OPERATING INSTRUCTIONS
AND
FIELD MAINTENANCE

MODEL TL-40D (DIESEL) TRACTOR LOADER

WARNING

DO NOT OPERATE THIS MACHINE
WITHOUT FIRST READING
THE OPERATOR MANUAL

English

ALLIS-CHALMERS MFG. CO.

MILWAUKEE, WISCONSIN, U. S. A.

THIS MANUAL SHOULD BE KEPT WITH THE TRACTOR

Litho. in U. S. A.

3035930

SUPPLEMENT TO
OPERATING INSTRUCTIONS AND FIELD MAINTENANCE

TL40D Manual #3035930

Page	Paragraph	Correction or Change
10	3. TRANSMISSION AND CONVERTER – OIL LEVEL	Change this paragraph to read as follows: Before starting the engine, remove the upper oil level plug on the right side of the transmission (Fig. 9) and check for a free flow of fluid from the plug hole. If necessary, add fluid until a free flow is obtained. Replace the plug. Start the engine and after the transmission reaches operating temperature again remove the **upper** level plug and check for a flow of oil from the plug hole. Add oil, if necessary, until it begins to flow from the hole. Install the plug and tighten securely. During this final check the engine should be running at low idle speed (600 rpm).

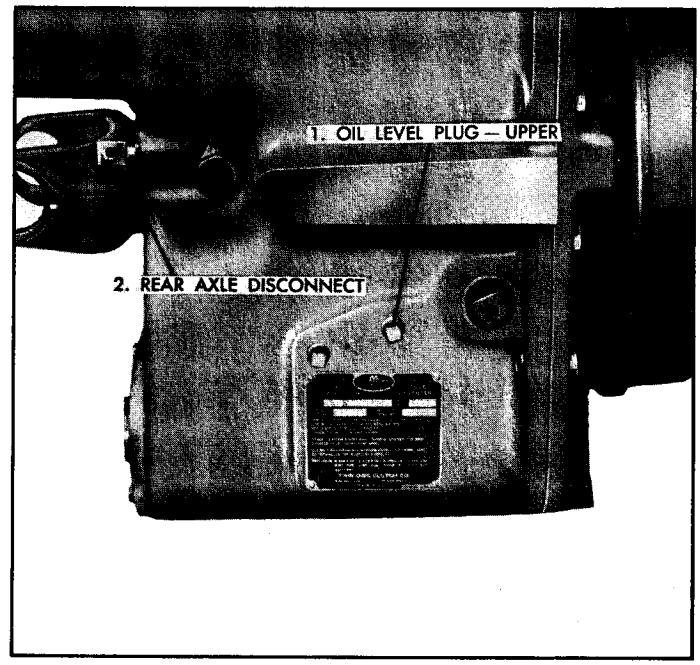

Fig. 9

50	B. CHECKING OIL LEVEL	Change this paragraph to read as follows: Refer to "SPECIFICATIONS OF LUBRICANTS" for correct transmission fluid. No specific brand of oil is recommended. Use only products qualified under the above specifications and recommended by reputable oil companies. Two level plugs are located on the lower right side of the transmission. Check the oil daily before beginning operations. Before starting the engine remove the **upper** level plug and check for a free flow of oil from the plug hole. If necessary, add oil through the filler pipe, located at the right hand side of the converter, until oil begins to flow freely through the plug hole. Install the plug and start the engine. After the transmission reaches operating temperature again remove the **upper** plug and check for a flow of oil from the plug hole. Add oil, if necessary, in the filler pipe until it begins to flow from the plug hole. Install the plug and tighten securely. During this final check the engine should be running at low idle speed (600 rpm). The unit is now ready for operation.

Page	Paragraph	Correction or Change
45	C. SERVICE	Change this paragraph to read as follows: When the Service Indicator indicates that servicing of the filter is required, proceed as follows: 1. Loosen clamps attached to air cleaner housing and remove air pre-cleaner. 2. Carefully remove dirty filter cartridge from air cleaner housing and discard. DO NOT CLEAN OR RE-USE DIRTY FILTER CARTRIDGE. 3. Inspect inside of air cleaner housing to be sure it is free of all foreign material. 4. Place a new filter cartridge in air cleaner housing. CAUTION: Inspect each filter cartridge for shipping damage before installation. 5. Install the air pre-cleaner. Tighten the wing nuts (in a diagonal pattern) to 5 lbs. ft. if a torque wrench is available. If a torque wrench is not available, tighten each wing nut finger tight, then using a suitable tool, turn each wing nut (in a diagonal pattern) one and one half additional turns. 6. Re-set Service Indicator by pushing re-set button on bottom of indicator. Inspect flexible hose and clamps. Be sure all fittings are air tight. NOTE: If inspection at a later date reveals less than 5 lbs. ft. of torque on the pre-cleaner wing nuts, do not retighten. The condition is due to the plastic face of the filter element taking a slight set and does not impair the seal between the element and the housing. Tighten the wing nut only if they are **loose**.

3035930 (10-64)
S1 (3-65)

AVOID ACCIDENTS

MOST ACCIDENTS, WHETHER THEY OCCUR IN INDUSTRY, ON THE FARM, AT HOME OR ON THE HIGHWAY, ARE CAUSED BY THE FAILURE OF SOME INDIVIDUAL 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 thousand serious injuries each year. That rule is:
Never attempt to clean, oil or adjust a machine while it is in motion.

NATIONAL SAFETY COUNCIL

FOREWORD

This book is written for the purpose of giving the operator essential information regarding the day-to-day care, adjustments, and lubrication of the tractor loader. Economical operation will be assured if these instructions are followed.

The instructions in this book cover the operation of the "Allis-Chalmers" Model TL-40D Diesel Tractor Loader. A close adherence to these instructions will result in many hours of trouble-free operation and a longer life for the unit.

Many owners of "Allis-Chalmers" equipment employ "Allis-Chalmers" Dealer's Service Department for all work other than routine care and adjustments. This is encouraged as the dealers are kept well informed by the factory regarding advanced methods of servicing "Allis-Chalmers" products and are equipped to render satisfactory service.

To assure the best results and to maintain the original quality built into the tractor loader, always use Genuine "Allis-Chalmers" Parts obtained through your "Allis-Chalmers" Dealer.

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GENERAL DESCRIPTION

The Model TL-40D Diesel Tractor Loader is a 45,100 pound (with standard bucket), four wheel drive, loader unit powered with a 6 cylinder direct injection, turbocharged diesel engine.

Power from the engine is transmitted directly to the single-stage type torque converter. Torque, which is increased a maximum of 2.8 to 1 in the converter, is then transmitted to the full power-shift transmission. The engine supplies power to the hydraulic system pump whenever the engine is running. Forward and reverse direction in any speed range is transmitted from the transmission through the universal drive shafts, to both the front and the rear differentials and axles.

The transmission provides 4 forward speeds and 4 reverse speeds, ranging from 3.0 M.P.H. in low to 21.5 M.P.H. in high, at the rated engine speed of 2000 R.P.M. (Governed full load).

Operation of the loader is accomplished hydraulically by the converter mounted hydraulic pump, a control valve with two control levers, two lift cylinders, two dump cylinders, and the necessary hydraulic lines.

There are no exposed hoses or fittings located in or around the operator's compartment. The hydraulic tank, located behind the operator's seat, provides a mount for the control valve and incorporates the necessary tubing and safety valves. Short external pressure hoses on each side of the operator's compartment carry oil to the lift and dump cylinders.

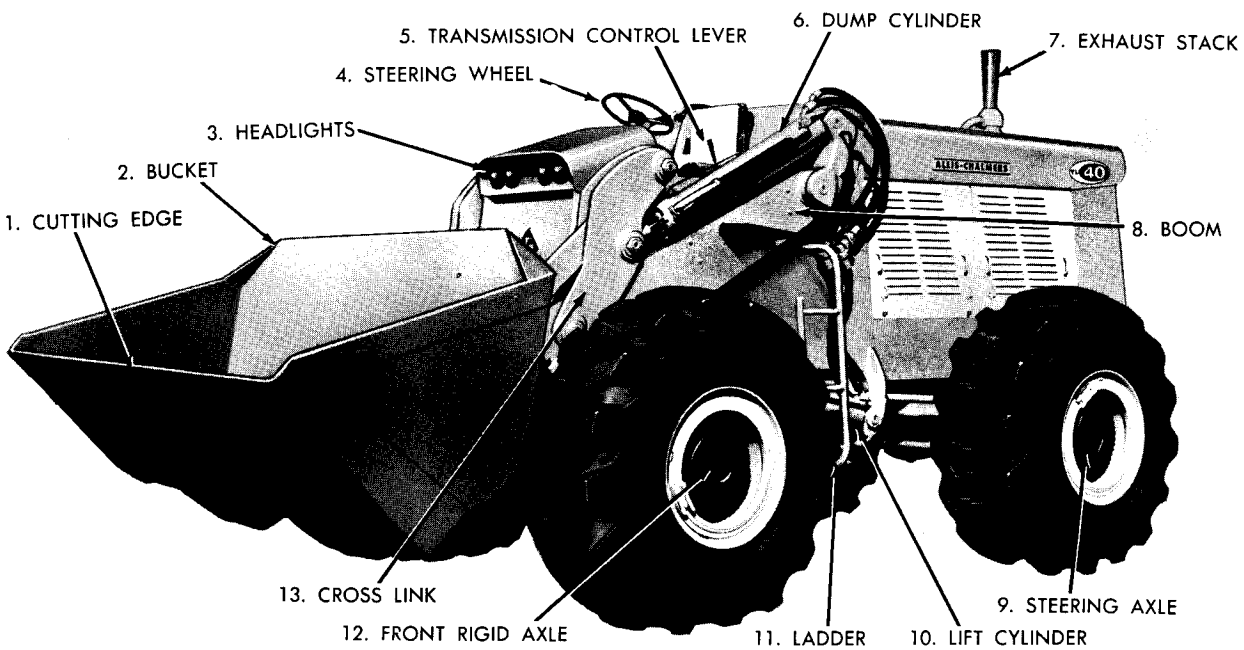
The loader design provides top visibility, strength, and servicing accessibility. The loader main frames are mounted to the axles with forged, cadmium plated, heat-treated pins. The rear stabilizer shroud and the heavy steel seat frame are welded together with the side braces to provide a rigid box construction. This provides a mount for the boom, the hydraulic cylinders, and other loader linkage. The boom assembly, of heavy steel plates, gives added assurance of long life at heavy-duty work.

Levers, pedals, gauges, etc., are well situated in the operator's compartment so that full control of the tractor loader can be maintained at all times.

Standard equipment includes: bucket level indicator; hi-traction differentials; lift and dump cylinders with chrome plated piston rods; formed steel cowl and plates around the operator; six-way adjustable seat; heavy duty bumper; drawbar; torque converter and full power-shift transmission; rear axle disconnect; air brakes and mechanical parking brake; power-booster steering; electric starter; generator and generator regulator; headlights, auxiliary lights, stop and tail lights; air horn; dry type air cleaner; oil filter; turbocharger; hour meter; and auxiliary air supply hose.

Optional equipment includes: special tire equipment; and hydraulic system accumulator.

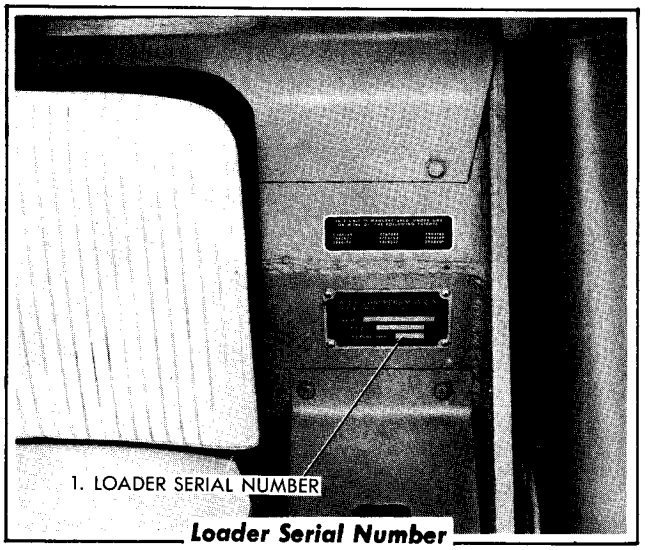
Special equipment includes: Dozer Blade; and bucket teeth.



Model TL-40D Tractor Loader

FIG. 1

TRANSMISSION, ENGINE AND LOADER SERIAL NUMBERS

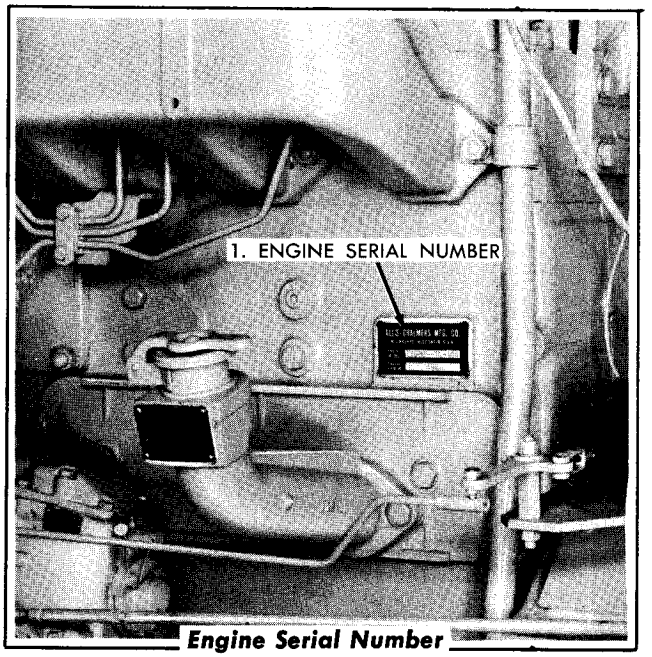


Loader Serial Number

FIG. 2

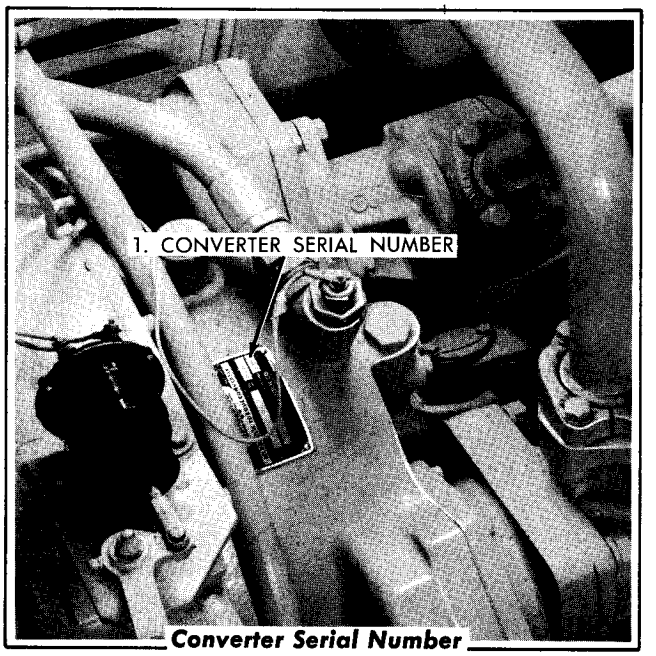
On all parts orders and in all correspondence relative to the loader, it is necessary that the loader model and serial number be given. All major components of the loader (such as, engine, transmission, hydraulic pump, hydraulic control valve, power steering pump and front and rear axles), have serial numbers which should also be given to properly identify the unit and component. These will assure obtaining the correct replacement parts.

The loader serial number is located on the nameplate attached to the left rear of the seat frame in the operator's compartment as shown in Fig. 2.



Engine Serial Number

FIG. 3



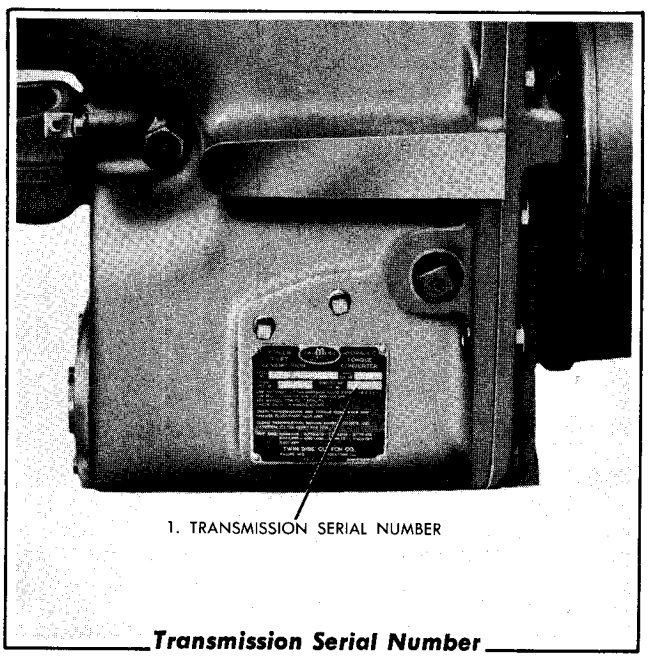
Converter Serial Number

FIG. 4

The engine serial number is located on the nameplate on the right side of the engine block as shown in Fig. 3.

The converter serial number is located on a nameplate on the top of the converter housing as shown in Fig. 4.

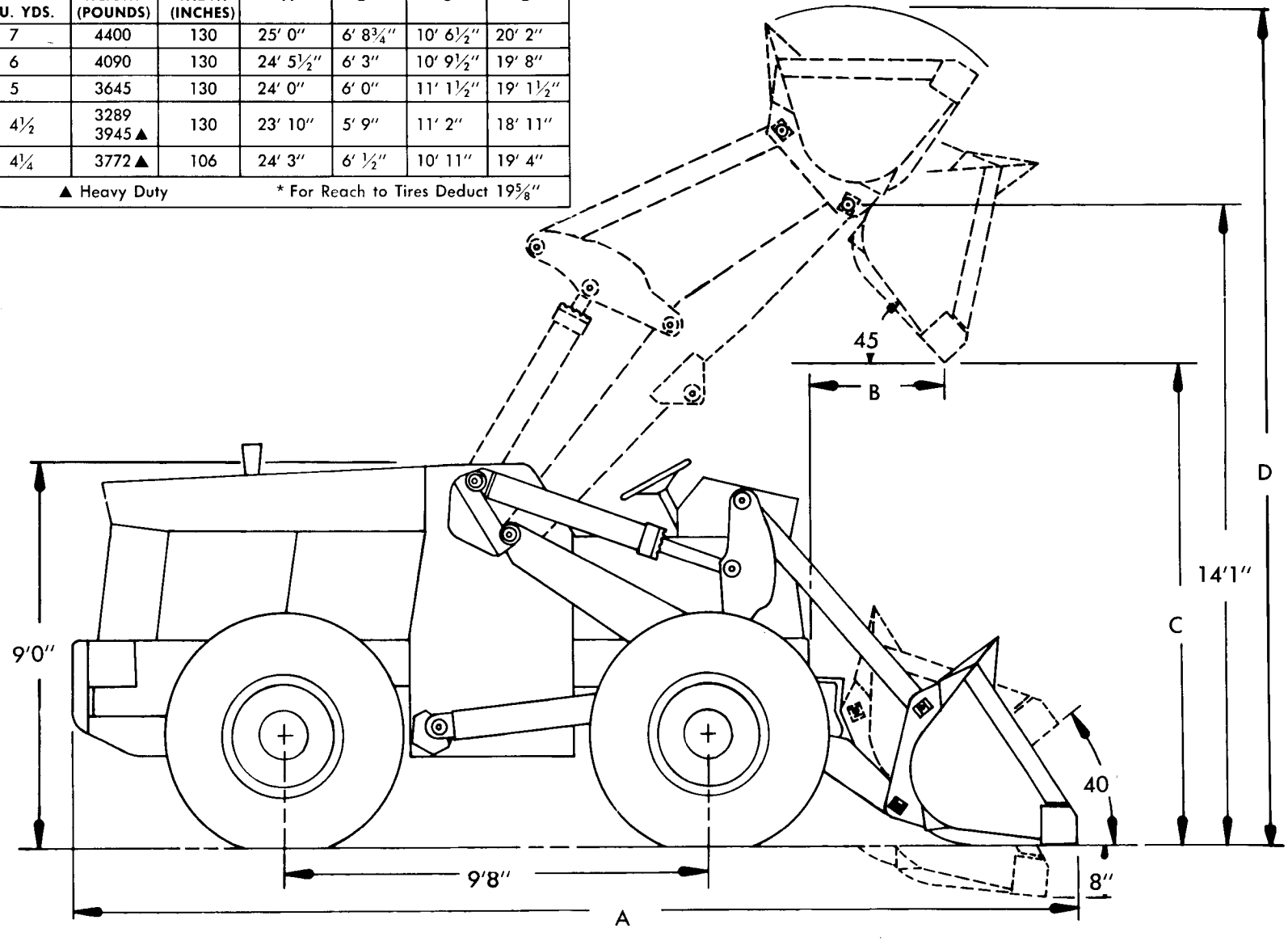
The transmission serial number is located on a nameplate on the left side of the housing as shown in Fig. 5.



Transmission Serial Number

FIG. 5

BUCKET SPECIFICATIONS			DIMENSIONS			
SAE RATED CAPACITY CU. YDS.	WEIGHT (POUNDS)	OUTSIDE WIDTH (INCHES)	A	B *	C	D
7	4400	130	25′ 0″	6′ 8¾″	10′ 6½″	20′ 2″
6	4090	130	24′ 5½″	6′ 3″	10′ 9½″	19′ 8″
5	3645	130	24′ 0″	6′ 0″	11′ 1½″	19′ 1½″
4½	3289 3945 ▲	130	23′ 10″	5′ 9″	11′ 2″	18′ 11″
4¼	3772 ▲	106	24′ 3″	6′ ½″	10′ 11″	19′ 4″
▲ Heavy Duty			* For Reach to Tires Deduct 19⅝″			



Loader Dimensions (General Purpose Bucket)

FIG. 6

GENERAL SPECIFICATIONS

General Dimensions and Weight

Weight, Shipping (approximate)	45,100 lbs.
Front Wheels	18,600 lbs.
Rear Wheels	26,500 lbs.
Overall Width (Wheel Hubs)	10′ 3″
Overall Height with Bucket Down (or to Top of Frame)	9′ 0″
Overall Length with Cutting Edge Level on Ground	24′ 0″
Ground Clearance	20½″
Drawbar Height	32″

General Purpose Bucket (Standard)

	Published
Capacity (cu. yds.)	5
Published Capacity: "SAE Rating (Nominal Heaped)" average volume of common earth handled per bucket load.	
Maximum Bucket Tip Back	40°
Maximum Dumping Angle (Controllable in all Bucket Positions)	
At Maximum Raise	49°
At Ground Level	117°
Carry Capacity	16,500 lbs.
Maximum Lifting Capacity	Up to 40,000 lbs.
Breakout Force	Up to 42,000 lbs.
Lifting Time	9.0 sec.
Lowering Time	7.3 sec.

Hydraulic System

Transmission Mounted Pump G.P.M. at 2000 R.P.M.	110 G.P.M.
Capacity, Hydraulic System — Gallons (approximate)	77 Gal.
Lift Cylinders	(2) "Double Acting" 7" Dia. (For Down Pressure)
Dump Cylinders	(2) "Double Acting" 6½" Dia. (For Controlled Dump and Quick Return)
Oil Reservoir	Tank Behind Operator's Seat
Type of Filters	Micronic and Full Flow
Control Valve	Four Positions — Raise, Hold, Lower and Float

Tire and Tread

Tread, Front and Rear Wheels	96″
Tires (Tubeless) Front and Rear	26.5 x 25 — 14 Ply
Tire Pressure	35 P.S.I.

Engine

Make	Allis-Chalmers
Model	21000-H
Type — Vertical In-Line, Compression Ignition, Water Cooled, Four Cycle, Direct Injection, Turbocharged	Full Diesel

Engine — *Continued*

Number of Cylinders	6
Bore	5¼″
Stroke	6½″
Crankshaft Rotation (when viewed from fan end)	Clockwise
Number of Main Bearings	7
Piston Displacement	844 cu. in.
Firing Order	1-5-3-6-2-4
Lubrication	Full Pressure
Fuel Used	See Fuel Specifications
Fuel Supplied By	Model APE6BB-1100-5635A3 Fuel Injection Pump
Low Idle Speed	600 R.P.M.
High Idle Speed	2140 - 2200 R.P.M.
Rated R.P.M. (Governed at Full Load)	2000 R.P.M.
Air Cleaner	Dry Type
Oil Filter	Full Flow
Electrical System	24 Volt

Turning Radius

Tip of Bucket (at 14″ Carry Position)	32′ 8″
Outer Steering Wheel (Measured at Hub)	33′ 10½″

Capacities (Approximate) (U. S. Standard Measure)

Cooling System	15.5 Gals.
Crankcase:	
Dry to Fully Wet	33 Qts.
Oil and Filter Change	30 Qts.
Transmission and Converter	11 Gals.
Differential (Each)	10.5 Gals.
Planetary Hubs (Each)	2 Gals.
Steering Gear	1½ Lbs.
Fuel Tank	95 Gals.

Speeds (M.P.H. at Rated Engine Speed)

1st	0-3.0
2nd	0-5.5
3rd	0-11.9
4th	0-21.5
1st Reverse	0-3.0
2nd Reverse	0-5.5
3rd Reverse	0-11.9
4th Reverse	0-21.5

U. S. Metric Measure Conversion Factors:

Pints × .4732 = Liters
Quarts × .9463 = Liters
Gallons × 3.7853 = Liters
Pounds × .4536 = Kilograms

The Allis-Chalmers Manufacturing Company reserves the right to make changes in the above specifications or to add improvements at any time without notice or obligation.

SPECIFICATIONS OF LUBRICANTS

A. Engine Crankcase Lubricant (Symbol EO)

USE NON-CORROSIVE "DIESEL" ENGINE LUBRICATING OIL CONTAINING ADDITIVES WHICH WILL PREVENT SLUDGE OR GUM DEPOSITS.

Use oils of the following viscosities:

Atmospheric Temperature	Viscosity
32° F. and above	Use SAE 30
0° F. to 32° F.	Use SAE 20W
0° F. and below	Use SAE 10W

The oil should meet the American Petroleum Institute (API) Diesel classification of "For Service DS" or "Series 3."

"For Service DS" or "Series 3" oils contain additives which promote general cleanliness within the engine and prevent the formation of sludge, hard carbon, and varnish deposits on/or within engine parts.

Detergent type oils will become darker in color within a short period of operation. The darkening of the oil is due to minute particles of carbon being suspended in the oil. One of the primary functions of a detergent type oil is to hold carbon particles in suspension; therefore, darkening of the oil is normal and should not cause concern.

Suppliers of lubricants recognize the importance of the qualities required for use in our equipment and they are cooperating fully to assure the use of only those oils which fulfill these requirements. The lubricant supply source is to be held responsible for the results obtained from their product.

Proper operation and maintenance of the engine are necessary to obtain the desired results from the lubricating oil. NOTE: *If "For Service DS" or "Series 3" oil is not available through your oil distributor in the viscosities recommended, use oil of the viscosity recommended by the particular oil distributor and/or supplier.*

For additional information regarding engine lubricating oil, contact your "Allis-Chalmers" dealer.

B. Transmission and Converter Lubricant (Symbol TF)

Lubricate these assemblies with a good grade of Transmission Fluid type "C-1" oil purchased from a reputable oil company.

C. Differential Lubricant (Symbol MGO)

Both the differentials use Multipurpose (E.P. type) gear oil of the following viscosities:

Atmospheric Temperature	Viscosity
Above 32° F.	Use SAE 140
32° F. and below	Use SAE 90

D. Planetary Hub Lubricant (Symbol MGO)

All four planetary hubs use Multipurpose (E.P. type) gear oil. Use SAE 90 both Summer and Winter.

E. Pressure Gun Lubricant (Symbol PGL)

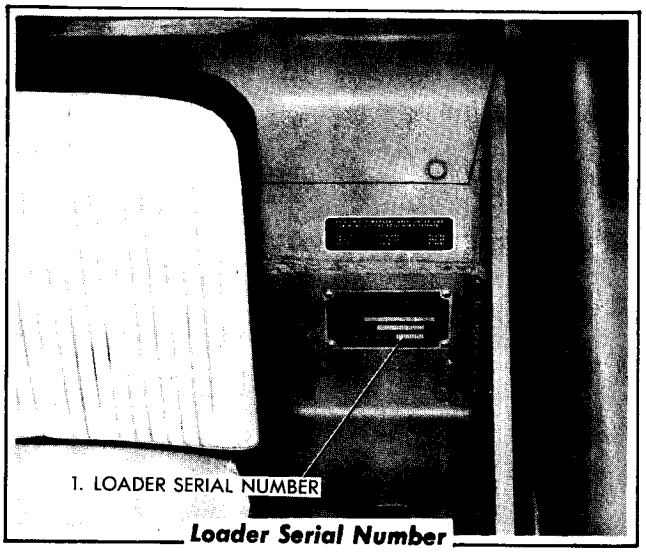
Use a ball and roller bearing lubricant with a minimum melting point of 300° F. This lubricant should have a viscosity range so as to assure easy handling in the lubricating gun at the prevailing atmospheric temperature, and MUST be waterproof.

F. Hydraulic System (Symbol HO or EO)

Hydraulic oil meeting the following specifications is recommended:

		ASTM TEST METHOD
Viscosity @ 0° F., secs., max.	12000	D 343
Viscosity @ 100° F., secs.	150-190	D 88
Viscosity Index, min.	90	D 567
Flash Point, deg. F., min.	370	D 92
Neutralization No., mgs. KOH/g. oil	0.10	D 664
Aniline Point, deg. F.	180-220	D 611
Oxidation Stability, hrs., min.	1000	D 943
Pour Point, deg. F., min.	Minus 20	D 97
Rust Test	Pass	D 665
Foam Inhibited		

TRANSMISSION, ENGINE AND LOADER SERIAL NUMBERS

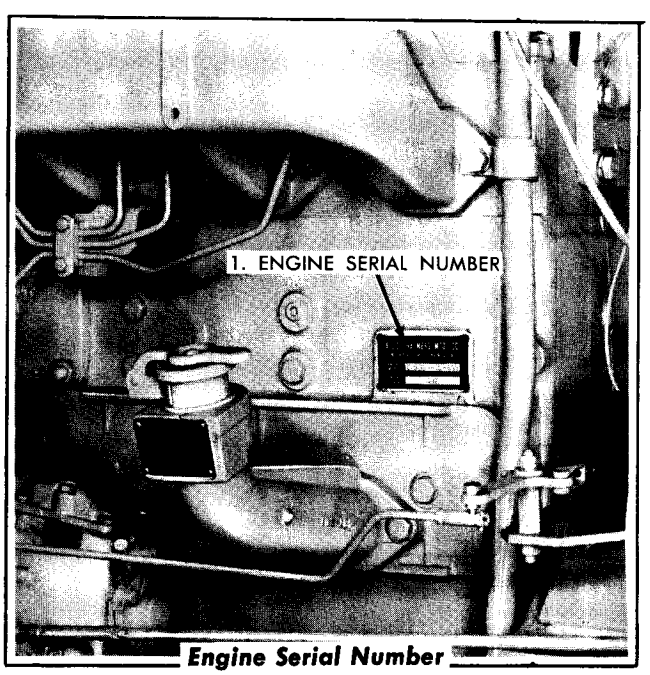


Loader Serial Number

FIG. 2

On all parts orders and in all correspondence relative to the loader, it is necessary that the loader model and serial number be given. All major components of the loader (such as, engine, transmission, hydraulic pump, hydraulic control valve, power steering pump and front and rear axles), have serial numbers which should also be given to properly identify the unit and component. These will assure obtaining the correct replacement parts.

The loader serial number is located on the nameplate attached to the left rear of the seat frame in the operator's compartment as shown in Fig. 2.



Engine Serial Number

FIG. 3

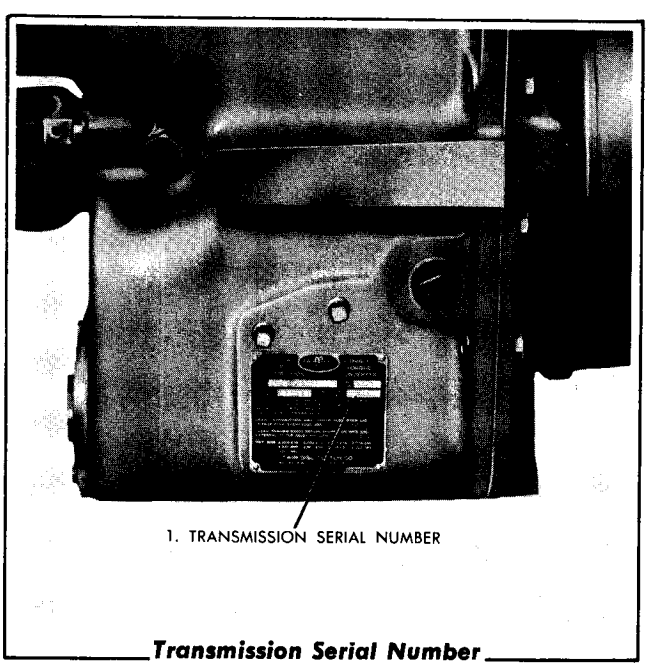
Converter Serial Number

FIG. 4

The engine serial number is located on the nameplate on the right side of the engine block as shown in Fig. 3.

The converter serial number is located on a nameplate on the top of the converter housing as shown in Fig. 4.

The transmission serial number is located on a nameplate on the left side of the housing as shown in Fig. 5.



Transmission Serial Number

FIG. 5

The hydraulic oil should be compatible in all proportions with SAE 10W engine crankcase oil of similar quality with prevailing detergency levels. The hydraulic oil, in its original state, should not contain any substances added to improve or increase the viscosity index. The oil should also be free of water, dirt, sediment and foreign matter and should not be corrosive or otherwise injurious to any of the materials commonly used in hydraulic systems.

In the event the atmospheric temperature is lower than the pour point of the hydraulic oil being used, the hydraulic oil must be diluted 20% with *kerosene*. (Do *not* use diesel fuel or furnace oil.) For continuous operation at atmospheric temperatures 32° F. and higher, the diluted oil must be drained and the system refilled with hydraulic oil of the aforementioned general specifications.

If desired, SAE 10W engine crankcase oil of the classifications for Service MM, MS, DG, DM, or DS can be used. Multi-viscosity oils such as SAE 10W-30 are not recommended. For operation at atmospheric temperatures below minus 10° F. the SAE 10W engine crankcase oil must be diluted 20% with kerosene. For continuous operation at atmospheric temperatures of 32° F. and above, the diluted oil must be drained and the system refilled with SAE 10W oil meeting the aforementioned classifications.

No specific brands of oil are recommended. Use only products qualified under the aforementioned oil viscosity specifications and classifications and recommended by reputable oil companies.

SPECIFICATIONS OF FUEL

The "Diesel" fuel should be a natural distillate petroleum oil and must have certain qualities in order to ignite and burn at the proper rate and temperature. Field experience has shown that the fuel best suited for this engine closely approximates the following specifications:

Gravity API	30 - 35
Viscosity Saybolt Universal at 100° F.	35 - 40
Flash Point	150° F.
Diesel Index	48.5 to 65.5
Cetane Number	46 to 60
Pour Point	0° F.
Volatility 90%	650 °F. Max.
End Point 98%	
Summer	700° F. Max.
Winter	600° F. Preferable
Sediment and Water	Trace
Ash	.02 of 1% Max.
Conradson Carbon	.03 of 1% Max.
Sulphur	½ of 1% Max.

For satisfactory fuel flow through lines and filters in cold weather, the pour point of the fuel must be at least 10° F. below the prevailing atmospheric temperature.

The API gravity of a fuel varies with its specific gravity. The low API fuels are desirable because they have a high specific gravity and more heat units per gallon. However, the higher the API gravity, the better will be the ignition quality of the fuel.

The ignition quality of a fuel is expressed as a "cetane number." The higher the cetane number, the higher the quality of the fuel. The higher cetane fuel shortens the ignition delay period to facilitate starting and improve combustion. The "Diesel" index number, which is a close approximation of the cetane number, is a field method to represent ignition quality.

The distillation 90% point and the end point are important. High volatility is required to enable complete vaporization of the fuel, clean combustion, and low residue formation.

The flash point of a fuel has no quality significance, but is important with respect to safety in storage and handling of fuel.

