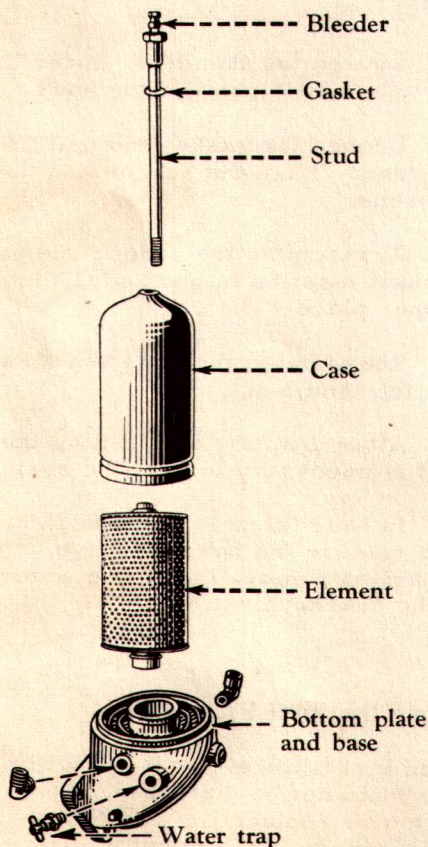
DIESEL FUEL SYSTEM FOR TRACTORS EQUIPPED WITH BOSCH FUEL INJECTION PUMPS - Continued

and sediment it must remove from the fuel. It is therefore important to keep the fuel clean and free from water during storage and when handling it.

The need for frequent venting of the fuel filter indicates either air leakage into the fuel lines or that the fuel filter has become clogged, restricting the fuel flow to the engine. Loss of power and engine missing are indications of restriction of the fuel filter.

To replace the fuel filter element:

1. Close the fuel shut-off valve under the fuel tank.
2. Clean the outside of the filter case and the base thoroughly with diesel fuel or kerosene.
3. Open the bleeder valve (air vent) at the top of the filter and remove the drain plug in the base of the filter, and allow the fuel to drain.



A-21360

Illust. 88
Diesel fuel filter disassembled.

4. Unscrew the case stud and lift the filter case and stud from the filter base.

5. Remove the old element.

6. Place the new filter element in the base. (The end with the large pilot must be down.) Insert the new element carefully, using a slight twisting motion to prevent damage to the seal ring on the bottom pilot.

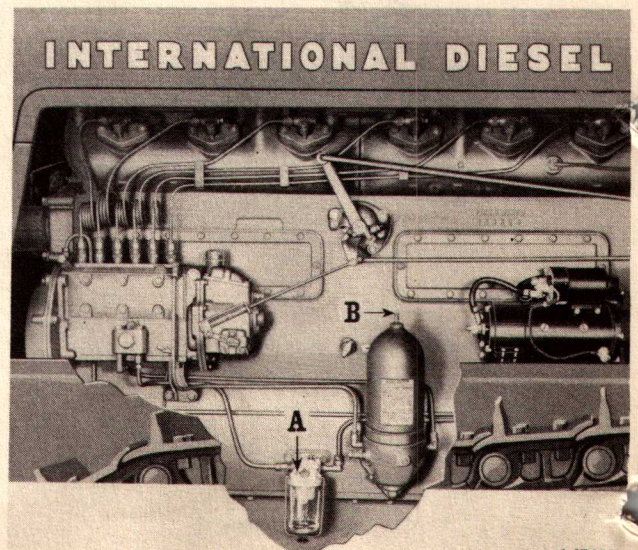
7. Install the case (making sure the gasket is in good condition) and insert the stud through the filter element and into the filter base. (When inserting the stud through the element turn the threaded portion of the seal ring into the top of the filter element to prevent damage.) Draw the case down tight by tightening the case stud.

Cleaning Breather Cap

The breather cap on the top of the governor should be removed and cleaned after every 240 hours of operation, or more often if dusty conditions require it. To clean the breather, wash it in diesel fuel or kerosene, dip it in engine lubricating oil, and install it after the excess oil has been wiped off.

Venting Air

If the fuel filter has been drained, if the fuel pipes have been disconnected, or if air has entered the system for any reason, it



A-17623

Illust. 89
Venting air.

SPECIAL ATTACHMENTS

DIESEL FUEL SYSTEM FOR TRACTORS EQUIPPED WITH BOSCH FUEL INJECTION PUMPS - Continued

will be necessary to vent the system before the engine will operate properly on the diesel cycle. To remove the air it is necessary to vent the system by opening the vents on the fuel filter as follows:

1. Be sure the shut-off valve under the fuel tank is open.

2. Open the water trap air vent "A". (Illust 89). When fuel flows from the vent free from air close the vent.

3. Start the engine on gasoline. With the engine operating on gasoline open the fuel filter vent "B". When fuel flows free from air close the vent.

4. With the engine still operating on the gasoline cycle advance the engine speed con-

trol lever slightly until white smoke appears in the exhaust. Switch to diesel cycle and work engine speed control lever back and forth until air is removed from injection lines and nozzles.

Removing the Fuel Injection Pump

Refer to pages 69 and 70.

