

**OPERATION AND  
MAINTENANCE  
INSTRUCTIONS**

**CATERPILLAR**

**D8  
TRACTOR**

**SERIAL NUMBERS**

**14A1-UP**

**15A1-UP**

Caterpillar Tractor Co., Peoria, Illinois, U.S.A. • Caterpillar Americas Co., Peoria, Illinois, U.S.A. • Caterpillar Overseas C.A., Caracas, Venezuela • Caterpillar of Australia Pty. Ltd., Melbourne • Caterpillar Brasil S.A., Sao Paulo • Caterpillar Tractor Co. Ltd., Glasgow, Scotland • Caterpillar Canada Ltd., Toronto, Ontario

TITAN HAYZ  
910 112 12<sup>th</sup>

# 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.

## 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.

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## 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.**

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## 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.

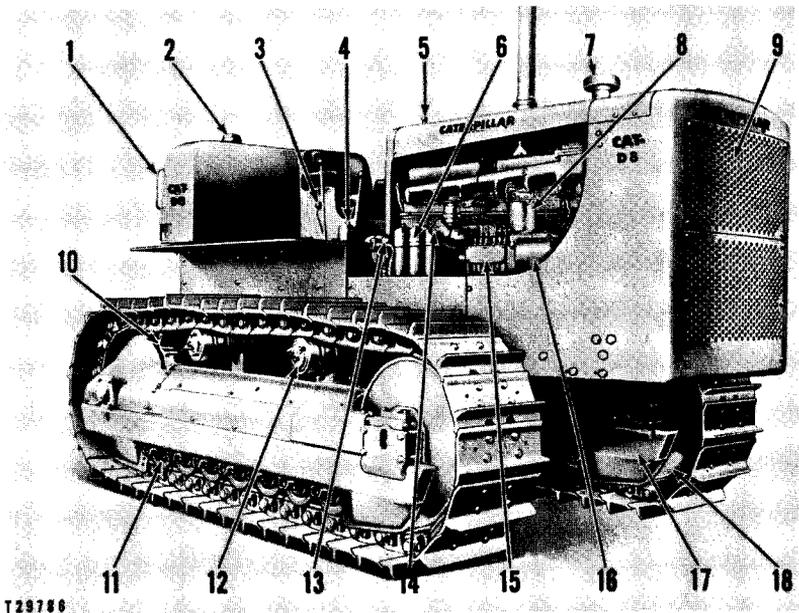
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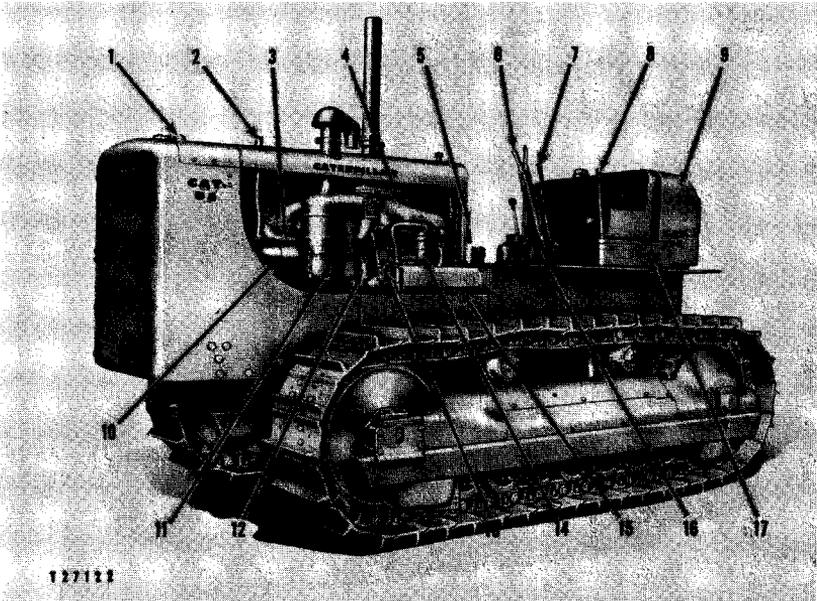
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#### D8 TRACTOR - RIGHT FRONT VIEW

1-Handle. 2-Diesel fuel tank filler cap. 3-Governor control lever. 4-Transmission oil filter. 5-Starting engine fuel tank filler cap. 6-Diesel engine crankcase oil filters. 7-Precleaner. 8-Fuel filter housing. 9-Radiator guard. 10-Sprocket. 11-Track rollers. 12-Track carrier rollers. 13-Hydraulic pump. 14-Diesel engine crankcase filler cap. 15-Fuel injection pump housing. 16-Governor housing. 17-Track roller frame. 18-Front idler.



#### D8 TRACTOR — LEFT FRONT VIEW

1-Sealed pressure overflow unit. 2-Starting engine exhaust pipe. 3-Diesel engine inlet manifold. 4-Diesel engine exhaust manifold. 5-Clutch and starter pinion control lever. 6-Parking brake. 7-Steering clutch control levers. 8-Flywheel clutch control lever. 9-Diesel fuel tank. 10-Charging generator. 11-Diesel engine air cleaner. 12-Starting engine magneto. 13-Starting engine crankcase filler cap. 14-Starting engine air cleaner. 15-Starting engine transmission oil gauge. 16-Brake pedals. 17-Tool box.

## Lubrication Instructions

### SERVICE METER

The Service Meter is located on the right side of the engine near the bottom of the governor 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 engine. 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

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

## CRANKCASE LUBRICATING OIL (Abbreviated CO)

### Type of Oils

**(CO) Superior Lubricants (Series 3):** Only those lubricating oils known as Superior Lubricants (Series 3) for Caterpillar Diesel Engines should be used in the diesel engine crankcase and the starting engine crankcase on machines equipped with interconnected lubricating oil systems. For recommended oil change periods, see the topic, CRANKCASE LUBRICATING OIL CHANGE PERIODS.

### NOTE

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) Straight Mineral, MIL-L-2104A Oils Or Superior Lubricants (Series 3):** In compartments other than the diesel engine crankcase where crankcase lubricating oil is recommended (such as starting engine transmission, fuel injection pump housing, diesel and starting engine air cleaners†, steering clutch and brake compartment and the flywheel clutch compartment on tractors with direct drive, 14A1-up, use either straight mineral crankcase lubricating oil, an oil conforming to the requirements of MIL-L-2104A specification or Superior Lubricants (Series 3) whichever is most convenient and economical.

### S.A.E. Grade of Oil

At temperatures above freezing, S.A.E. No. 30 oil should be used in all compartments except the oil steering clutch compartments on tractor effective with 14A3740 and 15A1600 which require S.A.E. No. 10W oil for all temperature ranges.

At temperatures below freezing S.A.E. No. 10W oil should be used to provide better lubrication at low temperatures and also to make cranking easier.

† 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.

S.A.E. No. 10W oil should be fluid enough for easy cranking at temperatures down to at least  $-10^{\circ}\text{F}$ . In lower temperatures it may be necessary to dilute S.A.E. No. 10W oil with kerosene (except in air cleaners) so it will be fluid enough to insure free circulation. Evaporation in the engine crankcase, the oil steering clutch compartments effective with 14A3740 and 15A1600 and possibly in the oil clutch compartment on tractors with direct drive, 14A1-up, under steady operation may make it necessary to again add kerosene to maintain proper fluidity. This should be done before stopping for the day. After kerosene has been added the engine should be operated for a few minutes to mix the kerosene and oil.

For an approximate check to determine if the oil will flow, remove the oil level gauge and if the oil on it will flow off, the oil is fluid enough to properly circulate in the engine or clutch compartment on tractors with direct drive, 14A1-up.

### Crankcase Lubricating Oil Change Periods

The crankcase lubricating oil change periods for these engines 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. Experience shows that dirt and foreign material is present in reconditioned engines even though best service practices have been followed.

#### DIESEL ENGINE CRANKCASE LUBRICATING OIL CHANGE PERIOD CHART USE ONLY SUPERIOR LUBRICANTS (Series 3)

FUEL SULPHUR CONTENT	OIL CHANGE PERIOD*	FILTER CHANGE PERIOD
0.4% or less	300 Service Hrs.	300 Service Hrs.
0.4% to 1.0%**	150 Service Hrs.	150 Service Hrs.

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

\*\*Reduce change period one half when sulphur content is greater than 1%.

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### 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.

### **TRACK ROLLER LUBRICANT (Abbreviated RL)**

**(RL)** This 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.

### **TRANSMISSION OIL (Abbreviated TO)**

**(TO) MIL-L-2105 Oil:** Use an oil conforming to the requirements of MIL-L-2105 specification. Be sure your oil supplier furnishes a MIL-L-2105 oil that is filterable. If the transmission oil filter becomes plugged, damage to the transmission may result.

At temperatures above freezing use S.A.E. No. 90 oil, but when operating continuously in extremely hot temperatures, use S.A.E. No. 140 oil.

Below freezing S.A.E. No. 80 oil will be required, however, in extremely cold weather S.A.E. No. 80 oil should be diluted with sufficient kerosene to provide fluidity.

### **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 in.

**LUBRICATION CHART**  
**CATERPILLAR**  
**D8 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 lubricating and service information.

## Key To Lubricants

**CO** Crankcase Lubricating Oil

**TO** Transmission Oil

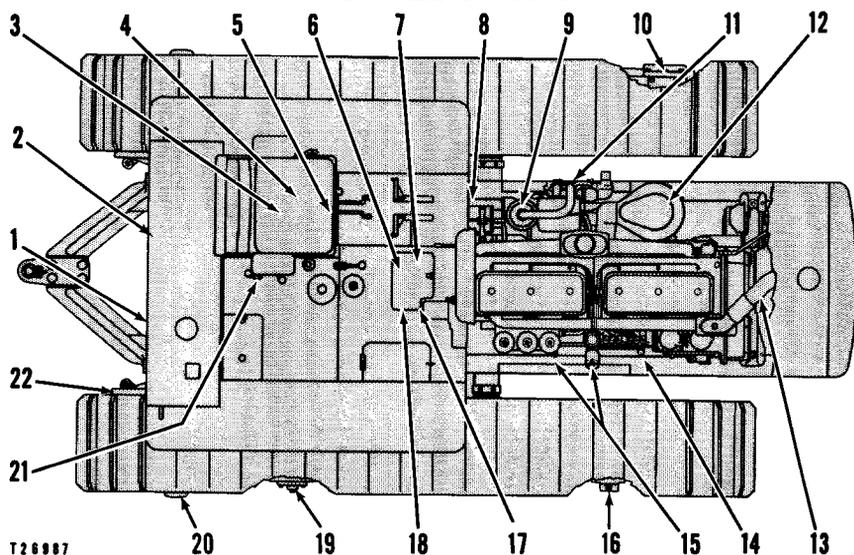
**RL** Track Roller Lubricant

**BR** Ball and Roller Bearing Lubricant

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

Point and Identification	Lubri- cant	SERVICE HOURS								
		10	50	125	150	250	300	500	1000	2000
1 Steering Clutch and Brake Compartment	CO	X	X			X		X	X	
2 Track Roller Frame Inner Bearings	BR	X								
3 Transmission	TO			X		X			X	
4 Brake Control Shaft Bearings	BR									X
5 Steering Clutch Control Lever Bearings	BR									X
6 Torque Converter Clutch Release Bearing and Shaft Bearings (Tractors with torque converter drive, 15A1-up)	BR	X								
7 Flywheel Clutch Compartment (Tractors with Direct Drive, 14A1-up)	CO	X								X
8 Starting Engine Transmission	CO					X				X
9 Starting Engine Air Cleaner	CO		X							
10 Front Idlers	RL	**X		X						
11 Starting Engine Crankcase	CO	X		*X		X				
12 Diesel Engine Air Cleaner	CO	*X	X							
13 Fan Bearings	BR					X				
14 Fuel Injection Pump Housing	CO			X		X				
15 Diesel Engine Crankcase Lubricating Oil System	CO	X			†X			†X		
16 Track Rollers	RL	**X		X						
17 Flywheel Clutch Brake Bellcrank (14A1-Up)	BR	X								
18 Universal Joint	BR									X
19 Track Carrier Rollers	RL	**X		X						
20 Track Roller Frame Outer Bearings	BR	X								
21 Steering Clutch and Brake Hydraulic Control	CO					X				X
22 Final Drives	TO			X				**X		X

### Location Of Points Of Lubrication



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\*Only when operating in extremely dusty conditions.

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

†See the Diesel Engine Crankcase Lubricating Oil Change Period Chart.

## CO Crankcase Lubricating Oil

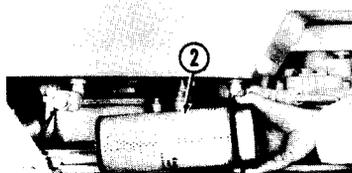


1

### STEERING CLUTCH AND BRAKE COMPARTMENT

Check oil level in each compartment every 10 service hours. Oil should be up to full mark on gauge (1).

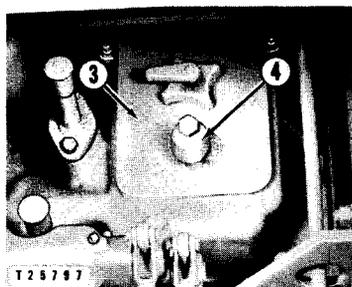
Remove the seat cushion to check the oil level in the left compartment and remove the floor plate to check the right compartment.



1

### STEERING CLUTCH AND BRAKE COMPARTMENT FILTER ELEMENT

Replace the filter element (2) one in each steering clutch compartment after the first 50 service hours of operation and every 500 service hours thereafter. To change the filter elements, see the topic, STEERING CLUTCHES AND BRAKES.



1

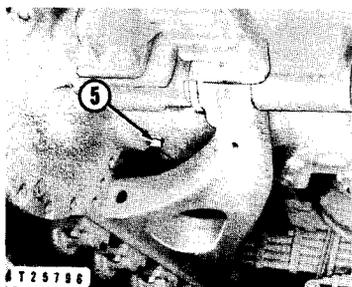
### STEERING CLUTCH AND BRAKE COMPARTMENT

Every 1000 service hours drain compartment at (5) by removing two drain plugs one for each compartment. Wash, clean magnetic drain plugs and refill compartments by removing inspection cover at (3). For the right steering clutch compartment, remove the floor plate and inspection cover to fill the compartment.

Extreme care should be taken to prevent dirt getting in the compartments.

When extreme usage of the steering clutches and brakes and high temperatures are encountered it may be necessary to change the oil more often. This can be determined by examining the oil on the oil level gauge and if it appears to be extremely thick and black, the oil should be changed.

Every 250 service hours remove breather (4), wash, oil and replace (one breather on each cover).



# CO Crankcase Lubricating Oil

## 7

### FLYWHEEL CLUTCH COMPARTMENT

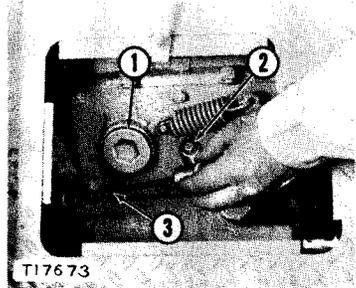
(Tractors with direct drive, 14A1-up)

Remove clutch inspection floor plate and 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 (3). If the oil level is above the full mark on the gauge, remove the plug on the left side of the flywheel housing and allow excess oil to drain. See the topic, "Daily Care".

Every 250 service hours remove clutch inspection floor plate, then remove, wash and oil the breather (2).

Extreme care should be taken to prevent dirt getting into the clutch compartment when removing the filler plug (1) for filling.

Remove clutch inspection floor plate. Remove filler plug (1) and fill compartment to full mark on gauge. Approximately 4 gallons of oil is required to fill the compartment. Install filler plug tightly.



## 7

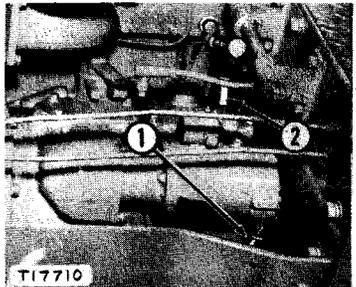
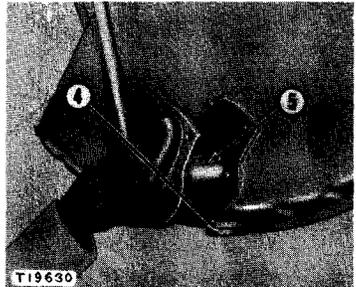
### FLYWHEEL CLUTCH COMPARTMENT

(Tractors with direct drive, 14A1-up)

Every 1000 service hours, drain the clutch compartment by removing drain plug (4). Engaging and disengaging clutch will force oil out of hydraulic booster cylinder.

When extreme usage of the flywheel clutch and high temperatures are encountered it may be necessary to change the oil more often. This can be determined by examining the oil on the oil level gauge and if it appears to be extremely thick and black, the oil should be changed.

If sludge is noticed in the oil when draining, remove, disassemble and wash oil pump suction screen assembly (5). Clean the magnetic drain plug. When removing the suction screen assembly be careful not to damage the gasket. Reassemble and install the suction screen assembly and drain plug. See the topic, "Flywheel Clutch".

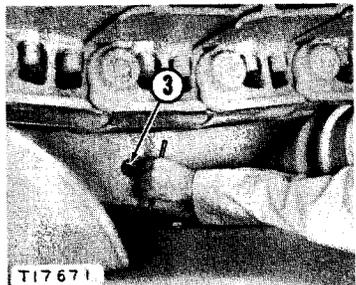


## 8

### STARTING ENGINE TRANSMISSION

Every 250 hours check oil level. Oil should be up to "full" mark on gauge (1). Remove, wash and oil the breather.

Every 1000 service hours drain at (3). Wash and refill at (2) to "full" mark on gauge. See the topic, "Washing Gear Compartments".



# CO Crankcase Lubricating Oil

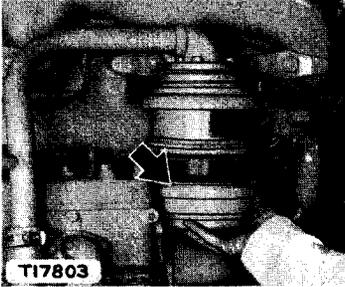
## 9

### 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 also 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".



## 11

### STARTING ENGINE CRANKCASE

Check the oil level every 10 service hours before starting the engine. Oil should be up to full mark on gauge (2).

(Effective with Tractors 14A4355 and 15A1852)

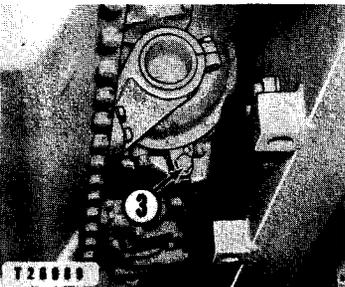
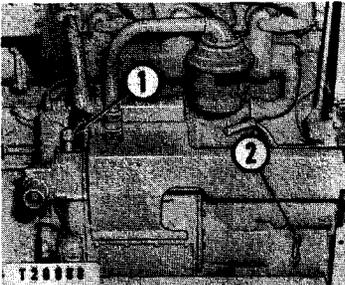
Drain the starting engine crankcase each time the diesel engine crankcase is drained by loosening the drain plug (3). When draining be sure the engine is level so the starting engine clutch compartment will drain. Tighten the drain plug and refill the crankcase at (1) with  $4\frac{1}{2}$  quarts of oil of the same type and grade as is used in the diesel engine crankcase. Check the oil level, which should be up to the "full" mark on the gauge.

See the topic, "Crankcase Lubricating Oil".

(Tractors Before 14A4355 and 15A1852)

Every 125 to 250 service hours, depending on dust conditions, drain at (4) and wash the crankcase. When draining be sure the engine is level so the oil in the starting engine clutch compartment will drain. Disassemble breather (1) and wash at each oil change period.

Refill the crankcase at (1). Refill with  $4\frac{1}{2}$  qts. of oil which will bring the level  $1\frac{1}{2}$  inches above the full mark on gauge. Start and run the engine at least one minute to pump oil into the clutch compartment. Check the oil again with engine stopped. Oil should be up to full mark on gauge.



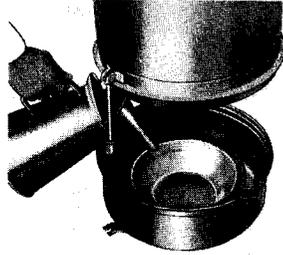
# CO Crankcase Lubricating Oil

## 12

### 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 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 also 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."



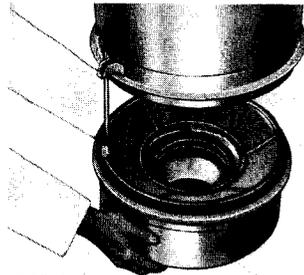
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## 12

### DIESEL ENGINE AIR CLEANER TRAY ASSEMBLY

When the oil cup is removed for inspection, remove the air cleaner separable tray screens from the cup, 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".

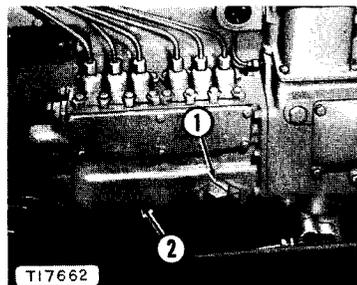


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## 14

### FUEL INJECTION PUMP HOUSING

Check oil level every 125 service hours. Keep filled to top of filler elbow (1). Drain at (2) and refill every 250 service hours.

