

**OPERATION AND
MAINTENANCE
INSTRUCTIONS**

7020756

CATERPILLAR

D4 TRACTOR

7020756

SERIAL NUMBERS

6U1-UP

7U1-UP

Caterpillar Tractor Co., General Offices, Peoria, Illinois. • Caterpillar Americas Co., Peoria, Illinois. • Caterpillar Overseas S.A., Geneva. • Caterpillar of Australia Pty. Ltd., Melbourne. • Caterpillar Brasil S.A., São Paulo. • Caterpillar Tractor Co. Ltd., Glasgow. • Caterpillar of Canada Ltd., Toronto. • Caterpillar France S.A., Grenoble.

Warranty

The Manufacturer warrants its products for six (6) months after the date of delivery to the initial user. This warranty is limited to the repair or replacement, as the Manufacturer may elect, at one of its factories designated by it, of such parts as shall appear to the Manufacturer upon inspection to have been defective in material or workmanship but does not include any installation or transportation costs. No warranty is made with respect to items made by others when such items are warranted by their respective makers or when they are supplied by the Manufacturer on special order. This warranty is in lieu of all other warranties, express or implied, and no other warranty of any kind is made or authorized by the Manufacturer. No recommendation by the Manufacturer of items made by others shall imply or constitute any warranty with respect to such items.

T25495

Foreword

Caterpillar products are a result of advanced engineering, skilled manufacturing, and the finest materials metallurgical science can select. Thousands of satisfying, economical working hours are built into each machine.

Whether or not the owner derives the maximum service from his machine depends largely on the care exercised in its operation and maintenance. This book is written to give the operator essential information regarding the day-to-day operation, lubrication and adjustment of the machine. Careful adherence to these instructions will result in assured economy.

More and more Caterpillar owners are depending upon their dealer for service other than the care and adjustments described in this book. This practice is recommended because Caterpillar dealers have stocks of genuine Caterpillar parts and are equipped with tools designed and built by Caterpillar. Their servicemen are factory-trained and are kept closely informed by the factory regarding advanced methods of servicing Caterpillar products — thus, in all ways they are equipped to render the best of service.

Avoid Accidents

Most accidents, whether they occur in the air, in industry, on the farm, at home, on the highways, or at sea, are caused by someone's failure to follow simple and fundamental safety rules or precautions. For this reason most accidents can be prevented by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident.

The complete observance of one simple rule would prevent many thousands of serious injuries each year. That rule is: "Never attempt to clean, oil or adjust a machine while it is in motion."

T24352

Railroad Loading Rules

For domestic customers within continental
limits of the United States.

The loading rules and specifications published in Association of American Railroads Pamphlet No. MD-6, must be complied with when shipping Tractors, Road Grading, Road Making, and Farm Equipment Machinery, on open top cars. Contact the local railroad agent or inspector for these specifications.

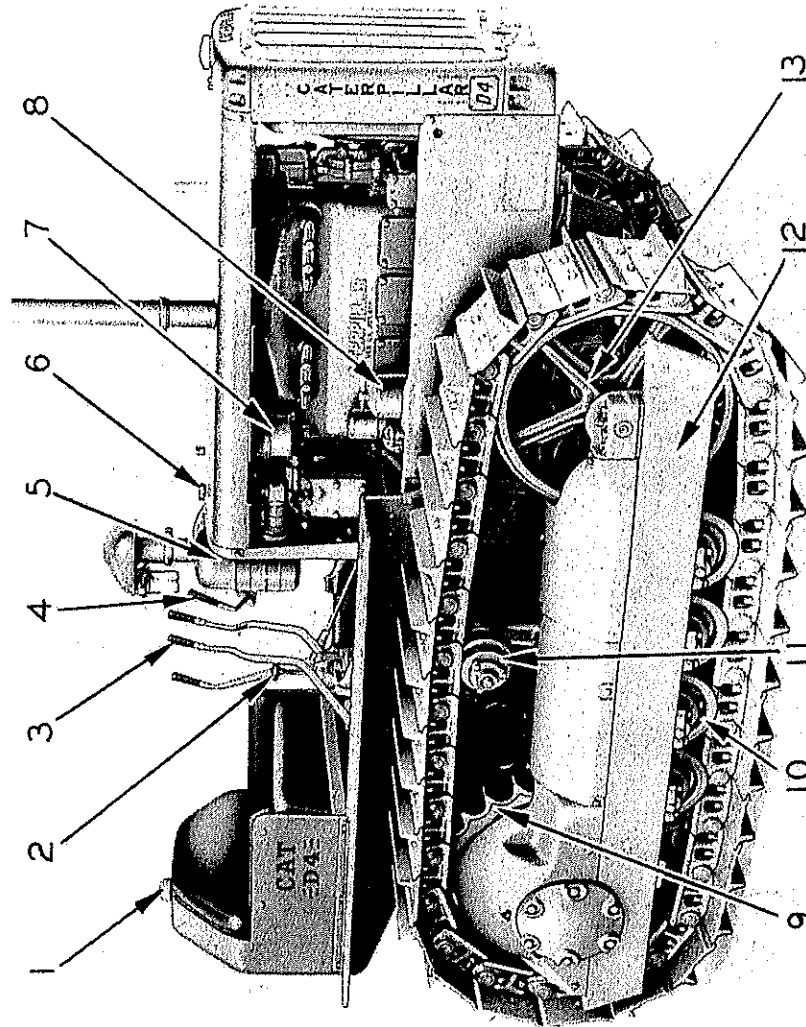
T24353

Table of Contents

	Page
LUBRICATION INSTRUCTIONS	7-25
Service Meter — General Lubricating Information — Crankcase Lubricating Oil — Ball and Roller Bearing Lubricant — Transmission Lubricants Track Roller Lubricant — Lubrication Chart	
OPERATION INSTRUCTIONS	27-48
Preparing the Tractor for Use — Starting the Engine — Gauges — Driving The Tractor — Steering The Tractor — Operating Over An Obstruction — Oper- ating In Deep Mud Or Water — Drawbar Adjustment — Stopping The Tractor — Stopping The Diesel Engine — Daily Care — Operating In Cold Weather — Storage	
MAINTENANCE INSTRUCTIONS	49-88
Air Cleaners — Crankcase Lubricating Oil System — Fuels — Care Of The Fuel Supply — Care Of The Diesel Fuel Tank — Fuel System — Care Of The Fuel Filter — Priming The Fuel System — Fuel Injection Equipment — Starting Engine Fuel System — Cooling System — Fan Belt Adjustment — Valve Clearance Adjustment — Spark Plug Adjustment — Starting Engine Magneto — Starting Engine Clutch — Flywheel Clutch — Steering Clutches And Brakes — Seat Adjustment — Tracks — Final Drive Sprocket Hub Bearings — Washing Gear Compartments	
ATTACHMENT INSTRUCTIONS	89-102
Rear Mounted Equipment — Electrical System — Electric Starter — Lighting Systems — Glow Plugs — Ether Starting Aid — Fuel Priming Pump — Flywheel Clutch (Oil Type)	
CAPACITIES	Inside Back Cover
INDEX	103-104

**D4 TRACTOR
(RIGHT FRONT VIEW)**

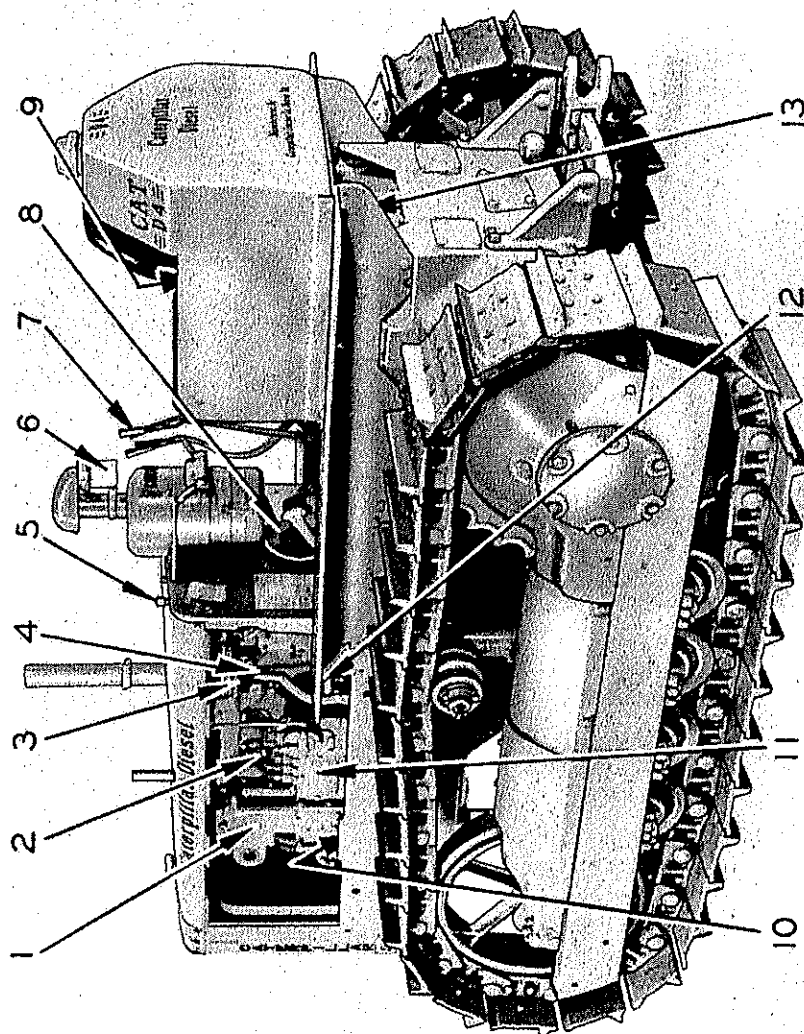
1. Diesel fuel tank filler cap.
2. Gear selector lever.
3. Steering clutch control levers.
4. Governor control lever.
5. Diesel engine air cleaner.
6. Starting engine fuel tank filler cap.
7. Starting engine air cleaner.
8. Crankcase lubricating oil filter housing.
9. Sprocket.
10. Track rollers.
11. Track carrier rollers.
12. Track roller frame.
13. Idler.



T11800

**D4 TRACTOR
(LEFT REAR VIEW)**

1. Fuel filter housing.
2. Governor auxiliary control lever.
3. Compression release lever.
4. Starting engine clutch lever.
5. Starting engine crankcase oil filler cap.
6. Precleaner jar.
7. Flywheel clutch control lever.
8. Starting engine flywheel.
9. Tool box under the seat.
10. Hour meter.
11. Fuel injection pump housing.
12. Starter pinion control lever.
13. Fuel tank drain valve.



T11799

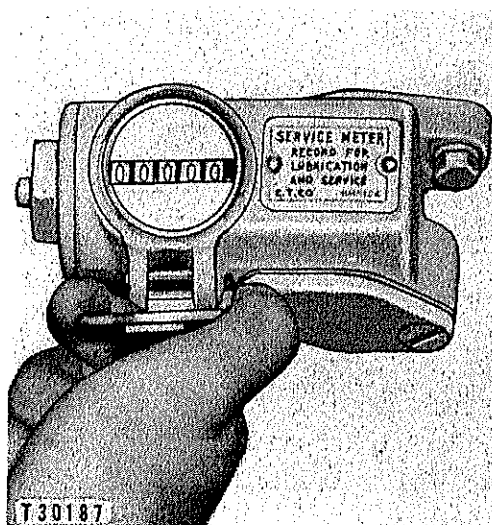
Lubrication Instructions

SERVICE METER

The Service Meter is located on the left side of the engine near the bottom of the fuel filter housing. It is geared to the engine, and when the crankshaft turns as many revolutions as are made in an hour at normal operating speed, the dial advances one number. There are many applications that will result in a lower than normal average engine speed. Under this condition, the advance in the Service Meter reading will be less than the number of clock hours of operation.

The purpose of the Service Meter is to indicate when to perform the recommended maintenance and lubrication operations. The established intervals in the lubrication chart and maintenance instructions are given in service hours, so daily readings will tell when to service the tractor. Rely on the Service Meter and not on the clock to measure service intervals.

COVER ON SERVICE METER RAISED
TO OBSERVE DIAL READING



GENERAL LUBRICATING INFORMATION

Naturally, any precautions taken during cold weather to house the tractor, cover it with a tarpaulin, or warm it before starting, will cause more rapid oil distribution.

Lubricate all miscellaneous points, not equipped with fittings, with crankcase lubricating oil every 50 service hours.

CAUTION

Under no circumstances should the track be lubricated. The stiffness noted between the links of a new track is not caused by a lack of clearance between the track pins and bushings, and it will disappear as the track wears.

It is extremely important in handling the oil to keep it clean. Every precaution should be taken to use only clean filler cans and to be sure that all dirt is removed from the filler cap before it is taken off for filling. The operator should take every precaution to prevent dirt getting into any system to prolong the life of the tractor.

Careful attention to the following information on lubricants and their proper selection will add much to performance, economy and long life of your tractor. The lubrication chart specifies the lubricants to be used, the points to be serviced and the intervals of servicing according to service hours.

CRANKCASE LUBRICATING OIL (Abbreviated CO)

Type of Oils

Some compartments of this machine require one specific type of crankcase lubricating oil while for other compartments, a choice may be made from three types of crankcase lubricating oils. The specific type of crankcase lubricating oil recommended for each compartment is indicated under the three following headings.

Diesel Engine Crankcase

Detergent type oils that are recommended for use in Caterpillar Diesel Engines will, within a short period of operation, become much darker in color. This should not be any cause for concern. The darkening of the oil is due to minute particles of carbon, resulting from the combustion process, being held in suspension in the oil. This ability to hold carbon particles in suspension is one of the primary functions of a detergent type lubricant. Otherwise, these particles would settle out, eventually leading to objectionable deposits in the engine. When the oil darkens therefore, it is an indication that it is keeping the engine clean and insuring satisfactory lubrication performance.

(CO) Superior Lubricants (Series 3) should be used in the diesel engine crankcase. For recommended oil change periods, see the topic, DIESEL ENGINE CRANKCASE LUBRICATING OIL CHANGE PERIODS.

If Superior Lubricants (Series 3) are not available, crankcase lubricating oils meeting the requirements of MIL-L-2104A specifications can be used successfully in the diesel engine crankcase when the fuel sulphur content is less than 0.4%. For the recommended oil change periods see the topic, DIESEL ENGINE CRANKCASE LUBRICATING OIL CHANGE PERIODS.

Lubricated for Life Track Rollers, Carrier Rollers and Front Idlers

(CO) Superior Lubricants (Series 3) should be used in the lubricated for life track rollers, carrier rollers and front idlers when they have been assembled after reconditioning or when new track rollers or idlers are installed on the machine.

Gear Compartments

(CO) Superior Lubricants (Series 3) crankcase lubricating oil is recommended for use in all gear compartments such as transmission and final drive compartments.

Straight mineral transmission oil may be used in gear compartments but it does not offer as much protection against corrosion as Superior Lubricants (Series 3). See the topic, TRANSMISSION LUBRICANTS.

Compartments Other Than Diesel Engine Crankcase, Gear Compartments and Lubricated for Life Track Rollers, Carrier Rollers and Front Idlers

(CO) Use either straight mineral crankcase lubricating oil, or oil conforming to requirements of MIL-L-2104A or Superior Lubricants (Series 3) whichever is most convenient and economical, in the starting engine crankcase, starting engine clutch, fuel injection pump housing, diesel and starting engine air cleaners†, flywheel clutch shift collar (earlier models) and oil type flywheel clutch attachment.

S. A. E. Grade of Oil

The grade of oil is classified in terms of viscosity (fluidity or flow ability) and is identified with numbers called SAE numbers. There are two distinct series of numbers within the SAE numbering system, one being for crankcase lubricating oils and the other for transmission and axle lubricants. The lower SAE numbers within each of these two series are more fluid and flow more readily than do those with the higher numbers within the same series. The fact that flow characteristics overlap in the recommended transmission oils and crankcase lubricating oils is shown in the TEMPERATURE AND VISCOSITY RANGE CHART where either of these oils may be used in the gear compartment.

To determine if the oil in the compartments will flow in cold weather, remove the oil level gauge or dip a finger into the oil before starting and if the oil will flow off, the oil is fluid enough to circulate properly.

The oil that has been diluted for cold weather operations, should be drained and replaced with undiluted oil at the end of the cold season when dilution is no longer required.

The following chart will aid in the selection of the proper SAE grade of oil to be used in the various compartments at the prevailing atmospheric temperature.

† For air cleaners it is permissible to use clean undiluted reclaimed oil or the most inexpensive straight mineral oil. Be sure to change oil in the air cleaners regularly.

TEMPERATURE AND VISCOSITY RANGE CHART				
Compartment	SAE GRADE OF OIL TO USE AT PRE- VAILING ATMOSPHERIC TEMPERATURE			
	Above +32°F.	+32°F. to +10°F.	+10°F. to -10°F.	-10°F. and Lower
Lubricated for Life Track Rollers and Idlers	(CO) Superior Lubricants (Series 3) Only SAE 30 SAE 30 SAE 30 SAE 30			
Diesel Engine Crankcase	(CO) Superior Lubricants (Series 3) or MIL-L-2104A Oils SAE 30 SAE 10W SAE 10W *Dilute SAE 10W			
Starting Engine Crankcase Starting Engine Clutch Fuel Injection Pump Housing Flywheel Clutch (Oil Type)	(CO) Superior Lubricants (Series 3), Straight Mineral or MIL-L-2104A Oils SAE 30 SAE 10W SAE 10W *Dilute SAE 10W			
Diesel and Starting Engine Air Cleaners Flywheel Clutch Shift Collar (earlier models)	(CO) Superior Lubricants (Series 3), Straight Mineral or MIL-L-2104A Oils SAE 30 SAE 10W SAE 10W SAE 10W			
Gear Compartments — Transmission Final Drive	(CO) Superior Lubricants (Series 3) SAE 30 SAE 30 SAE 10W SAE 10W (TO) Straight Mineral Transmission Oil SAE 90 SAE 80 SAE 80 *Dilute SAE 80			

*In lower temperatures it may be necessary to dilute oil with kerosene so it will be fluid enough to insure free circulation. This should be done before stopping, then operate the machine for a few minutes to mix the kerosene and oil. Evaporation in the engine crankcase and in the oil clutch compartment, when so equipped, under steady operation may make it necessary to again add kerosene to maintain proper fluidity.

Diesel Engine Crankcase Lubricating Oil Change Periods

The crankcase lubricating oil change periods for the engine have been carefully established for the purpose of protecting the service life of the engine as economically as possible.

Change the oil and filter elements after the first 10 service hours of operation of a reconditioned engine.

SUPERIOR LUBRICANTS (SERIES 3) CHANGE PERIOD CHART

FUEL SULPHUR CONTENT †	OIL CHANGE PERIOD ‡	FILTER ELEMENT CHANGE PERIOD FULL FLOW	BY-PASS **
0.4% or Less	500 Service Hrs.	250 Service Hrs.	250 Service Hrs.
0.4% to 1.0%	500 Service Hrs.*	250 Service Hrs.	250 Service Hrs.

MIL-L-2104A OIL CHANGE PERIOD CHART

FUEL SULPHUR CONTENT	OIL CHANGE PERIOD ‡	FILTER ELEMENT CHANGE PERIOD FULL-FLOW	BY-PASS **
0.4% or Less	250 Service Hrs.	250 Service Hrs.	250 Service Hrs.

*Reduce change period one half when sulphur content is greater than 1.0%.

**Change by-pass filter elements every 250 service hours except under severe dusty operating conditions when changes should be made at 125 service hour intervals.

‡Regardless of time operated, the crankcase oil should be changed at least every six months.

T26948

BALL AND ROLLER BEARING LUBRICANT**(Abbreviated BR)**

(BR) This lubricant is a mixture of mineral oil and metallic soaps. Use No. 2 grade for most temperatures. For extremely low temperatures use No. 0 or No. 1 grade.

This grease can be applied to all bearing points — plain bushings, ball bearings and roller bearings — where equipped with hydraulic pressure fittings or when bearings are hand packed.

Use only a high grade Ball and Roller Bearing Grease of short fiber. This grease must be satisfactory in anti-friction bearings at speeds up to 3000 RPM at a maximum temperature of 300°F. It is a grease with sufficient adhesive qualities to cling to the bearings in all extremes of high and low operating temperatures.

TRANSMISSION LUBRICANTS**(Abbreviated CO and TO)****Gear Compartments**

(CO) Superior Lubricants (Series 3) Crankcase Lubricating Oil (Abbreviated CO) are recommended for use in all gear compartments. These lubricants have maximum rust protection, adequate load carrying capacity and stability. See the topic, SAE GRADE OF OIL, for the SAE grades recommended.

(TO) Straight Mineral Transmission Oils (Abbreviated TO) may be used if desired. These oils are also known as Regular Type Gear Lubricants and only high quality products with good temperature stability should be used. Some oils of this type may contain oxidation and corrosion inhibitors. See the topic, SAE GRADE OF OIL, for the SAE grades recommended.

TRACK ROLLERS, CARRIER ROLLERS AND FRONT IDLER LUBRICANT
(Abbreviated CO and RL)

(CO) Superior Lubricants (Series 3) Crankcase Lubricating Oils are recommended for use in lubricated for life track rollers, carrier rollers and front idlers. See the topic, CRANKCASE LUBRICATING OIL.

(RL) Track Roller Lubricant is a stringy, tacky lubricant of a semi-fluid consistency at the prevailing atmospheric temperature.* This lubricant developed for track rollers is recommended for use at points provided with button head fittings. It can be handled readily in the standard volume compressor.

In sub-zero weather, crankcase lubricating oils may be used when track roller lubricant is too heavy to be handled in the compressor.

Seasonal changes must be anticipated to be sure the proper grade of lubricant is introduced prior to temperature changes. A light grade lubricant used in the winter may leak excessively in warmer weather and a heavy grade lubricant, normally used during warm weather will not provide adequate lubrication during colder temperatures. Thus roller bushings and shafts can be damaged, unless the correct grades of lubricant are used.

LUBRICATION CHART CATERPILLAR DIESEL D4 TRACTOR

The folded page is arranged to serve two purposes:

First, it is a complete outline of all the information required to lubricate the tractor.

Second, the illustration and identification of points of lubrication can be used with the detailed illustrations and information on the pages following the chart as a reference for lubrication and service information.

Key To Lubricants

CO Crankcase Lubricating Oil.

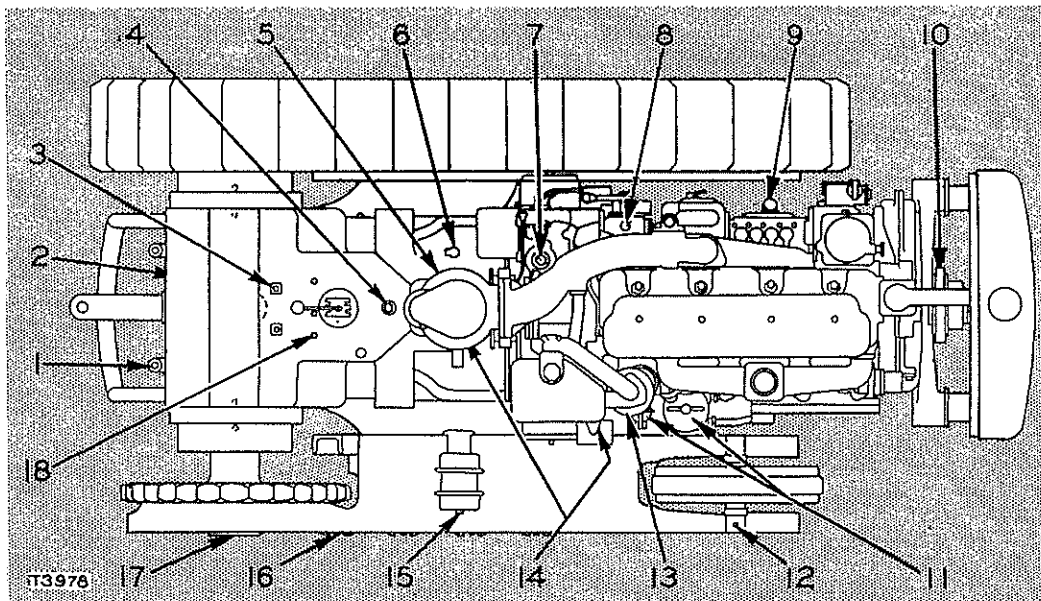
BR Ball and Roller Bearing Lubricants.

RL Track Roller Lubricant.

Identification Of Points Of Lubrication, Lubricant To Apply And Interval Of Service

Point and Identification		Lubri- cant	SERVICE HOURS					
			10	50	125	250	500	1000
1	Final Drive	##CO			X		†X	X
2	Track Roller Frame Inner Bearings	BR	X					
3	Steering Clutch Release Bearing	BR	X					
4	Transmission	##CO			X	X		X
5	Diesel Engine Air Cleaner	CO	*X	X				
6	Flywheel Clutch Shift Bearing	BR	X					
7	Starting Engine Crankcase	CO	X		X	X		
8	Starting Engine Clutch	CO			X	X		
9	Fuel Injection Pump Housing	CO			X	X		
10	Fan Bearings	BR				X		
11	Diesel Engine Crankcase Lubricating Oil System	CO	X		††X	††X	††X	
12	Front Idlers	‡RL	**X		X			
13	Starting Engine Air Cleaner	CO		X				
14	Flywheel Clutch Pilot Bearing	BR				X		
15	Track Carrier Rollers	RL	**X		X			
16	Track Rollers	RL	**X		X			
17	Track Roller Frame Outer Bearings	BR	X					
18	Steering Clutch Control Lever Shaft Bearings	BR	X					

Location Of Points Of Lubrication



†Only when operating in extremely dusty conditions or deep mud and water.

*Only when operating in extremely dusty conditions. **Only when operating in deep mud and water.

††See the Superior Lubricants (Series 3) and MIL-L-2104A Oil Change Period Charts.

‡Tractors effective with 6U12713 and 7U43898 have lubricated for life track rollers, carrier rollers and front idlers. See page 19 for detailed information.

††Straight Mineral Transmission Oil may be also used.

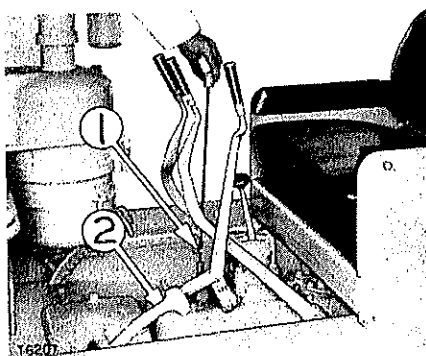
CO Crankcase Lubricating Oil



1

FINAL DRIVE

Check oil level by removing two filler plugs, one for each side, every 125 service hours. Keep lubricant to level of filler opening. Drain compartments at (1), wash and refill it every 1000 service hours (500 service hours when operating in either extremely dusty conditions or deep mud and water). See topic, "Washing Gear Compartments."

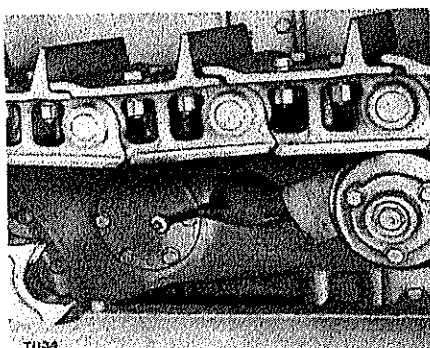


4

TRANSMISSION

Check oil level every 10 service hours. Keep oil level up to full mark (1) on gauge.

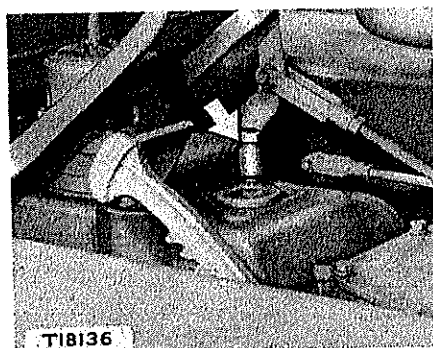
Tractors before 6U10395 and 7U29881 if equipment mounted on the tractor interferes in checking the oil level with the gauge, keep the oil level to the plug on the right side of the transmission case. Refill or replenish with oil at (2).



4

TRANSMISSION BREATHER

Every 250 service hours remove breather, wash, oil and replace. On earlier tractors equipped with a breather, every 1000 service hours disassemble breather, and wash the element by shaking it in some non-inflammable cleaning fluid that will dry free of oil film.

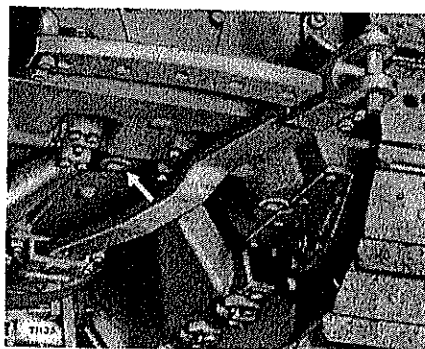


CO Crankcase Lubricating Oil

4

TRANSMISSION

Drain the transmission case every 1000 service hours. Wash and refill to level plug on the right side of the transmission case or to level mark on gauge. Openings connect the transmission and bevel gear compartments. The oil will maintain the same level in both compartments. See topic, "Washing Gear Compartments".

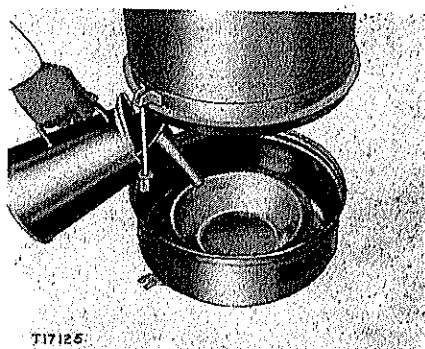


5

DIESEL ENGINE AIR CLEANER CUP

Inspect the oil in the air cleaner cup every 10 to 50 service hours depending upon dust conditions. Wash and fill both the inner and outer cups to the flat face of the inner cup on later engines and to the oil level bead on earlier engines either when the oil will not flow freely, the sediment in the cup is $\frac{1}{2}$ inch deep, or every 50 service hours, whichever occurs first. See the topic, "Air Cleaners".

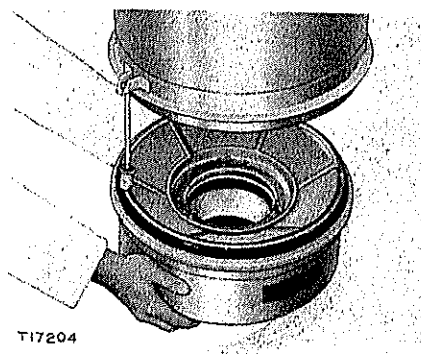
Refill the cup with the same S.A.E. grade of oil as is used in the diesel engine crankcase and the same type of oil may be used. However, it is permissible to use clean, undiluted reclaimed oil or the most inexpensive straight mineral oil. See the topic, "Crankcase Lubricating Oil".



5

DIESEL ENGINE AIR CLEANER TRAY ASSEMBLY

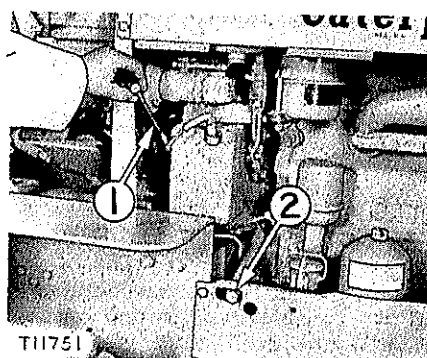
When the oil cup is removed for inspection, remove the air cleaner separable tray screens from the cup on later engines or from the inlet pipe on earlier engines, inspect and wash them if dirty. Inspect the inside of the air cleaner inlet pipe and clean if necessary. Clean the inside of the air cleaner inlet pipe every 50 service hours. See the topic, "Air Cleaners".



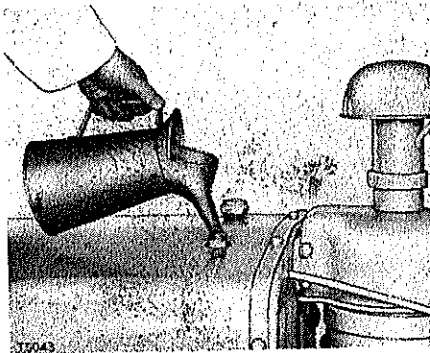
7

STARTING ENGINE CRANKCASE

Check oil level at full mark (1) on gauge every 10 service hours. Every 125 to 250 service hours, depending on dust conditions, drain at (2) and wash the crankcase. See topic, "Crankcase Lubricating Oil System".