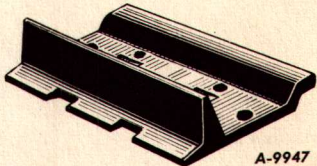
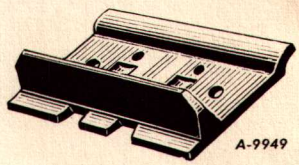
Installing the Fuel Injection Pump

Refer to pages 70 and 71.

Timing the Fuel Injection Pump

Refer to page 71.

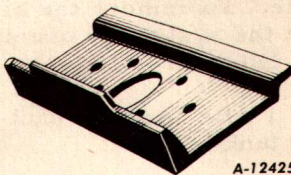
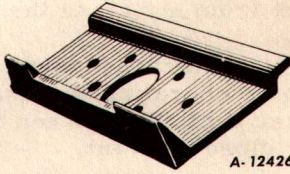
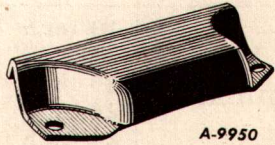

TRACK SHOE ATTACHMENTS

TYPE OF SHOE	SHOE WIDTH	ATTACHMENT NUMBER	SHOE NUMBER	SHOES REQUIRED	
REGULAR SHOE Square Corner Grouser	18 inch	259 286 R91	254 013 R1	78	 <p style="text-align: center;">Illust. 90</p> <p>For all general operating conditions.</p>
	18 inch	*259 289 R91	254 013 R1	84	
	20 inch	259 290 R91	251 746 R1	78	
	20 inch	*259 291 R91	251 746 R1	84	
	22 inch	256 076 R91	253 212 R1	78	
	22 inch	*256 077 R91	253 212 R1	84	
	24 inch	256 078 R91	254 014 R1	78	
	24 inch	*256 079 R91	254 014 R1	84	
	26 inch	256 080 R91	254 015 R1	78	
	26 inch	*256 081 R91	254 015 R1	84	
	28 inch	257 801 R91	254 016 R1	78	
	28 inch	*257 802 R91	254 016 R1	84	
REGULAR SHOE Clipped Corner Grouser	18 inch	259 292 R91	254 017 R1	78	 <p style="text-align: center;">Illust. 91</p> <p>Less likely to damage pavements or smooth surfaces when turning. Pull out of ground easier and retard tractor less in heavy soil.</p>
	18 inch	*259 293 R91	254 017 R1	84	
	20 inch	259 294 R91	254 018 R1	78	
	20 inch	*259 295 R91	254 018 R1	84	
	22 inch	257 803 R91	254 019 R1	78	
	22 inch	*257 804 R91	254 019 R1	84	
	24 inch	257 805 R91	254 020 R1	78	
	24 inch	*257 806 R91	254 020 R1	84	
	26 inch	257 807 R91	254 021 R1	78	
	26 inch	*257 808 R91	254 021 R1	84	
	28 inch	*257 809 R91	254 022 R1	78	
	28 inch	*257 810 R91	254 022 R1	84	

*These attachments are for application on tractors equipped with extended (7 roller) track frame attachments.

SPECIAL ATTACHMENTS

TRACK SHOE ATTACHMENTS - Continued

TYPE OF SHOE	SHOE WIDTH	ATTACHMENT NUMBER	SHOE NUMBER	SHOES REQUIRED	
STAGGERED LUG ICE GROUSER AND SNOW SHOE	22 inch	261 391 R91	{ 261 381 R1 261 382 R1	39 39	 <p>A-12425</p> <p>Illust. 92</p>
	22 inch	*261 392 R91	{ 261 381 R1 261 382 R1	42 42	
	24 inch	261 393 R91	{ 261 383 R1 261 384 R1	39 39	 <p>A-12426</p> <p>Illust. 93</p> <p>For continued service in ice and snow. Non-overlapping edge and cut-out hole prevent snow from packing in track chain.</p>
	24 inch	*261 394 R91	{ 261 383 R1 261 384 R1	42 42	
	26 inch	261 395 R91	{ 261 385 R1 261 386 R1	39 39	
	26 inch	*261 396 R91	{ 261 385 R1 261 386 R1	42 42	
STREET PLATE		261 388 R91 (Half Set) (For standard or extended track frames)	261 380 R1	42	 <p>A-9950</p> <p>Illust. 94</p> <p>Fit over all sizes of staggered lug ice grousers, square or clipped corner track shoes, and prevent damage to hard surfaced roads.</p>
		261 389 R91 (Full set)	261 380 R1	78	
		*261 390 R91 (Full set)	261 380 R1	84	
TEE TYPE ICE GROUSER		261 397 R91	261 387 R1	78	 <p>A-27942</p> <p>Illust. 95</p> <p>Used on all sizes of square corner and clipped corner track shoes.</p>
		*261 398 R91	261 387 R1	84	

*These attachments are for application on tractors equipped with extended (7 roller) track frame attachments.

SPECIAL ATTACHMENTS

SPRING - LOADED ENGINE CLUTCH

Description

This clutch is a 16 inch, 2 plate, spring-loaded clutch. A foot pedal with a booster spring makes clutch disengagement easy and facilitates rapid gear shifting.