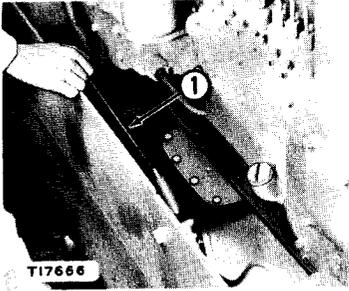


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# CO Crankcase Lubricating Oil

## 15

### DIESEL ENGINE CRANKCASE LUBRICATING OIL SYSTEM



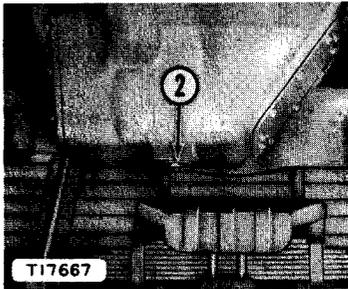
Check oil level with engine running every 10 service hours. Oil level should be between the "full" and "low" marks on gauge (1). The oil level maintained at the "full" mark is more desirable, however, any level above the "low" mark is permissible.

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 Notes A and B.

## 15

### DIESEL ENGINE CRANKCASE LUBRICATING OIL SYSTEM

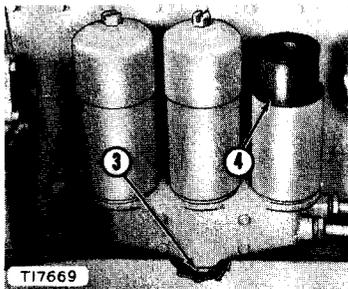


Drain crankcase at (2) while the engine is hot. For recommended oil change periods see the "Diesel Engine Crankcase Lubricating Oil Change Period Chart". Also see the topics, "Crankcase Lubricating Oil" and "Crankcase Lubricating Oil System".

When equipped with gasoline starting engine having an interconnected lubricating oil system, also drain the starting engine crankcase. See the topic, "Starting Engine Crankcase".

## 15

### DIESEL ENGINE CRANKCASE LUBRICATING OIL SYSTEM



Remove the plug (3) from the filter base to drain the unfiltered oil from the base and replace the filter elements (4) with new elements at each oil change period. See the topic, "Crankcase Lubricating Oil System".

**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. See the "Crankcase Lubricating Oil Change Period Chart."

**NOTE B:** The diesel engine has a guard to protect the gauge from spray so the oil level should be checked with the engine running. Always check the oil level with the engine in a level position.

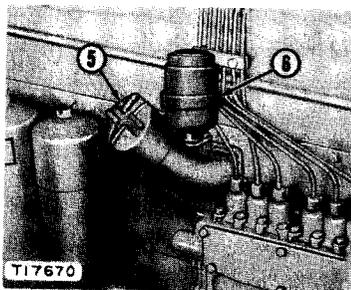
## CO Crankcase Lubricating Oil

### 15

#### DIESEL ENGINE CRANKCASE LUBRICATING OIL SYSTEM

After draining crankcase refill at (5) 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.

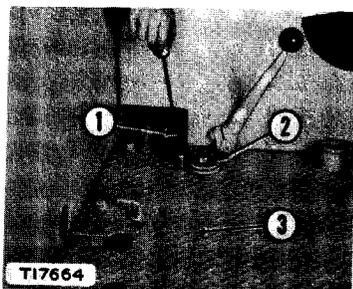
Disassemble breather (6) and wash elements each time crankcase oil is drained.



### 21

#### STEERING CLUTCH AND BRAKE HYDRAULIC CONTROL COMPARTMENT

Check oil level every 250 service hours. Oil should be up to full mark on gauge (1). Add lubricant at (2) to bring oil to proper level. Prevent dirt from entering the compartment. Remove, wash and oil the breather. The breather may be reached by removing the floor plate (3).



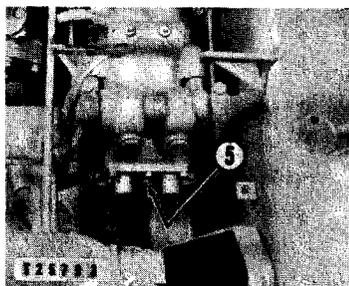
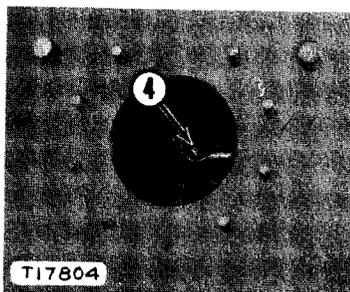
### 21

#### STEERING CLUTCH AND BRAKE HYDRAULIC CONTROL COMPARTMENT

Every 1000 service hours, drain the steering clutch hydraulic control compartment by removing the cover on the back of the steering clutch case and the plug (4) from the rear face of the hydraulic control compartment and drain the brake hydraulic control compartment by removing plug (5) from under the tractor. Replace the drain plugs and fill both compartments at filler opening (2). Remove and clean filler strainer at each oil change period. Floor plate removed for illustration purpose only.

If rear mounted equipment interferes with removing the drain plug, suck out the oil through the filler opening. Use care to prevent dirt from entering the housing. Fill the housing to the proper level.

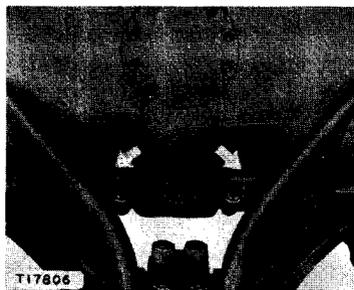
The hydraulic system filter element in the supply line between the hydraulic pump and booster should be replaced only when some part of the hydraulic system has been disassembled for reconditioning.



### BREATHERS

Remove, wash and oil all breathers of the type shown every 250 service hours. These breathers are on the starting engine clutch and transmission housings, the steering clutch housing covers, the transmission and the steering clutch hydraulic control compartment. On tractors with direct drive, 14A1-up, there is also a breather on the fly-wheel clutch housing inspection cover.

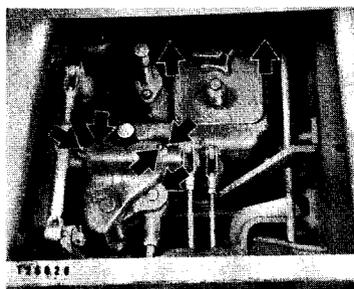
## BR Ball And Roller Bearing Lubricant



### 2

#### TRACK ROLLER FRAME INNER BEARINGS

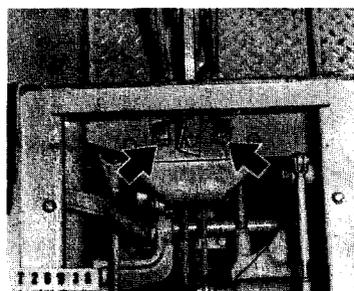
Lubricate two bearings every 10 service hours.



### 4

#### BRAKE CONTROL SHAFT BEARINGS

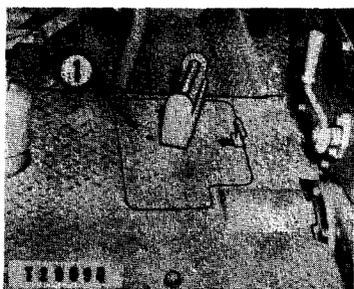
Every 2000 service hours remove the ten plugs (seven on the left side and three on the right side), install  $\frac{1}{8}$  inch fittings and lubricate. Remove fittings and reinstall plugs.



### 5

#### STEERING CLUTCH CONTROL LEVER BEARINGS

Lubricate each bearing every 2000 service hours.



### 6

#### TORQUE CONVERTER CLUTCH RELEASE BEARING AND SHAFT BEARINGS

(Tractors with torque converter drive,  
15A1-up)

Remove floor plate (1) and lubricate shaft bearings and clutch release bearing through three fittings with five strokes from the grease gun every 10 service hours.

#### NOTE

On machines with hydraulic track adjusters, a pressure fitting located on the recoil spring piston flange is to be used for adjusting the track. Apply lubricant only when track adjustment is required. See the topic, TRACK ADJUSTMENT.

## BR Ball And Roller Bearing Lubricant

### 13

#### FAN AND ADJUSTING PULLEY BEARINGS

Every 250 service hours lubricate through two fittings with 5 strokes from the grease gun. Earlier tractors were not equipped with an adjusting pulley.

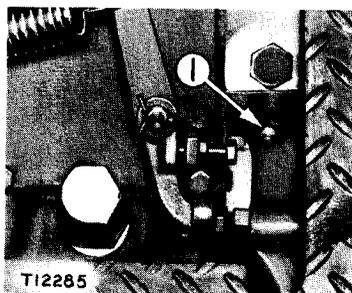


### 17

#### FLYWHEEL CLUTCH BRAKE BELLCRANK

(Tractors with direct drive, 14A1-up)

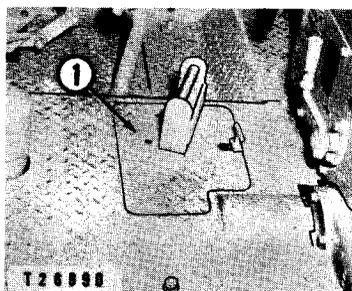
Remove clutch inspection floor plate cover and lubricate the clutch brake bellcrank every 10 service hours through fitting (1).



### 18

#### UNIVERSAL JOINTS

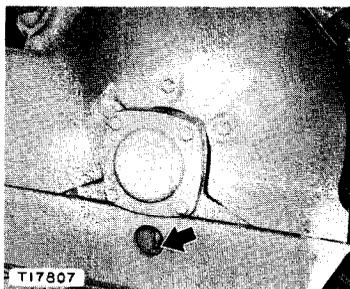
Every 1000 service hours remove the clutch inspection floor plate (1) and lubricate universal joints through two fittings. Care must be taken when lubricating the universal joint bearings so that the internal seals are not damaged by excessive pressure.



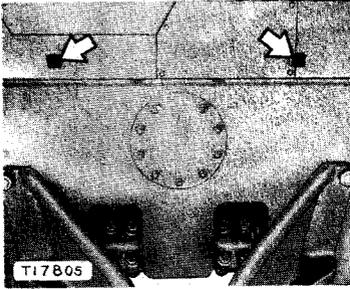
### 20

#### TRACK ROLLER FRAME OUTER BEARINGS

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

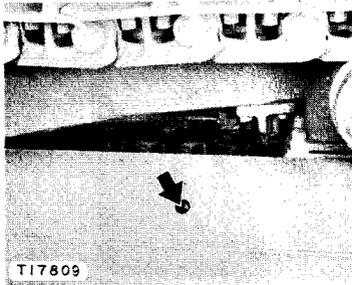


## BR Ball And Roller Bearing Lubricant



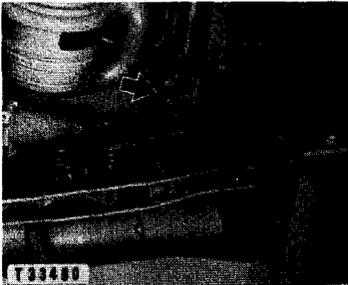
### STEERING CLUTCH RELEASE BEARINGS

Tractors before 14A3740 and 15A1600 not equipped with oil type steering clutches and brakes, lubricate each steering clutch release bearing sparingly through fittings on top rear of steering clutch case every 10 service hours.



### TRACK ADJUSTING SCREWS

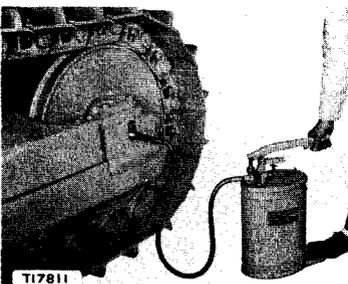
Tractors before 14A3500 and 15A1503 not equipped with hydraulic track adjusters lubricate the track adjusting screw on each side of the tractor every 250 service hours.



### STARTER PINION AND CLUTCH CONTROL BEARINGS

Every 125 service hours lubricate two points, one at the top and one at the bottom.

## RL Track Roller Lubricant



## 10

### FRONT IDLERS

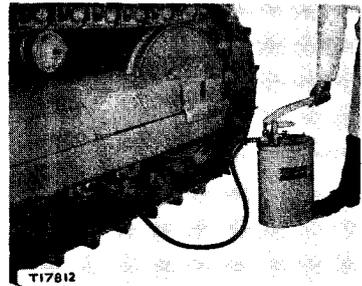
Every 500 service hours, remove plugs from idler shaft and install button head fitting. Lubricate idlers on both sides of machine and reinstall the plugs. If operating in deep mud or water, lubricate every 250 service hours. See Note C.

## RL Track Roller Lubricant

### 16

#### TRACK ROLLERS

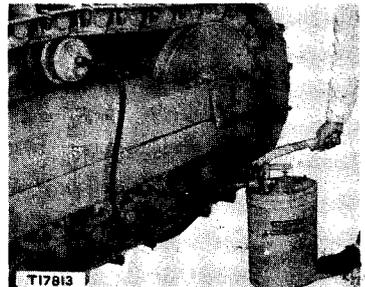
Every 500 service hours, remove plugs from track roller shafts and install the short button head fitting. Lubricate each roller on both sides of machine and reinstall the plugs. If operating in deep mud or water, lubricate every 250 service hours. See Note C.



### 19

#### TRACK CARRIER ROLLERS

Lubricate rollers on both sides of machine every 50 service hours. If operating in deep mud or water, lubricate every 10 service hours. Lubricant should be applied until a slight amount of lubricant is forced past the seals.



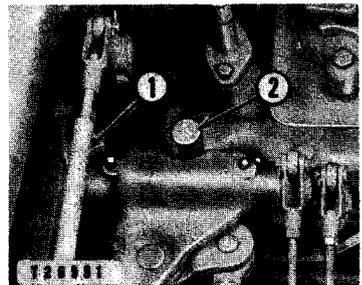
## TO Transmission Oil

### 3

#### TRANSMISSION

Remove seat cushion and check transmission oil level every 125 service hours. Oil should be up to full mark on gauge (2).

Remove, wash and oil the breather (1).



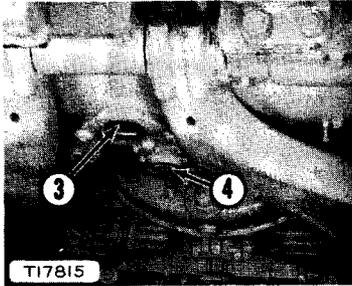
Note C: With the hand operated volume compressor, apply lubricant only until a slight additional resistance is felt on the handle of the volume compressor. Further pumping may damage the seals. Lack of this slight resistance when filling may indicate damaged seals, which should be replaced.

Power operated pressure lubrication dispensers can deliver lubricant in such volume and at pressures sufficiently high to damage the seals. Therefore, a pressure relief valve should be used in the lubricant line that will automatically unload when the pressure reaches approximately 450-500 PSI.

# TO Transmission Oil

## 3

### TRANSMISSION



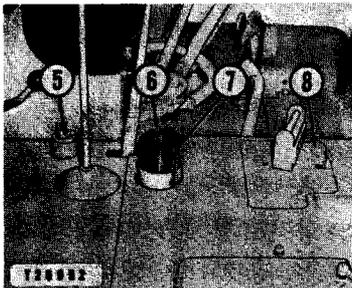
Drain bevel gear compartment at (3) and speed change compartment at (4) every 1000 service hours, wash and refill to full mark on gauge.

When extreme loads and high temperatures are encountered it may be necessary to change oil every 500 service hours. This can be determined by examining the oil on the oil level gauge and if it appears to be extremely thick and black the oil should be changed.

Clean the collected particles from the magnetic drain plugs before replacing the plugs. See the topic, "Washing Gear Compartments".

## 3

### TRANSMISSION



Check the transmission oil filter element (6) every 125 service hours. It is advisable to replace the element with a new Caterpillar element when excessive sludging of the element is observed or every 250 service hours whichever occurs first.

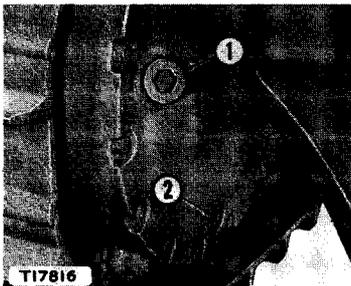
Service the transmission oil filter completely as described in the topic, "Transmission Lubricating Oil System".

Drain the filter housing by removing the plug at (7). The drain plug may be reached by removing the flywheel clutch inspection floor plate (8).

Fill housing at (5) to full mark on gauge, start the diesel engine and run it at half engine speed for two minutes with the flywheel clutch engaged. This will fill the filter, oil passages and bearings with lubricant before driving the tractor.

## 22

### FINAL DRIVES



Check oil level at (1) by removing two filler plugs, one for each side, every 125 service hours. Keep lubricant to level of filler opening.

Drain compartment at (2), wash and refill it every 1000 service hours (500 service hours when operating in either extremely dusty conditions or deep mud and water). See the topic, "Washing Gear Compartments".

## Lubrication of Attachments

(For further attachment information see page 97)

The following list of identifying letters, names of attachments requiring lubrication, and type of lubricant required will help in lubrication of attachments.

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

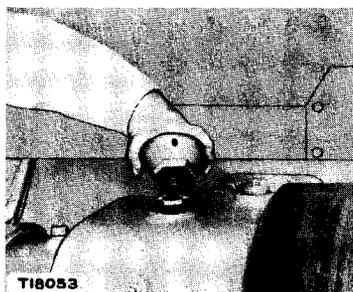
Point And Identification	Lubri- cant	SERVICE HOURS			
		50	125	250	1000
<b>A</b> Belt Pulley Drive Housing Breather	<b>CO</b>			<b>X</b>	
<b>B</b> Rear Power Take-off Control Shaft (Direct Drive)	<b>BR</b>	<b>X</b>			
<b>C</b> Rear Power Take-off Housing	<b>TO</b>		<b>X</b>		<b>X</b>
<b>D</b> Belt Pulley Drive Housing	<b>TO</b>		<b>X</b>		<b>X</b>

## CO Crankcase Lubricating Oil

### A

#### BREATHER FOR BELT PULLEY DRIVE HOUSING

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



## BR Ball And Roller Bearing Lubricant

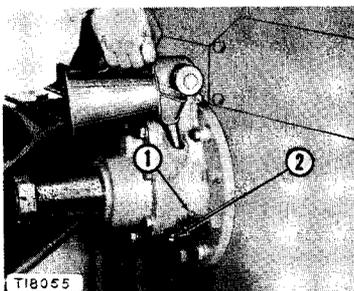
### B

#### REAR POWER TAKE-OFF CONTROL SHAFT (Direct Drive)

Lubricate bearing every 50 service hours.



# TO Transmission Oil

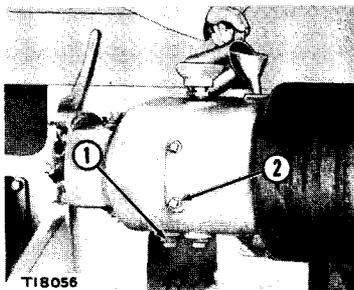


## C

### REAR POWER TAKE-OFF HOUSING (Direct Drive)

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 level plug opening. See the topics, "Washing Gear Compartments" and "Continuous Operation on Stationary Work".



## D

### BELT PULLEY DRIVE HOUSING

Check oil level at level plug (2) every 125 service hours. Keep lubricant to level of plug opening. Over filling will cause excessive heat.

Remove plug (1) to drain housing every 1000 service hours, wash housing and refill. See the topics, "Washing Gear Compartments" and "Continuous Operation on Stationary Work".

# Operation Instructions

(For further attachment information see page 97)

## 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.

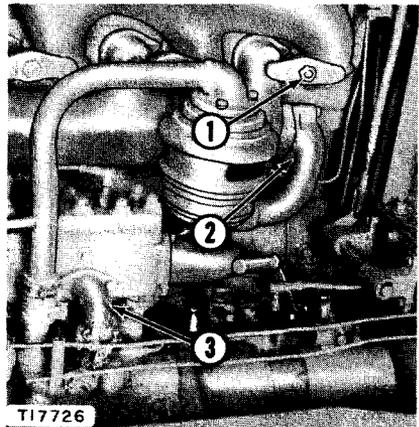
Fill the cooling system with clean soft water, or with the correct anti-freeze solution if temperatures below freezing are likely to be encountered. See the topic, COOLING SYSTEM.

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 tightened 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 cylinder head stud nuts, the starting engine stud nuts, the diesel engine exhaust and inlet manifold clamp nuts (1), the starting engine exhaust connections (2) and the carburetor elbow, (3). 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.

### POINTS TO BE SERVICED AT RECHECK PERIOD

1-Diesel engine exhaust and inlet manifold clamp nuts. 2-Starting engine exhaust connections. 3-Carburetor elbow.



T17726

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

**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.

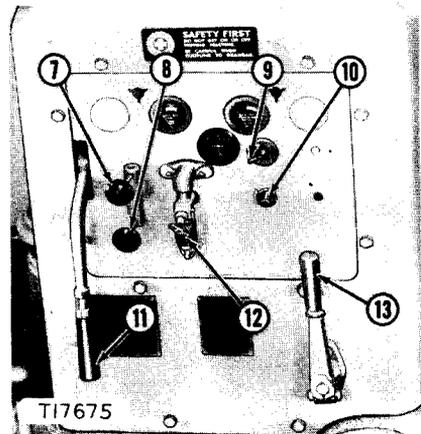
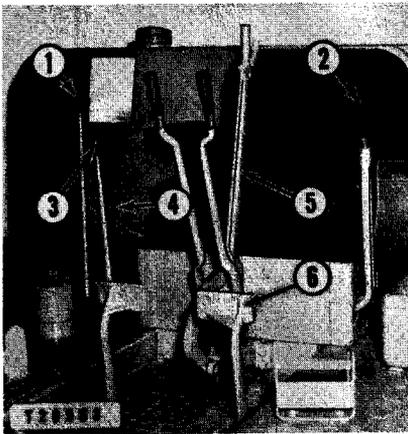
### STARTING THE ENGINES

Before attempting to start the starting engine check the diesel engine and tractor controls as well as the starting engine controls to see that they are in the correct position for starting.

**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 for tractors with direct drive. 14A1-up.

#### Position Controls for Starting

1. Disengage the flywheel clutch (lever (2) pushed forward).
2. Shift the speed selector lever (1) to the neutral position.