It is important that the fuel be within the specified limits for ash, carbon, water, and sediment content, etc., to prevent excessive wear and damage to engine parts.

It is also important that the fuel has lubricating properties so that the fuel injection pump and fuel injection nozzles are adequately lubricated. At

times it may be necessary to use fuel with inadequate lubricating properties. If this occasion arises, add one quart of SAE 10 engine oil to every 10 gallons of fuel. When the proper fuel is again available, the fuel system must be drained before the proper fuel is added. CAUTION: *The sulphur content of "Diesel" fuel should be as low as possible. The fuel should not contain a sulphur content of more than ½ of 1%.*

Generally speaking, a No. 2 "Diesel" fuel purchased from a reputable oil company will meet the above specifications.

FUEL STORAGE

The importance of proper storage of fuel cannot be too strongly stressed. Storage tanks, drums or service tanks must be free from rust, scale, sediment or any other foreign matter which will contaminate the fuel. Contaminated fuel will clog the engine fuel filters and eventually damage the fuel injection pump and fuel injection nozzles.

A portable storage tank provides the best method for storing fuel on the job. In such a tank, the sediment and water can easily be drained and the fuel can be pumped into the loader fuel tank with a minimum of handling. Consult your nearest "Allis-Chalmers" dealer for details about this type of storage tank. Since condensation will occur in the storage tank, it is very important that a sediment sump be provided in the bottom of the tank so that water and sediment can be drained daily. Fuel should be allowed to settle at least 48 hours in a storage container before it is added to the fuel tank of the loader. It is advisable to use a pump and draw the fuel from the storage tank, or barrel, rather than to drain it from the bottom of the fuel container. Where conditions are such that drums must be used to supply fuel, it is advisable to have enough drums to allow sufficient time for the fuel to settle. The fuel thus left in a number of drums can be collected into one drum and used after the usual time allowed for settling. In this manner, the sediment and foreign matter will be disposed of and no fuel will be wasted. Whenever drums are used for fuel storage, they should be covered or placed under shelter so that the fuel will not become contaminated with water, which will enter through the filler plugs when it rains, even though the plugs are tight.

The fuel tank of the loader should be filled at the end of the day's run rather than at the start; this will reduce the water content, as a full tank is less subject to condensation.

PERIODIC LUBRICATION AND PREVENTIVE MAINTENANCE

Lubrication is an essential part of preventive maintenance, controlling to a great extent the useful life of the unit. Different lubricants are needed and some components in the unit require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and the frequency of their application, as given in this manual and on the "LUBRICATION GUIDE," be explicitly followed. Periodic lubrication of the moving parts reduces to a minimum the possibility of mechanical failures.

To prevent minor irregularities from developing into serious conditions that might involve shut-down and major repair, several other services or inspections are recommended for the same intervals as the periodic lubrication. The purpose of these services or inspections, which require only a few minutes, is to assure the uninterrupted operation of the unit by revealing the need for adjustment caused by normal wear. The need for some minor adjustment, if neglected, could result in failure and shut-down. Refer to the following "LUBRICATION GUIDE" for relative location of the service points of the unit to be serviced.

SERVICE LUBRICATION GUIDE TABLE — TL-40D

Service Point No.	Identification of Service Point	No. of Points	Recommended Lubrication	Service Interval					
				10	50	100	200	500	1000
1, 28	Engine Cranckcase*	1	EO	✓	*		X		
2, 21, 37	Hydraulic System	1	HO	✓		✓			OX
3, 40	Transmission & Converter (Oil Level)	1	TF	✓					X
4, 18	Radiator (Coolant Level — Check Core for Plugging)	1		✓		✓			
5	Engine Air Cleaner (Check Service Indicator)	1		✓					
6, 22	Batteries	12		✓		✓			
7	Tires (Pressure and Inspection)	8		✓					
8	Axle Breathers	2		✓					
9, 24	Hydraulic Tank Breather	1		O		X			
10	Fuel Tank — Fill	1		✓					
11, 12, 34	1st and 2nd Stage Fuel Filters — Fuel Tank Drain Plug (Drain)	3		✓				X	
13	Air Brake Reservoir (Drain)	2		✓					
14	Steering Linkage Lubrication Fittings	13	PGL	+					
15	Loader Linkage Lubrication Fittings	18	PGL	+					
16	Converter to Transmission Univ. Joint Assy. — Lube	3	PGL		+				
17	Brake Cam Actuating Shafts — Front and Rear — Lube	6	PGL		✓				
19, 38	Axle Differentials	2	MGO			✓			X
20, 39	Planetary Hubs	4	MGO			✓			X
23	Hydraulic System Filters — Screen and Magnet	4				XO			
25	Univ. Joint Assy's. — Trans. to Differentials — Lube	6	PGL			+			
27	Transmission, Control Valve and Accelerator Linkage	34	EO			+			
29	Engine Oil Filters	2					X		
30	Engine Water Pump Idler Pulley — Lube	1	PGL				+		
31	Fan Hub — Lube	1	PGL				+		
32	Turbocharger	1						✓	
33	Steering Gear — Oil Level	1	SGL					✓	
35	Transmission-Converter Oil Filter	1						X	
36	Steering Axle Trunnion Sockets — Lube	4	PGL					+	
41	Transmission Sump Suction Screen	1							O
42	Air Compressor	2							✓O

— KEY —

EO — Engine Lubricating Oil
HO — Hydraulic Oil
TF — Transmission Fluid (Type "C-1" Oil)
PGL — Pressure Gun Lubricant (Ball and Roller Bearing Lubricant with Min. Melting Point of 300° F.)
MGO — Multi-Purpose Gear Oil (E.P. Type)
SGL — Steering Gear Lubricant (GM — 4673M)
* — Initial Oil Change is at 50 Hours — All others are at 200 Hour Intervals

✓ — Check
X — Change
+ — Lubricate
O — Clean

LUBRICATION GUIDE

IMPORTANT: *Thoroughly clean all lubrication fittings, caps, filler and level plugs and their surrounding surfaces before servicing. Prevent dirt from entering with the lubricant. The lubricant should be warm (operating temperature) when draining at oil change intervals.*

The intervals given in this guide are based on normal operation; perform these services, inspections, etc., more often (as necessary) for operation under abnormal and severe conditions.

10-HOUR SERVICES

INSPECT:

1 ENGINE CRANKCASE—OIL LEVEL

Check the oil level and add oil through the crankcase oil filler pipe (Fig. 7) if necessary to raise the level to the "FULL" mark on the gauge rod.

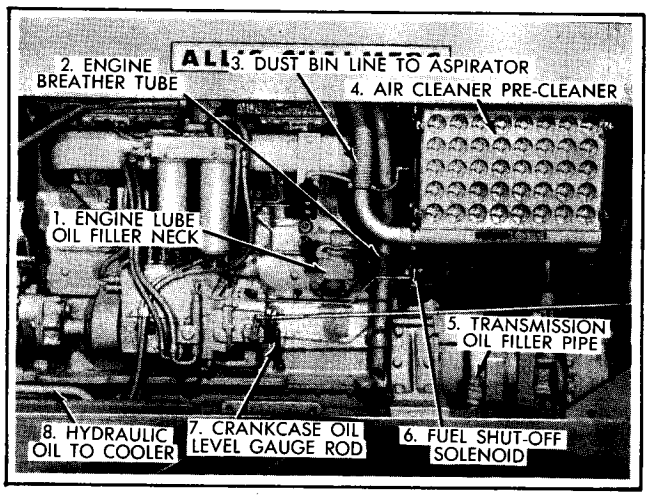


FIG. 7

2 HYDRAULIC SYSTEM—OIL LEVEL

Clean the top of the hydraulic tank at the filler plug location. Be certain that the loader is level, the dump cylinders are fully retracted, and that the bucket is lowered to ground level. Remove the oil level dip-stick and the oil filler plug (Fig. 8), and dry the dip-stick with a clean cloth. Insert the dip-stick back into the tank, resting the filler plug on top of the oil filter cover. Withdraw the dip-stick and note the oil level. The oil level should be even with the ring groove in the dip-stick. Add oil as necessary to raise the oil in the tank to the proper level. Install the dip-stick and the oil filler plug, and tighten securely.

3 TRANSMISSION AND CONVERTER—OIL LEVEL

Before starting the engine, remove the oil level plug (upper) on the right side of the transmission (Fig. 9) and check for a free flow of fluid from the plug hole.

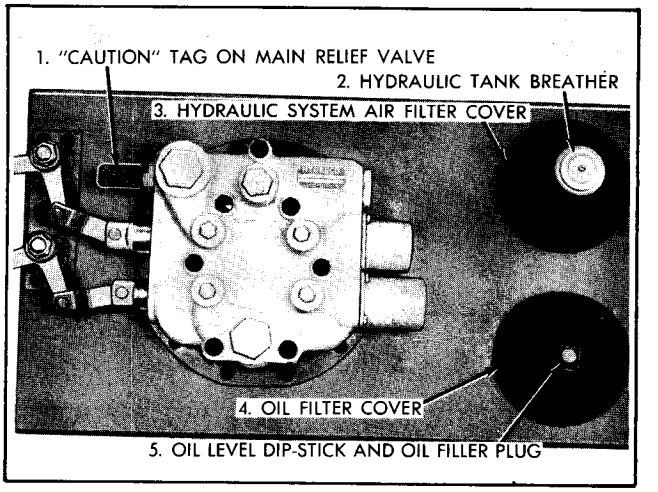


FIG. 8

If necessary, add fluid until a free flow is obtained. Replace the plug. Start the engine and after the transmission reaches operating temperature, check the level of the oil in the sight gauge (or at the lower plug if the unit is so equipped). If no oil is visible, add oil until it appears half-way up (level with lower plug) on the sight gauge.

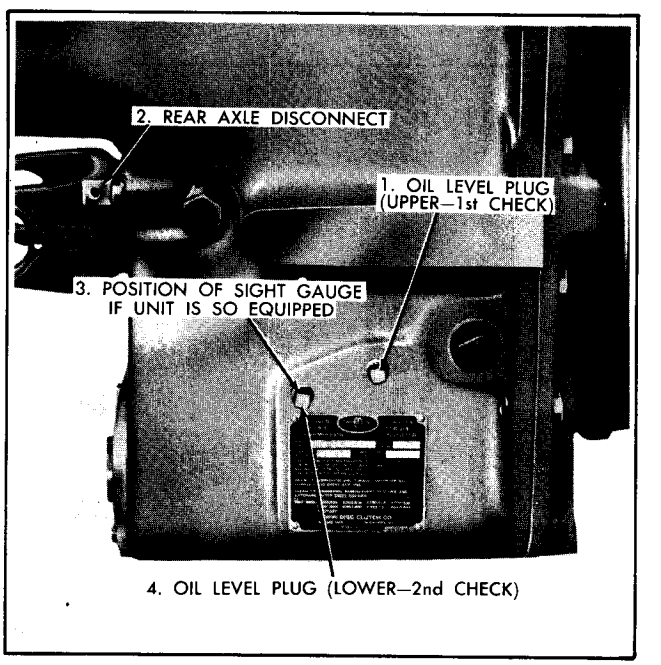


FIG. 9

4 RADIATOR—COOLANT LEVEL

Remove the radiator cap and check the level of the coolant. Keep the coolant level within approximately 1 inch below the bottom of radiator filler pipe by the addition of clean, soft water or anti-freeze solution.

CAUTION: *Do not remove the pressure type radiator*

cap while the coolant is near 212° F., as the coolant will break into a boil and will splash onto the person removing the cap. Refer to "ENGINE COOLING SYSTEM" for detailed information.

5 ENGINE AIR CLEANER

Check the air cleaner Service Indicator (Fig. 10) daily or more often under extremely dusty conditions. Replace filter cartridge as required. DO NOT ATTEMPT TO CLEAN A DIRTY CARTRIDGE. Refer to "AIR CLEANER" for detailed information.

6 BATTERIES

Clean and remove the 6 filler caps on each battery (Fig. 11). Inspect the electrolyte level and add clean distilled water to keep the level 3/8 inch above the plates. Install and tighten the filler caps. Keep the top of the batteries clean and the terminals free from corrosion. Test the batteries with a hydrometer every 100 hours. Refer to "ELECTRICAL SYSTEM" for detailed information.

7 TIRES—PRESSURE AND INSPECTION

Check the tires for proper inflation (35 P.S.I.), and remove any stones from the tread. Check tires for cuts and bruises. If a cut is suspected of being deep enough to injure the cord, the tire should be removed at once and the cut repaired. Continued operation with tires having deep cuts will only result in short tire life.

8 AXLE BREATHERS

Press the caps, located on top of each of the differential carrier housings, several times to be certain the breathers are free to function.

9 HYDRAULIC TANK BREATHER

Remove the screw and the lockwasher attaching the breather cap (Fig. 8) to the base. Remove the breather cap and element. Wash the element in a clean solvent or fuel oil, dry with compressed air (from inside out), and dip the element in clean oil. Shake off excess oil and reinstall the element, breather cap and the screw (with lockwasher).

NOTE: *Hydraulic suction line screen and magnet—It is important that these parts be cleaned daily during the first week of operation, or until the amount of foreign matter collected daily has practically disappeared. Thereafter, the suction line screen and the magnet, located inside the hydraulic tank, should be removed and cleaned after every 100 hours of operation, or more often if conditions warrant. (Refer to "HYDRAULIC SYSTEM" for detailed information).*

10 FUEL TANK—FILL

Fill the tank at the end of each operating period to keep condensation in the tank to a minimum; refer to "SPECIFICATION OF FUEL."

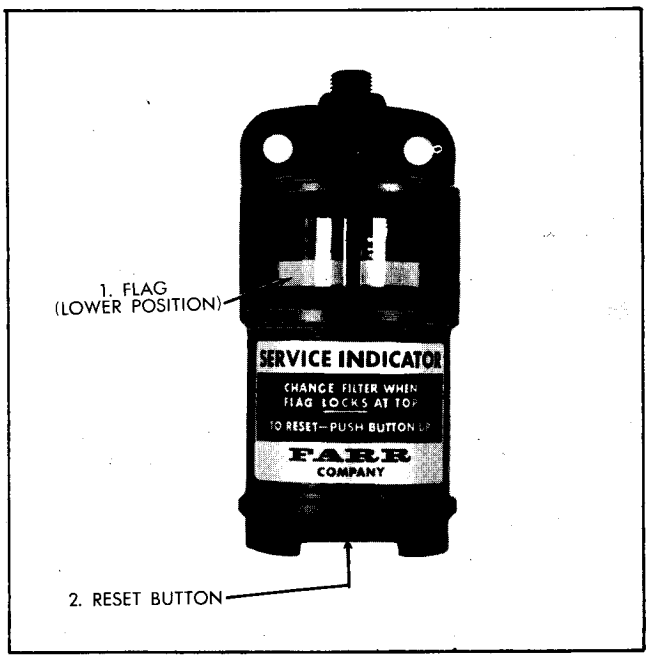


FIG. 10

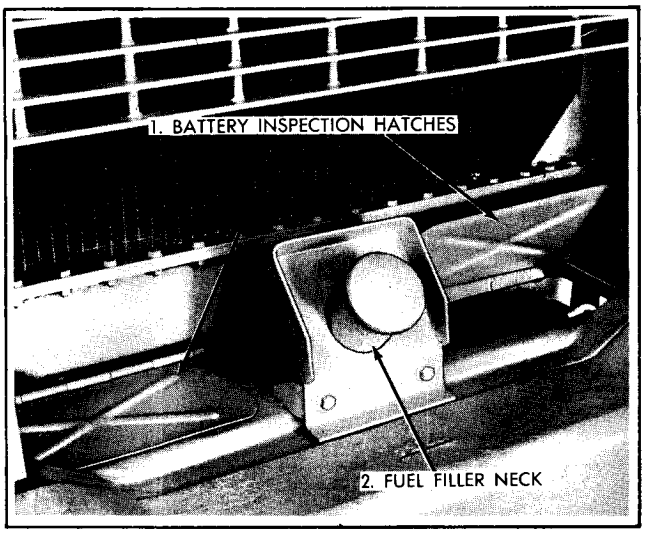


FIG. 11

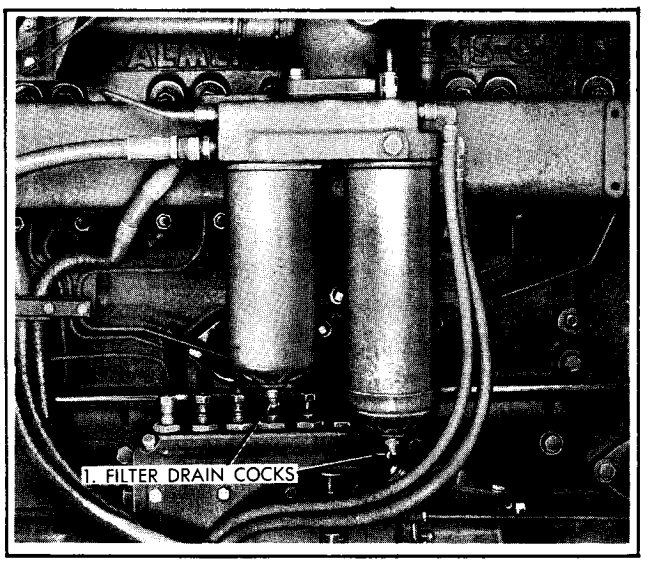


FIG. 12

11 FIRST STAGE AND SECOND STAGE FUEL FILTERS — DRAIN

Open the drain cock (Fig. 12) in the bottom of the first and second stage fuel filters daily (or as often as conditions warrant), and allow any sediment to drain; close the drain cocks when clean fuel runs out. Perform this service before the start of the day's operation in warm weather or shortly after the end of the day's operation in freezing weather.

12 FUEL TANK DRAIN

Loosen the fuel tank drain plug and retighten when clean fuel runs out.

13 BRAKE AIR RESERVOIR

Two air tanks (Fig. 13) are mounted on the underside of the loader main frame directly beneath the operator's compartment. Each is provided with a petcock to allow draining of condensation. The tanks should be drained daily, preferably at the end of the day's operation.

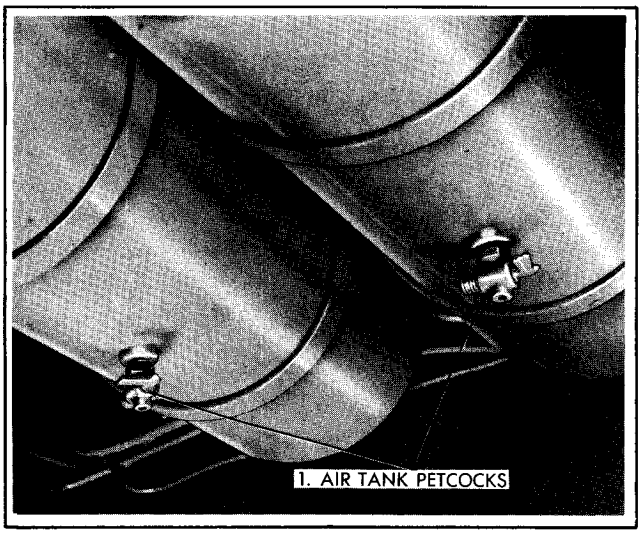


FIG. 13

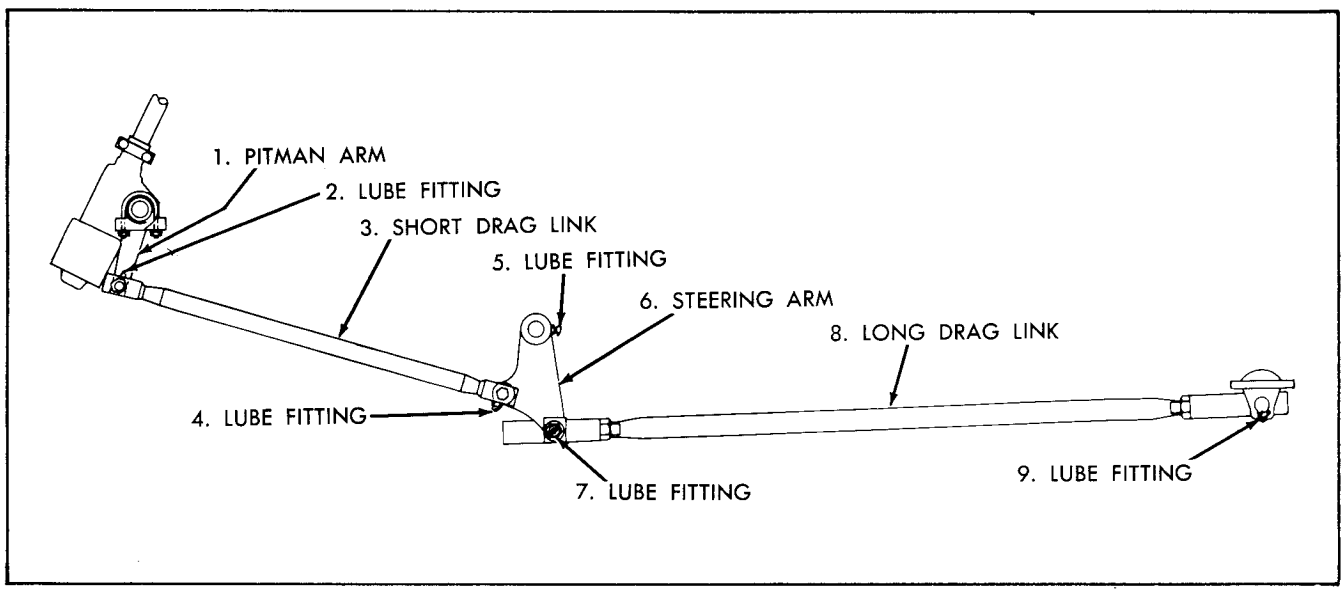


FIG. 14

LUBRICATE:

14 STEERING LINKAGE LUBRICATION FITTINGS

Power Steering Cylinders — 4 lub points, one at each end of each cylinder (Fig. 28). Lubricate with pressure gun lubricant.

Steering Arm Pivot Pin — 1 Lube Point (Fig. 14). Lubricate with pressure gun lubricant.

Drag Links — 4 Lube Points. Two in the short drag link and two in the long drag link (Fig. 14). Lubricate with pressure gun lubricant.

Tie Rod — 2 Lube Points, one in each end (Fig. 28). Lubricate with pressure gun lubricant.

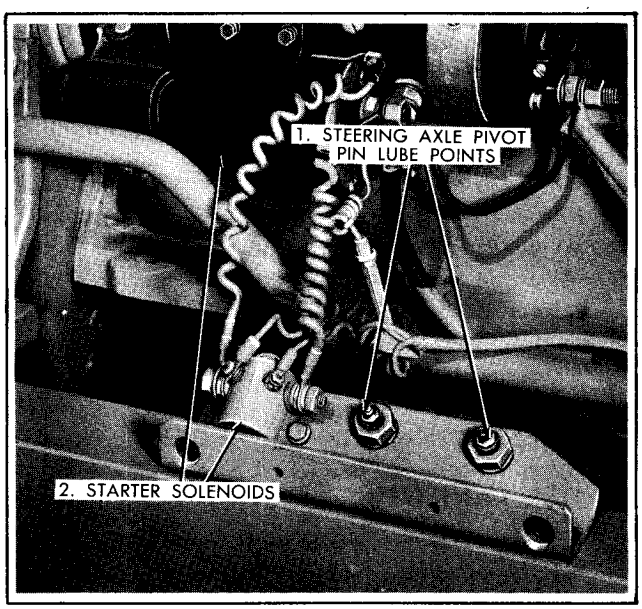


FIG. 15

Steering Axle Pivot Pins — 2 Lube Points (Fig. 15). Lubricate with pressure gun lubricant.

15 LOADER LINKAGE LUBRICATION FITTINGS

Booms — 4 Lube Points, two in each boom, front and rear (Fig. 16 and 17). Lubricate with pressure gun lubricant.

Dump Cylinders — 2 Lube Points at the rear end of each cylinder (Fig. 17). Lubricate with pressure gun lubricant.

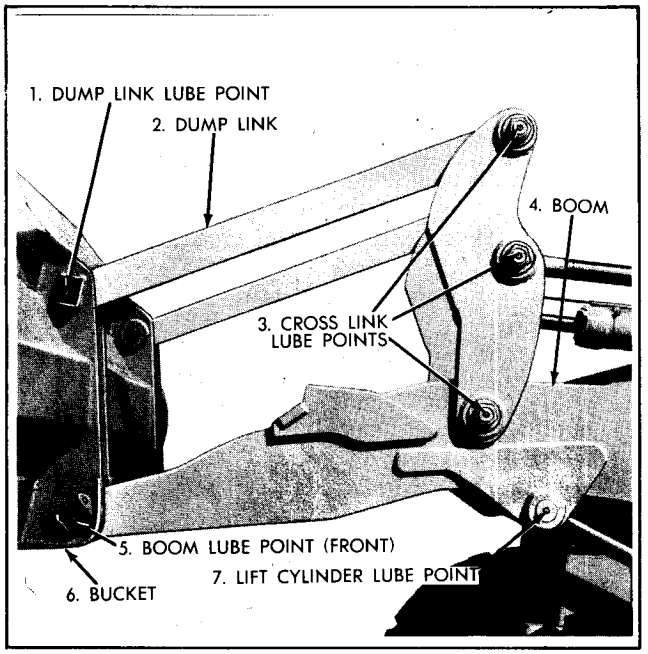


FIG. 16

Cross Links — 6 Lube Points, 2 at the lower end, 2 at the center, and 2 at the top (Fig. 16). Lubricate with pressure gun lubricant.

Lift Cylinders — 4 Lube Points, 2 at the rear end and 2 at the front end (Figs. 16 and 17). Lubricate with pressure gun lubricant.

Dump Links — 2 Lube Points at the front end (Fig. 16). Lubricate with pressure gun lubricant.

50-HOUR SERVICES

(NOTE: *Also perform the 10-Hour Services*)

16 CONVERTER TO TRANSMISSION

Universal Joint Assembly — Lube Fittings — 3 Lube Points — 1 in each of the 2 universal couplings and 1 in the slip yoke shaft between converter and transmission. Lubricate with a good grade of "Universal Joint Grease." The general specification for a good standard of universal joint grease is a ball and roller bearing lubricant with a minimum melting point of 300° F. and must be waterproof.

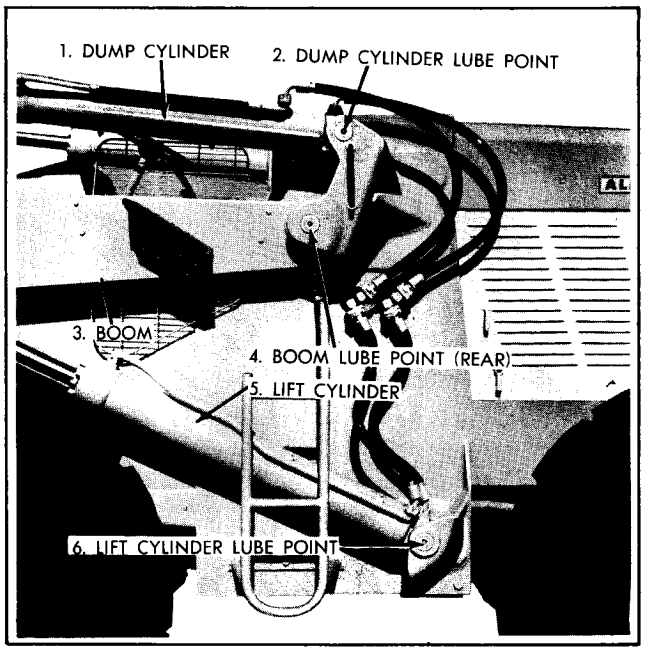


FIG. 17

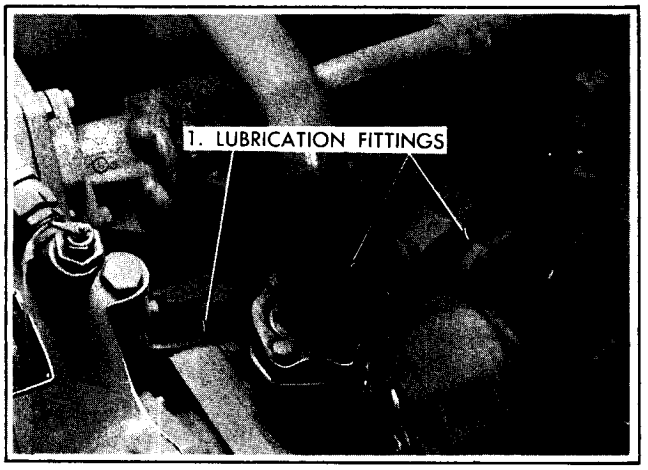


FIG. 18

17 BRAKE CAM ACTUATING SHAFT LUBRICATION FITTINGS

Front Axle — 4 Lube Points. Two each side, between slack adjuster and backing plate (Fig. 19). Lubricate with pressure gun lubricant.

Rear Axle — Two Lube Points. One each side on knuckle flange near top (Fig. 20). Lubricate with pressure gun lubricant.

100-HOUR SERVICES

(NOTE: *Also perform the 10 and 50-Hour Services*)

INSPECT:

18 RADIATOR

Check the core for plugging. Clean with water or air if necessary.

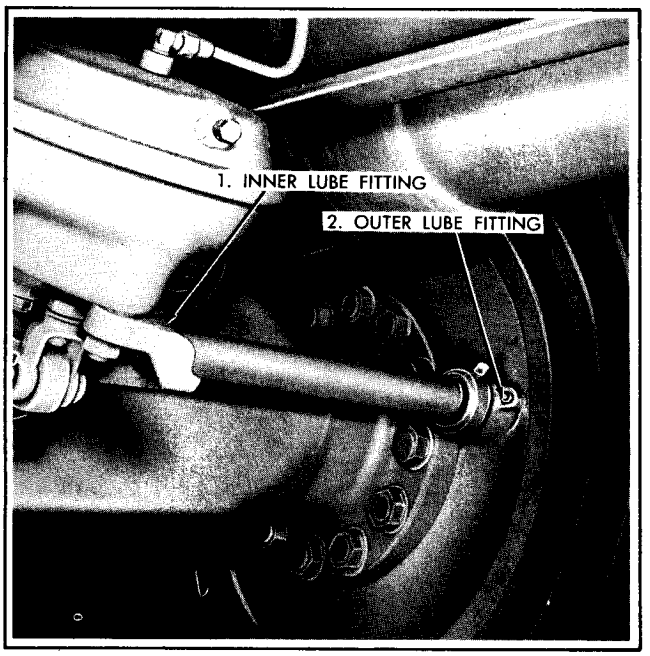


FIG. 19

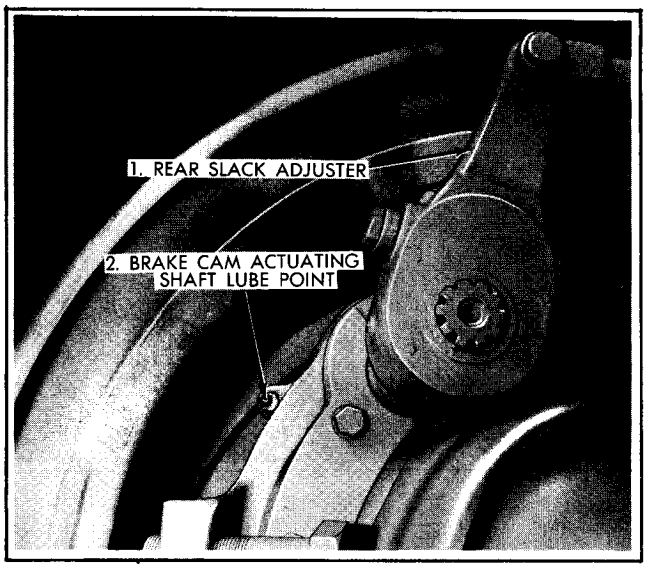


FIG. 20

19 AXLE DIFFERENTIALS — OIL LEVEL

Check the oil level in both differentials and add oil if necessary. The front differential filler plug may be reached by removing the access cover in the front frame crossmember. Refer to Fig. 21 for rear differential filler plug. (Refer to "SPECIFICATIONS OF LUBRICANTS.")

20 PLANETARY HUBS — OIL LEVEL

Check the oil level in all four planetary hubs (Fig. 22) and fill, if necessary, to the level indicated on the hub face. The hub is correctly positioned when the drain plug is at its lowest point. Add oil through the level plug until the indicated level is reached. (Refer to "SPECIFICATIONS OF LUBRICANTS.")

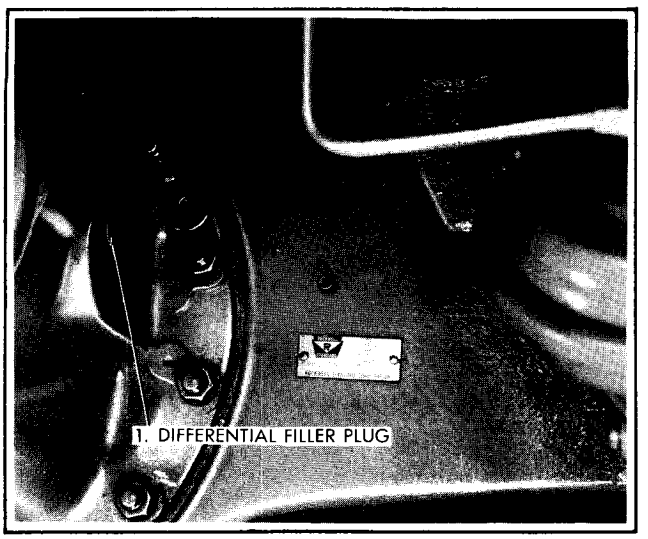


FIG. 21

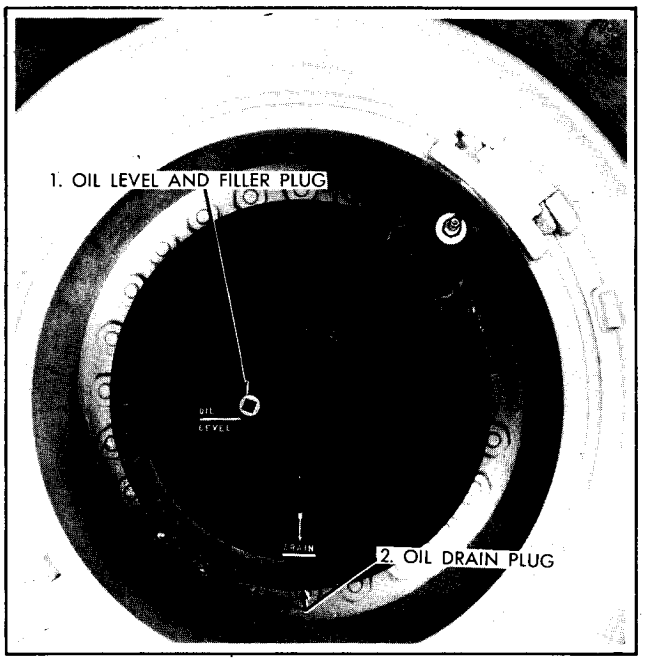


FIG. 22

21 HYDRAULIC SYSTEM

Hydraulic Hoses, Lines and Fittings — Check all hoses, lines, and fittings for leaks. Tighten or replace, if necessary. Refer to "HYDRAULIC SYSTEM" for detailed information.

Hydraulic Cylinder Piston Rod Packing — Adjustments — Check the packing adjustments of the lift and dump cylinder piston rods (Fig. 78). Refer to instructions in "HYDRAULIC SYSTEM" under "GENERAL CARE OF HYDRAULIC SYSTEM."

22 BATTERIES

Test with hydrometer for specific gravity of each cell. Maintain electrolyte level as indicated on cap by adding clean distilled water. Refer to "ELECTRICAL SYSTEM" for detailed information.

23 HYDRAULIC SYSTEM FILTERS — SCREEN AND MAGNET

Hydraulic System Oil Filter — Replace Element — Clean off the oil filter cover (Fig. 8) and the surrounding area. Remove the filter cover, cover gasket, and the old element. Clean the inside of the filter case. Be certain that the spring and metal washer are in position on the pipe in the bottom of the filter case. Insert a new element, install a new gasket, and install the filter cover. Refer to "HYDRAULIC SYSTEM" for detailed information.

Hydraulic Tank Air Filter — Replace Element — Clean off the filter cover located at the left rear side, inside the hydraulic tank (Fig. 8). Remove the filter cover (with the tank Breather), the cover gasket, and the old element. Clean the inside of the filter case. Insert a new filter element (with open end upward) and center the element within the case. Install a new cover gasket and install the filter cover. Refer to "HYDRAULIC SYSTEM" for detailed information.