Maintenance

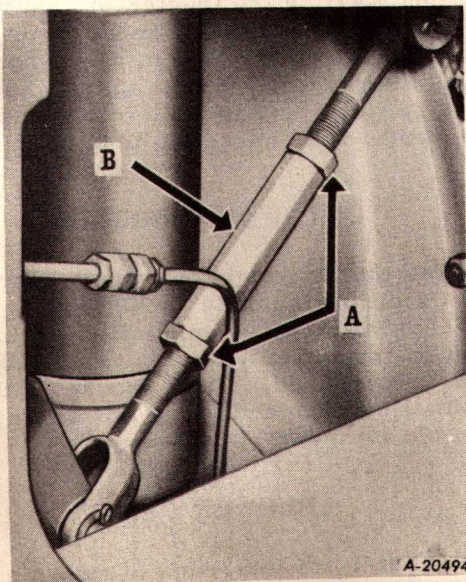
This clutch requires a minimum of attention. However, it is very important to observe closely the instructions contained in the "LUBRICATION GUIDE" on pages 42 and 43.

When operating the tractor in water or under very wet conditions, or under extremely dusty conditions, water or dust may enter the clutch compartment through the hole in the bottom of the flywheel housing. To avoid this, insert a 3/4 inch pipe plug into this hole. This plug should be removed after every 60 hours of operation to allow any oil accumulation to drain out.

Operation

1. The clutch is fully engaged when the clutch pedal is all the way back. The pedal should have about 2-1/4 inches of free movement.

2. The clutch should be adjusted when there is a noticeable clutch slippage under a load or when the free movement of the clutch pedal becomes less than 1/4 inch.



Illustr. 96
Engine clutch adjustment (partial).

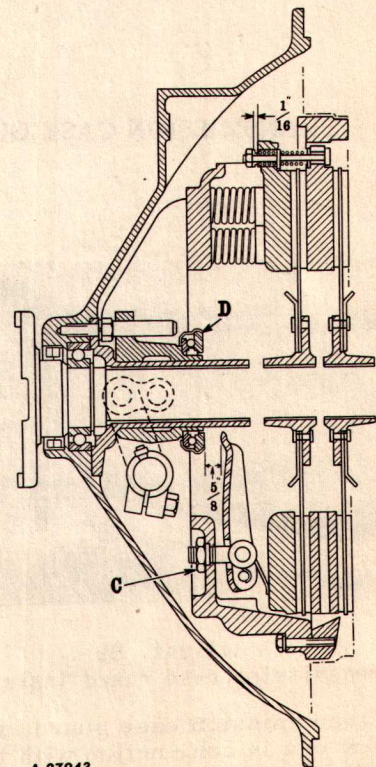
Clutch Replacement

If it becomes necessary to install a new engine clutch, it will not be necessary to adjust the fingers, since the clutch has been properly adjusted at the factory.

Clutch Adjustment - (Partial)

When clutch adjustment is to be made, proceed as follows:

1. Remove the floor plates in the operator's compartment.
2. Remove the cover from the clutch housing.
3. Loosen the lock nuts "A" (Illustr. 96) and turn the turnbuckle "B" until 3/16 inch clearance is obtained between the clutch fingers and the throwout bearing. This simple or "partial" adjustment will ordinarily be sufficient. It should produce about 2-1/4 inches of free movement in the clutch pedal.
4. Tighten the lock nuts "A" and install the cover and floor plates.



Illustr. 97
Engine clutch adjustment (major).

SPECIAL ATTACHMENTS

SPRING - LOADED ENGINE CLUTCH - Continued

Clutch Adjustment - (Major)

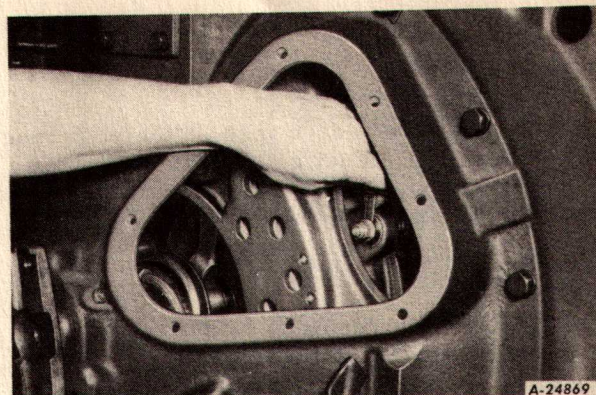
When the above "partial" adjustment can no longer be obtained, then a "major" adjustment is necessary. Proceed as follows:

1. Loosen the jam nuts "C" (*Illust. 97*) until $5/8$ inch clearance is secured between the fingers and the throwout bearing "D" which must be back all the way.
2. After the fingers have been adjusted loosen the lock nuts "A" (*Illust. 96*) and turn the turnbuckle "B" until $3/16$ inch clearance is obtained between the fingers and the throwout bearing. Tighten the lock nuts.
3. Install the cover and floor plates.