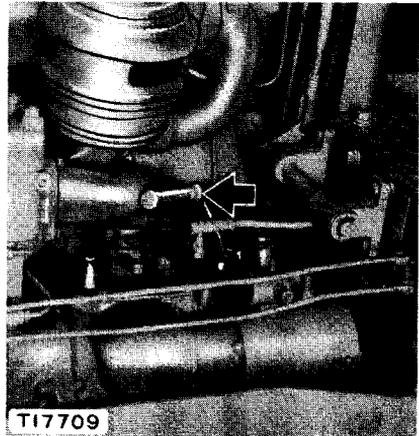
#### POSITION CONTROLS FOR STARTING

- 1-Speed selector lever. 2-Flywheel clutch control lever. 3-Forward and reverse lever. 4-Governor control lever. 5-Parking brake control lever. 6-Steering clutch brake pedals. 7-Throttle control. 8-Choke control. 9-Magneto switch. 10-Electric starter switch. 11-Starting engine clutch and starter pinion control lever. 12-Fuel valve control. 13-Compression release control lever.

3. Move the forward and reverse lever (3) to the neutral position.
4. Push the governor control lever (4) down as far as possible.
5. Push down the left steering clutch brake pedal (6) and pull back the parking brake control lever (5).

**STARTING ENGINE TRANSMISSION  
CONTROL LEVER IN HIGH  
SPEED POSITION**

◆



On earlier tractors not equipped with a parking brake, either brake pedal or both may be locked in the applied position by applying the brake and turning the brake lock control clockwise.

6. See that the starting engine transmission control lever is in HIGH speed position.
7. Move the compression release control lever (13) to the START position.
8. Disengage the starting engine clutch by pushing down the clutch and starter pinion control lever (11).
9. Open the starting engine fuel valve by unscrewing the fuel valve control (12).
10. Pull out the starting engine choke control (8).
11. Push in the starting engine throttle control (7).
12. Turn ON the magneto switch (9).

### **Starting Engine**

Press the starting engine electric starter switch (10).

**Do not run the starter more than thirty seconds at a time. Then, allow two minutes intermission for cooling before using it again.**

As soon as the engine starts, the starter button should be released.

If the electric starter pinion disengages for any reason before the engine starts, release the starter switch, wait until the starter stops rotating, and again press the starter switch.

If it is necessary for any reason to start the starting engine manually, insert the crank in position and crank until the engine starts.

**Pull the crank through a compression stroke. Do not attempt in any manner to spin or push the crank through a cranking arc.**

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. Push in the choke control as soon as the engine will run with the choke off.

**When the engine starts keep the speed low until the crankcase lubricating oil has a chance to warm up and better lubricate the engine.**

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

### Diesel Engine

**The following steps should be carefully followed to prevent damage to the starter pinion or flywheel ring gear.**

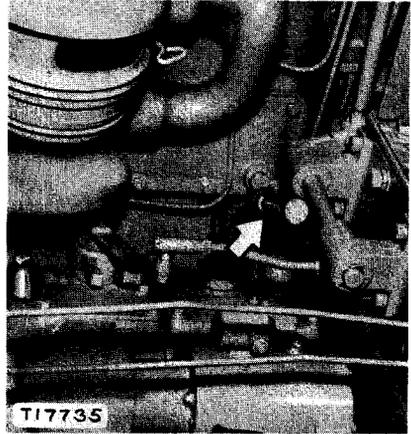
1. Check to see that the flywheel clutch is disengaged.
2. Check to see that the starting engine is running at high idle speed.
3. Apply sufficient pressure to the starting engine clutch brake to **stop the starter pinion from rotating** by pushing the clutch and starter pinion control lever all the way down, then hold it in the brake applied position for 5 seconds.
4. Engage the starter pinion with the flywheel ring gear and engage the clutch by quickly pulling up on the clutch and starter pinion control lever until the clutch snaps over center.
5. 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. See the topic, OPERATING IN COLD WEATHER.

During cold weather, or whenever the normal cranking speed cannot be reached with the transmission control lever in HIGH position, the starting engine transmission will be found quite beneficial.

To use the starting engine transmission for starting a cold engine proceed as follows:

1. Disengage the starting engine clutch.

**STARTING ENGINE TRANSMISSION  
CONTROL LEVER IN LOW  
SPEED POSITION**

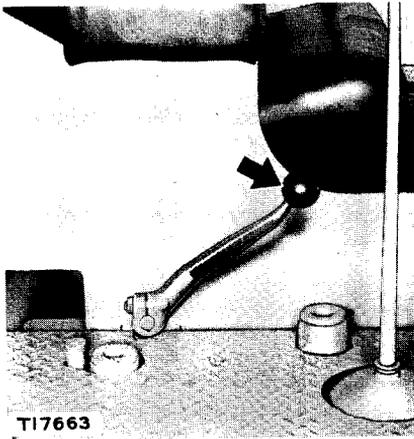


2. Shift the starting engine transmission into LOW.
3. Engage the starting engine clutch and after the cranking effort required is reduced, move the compression release lever to the RUN position.
4. Allow the starting engine to turn the diesel engine for several minutes as the heat of compression will assure easy starting.
5. Move the compression release lever to the START position, disengage the starting engine clutch, shift the starting engine transmission to HIGH and engage the clutch.

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 inlet manifold warms the cylinders, pistons, and combustion chambers to the starting temperature. Actual experience will determine the length of time necessary to crank the diesel engine to warm it sufficiently to assure easy starting.

After the starting engine has cranked the diesel engine against compression until the diesel engine is sufficiently warm, move the governor control lever to approximately half engine speed position. If the diesel engine does not start after it has turned several revolutions, move the governor control lever to the shut-off position and let the starting engine turn the diesel engine a little longer to raise its temperature.

If the diesel engine 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 engine exhaust, fuel has been reaching the cylinders. If no smoke has been evident when the governor control lever was in approximate half engine speed position, check the fuel supply. If the diesel fuel tank is empty or the fuel tank valve is closed, it will be



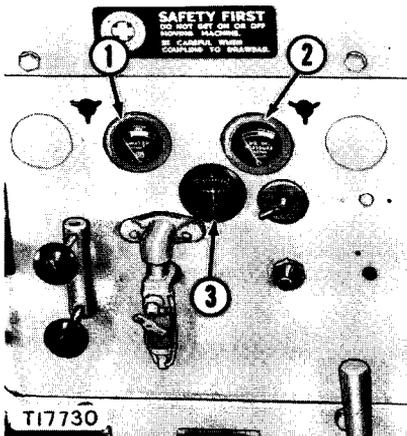
**GOVERNOR CONTROL LEVER IN  
APPROXIMATE HALF ENGINE  
SPEED FOR STARTING**

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.

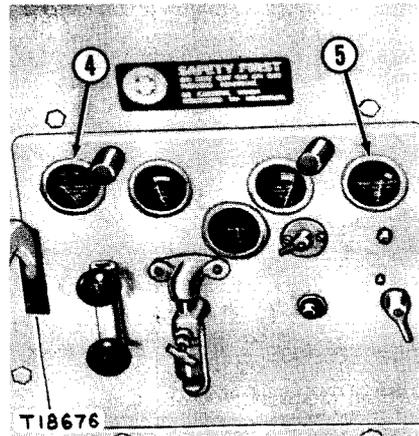
When the diesel engine begins to run the starting engine clutch and starter pinion automatically disengage.

Stop the starting engine by closing the starting engine fuel valve, allowing the engine to burn all the fuel in the carburetor. Then turn OFF the magneto switch.

Notice the charging rate as indicated by the ammeter (3). When the lights or other electrical equipment are switched off, placing no load on



(Tractors 14A1-up)



(Tractors 15A1-up)

#### GAUGES

- 1-Water temperature gauge. 2-Crankcase lubricating oil pressure gauge.  
3-Ammeter. 4-Torque converter temperature gauge. 5-Torque converter oil pressure gauge.

the battery, the pointer should be in the charge range when the engine is running. See the topic, VOLTAGE REGULATOR.

When the engine is warm and running at rated engine speed the lubricating oil pressure gauge (2) should register in the "Operating Range". A lower pressure reading is normal at low idling speeds. If no pressure is indicated, investigate at once.

The 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. The indicator on the water temperature gauge (1) should register in the "Operating Range".

**Tractors With Torque Converter Drive, 15A1-Up:** When the engine is running at high idle speed the indicator on the torque converter pressure gauge (5) should be in the NORMAL (white) range. If the indicator does not register in this range, see the topic, TORQUE CONVERTER FLUID SYSTEM.

When the torque converter is operating, the indicator on the torque converter temperature gauge (4) should normally register between 160°F. and 220°F. However, it is permissible for the temperature to rise to 250°F. for short periods of operation. Never operate the tractor with the torque converter temperature exceeding 250° F. When operating with a heavy load and overheating occurs, shift into a lower gear, or reduce the load. If overheating occurs when operating with a light load, shift to a higher gear, or reduce engine speed.

Air in the torque converter may also cause overheating. A check for air in the system can be made by stopping the diesel engine and observing the torque converter pressure gauge. If air is present in the torque converter, the indicator will move slowly to the left. If air is not present the indicator will move rapidly to the left.

Loss of power accompanied with high torque converter temperature may be an indication that the fuel supply is exhausted.

## DRIVING THE TRACTOR

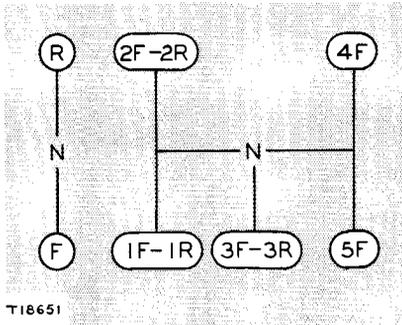
Allow the diesel engine to idle 5 minutes with the governor control lever in half engine speed position before applying the load. This warming up should be done on tractors with direct drive, 14A1-up, with the flywheel clutch engaged. On tractors with torque converter drive, 15A1-up, the flywheel clutch should be disengaged when the engine is allowed to idle for more than two minutes at half engine speed to prevent excessive heating of fluid in the converter fluid system.

The constant mesh transmission is pressure lubricated. Tractors with direct drive, 14A1-up have five forward and three reverse speeds. Trac-

tors with torque converter drive, 15A1-up, have three forward and three reverse speeds. The forward and reverse lever controls the direction of travel of either tractor.

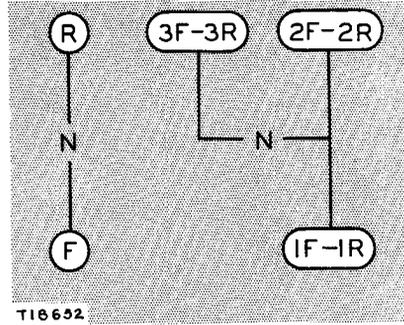
The clutch lever controls a locking mechanism which holds the sliding collars in position so the collars cannot be shifted into or out of mesh. Always shift the collars completely into mesh when the clutch is engaged.

On tractors with direct drive, 14A1-up, shifting from forward to reverse or reverse to forward in first, second and third speed is accomplished



T18651

(Tractors 14A1-up)



T18652

(Tractors 15A1-up)

### SPEED SELECTOR AND FORWARD AND REVERSE LEVER POSITION DIAGRAM

without moving the speed selector lever. On tractors with torque converter drive, 15A1-up, shifting from forward to reverse or reverse to forward in first, second or third gear is accomplished without moving the speed selector lever. Simply disengage the flywheel clutch and move the forward and reverse lever to either forward or reverse position.

Speed selector and forward and reverse lever positions are illustrated here and on the instruction plate located on the dash plate.

### WARNING

On tractors with direct drive, 14A1-up, the tractor will move forward in fourth and fifth speed with the forward and reverse lever in either **forward** or **neutral** positions.

When the diesel engine has been running long enough to warm up, move the governor control lever to the idling position. Unlock the steering clutch brake lock.

On tractors with direct drive, 14A1-up, disengage the flywheel clutch and press 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. Move the speed selector lever into position for the speed desired and the forward and reverse lever in the desired direction. Move the governor control lever to the high speed position and care-

fully engage the flywheel clutch until the slack is taken up between the tractor and the load. Then, as soon as the tractor begins to move the load, pull the clutch lever all the way back so that it 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.

On tractors with torque converter drive, 15A1-up, move the speed selector lever into position for the speed desired and the forward and reverse lever in the desired direction. The clutch should be engaged with a rapid movement of the control lever until it snaps over center. This can be done because the torque converter acts as a cushion to absorb some of the shock load from the engine when the clutch is engaged. Then increase the engine speed to move the load.

During operation when the machine stalls, the output shaft of the torque converter is stationary. Operation at or near the stall point should be avoided except for short periods to prevent overheating of the torque converter fluid. Heating of the torque converter can also occur when traveling without load at high speeds.

#### **CAUTION**

Before driving the tractor after transmission oil drain and fill periods, the transmission oil pressure system should be completely filled. To do this, start the diesel engine and run it at half engine speed for 2 minutes with the flywheel clutch engaged.

#### **STEERING THE TRACTOR**

The tractor is steered by hand levers that actuate control valves in the hydraulic control, which in turn operates the steering clutches. Pedals control the steering clutch brakes to aid in steering. The hydraulic control reduces the effort required to release the clutches during operation of the tractor. 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 in steering, 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 pedals may be locked in brake applied position to hold the tractor on slopes or when doing stationary work.

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

**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 is 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.

Do not disengage the flywheel clutch when operating downgrade except to change gears. When the tractor speed increases due to down hill operations excessively high engine speeds can be encountered regardless of the transmission gear selection. To avoid over speeding the engine, both steering clutch brakes should be applied at the same time.

### 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 tractor balances on top of the obstruction. Then one clutch may be engaged gradually so that 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. On tractors with torque converter drive, 15A1-up, remove the drilled plug from the bottom of the flywheel clutch compartment and install a plug that is not drilled to prevent any mud or water from entering the clutch compartment. See the topic, DRAINING THE FLYWHEEL CLUTCH COMPARTMENT. Lubricate the track rollers and the front idlers every 250 service hours and the track carrier rollers every 10 service hours. Inspect the oil in the final drives frequently for mud or water and drain, wash and refill if the oil shows the presence of any mud or water. The presence of mud in the final drives or the excessive leakage of oil indicates the seals should be repaired or replaced. See the topic, LUBRICATION CHART.

### STOPPING THE TRACTOR

To stop the tractor when it is desired to allow the engine to run, disengage the flywheel clutch, move the governor control lever to reduce the engine speed, and place the **speed selector lever and the forward and reverse lever in neutral position.** Engage the flywheel clutch on

tractors with direct drive, 14A1-up. On tractors with torque converter drive, 15A1-up, **do not** engage the flywheel clutch if the tractor is to stand with the engine running for over two minutes.

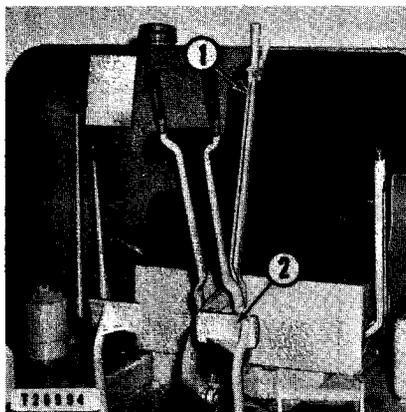
Tractors effective with 14A4598 and 15A1913 are equipped with a parking brake control lever (1). Machines before these serial numbers were equipped with a brake pedal lock which locks either brake pedal or both in the applied position. This brake lock may be converted to the parking brake control lever arrangement by the installation of the changeover group, providing the machine is equipped with oil type steering clutches and brakes.

The parking brake control lever arrangement is provided to apply and positively lock the left steering clutch brake in the applied position to hold the machine on slopes or when doing stationary work. With the steering clutches engaged this will apply braking effort to both tracks. Apply the parking brake by first depressing the left steering clutch brake pedal (2) and then pulling back the parking brake control lever. The brake pedal will then return to the normal released position.

Release the parking brake by depressing the steering clutch brake pedal as far as possible, pushing the parking brake control lever all the way forward, and then release the steering clutch brake pedal.

#### **PARKING BRAKE**

- 1-Parking brake control lever.
- 2-Left steering clutch brake pedal.



#### **CONTINUOUS OPERATION ON STATIONARY WORK** (Tractors With Direct Drive, 14A1-up)

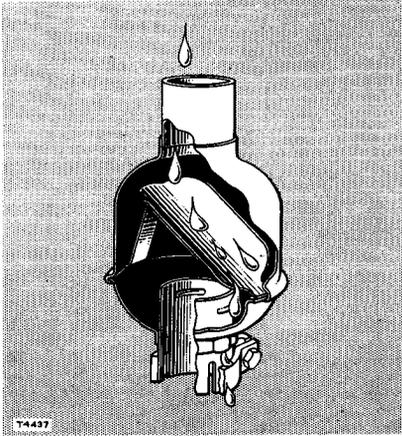
The transmission gears and bearings in the tractor are adequately lubricated when the engine is running with the flywheel clutch engaged, but the forward and reverse lever and the speed selector lever should always be placed in the neutral position.

When these instructions are followed, the transmission upper shaft, bearings and gears are lubricated.

#### **STOPPING THE 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 and

the flywheel clutch engaged on tractors with direct drive, 14A1-up, before stopping. On tractors with torque converter drive, 15A1-up the flywheel clutch should be disengaged.



**RAIN TRAP FOR  
EXHAUST PIPES**



Move the governor control lever to the shut-off position. 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.

### **DAILY CARE**

Attention should be given to the operations mentioned in this topic every 10 service hours or daily, whichever occurs first.

A daily check of the tractor should be made to see if there are any loose nuts, bolts, 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:

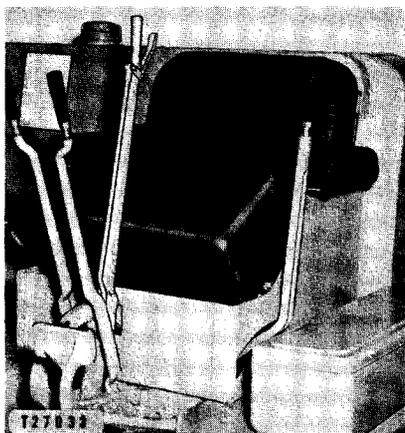
1. Gasketed joints of final drive cases, inspect for tightness.
2. Exhaust and inlet manifold and air cleaner connections, inspect for tightness.
3. Track shoe bolts, inspect for tightness.
4. Track roller end collar bolts, inspect for tightness.
5. Equalizer spring clip nuts, inspect for tightness.
6. Cooling system, clean trash from radiator core and add coolant or anti-freeze if necessary.

7. Fuel pressure gauge, inspect with engine running to see that indicator is not in red range.
8. Diesel engine air cleaner cup, inspect for dirt in cleaner cup when operating in extremely dusty conditions.
9. Hydraulic system, inspect for leaks.
10. Sprocket hub seals, inspect for leakage.
11. Oil type flywheel clutch and torque converter.
  - a. Flywheel clutch, on tractors with direct drive, 14A1-up, check for excessively high oil level when continually working on uphill operations. If an excessively high oil level is found remove the oil level plug on the lower left side of the flywheel compartment to drain any excess oil from the clutch compartment.
  - b. Torque converter, on tractors equipped with torque converter drive, 15A1-up, check for excessive leakage of fuel from the seal drain tube when the engine is running, the clutch is engaged and the torque converter is at normal operating temperature. See the information on seal drains in the topic, TORQUE CONVERTER FLUID SYSTEM.
12. Flywheel clutch housing drain plug, on tractors with torque converter drive, 15A1-up, check to see that cotter pin is free to turn in the hole in the drain plug. If the tractor is to be operated in deep mud or water, see the topic, OPERATING IN DEEP MUD OR WATER.

Fill the fuel tank 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, lubrication and maintenance.

**SEAT CUSHION TIPPED TO  
PROTECT PADDING**



If the tractor must stand without shelter the operators 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 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 LUBRICATION INSTRUCTIONS section of this book.

**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, see the topics, FUELS and CARE OF THE DIESEL FUEL TANK.

**Electrical Equipment:** During cold weather, more attention should be given the condition of the battery. It should be tested frequently and charged as often as necessary to insure sufficient power for starting. All switches and connections in the electrical system should be inspected and kept in good condition to prevent losses through improper contacts. See the topic, BATTERY CARE.

**Starting the Starting Engine:** If the tractor has been standing without shelter in extremely cold weather, the following suggestions will materially assist starting.

It is very important to keep low viscosity crankcase lubricating oil up to the full mark on the gauges, in the diesel engine crankcase, starting engine crankcase and flywheel clutch compartment 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 pouring 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.

Avoid over-choking and over-priming the starting engine when attempting to start it.

Sometimes the starting engine can be started more quickly by pulling out the throttle control. **When the engine starts push in the throttle control 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.

**Starting Engine and 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.

The oil film should be renewed once a week by running the starting engine and diesel engine until they are thoroughly warm. This will circulate the oil and prevent rusting from condensation.

**Transmission and Final Drive Compartments:** Drive the tractor every 30 days a short distance to renew the oil film on shafts, gears, and bearings and to prevent the final drive seal gaskets from sticking to the wear washer. 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 instructed in the topic, COOLING SYSTEM.

**Battery:** Periods of two weeks or more when the engine is not operated necessitates provisions being made to keep the battery charged. This may be done by running the engine once a week or taking the battery to your Caterpillar dealer for charging.



## 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 is thin enough to flow freely, so it will spray into the filter section and wash back the dirt collecting there. For this reason, 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.

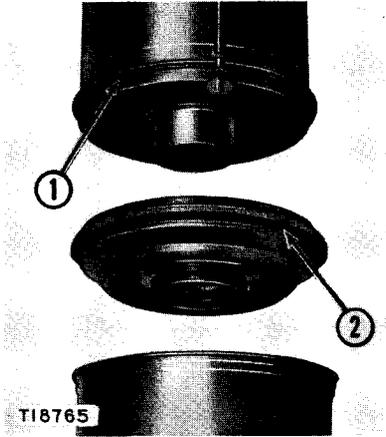
1. Loosen the wing nuts and take off the diesel engine air cleaner cup and separable tray.
  - a. On starting engine air cleaners the oil cup is removed by loosening the screw clamp.