Hydraulic Suction Line Screen and Magnet — Clean — Refer to Service Point No. 9, "NOTE." The suction line screen and magnet should be cleaned every 100 hours of operation, or more often if conditions warrant.

24 HYDRAULIC TANK BREATHER — REPLACE ELEMENT

Remove the screw and lockwasher attaching the breather cap (Fig. 8) to the base. Remove the breather cap element and discard. Dip the new element in clean oil and shake off excessive oil. Install the new element, breather cap, and the screw (with lockwasher).

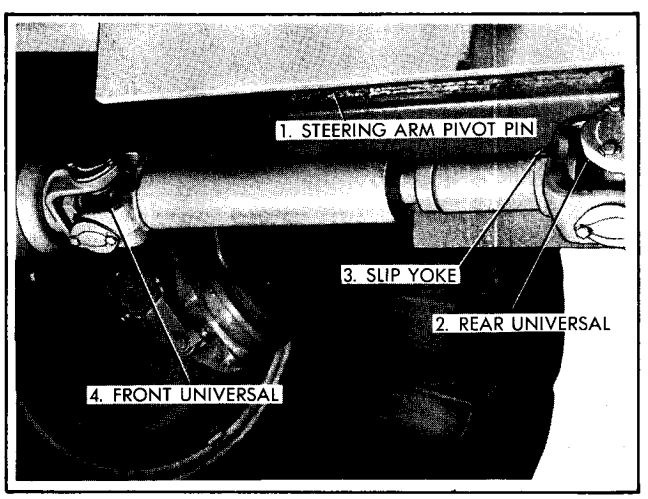


FIG. 23

LUBRICATE:

25 UNIVERSAL JOINT ASSEMBLY — LUBE FITTINGS

Transmission-Differential — 6 Lube Points, 1 in each of the 4 universal joints, and 1 in each of the 2 slip yoke shafts located between the transmission and the axles (Fig. 23). Lubricate with a good grade of "Universal Joint Grease." The general specification for a good standard of universal joint grease is a Ball and Roller Bearing Lubricant having a minimum melting point of 300° F. and it must be waterproof.

26 GENERATOR AND STARTER

Generator — The generator is equipped with sealed bearings. No lubrication is required.

Starter Motor — The starter motor is equipped with life long lubrication. No lubrication is required.

27 TRANSMISSION, CONTROL VALVE, AND ACCELERATOR LINKAGE

Transmission Control Linkage — 16 Lube Points. Lubricate with SAE 20W motor oil.

Control Valve Linkage — 12 Lube Points. Lubricate with SAE 20W motor oil.

Accelerator Linkage — 6 Lube Points located along linkage from accelerator pedal to the fuel injection pump. Lubricate with SAE 20W motor oil.

200-HOUR SERVICES

(NOTE: *Also perform 10, 50 and 100-Hour Services*)

SERVICE:

28 ENGINE CRANKCASE — CHANGE OIL

The initial engine oil change is made after 50 hours. All other oil changes are made at 200 hour intervals. Operating conditions may necessitate this service at shorter intervals. Remove drain plug located on the

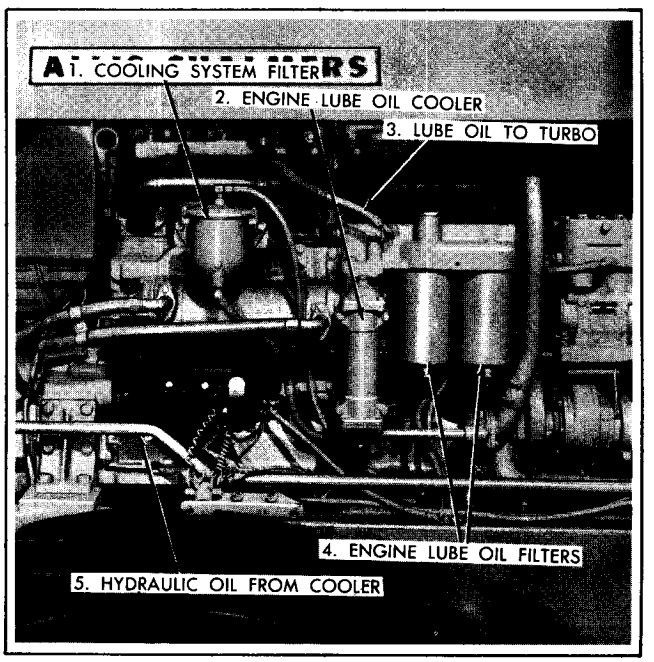


FIG. 24

right side of crankcase sump and allow oil to drain. Change oil filter (See Service Point No. 29 below). Reinstall drain plug and refill (capacity, 30 quarts) with specified oil. Fill to "FULL" mark on oil level gauge rod (Fig. 7). CAUTION: *Under no circumstances should a corrosive engine lubricating oil be used.*

29 ENGINE OIL FILTER—REPLACE ELEMENTS

When oil is drained from engine crankcase (see Service Point No. 28 above), remove filter elements and discard. Clean filter base and shells and install new filter element assemblies. Refer to "ENGINE LUBRICATION SYSTEM" for detailed information.

LUBRICATE:

30 ENGINE WATER PUMP IDLER PULLEY—LUBE FITTING

1 Lube Point in the pulley mounting bracket (Fig. 25). Lubricate with 1 or 2 shots of pressure gun lubricant.

31 FAN HUB—LUBE POINT

1 Lube Point in fan hub. Remove pipe plug in fan hub (Fig. 26) and insert zerk fitting. Lubricate with 1 to 2 shots of pressure gun lubricant. Replace pipe plug. CAUTION: *Do not over grease.*

500-HOUR SERVICES

(NOTE: *Also perform 10, 50 and 100-Hour Services*)

INSPECT:

32 TURBOCHARGER

Remove air cleaner-to-turbocharger hose and inspect the compressor impeller for dust build-up. Clean if dust is 1/32" to 1/16" thick. Refer to "TURBOCHARGER" for proper procedure.

FIG. 25

FIG. 26

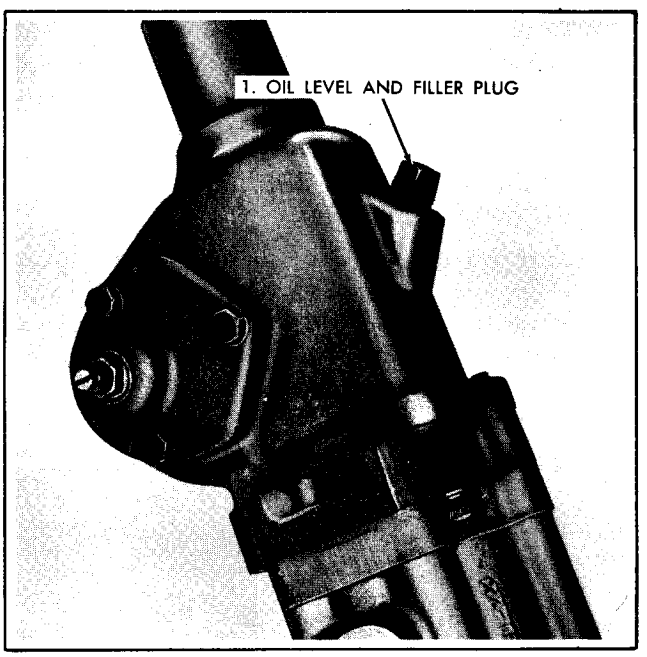


FIG. 27

33 STEERING GEAR—OIL LEVEL

Remove filler plug (Refer to "POWER STEERING") from the gear housing (Fig. 27) and check the level of the oil. Fill to level of filler plug, if necessary, and reinstall filler plug. Use GM-4673M steering gear lubricant, or its equivalent.

SERVICE:

34 FIRST AND SECOND STAGE FUEL FILTERS — CHANGE ELEMENTS

Install a new element in each fuel filter after approximately every 500 hours of operation. Do not attempt to clean clogged filter elements.. Refer to "FUEL SYSTEM" for detailed information.

35 TRANSMISSION — CONVERTER OIL FILTER — CHANGE ELEMENTS

Clean filter shell and surrounding area. Remove the filter element and discard it. Clean filter base and inside of filter shell and replace element. Refer to "TORQUE CONVERTER AND TRANSMISSION" for detailed information.

LUBRICATE:

36 STEERING AXLE TRUNNION SOCKET

4 Lube Points, 1 located in each trunnion bearing cap — upper and lower. Remove pipe plugs and install lube fitting (Fig. 28). Lubricate with 3 shots or approximately 1 ounce of grease. DO NOT OVER-GREASE! Use "Marfax" No. 2 heavy duty grease or its equivalent. Each trunnion socket should be lubricated every 500 hours of operation, or more often if conditions warrant. Remove lubrication fitting and replace with pipe plug.

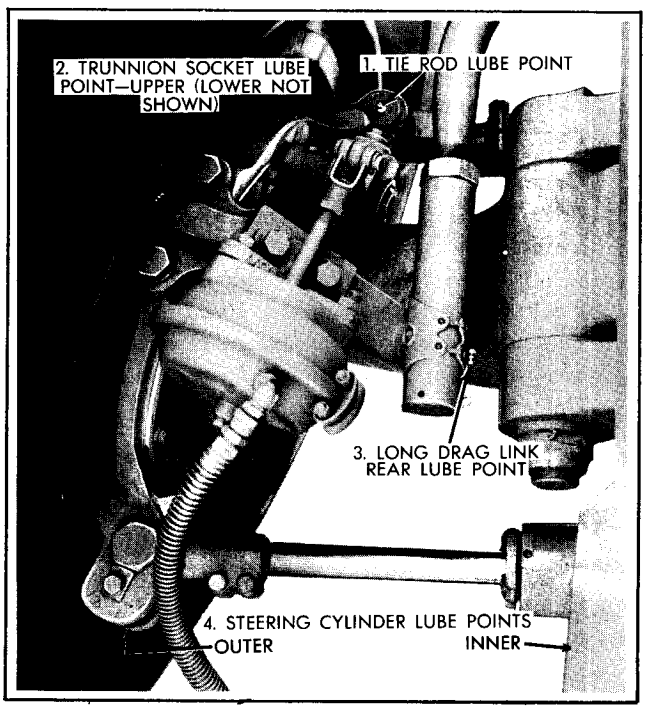


FIG. 28

1000-HOUR SERVICES

(NOTE: *Also perform 10, 50, 100, 200 and 500-Hour Services)*

SERVICE:

37 HYDRAULIC SYSTEM — DRAIN, FLUSH, AND REFILL

Remove the drain plug located in the bottom front right side of the tank and allow the oil to drain. Drain all cylinders and lines. Flush the system and clean the suction line screen and magnet, and install new filter elements. Refill with new oil. Use SAE 10W. For extremely cold weather, dilute the oil with the best grade of kerosene. DO NOT USE AN OIL THAT FOAMS! This service should be performed more often if the oil shows signs of discoloration. Refer to "HYDRAULIC SYSTEM" for detailed information.

38 AXLE DIFFERENTIALS — CHANGE OIL

Remove the filler plug (Fig. 21) and the drain plug. Allow the oil to drain and replace the drain plug. Refill with multipurpose (E.P. type, or its equivalent, refer to "SPECIFICATIONS OF LUBRICANTS") gear oil. Capacity of each differential is 10.5 gallons. Reinstall the filler plug.

39 PLANETARY HUBS — CHANGE OIL

Center the wheel with the drain plug at its lowest point (Fig. 22). Remove the oil level plug. Remove the drain plug and allow the hub to drain. Replace the drain plug. Add oil through the oil level plug opening until the indicated level is reached. Replace the oil level plug. Use multipurpose (E.P. type, or its equivalent, refer to "SPECIFICATIONS OF LUBRICANTS") gear oil.

40 TRANSMISSION AND CONVERTER OIL LEVEL

Transmission — Oil Change — Remove the drain

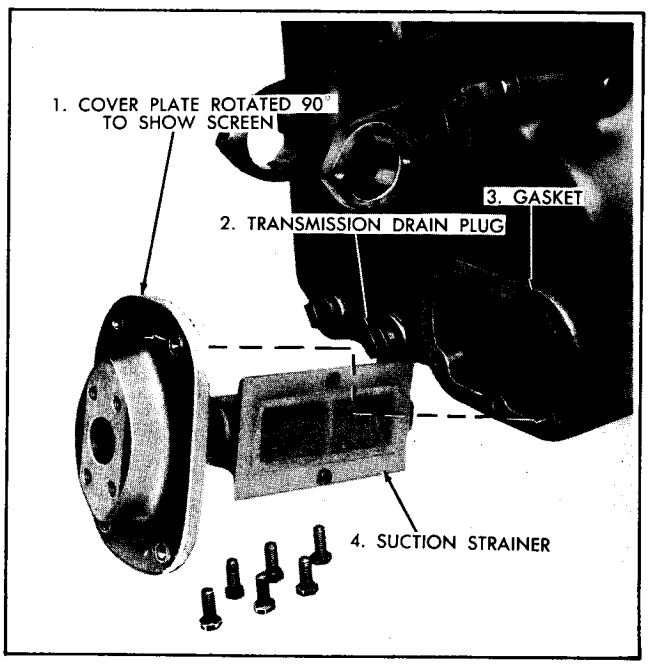


FIG. 29

plug from lower rear face of transmission oil sump housing and allow the oil to drain. NOTE: *Clean suction strainer.* See Service Point 41. Reinstall the drain plug and refill the transmission. Transmission's capacity is approximately 44 quarts. Use transmission fluid type "C-1." Refer to "TORQUE CONVERTER AND TRANSMISSION" for detailed information.

41 TRANSMISSION SCREEN

Transmission Sump Suction Screen — Clean — The screen is located in the oil sump of the transmission. It is accessible by removing the 6 capscrews in the rear face of the sump. The screen must be removed and cleaned each time the transmission-converter oil is changed, or more often if conditions warrant. To clean the screen, remove the drain plug from the oil sump. Thoroughly clean the screen cover flange and the surrounding area. Remove the capscrews and slide the screen out. Thoroughly clean the screen in mineral spirits, using a soft bristle brush. Reinstall the screen, using a new gasket. Be sure the capscrews are securely tightened.

42 AIR COMPRESSOR — INSPECT

Remove the compressor discharge valve cap nuts (Fig. 67) and check for presence of carbon. Remove any excess carbon. Inspect the discharge line for carbon and clean if necessary.

PERIODIC SERVICES

Axle Anchor Pins — Torque axle anchor pins (axle to frame) to 1325 to 1375 lbs. ft. every 100 hours of operation.

Capscrews, Nuts and Pins — Check entire unit to be certain that all capscrews, nuts and pins are tight.

Engine Air Cleaner — Check the Service Indicator at least once a day (more often in extremely dusty conditions) and replace filter element as required. DO NOT ATTEMPT TO CLEAN A FILTER ELEMENT. For detailed information refer to "AIR CLEANER."

Engine Breather Tube — Remove tube, wash in solvent and blow out with compressed air.

Engine Cooling System — Drain and flush periodically. Keep the cooling system filled with clean soft water. In freezing weather, use permanent type (glycol base) anti-freeze solution. Refer to "ENGINE COOLING SYSTEM" for detailed information.

Engine Radiator — Check core for plugging. Clean with water or air if necessary.

First and Second Stage Fuel Filters — Install a new element in each fuel filter after every 500 hours of operation. DO NOT ATTEMPT TO CLEAN CLOGGED FILTER ELEMENTS. Refer to "FUEL SYSTEM" for detailed information.

Fuel Tank — Drain water and sediment from fuel tank. If a large accumulation of water, rust and scale is evident, drain and flush the tank.

Hydraulic Control Valve — Torque the hold-down capscrews to 50 to 60 lbs. ft.

Hydraulic Pump — Tighten capscrews if necessary.

Hydraulic Tank Mounting — Check mounting capscrews and tighten if necessary.

Tire Pressure — A tire pressure of 35 P.S.I. should be maintained. Under inflation or over inflation are the major causes of excessive tire wear and damage. Uneven tire pressure can also cause hard steering. Maintenance of the correct inflation pressures is one of the most important elements in tire care.

Wheel Lug Nuts — Torque the lug nuts holding the wheels to the hubs to 330 to 350 lbs. ft.

PERIODIC ADJUSTMENT

Air Compressor, Fan, and Water Pump Drive Belts — The air compressor and water pump belts are properly adjusted when the belts can be pressed inward approximately ½" at a point halfway between their respective pulleys. The fan to crankshaft belts are properly adjusted when the belts can be pressed in ½" to ¾" at a point halfway between their respective pulleys. Adjust the belts when slippage is evident. Refer to "ENGINE COOLING SYSTEM" for detailed information.

Brake Adjustment — Check the brake lining periodically for normal lining wear. If adjustment is needed, refer to "AIR BRAKES" for detailed information.

Generator Drive Belt Adjustment — The generator drive belt is properly adjusted when the belt can be pressed inward by hand approximately ½" to ¾" at a point halfway between the generator and the fan pulley. To adjust the drive belt, loosen the generator adjusting arm capscrew and move the generator in or out to obtain the correct belt tension. Tighten the adjusting capscrew securely.

Hydraulic System — The hydraulic tank is designed so that with little periodic service, top performance can be maintained indefinitely. Service of filters, breathers, suction line screen, etc., is dependent upon operating conditions. The dump line safety valve, the return line safety valve, and the check valve located inside the hydraulic tank are properly adjusted at the factory and require no further adjustment. Check and adjust the pressure relief valve, the cylinder packing glands, the piston rod wiper seals, hoses, lines and fittings and, if necessary, replace. Refer to "HYDRAULIC SYSTEM" for detailed information.

PREPARATION OF LOADER FOR USE

Fill the fuel tank with the specified fuel. Use care to prevent the entrance of dirt and foreign matter while filling the tank. Fill the engine cooling system with clean soft water or a suitable anti-freeze solution.

Check the oil level in the engine crankcase, transmission, differentials, and planetary hubs. Lubricate all points where lube fittings are provided for use of a lubricating gun.

Loosen wing nuts on air cleaner pre-cleaner and remove pre-cleaner. Check cartridge to be sure rubber-like plastic face plate is facing pre-cleaner and is in good condition.

Check the level of the electrolyte solution in the batteries; check the tire pressure.

Check the wheel lug nuts for tightness, and be sure that all of the capscrews on the unit are tight. NOTE: *Check wheel lug nut torque daily for first four days of operation of new machine.* By tightening the capscrews now and at the end of 10 hours of operation, the possibility of their becoming loose and enlarging the capscrew holes will be eliminated.

Check the oil level in the hydraulic tank and be certain that the oil is at the proper level on the dip-stick. NOTE: *Before checking the oil, be sure that the loader is on level ground.* Refer to "STARTING AND STOPPING THE ENGINE."

Start the engine. With the engine running at full throttle, raise the booms to the horizontal position. Activate the bucket through its full travel several times to be certain that the dump cylinders are full of oil, then retract the dump cylinders. Move the boom control lever to the "LOWER" position and lower the bucket to ground level, then return the control lever to its "NEUTRAL (HOLD)" position. Be sure that the engine is running at full throttle when performing these operations. Stop the engine and check the oil level in the hydraulic tank.

Start the engine. *Do not put the loader in motion until the brake air pressure warning signal stops!* Operate the loader controls and check for proper operation. Check all hoses, lines and fittings for oil leakage, and tighten the connections if necessary. Operate the loader with a light load for the first 60 hours. The most efficient engine operation is obtained with the engine coolant temperature held within the operating range indicated on the instrument panel gauge. Operating the engine with the coolant temperature below this range will result in incomplete combustion with less power, and will cause harmful gummy deposits within the engine.

When operating in cold weather, provide a cover for the sides of the engine compartment if the thermostats prove inadequate to maintain the normal operating coolant temperature.

The hydraulic suction line screen and magnet, located in the hydraulic tank, must be cleaned daily during the first week of operation, or until the amount of foreign material collected daily has practically disappeared. Thereafter, the screen and magnet should be cleaned after every 100 hours of operation (refer to "HYDRAULIC SYSTEM" for detailed information).

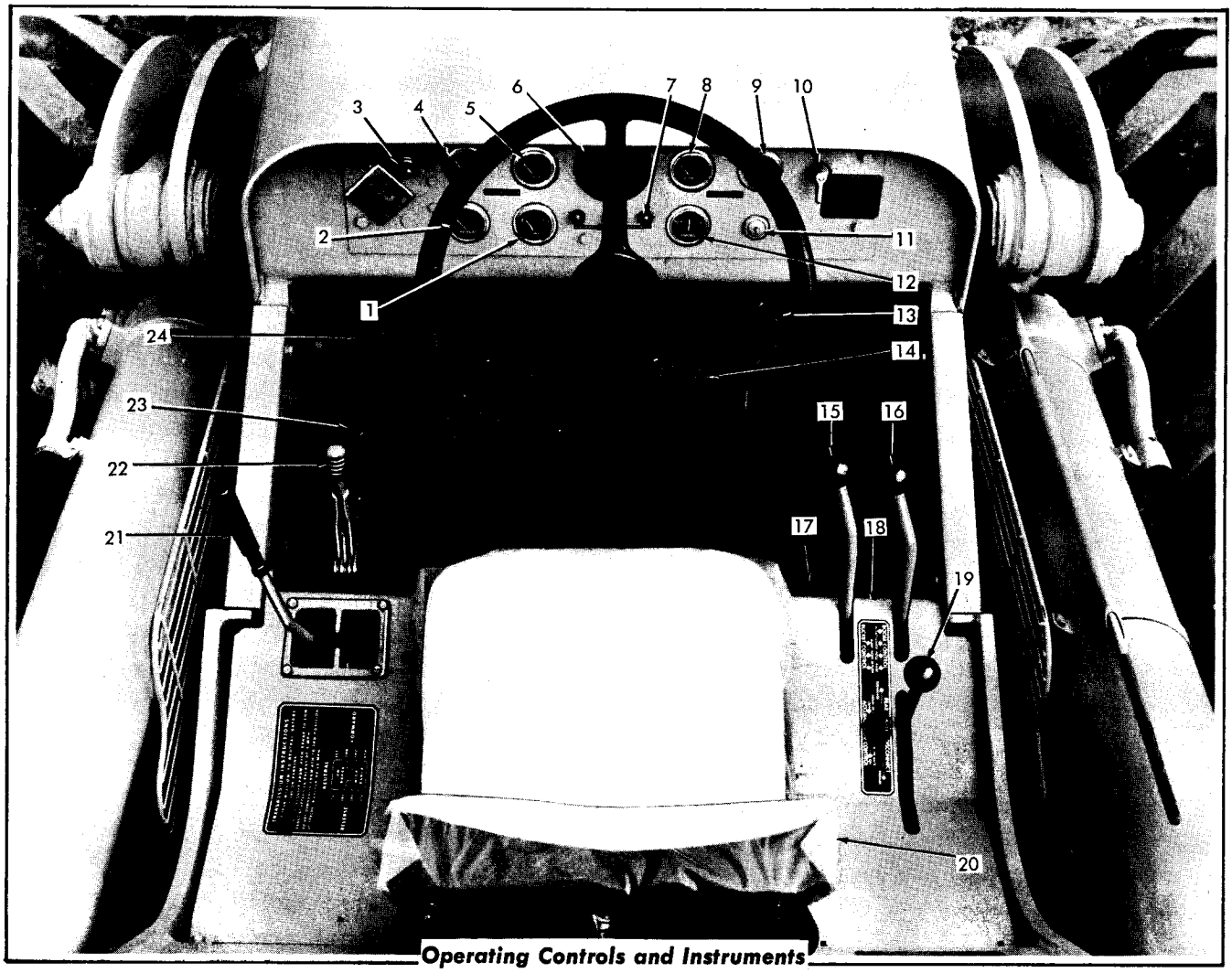


FIG. 30

1. Fuel
2. Brake Air Pressure
3. Air Brake Low Pressure Warning Light
4. Transmission Oil Temperature
5. Transmission Clutch Pressure
6. Hour Meter
7. Fuses (3)
8. Engine Oil Pressure
9. Engine Operating Temperature
10. Light Switch
11. Starter Key Switch and Pushbutton (Not Shown)
12. Ammeter
13. Accelerator Pedal
14. Brake Pedals (2)
15. Bucket Control Lever
16. Boom Control Lever
17. Seat Locking Lever
18. Clutch Cut-Off Control (Not Shown)
19. Rear Axle Disconnect Lever
20. Operator's Seat (Raise Seat for Access to Auxiliary Air Hose)
21. Transmission Control Lever
22. Hand Brake Lever
23. Horn Button
24. Foot Rest

The operator of the tractor loader unit must familiarize himself with the various controls and the instruments provided for its operation. Although many of these controls are similar to those of other loaders, there are important differences. It is not wise, regardless of previous experience, to operate the loader unit before fully understanding the purpose of each control and instrument. NOTE: *The terms "LEFT HAND" and "RIGHT HAND" as referred to in this Manual (unless otherwise specified) are determined by sitting in the operator's seat and facing the front or bucket and of the loader.*

A. OPERATING CONTROLS

1. Starting Switch

A starting (key-turn) switch is located on the right side of the instrument panel. It has four positions — "SOLENOID-FUEL (SHUT-OFF)," "OFF," "RUN-ACCESSORIES," and "START." Turn the switch to the "START" position and depress the starting button to actuate the starter. Release the switch and pushbutton as soon as the engine starts. In the event that the engine does no continue to run after the first few revolutions, the key must be released from the "START" position in order to give the starter time to stop spinning. A second application of the key in the "START" position may then take place.

After the engine starts and the switch is released, it snaps back to the "ON" position and the ammeter and fuel gauge should operate immediately followed by the rest of the gauges. To stop the engine, the key must be turned thru the center or "OFF" position to "SOLENOID-FUEL" position on the extreme left and held in that position until the engine stops. In the "SOLENOID-FUEL" position, a fuel shut-off solenoid is actuated to cut the supply of fuel to the engine. When the engine stops, the key may be released from the "SOLENOID-FUEL" position and it automatically snaps back to the "OFF" position. While the key is being held in the "SOLENOID-FUEL" position, the gauges and accessories will continue to work.

2. Light Switch

The light switch, located on the right side of the instrument panel, controls the main headlights, auxiliary headlights, back-up lights, tail light, and instrument panel lights. It has four positions — "OFF," "DIM," "BRIGHT," and "AUXILIARY." The switch is turned from the vertical "OFF" position, counter-clockwise, through its other three positions.

3. Fuse Holders

Three fuse holders are located in the center of the instrument panel. From left to right they are as follows: main fuse to ammeter; 30 amp fuse, auxiliary headlights and back-up lights; 10 amp fuse, main headlights, tail light and instrument panel lights; 10 amp fuse.

4. Accelerator Pedal

The accelerator pedal is located on the right front floor of the operator's compartment. It is connected by linkage to the governor on the fuel injection pump. The engine will run at idle when the pedal is not pressed; depress the pedal to increase the engine speed desired.

5. Transmission Speed and Direction Control Lever

Transmission control, both speed and direction, is accomplished by a single lever. The transmission functions are controlled and carried out by hydraulic pressure thereby eliminating the need of a clutch pedal and the customary "declutching" operation on the part of the operator. The Full-Power-Shift transmission has four ranges. The desired range is selected by moving the control lever toward or away from the operator (Fig. 30). Forward or reverse motion is obtained by moving the control lever in the direction desired; toward the instrument panel for forward motion and toward the tractor engine for reverse. As was stated above, the transmission is full-power shifting and as such, it is possible to upshift or downshift the transmission at wide-open throttle regardless of the load. However, do not downshift to a lower range if the vehicle speed is in excess of the maximum speed of the selected lower range.

When changing directions, release the accelerator pedal while the lever is being moved.

6. Clutch Cut-Off Valve

The clutch cut-off valve is located on the seat support plate beneath the operator's seat. When the clutch cut-off is operating, by depressing the brake pedal, it diverts all of the engine power from the transmission to the loader hydraulic pump. When operating on grades, this feature may be undesirable because the machine may move forward or backward momentarily before power can be restored to the transmission. Accordingly, a clutch control valve (check valve) is provided to disengage the automatic clutch release feature as desired. When changing the position of the cut-off valve,

THE BRAKE PEDAL SHOULD BE FULLY RELEASED. In the "UP" position the clutch cut-off is disengaged.

7. Steering Wheel

The steering wheel is connected to the hubs of the steering axles through "Power Booster" linkage. When the wheel is turned in either direction, two hydraulic cylinders exert pressure on the steering linkage in the direction of the turn. If the hydraulic power fails, the wheels can still be turned.

8. Brake Pedals

The brake pedals are used to retard the speed or stop the loader. The four-wheel, air brake pedals are located one on each side of the steering column. Either pedal actuates the brake valve which in turn energizes the brake air chambers and applies the brakes.

9. Parking Brake

The mechanical parking brake lever is located on the left side of the Operator's compartment. The parking brake is located at the lower front side of the transmission at the drive shaft. Pull the brake lever from the horizontal or "OFF" position, to the vertical "ON" position, to lock the parking brake. The parking brake operates independently of the service brakes. IT IS A GOOD HABIT TO SET THE PARKING BRAKE BEFORE LEAVING THE MACHINE, BUT BE SURE TO RELEASE IT BEFORE USING THE MACHINE AGAIN. The parking brake tension is adjusted by turning the knob at the top of the lever.

CAUTION: *The parking brake is, as its name implies, a parking brake. No attempt should be made to hold the loader with the parking brake alone while the transmission is in gear and the engine is accelerated.*

10. Boom Control Lever

The boom control lever and the bucket control lever are located at the right side of the operator's compartment. The boom lever is at the right of the bucket lever and is connected by linkage to the boom plunger in the control valve. The plunger is of the detent type and has four positions — "RAISE," "NEUTRAL (HOLD)," "LOWER," and "FLOAT."

11. Bucket Control Lever

The bucket control lever, located at the left of the boom control lever, is connected by linkage to the bucket plunger in the control valve. The plunger is of the spring loaded type and, when released, automatically returns to its "NEUTRAL (HOLD)" position and the bucket will remain in the position to which it has been moved. The bucket is dumped by pushing forward on the control lever, and is returned to the "digging" position by pulling back on the control lever.

12. Rear Axle Disconnect Lever

The rear axle disconnect lever is located to the right of the operator and directly behind the boom and bucket control levers (Fig. 30). To disengage the rear axle, move the lever forward. The rear axle should be disengaged when traveling on the highway with no load in the bucket. With the rear axle disconnected better control of the loader at highway speeds is obtained, and tire wear is cut to a minimum. When working the loader four-wheel drive should always be used.

13. Seat Adjusting Lever

The seat adjusting lever is located at the base of the operator's seat. The seat may be adjusted by disengaging the lever and moving the seat forward and backward to the desired position, and then reengaging the lever.

B. INSTRUMENTS

1. Engine Temperature Gauge

This gauge indicates the operating range (green) of the engine coolant. The engine must not be operated with the coolant in the Red (danger) area. Continued operation in the "Yellow" (cold) range is uneconomical and tends to produce sludge in the engine crankcase.

2. Engine Oil Pressure Gauge

This gauge indicates the pressure at which the engine lubricating oil is circulated through the engine. At full throttle the oil pressure should be between 30 and 55 pounds at normal operating temperature.

CAUTION: *If no oil pressure is indicated by the gauge, the engine must be stopped immediately and the cause determined and corrected.*

3. Fuel Gauge

The fuel gauge indicates the quantity of fuel that is contained in the fuel tank. It is connected to a rheostat and float unit that is located in the tank. The gauge indicates "E" (EMPTY, "1/4," "1/2," "3/4," and "F (FULL)." The fuel tank should be filled at the end of each operating period, rather than at the start, to reduce the possibility of water condensation.

4. Ammeter

The ammeter indicates the charging rate of the generator. When the batteries are in a discharge condition, the ammeter should indicate a good rate of charge until the battery approaches a fully charged condition. When the battery is fully charged, the ammeter will indicate nearly zero except for a short time after the starter is used.

5. Transmission Oil Pressure Gauge

The transmission oil pressure gauge indicates the pressure at which the transmission clutches are operating. The normal operating pressure of the clutches is from 190 to 200 P.S.I.

6. Transmission Temperature Gauge

The transmission temperature gauge indicates the temperature of oil before it leaves the torque converter on its way to the oil (cooler) radiator. Normal operating temperature is 150° to 200° F.

CAUTION: *Converter oil temperature (indicated by the transmission temperature gauge) must not exceed 250° F. Refer to "TORQUE CONVERTER AND TRANSMISSION" for detailed information.*

7. Engine Hour Meter

The engine hour meter is a direct reading type. The meter records up to 10,000 hours and repeats. The four figures of the hours are read directly. The red (or right side) figure indicates 10ths of an hour, the small indicator (upper left) visibly turns when the meter is recording.

8. Air Pressure Gauge

The air pressure gauge indicates the amount of available brake air pressure in the reservoirs. Never operate the machine with less than 60 P.S.I. For normal operation the gauge must read between 105 P.S.I. and 125 P.S.I.

A warning device is provided to inform the operator whenever the pressure drops below 55 to 60 P.S.I. At any time that the brake air pressure in the reservoirs drops below 55 to 60 P.S.I., while the key switch is in the "ON" position, the warning buzzer will sound and the red warning light on the instrument panel will glow until the pressure has risen to the 55 to 60 P.S.I. level again.

CAUTION: *AT NO TIME MUST THE LOADER BE OPERATED WHILE THE BRAKE AIR PRESSURE WARNING SIGNAL IS OPERATING.*

STARTING AND STOPPING OF ENGINE

A. Starting of Engine

1. Before starting the engine, check the oil levels of the following and add the specified lubricant as necessary to raise to the proper level: engine crankcase, hydraulic tank, transmission, differential, and planetary hubs. Fill the fuel tank with specified fuel. Check the level of the water or antifreeze solution and add coolant if necessary. If repairs have been made since the last operating period, be sure that all nuts and capscrews affected by the repairs are tightened and the parts are properly adjusted.

2. Place the transmission control lever in its neutral position.

3. Place the bucket and boom levers in their neutral positions.

4. Depress the accelerator pedal approximately ¼ of its travel. Turn the switch to the "START" position and press the starter button until the engine starts. On cold weather starts the use of a "spray can" starting aid is helpful. One or two shots sprayed around the air cleaner air intake AFTER THE ENGINE IS CRANKING should bring the desired result. When the engine starts, release the switch and the starter button.

5. As soon as the engine starts, depress the accelerator pedal until the engine is running at half speed. Continue to use the starting aid intermittently if necessary until the engine is running smoothly. CAUTION: *Excessive use of the starting aid will cause severe detonation with resulting internal damage to the engine.*

6. Observe the engine lubricating oil pressure indicated by the gauge. With the engine running at half speed, and with the engine coolant at normal operating temperature, the oil pressure should be between 30 and 55 pounds. If the oil is cold, no pressure may be indicated by the gauge for several seconds after the engine starts; but if the pressure does not then rise to normal or above, the engine must be stopped immediately and the cause determined and corrected.

7. Observe the converter "OUT" temperature indicated by the transmission temperature gauge. With the transmission pressure at 190 to 200 pounds (as indicated by the transmission pressure gauge), the transmission temperature should be approximately 150° F. The transmission temperature must not exceed 250° at any time.

   NOTE: *If the air brake pressure in the reservoirs is not up to the 55 to 60 P.S.I. operating minimum, the warning device will sound.*

B. Stopping of Engine

Always allow the engine to idle at least five minutes so that the engine and transmission may cool gradually and uniformly and the turbocharger impeller speed may be substantially reduced before its supply of lubricating and cooling oil is cut off. *This is important.*

Release the accelerator pedal. Turn the switch key to "SOLENOID-FUEL" position (extreme left) and hold it there until the engine stops running. When the engine stops, release the key and it will automatically return to the "OFF" position.

CAUTION: *AS A SAFETY PRECAUTION, ALWAYS LOWER THE BUCKET TO THE GROUND WHEN THE LOADER UNIT IS NOT IN USE OR WHEN MAKING REPAIRS, ADJUSTMENTS, OR SERVICING THE UNIT.*

ENGINE IDLING

Prolonged engine idling causes the engine coolant temperature to fall below the specified operating range. Since engine starting is readily accomplished with an electric starter, there should be no reason for prolonged engine idling.

DRIVING AND OPERATING INSTRUCTIONS

A. Starting of Loader

Start the engine and allow it to warm up, then slow the engine to idling speed. The air brake pressure warning signal will sound until an operating pressure above 55 to 60 P.S.I. is reached.

CAUTION: *Do not move the loader while the warning signal is operating.*

Move the transmission selector lever into the required range for the desired speed or power. Release the parking brake and move the transmission lever to the required position for either forward or reverse travel. Depress the accelerator pedal to regulate the engine speed as desired.