Separator Mechanism Adjustment

The separator mechanism requires adjustment every time a "partial" or "major" adjustment is made.

1. Turn the engine until 1 of the 4 center plate return screws is adjacent to the opening (*Illust. 98*).



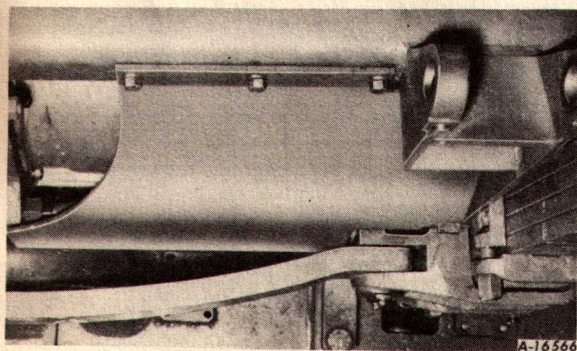
Illust. 98

Checking clearance of pressure plate.

2. With a feeler gauge, see if there is a $1/16$ inch gap between the lip of the return screw bushing and the pressure plate with the clutch engaged. If the gap is greater than $1/16$ inch, tighten the self-locking nut until the proper clearance is obtained.

3. Repeat steps 1 and 2 with the other 3 return screws.

TRANSMISSION CASE GUARD



Illust. 99

Transmission case guard installed.

The transmission case guard is recommended for use in conjunction with the crank-case guard. It will protect the transmission and clutch area from damage against stumps, logs, large boulders and other obstructions.

STARTING PRIMER

When starting the tractor in cold weather, the engine should be primed. A few strokes of the primer button, which sprays raw gasoline directly into the intake manifold, is sufficient. The number of strokes will depend on the operating temperature.

CUTAWAY SPROCKET

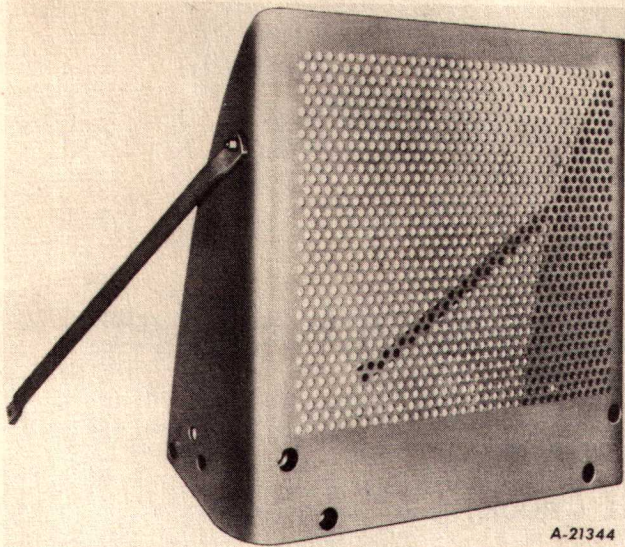
When the tractor is operated under adverse conditions such as snow, mud or sand, the possibility of an accumulation forming around the sprocket teeth and track links is naturally increased. This sprocket with cut-away teeth is designed to cut down this condition to a minimum.

BLOWER FAN

It is often advantageous to reverse the air flow through the radiator, thus preventing chaff or foreign particles from clogging the radiator and grille.

SPECIAL ATTACHMENTS

RADIATOR GUARD



Illust. 100
Radiator guard.

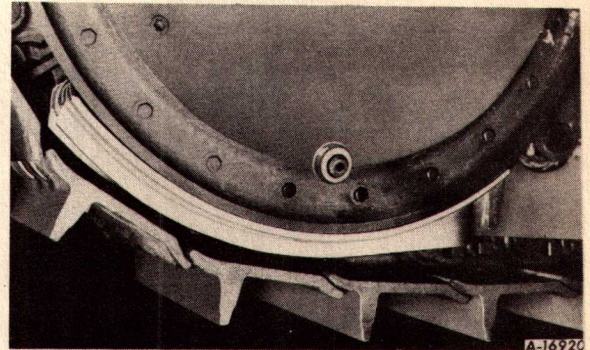
Crawler tractors are built to operate in rough terrain and will stand the gaff of obstacles ordinarily encountered. However, in forest work, mining, land-clearing, brush-breaker plowing, certain earth-moving jobs, etc., the front end of the tractor frequently gets an unusual amount of rough treatment. The special designed radiator guard adds protection for the radiator against damage from trees, stumps, boulders and other objects.

Such protection has the effect of speeding up the work and finishing the job in less time than would be possible with the operator proceeding cautiously to avoid obstacles. Considered from this standpoint, a radiator guard not only prolongs the life of the tractor and saves upkeep expense, but also saves labor cost and increases output.

AIR PIPE EXTENSION

The regular air intake cap is located high enough above the ground to take care of most conditions, but in some localities heavy clouds of dust rise up to the height of the intake cap. With this 36 inch air pipe extension the air screen is above the dust, assuring a cleaner supply of air to the engine.