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 and to the oil level bead on the starting engine air cleaner cup. 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 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.

**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 overspeeding.



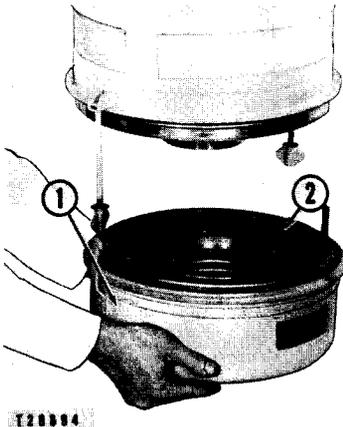
#### AIR CLEANER SEALS

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



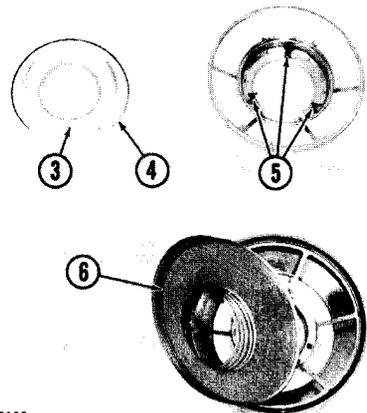
**Wash Air Cleaner Lower Filter Section:** At every air cleaner cup service period, between 10 to 50 service hours, depending on operating conditions, wash the separable tray screens.

1. Remove the separable tray (2) and cup (1) by loosening the wing nuts that hold them in place.



#### REMOVING AIR CLEANER CUP AND SEPARABLE TRAY

- 1-Cup. 2-Separable tray.



T20095

#### AIR CLEANER SEPARABLE TRAY DISASSEMBLED

- 3-Screen. 4-Snap ring. 5-Thumb screws. 6-Screens.

2. Remove the tray and cup from the air cleaner body.
3. Remove the screen (3) by first taking out the snap ring (4). This screen and snap ring are not used on earlier model tractors.
4. Disassemble the separable tray by loosening the thumb screws (5) and lift out the screens.
5. Wash the separable tray screens with a brush in kerosene or some non-inflammable cleaning fluid.
6. Assemble the separable tray by placing the screens (6) in the tray, and tightening the thumb screws. Install the screen (3) and snap ring (4). The screen and snap ring are not used on earlier models.
7. Assemble the separable tray and cup to the air cleaner body.
8. Make sure all connections are tight.

**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 the separable tray screens, inspect the inside of the air cleaner inlet pipe by reaching up from the bottom of the pipe. If a heavy accumulation 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. This material must be cleaned out to maintain proper air cleaner performance.

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

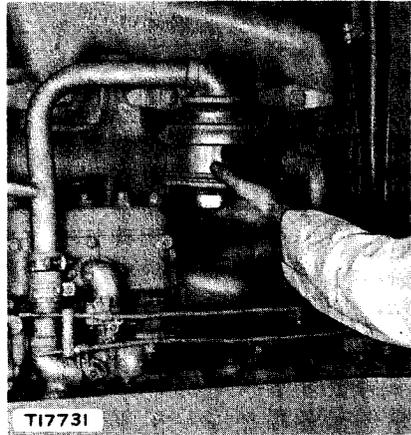
1. The entire air cleaner should be removed from its support in order to thoroughly clean the upper filter section in the cleaner body.
2. Remove the oil cup and separable tray.
3. Immerse the entire upper filter section of the air cleaner in kerosene or some non-inflammable cleaning fluid. Steam cleaning 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 them, making certain all connections are air tight.

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

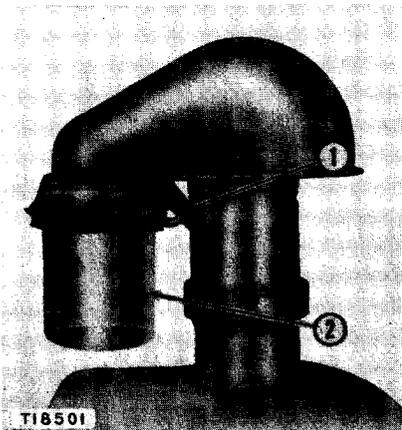
1. Loosen the screw clamp and remove the oil cup.

2. Remove the cleaner body by taking out the capscrews at the top of the cleaner.
3. Wash the filter by shaking the air cleaner body 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 Care:** (Earlier models) Remove and empty the jar (2) before it becomes three-fourths full by loosening the clamp bolt (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. Make sure the jar is installed correctly and replace either a broken jar or gasket immediately, because the precleaner will not work properly without them.



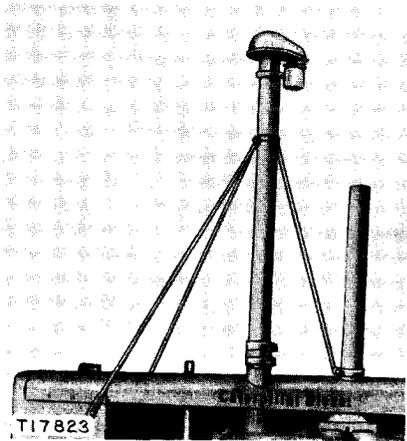
#### PRECLEANER

1—Screw clamp. 2—Jar.



**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**



**CRANKCASE LUBRICATING OIL SYSTEM**

The crankcase lubricating oil flows from the oil pump, located in the crankcase, to the oil cooler where it is cooled; then flows to the oil filter base, through the filters and then is distributed to the bearings and all points of lubrication in the engine.

The oil is cleaned by a full-flow filtering system incorporating three filter elements. These filters, located on the right side of the engine, are installed in the main pressure line so that the entire pump capacity is put through these units.

Servicing the crankcase lubricating oil filter as described, should be performed each time the crankcase lubricating oil is changed, or after 10 service hours of operation of a reconditioned engine. Experience shows that a certain amount of dirt and foreign material is present in a reconditioned engine even though best service practices are followed.

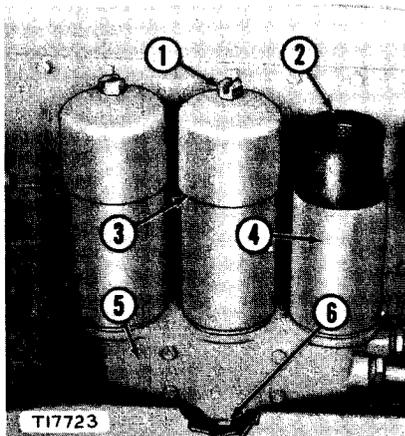
**Crankcase Lubricating Oil Filter:** The filter elements should be replaced with new Caterpillar elements at each filter service period as follows:

To service the filters proceed as follows:

1. Remove the drain plug (6) from the oil filter base (5). Then loosen the clamp screw (1) and remove the cover (3) and screw as a unit.
2. Lift out the elements (2) and discard them.

### CRANKCASE LUBRICATING OIL FILTER

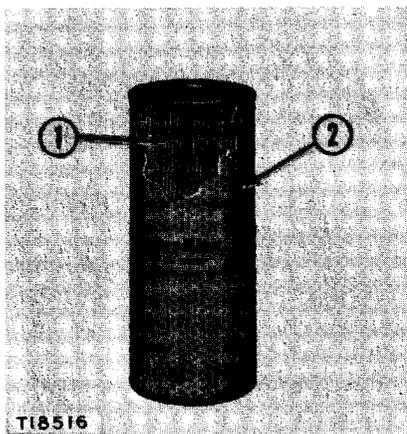
- 1—Clamp screw. 2—Filter element.  
3—Cover. 4—Housing. 5—Filter  
base. 6—Drain plug.



3. Install new Caterpillar elements in the housings (4).
4. Reinstall the cover, tighten the clamp screws and replace the drain plug.

**Crankcase Lubricating Oil Filter Element:** The filter element is of the plastic impregnated paper type. The impregnated paper (1) is pleated around a center core and encased within a perforated cover (2).

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.



### FILTER ELEMENT

- 1—Impregnated paper.  
2—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, giving 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 ( $-18^{\circ}\text{C}.$ ) 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

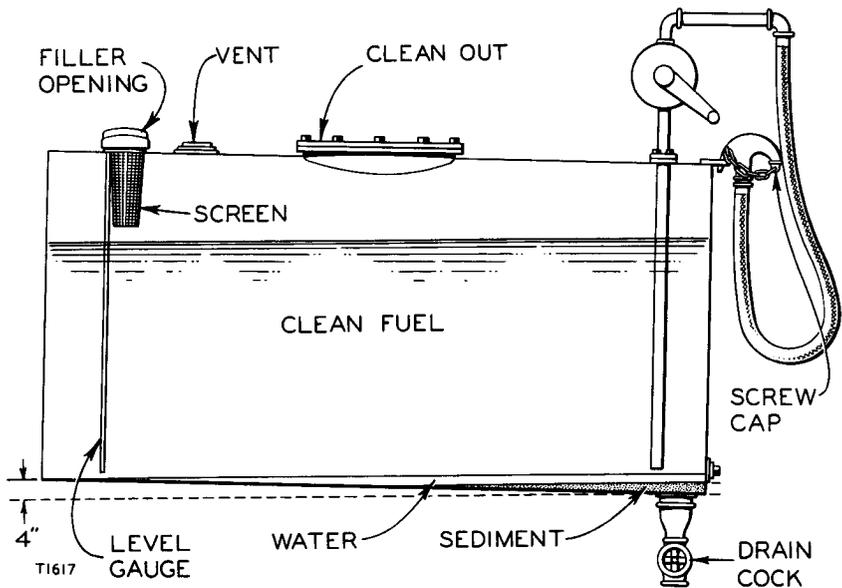
**Keep The Fuel Clean:** Too much emphasis cannot be placed on the importance of using only clean diesel fuel. In selecting a fuel, it should be pointed out that distillates are especially desirable because, in refining, they are heated to a vaporous state and condensed in another container; thus, all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

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.



**RECOMMENDED FUEL STORAGE TANK**

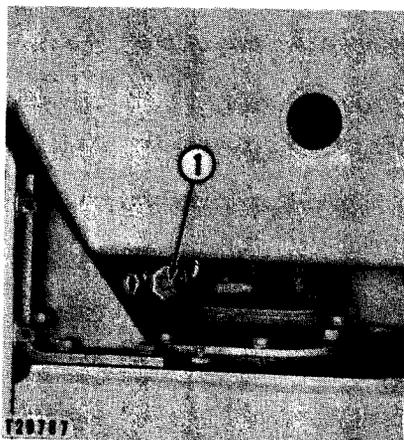
### **CARE OF THE DIESEL FUEL TANK**

The fuel level in the diesel fuel tank may be checked with the plunger gauge in the filler opening. The strainer in the diesel fuel tank filler opening should be removed and cleaned regularly. Remove the snap ring and lift out the strainer.

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

**DIESEL FUEL TANK DRAIN**

1-Drain cock.



**Drain Diesel Fuel Tank Sediment Accumulation:** Open the drain cock (1) and drain off any sediment or water which may accumulate in the fuel tank every 125 service hours (drain every 50 service hours when operating in temperatures below freezing or in climates where a great amount of condensation occurs). In temperatures above freezing drain the water and sediment before starting the engine. In temperatures below freezing, drain shortly after the machine has stopped to prevent water freezing in the bottom of the tank and other low points in the system.

**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 kerosene or some non-inflammable cleaning fluid. After the cap is washed pour a small amount of crankcase lubricating oil on the filter elements.

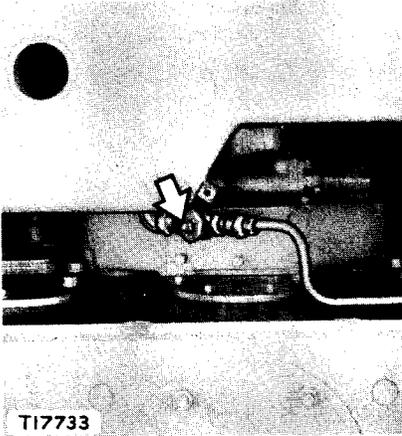
**FUEL SYSTEM**

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 filter removes 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 pre-combustion chamber where it is ignited and passed into the main combustion chamber or cylinder.

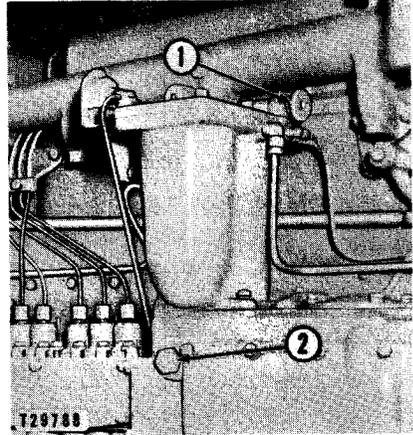
In addition to the diesel engine fuel supply system, diesel fuel is also used as fluid for the torque converter on tractors with torque converter drive, 15A1-up. See the topic, TORQUE CONVERTER FLUID SYSTEM.

## 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 line valve located under the fuel tank, remove the filter housing drain plug (2) and open the vent (1) in the housing. Replace the drain plug and prime the system. See the topic, PRIMING THE FUEL SYSTEM.



**FUEL LINE VALVE**



**DRAINING FUEL FILTER HOUSING**

1-Vent. 2-Drain plug.

**Fuel Filter Elements:** The fuel filter elements are of the plastic impregnated paper type. When the pleated elements have collected enough contamination to interfere with engine performance, they must be replaced with new elements. These elements will continue to collect 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 around the perforated metal core.

The plastic impregnated paper type filter elements collect and hold contaminants and 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 filter elements should be changed and new Caterpillar elements installed.

**Removing Used Filter Elements:** To remove the used filter elements, proceed as follows:

1. Close the diesel fuel line valve.
2. Remove the filter housing drain plug.
3. Open the vent in the filter housing.
4. Thoroughly clean the top of the cover and around the edges of the gasket joint between the filter housing and cover to prevent dirt dropping into the filter housing when it is removed.
5. Remove the cover from the filter housing.
6. Lift the filter elements out of the housing.

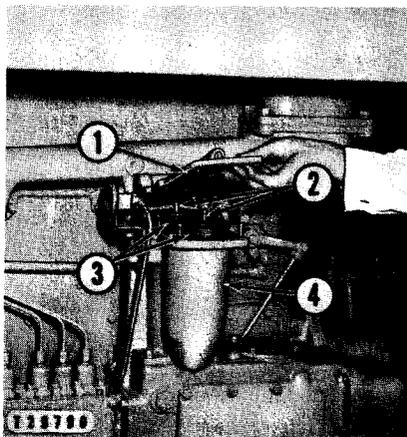
The rods and rod springs may be lifted out of the housing to permit the inside of the housing to be thoroughly cleaned if so desired.

**Installing Filter Elements In Housing:** To install the elements in the housing proceed as follows:

1. If the rods and rod springs have been removed from the housing, replace the springs and then the rods (2) in the housing. Make certain the rod ends enter the drilled holes in the bottom of the housing and that the springs are piloted on the bosses of the housing and rods.
2. Place the filter elements (3) over the rods.
3. Place a new gasket on the filter housing.

#### INSTALLING FUEL FILTER ELEMENTS

1-Cover. 2-Rods. 3-Elements. 4-Housing.



4. Install the cover (1) to the housing (4), making certain that the rods enter the center of the overlapping drilled holes in the cover.

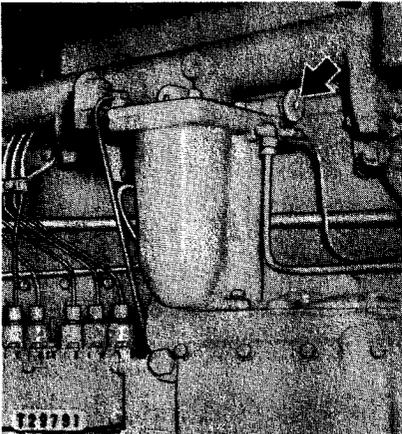
**Keep New Filter Elements On Hand:** An extra set of filter elements should be kept on hand for replacement. Always keep the elements wrapped in their original cartons to insure against dust and dirt accumulation which will shorten the life of the elements if it gets on the outside or may cause damage to the fuel injection equipment if it gets on the inside.

## PRIMING THE FUEL SYSTEM

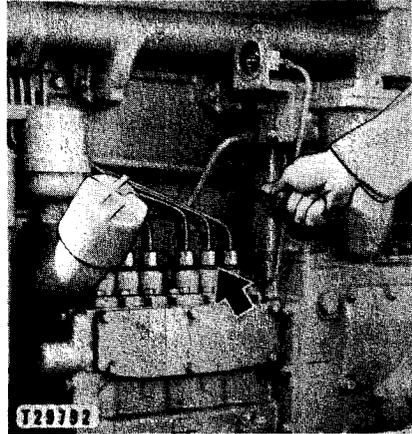
Any time the fuel flow is broken and air is allowed to get into the fuel system, the fuel system must be primed. If air is left in the lines, the fuel system may become air bound, resulting in inability to start the diesel engine or the mis-firing of one or more cylinders.

**Priming The Fuel System:** Priming the fuel system will allow the fuel transfer pump to force air and fuel through the fuel filters and the fuel injection pump vents if the engine is level. Prime the system as follows:

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.
3. Move the compression release lever to the START position.



**FUEL FILTER VENT VALVE**



**FUEL INJECTION PUMP VENTS**

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 valve and fuel injection pump vents. When the flow of fuel from the vents 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 tractors with torque converter drive 15A1-up, have the fuel supply exhausted, air will enter the torque converter. After priming the fuel system, as instructed in the previous steps, it may require approximately three minutes of running the engine at high idle speed before normal pressure is indicated by the torque converter pressure gauge.

## 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 filter element if necessary. Then prime the fuel system until clean fuel passes through the vents on the fuel injection pumps. If the fuel system is air bound, priming the system will overcome the difficulty.

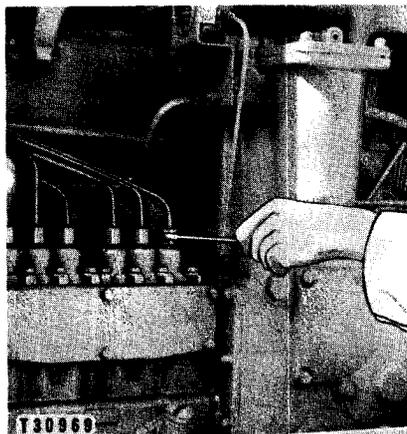
When the engine is running irregularly, and smoking, a fuel injection valve may not be spraying the fuel properly.

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

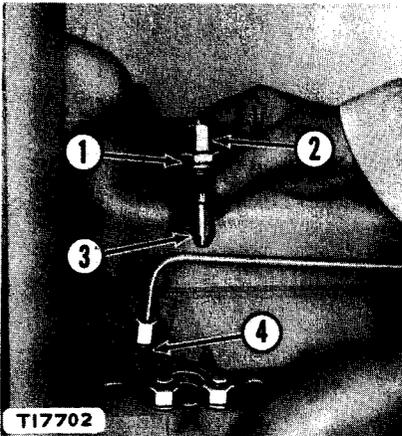
**Testing Fuel Injection Valves:** Whenever an engine performs in such a manner that a fuel injection valve is suspected of causing trouble, test all fuel injection valves. To test the injection valves, loosen the fuel injection line nuts at the fuel injection pumps, one at a time, while the engine is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

#### LOOSENING FUEL INJECTION LINE NUT TO TEST VALVE



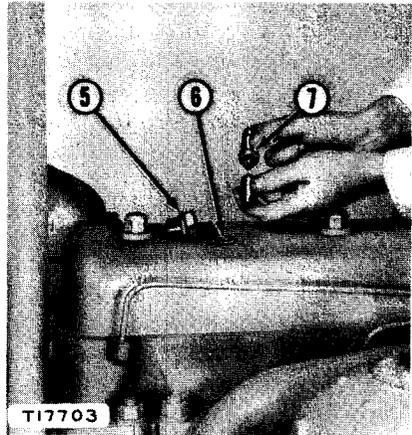
**Removing Fuel Injection Valves:** Before removing a valve clean the dirt from around the valve and connections.

Disconnect the fuel injection line from the injection valve and pump. Install the plug (4) and cover (2). Remove the valve retainer nut (1) and lift out the nozzle assembly (3) and body as a unit.



#### REMOVING FUEL INJECTION VALVE

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



#### INSTALLING FUEL INJECTION VALVE

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

**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.

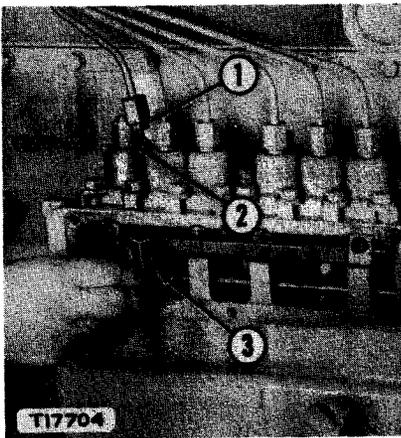
### Fuel Injection Pumps

**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 checked 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. Clean the top of the housing and around the inspection plate before removing the plate. When fuel injection pumps are removed the pump plungers must not be taken from the barrels as any dust or dirt will scratch these finely finished parts.

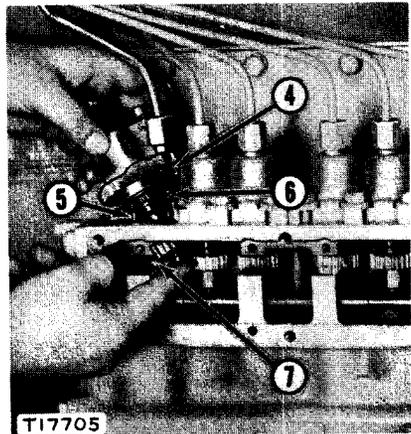
After cleaning the top of the housing, and around the inspection plate, remove the fuel injection lines from the pumps and immediately cap and plug the openings with covers (2) and plugs (1) provided in the tool equipment. Remove the inspection plate. Remove the fork (3) that fastens the rack to the slide bar. Remove the two bolts and plates that hold the rack in place and pull the rack out of the housing.