Satisfactory and efficient operation depends largely on the operator's judgment in selecting the proper range for the various loads or operation. Always operate the loader in the speed range that will permit the engine to operate at full speed. This will not only assure the most power from the engine, but will also allow the engine to operate at its highest efficiency. Once the proper speed range is selected, the forward and the reverse direction of the loader may be continuously changed without constant "declutching" of the transmission.

B. Operating the Loader (General Instruction)

The general purpose bucket (standard bucket) has the correct "digging" angle when the bucket is tilted forward so that the cutting edge rests flat on the ground. The operator can quickly determine the proper "digging" position (angle) of the bucket by observing the bucket level indicator (Fig. 31), located on the right dump cylinder. The indicator may be easily adjusted by the operator to suit any digging condition. When the rear end of the inner rod is flush with the rear end of the outer rod the bucket is positioned at the proper digging angle. The bucket is loaded by adjusting the digging depth to suit the forward movement of the loader according to digging conditions.

Digging depth is obtained by applying down pressure, controlled by pushing forward on the boom control lever (Fig. 30). This lever controls the boom for raising, holding, lowering, or floating. With the bucket held in the "dig" position, drive the loader into the stockpile. If the loader begins to stall while penetrating into the pile at full throttle, touch the brake lightly for short periods and, at the same time, tip-back the bucket slightly (decreasing the digging angle) by pulling back momentarily on the bucket control lever (Fig. 30). After the bucket is loaded, and retracted, it is lifted by pulling the boom control lever to the "RAISE" position. Return the raise control lever to the "NEUTRAL" position when the lift cylinders reach the end of their stroke. Otherwise, the hydraulic pump is subjected to excessive load. Normally, the accelerator pedal should be fully depressed during the entire loading cycle.

When using the bucket to load material that is difficult to break loose, the boom control lever may be placed in the "FLOAT" position, while "breaking out" with the dump cylinders, so that the heel of the bucket is lower than the cutting edge. This permits using the curved bucket bottom as a fulcrum point for greater leverage and "increased breakout" force. If the material is hard to penetrate, the bucket can be worked into the pile by alternate back and forth movement of the bucket control lever.

Generally, the first speed forward is the most satisfactory speed for loading. Depending on operating conditions, any speed in reverse may be selected to maneuver the loader. The torque converter reduces the possibility of wheel spinning.

However, short tire life will result if the wheels are allowed to spin excessively.

Although the brakes can be actuated with either the left or right brake pedal, the loader is controlled more easily and safely by applying the right foot on the accelerator and the left foot ready for the brake at all times.

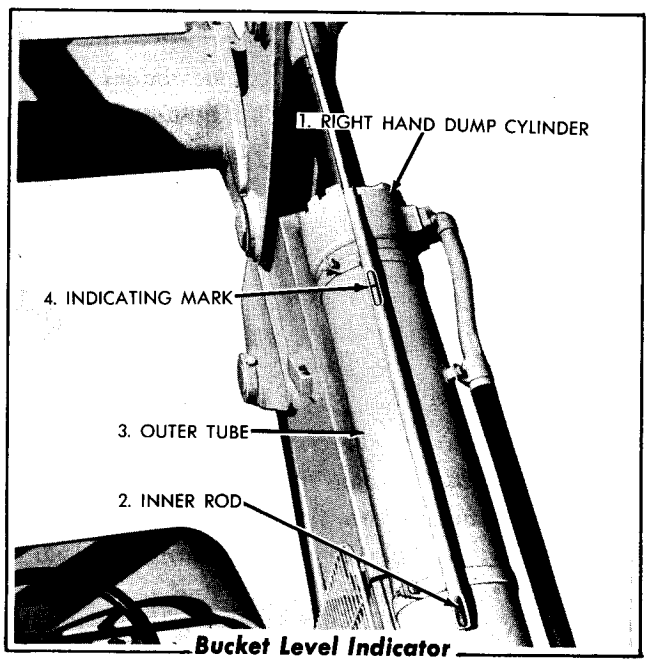


FIG. 31

The bucket is dumped by pushing forward on the bucket control lever (Fig. 30). The speed of the dumping operation is controllable by this lever. If the material being handled has a tendency to stick to the bottom of the bucket, it can be jarred loose by bumping the stops. This is done by moving the bucket control lever back and forth rapidly. This should be done only under extreme sticking conditions.

By placing the boom control lever in its "FLOAT" position rather than in its "DOWN" position, it is possible to retract the bucket with the bucket control lever at the same time that the booms are being lowered.

This practice is particularly advantageous on short hauls and stockpile work. A check valve that is located in the top left side of the hydraulic control valve is connected to the boom lowering lines, so that oil may be transferred from the bottom side to the top side of the lift cylinder as required to keep the cylinders full of oil at all times. With the bucket empty and in the "FLOAT" position, the bucket is automatically stopped about three feet above the ground when lowering the bucket in the full tip-back position. This is a reminder to begin lining-up the bucket level indicator (located on the right dump cylinder) to assure the correct "dig" position by the time the bucket reaches the ground.

It is possible to create high pressures in the dump cylinders by such abnormal practices as back-dragging or bulldozing with the bucket partially dumped.

Although two safety valves are provided in the hydraulic system for the dump cylinders (in addition to the main relief valve) to protect the loader linkage from these high pressures; such practices should be avoided whenever possible. It is also possible to create high pressures within the dump cylinders by raising the boom above the horizontal position after the bucket is tipped over to a "back-dragging" position. Always return the bucket to the dig or carry position before raising the boom above the horizontal position.

One safety valve (set at 2050-2100 P.S.I.) for the dump cylinders is located inside of the hydraulic tank on the right side of the manifold plate (Fig. 74) and is connected into the bucket dump line. Another safety valve (set at 2600-2650 P.S.I.) is located on the left side of the manifold plate and is connected into the bucket return line. A third safety valve (set at 2200-2250 P.S.I.) is located in the left hand lift tube. All these valves have been properly adjusted at the factory and require no further adjustment in the field. A fourth valve, (non-adjustable) is a "one way" compensator check valve, located inside the bucket control spool in the control valve and connects the low pressure side of the main control valve to the tail end of the dump cylinders. When loads are carried for any appreciable distance, the bucket should be carried as close to the ground as possible because the best overall balance is obtained in this position, and with the bucket tipped back, the load can be carried low without spillage.

C. Stopping the Loader

To stop the loader, release the accelerator pedal, move the transmission lever to its neutral position, and apply the brakes. If the loader is parked on a grade where there is a possibility of its rolling, lock the parking brake in its applied position by pulling the parking brake lever all the way back. As a safety precaution, always lower the bucket to the ground when the loader unit is not in use, or when making repairs, adjustments, or servicing. Allow the engine to idle for at least five minutes so that the engine and transmission can cool gradually and uniformly and the turbocharger impeller speed may be substantially reduced before its supply of lubricating and cooling oil is cut off; then turn the switch to the "SOLENOID-FUEL" position and allow the engine to come to a full stop. Release the key and it will return to the "OFF" position.

D. Push Starting and Towing

CAUTION: *The loader should never, under any circumstances, be pushed or towed to start the engine.*

When the loader is being towed or pushed, with the drive line connected, the power flow going from the loader's wheels, through the drive line and into the transmission and converter, causes certain parts in the transmission and converter to rotate. Even though there is little or no load on these parts, they require sufficient lubrication to prevent damage due to friction and heat. Since the lubrication requirements of the transmission will not be fully satisfied while the loader is being towed or pushed, it is imperative that BOTH drive shafts be disconnected when travel of any distance is done in this manner.

The maximum distance the loader may be towed with the drive lines connected is ½ mile and at low speed. Disregard for the above limits can result in serious damage to the transmission, necessitating a complete overhaul of this unit.

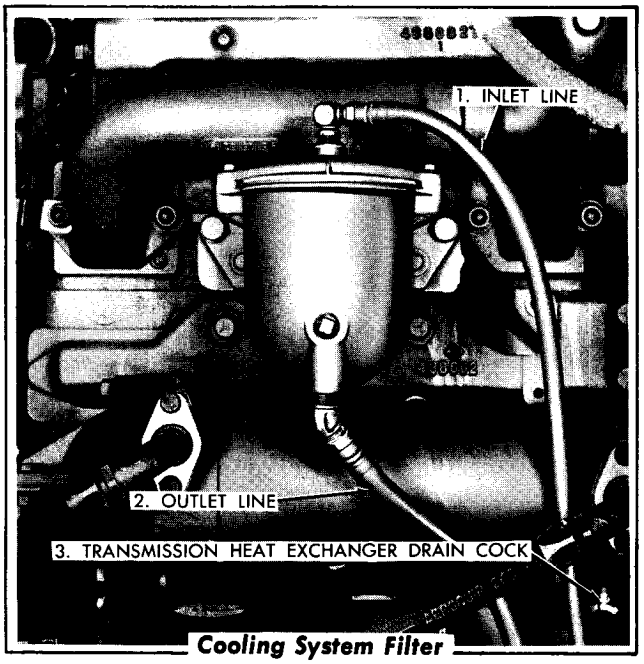
ENGINE COOLING SYSTEM

A. DESCRIPTION OF SYSTEM

The engine cooling system includes the water pump, radiator, thermostat, engine temperature gauge, cooling fan, cooling system filter, and the water passages in the cylinder block and cylinder head. In addition, the engine cooling system cools the air compressor, transmission oil cooler and the engine oil cooler (Fig. 24). The water pump draws the coolant from the bottom of the radiator and circulates it through the engine and accessories. The coolant is discharged from the cylinder head into the water outlet manifold and passes through the thermostat housing and the radiator inlet to the tank at the top of the radiator. The coolant is cooled as it passes from the top to the bottom of the radiator core by the pusher type cooling fan.

The thermostats, located in the thermostat housing at the rear of the water manifold of the engine, operate automatically to maintain the coolant at a normal operating temperature.

A double acting valve in the radiator cap is provided for relieving pressure due to expansion (from heating of coolant), and allows atmospheric pressure to enter when contraction (due to cooling of

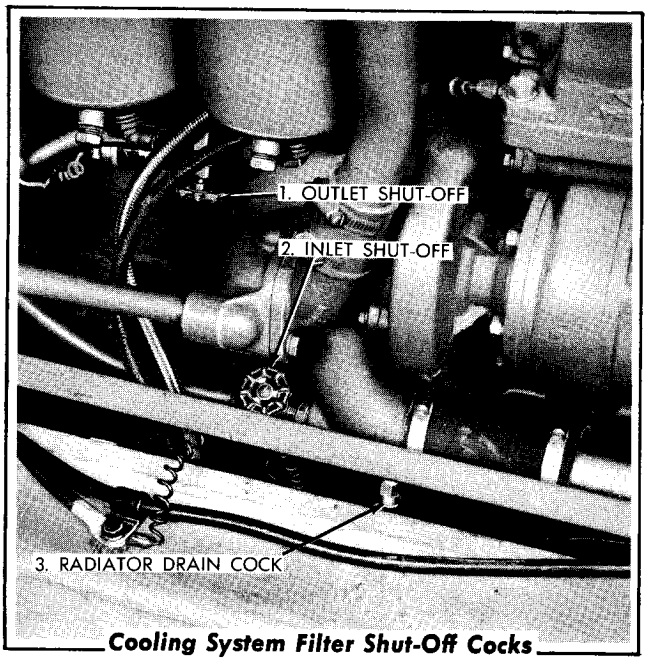


Cooling System Filter

FIG. 32

coolant), occurs. Because this is a pressure type cooling system, it is necessary to keep the radiator cap tight.

CAUTION: *Do not remove the pressure type radiator cap while the coolant is near 212° F., as the coolant will boil and splash the person removing the cap.*



Cooling System Filter Shut-Off Cocks

FIG. 33

B. GENERAL MAINTENANCE

Keep radiator air passages free from leaves, trash and other material which will restrict the flow of air through the radiator. All leaks in the cooling system must be corrected as soon as they are evident. The fan and generator drive belts must be kept properly adjusted.

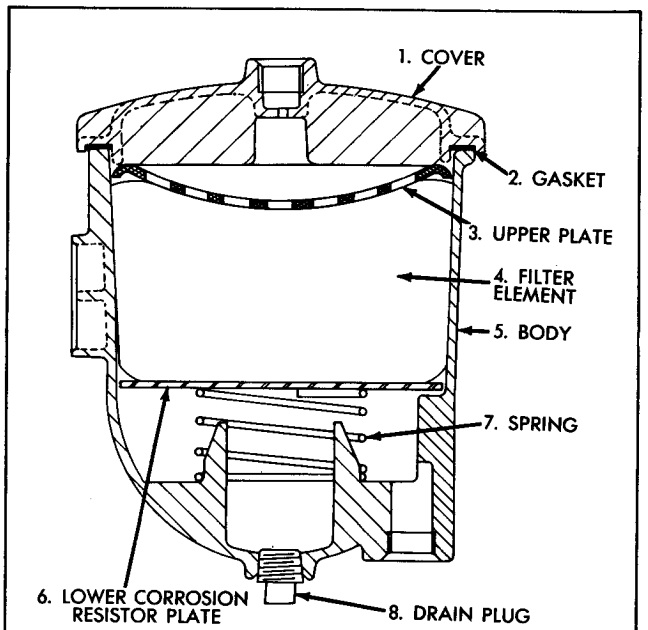
The replaceable, element-type, cooling system filter (Fig. 32) is mounted on the exterior of the engine and is connected to the engine cooling system with by-pass hose connections. Coolant from the outlet side of the water pump passes through the filter and is returned to the suction side of the water pump.

The purpose of the filter is to extend engine life by establishing and maintaining a rust, scale and corrosion free cooling system.

The filter contains a replaceable type, chemically activated element which performs the following functions:

1. Mechanical Filtration

Dirt and foreign matter, suspended in the coolant, is trapped by the filtering medium of the element and prevented from circulating through the cooling system. This action assists in keeping the radiator tubes and water passages free of sludge and dirt and also reduces wear on water pump components.



Cooling System Filter — Sectional View

FIG. 34

2. Acid-Alkali Level

Buffering agents, contained in the element, condition the coolant to meet the most desirable acid-alkali level. This reduces rust formation and corrosion of metal surfaces of the coolant system.

3. Water Softening

An ion exchange resin, contained in the element, removes water hardness components from the coolant. This prevents the formation of scale on the metal surfaces within the cooling system. As the demineralized coolant is circulated through the system, any existing scale present in the system is gradually dissolved and subsequently removed by the softening action of the resin.

4. Inhibition

A combination of chemical inhibitors, contained in the element, provide a protective film over the entire cooling system area.

5. Electrolyte Control

A replaceable type lower corrosion resistor plate (Fig. 34) is provided in the filter body to control electrolytic action. Control of electrolytic action prevents pitting of the metal tubes and walls within the cooling system.

The cooling system filter element should be changed after each 300 to 500 hours of operation, or more often depending upon the amount of coolant added to the cooling system during this operating period.

Each time the filter element is replaced, the lower corrosion resistor plate (Fig. 34) should be inspected and buffed to a bright finish with a wire brush or wheel. When the plate becomes thin and pliable, or develops large jagged holes, it MUST be replaced.

Replace the cooling system filter as follows:

1. Thoroughly clean filter body and surrounding area.
2. Close inlet and outlet shut-off cocks (Fig. 33).
3. Remove drain plug from bottom of the filter body and allow coolant to drain.
4. Disconnect outlet line from fitting in top of filter cover. Remove capscrews attaching filter cover to filter body and remove filter cover.
5. Lift upper plate and filter element out of filter body. Discard filter element. Remove lower corrosion resistor plate and spring from filter body.
6. Inspect and clean lower corrosion resistor plate as described above. Refer to Fig. 34 and install spring and lower corrosion resistor plate in filter body.
7. Install a new filter element in filter body. Refer to Fig. 34 and install upper plate in filter body.
8. Be certain gasket is in good condition, then install filter cover and secure with attaching capscrews. Open inlet and outlet shut-off cocks.
9. Operate engine until normal operating temperature has been reached. Remove radiator cap and check level of coolant. Add coolant if necessary.
10. Check cooling system for leaks and correct any leaks found.

    NOTE: *To obtain the most efficient performance from the water filter in a system using permanent type anti-freeze, a filter containing a Borate inhibitor is available from your "Allis-Chalmers" Dealer.*

It is recommended that one ounce of "Allis-Chalmers" Cooling System Conditioner be added to each five gallons of coolant when a rebuilt engine is first put back in operation. This Conditioner can be purchased from your "Allis-Chalmers" Dealer. When operating the engine with conditioner in the system, both the inlet and the outlet shut-off cocks of the cooling system filter MUST be shut off to prevent cooling solution from passing through the filter, otherwise the filter will trap out some of the ingredients present in the conditioner and will clog the filter element.

Operate the engine for 60 hours with conditioner in the cooling system, then drain the cooling system. If a new filter element was not installed in the cooling system when the engine was rebuilt, install a new filter element in the filter. Open inlet and outlet shut-off cocks of the cooling system filter. Fill cooling system to proper level with fresh water or permanent type anti-freeze solution. Soluble oil will no longer be required on units equipped with a Cooling System filter.

CAUTION: *Drain, flush and refill the cooling system with clean water before adding anti-freeze solution for cold weather operation. Never add a rust inhibitor to a cooling system that contains an*

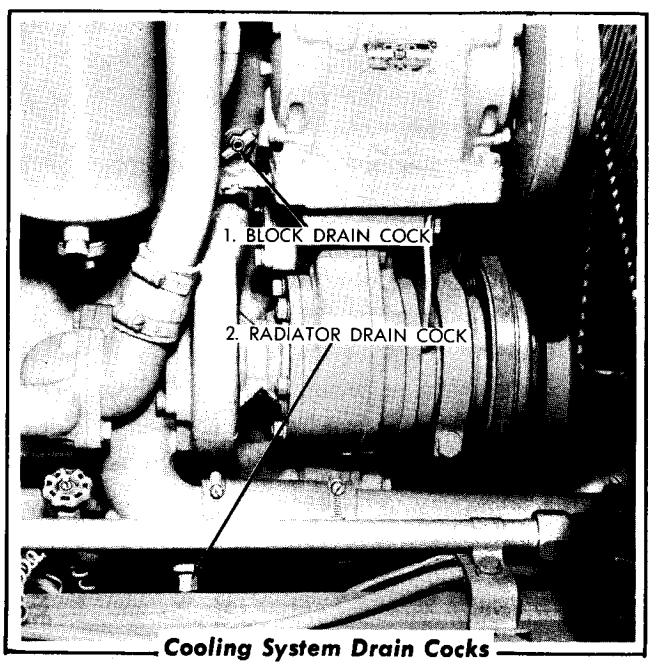
anti-freeze solution.

DO NOT remove the hood sides during warm weather operation, especially in loose abrasive material such as sand. With the hood sides removed the pusher type fan can draw to it the material picked up by the tires and force it through the radiator core with resulting rapid wear to the radiator. Testing has proven that the drop in engine operating temperature due to the removal of the hood sides, is negligible.

All leaks in the cooling system must be corrected as soon as they are evident. The fan, and water pump drive belts must be kept properly adjusted.

The most efficient engine operation is obtained with the coolant operating temperature held within the range indicated on the instrument panel gauge. Operating the engine with the coolant temperature below this range will result in incomplete combustion of fuel, higher fuel consumption with less power, and will cause harmful deposits within the engine.

Maintaining the normal coolant operating temperature depends mostly on proper functioning of the thermostats. If the coolant temperature remains consistently below normal, the thermostats should be removed, checked for proper operation, and replaced if necessary.



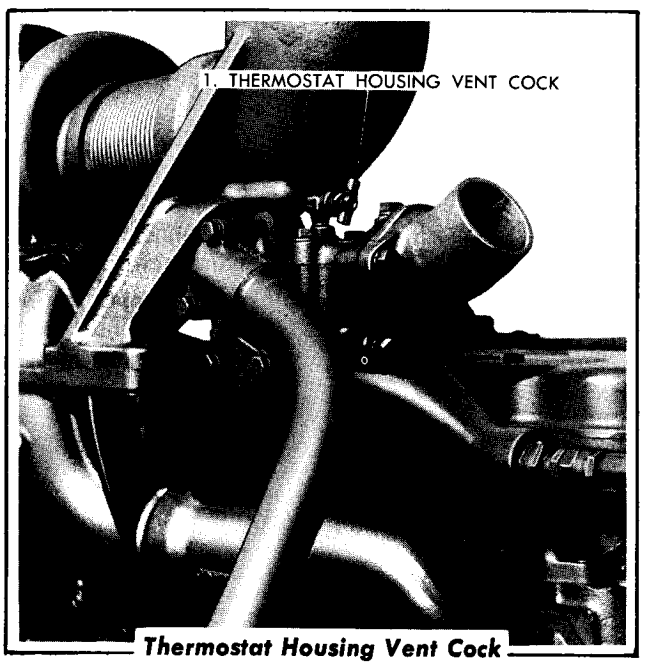
Cooling System Drain Cocks

FIG. 35

C. DRAINING OF COOLING SYSTEM

Remove the radiator cap and open the cylinder block drain cock, located on the left rear side of the cylinder block between the lubricating oil filters and the air compressor. Open the radiator drain cock located in the bottom of the water pump elbow and the drain cock in the bottom of the transmission heat exchanger (Fig. 32).

CAUTION: *When draining the cooling system in freezing weather, be certain that the coolant flows freely from the drain cocks and that the system drains completely.*



Thermostat Housing Vent Cock

FIG. 36

D. FILLING OF COOLING SYSTEM

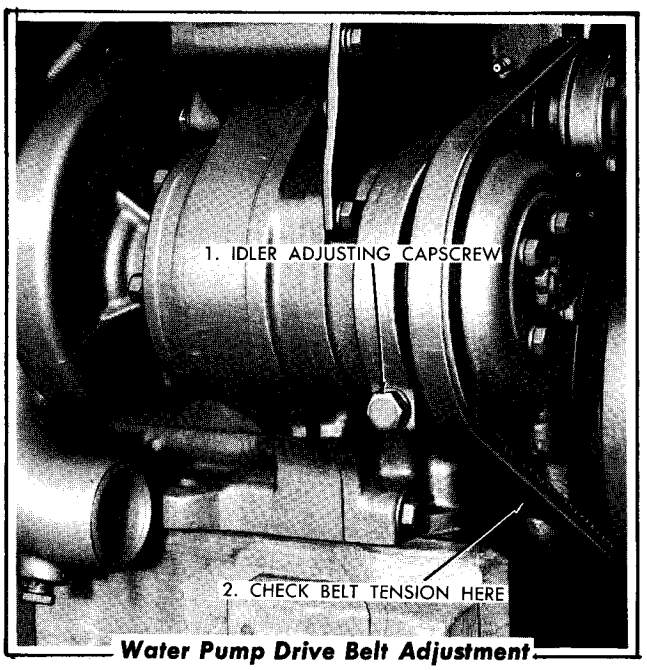
Close the drain cocks which were opened to drain the system in Par. C above. Fill the cooling system through the radiator filler cap opening until the coolant flows from the thermostat housing vent cock, then close the cock and continue to fill the system until the coolant is within approximately 2 inches of the top of the radiator and install the radiator filler cap.

E. WATER PUMP DRIVE BELT ADJUSTMENT

The water pump drive belt is correctly adjusted when the lower side of the belt, between the water

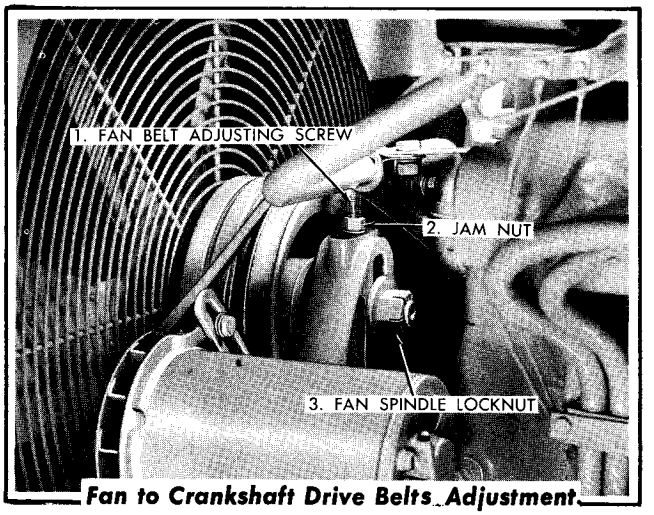
pump pulley and the crankshaft pulley, can be pressed upward by hand approximately ½". To adjust the drive belt proceed as follows:

1. Loosen capscrew securing water pump idler pulley mounting bracket to water pump.
2. Raise or lower mounting bracket and idler pulley until desired tension on belt is obtained.
3. Hold mounting bracket in this position and tighten capscrew.



Water Pump Drive Belt Adjustment

FIG. 37

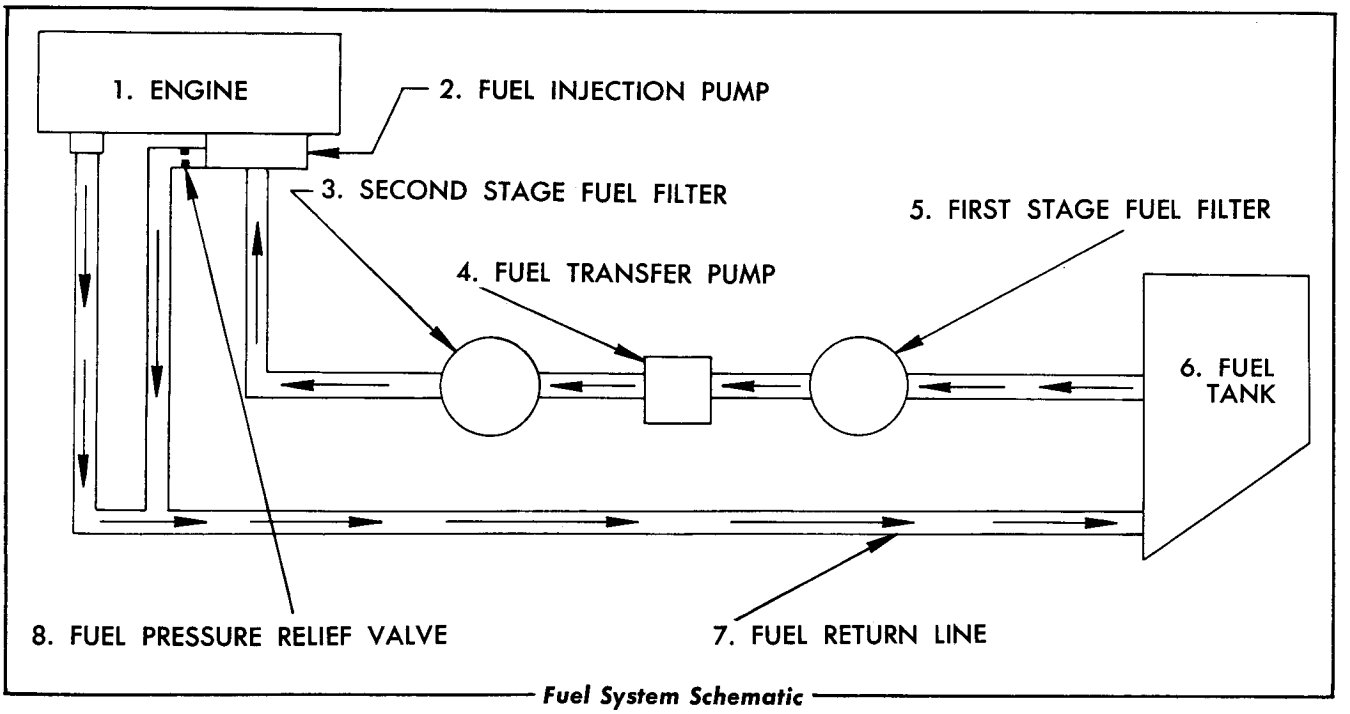


Fan to Crankshaft Drive Belts Adjustment

FIG. 38

F. FAN TO CRANKSHAFT DRIVE BELTS ADJUSTMENT

The fan to crankshaft drive belts are correctly adjusted when the sides of the belts can be pressed in ½" to ¾" at a point half-way between their respective pulleys. To adjust the belts, loosen the fan spindle locknut (Fig. 38). Loosen the jam nut on the fan belts adjusting screw and turn the screw in or out to obtain the proper tension on the belts. Retighten the jam nut and locknut.



Fuel System Schematic

FIG. 39

A. DESCRIPTION OF SYSTEM

The engine fuel system shown schematically consists of a fuel tank, first stage fuel filter, fuel transfer pump, second stage fuel filter, fuel injection pump, fuel nozzles and fuel lines. There are two fuel pressure systems; the low pressure system and the high pressure system.

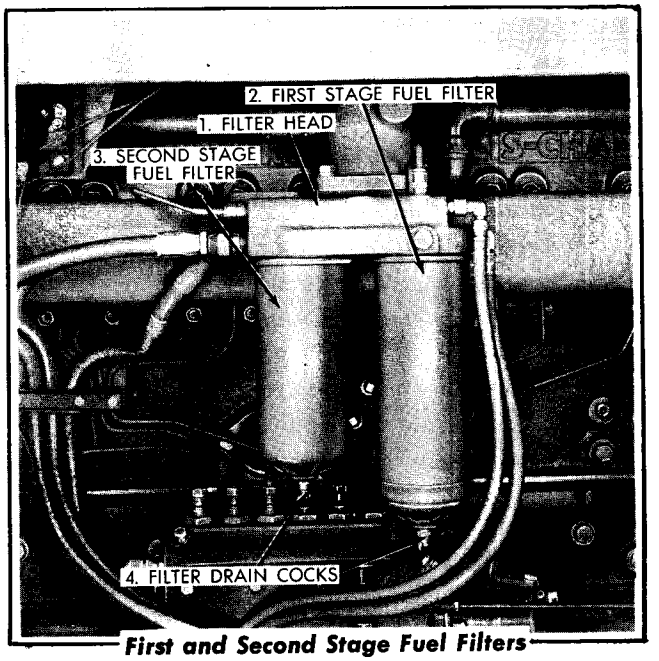
The low pressure system consists of the fuel tank, first stage fuel filter, fuel transfer pump, second stage fuel filter, fuel return manifolds and the fuel line leading from the fuel overflow valve in the hydraulic header section of the fuel injection pump to the fuel tank.

The high pressure system consists of the hydraulic header section, fuel nozzles and all high pressure fuel lines connecting the fuel injection pump to the fuel nozzles. The high pressure lines are seamless steel tubing.

The fuel is drawn from the fuel tank through the first stage fuel filter by the fuel transfer pump. After passing through the transfer pump it is directed to the second stage fuel filter. From the second stage filter the fuel, at transfer pump pressure, is conveyed by an external line, to the fuel sump in the header section of the injection pump. The amount of fuel necessary for combustion is taken from the sump, subjected to high pressure by the pump plungers and passed through the delivery valves to the injection nozzles. The fuel leaving the nozzles, enters the combustion chambers in a fine cone shaped spray. Excess fuel from the injection pump is returned, by an external line, to the fuel tank.

B. FUEL TANK AND DRAIN PLUG

A drain plug, located in the bottom of the fuel tank, provides a means for draining the tank when flushing and also acts as a sediment sump. Loosen the plug before starting the engine at the beginning of the day's operation in warm weather or at the end of the day's operation in freezing weather, and allow any water and sediment to drain. Tighten the drain plug when clean fuel runs out. Drain and flush the fuel tank and replace the fuel filters when a large accumulation of rust and scale is evident. The fuel tank should be filled at the end of each operating period rather than at the start. This will reduce the water content because a full tank is less subject to condensation.



First and Second Stage Fuel Filters

FIG. 40

C. FIRST AND SECOND STAGE FUEL FILTERS

1. Description

The first and second stage fuel filters each contain a replaceable type element. Dirt and sediment is collected by the first stage fuel filter and prevented from entering the fuel transfer pump. Any dirt or sediment passing through the first stage fuel filter and the fuel transfer pump is collected by the second stage fuel filter and prevented from entering the fuel injection pump.

2. Service

Open the drain cock in the bottom of each fuel filter shell daily, before the start of the day's operation in warm weather or shortly after the end of the day's operation in freezing weather, and allow any water or sediment to drain. Close drain cocks as soon as clean fuel runs out. Remove and discard the filter element in each filter and install new elements after every 500 hours of operation (more often if conditions warrant). Clogged fuel filter elements are usually indicated by irregular engine performance.

3. To Replace First Stage Fuel Filter Element

a. Clean all dirt from around filter head and shell. Loosen vent screw in top of hex-retaining nut and drain cock in the bottom of filter shell and allow fuel to drain.

b. Loosen hex-retaining nut in filter head until it is free from shell center bolt and remove filter shell from filter head.

c. Remove and discard filter element and shell gasket. Thoroughly wash and dry interior of filter shell.

d. Install a new filter element and push it down firmly so that up-turned edge of seat plate, attached to bottom of shell center-bolt, is firmly impressed into bottom of filter element.

e. Install a new shell gasket in position in lip of shell. Fill filter shell with CLEAN fuel. Hold filter shell in position under filter head and engage threads of hex-retaining nut with shell centerbolt and tighten hex-retaining nut securely. CAUTION: *Do not over-tighten retaining nut.*

4. To Replace Second Stage Fuel Filter Element

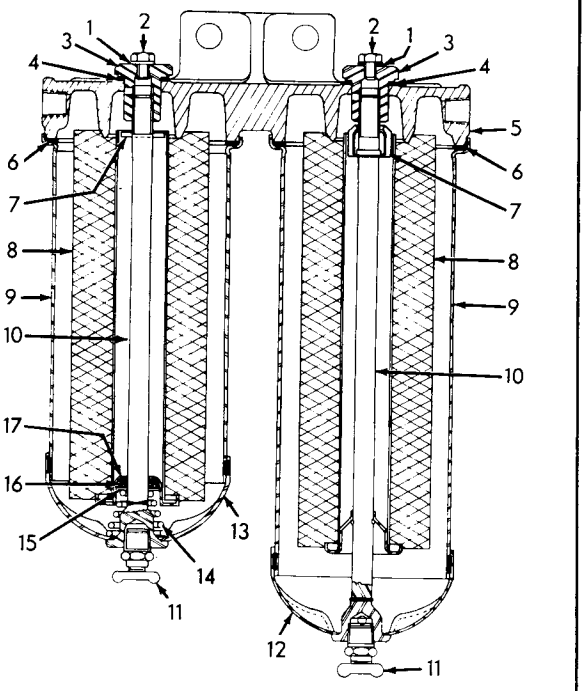
a. Clean all dirt from around filter head and shell. Loosen vent screw in top of hex-retaining nut and drain cock in bottom of filter shell and allow fuel to drain.

b. Loosen hex-retaining nut in filter head until it is free from shell centerbolt and remove filter shell from filter head.

c. Remove and discard filter element. Remove centering guide, element seating plate, seating plate gasket, metal washer and element spring from shell centerbolt. Discard seating plate gasket, metal washer and shell gasket.

d. Thoroughly wash and dry interior of filter shell. Close and tighten drain cock located in bottom of filter shell.

e. Place element spring (large end downward) in position on shell centerbolt and install



First and Second Stage Fuel Filter Details

FIG. 41

1. Vent Screw Gasket
2. Vent Screw
3. Hex-Retaining Nut
4. Retaining Nut Gasket
5. Filter Head
6. Shell Gasket
7. Centering Guide
8. Element
9. Shell
10. Centerbolt
11. Drain Cock
12. First Stage Fuel Filter
13. Second Stage Fuel Filter
14. Spring
15. Metal Washer
16. Seating Plate Gasket
17. Seat Plate

a new metal washer over shell centerbolt and down onto the element spring.

f. Install a new seating plate gasket in position in element seating plate, then install gasket and element seating plate in position on shell centerbolt. NOTE: *When installing element seating plate and gasket on shell centerbolt, install seating plate so that gasket contacts metal washer.*

g. Install centering guide in position on shell centerbolt and install a new filter element in position in filter shell. Install a new shell gasket in position in lip of filter shell.

h. Fill filter shell with CLEAN fuel. Hold filter shell in position under filter head, install hex-retaining nut and retaining nut gasket, and tighten retaining nut securely.

i. With engine running, check for fuel leaks around both fuel filters; correct any leaks found.

5. Hand Primer Pump

After having replaced the fuel filter elements or disconnected the pump to nozzle fuel lines, it may become necessary to bleed the air from the system. To bleed the pump sump, disconnect the fuel line from the over-flow valve and actuate the hand primer (Fig. 42) until fuel oil flows freely from the overflow valve. Reconnect the fuel line to the overflow valve.

