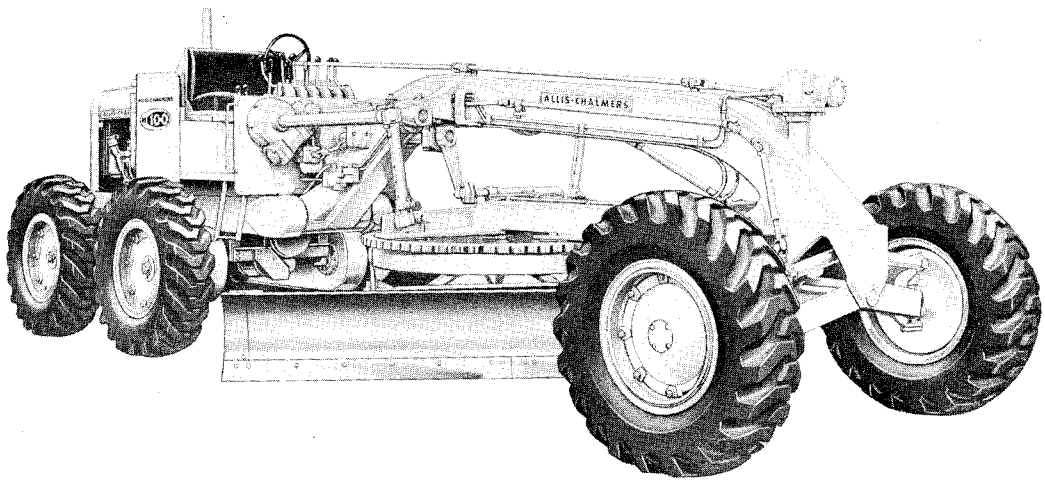
OPERATING INSTRUCTIONS
AND
FIELD MAINTENANCE

MODEL M 100
DIESEL MOTOR GRADER



ALLIS-CHALMERS MFG. CO.

MILWAUKEE, WISCONSIN, U. S. A.

LITHO. IN U. S. A.

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(11-62)

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, lubrication, and adjustment of the grader. Economical operation will be assured if these instructions are followed.

The instructions given in this book cover the operation of the "Allis-Chalmers" Model M 100 Motor Grader (Standard Model). A close adherence to these instructions will result in many hours of trouble-free operation and a longer operating life for the unit.

Many owners of "Allis-Chalmers" equipment employ the Dealer's Service Department for all work other than routine care and adjustments. This practice is encouraged as our 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 motor grader, always use Genuine "Allis-Chalmers" Parts obtained through your "Allis-Chalmers" Dealer.

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GENERAL DESCRIPTION

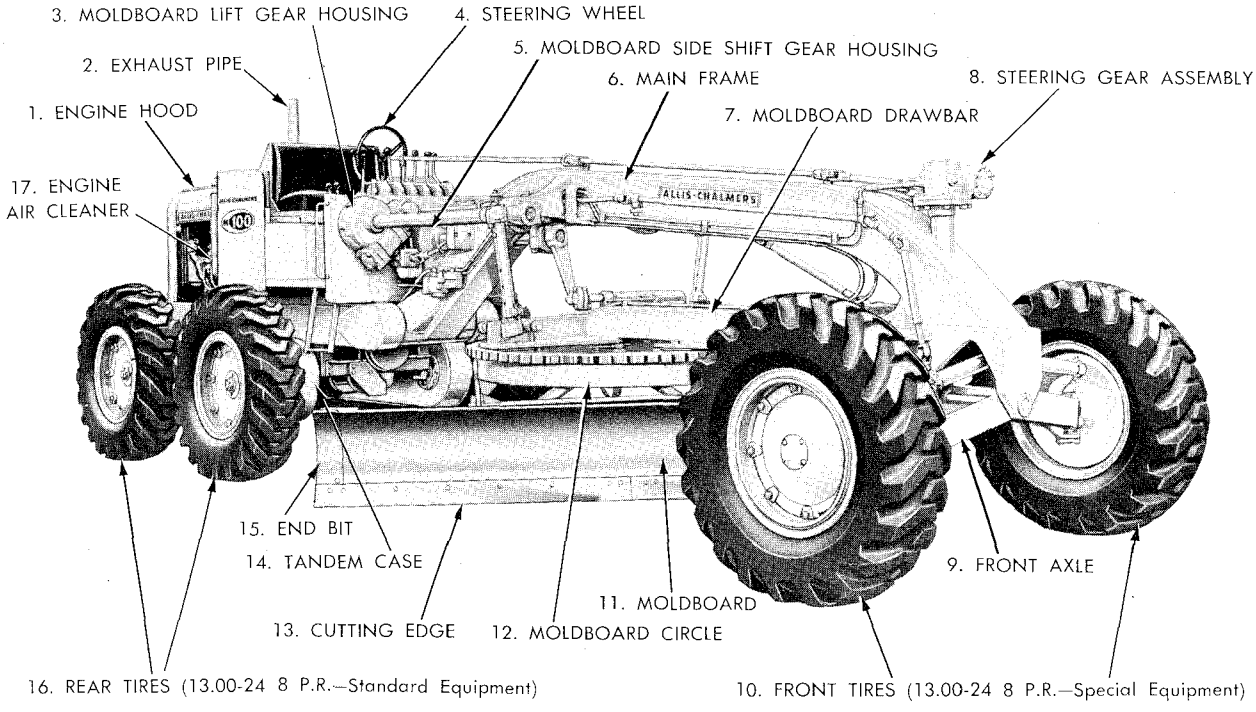
The Model M 100 Motor Grader is a 25,700 pound unit designed for use in construction and maintenance of roads, general grading, and snow removal. The main frame is of welded, box-type construction. The grader is powered with a naturally aspirated, 6 cylinder, 4 stroke cycle, "Allis-Chalmers" Model 10000 diesel engine. Power from the engine is transmitted through an oil-type, multiple disc, spring loaded, hydraulic power assist engine clutch to the transmission through a universal joint assembly. From the transmission the power is transmitted to the bevel gear and rear axle assembly and to the tandem drive shafts and the rear wheels. The rear wheels are driven by heavy roller driving chains, which connect the sprockets of the wheel shafts with the driving sprockets on the rear axle shafts.

Both wheels of the tandems are equipped with power assist, self-adjusting type, hydraulic brakes. A lever controlled, shoe and drum type, mechanical brake installed on the front end of the transmission bottom shaft is provided as a parking brake.

The transmission is controlled by two gear shift levers which provide 6 forward and 3 reverse speeds. At full governed engine speed of 1800 R.P.M., the forward speeds range from 2.7 to 20.0 M.P.H. and the reverse speeds range from 3.1 to 6.8 M.P.H.

A mechanical power control box with six control levers for controlling the moldboard, front wheel lean, and scarifier or snow plow is located directly in front of the operator. The moldboard may be rotated 360 degrees, thereby allowing work to be done with the machine traveling backward as well as forward. The moldboard can be tilted to several different pitch positions to obtain the desired rolling or cutting action and can also be shifted out to either side for cutting ditches or sloping banks. The front wheels can be leaned to the right or left to counteract side draft. A power steering system is provided for steering the grader. The arched front axle permits the handling of heavy windrows of dirt, gravel, or oil mix material. Provision is made for mounting and operating special equipment such as a scarifier, snow plow, or hydraulic shiftable moldboard.

The standard model grader is equipped with a power steering system; 4-wheel power brakes; hydraulic power assist, oil-type engine clutch; four 13.00-24 (8 ply) rear and two 9.00-24 (10 ply) front pneumatic tires; with regular tubes; 24-volt electric starting equipment; 12-foot moldboard with end bits; foot accelerator-decelerator pedal; adjustable type seat; rear bumper; muffler; combination tail and stop lights; and horn.



Model M 100 Motor Grader

FIG. 1

GENERAL SPECIFICATIONS
(STANDARD GRADER)

General:

Weight — Approximate	25,700 lbs.
(with Scarifier)	27,100 lbs.
Weight on Front Wheels	7,650 lbs.
(with Scarifier)	8,900 lbs.
Weight on Rear Wheels	18,050 lbs.
(with Scarifier)	18,200 lbs.
Blade Pressure	13,000 lbs.
(with Scarifier)	15,100 lbs.
Overall Length	25 ft. 10 in.
Overall Width	7 ft. 7¾ in.
Overall Height (to top of Exhaust Stack)	9 ft. ½ in.
(with Cab)	10 ft. 6⅛ in.
Wheelbase	18 ft. 9 in.
Tread Width	
Front (9.00 — 24 Tires) Standard	6 ft. 9$\frac{3}{16}$ in.
Front (13.00 — 24 Tires) Special Equipment	7 ft.
Rear (13.00 — 24 Tires)	6 ft. 6½ in.
Tires (Standard)	
Front (10 Ply)	9.00 — 24
Rim Type	Flat Base
Rear (8 Ply)	13.00 — 24
Rim Type	Semi-Drop Center
Turning Radius	36 ft. 0 in.
Front Axle Clearance at Center	
(with 9.00 — 24 Tires) Standard	23⅝ in.
(with 13.00 — 24 Tires) Special Equipment	26⅛ in.
Wheel Brakes	
Number of Brakes (Standard)	4
Type (Hydraulic)	Duo-Servo
Controls (Standard)	Mechanical with Power Assist

Moldboard:

Length	12 ft.
Number of End Bits	2
Side Shift (Maximum with Moldboard on Ground and Link and Ball Adjusted and Moldboard Extended on Arms)	49 in. R.H. 42¼ in. L.H.
Maximum Reach Outside Front Wheels (Adjusted as Above)	73$\frac{5}{16}$ in. R.H. or 66$\frac{13}{16}$ in. L.H.
Number of Pitch Positions	5
Lateral Shift of Moldboard	21 in. L.H. 27 in. R.H.
Maximum Lift Above Ground	15½ in.
Ground Penetration (Maximum)	25½ in.
Bank Cutting Angle	90°

Engine:

Make	"Allis-Chalmers" Diesel
Model	10000

Engine — *Continued*

Type	4 Stroke Cycle (Naturally Aspirated)
Number of Cylinders	6
Bore	4$\frac{7}{16}$ in.
Stroke	5$\frac{9}{16}$ in.
Crankshaft Rotation (When Viewed from Fan End)	Clockwise
Number of Main Bearings	7
Piston Displacement	516 cu. in.
Lubrication	Full Pressure (Forced Feed)
Fuel Used	Diesel Fuel
Fuel Supplied By	Injection Pump
Low Idle Speed	500 to 600 R.P.M.
High Idle Speed	1925 to 1980 R.P.M.
Governed at Full Load	1800 R.P.M.

Road Speeds (At Rated Engine Speed):

1st Gear	2.7 M.P.H.
2nd Gear	3.9 M.P.H.
3rd Gear	5.9 M.P.H.
4th Gear	8.3 M.P.H.
5th Gear	12.1 M.P.H.
6th Gear	20.0 M.P.H.
1st Reverse	3.1 M.P.H.
2nd Reverse	4.5 M.P.H.
3rd Reverse	6.8 M.P.H.

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

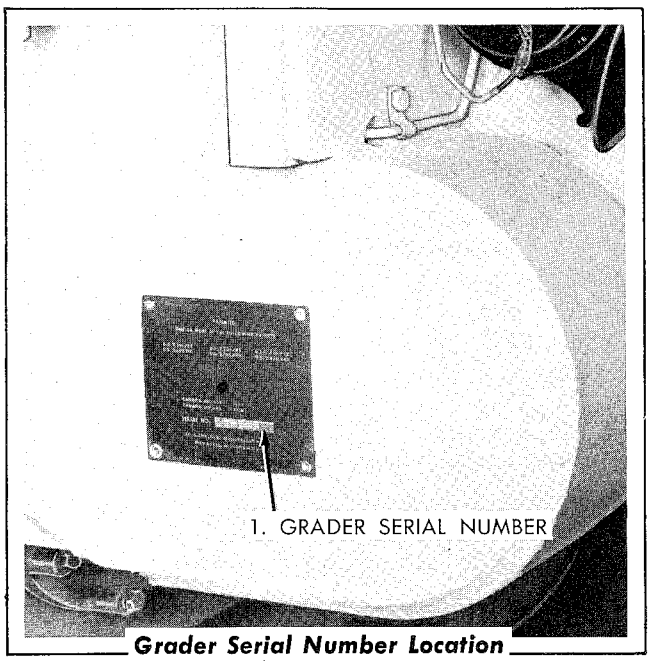
Fuel Tank	55 gals.
Cooling System	8¾ gals.
Engine Crankcase (with Filters & Clutch)	4 gals.
Transmission (including Filter)	4 gals.
Rear Axle Housing Center Compartment	5¼ gals.
End Compartments (each)	1¼ gals.
Tandem Drive Cases (each)	8 gals.
Hydraulic System and Filter	10½ gals.
Power Take-Off Drive Housing	1 qt.
Power Control Box	1¾ gals.
Side Shift Gear Housing	1¼ gals.
Moldboard Lift Gear Housing (each)	1¼ gals.
Circle Turn Gear Housing	5 lbs.
Front Wheel Lean Gear Housing	4½ lbs.
Brake Master Cylinder	2¼ pts.

U. S.-Metric Measure Conversion Factors

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

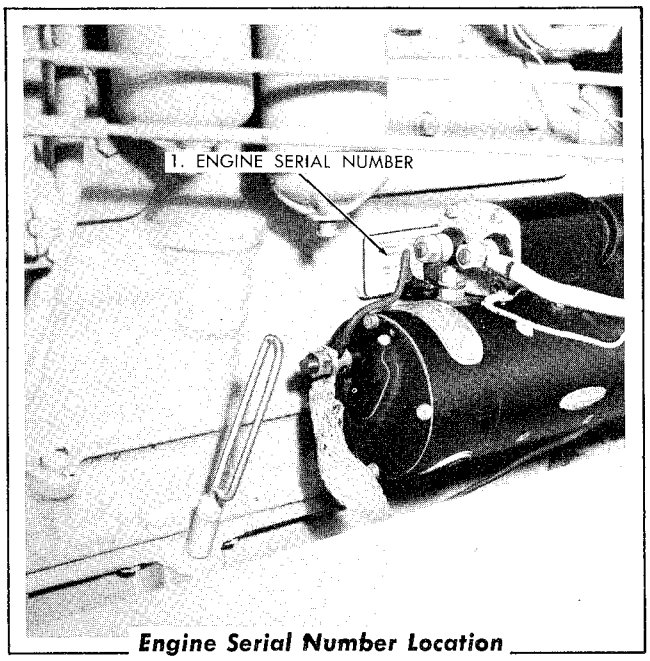
The Allis-Chalmers Manufacturing Company reserves the right to make changes in the above specifications or to add improvements at any time without notice or obligation.

GRADER AND ENGINE SERIAL NUMBERS



Grader Serial Number Location

FIG. 2



Engine Serial Number Location

FIG. 3

On all parts orders and in all correspondence relative to the grader, it is necessary that both the grader and the engine serial numbers be given. This will properly identify the particular grader and will assure obtaining the correct replacement parts for it.

The grader serial number is stamped on a plate located on the right side of the main frame (Fig. 2).

The engine serial number is stamped on a plate attached to the side of the cylinder block (Fig. 3).

SPECIFICATIONS OF LUBRICANTS

A. Engine Crankcase Lubricant

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 the 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 Series 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; Steering, Power Brakes, and Clutch Booster Hydraulic System

A good quality Automatic Transmission Fluid "Type A," purchased from a reputable oil company, is recommended for all atmospheric temperature ranges.

For operation ABOVE 32° F., a good quality of non-foaming SAE 10W engine crankcase oil may be used if desired. NOTE: *Automatic Transmission Fluid "Type A" must be used for operation below 32° F.*

C. Moldboard Lift, Side Shift, and Power Take-Off Drive Housings

Use an SAE 90 viscosity *EXTREME PRESSURE* gear lubricant of the non-corrosive type.

D. Rear Axle Housing Compartments, Tandem Drive Cases, and Power Control Box

Lubricate with SAE REGULAR TYPE GEAR LUBRICANT (straight mineral oil) or a good quality engine crankcase oil purchased from a reputable oil company. CAUTION: *Do not use extreme pressure (EP) gear lubricant.*

Use oils of the following viscosities:

Atmospheric Temperature	Viscosity
Above 32° F.	SAE 90 Gear Lube or SAE 50 Crankcase Oil
32° F. and below	SAE 80 Gear Lube or SAE 30 Crankcase Oil

E. Pressure Gun Lubricant

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 lubricating gun at the prevailing atmospheric temperature. The ball and roller bearing lubricant MUST be waterproof.

F. Hydraulic Brake Fluid

Use a good grade of moderate duty hydraulic brake fluid (SAE 70R2) or better, in the brake hydraulic system.

G. Front Wheel Bearings

Pack the front wheels with a good grade of wheel bearing grease.

H. Circle Turn and Front Wheel Lean Gear Housing

Use a good quality No. 0 consistency grease (track roller lubricant) to pack circle turn and front wheel lean gear housings.

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 the engine closely approximates the following specifications:

Gravity API	30–35
Viscosity Saybolt Universal at 100° F.	35–40
Flash Point	150° F.
Diesel Index	48.5–65.5
Cetane Number	46–60
Pour Point	0° F. Min.
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 the fuel.

It is important that the fuel be within the specific limits for ash, carbon, water, 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. In instances where fuel with inadequate lubricating properties must be used, one quart of SAE 10W engine oil must be added to every 10 gallons of fuel to provide the necessary lubrication; contact the fuel supplier and follow his recommendations as to whether or not engine oil should be added to the fuel.

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 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, sediment and water can easily be drained and the fuel can be pumped into grader 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 bottom of 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 fuel tank of the grader. It is advisable to use a pump and draw the fuel from storage tank or barrel, rather than to drain it from 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, 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 by water, which will enter through the filler plugs when it rains, even though plugs are tight.

The fuel tank of the grader should be filled at 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 grader. Different lubricants are needed and some units in the grader require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and frequency of their application, as given in this manual be explicitly followed. Periodic lubrication of 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 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 grader 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 service points of the grader to be serviced.

LUBRICATION GUIDE

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

The intervals given on the 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:

ENGINE CRANKCASE — OIL LEVEL — Check oil level and add oil if necessary to raise level to "FULL" mark on gage rod (Fig. 4, View A).

RADIATOR — COOLANT LEVEL — Remove radiator cap (not shown) and check level of coolant. Keep cooling system full by addition of clean soft water or anti-freeze solution. Refer to "COOLING SYSTEM" for detailed information.

HYDRAULIC SYSTEM — Check level of hydraulic oil, add oil if necessary to bring up to "FULL" mark on gage rod. Gage rod located inside operator's compartment, left of seat (Fig. 4, View B).

BATTERIES — 3 Points each battery (Fig. 4, View B). Clean and remove filler caps. Inspect electrolyte level and add clean distilled water to keep level $\frac{3}{8}$ inch above plates. Install and tighten filler caps. Keep tops of batteries clean and terminals free from corrosion. Test batteries with a hydrometer. Refer to "ELECTRICAL SYSTEM" for detailed information.

SERVICE:

FIRST STAGE AND SECOND STAGE FUEL FILTERS — DRAIN SEDIMENT — Open drain cock at bottom of each filter (Fig. 4, View A) before engine is started at beginning of an operating period in warm weather, or shortly after stopping at end of an operating period in freezing weather, and allow any water and sediment to drain. Tighten the drain cocks when clean fuel runs out.

FUEL TANK — DRAIN SEDIMENT — Open fuel tank drain cock (Fig. 4, View C) before engine is started in warm weather, or shortly after end of day's operation in freezing weather, and allow any water and sediment to drain. Close drain cock when clean fuel runs out.

FUEL TANK — FILL — Clean and remove filler cap (Fig. 4, View D). Fill tank at end of each operating period to keep condensation in tank to a minimum. Reinstall the filler cap.

LUBRICATE:

CIRCLE TURN SHAFT BEARINGS — 4 Lube Points (Fig. 5, View H). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots).

MOLDBOARD LIFT SHAFT BEARINGS — 2 Lube Points each side (Fig. 5, View H). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 6 to 10 shots each).

FRONT WHEEL LEAN LINKS — 4 Lube Points (Fig. 4, View E). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

STEERING GEAR DRAG LINKS — 3 Lube Points (Fig. 4, View F). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots).

FRONT WHEEL LEAN SHAFT BEARINGS — 4 Lube Points (Fig. 4, View E). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

FRONT WHEEL LEAN KNUCKLE PIVOT BOLT — 1 Lube Point each side (Fig. 4, View F). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

FRONT AXLE PIVOT PIN — 2 Lube Points (Fig. 4, View F). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 6 to 8 shots each).

DRAWBAR BALL AND SOCKET — 1 Lube Point (Fig. 4, View F). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 6 to 14 shots).

MOLDBOARD LIFT LINKS — 2 Lube Points each side (Fig. 5, View K). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

SIDE SHIFT LINK — 2 Lube Points (Fig. 5, View H and K). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

SIDE SHIFT WORM GEAR SHAFT BEARING — 2 Lube Points (Fig. 5, View H and J). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 6 to 10 shots each).

SIDE SHIFT BEVEL GEAR HOUSING BEARINGS — 2 Lube Points (Fig. 5, View J). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots).

STEERING WHEEL SHAFT BEARINGS — 3 Lube Points (Fig. 6, View O). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 2 to 4 shots).

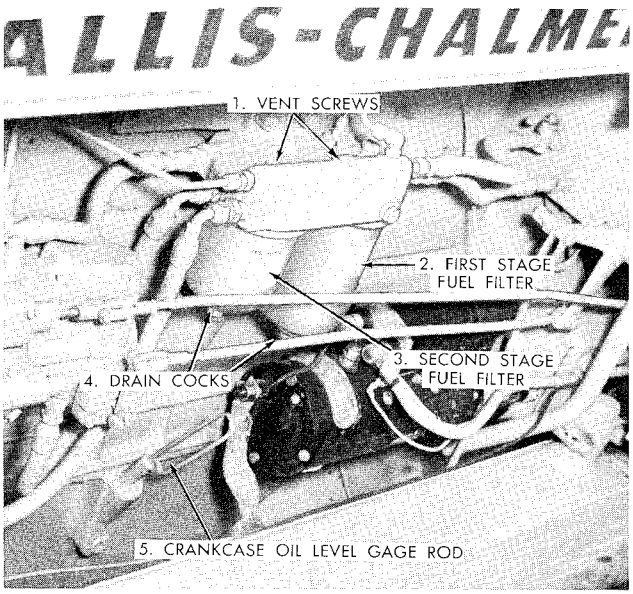
CIRCLE TURN BEVEL GEAR HOUSING BEARINGS — 2 Lube Points (Fig. 4, View F). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

100-HOUR SERVICES

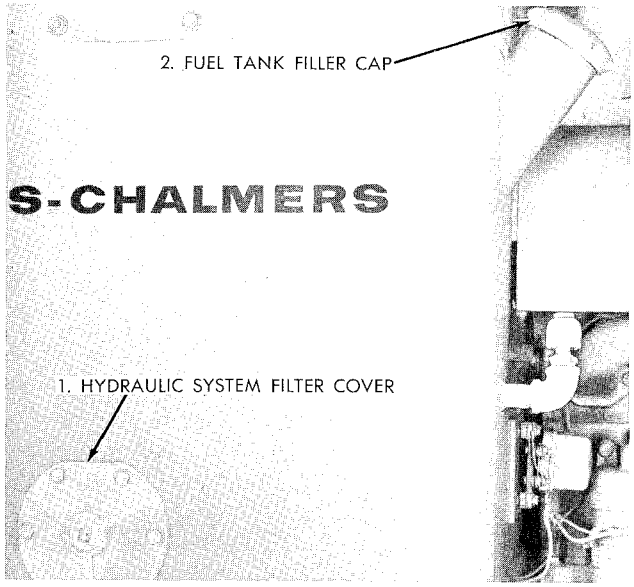
(NOTE: *Also perform the 10-Hour Services)*

INSPECT:

BRAKE MASTER CYLINDER — FLUID LEVEL — Remove brake fluid filler plug (Fig. 5, View J). Inspect fluid level in reservoir of cylinder and add hydraulic brake fluid as necessary to maintain the level $\frac{1}{2}$" below top of reservoir. Install and tighten filler plug.