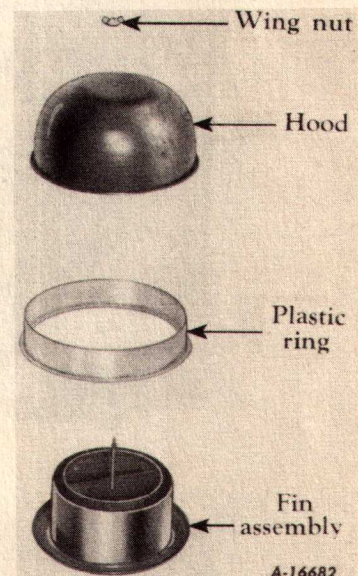
SPROCKET ROCK DEFLECTOR



Illust. 101
Rock deflector installed.

Recommended where rocks, stones, branches, etc., are encountered.

AIR PRE - CLEANER



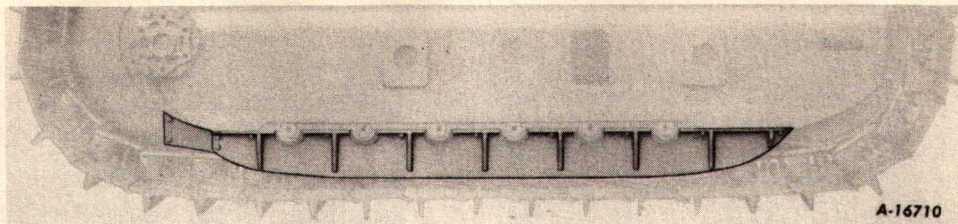
Illust. 102
Air pre-cleaner.

This pre-cleaner replaces the regular cap on the air cleaner and is recommended for use when the tractor is operating in extreme dust conditions. Its use will avoid servicing the air cleaner more frequently than the regular 10 hour servicing period.

For cleaning, loosen the clamp and remove the top of the pre-cleaner. Clean and reinstall the top. When the screens and fins become oily and dirty, wash the entire pre-cleaner in kerosene.

SPECIAL ATTACHMENTS

TRACK ROLLER SHIELD



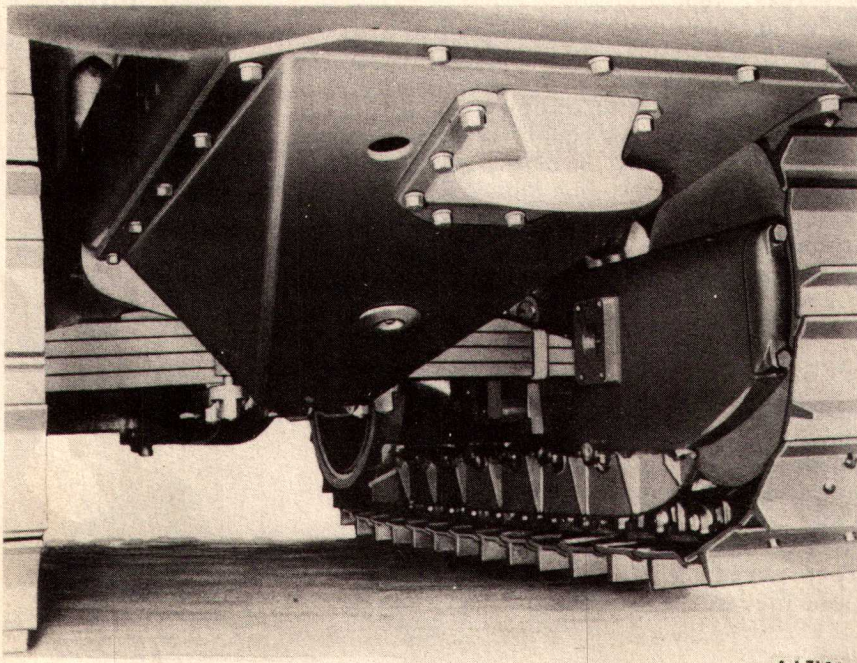
Illust. 103
Track roller shield installed.

Will stop rocks, mud, logs, etc., from entering the track rollers. Made to take extremely hard punishment. Available for

use on regular tractors and on tractors equipped with 7-roller extended track frame attachments.

CRANKCASE GUARD

FRONT PULL - HOOK



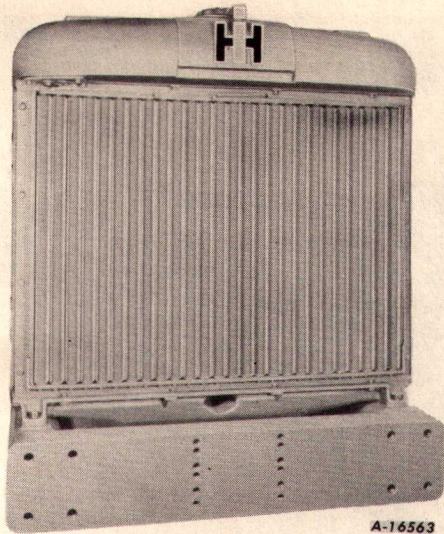
Illust. 104
Crankcase guard and pull-hook installed.

The crankcase guard provides protection against damage to the crankcase oil pan. When operating under conditions where stumps, logs, large boulders or other obstructions are a constant threat, it is advisable to equip the tractor with 1 of these attachments.