To bleed the fuel discharge lines from the fuel injection pump to the nozzle holders, loosen the tubing nuts at the nozzle holders. Move the pump control rack to the maximum fuel delivery position and crank the engine until fuel oil flows at the loosened connections. Retighten the fuel discharge tubing nuts.

FUEL INJECTION PUMP

A. General

The injection pump was adjusted at the factory to provide for the proper horsepower and a full governed engine speed (under load) of 2000 R.P.M. The injection pump should require no adjustment during the warranty period. Should an adjustment become apparent while the loader is in the warranty period, contact your nearest authorized "Allis-Chalmers" Dealer.

B. Checking Engine Speed

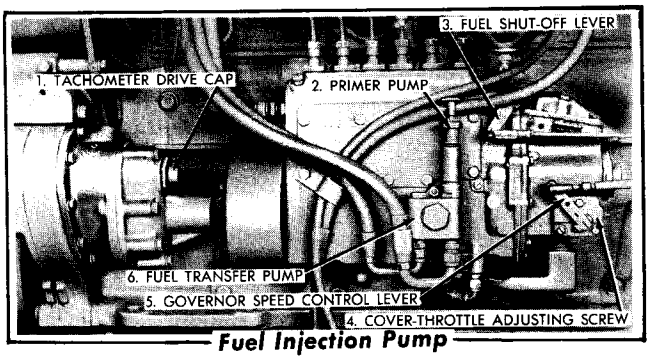
The injection pump very seldom gets out of working order. If the engine speed is irregular, check the fuel system and all other engine adjustments before changing the injection pump setting.

Operate the engine until normal operating range is indicated by the engine temperature gauge. Check the speed as follows:

1. Remove right hand engine side panel.
2. Remove cap from tachometer drive on engine accessory drive housing (Fig. 42).
3. Hold tachometer against the exposed end of tachometer drive shaft with accelerator pedal fully depressed. The tachometer should read 3210 to 3300 R.P.M. With accelerator released the tachometer should read 900 R.P.M. NOTE: *The tachometer drive in the engine accessory drive housing rotates at 1½ times engine crankshaft speed,* therefore, indicated readings of 3210 to 3300 R.P.M. on the tachometer would correspond to 2140 to 2200 crankshaft R.P.M. A reading of 900 R.P.M. on the tachometer would correspond to 600 crankshaft R.P.M.

C. Low Idle and High Idle Engine Speed Adjustments

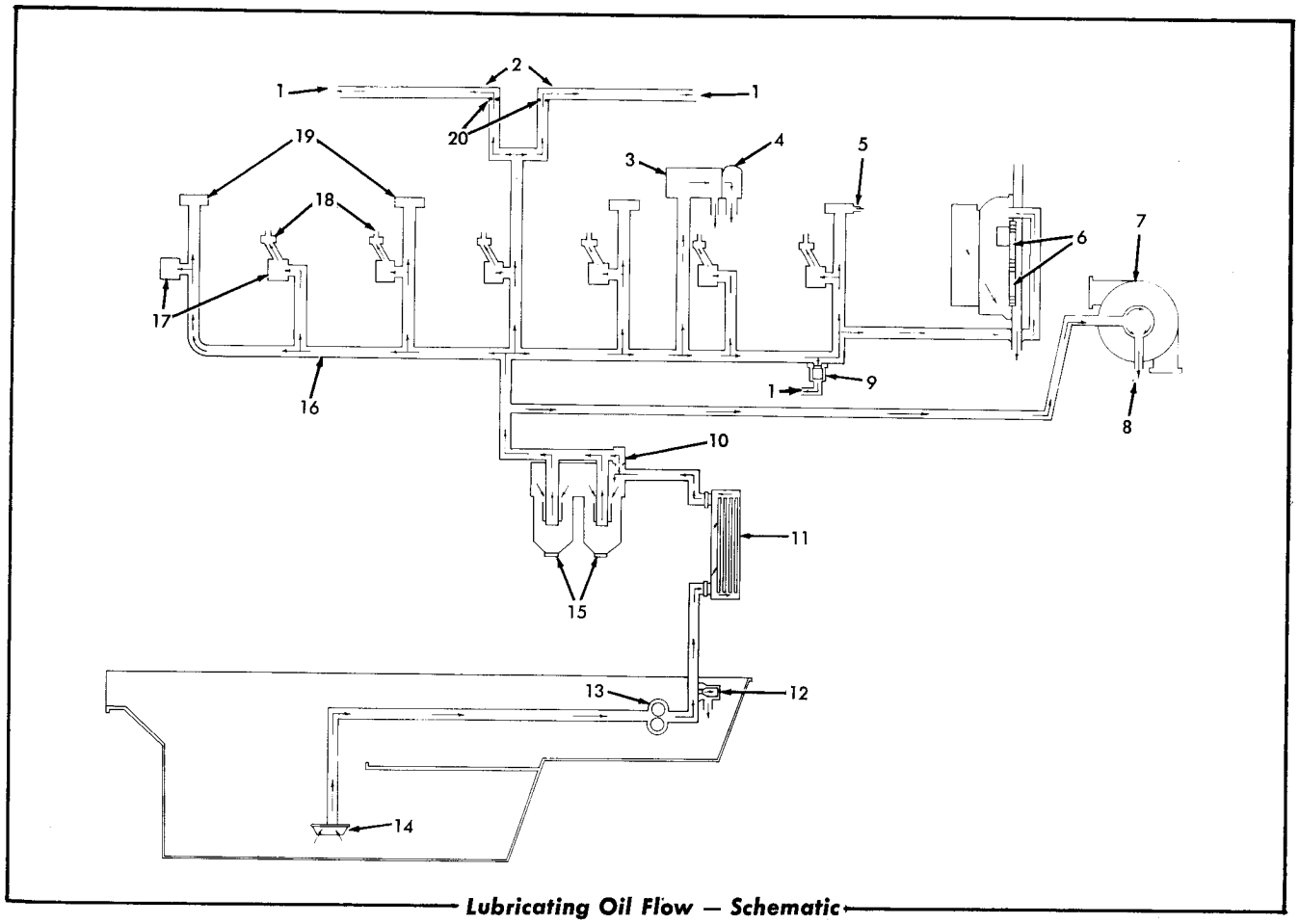
Before changing the high idle speed, with accelerator pedal fully depressed, and the low idle speed, with the accelerator pedal fully released, be certain that the throttle control linkage moves the governor speed control lever through its full travel. To adjust the engine speed, proceed as follows:



Fuel Injection Pump

FIG. 42

1. Disconnect throttle control rear rod from governor speed control lever so that lever may be moved by hand.
2. Remove capscrew and cover (Fig. 42) over throttle adjusting screws.
3. With engine running, loosen jam nut on the low idle adjusting screw. Hold the governor speed control lever toward the rear so that control lever shaft stop plate contacts low idle adjusting screw. Turn low idle adjusting screw "in" as necessary to increase, and "out" as necessary to decrease low idle speed. When a speed of 900 R.P.M. is indicated on tachometer (600 crankshaft R.P.M.), hold low idle adjusting screw and tighten jam nut.
4. With engine running, loosen the jam nut on high idle adjusting screw. Hold governor speed control lever toward front so that the control lever shaft stop plate contacts high idle adjusting screw. When, by rotating the adjusting screw, a speed of 3210 to 3300 R.P.M. is indicated on the tachometer (2140 to 2200 crankshaft R.P.M.), hold high idle adjusting screw and tighten jam nut.
5. Replace adjusting screw cover with its capscrew.
6. Connect throttle control rear rod to governor speed control lever.
7. Install right hand engine side panel.



Lubricating Oil Flow — Schematic

FIG. 43

1. Returns to Oil Pan
2. Valve Rocker Arm Shafts
3. Fuel Injection Pump
4. Governor
5. To Camshaft Gear
6. Accessory Drive Gears
7. Turbocharger
8. To Gear Train
9. Pressure Regulating Valve
10. Oil Filter By-Pass Valve
11. Engine Oil Cooler
12. Lubricating Oil Pump Pressure Relief Valve
13. Lubricating Oil Pump
14. Oil Pump Suction Screen
15. Lubricating Oil Filters
16. Main Oil Gallery
17. Main Bearings
18. Connecting Rod Bearings and to Piston Pins (Drains Back to Oil Pan)
19. Camshaft Bearings
20. Orifice in Rocker Arm Shaft (Located in No's. 3 and 4 Rocker Arm Bracket Positions)

A. DESCRIPTION

The engine is pressure lubricated throughout by a gear type lubricating oil pump, driven by the oil pump driving gear in mesh with the crankshaft gear.

An external oil line, extending from the lubricating oil filter head to the turbocharger, is provided for the flow of lubricant to the turbocharger. An external oil line, extending from the bottom of the turbocharger to the right side of the engine block, returns oil from the turbocharger to the engine oil pan.

The engine lubricating oil filters, located on the right side of the engine, are of the full-flow type and contain replaceable type elements. A drain plug in each filter body permits draining of the filters when replacing filter elements. New elements must be installed each time the oil in the crankcase is changed (after each 200 hours of operation) or more often if conditions warrant.

B. TO CHANGE ENGINE OIL AND REPLACE OIL FILTER ELEMENTS

The engine crankcase lubricant must be drained and refilled to the proper level with the specified lubricant and new filter elements installed in the engine lubricating oil filters after each 200 hours of operation or more often if conditions warrant. NOTE: *The engine should be at operating temperature when draining the lubricant.*

1. Remove drain plug from engine oil pan and allow oil to drain.

2. Install and tighten drain plug.

3. Service engine lubricating oil filters as follows:

   a. Thoroughly clean filter head, filter bodies and surrounding area. Remove oil drain plug from each oil filter body and allow filters to drain.

   b. Loosen body centerbolts and remove centerbolts, filter bodies and filter elements as assemblies from oil filter head.

   c. Remove filter elements from filter bodies and discard elements. Remove and discard body gaskets.

   d. Thoroughly wash and dry interior of filter bodies. Install new elements in position in filter bodies.

   e. Install filter body assemblies in position on filter head using new body gaskets. Tighten each body centerbolt to a torque of 75 to 80 lbs. ft. Install filter oil drain plugs and tighten securely.

4. Fill engine crankcase, through crankcase oil filler pipe, with 30 quarts of specified lubricant.

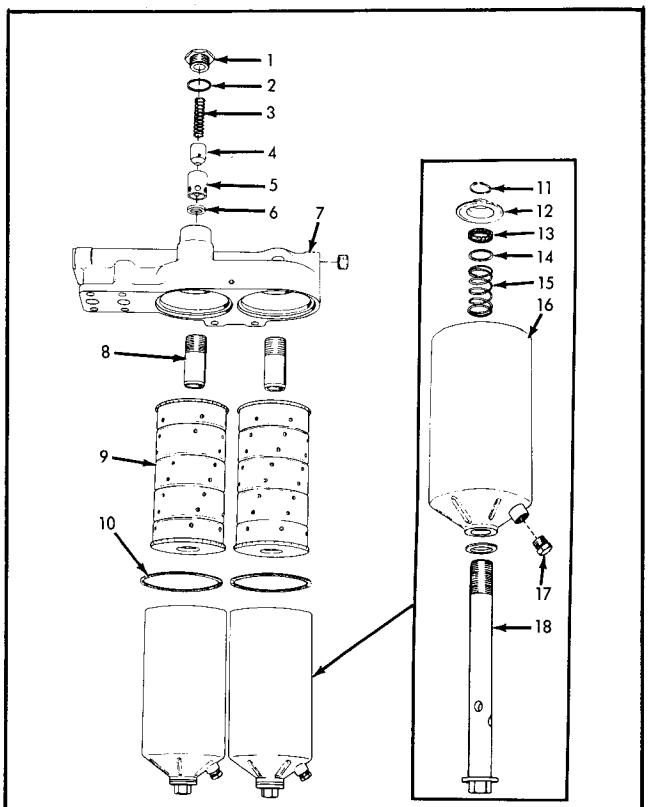
5. Check oil level after filling as follows:

   a. Hold fuel shut-off lever (Fig. 42) in off position (all the way forward) and crank engine with starter for 15 seconds. This will assure filling of filters and that lubricant has been pumped to engine components before engine is started. Release fuel shut-off and start engine. Operate engine at ¼ throttle for approximately 5 minutes.

   b. Stop engine and allow several minutes for oil to drain back before checking oil level.

   c. Using oil level gauge rod, check oil level and add oil as necessary to raise level even with uppermost mark on gauge rod.

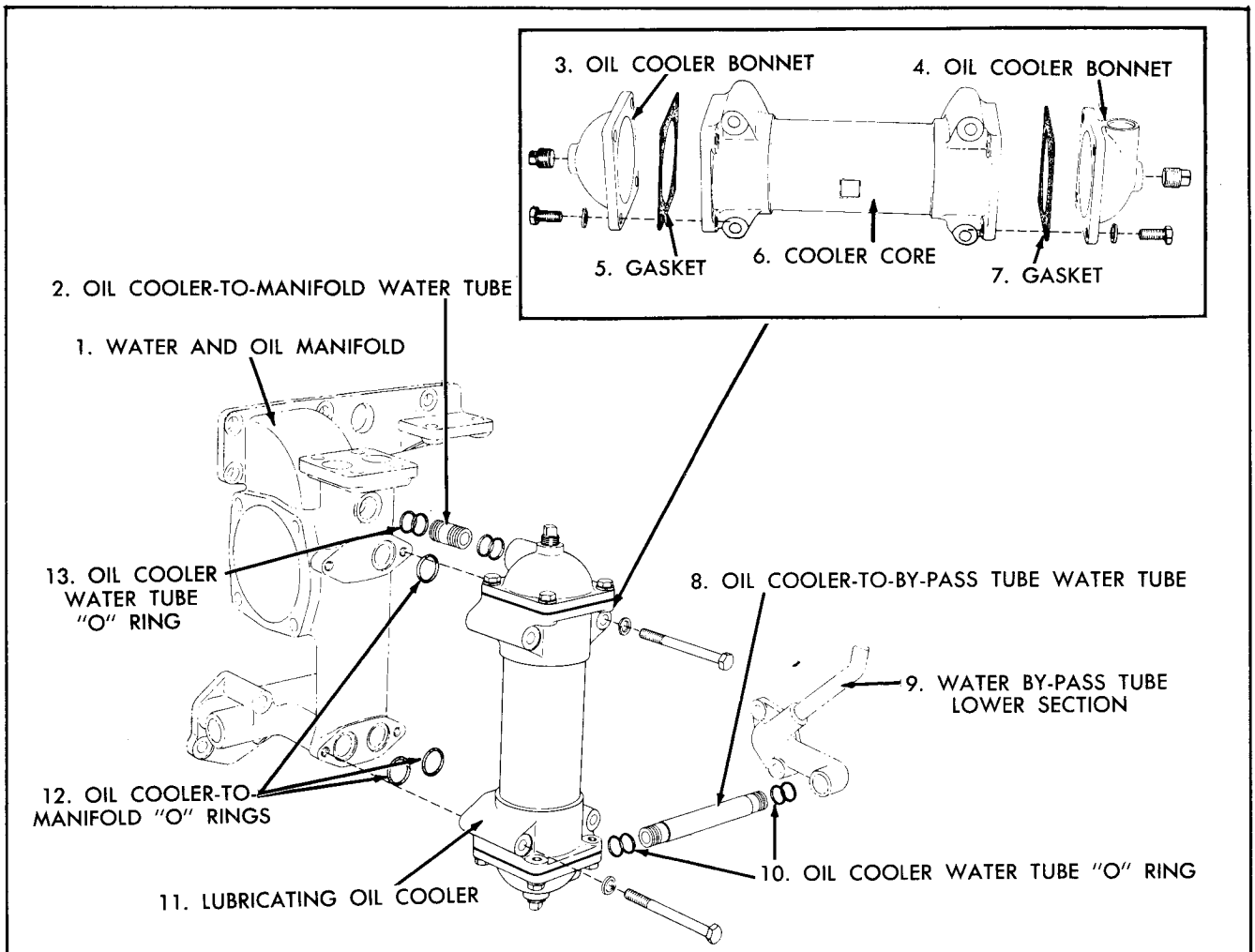
   d. Observe engine lubricating oil filters for oil leakage and be certain that body and body gaskets are properly installed.



Lubricating Oil Filter Details

FIG. 44

1. By-Pass Valve Cap
2. Gasket
3. Spring
4. By-Pass Valve Piston
5. Piston Sleeve
6. Piston Seat
7. Filter Head
8. Centerbolt Adapter
9. Filter Element
10. Gasket
11. Snap Ring
12. Element Adapter
13. Seal
14. Washer
15. Spring
16. Filter Body
17. Drain Plug
18. Centerbolt



Lubricating Oil Cooler Details

FIG. 45

C. LUBRICATING OIL COOLER

1. Description

The lubricating oil cooler (Fig. 24) located on the left side of the engine, consists of a corrosion resistant cooling core and tank. The water pump circulates coolant through the cooling core tubes and the engine lubricating oil pressure pump circulates oil through the tank, around the outside of the tubes of the cooling core, thereby controlling the oil temperature. The cooling core consists of small brass tubes which dissipate heat from the oil to the engine coolant. If proper lubricating oil maintenance procedure is followed, the oil cooler will function efficiently. However, if the oil in the engine is not changed at the recommended intervals, impurities will be deposited in the cooler and will restrict the flow of oil around the tubes of the cooling core. Restriction of the flow of oil around the tubes of the cooling core is usually indicated by a drop in oil pressure, due to the oil overheating. If this occurs, the oil cooler must be cleaned or a new one installed.

IMPORTANT: *It is absolutely necessary that the oil cooler unit be kept clean for proper oil cooling.*

A by-pass valve located in the lubricating oil filter head permits oil to pass directly to the engine lubricating system if the oil filters become clogged or if in cold weather the oil is too thick to flow freely through the oil filters.

2. Removal of Oil Cooler

a. Drain the cooling system (refer to "ENGINE COOLING SYSTEM").

b. Remove capscrews and lockwashers attach-

ing oil cooler to water and oil manifold.

c. Refer to Fig. 45 and move the top of oil cooler outward from manifold to free oil cooler-to-manifold water tube, move bottom of oil cooler to rear of engine to free tube between oil cooler and water by-pass tube lower section and remove oil cooler from engine.

3. Disassembly of Oil Cooler

Remove capscrews, lockwashers, and nuts attaching bonnets to the oil cooler core and remove bonnets and gaskets (Fig. 45).

4. Cleaning of Oil Cooler

Thorough cleaning of oil cooler may require use of special solvents. Several solvents for this purpose are available and must be used according to manufacturer's directions. Some of the solvents are as follows:

Excello Floor Cleaning Compound
Turco Cleaning Compound
No. 70 Stripper
Mixture of 3 parts Oakite No. 7 and
5 parts fuel oil
Bendix Cleaning Compound

To use the last named solvent, merely submerge the oil cooler into the solution for a sufficient length of time to allow the chemical action of the solvent to dissolve or loosen the sludge or other foreign matter. Flush the oil cooler thoroughly with live steam or spirits after cleaning, regardless of the type of cleaner used. NOTE: *If the oil cooler core is badly clogged, a new oil cooler core must be installed.*

5. Assembly of Oil Cooler

a. Using gasket cement, cement a new bonnet gasket to one face of oil cooler. Coat outer side of gasket with gasket cement, then place bonnet in position on oil cooler and secure with capscrews, lockwashers, and nuts.

b. Cement a new bonnet gasket to other face of oil cooler. Coat the outer side of gasket with gasket cement, then place other bonnet in position on oil cooler and secure with capscrews, lockwashers, and nuts. NOTE: *Refer to Fig. 45 and be certain water inlet and outlet openings in oil cooler bonnets are properly positioned in relation to each other and to oil cooler core.*

6. Installation of Oil Cooler

a. Refer to Fig. 45 and install new "O" rings in position in grooves machined in the O.D. of oil cooler-to-by-pass tube, water tube and insert water tube into counterbore in water by-pass tube lower section.

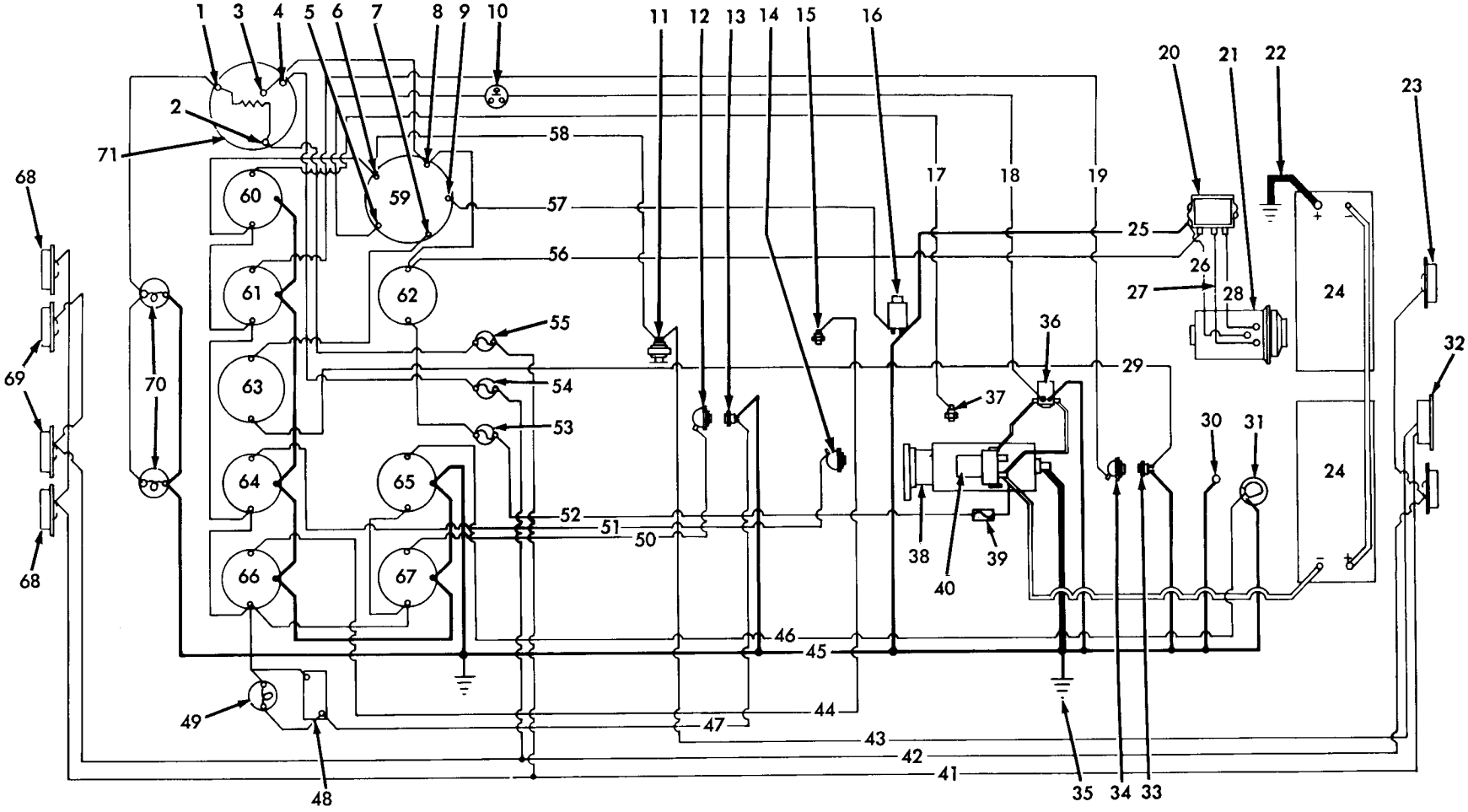
b. Refer to Fig. 45 and install "O" rings in position in the grooves machined in O.D. of oil cooler-to-manifold water tube.

c. Position "O" rings in three counterbores in the water and oil manifold (Fig. 45).

d. Install oil cooler in position on the water and oil manifold and secure with capscrews and lockwashers.

e. Fill cooling system.

f. Operate engine and check for oil and water leaks at oil cooler connections and correct any leaks found. Stop engine and check crankcase oil level; add oil as necessary, to raise oil level to "full" mark on oil level gauge rod.



Wiring Diagram — Schematic

FIG. 46

1. Instrument Lights
2. Headlights
3. Battery
4. Auxiliary Lights
5. Solenoid
6. Accessories
7. Ignition
8. Battery
9. Off
10. Push Button Starter Switch
11. Stop Light Switch
12. Air Pressure Sender
13. Low Air Pressure Warning Switch
14. Transmission Oil Pressure
15. Converter Temperature
16. Fuel Shut-Off Solenoid
17. Brown
18. White and Red
19. White
20. Voltage Regulator
21. Generator
22. Positive Ground
23. Back-Up Lights
24. 12V Battery
25. Black
26. Ground Terminal
27. Generator Terminal
28. Field Terminal
29. Yellow
30. Engine Ground
31. Fuel Tank Gauge Unit
32. Tail Light
33. Hour Meter Pressure Switch
34. Engine Oil Pressure
35. Frame Ground
36. Magnetic Switch (Primary Solenoid)
37. Engine Water Temperature
38. Starter
39. Fuse (30 amp.)
40. Starter Solenoid (Secondary Solenoid)
41. Orange and Black
42. Black and White
43. Red
44. Orange
45. Black
46. Light Green
47. Dark Blue
48. Warning Buzzer
49. Warning Light
50. Gray
51. Dark Green
52. Gray
53. Main Fuse (Ammeter — 30 Amp)
54. Auxiliary Light Fuse (10 Amp)
55. Headlight Fuse (10 Amp)
56. Light Blue
57. Yellow
58. Yellow and Black
59. Starter Switch (Key)
60. Engine Temperature
61. Engine Oil Pressure
62. Ammeter
63. Hour Meter
64. Transmission Oil Pressure
65. Fuel Gauge
66. Converter Temperature
67. Air Pressure
68. Headlights
69. Auxiliary Lights
70. Panel Lights
71. Light Switch

A. Description

The electrical system, which includes the starter, generator, generator regulator, ammeter and gauges, lights, and wiring, is a 24 volt system throughout. Two 12 volt wet cell storage batteries, located in a compartment beneath the engine radiator, are used to supply current for the system. Electrical energy drained from the batteries through the operation of the above named units is replaced by the generator. The output of the generator is controlled by the generator regulator to prevent overcharging of the batteries.

B. Batteries

Check the level of the electrolyte solution every 10 hours of operation. Maintain the solution level as indicated on the battery caps. Keep the battery and cable terminals tight and clean.

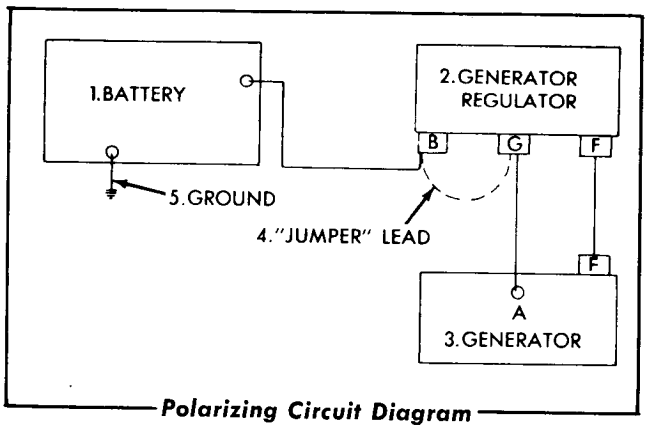
CAUTION: *To prevent the possibility of bodily injury, always disconnect the battery-to-ground cable (positive terminal) before disconnecting or repairing any of the heavy electrical cables.*

If corrosion occurs, clean the battery posts and terminals with a strong soda solution and coat the terminals lightly with petroleum jelly before connecting them again. The petroleum jelly will prevent further corrosion.

When the atmospheric temperature is below the freezing point, special attention should be given to the hydrometer readings of the batteries. A specific gravity of 1.270 to 1.215 at 80° F. is considered satisfactory for continued use. Specific gravity readings without correction for temperature are practically meaningless. For each 10 degrees that the temperature of the electrolyte is above 80° F., add 4 points to the hydrometer reading, and for each 10 degrees below 80° F., subtract 4 points to get the true specific gravity. For example, if the hydrometer reading is 1.250 and the electrolyte temperature is 20° F. (60 degrees below 80° F.), 1.250 minus 24 points equals 1.226 — the true specific gravity.

If the corrected readings are below 1.215, the batteries are not receiving sufficient charge. This might indicate that the generator or the generator regulator requires attention. If these units prove satisfactory, inspect the system for short circuits and for loose or corroded connections. In zero weather there is a danger of the batteries freezing if the specific gravity is below 1.100. Batteries with a specific gravity of 1.100 will freeze at

18° F.; batteries with a specific gravity of 1.220 will freeze at 31° below zero F. During freezing weather, any addition of water to the cells should be made after the engine is started at the beginning of an operating period to be certain that the water and electrolyte solution will be thoroughly mixed; otherwise it may freeze. The filler caps must be kept tight at all times and the tops of the batteries kept clean and dry.



Polarizing Circuit Diagram

FIG. 47

C. Generator and Generator Regulator

The generator, mounted on a bracket on the right rear side of the engine, is belt driven from the fan pulley. The generator and generator regulator are set to keep the batteries fully charged under normal conditions. The ammeter should indicate a good rate of charge for a short time after starting the engine, or until the generator replaces the energy drained from the batteries during cranking; then it will show little or no charge. It is important that the generator regulator be maintained in good condition so that the batteries will be kept charged.

Testing and adjustment of the generator and generator regulator should not be attempted without dependable testing equipment. Therefore, it is recommended that these units be taken to a dependable electrical repair shop when service is required.

IMPORTANT: *Whenever the generator has been removed for repairs or replacement, or when the generator leads have been disconnected and reconnected, the generator must be polarized BEFORE the engine is started.* Polarizing causes the current to flow in the normal direction through the field coils and will prevent vibration, arcing, and burning and sticking of the regulator points.

Polarize the generator as follows:

1. With a screwdriver or similar tool, raise one of the generator brushes to break contact with commutator.

2. Using a short "jumper" lead, momentarily touch "jumper" lead to "BAT" (Battery) and to "GEN" (Generator) terminal of generator regulator. NOTE: *Regulator terminals are marked "F" (Field) "GEN" (Generator), and "BAT" (Battery).*

3. Lower generator brush to make contact with commutator. CAUTION: *Do not run or test the generator on an open circuit. If it should become necessary to operate the generator without it being connected to the batteries, it should be short circuited. This can be done by disconnecting the lead connected to the "GEN" terminals of the regulator and connecting the end of the lead to a convenient ground.*

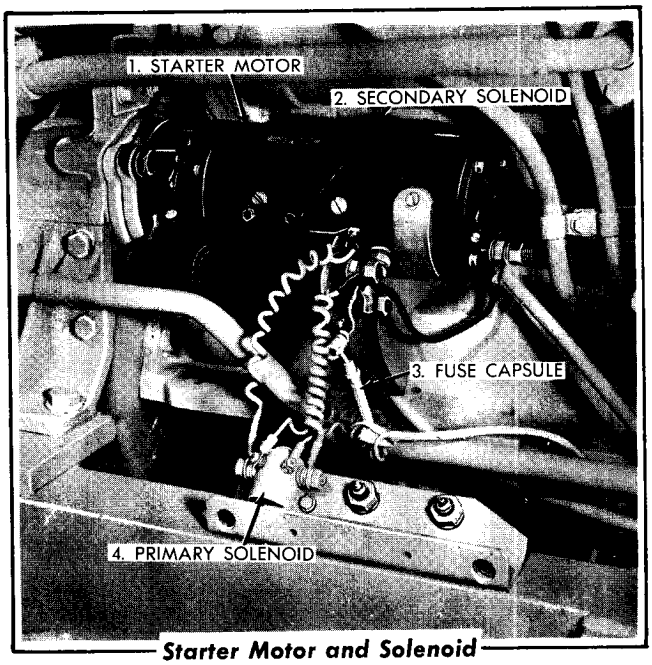
D. Starter

The 24 volt starter (Fig. 48) is mounted on the left side of engine flywheel housing. An overrunning clutch type drive is used to mesh the drive pinion of the starter with the flywheel ring gear for cranking the engine and to automatically disengage the drive pinion when the engine has started. The starter is actuated by a heavy-duty solenoid which is mounted on the starter and controlled by an auxiliary solenoid which in turn is actuated by the key switch on the instrument panel.

When the starter switches are closed it actuates the solenoids, which shift the drive pinion of the starter into mesh with the flywheel ring gear, and also closes the circuit between batteries and starter.

CAUTION: *When using the starter to crank the engine, and the engine does not start within 30 seconds, allow the starter to cool for 2 minutes before using it again.*

The starter very seldom causes difficulty; however, if it fails to crank the engine properly with fully charged batteries, check all the connections, being



Starter Motor and Solenoid

FIG. 48

sure that they are clean and tight. A firm pressure on the starter switch when starting the engine will minimize pitting of the contact points.

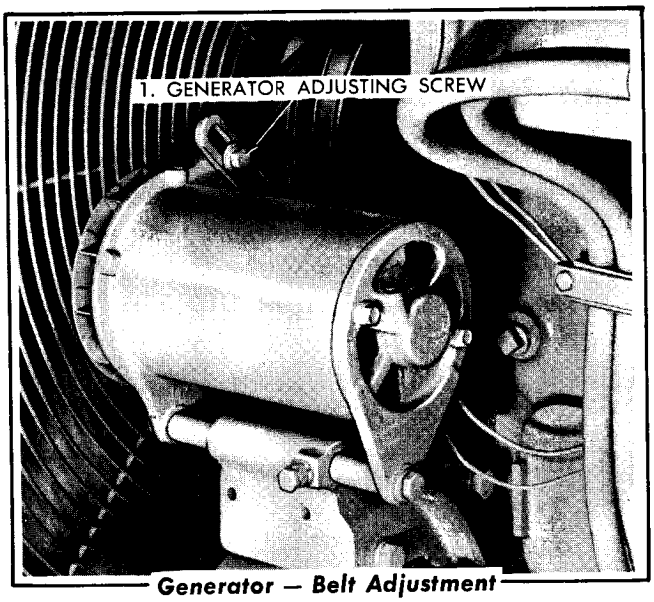
It is recommended that the starter be taken to a dependable electrical repair shop when service is required.

E. Electrical Cables

Inspect the electrical cables frequently to detect any loose connections or frayed insulation. Tighten the connections and wrap any frayed spots with friction tape to prevent short circuits. CAUTION: *To prevent the possibility of bodily injury, always disconnect the battery-to-ground cable before cleaning, repairing, disconnecting, or connecting any of the heavy electrical cables.*

F. Generator Drive Belt Adjustment

The generator drive belt is properly adjusted when the belts can be pressed inward by hand approximately ½" to ¾" at a point halfway between the generator and the fan pulley. To adjust the drive belt, loosen the generator adjusting arm capscrew (Fig. 49) and move the generator up or down to obtain the correct belt tension, then tighten the adjusting arm capscrew.



Generator — Belt Adjustment

FIG. 49

G. Lights

Four front lights, two rear lights and a tail light are used on the loader. All of these lights are vapor, moisture, dust and water proof, and, with the exception of the tail light, are of the sealed beam type. All of the lights are controlled by the light switch mounted on the instrument panel.

To replace the sealed beam element, pry the sealed beam element out of the rubber light frame and disconnect the wires in back of the element. Discard the old element.

Install new sealed beam element in reverse order of above.

H. Gauges

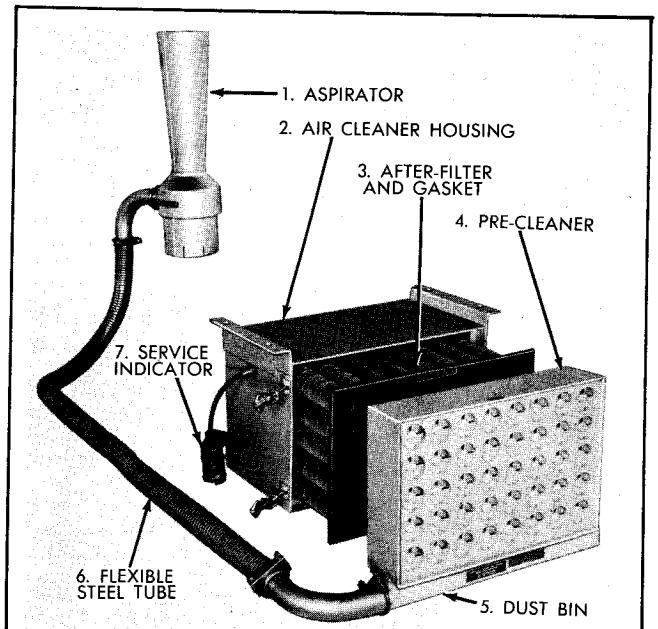
All the gauges are electrically operated by means of a "sender unit" located at each check point and a wire leading to the corresponding gauge on the instrument panel. Each gauge circuit is energized when the switch, located on the instrument panel (refer to "OPERATING CONTROLS AND INSTRUMENTS") is turned on. It is imperative that this switch be turned OFF each time the engine is stopped, to avoid discharging the batteries.