VIEW A



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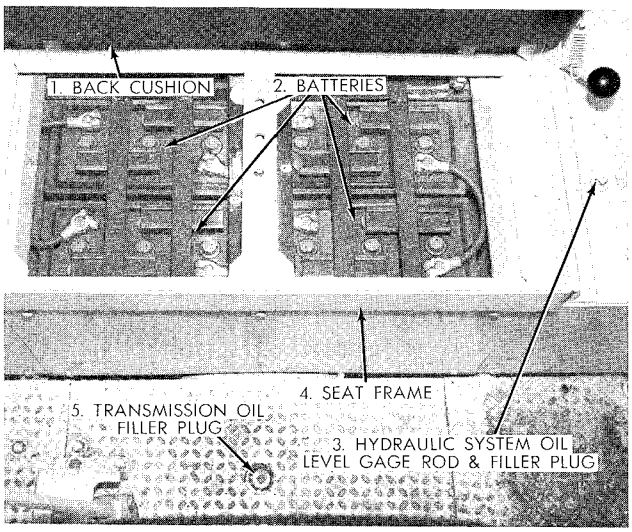
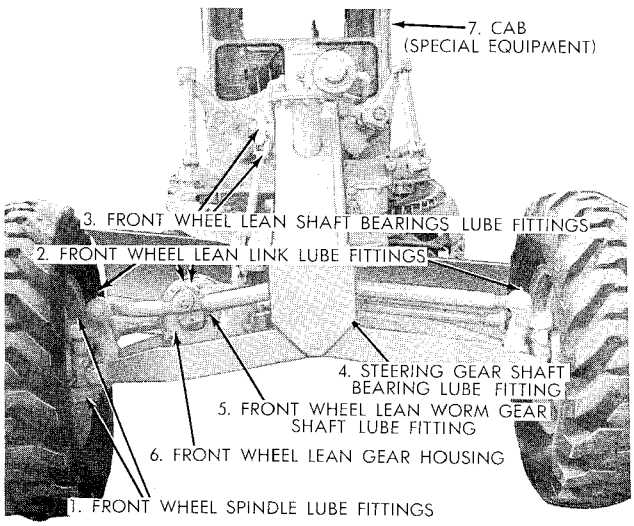
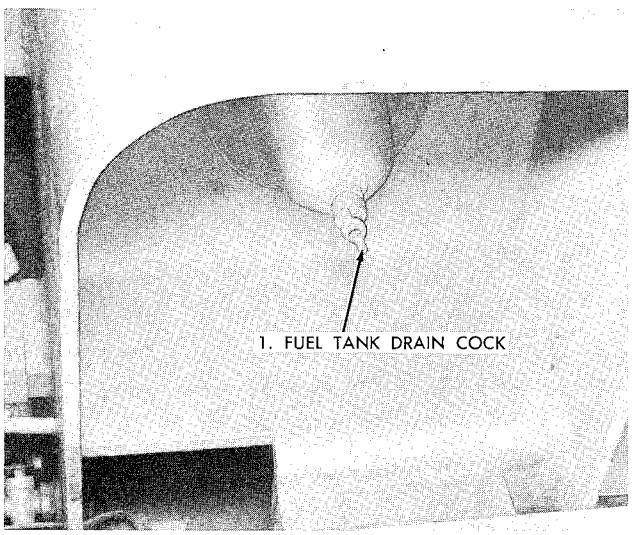


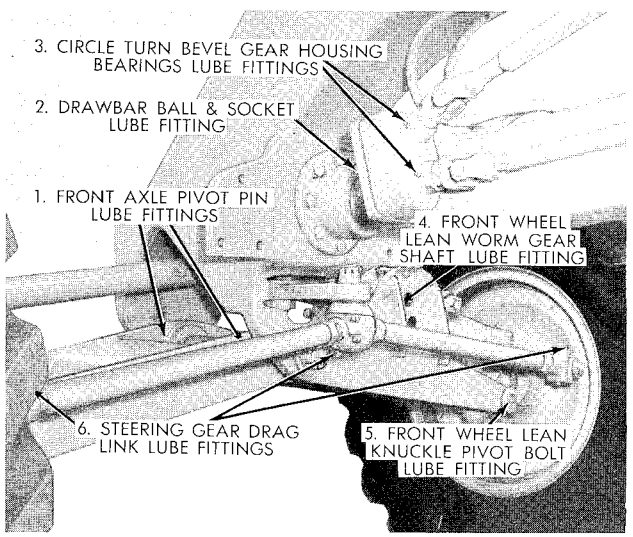
VIEW B



VIEW E



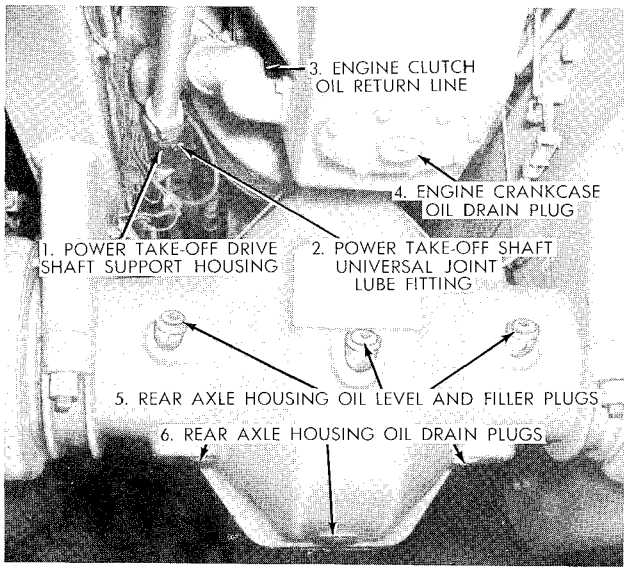
VIEW C



VIEW F

Lubrication Guide

FIG. 4



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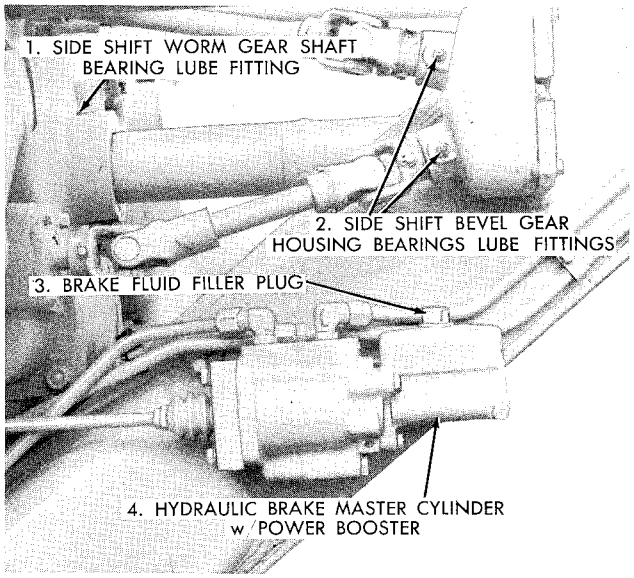

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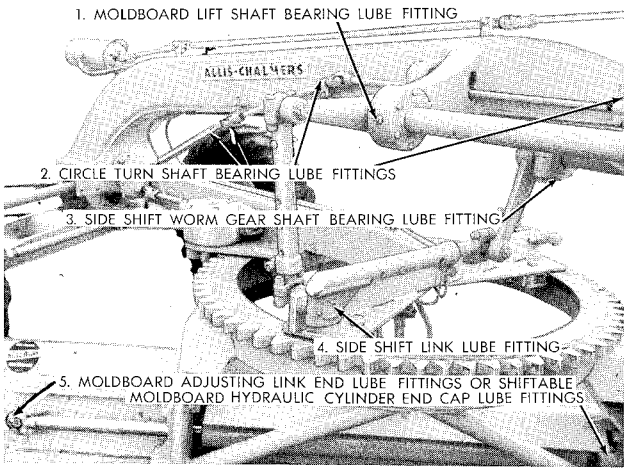

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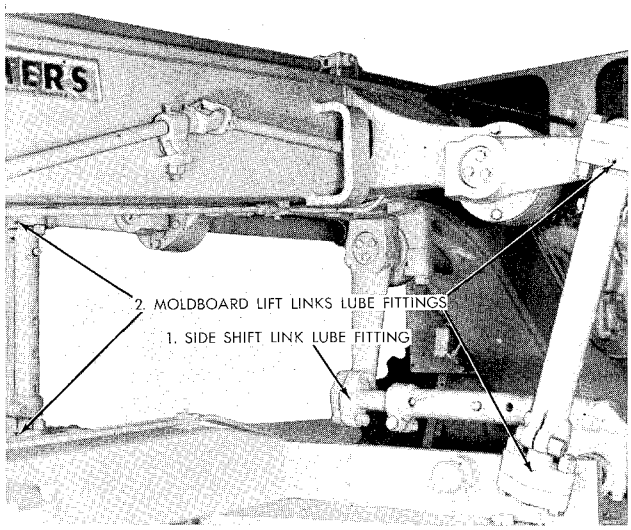
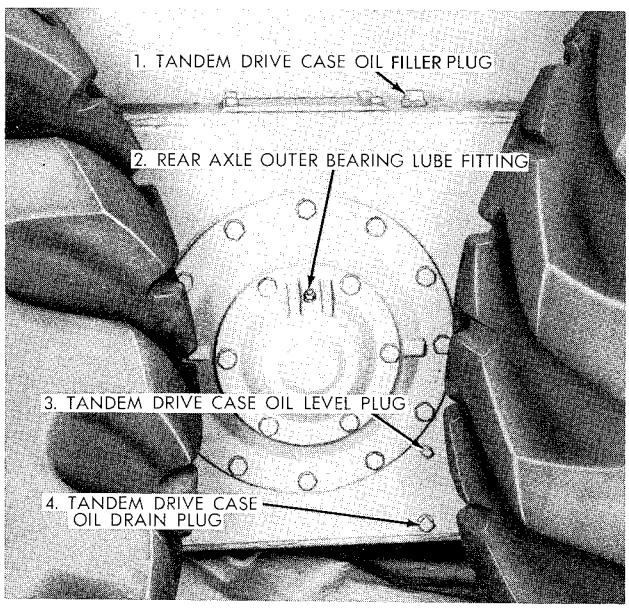
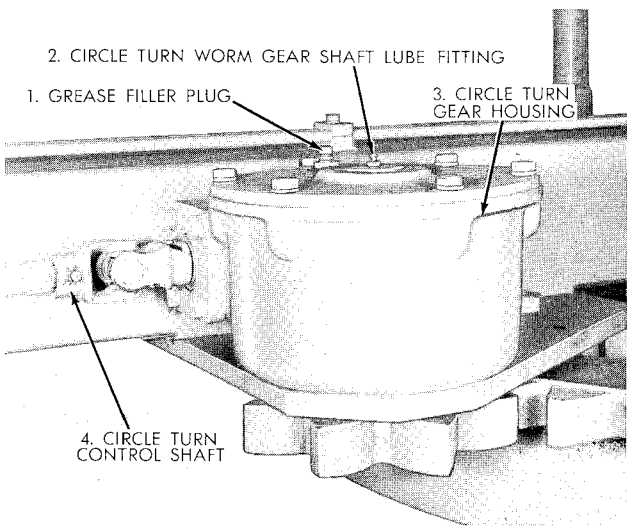


VIEW K



VIEW I



VIEW L

Lubrication Guide

FIG. 5

LUBRICATE:

FRONT WHEEL LEAN WORM GEAR SHAFT — 2 Lube Points (Fig. 4, View E and Fig. 4, View F). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 6 to 10 shots each).

CIRCLE TURN WORM GEAR SHAFT — 1 Lube Point (Fig. 5, View L). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 6 to 10 shots each).

FRONT WHEEL SPINDLES — 2 Lube Points each side (Fig. 4, View E). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

200-HOUR SERVICES

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

INSPECT:

TRANSMISSION — OIL LEVEL — Check oil level and add oil if necessary to raise oil level even with oil level plug (Fig. 6, View M and Fig. 4, View B).

REAR AXLE HOUSING — OIL LEVEL — Center compartment and 2 end compartments — Check oil level and add oil if necessary to raise oil level even with oil level plugs (Fig. 5, View G).

TANDEM DRIVE CASES — OIL LEVEL — 1 Level plug each tandem case. Check oil level and add oil if necessary to raise oil level even with oil level plug (Fig. 5, View I).

POWER CONTROL BOX — OIL LEVEL — Check oil level (Fig. 6, View O) and add oil if necessary to raise oil level even with oil level plug.

POWER TAKE-OFF DRIVE HOUSING — OIL LEVEL — Check oil level (Fig. 6, View N) and add oil if necessary to raise oil level even with oil level plug.

MOLDBOARD LIFT GEAR HOUSINGS — OIL LEVEL — 2 housings (large and small) on each side (Fig. 6, View O and Fig. 7, View S). Check oil level and add oil if necessary to raise oil level to oil level plugs.

SIDE SHIFT GEAR HOUSINGS — OIL LEVEL — 2 housings (large and small) in center (Fig. 6, View O and Fig. 7, View S). Check oil level and add oil if necessary to raise oil level to oil level plugs.

CIRCLE TURN GEAR HOUSING — Check — (Fig. 5, View L). Must be packed with "O" consistency truck wheel lubricant.

TIRES — INFLATION PRESSURE — Check all tires for specified inflation pressure. Inflate to specified pressure. Refer to "TIRES" for detailed information.

SERVICE:

ENGINE CRANKCASE — CHANGE OIL — Operating conditions may necessitate this service at shorter intervals. Drain the oil when engine is at normal operating temperature. Remove engine crankcase oil drain plug (Fig. 5, View G) and allow oil to drain. Install oil drain plug and tighten securely. Fill the crankcase with new oil to "FULL" mark on the gage rod (Fig. 4, View A). Crankcase and filter — Cap. 4 gallons.

LUBRICATING OIL FILTER — REPLACE ELEMENT — Remove drain plugs (Fig. 6, View Q) and allow oil to drain. Remove each filter body and remove the old elements. Clean each filter body and install new element kits. Install and tighten the drain plugs. Refer to "ENGINE LUBRICATING SYSTEM" for detailed instructions.

FIRST STAGE AND SECOND STAGE FUEL FILTERS — Install a new element in each fuel filter (Fig. 4, View A) after every 200 hours of operation, or when the fuel pressure drops below normal range (5 to 20 P.S.I.) due to filters clogging. Do not attempt to clean clogged filter elements. Refer to "FUEL SYSTEM" for detailed information.

LUBRICATE:

POWER TAKE-OFF DRIVE SHAFT SUPPORTING HOUSING — 1 Lube Point (Fig. 6, View P). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 8 to 14 shots).

POWER TAKE-OFF DRIVE ASSEMBLY — 1 Lube Point (Fig. 6, View R). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 8 to 14 shots).

FAN BEARINGS — 1 Lube Point (Fig. 6, View Q). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 8 shots).

FAN BELT TIGHTENER BEARINGS — 1 Lube Point (Fig. 6, View Q). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots).

WATER PUMP BEARINGS — 1 Lube Point (Fig. 6, View Q). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots).

GENERATOR OIL CUPS — 2 Oil Cups (Fig. 6, View Q). Lubricate with 10 drops of light engine oil in each cup.

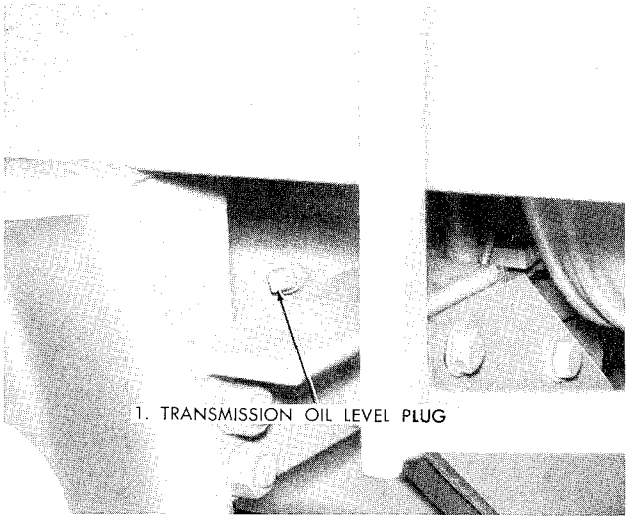
POWER TAKE-OFF DRIVE SHAFT UNIVERSAL JOINTS — 1 Lube Point in each of the 4 "U" joints (Fig. 5, View G). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

MOLDBOARD ADJUSTING LINK ENDS — 2 Lube Points (Fig. 5, View H). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots).

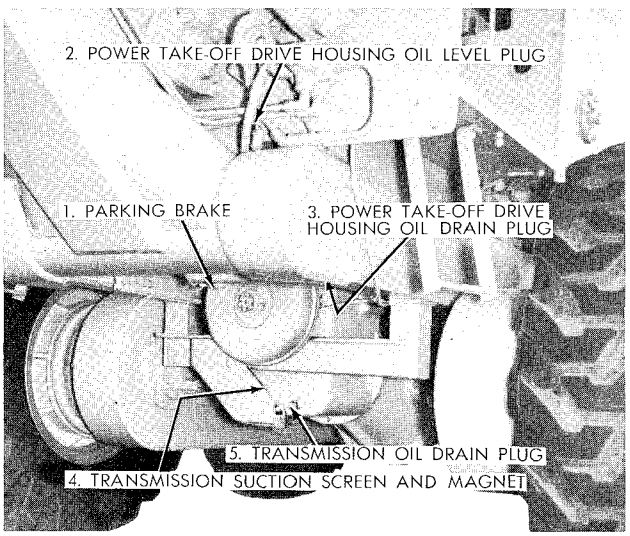
STEERING GEAR SHAFT BEARING — 1 Lube Point (Fig. 4, View E). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 6 to 12 shots).

REAR AXLE OUTER BEARINGS — 1 Lube Point each side (Fig. 5, View I). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 14 to 20 shots each).

TANDEM WHEEL SHAFTS OUTER BEARINGS — 2 Lube Points each tandem (Fig. 7, View T). Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 14 to 20 shots each).



VIEW M



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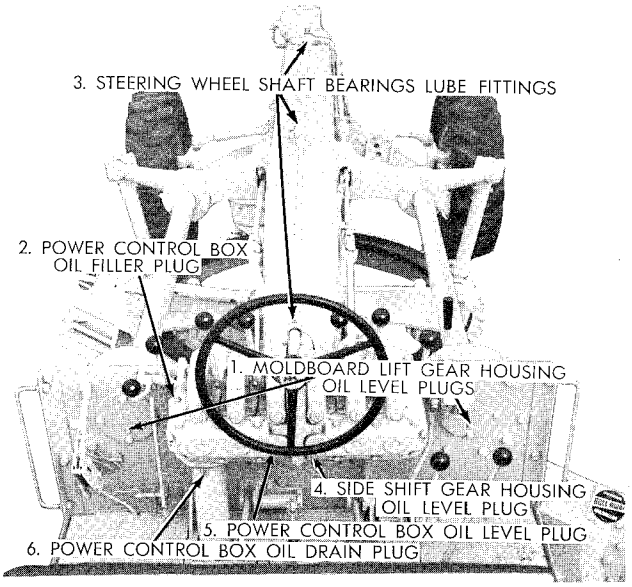
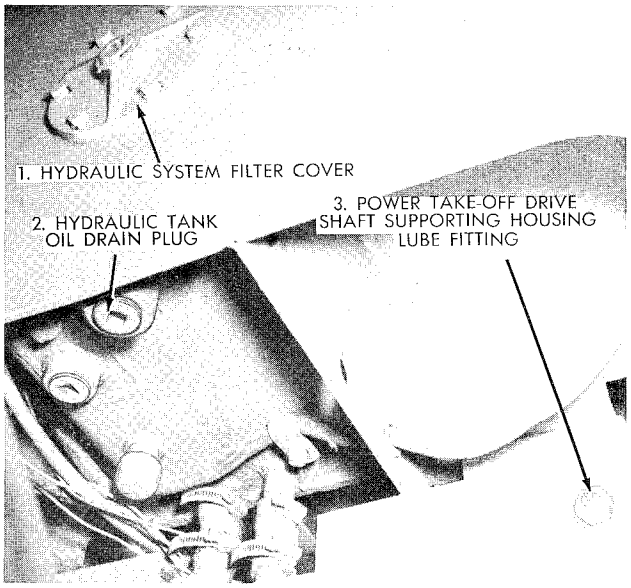
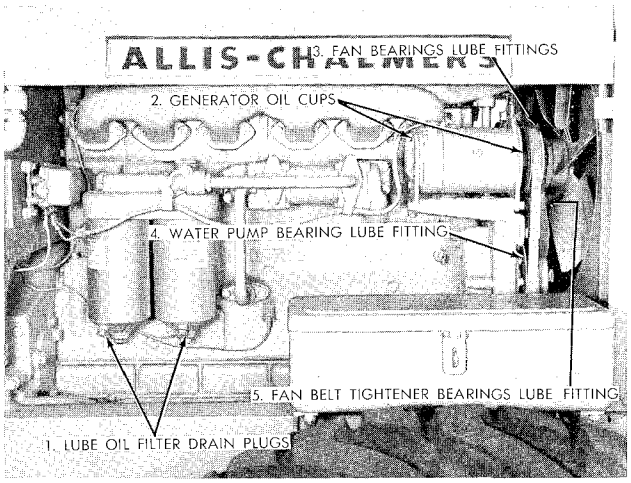