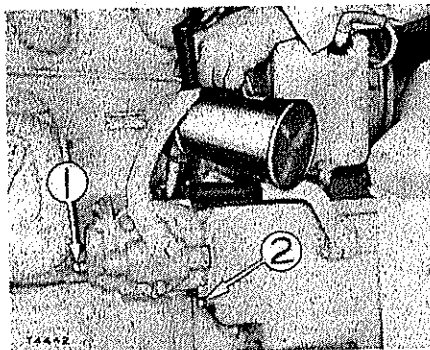
CO Crankcase Lubricating Oil



7

STARTING ENGINE CRANKCASE

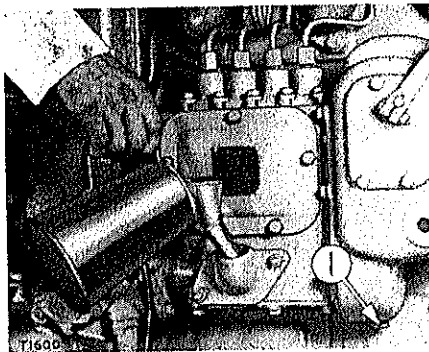
Refill crankcase every 125 to 250 service hours.



8

STARTING ENGINE CLUTCH

Check oil level by removing plug (1) every 125 service hours. Keep lubricant to level plug opening. Drain at (2), wash and refill housing every 250 service hours. See topic, "Starting Engine Clutch".



9

FUEL INJECTION PUMP HOUSING

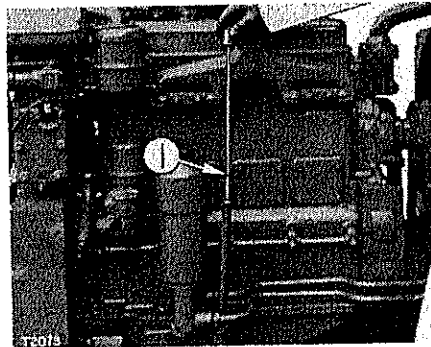
Check oil level every 125 service hours. Keep filled to top of filler elbow. Drain at (1) and refill every 250 service hours.

11

CHECK THE CRANKCASE LUBRICATING OIL LEVEL

Check oil level with engine running every 10 service hours. Oil level should be between the "full" and "low" marks on gauge (1). The oil level maintained at the "full" mark is more desirable, however, any level above the "low" mark is permissible.

The oil level may be considerably higher than the "full" mark on the gauge if the full capacity of crankcase oil is checked after the engine has been stopped for several minutes. See the topic, "Crankcase Lubricating Oil"—also see Note A.



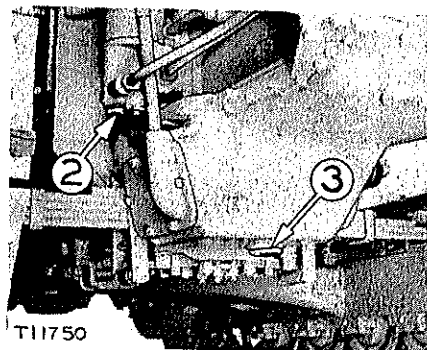
NOTE A: Caterpillar Diesel Engines are built in a clean modern diesel engine factory and each crankcase is filled with a good quality of new crankcase oil. For these reasons the initial crankcase oil change period for this engine should be at the usual crankcase oil change period as given in the SUPERIOR LUBRICANTS (Series 3) CHANGE PERIOD CHART.

CO Crankcase Lubricating Oil

11

DIESEL ENGINE CRANKCASE

Every 250 or 500 service hours depending on type of crankcase lubricating oil used, drain crankcase at (3) and filter at (2) while the engine is hot. See the topics, "Crankcase Lubricating Oil" and "Crankcase Lubricating Oil System". See Note A.

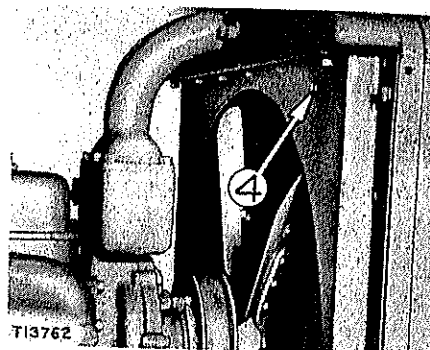


11

DIESEL ENGINE CRANKCASE

(Earlier Models)

Open oil cooler vent valve (4) so the oil will drain more rapidly from the oil cooler each time the crankcase is drained.

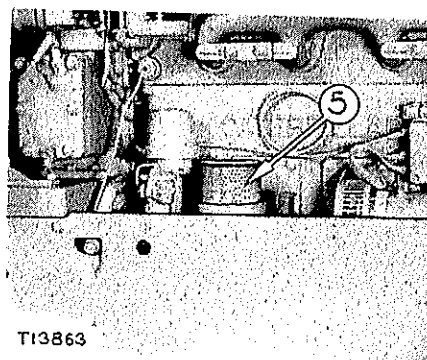


11

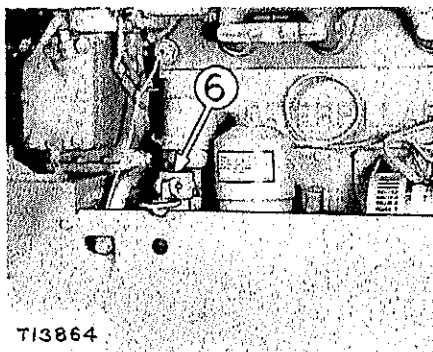
DIESEL ENGINE CRANKCASE LUBRICATING OIL FILTER

On tractors effective with 6U6299 and 7U12905 or those equipped with full-flow crankcase lubricating oil filter change-over groups, remove the plug from the filter base to drain the unfiltered oil from the base and replace the filter element (5) with a new Caterpillar element at every 250 service hour interval. See the topic, "Crankcase Lubricating Oil System".

On tractors before 6U6299 and 7U12905 not equipped with a full-flow crankcase lubricating oil filter, wash the metallic strainer element and replace the inner element with a new element at 250 service hours. When operating in extremely dusty conditions, wash the metallic strainer element and replace the inner element every 125 service hours. See the topic, "Crankcase Lubricating Oil System."



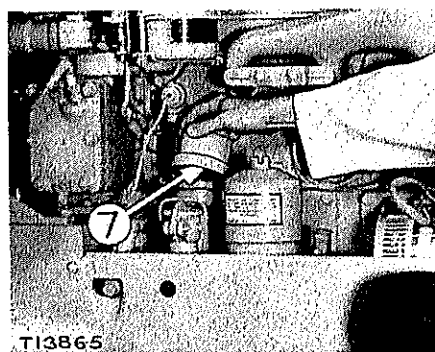
CO Crankcase Lubricating Oil



11

DIESEL ENGINE CRANKCASE

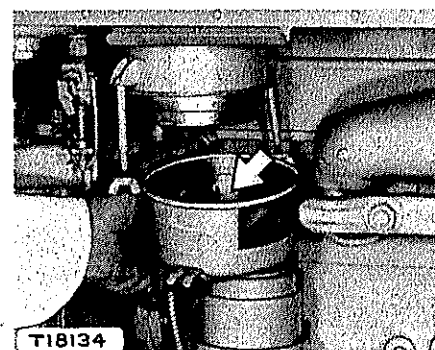
After draining crankcase refill at (6) and start the diesel engine. Run engine for two minutes then add oil to bring level to full mark on gauge, while engine is running.



11

DIESEL ENGINE CRANKCASE BREATHER

Wash breather element (7) each time crankcase oil is drained. Pour $\frac{1}{4}$ pint (0.12 liter) oil through element and replace.

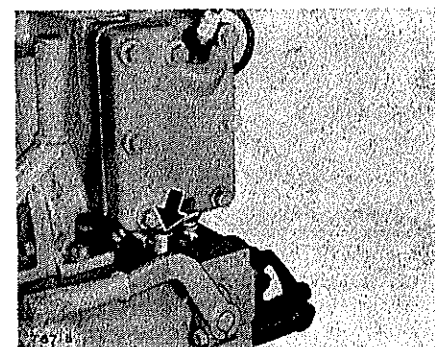


13

STARTING ENGINE AIR CLEANER

Inspect the oil in the air cleaner cup every 50 service hours. Wash and refill cup to oil level bead when oil will not flow freely or if the sediment in the cup is $\frac{1}{4}$ inch deep. See the topic, "Air Cleaners".

Refill the cup with the same S.A.E. grade of oil as is used in the diesel engine crankcase and the same type of oil may be used. However, it is permissible to use clean, undiluted reclaimed oil or the most inexpensive straight mineral oil. See the topic, "Crankcase Lubricating Oil".



STARTER PINION

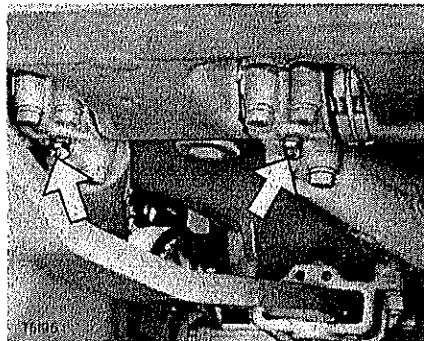
Earlier engines are equipped with oil cups. Experience with later engines without oil cups shows that lubrication is not essential at this point. Where cup is provided no lubrication is required and can be removed and a plug installed in its place.

BR Ball And Roller Bearing Lubricant

2

TRACK ROLLER FRAME INNER BEARINGS

Lubricate two bearings every 10 service hours, one fitting for each bearing.

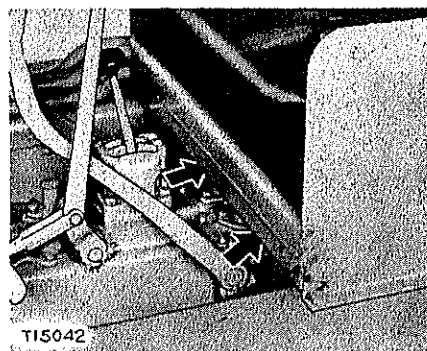


3

STEERING CLUTCH RELEASE BEARINGS

Lubricate two bearings every 10 service hours sparingly.

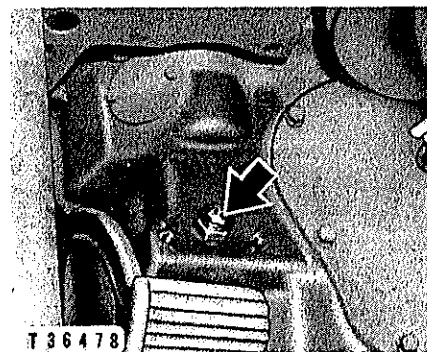
On tractors before 6U8660 and 7U22140 lubricate steering clutch release bearings by filling oil cups with CRANKCASE LUBRICATING OIL every 10 service hours.



6

FLYWHEEL CLUTCH SHIFT BEARING

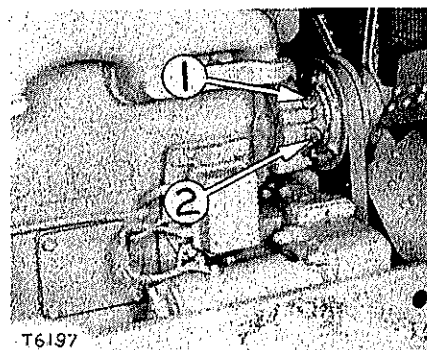
Lubricate bearing every 10 service hours. See Note B.



10

FAN BEARINGS

Lubricate every 250 service hours. Lubricate through fitting (2) until grease appears at relief valve (1). Wipe off excess grease.

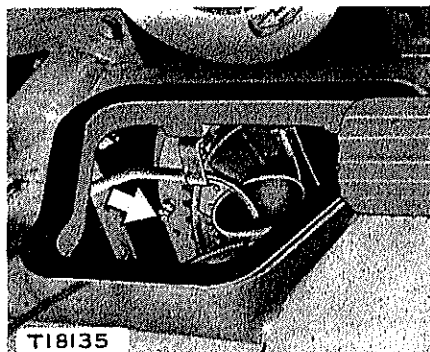


NOTE B: On tractors before 6U12506 and 7U42773 lubricate the shift collar by filling oil cup with CO every 10 service hours, with engine stopped.

BR Ball And Roller Bearing Lubricant

14

FLYWHEEL CLUTCH PILOT BEARING

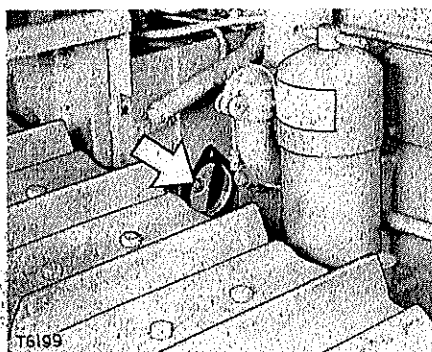


This bearing may be lubricated through the fitting on the rear face of the flywheel, as shown in the accompanying illustration, or through the fitting on the front face of the flywheel, as shown in the following illustration. Use the one most convenient.

Lubricate bearing sparingly every 250 service hours. Remove inspection cover, turn flywheel until fittings appear.

14

FLYWHEEL CLUTCH PILOT BEARING

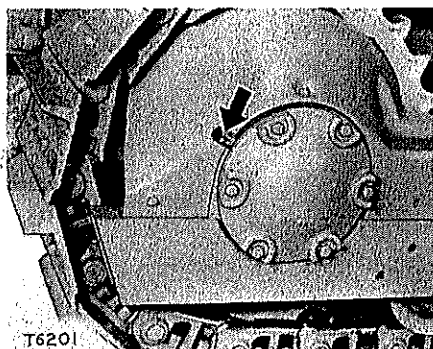


The fitting on the front face of the flywheel and the opening shown in the accompanying illustration are provided for convenience in lubrication of the pilot bearing.

On HT4 Shovel arrangements use the fitting on the rear face of the flywheel. See the explanation accompanying the preceding illustration.

17

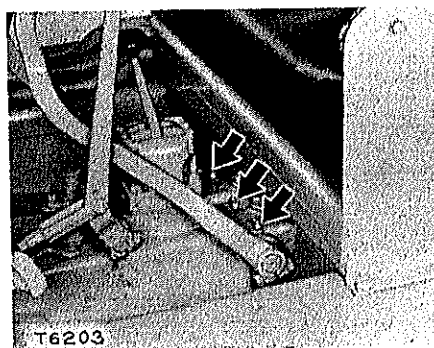
TRACK ROLLER FRAME OUTER BEARINGS



Lubricate two bearings every 10 service hours, one fitting on each side of the tractor.

18

STEERING CLUTCH CONTROL LEVER SHAFT BEARINGS



Lubricate steering clutch control lever shaft bearings every 50 service hours.

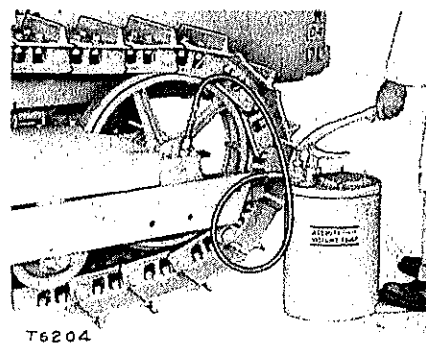
RL Track Roller Lubricant

12

FRONT IDLERS

(Tractors before 6U12713 and 7U43898)

Lubricate through fitting on both sides of tractor every 125 service hours. If operating in deep mud or water, lubricate every 10 service hours. See Note C.

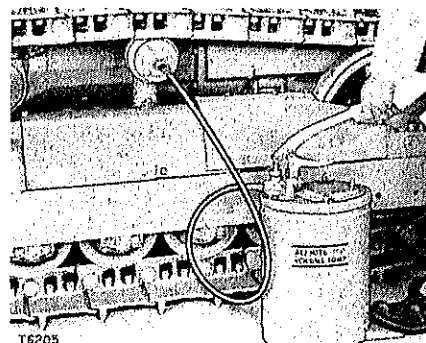


15

TRACK CARRIER ROLLERS

(Tractors before 6U12713 and 7U43898)

Lubricate rollers on both sides of tractor every 125 service hours. If operating in deep mud or water, lubricate every 10 service hours. See Note C.

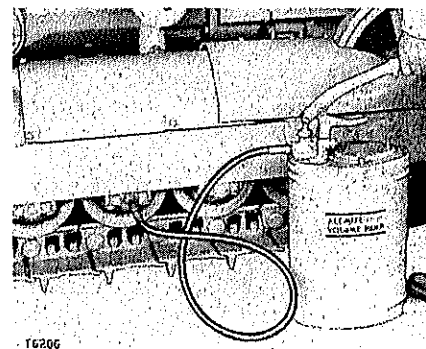


16

TRACK ROLLERS

(Tractors before 6U12713 and 7U43898)

Lubricate each roller on both sides of tractor every 125 service hours. If operating in deep mud or water, lubricate every 10 service hours. See Note C.

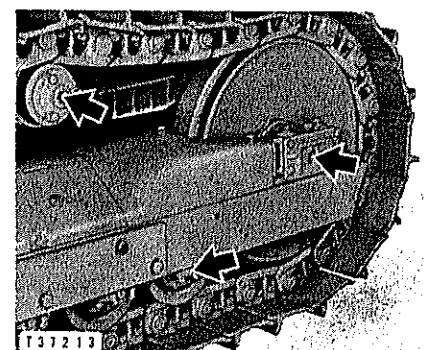


LUBRICATED FOR LIFE TRACK ROLLERS, TRACK CARRIER ROLLERS AND FRONT IDLERS

(Tractors Effective with 6U12713 and 7U43898)

Later tractors are equipped with lubricated for life track rollers, track carrier rollers and front idlers. These assemblies are lubricated for life at the factory and need no further lubrication unless they have been disassembled for reconditioning. A lubricator nozzle complete with instructions is available from your Caterpillar dealer.

The lubricated for life track rollers, track carrier rollers and front idlers can be identified by a plug, in the outer end of each shaft, measuring 15/16 inches across the flats.



INSTRUCTIONS FOR USING THE SPECIAL LUBRICATOR NOZZLE

This nozzle is used with a volume compressor to fill lubricated-for-life track rollers, carrier rollers, and idlers after they have been reconditioned.

1. Use SAE No. 30 Superior Lubricants (Series 3) oil for all temperature ranges.
2. Thoroughly clean the nozzle and fitting and remove the plug in the outer end of the shaft.

NOTE C: Apply grease with the volume compressor only until resistance is felt on the handle of the compressor. Further pumping may damage the seals.

3. Insert the lubricator nozzle in the end of the shaft and screw the nozzle tightly against the bottom of the shaft bore.
4. Position the roller or idler so that the shaft is in a horizontal position.
5. Force oil slowly through the nozzle and into the shaft until oil without air bubbles is observed leaking past the flats on the nozzle.
6. Remove the nozzle and install the plug.

Lubrication Of Attachments

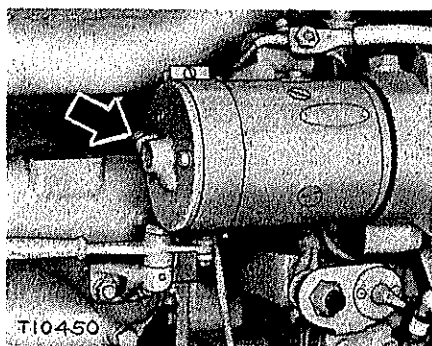
The following list of identifying letters, names of attachments requiring lubrication, and types of lubricant required will help in lubrication of attachments. For further attachment information see page 89.

Identification Of Points Of Lubrication, Lubricant To Apply And Interval Of Service

Point and Identification	Lubri- cant	SERVICE HOURS				
		10	50	125	250	1000
A Starting Engine Electric Starter	CO			X		
B Generator	CO			X		
C Non-oscillating Bar Pivot Pin	BR	X		X		
D Rear Power Take-off Gear Case (Single Speed)	##CO			X		X
E Belt Pulley Drive Gear Case (Single Speed)	##CO			X		X
F Rear Power Take-off Gear Case (Two Speed)	##CO			X		X
G Belt Pulley Drive Bevel Gear Housing (Two Speed)	##CO			X		X
H Breather For Belt Pulley Drive Gear Case	CO				X	
I Rear Power Take-off Shifter Lever Shaft (Single Speed)	BR		X			
J Belt Pulley Drive Shifter Lever Shaft (Single Speed)	BR		X			
K Belt Pulley Drive Bevel Gear Housing (Single Speed)	##CO			X		X
L Odometer Drive	BR					X
M Odometer Drive Housing	##CO					X
N Front Power Take-off	BR		X	X		
O Flywheel Clutch (Oil Type)	CO	X				X

##Straight Mineral Transmission Oil may be also used.

CO Crankcase Lubricating Oil



A

STARTING ENGINE ELECTRIC STARTER

Lubricate the bearing, when equipped with oil cup, with two or three drops of oil every 125 service hours.

Some starters have bearings packed with BALL AND ROLLER BEARING GREASE making lubrication necessary only when the starter is disassembled for cleaning or servicing.

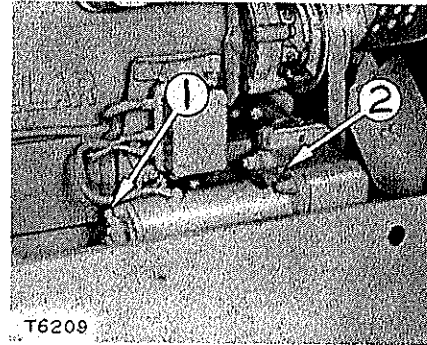
CO Crankcase Lubricating Oil

B

GENERATOR

Lubricate rear bearing (1), front bearing (2), with two or three drops of oil every 125 service hours.

Some generators have bearings packed with BALL AND ROLLER BEARING GREASE making lubrication necessary only when the generator is disassembled for cleaning or servicing.

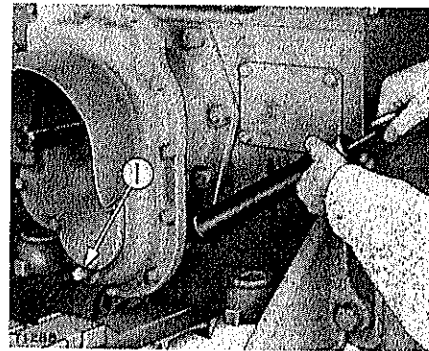


D

REAR POWER TAKE-OFF GEAR CASE (Single-Speed)

Check oil level at filler opening every 125 service hours and bring level to plug opening. Over filling will cause excessive heat.

Drain housing by removing plug (1) every 1000 service hours, wash housing and refill to top of filler opening. See topic, "Washing Gear Compartments".

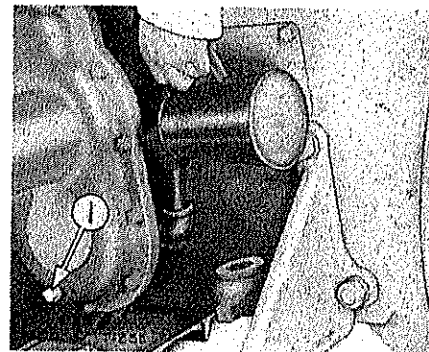


E

BELT PULLEY DRIVE GEAR CASE (Single-Speed)

Check oil level by removing filler elbow plug every 125 service hours. Keep lubricant to level of filler opening. Over filling will cause excessive heat.

Drain compartment by removing plug (1) every 1000 service hours. Wash compartment and refill it to the top of filler elbow. See topic, "Washing Gear Compartments".

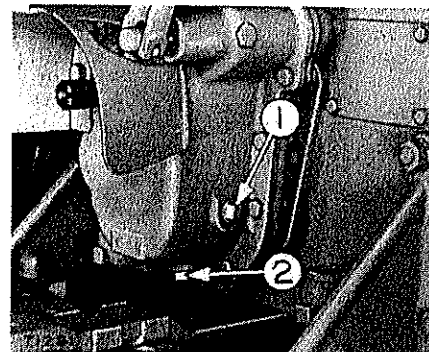


F

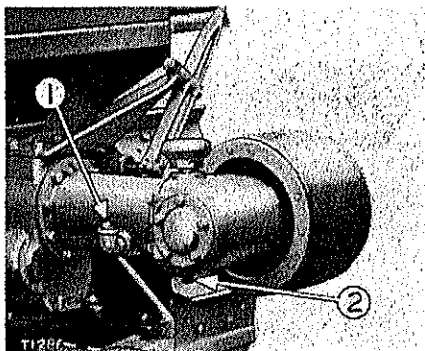
REAR POWER TAKE-OFF GEAR CASE (Two-Speed)

Check oil level at plug (1) every 125 service hours and bring level to plug opening. Over filling will cause excessive heat.

Drain housing by removing plug (2) every 1000 service hours. Wash housing and refill to top of filler opening. See topic, "Washing Gear Compartments".



CO Crankcase Lubricating Oil

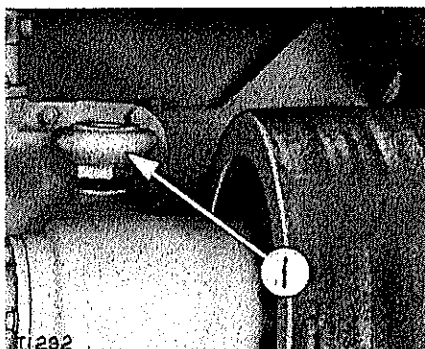


G

BELT PULLEY DRIVE BEVEL GEAR HOUSING (Two-Speed)

Check oil level at filler elbow (1) every 125 service hours. Keep lubricant to level of filler opening. Over filling will cause excessive heat.

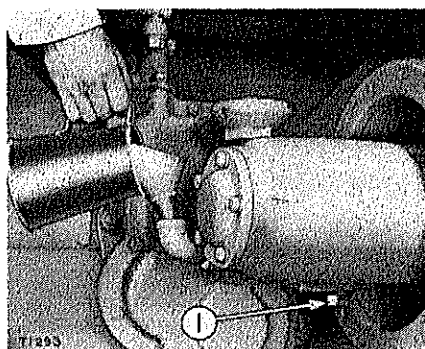
Remove plug (2) to drain housing every 1000 service hours, wash housing and refill. See topic, "Washing Gear Compartments."



H

BREATHER FOR BELT PULLEY DRIVE GEAR CASE

Remove the breather (1) every 250 service hours and wash it with kerosene. Saturate element with oil and reinstall breather.

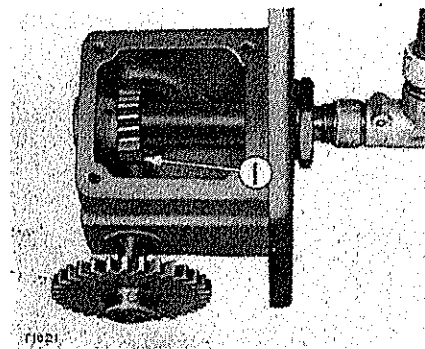


K

BELT PULLEY DRIVE BEVEL GEAR HOUSING (Single-Speed)

Check oil level at filler elbow every 125 service hours. Oil should be to elbow opening. Over filling will cause excessive heat.

Drain housing by removing plug (1) every 1000 service hours. Wash and refill housing to top of filler elbow. See topic, "Washing Gear Compartments."



M

ODOMETER DRIVE HOUSING

Change lubricant in housing every 1000 service hours.

Remove the mounting bolts and the drive housing from the transmission case. Remove the cover and drain lubricant from housing. Refill housing with fresh lubricant to top of worm drive gear (1).

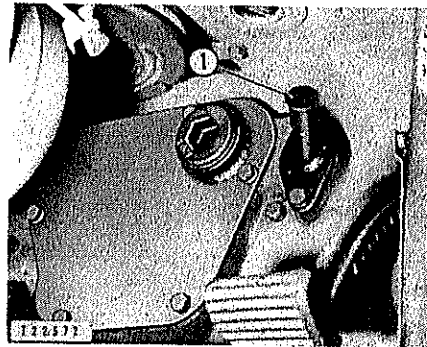
Wipe BALL AND ROLLER BEARING GREASE on gear teeth that mesh with gear teeth on steering clutch brake drum.

CO Crankcase Lubricating Oil



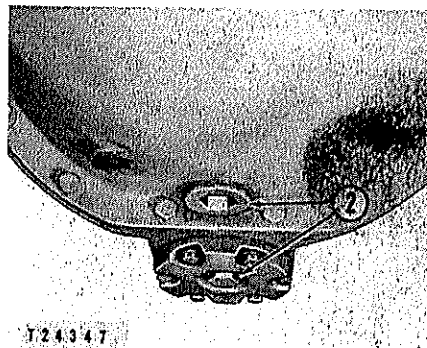
FLYWHEEL CLUTCH COMPARTMENT

Check oil level in the clutch compartment every 10 service hours with the engine stopped. Oil should be kept up to the "full" mark on gauge (1).



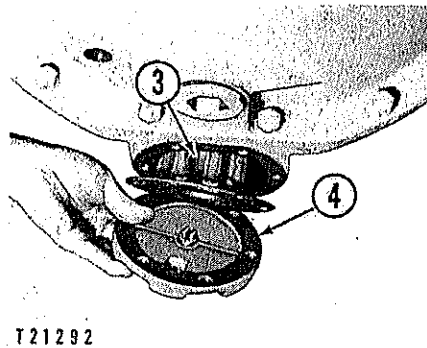
FLYWHEEL CLUTCH COMPARTMENT

Every 1000 service hours drain the clutch compartment by removing drain plugs (2).



FLYWHEEL CLUTCH COMPARTMENT

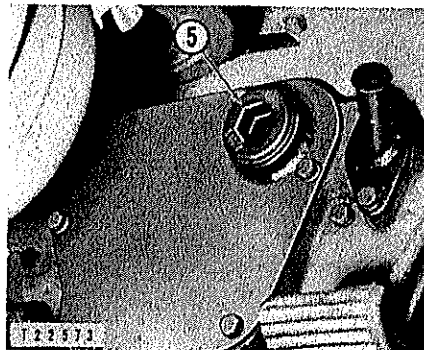
Remove and wash oil pump suction screen (3) at each oil change period. When removing the cover (4) be careful not to damage the gasket. Clean the magnetic drain plug. Install the suction screen and drain plug.



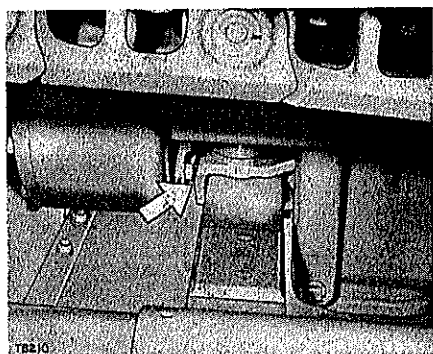
FLYWHEEL CLUTCH COMPARTMENT

Extreme care should be taken to prevent dirt getting into the clutch compartment when removing the filler plug (5) for filling.

After removing filler plug refill clutch compartment to "full" mark on gauge. Approximately 16 quarts of oil is required to fill the compartment. Install filler plug tightly.



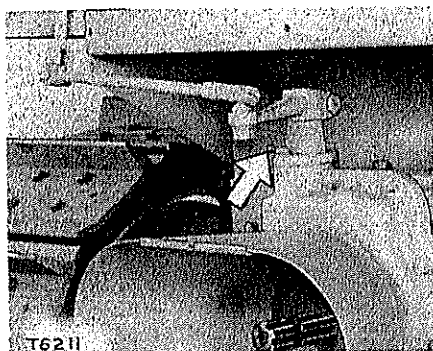
BR Ball And Roller Bearing Lubricant



C

NON-OSCILLATING BAR PIVOT PIN

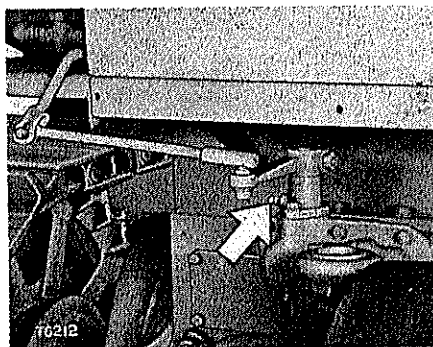
Lubricate pin every 125 service hours from the right side of the tractor. When operating in deep mud and water, lubricate every 10 service hours.