I. Fuses

The three fuse holders mounted in the center of the instrument panel contain the fuses for the (1) main fuse to ammeter; (2) fuse to auxiliary headlights, and back-up lights; (3) fuse to main headlights, tail light and instrument panel lights. They are 30 amps., 10 amps., and 10 amps. respectively. Fuses are changed by depressing the fuse holder cap slightly and giving it approximately ¼ turn counterclockwise. Remove the cap and lift out the fuse.

A 30 amp fuse is located in a capsule near the starter motor and is wired in series with the 30 amp main fuse on the instrument panel. This fuse protects the circuit between the "Starter-Battery" connection and the dash fuse.

AIR CLEANER

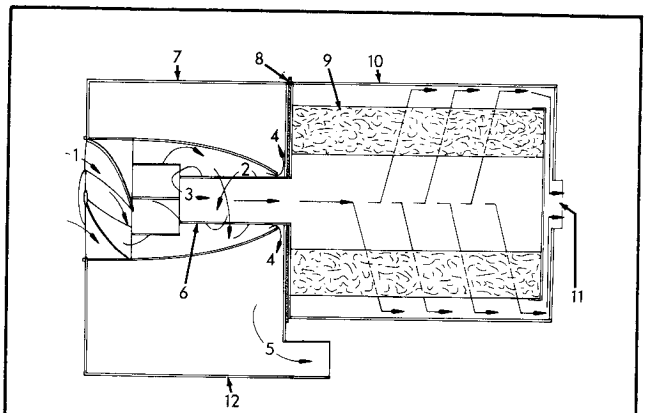


Air Cleaner Assembly

FIG. 50

A. Description and Purpose

The purpose of the air cleaner is to remove dust and other foreign matter from the air used by the engine. Efficient engine operation depends largely upon the proper servicing of the air cleaner. While lack of servicing will not allow dirt to override the filtering system or cause the filter element to rupture, it will, by restricting the flow of air to the engine, reduce the power output and cause smoking. Neither of these actions will affect wear on the engine but in effect are built in safety devices. However, to determine the condition of the filter element more accurately a "Service Indicator" is provided. A glance at this indicator, *while the engine is running,* will reveal the immediate condition of the air cleaner.



Air Flow Through Pre-Cleaner and Filter Element

FIG. 51

1. Incoming Air
2. First Reversal
3. Second Reversal
4. Incoming Air (10%) Plus Dust Particles
5. Air and Dust Particles Exit to Atmosphere Through Aspirator
6. Discharge Tube
7. Pre-Cleaner Housing
8. Gasket (Integral with After-Filter)
9. After-Filter
10. Air Cleaner Housing
11. Clean Air to Engine
12. Dust Bin

B. Operation

Air entering the vaned pre-cleaner (Fig. 51) sets up a cyclonic action. While traveling along the primary chamber, dust particles are centrifuged against the outer walls of the chamber and are carried off by a bleed-off of incoming air (10%) to the dust bin at the bottom of the pre-cleaner.

The remaining air reverses direction and spirals back along the discharge tube, centrifuging the

air again. This filtered air once more reverses direction and flows through the center of the discharge tube to the after (paper) filter. As the air passes from the center of the after filter, out into the filter housing it is filtered again by the many pleats of the multi-element after filter. The clean air then enters the engine.

Dust particles deposited in the dust bin at the bottom of the pre-cleaner, are removed by the exhaust aspirator. The aspirator, attached to the exhaust stack, utilizes the energy in the exhaust gases (by means of a Venturi device) to create an air flow through the dust bin. This air flow carries away the dust particles and ejects them into the atmosphere with the exhaust gases.

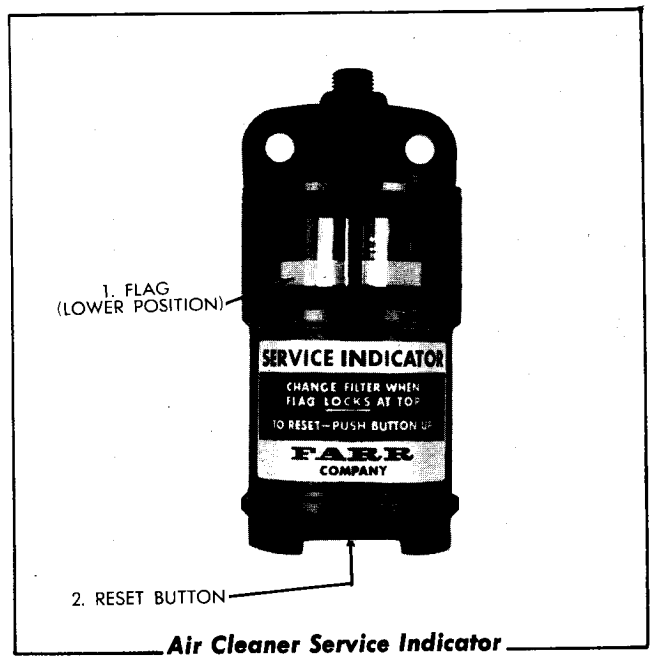
Sealing of the unit is accomplished by the gasket moulded into the face of the after filter cartridge. Thus, every time the filter cartridge is replaced the gasket is automatically renewed.

The Service Indicator, connected to the filter housing, *indicates while the engine is running,* the immediate condition of the filter cartridge. As dirt is trapped in the air cleaner cartridge the volume of air flowing through the cartridge is reduced and the pressure drop across the air cleaner to engine circuit increases. At a pre-determined point the flag in the indicator begins to rise. When the flag is at the top of its travel it is locked in position and servicing of the air cleaner is required.

C. Service

When the Service Indicator indicates that servicing of the filter is required, proceed as follows:

1. Loosen clamps attached to air cleaner housing and remove air pre-cleaner.



Air Cleaner Service Indicator

FIG. 52

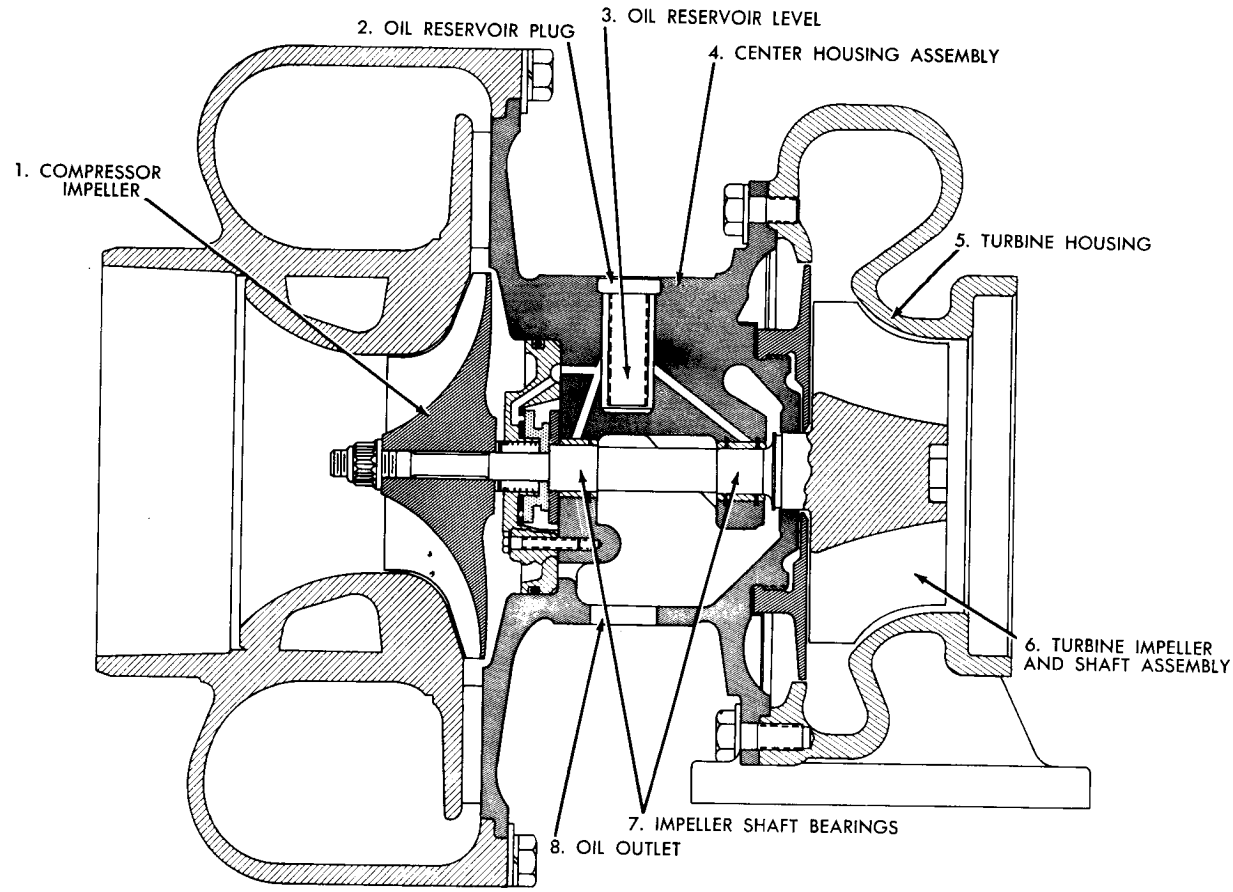
2. Carefully remove dirty filter cartridge from air cleaner housing and discard. DO NOT CLEAN OR RE-USE DIRTY FILTER CARTRIDGE.

3. Inspect inside of air cleaner housing to be sure it is free of all foreign material.

4. Place new filter cartridge in air cleaner housing. CAUTION: *Inspect each filter cartridge for shipping damage before installation.*

5. Replace air pre-cleaner and tighten wing nuts securely to assure good air seal.

6. Re-set Service Indicator by pushing re-set button on the bottom of indicator. Inspect flexible hose and clamps. Be sure all fittings are air tight.



Turbocharger — Sectional View

FIG. 53

A. DESCRIPTION

The engine is equipped with an "AiResearch" Turbocharger. The turbocharger is designed to increase diesel engine power output by supplying compressed inlet air to the engine. The unit compressor mounted on a common shaft with a single stage radial inflow turbine, a two-piece bearing carrier, a two-piece main housing, a turbine housing and a compressor housing. The turbine rotor, which drives the compressor impeller during operation, is driven by engine exhaust gases.

B. OPERATION

During operation of the engine, exhaust gases from the engine pass through the turbine nozzle and cause the turbine rotor to rotate. As the turbine rotor rotates, the compressor impeller, which is installed on a common shaft with the turbine rotor, rotates and thus supplies compressed air to the engine air intake manifold. During operation, the turbocharger responds to engine load demands by reacting to the flow of engine exhaust gases and the corresponding demand of the engine for inlet air.

The turbocharger is lubricated by filtered engine oil supplied directly from the engine lubricating system. Oil is directed from the lubricating oil filter head through an external oil line to the oil inlet side of the turbocharger, then to the turbocharger bearings. The oil is returned by gravity through an external oil line, extending from the bottom of the turbocharger to the rear of the timing gear housing, and returns to the engine oil pan.

The fuel injection pump and governor, as set by

the factory, permits operation of the loader at altitudes up to 8,000 feet above sea level. CAUTION: *BEFORE OPERATING THE LOADER AT 8,000 FEET, OR MORE, ABOVE SEA LEVEL, REFER TO HIGH ALTITUDE OPERATION, PAR. D, BELOW.*

C. SERVICE

1. Inspections

The following inspections should be made daily:

a. Inspect all connections to be certain that they are tight and secure and that there is no lubrication or air leakage.

b. Make certain that the exhaust manifold gaskets are in good condition and that the manifold stud nuts are tightened securely to avoid exhaust leakage.

c. Make certain that the air intake manifold gaskets are in good condition and that the manifold stud nuts are tightened securely to avoid air leakage.

d. Make certain that the turbocharger mounting bolts are secure.

e. Check and make certain the engine breather tube (Fig. 7) is open.

f. Operate the engine at rated output (approximately) and listen for excessive turbocharger noises. If a shrill high pitch whine is audible, stop the engine immediately. The whine is indicative of imminent turbocharger bearing failure and the turbocharger must be removed for inspection and repair. IMPORTANT: *Do not confuse the whine audible during run down (deceleration) with that which would indicate a bearing failure during operation.* If any other noises are audible, the turbocharger should be removed from the engine and disassembled and inspected.

2. Inspection and Cleaning of Turbocharger Compressor Impeller

The air cleaner-to-turbocharger hose should be removed periodically (after approximately every 500 hours of operation) and the compressor impeller visually checked for dirt build-up on the vanes of the impeller. The dirt build-up must never be allowed to exceed 1/16" thickness. An unequal accumulation of dirt build-up on the compressor impeller unbalances the rotating group which eventually results in turbocharger failure. Inspect and clean as follows:

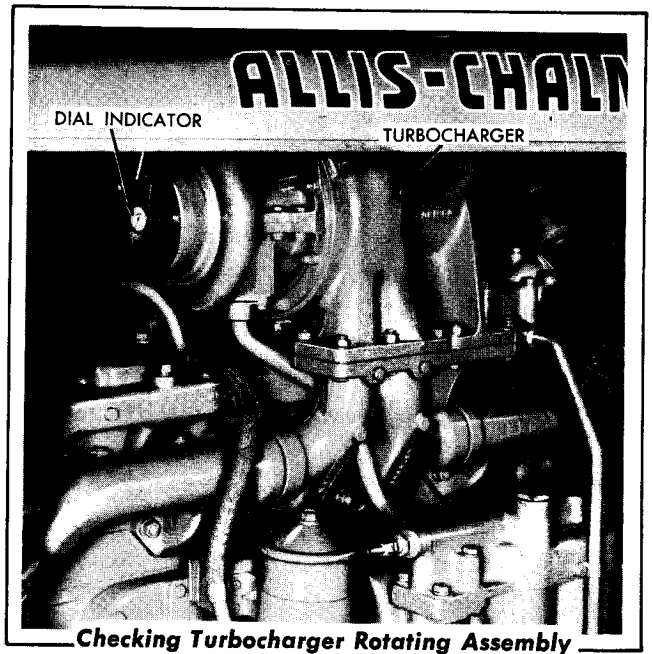
a. Thoroughly clean the turbocharger and the surrounding area. Remove the air cleaner-to-turbocharger hose. Visually inspect for dirt build-up on the compressor impeller. If a dirt build-up on the vanes is from 1/32" to 1/16" thick, cleaning of the vanes is necessary.

b. Loosen the upper hose clamp on the turbocharger-to-intake elbow hose. Disconnect air compressor-to-intake manifold line at intake elbow.

c. Remove the capscrews, lockwashers, plainwashers and nuts attaching the intake manifold elbow to the engine air intake manifold. Remove the intake manifold elbow and turn the elbow 180° on the engine intake manifold, so that the hose end of the elbow is toward the right side of the tractor. Secure the elbow to the intake manifold with two capscrews. NOTE: *Turning the intake manifold elbow 180° on the manifold keeps the opening away from the work area and also protects the intake manifold from foreign objects.*

d. Check the turbocharger rotating assembly cartridge for bearing wear by using a dial indicator as shown in Fig. 54. The end clearance should be within .004" to .008" and the radial clearance at the impeller nut should be within .004" to .009".

e. Using a soft bristle, cylindrically shaped brush (such as an injector cleaning brush), thoroughly clean the compressor impeller vanes. Special attention should be employed at this time as the brush alone may not remove all the foreign material packed on the vanes. To loosen this packed mate-



Checking Turbocharger Rotating Assembly Cartridge for End Clearance

FIG. 54

rial, use a piece of ¼" round hard wood dowel rod cut off square and having one flat side similar to one side of a chisel. If an oily substance is present, it may be necessary to use a cloth moistened in kerosene, fuel oil or cleaning solvent and wrapped around a piece of hard wood. IMPORTANT: *Under no circumstances should harsh caustic chemical cleaners be used.*

f. After the compressor inlet vanes have been thoroughly cleaned, start the engine and run it at low idle speed for approximately 10 minutes to clean out all loose particles of dirt and carbon and any solvent that has collected. CAUTION: *Do not operate the engine above low idle speed because higher engine speed will cause the turbocharger to overspeed. Keep hands, clothing and foreign objects away from the compressor inlet to avoid personal injury and damage to the turbocharger. Keep away from the air stream coming from the outlet opening of the compressor housing, as the carbon and dirt particles being blown out can cause bodily injury. Stop the engine.*

g. Reposition the intake manifold elbow, making certain the elbow-to-intake manifold gasket is in good condition. Secure with four plain washers, lockwashers and capscrews.

h. Properly position the turbocharger-to-intake elbow hose and hose clamp, making certain the hose is in good condition and is not crimped resulting in air leakage, then tighten the hose clamp.

i. Connect the air compressor-to-intake manifold line at intake elbow.

j. Install the air cleaner-to-turbocharger hose. Tighten the hose clamps securely, making certain the hose is in good condition and is not crimped resulting in air leakage.

D. HIGH ALTITUDE OPERATION

The fuel injection pump and governor unit, as set by the factory, permits the operation of the tractor up to 8,000 feet above sea level. Before operating the tractor at 8,000 feet or more above sea level, it is absolutely necessary to reduce the fuel input to the engine to avoid over-speeding of the turbocharger and to keep the exhaust temperature within the permissible limits; contact your nearest authorized "Allis-Chalmers" Construction Machinery Dealer so that he can make the proper adjustments.

VALVE ADJUSTMENT AND CYLINDER HEAD

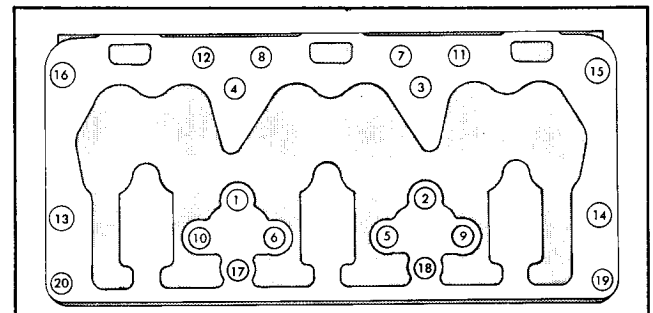
A. VALVES

The correct clearance (lash) between the ends of the intake and exhaust valve stems and the rocker arms is very important in a "DIESEL" engine, due to the high compression developed within the cylinders. Insufficient valve clearance will cause loss of compression, misfiring, and will eventually cause burning of the valves and valve seats. Excessive valve clearance will result in faulty engine operation, valve tappet noise, and cause rapid wear on the valve operating mechanism.

With the engine in the normal operating range the proper valve lash is: intake valves .015" and exhaust valves .020". After any mechanical work has been done which would disturb the valve lash, the intake valves may be set "cold" at .018" and the exhaust valves at .023" clearance so that the engine may be run and allowed to warm up to normal operating temperature. After engine has been "warmed" up to normal operating temperature, the valve clearance should be checked and readjusted if necessary. NOTE: *The firing order of the engine is 1 - 5 - 3 - 6 - 2 - 4.*

Check the valve clearance periodically and adjust when necessary to obtain the specified lash of .015" for the intake valves and .020" for the exhaust valves.

1. Operate engine until it reaches normal operating range and then stop engine.
2. Remove engine side panels and engine hood. Thoroughly clean valve rocker arm cover and surrounding area.
3. Remove retaining nuts and then remove rocker arm cover.
4. Crank engine until all valves for No. 1 cylinder are closed and valve push rods are at their lowest position.
5. Check clearance between valve stems and the rocker arms. Use a .015" feeler gauge to check lash of intake valves and a .020" feeler gauge for exhaust valves. Feeler gauge should pass between rocker arm and corresponding valve stem with a slight drag when valve lash is properly adjusted.
6. Adjust each valve by loosening locknut and turning adjusting screw clockwise to decrease clearance or counterclockwise to increase clearance as necessary. When proper clearance is obtained, tighten locknut and re-check to be sure that clearance did not change when locknut was tightened.
7. Repeat above operations on valves for other cylinders. Install rocker arm covers, being certain that cover gaskets are in good condition.
8. Replace engine hood and side panels.



Torque Sequence

FIG. 55

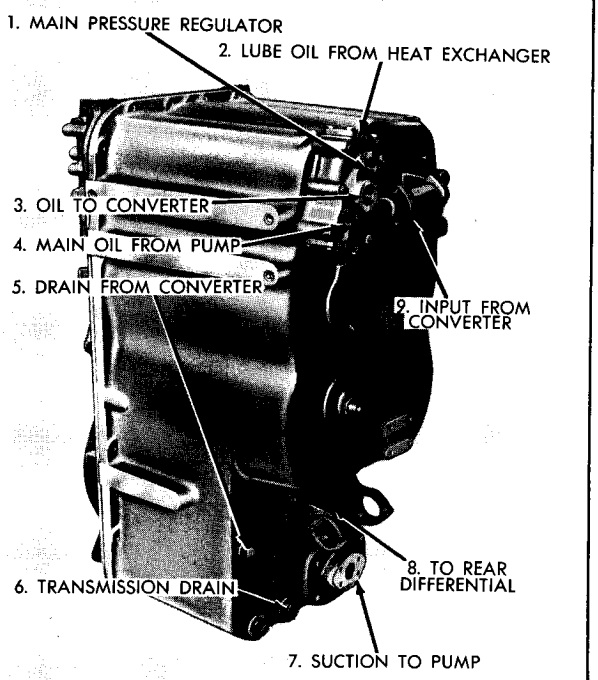
B. Cylinder Heads

The tightness of the cylinder head capscrews MUST be checked at least once after a new or rebuilt engine has been placed in operation. The checks must be made after the first 100 hours of operation. If the cylinder head capscrews are not maintained at the correct torque it is possible that cylinder head gasket trouble will be encountered. The correct torque for the $\frac{5}{8}$" capscrew is 180-185 lbs. ft. and the correct torque for the $\frac{3}{4}$" capscrews is 260-275 lbs. ft. NOTE: *Torques indicated are with clean lubricated threads.*

After the cylinder head capscrews have been torqued it will be necessary to check the valve tappets for proper clearance.

A. GENERAL

The torque converter and transmission are two separate but highly compact units. They are mechanically connected by a universal drive shaft and, by means of suitable external lines and fittings, share a common hydraulic circuit. An oil cooler, located on the left side of the engine block, serves to dissipate the heat of the transmission-converter hydraulic oil.



Transmission (Left Rear)

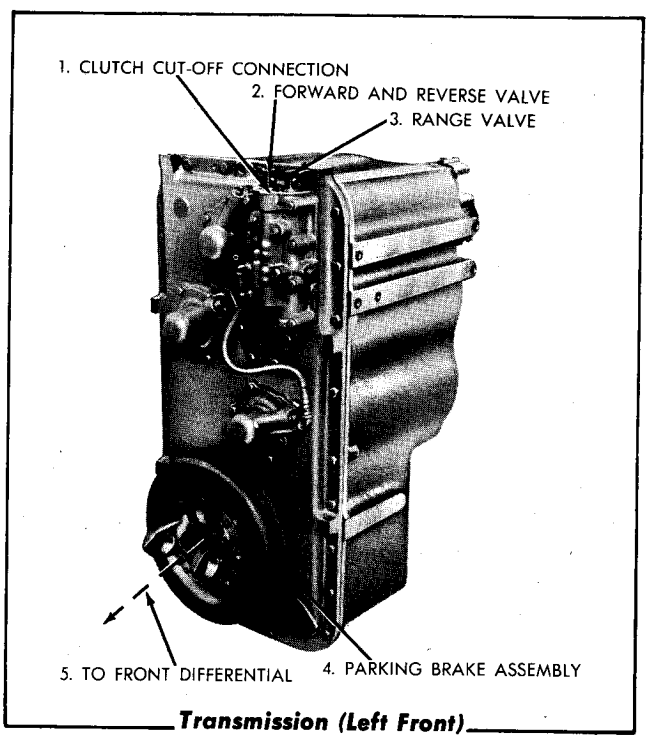
FIG. 56

A gear type pump, driven directly from the converter, serves as a converter charging pump. This pump delivers oil from the transmission sump to the main pressure regulator on the transmission housing. After leaving the charging pump and before it reaches the main pressure regulating valve, the oil passes through the full-flow oil filter. In cold weather if the oil is too thick to circulate freely through the filter or in the event the filter becomes clogged, a by-pass valve, located within the filter assembly, by-passes oil around the filter preventing a pressure build-up and subsequent material damage.

After the requirements of the range and directional clutches are satisfied, the excess gallonage is directed to the converter. Pressure within the converter is controlled by a relief valve set at 35-40 P.S.I.

Oil leaving the converter is piped to the transmission heat exchanger mounted on the left side of the engine block. Oil returning from the heat exchanger is directed to the pressure regulating valve. From here it is guided through cored and drilled passages to lubricate the clutches, gears, splines and bearings within the transmission. Excess lubricating oil is returned to the sump.

The converter is a heavy-duty, single stage, rotating housing, sumpless type and is driven directly by the engine flywheel through an internal-external tooth gear arrangement.



Transmission (Left Front)

FIG. 57

The transmission, of countershaft design, employs constant mesh spur gear trains actuated by three multiple-disc oil cooled and hydraulically actuated duplex clutches. The transmission valve assembly utilizes two main central spools; one offers four speed selections; and the other forward, neutral and reverse. This valve assembly includes a separate oil pressure line to prevent range clutch

downshifting when the directional control valve is placed in the neutral position. The clutch cut-off valve allows an automatic shift to neutral position when the brakes are applied. This is accomplished by a connection with the air brake system.

A parking brake and disconnect clutch are installed on the output shaft. The disconnect clutch may be engaged for four wheeled drive or disengaged for two wheeled drive.

1. Torque Converter Housing Assembly

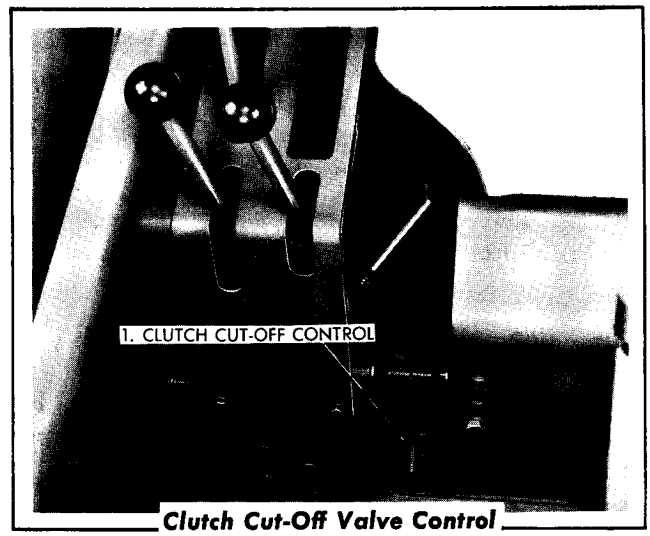
The torque converter multiplies torque automatically and instantaneously as required by the load. It also permits the engine to work at its most effective speed range and produce maximum horsepower whenever required. It provides a cushion between engine and transmission to dampen shocks and delivers an infinite variety of output ratios for maximum efficiency and fuel economy.

The torque converter is bolted directly to the engine flywheel housing and may be removed as a unit. It provides a mount for the hydraulic system pump, the converter charging and power steering pumps. The converter is a single stage type and has a 2.8 to 1 torque multiplication ratio. It is composed of three major parts; the impeller wheel (connected to the engine), the turbine wheel (connected to the drive wheels), and the guide wheel (which receives oil from the turbine and redirects it back to the impeller).

2. Transmission Housing Assembly

The remote mounted transmission houses the necessary gears, shafts, and clutches of the power train. The transmission housing also contains the directional valve, range valve, pressure regulating valves, clutch cut-off valve and the necessary passages and lines to convey the lube oil and high pressure (clutch actuating) oil. In addition, the lower end of the housing acts as a reservoir for the transmission hydraulic system. It also houses the rear axle disconnect mechanism, the transmission oil strainer and provides a mounting place for the transmission oil sight gauge and/or level plug(s).

All gears are in constant mesh, the correct speed and direction being determined by the operator in his selection of applied clutches. The transmission, being remote mounted, may be removed without disturbing the converter.



Clutch Cut-Off Valve Control

FIG. 58

3. Clutch Cut-Off Valve

The clutch cut-off valve is located in the selector valve assembly in the upper, left hand, forward corner of the transmission housing. It will allow oil to be delivered to the forward and reverse clutches until "actuated" to cut off the flow of oil which automatically releases the engaged directional clutch. The cut-off valve is actuated by lightly applying the brake because it is connected to the air brake system. Therefore, as long as the loader brakes are applied, all the engine power is available to the loader hydraulic pump for a more powerful loading action. Upon release of the brakes the cut-off valve again passes oil to the directional clutch which automatically engages it.

a. Control of Clutch Cut-Off Valve

When precise control of the machine is required on grades, the automatic clutch release feature offered by the clutch cut-off valve may be undesirable. Accordingly, a control lever, located near the floor of the operator's compartment on the right hand side, is provided so that the operator can easily disengage the automatic release feature as desired. Control is accomplished by the hand operated check valve in the

line between the air brake circuit and the clutch cut-off valve. When the lever is in the up position the automatic feature is disconnected. IMPORTANT: *When changing the position of the control lever, the brake pedal should be fully released.*

B. CHECKING OIL LEVEL

A good grade of type "C-1" transmission fluid is recommended year around for use in the transmission hydraulic system. No specific brand of oil is recommended. Use only products qualified under the above specification and recommended by reputable oil companies.

An oil level plug and sight gauge (Alternate on Some Units: Two Level Plugs) are located on the lower right side of the transmission. Check the oil daily before beginning operations. Before starting the engine remove the level plug (upper) and check for a free flow of oil from the plug hole. If necessary, add oil through the filler pipe, located at the right hand side of the converter, until oil just begins to flow freely through the plug hole. Replace the plug and tighten securely. Start the engine, and after the transmission reaches operating temperature check the oil level in the sight gauge window (or lower plug). If oil is not visible in the window, add oil in the filler pipe until it appears half way up (level with lower plug hole) on the sight gauge. The unit is now ready for operation.

C. CHANGE TRANSMISSION-CONVERTER OIL

The fluid capacity of the transmission-converter system after complete draining and overhaul is 11 gallons. However, the refill capacity for an oil change is 9½ to 10 gallons because the draining operation leaves some oil inside the converter and transmission.

Since the oil system is the "heart" of the transmission-converter, it is especially important that emphasis be placed on cleanliness of the oil.

The transmission-converter system should be drained and refilled with new oil after 1000 hours of operation, or more often if the oil shows evidence of discoloration, or has a strong odor resulting from operations causing high temperatures. NOTE: *The oil should be operating temperature (between 150° to 200° F.) when oil is drained. When draining the system, allow time for the oil to drain down to the sump.*

Change oil as follows:

1. Remove drain plug from lower rear face of transmission. NOTE: *If oil is contaminated with metal particles, entire assembly should be disassembled, cleaned, and damaged parts replaced.*

2. Clean the strainer and replace the transmission filter element. (Refer to Paragraphs D & E).

   IMPORTANT: *THE ENGINE SHOULD NEVER BE STARTED WHEN THE TRANSMISSION CONVERTER SYSTEM IS EMPTY. DAMAGE TO THE PUMP AND CONVERTER WOULD RESULT DUE TO LACK OF LUBRICATION.*

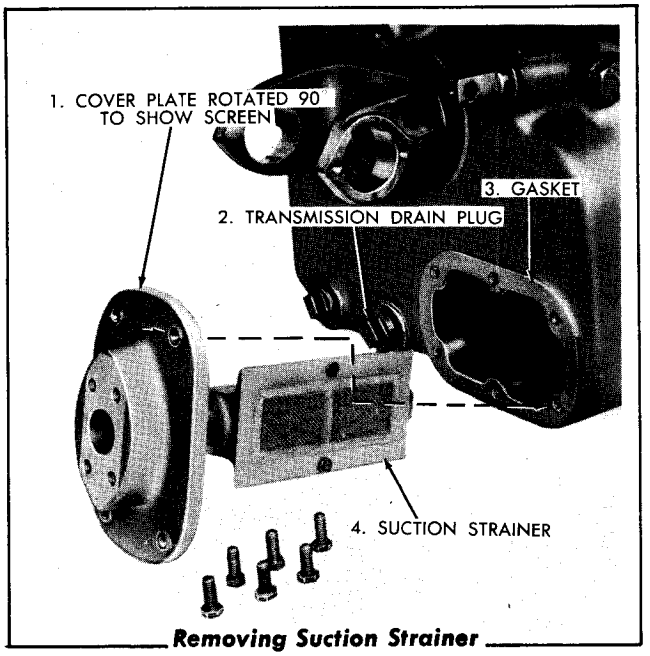
3. Reinstall drain plug.

4. Remove oil level plug (upper) from lower right side of transmission and add oil through transmission filler pipe until there is a free flow of oil from plug hole. Replace plug and tighten securely.

5. Start engine and allow it to run for two minutes at low idle to charge system. Then, with engine running at ¼ throttle, add oil through filler pipe until oil is half way up on sight gauge window (level with lower plug hole).

6. Continue to operate engine until transmission reaches operating temperature. Check sight gauge again. Add oil if necessary to bring level half way up on gauge window.

Bleeding the system is not necessary, but the engine should be allowed to idle for several minutes after refilling before applying a load to the converter.



Removing Suction Strainer

FIG. 59

D. CLEANING THE SUCTION STRAINER

The suction strainer should be removed and cleaned each time the transmission-converter oil is changed. The suction strainer is located in a cover plate at the rear right side of the transmission sump.

Remove and clean the strainer as follows:

1. Remove six hex head capscrews from strainer cover plate and remove strainer.
2. Thoroughly clean strainer in a clean solvent. Wipe inside of the strainer housing to remove sediment left by strainer.
3. Install strainer in housing and replace cover plate and capscrews and tighten securely.

E. REPLACING THE FILTER ELEMENT

The full flow type filter is located at the lower left hand side of the converter. It contains a replaceable element that must be replaced every 500 hours, or more often if conditions warrant. NOTE: *It may be necessary to change this filter more often during the first few hours of operation.*

Replace the element as follows:

1. Thoroughly clean filter shell and surrounding area.
2. Loosen centerbolt in filter shell and allow filter to drain. When the filter is completely drained remove filter centerbolt shell, base gasket and element. Discard filter element.
3. Thoroughly clean the interior of the filter shell.
4. Install a new filter element and gasket. Replace the filter shell and centerbolt and tighten securely.

F. OIL PRESSURES AND TEMPERATURES, TRANSMISSION-CONVERTER

Fewer shut-downs will be experienced if the operator periodically reads the transmission system pressure gauge and the converter temperature gauge provided on the instrument panel.

The transmission pressure gauge should read 190-200 P.S.I. at any time that both range and direction clutches are engaged. If the pressure consistently drops below 190 P.S.I. with any combination of clutches engaged, it may allow the clutches to slip and overheat.

Ordinarily, the converter "out" pressure reading is not required during operation — thus, no gauge is provided. It is specified at 40 P.S.I. max. at full throttle. If the pressure consistently drops below 40 P.S.I. it indicates the converter is not receiving sufficient oil and the following points should be checked.

1. Check the oil level in the transmission.
2. If the suction line connections are loose the charging pump may be sucking air. Tighten if necessary.
3. Check and clean the suction strainer in the transmission. Check the transmission filter element. Replace if necessary.

NOTE: *All pressure readings should be made with the transmission at operating temperature (approx. 150° F.).*

The converter "out" oil temperature should never

be allowed to go above 250° F. maximum. If it should exceed the maximum, stop the loader, shift the transmission to neutral and run the engine at ⅓ throttle. The temperature should drop rapidly to approximately equal the engine water temperature in two or three minutes. If the temperature does not drop, the engine should be stopped immediately and the cause determined.

G. TRANSMISSION OIL COOLER

The transmission oil cooler, located on the left side of the engine, consists of a corrosion resistant cooling core and a tank. The water pump circulates coolant through the cooling core tubes and the transmission converter circulates oil through the tank, around the outside of the tubes of the cooling core, thereby controlling the oil temperature.