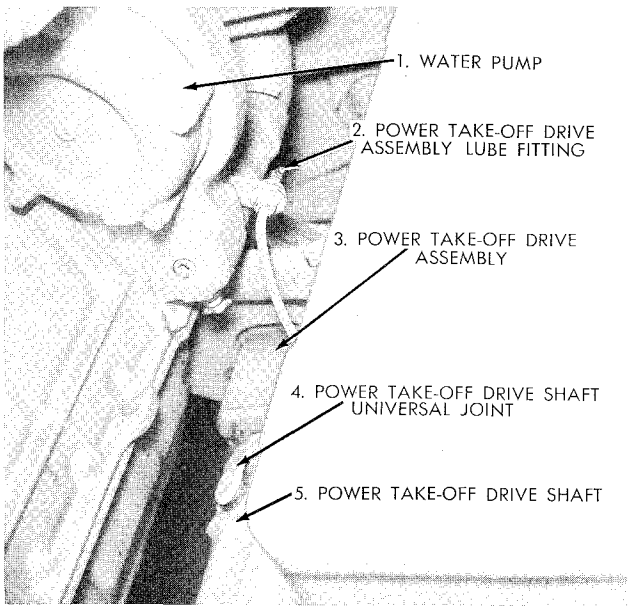
VIEW O



VIEW P



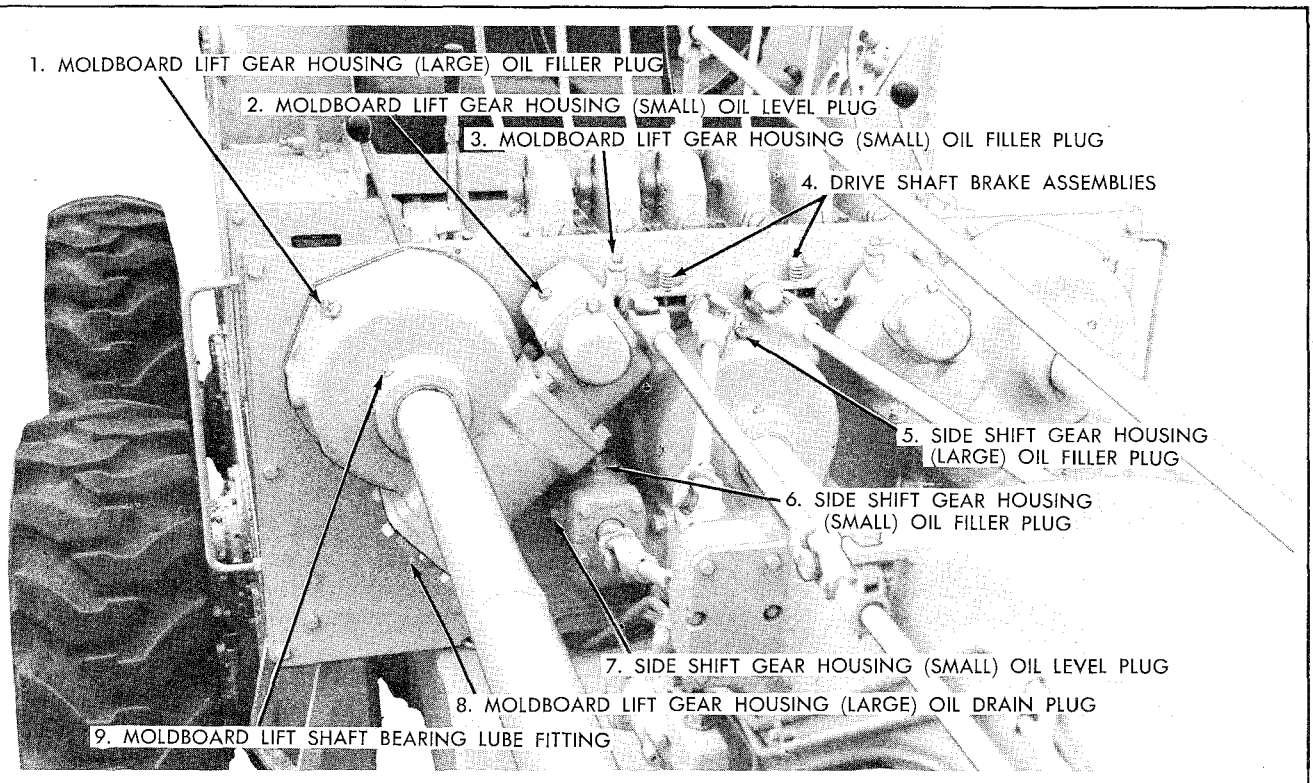
VIEW Q



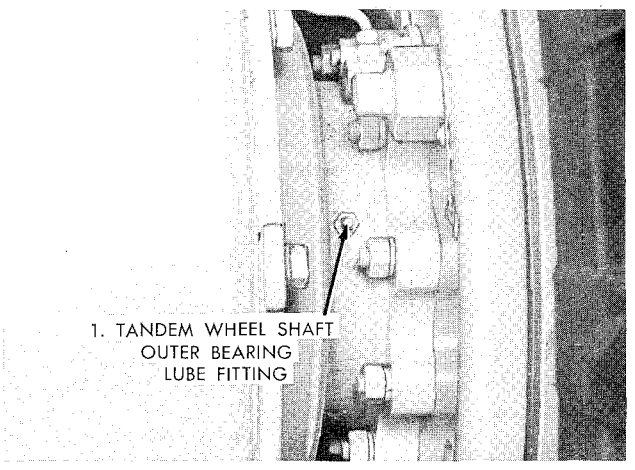
VIEW R

Lubrication Guide

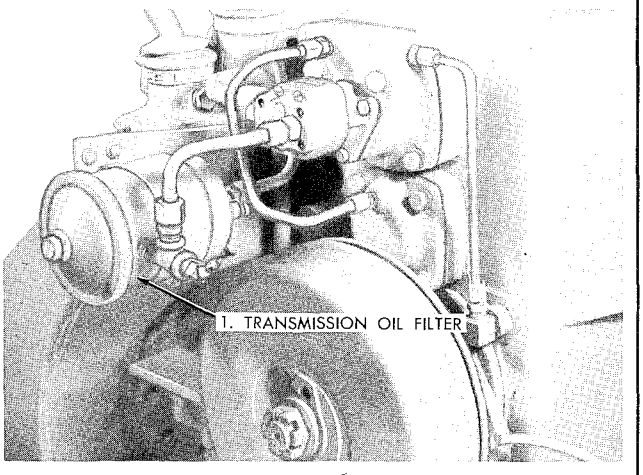
FIG. 6



VIEW S



VIEW T



VIEW U

Lubrication Guide

FIG. 7

1000-HOUR SERVICES

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

SERVICE:

TRANSMISSION — CHANGE OIL — Climatic or operating conditions may require this service at shorter intervals. Remove the transmission oil drain plug (Fig. 6, View N) and allow oil to drain. Reinstall the drain plug and tighten securely. Fill the transmission through the oil filler plug opening (Fig. 4, View B) to level even with oil level plug opening (Fig. 6, View M), then install and tighten the oil filler and oil level plugs (Cap. 4 gals.).

TRANSMISSION OIL FILTER — CHANGE — Install a new element every 1000 hours or more often if climatic or operating conditions indicate (Fig. 7, View U).

HYDRAULIC SYSTEM AND FILTER — CHANGE OIL AND FILTER — Remove hydraulic tank oil drain plug (Fig. 6, View P) and allow oil to drain. Remove hydraulic system filter cover and replace filter element with a new element. Reinstall filter cover and oil drain plug and fill hydraulic tank with specified lubricant to proper level (Fig. 4, View B).

FRONT WHEEL LEAN GEAR HOUSING — Check — (Fig. 4, View E). Must be packed with "O" consistency truck wheel lubricant.

TRANSMISSION SUCTION SCREEN AND MAGNET — Remove and clean (Fig. 6, View N) and reinstall.

REAR AXLE HOUSING — CHANGE OIL — Center compartment and 2 end compartments (Fig. 5, View G). Remove oil drain plugs and allow oil to drain. Install and tighten oil drain plugs. Remove oil level and filler plugs and fill each compartment to a level even with the oil level and filler plug openings. Install and tighten oil level and filler plugs (Cap. of center compartment 5¼ gals. and each end compartment 1¼ gals.).

TANDEM DRIVE CASES — CHANGE OIL — 1 tandem drive case each side (Fig. 5, View I). Drain and refill with the specified lubricant (Cap. 8 gals. each).

POWER CONTROL BOX — CHANGE OIL — (Fig. 6, View O). Drain and refill with the specified lubricant to a level even with oil level plug opening (Cap. 1¾ gals.).

POWER TAKE-OFF DRIVE HOUSING — CHANGE OIL — (Fig. 6, View N). Drain and refill with the specified lubricant to a level even with oil level plug opening (Cap. 1 qt.).

LUBRICATE:

FRONT WHEEL BEARINGS — Remove each front wheel and repack with 2 pounds of wheel bearing lubricant.

ENGINE CLUTCH SHAFT UNIVERSAL JOINT — 2 Lube Points. Lubricate with pressure gun lubricant. Use hand type lubricating gun furnished with grader (approximately 8 to 14 shots each).

SPECIAL EQUIPMENT

SHIFTABLE MOLDBOARD HYDRAULIC CYLINDER END CAPS — (Fig. 5, View H) — 2 Lube Points. Lubricate with pressure gun lubricant after every 50 hours of operation. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

SCARIFIER LIFT LINKS — 2 Lube Points each side. Lubricate with pressure gun lubricant after every 10 hours of operation. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots each).

SCARIFIER WORM GEAR SHAFT — 3 Lube Points. Lubricate with pressure gun lubricant after every 50 hours of operation. Use hand type lubricating gun furnished with grader (approximately 6 to 10 shots each).

SCARIFIER WORM GEAR HOUSING — Check oil level in each housing (upper and lower) after every 200 hours of operation. Add oil if necessary to raise oil level even with oil level and filler plug openings.

SCARIFIER WORM GEAR HOUSING — CHANGE OIL — Remove the oil drain plug from the lower housing after every 1000 hours of operation and allow oil to drain. Install and tighten the oil drain plug. Fill the lower housing to the proper level with the specified lubricant (Cap. 1 gal.).

SCARIFIER CONTROL SHAFT BEARING — 1 Lubrication Point. Lubricate with pressure gun lubricant after every 10 hours of operation. Use hand type lubricating gun furnished with grader (approximately 4 to 6 shots).

PERIODIC SERVICES

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.

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

ENGINE AIR INTAKE SYSTEM — Check all capscrews, hoses, clamps, etc. and tighten if necessary. Also make certain all gaskets are properly installed and are in good condition to avoid air leaks. Refer to "ENGINE AIR CLEANER" for detailed information.

PERIODIC ADJUSTMENTS

ENGINE CLUTCH LINKAGE — Periodically check the free travel of the clutch operating pedal. The clutch linkage is properly adjusted when the pedal has ¾" free travel. When readjustment is necessary, refer to "ENGINE CLUTCH" for detailed information.

ENGINE CLUTCH BRAKE LINKAGE — The clutch brake linkage must be readjusted after each adjustment of the engine clutch linkage. Refer to "ENGINE CLUTCH BRAKE ADJUSTMENT" for detailed information.

POWER TAKE-OFF DRIVE BELTS — The power take-off drive belts are properly adjusted when one side of the belts can be pressed inward approximately ½" at a point half-way between the two pulleys. Adjust belts when slippage is evident. Refer to "POWER TAKE-OFF DRIVE BELT ADJUSTMENT" for detailed information.

FAN DRIVE BELTS — The fan drive belts are properly adjusted when the straight side (right side) of the belts can be pressed inward approximately ¾" at a point half-way between the fan and crankshaft pulleys. Adjust the belts when slippage is evident. Refer to "ENGINE COOLING SYSTEM" for detailed information.

WHEEL BRAKES — Periodically check the free travel of the brake pedal; the brake pedal should have 7/16" to 5/8"

free travel before brake application begins. Refer to "WHEEL BRAKES" for detailed information.

GENERATOR DRIVE BELT ADJUSTMENT — The generator drive belt is properly adjusted when the belt can be pressed inward approximately ½" at a point half-way between the generator and water pump pulleys. Adjust the drive belt when slippage is evident. Refer to "ELECTRICAL SYSTEM" for detailed information.

WHEEL RIM CLAMP NUTS — Check periodically and tighten if necessary.

PREPARATION OF GRADER FOR USE

Fill fuel tank with specified fuel (refer to "SPECIFICATIONS OF FUEL"). Use care to prevent entrance of dirt or foreign matter while filling tank. Fill engine cooling system with clean soft water or a suitable anti-freeze solution (refer to "ENGINE COOLING SYSTEM").

Refer to LUBRICATION GUIDE and check oil level in the engine crankcase, transmission, rear axle housing compartments, tandem drive cases, power control box, power take-off drive housing, and all worm gear housings. Lubricate all points where lube fittings are provided for use of a lubricating gun. Make certain the oil in hydraulic system reservoir is at proper level.

Remove dust cup from bottom of engine air cleaner and check to be sure it is clean and properly installed (refer to "ENGINE AIR CLEANER").

OPERATING CONTROLS AND INSTRUMENTS

The operator of the grader must familiarize himself with the various controls and instruments provided for its proper operation. Although many of these controls are similar to those of other motor graders, there are important differences and it is not wise, regardless of previous experience, to operate the grader before fully understanding the purpose of each control.

A. OPERATING CONTROLS

Throttle Lever (Fig. 8)

The throttle operating lever is connected by linkage to the speed control lever of the governor. The engine will run at idling speed with throttle operating lever all the way forward; pull lever back to increase engine speed as desired.

Accelerator-Decelerator Pedal (Fig. 8)

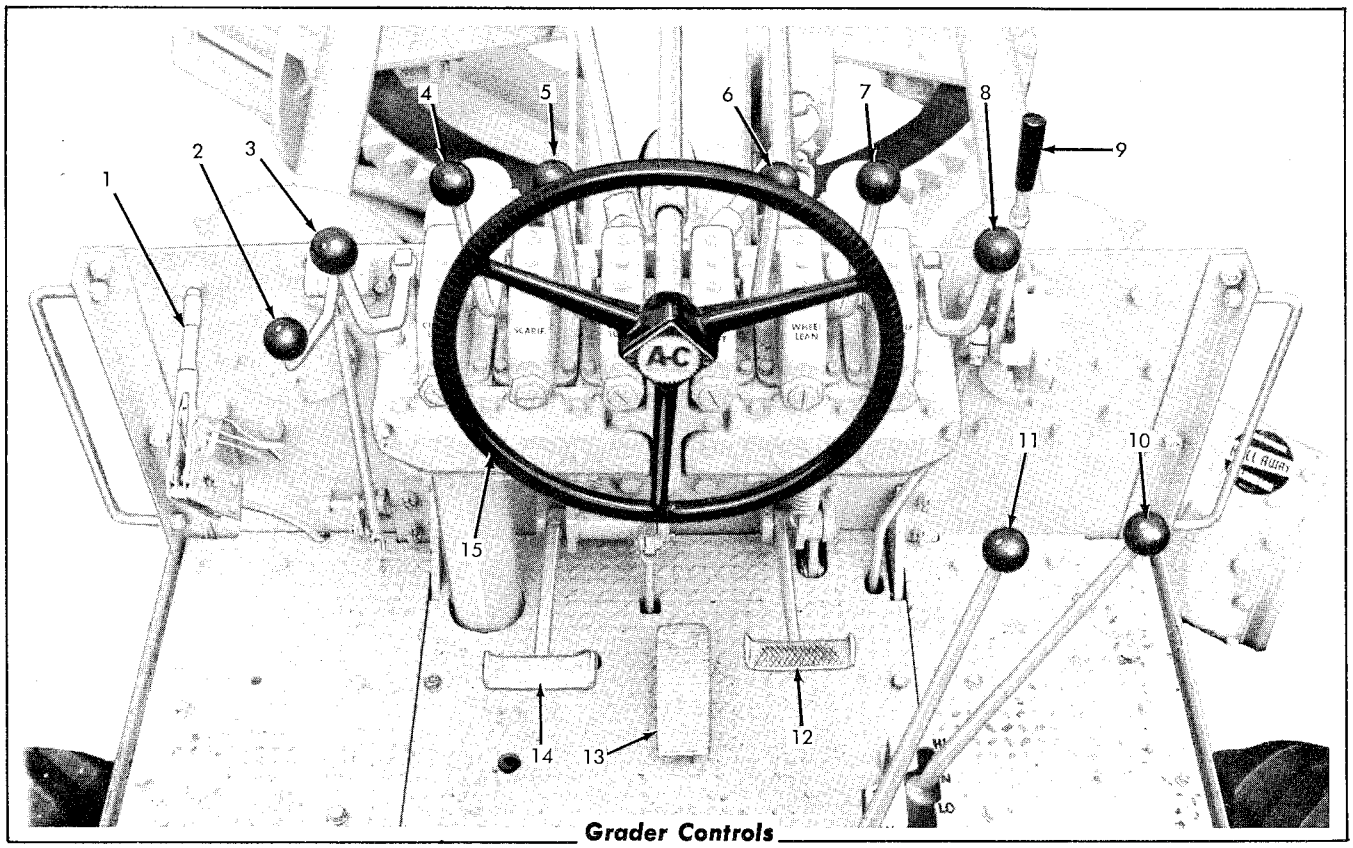
The accelerator-decelerator pedal, located between the clutch and brake pedals, is also provided for regulating engine speed. When throttle operating lever is pulled approximately half-way back, the accelerator-decelerator pedal can be used to accelerate by pressing on the toe end of the pedal or can be used to decelerate by pressing on heel end of the pedal. This pedal should be used for decelerating when shifting gears.

Engine Shut-Off Knob (Fig. 9)

The engine shut-off knob is provided to actuate the fuel shut-off control lever, located in the fuel injection pump. Pull engine shut-off knob all the way up when engine is to be started; push knob all the way down to stop the engine. CAUTION: *Do not stop the engine without first slowing to idling speed. The engine should be slowed to idle speed and allowed to idle for 3 to 4 minutes before stopping.*

Starter Switch (Fig. 10)

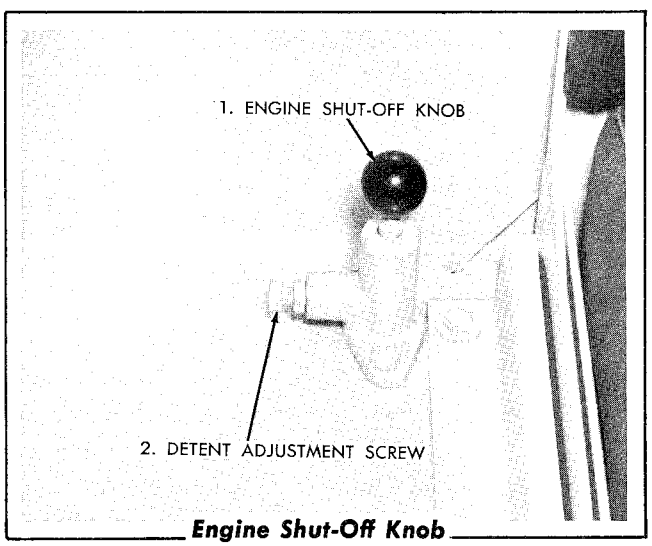
The starter switch, located in upper front corner of instrument panel, is a key operated switch. When key is in a vertical position, the electrical circuit is open and the entire electrical circuit is inoperative. Turning the key to right to first detent, connects the entire electrical system of the motor grader permitting the use of any electrical equipment; turning the key as far toward the right as possible actuates the starter. Removing the key from switch prevents starting the engine when motor grader is parked or stored. NOTE: *If engine does not start within 30 seconds, allow starter to cool for 2 minutes before using it again (refer to "STARTING OF ENGINE").*



Grader Controls

FIG. 8

1. Parking Brake Lever
2. Moldboard Side Shift Lever (Special Equipment)
3. Circle Lift Lever (Left Side)
4. Scarifier Lever (Special Equipment)
5. Circle Turn Lever
6. Circle Side Shift Lever
7. Wheel Lean Lever
8. Circle Lift Lever (Right Side)
9. Throttle Lever
10. Shift Lever — High, Low, Reverse
11. Shift Lever — 1st, 2nd, 3rd
12. Brake Pedal
13. Accelerator-Decelerator Pedal
14. Clutch Pedal
15. Steering Wheel



Engine Shut-Off Knob

FIG. 9

Engine Clutch Pedal (Fig. 8)

The engine clutch pedal actuates the engine clutch power booster which in turn disengages the engine clutch. The engine clutch transmits power from the engine to the transmission and also applies the engine clutch brake to stop rotation of transmission top shaft for shifting gears.

Pressing engine clutch pedal part way down disengages the engine clutch; pressing pedal all the way down disengages the engine clutch and also applies the engine clutch brake (the last 2½" downward travel of pedal applies the engine clutch brake). To shift transmission into the desired speed range, where the engine has been idling with one or both of the transmission gear shift levers in

neutral and with the engine clutch engaged, press the engine clutch pedal down far enough to disengage the clutch and to apply the clutch brake, then move the gear shift levers to the desired speed range position. To shift into a higher or lower speed range while grader is in motion, depress heel end of accelerator-decelerator pedal to slow the engine speed and at the same time, press the clutch pedal down far enough to disengage the clutch and transmission gear shift lock and to partially apply the clutch brake, then shift the transmission into the desired speed range, release the clutch pedal and accelerate the engine to desired speed.

Transmission Gear Shift Levers (Fig. 8)

The left-hand shift lever is the speed selector shift lever; the right-hand shift lever is the high-low-reverse shift lever. Each shift lever has three positions in addition to neutral position. To obtain 1st, 2nd, or 3rd forward speeds, move high-low-reverse shift lever into "LO" position then move the speed selector shift lever into 1st, 2nd, or 3rd forward speed position. To obtain 4th, 5th, or 6th forward speeds, move high-low-reverse shift lever into "HI" position then move the speed selector shift lever into 4th, 5th, or 6th forward speed position. To obtain 1st, 2nd, or 3rd reverse speed, move high-low-reverse shift lever into "R" position then move the speed selector shift lever into 1st, 2nd, or 3rd speed position. The grader will not move when either of the two shift levers are in NEUTRAL position.

Brake Pedal (Fig. 8)

Press down on brake pedal to activate the power booster and apply the wheel brakes to slow or stop the grader; disengage the engine clutch before grader is brought to a complete stop.

Parking Brake Lever (Fig. 8)

The parking brake lever is provided to apply the parking brake, located on front end of transmission bottom shaft. Pull lever back to apply the brake when grader is parked. CAUTION: *Do not use this brake for stopping the grader.*

Steering Wheel (Fig. 8)

Turn wheel to right or to left to steer the grader.

Seat Adjusting Latch Lever (Fig. 10)

The seat adjusting latch is located to left of the seat cushion. Disengage the latch by pushing lever down, move seat forward or rearward to desired position, then release the lever.

Power Control Levers (Fig. 8)

The levers, located above the power control box, are provided to engage sliding jaw clutches with clutch gears in the control box which drive the control rods extending to the various worm and gear assemblies of the grader. The two outer control levers, located on the control box, raise and lower the circle and moldboard; the center control lever, to left of steering wheel, raises and lowers the scarifier (when grader is so equipped); the inner lever, to left of steering wheel, turns the circle and moldboard; the inner lever, to right of steering wheel, shifts the circle and moldboard right or left, the center lever, to right of steering wheel, leans the front wheels.

Light Switch (Fig. 10)

The light switch is located in the instrument panel.