I

REAR POWER TAKE-OFF SHIFTER LEVER SHAFT (Single-Speed)

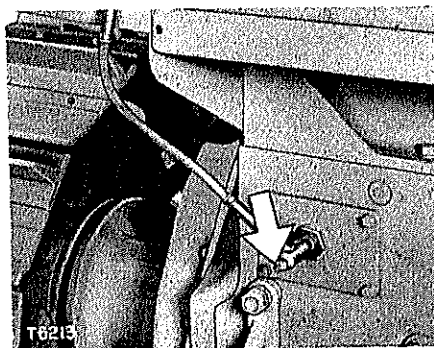
Lubricate bearing every 10 service hours.



J

BELT PULLEY DRIVE SHIFTER LEVER SHAFT (Single-Speed)

Lubricate bearing every 50 service hours.



L

ODOMETER DRIVE

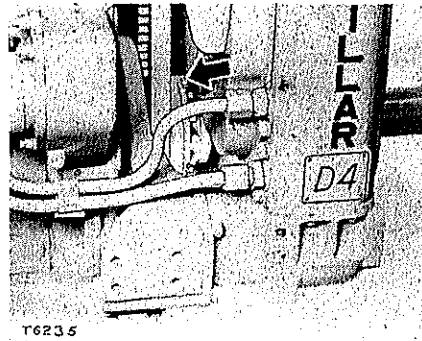
Lubricate drive every 1000 service hours. Fill drive with grease through fitting until lubricant appears at relief valve.

BR Ball And Roller Bearing Lubricant

N

FRONT POWER TAKE-OFF COUPLING

Lubricate sparingly every 125 service hours. Excessive grease applied in the coupling may work out on to fan belt and pulley causing excessive wear.

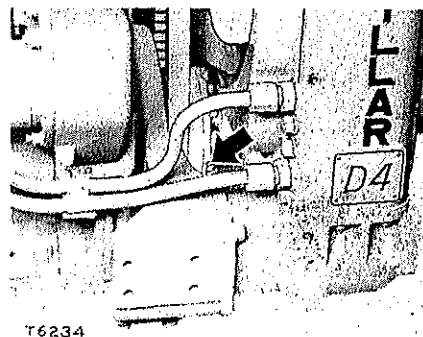


N

FRONT POWER TAKE-OFF BEARING

Lubricate bearing through fitting every 50 service hours. Do not overlubricate. Excess grease may work out on belts resulting in excessive wear.

Earlier front power take-off bearing lubrication is accomplished through a fitting at the front of the tractor.



Operation Instructions

PREPARING THE TRACTOR FOR USE

New Tractor Initial Service: The first duty of anyone charged with the care and operation of a tractor is to give it a detailed inspection, and to lubricate all parts as directed in the LUBRICATION INSTRUCTIONS section of this book.

Fill the diesel fuel tank, taking care no dirt, water, or other foreign substances are admitted with the fuel. Give particular attention to the details of fuel handling as outlined under the topic, CARE OF THE FUEL SUPPLY. Fill the starting engine fuel tank with gasoline.

Fill the cooling system with clean soft water, or with the correct anti-freeze solution if temperatures below freezing are likely to be encountered. See the topic, COOLING SYSTEM.

During the initial operation of the tractor, the bolts of the track roller end collars, the track shoe bolts, the inlet manifold stud nuts and the equalizer spring clips should be checked and tighten if necessary. Since these parts are subjected to continued stress, daily checks should be made to prevent forced stops. See the topic, DAILY CARE.

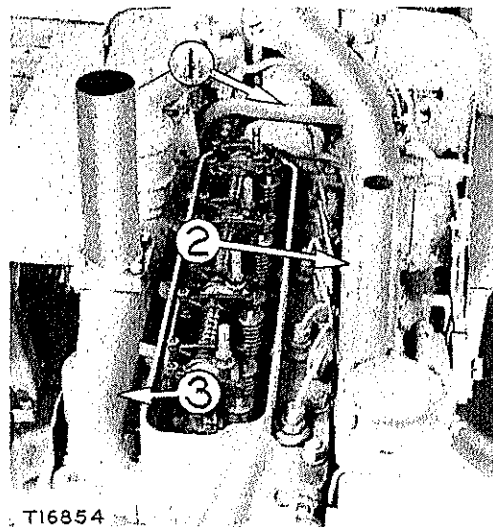
New Tractor Recheck: After the first 100 to 125 service hours of operation tighten the diesel engine inlet manifold (2), exhaust manifold (3) and the starting engine manifold assembly (1).

When the diesel engine cylinder head stud nuts are tightened the cylinder head gasket is compressed and the valve clearances are changed. Adjust the valve clearance as described in the topic, VALVE CLEARANCE ADJUSTMENT.

During the initial operation of the tractor the sprocket bearings are likely to require some adjustment. See the topic, FINAL DRIVE SPROCKET HUB BEARINGS.

POINTS TO BE SERVICED AT RECHECK PERIOD

- 1-Starting engine manifold assembly.
- 2-Diesel engine inlet manifold.
- 3-Diesel engine exhaust manifold.



T16854

New Operator's Responsibility: The operator who is given the responsibility of care and operation of a tractor already in service, should first, check it for necessary lubrication, fuel supply and coolant in the radiator.

Second, the tractor should have any necessary adjustments made to obtain satisfactory performance.

Third, if the tractor has been stored with oil in the cylinders, comply with the starting procedure under the topic, STORAGE.

STARTING THE ENGINE

There are two methods available for starting the diesel engine, gasoline starting engine and an electric starting motor. The two methods are covered in these instructions. The following topic covers the starting information required, regardless of the starting method involved.

Before Starting: Check the diesel engine crankcase oil level to be sure it is considerably above the "low" mark on the gauge. Check the oil level in the starting engine crankcase to be sure it is to the "full" mark on the gauge. Make certain the oil is to the proper level in the flywheel clutch compartment.

Position Controls For Starting:

1. Disengage the flywheel clutch (lever (2) pushed forward).
2. Apply the right steering clutch brake **and lock with the brake lock.**
3. Shift the gear selector lever (1) to the neutral position.

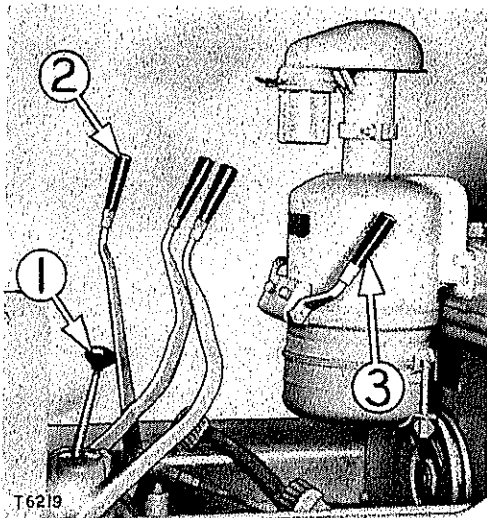
Gasoline Engine Starting

The starting engine is started with the starting engine electric starter or it may be started by cranking it manually.

Helpful suggestions for starting the starting engine in cold weather are in the topic, OPERATING IN COLD WEATHER.

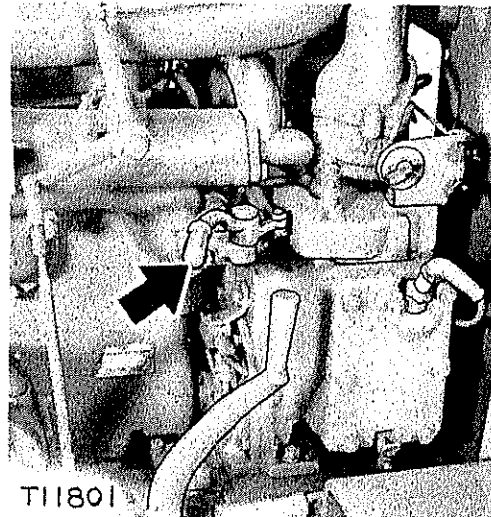
Position Controls For Starting: Before attempting to start the starting engine, position the controls of both the diesel and starting engine.

1. Check the crankcase oil level in the starting engine to make certain the oil is up to the "full" mark on the gauge.
2. Push the governor control lever (3) forward as far as possible so the injection pumps are closed.
3. Move the compression release lever to the START position.
4. Disengage the starting engine clutch by pulling the lever back toward the starting engine.
5. Open the starting engine fuel valve by unscrewing the fuel valve control (2) located below the compression release lever.



**TRACTOR CONTROLS IN
START POSITIONS**

1-Gear selector lever, 2-Flywheel
clutch control lever, 3-Governor
control lever.

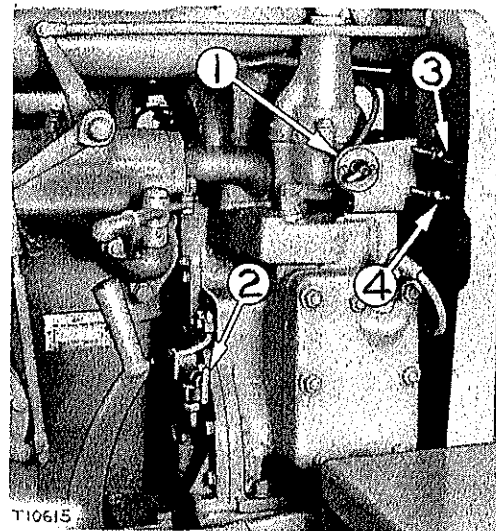


**COMPRESSION RELEASE LEVER
IN START POSITION**

6. Pull out the starting engine choke control (3).
7. Pull out the starting engine throttle control (4).
8. Turn ON the ignition switch (1).

STARTING ENGINE CONTROLS

1-Ignition switch, 2-Fuel valve control,
3-Choke control, 4-Throttle control.

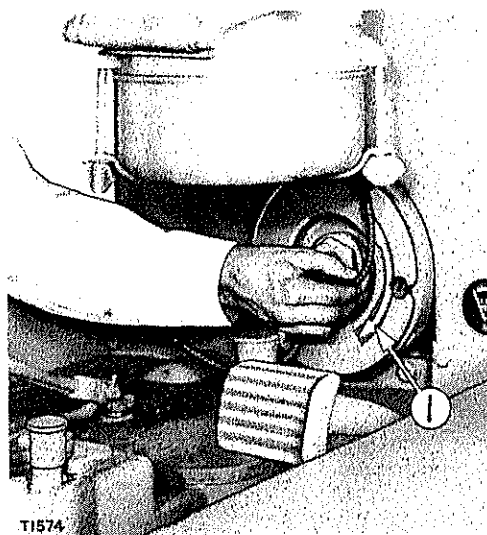


Starting the Starting Engine: After positioning the controls correctly, the starting engine may be started as follows:

1. Place the knotted end of the starting rope with the knot to the outside, in one of the two notches on the starting engine flywheel flange, and wind the rope around the groove in such a manner, that pulling the rope will turn the flywheel in the direction indicated by the arrow (1) on the flywheel.
2. Grasp the starting rope handle with the right hand and turn the flywheel with a quick pull on the rope.

PLACING STARTING ROPE ON FLYWHEEL

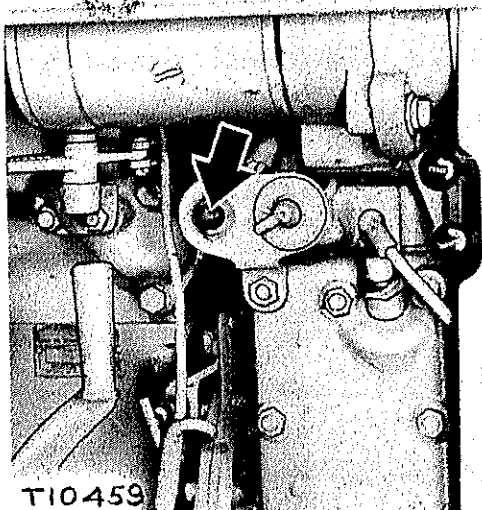
- 1—Arrow indicating direction flywheel turns.



3. Push in the choke control when the engine will run with the choke off. Temperature and altitude will vary the length of time it is necessary to have the choke on. Actual experience in starting will determine this interval.
4. Sometimes the starting engine can be started more quickly by leaving the throttle control pushed in. When the engine starts, pull the throttle control out to keep the engine speed low until the crankcase lubricating oil has a chance to warm up and better lubricate the engine.

Operating Starting Engine Electric Starter: Place the diesel and starting engine controls in the same position as described in the preceding topic. Then start the starting engine with the electric starter as follows:

1. Press the electric starter switch to crank the engine. Do not run the starter for more than thirty seconds at a time. Then allow two minutes for cooling before using it again. If the electric starter pinion disengages for any reason before the engine starts, release the starter



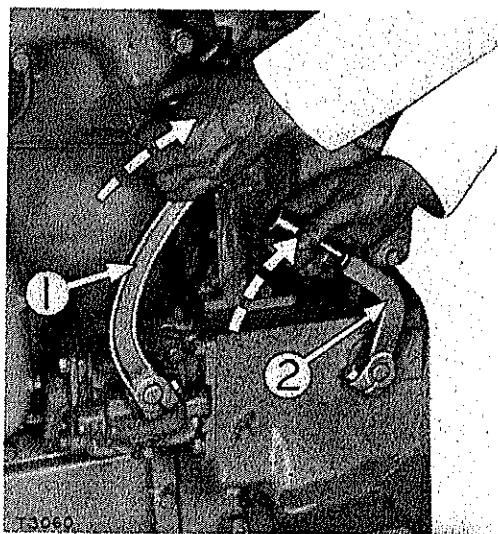
**STARTING ENGINE ELECTRIC
STARTER SWITCH**

switch and wait until the starting motor stops turning and the engine stops "rocking" before again pressing the starting switch.

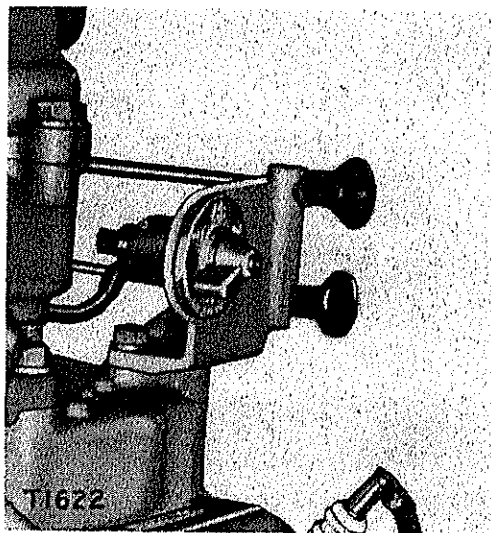
2. As soon as the engine starts, release the starter switch.

Starting the Diesel Engine: The steps to start the diesel engine should be carefully followed to prevent damage to the starter pinion or the flywheel ring gear.

1. Check to see that the starting engine is running at low idle speed.
2. Apply the starting engine clutch brake to stop the starter pinion from rotating by pulling the clutch control lever (1) all the way back and holding it there.
3. Engage the starter pinion with the flywheel ring gear by pulling up on the starter pinion control lever (2), then release the clutch brake and partially engage the clutch to be sure of full engagement of the starter pinion.
4. Push the throttle control in to let the starting engine run at full governed speed.



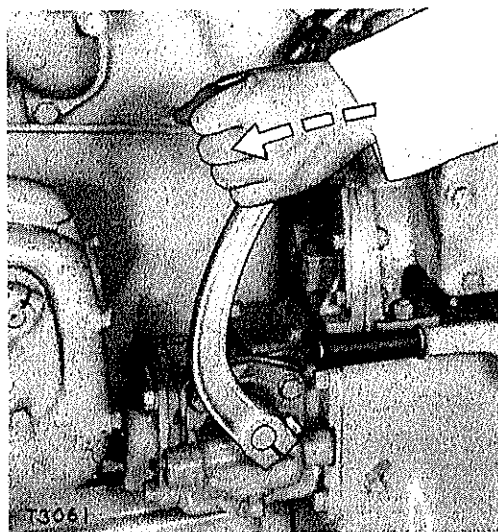
ENGAGING STARTER PINION
1-Clutch control lever. 2-Pinion control lever.



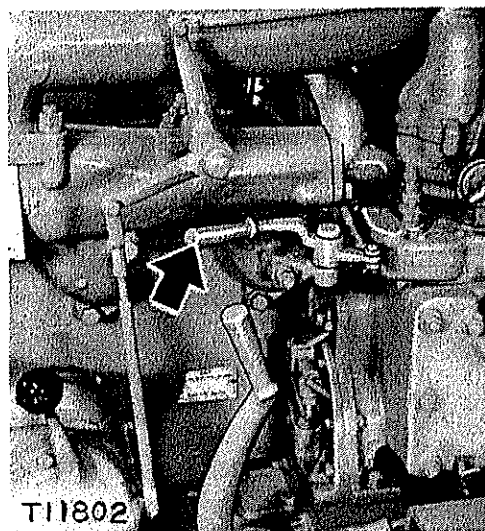
**STARTING ENGINE THROTTLE AND
CHOKE CONTROL POSITIONS FOR
FULL GOVERNED SPEED**

5. Engage the starting engine clutch by pushing the lever forward until it snaps over center. If the engine slows to the stalling point when the clutch is engaged, as it might in cold weather, disengage the clutch and let the engine pick up speed again.
6. Move the compression release lever to the RUN position as soon as the starting engine is cranking the diesel engine at normal cranking speed.

The heat generated when the starting engine is cranking the diesel engine against compression, and the circulation of the starting engine exhaust through the tube in the diesel engine air inlet pipe warms the cylinders, pistons, and combustion chambers to the starting temperature.



ENGAGING STARTING ENGINE
CLUTCH



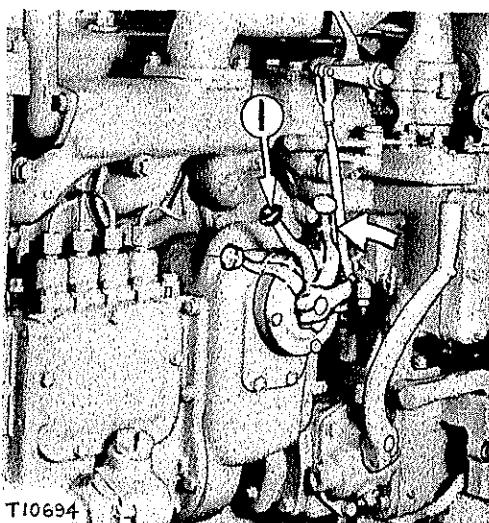
COMPRESSION RELEASE LEVER
IN RUN POSITION

7. Move the auxiliary governor control lever (1) to approximately half engine speed position. If the diesel engine does not start after it has turned several revolutions, move the auxiliary governor control lever to the stop position so the injection pumps are shut off, and let the starting engine turn the diesel engine against compression a little longer, before repeating the procedure.

Earlier tractors not equipped with a governor auxiliary control lever can be started in a similar manner, when the governor control lever (2) is in the half engine speed position as shown.

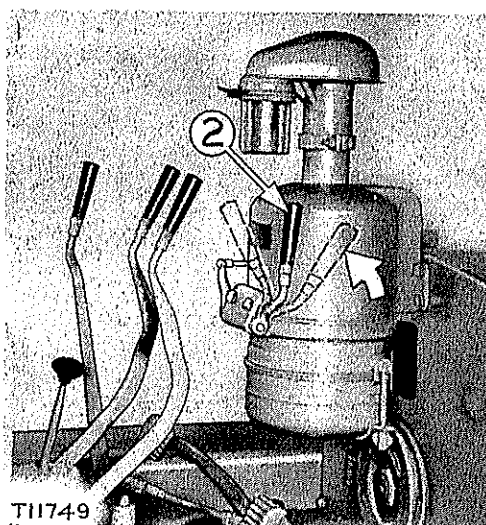
If the diesel is thoroughly heated but does not start, make an inspection to see that everything is correctly set for starting. If smoke has been coming from the diesel exhaust, fuel has been reaching the cylinders. If no smoke has been evident when the governor control lever was in the RUN position, check the fuel supply. If the diesel fuel tank is empty or the fuel tank valve is closed, it will be necessary to prime the system as outlined under the topic, PRIMING THE FUEL SYSTEM. In case there may be water or dirt in the fuel system, or if the fuel injection equipment is suspected, see the topic, FUEL INJECTION EQUIPMENT.

When the diesel engine begins to run, the starter pinion automatically disengages, but it is necessary to disengage the starting engine clutch by pulling back on the control lever.



**GOVERNOR AUXILIARY CONTROL
LEVER**

1-Governor auxiliary control lever in
half engine speed position.



GOVERNOR CONTROL LEVER

2-Governor control lever in half
engine speed position.

8. Pull the starting engine throttle control out in the idling position. Stop the starting engine by closing the fuel valve control, allowing the engine to burn all the fuel in the carburetor, then turn OFF the ignition switch.

Direct Electric Starting

The tractor is equipped with a 24 volt electric starting motor which is mounted on the diesel engine flywheel housing on the left side of the engine. The starter pinion automatically engages with the diesel engine flywheel ring gear when the starting motor starts to turn and disengages when the diesel engine starts and the switch is released. Four 6 volt batteries are connected in series and are mounted in front of the dash.

The diesel engine 24 volt electric starter can be used successfully in temperatures of 10° F. or above. When starting in temperatures below 32° F., it is advisable to use crankcase lubricating oil of a lower viscosity in the engine crankcase to reduce the cranking effort required. See the topic, CRANKCASE LUBRICATING OIL.

Diesel engines which depend upon electric cranking systems require certain aids when starting in lower temperatures. These engines are equipped with a glow plug in each combustion chamber and an ether starting aid to assist in cold weather starting.

The glow plug preheats the precombustion chamber so that a minimum of cranking time is required. Pressing the HEAT switch, which is located on the dash, causes the glow plugs to heat. It is recommended that the glow plugs be used to assist starting in temperatures below 60° F.

The ether starting aid provides a means of starting the engine when ambient temperatures are below 32° F. It is not advisable to use electric starting in temperatures below 10° F. without addition of some heat to the cooling system of the engine or without the use of additional batteries. If heating the cooling system is more desirable in these lower temperatures, the coolant should be maintained between 15° F. and 30° F. for easy cranking, quicker starting and rapid oil distribution.

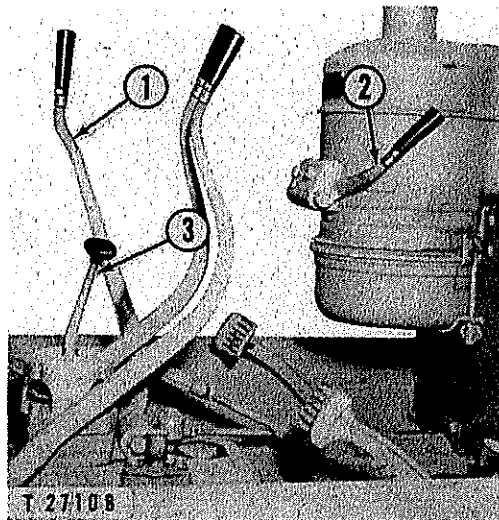
Ether capsules are of a definite size to limit the quantity of ether to be injected.

A discharger is used to inject ether into the inlet manifold. When the discharger lever is moved the metal capsule is pierced. Ether is forced out of the capsule by a small quantity of gas, under high pressure, into the inlet manifold to be taken into the cylinders for quick starting.

The engine must be kept in the best mechanical condition possible, the batteries kept fully charged and all terminals kept clean and tight for satisfactory performance of the starting system.

Position Controls For Starting: Before attempting to start the diesel engine the controls should be correctly positioned as follows:

1. Disengage the flywheel clutch by pushing the lever (1) forward.



CONTROLS IN START POSITION

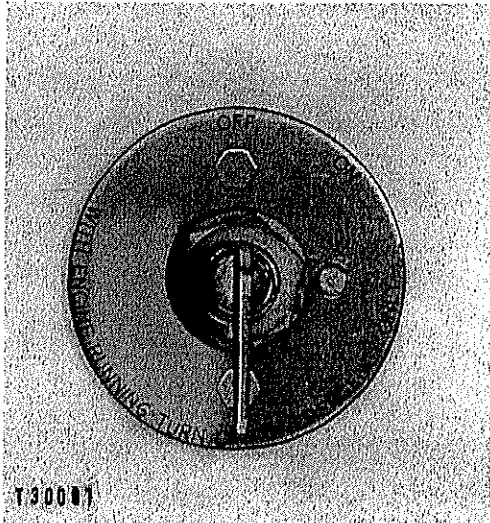
1-Flywheel clutch lever. 2-Governor control lever. 3-Gear selector lever.



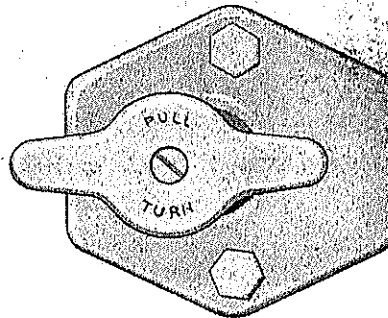
2. Shift the gear selector lever (3) to the neutral position.
3. Push down the right steering clutch brake pedal and lock it with the brake lock.
4. Move the governor control lever (2) to approximately half engine speed position.

5. Insert the key in the disconnect switch and turn the switch ON. The disconnect switch should be left in the ON position while the engine is RUNNING to charge the batteries.

Operation of the Disconnect and the Heat and Start Switches: Later tractors are equipped with a disconnect switch with a removable key, which is used to place the switch in the ON and OFF positions. Tractors equipped with this key-type disconnect switch do not have a key in the HEAT and START switch.



**LATER TYPE DISCONNECT
SWITCH**



**EARLIER TYPE DISCONNECT
SWITCH**

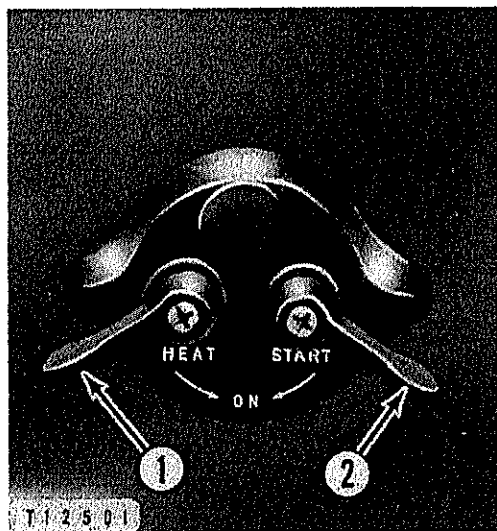
Earlier tractors are equipped with a handle type disconnect switch. The handle is used to place the switch in the ON and OFF positions. To place this switch in the ON position, pull the handle out, turn it to the horizontal position and release it. To place the switch in the OFF position, pull the handle, turn it in either direction and release it. Tractors equipped with this type of disconnect switch have a removable key in the HEAT and START switch. To unlock the HEAT and START switches, turn the key to the right. The key removable in either the locked or unlocked position.

CAUTION

Either type disconnect switch should be left in the ON position while the engine is running. If the switch is left in the OFF position, damage to the generator regulator may result.

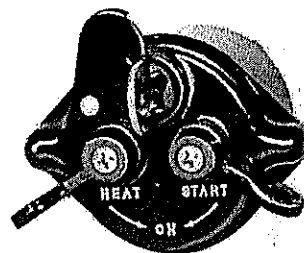
To operate the heat switch, move it to the ON position and hold for the desired time. See the Starting Aid Chart.

To operate the start switch, move it to the ON position and hold until the engine starts, but not more than thirty seconds.



LATER TYPE HEAT AND START
SWITCH

1-Heat switch. 2-Start switch.



T 2 2 6 9 8

EARLIER TYPE HEAT AND START
SWITCH

Starting The Diesel Engine At 60° F. And Above: After positioning the controls correctly, the diesel engine may be started as follows:

1. Move the START switch (2) to the ON position. As soon as the engine starts, release the switch.
2. If the engine does not start in a few seconds, continue to crank the diesel engine but shut off the fuel supply by moving the governor control lever to the shut-off position for about ten seconds to clear the cylinders of raw fuel.
3. If the diesel engine fails to start within **thirty seconds**, release the START switch and wait **two minutes** to allow the electric starter to cool before using it again.
4. If the electric starter pinion disengages for any reason before the engine starts, release the START switch and wait until the electric starter stops rotating and the diesel engine stops "rocking" before again pressing the START switch. When the engine starts, see the topic, GAUGES.

Starting The Diesel Engine Between 60° F. And 32° F. Using Glow Plugs: Ease of starting the diesel engine can best be obtained by following the instructions closely. Particular attention should be given to the time necessary to hold the HEAT switch ON. After positioning the controls correctly, the diesel engine may be started as follows:

1. Move the HEAT switch (1) to the ON position for the length of time necessary as indicated in the STARTING AID CHART.

NOTE

Each glow plug uses approximately 7 amperes while the HEAT switch is in the ON position. This is actually a small amount in comparison to the starter load that is imposed on the battery when the START switch is ON.

2. Move the START switch to the ON position while continuing to hold down the HEAT switch. As soon as the engine starts, release the START switch, but hold the HEAT switch ON until the engine is running smoothly.

If the engine fails to start after 10 seconds of cranking, release the START switch and continue to hold the HEAT switch ON for about 30 seconds before cranking the engine again. When the starting motor is cranking, the battery voltage is reduced and the glow plugs cool. Re-heating them after 10 seconds of cranking makes the glow plugs more effective and conserves the battery. **Do not move the glow plug switch to the ON position while the engine is warm and running.**

When the engine starts see the topic, GAUGES.

Starting Aid Chart

Starting Temperature Range	Glow Plug Heating Time — Heat Switch On	Number of Ether Capsules to Use
Above 60°	None	None
60° to 45°	45 Sec.	None
45° to 32°	1 Min.	None
32° to 20°	2 Min.	1 Capsule
20° to 10°	2 Min.	2 Capsules

Starting Between 32° F. and 10° F. Using Glow Plugs and Ether Starting Aid: Ease of starting the diesel engine can best be obtained by following the instructions closely. Particular attention should be given to the time necessary to hold the HEAT switch ON.

After positioning the controls correctly, the diesel engine may be started as follows:

1. Load the dischargers by unscrewing the nut (2), removing the spent capsules and placing new capsules (3) in the dischargers as shown. Install the nuts finger tight.

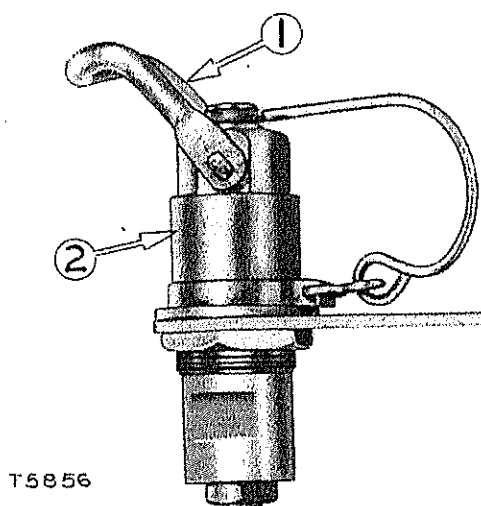
2. Move the HEAT switch to the ON position for the length of time necessary as indicated in STARTING AID CHART.

NOTE

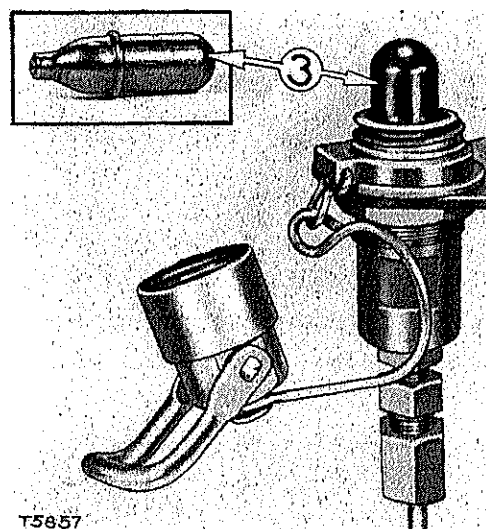
Each glow plug uses approximately 7 amperes while the HEAT switch is in the ON position. This is actually a small amount in comparison to the starter load that is imposed on the battery when the start switch is on.

3. Discharge ether by moving the discharge lever (1) to pierce the capsule. See the STARTING AID CHART for the number of capsules required.

Be sure the spent capsule is left in the discharger when the engine is running and the nut (2) is finger tight on the discharger to keep dirt out of the engine.



T5856



T5857

ETHER DISCHARGER

1-Discharging lever. 2-Nut. 3-Capsule.

Actual experience will determine the number of capsules required for easy starting.

If more than one capsule is needed in the manifold, discharge the first two capsules and install the second set of capsules in the dischargers before cranking the diesel engine. Only one or two capsules should be discharged into the manifold before cranking the engine. The discharge of the second set of capsules can be performed when the engine has been cranked a few revolutions, or when it starts to stall.