Remove the bolts and clamps that hold the fuel injection pump to the housing and lift the pump straight up only enough to clear the dowel (5).



**REMOVING RACK FORK**

- 1—Fuel line plug. 2—Pump cover.
- 3—Fork.



**REMOVING FUEL INJECTION PUMP**

- 4—Stopper. 5—Dowel. 6—Ferrule cap seal. 7—Lifter.

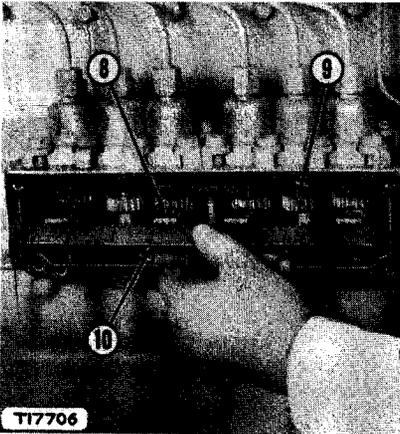
Insert a finger through the inspection hole to hold the plunger from dropping out and shift the pump to one side so the end of the pump plunger will free itself from the slot in the lifter (7); then remove the pump. Place the ferrule cap seal (6) and stopper (4), furnished in the tool equipment,

over the fuel outlet of the fuel housing and in the inlet of the pump to keep out dirt.

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. Slide the end of the plunger into the slot in the lifter. Lower the pump onto the dowel and fasten in place.

Turn the gears on the pump plungers until the marked tooth of each gear faces outward toward the pump rack. Replace the pump rack, engaging the marked teeth (9) of the pump plunger gears with the marks (10) on the rack. The end and two center pump gears can be aligned with the marks (8) on the fuel pump housing. The other two pump gears can be aligned quite easily as the rack is slid into position. It is advisable to pull the rack out part way to see that the marks are correctly aligned.



#### INSTALLING PUMP RACK

8-Marks on housing. 9-Marked teeth on gears. 10-Marks on rack.



Install the bolts and plates which hold the rack in place. Move the governor control lever to the full engine speed position and fasten the fork in place. Replace the inspection cover and connect the fuel lines.

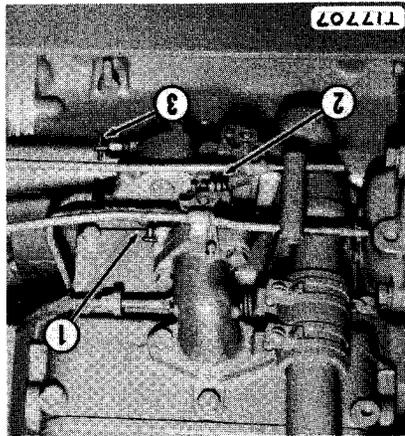
### STARTING ENGINE FUEL SYSTEM

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 sediment bowl. Check the carburetor for proper adjustment every 500 service hours.

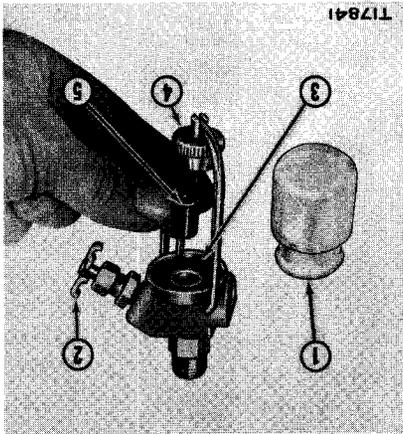
Occasionally remove the drain filter from the starting engine air inlet tube and inspect the filter element. If it is deteriorated, replace it.

**Carburetor Adjustment:** To obtain an approximate carburetor adjustment, turn the adjusting screws gently against their seats. Then back off the high speed screw (3) one turn from the closed position and the idling speed adjusting screw (1) one-half turn from the closed position.

A more accurate adjustment can be made with the engine running at full governed speed by turning the high speed adjusting screw out to make the mixture richer or in 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 adjusting screw until the engine will idle regularly at slow speed without emitting black smoke from the exhaust. Turn this screw out to make the mixture richer or in to make it leaner. Turn the idling speed control screw (2) to the left (out) to decrease idling speed or to the right (in) to increase the speed.



**CARBURETOR ADJUSTMENT**  
1-Idling speed adjusting screw. 2-Idling speed control screw. 3-High speed adjusting screw.



**STARTING ENGINE SEDIMENT BOWL FILTER**  
1-Sediment bowl. 2-Valve. 3-Gasket. 4-Nut. 5-Edge-type filter element.

**Sediment Bowl Filter:** The sediment bowl (1) collects water and sediment that may be in the fuel. To remove the collected water and sediment, close the valve (2) and remove the bowl by unscrewing the nut (4) that clamps it to the body of the valve. Unscrew the edge-type filter element (5) and shake it in kerosene or some non-inflammable cleaning fluid. When the bowl is replaced see that the gasket (3) is clean, is in the correct position and is not broken.

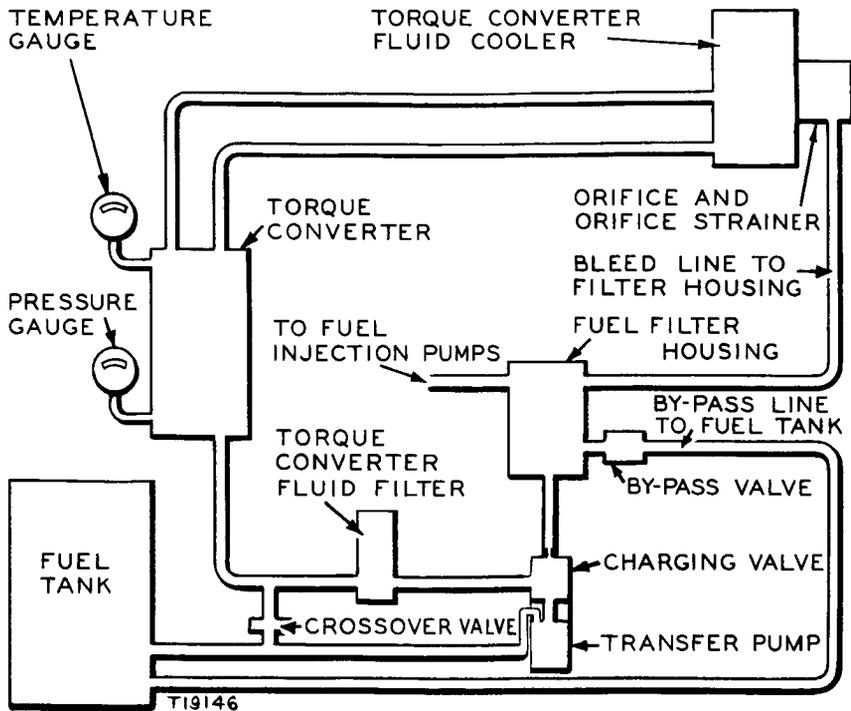
## TORQUE CONVERTER FLUID SYSTEM

Diesel fuel flows from the fuel tank, through an open passage within the charging valve assembly to the suction side of the fuel transfer pump.

The fuel transfer pump returns fuel under pressure to another passage in the charging valve assembly then, to the torque converter. All of the fuel used in the torque converter must go through the fluid filter.

When the normal fluid pressure within the charging system has been reached, the charging valve is moved off its seat to permit the passage of fuel to the diesel engine fuel filter where it is filtered and consumed by the engine.

The fluid pressure gauge indicates the fluid pressure of the charging system and the indicator on the gauge should register in the NORMAL (white) range when the engine is running at high idle speed.



**TORQUE CONVERTER FLUID SYSTEM**

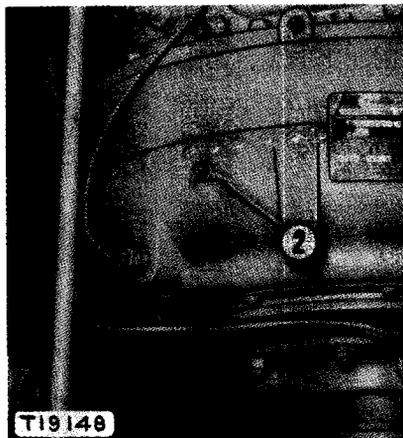
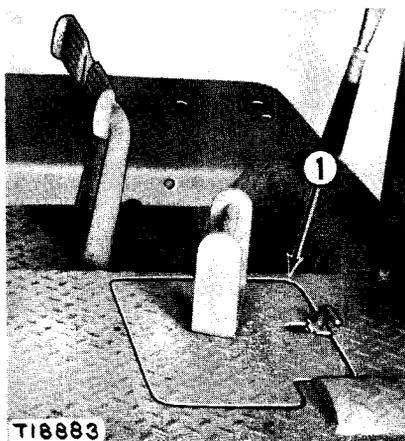
The orifice assembly located on the fluid cooler is provided to continuously bleed off any entrapped air or excess fuel in the charging system due to heat and expansion during operation. The excess fuel or air expelled by the orifice assembly is delivered to the engine fuel filter where the fuel and air is forced through the by-pass valve in the filter housing and returned to the fuel tank. A portion of the excess fuel is consumed by the engine during low idle speed operation.

The fluid temperature gauge registers operating temperatures which should be from 160° to 220° F., however, it is permissible to operate at 250° F. for limited periods.

Extra precaution should be taken when operating in temperatures below freezing to minimize condensation entering the torque converter. See the topic, CARE OF THE DIESEL FUEL TANK.

**Filling:** When the torque converter has been drained for any reason, the system should be filled before starting the diesel engine. To fill the system proceed as follows:

1. Remove the clutch inspection floor plate (1).
2. Open the vent valve (2) on top of the torque converter housing.
3. Loosen the diesel fuel tank filler cap to allow air to enter the tank rapidly.



**FILLING TORQUE CONVERTER FLUID SYSTEM**

1-Clutch inspection floor plate.

2-Torque converter vent valve.

4. Turn the crossover valve control (3) until the line on the valve control is parallel with the valve body.

**CROSSOVER VALVE**

3-Valve control.



- When fuel, with no air bubbles, flows from the vent on top of the torque converter, close the vent valve and crossover valve.

If the fuel system requires priming, see the topic, PRIMING THE FUEL SYSTEM.

When the system is properly filled and vented, the indicator on the torque converter pressure gauge moves instantly to the NORMAL (white) range upon starting the diesel engine, and to the left when the engine is stopped. Any sluggishness noted in the indicator movement indicates air in the system. However, normal pressure should be indicated on the pressure gauge after approximately three minutes of engine operation at high idle speed with the flywheel clutch disengaged.

**Orifice and Orifice Strainer:** A small internal orifice and orifice strainer is located within the top of the fluid cooler. Due to heat and expansion of the fuel in the fluid system the orifice continuously bleeds a small amount of fuel and any air from the highest point in the converter fluid system to the diesel engine fuel filter housing through the charging valve. The fuel flow through the orifice supplies the diesel engine with fuel when operating at low idle speed.

The orifice and orifice strainer should be cleaned after the first 50 service hour operating interval, thereafter they should be cleaned every 250 service hours. To do this proceed as follows:

- Remove the screw and strainer (1) from the top of the fluid cooler (2).
- Unscrew the strainer from the screw body.
- Wash the strainer in kerosene or clean diesel fuel.
- Clean the orifice by inserting a wire, not exceeding .052 inch in diameter, into the opening from which the strainer was removed. The



#### CLEANING ORIFICE AND ORIFICE STRAINER

1—Screw and strainer. 2—Fluid cooler.



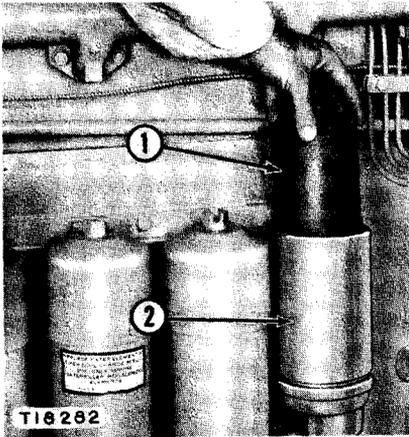
orifice is located near the top of this opening. This should be done each time the strainer is removed for cleaning.

**Fluid Filter:** The fluid filter housing contains one filter element. The filter element should be replaced with a new Caterpillar element whenever the torque converter pressure gauge indicator registers in the LOW range with the engine running at high idle speed.

To service the filter proceed as follows:

1. Loosen the clamp screw and remove the cover and screw as a unit.
2. Lift out the filter element (1) and discard it.
3. Install a new Caterpillar element in the housing (2).
4. Reinstall the cover and tighten the clamp screw. Vent the system, if necessary, as described in the topic, FILLING.

If the filter has been serviced as instructed in the preceding paragraph, and the indicator on the torque converter pressure gauge still does not register in the NORMAL (white) range, see your Caterpillar dealer.



**FLUID FILTER**  
 1-Fluid filter element.  
 2-Fluid filter housing.



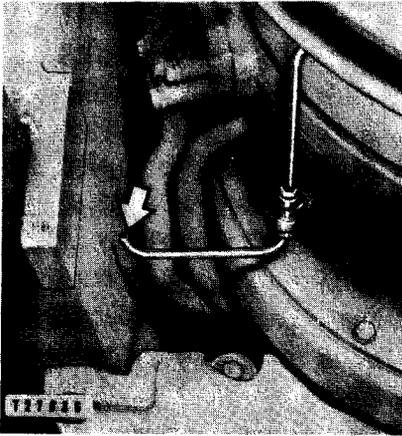
**TORQUE CONVERTER STRAINER**  
 1-Strainer

**Strainer:** A fine mesh metal strainer is located at the fluid inlet to the torque converter, on the right side. This strainer should be cleaned every 1000 service hours.

1. Close the diesel fuel supply valve, located under the fuel tank.
2. Remove the plug and the strainer (1). Wash the strainer in clean diesel fuel and reinstall it.
3. Open the diesel fuel supply valve and fill the torque converter as described in the topic, FILLING.

**Seal Drains:** The seal drain tubes should be inspected for leakage every ten hours with the engine running and the clutch engaged. Seal leakage may exceed 10 drops a minute when first starting the engine and the torque converter is cold. Leakage should not exceed 10 drops a minute after normal operating temperature of the converter has been reached. If seal leakage is in excess of 10 drops per minute during normal operation, the seals should be replaced. **Do not plug the seal drain tube.**

If excessive leakage of one seal is suspected, it can be determined by disconnecting the tubes at the junction or at the torque converter. The tube is visible through the brake pedal openings.



SEAL DRAIN TUBE



On tractors before 15A1379, the drain tube extends through the main frame and can be observed from the left side of the tractor.

## COOLING SYSTEM

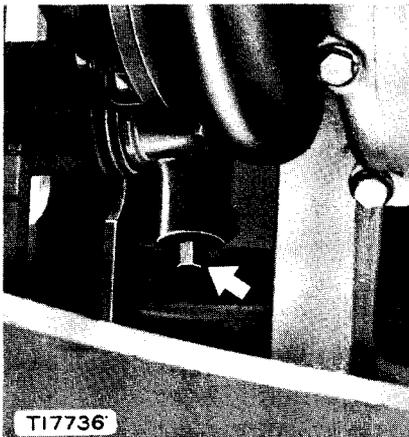
**Coolants:** Water used in the cooling system should be soft, or as free as possible from scale forming minerals. If it is impossible to obtain soft water it is advisable to treat the available water with Caterpillar Rust Inhibitor. The use of this rust inhibitor in the cooling system will prevent the 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 inhibitor with those anti-freeze solutions which do contain rust inhibitor. 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

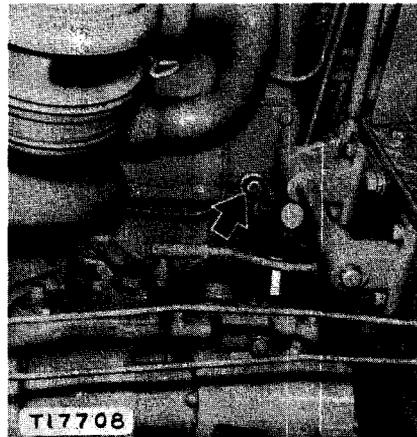
of the diesel engine, the solution should be tested frequently — even daily — and kept up to correct strength. This loss by evaporation is objectionable **but the temperature regulators should not be removed.** Doing so might make the solution run cooler and save the alcohol, but is not desirable for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

**Filling:** Fill the starting and diesel engine cooling system by pouring the coolant into the radiator filler opening.

**Draining:** The cooling system is drained by opening the valve on the radiator water outlet on the left side and by removing the diesel cylinder



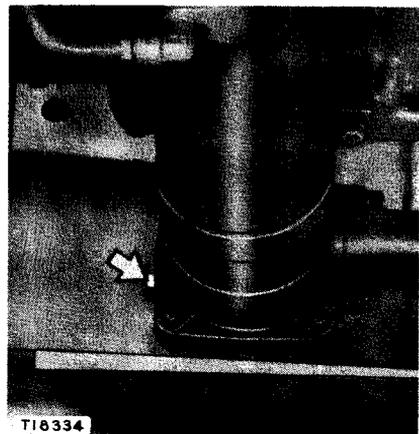
**RADIATOR DRAIN VALVE**



**CYLINDER BLOCK DRAIN PLUG**

block drain plug at the rear of the diesel engine cylinder block. Tractors with torque converter drive, 15A1-up, remove the drain plug from the fluid cooler. This should be done at the end of the day's run when all the material is in suspension and will drain with the liquid.

**TORQUE CONVERTER FLUID  
COOLER DRAIN PLUG**



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

**Cleaning The Cooling System:** The cooling system should be drained every 1000 service hours to remove dirt and sediment which accumulates. The draining should be done at the end of the day's run, when the foreign material is in suspension and will easily drain with the liquid.

The cooling system should be washed out occasionally. To do this, 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 or .8 Imp. Gal.) of water. Run the engine for about one-half hour, and again drain and flush the system with clean water.

### **RADIATOR SEALED PRESSURE OVERFLOW UNIT**

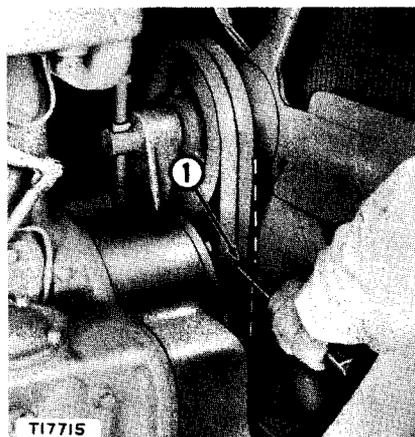
The sealed pressure overflow unit should be cleaned every 1000 service hours to remove lime deposits and other accumulations which might hold the valve in the "open" position. Such deposits are not so noticeable where inhibitors are used in the cooling system, but, even so, regular cleaning of the unit should be encouraged.

To clean the unit, disassemble by removing the screws which hold the cover in position. Lift off the cover, then remove the seal assembly and brush the parts thoroughly until all of the foreign matter has been removed. **Caution: Do not wash the unit in any kind of cleaning solution because so doing may damage the seal.**

### **FAN BELT ADJUSTMENT**

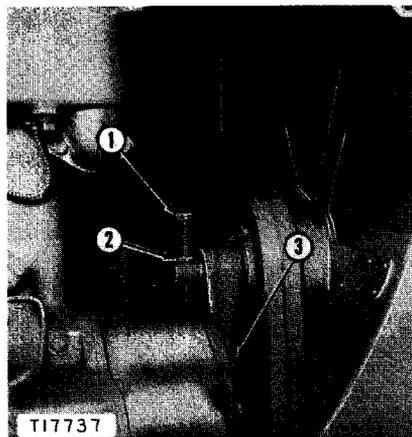
The fan belts should be checked every 250 service hours for proper adjustment. If the fan belts are operated too loose, they will slap against the pulleys, causing unnecessary wear to the belts and possibly slipping to the extent that the engine will overheat. If the belts are too tight, unnecessary stresses are placed upon the fan bearings and belts, which might shorten the life of both. Correct adjustment exists when the belts can be pushed inward approximately 1½ inches (3.81 cm.) as shown at (1).

When a belt (or belts) need replacing, a matched set which is available from your Caterpillar dealer should be used. Always install a matched set — never only one.



**CHECKING FAN BELT TENSION**

1-Correct adjustment allows approximately 1½ inch (3.81 cm.) slack at this point.



**FAN BELT ADJUSTMENT**

1-Adjusting screw. 2-Locknuts. 3-Retaining nuts.

**Adjusting Belts:** Loosen the three retaining nuts (3) which hold the fan hub bracket to the timing gear cover. Loosen the locknut (2) on the adjusting screw (1) and turn the screw until the belts can be pushed inward approximately 1½ inches (3.81 cm.). Recheck the adjustment after tightening the locknut and bracket retaining nuts.

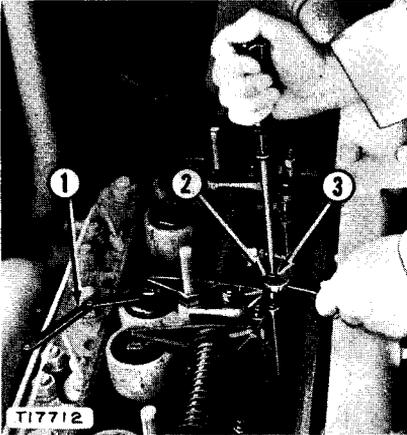
**VALVE CLEARANCE ADJUSTMENT**

The initial valve clearance adjustment should be made after the first 100 to 125 service hours of operation. Thereafter, the clearance 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 is made with the engine stopped and is not completed during this twenty minute interval, start the engine and allow it to warm up. The valve clearance adjustment and the compression release clearance adjustment must be made, or the clearances checked, with the compression release lever in the RUN position.