The cooling core consists of small copper tubes which dissipate the heat from the oil to the engine coolant. If proper transmission oil maintenance procedures are followed the oil cooler will function efficiently. However, if the transmission oil is not changed at the recommended intervals, impurities will be deposited in the oil cooler, restricting the flow of oil around the tubes of the cooling core. Restriction of the flow of oil around the tubes of the cooling core is usually indicated by a drop in oil pressure. If this occurs the oil cooler must be cleaned or a new one installed. IMPORTANT: *IT IS ABSOLUTELY NECESSARY THAT THE OIL COOLER UNIT BE KEPT CLEAN FOR PROPER COOLING.*

H. CLEANING OF TRANSMISSION OIL COOLER

Cleaning the transmission oil cooler requires the use of special solvents. The following solvents have been found effective when used according to the manufacturer's direction:

Excello Floor Cleaning Compound
Turco Cleaning Compound
No. 70 Stripper
Mixture of 3 parts Oakite No. 7 and 5 parts fuel oil
Bendix Cleaning Compound

To use the last named solvent, merely submerge the oil cooler into the solution for a sufficient length of time to allow the chemical action of the solvent to dissolve or loosen the sludge or other foreign matter.

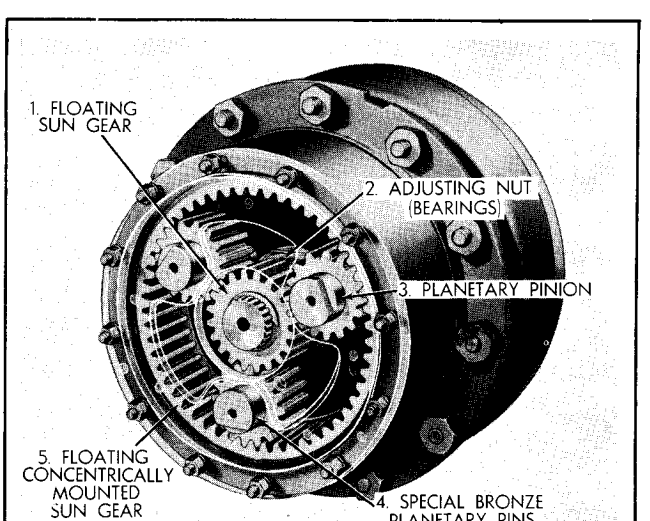
Flush the oil cooler thoroughly with live steam or spirits after cleaning regardless of the type of cleaner used. NOTE: *IF THE OIL COOLER IS BADLY CLOGGED, A NEW OIL COOLER MUST BE INSTALLED.*

PLANETARY AXLES, FRONT AND REAR

A. General

The front and rear axles each consist of a central differential carrier section, two air actuated brake assemblies and two planetary wheel hubs. The rear axle has in addition, two steering knuckle assemblies located betwen the central section and wheel hubs to provide a steering type drive axle. "Toe-in" is not required since the steering wheels are also driving wheels.

The front and rear central differential carrier sections are similar in construction. Each consists of a differential assembly with hypoid type ring gear and pinion. The housing for the central section also serves as a reservoir for lubricating gear oil for these parts.



Typical Planetary Hub Assembly

FIG. 60

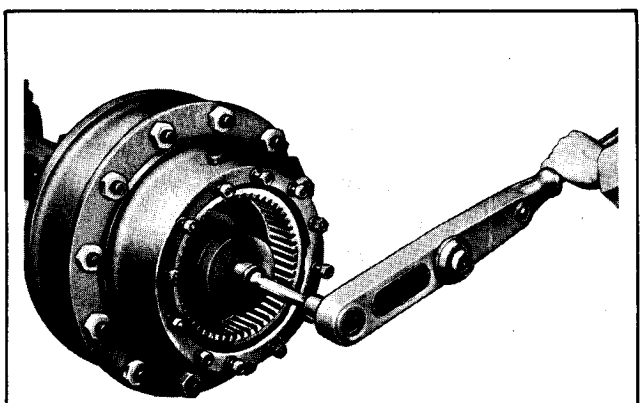
All four planetary hubs are similar and each consists of a floating ring gear, a floating sun gear and three planetary pinions which rotate on forged bronze planet pins. These parts are lubricated by the oil carried in each planetary hub.

As the wheel hub and planetary spider rotate, they pick up oil contained in the hub and channel it to wheel bearings and gears. Oil, therefore, is constantly flowing around these parts and through the channels in the planet pin to lubricate pinions. This assures full flow lubrication under all operating conditions. CAUTION: *For safety use blocks in addition to a jack if removing wheels, tires, axles, etc.*

B. Adjustment of Wheel Bearings

Since wheel bearings are constantly lubricated by oil inside planetary hub, no additional lubrication or "packing" is required. When adjustment becomes necessary on either front or rear axle, proceed as follows:

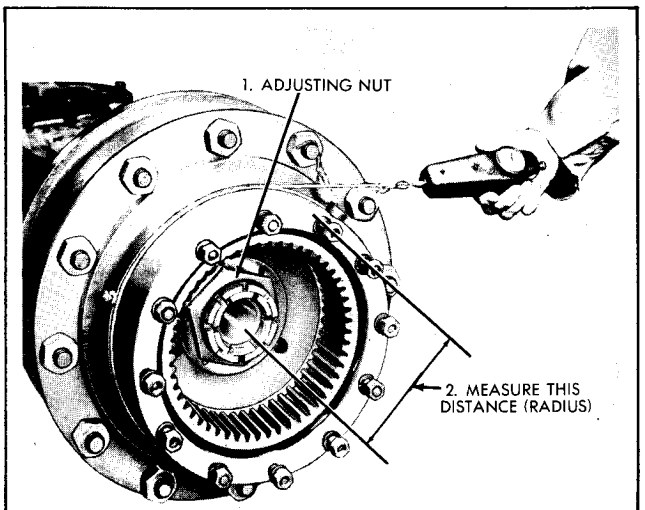
1. Remove wheel and tire assembly.
2. Drain wheel hub and remove planetary end cover from the spider.
3. Insert capscrews in each of the three jack screw holes of spider. Turn capscrews in evenly until spider (including planetary pins and pinions) pulls free of wheel hub.
4. Remove snap ring, sun gear, thrust washer and lock nut (for adjusting nut) from axle shaft. Loosen adjusting nut.



Tightening Adjusting Nut

FIG. 61

5. Tighten the adjusting nut to 400 pound feet while the wheel is being rotated. Rotate the wheel in both directions to make sure bearings and related parts are fully seated.
6. Back off adjusting nut ¼ turn to relieve preload on bearings.

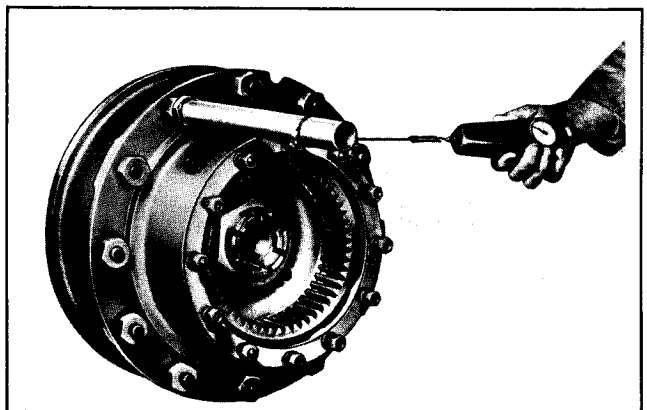


Checking Bearing Preload

FIG. 62

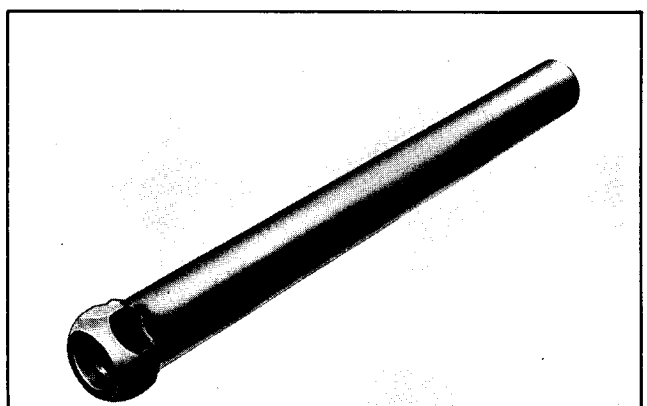
7. Attach a suitable cord to one of the wheel mounting lugs and wrap cord around hub several times. Attach a spring scale to end of cord. After starting resistance is overcome read the ROLLING TORQUE on the spring scale. Rolling torque is the amount of torque necessary to keep hub rolling *after* it is in motion. Adjust the torque on the bearing adjusting nut until a rolling torque of 13-17 lbs. ft. for the front hubs or 8-12 lbs. ft. for the rear hubs is indicated on the spring scale.
8. If it is not convenient to remove the wheels, check the wheel bearing preload torque as shown in Fig. 63. The extension (Fig. 64) permits a reading to be taken without interference from the tire.

   Bearing preload torque is figured by multiplying the radius (the distance from the center of the wheel to the point where the cord, attached to the spring scale, just contacts the wheel hub) by the reading on the pound scale. For example: Assume the distance from the center of the wheel to



Alternate Method of Checking Bearing Preload

FIG. 63



Wheel Lug Extension

FIG. 64

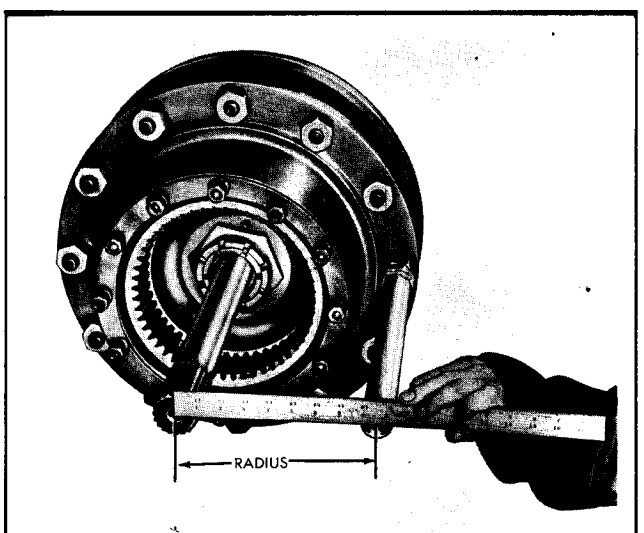
the cord contact point is 7 inches, and the reading on the pound scale is 24 pounds — multiplying 7 inches by 24 pounds we get 168 inch pounds. Since our preload specifications are listed in foot pounds we divide 168 inch pounds by 12 and arrive at a reading of 14 foot pounds.

9. Install nut lock. Back off adjusting nut to nearest slot if necessary. Recheck rolling torque with cord and spring scale.

10. Reinstall thrust washer, sun gear, snap ring, spider assembly and end cover. Reinstall wheel and tire assembly. Refill hub with oil. (Refer to 1000 HOUR ROUTINE SERVICE, "PLANETARY HUBS.")

C. Steering Knuckles — Rear Axle

The steering knuckles, or ball joints, each consist of a constant velocity universal joint and a trunnion socket. The universal joint, contained in the trunnion socket, is designed to transmit power while machine is being steered — thus a drive type steering axle. The trunnion socket is a "ball-shaped" housing with integral king pins on which are mounted two bronze bushings. These trunnion bearings support the wheel hub and allow it to pivot during steering.



Measuring Radius Using Alternate Method

FIG. 65

The universal joint and trunnion bearings are prepacked with grease during assembly so that very little lubrication is required in the field. Add two or three shots of grease (Marfax No. 2 Heavy-duty or equal) every 500 hours of operation. (Refer to Routine Service, "STEERING AXLE"). DO NOT OVERGREASE.

The trunnion bearings are adjusted by shims located under their bearing caps. The quantity of shims used under upper cap should approximately equal those used under lower cap to center the universal joint in trunnion socket housing. When adjustment becomes necessary, proceed as follows:

1. Remove tire and wheel assembly.

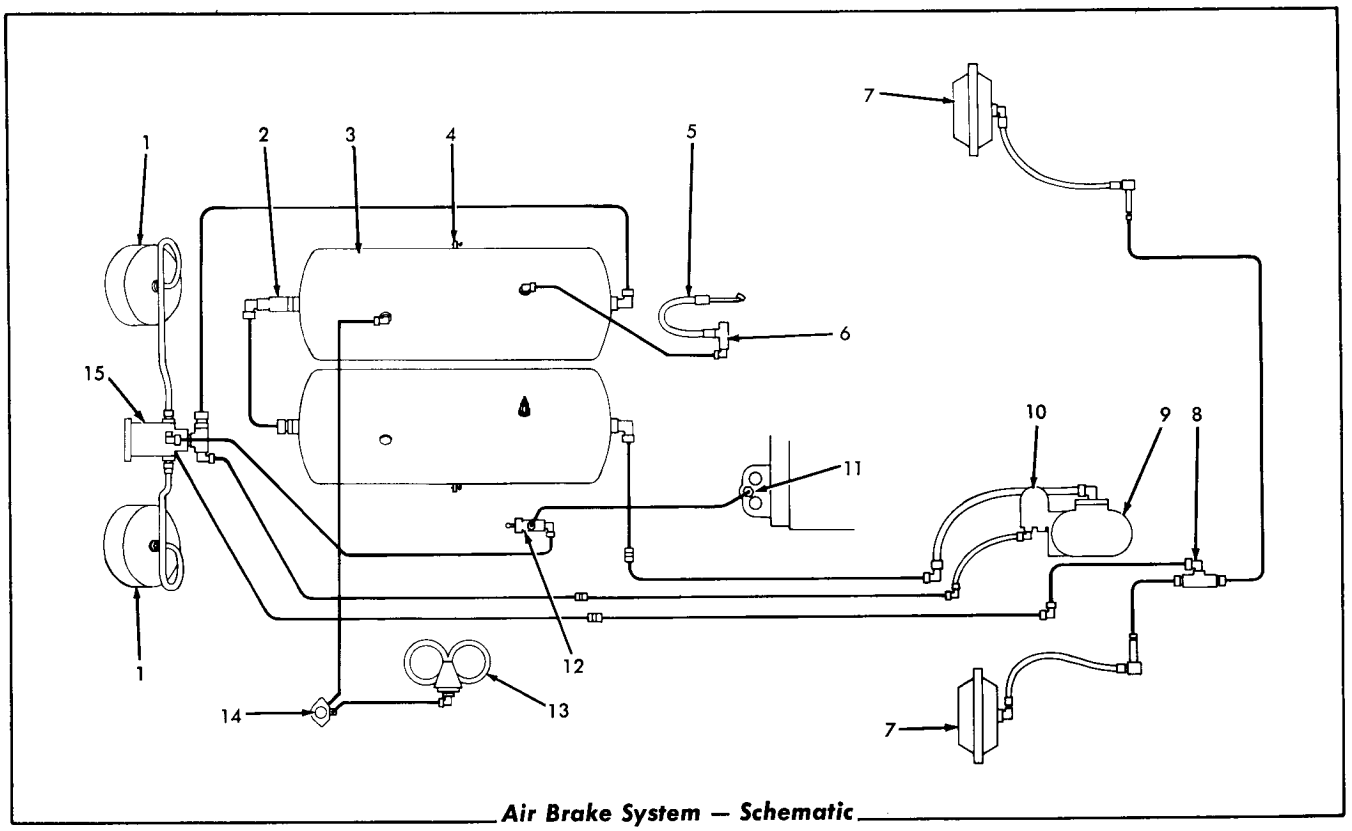
2. Add or remove shims under upper and lower trunnion bearing caps in approximately equal mount, until there is no perceptible "play" when wheel hub is manually moved up and down. Wheel hub should

pivot freely right or left, as when steering.

3. Reduce shim pack by .005" under each cap, and replace cap. Wheel hub should now pivot with a slight drag when turning right or left.

4. Replace tire and wheel assembly, and torque the wheel lug nuts to 330 to 350 lbs. ft.

AIR BRAKES



Air Brake System — Schematic

FIG. 66

1. Front Brake Chamber
2. Check Valve
3. Air Tank (2)
4. Drain Cock (2)
5. Auxiliary Air Supply Hose
6. Air Supply Valve
7. Rear Brake Air Chamber
8. Quick Release Valve
9. Air Compressor
10. Governor
11. Clutch Cut-Off Valve on Transmission
12. Clutch Cut-Off Control Valve
13. Horn
14. Horn Valve
15. Air Application Valve

A. GENERAL DESCRIPTION

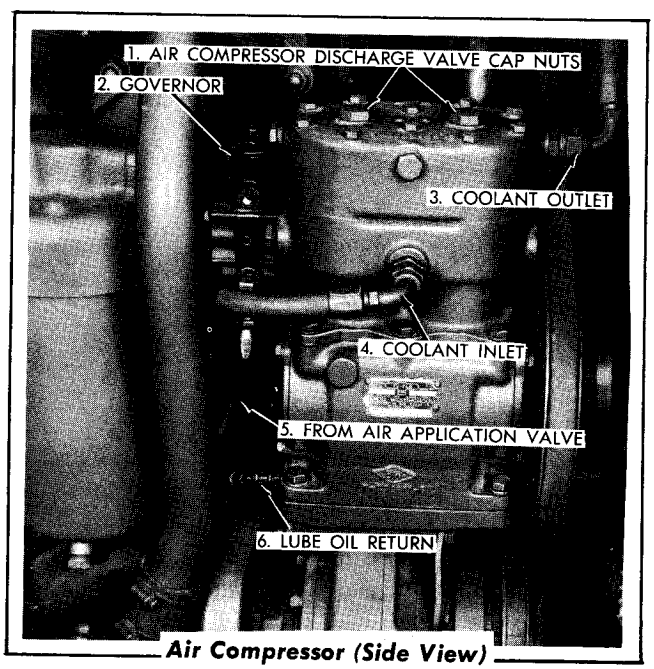
The tractor loader is equipped with a belt driven governor controlled, air compressor having an output capacity of 12 cubic feet per minute. Two air storage tanks, located on the main frame beneath the operator's compartment are provided to maintain an adequate supply of compressed air to actuate the loader wheel brakes. In addition, a warning device is incorporated in the system to alert the operator at any time the brake air pressure drops below the minimum operating pressure of 55 to 60 P.S.I. When the brake air pressure drops below 55 to 60 P.S.I. the red light on the instrument panel will glow and a warning buzzer will sound.

CAUTION: *At any time that the warning signal is operating there is insufficient air in the air brake system to stop the loader. Do not move the loader while the warning signal is in operation.*

B. AIR COMPRESSOR

1. General

The air compressor (Fig. 67) is a single acting, reciprocating 2 cylinder type. The compressor is mounted on the left rear side of the engine and is belt driven by the engine crankshaft through the fan assembly. Lubrication for the air compressor is provided by an external oil line extending from the main oil gallery of the engine to the rear end cover of the compressor and the oil enters the drilled passage in the compressor crankshaft. From these passages, the air compressor bearings, pistons, pins, etc., are lubricated. The excess oil spills down into the hollow mounting base of the compressor and drains back to the engine crankcase through an external oil line.



Air Compressor (Side View)

FIG. 67

Two lines connecting the air compressor to the engine cooling system provide the necessary coolant for the compressor.

The intake air for the compressor is obtained from the engine air intake manifold, through an air intake tube connecting the intake part of the air compressor to the engine air intake manifold. Therefore, only clean air enters the air compressor.

2. Operation

The air compressor runs continuously whenever the engine is operating, but the actual compression of air is controlled by the air compressor governor. The governor, acting in conjunction with the unloading mechanism in the compressor cylinder block, starts or stops the compression of air by unloading the compressor when the pressure in the air storage tanks reaches a minimum of 105 to 110 pounds or a maximum of 120 to 125 pounds.

a. Compressor Loading (Compressing Air)

During the down stroke of each piston of the air compressor, a partial vacuum is created above the piston which unseats the inlet valve, allowing intake air to enter the cylinder above the piston. As the piston starts its upward stroke, the air pressure on top of the inlet valve, plus the inlet valve return spring force, closes the inlet valve. The air above the piston is further compressed until the pressure lifts the discharge valve and the compressed air is discharged through the discharge line into the air storage tanks. As each piston starts its down stroke, the discharge valve above the piston returns to its seat, preventing the compressed air from returning to the cylinder, and the same cycle is repeated.

b. Compressor Unloaded (Not Compressing Air)

When air pressure in the air storage tanks reaches the maximum setting of the compressor governor (120 to 125 pounds), compressed air from the storage tanks passes through the governor into the cavity below the unloading pistons in the compressor cylinder block. The air pressure lifts the unloading pistons which in turn lift the inlet valves off their seats.

c. Passage of Air During Non-Compression

With the inlet valves held off their seats, the air during each upstroke of the piston is forced through the air inlet cavity and to the other cylinder where the piston is on the down stroke. When the air pressure

is the storage tanks is reduced to the minimum setting of the governor (105 to 110 pounds), the governor releases the air pressure beneath the unloading pistons. The unloading piston return spring then forces the pistons down and the inlet valve springs return the inlet valves to their seats and compression is resumed.

3. Service

a. After approximately every 1000 hours of operation, remove compressor discharge valve cap nuts (Fig. 67) and check for presence of excessive carbon. If excessive carbon is found, clean or replace compressor cylinder head.

b. Inspect compressor discharge line for carbon and clean or replace discharge line if necessary.

c. Remove and clean external lubricating oil line, extending from main oil gallery of engine to rear end cover of compressor.

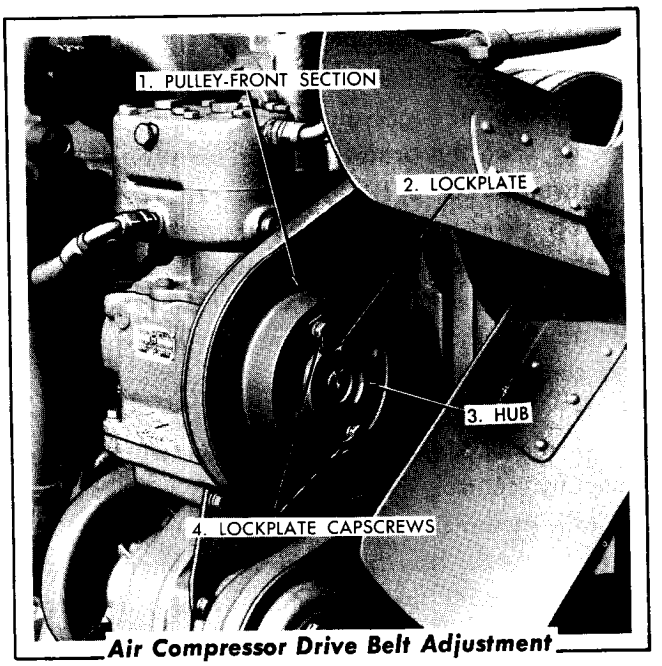
d. Remove compressor from its mounting base and thoroughly clean interior of the hollow mounting base and oil return hole in base.

e. Failure of compressor to maintain normal air pressure in system usually denotes loss of efficiency due to wear, provided leakage in remainder of air system is not excessive. Also, another sign that compressor is excessively worn is indicated by presence of excessive oil in air storage tanks when "bleeding." If either of above conditions develop, air compressor must be removed and repaired or replaced.

4. Air Compressor Drive Belt Adjustment

The air compressor drive belt is correctly adjusted when the belt can be depressed ½ inch at a point half-way between the compressor pulley and the fan pulley. To adjust the air compressor drive belt, proceed as follows:

a. Remove two (2) capscrews attaching lock plate (Fig. 68) to pulley front section and remove lock plate.



Air Compressor Drive Belt Adjustment

FIG. 68

b. Hold pulley rear section stationary and turn pulley front section clockwise to tighten or counter-clockwise to loosen drive belt.

c. When correct drive belt adjustment is obtained, turn pulley front section as necessary to align nearest capscrew holes with notches on pulley hub. Install lock plate in position on pulley hub and secure lock plate to pulley front section with two attaching capscrews.

C. AIR COMPRESSOR GOVERNOR

1. General

The purpose of the air compressor governor is to automatically control the air compressor to maintain a pressure in the air storage tanks between 105 and 120 pounds. To understand the function of the governor, it should be remembered that while the compressor may run continuously, actual compression of air is controlled by the governor. The governor acting in conjunction with the compressor unloading mechanism, starts or stops compression when a minimum of 105 to 110 pounds, or a maximum of 120 to 125 pounds, in the air storage tanks is reached.

2. Operating Test

Observing the air pressure gauge in the instrument

panel, start the engine and build up air pressure in the air system to determine at what pressure the governor unloads the compressor, stopping further compression. The governor must unload the compressor when the pressure in the air storage tanks is between 120 to 125 pounds. With the engine running slowly, reduce the air pressure in the system by depressing and releasing the brake pedal and observe at what pressure (indicated by the gauge) the governor loads the compressor and compression is resumed.

The governor was pre-set at the factory to automatically control the compressor to maintain a pressure in the air storage tanks of between 105 to 120 pounds, and no further adjustment should be necessary. If the governor fails to load and unload the compressor to maintain the specified pressure of between 105 and 120 pounds, the governor must be removed and replaced.

D. WHEEL BRAKES

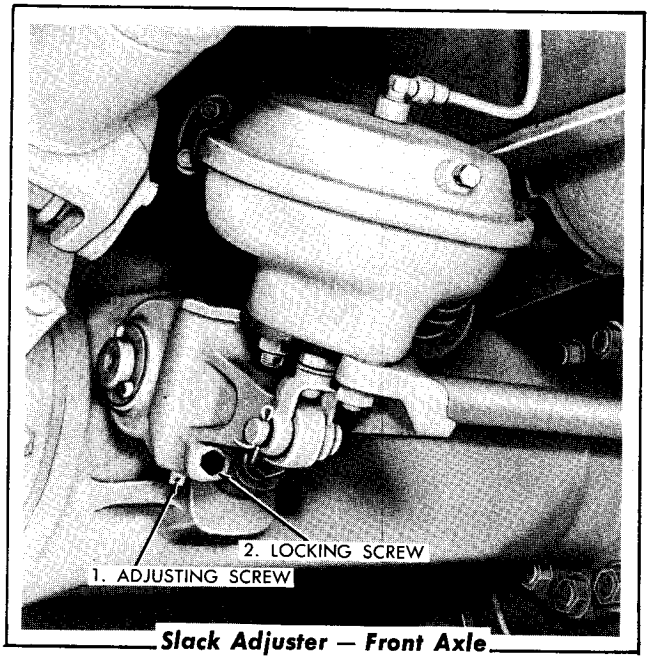
1. General

Four brake air chambers (Fig. 70) (one for each wheel) are used to convert the energy of the compressed air into mechanical force and motion necessary to apply the wheel brakes of the tractor loader. A rubber diaphragm within each air chamber forms an air tight seal; the outside is clamped against the inside wall of the cylinder while the center is clamped to the diaphragm guide. When air pressure enters the air chamber the diaphragm guide moves forward and applies the brakes. The brake pedals extending through the floor of the operator's compartment are used to actuate the brakes on all four wheels.

The wheel brake linkage is properly adjusted when both the front and rear push rods have a travel of between 1¾" - 2" when the brakes are applied. Adjustment of the linkage (by the slack adjusters) is necessary when the travel of the push rods reaches 2½" - 2¾" when the brakes are applied.

2. Slack Adjusters

Slack adjusters (Figs. 69 & 70) perform two functions: They serve as a lever during normal braking operation and they provide a quick and easy



Slack Adjuster — Front Axle

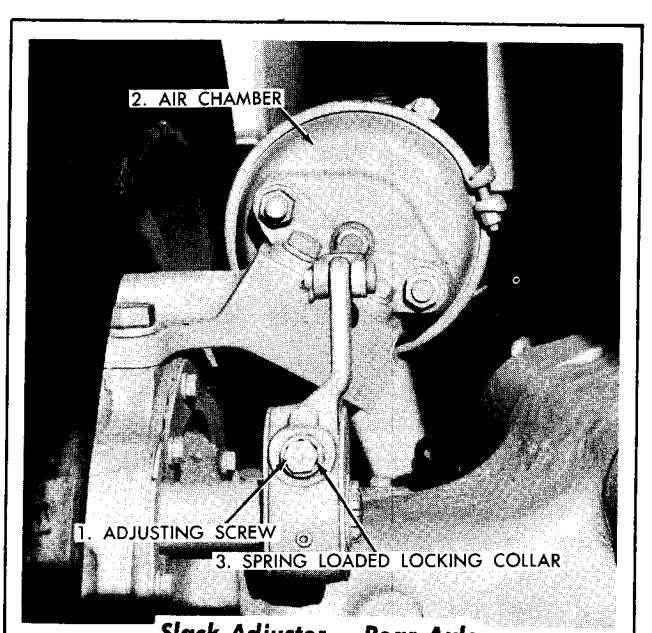
FIG. 69

method of adjusting the brakes. Brakes are properly adjusted when the travel of the push rod of each brake air chamber (brakes applied) measures 1¾" - 2".

3. Adjust Loader Brakes — Front

To adjust the loader front brakes proceed as follows:

a. Disengage slack adjuster locking screw



Slack Adjuster — Rear Axle

FIG. 70

(Fig. 69) by turning it out (counterclockwise) about ¼ turn.

b. Turn adjusting screw (square head) as necessary to obtain 1¾" to 2" travel of air chamber push rod when brakes are fully applied.

c. When correct adjustment is obtained, engage locking screw by turning it in (clockwise).

4. Adjust Loader Brakes — Rear

To adjust the loader rear brakes proceed as follows:

a. Position a wrench over adjusting screw (Fig. 70) and disengage the locking sleeve by depressing it.

b. Holding locking sleeve disengaged, turn adjusting screw as necessary to obtain specified 1¾" - 2" push rod travel when brakes are applied.

c. When correct adjustment is obtained, be sure locking sleeve returns to its locked position engaging head of locking screw.

CAUTION: *After adjusting the brakes, raise the wheels off of the ground and check to be certain that the brakes are not dragging when fully released.*

POWER STEERING SYSTEM

A. GENERAL

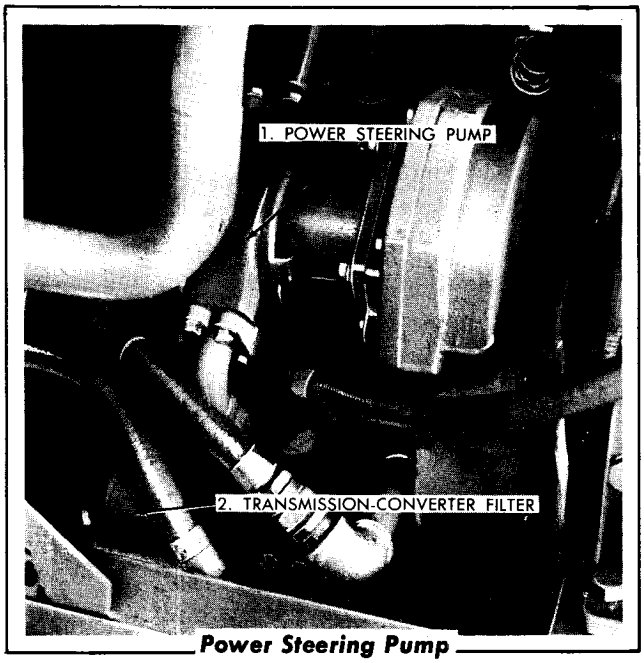
The oil for the power steering system is supplied from the main hydraulic system tank, thus eliminating the need of a special reservoir. The other main components of the power steering system are the pump, safety relief valve, control valve, oil cooler, and two hydraulic cylinders mounted on the back of the rear differential and connected directly to the rear axle steering hubs. A two-piece drag link connected by a bell crank supplies the directional control in conjunction with the steering gear and steering wheel.

B. PUMP

The power steering "gear type" pump is located on the forward, upper, left hand side of the converter. The pump is directly connected through gears to the engine crankshaft, which, in turn enables it to supply power to the steering valve whenever the engine is running. No adjustment is necessary but the mounting bolts should be checked for tightness occasionally.

C. SAFETY RELIEF VALVE

The spring loaded safety relief valve assembly, located inside near the bottom of the loader hydraulic tank, is provided to limit the pressure in the power steering system. This safety valve is properly adjusted at the factory for an opening pressure of 1350 to 1375 P.S.I. When the valve opens, oil is by-passed from the system directly to the hydraulic tank. Since the safety valve is properly adjusted at the factory, no further adjustment should be necessary in the field.



Power Steering Pump

FIG. 71

D. CONTROL VALVE

This hydraulic valve is bolted to the bottom of

the steering gear housing. It consists of a spool within a housing which has three grooves accurately located in relation to the spool. The spool and housing are machined and ground to a sliding fit to retain high pressure oil. The spool and housing are, therefore, not serviced separately.

The valve spool attached to the steering shaft and worm, moves slightly in the valve housing to direct the flow of oil as the steering wheel is turned. This slight movement is caused by the resistance to turn offered by the steering wheels on the rear axles. Ten spring loaded centering plungers are provided to hold the valve spool in "neutral" position except when the steering hand wheel is being turned.

When the steering hand wheel is turned it actuates the spool, closing some valve ports and opening others. This in turn redirects the circulating oil to the rear end of one cylinder and the forward end of the other, depending on the direction of the turn. Excess oil is returned to the hydraulic tank. As the cylinders reach the end of their stroke the safety relief valve opens and stops the circulating flow of oil. When the steering hand wheel is released the spool returns to neutral under the pressure of the centering plungers. A built-in check valve is provided in the event of a hydraulic power failure or if steering is done with the engine off.

E. STEERING GEAR

1. Description

The steering gear, located at the base of the steering column, is of the re-circulating ball type and consists of the steering shaft and worm, ball nut, sector shaft and gear and "Pitman" arm. Helical grooves inside the ball nut are filled with steel balls that engage the mating grooves in the worm portion of the steering shaft. Rack teeth are machined on one side of the ball nut which engage the teeth on the sector shaft gear. When the steering wheel is turned, the steering shaft and worm rotate, causing the ball nut to move up or down. Movement of the ball nut rotates the sector shaft and gear which imparts motion through the "Pitman" arm to the drag link.

2. Adjustments

There are two major adjustments of the steering gear assembly; the Thrust Bearing adjustment and the Lash adjustment. CAUTION: *It is very important that the thrust bearing adjustment be checked and readjusted if necessary before the lash adjustment is made. Failure to follow this proper sequence may result in serious damage to the steering gear. If it becomes necessary to remove the steering handwheel, a puller must be used. Damage to the valve components and bearings is certain to result if it is driven off.*

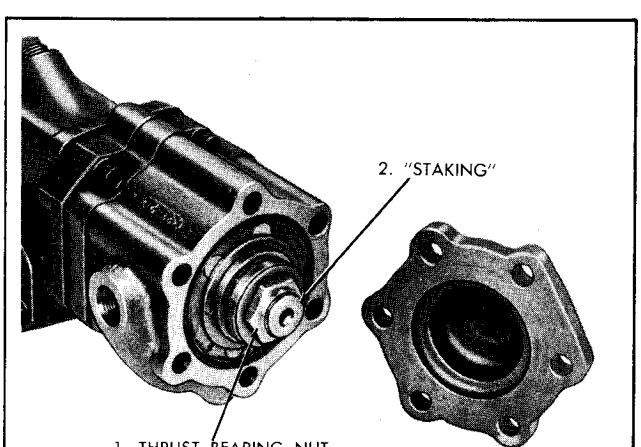
To adjust the thrust bearing proceed as follows:

a. Disconnect drag link from "Pitman" arm.

b. Loosen steering column support bracket on instrument panel to be certain there is no binding due to anchorage.

c. Loosen locknut and turn lash adjuster a few turns counterclockwise (Fig. 73). This removes load from thrust bearing due to close mesh between ball nut rack and sector shaft and gear.

d. Remove end cover from bottom of valve housing and install in its place a valve clamping ring. A valve clamping ring may be made from an end cover by cutting out the middle portion and leaving the outer ring only. The purpose of this clamping



Steering Gear — Thrust Adjustment

FIG. 72

ring is to hold the valve in place, and at the same time provide access to the thrust bearing nut.

e. Clean up "staking" that secures the thrust bearing nut to steering shaft and remove nut. Reinstall a new nut.