4. Move the START switch to the ON position while continuing to hold down the HEAT switch, as soon as the engine starts, release the START switch, but hold the HEAT switch ON and discharge ether

capsules as required, to prevent stalling, until the engine is running smoothly. **Do not move the glow plug switch to the ON position while the engine is warm and running.**

If the engine does not start after 10 seconds of cranking, release the START switch and continue to hold the HEAT switch ON for 30 seconds then, repeat the starting procedure.

When the engine starts see the topic, GAUGES.

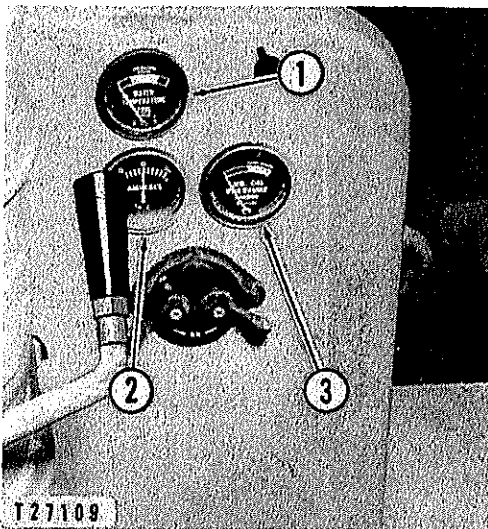
CAUTION

Do not discharge more than 2 ether capsules without cranking the engine.

GAUGES

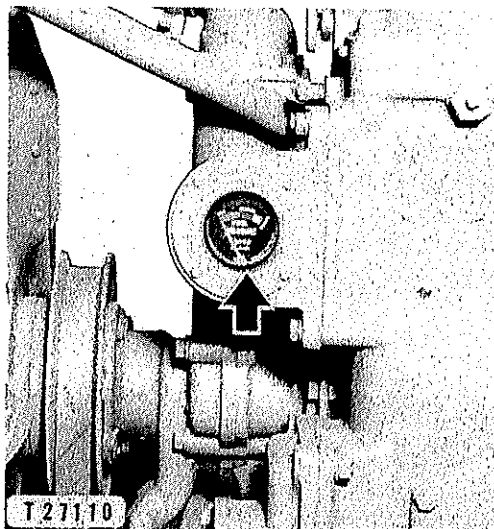
After the engine has started it should be allowed to warm up for five minutes with the governor control lever in approximately half speed position before applying the load. During this warm-up period the engine gauges should be observed for proper readings as explained in the following paragraphs.

Oil Pressure Gauge: Immediately after the engine has started, check the crankcase lubricating oil pressure gauge (3) to see that it is register-



GAUGES

1-Water temperature gauge. 2-Ammeter.
3-Crankcase lubricating oil pressure gauge.



FUEL PRESSURE GAUGE

ing pressure. When the engine is running at rated engine speed the gauge should register in the "Operating Range". A lower pressure read-

ing is normal at low idling speeds. If no pressure is indicated, investigate at once.

Water Temperature Gauge: The indicator on the water temperature gauge (1) should register in the "Operating Range". The water temperature regulators within the diesel engine cooling system are designed to give an approximate minimum coolant temperature of 160° F. (71° C.). The maximum operating temperature will vary according to the air temperature and load factor, but should never exceed boiling temperature at the prevailing altitude.

Fuel Pressure Gauge: The indicator on the fuel pressure gauge should register in the NORMAL (white) range. See the topic, CARE OF THE FUEL FILTER.

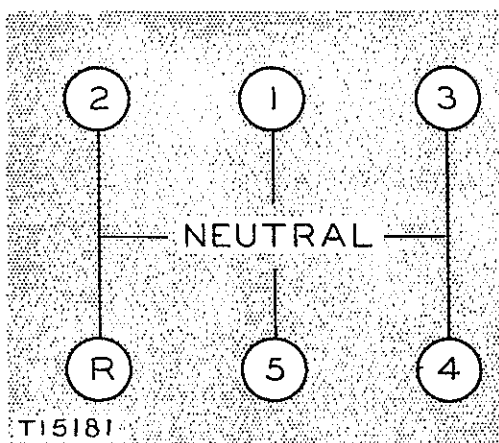
Ammeter: Check the ammeter (2) to see that the indicator is registering in the charging range (indicator on the + side of zero). If the indicator registers in the discharging range (indicator on the — side of zero) investigate at once. See the topic, GENERATOR.

DRIVING THE TRACTOR

When the engine has been running long enough to warm up, move the governor control lever to the low idle speed position. Disengage the fly-wheel clutch by pressing the clutch control lever forward as far as it will go. This applies the clutch brake. Continue to press forward on the lever until the clutch stops turning. Carefully move the gear selector lever into position for the speed desired.

Gear selector lever positions effective with 6U9187 and 7U24216 are illustrated here and on the instruction plate located on the governor control lever bracket.

Gear selector lever positions before 6U9187 and 7U24216 are cast at the ends of the slots in the plate around the gear selector lever.



STANDARD TRANSMISSION GEAR
SELECTOR LEVER POSITIONS

On tractors equipped with special transmissions, refer to the instruction plate mounted on the governor control lever bracket.

The clutch lever controls the locking mechanism that holds the sliding transmission gears in position, so the gears cannot be shifted into or out of mesh with the clutch engaged. Always shift gears completely into mesh.

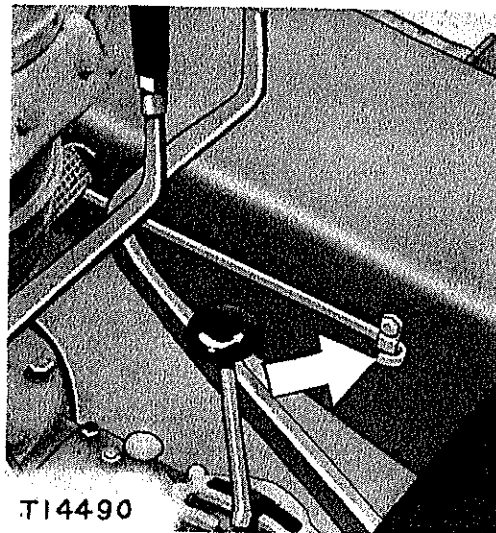
Carefully engage the flywheel clutch until the slack is taken up between the tractor and the load. When the tractor begins to move the load, pull the clutch lever all the way back so the engaging mechanism will snap over center and remain fully engaged. Never move a load with the flywheel clutch only partially engaged as this causes heating and rapid unnecessary wear on the clutch plates.

STEERING THE TRACTOR

The tractor is steered by hand levers that operate the steering clutches and by pedals that control the steering clutch brakes. Release the steering clutch on the side toward which the turn is to be made by pulling back on that steering clutch control lever. Apply the brake on the same side by pressing down on the pedal just hard enough to turn at the desired angle. Both controls should be handled smoothly so the turn will be made evenly, and not as a series of jerks. Just before the turn is completed, release the brake. Then engage the steering clutch by releasing the control lever quickly but gently.

When the tractor is pulling a load, it is seldom necessary to use the brakes except for sharp turns, since the load acts as a brake. The brakes may also be used to hold the tractor back when going down grade. The right pedal may be locked in position to hold the tractor on slopes or when doing stationary work, by first depressing the pedal and then pulling back on the brake lock control rod on the inside of the right fender.

**BRAKE LOCK
CONTROL ROD**



Steering Down Grade: When going down grade with the tractor pulling the load, steer in the usual manner. If the load is pushing the tractor, the operation of the steering clutches should be reversed. For example, to turn to the right under these conditions, release the steering clutch on the left, but do not apply the brake. This allows the left track to travel faster while the right track is held back by the engine which acts as a brake.

The pedals must be in the fully released position during the normal operation of the tractor. **Keep the feet off the pedals except when it is necessary to use the brakes.**

OPERATING OVER AN OBSTRUCTION

The fact that the steering clutches are controlled by separate levers may be used to advantage in running over an obstruction, such as a log or a ditch bank. Both of the clutches may be released slightly until the tractors balances on top of the obstruction. Then one clutch may be engaged gradually so the tractor moves forward at an angle, over and down. If the tractor is being operated without a load it may be necessary to use the brakes.

OPERATING IN DEEP MUD OR WATER

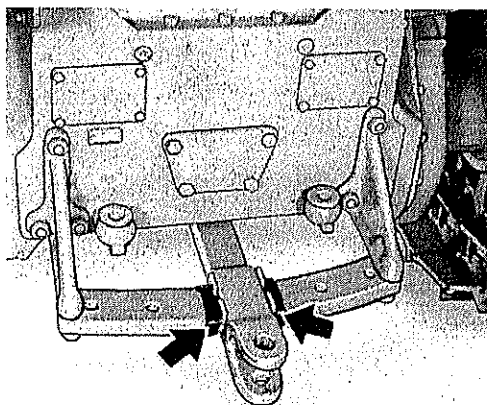
If the tractor must be operated for any length of time in deep mud or water, certain precautions are necessary. See that the plugs are in place under the steering clutch compartments. Lubricate the track rollers, carrier rollers, the front idlers and track roller frame inner and outer bearings every 10 service hours. Inspect the oil in the final drives frequently for mud or water and drain, wash and refill as soon as the oil shows the presence of mud or water. The presence of mud or water in the final drives or the excessive leakage of oil indicates the seals should be replaced. See the topic, LUBRICATION CHART.

DRAWBAR ADJUSTMENT

The tractor drawbar is provided with pins which may be removed, thus allowing the drawbar to swing sideways lining up with the draft.

There are three drawbar adjustments possible—fixed, full swing and modified swing. Whenever the tractor is pulling a free load or using scraper type equipment the drawbar must be used in the fixed position, pinned in the center. The full swing drawbar allows the tractor to turn much easier and shorter because the load pivots freely from a point near center of the tractor. The modified swing is recommended where an offset load such as is imposed when pulling a moldboard plow. It will be desirable to let the drawbar swing between limits of four or five inches as this will hold the plow to its proper course.

DRAWBAR PINS



T11768

All implement hitches produce individual problems that effect the operation of the implement and tractor. Your Caterpillar dealer is available for suggestions to help solve these problems.

STOPPING THE TRACTOR

To stop the tractor when it is desired to allow the engine to continue to run, disengage the flywheel clutch and move the governor control lever to the low idle speed position. Shift the transmission gears into neutral and engage the flywheel clutch. Do not allow the tractor to stand with the engine idling and with the flywheel clutch disengaged.

STOPPING DIESEL ENGINE

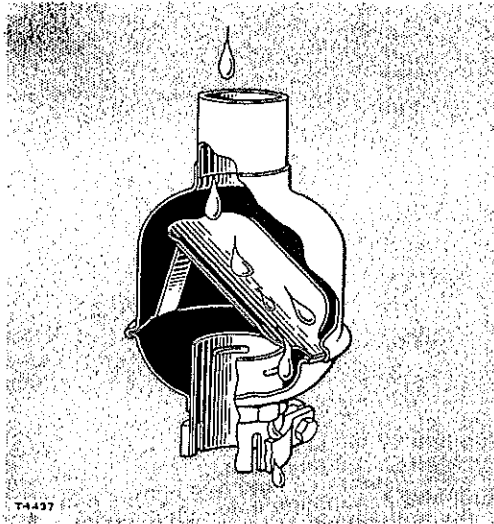
After the normal load is removed from the engine allow it to idle five minutes with the governor control lever at half engine speed position before stopping.

Move the governor control lever to the extreme forward position, which shuts off the fuel injection pumps. Leave the diesel fuel tank valve open.

If the tractor must stand without shelter, cover the exhaust pipes to exclude rain or snow. Rain traps for this purpose may be obtained from your Caterpillar dealer. If the temperature is below freezing, or if freezing weather is expected before the engine will be started again, drain the cooling system or protect it with an anti-freeze solution. See the topic, COOLING SYSTEM.

When Equipped With Direct Electric Starting: When the diesel engine is stopped, turn the disconnect switch to the off position to open the circuit between the battery and the remainder of the electrical system. The disconnect switch is provided for three reasons: first to prevent actuating

the starting motor or glow plugs if the START or HEAT switches are pressed accidentally. Second, to prevent damaging the electrical system when performing service operations on the equipment. Third, to prevent discharging the batteries when the machine is not in operation.



RAIN TRAP FOR EXHAUST PIPES

DAILY CARE

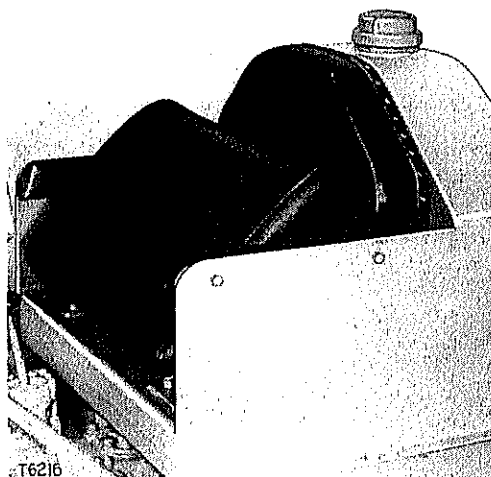
A daily check of the machine should be made to see if there are any loose nuts, bolts, capscrews, or parts worn to such an extent that they are no longer serviceable. Points to be checked daily for tightness or leaks are listed as follows:

1. Gasketed joints of final drive cases, inspect for tightness.
2. Exhaust and inlet manifold and air cleaner connections, inspect for tightness.
3. Track shoe bolts, inspect for tightness.
4. Track roller end collar bolts, inspect for tightness.
5. Cooling system, clean trash from radiator core and add coolant or anti-freeze if necessary.
6. Fuel pressure gauge, inspect with engine running to see that indicator is not in red range.
7. Diesel engine air cleaner cup, inspect for dirt in cleaner cup when operating in extremely dusty conditions.
8. Sprocket hub seals, inspect for leakage.
9. Equalizer spring clip nuts, inspect for tightness.

Fill the fuel tank full at the end of the day's run. See the topic, CARE OF THE DIESEL FUEL TANK, for other periodic care.

Dirt should not be allowed to accumulate on the tractor. A few minutes spent daily in keeping it clean are well repaid in improved appearance, and greater ease and safety in operation and maintenance.

**SEAT CUSHION TIPPED
TO PROTECT PADDING**



If the tractor must stand without shelter the operator's seat cushion should be tipped as shown. When this is done the water proof covering prevents moisture entering the padding under the covering. If the cushion is turned bottom side up in rainy weather the padding under the water proof covering may become damp. This moisture with accumulated dirt and heat will shorten the life of the cushion.

OPERATING IN COLD WEATHER

If the starting engine and the diesel engine are both in good mechanical condition, and the precautions necessary for cold weather operation are taken, ordinary cold weather will not cause difficulty in starting or loss of efficiency.

Lubricants: As the atmospheric temperatures become lower, where warm housing facilities are not available, lubricants of lower viscosity should be used. See the topic, CRANKCASE LUBRICATING OIL.

Coolant: When the temperature is below freezing, sufficient anti-freeze solution should be used in the cooling system to prevent freezing. See the topic, COOLING SYSTEM.

The liquid in the cooling system may be warmed to make starting easier and quicker. When warming anti-freeze solutions, keep away from

flames, as some of these solutions may be inflammable. Avoid getting the solution hot, and even a warm solution should be poured very slowly into a cold cooling system to prevent damage by sudden expansion.

Fuel: Fuel must be "free flowing" enough to flow readily through the fuel lines at the lowest temperature at which the tractor will be started and operated. For additional information on this subject, see the topic, FUELS.

Starting The Starting Engine: If the tractor has been standing without shelter in extremely cold weather, the suggestions that follow will materially assist starting as well as protect the engine against damage.

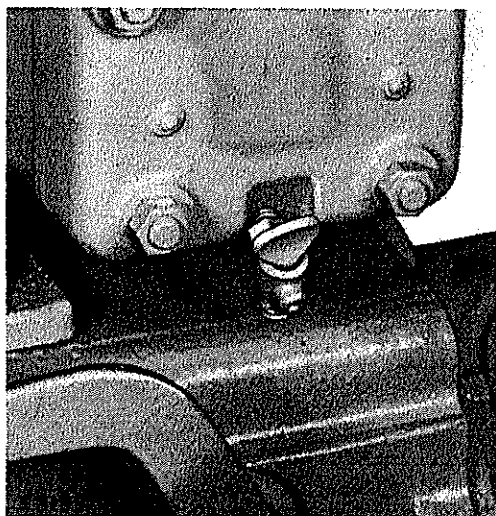
It is very important to keep low viscosity crankcase lubricating oil up to the full mark on the gauges in both the diesel engine and starting engine to provide proper lubrication when starting. Refer to the topic, CRANKCASE LUBRICATING OIL.

Crank the starting engine several revolutions with the ignition switch off, and the starting engine clutch disengaged. This will better distribute oil to the bearings and cylinder walls.

Sometimes moisture, or fuel which has not vaporized, collects on the starting engine spark plugs. They may be dried out by removing them and pour gasoline over the electrodes. Ignite the gasoline and allow it to burn. **Use care to prevent fire.**

Pouring a small amount of gasoline on the electrodes before they are replaced in the engine is more effective in promoting combustion than priming the cylinders with gasoline. A small amount of gasoline in the cylinders will remove the film of oil from the cylinder walls and interfere with compression.

If the starting engine is flooded, open the drain cock on each cylinder head and turn the flywheel until the cylinders are cleared of excess fuel.



CYLINDER HEAD
DRAIN COCK

Sometimes the starting engine can be started more quickly by pushing in the throttle control. **When the engine starts, pull out the throttle to the idling position to keep the engine speed low until the crankcase lubricating oil has a chance to warm up and better lubricate the engine.**

STORAGE

Lubricate all points mentioned in the lubrication chart if the tractor is to be stored or left standing for any length of time. This will protect against rusting.

Diesel Engine: If the tractor is to be stored or left standing, for a long period of time, the lubricating oil may drain away from the cylinder walls and piston rings. This lack of lubricant permits the rings and liners to rust. It also permits unnecessary wear caused by metal-to-metal contact between the pistons, rings and liners when the engine is started before fresh oil has reached these surfaces. The lack of lubricant may not cause any noticeable change in engine operation after it has been started but it does contribute to shorter engine life.

On the diesel engine the film should be renewed by running the engine once a week until it is thoroughly warm. This will circulate the oil and prevent rusting from condensation. If it is not convenient to start the engine, remove the injection valves once a month and pour $\frac{1}{8}$ pint (0.06 liter) of crankcase lubricating oil into each cylinder. Then turn the engine several revolutions with the compression release lever in the START position and the governor control lever in the CLOSED position. Replace the injection valves. Thereafter, turn the engine once a week between monthly oiling intervals to distribute the oil on the cylinder walls and pistons.

CAUTION

If rusting in the diesel engine has been guarded against by pouring oil into the cylinders rather than by running the engine, the following precaution should be observed before starting:

Move the compression release lever to the START position to release the compression, then turn the engine to dissipate oil that may have accumulated in the cylinders.

If excess oil is not removed, compressing it in the small space between the piston and cylinder head will cause damage to the engine.

Starting Engine: The oil film should be renewed in the starting engine by running the engine once a week until it is thoroughly warm. If it is not convenient to start the engine, remove the spark plugs once a month and pour $\frac{1}{8}$ pint (0.06 liter) of oil into each cylinder. Then turn the fly-

wheel several revolutions and replace the spark plugs. Thereafter, turn the engine once a week between monthly oiling intervals to distribute the oil on the cylinder walls and pistons.

Final Drive: Allowing the tractor to stand idle for lengthy periods may permit the gasket on the final drive seals to become lightly stuck to the washer on which it operates. When this occurs the gaskets may be damaged when the tractor is operated, causing the seals to leak. For this reason the tractor should be driven backward and forward occasionally during the storage period. A convenient time to do this would be when starting the engine to renew the oil film on the cylinder walls and piston rings.

Cooling System: If the temperature will be below freezing, the cooling system should be drained if it has not been serviced as indicated in the topic, COOLING SYSTEM.

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Maintenance Instructions

The foregoing paragraphs have been devoted to instructions which are necessary for day-to-day operation of the tractor. The following topics give detailed instructions regarding the care and adjustment of the various parts.

AIR CLEANERS

The air cleaners do their work efficiently only as long as the oil in the cups flows freely at operating temperature, so it will spray into the filter sections and wash back the dirt collecting there. For this reason, the air cleaners should be inspected frequently and serviced according to the following instructions.

Inspect the Oil in the Diesel and Starting Engine Air Cleaner Cups:

Every 10 to 50 service hours, depending upon operating conditions, inspect the oil in the diesel engine air cleaner cup. The air cleaner cup should be washed and refilled every 50 service hours or when the oil in the cup will not flow freely at operating temperature, or if the sediment in the cup is $\frac{1}{2}$ inch deep ($\frac{1}{4}$ inch in a starting engine air cleaner), whichever occurs first. It may be necessary to inspect the oil in the starting engine air cleaner cup only every 50 service hours.

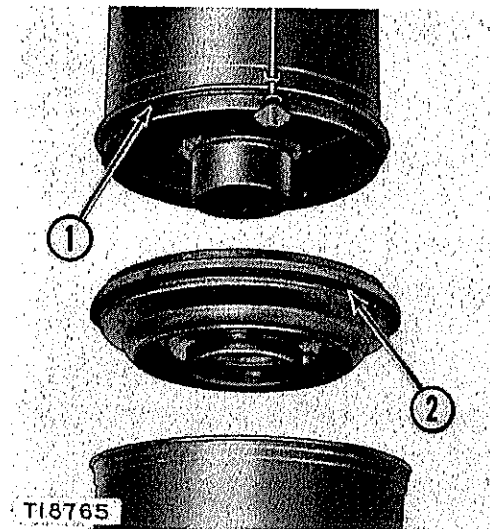
1. Loosen the wing nuts and take off the diesel engine air cleaner cup and separable tray. Earlier engines, the separable tray is fastened to the air cleaner inlet pipe by wing nuts.
 - a. On starting engine air cleaners the oil cup is removed by loosening the wing nuts.

Some thickening of the oil in the cup should be no cause for alarm, actually it can be considerably thicker than the S.A.E. grade that was last put in the cup, as long as the oil at operating temperatures will flow freely. For a check to determine if the oil will flow freely, dip into the oil with a finger and if the oil on it will flow off, the oil is fluid enough to flow freely.

2. Service other parts of the air cleaner while the oil cup is removed, as indicated in the following topics.
3. When refilling the oil cup, care should be taken to see that both the inner and outer cups are filled to the flat face of the inner cup on later engines and to the oil level bead on earlier engines and starting engines. In temperatures above freezing S.A.E. No. 30 oil should be used. In temperatures below freezing use S.A.E. No. 10W oil. Do not dilute S.A.E. No. 10W oil.
4. Seals between the cup, separable tray and body prevent oil running out of the cup during hillside operations. Air leakage at this point can possibly upset proper air cleaner action. When replacing the oil cup

AIR CLEANER SEALS

- 1-Seal in the groove on the body.
- 2-Seal in the groove on the separable tray.

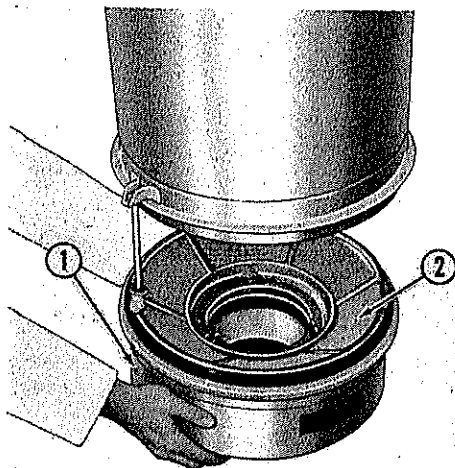


and separable tray on air cleaners, check to see that the seal (2) between the air cleaner cup and separable tray and the seal (1) between the separable tray and body are in place and in good condition. Earlier engines, there is only one seal which is located between the cup and body.

Never attempt to change the oil in the air cleaner cup when the engine is running. This will cause dirty oil to be held in the filter section by intake action. The dirty oil held in the filter section will contaminate the fresh oil, and also cause an abnormally high oil level which may allow oil in the screens to be carried into the engine resulting in over-speeding.

Wash Air Cleaner Lower Filter Section: At every air cleaner cup service period, between 10 to 50 service hours, depending on operating conditions, wash the separable tray screens or element. Air cleaners without separable tray should be serviced every 10 service hours.

1. Remove the separable tray (2) and cup (1) by loosening the wing nuts that hold them in place. Earlier engines, the separable tray and cup are removed separately.



REMOVING AIR-CLEANER CUP AND SEPARABLE TRAY

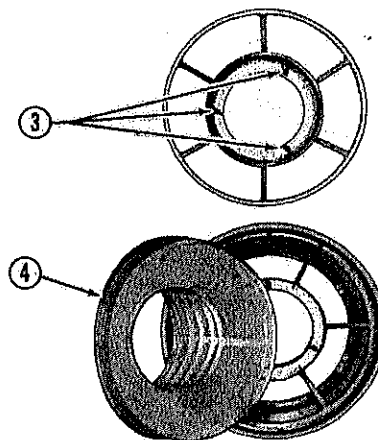
- 1-Cup. 2-Separable tray.



2. Remove the tray and cup from the air cleaner body.
3. Disassemble the separable tray by loosening the thumb screws (3) and lift out the screens.
4. Wash the separable tray screens or element with a brush, in kerosene or some non-inflammable cleaning fluid.
5. Assemble the separable tray by placing the screens (4) in the tray, and tightening the thumb screws.

**AIR CLEANER SEPARABLE
TRAY DISASSEMBLED
(Later Tractors)**

3-Thumb screws. 4-Screens.



T18767

6. Install the separable tray and cup to the air cleaner body.
7. Make sure all connections are tight and install the air cleaner cup.

Inspect the Inside of the Air Cleaner Inlet Pipe: Every 10 to 50 service hours, depending on operating conditions, when the air cleaner cup is removed to clean separable tray the screens or element, inspect the inside of the air cleaner inlet pipe by reaching up from the bottom of the pipe. If heavy accumulations of dirt is noticed, clean the pipe.

Inspect the Air Cleaner Upper Filter Section: Inspect the bottom screen of the air cleaner upper filter section whenever chaff, lint, leaves or other such material shows up in the oil or in the separable tray or cup. This material must be cleaned out to maintain proper air cleaner performance.

Wash the Entire Air Cleaner: Every 2000 hours—more often in dusty conditions—wash the entire air cleaner.

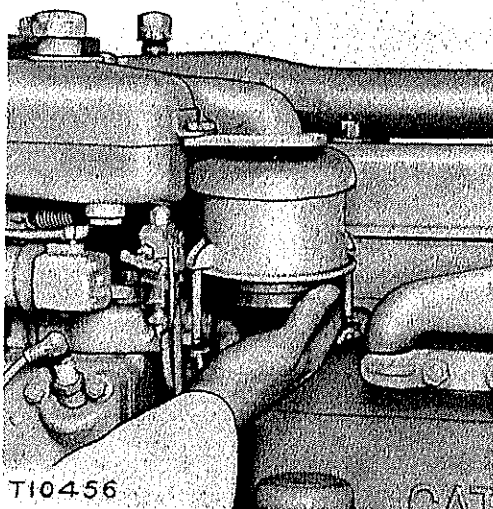
1. The entire air cleaner should be removed in order to thoroughly clean the upper filter section in the cleaner body.
2. Remove the oil cup and separable tray.
3. Immerse the entire cleaner in kerosene or some non-inflammable cleaning fluid. Steam cleaning is not recommended because some

forms of dust rolls into small balls when steam is applied, and these balls cannot be washed out of the screens.

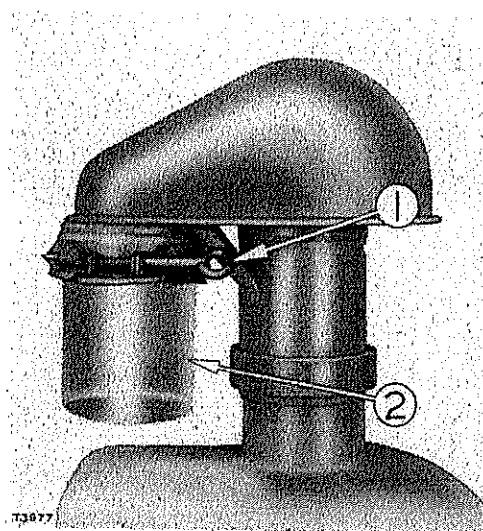
4. Wash the oil cup and separable tray as outlined in the preceding topics.
5. Dry the air cleaner parts thoroughly and reassemble, making certain all connections are air tight.

Wash Starting Engine Air Cleaner: Every 1000 service hours wash the starting engine air cleaner.

1. Unscrew the wing nuts and remove the oil cup.
2. Remove the cleaner body by taking out the bolts at the top of the cleaner.
3. Wash the filter by shaking the entire air cleaner in a pan of kerosene or some non-inflammable cleaning fluid.
4. Wash and refill the oil cup.
5. Assemble and install the air cleaner, but be sure the mating faces of the air cleaner and the cleaner pipe are clean, the gasket between them is in place and all connections are air tight.



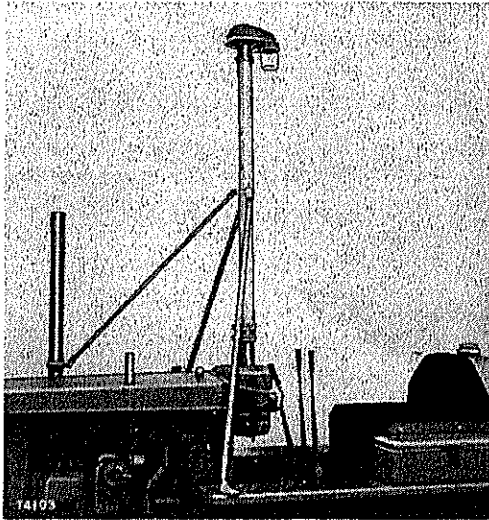
**REMOVING STARTING
ENGINE AIR CLEANER**



PRECLEANER
1-Screw clamp. 2-Jar.

Precleaner Care: The precleaner is recommended to lengthen air cleaner service periods because it removes some of the dirt from the inlet air. For this reason, always install the jar (2) correctly and replace either a broken jar or gasket immediately, because the precleaner will not work properly without them. Remove and empty the jar before it becomes three-fourths full by loosening the clamp screw (1) that holds it in place. Inspect the fins in the precleaner regularly and when they are dirty remove the entire precleaner and wash it in water.

Air Inlet Pipe Extension: Where dust conditions are severe, dust and abrasives may be carried in a heavy cloud rising to the height of the air inlet. In these conditions an air inlet pipe extension, which is available from your Caterpillar dealer, will put the precleaner up where the air is cleaner, reducing engine wear and the frequency of air cleaner service.

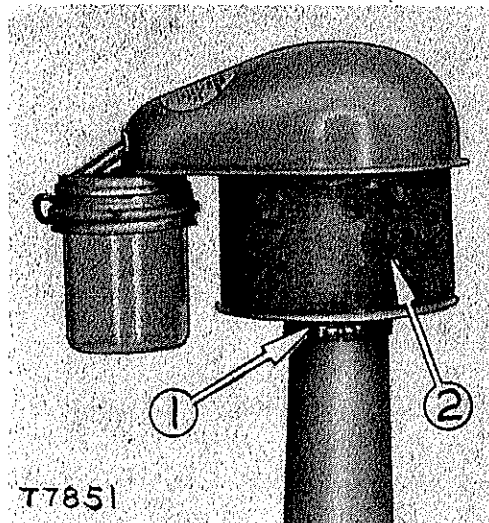


**AIR INLET
PIPE EXTENSION**



Prescreener Care: Where the air contains objectionable foreign material, such as, cotton lint, small leaves or other particles the special prescreener should be used to prevent these materials entering the air cleaner. When the prescreener is used, inspect the screen (2) regularly and when it is dirty remove by loosening the clamp bolt (1) which holds it in place. Clean the screen with a dry brush or wash it in water.

PRESCREENER
1-Clamp bolt. 2-Screen.