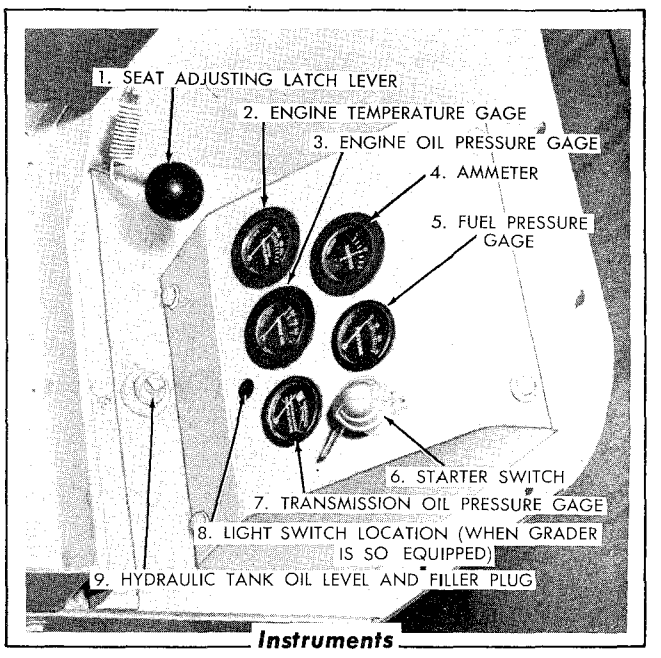


FIG. 10

Pull out on light switch button to turn the lights on; push in to turn the lights off.

B. INSTRUMENTS

Engine Temperature Gage (Fig. 10)

This gage indicates the engine coolant operating temperature, which should be maintained at 160° F. minimum.

Engine Oil Pressure Gage (Fig. 10)

This gage indicates the pressure at which engine oil is circulated through the engine. At full throttle, the oil pressure should be between 30 and 55 pounds at normal engine operating temperature. CAUTION: *If no oil pressure is indicated by the gage, the engine must be stopped immediately and cause determined and corrected.*

Fuel Pressure Gage (Fig. 10)

This gage indicates the pressure at which the fuel is circulated through the low pressure fuel system. Under normal conditions, with the engine operating at full governed speed, the fuel pressure should be between 5 and 20 pounds.

Ammeter (Fig. 10)

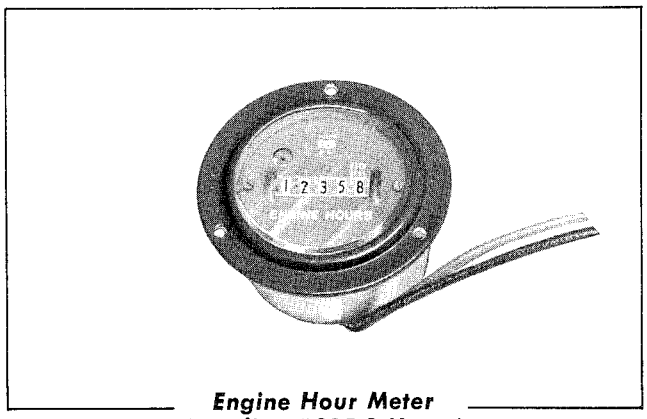
The ammeter indicates the charging rate of the generator. When batteries are in a discharged condition, the ammeter should indicate a good rate of charge until batteries approach a fully charged condition. When batteries are fully charged, the ammeter will indicate nearly zero, except for a short time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

Transmission Oil Pressure Gage (Fig. 10)

This gage indicates the pressure at which transmission oil is being circulated through the transmission for lubricating purposes. The yellow area indicates 0-8 psi. The operating range indicates 8-30 psi.

Engine Hour Meter (Fig. 11)

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



Engine Hour Meter (Reading 1235.8 Hours)

FIG. 11

STARTING AND STOPPING OF ENGINE

A. Starting of Engine

1. Before starting the engine, check oil levels of the following and add specified lubricant as necessary to raise to proper level: Engine crankcase, transmission, rear axle housing compartments, tandem drive cases, power control box, power take-off drive housing and all worm gear housings. Make certain oil in hydraulic system reservoir is at the proper level.

   Fill the fuel tank with specified fuel. Check level of water or anti-freeze solution in the cooling system and add coolant if necessary.

2. If repairs have been made since last operating period, be sure all nuts and bolts affected by repairs have been tightened and the parts have been properly adjusted. Move the transmission shift levers to their neutral positions. IMPORTANT: *Before starting the engine when engine is cold (engine coolant below normal operating temperature), make certain that engine shut-off knob is pushed all the way down*

(stop position) and crank engine with starter for about 5 seconds. This will assure proper lubrication of engine components before engine is started.

3. Pull engine shut-off knob all the way up (run position) and pull the throttle operating lever back to about ¼ throttle position. Turn the starter switch key to right as far as possible to actuate the starter. If starter spins but does not crank the engine, release starter switch key and wait until starter stops spinning before attempting to use starter again. CAUTION: *If engine does not start within 30 seconds, allow starter to cool for 2 minutes before using it again.*

4. As soon as the engine starts, release starter switch key, pull throttle operating lever back to about ½ of full speed, and allow engine to warm up.

5. Observe engine lubricating oil pressure indicated by the gage. With engine running at full speed and with engine coolant at normal operating temperature (160° F. minimum), the oil pressure should be between 30 and 55 pounds. If oil is cold, no pressure may be indicated by the gage for several seconds after engine starts, but if pressure does not then rise to normal or above, the engine must be stopped immediately and the cause determined and corrected.

6. Observe fuel pressure indicated by the gage. With engine operating at full speed, the fuel pressure should be between 5 and 20 pounds.

7. In cold weather when it is necessary to use commercial type starting fluid, contained in a pressurized can, as an aid in starting the engine, proceed as described above in the first 3 operations, then proceed as follows:

   a. Turn the starter switch key to right as far as possible to actuate the starter, and at the same time spray starting fluid into engine air cleaner until engine starts. Continue spraying until the engine runs smoothly.

      IMPORTANT: *When using the commercial type starting fluid, observe the caution instructions printed on the starting fluid container.*

   b. As soon as engine starts, release the starter switch key, increase engine speed to about ½ of full speed, and allow engine to warm up.

B. Stopping of Engine

Push throttle operating lever all the way forward (low idle position) and allow engine to idle for 3 to 4 minutes, so that engine may cool gradually and uniformly, then push engine shut-off knob all the way DOWN to stop the engine. Cover the exhaust pipe at end of each day's operation to prevent rain from entering while grader is idle.

COLD WEATHER OPERATION

When atmospheric temperature drops to the freezing point or below, the engine crankcase and all other oil compartments must be drained and refilled with oil of lighter viscosity (refer to "SPECIFICATIONS OF LUBRICANTS"). The cooling system must be checked for leaks and filled with a permanent type (glycol base) anti-freeze solution to protect it from freezing. IMPORTANT: *The quantity of anti-freeze to be added to cooling system to provide adequate protection must be in accordance with the anti-freeze manufacturer's directions.*

If grader is to be operated in arctic temperatures, consult your nearest authorized dealer or write the factory for information regarding availability of special cold weather equipment.

IMPORTANT: *When starting in cold weather, it is advisable to operate the engine at about ½ throttle for 10 to 15 minutes to allow engine to reach operating temperature before operating the grader.*

AVOID UNNECESSARY ENGINE IDLING

Prolonged engine idling causes the engine coolant temperature to fall below 160° F. Operating with a coolant temperature below this temperature is detrimental to the engine, causing incomplete combustion of fuel, which in turn causes crankcase dilution and lacquer or gummy deposits to form on valves, pistons, rings, etc. It also causes rapid accumulation of sludge within the engine.

Since starting the engine is readily accomplished with an electric starter, there should be no reason for prolonged engine idling.

DRIVING INSTRUCTIONS

The transmission can be shifted all the way through the six forward speed ranges or the three reverse speed ranges with the grader in motion by disengaging the engine clutch, decelerating the engine by use of the accelerator-decelerator pedal and shifting from one speed range to another. However, when the grader is working, it should be started in the transmission speed range necessary to move the load.

When starting the grader, depress the engine clutch pedal far enough to disengage the clutch and to apply the engine clutch brake, then shift to the desired speed range. Move throttle operating lever to meet the operating requirements and release the clutch pedal slowly and smoothly so the load will be picked up by the engine without a sudden jerk. Do not slip the engine clutch in an effort to pull an overload; avoid unnecessary wear on the clutch by shifting to a lower speed range. CAUTION: *Do not "RIDE" the engine clutch pedal while operating the grader.*

INFORMATION ON GRADER OPERATION

A. General

Always operate the grader in the transmission speed range low enough to permit engine to operate at full speed. This will not only assure the most power from the engine but will also allow engine to operate at its highest efficiency. Start into a cut with transmission shifted into the speed range that will permit completing the cut without further shifting, thus avoiding unnecessary wear on the engine clutch.

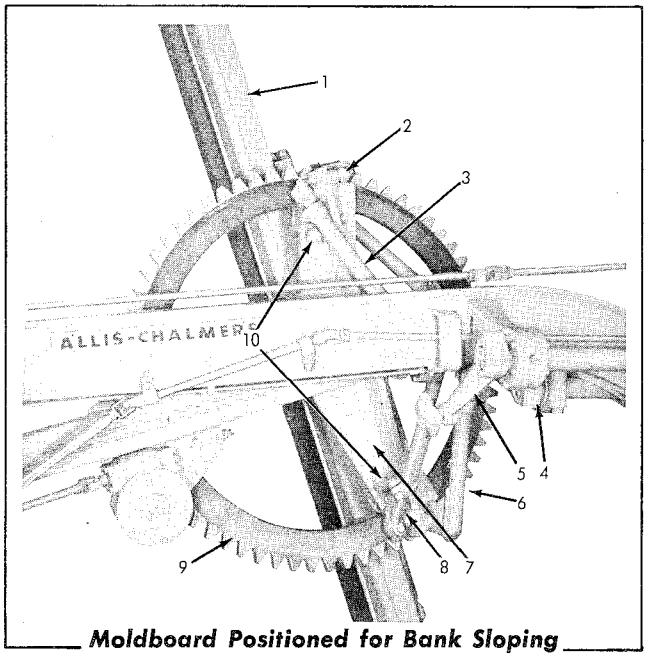
Keep grader directly above the work as much as possible. This will prevent side draft, with its resultant loss of power, and will also prevent unnecessary side stress on the various parts affected.

If a deep cutting action is desired, tilt the top of the moldboard back by means of the pitch adjusting bolts to change the pitch of the blade; less pressure will then be required on the controls to force the blade into ground. If a rolling action is desired, as when mixing oil with gravel, tilt the top of the moldboard forward; this will cause the material to roll and mix more thoroughly before it passes out the "heel" end of moldboard.

When moldboard is to be shifted out to the right side for sloping banks, refer to Fig. 12; adjust the circle and moldboard left lift link to its longest length, and adjust the side shift link and the circle and moldboard right lift link to their shortest length(s). Move the side shift crank to the extreme right position and move both circle and moldboard lift cranks counterclockwise until moldboard is in desired position.

When the circle and moldboard are to be shifted out the left side for sloping banks, disconnect side shift link from left side of circle drawbar and connect it to ball on right side of drawbar. Adjust the circle and moldboard right lift link to its longest length, and adjust the side shift link and the circle and moldboard left lift link to their shortest length(s). Move the side shift crank to the extreme left position and move both circle and moldboard lift cranks clockwise until moldboard is in desired position.

NOTE: *The above procedures permit a maximum 1:1 bank slope with grader on level ground. To obtain a maximum 1.5:1 bank slope with grader on level ground, connect circle and moldboard lift link on side TOWARD bank to INNER ball on circle*



Moldboard Positioned for Bank Sloping

FIG. 12

1. Moldboard
2. Side Shift Link Right Ball
3. Circle and Moldboard Right Lift Link
4. Side Shift Crank
5. Circle and Moldboard Left Lift Crank
6. Side Shift Link
7. Moldboard Drawbar
8. Circle and Moldboard Left Lift Link
9. Moldboard Circle
10. Moldboard Drawbar Inner Balls

drawbar; then move moldboard as described to bank slope toward right or left.

B. Care of Moldboard Circle

Do not use oil or grease on moldboard circle face as these will mix with dirt and cause hard "caking." If lubrication is desired, frequent application of "Diesel" fuel will prove to be most satisfactory; this will also prevent mud or snow from freezing to circle when operating in cold weather.

C. Moldboard Pitch Adjustment

Lower the moldboard to ground before attempting to change pitch of the moldboard. With the cutting edge of moldboard resting on ground, remove the moldboard pitch adjusting bolts (Fig. 38), then move grader forward or backward until the desired moldboard pitch is obtained. Install and tighten moldboard pitch adjusting bolts.

D. To Offset Moldboard

The moldboard may be adjusted laterally 21" to the left or 27" to the right when operations require it. Clean any dirt from the moldboard slides and the moldboard shifting link and lubricate with "Diesel" fuel. Do not use oil or grease as these will mix with dirt and cause hard "caking." Side shift the circle as far as possible in the direction which moldboard is to be offset. Place opposite end of moldboard against some solid object or lower the moldboard so that the cutting edge rests lightly on ground. Loosen the moldboard shifting link clamping bolt, remove shifting link coupling pin, then side shift the circle away from the direction which moldboard is to be offset until the desired amount of offset is obtained. Install shifting link coupling pin and secure with retaining clip. Tighten the shifting link clamping bolt securely.

E. Moldboard Cutting Edges and End Bits

The moldboard cutting edges should be removed and sharpened when edges become blunt. New cutting edges should be installed before old ones are worn to the point where further use would cause wear on the main structure of moldboard. The end bits are also replaceable and should be sharpened or replaced when necessary.

F. Scarifier (Special Equipment)

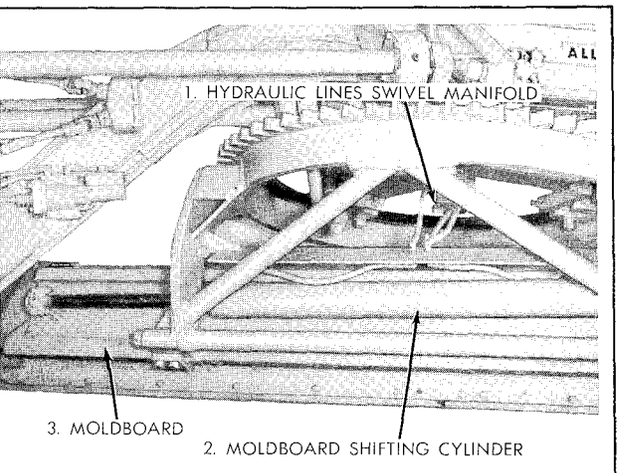
When the scarifier is not in use, carry it raised to its extreme height. To provide 360° rotation of moldboard, remove the scarifier teeth; the teeth may be carried elsewhere on grader until they are needed again. When moldboard is moved out to one side for bank sloping, the scarifier lift cranks should be moved forward from their vertical position to prevent the circle striking the scarifier.

When operating the scarifier, it is preferable to lower it so the lift cranks move in the rearward arc (toward rear of grader), however, it may be used with the lift cranks toward front if desired.

G. Hydraulic Shiftable Moldboard (Special Equipment)

The hydraulic shiftable moldboard, having a total travel of 48" (27" to right and 21" to left of center),

is operated by means of a hydraulic cylinder. The end of the hydraulic shifting cylinder tube is attached to the right arm of moldboard circle and the end of the cylinder piston rod is attached to left rear side of moldboard. The hydraulic shiftable moldboard is controlled by means of an operating valve lever, mounted on the panel to left of the power control box.



Hydraulic Shiftable Moldboard

FIG. 13

ENGINE COOLING SYSTEM

A. Description of System

The engine cooling system includes the water pump, radiator, engine oil cooler, thermostats, engine temperature gage, cooling fan, and the water passages in the cylinder block and cylinder heads.

The thermostats, located in thermostat housing at the front of water outlet manifold of the engine, operate automatically to maintain a minimum operating coolant temperature of 160° F.

The engine cooling system is a pressure type system and it is necessary to keep the radiator cap turned on tightly. CAUTION: *Do not remove the pressure type radiator cap while the coolant is near 212° F. or above as coolant will break into a boil and will splash onto person removing the cap.*

B. General Maintenance

In warm weather, keep cooling system filled with clean soft water or rain water whenever possible. If soft water is not available and hard water must be used, the hard water should first be treated with a water softener. A commercially reliable rust inhibitor should be added to the cooling system for warm weather operation. CAUTION: *Never add a rust inhibitor to a cooling system that contains an anti-freeze solution.* Drain, flush, and refill the cooling system with clean water before adding an anti-freeze solution for cold weather operation.

Keep radiator air passages free from leaves, trash, and other material which will restrict flow of air through the radiator.

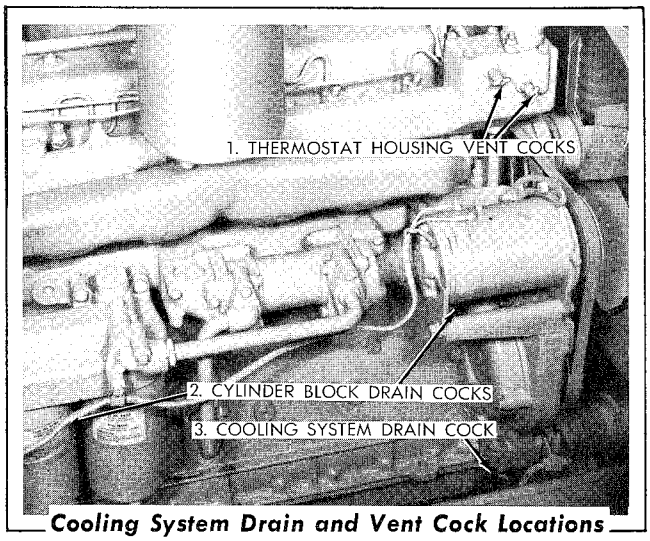
All leaks in the cooling system must be corrected as soon as they are evident. The fan drive belts and the water pump and generator drive belt must be kept properly adjusted.

C. Draining of Cooling System

Remove radiator filler cap. Open cooling system drain cock, located in bottom of timing gear housing directly below water pump, and cylinder block drain cocks, located on right side of cylinder block (Fig. 14). NOTE: *One drain cock is located behind lube oil filters.* Open thermostat housing vent cocks, located on water outlet manifold. CAUTION: *When draining the cooling system in freezing weather, make certain that coolant flows freely from all drain cocks and system drains completely.*

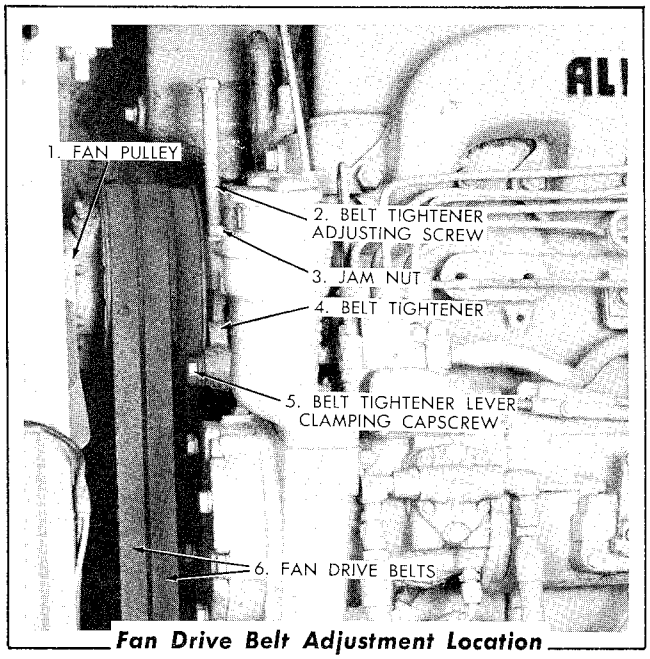
D. Filling of Cooling System

Close drain cocks which were opened to drain the system in Par. C above. Fill cooling system through radiator filler pipe until coolant flows from lower vent cock in thermostat housing, then close lower vent cock. Continue filling until coolant flows from upper vent cock in thermostat housing, then close the upper vent cock. Complete the filling until coolant level is approximately 1" below the



Cooling System Drain and Vent Cock Locations

FIG. 14



Fan Drive Belt Adjustment Location

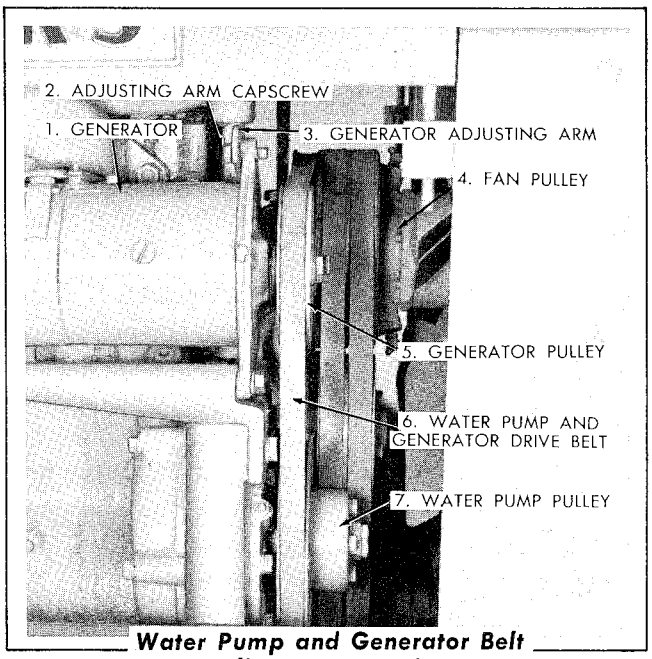
FIG. 15

bottom of radiator filler pipe. Install radiator filler cap.

E. Fan Drive Belt Adjustment

The fan drive belts are properly adjusted when the straight side (right side) of the belts can be pressed inward by hand approximately $\frac{3}{4}$ inch at a point half-way between the crankshaft and fan pullevs.

To adjust belts loosen belt tightener lever clamping capscrew. Loosen the jam nut on fan belt tightener adjusting screw and turn adjusting screw in or out as necessary to obtain correct tension on the drive belts, then tighten adjusting screw jam nut. Tighten the fan belt tightener lever clamping capscrew securely.



Water Pump and Generator Belt Adjustment Location

FIG. 16

F. Water Pump and Generator Drive Belt Adjustment

The water pump and generator drive belt is properly adjusted when the belt can be pressed inward by hand approximately $\frac{1}{2}$ inch at a point halfway between the generator pulley and the water pump pulley. To adjust the drive belt, loosen generator adjusting arm capscrew, move generator up or down to obtain proper tension of drive belt, then tighten adjusting arm capscrew.

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 injection nozzles, fuel pressure gage, and the necessary fuel lines.

B. FUEL TANK AND DRAIN COCK

A drain (Fig. 4, View C), located at bottom of fuel tank, provides a means for draining the tank when flushing and also acts as a sediment sump. Open the drain cock before engine is started at beginning of day's operation in warm weather, or shortly after end of the day's operation in freezing weather, and allow any water and sediment to drain; close drain cock when clean fuel runs out. Drain and flush fuel tank when a large accumulation of rust and scale is evident.