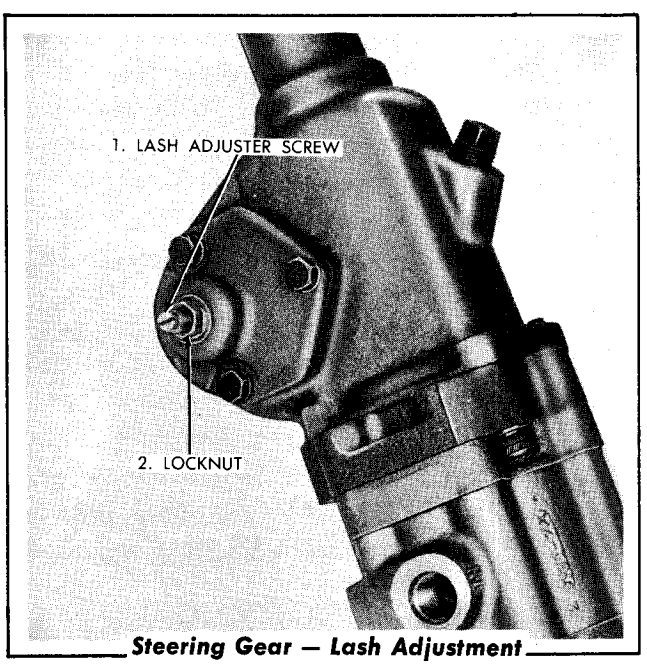
f. Turn steering wheel to extreme right turn position which fully compresses centering plunger springs.

g. Hold hand wheel in this position and tighten thrust bearing nut firmly against outer bearing race. Then back off nut and retighten *lightly*. This adjustment seats thrust bearings against all centering plungers and provides proper clearance between bearing races and spool.

h. Release hand wheel and attach a spring scale to one spoke of wheel at rim (9" radius). Measure pull at 90° to spoke. It should not exceed ½ to 1 pound.

i. Stake thrust bearing nut into keyway of shaft, being sure nut does not turn from its adjusted position.

j. Remove clamping ring. Reinstall end cover, being certain seal ring is in good condition.



Steering Gear — Lash Adjustment

FIG. 73

After having completed the thrust bearing adjustment proceed with the lash adjustment, which covers a range of approximately one-half turn of the handwheel on each side of the center position.

a. Turn steering handwheel slowly from one extreme to the other, then turn wheel back to the center position.

b. Attach a spring scale to one spoke of wheel at rim (9" radius) so that pull required to turn wheel through "center" position can be observed.

c. Turn lash adjuster screw (Fig. 73) clockwise until back-lash disappears between teeth on ball nut and teeth on sector shaft and gear. When adjustment is correct, pull required to turn wheel through a 20° arc over center position (line of pull at 90°) should be approximately 1¼ - 2 pounds.

d. Carefully secure locknut (Fig. 73), being sure that lash adjuster does not move.

After completing both adjustments, reconnect drag link to "Pitman" arm and secure column support bracket to instrument panel.

3. Lubrication

The steering gear is filled at the factory with a special lubricant (GM-4673M) developed for both summer and winter operation. Seasonal change of lubricant and draining of the gear case is not necessary. The gear case should be kept filled to the level of the filler plug with the above lubricant or SAE 90 gear lubricant.

F. STEERING LINKAGE ADJUSTMENTS

Adjust the steering linkage as follows:

1. Center steering wheel by counting number of turns from extreme left to extreme right turn position. From extreme right turn position, turn wheel half as many turns back to left. Steering wheel is centered in this position, and "Pitman" arm at base of steering column should be perpendicular to ground.

2. Hold a straightedge across each of the rear tires at rim height and measure between straightedge and main frame at points forward and rear of axle. If measurements are unequal, drag link or tie rod must be adjusted until wheels are parallel with loader's main frame.

G. STEERING CYLINDERS

Two double acting steering cylinders are mounted on the back side of the planetary steering axle. The cylinders are fastened to the rear differential and axle housing and their actuating rods are attached to the steering wheels. Adjust the steering cylinders as follows:

1. Disconnect drag link.
2. With frame and axle level turn left wheel to 26° (front end of tire in and rear end of tire out) and adjust open length of left steering cylinder and closed length of right steering cylinder to fit.
3. Turn right wheel to 25° and check cylinder lengths. If right cylinder is not fully open or left cylinder is not fully closed adjust cylinder length to average required.
4. Turn wheels straight and center "Pitman" arm. Adjust drag link to correct length and install it.

H. POWER STEERING SYSTEM INSPECTION

If the power steering system fails to function properly, the following simple checks can be easily made.

1. Inoperative relief valve in the hydraulic tank.
2. Incorrect tire pressure.
3. Steering column misaligned at instrument panel.
4. Improper lubrication or adjustment of the steering linkage.
5. Improper steering gear thrust bearing or lash adjustment.
6. Improper wheel bearings adjustment.

HYDRAULIC SYSTEM

A. GENERAL

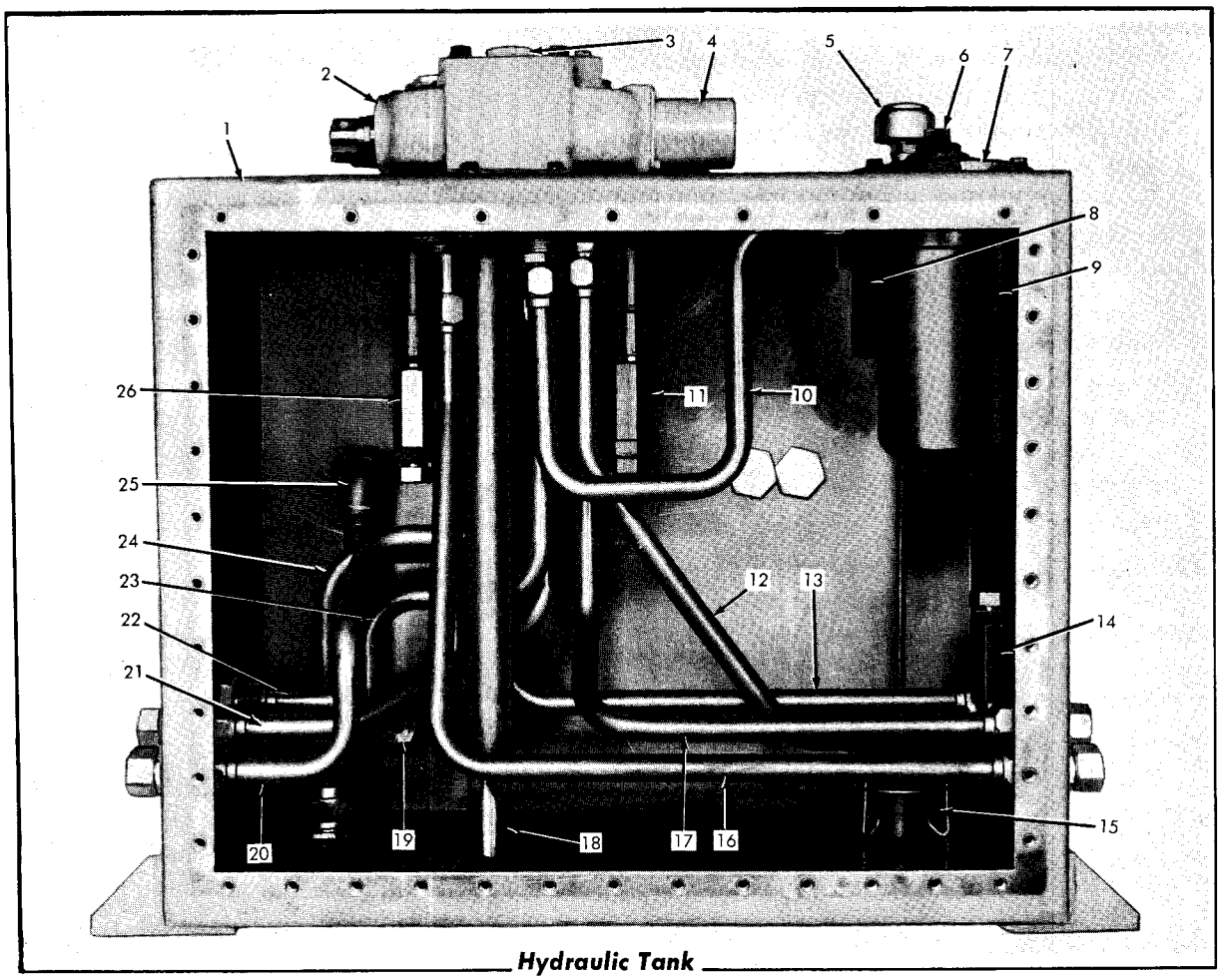
The hydraulic system consists of a gear type hydraulic pump, hydraulic tank assembly (with safety valves), control valve, double acting hydraulic cylinders for loader boom, and bucket, and the necessary tubes and lines to complete the system. The hydraulic pump supplies hydraulic power to operate the loader. The pump is externally mounted on torque converter housing and is directly connected to the engine crankshaft through a gear train. The loader is controlled by the double control valve bolted to top of hydraulic tank, which is located at rear of seat frame.

The hydraulic tank is designed so that with little periodic service, top performance can be maintained indefinitely. Service of filters, breathers, suction line screen, etc., of tank assembly is dependent upon operating conditions.

The bucket dump line safety valve, bucket return line safety valve, and lift circuit safety valve located inside the hydraulic tank as shown in Fig. 74, are properly adjusted at the factory and require no further adjustment in the field. To insure positive bucket positioning, a compensator check valve is located inside the bucket control spool, in the control valve, in order that oil may flow from the front ends to rear ends of dump cylinders to keep cylinders full of oil.

The lift cylinder safety relief valve is to relieve excessive pressures that can be developed when bucket and boom levers are in their neutral positions while tractor loader is driven into a load. Set at 2200 to 2250 P.S.I., the valve prevents booms, bucket, and linkage from being damaged.

The flow control valve, (Fig. 74) located in top front end of loader's control valve assembly and



Hydraulic Tank

FIG. 74

1. Hydraulic Tank
2. Hydraulic Control Valve
3. Flow Control Valve Cap
4. Detent Cap
5. Hydraulic Tank Breather
6. Oil Filler Plug and Dip-Stick
7. Filter Cover and Gasket
8. Air Filter
9. Oil Filler
10. Filter Tube
11. Return Line Safety Valve 2600 - 2650 P.S.I.
12. Raise Tube (L.H. Cyl.)
13. Dump Tube (L.H. Cyl.)
14. Lift Circuit Safety Valve 2200 - 2250 P.S.I.
15. Suction Line Screen and Magnet Assembly
16. Lower Tube (L.H. Cyl.)
17. Retract Tube (L.H. Cyl.)
18. Discharge Line (Snorkel)
19. Power Steering Relief Valve — 1350 - 1375 P.S.I.
20. Lower Tube (R.H. Cyl.)
21. Retract Tube (R.H. Cyl.)
22. Dump Tube (R.H. Cyl.)
23. Raise Tube (R.H. Cyl.)
24. Pressure Tube
25. Return Line from Oil Cooler
26. Dump Line Safety Valve — 2050 - 2100 P.S.I.

connected to the lift cylinders lowering line, is provided so that oil may be transferred from bottom side to top side of lift cylinders as required to keep lift cylinders full of oil at all times.

B. OIL RECOMMENDED FOR HYDRAULIC SYSTEM

Refer to "Specifications of Lubricants" in this Manual.

C. OIL FILTER

The oil filter, located inside the hydraulic tank (Fig. 74), has a micronic element which should be replaced after every 100 hours of operation or more often if conditions warrant. When oil is at operating temperature, all of the oil is 100%

filtered. Replace oil filter element as follows:

1. Remove cover plate from top of stabilizer for access to hydraulic tank assembly. Thoroughly clean filter cover and surrounding area.

2. Remove filter cover (with oil dip stick) from top of hydraulic tank.

3. Remove filter element from oil filter case and discard the element. Thoroughly clean inside of filter case.

4. Be certain that spring and metal washer are in position on pipe in bottom of filter case. Insert a new element into position in filter case, being certain that lower end of element seats squarely on metal washer.

5. Place a new cover gasket in position on tank and install filter cover (with oil dipstick). Tighten hex nuts evenly to 25 lbs. ft. torque.

CAUTION: *If filter case is removed, be certain when reinstalling it that none of its oil holes will be aligned with oil stream coming from filter tube.*

D. TANK BREATHER

The tank breather should be serviced after every 10 hours of operation, or more often if conditions warrant. The breather element should be replaced after every 100 hours of operation. Clean breather element as follows:

1. Loosen and remove machine screw and lockwasher attaching breather cap to base. Remove breather cap and breather element.

2. Wash element in clean solvent or fuel oil, dry it with compressed air (from inside out), and dip element in clean oil. Shake off excess oil and reinstall element, breather cap, and machine screw (with lockwasher).

E. AIR FILTER

The element of the air filter, located inside hydraulic tank (Fig. 74) should be replaced after every 100 hours of operation, or more often when operating in extremely dusty conditions. Replace filter element as follows:

1. Thoroughly clean filter cover and surrounding area.

2. Remove filter cover (with tank breather) from top of hydraulic tank.

3. Remove filter element from filter case and discard element. Thoroughly clean inside of filter case.

4. Insert a new filter element (with open end upward) into position in filter case and center element within case.

5. Place a new cover gasket in position on tank and install filter cover (with tank breather). Tighten hex nuts evenly to 25 lbs. ft. torque.

F. HYDRAULIC SUCTION LINE SCREEN AND MAGNET

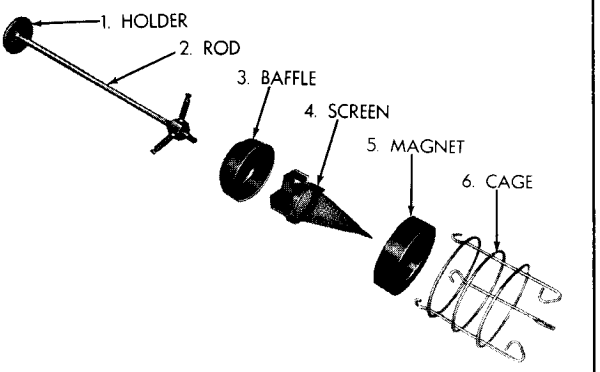
It is important that the suction line screen and magnet be cleaned daily during first week of operation or until the amount of foreign material collected daily has practically disappeared. Thereafter, the screen and magnet should be cleaned after every 100 hours of operation. These parts are accessible for cleaning by the removal of the air filter cover, filter element, and air filter case, and by reaching down into tank.

IMPORTANT: *Plugging of screen with foreign material (particularly fibers worn from packing rings) will starve hydraulic pump, which almost always results in serious damage to internal parts of pump. Therefore, it is imperative that suction screen be kept clean.*

Clean suction screen and magnet as follows:

1. Remove air filter element following the procedure in preceding paragraph, steps 1 through 3. Remove air filter case from hydraulic tank.

2. Reach down into the tank and remove screen and magnet assembly by grasping



Suction Line Screen and Magnet

FIG. 75

rod and holder (visible through the filter opening) and remove entire assembly.

3. Disassemble screen and magnet assembly by holding the cage and rotating holder at top of rod in a counterclockwise direction.

4. Wash suction screen in a clean solvent or fuel oil, and dry it with compressed air. Clean magnet.

5. Reassemble screen and magnet assembly in their correct positions (Fig. 75) and install entire unit back in the tank.

6. Be certain that air filter case ring (located in bore of tank) is in good condition, and insert air filter case into position in tank. Install filter element following steps 4 and 5 in preceding paragraph.

G. PRESSURE RELIEF VALVE

The spring loaded pressure relief valve assembly, located in the loader's control valve housing, is provided for regulating pressure within the hydraulic system. The relief valve is properly adjusted at the factory for an opening pressure of 1700 to 1750 P.S.I. When valve opens, oil is by-passed from the hydraulic pump directly into hydraulic tank. Since pressure relief valve is properly adjusted at the factory, no further adjustments should be necessary in the field.

1. Testing the Hydraulic System for Proper Operation

If hydraulic system is functioning properly, time required to raise an empty bucket from ground level to fully raised position, with the engine running at full throttle, should be approximately 9 seconds. NOTE: *Hydraulic system should be at normal operating temperature when making this test.*

If it is found that bucket raises slowly when testing as above, check following:

1. Be certain that oil in the hydraulic tank is at proper level.

2. Be certain that suction line filter screen, located in hydraulic tank, is clean.

3. The hydraulic pump should be removed, disassembled and inspected after one year of operation, even though no noticeable decrease in operating efficiency has become apparent. Without actually inspecting internal parts of the pump, it is difficult to determine from operating test exactly when an overhaul should be made to the gear type pump. A gear type pump may maintain operating efficiency to a point where the bearings start to fail.

2. Testing of Pressure Relief Valve

The pressure relief valve is properly adjusted when it opens at a pressure of 1700 to 1750 P.S.I. As this pressure relief valve was properly adjusted at the factory no further adjustment should be necessary in the field. However, if repairs to loader control valve assembly have been made, or if a new control valve assembly has been installed, pressure relief valve should be tested and adjusted for proper opening pressure. Testing and adjusting of pressure relief valve is also necessary when a new or a rebuilt hydraulic pump has been installed. CAUTION: *Never adjust a pressure relief valve (to increase pressure) without first being certain that suction line filter screen in hydraulic tank is clean. Also be certain that oil in the hydraulic system is at normal operating temperature.*

Test and adjust pressure relief valve as follows:

a. Lower bucket to ground. Remove cover plate from top of stabilizer. Thoroughly clean top of loader control valve.

b. Remove rear pipe plug from loader control valve and install a 3000 P.S.I. capacity pressure gauge. NOTE: *A master gauge kit is available through your "Allis-Chalmers" Construction Machinery Dealer.*

c. Start engine and operate it at full throttle. Raise bucket to its maximum height.

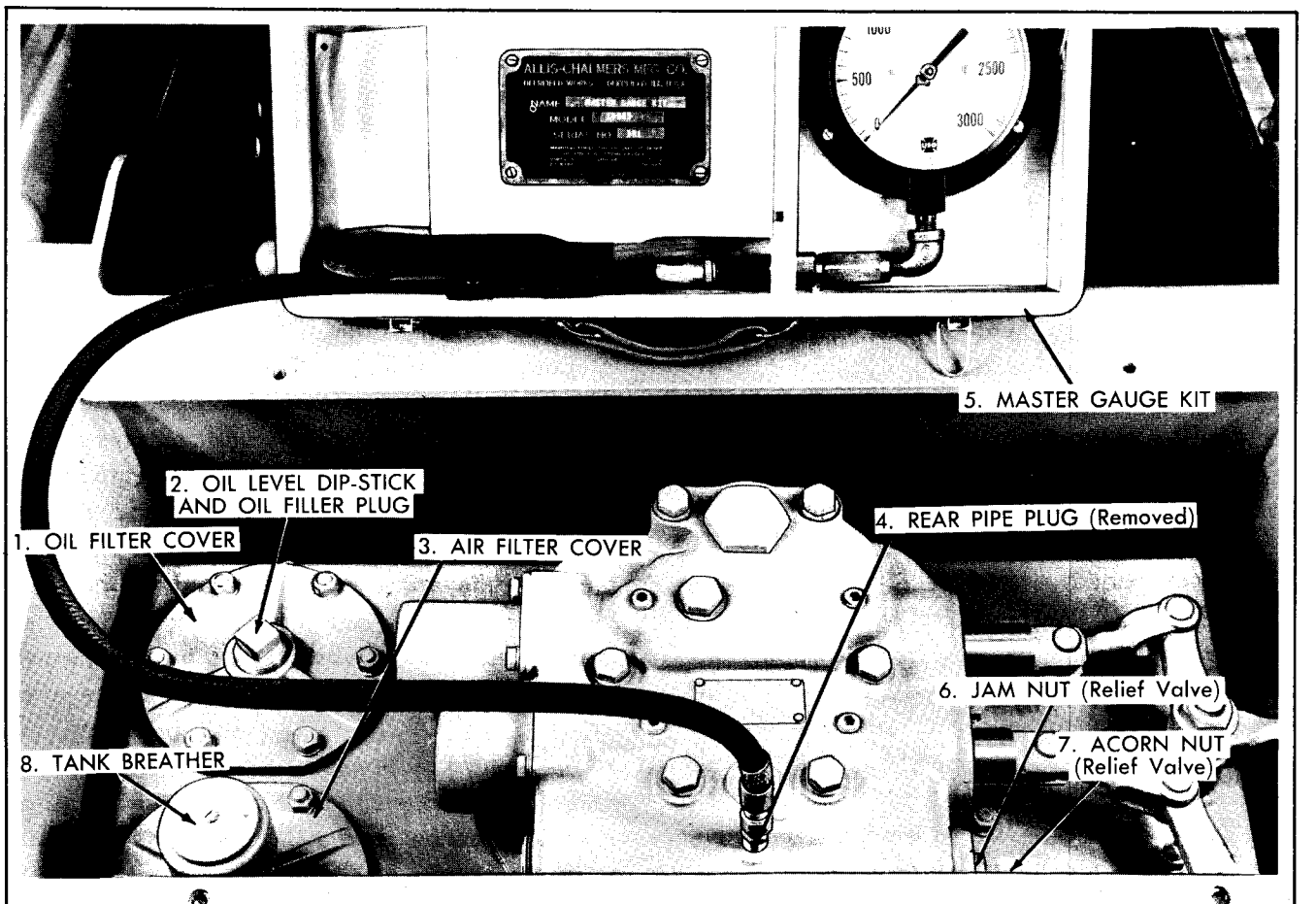
d. Move boom control lever to its fully "RAISED" position and observe pressure indicated by the gauge. Pressure should be 1700 to 1750 P.S.I. Return boom control lever to its neutral position. CAUTION: *When performing this test, do not hold boom control lever in "RAISED" position for long periods of time; hold it just long enough to obtain an accurate gauge reading.*

e. If pressure indicated by gauge is above or below recommended pressure setting (1700 to 1750 P.S.I.), adjustment of pressure relief valve is necessary.

f. To adjust pressure relief valve, remove pressure relief acorn nut and loosen jam nut on adjusting screw. First "back off" adjusting screw about 2 turns. Carefully turn adjusting screw IN to increase pressure as necessary. The valve carries an instruction plate which states:

CAUTION: *Do not turn the adjusting screw IN more than ¼ turn at a time.*

When correct adjustment is obtained, lock adjusting screw securely with jam nut and install acorn nut. NOTE: *Pressure in excess*



Checking Hydraulic Relief Valve Pressure

FIG. 76

of 1750 P.S.I. has no effect on speed or efficiency of bucket operation, but definitely causes unnecessary wear on component parts — particularly the pump assembly.

g. Slow engine to idling speed and lower bucket to ground. Move boom control lever to "FLOAT" position and stop engine.

h. Remove pressure gauge. Install pipe plug and tighten it securely. Replace cover plate on top of stabilizer.

H. SAFETY VALVES

The safety valves located in the dump line, return line, and raise circuit are preset at the factory and should require no adjustment in the field. If, however, a safety valve is diagnosed as the source of a malfunction it may be tested in one of two ways:

The first and most desirable method is to remove the valve from the hydraulic tank. Disassemble the valve; clean all parts thoroughly, inspect, reassemble, and test valve on a test stand.

The second method may be more desirable in the field. Proceed as follows:

1. Remove louvered cover from top of stabilizer assembly. Clean hydraulic control valve thoroughly and the surrounding area.

2. Using Paragraph G of this Section as a guide set main pressure relief valve to approximately 100 P.S.I. above Return Line Safety Valve or 2700 P.S.I.

3. Select circuit to be tested and remove proper pipe plug (Fig. 77) from control valve and install a 3000 P.S.I. capacity pressure gauge in its place.

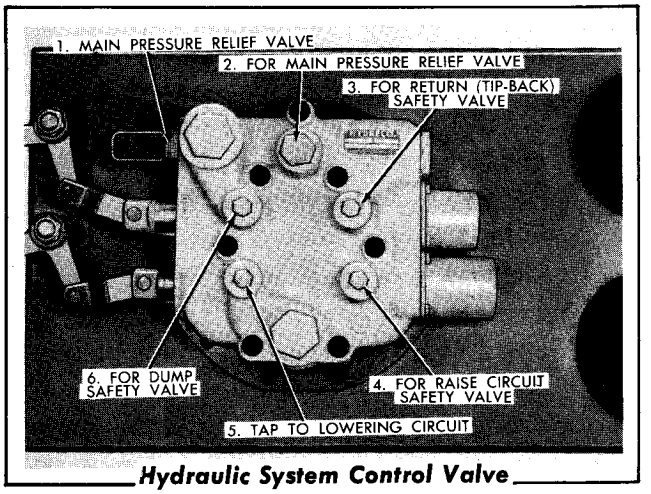
4. With hydraulic system at normal operating temperature, raise bucket to its full height. NOTE: *Hydraulic system must be filled to correct level.*

5. Operate engine at high idle speed and hold control lever of the circuit to be tested against its proper stop only long enough to get an accurate reading, i.e., if Dump safety valve is being tested, dump lever should be held against its forward stop; Return safety valve, hold dump lever against its rear stop, etc.

WARNING: *WHEN TESTING IS COMPLETE, RESET THE MAIN PRESSURE RELIEF VALVE TO THE NORMAL 1700 - 1750 P.S.I.*

The following pressures are effective with TL-40D tractor loader.

Main Pressure Relief Valve . . . 1700 - 1750 P.S.I.
Return Line Safety Valve . . . . . 2600 - 2650 P.S.I.
Dump Line Safety Valve . . . . . 2050 - 2100 P.S.I.
Lift Circuit Safety Valve . . . . . 2200 - 2250 P.S.I.



Hydraulic System Control Valve

FIG. 77

I. CHECKING OIL LEVEL OF HYDRAULIC SYSTEM

An oil level dip-stick, attached to the oil filler plug (Fig. 74) is provided in the left front corner of the hydraulic tank. The oil level should be checked after every 10 hours of operation by removing the dip-stick and oil filler plug. NOTE: *Be certain tractor loader is level before checking the oil level.* With engine running at full throttle, raise boom to radiator height. Actuate bucket through its full travel several times to be certain that dump cylinders are full of oil, then fully retract dump cylinders. Move boom control lever to "LOWER" position and lower bucket to ground level, then return control lever to its "NEUTRAL" (HOLD) posi-

tion. Be sure that engine is running at full throttle when performing these operations. Stop engine and check the oil level as follows:

1. Thoroughly clean top of hydraulic tank (at oil filler plug location) before removing filler plug.

2. Remove dip-stick and oil filler plug (Fig. 74) and dry dip-stick with a clean cloth.

3. Insert dip-stick back into hydraulic tank, resting oil filler plug on top of oil filter cover. Withdraw dip-stick and note oil level; the oil level should be even with ring groove in dip-stick.

4. Add oil to hydraulic tank as necessary to raise level even with ring groove in dip-stick. Install dip-stick and oil filler plug and tighten securely.

   IMPORTANT: *The oil level should never be allowed to drop more than 1 inch below ring groove in the dip-stick. When oil level in the hydraulic tank is too low, action of the lift and dump cylinders will be sluggish because the hydraulic pump is not receiving enough oil and is, to some extent, pumping air. The upward movement of the bucket during lifting operation might be slowed to half its normal speed, or it may stop entirely, due to an insufficient supply of oil in system. The same applies to dump cylinders. Considerable damage can be done to the hydraulic pump when oil level is allowed to get so low that suction line tube is not full.*

J. DRAINING, FLUSHING AND FILLING OF HYDRAULIC SYSTEM

The hydraulic system should be drained, flushed and refilled with new oil after every 1000 hours of operation, or more often if the oil is found discolored. NOTE: *The oil should be at normal operating temperature when draining it from system.*

Drain, flush, and refill the system as follows:

1. Remove bucket from machine.

2. Start engine and carefully retract dump cylinders all the way. Use care to see that front end of the dump links are moving freely.

3. Raise booms to their full height. When oil reaches operating temperature, stop engine.

   CAUTION: *Suitably support boom to prevent it from accidentally dropping during next operation.*

4. Drain hydraulic tank completely as follows:

   a. Remove magnetic drain plug located on right side in bottom of tank.

   b. Remove suction and pressure elbow fittings from loader hydraulic pump to accelerate draining operation. The baffle cup, placed upside down over the suction line opening inside tank, will serve as a temporary cover to prevent loss of oil while removing suction elbow.

5. Move bucket (dump) control lever back and forth several times to relieve any pressure. Disconnect both dump cylinder hoses on each side of machine where they pass through loader frame. Place a container under hoses (close to tank bulkhead fittings) to catch drained oil — about 4½ gallons on each side.

6. Remove boom support. Move boom control lever to "LOWER" position, allowing booms to descend until all of the oil is expelled from lift cylinders into tank and out through drain. Do not use "FLOAT" position. NOTE: *Some of the oil will be discharged through dump cylinder hoses while booms are being lowered.*

7. Use an external power source to completely extend dump cylinder rods, thereby expelling all of the oil.

8. Oil remaining in loader control valve may be drained by disconnecting lift cylinder

hoses at cylinders, and pressure line at pump.

9. Install a new oil filter, an air filter and a new tank breather element (refer to Paragraphs C, D and E). Clean the suction line screen and magnet (refer to Paragraph F). Clean and reinstall the magnetic drain plug in the hydraulic tank.

10. Reconnect all lines that were disconnected during draining procedure, such as:

    a. The pressure and suction lines — pump to tank.

    b. The lift and dump cylinder hoses — cylinders to tank.

11. COMPLETELY fill hydraulic tank with best grade of kerosene. Start engine to circulate kerosene through system. Operate both of loader control valve levers four or five times to thoroughly flush out lift and dump cylinders.

12. Drain hydraulic system by following steps 2 through 8 above. Referring to step 10, reconnect all lines.

13. Remove dip-stick and oil filler plug from hydraulic tank. Fill hydraulic tank to a level even with ring groove in dip-stick with specified oil. Install dip-stick and oil filler plug.

14. Start engine. Operate loader control valve levers so lift and dump cylinders fill with oil. Add oil to hydraulic tank as necessary to keep suction line filled.

15. Reinstall bucket.

16. Fully retract dump cylinders and lower bucket to ground level.

17. Remove dip-stick and oil filler plug and dry with a clean cloth. Insert dip-stick back into tank, resting oil filler plug on top of oil filter cover. Withdraw dip-stick and oil filler plug and note oil level; level should be even with ring groove in dip-stick.

18. Add oil to hydraulic tank as necessary to raise level even with ring groove in dip-stick. On final check, allow a few minutes for oil to settle before rechecking proper level. Install dip-stick and oil filler plug and tighten it securely. Hydraulic system is now full and ready to operate.

K. GENERAL CARE OF HYDRAULIC SYSTEM

1. Keep all of tube fittings and the hose connections tight to prevent any oil leaks. DO NOT OVER-TIGHTEN OR USE SEALING COMPOUNDS.

2. Use compounds as "Permatex" #2 on pipe threads when replacing fittings. Be certain that all parts are thoroughly cleaned before they are installed.

3. When installing hose assemblies be sure that they are not twisted when their connections are tightened.

4. Keep all hose clamps tight to avoid hose chafing.

5. Keep packing glands for hydraulic lift and dump cylinders properly adjusted to avoid oil leakage. Packing gland end plates should be adjusted so that there is a light film of oil on piston rods when the unit is in operation.

   The packing gland of each cylinder is adjusted by removing the lockwire from capscrews in packing gland end plate. Tighten four capscrews evenly, using a slight pressure on a short wrench. Lock capscrews with a lockwire. NOTE: *Excessive tightening of packing glands results in rapid wear of packing rings and severe wiping of piston rod. If packing gland leaks oil after being adjusted properly, it is an indication that packing rings are worn and should be replaced.*

L. TO REPLACE WORN PACKING RINGS

1. Lower bucket to its normal position (dig position) on ground. Remove lockwire and four capscrews attaching packing gland

end plate.

2. Slide packing gland end plate and packing gland bearing forward on piston rod.

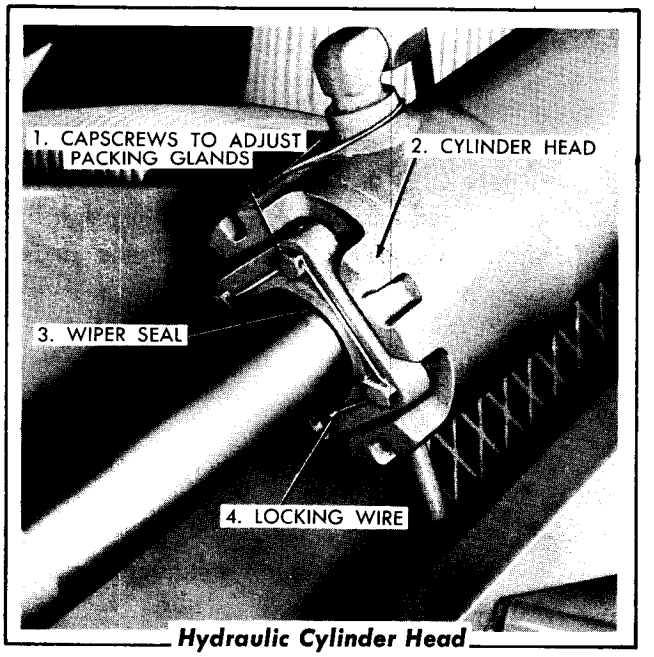
3. Remove four (4) packing rings and wipe out packing ring space. NOTE: *Do not remove bottom adapter ring.*

4. Insert four (4) new packing rings into position in recess of the cylinder head, being certain that open end of "V's" are toward rear of cylinder. CAUTION: *When installing packing rings, stagger gaps so that no two gaps are adjacent and be certain that edges are not doubled back.*

5. Slide packing gland bearing and end plate back on piston rod and install attaching capscrews. Tighten capscrews evenly, using a slight pressure on a short wrench. DO NOT OVER-TIGHTEN. Lock screws with a lockwire.

M. HYDRAULIC CYLINDER PISTON ROD WIPER SEALS

The wiper seal, installed in packing gland end plate of each cylinder, serves to wipe off dirt from piston rod surface. The wiper seal should be replaced when there are indications that seal is not wiping the rod surface properly. To replace wiper seal it is necessary to remove cylinder head, remove piston from piston rod so that packing gland end plate can be slipped off piston rod. When installing a new wiper seal, be certain that lip of the seal faces outward.



Hydraulic Cylinder Head

FIG. 78

PREPARATION OF LOADER FOR STORAGE

If the loader unit is to be stored during winter or slack season, make a complete inspection of unit for loose, worn, or damaged parts, and make necessary repairs before it is stored.

Drain engine crankcase and all other oil compartments and refill them with new oil. To protect fuel injection system, drain fuel tank, then pour about 10 gallons of a mixture of 40% mineral oil and 60% "Perfection Kerosene" in fuel tank and run engine for 15 minutes to circulate mixture through fuel system. This will leave fuel system filled with mixture and prevent corrosion or gumming of working parts. Major oil companies can supply this storage fuel mixture.

Coat bottom of bucket and cutting edges with heavy grease to prevent rust. Raise and block up axles to remove weight of loader from tires. Lower and retract bucket to fully retract piston rods into cylinders for protection. Place boom control lever in "FLOAT" position and coat extended portion of valve plungers with light grease to protect plunger surfaces.

After loader has been stored, fill fuel tank with specified Diesel fuel to minimize condensation in tank. NOTE: *This fuel need not be drained when tractor is again placed in service.*

Remove batteries, clean and store them in a cool, dry place (refer to "ELECTRICAL SYSTEM"). Test them once a month and recharge them if specific gravity of electrolyte falls below 1.215. Keep specific gravity of electrolyte solution above 1.220 to prevent batteries from freezing.

Drain cooling system and fill it with an anti-freeze solution that will withstand the lowest anticipated temperature. Cover exhaust pipe.

COLD WEATHER OPERATION

When atmospheric temperature drops to freezing or below and truck is to be operated in temperatures below 32° F., it should be prepared for cold weather operation.

The lubricating oil in the engine crankcase should be drained and refilled with oil of a lighter viscosity. Refer to the SPECIFICATIONS OF LUBRICANTS.

The engine cooling system must be drained, cleaned and checked for leaks. Refill with a permanent type anti-freeze solution to prevent freeze-up at the prevailing atmospheric temperature. Refer to ENGINE COOLING SYSTEM.

The oil in the drive unit, standard transmission and steering gear should be drained and the units refilled with a lubricant of lighter viscosity. Refer to the SPECIFICATIONS OF LUBRICANTS.

The battery, starter, generator, generator regulator and all parts of the ignition system should be carefully inspected and put in first-class condition at the onset of cold weather. Refer to ELECTRICAL SYSTEM.

IMPORTANT: *When starting in cold weather, it is advisable to operate the engine at ⅓ to ½ throttle for approximately 5 minutes to allow the oil in the hydraulic system to circulate and warm up before applying any loads.*