By using the front pull-hook in conjunction with the crankcase guard, the pulling power of the tractor reverse speed can be brought into play while the operator remains in the normal seated position, with the job in full view before him. It is handy for hitching tractors in tandem to pull extra heavy loads and is of practical value as an anchor for a tractor equipped with a winch.

SPECIAL ATTACHMENTS

RADIATOR SHUTTER



Illustr. 105
Radiator shutter.

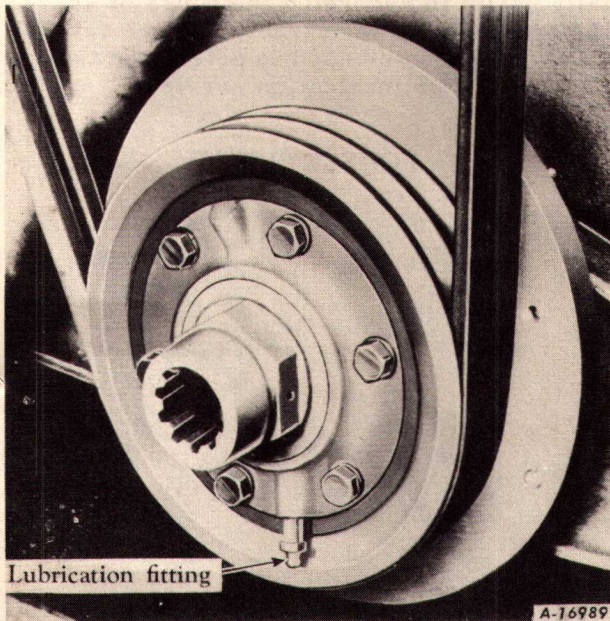
This attachment is useful when starting and operating in cold weather. The operator can easily maintain, from the seat, a more even operating temperature. This temperature registers on a heat indicator that is installed on the instrument panel. By using the control rod, the radiator shutter can be opened wide, closed tight for starting, or set in any intermediate position.

To assist in quickly warming up a cold engine:

1. Close the shutter completely.
2. When the heat indicator begins to show "HOT", open the shutter just enough to maintain the operating temperature on the high side of the "RUN" range.
3. Adjustment of the shutter will vary according to the tractor load, long periods of idling, or the atmospheric temperature.

NOTE: Do not start the engine in freezing weather without closing the shutter first.

FRONT POWER TAKE - OFF COUPLING

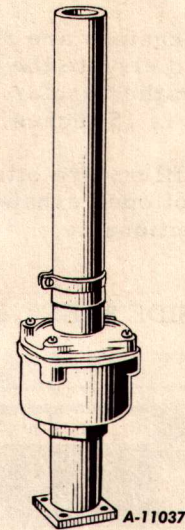


Illustr. 106
Front power take-off coupling.

This attachment provides a coupling at the front end of the crankshaft to which a front power take-off shaft can be attached.

After every 60 hours of operation apply 2 or 3 strokes of the lubricator to the fitting. Use chassis lubricant.

SPARK ARRESTER

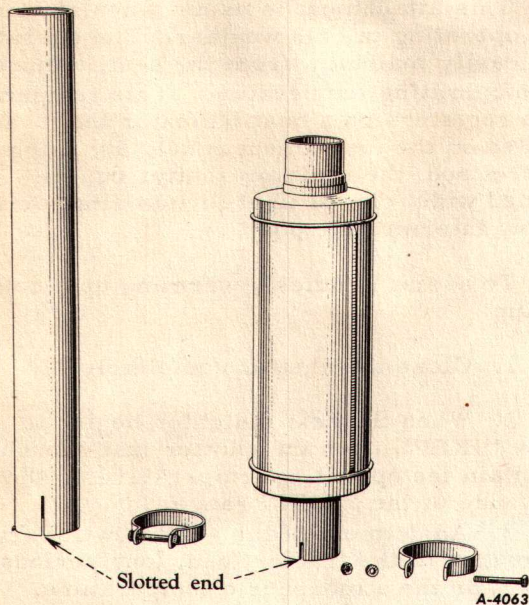


Illustr. 107
Spark arrester.

Spark arresters are valuable insurance against fire hazard when operating near dry underbrush, inflammable material, in forests, oil fields, grain fields, or any place where there is possibility of fire from an exhaust spark. Spark arresters throw the exhaust gases into cyclonic motion which smothers any sparks or hot carbon particles in the exhaust. Two are required for the 2 exhausts.

SPECIAL ATTACHMENTS

EXHAUST EXTENSION EXHAUST MUFFLER



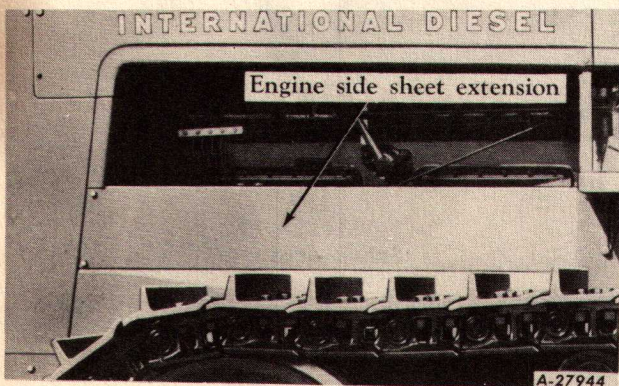
Illust. 108
Exhaust extension and muffler.