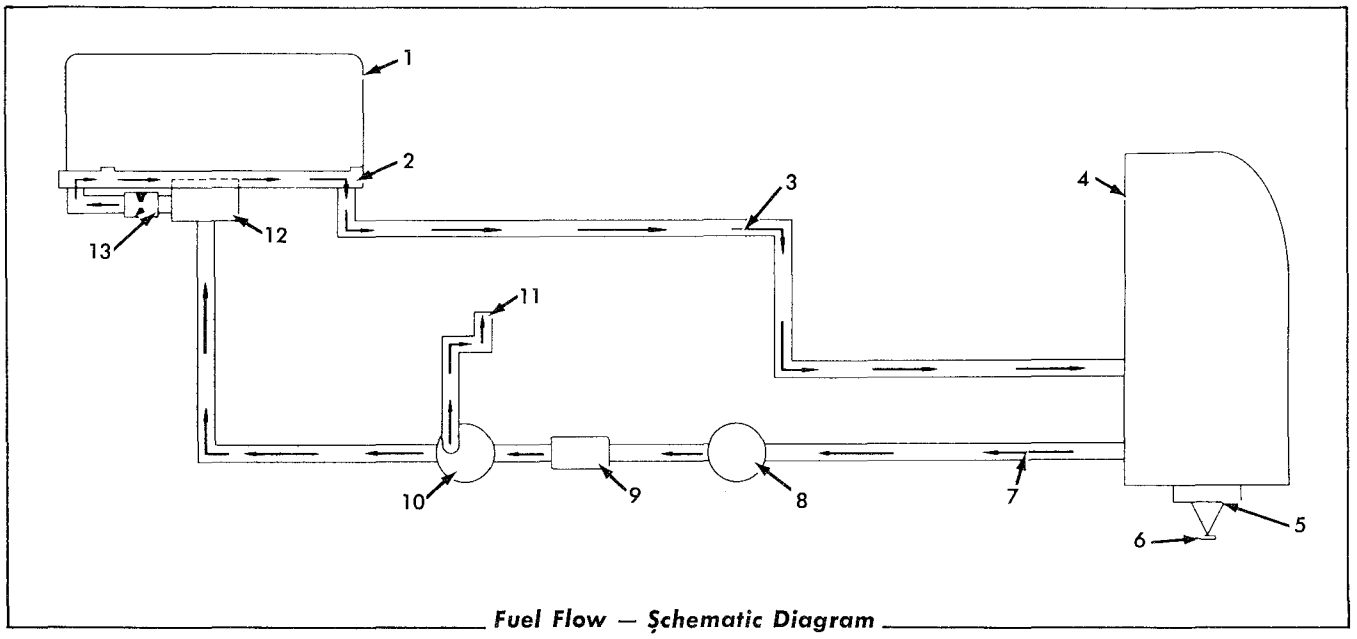
C. FIRST STAGE AND SECOND STAGE FUEL FILTERS

1. Description

The first stage and second stage fuel filter 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 fuel transfer pump is collected by second stage fuel filter and prevented from entering the fuel injection pump. A drain cock is provided in bottom of each filter shell for draining any water or sediment collected.

2. Service

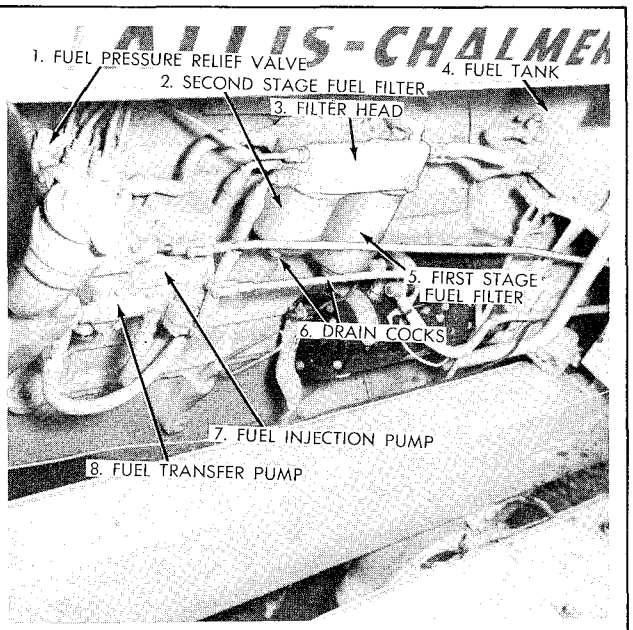
Open the drain cock in bottom of each fuel filter shell daily, before start of day's operation in warm



Fuel Flow — Schematic Diagram

FIG. 17

1. Engine
2. Fuel Return Manifold
3. Fuel Return Line
4. Fuel Tank
5. Sediment Sump
6. Drain Cock
7. Fuel Supply Line
8. First Stage Fuel Filter
9. Fuel Transfer Pump
10. Second Stage Fuel Filter
11. To Fuel Pressure Gage
12. Fuel Injection Pump
13. Fuel Pressure Relief Valve



First Stage and Second Stage Fuel Filter Location

FIG. 18

weather or shortly after end of 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 200 hours of operation (more often if conditions warrant), or when fuel filters become clogged and a pressure of less than 5 pounds is indicated by fuel pressure gage. Clogged filter elements are usually indicated by irregular engine performance.

3. To Replace First Stage Fuel Filter Element

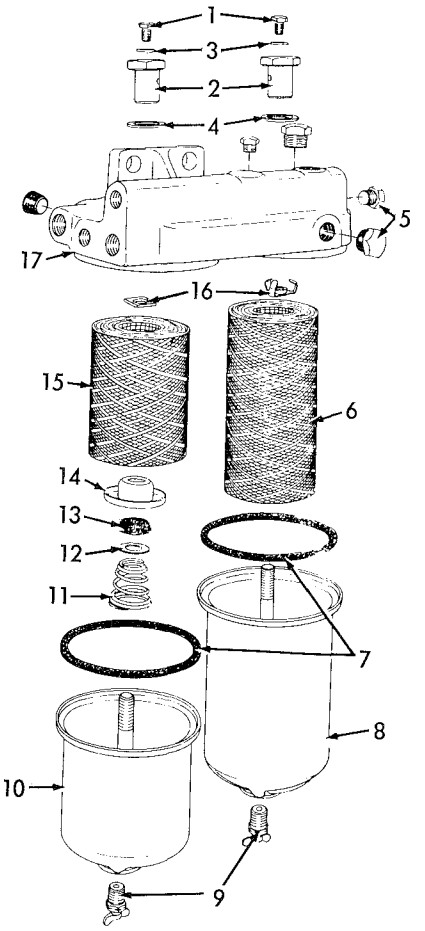
a. Close fuel tank shut-off valve. Clean all dirt from around filter head and shell. Loosen vent screw in the top of shell retaining nut and the drain cock in bottom of filter shell and allow filter to drain.

b. Loosen shell 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 the 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 the seat plate, attached to bottom of shell center-bolt, is firmly impressed into bottom of the filter element.

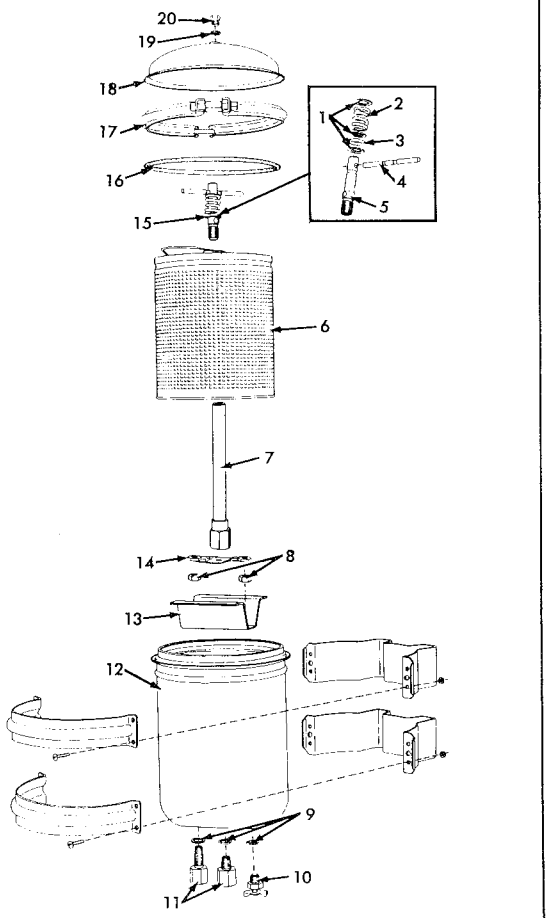
e. Install a new shell gasket in position in lip



First Stage and Second Stage Fuel Filter Details

FIG. 19

1. Vent Screws
2. Shell Retaining Nuts
3. Copper Washers
4. Gaskets
5. Hex-Head Pipe Plugs
6. First Stage Fuel Filter Element
7. Shell Gaskets
8. First Stage Fuel Filter Shell
9. Drain Cocks
10. Second Stage Fuel Filter Shell
11. Element Spring
12. Metal Washer
13. Element Seating Plate Gasket
14. Element Seating Plate
15. Second Stage Fuel Filter Element
16. Element Centering Guides
17. Filter Head



Heavy-Duty Fuel Filter Details

FIG. 20

1. Washers
2. Spring
3. Seal
4. Handle
5. Stud
6. Filter Element
7. Center Tube
8. Nuts
9. Gaskets
10. Drain Cock
11. Hollow Bolts
12. Filter Housing
13. Element Support
14. Nut Retainer
15. T-Handle Hold Down Assembly
16. O-Ring Gasket
17. Cover Clamp Ring Assembly
18. Cover
19. Washer
20. Vent Plug

of the shell. Hold filter shell in position under filter head and engage the threads of shell retaining nut with the shell center-bolt and tighten retaining nut securely.

f. Close filter drain cock. Open fuel tank shut-off valve and allow filter to fill with fuel by gravity. Tighten filter vent screw when fuel (free of bubbles) flows from around vent screw.

4. To Replace Second Stage Fuel Filter Element

a. Thoroughly clean fuel filter head and surrounding area. Loosen the vent screw in shell retaining nut and the drain cock in bottom of filter shell and allow filter to drain.

b. Loosen shell retaining nut in filter head until it is free from shell center-bolt and remove filter shell (with its components) from filter head.

c. Remove and discard filter element. Remove the centering guide, element seating plate, seating plate gasket, metal washer, and element spring from shell center-bolt. Discard the seating plate gasket, metal washer, and shell gasket.

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

e. Place element spring (large end downward) in position on shell center-bolt and install a new metal washer over shell center-bolt and down onto 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 center-bolt. NOTE: *When installing element seating plate and gasket on shell center-bolt, install seating plate so that the gasket contacts the metal washer.*

g. Install the centering guide in position on shell center-bolt 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 the filter shell with CLEAN fuel. Hold filter shell in position under filter head,

install shell retaining nut and retaining nut gasket, and tighten retaining nut securely.

i. Crank engine with starter until a full stream of fuel (free of bubbles) flows from around loosened vent screw; tighten vent screw while continuing to crank the engine.

j. Start engine and observe for fuel leaks and correct any leaks found.

D. HEAVY-DUTY FUEL FILTER (SPECIAL EQUIPMENT)

On graders equipped with a Heavy-Duty fuel filter, service as follows: open the drain cock located in bottom of the fuel filter shell, before engine is started at beginning of day's operation in warm weather or shortly after end of day's operation in freezing weather, and allow water or sediment to drain. Close drain cock when clean fuel runs out. Remove and discard old filter element and install a new one after every 200 hours of operation.

E. REPLACEMENT OF HEAVY-DUTY FUEL FILTER ELEMENT

1. Close the fuel tank shut-off valve.
2. Open drain cock in bottom of fuel filter housing and allow fuel to drain from filter. Remove cover clamp ring and lift cover from housing. Do not damage cover O-ring gasket.
3. Unscrew the T-handle hold-down assembly from shell center-tube and remove T-handle hold-down assembly. Remove filter element from housing by lifting with the pull-out bail. Discard the filter element.
4. Thoroughly clean interior of fuel filter housing and close the drain cock.
5. To assure leak-proof sealing, examine the center tube seat at each end of new filter element to see that the seats are in good condition and clean. Insert new filter element into position in filter housing and press filter element down firmly.
6. Install T-handle hold-down assembly and tighten securely.
7. Install cover O-ring gasket and place cover in position on filter housing. Install cover clamp ring and tighten securely.
8. Fill fuel tank so that there will be sufficient fuel in tank to fill the fuel filter by gravity. Open fuel tank shut-off valve.
9. Loosen vent plug in filter cover and allow filter to fill with fuel by gravity. Tighten vent plug when fuel flows from the vent plug.
10. Observe for fuel leaks at filter cover, vent plug and drain cock. Correct any leaks found.

CAUTION: *Use only the recommended filter element available through your authorized "Allis-Chalmers" Dealer.*

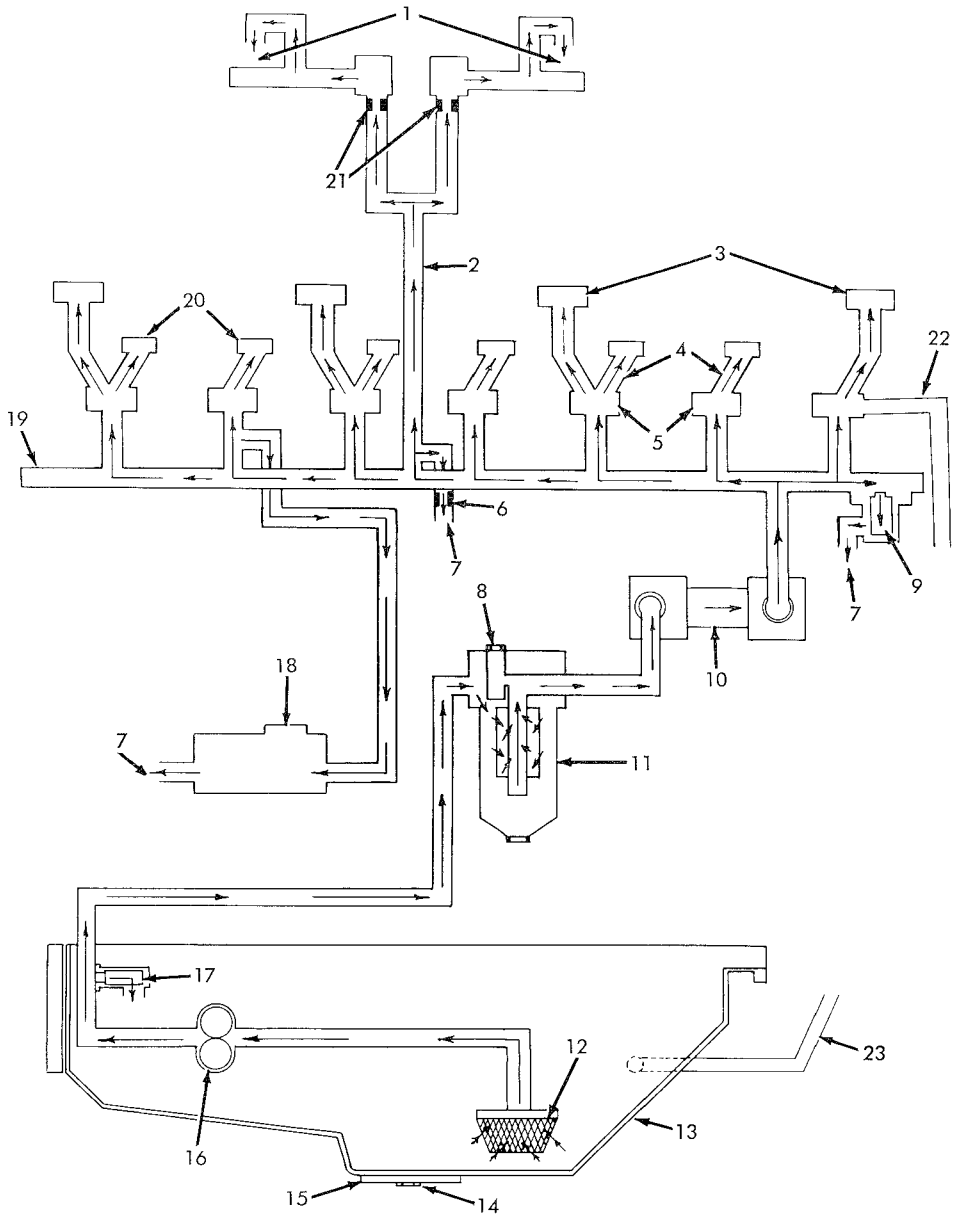
GOVERNOR

A. General

The governor was adjusted at the factory to provide for the proper horsepower and a full governed engine speed (under load) of 1800 R.P.M. The specified low and high idle engine speeds are 500 to 600 R.P.M. and 1925 to 1980 R.P.M. respectively. Should an adjustment of the governor become necessary, contact your nearest "Allis-Chalmers" Construction Machinery Dealer.

B. Checking Engine Speed

Operate the engine until an operating temperature of 160° F. (minimum) is indicated by the engine temperature gage. Hold a tachometer against fan end of engine crankshaft. With throttle operating lever all the way forward (low idle position) and with engine clutch disengaged, the engine speed should be 500 to 600 R.P.M. With throttle operating lever all the way back (high speed position), the engine speed should be 1925 to 1980 R.P.M.



Lubricating Oil Flow — Schematic Diagram

FIG. 21

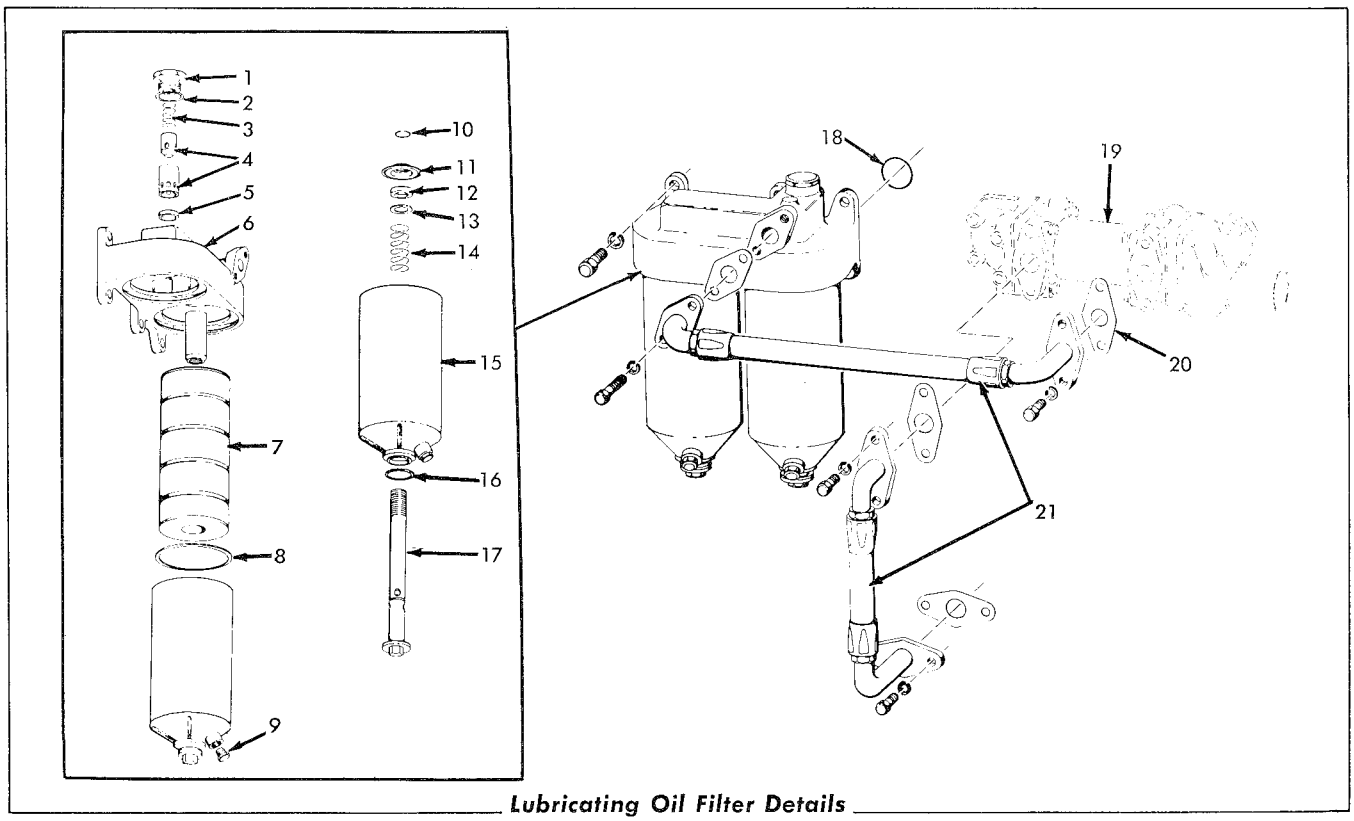
1. Rocker Arm Shaft Drain Tubes (Drains Back to Oil Pan)
2. To Valve Rocker Arm Shafts
3. Camshaft Bearings
4. Crankshaft Oil Passages
5. Main Bearings
6. Restrictor
7. Returns to Oil Pan
8. Oil Filter Pressure Relief Valve
9. Oil Pressure Regulating Valve
10. Engine Oil Cooler
11. Lubricating Oil Filters (2)
12. Oil Pressure Pump Suction Screen
13. Oil Pan
14. Oil Drain Plug
15. Hand Hole Cover
16. Lubricating Oil Pressure Pump
17. Lubricating Oil Pump Pressure Relief Valve
18. Fuel Injection Pump
19. Main Oil Gallery
20. To Connecting Rod Bearings and Piston Pins (Drains Back to Oil Pan)
21. Restricted Rocker Arm Shaft Brackets at Nos. 3 and 4 Cylinders
22. To Engine Clutch
23. Oil Return from Engine Clutch

A. Lubricating Oil Filter

The lubricating oil filters (Fig. 22) contain replaceable type elements. A drain plug located in each filter body permits draining of filter when replacing the element. New elements must be installed each time oil in crankcase is changed (after each 200 hours of operation), or more often if conditions warrant.

B. To Replace Filter Element

1. Thoroughly clean the filter head, filter body, and surrounding area. Remove oil drain from filter body and allow filter to drain.
2. Loosen body center-bolt and remove the center-bolt, filter body, and the filter element as an assembly from oil filter head.
3. Remove filter element from filter body and discard the element. Remove and discard the body gasket.
4. Thoroughly wash and dry interior of filter body. Install a new element in position in the filter body.
5. Install the filter body assembly in position on oil filter head, using a new body gasket. Tighten body center-bolt to a torque of 75 to 80 lbs. ft. Install oil drain plug in filter body and tighten securely.



Lubricating Oil Filter Details

FIG. 22

1. Relief Valve Cap
2. Gasket
3. Spring
4. Relief Valve Piston and Sleeve
5. Piston Seat
6. Filter Head
7. Filter Element
8. Gasket
9. Drain Plug
10. Snap Ring
11. Adapter
12. Seal
13. Washer
14. Spring
15. Body
16. Gasket
17. Center Bolt
18. O-Ring
19. Oil Cooler
20. Gasket
21. Hose Assemblies

6. After filling engine crankcase to proper level with specified lubricant, start the engine and observe for oil leakage between filter head and filter body. Stop the engine and check oil level of engine crankcase; add oil as necessary to raise oil level to "FULL" mark on oil level gage rod.

C. To Change Engine Oil

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

1. Thoroughly clean the engine oil pan drain plug and surrounding area.

2. Remove oil drain plug from bottom of engine oil pan and allow oil to drain. Install and tighten oil drain plug, making certain oil drain plug gasket is in good condition.