CRANKCASE LUBRICATING OIL SYSTEM

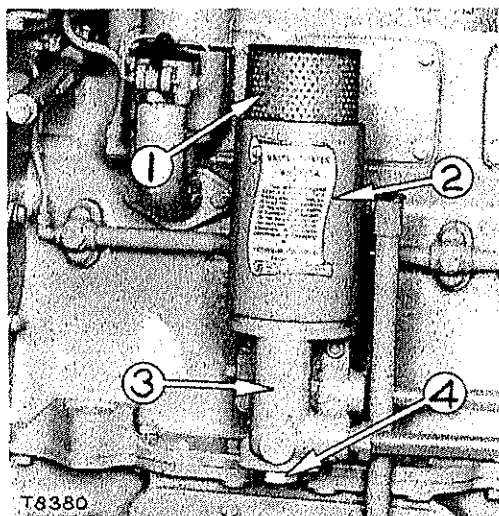
Two types of crankcase lubricating oil filter systems are covered in this topic. Tractors effective with 6U6299 and 7U12905 are equipped with a full-flow crankcase lubricating oil system. The filter has one large filter element only in the filter housing. Tractors before 6U6299 and 7U12905 were equipped at the factory with a by-pass crankcase lubricating oil system which may be converted to the full-flow system by the installation of the field changeover group. The by-pass system has an inner element and an outer metallic strainer element in the filter housing.

Servicing the crankcase lubricating oil filter as described, should be performed each 250 service hours, or after 10 service hours of operation of a reconditioned engine. When equipped with a by-pass system, change the element every 125 service hours in extremely dusty operations.

Full-Flow System

Crankcase Lubricating Oil Filter: The filter elements should be replaced with new Caterpillar elements at each service period as follows:

1. Remove the drain plug (4) from the oil filter base (3). Then loosen the clamp screw and remove the cover and screw as a unit.
2. Lift out the element (1) and discard it.
3. Install a new Caterpillar element in the housing (2).
4. Reinstall the cover, tighten the clamp screw and replace the drain plug.

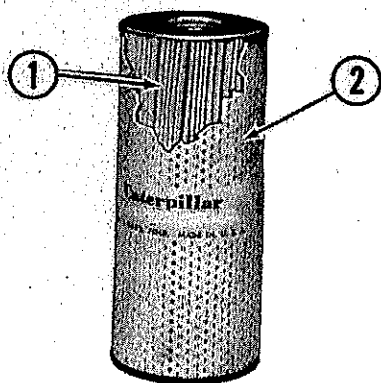


FULL-FLOW CRANKCASE LUBRICATING OIL SYSTEM FILTER

1-Element. 2-Housing.
3-Filter base. 4-Drain plug.



Full-Flow Crankcase Lubricating Oil System Filter Element: The filter element is of the resin impregnated cellulose material type. The resin impregnated cellulose material (1) is pleated around a center core and encased within a perforated cover (2).



CRANKCASE LUBRICATING OIL FULL-FLOW SYSTEM FILTER ELEMENT

1-Resin impregnated cellulose material. 2-Perforated cover.

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The filter housing, cover and element are designed to seal unfiltered oil from the filtered oil side of the element. Sealing is accomplished by a spring loaded flat plate in the cover which holds the element against the flat plate at the bottom of the housing.

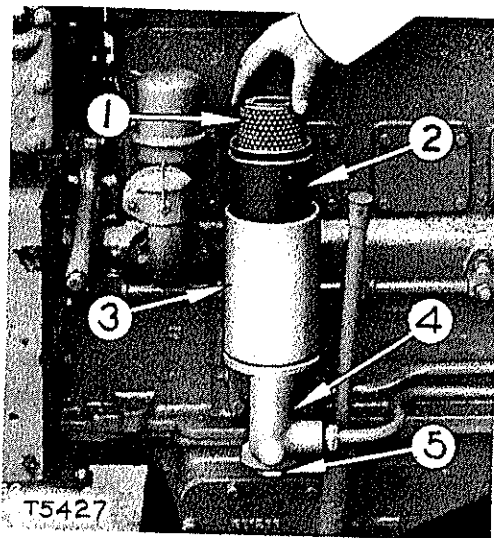
By-Pass System

Crankcase Lubricating Oil Filter: The filter elements should be replaced with new Caterpillar elements at each filter service period as follows:

1. Remove the drain plug (5) from the filter base (4). Then loosen the clamp screw and remove the cover and screw as a unit.
2. Lift out the inner element (1) and discard it.
3. Remove the metallic strainer element (2) and wash it in kerosene or some non-inflammable cleaning fluid. If the sludge must be brushed off, stroke parallel to the winding. Eventually, gums and lacquers may clog the metallic strainer element, even though it appears clean on the outside. The openings between the windings and

BY-PASS CRANKCASE LUBRICATING OIL SYSTEM FILTER

1-Inner element. 2-Metallic strainer element. 3-Housing. 4-Oil filter base. 5-Drain plug.



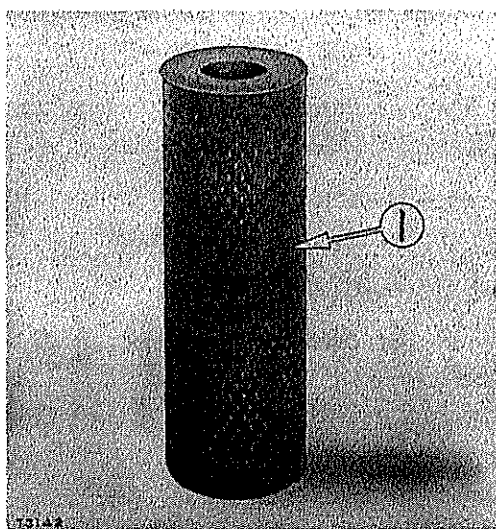
T5427

the internal condition of an element can be checked by comparing it with a new one. Plug the holes in the bottom of both old and new metallic strainer elements and immerse them to the top rim in diesel fuel. Compare the rate at which the fuel rises inside the elements. Discard the used one if it is not at least three-fourths full by the time the one is completely filled.

4. Install the metallic strainer element and new inner element in the housing (3).
5. Reinstall the cover, tighten the clamp screw and replace the drain plug.

By-Pass Crankcase Lubricating Oil System Filter Element: The filter element is of the resin impregnated cellulose material type. The perforated cover (1) encases the impregnated cellulose material which is pleated around a center core.

A self-sealing action at the ends of the element is developed by a spring loaded plate in the cover which holds the element against the flat plate at the bottom of the housing.



**BY-PASS CRANKCASE LUBRICATING
OIL FILTER SYSTEM INNER
ELEMENT**

1-Perforated cover.



Washing the Crankcase: Whenever the diesel or starting engine oil pan is removed for any reason it should be thoroughly cleaned before it is re-installed. The oil pump screen should also be cleaned while the oil pan is off the engine.

FUELS

As a source of power the diesel engine has two outstanding advantages over the gasoline engine. The first is its lower rate of fuel consumption — and second its ability to use cheaper fuels. Always buy the **lowest priced fuel giving satisfactory operation.**

Your Caterpillar dealer is familiar with fuels that are giving good results in Caterpillar Diesel Engines in his territory. If necessary, consult him for his recommendations. He will be glad to advise you.

Because of the lack of world-wide standardization of diesel fuel classifications, it is not possible to make specific recommendations for export territories. For best results see your Caterpillar dealer for brand names of satisfactory fuels in your particular area.

In the United States and Canada, diesel fuels are available under two general classifications. One is premium fuel and the other is domestic furnace oil No. 2 grade. Caterpillar Diesel Engines are designed to operate on the less expensive domestic furnace oils known as No. 2 grade. Fuels falling within this general class are widely available, give satisfactory results and cost considerably less than premium fuels.

There is appreciable variation in the composition of fuels furnished under the domestic furnace oil classification. For desirable engine service, it is most important to give special attention to two properties of the fuel which are: pour point and sulphur content.

Pour Point

In subzero (-18°C.) weather, where warm storage is not provided, fuels with unusually low pour points may be required. It is necessary that it be fluid enough to flow from the diesel fuel tank to the engine transfer pump at the lowest temperature at which the engine must start and operate.

Sulphur Content

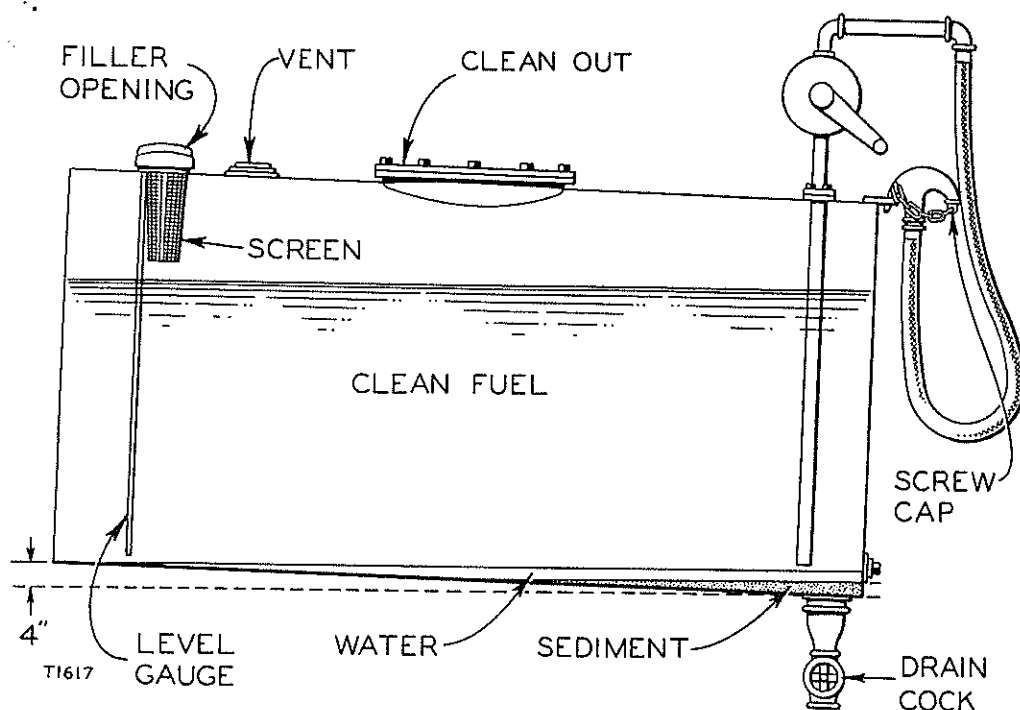
As the sulphur content of the fuel increases, the oil change periods should be reduced as indicated in the topic, CRANKCASE LUBRICATING OIL.

CARE OF THE FUEL SUPPLY

Keep The Fuel Clean: Too much emphasis cannot be placed on the importance of using only clean diesel fuel. In selecting a fuel, it should be pointed out that distillates are especially desirable because, in refining, they are heated to a vaporous state and condensed in another container; thus, all the sediment and residue remain in the still.

It is important to buy clean fuel, and keep it clean. The best fuel can be rendered unsatisfactory by inadequate storage facilities or careless handling. The clearance between the fuel injection pump plunger and the barrel is very small, actually less than .0001 inch (0.00254 mm.), which makes it evident that the invisible particles of dirt which might pass through the filters can damage these finely finished parts.

Effort should be constantly expended to prevent contamination of the fuel. Important steps are to use clean containers and funnels and to reduce the number of times the fuel must be handled. When the fuel can be delivered by the distributor to storage tanks and then pumped from the storage tank to the diesel fuel tank, the handling is reduced to a minimum.



RECOMMENDED FUEL STORAGE TANK

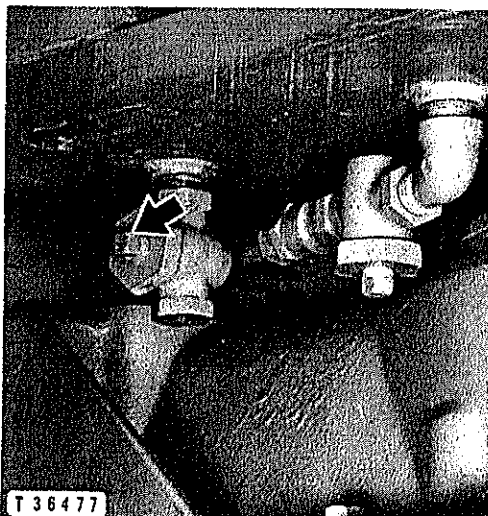
The illustration of a fuel storage tank is a typical, satisfactory installation. Since natural settling is an effective method of cleaning diesel fuel, the fuel should be allowed to stand at least 24 hours in the storage tank after it has been filled before fuel is transferred to the diesel fuel tank. Be sure to drain all water and sediment that has settled to the bottom of the tank before the tank is refilled. Occasionally, drain all of the fuel and clean the tank thoroughly.

CARE OF THE DIESEL FUEL TANK

Fill the diesel fuel tank at the end of the day, because the incoming fuel will drive out the moisture-laden air and prevent condensation.

Diesel Fuel Tank Filler Cap: The diesel fuel tank filler cap elements should be washed every 50 to 250 service hours depending upon the amount of dust in the air. To do this, remove the bolt and take out the baffle plate and gaskets. Wash the cap and elements in a can of kerosene or some non-inflammable cleaning fluid. After the cap is washed pour a small amount of crankcase lubricating oil on the filter elements.

Diesel Fuel Tank: The fuel level in the diesel fuel tank may be checked with the plunger gauge in the filler opening. Every 125 service hours before starting the engine, open the drain cock and drain off any sediment or water which may have accumulated. The strainer in the diesel fuel tank filler opening should be removed and cleaned regularly. Remove the snap ring and lift out the strainer.



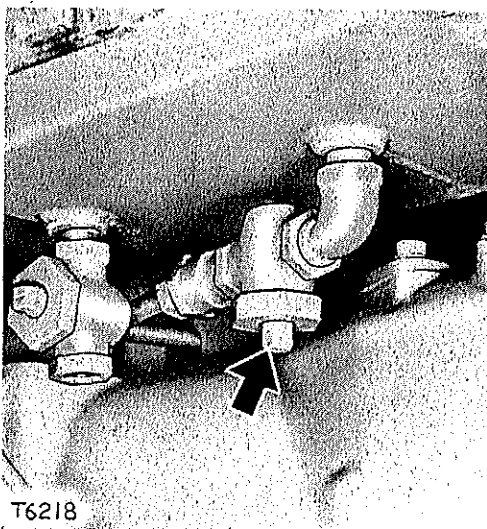
DIESEL FUEL TANK DRAIN

FUEL SYSTEM

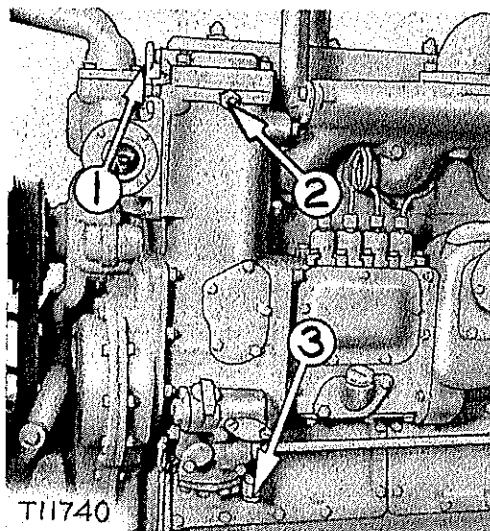
The fuel flows from the diesel fuel tank through the fuel line to the fuel transfer pump. The fuel transfer pump supplies the fuel under-pressure to the fuel filter housing, the filters remove the dirt and other foreign particles. From here the fuel is supplied to the fuel pump manifold for the individual fuel injection pumps. The fuel injection pumps meter and force the fuel through the fuel injection lines and the fuel injection valves in the cylinder head, into the precombustion chamber where it is ignited and passed into the main combustion chamber or cylinder.

CARE OF THE FUEL FILTER

Draining Fuel Filter Housing: Every 50 service hours, drain the filter housing of sediment and water which settles to the bottom of the compartment. Close the diesel fuel tank valve, remove the filter housing drain



DIESEL FUEL TANK VALVE



DRAINING FUEL FILTER HOUSING

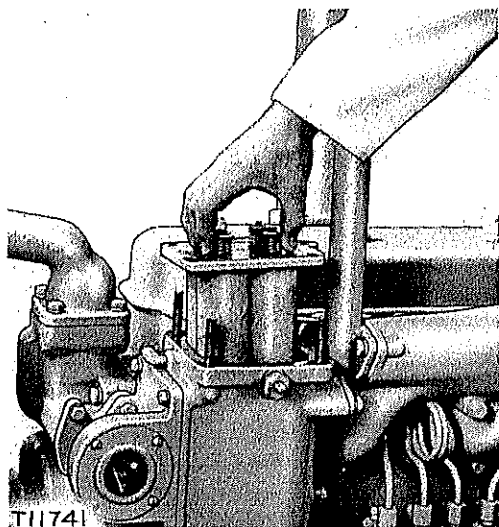
1-Upper vent. 2-Lower vent.
3-Drain plug.

plug (3) and open the lower vent (2) and then the upper vent (1) in the housing. Replace the drain plug, and prime the system. See the topic, PRIMING THE FUEL SYSTEM.

Fuel Filter Elements: When the absorbent filter elements have collected enough contamination to interfere with free flow of fuel, they must be replaced with new elements. These elements will continue to absorb particles until fuel will no longer flow through them at a rate to maintain maximum engine performance. They will not discharge their burden into the clean fuel; this is prevented by the fine grade filter paper at the core.

Because these filter elements absorb and hold contaminants, they cannot be washed or otherwise restored.

As the filters gradually become clogged with foreign material, the position of the fuel gauge indicator will work back from the original position in the NORMAL (white) range, to the CAUTION (green) range, and later into the OUT (red) range. When the indicator shows in the OUT (red) range the filters should be changed and all new filter elements installed — never only one.



REMOVING FUEL FILTER
ASSEMBLY



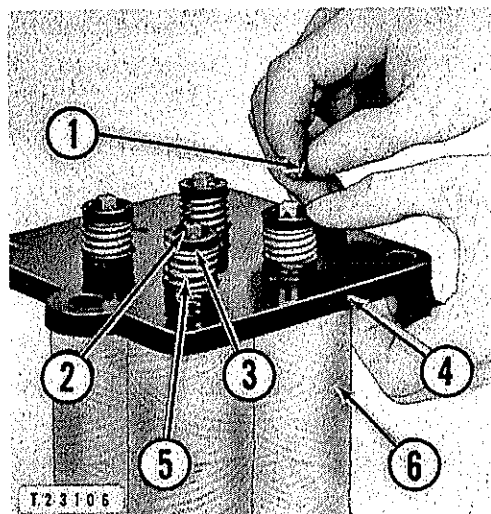
Removing Used Filter Elements: Remove the engine hood. Thoroughly clean the top of the filter cover and around the edges of the gasket joint between the filter body and cover, to guard against loose dirt dropping into the filter housing when the cover is removed. Close the diesel fuel tank valve, remove the filter housing drain plug, open the lower and then the upper filter housing vents.

Remove the cover, and lift the assembly of filter element plate and all filter elements out of the housing.

To remove the used filter elements, set the assembly on a flat surface and compress each spring (5) until the retainer (3) will permit removal of the pin (1). Lift off the filter element plate (4) and remove the used elements (6) from the retainer rods (2).

REMOVING FILTER ELEMENT

- 1-Pin. 2-Retainer rod. 3-Retainer.
4-Filter element plate. 5-Spring.
6-Filter element.



Attaching New Filter Elements To Filter Element Plate: Thoroughly wash the plate, retainer rods, retainers, pins, and springs in kerosene, diesel fuel or a non-inflammable cleaning fluid. Make sure that the hands are clean before attempting to install the new parts. Place the retainer rods into each new filter element and attach to the plate individually by compressing the spring and inserting the pin so that it is held securely in the counterbore of the retainer. Grasp each element at the bottom end and give it approximately a half turn under light pressure to seat the ends of the element against the plate and against the disc on the bottom of the retainer rod. Keep the elements parallel and square with the plate while performing this operation.

Installing Filter Elements In Housing: Exercise extreme care to see that the top side of the retainer plate, retainer assembly, and the inside of the housing cover are clean. These parts are on the clean side of the elements and if dirt is not completely removed, it will find its way into the fuel injection equipment. To install the elements in the housing proceed as follows:

1. Flush out the housing with clean fuel and replace the drain plug.
2. Install a new gasket on the housing.
3. Fill the housing approximately half full with clean fuel, so that minimum of cranking is required to prime the system.
4. Install the elements and plate in the housing.
5. Install a new gasket on the plate.
6. Replace the cover and follow the instructions given in the topic, PRIMING THE FUEL SYSTEM.

Keep New Elements On Hand: An extra set of filter elements should be kept on hand for replacement. Always keep the elements wrapped in their original cartons to insure against dust and dirt accumulation which

will shorten the life of the elements if it gets on the outside or may cause damage to the fuel injection equipment if it gets on the inside.

PRIMING THE FUEL SYSTEM

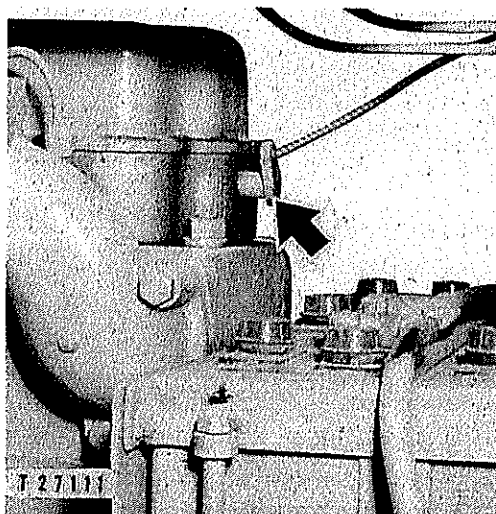
Any time the fuel flow is broken and air is allowed to get into the fuel system, the system must be primed. If air is left in the lines, the fuel system may become air bound, resulting in inability to start the diesel engine or the mis-firing of one or more cylinders.

When Equipped With Gasoline Starting Engine:

1. Check to see that the diesel fuel tank valve is open.
2. Move the governor control lever to the shut-off position, so the fuel injection pumps are closed.
3. Move the compression release lever to the START position.
4. Start the starting engine, engage the starter pinion and clutch. Allow the starting engine to crank the diesel engine at starting engine low idle speed.
5. Open the fuel filter vent valves and fuel injection pump vents. When the flow of fuel from the vent is continuous and contains no air bubbles, close the vent valves.
6. Open and close the vent valves several times in succession to be sure all air is bled from the system.

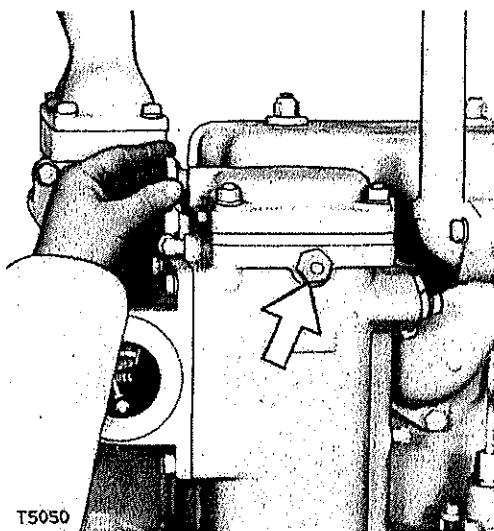
When Equipped With Direct Electric Starting Motor:

1. Check to see that the diesel fuel tank valve is open.
2. Move the governor control lever to the stop position so the fuel injection pumps are closed.



COMPRESSION RELEASE LEVER
IN RUN POSITION

3. Move the compression release lever to the right to release the compression.
4. Open the fuel filter vent valves and fuel injection pump vents.
5. Turn the diesel engine over with the starting motor until the flow of fuel from the vents is continuous and contains no air bubbles, close the vent valves.
6. Place the compression release lever in the run position and then start the engine. If the engine does not run smoothly further bleeding may be necessary. Open and close the fuel injection pump vents, one at a time, several times in succession to be sure all the air is bled from the system.

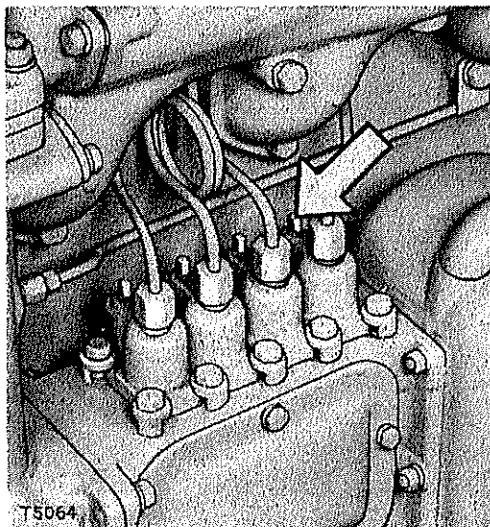


OPENING FUEL FILTER
VENTS



A fuel priming pump is available for use with direct electric starting. See the topic, FUEL PRIMING PUMP.

FUEL INJECTION
PUMP VENTS



FUEL INJECTION EQUIPMENT

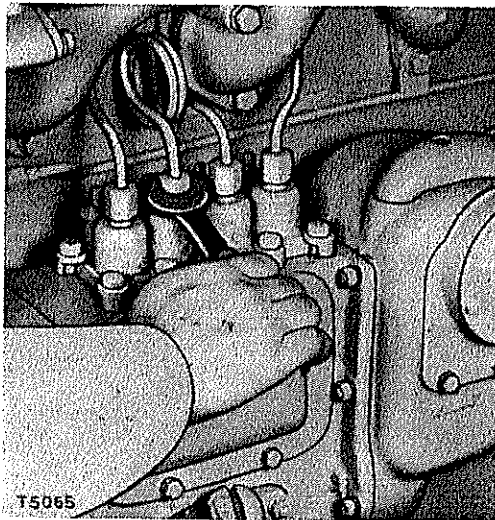
When improper fuel injection is affecting the diesel engine operation, a systematic check should be made to determine the cause. The most likely cause is dirt or water in the fuel. Drain the sediment from the diesel fuel tank and drain the fuel filter housing. Check the fuel pressure gauge as mentioned in the topic, CARE OF THE FUEL FILTER. Replace the filters if necessary. Then prime the fuel system until clean fuel passes through the vent valves on the fuel injection pumps. If the fuel system is air bound, priming the system will overcome the difficulty.

When the engine is running irregularly, and smoking, a fuel injection valve may not be spraying the fuel properly.

As the clearance between the plunger and the barrel of a fuel injection pump increases, due to wear, fuel leakage occurs. When the leakage increases to the point where insufficient fuel is injected into the cylinder, a loss of power is noticeable. With the loss of power, hard starting is also encountered.

Fuel Injection Valves

Testing Fuel Injection Valves: Whenever an engine performs in such a manner that a fuel injection valve is suspected of causing trouble, test all fuel injection valves. To test the injection valves: loosen the fuel injection line nuts at the fuel injection pumps, one at a time, while the engine is running. When a nut is loosened and the exhaust smoking is completely



LOOSENING FUEL INJECTION LINE
NUT TO TEST VALVE



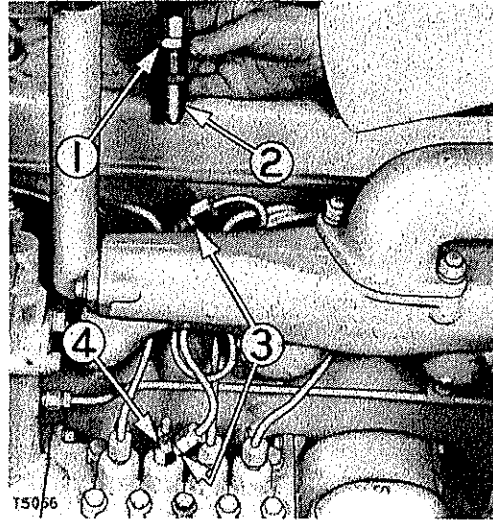
or partially eliminated and the irregularity in running is not affected, this identifies the defective valve and a new one should be installed in that cylinder. These valves can be tested by your Caterpillar dealer.

Removing Fuel Injection Valves: Before removing a valve clean the dirt from around the valve and connections.

Disconnect the fuel injection line from the injection valve and pump. Immediately install the plug (3) and cover (4) to prevent dirt entering the fuel passages. Remove the valve retainer nut (1) and lift out the nozzle assembly (2) and body as a unit.

REMOVING FUEL INJECTION VALVE

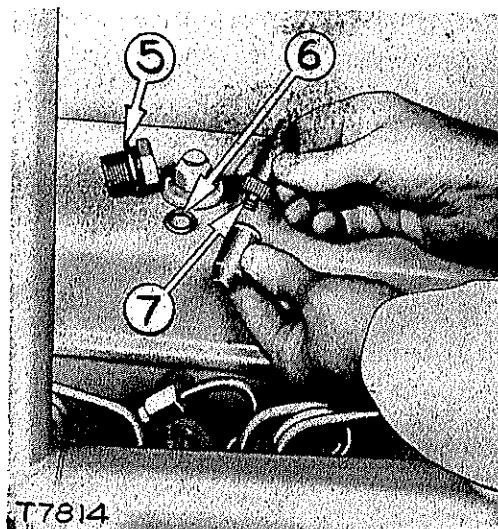
1-Retainer nut. 2-Fuel injection valve nozzle assembly. 3-Plug. 4-Cover.



Installing Fuel Injection Valves: Before installation of a fuel injection valve, be sure the wrench is clean. Put the dust cover on the valve body as soon as possible to prevent dirt entering the fuel passage. Install the fuel injection valve in the following manner.

1. Screw the valve body (7) into the fuel injection valve nozzle assembly only finger tight. The threads of the body and nozzle assembly are made to fit loosely. The clearance between the threads provides a passage for fuel to enter the nozzle assembly from the body.
2. Insert the nozzle assembly and valve body as a unit into the pre-combustion chamber opening. Turning the body in a clockwise direction and at the same time pressing down will assure alignment of the serrations.
3. Install a new large seal (5) on the retainer nut. A light coating of lubricant on the seal will permit it to seat properly.
4. Tighten the retainer nut good and tight to prevent leaks between the nozzle assembly and the nozzle assembly seats. For proper installation of the valve use one of the following methods.
 - a. Tighten with a torque wrench from 100 to 110 pounds feet.
 - b. Tighten good and tight with a steady pull.

5. Place a new small seal (6) over the threads on the top of the valve body and on the retainer nut.
6. Connect the fuel injection line and tighten the nuts.



INSTALLING FUEL INJECTION VALVE

5—Large seal. 6—Small seal.
7—Injection valve body.



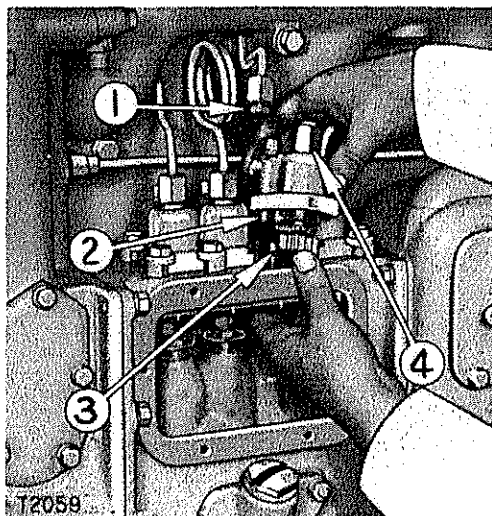
Fuel Injection Pumps

Testing Fuel Injection Pumps: It is not usual for one pump on an engine to require replacement unless all the pumps are worn. Worn fuel injection pumps will result in loss of power and hard starting. When loss of power and hard starting is accompanied with a clear exhaust, good compression and no blow-by gases from the crankcase breather, it indicates worn injection pumps. These pumps can be tested by your Caterpillar dealer.

Removing Fuel Injection Pumps: Every precaution should be taken to prevent dirt from getting into the fuel injection pumps or housing. Use the brush supplied in the tool equipment to clean the top of the housing and around the inspection plate before removing. When fuel injection pumps are removed the pump plungers must not be taken from the barrels because dust or dirt will scratch these finely finished parts.

After cleaning the top of the housing, and around the inspection plate, remove the fuel injection lines from the pumps and immediately cap and plug the openings with covers (4) and plugs (1) provided in the tool equipment. Remove the inspection plate.

Remove the capscrews and clamps holding the fuel injection pump to the housing and lift the pump straight up only enough to clear the dowel pins. Then insert a finger through the inspection hole, hold the plunger from dropping out and shift the pump to one side so the end of the pump plunger will free itself from the slot in the lifter. Place the ferrule cap seal (3) and stopper (2) furnished in the tool equipment over the fuel outlet of the fuel housing and in the inlet of the pump to keep out dirt.