These attachments are used in pairs on the two exhaust pipes.

Exhaust extensions are desirable in certain conditions to elevate the exhaust fumes higher than from the regular exhausts. The extension height is 15 inches.

Exhaust mufflers are often required where the roar of open exhausts may be disturbing and objectionable.

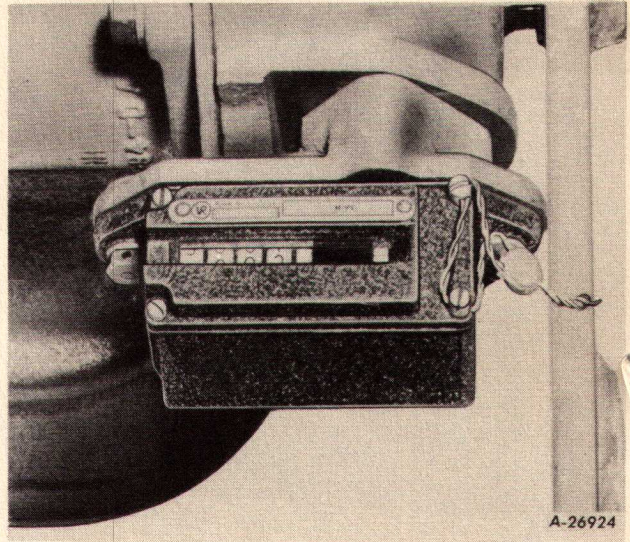
ENGINE SIDE SHEET EXTENSION



Illust. 109
Engine side sheet extension.

The engine side sheet extension will protect the engine from dirt, dust or any debris which may accumulate from the tracks.

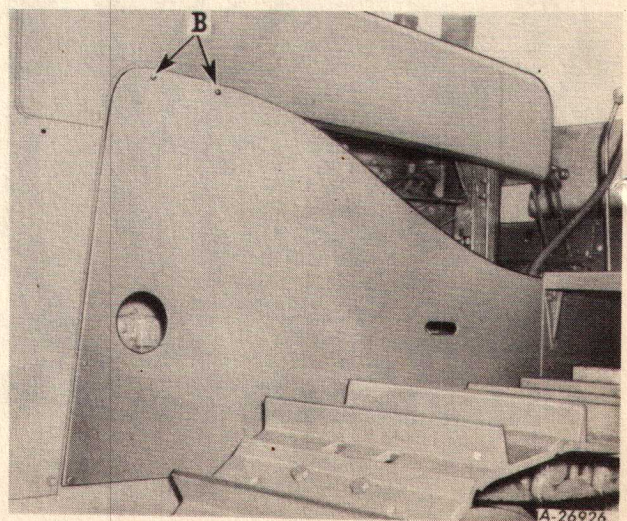
SERVICE METER



Illust. 110 - Service meter.

With a service meter, a check can be kept on the hours the tractor has been operating. It makes possible an accurate computation of the fuel consumption or other operating costs per hour or per job and is especially useful in recording the hours of service performed by each tractor where several are used. It can be used to determine the proper time for lubrication service.

FOREST SHIELD

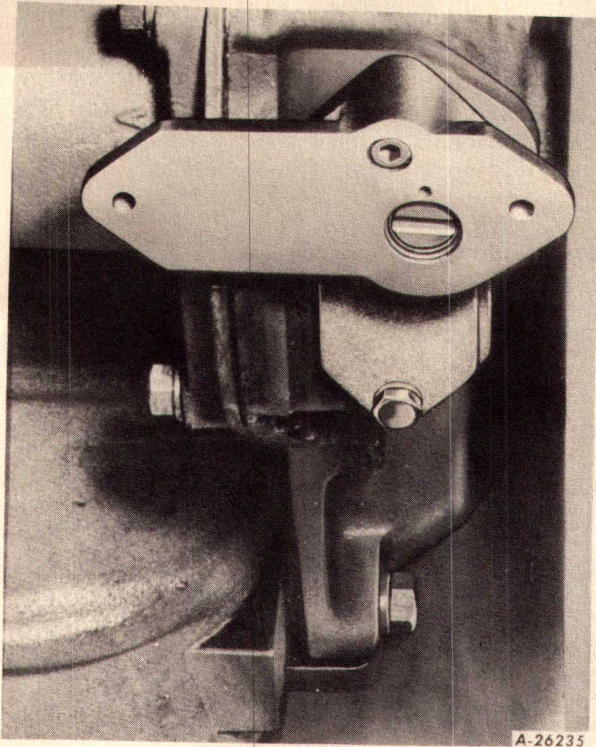


Illust. 111 - Forest shield.

This attachment protects the sides of the engine, saving possible damage to parts, such as fuel line piping, distributor, injection pump, carburetor, etc.