3. Install a new element in each lubricating oil filter (refer to Paragraph B. above).

4. Fill the crankcase, through crankcase oil filler tube, with 4 gallons of specified lubricant.

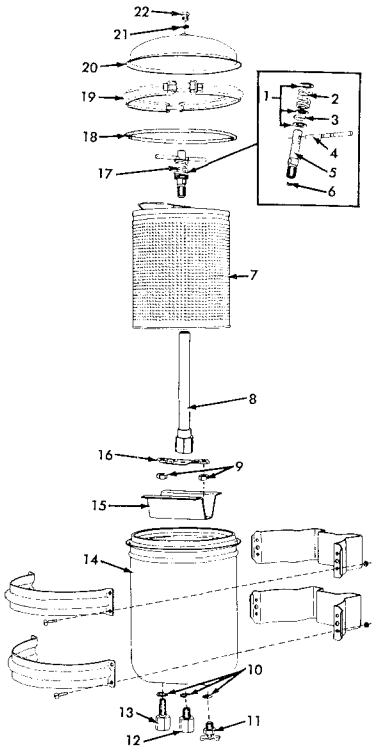
5. Start engine and operate it at approximately ¼ throttle for several minutes. Observe oil filters for oil leakage and make certain that the filter bodies and gaskets are properly installed.

6. Stop engine and allow several minutes for oil to drain back into oil pan before checking oil level.

7. Using the oil level gage rod, check oil level and add oil, as necessary, to raise oil level even with "FULL" mark on gage rod.

D. Heavy-Duty Lubricating Oil Filter (Special Equipment)

On graders equipped with a Heavy-Duty lubricating oil filter, the filter element must be changed at each engine oil change. Replace oil filter element as follows:



Heavy-Duty Lubricating Oil Filter Details

FIG. 23

1. Washers
2. Spring
3. Seal
4. Handle
5. Stud
6. Orifice Plug
7. Filter Element
8. Center Tube
9. Nuts
10. Gaskets
11. Drain Cock
12. Outlet Check Valve Assembly
13. Inlet Check Valve Assembly
14. Filter Housing
15. Element Support
16. Nut Retainer
17. T-Handle Hold Down Assembly
18. O-Ring Gasket
19. Cover Clamp Ring Assembly
20. Cover
21. Washer
22. Vent Plug

1. Thoroughly clean exterior of the oil filter. Open drain cock in bottom of filter housing and allow oil to drain. Remove cover clamp

ring and lift cover from filter housing. Do not damage cover O-ring gasket.

2. Unscrew the T-handle hold-down assembly from center-tube and remove T-handle hold-down assembly. Remove filter element from housing by lifting with the pull-out bail. Discard the filter element.

3. Thoroughly clean interior of filter housing and close drain cock.

4. To assure leak-proof sealing, examine the center-tube seat at each end of new filter element to see that seats are in good condition and clean. Insert new filter element into position in filter housing and press filter element down firmly.

5. Make certain that the hole in orifice plug, located in T-handle hold-down assembly, is open. Install T-handle hold-down assembly and tighten securely. CAUTION: *When servicing the Heavy-Duty filters, make certain that the T-handle hold-down assemblies are reinstalled in their respective filter, as the T-handle hold-down assembly for engine lubricating oil filter contains an orifice plug. The T-handle hold-down assembly for fuel filter does not contain an orifice plug.*

6. Install cover O-ring gasket and place cover in position on filter housing. Install cover clamp ring and tighten securely.

7. Fill the engine crankcase with 4 gallons of specified lubricant as in Paragraph C., Step 4 above.

8. Remove vent plug from filter cover.

9. Start engine and operate it at ¼ throttle. Observe oil filter and when oil flows from vent plug opening in filter cover, install and tighten vent plug.

10. Refer to Paragraph C., Steps 6 and 7, and check oil level and add oil as necessary.

CAUTION: *Use only the recommended filter element available through your authorized "Allis-Chalmers" Dealer.*

TRANSMISSION LUBRICATING OIL SYSTEM

A. DESCRIPTION

The oil system of the pressure lubricated transmission (Fig. 24) consists basically of a gear type oil pump driven from front end of transmission top shaft, full-flow type oil filter, and the necessary oil tubes and fittings.

The transmission oil pump draws oil through the suction line screen, located in bottom of transmission case, and forces oil under pressure through the full-flow type oil filter. Oil from the filter enters the top shaft front bearing retainer where a portion of the oil is routed through exterior tubing (Fig. 24) to the intermediate shaft front bearing retainer and the reverse idler shaft.

Oil forced to the top shaft front bearing retainer lubricates the top shaft front bearing, enters drilled passage in top shaft, lubricates top shaft bushings and rear bearing by means of cross drilled passages in the shaft, and spills back to sump.

Oil entering the intermediate shaft front bearing retainer lubricates the intermediate shaft front bearing, spills down to lubricate the bottom shaft front bearing, and returns to sump.

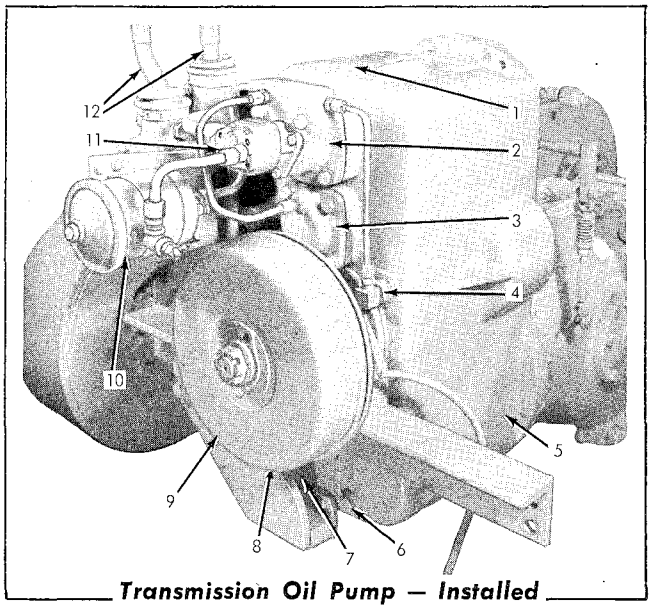
Oil entering the front of the drilled passage in reverse idler shaft lubricates reverse idler gear bearings by means of a cross drilled passage in the shaft.

Oil leaving the rear of the reverse idler shaft is directed through an external tube (Fig. 25) to lubricate the intermediate shaft rear bearing and enters the bottom shaft rear bearing retainer to lubricate the bearing. Oil enters drilled oil passages in the bottom shaft to lubricate bottom shaft bushings; then returns to sump.

B. SERVICE

1. To Change Oil in Transmission

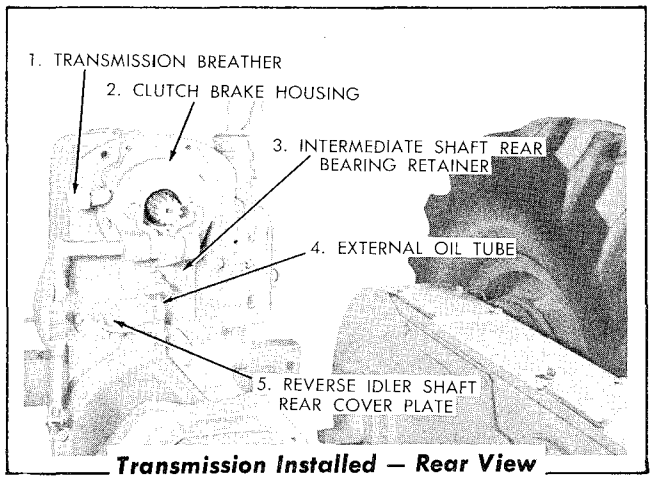
Oil in the transmission must be changed after each



Transmission Oil Pump — Installed

FIG. 24

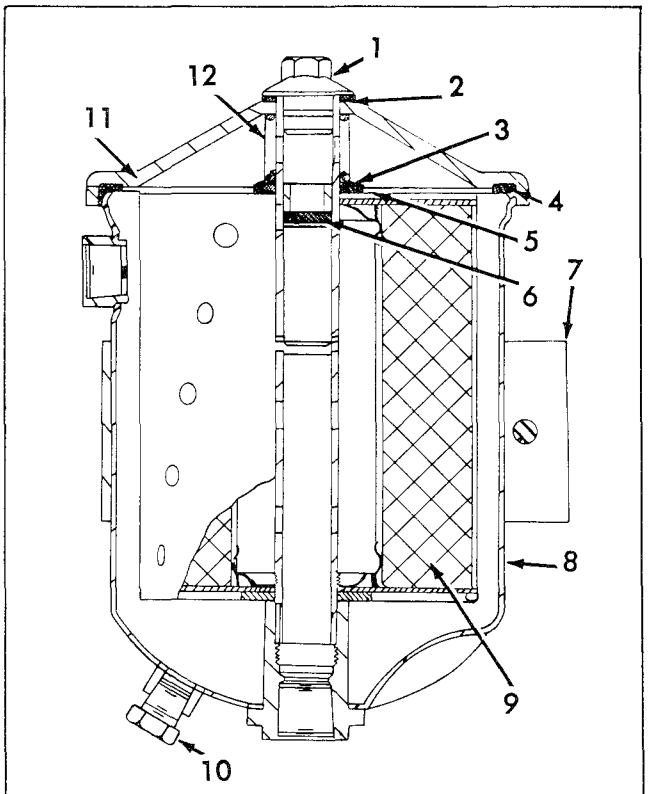
1. Transmission Oil Filler Plug
2. Top Shaft Front Bearing Retainer
3. Intermediate Shaft Front Bearing Retainer
4. Reverse Idler Shaft Oil Tube
5. Transmission Case
6. Transmission Oil Drain Plug
7. Suction Line Screen Cover
8. Brake Adjusting Hole Access Cover
9. Parking Brake Assembly
10. Oil Filter
11. Oil Pump
12. Gear Shift Levers



Transmission Installed — Rear View

FIG. 25

1000 hours operation, or more often under adverse conditions. Refer to Fig. 6, View N and remove oil drain plug from transmission case. Allow oil to drain completely; then install drain plug and tighten securely. Remove oil filler plug (Fig. 24)



Transmission Oil Filter Assembly — Sectional View

FIG. 26

1. Filter Center-Bolt
2. Center-Bolt Gasket
3. Metal Washer
4. Cover Gasket
5. Element Gasket
6. Relief Valve
7. Strap
8. Filter Body
9. Filter Element
10. Oil Drain Plug
11. Cover
12. Spring

and fill transmission with proper amount of specified oil (refer to "LUBRICATION GUIDE").

2. To Replace Oil Filter Element

The transmission oil filter element must be replaced each time oil in the transmission is changed. Refer to Fig. 26 and replace the filter element as follows:

a. Clean the filter and surrounding area. Loosen filter center-bolt and remove center-bolt and filter cover from filter body as an assembly.

b. Remove element gasket, metal washer, and spring from center-bolt. Discard element gasket. Withdraw center-bolt from filter cover and remove center-bolt gasket. Clean center-bolt and filter cover.

c. Using a new gasket, insert center-bolt in cover; then install spring, washer, and element gasket in position on center-bolt.

d. Remove element from filter body and discard element. Thoroughly clean interior of filter body and install new filter element.

e. Using a new cover gasket, install filter cover and center-bolt on filter body. Tighten center-bolt securely.

3. Suction Line Screen

The suction line screen should be removed periodically to make certain it does not become clogged. Also, whenever major repairs are made to the transmission, the screen MUST be removed and thoroughly cleaned.

ELECTRICAL SYSTEM

A. Batteries

Check level of electrolyte in batteries after every 10 hours of operation, or as often as operating conditions prove it necessary. Maintain level of the solution $\frac{3}{8}$" above plates of the batteries by addition of clean distilled water. Keep the battery and cable terminals tight and clean. CAUTION: *To prevent possibility of bodily injury, always disconnect the battery-to-ground cable before cleaning, repairing, disconnecting, or connecting any of the heavy electrical cables.*

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

When atmospheric temperature is below the freezing point, special attention should be given to 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 electrolyte is above 80° F., add 4 points to hydrometer reading and for each 10 degrees below 80° F., subtract 4 points to obtain the true specific gravity. For example, if hydrometer reading is 1.250 and electrolyte temperature is 20° F. (60 degrees below 80° F.), 1.250 minus 24 points equals 1.226 — the true specific gravity. If corrected readings are below 1.215, the batteries are not receiving sufficient charge.

In zero weather there is danger of batteries freezing if 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 engine is started at beginning of an operating period to make certain that water and electrolyte solution will be thoroughly mixed.

B. Generator and Generator Regulator

The generator and generator regulator are set to keep 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 energy drained from batteries during cranking; then it will show little or no charge. It is important that the generator and generator regulator be maintained in good condition so that 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 regulator leads have been disconnected and reconnected, the generator must be polarized BEFORE engine is started. Polarizing causes current to flow in the normal direction through field coils*

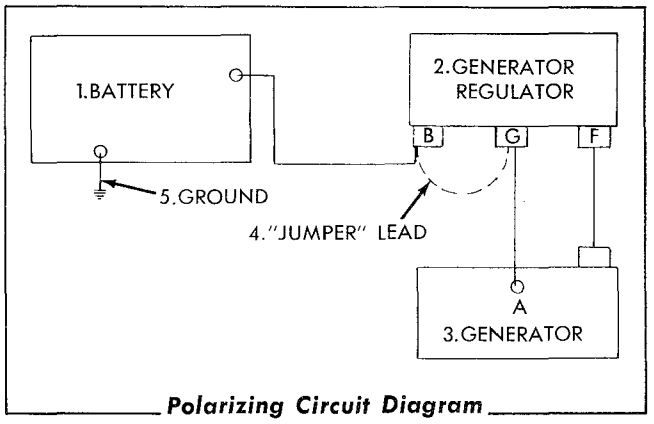
and will prevent vibration, arcing, burning and sticking of regulator points.

Polarize generator as follows:

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

2. Using a short "jumper" lead, momentarily touch the "jumper" lead to the "BAT." (Battery) and to the "GEN." (Generator) terminals of generator regulator.

3. Lower the generator brush to make contact with commutator.



Polarizing Circuit Diagram

FIG. 27

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 batteries, it should be short circuited. This can be done by disconnecting lead connected to the "GEN." terminal of the regulator and connecting end of lead to a convenient ground.

C. Water Pump and Generator Drive Belt Adjustment

The water pump and generator drive belt is properly adjusted when the belt can be pressed inward by hand approximately ½ inch at a point half-way between the generator and water pump pulleys.

To adjust drive belt, loosen generator adjusting arm capscrew (Fig. 16), move generator up or down to obtain correct tension on the drive belt, then tighten adjusting arm capscrew.

D. Starter

The 24-volt electric starter is mounted to 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 engine and to automatically disengage drive pinion when engine has started. The starter is equipped with a heavy duty switch. The shift lever in drive housing of the starter is connected by linkage to starter solenoid switch. When the starter switch key is turned as far as possible to the right, the solenoid switch is activated, closing the circuit between the batteries and starter, and also shifting the drive pinion of starter into mesh with flywheel ring gear.

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

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

E. Electrical Cables

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

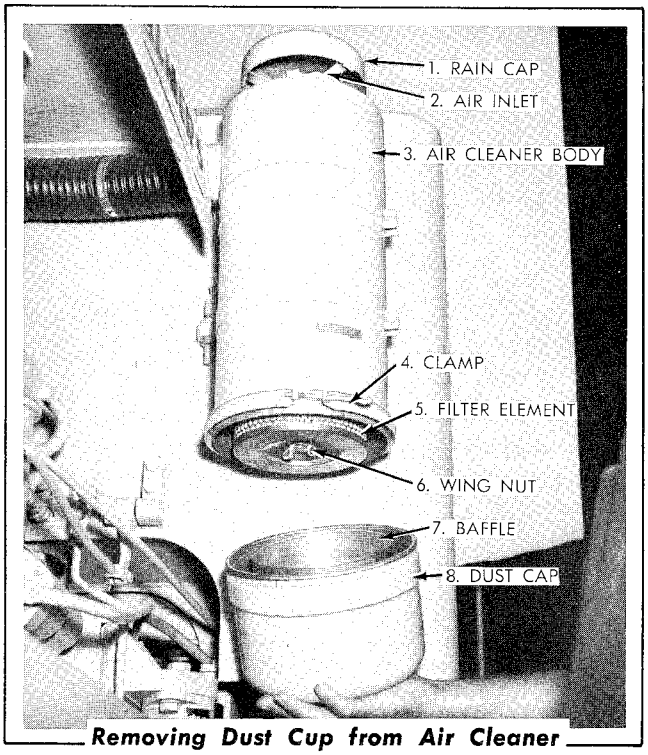
ENGINE AIR CLEANER

A. Description

The dry-type air cleaner is to remove dust and other foreign matter from the air used by the engine. The life of the engine depends largely upon efficiency of the air cleaner. Fast wear on cylinder sleeves, pistons, and rings will result if the air cleaner is not kept in good condition and properly serviced.

The air entering through air inlet tube of air cleaner strikes an air baffle which causes the heavy dust particles to fall into air cleaner dust cup.

The partially cleaned air is drawn through filter element (pleated, paper-type) which removes any dust particles still remaining in the air. The clean filtered air leaves the filter element through the air outlet opening and enters the engine intake manifold.



Removing Dust Cup from Air Cleaner

FIG. 28

B. Air Cleaner Service

The dust cup must be removed and cleaned daily (after each 10 hours of operation), or as often as operating conditions warrant. Never allow dust level in cup to reach the bottom of filter element.

Remove and clean dust cup as follows:

1. Loosen clamp attaching dust cup to filter body and remove cup.

2. Empty dust from cup and wipe inside of cup with a dry cloth. CAUTION: *Do not put oil in the dust cup.*

3. Place dust cup in position on cleaner body and tighten the clamp.

Each time the dust cup is removed for service, the area between the cleaner element and cleaner body should be inspected. If dust has caked on the walls they should be cleaned, and the air inlet should be cleaned also.

After every 100 hours of operation, or as often as operating conditions warrant, the air filter element should be removed from filter body and cleaned. Excessive smoke and loss of power are good indications that the filter element should be cleaned regardless of the time interval since last cleaning. Remove and clean filter element as follows:

1. Remove and clean dust cup as described above.

2. Remove wing nut securing filter element to the filter body and remove element.

3. Clean the element using any of the following methods:

   (1) Blow clean dry compressed air through filter element from inside of the element. Direct air up and down pleats while slowly rotating the element. When using compressed air to clean the element, use care to prevent rupturing or damaging the element.

   (2) Wash element in warm water (120° to 140° F.) containing a good non-sudsing household detergent. A water hose may be used to rinse element after washing, provided the water pressure does not exceed 40 P.S.I. Rinse the element until rinse water runs clear. Thoroughly air

dry the element before installing it in filter body.

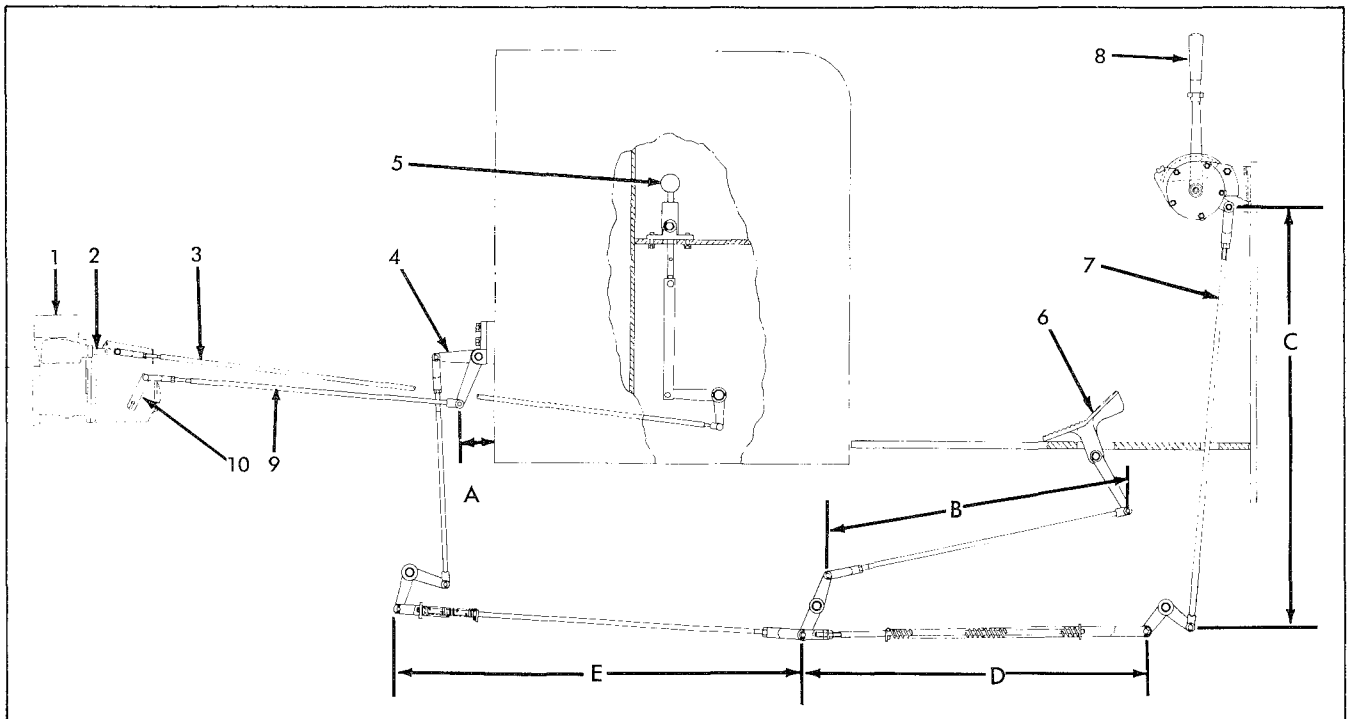
(3) NOTE: *This third method should be considered an emergency method only.* If equipment is not available to clean the filter element as described in Steps (1) or (2) above, dry dust can usually be removed from filter element by tapping the element against a solid flat surface. Rotate element while tapping, making certain that the dislodged dust particles do not fall on the clean inner surface of element.

After filter element has been cleaned, it must be inspected for rupture or holes. Place a bright electric light bulb inside element and inspect element from the outside. Light will shine through any holes or tears making them plainly visible. If any holes or tears are evident, the filter element must be replaced. Inspect the element upper and lower seals; if they are damaged in any way, the filter element must be replaced.

IMPORTANT: *A damaged hose, loose hose clamp, damaged gasket, damaged seal, or leak of any kind that allows air to enter the engine without first passing through the air cleaner will defeat the purpose of the air cleaner. Carefully inspect the air cleaner, air elbow, hose, and hose clamps connecting air cleaner to intake manifold. Repair any leaks found and replace or repair any worn or damaged parts.*

Clean the interior of the body and the air inlet tube. Assemble the air cleaner by a direct reversal of the disassembly procedure.