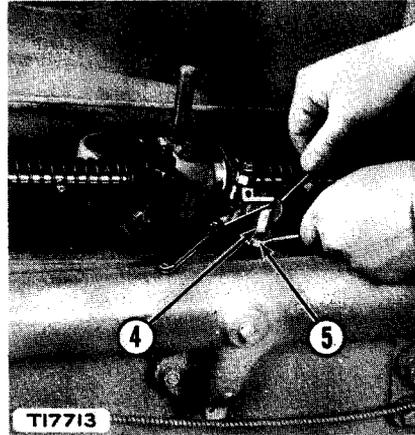
If adjustment is made with the engine stopped, turn the engine until the valve closes and the push rod is at its lowest point.

**To Adjust:** Loosen the valve adjusting screw locknut (2), turn the adjusting screw (3) to allow the thickness gauge (1) to pass between the top of the valve sleeve and the end of the valve rocker at the correct clearance. Set the clearance for the inlet and exhaust valves at .016 inch (.41 mm.). Tighten the adjusting screw locknut and check the adjustment.



#### VALVE CLEARANCE ADJUSTMENT

- 1-Thickness gauge. 2-Locknut.  
3-Adjusting screw.



#### COMPRESSION RELEASE PUSH ROD ADJUSTMENT

- 4-Adjusting nut. 5-Locknut.

After adjusting the clearance on the valves, and while the compression release lever is still in the RUN position, with the engine stopped, check the clearance between the upper end of the compression release push rod and the end of the valve rocker. This clearance should be .025 to .030 inch (0.64 to 0.76 mm.). To adjust, loosen the adjusting screw locknut (5) on the compression release push rod and turn the adjusting nut (4) until the correct clearance is obtained. If the compression release push rod turns when adjusting, hold the push rod with a wrench on the two flat surfaces below the locknut. Recheck the adjustment after the locknut is tightened. Check this clearance every time the valve clearance is changed or checked.

**Check Valve Rotators:** Check the valve rotators with the engine running, after the valve clearance adjustment check has been made, to see if the valves rotate. The rotating of valves decreases carbon build up and uneven wear, thereby increasing the life of the valves. To check the rotation of the valves, observe the lines on the spring retainer through one of the three holes in the valve sleeve. If the valves do not turn the valve rotators should be replaced. See your Caterpillar dealer.

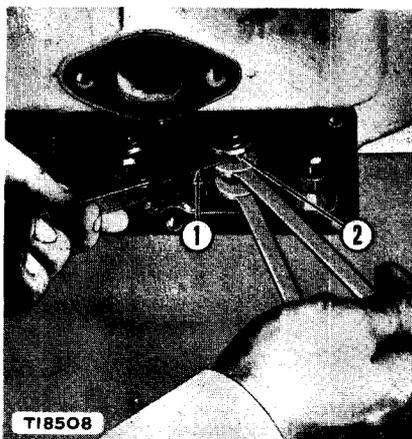
#### STARTING ENGINE VALVE CLEARANCE ADJUSTMENT

The valve clearance adjustment should be checked every 2000 service hours. To check the adjustment remove the carburetor and valve cover. The valve clearance check or adjustment should be made when the engine is hot. To check, crank the engine until the valve closes and the valve-lifter is at its lowest position.

**To Adjust:** Turn the adjusting screw until there is .008 inch (0.2 mm.) clearance at (2) between the adjusting screw and the end of the valve stem. Check this clearance with a thickness gauge (1).

#### STARTING ENGINE VALVE CLEARANCE ADJUSTMENT

1-Thickness gauge. 2-There should be .008 inch (0.2 mm.) clearance at this point.



#### SPARK PLUG ADJUSTMENT

The spark plugs should be examined every 1000 service hours. The gap should be kept at approximately .040 inch (1.016 mm.). Measure this gap with a thickness gauge. To adjust the gap, bend the outer electrode.

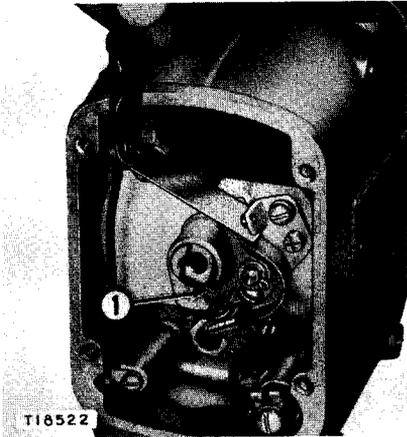
#### STARTING ENGINE MAGNETO

**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 1000 service hours check the contact point opening.

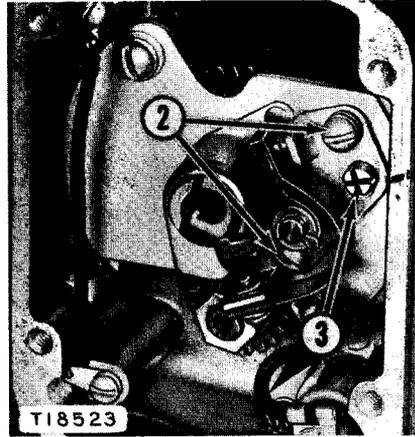
To check, first remove the distributor plate which is held in place by four screws. Care should be taken in removing the plate not to damage the gasket. Clean any carbon dust from inside the plate by using a soft cloth dampened with a non-inflammable cleaning fluid. Remove the distributor rotor, then turn the engine until the contact point bumper block (1) is on one of the highest elevations of the cam. Check the clearance with a thickness gauge between the contact points as illustrated. This clearance should be .014 to .018 inch (.36 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 screwdriver in the eccentric slotted head screw (3) and turn either



**CHECKING CONTACT POINT  
OPENING**

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



**ADJUSTING CONTACT POINT  
OPENING**

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

clockwise or counterclockwise until the correct point opening is obtained. Then tighten the fastening screws and recheck the adjustment.

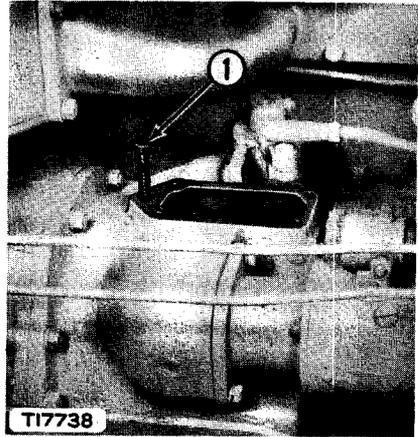
**Testing:** A magneto may be tested when coupled to the engine by turning the switch, ON, removing the cable from a spark plug, and holding the terminal  $\frac{1}{8}$  inch (3.17 mm.) away from the metal base of the plug while cranking the engine. If no spark passes from the terminal to the metal base, disconnect the magneto switch wire from the magneto where it is connected to the terminal on the top of the magneto housing and test again. If a spark passes from the terminal to the base with the switch wire removed, the wire 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:** Disconnect the cables from the magneto. One of the cables should be tagged or marked in some convenient manner which will designate the proper position of these cables. Remove the two capscrews that hold the magneto to the timing gear cover and lift off the magneto. Do not remove the magneto mounting trunnion when lifting the magneto from the engine.

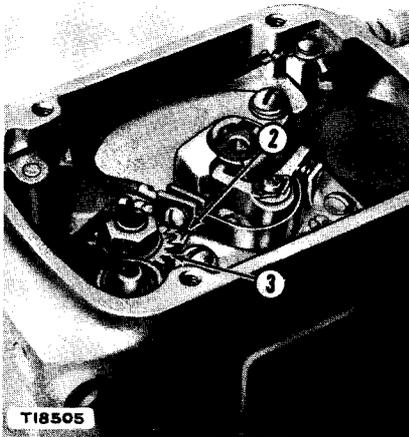
**To Time the Magneto to the Engine:** Check the adjustment of the contact points. Locate the firing point of No. 1 cylinder by removing the cover from the top of the starting engine clutch housing and the spark

**LOCATING CORRECT POSITION OF FLYWHEEL FOR TIMING MAGNETO TO ENGINE**

1-Bolt.

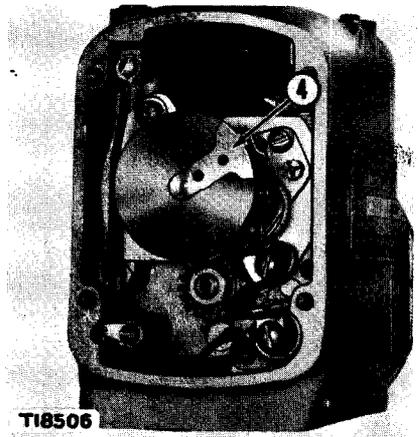


plug from No. 1 cylinder. Crank the engine slowly until air is forced from the spark plug opening. This indicates the piston is coming up on the compression stroke. Place a  $\frac{3}{8}$  inch x 2 inch bolt (1) in the hole in the flywheel housing. Continue to turn the crank slowly until the bolt drops in the hole in the flywheel. Remove the bolt and replace the cover.



**TIMING MARKS ON MAGNETO**

2-Mark "A" on the distributor gear.  
3-Magneto rotor shaft gear.



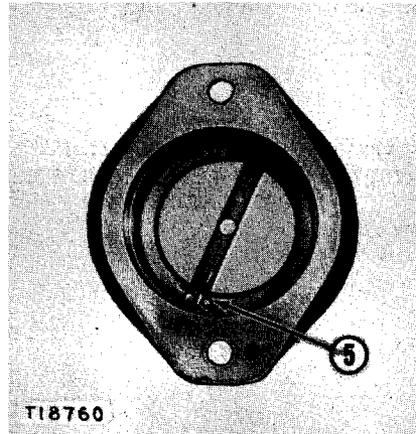
**ROTOR POSITION TO TIME MAGNETO TO ENGINE**

4-Rotor-contact.

Remove the plate at the end of the magneto by taking out the four small fastening screws. Turn the magneto shaft backwards (to prevent the impulse from catching) until the mark "A" on the distributor gear (2) lines up with the red line on the magnet rotor shaft gear (3). At this point if the distributor rotor is installed the distributor rotor contact (4) should be in the position shown. When the distributor plate is installed the No. 1 cylinder spark plug wire conductor in the plate will contact the rotor contact (4).

### TIMING MARKS ON MAGNETO MOUNTING TRUNNION

5-Mark "TC" in magneto mounting trunnion.

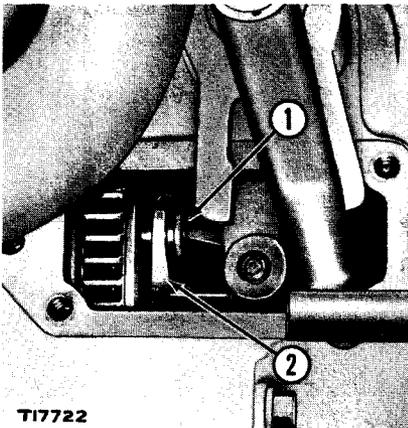


Place the magneto into position, making sure the mark on the impulse lug lines up with the mark "TC" (5) in the magneto mounting trunnion, and bolt the magneto into place. Check the location of the rotor before replacing the plate to be sure it has not changed its position and then replace the plate on the magneto.

### STARTING ENGINE CLUTCH

**To Test The Adjustment:** Pull the clutch lever to the engaged position. The lever should go into this position with a distinct snap, and should require a reasonably hard pull. The clutch should be checked every 500 service hours for proper adjustment.

**To Adjust:** Remove the plate from the top of the clutch compartment. Turn the clutch adjusting collar (2) until the lock pin (1) is accessible. Pull the lock pin out and turn the collar to the right until the lock pin drops into the next hole.



### STARTING ENGINE CLUTCH ADJUSTMENT

1-Lock pin. 2-Adjusting collar.



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.

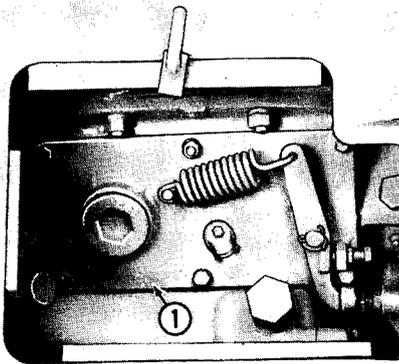
**FLYWHEEL CLUTCH**  
(Tractors With Direct Drive 14A1-Up)

The proper initial clutch adjustment will give a clutch lever pull between 120 and 130 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 engine is cold. Slightly higher pounds pull may be required when the clutch is warm.

The clutch is equipped with a hydraulic actuating mechanism so lever pull cannot readily be used to determine when the clutch should be adjusted. The clutch adjustment should be checked every 500 service hours and adjusted if necessary. The clutch should be adjusted immediately when it begins to slip, however when the clutch is properly adjusted the lever should go into engaged position with a distinct snap.

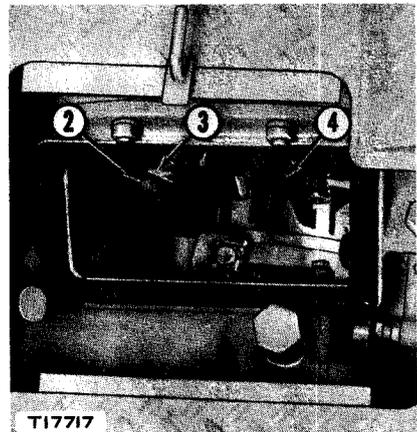
**To Adjust:** When clutch adjustment becomes necessary proceed as follows:

1. Remove the floor plate inspection cover. Care should be exercised to clean any dust or dirt from the top and around the 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 the adjustment locknut (2) is accessible. Loosen locknut about two turns. Tap lock plate (3) slightly to be sure it is free on stud. Rotate flywheel 180° and loosen the other locknut in same manner.



T17739

**CLUTCH ADJUSTMENT**  
1—Clutch compartment cover.



T17717

**ADJUSTING CLUTCH**  
2—Locknuts. 3—Lock plate.  
4—Adjusting ring.

3. Turn the adjusting ring (4) clockwise approximately three inches to tighten.
4. Tighten the locknuts to a torque of approximately 80 pounds feet. This can be accomplished with a steady pull on the end of the  $\frac{3}{4}$  inch box wrench supplied in the tool equipment.
5. Check to see that the clutch compartment cover is clean and the gasket is in good condition, then install the cover.

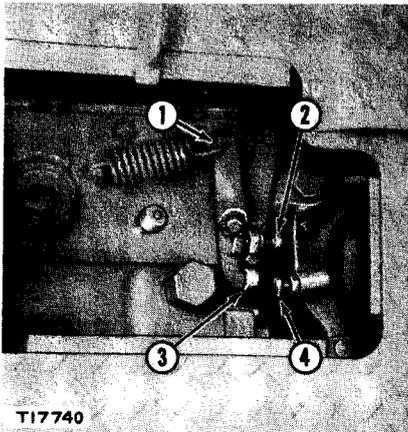
**Flywheel Clutch Brake:** The tractor is equipped with a clutch brake, which stops the clutch from turning, and permits shifting gears without clashing. To apply the brake, press the flywheel clutch control lever forward as far as it will go. Check the clutch brake adjustment every 250 service hours and adjust if necessary. If the clutch is slow in stopping, the clutch brake should be adjusted.

There are two adjustments for the clutch brake. One adjustment is provided to maintain proper clearance between the brake lining and brake drum when the clutch is engaged.

The other adjustment is provided to adjust the brake applied position of the flywheel clutch control lever.

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

1. Engage the clutch.
2. Loosen the locknut on adjusting screw (4) and turn the adjusting screw in (clockwise) all the way.
3. Loosen the locknut on adjusting screw (2) and turn the adjusting screw in (clockwise) until there is clearance between the brake release lever (1) and the brake actuating lever (3). This clearance should exist when pushing the brake actuating lever (3) toward the brake release lever (1) as far as possible to place the brake lining against the brake drum.



#### FLYWHEEL CLUTCH BRAKE ADJUSTMENT

- 1-Brake release lever. 2-Adjusting screw.  
3-Brake actuating lever. 4-Adjusting screw.

4. Turn the adjusting screw (2) out (counterclockwise) until the brake release lever (1) just touches the brake actuating lever (3), then turn the adjusting screw (2) out (counterclockwise) one-half turn more, and tighten the locknut.
5. Disengage the clutch and push the control lever to the extreme forward position, then release the control lever.
6. With the brake actuating lever (3) held against the brake release lever (1) turn the adjusting screw (4) out (counterclockwise) until it touches the brake actuating lever (3) and tighten the locknut.

#### CAUTION

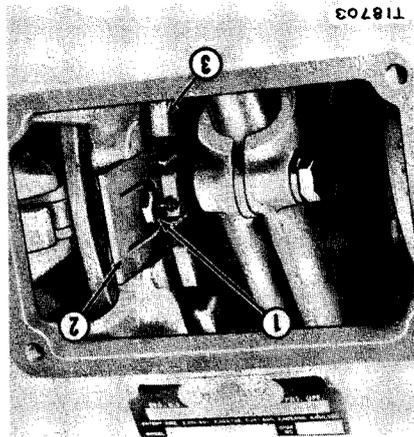
If brake is adjusted too tight the brake will be applied before the clutch is fully disengaged and difficult shifting and excessive clutch brake lining wear will result.

#### (Tractors With Torque Converter Drive, 15A1-Up)

The proper clutch adjustment will give a clutch lever pull of 15 to 25 pounds. This measurement is made with a spring scale placed at the bottom of the handle on the clutch control lever when the engine is stopped. The clutch should be adjusted immediately when above normal engine speed is noticed during normal operation under full load. When the clutch is properly adjusted, the lever should go into engaged position with a distinct snap.

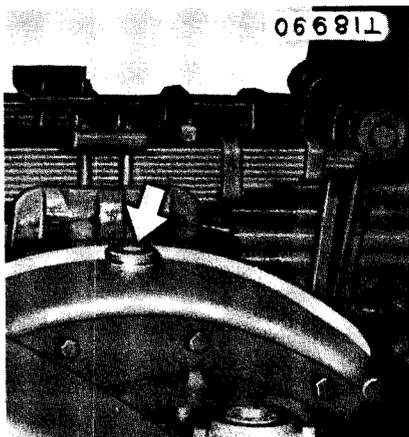
**To Adjust:** When clutch adjustment becomes necessary proceed as follows:

1. Remove the inspection cover.



T18703

FLYWHEEL CLUTCH ADJUSTMENT  
1-Nut, 2-Locking plate, 3-Adjusting ring.



T18990

REMOVING FLYWHEEL HOUSING  
DRAIN PLUG

2. Turn the flywheel until the locking plate (2) is accessible.
3. Loosen the nut (1) only enough so that the locking plate (2) will clear the notches in the adjusting ring (3).
4. Turn adjusting ring (3) clockwise to tighten the clutch.
5. After proper adjustment has been obtained see that the locking plate is in place and tighten the nut.
6. Replace the inspection cover.

**Draining The Flywheel Clutch Housing:** The clutch plates are designed to operate dry. The plug on the bottom of the flywheel housing, directly under the flywheel, has a hole drilled in it and a cotter installed in the hole to keep the hole open. This allows any lubricant that may have seeped into the compartment to escape. If the tractor is to be operated in deep mud or water, the plug should be removed and a solid plug having no hole should be installed in its place. If operating continuously in deep mud or water, the solid plug should be removed every 10 service hours to drain any lubricant that may have seeped into the compartment from the engine, or clutch bearings. If lubricant from these points is allowed to accumulate the clutch plates may become sticky and cause difficult operation of the clutch.

## STEERING CLUTCHES AND BRAKES

Two types of steering clutches and brakes are covered in this topic. Tractors effective with 14A3740 and 15A1600 operate in oil which affords longer service life due to the cooling effect of the oil on the steering clutches and brakes. Tractors before these serial numbers were equipped at the factory with steering clutches and brakes designed to operate in a dry compartment.

The steering clutches should be kept in proper adjustment to insure full engagement of the clutches when the control levers are in the forward position. Obstructions on and under the floor plate, such as rocks, sticks and the like which hinder the control levers traveling to the forward position should be removed. If the tractor is operated with improper steering clutch adjustment or with obstructions to the control levers the release bearings may become damaged.

### Oil Type Clutch

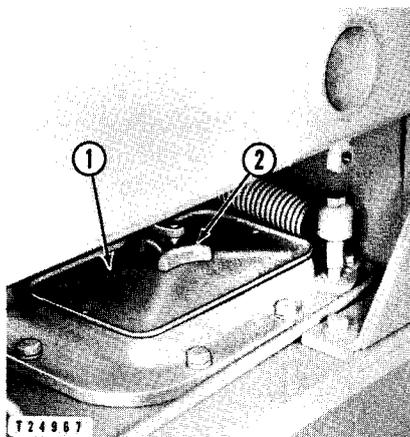
#### Steering Clutches:

Particular attention should be given to each step of checking and adjustment of the steering clutches to obtain maximum service life of the clutches.

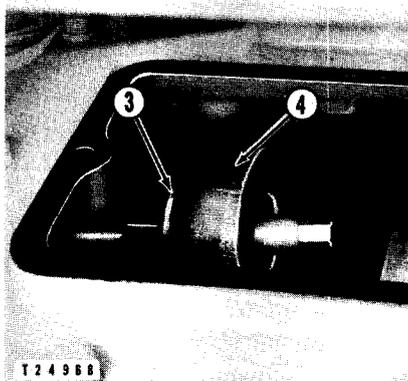
**Checking Adjustment:**

When a tractor is new, or when a set of lined disc assemblies are installed, steering clutch adjustments should be checked after the first 10 service hours of operation and once again after the second 10 service hours of operation. Then, check the adjustment after every 125 service hours of operation.