REMOVING FUEL INJECTION PUMP

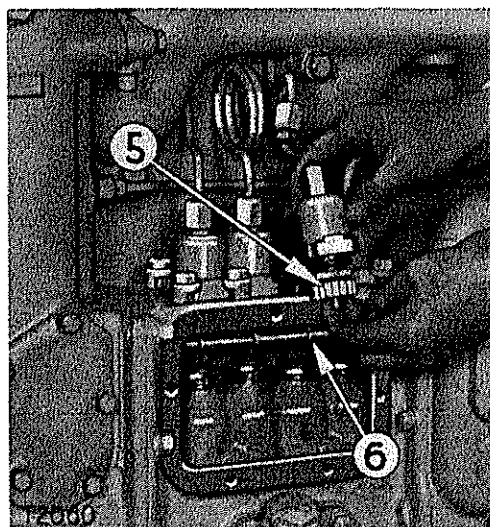
1-Fuel line plug. 2-Stopper. 3-Ferrule cap seal. 4-Cover.

Should the plunger accidentally be removed from the pump barrel, take every precaution to avoid nicking or scratching it since the slightest rough spot will cause undue wear in the barrel and shorten the life of the pump. The plunger should be rinsed in clean fuel before putting it back in the barrel. Be sure the plunger is replaced in the barrel from which it was withdrawn. **Each fuel injection pump assembly (plunger and barrel) is machined as a unit and finished to such exact limits that it must be used, removed, and replaced as a unit.**

Installing Fuel Injection Pumps: Lower the pump and plunger into the housing, taking care that the pump plunger does not slide out of the pump. Line up the marked tooth (5) of the injection pump plunger gear with the marks (6) on the rack as the plunger is lowered into place. Slide the end of the plunger into the slot in the lifter. Remove the ferrule cap seal and plug from the fuel passage and lower the pump onto the dowel pins. Fasten the pump in place.

INSTALLING FUEL INJECTION PUMP

5-Marked gear tooth. 6-Mark on rack.

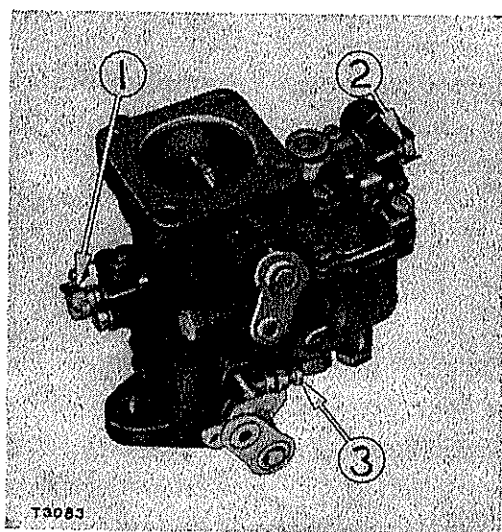


STARTING ENGINE FUEL SYSTEM

Keeping the starting engine fuel tank filled will prevent condensation in the tank. Periodically drain any water which may have accumulated in the starting engine fuel tank by loosening the plug in the bottom of the tank. Check the carburetor for proper adjustment every 500 service hours.

Carburetor Adjustment: To obtain an approximate carburetor adjustment, turn the adjusting screws in gently as far as possible. Then back off the high speed screw (2) one turn from the open position, and the idling speed adjusting screw (1) one half turn from the closed position.

A more accurate adjustment can be obtained while the engine is running by turning the high speed screw (2) in to make the mixture richer or out to make it leaner. Adjust this screw to a point that will give the greatest amount of power with a clear exhaust. Turn the idling speed

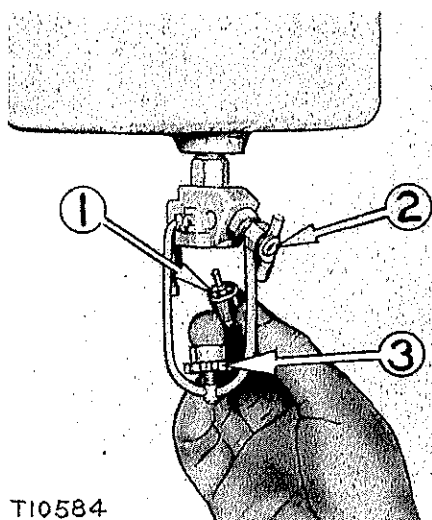


CARBURETOR ADJUSTMENT

1-Idling speed adjusting screw. 2-High speed adjusting screw. 3-Idling speed control screw.

adjusting screw (1) until the engine will idle regularly at slow speed without emitting black smoke from the exhaust. Turn this screw in to make the mixture richer or out to make it leaner. Turn the idling speed control screw (3) to the left (out) to decrease idling speed or to the right (in) to increase the speed.

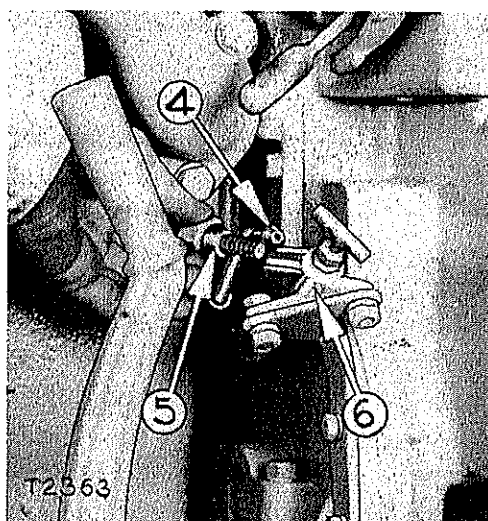
Sediment Bowl Filter And Fuel Line Screen: The sediment bowl collects water and sediment that may be in the fuel. To remove the collected water and sediment, close the valve (2) under the fuel tank and remove the bowl by unscrewing the nut (3) that clamps it to the body of the valve. Unscrew the edge-type filter (1) and shake it in kerosene or some non-inflammable cleaning fluid. When the bowl is replaced see that the gasket is clean, is in the correct position, and is not broken.



TI0584

STARTING ENGINE SEDIMENT BOWL FILTER (Later Tractors)

1-Edge-type filter. 2-Fuel shut-off valve. 3-Nut.



T2363

REMOVING STARTING ENGINE FUEL FILTER SCREEN (Earlier Tractors)

4-Fuel line. 5-Filter screen. 6-Filter body.

Earlier tractors have a filter screen (5) in the starting engine fuel shut off valve which collects sediment that may be in the fuel. This collected sediment can be removed by turning off the valve, removing the fuel line (4) from the filter screen nut and the screen nut from the body (6). Wash the screen in kerosene or non-inflammable cleaning fluid. The body can be washed out with the screen removed by opening the valve long enough to allow gasoline from the tank to remove the loose sediment. If water is noticed on the screen or in the fuel line loosen the plug on the bottom of the fuel tank to drain any water that has accumulated.

COOLING SYSTEM

Coolants: Water used in the cooling system should be soft, or as free as possible from scale forming minerals. If it is impossible to obtain soft water it is advisable to treat the available water with Caterpillar Rust Inhibitor. The use of this rust inhibitor in the cooling system will prevent the formation of rust. It will also retard, and in some cases completely eliminate mineral deposits within the engine. Most commercial anti-freeze solutions contain rust inhibitors, therefore, it is not necessary to use rust inhibitors with those anti-freeze solutions which do contain inhibitors. Your Caterpillar dealer stocks Caterpillar Rust Inhibitor in convenient one quart cans. Directions for its use are printed on each can.

When the temperature is below freezing sufficient anti-freeze should be used in the cooling system to prevent freezing. Various anti-freeze mixtures such as ethylene glycol (Prestone, G.M., Permaguard, Zerex, etc.) denatured ethyl alcohol, methanol (synthetic wood or methyl alcohol) and glycerine are all suitable for use. Alcohol can be used successfully

but, because it readily evaporates at the normal operating temperature of the diesel engine the solution should be tested frequently — even daily — and kept up to correct strength. This loss by evaporation is objectionable **but the temperature regulator should not be removed.** Doing so might make the solution run cooler and save the alcohol, but is not desirable for good performance. It is essential, therefore, that the coolant be tested frequently to assure adequate protection.

Filling: Fill the diesel engine cooling system, and the starting engine cooling system if so equipped, by pouring the coolant into the radiator. A vent cock located on top of the starting engine water manifold should be opened when filling the cooling system. This vent allows all air to escape from the system and assures complete filling. The vent cock should be closed as soon as the cooling system is full.



STARTING ENGINE WATER
MANIFOLD VENT COCK

Cleaning The Radiator: Every 10 service hours clean dirt and trash from in between the tubes of the radiator and oil cooler which may cause excessively high operating temperature. This dirt may be easily removed by removing the four capscrews which hold the radiator screen in place. Then wash, brush or blow the dirt out with which ever method is available and most effective.

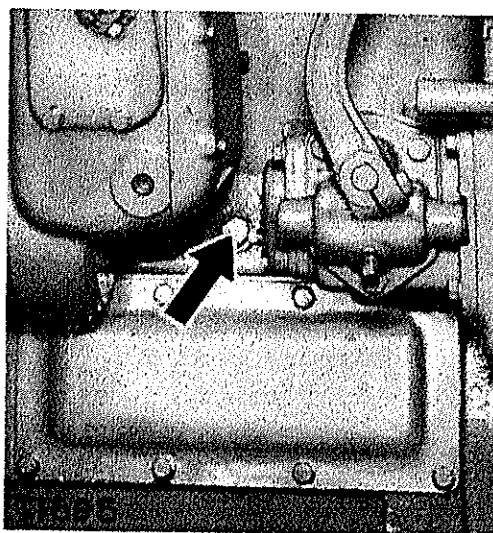
Draining: The cooling system is drained by opening the valve on the radiator water outlet on the right rear side of the radiator bottom tank and remove the plug in the left side of the engine block. This will drain the entire cooling system, of the diesel and starting engines, if the tractor is level.

Cleaning the Cooling System: An occasional washing of the cooling system may be necessary to remove the dirt and sediment which accumulates. The frequency of washing will depend on the amount of foreign material present in the water used in the system.



RADIATOR DRAIN VALVE

To wash the system, run the engine until the liquid in the cooling system is at operating temperature, and the loose foreign material is stirred up. Then stop the engine and drain as quickly as possible before the sediment has time to settle. Close the drain and pour in kerosene equal to about one-tenth the capacity of the cooling system and fill the remainder with a solution of one-half pound (226.8 grams) of washing soda to each gallon (3.8 liters of .8 Imp. Gal.) of water. Run the engine for about one-half hour, and again drain and flush the system with clean water.

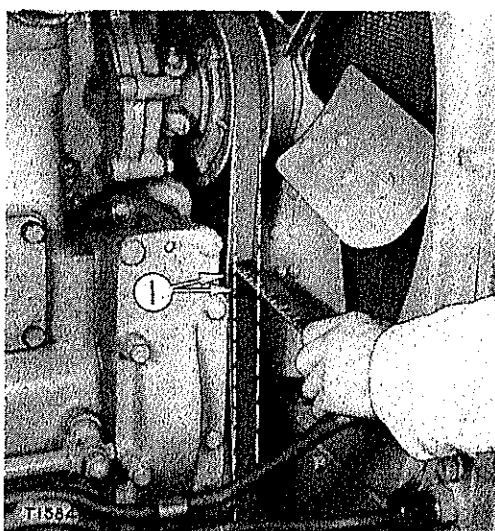


CYLINDER BLOCK DRAIN PLUG

FAN BELT ADJUSTMENT

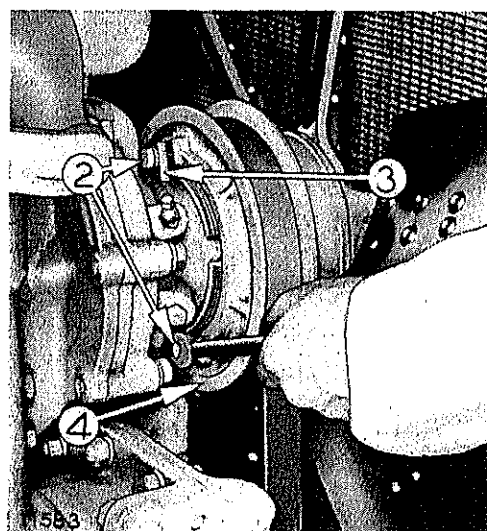
The fan belts should be checked every 250 service hours for proper adjustment.

To adjust the fan belt, remove the locks (3) holding the adjustable rim (4) of the pulley in position on the hub of the fan by taking out the fastening bolts (2). Screwing the rim toward the radiator will tighten the belt. Be sure the locks are lined up with the slots in the hub before the bolts are tightened. The adjustment is correct when the belt can be easily pushed inward a distance of approximately 1 inch (2.5 cm.) as shown at (1). If the fan belt is operated too loose, it will slip against the pulleys, causing unnecessary wear to the belt and possibly slipping to the extent that the engine will overheat. If the belt is too tight, unnecessary stresses are placed upon the fan bearing and belt, which might shorten the life of both.



CHECKING FAN BELT TENSION

1-Allow 1 inch (2.5 cm.) slack at this point. 2-Bolts. 3-Locks.
4-Adjustable rim.



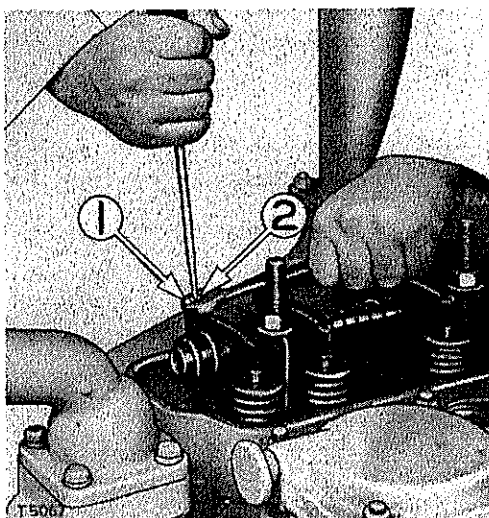
FAN BELT ADJUSTMENT

VALVE CLEARANCE ADJUSTMENT

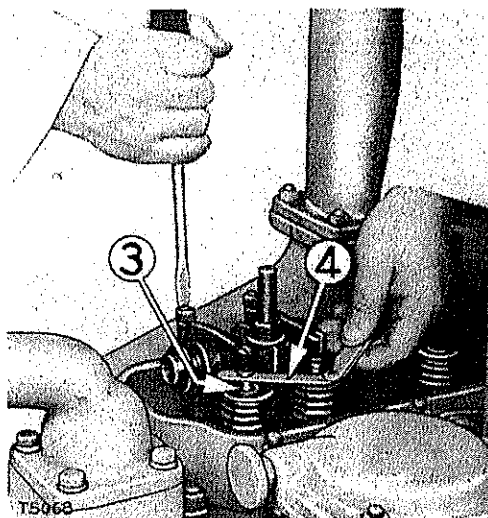
The initial valve clearance adjustment should be made after the first 100 to 125 service hours of operation. Thereafter the clearances should be checked and adjusted if necessary after every 500 service hour operating interval.

The valve clearance adjustment should be made while the engine is hot, either while the engine is running or before it has been stopped twenty minutes after having run long enough to thoroughly warm up. If the adjustment with the engine stopped is not completed during this twenty minute interval, start the engine and allow it to warm up. The valve clearance adjustment must be made or the clearances checked, with the compression release lever in the RUN position.

To adjust: Loosen the valve adjusting screw locknut (1), turn the adjusting screw (2) to allow a thickness gauge (4) to pass between the top

**LOOSENING LOCKNUT**

1-Locknut. 2-Adjusting screw. 3-Valve stem. 4-Thickness gauge.

**ADJUSTING VALVE CLEARANCE**

of the valve stem (3) and the end of the valve rocker at the correct clearance. Set this clearance at .010 inch (0.25 mm.) for exhaust and inlet valves. Tighten the adjusting screw locknut and check the adjustment.

If the adjustment is made with the engine stopped, turn the engine until the valve closes and the push rod is at its lowest point.

The compression release clearance is not adjustable but it should be checked when the valve clearances are checked. The normal clearance between the inlet valve rocker and flat of the compression release shaft is about .125 inch (approximately .3 cm.). If the clearance is not correct see your Caterpillar dealer.

SPARK PLUG ADJUSTMENT

The spark plugs should be examined every 1500 service hours. The gap may be kept at approximately .025 inch (0.64 mm.). Measure this gap with a thickness gauge. To adjust the gap, bend the outer electrode.

STARTING ENGINE MAGNETO

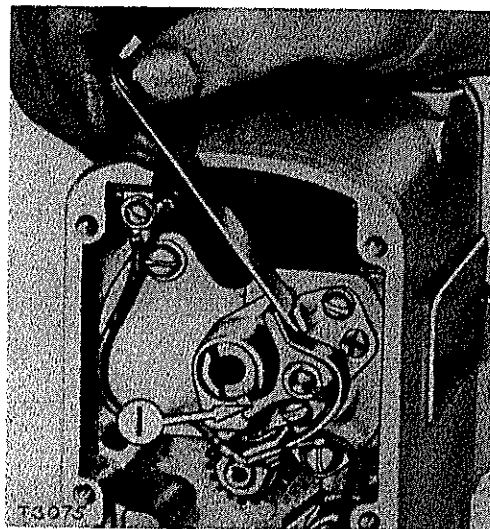
Do Not Lubricate The Magneto At Any Point: The bearings are packed with a ball and roller bearing grease when assembled, and this should be replaced only when the magneto is taken to your Caterpillar dealer for checking or reconditioning.

Checking Contact Point Opening: Every 1500 service hours check the contact point opening.

To check with magneto in place first remove the diesel engine air cleaner, the distributor plate and pull out the distributor rotor, then turn

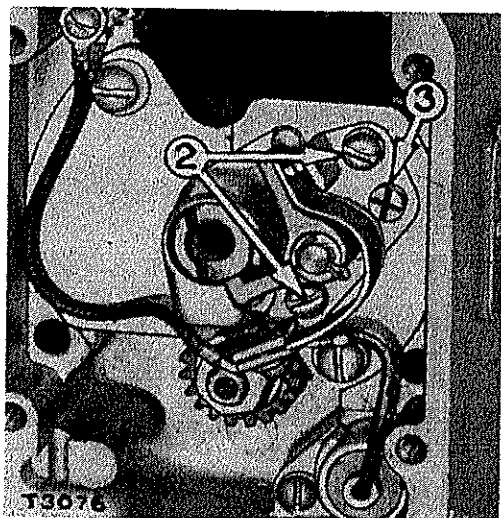
CHECKING CONTACT POINT OPENING

1-Contact point bumper block on one of the highest elevations of the cam.



the engine flywheel until the contact point bumper block (1) is on one of the highest elevations of the cam. Check the clearance with a thickness gauge. This clearance should be .014 to .018 inch (.35 to .46 mm.).

Adjusting Contact Point Opening: Loosen the screws (2) which hold the adjustable contact point bracket and move the bracket by inserting a



ADJUSTING CONTACT POINT OPENING

2-Bracket fastening screws.
3-Eccentric slotted-head screw.

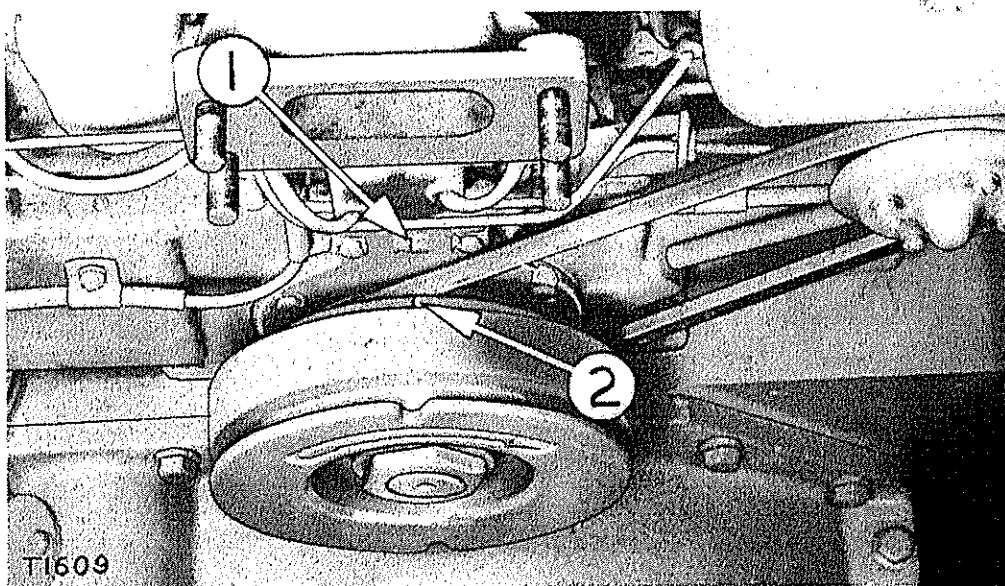


screw driver in the eccentric slotted-head screw (3) and turn until the correct point opening is obtained. Then tighten the fastening screws and recheck the adjustment.

Testing: A magneto may be tested when coupled to the engine by turning the switch ON, removing the cable from a spark plug, and holding the terminal $\frac{1}{8}$ inch (3.17 mm.) away from the metal base of the plug while turning the engine flywheel. If no spark passes from the terminal to the metal base, disconnect the magneto switch wire from the magneto which is connected to the terminal on top of the magneto housing and test again. If a spark passes from the terminal to the base with the switch wire removed, the cable running from the magneto to the switch has become grounded or the switch requires replacement. If, with the switch wire off, the magneto still does not fire, remove the magneto as instructed in the next paragraph and take it to your Caterpillar dealer for testing.

To Remove The Magneto For Testing: Remove the engine hood, the diesel engine air cleaner and air cleaner inlet pipe. Remove the spark plug cables from the distributor plate and the wire from the switch. Remove the starting engine crankcase breather pipe assembly by removing the capscrews holding it to the carburetor adapter and crankcase breather body. Remove the two stud nuts holding the magneto to the engine manifold assembly and lift off the magneto.

To Time The Magneto To The Engine: Check the adjustment of the contact points. Then open the cylinder head drain cock of No. 1 (rear or left) cylinder and turn the engine flywheel slowly until a rush of air is noted coming from the cylinder. This indicates the piston is coming up

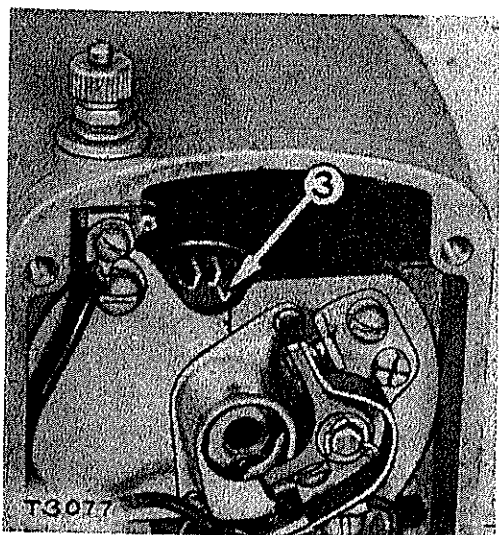


STARTING ENGINE FLYWHEEL AND CRANKCASE COVER TIMING MARKS
1-Mark on cover. 2-"MAG" mark on flywheel.

on the compression stroke. Continue to turn the flywheel slowly until the mark (MAG) (2) is even with the mark (1) on the starting engine crankcase cover.

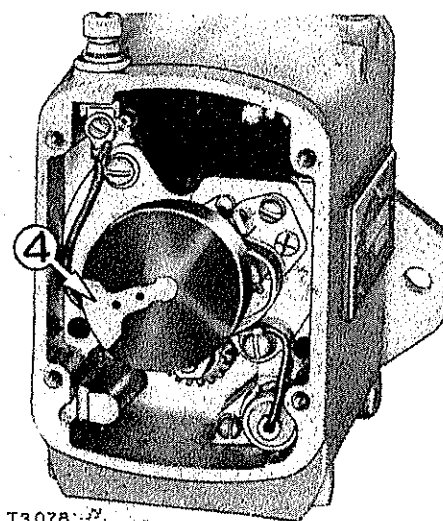
With the magneto off the engine, remove the distributor plate and rotor from the magneto. Rotate the magneto drive gear until the "A" mark (3) on the distributor gear is showing. In this position the distributor rotor contact (4) will be in line with the conductor for No. 1 cylinder spark plug wire. The contact points should be barely separated.

Install the magneto on the engine and replace the distributor rotor and cover.



TIMING MARKS

3—"A" mark on distributor gear.



**ROTOR POSITION TO TIME
MAGNETO TO ENGINE**

4-Rotor contact.

Checking Timing With Magneto In Place: Locate the firing point of No. 1 cylinder as described in the topic, **TO TIME THE MAGNETO TO THE ENGINE**. Remove the cover from the magneto. The "A" mark on the distributor gear should be in position as shown. If the magneto timing is not correct, remove the two stud nuts securing the magneto to the top cover. Pull the magneto away from the cover sufficiently to disengage the magneto drive gear from the engine camshaft gear. Turn the magneto gear until the "A" mark on the distributor gear is in the position as described in the topic, **TO TIME MAGNETO TO THE ENGINE**, and push the magneto into place.

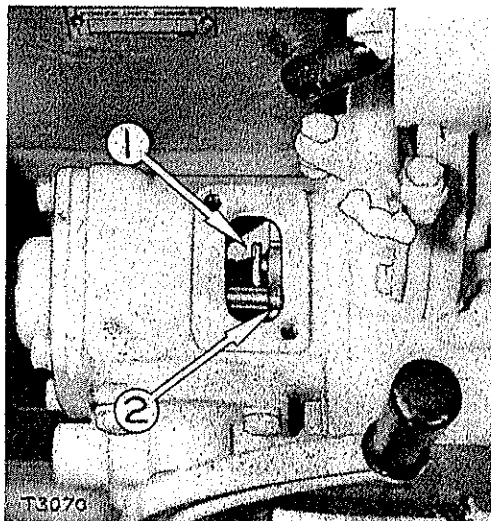
STARTING ENGINE CLUTCH

To Test The Adjustment: Push the clutch lever to the engaged position. The lever should go into position with a distinct snap, and should require a reasonably hard push. The clutch should be checked every 500 service hours.

To Adjust: Remove the oil filler plate or plug. Insert a screw driver in this opening and turn the clutch adjusting collar (2) until the lock pin (1) can be reached. Engage the starter pinion. Pry out the lock pin, and tighten by turning the collar away from the diesel engine until the lock pin drops into the next hole. Test the adjustment by engaging the clutch. If one hole gives a slightly loose adjustment and the next gives too tight an adjustment, use the looser adjustment.

STARTING ENGINE CLUTCH ADJUSTMENT

1-Lock pin. 2-Adjusting collar.



To Wash: Every 250 service hours, remove the drain plug while the oil is warm. Refill to the proper level with kerosene or some non-inflammable cleaning fluid and run the engine 3 minutes, engaging and disengaging the clutch. Remove the drain plug and let the housing drain thoroughly. Then fill with fresh oil.

FLYWHEEL CLUTCH

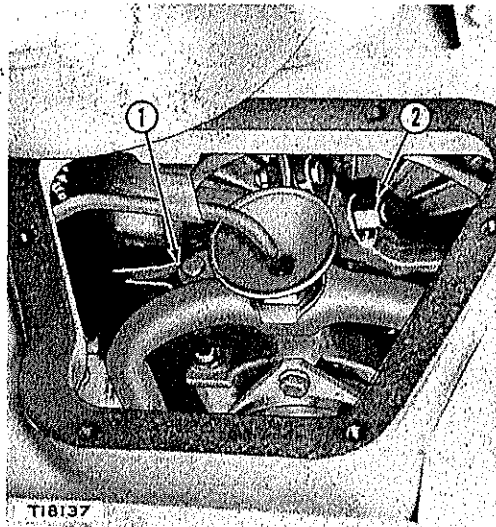
For flywheel clutch (oil type) information see the attachment section of this book.

To Test The Adjustment: Pull the clutch lever to the engaged position. For a desirable adjustment the lever should go into position with a distinct snap, requiring a reasonably hard pull.

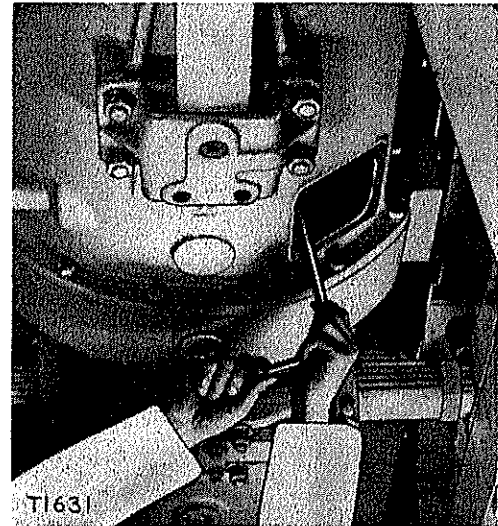
To Adjust: To adjust the clutch proceed as follows:

1. Push the clutch control lever forward to disengage the clutch.
2. Shift the gear selector lever to the neutral position.
3. Remove the inspection cover. Tractors effective with 6U10395 and 7U29881, remove the inspection cover from the top of the clutch compartment. On tractors before 6U10395 and 7U29881 remove the inspection cover from the bottom of the clutch compartment.
4. Rotate the adjusting collar (1) so the clamp bolt nut (2) is accessible.
5. Shift the gear selector lever to any one of the engaged positions.

6. Loosen the clamp bolt nut (2) and turn the adjusting collar clockwise to tighten.
7. When the desired adjustment is obtained, tighten the clamp bolt nut and replace the inspection cover.



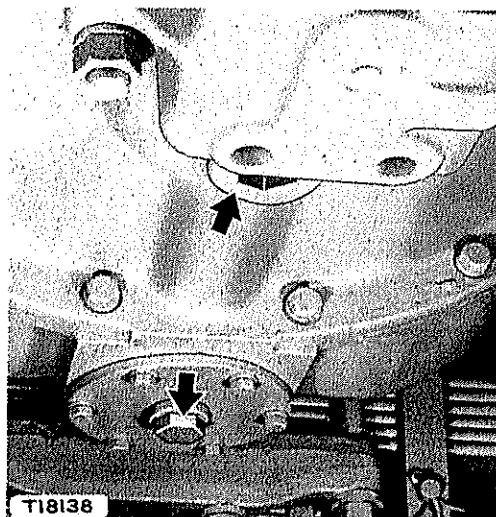
FLYWHEEL CLUTCH ADJUSTMENT
1-Adjusting collar. 2-Clamp bolt nut.



ADJUSTING CLUTCH
(Tractors before 6U10395 and 7U29881)

Draining The Flywheel Clutch Housing: The clutch plates are designed to operate dry. The drain plug in the bottom of the flywheel housing, should be removed every 50 service hours to drain any lubricant that may have seeped into the compartment from the engine, transmission, or clutch bearings. Lubricants from these points should not be allowed to accumulate in the housing. Any accumulation which will not drain from the housing should be washed out as instructed in the next paragraph.

Washing The Flywheel Clutch Housing: Remove the flywheel housing drain plug and the cover from the housing every 1000 service hours and



**FLYWHEEL CLUTCH HOUSING
DRAIN PLUG**

wash or flush the clutch housing with a non-inflammable cleaning fluid when the engine is stopped. The cleaning fluid should be forced on the housing inside surfaces, not on the clutch, with a flush type grease gun and allowed to drain with the accumulations from the housing.

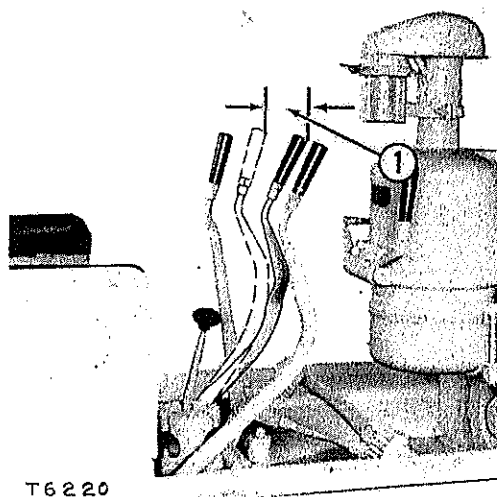
Wash The Flywheel Clutch Linkage: If difficult operation of the clutch is encountered it may be that the clutch engaging linkage has become dirty. This dirt can be removed by washing the linkage with some non-inflammable cleaning fluid. When washing, care must be taken not to get greases and oils on the clutch plates. After washing the linkage the flywheel clutch shift collar should be lubricated as instructed in the LUBRICATION CHART.

STEERING CLUTCHES AND BRAKES

The steering clutches should be kept in proper adjustment to insure full engagement of the clutches when the control levers are in the free forward position. Obstructions such as rocks, sticks and the like should

STEERING CLUTCH ADJUSTMENT

- 1—There should be 3 inches (7.6 cm.) free motion at this point.