ENGINE CONTROL ADJUSTMENTS



Engine Controls and Linkage

FIG. 29

1. Fuel Injection Pump
2. Pump Fuel Shut-Off Rod
3. Engine Shut-Off Rear Rod
4. Bellcrank
   Dim. "A" — Approx. 2 11/16"
5. Engine Shut-Off Knob
6. Accelerator-Decelerator Pedal
   Dim. "B" — Approx. 24 1/4"
7. Throttle Control Front Rod
   Dim. "C" — Approx. 33"
8. Throttle Operating Lever
   Dim. "D" — Approx. 27 1/16"
9. Throttle Control Rear Rod
10. Governor Speed Control Lever
    Dim. "E" — Approx. 32"

A. General

The engine shut-off knob, located to right of the seat cushion, is connected by linkage to the pump fuel shut-off rod of fuel injection pump. When shut-off knob is pulled all the way up, the pump fuel shut-off rod is moved to rear to the "RUN" position; pushing knob all the way down pulls the pump fuel shut-off rod forward to the "STOP" position. Improper adjustment of engine shut-off control linkage may result in loss of engine speed or power, failure of engine to start with shut-off knob pulled up, or failure of engine to stop when shut-off knob is pushed down.

The throttle operating lever, located in front and to right of the operator, is connected by linkage to the speed control lever of the governor. The engine will run at low idle speed with throttle operating lever moved all the way forward; pull back on lever to increase engine speed as desired. Improper adjustment of throttle control linkage may result in loss of engine speed. An accelerator-decelerator pedal, located to left of the brake pedal, is also provided for regulating the engine speed. When throttle operating lever is in the high speed position, the accelerator-decelerator pedal can be used for deceleration only. When the throttle operating lever is moved to the half-throttle position, the accelerator-decelerator pedal can be used to accelerate by pressing on the toe end of pedal or can be used to decelerate by pressing on the heel end of pedal. This pedal should be used for decelerating when shifting gears.

B. Adjustment of Engine Shut-Off Control Linkage

If engine shut-off controls fail to operate properly, first be sure the linkage and levers are properly lubricated and the condition is not due to binding in linkage or to a broken spring. Adjust shut-off linkage as follows:

1. Pull engine shut-off knob to the "RUN" position. Check the pump fuel shut-off rod of fuel injection pump to see if rod is moved to rear as far as it will go.

2. If pump fuel shut-off rod is not pushed to its extreme rear position (as far as it will go), adjust the control linkage as necessary to obtain full travel of pump fuel shut-off rod.

C. Adjustment of Throttle Control Linkage

If throttle controls fail to operate properly, first be sure the linkage is properly lubricated and the condition is not due to binding or to a broken spring. Adjust throttle control linkage as follows:

1. Move throttle operating lever forward to the low idle position. Check the governor speed control lever (located on right side of governor) to determine if throttle control linkage moves the lever forward as far as it will go.

2. Pull throttle operating lever all the way back (high speed position) and make certain throttle linkage moves the governor speed control lever rearward as far as it will go; adjust control linkage as necessary to obtain full travel of the governor speed control lever.

3. The throttle assembly (to which throttle operating lever is attached) contains a friction band; the band is provided to hold the throttle operating lever in any desired speed position between low idle and high speed position. If throttle operating lever will not remain stationary when moved to desired position, adjustment of throttle assembly is necessary. Remove cotter pin from throttle assembly adjusting capscrew and turn the capscrew IN to increase or OUT to decrease the friction band tension as necessary. Install cotter pin in throttle assembly adjusting capscrew.

ENGINE CLUTCH AND CLUTCH BRAKE

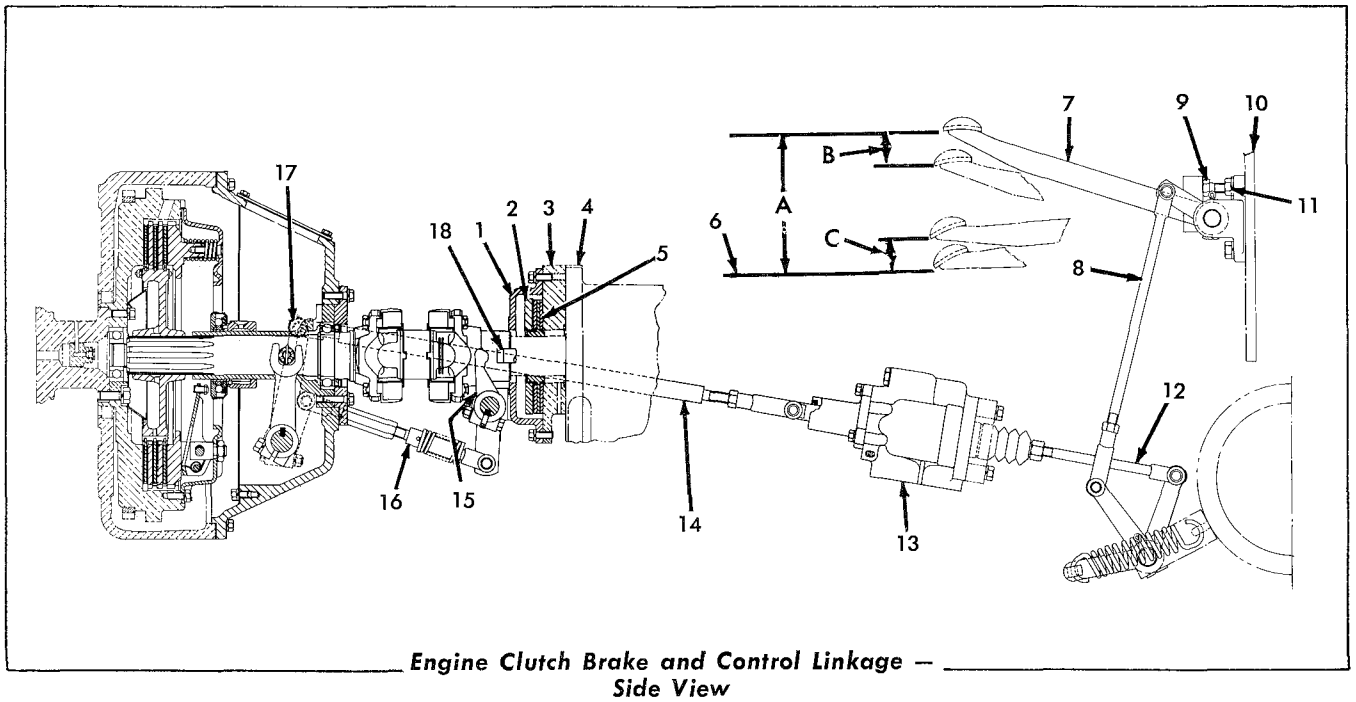
A. General

The engine clutch is a spring loaded, multiple disc, oil-type clutch with hydraulic power assist. No adjustment is necessary within the clutch housing unless the assembly is overhauled. There will be no appreciable wear on the clutch discs; however, as the clutch linkage wears it must be adjusted to maintain adequate free travel of the clutch pedal and clutch lever. This is necessary to assure full engagement of the clutch and to prevent clutch slippage. The control linkage is adjusted at the factory to provide 1/8" free travel of the front control rod (approximately 3/4" pedal free travel). NOTE: *Pedal should never have less than 3/4" free travel at any time.*

The clutch lever is adjusted properly when there is 5/16" free travel in the rear control rod.

The clutch brake control linkage is adjusted properly when the brake starts to apply with the clutch pedal 2 1/2" above the floor plate.

The transmission shifting collars and the sliding gear are locked in mesh by a locking mechanism consisting of a plunger attached to, and actuated by a lever located on the engine clutch shifting yoke shaft. The gears are locked in mesh when the engine clutch is fully engaged and cannot be shifted out of mesh until the engine clutch is disengaged.



Engine Clutch Brake and Control Linkage — Side View

FIG. 30

1. Cover
2. Brake Pressure Plate
3. Adapter
4. Transmission Case
5. Clutch Brake Disc
6. Floor Plate
   "A" Dim. — 7 1/2"
   "B" Dim. — 3/4" Free Travel
7. Clutch Pedal
8. Vertical Adjusting Rod
9. Clutch Pedal Stop Capscrew
10. Dash
11. Jam Nut
12. Front Control Rod
13. Power Booster
    "C" Dim. — 2 1/2" Clutch Brake Application Begins
14. Rear Control Rod
15. Clutch Brake Operating Yoke
16. Clutch Brake Control Rod
17. Clutch Lever
18. Brake Pressure Plate Studs

B. Operation of Clutch Brake

Pressing the clutch operating pedal part way down disengages the engine clutch; pressing pedal all the way down disengages the engine clutch and also applies the clutch brake (the last 2½" downward travel of pedal applies the clutch brake). To shift the transmission gears into desired speed range, where the engine has been idling with one or both of the transmission shift levers in neutral and with engine clutch engaged, press clutch operating pedal down far enough to disengage the clutch and to apply the clutch brake, then move transmission shift levers to desired speed range position. When shifting the transmission while grader is in motion, depress the accelerator-decelerator pedal to slow engine and, at the same time, press the clutch operating pedal down far enough to disengage the clutch and partially apply the clutch brake, then shift the transmission into the desired speed range; release the clutch pedal and accelerate engine to the desired speed.

C. Engine Clutch and Clutch Brake Control Linkage Adjustment

IMPORTANT: *Make certain engine is stopped when checking and adjusting engine clutch and clutch brake control linkage.*

1. Before attempting to adjust the linkage, turn the clutch pedal stop screw (Fig. 30) as necessary so that the clutch pedal is located 7½" above the floor plate. Tighten stop screw jam nut.

2. Adjust the front control rod and vertical control rod to obtain ⅛" free travel of the front control rod. NOTE: *Make certain pedal has no less than ¾" free travel.*

3. Adjust rear control rod to obtain 5/16" free movement of the clutch lever (Fig. 30, Item 17).

4. Push clutch pedal down to within 2½" above the floor plate (Fig. 30). Hold pedal in this position by wedging a piece of wood (of suitable length) between the upper side of pedal and power control box, or in any other manner.

5. Loosen jam nut on front end of the clutch brake control rod, located under the floor plate. Remove yoke pin from the brake control rod yoke, turn the yoke as necessary so that clutch brake operating yoke just contacts the brake pressure plate studs (Fig. 30) when the yoke is reconnected. Install the yoke pin and secure with a cotter pin.

6. After adjusting the clutch brake control linkage, check for proper operation of clutch brake as follows:

   a. Place the transmission shift levers in their neutral positions.

   b. Start engine and operate it at approximately ½ of full speed.

   c. While observing the clutch shaft universal joint, fully depress clutch pedal several times and observe operation of the clutch brake. The clutch brake should stop the rotation of clutch shaft universal joint before clutch pedal is depressed all the way to the floor plate, or during the last 2½" of downward travel of clutch pedal.

VALVE ADJUSTMENT AND CYLINDER HEADS

A. Valves

The correct clearance (lash) between 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 engine at operating temperature (160° F. minimum), the specified valve lash is .018" for both the intake and exhaust valves. After any mechanical work has been done which would disturb the valve lash, the intake and exhaust valves may be set "cold" at .020" clearance so that 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 lash should be checked for proper clearance. NOTE: *The firing order of the engine is 1 - 5 - 3 - 6 - 2 - 4.*

B. Procedure for Adjusting Valves

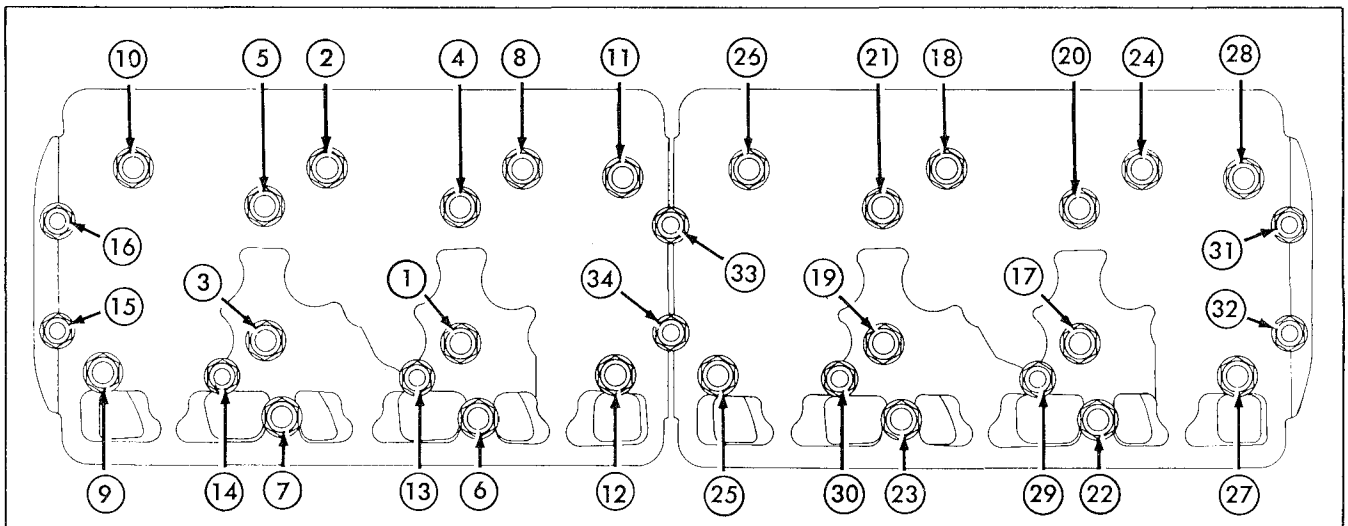
The valves must be adjusted when piston is near top dead center on its compression stroke and intake and exhaust valves closed. No. 1 and No. 6 pistons move up and down in their respective cylinders together and when one piston is on its compression stroke the other piston is on its exhaust stroke and vice versa. Observe valves of the No. 6 cylinder; when exhaust valve is nearly closed and intake valve starts to open, No. 6 piston is near top dead center on its exhaust stroke and No. 1 piston is in the same relative position on its compression stroke; therefore, both valves of No. 1 cylinder are fully closed and may be adjusted. The firing order of the engine is 1 - 5 - 3 - 6 - 2 - 4 and if this sequence is followed in adjusting valves, all valves can be adjusted in two complete revolutions of the crankshaft. Starting with valves on No. 1 cylinder, adjust valves in the following sequence:

1. Crank engine until No. 6 cylinder exhaust valve is nearly closed and intake valve starts to open, then adjust intake and exhaust valves of No. 1 cylinder.

2. Crank engine until No. 2 cylinder exhaust valve is nearly closed and intake valve starts to open, then adjust intake and exhaust valves of No. 5 cylinder.

3. Crank engine until No. 4 cylinder exhaust valve is nearly closed and intake valve starts to open, then adjust intake and exhaust valves on No. 3 cylinder.

4. Crank engine until No. 1 cylinder exhaust valve is nearly closed and intake valve starts to open, then adjust intake and ex-



Sequence of Tightening Cylinder Head Stud Nuts

FIG. 31

haust valves on No. 6 cylinder.

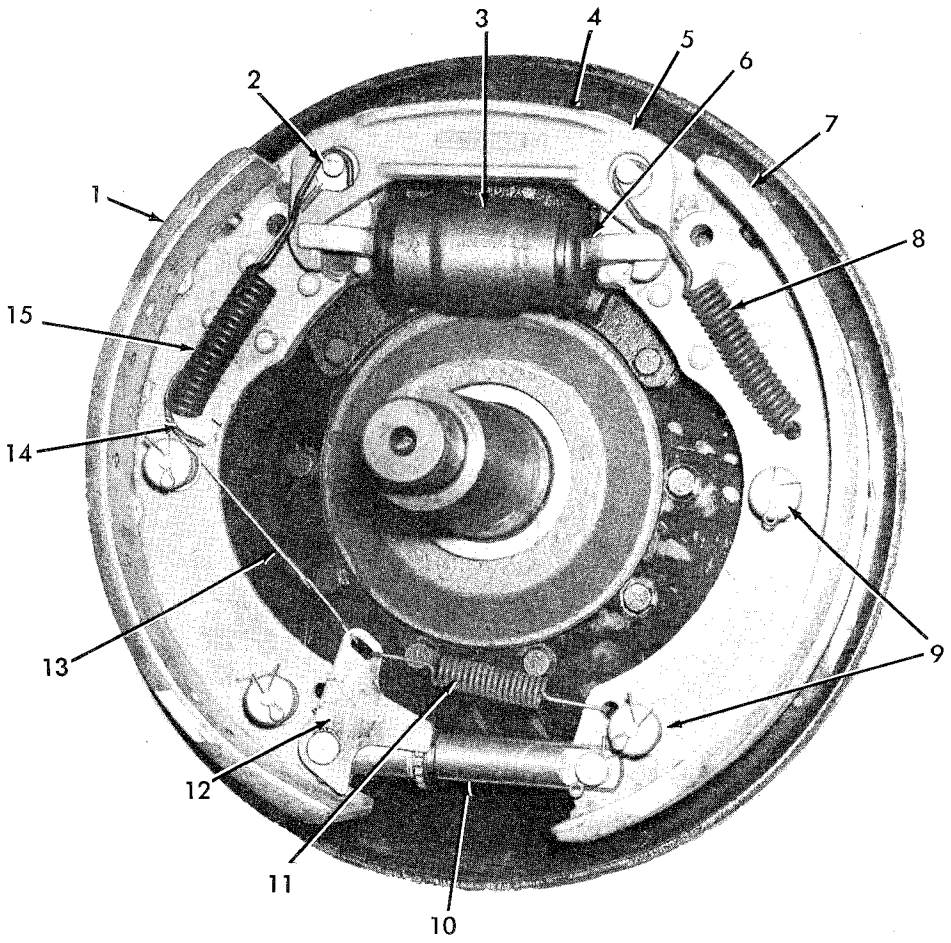
5. Crank engine until No. 5 exhaust valve is nearly closed and intake valve starts to open, then adjust intake and exhaust valves on No. 2 cylinder.

6. Crank engine until No. 3 exhaust valve is nearly closed and intake valve starts to open, then adjust intake and exhaust valves on No. 4 cylinder.

C. Cylinder Heads

If the cylinder heads are removed for any reason (as when necessary for making engine repairs) the cylinder head stud nuts must be tightened evenly following the sequence illustrated in Fig. 31. The specified torque for tightening the ½" nuts is 95 to 105 lbs. ft. and for the ⅝" nuts is 180 to 190 lbs. ft.

WHEEL BRAKES



Self-Adjusting Hydraulic Brakes

FIG. 32

1. Left Shoe Assembly*
2. Anchor Pin
3. Wheel Cylinder
4. Upper Shoe Retracting Spring
5. Guide Plate
6. Wheel Cylinder Link
7. Right Shoe Assembly*
8. Right Shoe Retracting Spring
9. Shoe Retainer Assembly
10. Adjusting Screw
11. Adjusting Lever Spring
12. Adjusting Lever
13. Adjusting Cable Assembly
14. Adjusting Cable Guide
15. Left Shoe Retracting Spring

*Determined when viewed from outer end of shaft.

A. General

The brakes are 4 wheel hydraulic with power assist, self-adjusting, self-energizing type and automatically adjust themselves when brakes are applied while the Grader is in reverse motion.

The level of the brake fluid in the reservoir of the brake master cylinder (Fig. 5, View J) should be maintained $\frac{1}{2}$" below the top of reservoir. Remove filler plug from top of brake master cylinder to check fluid level and to add fluid if necessary. CAUTION: *Thoroughly clean the filler plug and surrounding area before removing filler plug, to prevent entrance of dirt into fluid reservoir. It is important that the proper fluid level be maintained, as air will be pumped into brake system if fluid is not maintained at proper level. Air in system will result in a "spongy" brake action and will require "bleeding" the wheel cylinders and lines.*

B. Brake Pedal Linkage Adjustment

When the brakes are properly adjusted, the brake pedal should have $\frac{7}{16}$" to $\frac{5}{8}$" free travel before brake application pressure starts.

The linkage between the brake pedal arm and the brake master cylinder was properly adjusted at the factory and further adjustment is seldom required, unless excessive wear on the brake pedal shaft and linkage occurs. This wear can be prevented by periodic lubrication of these parts.

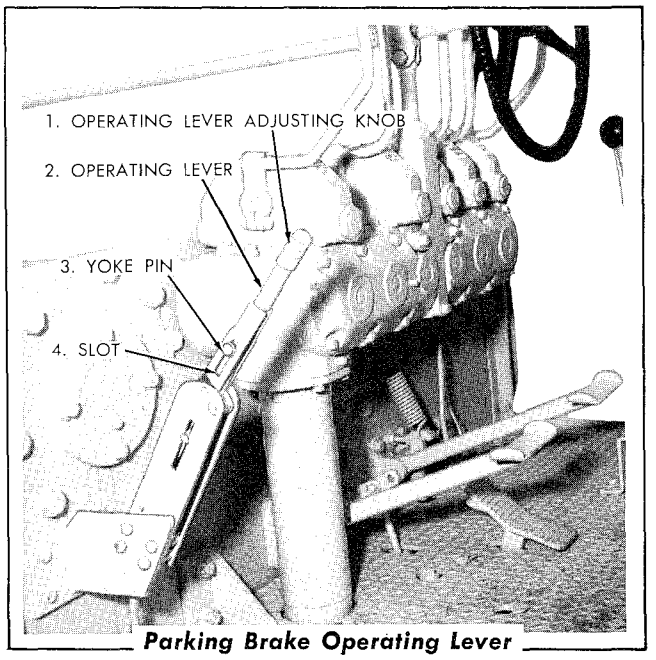
When necessary, the free travel of the pedal can be adjusted by shortening or lengthening the brake pedal control rod, extending from pedal arm to master cylinder. Lubricate the pedal shaft and arm if the pedal does not return sharply to the released position.

C. To Adjust the Brakes

Normal adjustment is accomplished automatically when the brakes are applied as the grader backs up.

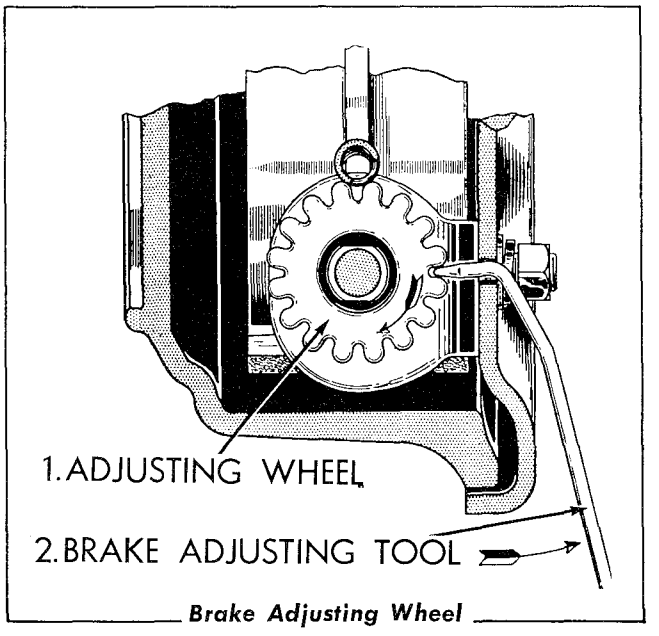
The brake lining wear must be checked at reasonable intervals, to prevent drum damage from the rivets exposed by worn linings.

PARKING BRAKE



Parking Brake Operating Lever

FIG. 33



Brake Adjusting Wheel

FIG. 34

A. General

The parking brake, located at front of transmission, should be adjusted so that when the parking brake operating lever is pulled back over center, the brake will be fully applied and will prevent grader from rolling. The adjustment must also allow for

the brake to be fully released when parking brake operating lever is all the way forward.