1. Loosen the clamp knob (2) and remove the inspection cover (1).



**INSPECTION COVER REMOVAL**  
1-Inspection cover. 2-Clamp knob.



**CHECKING CLEARANCE BETWEEN  
ADJUSTING ROD NUT AND  
RELEASE YOKE**  
3-Adjusting rod nut. 4-Release yoke.

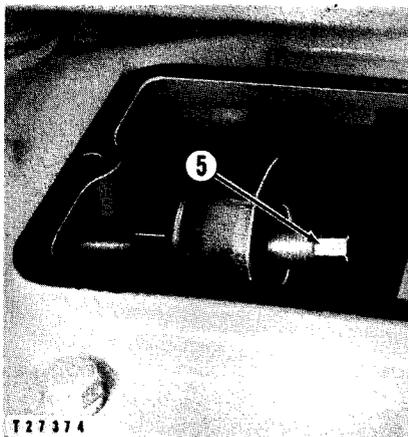
2. Check to see that there is clearance between the adjusting rod nut (3) and the release yoke (4) by moving the yoke from side to side by hand or by moving the adjusting rod back and forth. If there is no clearance between the yoke and adjusting rod nut, adjust as given in the following topic.
3. Install the inspection cover if no adjustment is needed.

**Steering Clutch Adjustment:** To adjust the steering clutches proceed as follows:

1. Turn the steering clutch yoke adjusting rods (5) counterclockwise until clearance is noted between the yoke and adjusting rod nut.
2. Turn the steering clutch adjusting rods (5) clockwise only until all the clearance is removed between the yoke and adjusting rod nut.
3. For clearance between the steering clutch yoke and the adjusting rod nut, turn the rods counterclockwise  $2\frac{1}{2}$  turns. Spring pressure on the inner end of the adjusting rod, will cause a click when turning the adjusting rod each sixth of a turn.

**STEERING CLUTCH ADJUSTMENT**

5-Yoke adjusting rod.



**Steering Clutch Linkage Adjustment:** Every 2000 service hours adjust the linkage between the control levers and the hydraulic control compartment as follows:

1. Remove the pin from the linkage lever and rod end (6) at the rear of the adjustable control rod.
2. Move the steering clutch control lever to the full forward position.
3. Move the linkage lever, from which the pin was removed in Step 1, forward to take up clearance in the linkage. After clearance is removed from the linkage, spring resistance will be felt. **Do not** move the linkage lever forward to the extent that the spring on the hydraulic booster mechanism valve is compressed.
4. Adjust the rod end on the control rod so the pin can be easily installed in the rod end and linkage lever.
5. Adjust the linkage on the other side, using the same procedure.

**STEERING CLUTCH LINKAGE**

6-Rod end.



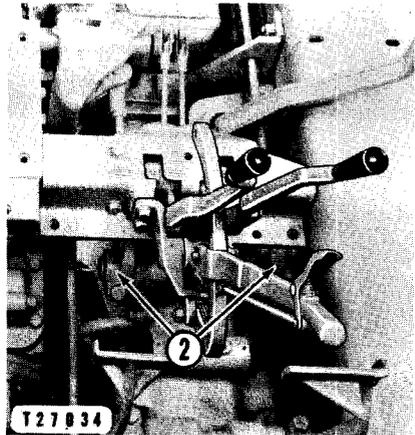
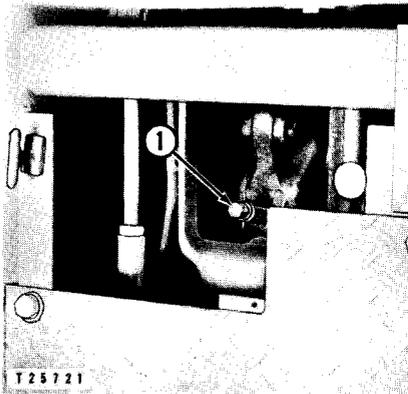
**Steering Clutch Brakes:**

After the first 10 service hours of operation of a new tractor adjust the brake control linkage as outlined in the following step 4.

The operation of the tractor serves as a constant check on the adjustment of the steering clutch brakes. If excessive steering clutch brake pedal movement is noted the brakes should be adjusted.

**Adjustment:** If adjustment becomes necessary proceed as follows:

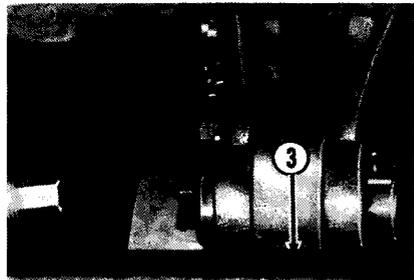
1. Remove the steering clutch compartment inspection covers.
2. Turn the front adjusting screw (1) in (clockwise) until the brake band is tight on the drum.



**STEERING CLUTCH BRAKE ADJUSTMENT**  
 1-Front adjusting screw. 2-Levers on brake booster.

When the front adjusting screw (1) has been turned all the way in (clockwise), turn it all the way out (counterclockwise). Turn the rear ad-

**STEERING CLUTCH BRAKE ADJUSTMENT**  
 3-Rear adjusting screw.



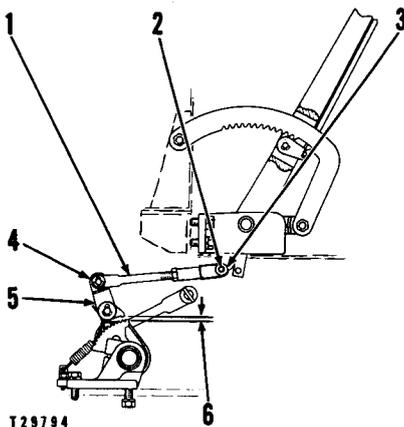
justing screw (3) all the way in (clockwise) and adjust with the front adjusting screw.

3. For proper clearance between the brake lining and brake drum, turn the adjusting screw out (counterclockwise)  $1\frac{1}{2}$  turns.
4. Adjust the length of the control rods by turning the rod ends at the top of the levers (2) until the pin holes are in alignment when the levers are held to the rear and the rods are pulled forward.

**Parking Brake:** Effective with 14A4598 and 15A1913 a lever type parking brake was provided to operate on the left steering clutch.

**Adjustment:** Adjustment should only be required after the steering clutch brake control rods have been adjusted.

1. Remove the pin (2) which assembles the forward end of the parking brake control rod (1) to the parking brake hand lever (3).
2. Move the parking brake control rod and the spring-loaded lever assembly (4) to the rear until the tang (5) on the spring-loaded lever assembly is against the flywheel clutch lever cross shaft bracket.
3. Move the parking brake hand lever all the way forward.
4. Adjust the length of the parking brake control rod (1) to provide  $1/16$  inch to  $3/32$  inch clearance (6) between the pawl and the ratchet.
5. Assemble the pin connecting the forward end of the parking brake control rod to the lower end of the parking brake hand lever, making sure that the levers are positioned and the clearance is maintained as detailed in Steps 2, 3 and 4.



#### PARKING BRAKE ADJUSTMENT

- 1-Control rod. 2-Pin. 3-Hand lever.  
4-Lever assembly. 5-Tang.  
6-Clearance.

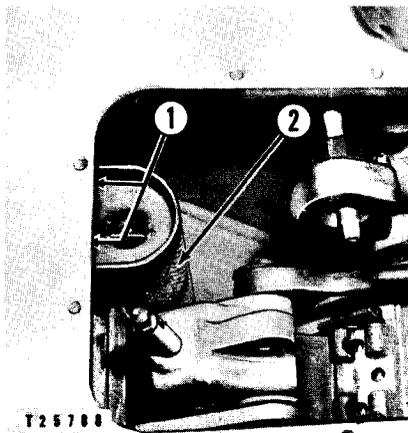


**Steering Clutch and Brake Oil Filter:** A gravity flow oil filter is provided in each compartment. During operation the steering clutch brake drum picks up the oil and deposits it in a trough assembly above each filter. The oil is then filtered by gravity through the filter elements.

**Filter Element Replacement:** Replace the filter elements after the first 50 service hours of operation on a new machine or on a machine which has had some part of the system disassembled for reconditioning and every 500 service hours thereafter. The filters are located inside the steer-

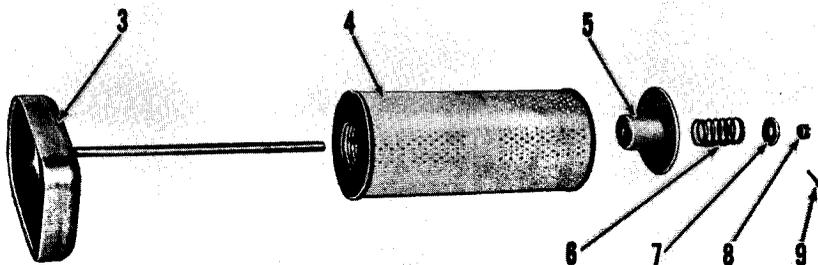
**FILTER ELEMENT REPLACEMENT**  
(Fuel tank and covers removed for illustration purpose only)

1-Stud nuts. 2-Filter assembly.



ing clutch compartments where they are fastened on the rear of the bevel gear case. Replace the filter elements as follows:

1. Remove the inspection covers. Care should be exercised to clean any dust or dirt from around the inspection covers.  
Be sure all tools used to remove the filters are clean.
2. Remove the stud nuts (1) that hold the filter assembly (2) in place.
3. Remove the filter assembly.
4. To remove the filter assembly on the left side of tractors 14A3740 to 14A6076 and 15A1600 to 15A2246, it is necessary to raise the fuel tank approximately two inches. See step 6.



T31111

**FILTER ELEMENT REPLACEMENT**

3-Trough assembly. 4-Filter element. 5-Plate assembly. 6-Spring. 7-Washer. 8-Nut. 9-Cotter pin.

5. Disassemble the filter by removing cotter pin (9), nut (8), washer (7), spring (6), plate assembly (5) and filter element (4) from the trough assembly (3).
6. Assemble a new Caterpillar 9F6700 element on the trough assembly and install the filter in the steering clutch compartment on tractors effective with 14A6067 and 15A2246. Tractors 14A3740 to 14A6076 and 15A1600 to 15A2246, the Caterpillar 8H847 element with the 7H9314 adapter should be used to eliminate the need for raising the fuel tank mentioned in step 4.

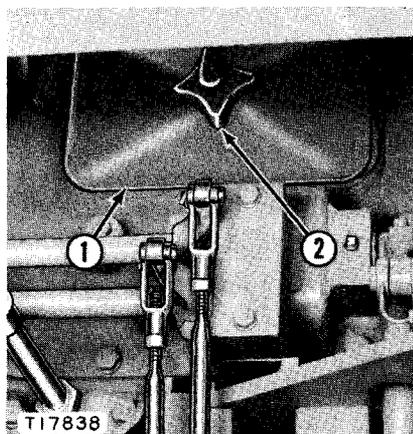
### Dry Type

#### Steering Clutches:

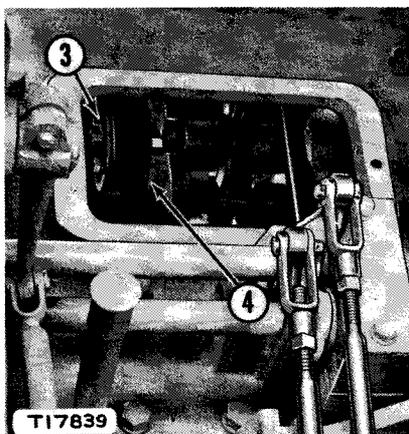
Particular attention should be given to each step of checking and adjustment of the steering clutches to obtain maximum service life of the clutches.

**Checking Adjustment:** The steering clutch adjustment should be checked every 125 service hours as follows:

1. Remove the seat cushion and the floor plate located to the right of the seat.
2. Loosen the clamp nut (2) and remove the inspection cover (1).



**INSPECTION COVER REMOVAL**  
1-Inspection cover. 2-Clamp nut.



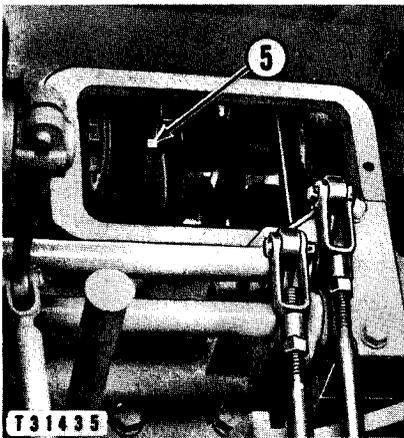
**CHECKING CLEARANCE BETWEEN  
ADJUSTING ROD NUT AND  
RELEASE YOKE**  
3-Adjusting rod nut. 4-Release  
yoke.

3. Check to see that there is clearance between the adjusting rod nut (3) and the release yoke (4) by moving the yoke by hand toward one side and the other side of the tractor.

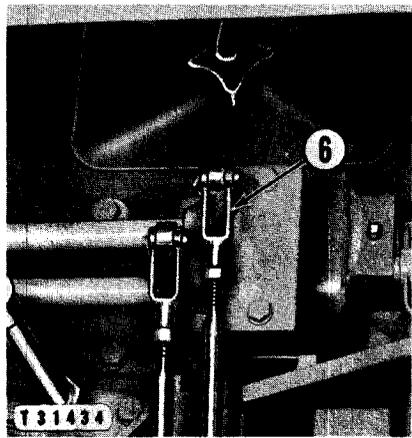
4. Install the inspection cover, the floor plate and seat cushion if no adjustment is needed.

**Steering Clutch Adjustment:** To adjust the steering clutches proceed as follows:

1. Turn the steering clutch yoke adjusting rods (5) in the clockwise direction until all slack is removed.
2. Loosen the steering clutch yoke adjusting rods by turning in the counterclockwise direction  $2\frac{1}{2}$  turns.



**STEERING CLUTCH ADJUSTMENT**  
5-Yoke adjusting rod.

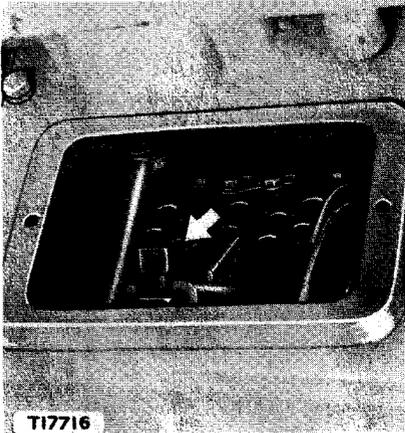


**STEERING CLUTCH LINKAGE**  
6-Rod end.

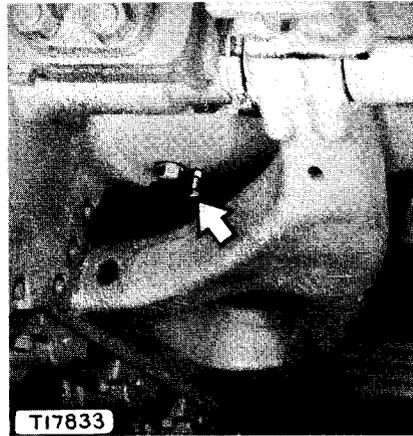
**Steering Clutch Linkage Adjustment:** Every 2000 service hours adjust the linkage between the control levers and the hydraulic control compartment as follows:

1. Remove the pin from the linkage lever and rod end (6) at the rear of the adjustable control rod.
2. Move the steering clutch control lever to the full forward position.
3. Move the linkage lever, from which the pin was removed, in Step 1, forward to take up clearance in the linkage. After clearance is removed from the linkage, spring resistance will be felt. **Do not** move the linkage lever forward to the extent that the spring on the hydraulic booster mechanism valve is compressed.
4. Adjust the rod end on the control rod so the pin can be easily installed in the rod end and linkage lever.
5. Adjust the linkage on the other side in the same manner.

**Steering Clutch Brakes:** Check the adjustment every 250 service hours. 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 approximately  $5\frac{1}{2}$  inches (14.08 cm.).



**STEERING CLUTCH BRAKE  
ADJUSTING SCREW**



**BRAKE SUPPORT SCREW**

**Adjustment:** If adjustment becomes necessary proceed as follows:

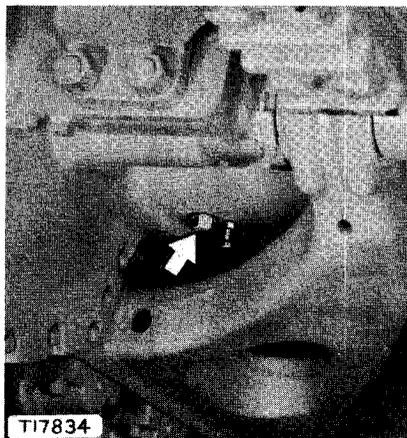
1. Remove the covers on top of the steering clutch case covers.
2. Turn the head of the adjusting screw in a clockwise direction to tighten the brakes. Tighten the brakes until the band is tight on the drum, then turn the adjusting screw  $2\frac{1}{2}$  turns in the counterclockwise direction. This adjustment provides approximately  $5\frac{1}{2}$  inches (14.08 cm.) movement when the brake pedal is depressed from the released position to the applied position. Replace the covers.
3. Loosen the lock nut on the support screw on the under side of the steering clutch compartment below the brake drum.
4. Turn the support screw up tight against the band and then back off  $1\frac{1}{2}$  turns and tighten the lock nut.

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. In order to maintain a smooth brake action, care should be exercised to keep them properly adjusted at all times. Excessive looseness developing in the brake mechanism may cause kick back of the pedals during operation.

**Draining Dry Type Steering Clutch Compartment:** Excess release bearing lubricant, 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.

#### DRY TYPE STEERING CLUTCH COMPARTMENT DRAIN PLUGS



**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.

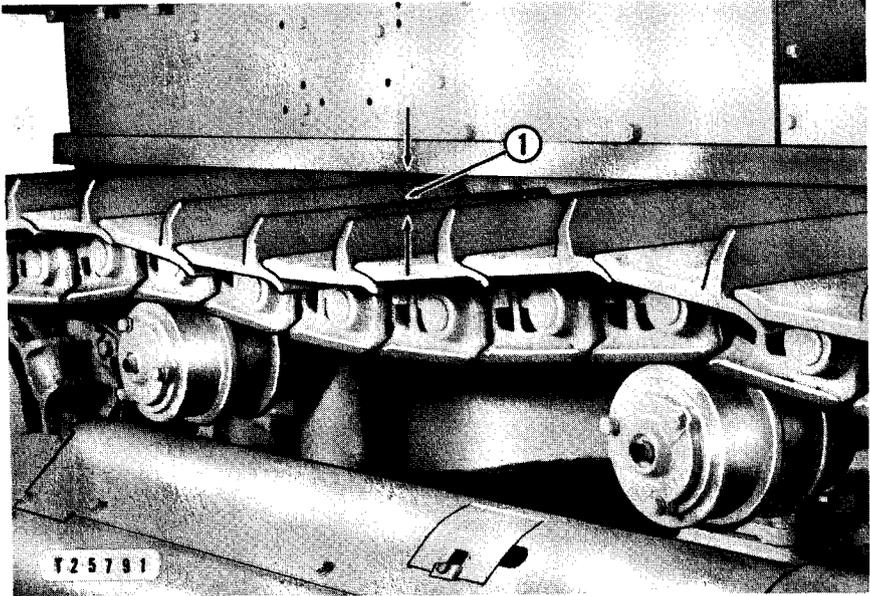
#### WARNING

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

3. Operate the tractor 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.

## TRACK ADJUSTMENT

Two methods of adjusting the track are covered in this topic. Tractors effective with 14A3500 and 15A1503 are equipped with hydraulic track adjusters. Tractors before these serial numbers were equipped at the



### CHECKING TRACK ADJUSTMENT

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

factory with the adjusting screw type, which may be converted to the hydraulic type by the installation of the changeover group.

In either type, the track adjustment is correct when the track has 1 to 1½ inches (2.5 cm. to 3.8 cm.) sag measured at a point half way between the carrier rollers as shown at (1).

### Hydraulic Type

#### To Adjust:

1. Loosen the bolt, turn the lock and raise the inspection plate in back of the equalizer spring support bracket (7).
2. Apply ball and roller bearing lubricant, with a grease gun through 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.

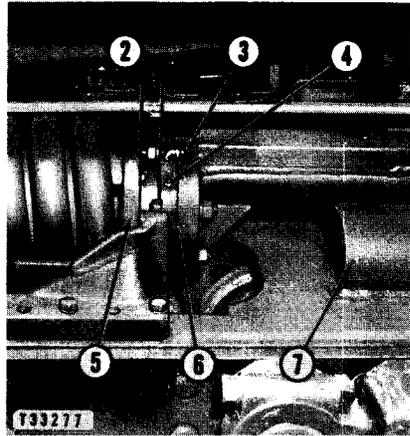
As continued track adjustment becomes necessary through service, the following precaution should be observed to prevent damage to the equalizer spring support bracket (7) on earlier direct drive tractors, and damage to the track adjusting cylinder on later direct drive and all torque converter tractors.

The maximum measurement (2) between the adjacent faces of the spring pilot assembly (5) and the cylinder (6) must not exceed  $5\frac{3}{8}$  inches (13.6 cm.).

**ADJUSTING TRACK**

(Guards removed for illustration purpose only)

- 2-Maximum measurement. 3-Relief valve.
- 4-Fitting. 5-Spring pilot assembly.
- 6-Cylinder. 7-Equalizer spring support bracket.



**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. Loosen the screw in the track adjuster relief valve (3) no more than **one half turn** and allow grease to escape from the passages on the side of the valve.

**WARNING**

To avoid the possibility of personal injury, do not loosen the screw in the release valve more than one half turn as the pressure in the cylinder could blow the screw out of the valve with considerable force. As an added precaution, place a heavy cloth or piece of canvas over the valve to stop either the screw or grease from being blown from the valve.