SPECIAL ATTACHMENTS

HORIZONTAL READING SERVICE METER BRACKET



Illustr. 112
Horizontal reading service meter bracket.

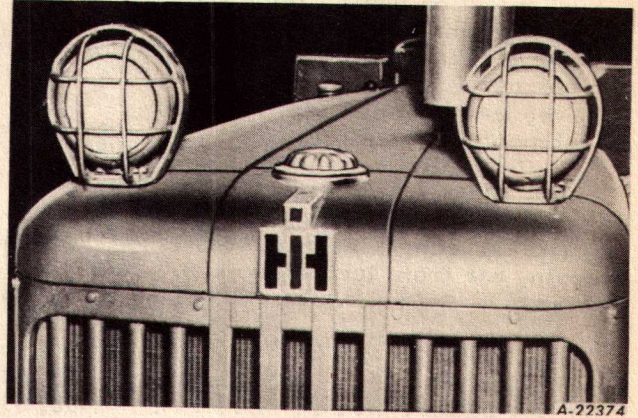
The horizontal reading service meter bracket is to be used on a tractor equipped with a vertical service meter. This attachment enables the operator to read the meter without any inconvenience.

ELECTRIC LIGHTING ATTACHMENTS

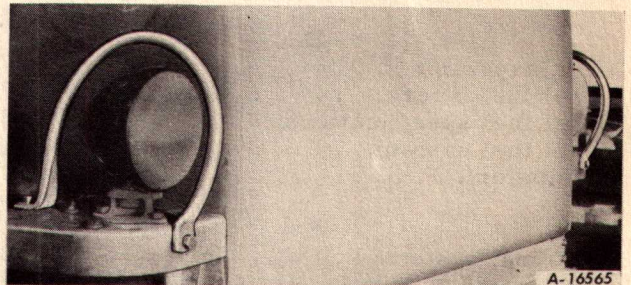
Two head lamps, 2 dash lamps, 1 rear lamp. (Rear lamp mounted on right or left side.)

LAMP GUARDS

Lamp guards are available for protecting both head and rear lamps where the nature of operations would subject them to rough treatment.



Illustr. 113
Head lamp guards.



Illustr. 114
Rear lamp guards.

SUPPLEMENTARY REAR LAMP

For tractors equipped with lighting attachment.

INDEX

A	Pages
Adjustment	61 to 63
Brakes	54
Carburetor	58, 59
Clutch	74
Distributor	57
Fan belt tension	71
Fuel injection pump timing	84
Track chain	60
Valve clearance	51, 52
Air cleaner	25, 26
Antifreeze solutions	89 to 99
Attachments, special	

B	Pages
Batteries	82, 83
"Before-starting" instructions	15, 16
Bleeding air from fuel system	71
Brakes	61 to 63

C	Pages
Carburetor	53, 54
Charging battery	82, 83
Checking mechanical problems	29 to 37
Clutch, engine	58, 59
Cold weather operation	25, 26
Controls and instruments	12 to 14
Cooling system	55 to 58

D	Pages
Daily inspection	17
Diesel fuel filters	66, 67
Diesel fuel specifications	8
Diesel fuel system	64 to 71
Distributor	72

E	Pages
Electrical system	77 to 83
Batteries	82, 83
Distributor	72
Generator	78
Spark plugs and cables	75, 76
Starting motor	79
Wiring diagram	80
Engine clutch	58, 59
Engine noises	34

F	Pages
Fan belts	57
Filters	
Diesel fuel	66, 67
Hydraulic oil	50, 51
Lubricating oil	49, 50
Fuel injection pump	67 to 71

G	Pages
Gasoline strainer	53
Gearshift levers	13, 21
Generator	78

H	Pages
Hot weather operation	26
Hydraulic controls	13, 22
Hydraulic system	50, 51

I	Pages
Ignition system	72 to 76
Injection pump	67 to 71
Inspection before starting	15, 16
Inspections, periodic	27, 28
Instruments and controls	12 to 14

L	Pages
Lubricating oil filters	49, 50
Lubrication	38 to 48
Lubrication guide	42, 43

M	Pages
Maintenance	49 to 85

N	Pages
Noises, engine	

O	Pages
Oil filters	49, 50
Oil pressure indicators	14
Operating instructions	
Diesel engine	19, 20
Tractor	21 to 24
Overheating	33

P	Pages
Periodic inspections	27, 28
Preventive maintenance	27 to 48
Pump, fuel injection	67 to 71

S	Pages
Scavenging valve	68
Shoes, track	84, 91, 92
Spark plugs and cables	75, 76
Special attachments	89 to 99
Specifications	
Diesel fuel	8
Lubricants	40
Tractor	7
Storage batteries	82, 83
Storing and housing	86 to 88

T	Pages
Thermostats	58
Timing the distributor	74
Timing the injection pump	71
Tools	11
Track assemblies	84, 85
Track shoes and grousers	84, 91, 92
Trouble-shooting--see "Checking mechanical problems"	29 to 37

V	Pages
Valve clearance adjustment	60
Venting air from fuel system	71

W	Pages
Water trap, diesel fuel	65, 66
Wiring diagram	80