B. To Adjust the Parking Brake

When adjustment of parking brake is necessary due to normal wear, adjust parking brake operating lever by turning operating lever adjusting knob (Fig. 33) until a positive over center action of lever is obtained. When all of adjustment of operating lever adjusting knob has been used, yoke pin will be against stop at top of slot in operating lever (with brake lever in the released position). If this occurs, back the adjusting knob of the operating lever off until yoke pin is midway in the slot in operating lever. Remove brake adjusting hole access cover (Fig. 24, Item 8). Using a brake adjusting tool, turn the brake adjusting wheel (Fig. 33) until brake shoes are adjusted tight against brake drum, then back brake adjustment off 10 notches and adjust operating lever adjusting knob to a positive over center action.

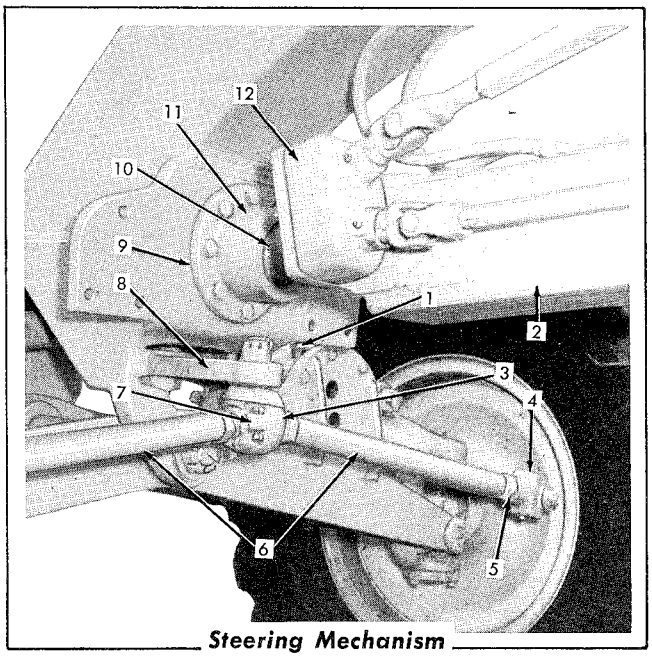
STEERING LINKAGE

A. General

Slack in the steering mechanism of the grader may be caused by play in the ball joint to which inner ends of drag links are connected or by loose bearings or worn parts in the steering mechanism.

B. Adjustment

Remove play in the ball joint and drag links by removing shims from between the ball joint caps. Since the ball may be worn slightly out of round, it is important that the wheels be turned their maximum (both ways) to make sure binding does not occur at any point due to removal of too many shims. Adjust any loose bearings and replace any worn parts as necessary.



Steering Mechanism

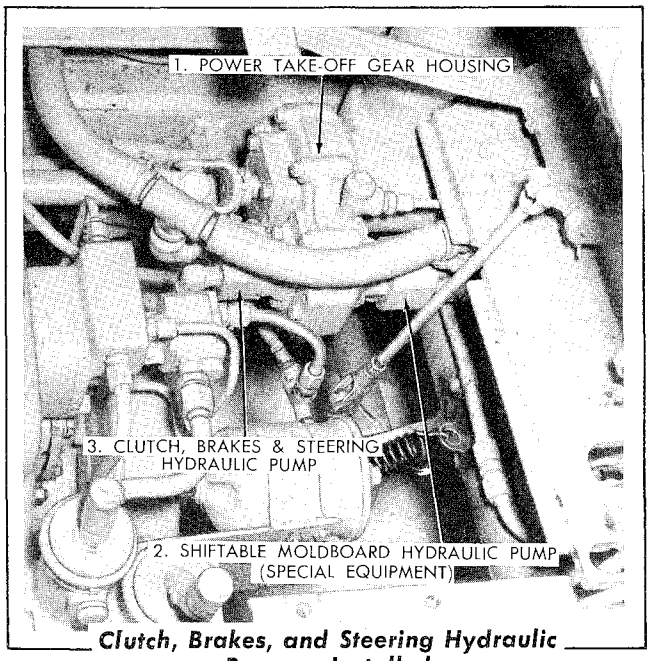
FIG. 35

1. Front Wheel Lean Gear Housing
2. Moldboard Drawbar
3. Shims
4. Swivel Joint
5. Jam Nut
6. Drag Links
7. Drag Link Ball Joint
8. Steering Arm
9. Shims
10. Drawbar Ball
11. Drawbar Ball Socket
12. Circle Turn Bevel Gear Housing

POWER ASSIST HYDRAULIC SYSTEM

A. GENERAL

A hydraulic system is used to provide a power assist when applying the brakes, disengaging the engine clutch, or steering the grader. The hydraulic system consists of a pump, driven by the power take-off gear train; two control valves (clutch and brakes); steering gear housing; oil reservoir; oil filter; and the necessary lines. NOTE: *On graders equipped with a shiftable moldboard (special equipment), a separate pump is provided to supply oil from the hydraulic system to the moldboard shift cylinder.* The pressure relief valve in each control valve is properly adjusted at the factory and readjustment in the field should not be necessary.



Clutch, Brakes, and Steering Hydraulic Pump — Installed

FIG. 36

B. SERVICE OF HYDRAULIC SYSTEM

1. Checking Oil Level

NOTE: *When checking oil level in reservoir on graders equipped with a shiftable moldboard, the moldboard must be centered under the main frame.* With the engine shut off, the oil level in reservoir must be maintained even with mark on oil level dip-stick (2½" from bottom of dip-stick).

If additional oil is necessary, refer to "LUBRICATION GUIDE" and add specified oil until oil level is even with mark on dip-stick. Inspect all lines and connections for leaks; correct any leaks found.

2. Replacing Oil Filter Element

The filter element, located inside the oil reservoir, must be replaced each time oil in reservoir is changed. Drain oil from reservoir and replace filter element as follows:

a. Remove filter cover (Fig. 4, View D) from oil reservoir.

b. Remove filter element and tank from oil reservoir. Thoroughly clean interior of tank.

c. Install tank with new filter element in oil reservoir.

d. Make certain filter element is properly seated on spring retaining washer, and using a new gasket, install filter cover.

e. Fill hydraulic system with specified oil (refer to "LUBRICATION GUIDE").

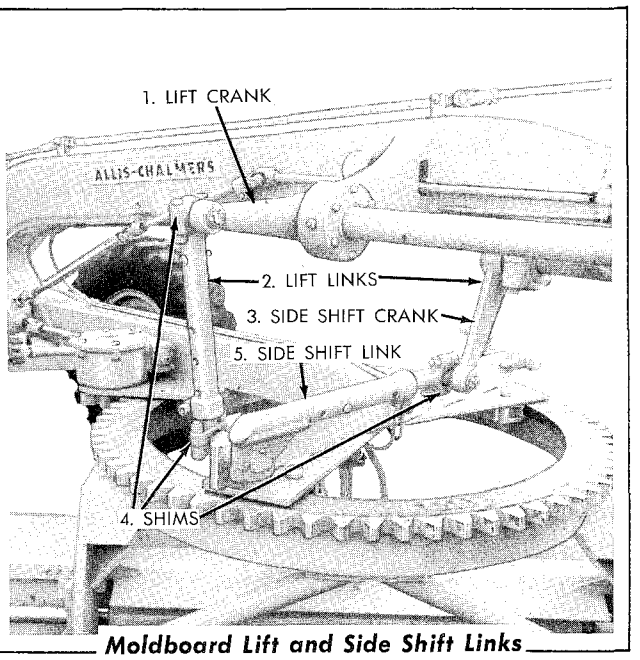
HYDRAULIC SHIFTABLE MOLDBOARD (SPECIAL EQUIPMENT)

On tractors equipped with a hydraulic shiftable moldboard, a hydraulic pump is mounted on the front side of the gear which drives the power assist hydraulic system oil pump (refer to Fig. 36). The pump draws oil from the power assist hydraulic system oil reservoir to actuate the moldboard shift cylinder. To shift moldboard to the right, push forward on moldboard side shift lever (Fig. 8, Item 2); to shift moldboard to the left, pull back on lever.

BALL AND SOCKET JOINT ADJUSTMENT

Shims are provided under the caps of the ball and socket joints on ends of the moldboard lift links and the moldboard side shift link. Looseness of these joints due to wear can be eliminated by removing the required number of shims. Always remove an equal amount of shims from each side of joint; do not remove too many as this would cause binding in the joint.

Looseness due to wear on the moldboard drawbar ball and socket, at front end of the moldboard drawbar, can be eliminated in the same manner by removing shims from under the ball socket (Fig. 35).



Moldboard Lift and Side Shift Links

FIG. 37

CIRCLE GUIDE ADJUSTMENT

A. General

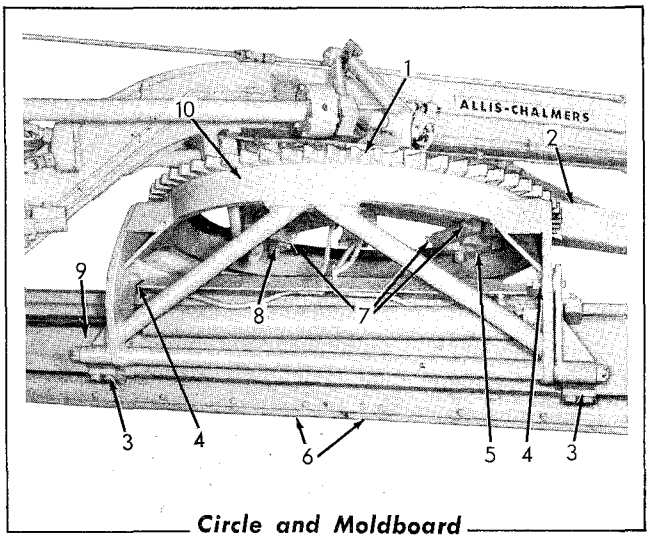
A maximum clearance of 1/16" must be maintained between the face of moldboard circle and the circle guide wear plates. A maximum clearance of 1/32" must be maintained between the rear guides and inner circumference of the circle. Shims and adjusting screws (Fig. 38) are provided for adjustment when clearance becomes excessive through normal wear.

B. Vertical Adjustment

Eliminate excessive play between the face of the moldboard circle and wear plates by removing shims as necessary from between the wear plates and circle guides (Fig. 38); each adjusting shim is 1/32" thick. When adjusting, make the adjustment on one guide at a time. Tighten the guide attaching bolts and rotate the circle a full 360° after the removal of any shims to make certain there is not more than 1/16" circle face-to-guide clearance at any point on the circle.

C. Horizontal Adjustment

After the vertical adjustment of the moldboard



Circle and Moldboard

FIG. 38

1. Shims
2. Moldboard Drawbar
3. Moldboard Slide Brackets
4. Moldboard Pitch Adjustment Bolts
5. Front Guide
6. Moldboard Cutting Edges
7. Guide Adjusting Screws
8. Rear Guide
9. Moldboard
10. Moldboard Circle

circle has been made, loosen lock nuts on the guide adjusting screws of front and rear guides (Fig. 38). Loosen guide adjusting screws of the rear guides and loosen the nuts on all the guide attaching capscrews. Tighten adjusting screws on front guide to obtain 1/32" to 1/16" backlash between circle turn gear and circle pinion. Rotate the circle a full 360° to be sure no bind occurs at any point.

After the front guide has been properly adjusted, adjust rear guides by use of adjusting screws to provide a maximum 1/32" clearance between inner circumference of circle and each of the rear guides. Tighten nuts on all guide attaching capscrews and lock nuts on guide adjusting screws. Make certain there is 1/32" to 1/16" backlash between circle turn gear and circle pinion after all nuts are tightened.

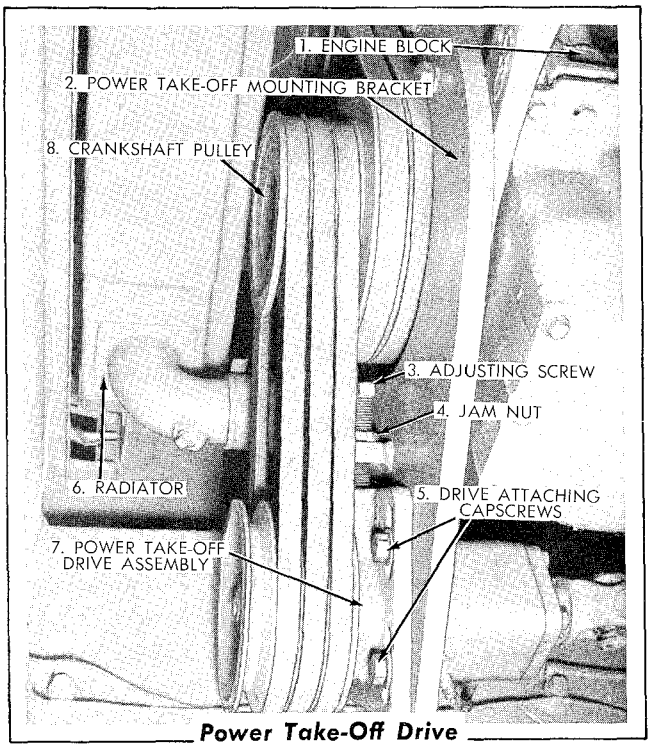
POWER TAKE-OFF DRIVE BELT ADJUSTMENT

A. General

The power take-off drive belts are properly adjusted when one side of the belts can be pressed inward (by hand) approximately 1/2" at a point half-way between the crankshaft and power take-off drive pulleys.

B. Adjustment

To adjust drive belts, loosen the four capscrews attaching power take-off drive assembly to the mounting bracket, then loosen jam nut on the adjusting screw and turn adjusting screw IN to tighten or OUT to loosen the belts as necessary, until proper adjustment is obtained. Tighten jam nut and the four attaching capscrews.



Power Take-Off Drive

FIG. 39

POWER CONTROL BOX

A. General

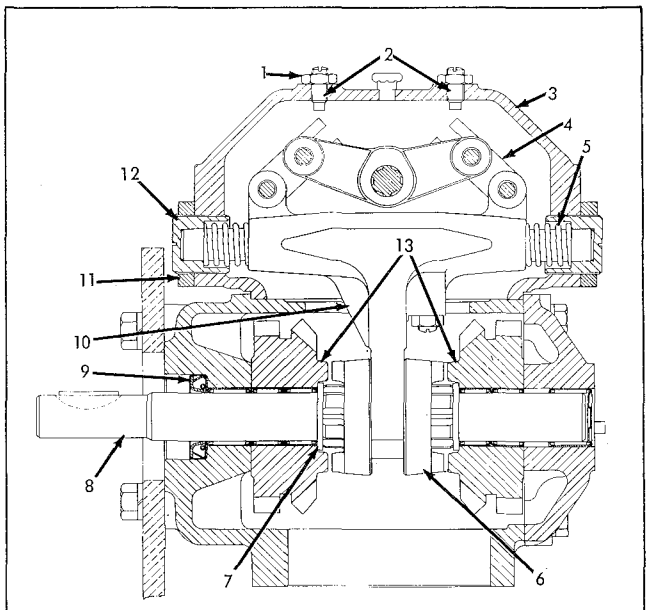
The power control box encloses the clutch gears, shafts, and sliding jaw clutches which are provided to drive and to control the front wheel lean, moldboard lift, circle turn, side shift, and the scarifier worm gear assemblies.

The input shaft of the power control box is driven through gears in the power take-off drive assembly; the power take-off drive assembly is driven by the belt driven power take-off shaft assembly, located at the left side of engine.

The six operating control levers of the power control box assembly are connected by toggle-type linkage to shifting forks which engage and disengage the sliding jaw clutches with their corresponding clutch gears.

Two shifting fork centering screws (with springs) are installed in each control lever housing (as shown in Fig. 40), to hold the shifting forks and control levers in their neutral positions.

A brake assembly is provided on each driving shaft (Fig. 7, View S) of the power control box to prevent driving shafts from turning while control levers are in their neutral positions.



Power Control Box — Sectional View

FIG. 40

1. Jam Nut
2. Shifting Lever Stop Screws
3. Housing
4. Shifting Lever Link
5. Spring
6. Sliding Jaw Clutch
7. Washer
8. Driving Shaft
9. Oil Seal
10. Shifting Fork
11. Jam Nut
12. Shifting Fork Centering Screw
13. Clutch Gears

B. Adjustment of Control Lever Linkage and Plungers

The control lever linkage and shifting fork centering screws are adjusted for proper operation at the factory and further adjustment should not be required for a period of time. However, as wear occurs on the jaws of the sliding clutches and clutch gears, an adjustment of the control linkage must be made. There are two shifting lever stop screws with jam nuts provided in the top of each lever housing. The stop screws are provided for the purpose of adjusting the control lever for the proper amount of disengaging force (tendency of control lever to return to neutral) noted when control lever is held in the engaged position during operation under normal load. Also, the two shifting fork centering screws must be properly adjusted so that they center the control lever and shifting fork in the neutral position when the control lever is not in use; this prevents the jaws of the sliding clutches from contacting the jaws of the clutch gears.

Adjust each of the controls for proper operation as follows:

1. Loosen the two jam nuts on shifting fork centering screws and back the screws out several turns.

2. Loosen the jam nut on each shifting lever stop screw, located in top of lever housing.

3. While pushing the control lever forward as far as it will go, back out the REAR stop screw until forward movement of control lever ceases.

4. While pulling the control lever rearward as far as it will go, back out the FRONT stop screw until rearward movement of control lever ceases.

5. Start engine and run at approximately ¼ throttle.

6. Pull the control lever rearward as far as it will go and while control is in operation under normal load (such as lifting the moldboard or turning the circle with moldboard raised off the ground), turn the FRONT stop screw in until a slight increase in hand pressure is required to hold control lever in the engaged position, then return control lever to neutral and stop the engine. Hold stop screw from turning and tighten the jam nut.

7. Start engine and run at approximately ¼ throttle.

8. Push the control lever forward as far as it will go and while control is in operation under normal load (such as lowering the moldboard to the ground or turning the circle with moldboard raised off the ground), turn the REAR stop screw in until a slight

increase in hand pressure is required to hold control lever in the engaged position, then return control lever to neutral and stop the engine. Hold stop screw from turning and tighten the jam nut. CAUTION: *At no time should a stop screw be backed out and locked in the position sufficient to eliminate the tendency of control lever to return to its neutral position when operating under normal load.*

9. With engine running at low idle speed, hold control lever in neutral position (keyway of shifting lever shaft straight up), turn the front centering screw in until knob of control lever is moved rearward approximately $\frac{1}{8}$", then tighten the jam nut. Turn the rear centering screw in until knob of control lever is moved forward to neutral position (straight up) and tighten the jam nut; this centers the control lever in neutral position, thus preventing jaws of sliding clutch from contacting jaws of clutch gears.

   NOTE: *If it is found that excessive hand pressure is required to hold the control lever in the engaged position (when operating under load) after the controls have been adjusted as described above, the stop screw(s) may be backed out slightly for ease of operation (refer to CAUTION under Step 8, above).*

C. Driving Shaft Brake Adjustment

The driving shaft brakes (Fig. 7, View S) are properly adjusted when they are tight enough to prevent driving shafts of control box from turning when control levers are in their neutral position, but not tight enough to cause a heavy drag on driving shafts when controls are used. Tighten or loosen the brake adjusting bolts as necessary to increase or decrease spring pressure on the brakes.

The brakes for the circle lift driving shafts are spring loaded and enclosed in a housing (Fig. 7, View S). These brakes are set at the factory and no further adjustment should be necessary.

TIRES

Keep tires free of oil and grease. Proper inflation and immediate repair of cuts will materially prolong life of the tires. The recommended inflation pressures for the various tire sizes that may be used on the grader are as follows:

Tire Size	Ply Rating	Recommended Inflation Pressure
9:00–24	10	50 P.S.I.
13:00–24	8	25 P.S.I.
13:00–24	10	30 P.S.I.
13:00–24	12	35 P.S.I.
14:00–24	8	25 P.S.I.
14:00–24	10	30 P.S.I.
14:00–24	12	35 P.S.I.

Calcium chloride solution may be added in the four rear tires of the grader to gain additional weight if desired. This liquid ballast affords increased traction and tends to stabilize the grader. The grader may be ordered from the factory with the solution in the tires as special equipment or the solution may be added by most tire companies. The tires are equipped with the proper valves for insertion of solution.

When the grader is ordered from the factory with the solution added, each rear tire contains a total of approximately 450 pounds of 27% calcium chloride solution. The solution will form a slush at approximately 20° F. but the tires will be comparatively safe for operation until slush freezes and becomes a solid mass which will not move inside the tires.

Ordinarily, high inflation pressures do not develop as the result of slush forming inside the tires and it is safe to operate the grader until complete freezing has been effected. The operation of the tires tends to warm up the solution and raise the temperature inside the tires, even though much lower outside temperature prevails.

To replace a valve core when tires contain this solution, turn the wheel so that valve is at top and raise the end of the tandem case to take weight

off wheel before removing the valve core; this will prevent loss of the liquid solution.

CAUTION: *Ordinary tire gages may be damaged by action of the liquid solution in the tires. Always use a tire inflation gage which has a "pump-out" feature; this permits flushing and oiling of gage to keep gage in good condition when testing liquid ballast tires.*

SPECIAL EQUIPMENT

Special equipment is the term used to designate equipment that is not included on standard grader but which may be ordered at additional cost and either installed at the factory when purchasing the grader or installed in the field. Consult your nearest "Allis-Chalmers" Construction Machinery Dealer concerning the following special equipment items:

Scarifier	Engine Primer
Cab	Front Pull Hook
Cab Heater	10 ft. Moldboard
Defroster Fan	Heavy-Duty Filter Group
Windshield Wiper	Engine Air Heater
Odometer	Hood Side Plates
Rear Flood Light	Hour Meter
Special Tire Equipment	Exhaust Deflector and Rainshield
Hydraulic Shiftable Moldboard	Exhaust Rain Cap
	Calcium Chloride Group
Power Tire Pump	Special Painting
Moldboard Extensions	Headlights
Rock Bits	14 ft. Moldboard

PREPARATION OF GRADER FOR STORAGE

If grader is to be stored during the winter or slack seasons, make a complete inspection of grader for loose, worn, or damaged parts and make the necessary repairs before grader is stored. Drain the engine crankcase and all other oil compartments and refill them with new oil. To protect the fuel injection system, drain the fuel tank, then pour about 10 gallons of a mixture of 40% mineral oil and 60% of the best grade kerosene in the fuel tank and run engine for 15 minutes to circulate the mixture through fuel system. This will leave fuel system filled with the mixture and will prevent corrosion or gumming of the working parts. Major oil companies can supply this storage fuel mixture. After grader is stored, fill the fuel tank with specified "Diesel" fuel to minimize condensation in tank.

NOTE: *This storage mixture need not be drained when the grader is again placed in service.*

Remove the 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 1.220. Keep specific gravity of electrolyte above 1.220 to prevent batteries from freezing.

Drain the engine cooling system or fill with an anti-freeze solution that will withstand the lowest anticipated temperature. Block up under the axles to take weight of grader off the tires. Coat the moldboard with heavy grease to prevent rusting. Cover the exhaust pipe.