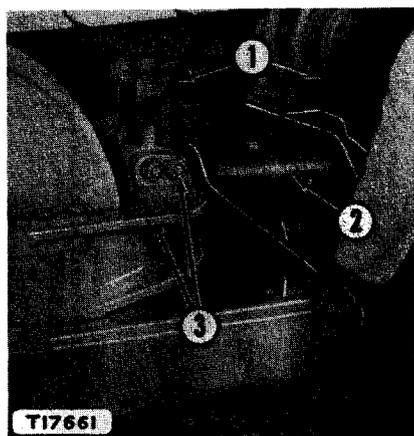
2. Tighten the screw in the release valve.
3. Check the track adjustment.
4. Repeat the above steps until the adjustment is correct.

**Adjusting Screw Type**

**Adjustment:** To adjust the track, remove the cover back of the front idler and loosen the clamp nuts (3) on the front idler arms. Turn the ad-

justing screw (2) until the track is at the correct adjustment. When the adjustment has been made, drive the tractor backward and forward to equalize the adjustment. Then, recheck the adjustment. Tighten the clamp nuts and replace the cover.

As continued track adjustment becomes necessary through service, the following precaution should be observed to prevent the adjusting



### ADJUSTING TRACK

1-Maximum measurement. 2-Adjusting screw. 3-Clamp nuts.

screw being screwed out of the nut at the front of the recoil spring, with subsequent damage to the threads: On tractors with direct drive, 14A1-up, the measurement (1) between the adjacent faces of the guide assembly and the front idler arms should not exceed  $17\frac{7}{8}$  inches (45.4 cm.); On tractors with torque converter drive, 15A1-up, the measurement (1) between the adjacent faces of the guide assembly and the front idler arms should not exceed  $8\frac{7}{8}$  inches (22.5 cm.).

The tractor is equipped with a two position idler. The high position can be used successfully for practically all types of work. The low position is used when the tractor is performing fine grading or finishing work. The idler will be set in the low position when leaving the factory unless otherwise specified. For further information, see your Caterpillar dealer.

### 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 tractor 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 tractor before 125 service hours of operation an adjustment of the bearing may stop the leak.

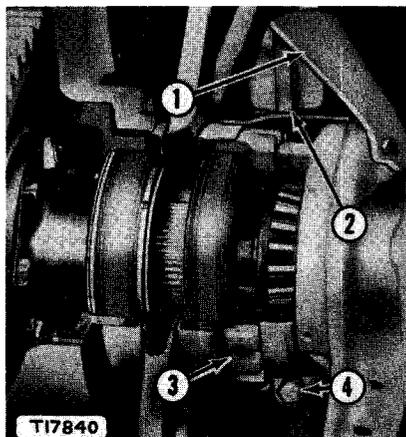
To check the bearing adjustment, place a four or five foot bar between the track roller frame and the sprocket. If any looseness in the sprocket hub bearings is noticed when prying with the bar, adjustment is necessary. This check should be made when there are no objects under the track which might put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

**To Adjust:**

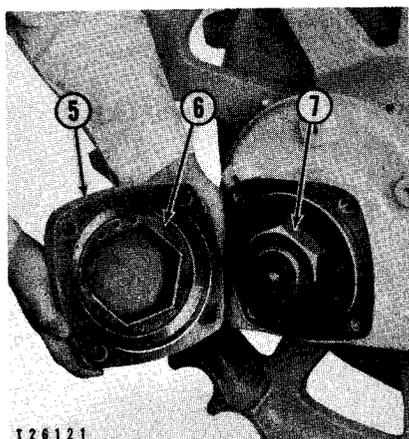
1. Remove the guard plates (1) and (2) from the track roller frame outer bearing and remove nut and lock from the clamp bolt (4) at the bottom of the holder assembly.

**CROSS SECTION OF FINAL DRIVE**

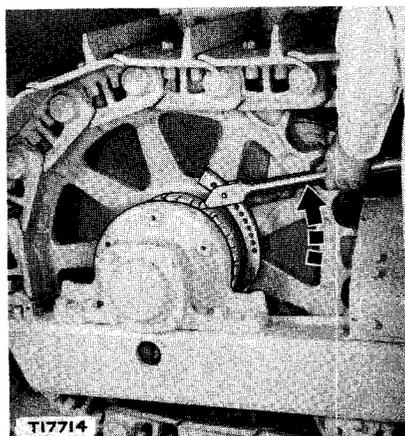
1-Large guard plate. 2-Small guard plate. 3-Adjusting nut. 4-Clamp bolt.



2. The bearing cage retainer nut (7) should also be checked for tightness before making the bearing adjustments. Remove the cap (5) and lock (6). 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.



**REMOVING RETAINER NUT CAP**  
5-Cap. 6-Lock. 7-Retainer nut.



**TIGHTENING SPROCKET HUB BEARINGS**

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.

## WASHING GEAR COMPARTMENTS

**Washing the Transmission:** Remove the drain plugs from the speed change and bevel gear compartments after a run, when the oil is warm. This drains the speed change compartment and the bevel gear compartment. Replace the plugs and fill to the proper level with kerosene or clean diesel fuel. 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 control levers and engage the flywheel clutch. Allow the gears to run 5 minutes, disengage the flywheel clutch, release the steering clutch control levers, and shift into neutral. Drain the cleaning fluid, replace drain plugs and refill with fresh lubricant to the correct level as instructed in the LUBRICATION INSTRUCTIONS section of this book. Service the transmission oil filter.

**Washing the Final Drives:** Remove the drain plugs from both cases after a run, when the oil is warm, and allow the old oil to drain. Replace the plugs and fill the compartments to the proper level with kerosene or clean diesel fuel. Drive the tractor back and forth for five minutes. Drain the cleaning fluid, replace the drain plugs and refill the final drives with fresh lubricant as instructed in the LUBRICATION INSTRUCTIONS section of this book.

**Washing the Starting Engine Transmission:** The starting engine transmission should be washed every 1000 service hours. Open the drain valve after the starting engine has been turning the transmission gears and has warmed the oil. After the oil has drained, close the drain valve and fill the compartment to the proper level with kerosene or clean diesel fuel. Set the starting and diesel engine controls in the positions as outlined in the topic, STARTING THE ENGINES, then start the starting engine and engage the starting engine clutch and pinion. Allow the starting engine to turn the transmission gears and the diesel engine for several minutes. Disengage the starting engine clutch, stop the starting engine and open the transmission drain valve. After all the cleaning fluid has drained, close the drain valve and fill the transmission with fresh oil to the correct level 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 clean diesel fuel. Operate the gears for five minutes to wash the housing. Drain the cleaning fluid, replace the drain plug and refill the housing to the proper level as instructed in the LUBRICATION INSTRUCTIONS section of this book.

### TRANSMISSION LUBRICATING OIL SYSTEM

The transmission lubricating oil system includes a double pump, located on the transmission front cover, and two suction bells.

Oil picked up by the rear suction bell (located in the bevel gear compartment) flows to the oil pump where it is pumped into the oil spray manifold. The oil sprays from the manifold to lubricate the gears on the upper shaft and the countershaft.

Oil picked up by the front suction bell (located in the transmission compartment) flows to the oil pump where it is pumped into the filter base, through the full-flow filter and is distributed to the upper shaft bearings, the countershaft bearings, the bevel gear and bearings and to the bushings of the transmission gears.

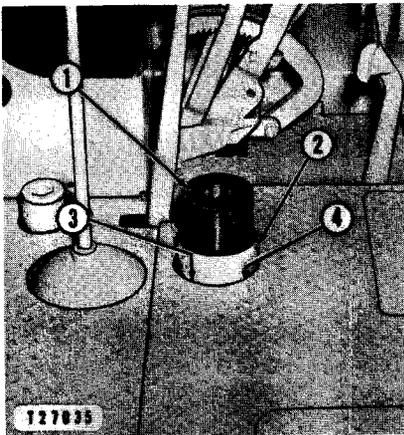
#### Transmission Lubricating Oil Filter

The filter element should be checked every 125 service hours for excessive sludging. If excessive sludging of the filter element is observed, or every 250 service hours, whichever occurs first the element should be replaced with a new Caterpillar element.

When the transmission has been disassembled and reconditioned, the filter element should be replaced with a new element after the first 10 service hour operating interval.

To service the filter:

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.



#### TRANSMISSION LUBRICATING OIL FILTER

- 1-Filter element. 2-Housing.  
3-Filter base. 4-Drain plug.
- ◆

2. Lift out the filter 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.

### 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, the bearings repacked and the commutator and brushes checked for glaze or darkening. At the same time the generator should 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.

#### **Generator Removal:**

1. Disconnect the wires from the generator and tag them so that they may be installed correctly.
2. Remove the bolts and nuts that hold the generator in position and remove the generator.

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

#### **Polarizing American-Bosch Generator:**

1. Remove the wire from the voltage regulator terminal marked FIELD.
2. Touch this wire momentarily to the voltage regulator terminal marked BAT.
3. Reconnect the wire to the voltage regulator terminal marked FIELD.

### CAUTION

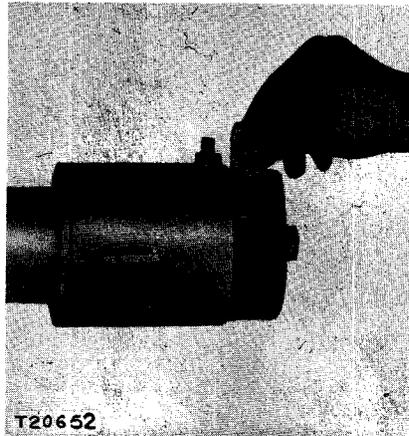
Never polarize a generator unless the field wire is disconnected from the voltage regulator FIELD terminal.

Make sure all connections are tight. A poor connection in the charging circuit will cause the generator to build up excessive voltage which may result in burned field or armature windings. A poor connection in the generator circuit will cause a low voltage.

## STARTING ENGINE ELECTRIC STARTER

**Cleaning Electric Starter:** Approximately 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 darkened, 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 the magneto switch turned OFF. Turn the sandpaper over to clean the contact surfaces of the brushes. The commutator should not be turning when the brushes are being cleaned. Make sure all trace of sand particles are removed from the commutator, brushes, and brush holders by blowing out with air or an equally effective method.

### SANDING STARTER BRUSH



**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 paragraph. 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.

## BATTERY CARE

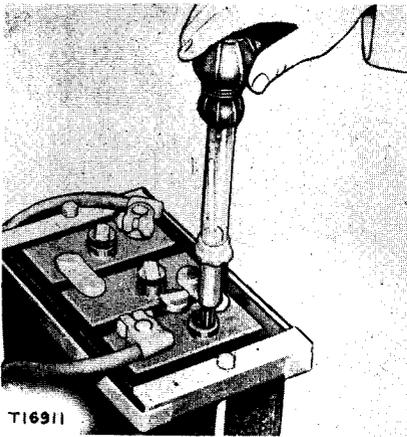
Every 50 service hours, or more often when continuous operation without the use of the battery is encountered, the following attention should be given to the battery to insure high efficiency and maximum operating life.

The battery should be tested with a hydrometer and kept within a margin of safety to a specific gravity above 1.275. Always test a battery

for degree of charge before adding water. 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  $-60^{\circ}$  F. without freezing.

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 battery life.

If it is necessary to add water too frequently to the battery, it is probably being overcharged and checks should be made to find and correct the trouble. Loose ground connections or a poorly functioning voltage regulator will cause overcharging of the battery.



#### TESTING SPECIFIC GRAVITY OF ELECTROLYTE



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.

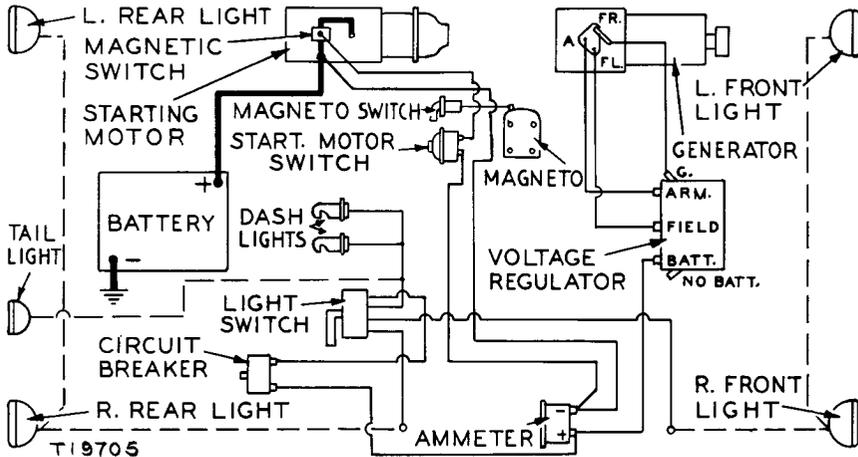
When replacing a battery that has been removed, make certain the negative post marked with a dash (—) or "N" is connected to the ground cable. Failure to connect the battery terminal to the correct post will damage the voltage regulator.

### VOLTAGE REGULATOR

The voltage regulator is properly adjusted at the factory and should not be changed except in case of failure. Then both the regulator and generator should be taken to your Caterpillar dealer, where the output of the generator can be checked and the regulator adjusted accordingly.

**WIRING DIAGRAM**

This diagram, covering the wiring arrangement, is 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.



**WIRING DIAGRAM**

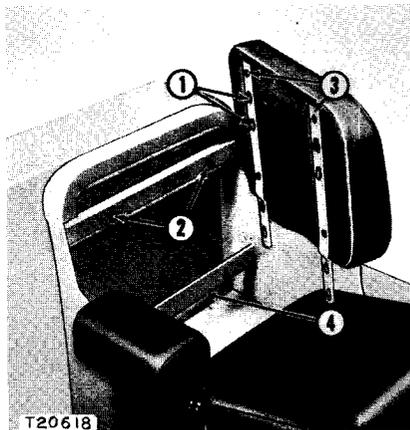
The dotted lines indicate the connections for lighting groups that are available as attachments.

**SEAT BACK CUSHION ADJUSTMENT**

The seat back cushion may be adjusted to two different heights for the operator's comfort. To do this, remove the seat cushion; then remove the bolts from the seat frame (4) that hold the lower end of fastener strips (3) in place. Then lift the seat back cushion off buttons (2) located near the top of the seat frame. Relocate the seat back cushion in the

**ADJUSTING SEAT BACK CUSHION**

- 1-Adjusting holes. 2-Button. 3-Fastener strips. 4-Lugs.



position desired by placing the cushion over the buttons. Make certain that the button heads are fastened securely in the adjusting holes (1), then install the bolts that hold the lower end of the fastener strips in place.



## 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 (Tractor With Direct Drive, 14A1-up)

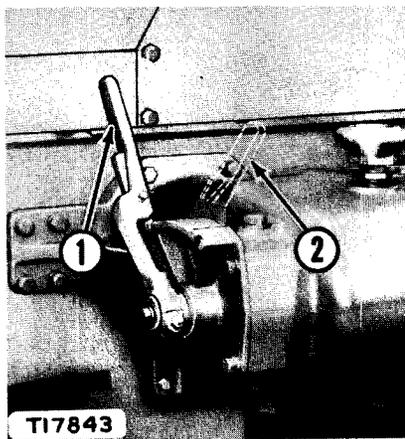
Most rear mounted equipment is driven with power from the transmission upper shaft whenever the flywheel clutch is engaged. The transmission bearings and gears are lubricated by oil from the pump located on the front transmission cover. Whenever the transmission top shaft is turning it will drive the pump to lubricate the transmission. When operating on stationary work, see the topic, CONTINUOUS OPERATION ON STATIONARY WORK.

**Direct Drive Rear Power Take-Off Operations:** Disengage the flywheel clutch, shift the speed selector lever into neutral position. Move the power take-off control lever (1) to the rear to engage the sliding gear with the drive gear. Engage the flywheel clutch to deliver power through the transmission to the power take-off.



**POWER TAKE-OFF CONTROL  
LEVER**

1—Control lever.



**BELT PULLEY DRIVE CONTROL  
LEVER**

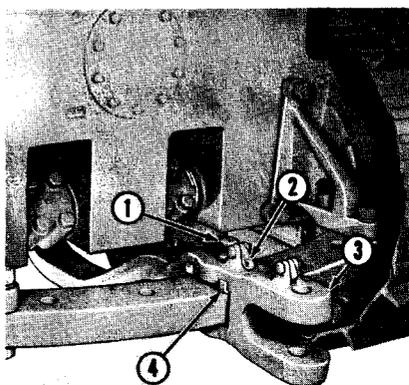
1—Belt pulley drive control lever (disengaged position). 2—Engaged position.

**Belt Pulley Drive Operation:** Disengage the flywheel clutch and shift the speed selector lever into neutral position. Pull the belt pulley drive control lever (1) back as shown at (2) to engage the belt pulley shaft gear with the drive gear. Engage the flywheel clutch to deliver engine power through the transmission to the belt pulley drive.

### SWINGING DRAWBAR

It will be found that the greatest amount of service will be obtained from the swinging drawbar if it is pinned, in the non-swinging position when doing scraper, heavy grading and similar work that imposes severe stress. The drawbar pin may be removed and the drawbar allowed to swing if it proves advantageous to do so on jobs less severe in nature.

The drawbar can be moved to any one of five positions after removing the drawbar pin (1) to free the drawbar (3). The latch (2) locks the drawbar pin in position so it cannot work out of place. The wear shoe (4) should be inspected periodically and replaced when necessary.



T18052

#### DRAWBAR

1-Drawbar pin. 2-Latch.  
3-Drawbar. 4-Wear shoe.



### LIGHTING SYSTEMS

Either two or four lamp lighting systems for use with or without cab are available as attachments. The tail lamp is provided with lighting systems for use with cab only. These systems are shown with dotted lines in the wiring diagram. See the topic, WIRING DIAGRAM.

The starting engine electric starter, 6 volt - 40 ampere generator, voltage regulator, two dash lights, light switch, circuit breaker and battery are standard equipment. Two wires for use with front and rear lights are connected to the light switch and brought out to the front and rear of the engine where they are insulated and taped.

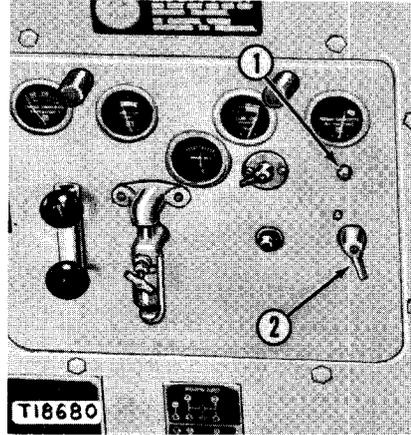
Installation of the lighting system is simple, as it is necessary only to install the lights and connect the lights to the light switch wires.

The lights of the lighting system will light whether the engine is in operation or stopped. The switch (2) to turn the lights on or off is mounted on the dash.

The circuit breaker located on the dash, is to break the circuit of the lighting system whenever there is an excessive load or a grounded wire

**CONTROLS**

- 1—Circuit breaker reset button.  
2—Light switch.
- ◆



in the lighting system circuit. In either case the circuit breaker which acts as an automatic switch will shut-off the flow of current to the lights. If the flow of current to the lights has been shut-off the lighting system wiring should be checked and if necessary the load reduced. To reset the circuit breaker push in the reset button (1) on the dash.

◆

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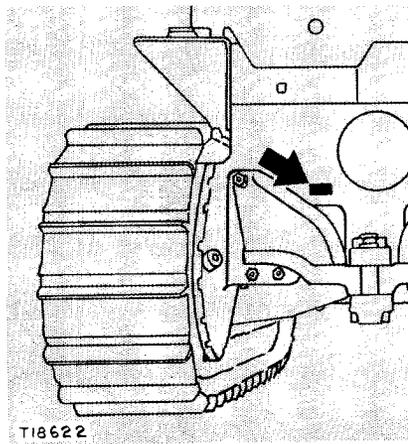
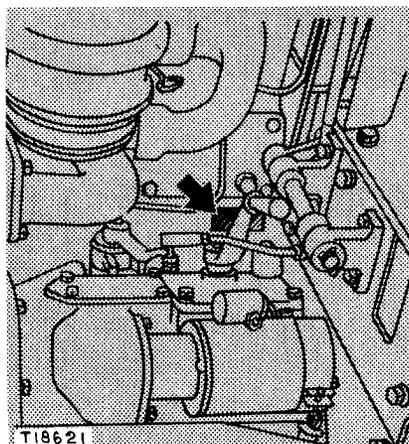
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## Capacities

Approximate Quantities

	U.S. Measure		Metric Measure Liters	Imperial Measure
Crankcase Lubricating Oil System, Diesel Engine	35	qt.	33	29.0 qt.
Starting Engine				
Tractors 14A4355, 15A1852-up	2½	qt.	2,2	1.9 qt.
Tractors before 14A4355, 15A1852	4½	qt.	4,3	3.7 qt.
Flywheel Clutch (Tractors 14A1-up)	4	gal.	15	3.3 gal.
Fuel Injection Pump Housing	1¼	qt.	1,2	1.1 qt.
Air Cleaner, Diesel Engine	5	qt.	4,7	4.2 qt.
Air Cleaner, Starting Engine	¾	qt.	0,8	0.7 qt.
Fuel Tank, Diesel	118	gal.	447	98.5 gal.
Fuel Tank, Starting Engine	4½	qt.	4,3	3.7 qt.
Cooling System	25	gal.	95	21 gal.
Final Drive (each)	20	qt.	19	16.5 qt.
Steering Clutch and Brake Compart- ment (each) Tractors 14A3740, 15A1600-up	7	gal.	26,5	5.8 gal.
Steering Clutch and Brake Hydraulic Control				
Tractors 14A3740, 15A1600-up	15	qt.	14	12.5 qt.
Tractors before 14A3740, 15A1600	12	qt.	11,5	10 qt.
Steering Clutch and Brake Hydraulic Control	12	qt.	11,5	10 qt.
Transmission (Tractors 14A1-up)	35	qt.	33,3	29 qt.
Transmission (Tractors 15A1-up)	31	qt.	29,5	26 qt.
Transmission, Starting Engine	1¼	qt.	1,2	1.1 qt.

## Location of Serial Number



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