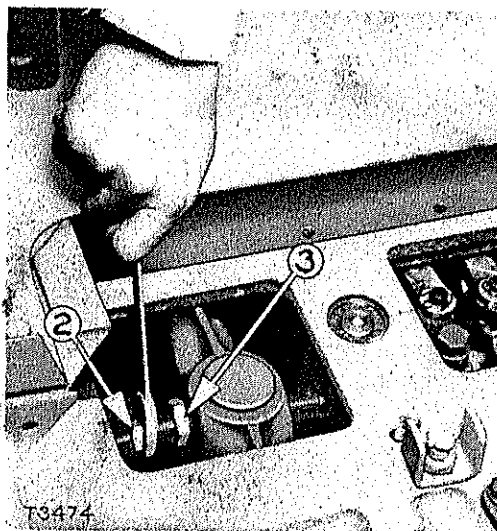


be removed which hinder the control levers traveling to the free forward position. If the tractor is operated with improper steering clutch adjustment or with obstructions to the control levers the release bearings may become damaged.

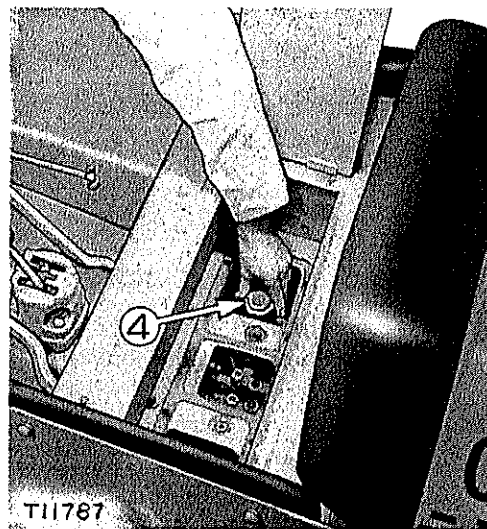
Checking Steering Clutch For Proper Adjustment: The steering clutch adjustment is correct when the steering clutch levers have 3 inches (7.6 cm.) free movement as shown at (1). Free movement should be measured between the free forward position of the control lever and the position of the control lever when the steering clutch first starts to disengage. This free movement reduces as the clutch facings wear and adjustment becomes necessary. The clutches should be checked periodically according to the following instructions:

1. Remove the seat cushion. On tractors equipped with seat mounted fuel tank; lift the tool box from the cut out section of the fuel tank. Remove the inspection cover.
2. With the control lever in the free forward position, the clutch release trunnion linkage (4) should be loose enough to be moved easily back and forth by hand. The clutch adjustment is correct if the looseness in the trunnion linkage is completely removed when the control lever reaches a point of 3 inches (7.6 cm.) back from the free forward position.

To Adjust: When it is necessary to adjust the clutch, loosen the locknut (3) which locks the adjusting screw (2). Turn the adjusting screw counterclockwise (away from the center of the tractor) to increase the looseness of the steering clutch trunnion linkage. When proper adjustment is obtained tighten the locknut, make the same adjustment to the other clutch and replace the cover.



ADJUSTING STEERING CLUTCH
2-Adjusting screw. 3-Locknut.



**CHECKING STEERING CLUTCH
TRUNNION LINKAGE FOR
LOOSENESS**
4-Release trunnion.

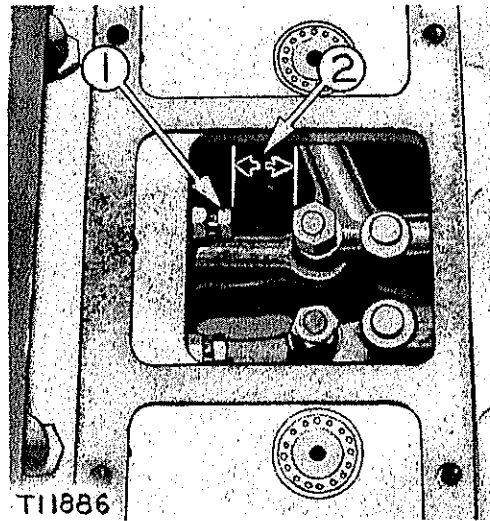
As the steering clutches become sufficiently worn through service to prevent restoring proper control adjustment, consult your Caterpillar dealer.

Steering Clutch Control Lever Stop Adjustment: Effective with tractors 6U4781 and 7U10027, there is a stop (1) for each steering clutch control lever which limits the travel when the lever is pulled back from the free forward position. An adjustment is provided to increase the amount of lever travel from the free forward position. To increase the travel loosen the locknut and turn the capscrew clockwise. To decrease the travel turn the capscrew counterclockwise. **Do not decrease the clearance to less**

than 15/16 inch (2.3 cm.) at (2) between the bellcrank nut and stop when the control lever is in the free forward position, as this will prevent proper clutch disengagement.

STEERING CLUTCH CONTROL LEVER STOP

1-Stop. 2-There should be at least 15/16 inch (2.3 cm.) clearance at this point.

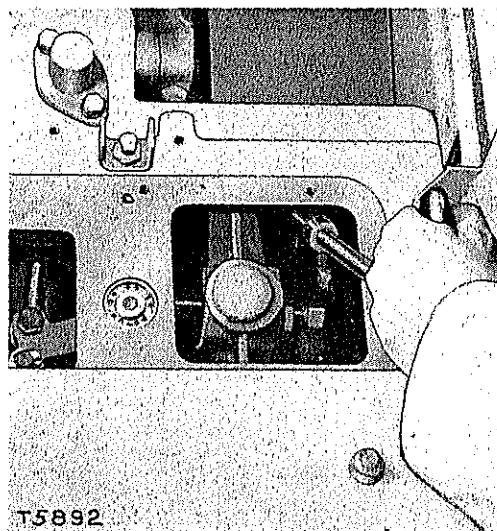


Steering Clutch Brake Adjustment: Keep the brakes adjusted just tight enough so the tractor will turn correctly when the steering clutch is released and the brake pedal is depressed about 3 to 4 inches (7.62 to 10.16 cm.). The band should be entirely free from the drum when the pedal is in the released position.

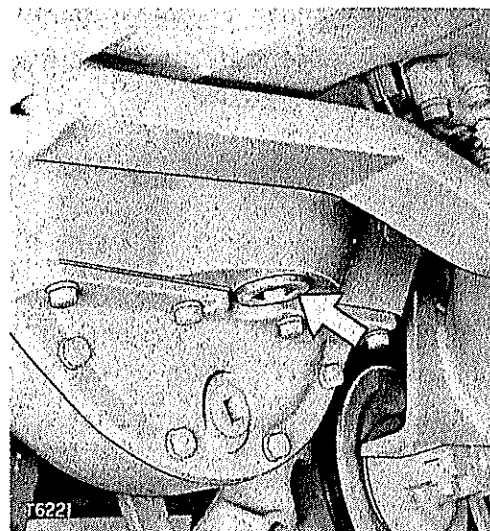
To Adjust: Remove the seat cushion and lift the tool box from the cut-out section of the fuel tank. Remove the inspection plate on the transmission top cover. Turn the adjusting nut in a clockwise direction to tighten the brakes. A spring, mounted on the tang of the brake band, engages the adjusting nut at each 1/6 turn, and keeps it from jarring out of adjustment. The adjusting nut should be turned sufficiently each time to allow the spring to seat firmly on the nut.

Loosen the locknut on the support screw on the under side of the transmission case below the brake drum. Apply the brake to draw the brake band tightly around the drum. Turn the support screw snugly against the band and then back off 1 1/2 turns and tighten the locknut. This screw supports the brake band and maintains the correct clearance between the lining and the drum. The band should be entirely free from the drum when the pedal is in the released position.

Draining Steering Clutch Compartment: The steering clutches are designed to operate dry. Oil is used only to lubricate the release bearings. This oil, and any seepage from the adjoining compartments should be drained every 50 service hours of operation by removing the plugs in the bottom of the case. Failure to observe proper draining periods may result in the clutches slipping or difficulty in steering the tractor. The drain plugs should be replaced to keep out dirt and moisture during operation.



STEERING CLUTCH
BRAKE ADJUSTMENT



STEERING CLUTCH COMPARTMENT
DRAIN PLUG

Washing The Steering Clutch Brakes: If the steering clutch compartments have not been drained at the proper interval or lubricant has accumulated on the steering clutch brakes sufficiently to cause slippage or difficult steering, some improvement in operation will result by washing the brakes. To do this proceed as follows:

1. Drain the compartments and replace the drain plugs.
2. Remove the brake adjustment covers and pour enough **non-inflammable** cleaning fluid into each compartment so that each steering clutch brake drum will dip into the fluid.

WARNING

Washing should be done when the compartments are cool and well ventilated to avoid the possibility of an explosion.

3. Operate the machine back and forth for five minutes without releasing the steering clutches. This will prevent the oil and dirt on the outside of the clutches and the inside of the cases from being washed in between the clutch discs.
4. Drain the compartments.
5. Repeat the washing procedure, this time applying the brakes occasionally.
6. Drain the compartments and replace the drain plugs.
7. Lubricate the steering clutch release bearings.

TRACKS

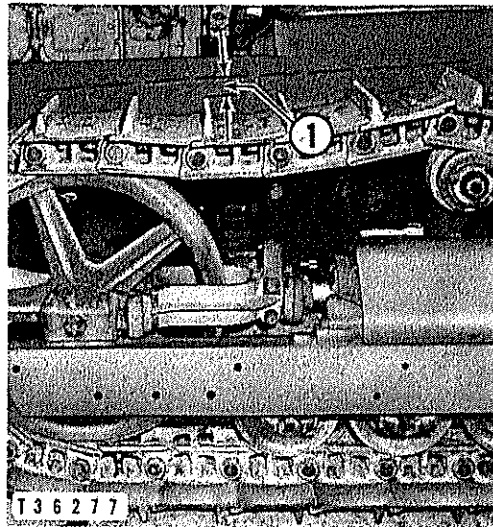
Proper care of the tracks, especially when operating the machine under adverse conditions, will greatly extend their service life.

After operating in mud or slush and below freezing temperatures are anticipated, park the machine on solid dry ground, planks, logs or brush to prevent the machine from freezing to the ground. Snow or mud should also be cleaned from around the track links, sprockets, idlers, rollers, and guards to prevent freezing of the tracks.

The tracks should be operated without tension, to avoid undue wear of moving parts. When properly adjusted, there should be no less than 1 to 1½ inches (2.5 to 3.8 cm.) slack measured at a point half way between the carrier roller and front idler as shown at (1). Looser adjustment may be required to prevent tension on the tracks when operating in material which will pack around the track parts and between pins and bushings.

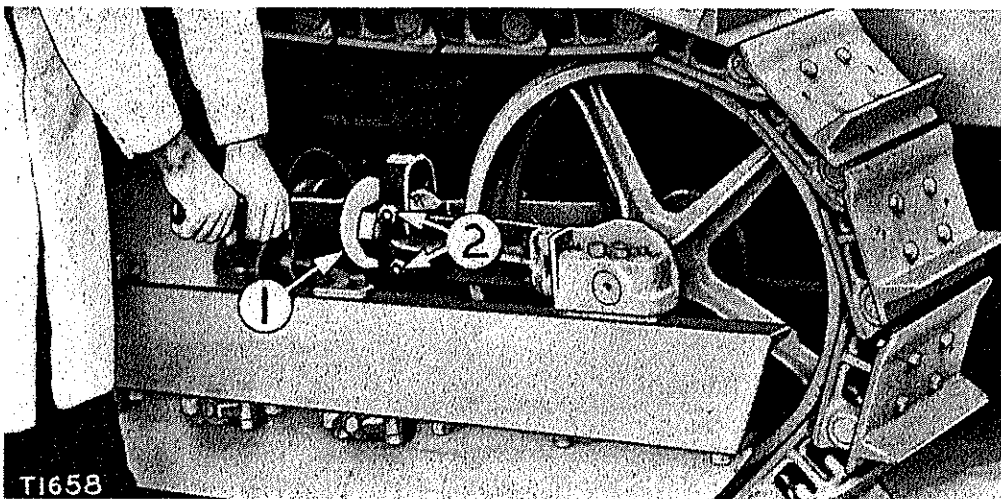
CHECKING TRACK ADJUSTMENT

1-There should be 1 to 1½ inches (2.5 to 3.8 cm.) sag at this point.



To Adjust:

1. Remove the guard and loosen the clamp nuts (2) on the front idler yoke.

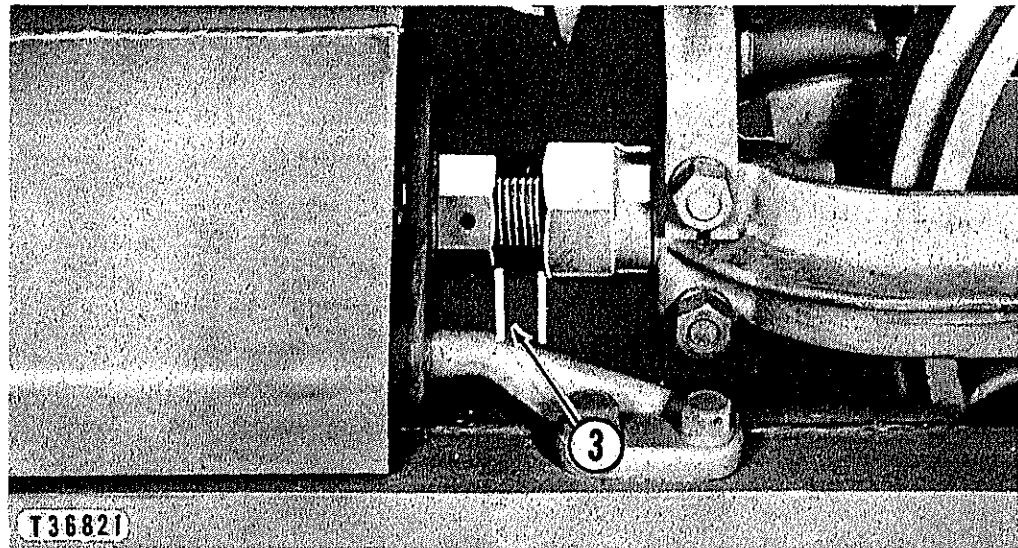


ADJUSTING TRACK

1-Wrench on track adjusting nut. 2-Track adjusting nut clamp nuts.

2. Turn the adjusting nut (1) until the track is at the correct adjustment.
3. Drive the machine backward and forward to equalize the adjustment.
4. Recheck the adjustment.

As continued track adjustment becomes necessary through service, the following precaution should be observed to prevent the adjusting bolt being screwed out of the large adjusting nut, with subsequent damage to the threads. A maximum measurement of 4 inches (10.2 cm.) should not be exceeded between the adjacent faces of the track adjusting nut and the nut that holds the recoil spring as shown at (3).



LIMIT OF ADJUSTING TRACK

3—This measurement should not exceed 4 inches (10.2 cm.).

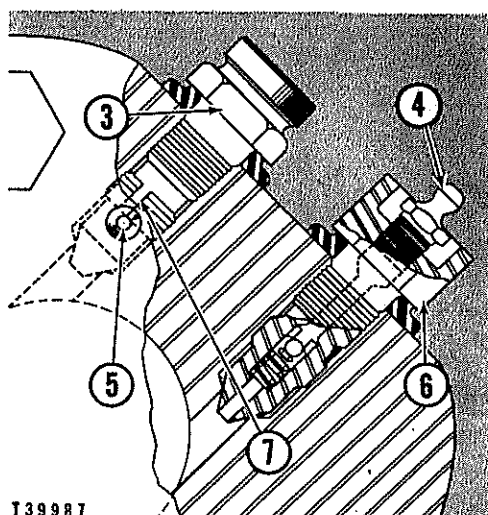
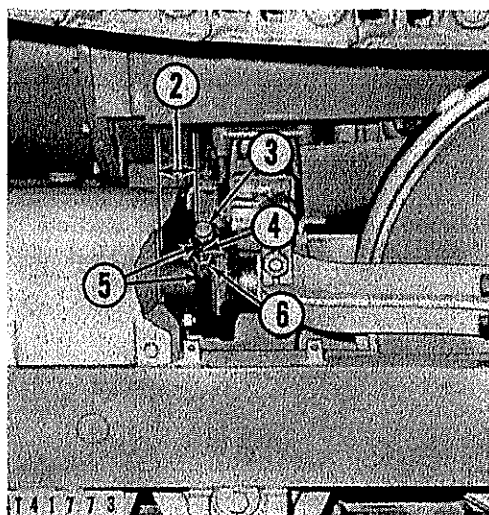
(Tractors with Hydraulic Track Adjuster Attachments)

To Adjust When Equipped with Ball Check Type Hydraulic Track Adjusters:

If the slack or sag in the track is greater than 1½ inches, proper adjustment can be obtained by proceeding as follows:

1. Raise the inspection plate on the track roller frame guard or remove the guard on earlier models that do not have an inspection plate.
2. Apply ball and roller bearing lubricant, with a grease gun, into the fitting (4) until the track is at the correct adjustment.
3. Operate the machine backward and forward to equalize the adjustment.
4. Recheck the adjustment.

As continued track adjustment becomes necessary through service, the following precaution should be observed to prevent damage. The measurement (2) between the back of the rod assembly flange and the front of the spring pilot should not be more than 5 3/16 inches (13.17 cm.).



TRACK ADJUSTMENT WITH BALL CHECK TYPE HYDRAULIC TRACK ADJUSTER

2-This measurement should not exceed 5 3/16 inches (13.17 cm.). 3-Relief valve. 4-Fitting. 5-Vent holes. 6-Ball check assembly. 7-Slot in lower section of threads.

To Loosen Track Adjustment: If the track is too tight, release some of the pressure in the hydraulic track adjuster cylinder, with caution, as given in the following steps:

1. Turn the relief valve (3) one turn counterclockwise and allow grease to escape from the vent hole (5) just below the relief valve. If grease does not appear when this relief valve is backed off one turn, proceed to turn the ball check assembly (6) one turn counterclockwise. If grease does not appear at either vent hole and the vent holes appear to be open and the track appears to have tension, the machine should be started and moved forward slightly.

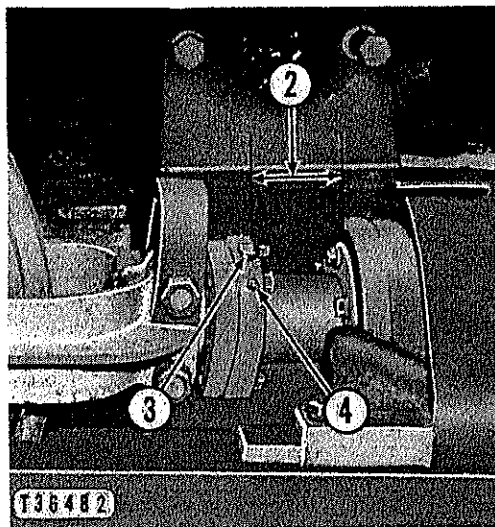
NOTE

If loosening both the relief valve and the ball check assembly one turn does not relieve track tension, then continue loosening the relief valve until the unthreaded portion between the upper and lower threaded section is exposed. Grease should then relieve through slot (7) in the lower section of threads.

2. Tighten the relief valve and the ball check assembly when sufficient slack has developed in the track.
3. Check the adjustment.
4. Repeat the above steps until the adjustment is correct.

To Adjust When Equipped with Earlier Type Hydraulic Track Adjusters:

1. Remove the track roller frame guard.



TRACK ADJUSTMENT WITH EARLIER TYPE HYDRAULIC TRACK ADJUSTERS

2-This measurement should not exceed $5 \frac{3}{16}$ inches (13.17 cm.). 3-Relief valve. 4-Fitting.



2. Apply ball and roller bearing lubricant, with a grease gun, into the fitting (4) until the track is at the correct adjustment.
3. Operate the tractor backward and forward to equalize the adjustment.
4. Recheck the adjustment.

To Loosen Track Adjustment: If the track is too tight, release some of the pressure in the hydraulic track adjuster cylinder with caution as given the following steps:

1. Loosen the knurled cap on the track adjuster relief valve (3) no more than **one-half turn** and allow grease to escape from the passage on the side of the valve.

WARNING

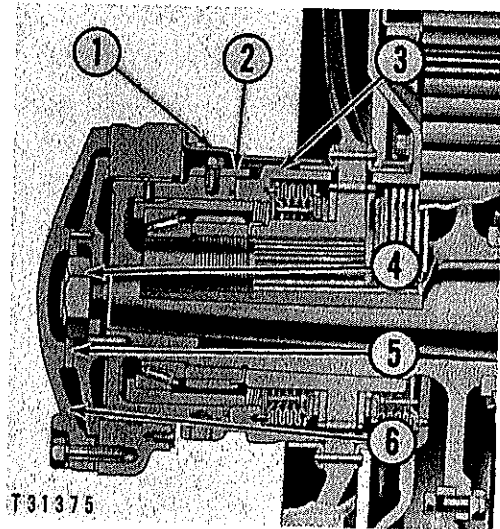
To avoid the possibility of personal injury, do not loosen the knurled cap on the relief valve more than one-half turn.

2. Tighten the knurled cap on the relief valve.
3. Check the track adjustment.
4. Repeat the above steps until the adjustment is correct.

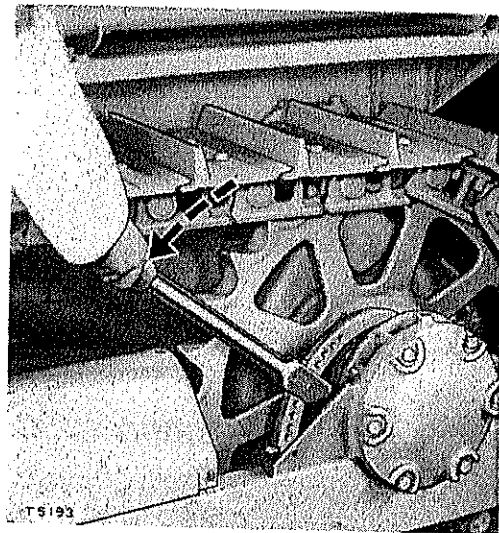
FINAL DRIVE SPROCKET HUB BEARINGS

During the initial operation of the tractor the sprocket hub bearings are likely to require some adjustment. By maintaining the proper adjustment bearing life can be increased. They should be checked on a new machine and adjusted if necessary after the first 125 service hours of operation, another check or two at 125 service hour intervals is suggested but thereafter every 1000 service hours should be sufficient. If leakage of lubricant is noticed around the sprocket hub on a new machine before 125 service hours of operation an adjustment of the bearing may stop the leak.

To check the bearing adjustment, place a four or five foot bar between the track roller frame and the sprocket. If any looseness in the sprocket hub bearings is noticed when prying with the bar, adjustment is necessary. This checking should be made when there are no objects under the track which might put the machine weight on the sprocket.



CROSS SECTION OF FINAL DRIVE



TIGHTENING SPROCKET HUB BEARINGS

1-Guard plate. 2-Lock. 3-Adjusting nut. 4-Retainer nut. 5-Lock. 6-Cap.

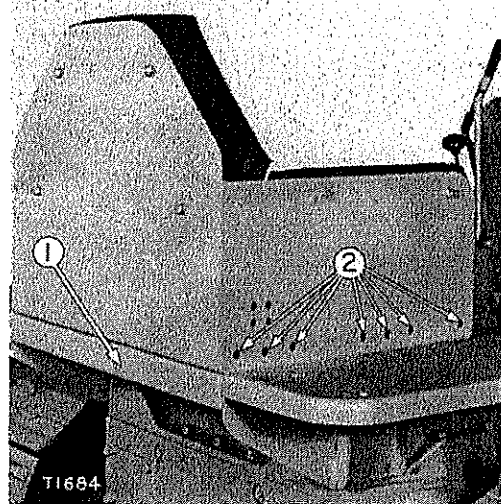
To Adjust:

1. Remove the guard plates (1) from the track roller frame outer bearing, and the lock (2) from the notch in the adjusting nut (3).
2. The bearing cage retainer nut (4) should also be checked for tightness before making the bearing adjustments. Remove the cap (6) and lock (5). Loosen the adjusting nut (3) one or two turns by turning it clockwise then tighten the retaining nut by using a five foot extension on the wrench.
3. Tighten the adjusting nut by turning it **counterclockwise**. Use a five foot extension on the wrench to be sure the nut is tight.
4. Install the lock and clamp bolt nut then tighten the clamp bolt and replace the guard plates.

Wrenches to make these adjustments are available from your Caterpillar dealer.

SEAT ADJUSTMENT (Fender Mounted Fuel Tank)

The seat may be adjusted to various positions, away from or toward the controls, by means of holes (2) in the sides of the seat and the supporting spacer (1). The same range of adjustments possible with the spacer in



SEAT ADJUSTMENT

1-Spacer. 2-Holes for seat adjustment.



place may also be obtained with the seat at a lower level by removing the spacer.

WASHING GEAR COMPARTMENTS

Washing The Transmission: Remove the drain plug from the transmission case after the tractor has been in operation while the oil is warm. This drains the speed change gear compartment and the bevel gear compartment. Replace the plug and fill to the proper level with kerosene or some non-inflammable cleaning fluid. Drive the tractor back and forth for 5 minutes, if it is convenient. If not, start the engine and put the gears in the highest speed. Tie back the steering clutch levers and engage the flywheel clutch. Allow the gears to run 5 minutes, disengage the clutch, and shift into neutral. Drain the cleaning fluid and refill with fresh transmission oil to the correct level as instructed in the LUBRICATION INSTRUCTIONS section of this book.

Washing The Final Drive Cases: Remove the drain plugs from both cases after the tractor has been in operation while the oil is warm, and allow the old oil to drain. Replace the plugs and fill the cases to the proper level with kerosene or some non-inflammable cleaning fluid. Drive the tractor back and forth for 5 minutes. Drain the cleaning fluid and refill the final drives with fresh transmission oil as instructed in the LUBRICATION INSTRUCTIONS section of this book.

Washing Belt Pulley Drive And Rear Power Take Off Housings: Remove the drain plug from the housing when the oil is warm, and allow the oil to drain. Replace the drain plug and fill the housing to the correct level with kerosene or some non-inflammable cleaning fluid. Operate the gears for 5 minutes to wash the housing. Drain the cleaning fluid and refill the housing to the proper level as instructed in the LUBRICATION INSTRUCTIONS section of this book.



Attachment Instructions

Attachments are available from your Caterpillar dealer. Many of these attachments will add to operator comfort and convenience as well as increase the usefulness of your tractor.

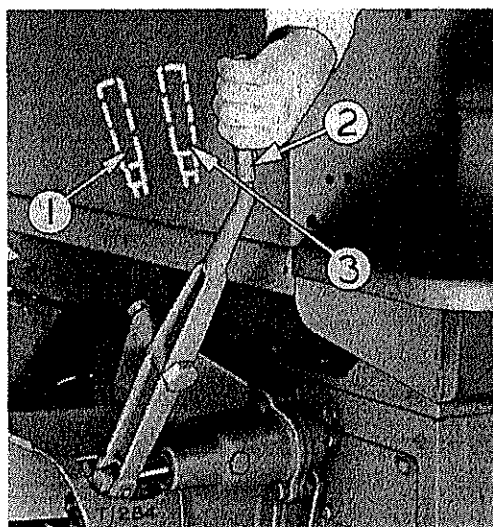
REAR MOUNTED EQUIPMENT

The rear mounted equipment is driven with power from the tractor engine by means of the flywheel clutch and transmission.

Two-Speed Power Take-Off Operation: Disengage the flywheel clutch and shift the transmission into neutral position (3). Pull the power take-off control lever to the extreme forward position (2) for fast shaft speed or push the lever to the extreme rear position (1) for slower shaft speed in the reverse direction. Engage the flywheel clutch to deliver engine power through the transmission to the power take-off. Disengage the flywheel clutch before changing speeds. Neutral position is (3) half way between the engaged positions.

TWO-SPEED POWER TAKE-OFF CONTROL

1-Slow speed position. 2-Fast speed
position. 3-Neutral position.



Single-Speed Power Take-Off Operation: Disengage the flywheel clutch and shift the transmission into neutral. Push the power take-off control lever down to engage the sliding gear with the drive gear. Engage the flywheel clutch to deliver engine power through the transmission to the power take-off.

Two-Speed Belt Pulley Drive Operation: The two-speed belt pulley drive is powered through the two-speed power take-off; operate the two-speed rear power take-off as described in the topic, TWO SPEED POWER TAKE-OFF OPERATION.

Single-Speed Belt Pulley Drive Operation: Disengage the flywheel clutch and shift the transmission into neutral. Push the control lever down to engage the sliding gear with the drive gear. Engage the flywheel clutch to deliver engine power through the transmission to the belt pulley drive.

ELECTRICAL SYSTEM

The basic electrical system is composed of the following:

1. Battery.
2. Generator.
3. Generator regulator.
4. Wiring.

These components function together to produce and store electricity for the electrical equipment on the machine and each is dependent upon the others for satisfactory operation. In the event of failure or improper operation it is essential to check the entire electrical system, as a defect in one component can cause damage to another.

The topics which follow describe the proper maintenance of the components to assure satisfactory operation of the electrical system.

Battery

Every 50 service hours, or more often when continuous operation without the use of the battery is encountered, the following attention should be given to the battery to insure high efficiency and maximum operating life.

Testing: The battery should be tested with a hydrometer and kept to a specific gravity of 1.250 or above. Always test a battery for degree of charge before adding water. The specific gravity between the cells should be within .025. A dangerously low point of charge is indicated by a hydrometer reading of 1.150 which will permit the battery to freeze. A specific gravity of 1.250 will permit the battery to withstand temperatures as low as -60°F . without freezing.

Water Addition: Water that escapes by evaporation should be replaced with distilled water or "approved water" (water free from impurities by analysis). The level should be maintained $\frac{3}{8}$ inch (9.5 mm.) above the top of the separators or insulators. Do not overfill or underfill the cells of the battery as either has a detrimental effect on the battery life.

Charging: The charging rate is correct when the battery maintains a minimum specific gravity of 1.250 and does not require the addition of more than 1 ounce of water per cell per week or 50 service hours.

When there is evidence of either overcharging or undercharging, the cause should be found and corrected as soon as possible to protect the service life of the battery. See the topics, GENERATOR, GENERATOR REGULATOR and WIRING.

Cleanliness: Keep the top of the battery clean and dry to prevent current losses and keep the terminals clean and tight. To clean corrosion from the battery terminals, scrub them with a weak solution of bicarbonate of soda (baking soda) and water. Dry the battery thoroughly,

then coat the terminals with lubricant to prevent corrosion. Keep the battery securely fastened in its compartment at all times.

Installation: When replacing a battery that has been removed, make certain the cables are attached to the correct battery terminals. Improper connections will damage the generator regulator.

Generator

Never operate a generator with an open circuit between it and the battery.

General Reconditioning: Every 2000 service hours, the generator should be removed and the commutator and brushes checked for glaze or darkening. At the same time the generator should be completely disassembled, washed and have all worn parts replaced. It is suggested that this cleaning and reconditioning be entrusted to your Caterpillar dealer.

Generator Removal: Remove all wires from the generator and tag them so that they may be connected correctly when the generator is reinstalled. Remove the bolts or stud nuts that hold the generator in position and lift off the generator.

Generator Installation: Whenever a generator is installed, or reconnected to the generator regulator, it must be polarized **before** starting the engine. Follow the instructions carefully to prevent damage to the generator, generator regulator, or both, due to incorrect polarizing.

1. Place the generator in position and install the bolts or stud nuts.
2. Connect all wires to the generator, regulator and battery. See the topic, WIRING.
3. Polarize the generator.

Polarizing American-Bosch Generator

1. Remove the wire from the generator regulator terminal marked FIELD.
2. Turn ON the disconnect switch.
3. Touch the wire which was removed from the FIELD terminal momentarily to the generator regulator terminal marked BAT.
4. Reconnect the wire to the generator regulator terminal marked FIELD.

CAUTION

Always disconnect the wire from the generator regulator terminal marked FIELD. **Never** use a jumper wire between the terminals on the generator regulator or generator marked FIELD, ARM or BAT.

Make sure all connections are clean and tight. See the topics, BATTERY, GENERATOR REGULATOR and WIRING.

Generator Regulator

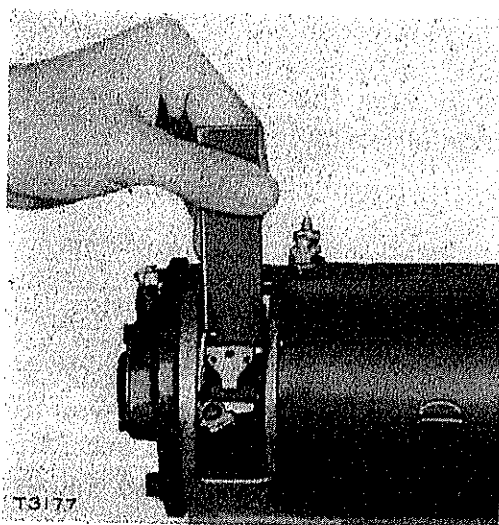
The generator regulator is adjusted at the factory for average operating conditions. The regulator may have to be readjusted to provide the proper charging rate for the particular operating conditions of the machine. In case of failure of either the regulator or generator, both units should be taken to your Caterpillar dealer, where the output of the generator can be checked and the regulator adjusted accordingly.

Charging Rate: The normal function of the generator regulator is to adjust the generator charging rate by sensing the degree of charge in the battery. As the battery becomes fully charged, the charging rate should be reduced until the ammeter indicates a rate only perceptibly above zero.

When improper charging of the battery is encountered, the entire electrical system should be carefully checked. Loose or dirty connections, worn or broken wires, or a faulty generator can prevent a good regulator from functioning properly. See the topics, BATTERY, GENERATOR, and WIRING.

ELECTRIC STARTER (6 and 24 volt systems)

Cleaning Electric Starter: Every 2000 service hours, the inspection covers should be removed from the starter and a check made of the commutator. If it is glazed or burned, polish it with "00" sandpaper. To polish, hold the sandpaper on the commutator with a stick while the commutator is turning. The polishing should be done on the starter by pressing the starter switch. With gasoline starting engine be sure the magneto switch is turned OFF. Turn the sandpaper over to clean the contact surface of the brushes. The commutator should not be turning when the brushes are being cleaned. Make sure all trace of sand particles is re-



**SANDING STARTER COMMUTATOR
AND BRUSHES**



moved from the commutator, brushes and brush holders by blowing out with air or an equally effective method.

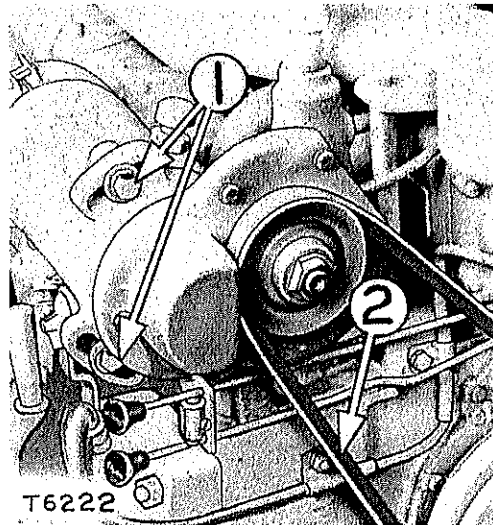
Brush Replacement: Brushes should be inspected and replaced if badly worn. When a new brush is installed, seat it properly with the contour of the commutator by using "00" sandpaper. See the preceding topic. Remove all sand particles and make certain the connections are all tight.

General Reconditioning: Approximately every 4,000 service hours, the starter should be removed so that it may be completely disassembled, washed and have all parts replaced that show evidence of being unsatisfactory for reason of wear. It is suggested that this cleaning and reconditioning be entrusted to your Caterpillar dealer.

Starting Engine Starter Belt Adjustment: The starter belt should be maintained at the proper tension at all times. To adjust, remove the hood,

STARTING ENGINE STARTER BELT ADJUSTMENT

1-Bolts. 2-Belt.



loosen the bolts (1) holding the starter belt pulley drive gear housing in place, then push the starter belt pulley against the belt (2) as tight as possible by hand, and tighten the bolts.

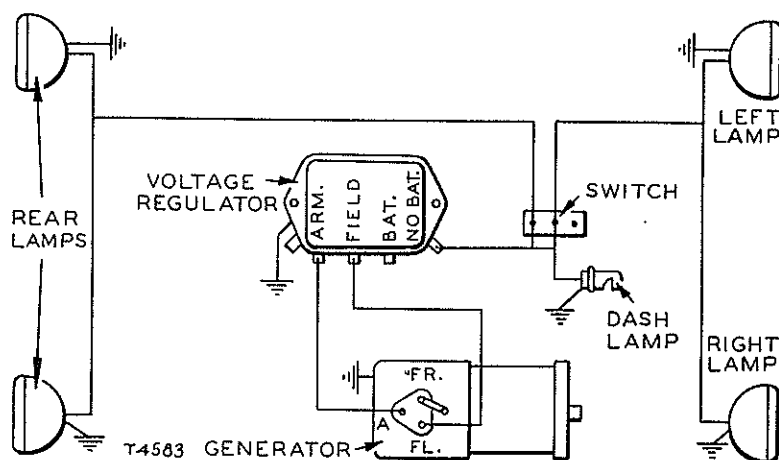
Starting Engine Starter Drive: If difficulty is experienced with the starter drive pinion failing to engage with the starter belt pulley drive gear, dirt in the worm drive is probably responsible. To correct, remove the starter from the mounting bracket; then take off the starter drive housing. Carefully clean the spiral grooves of the drive of any dirt or grease accumulations. Wash the spiral sleeve upon which the pinion operates, also the springs, gear teeth and drive housing. This washing should be done with kerosene or some non-inflammable cleaning fluid.

Before installing the drive, lubricate the threaded sleeve and the housing bushing with a few drops of light oil, then reassemble and install.

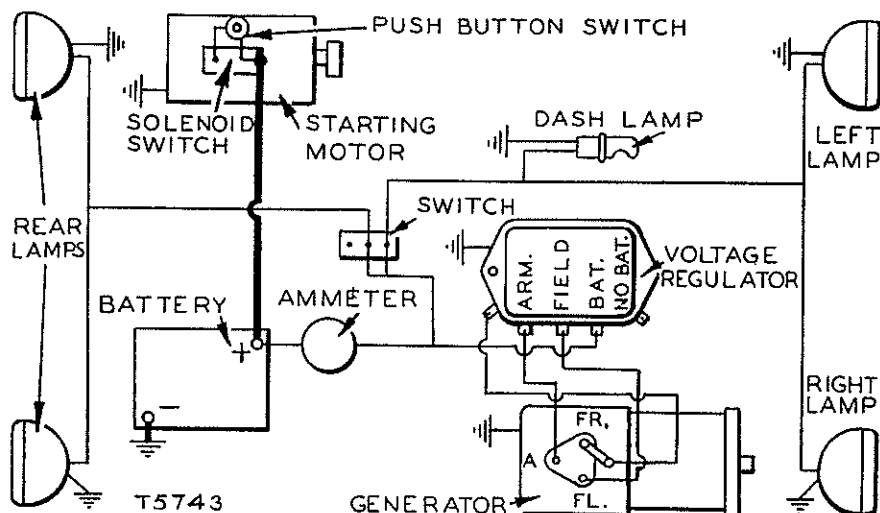
Wiring

The wiring forms an important part of the electrical system and care should be used to protect it from damage. When the electrical system is being serviced, check the wiring for loose or dirty connections, worn insulation or broken wires. Inspect the battery terminals and cables. Poor connections or wiring can cause trouble or damage in other parts of the electrical system. See the topics, BATTERY, GENERATOR and GENERATOR REGULATOR.

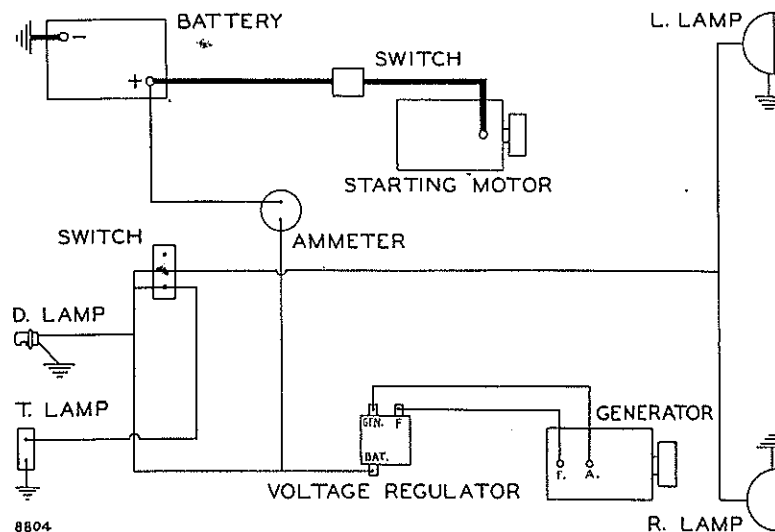
Wiring Diagrams: The diagrams are furnished so that when it becomes necessary to disturb the electrical equipment for purpose of reconditioning or parts replacement, reassembling may be accomplished without difficulty.



**LIGHTING SYSTEM - 40 AMPERE (200 WATT) GENERATOR - WITHOUT CAB;
WITHOUT BATTERY**
With four sealed beam lamps.

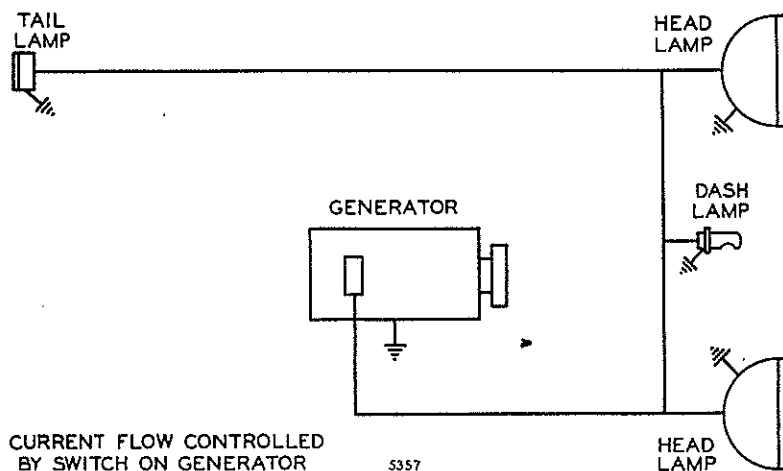


LIGHTING SYSTEM - 40 AMPERE (200 WATT) GENERATOR - WITH BATTERY
With four sealed beam lamps.



**LIGHTING SYSTEM - 175 OR 115 WATT GENERATOR - WITH BATTERY,
6 VOLT STARTING MOTOR AND CAB**

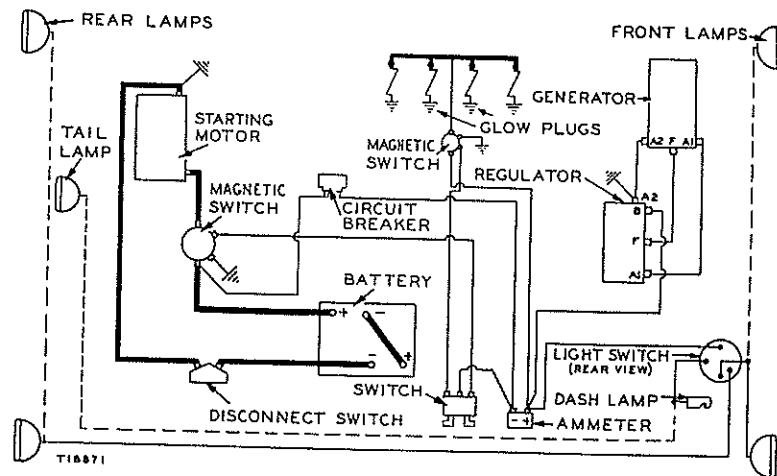
Without cab use above diagram and move one head lamp to tail lamp location.
No tail lamp is used in the group.



CURRENT FLOW CONTROLLED
BY SWITCH ON GENERATOR

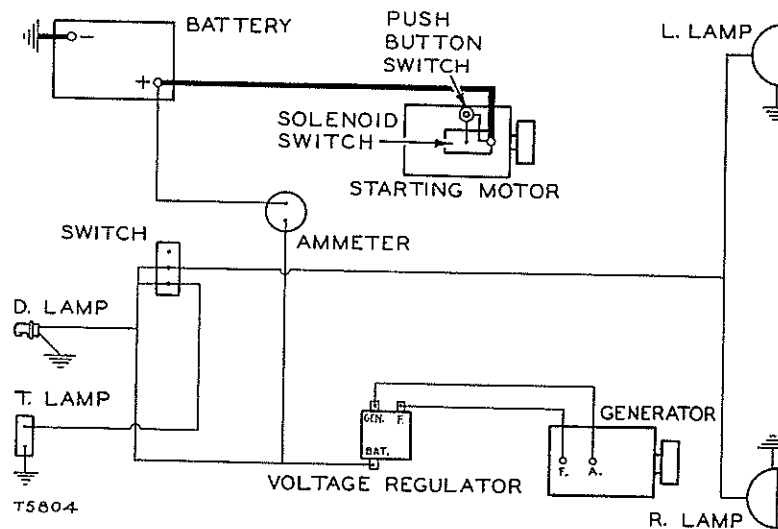
LIGHTING SYSTEM - 130 WATT GENERATOR - WITH CAB; WITHOUT BATTERY

Without cab add two rear lamps to above diagram and remove tail lamp.



**LIGHTING SYSTEMS - WITH OR WITHOUT CAB - WITH BATTERIES
AND 24 VOLT STARTING SYSTEM**

With cab and four lamp system, use the above complete diagram. With cab and two lamp system, omit one front and rear lamp and wires shown by dotted lines. Four and two lamp systems without cab are the same as above except the tail lamp is omitted in both cases.



**LIGHTING SYSTEM - 115 WATT GENERATORS - WITH BATTERY
AND 6 VOLT STARTING MOTOR**

LIGHTING SYSTEMS

Two types of lighting systems are available for use on this tractor. They are lighting systems with and without battery. In either type the generator armature revolves whenever the diesel engine is in operation.

The lights of the lighting system with battery will light whether the engine is in operation or stopped. The switch to turn these lights on or off is mounted on the battery box. The lights of the lighting system without battery will light only when the diesel engine is running. The switch for these lights is located on the generator where 130 watt generator is used, and is built in with the voltage regulator. To operate the switch on Auto-Lite generators, turn it to OPEN position, then back to ON position to light the lights.

Lighting systems with four sealed beam lamps without battery should use a 200 watt generator. In these systems the switch to turn the lights on is located on the dash.

The generators used with lighting systems without batteries are automatically regulated to provide the amount of current required to operate the lights within the capacity of the generator.

Generators are plainly marked and those of nominally 115 to 200 watt are most commonly used for lighting systems only. If watt rating is not indicated on the generator name plate, multiply volts by ampere rating to determine the watt rating. Mazda bulbs consume approximately 1 watt per candle power. Sealed beam lamps consume 6 to 8 amperes per lamp. This being the case it is easy to add up the candle power or ampere load of the various bulbs in the circuit to determine if the lights used are within the capacity of the generator.

For this reason, the generator size should always be checked before deciding to add additional lights or to increase the light intensity by replacing standard bulbs with those of higher candle power.

GLOW PLUGS

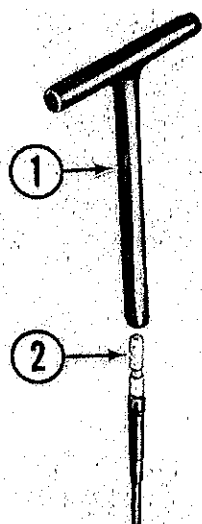
Maintenance: If it is suspected that the glow plugs are not correctly assisting in starting, the system should be checked for defective glow plugs. The ammeter should be observed when making this check to show that each glow plug uses approximately 7 amperes.

An ammeter of sufficient capacity should be connected to the magnetic switch on the glow plug side, and the HEAT switch moved to the ON position. A reading on the ammeter should be approximately equal to the number of glow plugs in the system multiplied by 7. Any reading that varies appreciably from this may indicate one or more defective glow plugs.

To locate the defective glow plug or plugs, check each glow plug separately by removing the leads from the glow plugs one at a time with the HEAT switch in the ON position. **Reconnect the lead to the plug before removing the lead from the next glow plug to be checked.** When a lead is removed from a glow plug, with no variation shown on the ammeter, it can be assumed that the plug is defective and should be replaced.

A check can be made of the individual glow plugs without the use of the ammeter as follows: Remove the lead from the glow plug and move the HEAT switch to the ON position. Contact the lead and glow plug for an instant. There should be a spark. If there is no sparking it can be assumed that the glow plug is defective.

To remove a defective glow plug, disconnect the lead from the glow plug; using the wrench (1), unscrew the glow plug (2) from the precombustion chamber.



WRENCH AND GLOW PLUG
1-Glow plug wrench. 2-Glow plug.

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Screw the new glow plug into the precombustion chamber and tighten.

Replacing Fuel Injection Valves: The instruction contained in the Operation and Maintenance Instructions should be followed with the following additions:

The glow plug should first be removed before removing and replacing a fuel injection valve to eliminate the possibility of damaging the glow plug.

Reinstall the glow plug into the precombustion chamber and tighten to a torque of from 9 to 10 pounds feet.

ETHER STARTING AID

Handling Precautions: Capsules are filled with ether which is highly flammable. These capsules are pressurized to act as an expellant. They are made of metal and this type of packaging provides maximum safety in storage, handling and use. The principal precautions to be taken are:

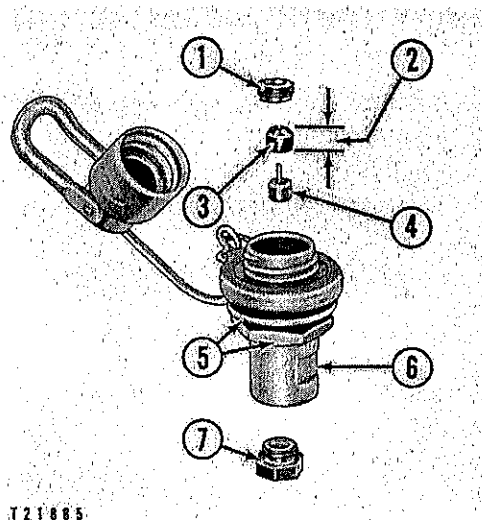
- a. Do not heat the capsules.
- b. When the discharger is being used for testing, inspecting or demonstrating purposes, and is not installed on an engine, the contents of capsules should **not** be discharged in confined areas or near an open flame.

Maintenance: If it is suspected that the ether starting aid is not functioning properly to assist in starting, disassemble the ether discharger (6).

1. Disconnect the tubing from the bottom of the discharger.
2. Remove the screen assembly (7) and wash the screen.
3. Remove the nut and washer (5) to remove the discharger.
4. Remove the screw (1), rubber washer (3) and pin (4).

ETHER DISCHARGER

1-Screw. 2-Free length measurement of $\frac{3}{8}$ inch. 3-Rubber washer. 4-Pin. 5-Nut and washer. 6-Ether discharger. 7-Screen assembly.



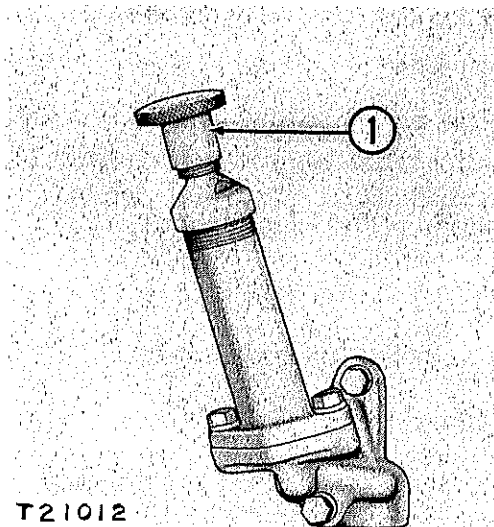
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5. Inspect the pin (4) to see that it is sharp. If the pin is not sharp, replace it.
6. Check the small hole through the pin to see that it is clean.
7. Inspect the rubber washer (3). The rubber washer should have a free length measurement of approximately $\frac{3}{8}$ inch at (2) and should not be distorted, otherwise replace it.
8. Assemble the discharger and replace it.

FUEL PRIMING PUMP

A priming pump is available for use with direct electric starting and prevents the battery from becoming run down due to excessive cranking when priming the fuel system. To prime the system proceed as follows:

1. Check to see that the diesel fuel line valve is open.
2. Open the vent valves on the fuel filter housing and fuel injection pumps.



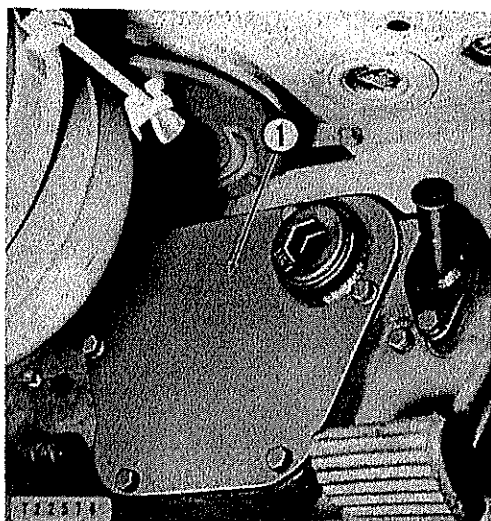
FUEL PRIMING PUMP

1-Knurled top.

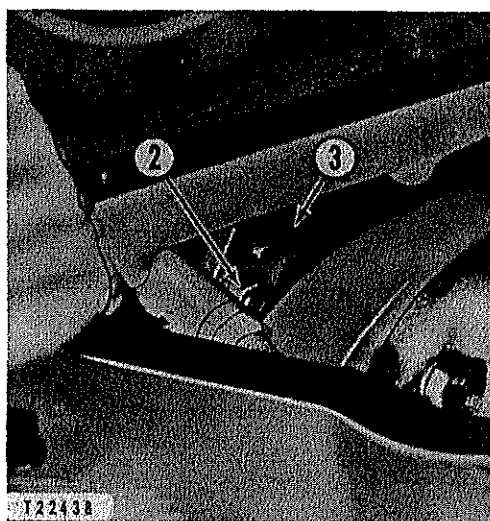
3. Loosen the knurled top (1) of the fuel priming pump.
4. Operate the pump plunger up and down until the flow of fuel from the vent valves becomes continuous and contains no air bubbles.
5. Close the vent valves.
6. Tighten the knurled top of the fuel priming pump to its original position.

FLYWHEEL CLUTCH (Oil Type)

The proper clutch adjustment will give a clutch lever pull of approximately 35 pounds. This measurement is made with a spring scale placed at the bottom of the handle on the clutch control lever with the engine stopped and when the clutch is cold. Slightly higher pounds pull may be required when the clutch is warm. Clutch lever pull will reduce when the engine is running, however when the clutch is properly adjusted the lever should go into engaged position with a distinct snap. The clutch adjustment should be checked every 500 service hours and adjusted if necessary.



CLUTCH ADJUSTMENT
1-Cover.



ADJUSTING CLUTCH
2-Locknuts. 3-Adjusting ring.

To Adjust: When clutch adjustment becomes necessary proceed as follows:

1. Care should be exercised to clean any dust or dirt from the top and around edges of the clutch compartment cover (1). Be sure all tools used to make the adjustment are clean. Remove the cover being careful not to damage the gasket under the cover.
2. Turn flywheel until one of the adjustment locknuts (2) is accessible. Loosen locknut about two turns. Tap plate slightly to be sure it is free on stud. Rotate flywheel 180° and loosen the other locknut in same manner.
3. Turn the adjusting ring (3) until 35 pounds pull is obtained on the clutch lever.
4. Tighten the locknuts to a torque of approximately 30 pounds feet. This can be accomplished with a steady pull on the end of the 9/16 inch L-handle socket wrench supplied with the tractor tool group.
5. Check to see that the clutch compartment cover is clean and the gasket is in good condition, then install the cover.

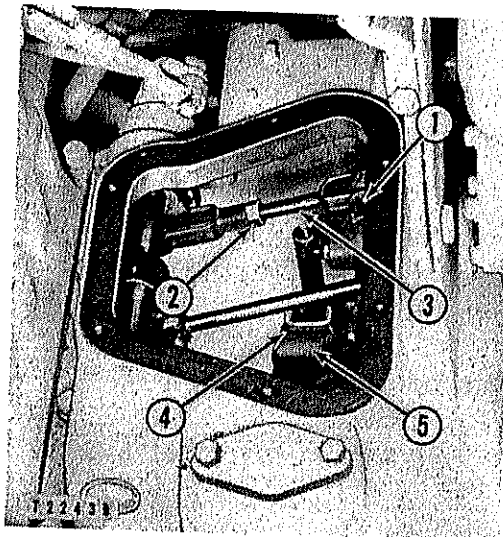
Clutch Brake Adjustment: The tractor is equipped with a clutch brake, which stops the clutch shaft from turning, and permits shifting gears without clashing. To apply the brake, press the flywheel clutch control lever forward as far as it will go. If the clutch is slow in stopping, the clutch brake should be adjusted.

To Adjust: If the brake has become worn and adjustment becomes necessary proceed in the following manner:

1. Place the flywheel clutch lever in the released position.
2. Loosen the locknut (2).
3. Take out the cotter pin and remove the pin (1).
4. Turn the rod end in several turns to shorten the control rod (3) so the brake lining (4) just touches the brake drum (5).
5. Install the pin (1) making sure it is held securely in place with the cotter pin.
6. Tighten the locknut.

NOTE

If brake is adjusted too tight the brake will be applied before the clutch is fully released and difficult shifting and high clutch brake lining wear will result.

**CLUTCH BRAKE ADJUSTMENT**

1-Pin. 2-Locknut. 3-Control rod. 4-Brake lining. 5-Brake drum.

Index

	Page		Page
Air Cleaners	13-16-49	Fuel Priming Pump	100
Air Inlet Pipe Extension	53	Fuel Supply, Care Of The	57
Attachment Instructions	89	Fuel System	59
Ball and Roller Bearing		Fuel System, Priming The	62
Lubricant	11-17-22	Fuel System, Starting Engine	68
Battery	90	Fuels	56
Belt Pulley Drive Operation	89	Gauges	39
Capacities	Inside Back Cover	Ammeter	40
Carburetor	68	Fuel Pressure	40
Clutch, Flywheel	18-77	Oil Pressure	39
Clutch, Flywheel (Oil Type)	100	Water Temperature	40
Clutch, Starting Engine	14-76	Generator	91
Coolants	69	Generator Regulator	92
Cooling System	69	Glow Plugs	97
Crankcase Lubricating Oil	8-12-20	Hydraulic Track Adjusters	84
Crankcase Lubricating Oil System	54	Lighting Systems	97
Daily Care	44	Lubricating Information,	
Diesel Engine Crankcase		General	7
Lubricating Oil Change Periods	10	Lubrication Chart	11A
Diesel Fuel Tank, Care Of The	58	Lubrication Instructions	7
Diesel Fuel Tank Filler Cap	58	Lubrication of Miscellaneous	
Direct Electric Starting	33	Points	7
Draining The Cooling System	70	Lubrication Of Attachments	20
Draining Steering Clutch		Maintenance Instructions	49
Compartment	81	Magneto	74
Draining The Flywheel Clutch		Model Views	4-5
Housing	78	Oil Viscosity Recommendations	10
Driving The Tractor	40	Operating In Cold Weather	45
Drawbar Adjustment	42	Operating In Deep Mud Or	
Electrical System	90	Water	42
Electric Starter	92	Operating Over an Obstruction	42
Ether Starting Aid	99	Operating Starting Engine	
Fan Belt	72	Electric Starter	30
Filter Elements		Operation Instructions	27
Full-Flow Lubricating Oil	13-54	Operation Of The Disconnect	
By-Pass Lubricating Oil	55	And Heat and Start Switches	35
Fuel Filters	59	Position Controls For Starting	28-34
Final Drive Sprocket Hub		Precleaner	52
Bearings	86	Preparing The Tractor For Use	27
Flywheel Clutch, Adjustment	77-100	Prescreener	53
Fuel Filter, Care Of The	59	Priming The Fuel System	62
Fuel Filter Elements	60	Pumps, Fuel Injection	66
Fuel Injection Equipment	64	Rear Mounted Equipment	22-89
Fuel Injection Pumps	66	Rear Power Take-Off Operations	89
Fuel Injection Valves	64	Seat Adjustment	87
Fuel Oil	56		

INDEX—Continued

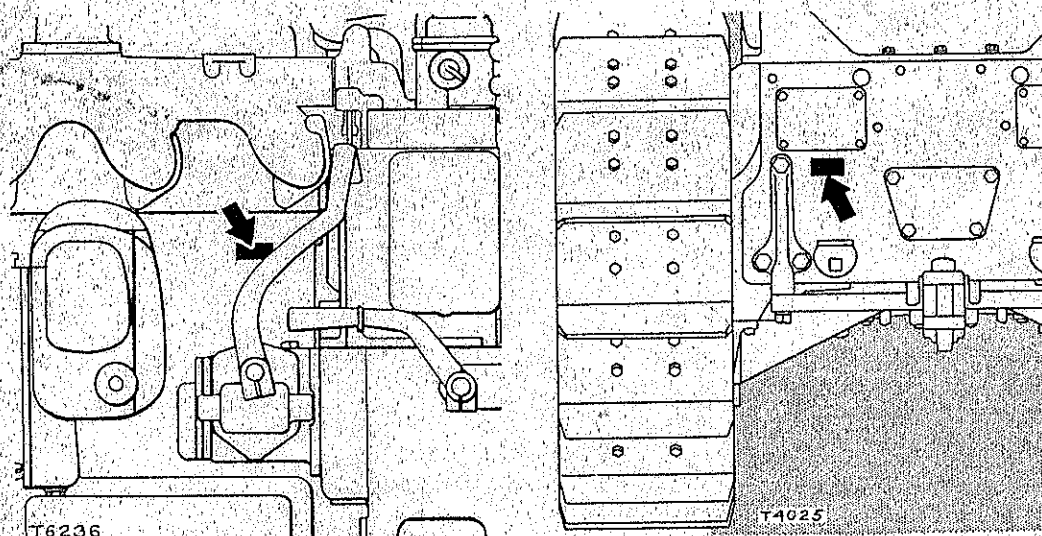
	Page		Page
Sediment Bowl Filter And Fuel		Temperature And Viscosity	
Line Screen	68	Range Chart	10
Serial Number		Tracks	83
Location Inside Back Cover		Tractor Initial Service	27
Service Meter	7	Track Roller Lubricant	11-19
Spark Plug Adjustment	73	Tractor Recheck	27
Starter, Electric	92	Transmission Lubricant	11
Starting Aid Chart	37		
Starting At 60° F. And Above	36	Valve Clearance, Diesel Engine	72
Starting Between 32° F. and		Valve, Fuel Injection	64
10° F.	37		
Starting Between 60° F. and		Washing Belt Pulley Drive And	
32° F.	36	Rear Power Take-Off	
Starting Engine Clutch,		Housings	88
Adjustment	76	Washing Gear Compartments	88
Starting Engine Magneto	73	Washing The Crankcase	56
Starting Engine, Storage	47	Washing The Final Drive	88
Starting The Engine	28	Washing The Flywheel Clutch	
Starting The Diesel Engine	31	Housing	78
Starting The Starting Engine	29	Washing The Starting	
Steering Clutches And Brakes	79	Engine Clutch	14-77
Steering The Tractor	41	Washing The Steering Clutch	
Stopping The Diesel Engine	43	Brakes	82
Stopping The Tractor	43	Washing The Transmission	17-88
Storage	47	Wiring Diagrams	94

Capacities

Approximate Quantities

	U.S. Measure	Metric Measure Liters	Imperial Measure
Crankcase Lubricating Oil System,			
Diesel Engine	15 qt.	14	12.5 qt.
Starting Engine	1 qt.	1	.8 qt.
Fuel Injection Pump Housing	$\frac{3}{4}$ qt.	.8	.7 qt.
Starting Engine Clutch Housing	$\frac{5}{8}$ qt.	.6	.5 qt.
Air Cleaner, Diesel Engine	2 $\frac{1}{2}$ qt.	2.4	2.1 qt.
Air Cleaner, Starting Engine	$\frac{1}{2}$ qt.	.5	.5 qt.
Flywheel Clutch (oil type)	16 qt.	15	13.5 qt.
Fuel Tank, Diesel Engine	30 U.S. gal.	114	25 gal.
Fuel Tank, Starting Engine	3 qt.	2.8	2.5 qt.
Final Drive, (each 60" gauge)	7 qt.	6.6	5.8 qt.
(each 44" gauge)	6 qt.	5.7	5 qt.
Transmission	16 qt.	15	13.5 qt.
Cooling System	11 U.S. gal.	41.5	9.2 gal.

Location Of Serial Number



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